DEVELOPMENT PLAN REVIEW – VTPM 38811-2
PARCEL 1 – SITE 1
CITY OF PERRIS
RIVERSIDE COUNTY, CALIFORNIA

Drainage Study Report

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SECTION 1 - GENERAL OVERVIEW

INTRODUCTION

The purpose of this study is to support the entitlement phase and determine minimum drainage improvements required for the proposed industrial development of approximately 59.7 acres and 323,000 square feet warehouse building with 168 truck docks, and parking lot that lays within the Harvest Landing Specific Plan, located in the City of Perris, County of Riverside CA. More specifically, the project site is bounded to the north by Orange Avenue, the vacated Indian Avenue to the west, vacant land to the south and Barrett Avenue to the east.

The primary objectives of this report are as follows:

1. Delineate the drainage areas tributary to the onsite above/underground basin

2. Based on drainage patterns, ground slope, land use and soil type and using the Riverside County Rational Method, perform hydrologic and hydraulics of onsite drainage facilities.

3. Determine the 100-year peak storm flows based upon the pre-project, proposed land use per the MDP and post-project condition for the 24-hour storm duration utilizing the Unit Hydrograph Method as outlined in the Riverside County Flood Control & Water Conservation District Hydrology Manual.

4. Determine the required underground detention facilities to mitigate the 100-year peak storm flows for the 24-hour storm duration in the post-project condition to flows less than or equal to the proposed land use condition flow rates.

5. Determine the required the minimum storm drain infrastructure to flood protect the project site for the 100-year storm event.

6. Preparation of a hydrology report, which consist of hydrological and analytical results and exhibits.

BACKGROUND

EXISTING CONDITIONS

The project site is located within Riverside County Flood Control's Perris Valley Master Drainage Plan, and tributary to a low point in Perris Boulevard and the existing MDP Line "K" (earthen V-Channel) located about 2600 lineal feet east of Indian Avenue.

The site is in a relatively mild to flat sloping undeveloped terrain on a drainage area which drains easterly towards Barrett Avenue with no offsite flows. All the developed storm flows continue to travel easterly through the property, to Barrett Avenue and the vacant parcels to the east where it ultimately reaches a low point at Perris Boulevard; storm drain flows are intercepted by existing street inlets and the existing MDP Line "K". MDP Line "K" is an earthen "V" channel (w= 16', H=8' & z=1:1) and planned as a future Trapezoidal Channel (b=6', d=8').

DEVELOPED CONDITIONS

The preliminary offsite design is shown on Exhibit F "Harvest Landing Industrial Phase 1 Offsite Master Storm Drain & Low Flow System". The offsite master storm drain system (backbone) will be part of a separate report and therefore excluded. The onsite storm water runoff will be collected and treated using proprietary devices in order accommodate the water quality component of mitigation. The onsite storm water runoff will be conveyed to an underground chamber system to mitigate the increased storm runoff to be at or below the current MDP land use condition flow. See the table below for the rational method results:

Description	**Q100 Peak Flow Rates**		
Watershed Area	**A**	B	**A+B**
Proposed	75.2	69.1	136.6
Existing	43.9	41.4	85.3
Onsite MDP	49.6	47.0	96.6

For purposes of this preliminary drainage report, the 100-year 24-hour peak flow rates for the post developed condition, predeveloped condition and proposed developed condition per the land use on the MDP were the only storm events analyzed for mitigation. The project storm mitigation is provided by utilizing the underground storm drain detention system and the outlet control structures. The total mitigation volume required was determined by selecting the flow rates from the recess limb of the proposed unit hydrograph runs for the 100-year 24-hour storm event that are equal or less than the flow rates from the proposed land use conditions. Smaller storm events were analyzed in this, however, since the storm volume demand to mitigate the storm flows from the 100-year 24hour event are considerably larger than volumes produced by the smaller storm events, thus a conservative approach.

MDP Condition Watershed A Volume: 5.51 ac-ft; $Q_{100\text{-}24hr}$: 10.92 cfs
Proposed Condition Watershed A Volume: 6.47 ac-ft; $Q_{100\text{-}24hr}$: 18.28 cfs
Underground Chamber Watershed A Volume: *7.06 ac-ft

MDP Condition Watershed B Volume: 4.21 ac-ft; $Q_{100\text{-}24hr}$: 13.69 cfs
Proposed Condition Watershed B Volume: 6.46 ac-ft; $Q_{100\text{-}24hr}$: 17.81 cfs
Underground Chamber Watershed B Volume: *6.80 ac-ft

*For watershed "A" since this volume is greater than 6.67 ac-ft the underground chambers have enough storage to mitigate peak storm flows to the proposed land use levels. Similarly for watershed "B" since the volume provided by the underground chambers exceeds 6.75 ac-ft, there is enough storage to mitigate peak storm flows to the proposed land use levels. See the table on the following page for the unit hydrograph results:

Watershed A

Storm Duration	SP Q_{peak}	SP V_{TOTAL}	MDP Q_{PEAK}	MDP V_{TOTAL}
1	76.65	2.6604	75.64	1.9036
3	48.99	4.1488	46.44	2.9443
6	42.57	5.25	38.93	4.2237
24	18.28	9.956	15.58	7.5103
Acreage	32.84		33.45	

Watershed B

Storm Duration	SP Q_{peak}	SP V_{TOTAL}	MDP Q_{PEAK}	MDP V_{TOTAL}
1	71.90	2.5642	65.26	2.1434
3	45.93	3.354	40.29	3.0817
6	38.00	4.7612	32.71	3.736
24	17.81	10.036	13.69	6.6471
Acreage	30.51		29.54	

METHODOLOGY

HYDROLOGY

Hydrologic calculations were performed using the Riverside County Rational Method from RCFCD & WCD Hydrology Manual, dated April 1978. The 100-year design discharge was computed by generating a hydrologic "link-node" model in which divides the area into drainage sub-areas, each tributary to a concentration point or hydrologic "node" point determined by the proposed layout. The computer results are included in section 2. The following assumptions/guidelines were applied for use of the Rational Method:

1. The map from the Riverside County Hydrology Manual indicates that the study area is primarily Group "B" and "C" soils, with a small area as "A". A USGS soils map for the project site is included as Exhibit D, under the Exhibit section.
2. Initial sub-areas were drawn to be less than 10-acres in size and less than 1,000 feet in length, per County guidelines. Time of concentration for the initial sub-area is based on Time of Concentration Nomograph for Initial Sub-area from the Hydrology Manual.
3. Antecedent Moisture Condition 2 was used for 100-year storm events.
4. Standard intensity-duration curve data for the project area was used for the Perris Valley area; Plate D-4.1.

HYDRAULICS

Civil Design hydrology module was used for preliminarily sizing the storm drainpipe system. The onsite storm drain infrastructure will consist of pipe sizes ranging from 12"-48" in diameter. A more detail analysis will be provided in subsequent submittals and a WSPG analysis for onsite storm drainpipe system will be performed during final engineering.

CONCLUSIONS & RECOMMENDATIONS

The hydrology analyses evaluated the proposed development to determine the necessary onsite drainage improvements required to mitigate flows for increased runoff and it has been concluded that:

1. The proposed drainage facilities will adequately convey the 100-year flows and provide flood protection to the project site.
2. The proposed underground pipe chamber system will have sufficient storage to adequately mitigate for increased runoff.

SECTION 2 - HYDROLOGY ANALYSIS

100-YEAR EXISTING ON-SITE HYDROLOGY WATERSHED A (RATIONAL METHOD)

100-YEAR EXISTING ON-SITE HYDROLOGY WATERSHED B (RATIONAL METHOD)

100-YEAR PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED A (RATIONAL METHOD)

100-YEAR PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED B (RATIONAL METHOD)

100-YEAR PROPOSED ON-SITE HYDROLOGY WATERSHED A (RATIONAL METHOD)

100-YEAR PROPOSED ON-SITE HYDROLOGY WATERSHED B (RATIONAL METHOD)

100-YEAR PROPOSED ON-SITE HYDROLOGY WATERSHED A + B (RATIONAL METHOD)

100-YEAR-24 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

100-YEAR-24 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

100-YEAR-24 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

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100-YEAR-6 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

100-YEAR-6 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

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100-YEAR-3 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

100-YEAR-3 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

100-YEAR-3 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/01/24 File:qa100site1.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
EXISTING CONDITION - WATERSHED A
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

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Process from Point/Station 10.000 to Point/Station 10.100
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 806.000(Ft.)
Top (of initial area) elevation = 1457.000(Ft.)
Bottom (of initial area) elevation = 1451.000(Ft.)
Difference in elevation = 6.000(Ft.)

```
Slope =    0.00744  s(percent)=       0.74
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   20.533 min.
Rainfall intensity =      1.894(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.781
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.480
Decimal fraction soil group C = 0.520
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  82.16
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     13.382(CFS)
Total initial stream area =        9.050(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station       10.100 to Point/Station       12.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     26.506(CFS)
Depth of flow =   0.416(Ft.), Average velocity =   1.532(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.00
      2            100.00              0.00
      3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     26.507(CFS)
  '     '    flow top width =     83.201(Ft.)
  '     '    velocity=    1.532(Ft/s)
  '     '    area =     17.306(Sq.Ft)
  '     '    Froude number =     0.592

Upstream point elevation =  1451.000(Ft.)
Downstream point elevation =  1447.400(Ft.)
Flow length =   464.000(Ft.)
Travel time  =    5.05 min.
Time of concentration =   25.58 min.
Depth of flow =   0.416(Ft.)
Average velocity =   1.532(Ft/s)
Total irregular channel flow =    26.506(CFS)
Irregular channel normal depth above invert elev. =   0.416(Ft.)
Average velocity of channel(s) =   1.532(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.758
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.660
Decimal fraction soil group C = 0.340
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  80.72
Pervious area fraction =  1.000; Impervious fraction =  0.000
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Rainfall intensity =      1.701(In/Hr) for a   100.0 year storm
Subarea runoff =     26.184(CFS) for     20.310(Ac.)
Total runoff =     39.566(CFS)      Total area =      29.360(Ac.)
Depth of flow =   0.483(Ft.), Average velocity =   1.693(Ft/s)


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Process from Point/Station       10.100 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     29.360(Ac.)
Runoff from this stream =     39.566(CFS)
Time of concentration =   25.58 min.
Rainfall intensity =     1.701(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       11.000 to Point/Station       11.100
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   627.000(Ft.)
Top (of initial area) elevation =  1461.500(Ft.)
Bottom (of initial area) elevation =  1454.000(Ft.)
Difference in elevation =     7.500(Ft.)
Slope =    0.01196  s(percent)=       1.20
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.890 min.
Rainfall intensity =      2.084(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.815
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  86.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      0.748(CFS)
Total initial stream area =        0.440(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station       11.100 to Point/Station       12.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.936(CFS)
Depth of flow =   0.180(Ft.), Average velocity =   0.906(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.00
      2            100.00              0.00
      3            200.00              1.00
```

```
Manning's 'N' friction factor =   0.030
-----------------------------------------------------------------
Sub-Channel flow  =      2.936(CFS)
  '     '    flow top width =     36.007(Ft.)
  '     '    velocity=    0.906(Ft/s)
  '     '    area =      3.241(Sq.Ft)
  '     '    Froude number =     0.532

Upstream point elevation =  1454.000(Ft.)
Downstream point elevation =  1448.000(Ft.)
Flow length =   724.000(Ft.)
Travel time  =   13.32 min.
Time of concentration =   30.21 min.
Depth of flow =   0.180(Ft.)
Average velocity =   0.906(Ft/s)
Total irregular channel flow =     2.936(CFS)
Irregular channel normal depth above invert elev. =   0.180(Ft.)
Average velocity of channel(s) =   0.906(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.753
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.590
Decimal fraction soil group C = 0.410
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  81.28
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.568(In/Hr) for a   100.0 year storm
Subarea runoff =      4.306(CFS) for      3.650(Ac.)
Total runoff =      5.053(CFS)      Total area =       4.090(Ac.)
Depth of flow =   0.221(Ft.), Average velocity =   1.037(Ft/s)


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Process from Point/Station       11.100 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
_________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.090(Ac.)
Runoff from this stream =      5.053(CFS)
Time of concentration =   30.21 min.
Rainfall intensity =     1.568(In/Hr)
Summary of stream data:

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


1       39.566     25.58               1.701
2        5.053     30.21               1.568
Largest stream flow has longer or shorter time of concentration
Qp =     39.566 + sum of
        Qa          Tb/Ta
         5.053 *    0.847 =      4.279
Qp =     43.845
```

```
Total of 2 main streams to confluence:
Flow rates before confluence point:
      39.566       5.053
Area of streams before confluence:
       29.360        4.090


Results of confluence:
Total flow rate =     43.845(CFS)
Time of concentration =    25.582 min.
Effective stream area after confluence  =     33.450(Ac.)
End of computations, total study area =           33.45 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number =  81.2
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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/01/24 File:q100bsite1.out

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English (in-lb) Units used in input data file

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Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

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Process from Point/Station 20.000 to Point/Station 20.100
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 951.000(Ft.)
Top (of initial area) elevation = 1464.700(Ft.)
Bottom (of initial area) elevation = 1450.000(Ft.)
Difference in elevation = 14.700(Ft.)
Slope = 0.01546 s(percent)= 1.55

```
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   18.955 min.
Rainfall intensity =      1.970(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.765
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.840
Decimal fraction soil group C = 0.160
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.28
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     10.936(CFS)
Total initial stream area =        7.260(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.100 to Point/Station       23.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     26.163(CFS)
Depth of flow =   0.432(Ft.), Average velocity =   1.405(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.00
      2            100.00              0.00
      3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     26.163(CFS)
  '     '    flow top width =     86.301(Ft.)
  '     '    velocity=    1.405(Ft/s)
  '     '    area =     18.620(Sq.Ft)
  '     '    Froude number =     0.533

Upstream point elevation =  1450.000(Ft.)
Downstream point elevation =  1447.500(Ft.)
Flow length =   402.000(Ft.)
Travel time  =    4.77 min.
Time of concentration =   23.72 min.
Depth of flow =   0.432(Ft.)
Average velocity =   1.405(Ft/s)
Total irregular channel flow =    26.163(CFS)
Irregular channel normal depth above invert elev. =   0.432(Ft.)
Average velocity of channel(s) =   1.405(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.773
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.480
Decimal fraction soil group C = 0.520
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  82.16
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.765(In/Hr) for a   100.0 year storm
```

Subarea runoff = 30.399(CFS) for 22.280(Ac.)
Total runoff = 41.335(CFS) Total area = 29.540(Ac.)
Depth of flow = 0.512(Ft.), Average velocity = 1.575(Ft/s)
End of computations, total study area = 29.54 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 81.5

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/01/24 File:qa100site1.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION - WATERSHED A
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 10.100
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 806.000(Ft.)
Top (of initial area) elevation = 1457.000(Ft.)
Bottom (of initial area) elevation = 1451.000(Ft.)
Difference in elevation = 6.000(Ft.)
Slope = 0.00744 s(percent)= 0.74

```
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.109 min.
Rainfall intensity =      2.201(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.781
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.480
Decimal fraction soil group C = 0.520
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  62.76
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =     15.560(CFS)
Total initial stream area =        9.050(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.100 to Point/Station       12.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     30.403(CFS)
Depth of flow =   0.438(Ft.), Average velocity =   1.585(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.00
      2            100.00              0.00
      3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     30.403(CFS)
  '     '    flow top width =     87.592(Ft.)
  '     '    velocity=    1.585(Ft/s)
  '     '    area =     19.181(Sq.Ft)
  '     '    Froude number =     0.597

Upstream point elevation =  1451.000(Ft.)
Downstream point elevation =  1447.400(Ft.)
Flow length =   464.000(Ft.)
Travel time  =    4.88 min.
Time of concentration =   19.99 min.
Depth of flow =   0.438(Ft.)
Average velocity =   1.585(Ft/s)
Total irregular channel flow =    30.403(CFS)
Irregular channel normal depth above invert elev. =   0.438(Ft.)
Average velocity of channel(s) =   1.585(Ft/s)
 Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.759
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.660
Decimal fraction soil group C = 0.340
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  60.42
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      1.919(In/Hr) for a   100.0 year storm
```

```
Subarea runoff =     29.596(CFS) for     20.310(Ac.)
Total runoff =     45.156(CFS)      Total area =      29.360(Ac.)
Depth of flow =   0.508(Ft.), Average velocity =   1.750(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.100 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     29.360(Ac.)
Runoff from this stream =     45.156(CFS)
Time of concentration =   19.99 min.
Rainfall intensity =     1.919(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       11.100
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   627.000(Ft.)
Top (of initial area) elevation =  1461.500(Ft.)
Bottom (of initial area) elevation =  1454.000(Ft.)
Difference in elevation =     7.500(Ft.)
Slope =    0.01196  s(percent)=       1.20
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.428 min.
Rainfall intensity =      2.422(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.811
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      0.864(CFS)
Total initial stream area =        0.440(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.100 to Point/Station       12.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      3.251(CFS)
Depth of flow =   0.187(Ft.), Average velocity =   0.929(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.00
      2            100.00              0.00
      3            200.00              1.00
Manning's 'N' friction factor =   0.030
```

```
----------------------------------------------------------------------
Sub-Channel flow  =      3.251(CFS)
  '     '    flow top width =     37.411(Ft.)
  '     '    velocity=    0.929(Ft/s)
  '     '    area =      3.499(Sq.Ft)
  '     '    Froude number =     0.535

Upstream point elevation =  1454.000(Ft.)
Downstream point elevation =  1448.000(Ft.)
Flow length =   724.000(Ft.)
Travel time  =   12.99 min.
Time of concentration =   25.42 min.
Depth of flow =   0.187(Ft.)
Average velocity =   0.929(Ft/s)
Total irregular channel flow =     3.251(CFS)
Irregular channel normal depth above invert elev. =   0.187(Ft.)
Average velocity of channel(s) =   0.929(Ft/s)
 Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.751
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.590
Decimal fraction soil group C = 0.410
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  61.33
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      1.706(In/Hr) for a   100.0 year storm
Subarea runoff =      4.680(CFS) for      3.650(Ac.)
Total runoff =      5.544(CFS)      Total area =       4.090(Ac.)
Depth of flow =   0.229(Ft.), Average velocity =   1.062(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.100 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.090(Ac.)
Runoff from this stream =      5.544(CFS)
Time of concentration =   25.42 min.
Rainfall intensity =     1.706(In/Hr)
Summary of stream data:

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


1       45.156     19.99               1.919
2        5.544     25.42               1.706
Largest stream flow has longer or shorter time of concentration
Qp =     45.156 + sum of
        Qa          Tb/Ta
         5.544 *    0.786 =      4.360
Qp =     49.516

Total of 2 main streams to confluence:
```

```
Flow rates before confluence point:
      45.156       5.544
Area of streams before confluence:
       29.360        4.090


Results of confluence:
Total flow rate =     49.516(CFS)
Time of concentration =    19.988 min.
Effective stream area after confluence  =     33.450(Ac.)
End of computations, total study area =           33.45 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged RI index number =  61.3
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/01/24 File:q100bsite1.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION - WATERSHED B
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 20.000 to Point/Station 20.100
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 951.000(Ft.)
Top (of initial area) elevation = 1464.700(Ft.)
Bottom (of initial area) elevation = 1450.000(Ft.)
Difference in elevation = 14.700(Ft.)
Slope = 0.01546 s(percent)= 1.55

```
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.948 min.
Rainfall intensity =      2.289(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.767
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.840
Decimal fraction soil group C = 0.160
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  58.08
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =     12.745(CFS)
Total initial stream area =        7.260(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.100 to Point/Station       23.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     29.903(CFS)
Depth of flow =   0.454(Ft.), Average velocity =   1.453(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1             0.00              1.00
      2           100.00              0.00
      3           200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     29.903(CFS)
  '     '    flow top width =     90.736(Ft.)
  '     '    velocity=    1.453(Ft/s)
  '     '    area =     20.583(Sq.Ft)
  '     '    Froude number =     0.538

Upstream point elevation =  1450.000(Ft.)
Downstream point elevation =  1447.500(Ft.)
Flow length =   402.000(Ft.)
Travel time  =    4.61 min.
Time of concentration =   18.56 min.
Depth of flow =   0.454(Ft.)
Average velocity =   1.453(Ft/s)
Total irregular channel flow =    29.903(CFS)
Irregular channel normal depth above invert elev. =   0.454(Ft.)
Average velocity of channel(s) =   1.453(Ft/s)
 Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.772
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.480
Decimal fraction soil group C = 0.520
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  62.76
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      1.990(In/Hr) for a   100.0 year storm
```

Subarea runoff = 34.233(CFS) for 22.280(Ac.)
Total runoff = 46.978(CFS) Total area = 29.540(Ac.)
Depth of flow = 0.537(Ft.), Average velocity = 1.627(Ft/s)
End of computations, total study area = 29.54 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged RI index number = 61.6

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/01/24 File:q100p1a.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED A
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 701.000(Ft.)
Top (of initial area) elevation = 1462.800(Ft.)
Bottom (of initial area) elevation = 1447.300(Ft.)
Difference in elevation = 15.500(Ft.)
Slope = 0.02211 s(percent)= 2.21

```
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.841 min.
Rainfall intensity =      2.862(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.879
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.640
Decimal fraction soil group C = 0.360
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  60.68
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     22.296(CFS)
Total initial stream area =        8.860(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1444.600(Ft.)
Downstream point/station elevation =  1440.900(Ft.)
Pipe length  =   526.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    22.296(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    22.296(CFS)
Normal flow depth in pipe =   19.27(In.)
Flow top width inside pipe =   24.41(In.)
Critical Depth =   19.85(In.)
Pipe flow velocity =      7.34(Ft/s)
Travel time through pipe =    1.19 min.
Time of concentration (TC) =    10.03 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      8.860(Ac.)
Runoff from this stream =     22.296(CFS)
Time of concentration =   10.03 min.
Rainfall intensity =     2.690(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.100 to Point/Station       11.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   662.000(Ft.)
Top (of initial area) elevation =  1461.200(Ft.)
Bottom (of initial area) elevation =  1447.300(Ft.)
Difference in elevation =    13.900(Ft.)
Slope =    0.02100  s(percent)=       2.10
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
```

```
Initial area time of concentration =    9.400 min.
Rainfall intensity =      2.778(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.853
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.880
Decimal fraction soil group C = 0.120
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  57.56
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =     18.125(CFS)
Total initial stream area =        7.650(Ac.)
Pervious area fraction = 0.200


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.200 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1442.440(Ft.)
Downstream point/station elevation =  1440.900(Ft.)
Pipe length  =    93.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    18.125(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    18.125(CFS)
Normal flow depth in pipe =   15.42(In.)
Flow top width inside pipe =   18.55(In.)
Critical Depth =   18.59(In.)
Pipe flow velocity =      9.58(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =     9.56 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.200 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      7.650(Ac.)
Runoff from this stream =     18.125(CFS)
Time of concentration =    9.56 min.
Rainfall intensity =     2.755(In/Hr)
Summary of stream data:

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


1       22.296     10.03               2.690
2       18.125      9.56               2.755
Largest stream flow has longer time of concentration
Qp =     22.296 + sum of
        Qb         Ia/Ib
        18.125 *    0.977 =     17.701
Qp =     39.997
```

```
Total of 2 main streams to confluence:
Flow rates before confluence point:
      22.296      18.125
Area of streams before confluence:
        8.860        7.650


Results of confluence:
Total flow rate =     39.997(CFS)
Time of concentration =    10.034 min.
Effective stream area after confluence  =     16.510(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1440.900(Ft.)
Downstream point/station elevation =  1440.400(Ft.)
Pipe length  =   109.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    39.997(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    39.997(CFS)
Normal flow depth in pipe =   26.34(In.)
Flow top width inside pipe =   31.90(In.)
Critical Depth =   24.72(In.)
Pipe flow velocity =      7.22(Ft/s)
Travel time through pipe =    0.25 min.
Time of concentration (TC) =    10.29 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     16.510(Ac.)
Runoff from this stream =     39.997(CFS)
Time of concentration =   10.29 min.
Rainfall intensity =     2.658(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.100 to Point/Station       12.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   623.000(Ft.)
Top (of initial area) elevation =  1454.600(Ft.)
Bottom (of initial area) elevation =  1447.000(Ft.)
Difference in elevation =     7.600(Ft.)
Slope =    0.01220  s(percent)=       1.22
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.227 min.
Rainfall intensity =      2.665(In/Hr) for a   100.0 year storm
APARTMENT subarea type
```

```
Runoff Coefficient = 0.854
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.740
Decimal fraction soil group C = 0.260
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  59.38
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      9.584(CFS)
Total initial stream area =        4.210(Ac.)
Pervious area fraction = 0.200


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.200 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1442.830(Ft.)
Downstream point/station elevation =  1440.400(Ft.)
Pipe length  =   324.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.584(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     9.584(CFS)
Normal flow depth in pipe =   12.93(In.)
Flow top width inside pipe =   20.43(In.)
Critical Depth =   13.83(In.)
Pipe flow velocity =      6.17(Ft/s)
Travel time through pipe =    0.88 min.
Time of concentration (TC) =    11.10 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.200 to Point/Station       13.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.210(Ac.)
Runoff from this stream =      9.584(CFS)
Time of concentration =   11.10 min.
Rainfall intensity =     2.560(In/Hr)
Summary of stream data:

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


1       39.997     10.29              2.658
2        9.584     11.10              2.560
Largest stream flow has longer or shorter time of concentration
Qp =     39.997 + sum of
        Qa          Tb/Ta
         9.584 *    0.927 =      8.880
Qp =     48.876

Total of 2 main streams to confluence:
Flow rates before confluence point:
      39.997       9.584
```

```
Area of streams before confluence:
       16.510        4.210


Results of confluence:
Total flow rate =     48.876(CFS)
Time of concentration =    10.286 min.
Effective stream area after confluence  =     20.720(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1440.400(Ft.)
Downstream point/station elevation =  1437.900(Ft.)
Pipe length  =   398.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    48.876(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    48.876(CFS)
Normal flow depth in pipe =   27.33(In.)
Flow top width inside pipe =   30.79(In.)
Critical Depth =   27.31(In.)
Pipe flow velocity =      8.49(Ft/s)
Travel time through pipe =    0.78 min.
Time of concentration (TC) =    11.07 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     20.720(Ac.)
Runoff from this stream =     48.876(CFS)
Time of concentration =   11.07 min.
Rainfall intensity =     2.564(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.100 to Point/Station       13.100
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   616.000(Ft.)
Top (of initial area) elevation =  1454.600(Ft.)
Bottom (of initial area) elevation =  1447.100(Ft.)
Difference in elevation =     7.500(Ft.)
Slope =    0.01218  s(percent)=       1.22
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.459 min.
Rainfall intensity =      2.769(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.876
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.880
```

```
Decimal fraction soil group C = 0.120
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  57.56
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      8.033(CFS)
Total initial stream area =        3.310(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.100 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1441.330(Ft.)
Downstream point/station elevation =  1437.900(Ft.)
Pipe length  =   330.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.033(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     8.033(CFS)
Normal flow depth in pipe =   11.63(In.)
Flow top width inside pipe =   17.22(In.)
Critical Depth =   13.18(In.)
Pipe flow velocity =      6.65(Ft/s)
Travel time through pipe =    0.83 min.
Time of concentration (TC) =    10.29 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.100 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.310(Ac.)
Runoff from this stream =      8.033(CFS)
Time of concentration =   10.29 min.
Rainfall intensity =     2.658(In/Hr)
Summary of stream data:

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


1       48.876     11.07               2.564
2        8.033     10.29               2.658
Largest stream flow has longer time of concentration
Qp =     48.876 + sum of
        Qb         Ia/Ib
         8.033 *    0.965 =      7.750
Qp =     56.626

Total of 2 main streams to confluence:
Flow rates before confluence point:
      48.876       8.033
Area of streams before confluence:
       20.720        3.310
```

```
Results of confluence:
Total flow rate =     56.626(CFS)
Time of concentration =    11.067 min.
Effective stream area after confluence  =     24.030(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1437.900(Ft.)
Downstream point/station elevation =  1437.500(Ft.)
Pipe length  =    78.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    56.626(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    56.626(CFS)
Normal flow depth in pipe =   30.56(In.)
Flow top width inside pipe =   32.12(In.)
Critical Depth =   28.82(In.)
Pipe flow velocity =      8.12(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =    11.23 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     24.030(Ac.)
Runoff from this stream =     56.626(CFS)
Time of concentration =   11.23 min.
Rainfall intensity =     2.546(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       15.000 to Point/Station       15.100
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   261.000(Ft.)
Top (of initial area) elevation =  1454.100(Ft.)
Bottom (of initial area) elevation =  1452.000(Ft.)
Difference in elevation =     2.100(Ft.)
Slope =    0.00805  s(percent)=       0.80
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.289 min.
Rainfall intensity =      3.146(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.180
Decimal fraction soil group C = 0.820
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  66.66
```

```
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      7.651(CFS)
Total initial stream area =        2.750(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       15.100 to Point/Station       15.100
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.738
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.630
Decimal fraction soil group C = 0.370
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  65.81
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =     7.29 min.
Rainfall intensity =      3.146(In/Hr) for a   100.0 year storm
Subarea runoff =      9.190(CFS) for      3.960(Ac.)
Total runoff =     16.841(CFS)      Total area =       6.710(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.100 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1445.000(Ft.)
Downstream point/station elevation =  1437.500(Ft.)
Pipe length  =   295.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.841(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    16.841(CFS)
Normal flow depth in pipe =   14.86(In.)
Flow top width inside pipe =   13.66(In.)
Critical depth could not be calculated.
Pipe flow velocity =     10.80(Ft/s)
Travel time through pipe =    0.46 min.
Time of concentration (TC) =     7.74 min.


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Process from Point/Station       15.100 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      6.710(Ac.)
Runoff from this stream =     16.841(CFS)
Time of concentration =    7.74 min.
Rainfall intensity =     3.054(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)
```

```
1       56.626     11.23               2.546
2       16.841      7.74               3.054
Largest stream flow has longer time of concentration
Qp =     56.626 + sum of
        Qb         Ia/Ib
        16.841 *    0.834 =     14.039
Qp =     70.665

Total of 2 main streams to confluence:
Flow rates before confluence point:
      56.626      16.841
Area of streams before confluence:
       24.030        6.710


Results of confluence:
Total flow rate =     70.665(CFS)
Time of concentration =    11.228 min.
Effective stream area after confluence  =     30.740(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.000 to Point/Station       17.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1437.500(Ft.)
Downstream point/station elevation =  1435.600(Ft.)
Pipe length  =    54.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    70.665(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    70.665(CFS)
Normal flow depth in pipe =   22.64(In.)
Flow top width inside pipe =   25.82(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.78(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    11.28 min.


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Process from Point/Station       16.000 to Point/Station       17.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     30.740(Ac.)
Runoff from this stream =     70.665(CFS)
Time of concentration =   11.28 min.
Rainfall intensity =     2.540(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       16.100 to Point/Station       16.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
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```
Initial area flow distance =   616.000(Ft.)
Top (of initial area) elevation =  1461.600(Ft.)
Bottom (of initial area) elevation =  1452.600(Ft.)
Difference in elevation =     9.000(Ft.)
Slope =    0.01461  s(percent)=       1.46
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.121 min.
Rainfall intensity =      2.819(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.991(CFS)
Total initial stream area =        1.200(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.200 to Point/Station       16.400
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1452.600(Ft.)
End of street segment elevation =  1449.200(Ft.)
Length of street segment  =   386.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  43.000(Ft.)
Distance from crown to crossfall grade break  =  41.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
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  =  16.000(Ft.)
Slope from curb to property line (v/hz) =   0.015
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 =      3.685(CFS)
Depth of flow =   0.305(Ft.), Average velocity =   2.001(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.912(Ft.)
Flow velocity =   2.00(Ft/s)
Travel time =    3.22 min.     TC =   12.34  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.878
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.500
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  62.50
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.431(In/Hr) for a   100.0 year storm
```

```
Subarea runoff =      1.280(CFS) for      0.600(Ac.)
Total runoff =      4.272(CFS)      Total area =       1.800(Ac.)
Street flow at end of street =      4.272(CFS)
Half street flow at end of street =      2.136(CFS)
Depth of flow =   0.317(Ft.), Average velocity =   2.068(Ft/s)
Flow width (from curb towards crown)=   9.519(Ft.)


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Process from Point/Station       16.200 to Point/Station       16.400
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.800(Ac.)
Runoff from this stream =      4.272(CFS)
Time of concentration =   12.34 min.
Rainfall intensity =     2.431(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.300 to Point/Station       16.400
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   349.000(Ft.)
Top (of initial area) elevation =  1451.400(Ft.)
Bottom (of initial area) elevation =  1449.200(Ft.)
Difference in elevation =     2.200(Ft.)
Slope =    0.00630  s(percent)=       0.63
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.597 min.
Rainfall intensity =      2.902(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.881
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.500
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  62.50
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.767(CFS)
Total initial stream area =        0.300(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.300 to Point/Station       16.400
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.300(Ac.)
Runoff from this stream =      0.767(CFS)
Time of concentration =    8.60 min.
Rainfall intensity =     2.902(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                  (In/Hr)
```

```
1        4.272     12.34                 2.431
2        0.767      8.60                 2.902
Largest stream flow has longer time of concentration
Qp =      4.272 + sum of
        Qb         Ia/Ib
         0.767 *    0.838 =      0.642
Qp =      4.914

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.272       0.767
Area of streams before confluence:
        1.800        0.300
Results of confluence:
Total flow rate =      4.914(CFS)
Time of concentration =    12.336 min.
Effective stream area after confluence =      2.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.400 to Point/Station       17.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1445.200(Ft.)
Downstream point/station elevation =  1435.600(Ft.)
Pipe length  =   104.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.914(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     4.914(CFS)
Normal flow depth in pipe =    7.20(In.)
Flow top width inside pipe =    7.21(In.)
Critical depth could not be calculated.
Pipe flow velocity =     12.97(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    12.47 min.


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Process from Point/Station       16.400 to Point/Station       17.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.100(Ac.)
Runoff from this stream =      4.914(CFS)
Time of concentration =   12.47 min.
Rainfall intensity =     2.418(In/Hr)
Summary of stream data:

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


1       70.665     11.28              2.540
2        4.914     12.47              2.418
```

```
Largest stream flow has longer or shorter time of concentration
Qp =     70.665 + sum of
        Qa          Tb/Ta
         4.914 *    0.904 =      4.444
Qp =     75.110

Total of 2 main streams to confluence:
Flow rates before confluence point:
      70.665       4.914
Area of streams before confluence:
       30.740        2.100


Results of confluence:
Total flow rate =     75.110(CFS)
Time of concentration =    11.278 min.
Effective stream area after confluence  =     32.840(Ac.)
End of computations, total study area =           32.84 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.245
Area averaged RI index number =  60.9
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/01/24 File:q100p1a.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED B
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 20.000 to Point/Station 20.100
**** INITIAL AREA EVALUATION ****

```
Initial area flow distance =   705.000(Ft.)
Top (of initial area) elevation =  1466.500(Ft.)
Bottom (of initial area) elevation =  1447.300(Ft.)
Difference in elevation =    19.200(Ft.)
Slope =    0.02723  s(percent)=       2.72
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.499 min.
Rainfall intensity =      2.918(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.877
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.970
Decimal fraction soil group C = 0.030
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.39
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     19.823(CFS)
Total initial stream area =        7.750(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       20.100 to Point/Station       21.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1442.350(Ft.)
Downstream point/station elevation =  1439.410(Ft.)
Pipe length  =    70.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    19.823(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    19.823(CFS)
Normal flow depth in pipe =   13.62(In.)
Flow top width inside pipe =   15.45(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.82(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =     8.58 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.100 to Point/Station       21.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      7.750(Ac.)
Runoff from this stream =     19.823(CFS)
Time of concentration =    8.58 min.
Rainfall intensity =     2.904(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       20.100
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   688.000(Ft.)
Top (of initial area) elevation =  1462.800(Ft.)
```

```
Bottom (of initial area) elevation =  1447.300(Ft.)
Difference in elevation =    15.500(Ft.)
Slope =    0.02253  s(percent)=       2.25
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.742 min.
Rainfall intensity =      2.878(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.876
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.960
Decimal fraction soil group C = 0.040
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.52
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     19.321(CFS)
Total initial stream area =        7.660(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       20.100 to Point/Station       21.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1442.850(Ft.)
Downstream point/station elevation =  1439.410(Ft.)
Pipe length  =   588.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    19.321(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    19.321(CFS)
Normal flow depth in pipe =   18.54(In.)
Flow top width inside pipe =   25.05(In.)
Critical Depth =   18.46(In.)
Pipe flow velocity =      6.64(Ft/s)
Travel time through pipe =    1.48 min.
Time of concentration (TC) =    10.22 min.


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Process from Point/Station       20.100 to Point/Station       21.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      7.660(Ac.)
Runoff from this stream =     19.321(CFS)
Time of concentration =   10.22 min.
Rainfall intensity =     2.666(In/Hr)
Summary of stream data:

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


1       19.823      8.58                2.904
2       19.321     10.22                2.666
Largest stream flow has longer or shorter time of concentration
Qp =     19.823 + sum of
        Qa          Tb/Ta
```

```
        19.321 *    0.840 =     16.232
Qp =     36.055

Total of 2 streams to confluence:
Flow rates before confluence point:
      19.823      19.321
Area of streams before confluence:
        7.750        7.660
Results of confluence:
Total flow rate =     36.055(CFS)
Time of concentration =     8.584 min.
Effective stream area after confluence =     15.410(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1439.410(Ft.)
Downstream point/station elevation =  1438.470(Ft.)
Pipe length  =   189.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    36.055(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    36.055(CFS)
Normal flow depth in pipe =   26.11(In.)
Flow top width inside pipe =   26.83(In.)
Critical Depth =   24.00(In.)
Pipe flow velocity =      7.15(Ft/s)
Travel time through pipe =    0.44 min.
Time of concentration (TC) =     9.02 min.


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Process from Point/Station       21.000 to Point/Station       22.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     15.410(Ac.)
Runoff from this stream =     36.055(CFS)
Time of concentration =    9.02 min.
Rainfall intensity =     2.834(In/Hr)


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Process from Point/Station       21.100 to Point/Station       21.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   430.000(Ft.)
Top (of initial area) elevation =  1463.300(Ft.)
Bottom (of initial area) elevation =  1448.210(Ft.)
Difference in elevation =    15.090(Ft.)
Slope =    0.03509  s(percent)=       3.51
TC = k(0.370)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.176 min.
Rainfall intensity =      2.974(In/Hr) for a   100.0 year storm
CONDOMINIUM subarea type
Runoff Coefficient = 0.821
```

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.900
Decimal fraction soil group C = 0.100
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  57.30
Pervious area fraction =  0.350; Impervious fraction =  0.650
Initial subarea runoff =      2.247(CFS)
Total initial stream area =        0.920(Ac.)
Pervious area fraction = 0.350


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Process from Point/Station       21.200 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1439.950(Ft.)
Downstream point/station elevation =  1438.470(Ft.)
Pipe length  =    95.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.247(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.247(CFS)
Normal flow depth in pipe =    6.04(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =    7.70(In.)
Pipe flow velocity =      5.68(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =     8.46 min.


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Process from Point/Station       21.200 to Point/Station       22.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.920(Ac.)
Runoff from this stream =      2.247(CFS)
Time of concentration =    8.46 min.
Rainfall intensity =     2.926(In/Hr)
Summary of stream data:

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


1       36.055      9.02                 2.834
2        2.247      8.46                 2.926
Largest stream flow has longer time of concentration
Qp =     36.055 + sum of
        Qb         Ia/Ib
         2.247 *    0.969 =      2.176
Qp =     38.231

Total of 2 streams to confluence:
Flow rates before confluence point:
      36.055       2.247
Area of streams before confluence:
       15.410        0.920
```

```
Results of confluence:
Total flow rate =     38.231(CFS)
Time of concentration =     9.024 min.
Effective stream area after confluence =     16.330(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1438.470(Ft.)
Downstream point/station elevation =  1436.840(Ft.)
Pipe length  =   325.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    38.231(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    38.231(CFS)
Normal flow depth in pipe =   27.70(In.)
Flow top width inside pipe =   24.23(In.)
Critical Depth =   24.70(In.)
Pipe flow velocity =      7.18(Ft/s)
Travel time through pipe =    0.75 min.
Time of concentration (TC) =     9.78 min.


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Process from Point/Station       22.000 to Point/Station       23.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     16.330(Ac.)
Runoff from this stream =     38.231(CFS)
Time of concentration =    9.78 min.
Rainfall intensity =     2.724(In/Hr)


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Process from Point/Station       22.100 to Point/Station       22.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   221.000(Ft.)
Top (of initial area) elevation =  1453.300(Ft.)
Bottom (of initial area) elevation =  1448.500(Ft.)
Difference in elevation =     4.800(Ft.)
Slope =    0.02172  s(percent)=       2.17
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.020 min.
Rainfall intensity =      3.456(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.873
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      2.505(CFS)
Total initial stream area =        0.830(Ac.)
```

Pervious area fraction = 0.200

++
Process from Point/Station 22.200 to Point/Station 23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1443.500(Ft.)
Downstream point/station elevation = 1436.840(Ft.)
Pipe length = 20.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.505(CFS)
Nearest computed pipe diameter = 6.00(In.)
Calculated individual pipe flow = 2.505(CFS)
Normal flow depth in pipe = 3.96(In.)
Flow top width inside pipe = 5.68(In.)
Critical depth could not be calculated.
Pipe flow velocity = 18.21(Ft/s)
Travel time through pipe = 0.02 min.
Time of concentration (TC) = 6.04 min.

++
Process from Point/Station 22.200 to Point/Station 23.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 0.830(Ac.)
Runoff from this stream = 2.505(CFS)
Time of concentration = 6.04 min.
Rainfall intensity = 3.450(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	38.231	9.78	2.724
2	2.505	6.04	3.450

Largest stream flow has longer time of concentration
Qp = 38.231 + sum of
Qb Ia/Ib
2.505 * 0.790 = 1.978
Qp = 40.209

Total of 2 streams to confluence:
Flow rates before confluence point:
38.231 2.505
Area of streams before confluence:
16.330 0.830
Results of confluence:
Total flow rate = 40.209(CFS)
Time of concentration = 9.778 min.
Effective stream area after confluence = 17.160(Ac.)

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Process from Point/Station 23.000 to Point/Station 24.000

```
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  1436.840(Ft.)
Downstream point/station elevation =  1435.420(Ft.)
Pipe length  =   283.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    40.209(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    40.209(CFS)
Normal flow depth in pipe =   25.52(In.)
Flow top width inside pipe =   32.70(In.)
Critical Depth =   24.78(In.)
Pipe flow velocity =      7.50(Ft/s)
Travel time through pipe =    0.63 min.
Time of concentration (TC) =    10.41 min.


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Process from Point/Station       23.000 to Point/Station       24.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     17.160(Ac.)
Runoff from this stream =     40.209(CFS)
Time of concentration =   10.41 min.
Rainfall intensity =     2.643(In/Hr)


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Process from Point/Station       23.100 to Point/Station       23.200
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________
Initial area flow distance =   345.000(Ft.)
Top (of initial area) elevation =  1453.400(Ft.)
Bottom (of initial area) elevation =  1448.300(Ft.)
Difference in elevation =     5.100(Ft.)
Slope =    0.01478  s(percent)=       1.48
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.216 min.
Rainfall intensity =      3.162(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.886
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      7.561(CFS)
Total initial stream area =        2.700(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       23.200 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  1440.000(Ft.)
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Downstream point/station elevation =  1435.420(Ft.)
Pipe length  =    78.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.561(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     7.561(CFS)
Normal flow depth in pipe =    8.71(In.)
Flow top width inside pipe =   10.71(In.)
Critical depth could not be calculated.
Pipe flow velocity =     12.40(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     7.32 min.


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Process from Point/Station       23.200 to Point/Station       24.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      2.700(Ac.)
Runoff from this stream =      7.561(CFS)
Time of concentration =    7.32 min.
Rainfall intensity =     3.140(In/Hr)
Summary of stream data:

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


1       40.209     10.41                2.643
2        7.561      7.32                3.140
Largest stream flow has longer time of concentration
Qp =     40.209 + sum of
        Qb         Ia/Ib
         7.561 *    0.842 =      6.364
Qp =     46.573

Total of 2 streams to confluence:
Flow rates before confluence point:
      40.209       7.561
Area of streams before confluence:
       17.160        2.700
Results of confluence:
Total flow rate =     46.573(CFS)
Time of concentration =    10.407 min.
Effective stream area after confluence =     19.860(Ac.)


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Process from Point/Station       24.000 to Point/Station       28.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1435.420(Ft.)
Downstream point/station elevation =  1435.100(Ft.)
Pipe length  =    58.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    46.573(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    46.573(CFS)
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```
Normal flow depth in pipe =   27.75(In.)
Flow top width inside pipe =   30.26(In.)
Critical Depth =   26.69(In.)
Pipe flow velocity =      7.97(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    10.53 min.


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Process from Point/Station       24.000 to Point/Station       28.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     19.860(Ac.)
Runoff from this stream =     46.573(CFS)
Time of concentration =   10.53 min.
Rainfall intensity =     2.628(In/Hr)


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Process from Point/Station       15.000 to Point/Station       25.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   467.000(Ft.)
Top (of initial area) elevation =  1454.100(Ft.)
Bottom (of initial area) elevation =  1451.000(Ft.)
Difference in elevation =     3.100(Ft.)
Slope =    0.00664  s(percent)=       0.66
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.560 min.
Rainfall intensity =      2.755(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.882
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.280
Decimal fraction soil group C = 0.720
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  65.36
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      6.290(CFS)
Total initial stream area =        2.590(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       25.000 to Point/Station       28.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1446.000(Ft.)
Downstream point/station elevation =  1435.100(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.290(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     6.290(CFS)
Normal flow depth in pipe =    6.86(In.)
Flow top width inside pipe =    7.67(In.)
Critical depth could not be calculated.
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Pipe flow velocity =     17.41(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     9.62 min.


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Process from Point/Station       25.000 to Point/Station       28.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.769
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =     9.62 min.
Rainfall intensity =      2.746(In/Hr) for a   100.0 year storm
Subarea runoff =      2.069(CFS) for      0.980(Ac.)
Total runoff =      8.360(CFS)      Total area =       3.570(Ac.)


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Process from Point/Station       25.000 to Point/Station       28.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.570(Ac.)
Runoff from this stream =      8.360(CFS)
Time of concentration =    9.62 min.
Rainfall intensity =     2.746(In/Hr)


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Process from Point/Station       26.000 to Point/Station       26.100
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   373.000(Ft.)
Top (of initial area) elevation =  1454.000(Ft.)
Bottom (of initial area) elevation =  1448.300(Ft.)
Difference in elevation =     5.700(Ft.)
Slope =    0.01528  s(percent)=       1.53
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.396 min.
Rainfall intensity =      3.124(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.885
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.130
Decimal fraction soil group C = 0.870
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  67.31
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      8.262(CFS)
Total initial stream area =        2.990(Ac.)
Pervious area fraction = 0.100
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Process from Point/Station       26.100 to Point/Station       28.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1440.000(Ft.)
Downstream point/station elevation =  1435.100(Ft.)
Pipe length  =   104.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.262(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     8.262(CFS)
Normal flow depth in pipe =    8.29(In.)
Flow top width inside pipe =   14.92(In.)
Critical Depth =   13.52(In.)
Pipe flow velocity =     11.89(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     7.54 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.100 to Point/Station       28.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 3
Stream flow area =      2.990(Ac.)
Runoff from this stream =      8.262(CFS)
Time of concentration =    7.54 min.
Rainfall intensity =     3.094(In/Hr)


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Process from Point/Station       23.100 to Point/Station       27.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   256.000(Ft.)
Top (of initial area) elevation =  1453.400(Ft.)
Bottom (of initial area) elevation =  1451.000(Ft.)
Difference in elevation =     2.400(Ft.)
Slope =    0.00938  s(percent)=       0.94
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.015 min.
Rainfall intensity =      3.206(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.886
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      3.124(CFS)
Total initial stream area =        1.100(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       27.000 to Point/Station       27.000
**** SUBAREA FLOW ADDITION ****
____________________________________________________________________________
CONDOMINIUM subarea type
Runoff Coefficient = 0.850
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.350; Impervious fraction =  0.650
Time of concentration =     7.01 min.
Rainfall intensity =      3.206(In/Hr) for a   100.0 year storm
Subarea runoff =      0.845(CFS) for      0.310(Ac.)
Total runoff =      3.969(CFS)      Total area =       1.410(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       27.000 to Point/Station       28.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________________
Upstream point/station elevation =  1446.000(Ft.)
Downstream point/station elevation =  1435.100(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.969(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     3.969(CFS)
Normal flow depth in pipe =    4.95(In.)
Flow top width inside pipe =    8.95(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.94(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     7.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       27.000 to Point/Station       28.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 4
Stream flow area =      1.410(Ac.)
Runoff from this stream =      3.969(CFS)
Time of concentration =    7.08 min.
Rainfall intensity =     3.191(In/Hr)
Summary of stream data:

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


1       46.573     10.53                2.628
2        8.360      9.62                2.746
3        8.262      7.54                3.094
4        3.969      7.08                3.191
Largest stream flow has longer time of concentration
Qp =     46.573 + sum of
        Qb         Ia/Ib
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         8.360 *    0.957 =      7.999
        Qb         Ia/Ib
         8.262 *    0.849 =      7.016
        Qb         Ia/Ib
         3.969 *    0.823 =      3.269
Qp =     64.857

Total of 4 streams to confluence:
Flow rates before confluence point:
      46.573       8.360       8.262       3.969
Area of streams before confluence:
       19.860        3.570        2.990        1.410
Results of confluence:
Total flow rate =     64.857(CFS)
Time of concentration =    10.528 min.
Effective stream area after confluence =     27.830(Ac.)


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Process from Point/Station       28.000 to Point/Station       28.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.764
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    10.53 min.
Rainfall intensity =      2.628(In/Hr) for a   100.0 year storm
Subarea runoff =      1.586(CFS) for      0.790(Ac.)
Total runoff =     66.442(CFS)      Total area =      28.620(Ac.)


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Process from Point/Station       28.000 to Point/Station       29.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1435.100(Ft.)
Downstream point/station elevation =  1434.400(Ft.)
Pipe length  =   205.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    66.442(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =    66.442(CFS)
Normal flow depth in pipe =   34.69(In.)
Flow top width inside pipe =   37.83(In.)
Critical Depth =   30.09(In.)
Pipe flow velocity =      7.28(Ft/s)
Travel time through pipe =    0.47 min.
Time of concentration (TC) =    11.00 min.


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Process from Point/Station       29.000 to Point/Station       29.100
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
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Upstream point/station elevation =  1434.400(Ft.)
Downstream point/station elevation =  1434.220(Ft.)
Pipe length  =    36.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    66.442(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =    66.442(CFS)
Normal flow depth in pipe =   32.16(In.)
Flow top width inside pipe =   35.58(In.)
Critical Depth =   30.68(In.)
Pipe flow velocity =      8.40(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    11.07 min.


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Process from Point/Station       29.000 to Point/Station       29.100
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     28.620(Ac.)
Runoff from this stream =     66.442(CFS)
Time of concentration =   11.07 min.
Rainfall intensity =     2.564(In/Hr)


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Process from Point/Station       28.100 to Point/Station       28.200
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   594.000(Ft.)
Top (of initial area) elevation =  1451.300(Ft.)
Bottom (of initial area) elevation =  1448.200(Ft.)
Difference in elevation =     3.100(Ft.)
Slope =    0.00522  s(percent)=       0.52
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.044 min.
Rainfall intensity =      2.567(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.179(CFS)
Total initial stream area =        0.520(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       28.200 to Point/Station       28.300
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1448.200(Ft.)
End of street segment elevation =  1446.300(Ft.)
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Length of street segment  =   452.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  28.000(Ft.)
Distance from crown to crossfall grade break  =  26.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  11.000(Ft.)
Slope from curb to property line (v/hz) =   0.015
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 =      2.514(CFS)
Depth of flow =   0.366(Ft.), Average velocity =   1.616(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  11.954(Ft.)
Flow velocity =   1.62(Ft/s)
Travel time =    4.66 min.     TC =   15.71  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.880
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.160(In/Hr) for a   100.0 year storm
Subarea runoff =      2.605(CFS) for      1.370(Ac.)
Total runoff =      3.784(CFS)      Total area =       1.890(Ac.)
Street flow at end of street =      3.784(CFS)
Half street flow at end of street =      3.784(CFS)
Depth of flow =   0.409(Ft.), Average velocity =   1.781(Ft/s)
Flow width (from curb towards crown)=  14.135(Ft.)


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Process from Point/Station       28.300 to Point/Station       29.100
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1440.000(Ft.)
Downstream point/station elevation =  1434.220(Ft.)
Pipe length  =    23.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.784(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     3.784(CFS)
Normal flow depth in pipe =    4.27(In.)
Flow top width inside pipe =    8.99(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.34(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =    15.73 min.


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Process from Point/Station       28.300 to Point/Station       29.100
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      1.890(Ac.)
Runoff from this stream =      3.784(CFS)
Time of concentration =   15.73 min.
Rainfall intensity =     2.159(In/Hr)
Summary of stream data:

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


1       66.442     11.07                2.564
2        3.784     15.73                2.159
Largest stream flow has longer or shorter time of concentration
Qp =     66.442 + sum of
        Qa          Tb/Ta
         3.784 *    0.704 =      2.663
Qp =     69.105

Total of 2 streams to confluence:
Flow rates before confluence point:
      66.442       3.784
Area of streams before confluence:
       28.620        1.890
Results of confluence:
Total flow rate =     69.105(CFS)
Time of concentration =    11.069 min.
Effective stream area after confluence =     30.510(Ac.)


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Process from Point/Station       29.100 to Point/Station       30.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________
Upstream point/station elevation =  1434.220(Ft.)
Downstream point/station elevation =  1432.500(Ft.)
Pipe length  =   144.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    69.105(CFS)

Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    69.105(CFS)
Normal flow depth in pipe =   27.94(In.)
Flow top width inside pipe =   30.02(In.)
Critical Depth =   31.75(In.)
Pipe flow velocity =     11.73(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =    11.27 min.
End of computations, total study area =           30.51 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.165
Area averaged RI index number =  62.1
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/01/24 File:q100p1a.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED A + B
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 701.000(Ft.)
Top (of initial area) elevation = 1462.800(Ft.)
Bottom (of initial area) elevation = 1447.300(Ft.)
Difference in elevation = 15.500(Ft.)
Slope = 0.02211 s(percent)= 2.21

```
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.841 min.
Rainfall intensity =      2.862(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.879
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.640
Decimal fraction soil group C = 0.360
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  60.68
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     22.296(CFS)
Total initial stream area =        8.860(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       11.000 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1444.600(Ft.)
Downstream point/station elevation =  1440.900(Ft.)
Pipe length  =   526.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    22.296(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    22.296(CFS)
Normal flow depth in pipe =   19.27(In.)
Flow top width inside pipe =   24.41(In.)
Critical Depth =   19.85(In.)
Pipe flow velocity =      7.34(Ft/s)
Travel time through pipe =    1.19 min.
Time of concentration (TC) =    10.03 min.


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Process from Point/Station       11.000 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      8.860(Ac.)
Runoff from this stream =     22.296(CFS)
Time of concentration =   10.03 min.
Rainfall intensity =     2.690(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       11.100 to Point/Station       11.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   662.000(Ft.)
Top (of initial area) elevation =  1461.200(Ft.)
Bottom (of initial area) elevation =  1447.300(Ft.)
Difference in elevation =    13.900(Ft.)
Slope =    0.02100  s(percent)=       2.10
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
```

```
Initial area time of concentration =    9.400 min.
Rainfall intensity =      2.778(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.853
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.880
Decimal fraction soil group C = 0.120
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  57.56
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =     18.125(CFS)
Total initial stream area =        7.650(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station       11.200 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1442.440(Ft.)
Downstream point/station elevation =  1440.900(Ft.)
Pipe length  =    93.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    18.125(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    18.125(CFS)
Normal flow depth in pipe =   15.42(In.)
Flow top width inside pipe =   18.55(In.)
Critical Depth =   18.59(In.)
Pipe flow velocity =      9.58(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =     9.56 min.


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Process from Point/Station       11.200 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      7.650(Ac.)
Runoff from this stream =     18.125(CFS)
Time of concentration =    9.56 min.
Rainfall intensity =     2.755(In/Hr)
Summary of stream data:

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


1       22.296     10.03               2.690
2       18.125      9.56               2.755
Largest stream flow has longer time of concentration
Qp =     22.296 + sum of
        Qb         Ia/Ib
        18.125 *    0.977 =     17.701
Qp =     39.997
```

```
Total of 2 main streams to confluence:
Flow rates before confluence point:
      22.296      18.125
Area of streams before confluence:
        8.860        7.650


Results of confluence:
Total flow rate =     39.997(CFS)
Time of concentration =    10.034 min.
Effective stream area after confluence  =     16.510(Ac.)


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Process from Point/Station       12.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1440.900(Ft.)
Downstream point/station elevation =  1440.400(Ft.)
Pipe length  =   109.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    39.997(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    39.997(CFS)
Normal flow depth in pipe =   26.34(In.)
Flow top width inside pipe =   31.90(In.)
Critical Depth =   24.72(In.)
Pipe flow velocity =      7.22(Ft/s)
Travel time through pipe =    0.25 min.
Time of concentration (TC) =    10.29 min.


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Process from Point/Station       12.000 to Point/Station       13.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     16.510(Ac.)
Runoff from this stream =     39.997(CFS)
Time of concentration =   10.29 min.
Rainfall intensity =     2.658(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       12.100 to Point/Station       12.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   623.000(Ft.)
Top (of initial area) elevation =  1454.600(Ft.)
Bottom (of initial area) elevation =  1447.000(Ft.)
Difference in elevation =     7.600(Ft.)
Slope =    0.01220  s(percent)=       1.22
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.227 min.
Rainfall intensity =      2.665(In/Hr) for a   100.0 year storm
APARTMENT subarea type
```

```
Runoff Coefficient = 0.854
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.740
Decimal fraction soil group C = 0.260
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  59.38
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      9.584(CFS)
Total initial stream area =        4.210(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station       12.200 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1442.830(Ft.)
Downstream point/station elevation =  1440.400(Ft.)
Pipe length  =   324.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.584(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     9.584(CFS)
Normal flow depth in pipe =   12.93(In.)
Flow top width inside pipe =   20.43(In.)
Critical Depth =   13.83(In.)
Pipe flow velocity =      6.17(Ft/s)
Travel time through pipe =    0.88 min.
Time of concentration (TC) =    11.10 min.


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Process from Point/Station       12.200 to Point/Station       13.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.210(Ac.)
Runoff from this stream =      9.584(CFS)
Time of concentration =   11.10 min.
Rainfall intensity =     2.560(In/Hr)
Summary of stream data:

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


1       39.997     10.29              2.658
2        9.584     11.10              2.560
Largest stream flow has longer or shorter time of concentration
Qp =     39.997 + sum of
        Qa          Tb/Ta
         9.584 *    0.927 =      8.880
Qp =     48.876

Total of 2 main streams to confluence:
Flow rates before confluence point:
      39.997       9.584
```

```
Area of streams before confluence:
       16.510        4.210


Results of confluence:
Total flow rate =     48.876(CFS)
Time of concentration =    10.286 min.
Effective stream area after confluence  =     20.720(Ac.)


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Process from Point/Station       13.000 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1440.400(Ft.)
Downstream point/station elevation =  1437.900(Ft.)
Pipe length  =   398.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    48.876(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    48.876(CFS)
Normal flow depth in pipe =   27.33(In.)
Flow top width inside pipe =   30.79(In.)
Critical Depth =   27.31(In.)
Pipe flow velocity =      8.49(Ft/s)
Travel time through pipe =    0.78 min.
Time of concentration (TC) =    11.07 min.


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Process from Point/Station       13.000 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     20.720(Ac.)
Runoff from this stream =     48.876(CFS)
Time of concentration =   11.07 min.
Rainfall intensity =     2.564(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       12.100 to Point/Station       13.100
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   616.000(Ft.)
Top (of initial area) elevation =  1454.600(Ft.)
Bottom (of initial area) elevation =  1447.100(Ft.)
Difference in elevation =     7.500(Ft.)
Slope =    0.01218  s(percent)=       1.22
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.459 min.
Rainfall intensity =      2.769(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.876
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.880
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Decimal fraction soil group C = 0.120
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  57.56
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      8.033(CFS)
Total initial stream area =        3.310(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       13.100 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1441.330(Ft.)
Downstream point/station elevation =  1437.900(Ft.)
Pipe length  =   330.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.033(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     8.033(CFS)
Normal flow depth in pipe =   11.63(In.)
Flow top width inside pipe =   17.22(In.)
Critical Depth =   13.18(In.)
Pipe flow velocity =      6.65(Ft/s)
Travel time through pipe =    0.83 min.
Time of concentration (TC) =    10.29 min.


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Process from Point/Station       13.100 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.310(Ac.)
Runoff from this stream =      8.033(CFS)
Time of concentration =   10.29 min.
Rainfall intensity =     2.658(In/Hr)
Summary of stream data:

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


1       48.876     11.07               2.564
2        8.033     10.29               2.658
Largest stream flow has longer time of concentration
Qp =     48.876 + sum of
        Qb         Ia/Ib
         8.033 *    0.965 =      7.750
Qp =     56.626

Total of 2 main streams to confluence:
Flow rates before confluence point:
      48.876       8.033
Area of streams before confluence:
       20.720        3.310
```

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Results of confluence:
Total flow rate =     56.626(CFS)
Time of concentration =    11.067 min.
Effective stream area after confluence  =     24.030(Ac.)


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Process from Point/Station       14.000 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1437.900(Ft.)
Downstream point/station elevation =  1437.500(Ft.)
Pipe length  =    78.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    56.626(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    56.626(CFS)
Normal flow depth in pipe =   30.56(In.)
Flow top width inside pipe =   32.12(In.)
Critical Depth =   28.82(In.)
Pipe flow velocity =      8.12(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =    11.23 min.


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Process from Point/Station       14.000 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     24.030(Ac.)
Runoff from this stream =     56.626(CFS)
Time of concentration =   11.23 min.
Rainfall intensity =     2.546(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       15.000 to Point/Station       15.100
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   261.000(Ft.)
Top (of initial area) elevation =  1454.100(Ft.)
Bottom (of initial area) elevation =  1452.000(Ft.)
Difference in elevation =     2.100(Ft.)
Slope =    0.00805  s(percent)=       0.80
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.289 min.
Rainfall intensity =      3.146(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.180
Decimal fraction soil group C = 0.820
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  66.66
```

```
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      7.651(CFS)
Total initial stream area =        2.750(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       15.100 to Point/Station       15.100
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.738
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.630
Decimal fraction soil group C = 0.370
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  65.81
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =     7.29 min.
Rainfall intensity =      3.146(In/Hr) for a   100.0 year storm
Subarea runoff =      9.190(CFS) for      3.960(Ac.)
Total runoff =     16.841(CFS)      Total area =       6.710(Ac.)


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Process from Point/Station       15.100 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1445.000(Ft.)
Downstream point/station elevation =  1437.500(Ft.)
Pipe length  =   295.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.841(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    16.841(CFS)
Normal flow depth in pipe =   14.86(In.)
Flow top width inside pipe =   13.66(In.)
Critical depth could not be calculated.
Pipe flow velocity =     10.80(Ft/s)
Travel time through pipe =    0.46 min.
Time of concentration (TC) =     7.74 min.


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Process from Point/Station       15.100 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      6.710(Ac.)
Runoff from this stream =     16.841(CFS)
Time of concentration =    7.74 min.
Rainfall intensity =     3.054(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)
```

```
1       56.626     11.23               2.546
2       16.841      7.74               3.054
Largest stream flow has longer time of concentration
Qp =     56.626 + sum of
        Qb         Ia/Ib
        16.841 *    0.834 =     14.039
Qp =     70.665

Total of 2 main streams to confluence:
Flow rates before confluence point:
      56.626      16.841
Area of streams before confluence:
       24.030        6.710


Results of confluence:
Total flow rate =     70.665(CFS)
Time of concentration =    11.228 min.
Effective stream area after confluence  =     30.740(Ac.)


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Process from Point/Station       16.000 to Point/Station       17.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1437.500(Ft.)
Downstream point/station elevation =  1435.600(Ft.)
Pipe length  =    54.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    70.665(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    70.665(CFS)
Normal flow depth in pipe =   22.64(In.)
Flow top width inside pipe =   25.82(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.78(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    11.28 min.


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Process from Point/Station       16.000 to Point/Station       17.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     30.740(Ac.)
Runoff from this stream =     70.665(CFS)
Time of concentration =   11.28 min.
Rainfall intensity =     2.540(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.100 to Point/Station       16.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
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```
Initial area flow distance =   616.000(Ft.)
Top (of initial area) elevation =  1461.600(Ft.)
Bottom (of initial area) elevation =  1452.600(Ft.)
Difference in elevation =     9.000(Ft.)
Slope =    0.01461  s(percent)=       1.46
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.121 min.
Rainfall intensity =      2.819(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.991(CFS)
Total initial stream area =        1.200(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       16.200 to Point/Station       16.400
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1452.600(Ft.)
End of street segment elevation =  1449.200(Ft.)
Length of street segment  =   386.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  43.000(Ft.)
Distance from crown to crossfall grade break  =  41.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
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  =  16.000(Ft.)
Slope from curb to property line (v/hz) =   0.015
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 =      3.685(CFS)
Depth of flow =   0.305(Ft.), Average velocity =   2.001(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.912(Ft.)
Flow velocity =   2.00(Ft/s)
Travel time =    3.22 min.     TC =   12.34  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.878
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.500
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  62.50
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.431(In/Hr) for a   100.0 year storm
```

```
Subarea runoff =      1.280(CFS) for      0.600(Ac.)
Total runoff =      4.272(CFS)      Total area =       1.800(Ac.)
Street flow at end of street =      4.272(CFS)
Half street flow at end of street =      2.136(CFS)
Depth of flow =   0.317(Ft.), Average velocity =   2.068(Ft/s)
Flow width (from curb towards crown)=   9.519(Ft.)


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Process from Point/Station       16.200 to Point/Station       16.400
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.800(Ac.)
Runoff from this stream =      4.272(CFS)
Time of concentration =   12.34 min.
Rainfall intensity =     2.431(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.300 to Point/Station       16.400
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   349.000(Ft.)
Top (of initial area) elevation =  1451.400(Ft.)
Bottom (of initial area) elevation =  1449.200(Ft.)
Difference in elevation =     2.200(Ft.)
Slope =    0.00630  s(percent)=       0.63
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.597 min.
Rainfall intensity =      2.902(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.881
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.500
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  62.50
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.767(CFS)
Total initial stream area =        0.300(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       16.300 to Point/Station       16.400
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.300(Ac.)
Runoff from this stream =      0.767(CFS)
Time of concentration =    8.60 min.
Rainfall intensity =     2.902(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                  (In/Hr)
```

```
1        4.272     12.34                 2.431
2        0.767      8.60                 2.902
Largest stream flow has longer time of concentration
Qp =      4.272 + sum of
        Qb         Ia/Ib
         0.767 *    0.838 =      0.642
Qp =      4.914

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.272       0.767
Area of streams before confluence:
        1.800        0.300
Results of confluence:
Total flow rate =      4.914(CFS)
Time of concentration =    12.336 min.
Effective stream area after confluence =      2.100(Ac.)


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Process from Point/Station       16.400 to Point/Station       17.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1445.200(Ft.)
Downstream point/station elevation =  1435.600(Ft.)
Pipe length  =   104.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.914(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     4.914(CFS)
Normal flow depth in pipe =    7.20(In.)
Flow top width inside pipe =    7.21(In.)
Critical depth could not be calculated.
Pipe flow velocity =     12.97(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    12.47 min.


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Process from Point/Station       16.400 to Point/Station       17.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.100(Ac.)
Runoff from this stream =      4.914(CFS)
Time of concentration =   12.47 min.
Rainfall intensity =     2.418(In/Hr)
Summary of stream data:

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


1       70.665     11.28              2.540
2        4.914     12.47              2.418
```

```
Largest stream flow has longer or shorter time of concentration
Qp =     70.665 + sum of
        Qa          Tb/Ta
         4.914 *    0.904 =      4.444
Qp =     75.110

Total of 2 main streams to confluence:
Flow rates before confluence point:
      70.665       4.914
Area of streams before confluence:
       30.740        2.100


Results of confluence:
Total flow rate =     75.110(CFS)
Time of concentration =    11.278 min.
Effective stream area after confluence  =     32.840(Ac.)


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Process from Point/Station       17.000 to Point/Station       30.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1435.600(Ft.)
Downstream point/station elevation =  1432.500(Ft.)
Pipe length  =  1204.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    75.110(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =    75.110(CFS)
Normal flow depth in pipe =   40.78(In.)
Flow top width inside pipe =   34.32(In.)
Critical Depth =   31.46(In.)
Pipe flow velocity =      6.60(Ft/s)
Travel time through pipe =    3.04 min.
Time of concentration (TC) =    14.32 min.


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Process from Point/Station       17.000 to Point/Station       30.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     32.840(Ac.)
Runoff from this stream =     75.110(CFS)
Time of concentration =   14.32 min.
Rainfall intensity =     2.260(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       20.000 to Point/Station       20.100
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   705.000(Ft.)
Top (of initial area) elevation =  1466.500(Ft.)
Bottom (of initial area) elevation =  1447.300(Ft.)
```

```
Difference in elevation =    19.200(Ft.)
Slope =    0.02723  s(percent)=       2.72
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.499 min.
Rainfall intensity =      2.918(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.877
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.970
Decimal fraction soil group C = 0.030
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.39
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     19.823(CFS)
Total initial stream area =        7.750(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.100 to Point/Station       21.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1442.350(Ft.)
Downstream point/station elevation =  1439.410(Ft.)
Pipe length  =    70.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    19.823(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    19.823(CFS)
Normal flow depth in pipe =   13.62(In.)
Flow top width inside pipe =   15.45(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.82(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =     8.58 min.


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Process from Point/Station       20.100 to Point/Station       21.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      7.750(Ac.)
Runoff from this stream =     19.823(CFS)
Time of concentration =    8.58 min.
Rainfall intensity =     2.904(In/Hr)


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Process from Point/Station       10.000 to Point/Station       20.100
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   688.000(Ft.)
Top (of initial area) elevation =  1462.800(Ft.)
Bottom (of initial area) elevation =  1447.300(Ft.)
Difference in elevation =    15.500(Ft.)
Slope =    0.02253  s(percent)=       2.25
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
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```
Initial area time of concentration =    8.742 min.
Rainfall intensity =      2.878(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.876
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.960
Decimal fraction soil group C = 0.040
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.52
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     19.321(CFS)
Total initial stream area =        7.660(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       20.100 to Point/Station       21.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1442.850(Ft.)
Downstream point/station elevation =  1439.410(Ft.)
Pipe length  =   588.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    19.321(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    19.321(CFS)
Normal flow depth in pipe =   18.54(In.)
Flow top width inside pipe =   25.05(In.)
Critical Depth =   18.46(In.)
Pipe flow velocity =      6.64(Ft/s)
Travel time through pipe =    1.48 min.
Time of concentration (TC) =    10.22 min.


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Process from Point/Station       20.100 to Point/Station       21.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      7.660(Ac.)
Runoff from this stream =     19.321(CFS)
Time of concentration =   10.22 min.
Rainfall intensity =     2.666(In/Hr)
Summary of stream data:

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


1       19.823      8.58                2.904
2       19.321     10.22                2.666
Largest stream flow has longer or shorter time of concentration
Qp =     19.823 + sum of
        Qa          Tb/Ta
        19.321 *    0.840 =     16.232
Qp =     36.055

Total of 2 streams to confluence:
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```
Flow rates before confluence point:
      19.823      19.321
Area of streams before confluence:
        7.750        7.660
Results of confluence:
Total flow rate =     36.055(CFS)
Time of concentration =     8.584 min.
Effective stream area after confluence =     15.410(Ac.)


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Process from Point/Station       21.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1439.410(Ft.)
Downstream point/station elevation =  1438.470(Ft.)
Pipe length  =   189.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    36.055(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    36.055(CFS)
Normal flow depth in pipe =   26.11(In.)
Flow top width inside pipe =   26.83(In.)
Critical Depth =   24.00(In.)
Pipe flow velocity =      7.15(Ft/s)
Travel time through pipe =    0.44 min.
Time of concentration (TC) =     9.02 min.


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Process from Point/Station       21.000 to Point/Station       22.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     15.410(Ac.)
Runoff from this stream =     36.055(CFS)
Time of concentration =    9.02 min.
Rainfall intensity =     2.834(In/Hr)


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Process from Point/Station       21.100 to Point/Station       21.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   430.000(Ft.)
Top (of initial area) elevation =  1463.300(Ft.)
Bottom (of initial area) elevation =  1448.210(Ft.)
Difference in elevation =    15.090(Ft.)
Slope =    0.03509  s(percent)=       3.51
TC = k(0.370)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.176 min.
Rainfall intensity =      2.974(In/Hr) for a   100.0 year storm
CONDOMINIUM subarea type
Runoff Coefficient = 0.821
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.900
Decimal fraction soil group C = 0.100
Decimal fraction soil group D = 0.000
```

```
RI index for soil(AMC 2)  =  57.30
Pervious area fraction =  0.350; Impervious fraction =  0.650
Initial subarea runoff =      2.247(CFS)
Total initial stream area =        0.920(Ac.)
Pervious area fraction = 0.350


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Process from Point/Station       21.200 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1439.950(Ft.)
Downstream point/station elevation =  1438.470(Ft.)
Pipe length  =    95.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.247(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.247(CFS)
Normal flow depth in pipe =    6.04(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =    7.70(In.)
Pipe flow velocity =      5.68(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =     8.46 min.


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Process from Point/Station       21.200 to Point/Station       22.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.920(Ac.)
Runoff from this stream =      2.247(CFS)
Time of concentration =    8.46 min.
Rainfall intensity =     2.926(In/Hr)
Summary of stream data:

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


1       36.055      9.02                2.834
2        2.247      8.46                2.926
Largest stream flow has longer time of concentration
Qp =     36.055 + sum of
        Qb         Ia/Ib
         2.247 *    0.969 =      2.176
Qp =     38.231

Total of 2 streams to confluence:
Flow rates before confluence point:
      36.055       2.247
Area of streams before confluence:
       15.410        0.920
Results of confluence:
Total flow rate =     38.231(CFS)
Time of concentration =     9.024 min.
Effective stream area after confluence =     16.330(Ac.)
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Process from Point/Station       22.000 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1438.470(Ft.)
Downstream point/station elevation =  1436.840(Ft.)
Pipe length  =   325.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    38.231(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    38.231(CFS)
Normal flow depth in pipe =   27.70(In.)
Flow top width inside pipe =   24.23(In.)
Critical Depth =   24.70(In.)
Pipe flow velocity =      7.18(Ft/s)
Travel time through pipe =    0.75 min.
Time of concentration (TC) =     9.78 min.


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Process from Point/Station       22.000 to Point/Station       23.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     16.330(Ac.)
Runoff from this stream =     38.231(CFS)
Time of concentration =    9.78 min.
Rainfall intensity =     2.724(In/Hr)


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Process from Point/Station       22.100 to Point/Station       22.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   221.000(Ft.)
Top (of initial area) elevation =  1453.300(Ft.)
Bottom (of initial area) elevation =  1448.500(Ft.)
Difference in elevation =     4.800(Ft.)
Slope =    0.02172  s(percent)=       2.17
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.020 min.
Rainfall intensity =      3.456(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.873
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      2.505(CFS)
Total initial stream area =        0.830(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station       22.200 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  1443.500(Ft.)
Downstream point/station elevation =  1436.840(Ft.)
Pipe length  =    20.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.505(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     2.505(CFS)
Normal flow depth in pipe =    3.96(In.)
Flow top width inside pipe =    5.68(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.21(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =     6.04 min.


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Process from Point/Station       22.200 to Point/Station       23.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.830(Ac.)
Runoff from this stream =      2.505(CFS)
Time of concentration =    6.04 min.
Rainfall intensity =     3.450(In/Hr)
Summary of stream data:

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


1       38.231      9.78                2.724
2        2.505      6.04                3.450
Largest stream flow has longer time of concentration
Qp =     38.231 + sum of
        Qb         Ia/Ib
         2.505 *    0.790 =      1.978
Qp =     40.209

Total of 2 streams to confluence:
Flow rates before confluence point:
      38.231       2.505
Area of streams before confluence:
       16.330        0.830
Results of confluence:
Total flow rate =     40.209(CFS)
Time of concentration =     9.778 min.
Effective stream area after confluence =     17.160(Ac.)


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Process from Point/Station       23.000 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  1436.840(Ft.)
Downstream point/station elevation =  1435.420(Ft.)
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```
Pipe length  =   283.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    40.209(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    40.209(CFS)
Normal flow depth in pipe =   25.52(In.)
Flow top width inside pipe =   32.70(In.)
Critical Depth =   24.78(In.)
Pipe flow velocity =      7.50(Ft/s)
Travel time through pipe =    0.63 min.
Time of concentration (TC) =    10.41 min.


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Process from Point/Station       23.000 to Point/Station       24.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     17.160(Ac.)
Runoff from this stream =     40.209(CFS)
Time of concentration =   10.41 min.
Rainfall intensity =     2.643(In/Hr)


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Process from Point/Station       23.100 to Point/Station       23.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   345.000(Ft.)
Top (of initial area) elevation =  1453.400(Ft.)
Bottom (of initial area) elevation =  1448.300(Ft.)
Difference in elevation =     5.100(Ft.)
Slope =    0.01478  s(percent)=       1.48
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.216 min.
Rainfall intensity =      3.162(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.886
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      7.561(CFS)
Total initial stream area =        2.700(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       23.200 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1440.000(Ft.)
Downstream point/station elevation =  1435.420(Ft.)
Pipe length  =    78.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.561(CFS)
Nearest computed pipe diameter  =     12.00(In.)
```

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Calculated individual pipe flow  =     7.561(CFS)
Normal flow depth in pipe =    8.71(In.)
Flow top width inside pipe =   10.71(In.)
Critical depth could not be calculated.
Pipe flow velocity =     12.40(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     7.32 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.200 to Point/Station       24.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.700(Ac.)
Runoff from this stream =      7.561(CFS)
Time of concentration =    7.32 min.
Rainfall intensity =     3.140(In/Hr)
Summary of stream data:

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


1       40.209     10.41                2.643
2        7.561      7.32                3.140
Largest stream flow has longer time of concentration
Qp =     40.209 + sum of
        Qb         Ia/Ib
         7.561 *    0.842 =      6.364
Qp =     46.573

Total of 2 streams to confluence:
Flow rates before confluence point:
      40.209       7.561
Area of streams before confluence:
       17.160        2.700
Results of confluence:
Total flow rate =     46.573(CFS)
Time of concentration =    10.407 min.
Effective stream area after confluence =     19.860(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.000 to Point/Station       28.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1435.420(Ft.)
Downstream point/station elevation =  1435.100(Ft.)
Pipe length  =    58.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    46.573(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    46.573(CFS)
Normal flow depth in pipe =   27.75(In.)
Flow top width inside pipe =   30.26(In.)
Critical Depth =   26.69(In.)
Pipe flow velocity =      7.97(Ft/s)
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```
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    10.53 min.


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Process from Point/Station       24.000 to Point/Station       28.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     19.860(Ac.)
Runoff from this stream =     46.573(CFS)
Time of concentration =   10.53 min.
Rainfall intensity =     2.628(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       25.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   467.000(Ft.)
Top (of initial area) elevation =  1454.100(Ft.)
Bottom (of initial area) elevation =  1451.000(Ft.)
Difference in elevation =     3.100(Ft.)
Slope =    0.00664  s(percent)=       0.66
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.560 min.
Rainfall intensity =      2.755(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.882
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.280
Decimal fraction soil group C = 0.720
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  65.36
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      6.290(CFS)
Total initial stream area =        2.590(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       25.000 to Point/Station       28.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1446.000(Ft.)
Downstream point/station elevation =  1435.100(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.290(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     6.290(CFS)
Normal flow depth in pipe =    6.86(In.)
Flow top width inside pipe =    7.67(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.41(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     9.62 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       28.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.769
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =     9.62 min.
Rainfall intensity =      2.746(In/Hr) for a   100.0 year storm
Subarea runoff =      2.069(CFS) for      0.980(Ac.)
Total runoff =      8.360(CFS)      Total area =       3.570(Ac.)


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Process from Point/Station       25.000 to Point/Station       28.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      3.570(Ac.)
Runoff from this stream =      8.360(CFS)
Time of concentration =    9.62 min.
Rainfall intensity =     2.746(In/Hr)


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Process from Point/Station       26.000 to Point/Station       26.100
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________________
Initial area flow distance =   373.000(Ft.)
Top (of initial area) elevation =  1454.000(Ft.)
Bottom (of initial area) elevation =  1448.300(Ft.)
Difference in elevation =     5.700(Ft.)
Slope =    0.01528  s(percent)=       1.53
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.396 min.
Rainfall intensity =      3.124(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.885
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.130
Decimal fraction soil group C = 0.870
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  67.31
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      8.262(CFS)
Total initial stream area =        2.990(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       26.100 to Point/Station       28.000
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**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  1440.000(Ft.)
Downstream point/station elevation =  1435.100(Ft.)
Pipe length  =   104.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.262(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     8.262(CFS)
Normal flow depth in pipe =    8.29(In.)
Flow top width inside pipe =   14.92(In.)
Critical Depth =   13.52(In.)
Pipe flow velocity =     11.89(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =     7.54 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.100 to Point/Station       28.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________
Along Main Stream number: 2 in normal stream number 3
Stream flow area =      2.990(Ac.)
Runoff from this stream =      8.262(CFS)
Time of concentration =    7.54 min.
Rainfall intensity =     3.094(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.100 to Point/Station       27.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________
Initial area flow distance =   256.000(Ft.)
Top (of initial area) elevation =  1453.400(Ft.)
Bottom (of initial area) elevation =  1451.000(Ft.)
Difference in elevation =     2.400(Ft.)
Slope =    0.00938  s(percent)=       0.94
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.015 min.
Rainfall intensity =      3.206(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.886
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      3.124(CFS)
Total initial stream area =        1.100(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       27.000 to Point/Station       27.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________
CONDOMINIUM subarea type
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Runoff Coefficient = 0.850
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.350; Impervious fraction =  0.650
Time of concentration =     7.01 min.
Rainfall intensity =      3.206(In/Hr) for a   100.0 year storm
Subarea runoff =      0.845(CFS) for      0.310(Ac.)
Total runoff =      3.969(CFS)      Total area =       1.410(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       27.000 to Point/Station       28.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1446.000(Ft.)
Downstream point/station elevation =  1435.100(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.969(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     3.969(CFS)
Normal flow depth in pipe =    4.95(In.)
Flow top width inside pipe =    8.95(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.94(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     7.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       27.000 to Point/Station       28.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 4
Stream flow area =      1.410(Ac.)
Runoff from this stream =      3.969(CFS)
Time of concentration =    7.08 min.
Rainfall intensity =     3.191(In/Hr)
Summary of stream data:

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


1       46.573     10.53                2.628
2        8.360      9.62                2.746
3        8.262      7.54                3.094
4        3.969      7.08                3.191
Largest stream flow has longer time of concentration
Qp =     46.573 + sum of
        Qb         Ia/Ib
         8.360 *    0.957 =      7.999
        Qb         Ia/Ib
         8.262 *    0.849 =      7.016
        Qb         Ia/Ib
```

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         3.969 *    0.823 =      3.269
Qp =     64.857

Total of 4 streams to confluence:
Flow rates before confluence point:
      46.573       8.360       8.262       3.969
Area of streams before confluence:
       19.860        3.570        2.990        1.410
Results of confluence:
Total flow rate =     64.857(CFS)
Time of concentration =    10.528 min.
Effective stream area after confluence =     27.830(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.000 to Point/Station       28.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.764
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  74.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    10.53 min.
Rainfall intensity =      2.628(In/Hr) for a   100.0 year storm
Subarea runoff =      1.586(CFS) for      0.790(Ac.)
Total runoff =     66.442(CFS)      Total area =      28.620(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.000 to Point/Station       29.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1435.100(Ft.)
Downstream point/station elevation =  1434.400(Ft.)
Pipe length  =   205.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    66.442(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =    66.442(CFS)
Normal flow depth in pipe =   34.69(In.)
Flow top width inside pipe =   37.83(In.)
Critical Depth =   30.09(In.)
Pipe flow velocity =      7.28(Ft/s)
Travel time through pipe =    0.47 min.
Time of concentration (TC) =    11.00 min.


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Process from Point/Station       29.000 to Point/Station       29.100
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1434.400(Ft.)
Downstream point/station elevation =  1434.220(Ft.)
Pipe length  =    36.00(Ft.)   Manning's N = 0.013
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No. of pipes = 1  Required pipe flow  =    66.442(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =    66.442(CFS)

Normal flow depth in pipe =   32.16(In.)
Flow top width inside pipe =   35.58(In.)
Critical Depth =   30.68(In.)
Pipe flow velocity =      8.40(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    11.07 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       29.000 to Point/Station       29.100
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     28.620(Ac.)
Runoff from this stream =     66.442(CFS)
Time of concentration =   11.07 min.
Rainfall intensity =     2.564(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       28.100 to Point/Station       28.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   594.000(Ft.)
Top (of initial area) elevation =  1451.300(Ft.)
Bottom (of initial area) elevation =  1448.200(Ft.)
Difference in elevation =     3.100(Ft.)
Slope =    0.00522  s(percent)=       0.52
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.044 min.
Rainfall intensity =      2.567(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.179(CFS)
Total initial stream area =        0.520(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       28.200 to Point/Station       28.300
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1448.200(Ft.)
End of street segment elevation =  1446.300(Ft.)
Length of street segment  =   452.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  28.000(Ft.)
```

```
Distance from crown to crossfall grade break  =  26.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  11.000(Ft.)
Slope from curb to property line (v/hz) =   0.015
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 =      2.514(CFS)
Depth of flow =   0.366(Ft.), Average velocity =   1.616(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  11.954(Ft.)
Flow velocity =   1.62(Ft/s)
Travel time =    4.66 min.     TC =   15.71  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.880
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.160(In/Hr) for a   100.0 year storm
Subarea runoff =      2.605(CFS) for      1.370(Ac.)
Total runoff =      3.784(CFS)      Total area =       1.890(Ac.)
Street flow at end of street =      3.784(CFS)
Half street flow at end of street =      3.784(CFS)
Depth of flow =   0.409(Ft.), Average velocity =   1.781(Ft/s)
Flow width (from curb towards crown)=  14.135(Ft.)


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Process from Point/Station       28.300 to Point/Station       29.100
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1440.000(Ft.)
Downstream point/station elevation =  1434.220(Ft.)
Pipe length  =    23.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.784(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     3.784(CFS)
Normal flow depth in pipe =    4.27(In.)
Flow top width inside pipe =    8.99(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.34(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =    15.73 min.


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Process from Point/Station       28.300 to Point/Station       29.100
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
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```
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.890(Ac.)
Runoff from this stream =      3.784(CFS)
Time of concentration =   15.73 min.
Rainfall intensity =     2.159(In/Hr)
Summary of stream data:

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


1       66.442     11.07                2.564
2        3.784     15.73                2.159
Largest stream flow has longer or shorter time of concentration
Qp =     66.442 + sum of
        Qa          Tb/Ta
         3.784 *    0.704 =      2.663
Qp =     69.105

Total of 2 streams to confluence:
Flow rates before confluence point:
      66.442       3.784
Area of streams before confluence:
       28.620        1.890
Results of confluence:
Total flow rate =     69.105(CFS)
Time of concentration =    11.069 min.
Effective stream area after confluence =     30.510(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       29.100 to Point/Station       30.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1434.220(Ft.)
Downstream point/station elevation =  1432.500(Ft.)
Pipe length  =   144.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    69.105(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    69.105(CFS)
Normal flow depth in pipe =   27.94(In.)
Flow top width inside pipe =   30.02(In.)
Critical Depth =   31.75(In.)
Pipe flow velocity =     11.73(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =    11.27 min.


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Process from Point/Station       29.100 to Point/Station       30.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     30.510(Ac.)
Runoff from this stream =     69.105(CFS)
Time of concentration =   11.27 min.
```

Rainfall intensity = 2.541(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	75.110	14.32	2.260
2	69.105	11.27	2.541

Largest stream flow has longer time of concentration
Qp = 75.110 + sum of
Qb Ia/Ib
69.105 * 0.889 = 61.463
Qp = 136.573

Total of 2 main streams to confluence:
Flow rates before confluence point:
75.110 69.105
Area of streams before confluence:
32.840 30.510

Results of confluence:
Total flow rate = 136.573(CFS)
Time of concentration = 14.320 min.
Effective stream area after confluence = 63.350(Ac.)
End of computations, total study area = 63.35 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.206
Area averaged RI index number = 61.5

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 10/02/24 File: q1auh10024100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION WATERSHED A
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 33.45(Ac.) = 0.052 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 33.45(Ac.) = 0.052 Sq. Mi.
Length along longest watercourse = 1351.00(Ft.)
Length along longest watercourse measured to centroid = 643.00(Ft.)
Length along longest watercourse = 0.256 Mi.
Length along longest watercourse measured to centroid = 0.122 Mi.
Difference in elevation = 13.50(Ft.)
Slope along watercourse = 52.7609 Ft./Mi.
Average Manning's 'N' = 0.024
Lag time = 0.073 Hr.
Lag time = 4.35 Min.
25% of lag time = 1.09 Min.
40% of lag time = 1.74 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

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

33.45 1.80 60.21

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
33.45	5.00	167.25

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.800(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
33.450	61.30	0.500

Total Area Entered = 33.45(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
61.3	61.3	0.456	0.500	0.251	1.000	0.251
					Sum (F) =	0.251

Area averaged mean soil loss (F) (In/Hr) = 0.251
Minimum soil loss rate ((In/Hr)) = 0.125
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	114.833	23.683	7.984
2	0.167	229.667	48.833	16.462
3	0.250	344.500	13.786	4.647
4	0.333	459.334	6.296	2.122
5	0.417	574.167	3.503	1.181
6	0.500	689.000	2.103	0.709
7	0.583	803.834	1.796	0.605
			Sum = 100.000	Sum= 33.711

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

Unit Time		Pattern	Storm Rain	Loss rate(In./Hr)			Effective
	(Hr.)	Percent	(In/Hr)	Max		Low	(In/Hr)
1	0.08	0.07	0.040	(0.445)		0.020	0.020

2	0.17	0.07	0.040	(0.443)	0.020	0.020
3	0.25	0.07	0.040	(0.441)	0.020	0.020
4	0.33	0.10	0.060	(0.439)	0.030	0.030
5	0.42	0.10	0.060	(0.438)	0.030	0.030
6	0.50	0.10	0.060	(0.436)	0.030	0.030
7	0.58	0.10	0.060	(0.434)	0.030	0.030
8	0.67	0.10	0.060	(0.433)	0.030	0.030
9	0.75	0.10	0.060	(0.431)	0.030	0.030
10	0.83	0.13	0.080	(0.429)	0.040	0.040
11	0.92	0.13	0.080	(0.428)	0.040	0.040
12	1.00	0.13	0.080	(0.426)	0.040	0.040
13	1.08	0.10	0.060	(0.424)	0.030	0.030
14	1.17	0.10	0.060	(0.422)	0.030	0.030
15	1.25	0.10	0.060	(0.421)	0.030	0.030
16	1.33	0.10	0.060	(0.419)	0.030	0.030
17	1.42	0.10	0.060	(0.417)	0.030	0.030
18	1.50	0.10	0.060	(0.416)	0.030	0.030
19	1.58	0.10	0.060	(0.414)	0.030	0.030
20	1.67	0.10	0.060	(0.412)	0.030	0.030
21	1.75	0.10	0.060	(0.411)	0.030	0.030
22	1.83	0.13	0.080	(0.409)	0.040	0.040
23	1.92	0.13	0.080	(0.408)	0.040	0.040
24	2.00	0.13	0.080	(0.406)	0.040	0.040
25	2.08	0.13	0.080	(0.404)	0.040	0.040
26	2.17	0.13	0.080	(0.403)	0.040	0.040
27	2.25	0.13	0.080	(0.401)	0.040	0.040
28	2.33	0.13	0.080	(0.399)	0.040	0.040
29	2.42	0.13	0.080	(0.398)	0.040	0.040
30	2.50	0.13	0.080	(0.396)	0.040	0.040
31	2.58	0.17	0.100	(0.394)	0.050	0.050
32	2.67	0.17	0.100	(0.393)	0.050	0.050
33	2.75	0.17	0.100	(0.391)	0.050	0.050
34	2.83	0.17	0.100	(0.390)	0.050	0.050
35	2.92	0.17	0.100	(0.388)	0.050	0.050
36	3.00	0.17	0.100	(0.386)	0.050	0.050
37	3.08	0.17	0.100	(0.385)	0.050	0.050
38	3.17	0.17	0.100	(0.383)	0.050	0.050
39	3.25	0.17	0.100	(0.382)	0.050	0.050
40	3.33	0.17	0.100	(0.380)	0.050	0.050
41	3.42	0.17	0.100	(0.378)	0.050	0.050
42	3.50	0.17	0.100	(0.377)	0.050	0.050
43	3.58	0.17	0.100	(0.375)	0.050	0.050
44	3.67	0.17	0.100	(0.374)	0.050	0.050
45	3.75	0.17	0.100	(0.372)	0.050	0.050
46	3.83	0.20	0.120	(0.371)	0.060	0.060
47	3.92	0.20	0.120	(0.369)	0.060	0.060
48	4.00	0.20	0.120	(0.367)	0.060	0.060
49	4.08	0.20	0.120	(0.366)	0.060	0.060
50	4.17	0.20	0.120	(0.364)	0.060	0.060
51	4.25	0.20	0.120	(0.363)	0.060	0.060
52	4.33	0.23	0.140	(0.361)	0.070	0.070
53	4.42	0.23	0.140	(0.360)	0.070	0.070
54	4.50	0.23	0.140	(0.358)	0.070	0.070
55	4.58	0.23	0.140	(0.357)	0.070	0.070
56	4.67	0.23	0.140	(0.355)	0.070	0.070
57	4.75	0.23	0.140	(0.354)	0.070	0.070
58	4.83	0.27	0.160	(0.352)	0.080	0.080

59	4.92	0.27	0.160	(0.350)	0.080	0.080
60	5.00	0.27	0.160	(0.349)	0.080	0.080
61	5.08	0.20	0.120	(0.347)	0.060	0.060
62	5.17	0.20	0.120	(0.346)	0.060	0.060
63	5.25	0.20	0.120	(0.344)	0.060	0.060
64	5.33	0.23	0.140	(0.343)	0.070	0.070
65	5.42	0.23	0.140	(0.341)	0.070	0.070
66	5.50	0.23	0.140	(0.340)	0.070	0.070
67	5.58	0.27	0.160	(0.338)	0.080	0.080
68	5.67	0.27	0.160	(0.337)	0.080	0.080
69	5.75	0.27	0.160	(0.335)	0.080	0.080
70	5.83	0.27	0.160	(0.334)	0.080	0.080
71	5.92	0.27	0.160	(0.332)	0.080	0.080
72	6.00	0.27	0.160	(0.331)	0.080	0.080
73	6.08	0.30	0.180	(0.330)	0.090	0.090
74	6.17	0.30	0.180	(0.328)	0.090	0.090
75	6.25	0.30	0.180	(0.327)	0.090	0.090
76	6.33	0.30	0.180	(0.325)	0.090	0.090
77	6.42	0.30	0.180	(0.324)	0.090	0.090
78	6.50	0.30	0.180	(0.322)	0.090	0.090
79	6.58	0.33	0.200	(0.321)	0.100	0.100
80	6.67	0.33	0.200	(0.319)	0.100	0.100
81	6.75	0.33	0.200	(0.318)	0.100	0.100
82	6.83	0.33	0.200	(0.316)	0.100	0.100
83	6.92	0.33	0.200	(0.315)	0.100	0.100
84	7.00	0.33	0.200	(0.314)	0.100	0.100
85	7.08	0.33	0.200	(0.312)	0.100	0.100
86	7.17	0.33	0.200	(0.311)	0.100	0.100
87	7.25	0.33	0.200	(0.309)	0.100	0.100
88	7.33	0.37	0.220	(0.308)	0.110	0.110
89	7.42	0.37	0.220	(0.307)	0.110	0.110
90	7.50	0.37	0.220	(0.305)	0.110	0.110
91	7.58	0.40	0.240	(0.304)	0.120	0.120
92	7.67	0.40	0.240	(0.302)	0.120	0.120
93	7.75	0.40	0.240	(0.301)	0.120	0.120
94	7.83	0.43	0.260	(0.300)	0.130	0.130
95	7.92	0.43	0.260	(0.298)	0.130	0.130
96	8.00	0.43	0.260	(0.297)	0.130	0.130
97	8.08	0.50	0.300	(0.295)	0.150	0.150
98	8.17	0.50	0.300	(0.294)	0.150	0.150
99	8.25	0.50	0.300	(0.293)	0.150	0.150
100	8.33	0.50	0.300	(0.291)	0.150	0.150
101	8.42	0.50	0.300	(0.290)	0.150	0.150
102	8.50	0.50	0.300	(0.289)	0.150	0.150
103	8.58	0.53	0.320	(0.287)	0.160	0.160
104	8.67	0.53	0.320	(0.286)	0.160	0.160
105	8.75	0.53	0.320	(0.285)	0.160	0.160
106	8.83	0.57	0.340	(0.283)	0.170	0.170
107	8.92	0.57	0.340	(0.282)	0.170	0.170
108	9.00	0.57	0.340	(0.281)	0.170	0.170
109	9.08	0.63	0.380	(0.279)	0.190	0.190
110	9.17	0.63	0.380	(0.278)	0.190	0.190
111	9.25	0.63	0.380	(0.277)	0.190	0.190
112	9.33	0.67	0.400	(0.275)	0.200	0.200
113	9.42	0.67	0.400	(0.274)	0.200	0.200
114	9.50	0.67	0.400	(0.273)	0.200	0.200
115	9.58	0.70	0.420	(0.271)	0.210	0.210

116	9.67	0.70	0.420	(0.270)	0.210	0.210
117	9.75	0.70	0.420	(0.269)	0.210	0.210
118	9.83	0.73	0.440	(0.267)	0.220	0.220
119	9.92	0.73	0.440	(0.266)	0.220	0.220
120	10.00	0.73	0.440	(0.265)	0.220	0.220
121	10.08	0.50	0.300	(0.264)	0.150	0.150
122	10.17	0.50	0.300	(0.262)	0.150	0.150
123	10.25	0.50	0.300	(0.261)	0.150	0.150
124	10.33	0.50	0.300	(0.260)	0.150	0.150
125	10.42	0.50	0.300	(0.258)	0.150	0.150
126	10.50	0.50	0.300	(0.257)	0.150	0.150
127	10.58	0.67	0.400	(0.256)	0.200	0.200
128	10.67	0.67	0.400	(0.255)	0.200	0.200
129	10.75	0.67	0.400	(0.253)	0.200	0.200
130	10.83	0.67	0.400	(0.252)	0.200	0.200
131	10.92	0.67	0.400	(0.251)	0.200	0.200
132	11.00	0.67	0.400	(0.250)	0.200	0.200
133	11.08	0.63	0.380	(0.249)	0.190	0.190
134	11.17	0.63	0.380	(0.247)	0.190	0.190
135	11.25	0.63	0.380	(0.246)	0.190	0.190
136	11.33	0.63	0.380	(0.245)	0.190	0.190
137	11.42	0.63	0.380	(0.244)	0.190	0.190
138	11.50	0.63	0.380	(0.242)	0.190	0.190
139	11.58	0.57	0.340	(0.241)	0.170	0.170
140	11.67	0.57	0.340	(0.240)	0.170	0.170
141	11.75	0.57	0.340	(0.239)	0.170	0.170
142	11.83	0.60	0.360	(0.238)	0.180	0.180
143	11.92	0.60	0.360	(0.236)	0.180	0.180
144	12.00	0.60	0.360	(0.235)	0.180	0.180
145	12.08	0.83	0.500	0.234	(0.250)	0.266
146	12.17	0.83	0.500	0.233	(0.250)	0.267
147	12.25	0.83	0.500	0.232	(0.250)	0.268
148	12.33	0.87	0.520	0.231	(0.260)	0.289
149	12.42	0.87	0.520	0.229	(0.260)	0.291
150	12.50	0.87	0.520	0.228	(0.260)	0.292
151	12.58	0.93	0.560	0.227	(0.280)	0.333
152	12.67	0.93	0.560	0.226	(0.280)	0.334
153	12.75	0.93	0.560	0.225	(0.280)	0.335
154	12.83	0.97	0.580	0.224	(0.290)	0.356
155	12.92	0.97	0.580	0.223	(0.290)	0.357
156	13.00	0.97	0.580	0.221	(0.290)	0.359
157	13.08	1.13	0.680	0.220	(0.340)	0.460
158	13.17	1.13	0.680	0.219	(0.340)	0.461
159	13.25	1.13	0.680	0.218	(0.340)	0.462
160	13.33	1.13	0.680	0.217	(0.340)	0.463
161	13.42	1.13	0.680	0.216	(0.340)	0.464
162	13.50	1.13	0.680	0.215	(0.340)	0.465
163	13.58	0.77	0.460	0.214	(0.230)	0.246
164	13.67	0.77	0.460	0.213	(0.230)	0.247
165	13.75	0.77	0.460	0.212	(0.230)	0.248
166	13.83	0.77	0.460	0.210	(0.230)	0.250
167	13.92	0.77	0.460	0.209	(0.230)	0.251
168	14.00	0.77	0.460	0.208	(0.230)	0.252
169	14.08	0.90	0.540	0.207	(0.270)	0.333
170	14.17	0.90	0.540	0.206	(0.270)	0.334
171	14.25	0.90	0.540	0.205	(0.270)	0.335
172	14.33	0.87	0.520	0.204	(0.260)	0.316

173	14.42	0.87	0.520	0.203	(0.260)	0.317
174	14.50	0.87	0.520	0.202	(0.260)	0.318
175	14.58	0.87	0.520	0.201	(0.260)	0.319
176	14.67	0.87	0.520	0.200	(0.260)	0.320
177	14.75	0.87	0.520	0.199	(0.260)	0.321
178	14.83	0.83	0.500	0.198	(0.250)	0.302
179	14.92	0.83	0.500	0.197	(0.250)	0.303
180	15.00	0.83	0.500	0.196	(0.250)	0.304
181	15.08	0.80	0.480	0.195	(0.240)	0.285
182	15.17	0.80	0.480	0.194	(0.240)	0.286
183	15.25	0.80	0.480	0.193	(0.240)	0.287
184	15.33	0.77	0.460	0.192	(0.230)	0.268
185	15.42	0.77	0.460	0.191	(0.230)	0.269
186	15.50	0.77	0.460	0.190	(0.230)	0.270
187	15.58	0.63	0.380	0.189	(0.190)	0.191
188	15.67	0.63	0.380	0.188	(0.190)	0.192
189	15.75	0.63	0.380	0.187	(0.190)	0.193
190	15.83	0.63	0.380	0.186	(0.190)	0.194
191	15.92	0.63	0.380	0.185	(0.190)	0.195
192	16.00	0.63	0.380	0.184	(0.190)	0.196
193	16.08	0.13	0.080	(0.183)	0.040	0.040
194	16.17	0.13	0.080	(0.182)	0.040	0.040
195	16.25	0.13	0.080	(0.181)	0.040	0.040
196	16.33	0.13	0.080	(0.180)	0.040	0.040
197	16.42	0.13	0.080	(0.180)	0.040	0.040
198	16.50	0.13	0.080	(0.179)	0.040	0.040
199	16.58	0.10	0.060	(0.178)	0.030	0.030
200	16.67	0.10	0.060	(0.177)	0.030	0.030
201	16.75	0.10	0.060	(0.176)	0.030	0.030
202	16.83	0.10	0.060	(0.175)	0.030	0.030
203	16.92	0.10	0.060	(0.174)	0.030	0.030
204	17.00	0.10	0.060	(0.173)	0.030	0.030
205	17.08	0.17	0.100	(0.172)	0.050	0.050
206	17.17	0.17	0.100	(0.171)	0.050	0.050
207	17.25	0.17	0.100	(0.171)	0.050	0.050
208	17.33	0.17	0.100	(0.170)	0.050	0.050
209	17.42	0.17	0.100	(0.169)	0.050	0.050
210	17.50	0.17	0.100	(0.168)	0.050	0.050
211	17.58	0.17	0.100	(0.167)	0.050	0.050
212	17.67	0.17	0.100	(0.166)	0.050	0.050
213	17.75	0.17	0.100	(0.166)	0.050	0.050
214	17.83	0.13	0.080	(0.165)	0.040	0.040
215	17.92	0.13	0.080	(0.164)	0.040	0.040
216	18.00	0.13	0.080	(0.163)	0.040	0.040
217	18.08	0.13	0.080	(0.162)	0.040	0.040
218	18.17	0.13	0.080	(0.162)	0.040	0.040
219	18.25	0.13	0.080	(0.161)	0.040	0.040
220	18.33	0.13	0.080	(0.160)	0.040	0.040
221	18.42	0.13	0.080	(0.159)	0.040	0.040
222	18.50	0.13	0.080	(0.158)	0.040	0.040
223	18.58	0.10	0.060	(0.158)	0.030	0.030
224	18.67	0.10	0.060	(0.157)	0.030	0.030
225	18.75	0.10	0.060	(0.156)	0.030	0.030
226	18.83	0.07	0.040	(0.155)	0.020	0.020
227	18.92	0.07	0.040	(0.155)	0.020	0.020
228	19.00	0.07	0.040	(0.154)	0.020	0.020
229	19.08	0.10	0.060	(0.153)	0.030	0.030

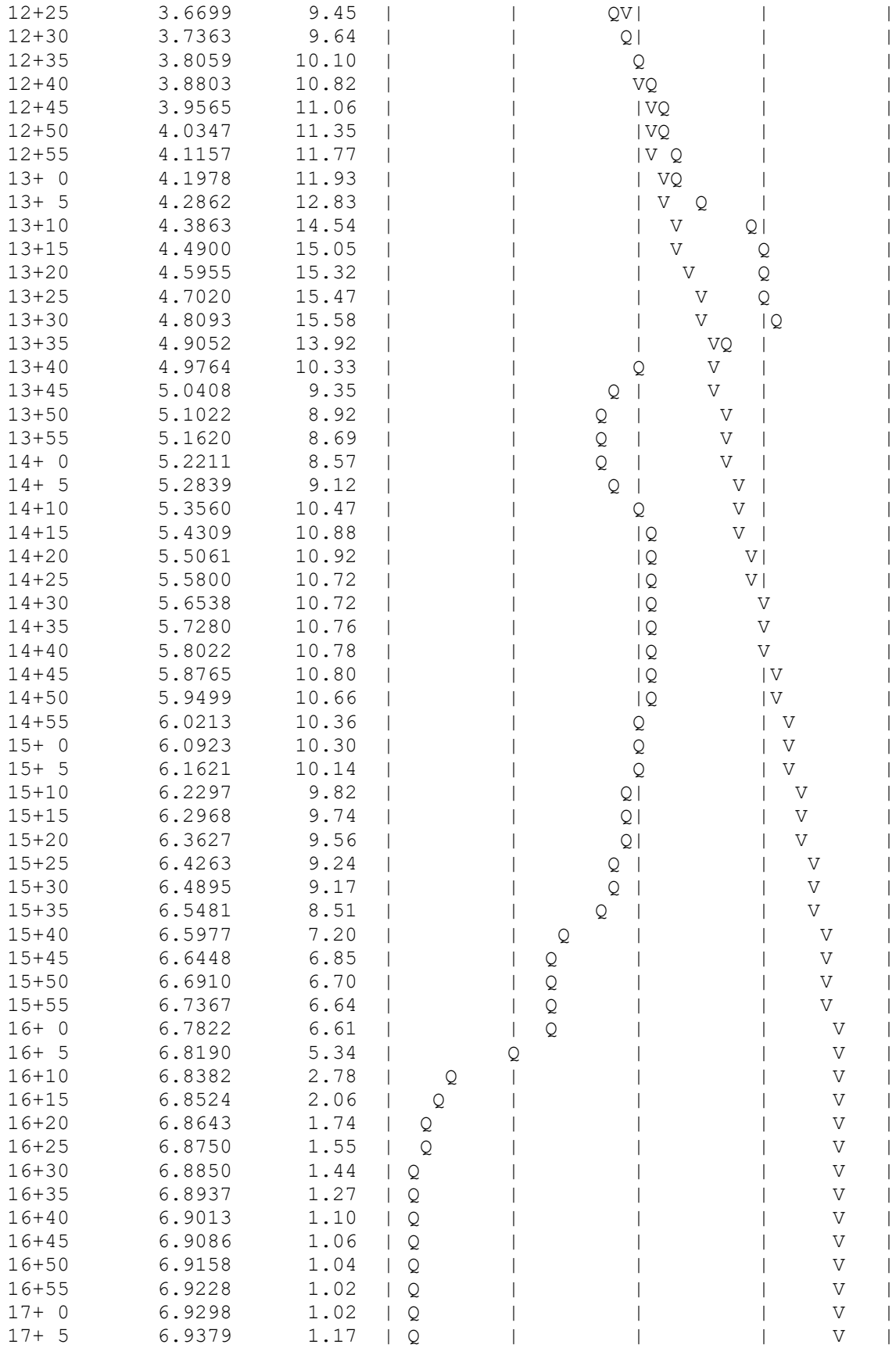
230	19.17	0.10	0.060	(0.152)	0.030	0.030
231	19.25	0.10	0.060	(0.152)	0.030	0.030
232	19.33	0.13	0.080	(0.151)	0.040	0.040
233	19.42	0.13	0.080	(0.150)	0.040	0.040
234	19.50	0.13	0.080	(0.150)	0.040	0.040
235	19.58	0.10	0.060	(0.149)	0.030	0.030
236	19.67	0.10	0.060	(0.148)	0.030	0.030
237	19.75	0.10	0.060	(0.148)	0.030	0.030
238	19.83	0.07	0.040	(0.147)	0.020	0.020
239	19.92	0.07	0.040	(0.146)	0.020	0.020
240	20.00	0.07	0.040	(0.146)	0.020	0.020
241	20.08	0.10	0.060	(0.145)	0.030	0.030
242	20.17	0.10	0.060	(0.144)	0.030	0.030
243	20.25	0.10	0.060	(0.144)	0.030	0.030
244	20.33	0.10	0.060	(0.143)	0.030	0.030
245	20.42	0.10	0.060	(0.142)	0.030	0.030
246	20.50	0.10	0.060	(0.142)	0.030	0.030
247	20.58	0.10	0.060	(0.141)	0.030	0.030
248	20.67	0.10	0.060	(0.141)	0.030	0.030
249	20.75	0.10	0.060	(0.140)	0.030	0.030
250	20.83	0.07	0.040	(0.140)	0.020	0.020
251	20.92	0.07	0.040	(0.139)	0.020	0.020
252	21.00	0.07	0.040	(0.138)	0.020	0.020
253	21.08	0.10	0.060	(0.138)	0.030	0.030
254	21.17	0.10	0.060	(0.137)	0.030	0.030
255	21.25	0.10	0.060	(0.137)	0.030	0.030
256	21.33	0.07	0.040	(0.136)	0.020	0.020
257	21.42	0.07	0.040	(0.136)	0.020	0.020
258	21.50	0.07	0.040	(0.135)	0.020	0.020
259	21.58	0.10	0.060	(0.135)	0.030	0.030
260	21.67	0.10	0.060	(0.134)	0.030	0.030
261	21.75	0.10	0.060	(0.134)	0.030	0.030
262	21.83	0.07	0.040	(0.133)	0.020	0.020
263	21.92	0.07	0.040	(0.133)	0.020	0.020
264	22.00	0.07	0.040	(0.132)	0.020	0.020
265	22.08	0.10	0.060	(0.132)	0.030	0.030
266	22.17	0.10	0.060	(0.132)	0.030	0.030
267	22.25	0.10	0.060	(0.131)	0.030	0.030
268	22.33	0.07	0.040	(0.131)	0.020	0.020
269	22.42	0.07	0.040	(0.130)	0.020	0.020
270	22.50	0.07	0.040	(0.130)	0.020	0.020
271	22.58	0.07	0.040	(0.130)	0.020	0.020
272	22.67	0.07	0.040	(0.129)	0.020	0.020
273	22.75	0.07	0.040	(0.129)	0.020	0.020
274	22.83	0.07	0.040	(0.129)	0.020	0.020
275	22.92	0.07	0.040	(0.128)	0.020	0.020
276	23.00	0.07	0.040	(0.128)	0.020	0.020
277	23.08	0.07	0.040	(0.128)	0.020	0.020
278	23.17	0.07	0.040	(0.127)	0.020	0.020
279	23.25	0.07	0.040	(0.127)	0.020	0.020
280	23.33	0.07	0.040	(0.127)	0.020	0.020
281	23.42	0.07	0.040	(0.127)	0.020	0.020
282	23.50	0.07	0.040	(0.126)	0.020	0.020
283	23.58	0.07	0.040	(0.126)	0.020	0.020
284	23.67	0.07	0.040	(0.126)	0.020	0.020
285	23.75	0.07	0.040	(0.126)	0.020	0.020
286	23.83	0.07	0.040	(0.126)	0.020	0.020

```
287  23.92     0.07      0.040       (  0.125)       0.020        0.020
288  24.00     0.07      0.040       (  0.125)       0.020        0.020
            (Loss Rate Not Used)
    Sum =     100.0                                   Sum =    32.3
     Flood volume = Effective rainfall      2.69(In)
      times area      33.5(Ac.)/[(In)/(Ft.)] =       7.5(Ac.Ft)
     Total soil loss =      2.31(In)
     Total soil loss =     6.426(Ac.Ft)
     Total rainfall =      5.00(In)
     Flood volume =      327149.6 Cubic Feet
     Total soil loss =      279928.2 Cubic Feet
     ---------------------------------------------------------------------
      Peak flow rate of this hydrograph =     15.580(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        5.0      10.0      15.0      20.0
 ---------------------------------------------------------------------------
   0+ 5       0.0011      0.16  Q         |         |         |         |
   0+10       0.0045      0.49  Q         |         |         |         |
   0+15       0.0085      0.58  VQ        |         |         |         |
   0+20       0.0133      0.70  VQ        |         |         |         |
   0+25       0.0195      0.89  VQ        |         |         |         |
   0+30       0.0260      0.95  VQ        |         |         |         |
   0+35       0.0328      0.99  VQ        |         |         |         |
   0+40       0.0397      1.00  VQ        |         |         |         |
   0+45       0.0466      1.01  V Q       |         |         |         |
   0+50       0.0542      1.09  V Q       |         |         |         |
   0+55       0.0628      1.26  V Q       |         |         |         |
   1+ 0       0.0718      1.30  V Q       |         |         |         |
   1+ 5       0.0804      1.24  V Q       |         |         |         |
   1+10       0.0879      1.09  V Q       |         |         |         |
   1+15       0.0951      1.05  V Q       |         |         |         |
   1+20       0.1023      1.04  V Q       |         |         |         |
   1+25       0.1093      1.02  V Q       |         |         |         |
   1+30       0.1163      1.02  V Q       |         |         |         |
   1+35       0.1233      1.01  V Q       |         |         |         |
   1+40       0.1303      1.01  V Q       |         |         |         |
   1+45       0.1372      1.01  V Q       |         |         |         |
   1+50       0.1448      1.09  V Q       |         |         |         |
   1+55       0.1534      1.26  V Q       |         |         |         |
   2+ 0       0.1624      1.30  V Q       |         |         |         |
   2+ 5       0.1715      1.32  V Q       |         |         |         |
   2+10       0.1807      1.34  V Q       |         |         |         |
   2+15       0.1899      1.34  |VQ       |         |         |         |
   2+20       0.1992      1.35  |VQ       |         |         |         |
   2+25       0.2085      1.35  |VQ       |         |         |         |
   2+30       0.2178      1.35  |VQ       |         |         |         |
   2+35       0.2277      1.43  |VQ       |         |         |         |
   2+40       0.2386      1.59  |V Q      |         |         |         |
   2+45       0.2499      1.64  |V Q      |         |         |         |
   2+50       0.2614      1.66  |V Q      |         |         |         |
```

2+55	0.2729	1.67	|V Q	|	|	|	|
3+ 0	0.2845	1.68	|V Q	|	|	|	|
3+ 5	0.2961	1.69	|V Q	|	|	|	|
3+10	0.3077	1.69	|V Q	|	|	|	|
3+15	0.3193	1.69	|V Q	|	|	|	|
3+20	0.3309	1.69	|V Q	|	|	|	|
3+25	0.3425	1.69	|V Q	|	|	|	|
3+30	0.3542	1.69	|V Q	|	|	|	|
3+35	0.3658	1.69	|V Q	|	|	|	|
3+40	0.3774	1.69	| VQ	|	|	|	|
3+45	0.3890	1.69	| VQ	|	|	|	|
3+50	0.4012	1.77	| VQ	|	|	|	|
3+55	0.4145	1.93	| VQ	|	|	|	|
4+ 0	0.4281	1.98	| VQ	|	|	|	|
4+ 5	0.4418	2.00	| VQ	|	|	|	|
4+10	0.4557	2.01	| V Q	|	|	|	|
4+15	0.4696	2.02	| V Q	|	|	|	|
4+20	0.4841	2.10	| V Q	|	|	|	|
4+25	0.4997	2.27	| V Q	|	|	|	|
4+30	0.5156	2.31	| V Q	|	|	|	|
4+35	0.5317	2.34	| V Q	|	|	|	|
4+40	0.5479	2.35	| V Q	|	|	|	|
4+45	0.5641	2.35	| VQ	|	|	|	|
4+50	0.5809	2.44	| VQ	|	|	|	|
4+55	0.5989	2.61	| V Q	|	|	|	|
5+ 0	0.6171	2.65	| V Q	|	|	|	|
5+ 5	0.6344	2.51	| V Q	|	|	|	|
5+10	0.6496	2.20	| VQ	|	|	|	|
5+15	0.6641	2.11	| VQ	|	|	|	|
5+20	0.6789	2.15	| VQ	|	|	|	|
5+25	0.6947	2.29	| VQ	|	|	|	|
5+30	0.7107	2.33	| VQ	|	|	|	|
5+35	0.7274	2.42	| VQ	|	|	|	|
5+40	0.7452	2.59	| V Q	|	|	|	|
5+45	0.7635	2.65	| VQ	|	|	|	|
5+50	0.7819	2.67	| VQ	|	|	|	|
5+55	0.8004	2.68	| VQ	|	|	|	|
6+ 0	0.8189	2.69	| VQ	|	|	|	|
6+ 5	0.8380	2.78	| VQ	|	|	|	|
6+10	0.8583	2.94	| VQ	|	|	|	|
6+15	0.8789	2.99	| VQ	|	|	|	|
6+20	0.8996	3.01	| V Q	|	|	|	|
6+25	0.9204	3.02	| V Q	|	|	|	|
6+30	0.9413	3.03	| VQ	|	|	|	|
6+35	0.9627	3.12	| VQ	|	|	|	|
6+40	0.9853	3.28	| VQ	|	|	|	|
6+45	1.0082	3.33	| VQ	|	|	|	|
6+50	1.0313	3.35	| VQ	|	|	|	|
6+55	1.0544	3.36	| VQ	|	|	|	|
7+ 0	1.0776	3.37	| VQ	|	|	|	|
7+ 5	1.1009	3.37	| VQ	|	|	|	|
7+10	1.1241	3.37	| VQ	|	|	|	|
7+15	1.1473	3.37	| Q	|	|	|	|
7+20	1.1711	3.45	| Q	|	|	|	|
7+25	1.1960	3.62	| VQ	|	|	|	|
7+30	1.2212	3.66	| VQ	|	|	|	|
7+35	1.2472	3.76	| VQ	|	|	|	|

7+40	1.2743	3.94	VQ				
7+45	1.3018	3.99	VQ				
7+50	1.3301	4.10	VQ				
7+55	1.3595	4.28	VQ				
8+ 0	1.3894	4.33	VQ				
8+ 5	1.4205	4.52	V Q				
8+10	1.4540	4.86	V Q				
8+15	1.4881	4.96	V Q				
8+20	1.5226	5.01	V Q				
8+25	1.5573	5.03	V Q				
8+30	1.5920	5.05	V Q				
8+35	1.6274	5.14	V Q				
8+40	1.6640	5.30	V Q				
8+45	1.7008	5.35	VQ				
8+50	1.7384	5.45	VQ				
8+55	1.7771	5.63	V|Q				
9+ 0	1.8162	5.68	V|Q				
9+ 5	1.8567	5.87	V|Q				
9+10	1.8994	6.21	V Q				
9+15	1.9429	6.31	V Q				
9+20	1.9872	6.44	V Q				
9+25	2.0328	6.63	V Q				
9+30	2.0789	6.69	|V Q				
9+35	2.1257	6.80	|V Q				
9+40	2.1738	6.98	|V Q				
9+45	2.2222	7.03	|V Q				
9+50	2.2714	7.14	| V Q				
9+55	2.3217	7.31	| V Q				
10+ 0	2.3725	7.37	| V Q				
10+ 5	2.4195	6.84	| VQ				
10+10	2.4588	5.69	|Q V				
10+15	2.4958	5.38	Q V				
10+20	2.5318	5.23	Q V				
10+25	2.5673	5.15	Q V				
10+30	2.6025	5.10	Q V				
10+35	2.6400	5.46	Q V				
10+40	2.6833	6.28	| Q V				
10+45	2.7282	6.51	| QV				
10+50	2.7738	6.62	| QV				
10+55	2.8198	6.68	| Q V				
11+ 0	2.8660	6.72	| Q V				
11+ 5	2.9119	6.67	| Q V				
11+10	2.9567	6.50	| Q V				
11+15	3.0011	6.45	| Q V				
11+20	3.0454	6.43	| Q V				
11+25	3.0897	6.42	| Q V				
11+30	3.1338	6.41	| Q V				
11+35	3.1769	6.25	| Q V				
11+40	3.2176	5.92	|Q V				
11+45	3.2578	5.83	|Q V				
11+50	3.2981	5.86	|Q V				
11+55	3.3395	6.00	| Q V				
12+ 0	3.3811	6.04	| Q V				
12+ 5	3.4274	6.73	| Q V				
12+10	3.4837	8.17	| Q V				
12+15	3.5429	8.60	| QV				
12+20	3.6048	8.98	| Q V|				



17+10	6.9482	1.50	Q				V
17+15	6.9592	1.59	Q				V
17+20	6.9705	1.64	Q				V
17+25	6.9819	1.66	Q				V
17+30	6.9934	1.67	Q				V
17+35	7.0051	1.69	Q				V
17+40	7.0167	1.69	Q				V
17+45	7.0283	1.69	Q				V
17+50	7.0393	1.61	Q				V
17+55	7.0493	1.44	Q				V
18+ 0	7.0589	1.40	Q				V
18+ 5	7.0683	1.37	Q				V
18+10	7.0777	1.36	Q				V
18+15	7.0871	1.36	Q				V
18+20	7.0963	1.35	Q				V
18+25	7.1056	1.35	Q				V
18+30	7.1149	1.35	Q				V
18+35	7.1237	1.27	Q				V
18+40	7.1313	1.10	Q				V
18+45	7.1386	1.06	Q				V
18+50	7.1452	0.96	Q				V
18+55	7.1505	0.78	Q				V
19+ 0	7.1555	0.73	Q				V
19+ 5	7.1609	0.78	Q				V
19+10	7.1673	0.93	Q				V
19+15	7.1740	0.97	Q				V
19+20	7.1814	1.07	Q				V
19+25	7.1899	1.24	Q				V
19+30	7.1989	1.30	Q				V
19+35	7.2074	1.24	Q				V
19+40	7.2149	1.09	Q				V
19+45	7.2222	1.05	Q				V
19+50	7.2288	0.96	Q				V
19+55	7.2341	0.78	Q				V
20+ 0	7.2392	0.73	Q				V
20+ 5	7.2445	0.78	Q				V
20+10	7.2509	0.93	Q				V
20+15	7.2576	0.97	Q				V
20+20	7.2644	0.99	Q				V
20+25	7.2713	1.00	Q				V
20+30	7.2782	1.01	Q				V
20+35	7.2852	1.01	Q				V
20+40	7.2922	1.01	Q				V
20+45	7.2991	1.01	Q				V
20+50	7.3056	0.93	Q				V
20+55	7.3108	0.77	Q				V
21+ 0	7.3158	0.72	Q				V
21+ 5	7.3212	0.78	Q				V
21+10	7.3276	0.93	Q				V
21+15	7.3343	0.97	Q				V
21+20	7.3405	0.91	Q				V
21+25	7.3457	0.75	Q				V
21+30	7.3506	0.71	Q				V
21+35	7.3560	0.78	Q				V
21+40	7.3624	0.93	Q				V
21+45	7.3691	0.97	Q				V
21+50	7.3754	0.91	Q				V

21+55	7.3806	0.75	|Q	|	|	|	V|
22+ 0	7.3855	0.71	|Q	|	|	|	V|
22+ 5	7.3909	0.78	|Q	|	|	|	V|
22+10	7.3973	0.93	|Q	|	|	|	V|
22+15	7.4040	0.97	|Q	|	|	|	V|
22+20	7.4102	0.91	|Q	|	|	|	V|
22+25	7.4154	0.75	|Q	|	|	|	V|
22+30	7.4203	0.71	|Q	|	|	|	V|
22+35	7.4251	0.70	|Q	|	|	|	V|
22+40	7.4299	0.69	|Q	|	|	|	V|
22+45	7.4346	0.68	|Q	|	|	|	V|
22+50	7.4392	0.67	|Q	|	|	|	V|
22+55	7.4439	0.67	|Q	|	|	|	V|
23+ 0	7.4485	0.67	|Q	|	|	|	V|
23+ 5	7.4532	0.67	|Q	|	|	|	V|
23+10	7.4578	0.67	|Q	|	|	|	V|
23+15	7.4624	0.67	|Q	|	|	|	V|
23+20	7.4671	0.67	|Q	|	|	|	V|
23+25	7.4717	0.67	|Q	|	|	|	V|
23+30	7.4764	0.67	|Q	|	|	|	V|
23+35	7.4810	0.67	|Q	|	|	|	V|
23+40	7.4857	0.67	|Q	|	|	|	V|
23+45	7.4903	0.67	|Q	|	|	|	V|
23+50	7.4950	0.67	|Q	|	|	|	V|
23+55	7.4996	0.67	|Q	|	|	|	V|
24+ 0	7.5043	0.67	|Q	|	|	|	V|
24+ 5	7.5078	0.51	|Q	|	|	|	V|
24+10	7.5091	0.19	Q	|	|	|	V|
24+15	7.5097	0.09	Q	|	|	|	V|
24+20	7.5101	0.05	Q	|	|	|	V|
24+25	7.5102	0.03	Q	|	|	|	V|
24+30	7.5103	0.01	Q	|	|	|	V|

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

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Study date 10/02/24 File: qbuh10024100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION WATERSHED B
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 29.54(Ac.) = 0.046 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 29.54(Ac.) = 0.046 Sq. Mi.
Length along longest watercourse = 1353.00(Ft.)
Length along longest watercourse measured to centroid = 881.00(Ft.)
Length along longest watercourse = 0.256 Mi.
Length along longest watercourse measured to centroid = 0.167 Mi.
Difference in elevation = 17.20(Ft.)
Slope along watercourse = 67.1220 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.098 Hr.
Lag time = 5.86 Min.
25% of lag time = 1.47 Min.
40% of lag time = 2.35 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
29.54	1.80	53.17

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
29.54	5.00	147.70

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.800(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
29.540	61.60	0.500

Total Area Entered = 29.54(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
61.6	61.6	0.453	0.500	0.249	1.000	0.249
					Sum (F) =	0.249

Area averaged mean soil loss (F) (In/Hr) = 0.249
Minimum soil loss rate ((In/Hr)) = 0.124
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	85.272	14.796	4.405
2	0.167	170.545	46.014	13.699
3	0.250	255.817	18.512	5.511
4	0.333	341.089	7.912	2.356
5	0.417	426.362	4.692	1.397
6	0.500	511.634	2.929	0.872
7	0.583	596.907	2.085	0.621
8	0.667	682.179	1.387	0.413
9	0.750	767.451	0.919	0.274
10	0.833	852.724	0.752	0.224
		Sum =	100.000 Sum=	29.771

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

Unit Time	Pattern	Storm Rain	Loss rate(In./Hr)	Effective

	(Hr.)	Percent	(In/Hr)	Max	Low	(In/Hr)
1	0.08	0.07	0.040	(0.441)	0.020	0.020
2	0.17	0.07	0.040	(0.440)	0.020	0.020
3	0.25	0.07	0.040	(0.438)	0.020	0.020
4	0.33	0.10	0.060	(0.436)	0.030	0.030
5	0.42	0.10	0.060	(0.435)	0.030	0.030
6	0.50	0.10	0.060	(0.433)	0.030	0.030
7	0.58	0.10	0.060	(0.431)	0.030	0.030
8	0.67	0.10	0.060	(0.430)	0.030	0.030
9	0.75	0.10	0.060	(0.428)	0.030	0.030
10	0.83	0.13	0.080	(0.426)	0.040	0.040
11	0.92	0.13	0.080	(0.424)	0.040	0.040
12	1.00	0.13	0.080	(0.423)	0.040	0.040
13	1.08	0.10	0.060	(0.421)	0.030	0.030
14	1.17	0.10	0.060	(0.419)	0.030	0.030
15	1.25	0.10	0.060	(0.418)	0.030	0.030
16	1.33	0.10	0.060	(0.416)	0.030	0.030
17	1.42	0.10	0.060	(0.414)	0.030	0.030
18	1.50	0.10	0.060	(0.413)	0.030	0.030
19	1.58	0.10	0.060	(0.411)	0.030	0.030
20	1.67	0.10	0.060	(0.410)	0.030	0.030
21	1.75	0.10	0.060	(0.408)	0.030	0.030
22	1.83	0.13	0.080	(0.406)	0.040	0.040
23	1.92	0.13	0.080	(0.405)	0.040	0.040
24	2.00	0.13	0.080	(0.403)	0.040	0.040
25	2.08	0.13	0.080	(0.401)	0.040	0.040
26	2.17	0.13	0.080	(0.400)	0.040	0.040
27	2.25	0.13	0.080	(0.398)	0.040	0.040
28	2.33	0.13	0.080	(0.396)	0.040	0.040
29	2.42	0.13	0.080	(0.395)	0.040	0.040
30	2.50	0.13	0.080	(0.393)	0.040	0.040
31	2.58	0.17	0.100	(0.392)	0.050	0.050
32	2.67	0.17	0.100	(0.390)	0.050	0.050
33	2.75	0.17	0.100	(0.388)	0.050	0.050
34	2.83	0.17	0.100	(0.387)	0.050	0.050
35	2.92	0.17	0.100	(0.385)	0.050	0.050
36	3.00	0.17	0.100	(0.384)	0.050	0.050
37	3.08	0.17	0.100	(0.382)	0.050	0.050
38	3.17	0.17	0.100	(0.380)	0.050	0.050
39	3.25	0.17	0.100	(0.379)	0.050	0.050
40	3.33	0.17	0.100	(0.377)	0.050	0.050
41	3.42	0.17	0.100	(0.376)	0.050	0.050
42	3.50	0.17	0.100	(0.374)	0.050	0.050
43	3.58	0.17	0.100	(0.373)	0.050	0.050
44	3.67	0.17	0.100	(0.371)	0.050	0.050
45	3.75	0.17	0.100	(0.369)	0.050	0.050
46	3.83	0.20	0.120	(0.368)	0.060	0.060
47	3.92	0.20	0.120	(0.366)	0.060	0.060
48	4.00	0.20	0.120	(0.365)	0.060	0.060
49	4.08	0.20	0.120	(0.363)	0.060	0.060
50	4.17	0.20	0.120	(0.362)	0.060	0.060
51	4.25	0.20	0.120	(0.360)	0.060	0.060
52	4.33	0.23	0.140	(0.359)	0.070	0.070
53	4.42	0.23	0.140	(0.357)	0.070	0.070
54	4.50	0.23	0.140	(0.356)	0.070	0.070
55	4.58	0.23	0.140	(0.354)	0.070	0.070
56	4.67	0.23	0.140	(0.353)	0.070	0.070

57	4.75	0.23	0.140	(0.351)	0.070	0.070
58	4.83	0.27	0.160	(0.349)	0.080	0.080
59	4.92	0.27	0.160	(0.348)	0.080	0.080
60	5.00	0.27	0.160	(0.346)	0.080	0.080
61	5.08	0.20	0.120	(0.345)	0.060	0.060
62	5.17	0.20	0.120	(0.343)	0.060	0.060
63	5.25	0.20	0.120	(0.342)	0.060	0.060
64	5.33	0.23	0.140	(0.340)	0.070	0.070
65	5.42	0.23	0.140	(0.339)	0.070	0.070
66	5.50	0.23	0.140	(0.338)	0.070	0.070
67	5.58	0.27	0.160	(0.336)	0.080	0.080
68	5.67	0.27	0.160	(0.335)	0.080	0.080
69	5.75	0.27	0.160	(0.333)	0.080	0.080
70	5.83	0.27	0.160	(0.332)	0.080	0.080
71	5.92	0.27	0.160	(0.330)	0.080	0.080
72	6.00	0.27	0.160	(0.329)	0.080	0.080
73	6.08	0.30	0.180	(0.327)	0.090	0.090
74	6.17	0.30	0.180	(0.326)	0.090	0.090
75	6.25	0.30	0.180	(0.324)	0.090	0.090
76	6.33	0.30	0.180	(0.323)	0.090	0.090
77	6.42	0.30	0.180	(0.321)	0.090	0.090
78	6.50	0.30	0.180	(0.320)	0.090	0.090
79	6.58	0.33	0.200	(0.319)	0.100	0.100
80	6.67	0.33	0.200	(0.317)	0.100	0.100
81	6.75	0.33	0.200	(0.316)	0.100	0.100
82	6.83	0.33	0.200	(0.314)	0.100	0.100
83	6.92	0.33	0.200	(0.313)	0.100	0.100
84	7.00	0.33	0.200	(0.311)	0.100	0.100
85	7.08	0.33	0.200	(0.310)	0.100	0.100
86	7.17	0.33	0.200	(0.309)	0.100	0.100
87	7.25	0.33	0.200	(0.307)	0.100	0.100
88	7.33	0.37	0.220	(0.306)	0.110	0.110
89	7.42	0.37	0.220	(0.304)	0.110	0.110
90	7.50	0.37	0.220	(0.303)	0.110	0.110
91	7.58	0.40	0.240	(0.302)	0.120	0.120
92	7.67	0.40	0.240	(0.300)	0.120	0.120
93	7.75	0.40	0.240	(0.299)	0.120	0.120
94	7.83	0.43	0.260	(0.297)	0.130	0.130
95	7.92	0.43	0.260	(0.296)	0.130	0.130
96	8.00	0.43	0.260	(0.295)	0.130	0.130
97	8.08	0.50	0.300	(0.293)	0.150	0.150
98	8.17	0.50	0.300	(0.292)	0.150	0.150
99	8.25	0.50	0.300	(0.291)	0.150	0.150
100	8.33	0.50	0.300	(0.289)	0.150	0.150
101	8.42	0.50	0.300	(0.288)	0.150	0.150
102	8.50	0.50	0.300	(0.287)	0.150	0.150
103	8.58	0.53	0.320	(0.285)	0.160	0.160
104	8.67	0.53	0.320	(0.284)	0.160	0.160
105	8.75	0.53	0.320	(0.283)	0.160	0.160
106	8.83	0.57	0.340	(0.281)	0.170	0.170
107	8.92	0.57	0.340	(0.280)	0.170	0.170
108	9.00	0.57	0.340	(0.279)	0.170	0.170
109	9.08	0.63	0.380	(0.277)	0.190	0.190
110	9.17	0.63	0.380	(0.276)	0.190	0.190
111	9.25	0.63	0.380	(0.275)	0.190	0.190
112	9.33	0.67	0.400	(0.273)	0.200	0.200
113	9.42	0.67	0.400	(0.272)	0.200	0.200

114	9.50	0.67	0.400	(0.271)	0.200	0.200
115	9.58	0.70	0.420	(0.269)	0.210	0.210
116	9.67	0.70	0.420	(0.268)	0.210	0.210
117	9.75	0.70	0.420	(0.267)	0.210	0.210
118	9.83	0.73	0.440	(0.265)	0.220	0.220
119	9.92	0.73	0.440	(0.264)	0.220	0.220
120	10.00	0.73	0.440	(0.263)	0.220	0.220
121	10.08	0.50	0.300	(0.262)	0.150	0.150
122	10.17	0.50	0.300	(0.260)	0.150	0.150
123	10.25	0.50	0.300	(0.259)	0.150	0.150
124	10.33	0.50	0.300	(0.258)	0.150	0.150
125	10.42	0.50	0.300	(0.257)	0.150	0.150
126	10.50	0.50	0.300	(0.255)	0.150	0.150
127	10.58	0.67	0.400	(0.254)	0.200	0.200
128	10.67	0.67	0.400	(0.253)	0.200	0.200
129	10.75	0.67	0.400	(0.252)	0.200	0.200
130	10.83	0.67	0.400	(0.250)	0.200	0.200
131	10.92	0.67	0.400	(0.249)	0.200	0.200
132	11.00	0.67	0.400	(0.248)	0.200	0.200
133	11.08	0.63	0.380	(0.247)	0.190	0.190
134	11.17	0.63	0.380	(0.246)	0.190	0.190
135	11.25	0.63	0.380	(0.244)	0.190	0.190
136	11.33	0.63	0.380	(0.243)	0.190	0.190
137	11.42	0.63	0.380	(0.242)	0.190	0.190
138	11.50	0.63	0.380	(0.241)	0.190	0.190
139	11.58	0.57	0.340	(0.240)	0.170	0.170
140	11.67	0.57	0.340	(0.238)	0.170	0.170
141	11.75	0.57	0.340	(0.237)	0.170	0.170
142	11.83	0.60	0.360	(0.236)	0.180	0.180
143	11.92	0.60	0.360	(0.235)	0.180	0.180
144	12.00	0.60	0.360	(0.234)	0.180	0.180
145	12.08	0.83	0.500	0.232	(0.250)	0.268
146	12.17	0.83	0.500	0.231	(0.250)	0.269
147	12.25	0.83	0.500	0.230	(0.250)	0.270
148	12.33	0.87	0.520	0.229	(0.260)	0.291
149	12.42	0.87	0.520	0.228	(0.260)	0.292
150	12.50	0.87	0.520	0.227	(0.260)	0.293
151	12.58	0.93	0.560	0.226	(0.280)	0.334
152	12.67	0.93	0.560	0.224	(0.280)	0.336
153	12.75	0.93	0.560	0.223	(0.280)	0.337
154	12.83	0.97	0.580	0.222	(0.290)	0.358
155	12.92	0.97	0.580	0.221	(0.290)	0.359
156	13.00	0.97	0.580	0.220	(0.290)	0.360
157	13.08	1.13	0.680	0.219	(0.340)	0.461
158	13.17	1.13	0.680	0.218	(0.340)	0.462
159	13.25	1.13	0.680	0.217	(0.340)	0.463
160	13.33	1.13	0.680	0.215	(0.340)	0.465
161	13.42	1.13	0.680	0.214	(0.340)	0.466
162	13.50	1.13	0.680	0.213	(0.340)	0.467
163	13.58	0.77	0.460	0.212	(0.230)	0.248
164	13.67	0.77	0.460	0.211	(0.230)	0.249
165	13.75	0.77	0.460	0.210	(0.230)	0.250
166	13.83	0.77	0.460	0.209	(0.230)	0.251
167	13.92	0.77	0.460	0.208	(0.230)	0.252
168	14.00	0.77	0.460	0.207	(0.230)	0.253
169	14.08	0.90	0.540	0.206	(0.270)	0.334
170	14.17	0.90	0.540	0.205	(0.270)	0.335

171	14.25	0.90	0.540	0.204	(0.270)	0.336
172	14.33	0.87	0.520	0.203	(0.260)	0.317
173	14.42	0.87	0.520	0.202	(0.260)	0.318
174	14.50	0.87	0.520	0.201	(0.260)	0.319
175	14.58	0.87	0.520	0.200	(0.260)	0.320
176	14.67	0.87	0.520	0.199	(0.260)	0.321
177	14.75	0.87	0.520	0.197	(0.260)	0.322
178	14.83	0.83	0.500	0.196	(0.250)	0.303
179	14.92	0.83	0.500	0.195	(0.250)	0.304
180	15.00	0.83	0.500	0.194	(0.250)	0.305
181	15.08	0.80	0.480	0.193	(0.240)	0.286
182	15.17	0.80	0.480	0.192	(0.240)	0.287
183	15.25	0.80	0.480	0.191	(0.240)	0.288
184	15.33	0.77	0.460	0.191	(0.230)	0.269
185	15.42	0.77	0.460	0.190	(0.230)	0.270
186	15.50	0.77	0.460	0.189	(0.230)	0.271
187	15.58	0.63	0.380	0.188	(0.190)	0.192
188	15.67	0.63	0.380	0.187	(0.190)	0.193
189	15.75	0.63	0.380	0.186	(0.190)	0.194
190	15.83	0.63	0.380	0.185	(0.190)	0.195
191	15.92	0.63	0.380	0.184	(0.190)	0.196
192	16.00	0.63	0.380	0.183	(0.190)	0.197
193	16.08	0.13	0.080	(0.182)	0.040	0.040
194	16.17	0.13	0.080	(0.181)	0.040	0.040
195	16.25	0.13	0.080	(0.180)	0.040	0.040
196	16.33	0.13	0.080	(0.179)	0.040	0.040
197	16.42	0.13	0.080	(0.178)	0.040	0.040
198	16.50	0.13	0.080	(0.177)	0.040	0.040
199	16.58	0.10	0.060	(0.176)	0.030	0.030
200	16.67	0.10	0.060	(0.176)	0.030	0.030
201	16.75	0.10	0.060	(0.175)	0.030	0.030
202	16.83	0.10	0.060	(0.174)	0.030	0.030
203	16.92	0.10	0.060	(0.173)	0.030	0.030
204	17.00	0.10	0.060	(0.172)	0.030	0.030
205	17.08	0.17	0.100	(0.171)	0.050	0.050
206	17.17	0.17	0.100	(0.170)	0.050	0.050
207	17.25	0.17	0.100	(0.169)	0.050	0.050
208	17.33	0.17	0.100	(0.169)	0.050	0.050
209	17.42	0.17	0.100	(0.168)	0.050	0.050
210	17.50	0.17	0.100	(0.167)	0.050	0.050
211	17.58	0.17	0.100	(0.166)	0.050	0.050
212	17.67	0.17	0.100	(0.165)	0.050	0.050
213	17.75	0.17	0.100	(0.164)	0.050	0.050
214	17.83	0.13	0.080	(0.164)	0.040	0.040
215	17.92	0.13	0.080	(0.163)	0.040	0.040
216	18.00	0.13	0.080	(0.162)	0.040	0.040
217	18.08	0.13	0.080	(0.161)	0.040	0.040
218	18.17	0.13	0.080	(0.160)	0.040	0.040
219	18.25	0.13	0.080	(0.160)	0.040	0.040
220	18.33	0.13	0.080	(0.159)	0.040	0.040
221	18.42	0.13	0.080	(0.158)	0.040	0.040
222	18.50	0.13	0.080	(0.157)	0.040	0.040
223	18.58	0.10	0.060	(0.157)	0.030	0.030
224	18.67	0.10	0.060	(0.156)	0.030	0.030
225	18.75	0.10	0.060	(0.155)	0.030	0.030
226	18.83	0.07	0.040	(0.154)	0.020	0.020
227	18.92	0.07	0.040	(0.154)	0.020	0.020

228	19.00	0.07	0.040	(0.153)	0.020	0.020
229	19.08	0.10	0.060	(0.152)	0.030	0.030
230	19.17	0.10	0.060	(0.151)	0.030	0.030
231	19.25	0.10	0.060	(0.151)	0.030	0.030
232	19.33	0.13	0.080	(0.150)	0.040	0.040
233	19.42	0.13	0.080	(0.149)	0.040	0.040
234	19.50	0.13	0.080	(0.149)	0.040	0.040
235	19.58	0.10	0.060	(0.148)	0.030	0.030
236	19.67	0.10	0.060	(0.147)	0.030	0.030
237	19.75	0.10	0.060	(0.147)	0.030	0.030
238	19.83	0.07	0.040	(0.146)	0.020	0.020
239	19.92	0.07	0.040	(0.145)	0.020	0.020
240	20.00	0.07	0.040	(0.145)	0.020	0.020
241	20.08	0.10	0.060	(0.144)	0.030	0.030
242	20.17	0.10	0.060	(0.143)	0.030	0.030
243	20.25	0.10	0.060	(0.143)	0.030	0.030
244	20.33	0.10	0.060	(0.142)	0.030	0.030
245	20.42	0.10	0.060	(0.141)	0.030	0.030
246	20.50	0.10	0.060	(0.141)	0.030	0.030
247	20.58	0.10	0.060	(0.140)	0.030	0.030
248	20.67	0.10	0.060	(0.140)	0.030	0.030
249	20.75	0.10	0.060	(0.139)	0.030	0.030
250	20.83	0.07	0.040	(0.139)	0.020	0.020
251	20.92	0.07	0.040	(0.138)	0.020	0.020
252	21.00	0.07	0.040	(0.137)	0.020	0.020
253	21.08	0.10	0.060	(0.137)	0.030	0.030
254	21.17	0.10	0.060	(0.136)	0.030	0.030
255	21.25	0.10	0.060	(0.136)	0.030	0.030
256	21.33	0.07	0.040	(0.135)	0.020	0.020
257	21.42	0.07	0.040	(0.135)	0.020	0.020
258	21.50	0.07	0.040	(0.134)	0.020	0.020
259	21.58	0.10	0.060	(0.134)	0.030	0.030
260	21.67	0.10	0.060	(0.133)	0.030	0.030
261	21.75	0.10	0.060	(0.133)	0.030	0.030
262	21.83	0.07	0.040	(0.132)	0.020	0.020
263	21.92	0.07	0.040	(0.132)	0.020	0.020
264	22.00	0.07	0.040	(0.131)	0.020	0.020
265	22.08	0.10	0.060	(0.131)	0.030	0.030
266	22.17	0.10	0.060	(0.131)	0.030	0.030
267	22.25	0.10	0.060	(0.130)	0.030	0.030
268	22.33	0.07	0.040	(0.130)	0.020	0.020
269	22.42	0.07	0.040	(0.129)	0.020	0.020
270	22.50	0.07	0.040	(0.129)	0.020	0.020
271	22.58	0.07	0.040	(0.129)	0.020	0.020
272	22.67	0.07	0.040	(0.128)	0.020	0.020
273	22.75	0.07	0.040	(0.128)	0.020	0.020
274	22.83	0.07	0.040	(0.128)	0.020	0.020
275	22.92	0.07	0.040	(0.127)	0.020	0.020
276	23.00	0.07	0.040	(0.127)	0.020	0.020
277	23.08	0.07	0.040	(0.127)	0.020	0.020
278	23.17	0.07	0.040	(0.126)	0.020	0.020
279	23.25	0.07	0.040	(0.126)	0.020	0.020
280	23.33	0.07	0.040	(0.126)	0.020	0.020
281	23.42	0.07	0.040	(0.126)	0.020	0.020
282	23.50	0.07	0.040	(0.125)	0.020	0.020
283	23.58	0.07	0.040	(0.125)	0.020	0.020
284	23.67	0.07	0.040	(0.125)	0.020	0.020

285	23.75	0.07	0.040	(0.125)	0.020	0.020
286	23.83	0.07	0.040	(0.125)	0.020	0.020
287	23.92	0.07	0.040	(0.125)	0.020	0.020
288	24.00	0.07	0.040	(0.125)	0.020	0.020

(Loss Rate Not Used)

Sum = 100.0 Sum = 32.4

Flood volume = Effective rainfall 2.70(In)
times area 29.5(Ac.)/[(In)/(Ft.)] = 6.6(Ac.Ft)
Total soil loss = 2.30(In)
Total soil loss = 5.661(Ac.Ft)
Total rainfall = 5.00(In)
Flood volume = 289546.4 Cubic Feet
Total soil loss = 246573.7 Cubic Feet

Peak flow rate of this hydrograph = 13.686(CFS)

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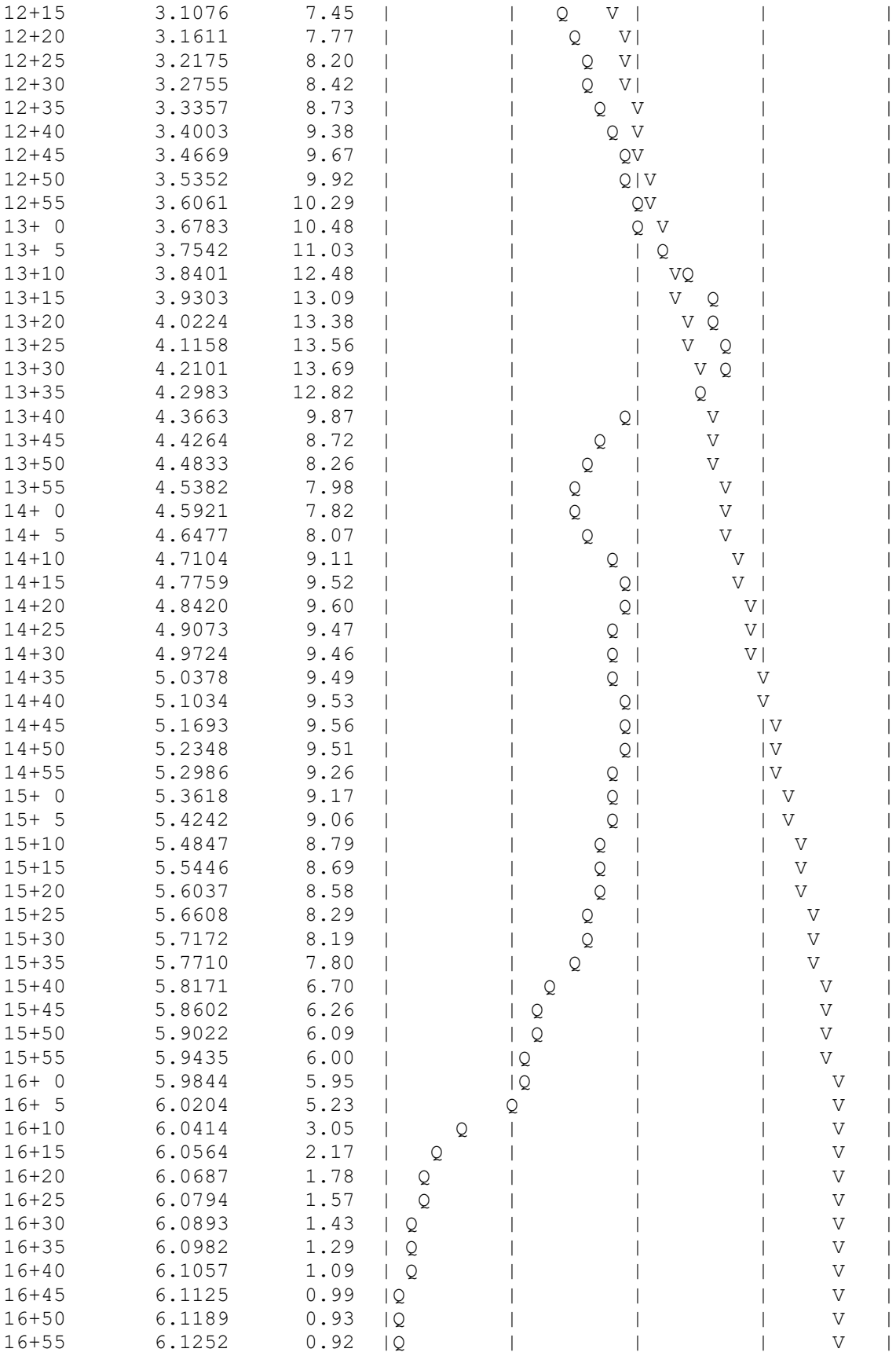
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0006	0.09	Q				
0+10	0.0031	0.36	Q				
0+15	0.0064	0.47	Q				
0+20	0.0102	0.56	VQ				
0+25	0.0153	0.73	VQ				
0+30	0.0208	0.80	VQ				
0+35	0.0265	0.84	VQ				
0+40	0.0325	0.86	VQ				
0+45	0.0385	0.87	VQ				
0+50	0.0449	0.93	VQ				
0+55	0.0522	1.07	V Q				
1+ 0	0.0600	1.13	V Q				
1+ 5	0.0676	1.11	V Q				
1+10	0.0744	0.99	VQ				
1+15	0.0809	0.94	VQ				
1+20	0.0873	0.92	VQ				
1+25	0.0935	0.91	VQ				
1+30	0.0998	0.91	VQ				
1+35	0.1060	0.90	VQ				
1+40	0.1122	0.90	VQ				
1+45	0.1184	0.90	VQ				
1+50	0.1248	0.94	VQ				
1+55	0.1322	1.07	V Q				
2+ 0	0.1400	1.13	V Q				
2+ 5	0.1479	1.15	V Q				
2+10	0.1560	1.17	V Q				
2+15	0.1641	1.18	V Q				
2+20	0.1722	1.18	|VQ				
2+25	0.1804	1.19	|VQ				
2+30	0.1886	1.19	|VQ				
2+35	0.1971	1.24	|VQ				
2+40	0.2066	1.37	|VQ				

2+45	0.2164	1.43	|VQ	|	|	|	|
2+50	0.2264	1.45	|VQ	|	|	|	|
2+55	0.2365	1.47	|VQ	|	|	|	|
3+ 0	0.2466	1.47	|VQ	|	|	|	|
3+ 5	0.2568	1.48	|VQ	|	|	|	|
3+10	0.2670	1.48	|VQ	|	|	|	|
3+15	0.2773	1.49	|VQ	|	|	|	|
3+20	0.2875	1.49	|VQ	|	|	|	|
3+25	0.2978	1.49	|VQ	|	|	|	|
3+30	0.3080	1.49	|VQ	|	|	|	|
3+35	0.3183	1.49	|VQ	|	|	|	|
3+40	0.3286	1.49	|VQ	|	|	|	|
3+45	0.3388	1.49	| Q	|	|	|	|
3+50	0.3494	1.53	| VQ	|	|	|	|
3+55	0.3609	1.67	| VQ	|	|	|	|
4+ 0	0.3728	1.73	| VQ	|	|	|	|
4+ 5	0.3848	1.75	| VQ	|	|	|	|
4+10	0.3970	1.76	| VQ	|	|	|	|
4+15	0.4092	1.77	| VQ	|	|	|	|
4+20	0.4217	1.82	| VQ	|	|	|	|
4+25	0.4352	1.96	| VQ	|	|	|	|
4+30	0.4491	2.02	| V Q	|	|	|	|
4+35	0.4632	2.05	| V Q	|	|	|	|
4+40	0.4774	2.06	| V Q	|	|	|	|
4+45	0.4917	2.07	| V Q	|	|	|	|
4+50	0.5063	2.12	| VQ	|	|	|	|
4+55	0.5219	2.26	| VQ	|	|	|	|
5+ 0	0.5378	2.32	| VQ	|	|	|	|
5+ 5	0.5534	2.26	| VQ	|	|	|	|
5+10	0.5671	2.00	| Q	|	|	|	|
5+15	0.5802	1.89	| Q	|	|	|	|
5+20	0.5932	1.90	| Q	|	|	|	|
5+25	0.6071	2.01	| VQ	|	|	|	|
5+30	0.6212	2.05	| VQ	|	|	|	|
5+35	0.6357	2.11	| VQ	|	|	|	|
5+40	0.6513	2.25	| VQ	|	|	|	|
5+45	0.6672	2.31	| Q	|	|	|	|
5+50	0.6833	2.34	| Q	|	|	|	|
5+55	0.6995	2.35	| Q	|	|	|	|
6+ 0	0.7158	2.37	| Q	|	|	|	|
6+ 5	0.7324	2.42	| Q	|	|	|	|
6+10	0.7500	2.56	| VQ	|	|	|	|
6+15	0.7681	2.62	| VQ	|	|	|	|
6+20	0.7863	2.64	| VQ	|	|	|	|
6+25	0.8045	2.66	| VQ	|	|	|	|
6+30	0.8229	2.67	| VQ	|	|	|	|
6+35	0.8416	2.72	| Q	|	|	|	|
6+40	0.8613	2.86	| Q	|	|	|	|
6+45	0.8814	2.91	| Q	|	|	|	|
6+50	0.9016	2.94	| Q	|	|	|	|
6+55	0.9219	2.95	| Q	|	|	|	|
7+ 0	0.9424	2.96	| Q	|	|	|	|
7+ 5	0.9628	2.97	| Q	|	|	|	|
7+10	0.9833	2.97	| Q	|	|	|	|
7+15	1.0038	2.98	| QV	|	|	|	|
7+20	1.0246	3.02	| Q	|	|	|	|
7+25	1.0464	3.16	| Q	|	|	|	|

7+30	1.0685	3.21	Q				
7+35	1.0911	3.28	Q				
7+40	1.1148	3.43	Q				
7+45	1.1388	3.50	Q				
7+50	1.1634	3.57	Q				
7+55	1.1891	3.73	Q				
8+ 0	1.2152	3.79	Q				
8+ 5	1.2422	3.91	Q				
8+10	1.2711	4.21	VQ				
8+15	1.3009	4.33	VQ				
8+20	1.3311	4.38	Q				
8+25	1.3615	4.41	Q				
8+30	1.3921	4.43	Q				
8+35	1.4230	4.49	Q				
8+40	1.4549	4.64	VQ				
8+45	1.4873	4.70	VQ				
8+50	1.5202	4.77	Q				
8+55	1.5541	4.92	Q				
9+ 0	1.5884	4.99	Q				
9+ 5	1.6236	5.10	VQ				
9+10	1.6607	5.40	VQ				
9+15	1.6987	5.52	VQ				
9+20	1.7374	5.62	VQ				
9+25	1.7773	5.79	VQ				
9+30	1.8177	5.86	VQ				
9+35	1.8586	5.94	Q				
9+40	1.9006	6.10	VQ				
9+45	1.9432	6.17	VQ				
9+50	1.9862	6.25	VQ				
9+55	2.0303	6.41	Q				
10+ 0	2.0749	6.47	Q				
10+ 5	2.1176	6.20	Q				
10+10	2.1538	5.26	Q V				
10+15	2.1874	4.88	Q V				
10+20	2.2200	4.72	Q V				
10+25	2.2519	4.63	Q V				
10+30	2.2833	4.57	Q V				
10+35	2.3161	4.75	Q V				
10+40	2.3533	5.41	Q V				
10+45	2.3923	5.66	Q V				
10+50	2.4320	5.77	Q V				
10+55	2.4722	5.84	Q V				
11+ 0	2.5127	5.88	Q V				
11+ 5	2.5531	5.87	Q V				
11+10	2.5928	5.75	Q V				
11+15	2.6321	5.71	Q V				
11+20	2.6713	5.70	Q V				
11+25	2.7105	5.68	Q V				
11+30	2.7495	5.67	Q V				
11+35	2.7880	5.58	Q V				
11+40	2.8245	5.30	Q V				
11+45	2.8602	5.19	Q V				
11+50	2.8959	5.18	Q V				
11+55	2.9324	5.29	Q V				
12+ 0	2.9691	5.33	Q V				
12+ 5	3.0085	5.73	Q V				
12+10	3.0563	6.94	Q V				



17+ 0	6.1315	0.91	Q				V
17+ 5	6.1383	0.99	Q				V
17+10	6.1470	1.26	Q				V
17+15	6.1564	1.37	Q				V
17+20	6.1661	1.41	Q				V
17+25	6.1761	1.44	Q				V
17+30	6.1861	1.46	Q				V
17+35	6.1962	1.47	Q				V
17+40	6.2064	1.48	Q				V
17+45	6.2167	1.48	Q				V
17+50	6.2266	1.45	Q				V
17+55	6.2356	1.31	Q				V
18+ 0	6.2443	1.25	Q				V
18+ 5	6.2527	1.23	Q				V
18+10	6.2611	1.22	Q				V
18+15	6.2694	1.21	Q				V
18+20	6.2777	1.20	Q				V
18+25	6.2859	1.20	Q				V
18+30	6.2941	1.19	Q				V
18+35	6.3020	1.15	Q				V
18+40	6.3090	1.01	Q				V
18+45	6.3156	0.96	Q				V
18+50	6.3217	0.89	Q				V
18+55	6.3267	0.74	Q				V
19+ 0	6.3314	0.67	Q				V
19+ 5	6.3361	0.69	Q				V
19+10	6.3417	0.81	Q				V
19+15	6.3475	0.85	Q				V
19+20	6.3538	0.91	Q				V
19+25	6.3610	1.06	Q				V
19+30	6.3687	1.12	Q				V
19+35	6.3763	1.10	Q				V
19+40	6.3831	0.98	Q				V
19+45	6.3895	0.94	Q				V
19+50	6.3956	0.88	Q				V
19+55	6.4006	0.73	Q				V
20+ 0	6.4052	0.67	Q				V
20+ 5	6.4100	0.69	Q				V
20+10	6.4155	0.81	Q				V
20+15	6.4214	0.85	Q				V
20+20	6.4273	0.86	Q				V
20+25	6.4333	0.87	Q				V
20+30	6.4394	0.88	Q				V
20+35	6.4455	0.88	Q				V
20+40	6.4516	0.89	Q				V
20+45	6.4577	0.89	Q				V
20+50	6.4636	0.85	Q				V
20+55	6.4685	0.71	Q				V
21+ 0	6.4730	0.66	Q				V
21+ 5	6.4777	0.68	Q				V
21+10	6.4832	0.80	Q				V
21+15	6.4890	0.85	Q				V
21+20	6.4947	0.82	Q				V
21+25	6.4995	0.69	Q				V
21+30	6.5039	0.64	Q				V
21+35	6.5085	0.67	Q				V
21+40	6.5140	0.80	Q				V

21+45	6.5198	0.85	|Q	|	|	|	V|
21+50	6.5255	0.82	|Q	|	|	|	V|
21+55	6.5302	0.69	|Q	|	|	|	V|
22+ 0	6.5347	0.64	|Q	|	|	|	V|
22+ 5	6.5393	0.67	|Q	|	|	|	V|
22+10	6.5448	0.80	|Q	|	|	|	V|
22+15	6.5506	0.85	|Q	|	|	|	V|
22+20	6.5562	0.82	|Q	|	|	|	V|
22+25	6.5610	0.69	|Q	|	|	|	V|
22+30	6.5654	0.64	|Q	|	|	|	V|
22+35	6.5698	0.62	|Q	|	|	|	V|
22+40	6.5740	0.61	|Q	|	|	|	V|
22+45	6.5782	0.61	|Q	|	|	|	V|
22+50	6.5823	0.60	|Q	|	|	|	V|
22+55	6.5865	0.60	|Q	|	|	|	V|
23+ 0	6.5906	0.60	|Q	|	|	|	V|
23+ 5	6.5947	0.60	|Q	|	|	|	V|
23+10	6.5988	0.60	|Q	|	|	|	V|
23+15	6.6029	0.60	|Q	|	|	|	V|
23+20	6.6070	0.60	|Q	|	|	|	V|
23+25	6.6111	0.60	|Q	|	|	|	V|
23+30	6.6152	0.60	|Q	|	|	|	V|
23+35	6.6193	0.60	|Q	|	|	|	V|
23+40	6.6234	0.60	|Q	|	|	|	V|
23+45	6.6275	0.60	|Q	|	|	|	V|
23+50	6.6316	0.60	|Q	|	|	|	V|
23+55	6.6357	0.60	|Q	|	|	|	V|
24+ 0	6.6398	0.60	|Q	|	|	|	V|
24+ 5	6.6433	0.51	|Q	|	|	|	V|
24+10	6.6449	0.23	Q	|	|	|	V|
24+15	6.6458	0.12	Q	|	|	|	V|
24+20	6.6463	0.08	Q	|	|	|	V|
24+25	6.6466	0.05	Q	|	|	|	V|
24+30	6.6468	0.03	Q	|	|	|	V|
24+35	6.6470	0.02	Q	|	|	|	V|
24+40	6.6470	0.01	Q	|	|	|	V|
24+45	6.6471	0.00	Q	|	|	|	V|

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

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Study date 10/02/24 File: q100p1auh24100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION WATERSHED A
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 32.84(Ac.) = 0.051 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 32.84(Ac.) = 0.051 Sq. Mi.
Length along longest watercourse = 1812.00(Ft.)
Length along longest watercourse measured to centroid = 1348.00(Ft.)
Length along longest watercourse = 0.343 Mi.
Length along longest watercourse measured to centroid = 0.255 Mi.
Difference in elevation = 25.30(Ft.)
Slope along watercourse = 73.7219 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.063 Hr.
Lag time = 3.78 Min.
25% of lag time = 0.95 Min.
40% of lag time = 1.51 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
32.84	1.80	59.11

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
32.84	5.00	164.20

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.800(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
32.840	60.90	0.755

Total Area Entered = 32.84(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
60.9	60.9	0.460	0.755	0.148	1.000	0.148
					Sum (F) =	0.148

Area averaged mean soil loss (F) (In/Hr) = 0.148
Minimum soil loss rate ((In/Hr)) = 0.074
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.296

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	132.184	28.615	9.471
2	0.167	264.368	48.175	15.944
3	0.250	396.552	12.342	4.085
4	0.333	528.736	5.500	1.820
5	0.417	660.920	3.010	0.996
6	0.500	793.104	1.628	0.539
7	0.583	925.288	0.730	0.242
			Sum = 100.000	Sum= 33.097

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.040	(0.262)	0.012	0.028
2	0.17	0.07	0.040	(0.261)	0.012	0.028

3	0.25	0.07	0.040	(0.259)	0.012	0.028
4	0.33	0.10	0.060	(0.258)	0.018	0.042
5	0.42	0.10	0.060	(0.257)	0.018	0.042
6	0.50	0.10	0.060	(0.256)	0.018	0.042
7	0.58	0.10	0.060	(0.255)	0.018	0.042
8	0.67	0.10	0.060	(0.254)	0.018	0.042
9	0.75	0.10	0.060	(0.253)	0.018	0.042
10	0.83	0.13	0.080	(0.252)	0.024	0.056
11	0.92	0.13	0.080	(0.251)	0.024	0.056
12	1.00	0.13	0.080	(0.250)	0.024	0.056
13	1.08	0.10	0.060	(0.250)	0.018	0.042
14	1.17	0.10	0.060	(0.249)	0.018	0.042
15	1.25	0.10	0.060	(0.248)	0.018	0.042
16	1.33	0.10	0.060	(0.247)	0.018	0.042
17	1.42	0.10	0.060	(0.246)	0.018	0.042
18	1.50	0.10	0.060	(0.245)	0.018	0.042
19	1.58	0.10	0.060	(0.244)	0.018	0.042
20	1.67	0.10	0.060	(0.243)	0.018	0.042
21	1.75	0.10	0.060	(0.242)	0.018	0.042
22	1.83	0.13	0.080	(0.241)	0.024	0.056
23	1.92	0.13	0.080	(0.240)	0.024	0.056
24	2.00	0.13	0.080	(0.239)	0.024	0.056
25	2.08	0.13	0.080	(0.238)	0.024	0.056
26	2.17	0.13	0.080	(0.237)	0.024	0.056
27	2.25	0.13	0.080	(0.236)	0.024	0.056
28	2.33	0.13	0.080	(0.235)	0.024	0.056
29	2.42	0.13	0.080	(0.234)	0.024	0.056
30	2.50	0.13	0.080	(0.233)	0.024	0.056
31	2.58	0.17	0.100	(0.232)	0.030	0.070
32	2.67	0.17	0.100	(0.231)	0.030	0.070
33	2.75	0.17	0.100	(0.230)	0.030	0.070
34	2.83	0.17	0.100	(0.229)	0.030	0.070
35	2.92	0.17	0.100	(0.228)	0.030	0.070
36	3.00	0.17	0.100	(0.227)	0.030	0.070
37	3.08	0.17	0.100	(0.226)	0.030	0.070
38	3.17	0.17	0.100	(0.225)	0.030	0.070
39	3.25	0.17	0.100	(0.224)	0.030	0.070
40	3.33	0.17	0.100	(0.224)	0.030	0.070
41	3.42	0.17	0.100	(0.223)	0.030	0.070
42	3.50	0.17	0.100	(0.222)	0.030	0.070
43	3.58	0.17	0.100	(0.221)	0.030	0.070
44	3.67	0.17	0.100	(0.220)	0.030	0.070
45	3.75	0.17	0.100	(0.219)	0.030	0.070
46	3.83	0.20	0.120	(0.218)	0.036	0.084
47	3.92	0.20	0.120	(0.217)	0.036	0.084
48	4.00	0.20	0.120	(0.216)	0.036	0.084
49	4.08	0.20	0.120	(0.215)	0.036	0.084
50	4.17	0.20	0.120	(0.214)	0.036	0.084
51	4.25	0.20	0.120	(0.213)	0.036	0.084
52	4.33	0.23	0.140	(0.212)	0.041	0.099
53	4.42	0.23	0.140	(0.212)	0.041	0.099
54	4.50	0.23	0.140	(0.211)	0.041	0.099
55	4.58	0.23	0.140	(0.210)	0.041	0.099
56	4.67	0.23	0.140	(0.209)	0.041	0.099
57	4.75	0.23	0.140	(0.208)	0.041	0.099
58	4.83	0.27	0.160	(0.207)	0.047	0.113
59	4.92	0.27	0.160	(0.206)	0.047	0.113

60	5.00	0.27	0.160	(0.205)	0.047	0.113
61	5.08	0.20	0.120	(0.204)	0.036	0.084
62	5.17	0.20	0.120	(0.203)	0.036	0.084
63	5.25	0.20	0.120	(0.203)	0.036	0.084
64	5.33	0.23	0.140	(0.202)	0.041	0.099
65	5.42	0.23	0.140	(0.201)	0.041	0.099
66	5.50	0.23	0.140	(0.200)	0.041	0.099
67	5.58	0.27	0.160	(0.199)	0.047	0.113
68	5.67	0.27	0.160	(0.198)	0.047	0.113
69	5.75	0.27	0.160	(0.197)	0.047	0.113
70	5.83	0.27	0.160	(0.196)	0.047	0.113
71	5.92	0.27	0.160	(0.196)	0.047	0.113
72	6.00	0.27	0.160	(0.195)	0.047	0.113
73	6.08	0.30	0.180	(0.194)	0.053	0.127
74	6.17	0.30	0.180	(0.193)	0.053	0.127
75	6.25	0.30	0.180	(0.192)	0.053	0.127
76	6.33	0.30	0.180	(0.191)	0.053	0.127
77	6.42	0.30	0.180	(0.190)	0.053	0.127
78	6.50	0.30	0.180	(0.190)	0.053	0.127
79	6.58	0.33	0.200	(0.189)	0.059	0.141
80	6.67	0.33	0.200	(0.188)	0.059	0.141
81	6.75	0.33	0.200	(0.187)	0.059	0.141
82	6.83	0.33	0.200	(0.186)	0.059	0.141
83	6.92	0.33	0.200	(0.185)	0.059	0.141
84	7.00	0.33	0.200	(0.184)	0.059	0.141
85	7.08	0.33	0.200	(0.184)	0.059	0.141
86	7.17	0.33	0.200	(0.183)	0.059	0.141
87	7.25	0.33	0.200	(0.182)	0.059	0.141
88	7.33	0.37	0.220	(0.181)	0.065	0.155
89	7.42	0.37	0.220	(0.180)	0.065	0.155
90	7.50	0.37	0.220	(0.179)	0.065	0.155
91	7.58	0.40	0.240	(0.179)	0.071	0.169
92	7.67	0.40	0.240	(0.178)	0.071	0.169
93	7.75	0.40	0.240	(0.177)	0.071	0.169
94	7.83	0.43	0.260	(0.176)	0.077	0.183
95	7.92	0.43	0.260	(0.175)	0.077	0.183
96	8.00	0.43	0.260	(0.175)	0.077	0.183
97	8.08	0.50	0.300	(0.174)	0.089	0.211
98	8.17	0.50	0.300	(0.173)	0.089	0.211
99	8.25	0.50	0.300	(0.172)	0.089	0.211
100	8.33	0.50	0.300	(0.171)	0.089	0.211
101	8.42	0.50	0.300	(0.171)	0.089	0.211
102	8.50	0.50	0.300	(0.170)	0.089	0.211
103	8.58	0.53	0.320	(0.169)	0.095	0.225
104	8.67	0.53	0.320	(0.168)	0.095	0.225
105	8.75	0.53	0.320	(0.167)	0.095	0.225
106	8.83	0.57	0.340	(0.167)	0.101	0.239
107	8.92	0.57	0.340	(0.166)	0.101	0.239
108	9.00	0.57	0.340	(0.165)	0.101	0.239
109	9.08	0.63	0.380	(0.164)	0.112	0.268
110	9.17	0.63	0.380	(0.163)	0.112	0.268
111	9.25	0.63	0.380	(0.163)	0.112	0.268
112	9.33	0.67	0.400	(0.162)	0.118	0.282
113	9.42	0.67	0.400	(0.161)	0.118	0.282
114	9.50	0.67	0.400	(0.160)	0.118	0.282
115	9.58	0.70	0.420	(0.160)	0.124	0.296
116	9.67	0.70	0.420	(0.159)	0.124	0.296

117	9.75	0.70	0.420	(0.158)	0.124	0.296
118	9.83	0.73	0.440	(0.157)	0.130	0.310
119	9.92	0.73	0.440	(0.157)	0.130	0.310
120	10.00	0.73	0.440	(0.156)	0.130	0.310
121	10.08	0.50	0.300	(0.155)	0.089	0.211
122	10.17	0.50	0.300	(0.154)	0.089	0.211
123	10.25	0.50	0.300	(0.154)	0.089	0.211
124	10.33	0.50	0.300	(0.153)	0.089	0.211
125	10.42	0.50	0.300	(0.152)	0.089	0.211
126	10.50	0.50	0.300	(0.151)	0.089	0.211
127	10.58	0.67	0.400	(0.151)	0.118	0.282
128	10.67	0.67	0.400	(0.150)	0.118	0.282
129	10.75	0.67	0.400	(0.149)	0.118	0.282
130	10.83	0.67	0.400	(0.148)	0.118	0.282
131	10.92	0.67	0.400	(0.148)	0.118	0.282
132	11.00	0.67	0.400	(0.147)	0.118	0.282
133	11.08	0.63	0.380	(0.146)	0.112	0.268
134	11.17	0.63	0.380	(0.145)	0.112	0.268
135	11.25	0.63	0.380	(0.145)	0.112	0.268
136	11.33	0.63	0.380	(0.144)	0.112	0.268
137	11.42	0.63	0.380	(0.143)	0.112	0.268
138	11.50	0.63	0.380	(0.143)	0.112	0.268
139	11.58	0.57	0.340	(0.142)	0.101	0.239
140	11.67	0.57	0.340	(0.141)	0.101	0.239
141	11.75	0.57	0.340	(0.140)	0.101	0.239
142	11.83	0.60	0.360	(0.140)	0.107	0.253
143	11.92	0.60	0.360	(0.139)	0.107	0.253
144	12.00	0.60	0.360	(0.138)	0.107	0.253
145	12.08	0.83	0.500	0.138	(0.148)	0.362
146	12.17	0.83	0.500	0.137	(0.148)	0.363
147	12.25	0.83	0.500	0.136	(0.148)	0.364
148	12.33	0.87	0.520	0.136	(0.154)	0.384
149	12.42	0.87	0.520	0.135	(0.154)	0.385
150	12.50	0.87	0.520	0.134	(0.154)	0.386
151	12.58	0.93	0.560	0.134	(0.166)	0.426
152	12.67	0.93	0.560	0.133	(0.166)	0.427
153	12.75	0.93	0.560	0.132	(0.166)	0.428
154	12.83	0.97	0.580	0.132	(0.172)	0.448
155	12.92	0.97	0.580	0.131	(0.172)	0.449
156	13.00	0.97	0.580	0.130	(0.172)	0.450
157	13.08	1.13	0.680	0.130	(0.201)	0.550
158	13.17	1.13	0.680	0.129	(0.201)	0.551
159	13.25	1.13	0.680	0.128	(0.201)	0.552
160	13.33	1.13	0.680	0.128	(0.201)	0.552
161	13.42	1.13	0.680	0.127	(0.201)	0.553
162	13.50	1.13	0.680	0.126	(0.201)	0.554
163	13.58	0.77	0.460	0.126	(0.136)	0.334
164	13.67	0.77	0.460	0.125	(0.136)	0.335
165	13.75	0.77	0.460	0.124	(0.136)	0.336
166	13.83	0.77	0.460	0.124	(0.136)	0.336
167	13.92	0.77	0.460	0.123	(0.136)	0.337
168	14.00	0.77	0.460	0.123	(0.136)	0.337
169	14.08	0.90	0.540	0.122	(0.160)	0.418
170	14.17	0.90	0.540	0.121	(0.160)	0.419
171	14.25	0.90	0.540	0.121	(0.160)	0.419
172	14.33	0.87	0.520	0.120	(0.154)	0.400
173	14.42	0.87	0.520	0.119	(0.154)	0.401

174	14.50	0.87	0.520	0.119	(0.154)	0.401
175	14.58	0.87	0.520	0.118	(0.154)	0.402
176	14.67	0.87	0.520	0.118	(0.154)	0.402
177	14.75	0.87	0.520	0.117	(0.154)	0.403
178	14.83	0.83	0.500	0.116	(0.148)	0.384
179	14.92	0.83	0.500	0.116	(0.148)	0.384
180	15.00	0.83	0.500	0.115	(0.148)	0.385
181	15.08	0.80	0.480	0.115	(0.142)	0.365
182	15.17	0.80	0.480	0.114	(0.142)	0.366
183	15.25	0.80	0.480	0.113	(0.142)	0.367
184	15.33	0.77	0.460	0.113	(0.136)	0.347
185	15.42	0.77	0.460	0.112	(0.136)	0.348
186	15.50	0.77	0.460	0.112	(0.136)	0.348
187	15.58	0.63	0.380	0.111	(0.112)	0.269
188	15.67	0.63	0.380	0.111	(0.112)	0.269
189	15.75	0.63	0.380	0.110	(0.112)	0.270
190	15.83	0.63	0.380	0.109	(0.112)	0.271
191	15.92	0.63	0.380	0.109	(0.112)	0.271
192	16.00	0.63	0.380	0.108	(0.112)	0.272
193	16.08	0.13	0.080	(0.108)	0.024	0.056
194	16.17	0.13	0.080	(0.107)	0.024	0.056
195	16.25	0.13	0.080	(0.107)	0.024	0.056
196	16.33	0.13	0.080	(0.106)	0.024	0.056
197	16.42	0.13	0.080	(0.106)	0.024	0.056
198	16.50	0.13	0.080	(0.105)	0.024	0.056
199	16.58	0.10	0.060	(0.105)	0.018	0.042
200	16.67	0.10	0.060	(0.104)	0.018	0.042
201	16.75	0.10	0.060	(0.103)	0.018	0.042
202	16.83	0.10	0.060	(0.103)	0.018	0.042
203	16.92	0.10	0.060	(0.102)	0.018	0.042
204	17.00	0.10	0.060	(0.102)	0.018	0.042
205	17.08	0.17	0.100	(0.101)	0.030	0.070
206	17.17	0.17	0.100	(0.101)	0.030	0.070
207	17.25	0.17	0.100	(0.100)	0.030	0.070
208	17.33	0.17	0.100	(0.100)	0.030	0.070
209	17.42	0.17	0.100	(0.099)	0.030	0.070
210	17.50	0.17	0.100	(0.099)	0.030	0.070
211	17.58	0.17	0.100	(0.098)	0.030	0.070
212	17.67	0.17	0.100	(0.098)	0.030	0.070
213	17.75	0.17	0.100	(0.097)	0.030	0.070
214	17.83	0.13	0.080	(0.097)	0.024	0.056
215	17.92	0.13	0.080	(0.096)	0.024	0.056
216	18.00	0.13	0.080	(0.096)	0.024	0.056
217	18.08	0.13	0.080	(0.095)	0.024	0.056
218	18.17	0.13	0.080	(0.095)	0.024	0.056
219	18.25	0.13	0.080	(0.095)	0.024	0.056
220	18.33	0.13	0.080	(0.094)	0.024	0.056
221	18.42	0.13	0.080	(0.094)	0.024	0.056
222	18.50	0.13	0.080	(0.093)	0.024	0.056
223	18.58	0.10	0.060	(0.093)	0.018	0.042
224	18.67	0.10	0.060	(0.092)	0.018	0.042
225	18.75	0.10	0.060	(0.092)	0.018	0.042
226	18.83	0.07	0.040	(0.091)	0.012	0.028
227	18.92	0.07	0.040	(0.091)	0.012	0.028
228	19.00	0.07	0.040	(0.091)	0.012	0.028
229	19.08	0.10	0.060	(0.090)	0.018	0.042
230	19.17	0.10	0.060	(0.090)	0.018	0.042

231	19.25	0.10	0.060	(0.089)	0.018	0.042
232	19.33	0.13	0.080	(0.089)	0.024	0.056
233	19.42	0.13	0.080	(0.088)	0.024	0.056
234	19.50	0.13	0.080	(0.088)	0.024	0.056
235	19.58	0.10	0.060	(0.088)	0.018	0.042
236	19.67	0.10	0.060	(0.087)	0.018	0.042
237	19.75	0.10	0.060	(0.087)	0.018	0.042
238	19.83	0.07	0.040	(0.086)	0.012	0.028
239	19.92	0.07	0.040	(0.086)	0.012	0.028
240	20.00	0.07	0.040	(0.086)	0.012	0.028
241	20.08	0.10	0.060	(0.085)	0.018	0.042
242	20.17	0.10	0.060	(0.085)	0.018	0.042
243	20.25	0.10	0.060	(0.085)	0.018	0.042
244	20.33	0.10	0.060	(0.084)	0.018	0.042
245	20.42	0.10	0.060	(0.084)	0.018	0.042
246	20.50	0.10	0.060	(0.083)	0.018	0.042
247	20.58	0.10	0.060	(0.083)	0.018	0.042
248	20.67	0.10	0.060	(0.083)	0.018	0.042
249	20.75	0.10	0.060	(0.082)	0.018	0.042
250	20.83	0.07	0.040	(0.082)	0.012	0.028
251	20.92	0.07	0.040	(0.082)	0.012	0.028
252	21.00	0.07	0.040	(0.081)	0.012	0.028
253	21.08	0.10	0.060	(0.081)	0.018	0.042
254	21.17	0.10	0.060	(0.081)	0.018	0.042
255	21.25	0.10	0.060	(0.080)	0.018	0.042
256	21.33	0.07	0.040	(0.080)	0.012	0.028
257	21.42	0.07	0.040	(0.080)	0.012	0.028
258	21.50	0.07	0.040	(0.080)	0.012	0.028
259	21.58	0.10	0.060	(0.079)	0.018	0.042
260	21.67	0.10	0.060	(0.079)	0.018	0.042
261	21.75	0.10	0.060	(0.079)	0.018	0.042
262	21.83	0.07	0.040	(0.078)	0.012	0.028
263	21.92	0.07	0.040	(0.078)	0.012	0.028
264	22.00	0.07	0.040	(0.078)	0.012	0.028
265	22.08	0.10	0.060	(0.078)	0.018	0.042
266	22.17	0.10	0.060	(0.077)	0.018	0.042
267	22.25	0.10	0.060	(0.077)	0.018	0.042
268	22.33	0.07	0.040	(0.077)	0.012	0.028
269	22.42	0.07	0.040	(0.077)	0.012	0.028
270	22.50	0.07	0.040	(0.076)	0.012	0.028
271	22.58	0.07	0.040	(0.076)	0.012	0.028
272	22.67	0.07	0.040	(0.076)	0.012	0.028
273	22.75	0.07	0.040	(0.076)	0.012	0.028
274	22.83	0.07	0.040	(0.076)	0.012	0.028
275	22.92	0.07	0.040	(0.075)	0.012	0.028
276	23.00	0.07	0.040	(0.075)	0.012	0.028
277	23.08	0.07	0.040	(0.075)	0.012	0.028
278	23.17	0.07	0.040	(0.075)	0.012	0.028
279	23.25	0.07	0.040	(0.075)	0.012	0.028
280	23.33	0.07	0.040	(0.075)	0.012	0.028
281	23.42	0.07	0.040	(0.074)	0.012	0.028
282	23.50	0.07	0.040	(0.074)	0.012	0.028
283	23.58	0.07	0.040	(0.074)	0.012	0.028
284	23.67	0.07	0.040	(0.074)	0.012	0.028
285	23.75	0.07	0.040	(0.074)	0.012	0.028
286	23.83	0.07	0.040	(0.074)	0.012	0.028
287	23.92	0.07	0.040	(0.074)	0.012	0.028

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288  24.00     0.07      0.040       (  0.074)       0.012        0.028
            (Loss Rate Not Used)
    Sum =     100.0                                    Sum =    43.7
     Flood volume = Effective rainfall      3.64(In)
      times area      32.8(Ac.)/[(In)/(Ft.)] =      10.0(Ac.Ft)
     Total soil loss =      1.36(In)
     Total soil loss =     3.726(Ac.Ft)
     Total rainfall =      5.00(In)
     Flood volume =      433684.7 Cubic Feet
     Total soil loss =      162323.1 Cubic Feet
     ---------------------------------------------------------------------
      Peak flow rate of this hydrograph =     18.283(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        5.0      10.0      15.0      20.0
 ----------------------------------------------------------------------------
   0+ 5       0.0018      0.27  Q          |         |         |         |
   0+10       0.0068      0.72  VQ         |         |         |         |
   0+15       0.0125      0.83  VQ         |         |         |         |
   0+20       0.0195      1.02  V Q        |         |         |         |
   0+25       0.0282      1.27  V Q        |         |         |         |
   0+30       0.0375      1.34  V Q        |         |         |         |
   0+35       0.0469      1.37  V Q        |         |         |         |
   0+40       0.0565      1.39  V Q        |         |         |         |
   0+45       0.0661      1.40  V Q        |         |         |         |
   0+50       0.0766      1.53  V  Q       |         |         |         |
   0+55       0.0887      1.76  V  Q       |         |         |         |
   1+ 0       0.1012      1.81  V  Q       |         |         |         |
   1+ 5       0.1130      1.71  V  Q       |         |         |         |
   1+10       0.1233      1.50  V Q        |         |         |         |
   1+15       0.1332      1.45  V Q        |         |         |         |
   1+20       0.1430      1.42  V Q        |         |         |         |
   1+25       0.1528      1.41  V Q        |         |         |         |
   1+30       0.1624      1.40  V Q        |         |         |         |
   1+35       0.1720      1.40  V Q        |         |         |         |
   1+40       0.1817      1.40  V Q        |         |         |         |
   1+45       0.1913      1.40  V Q        |         |         |         |
   1+50       0.2019      1.53  V  Q       |         |         |         |
   1+55       0.2140      1.76  V  Q       |         |         |         |
   2+ 0       0.2265      1.81  V  Q       |         |         |         |
   2+ 5       0.2391      1.84  V  Q       |         |         |         |
   2+10       0.2519      1.85  |V Q        |         |         |         |
   2+15       0.2647      1.86  |V Q        |         |         |         |
   2+20       0.2776      1.86  |V Q        |         |         |         |
   2+25       0.2904      1.86  |V Q        |         |         |         |
   2+30       0.3032      1.86  |V Q        |         |         |         |
   2+35       0.3170      2.00  |V Q        |         |         |         |
   2+40       0.3323      2.22  |V  Q       |         |         |         |
   2+45       0.3480      2.28  |V  Q       |         |         |         |
   2+50       0.3639      2.31  |V  Q       |         |         |         |
   2+55       0.3799      2.32  |V  Q       |         |         |         |
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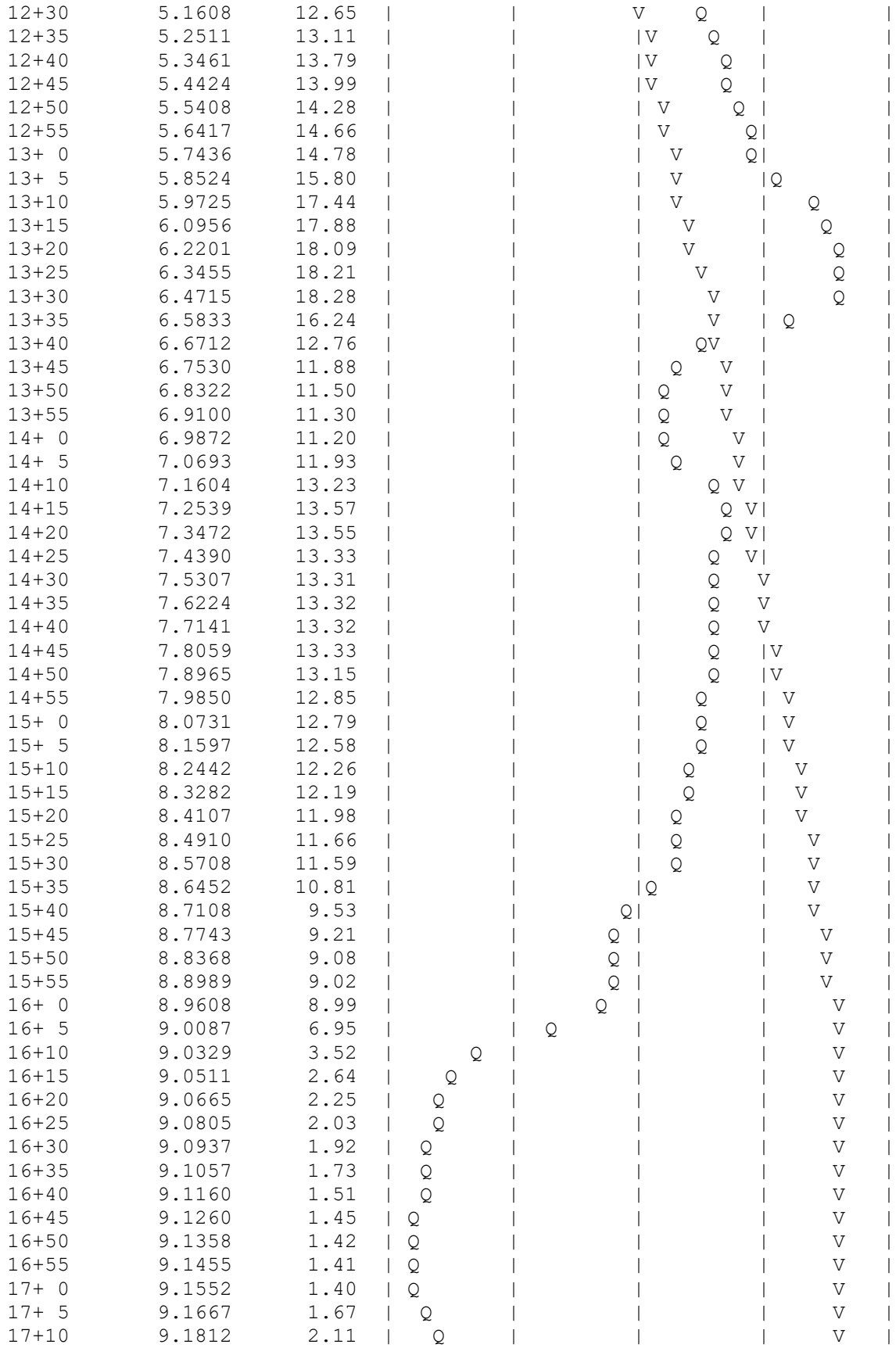
3+ 0	0.3959	2.33	V Q			
3+ 5	0.4120	2.33	V Q			
3+10	0.4280	2.33	V Q			
3+15	0.4441	2.33	V Q			
3+20	0.4601	2.33	V Q			
3+25	0.4762	2.33	V Q			
3+30	0.4922	2.33	V Q			
3+35	0.5083	2.33	V Q			
3+40	0.5243	2.33	V Q			
3+45	0.5404	2.33	V Q			
3+50	0.5574	2.46	V Q			
3+55	0.5759	2.69	V Q			
4+ 0	0.5948	2.75	V Q			
4+ 5	0.6139	2.77	V Q			
4+10	0.6331	2.79	V Q			
4+15	0.6523	2.79	V Q			
4+20	0.6725	2.93	V Q			
4+25	0.6942	3.16	V Q			
4+30	0.7164	3.21	V Q			
4+35	0.7387	3.24	V Q			
4+40	0.7611	3.25	V Q			
4+45	0.7835	3.26	V Q			
4+50	0.8069	3.40	V Q			
4+55	0.8319	3.62	V Q			
5+ 0	0.8572	3.68	V Q			
5+ 5	0.8809	3.44	V Q			
5+10	0.9016	3.00	V Q			
5+15	0.9215	2.90	V Q			
5+20	0.9420	2.98	V Q			
5+25	0.9639	3.18	V Q			
5+30	0.9861	3.22	V Q			
5+35	1.0093	3.37	V Q			
5+40	1.0342	3.61	V Q			
5+45	1.0595	3.68	V Q			
5+50	1.0850	3.70	V Q			
5+55	1.1106	3.72	V Q			
6+ 0	1.1363	3.73	V Q			
6+ 5	1.1629	3.86	V Q			
6+10	1.1910	4.09	V Q			
6+15	1.2196	4.15	V Q			
6+20	1.2483	4.17	V Q			
6+25	1.2771	4.18	V Q			
6+30	1.3060	4.19	V Q			
6+35	1.3358	4.33	V Q			
6+40	1.3672	4.55	V Q			
6+45	1.3989	4.61	V Q			
6+50	1.4309	4.64	V Q			
6+55	1.4629	4.65	V Q			
7+ 0	1.4950	4.66	V Q			
7+ 5	1.5271	4.66	V Q			
7+10	1.5592	4.66	V Q			
7+15	1.5913	4.66	V Q			
7+20	1.6243	4.80	V Q			
7+25	1.6589	5.02	V Q			
7+30	1.6939	5.08	V Q			
7+35	1.7299	5.24	V Q			
7+40	1.7677	5.48	V Q			

7+45	1.8058	5.54	V	Q			
7+50	1.8451	5.70	V	Q			
7+55	1.8860	5.94	V	Q			
8+ 0	1.9274	6.01	V	Q			
8+ 5	1.9708	6.30	V	Q			
8+10	2.0174	6.77	V	Q			
8+15	2.0648	6.89	V	Q			
8+20	2.1126	6.94	V	Q			
8+25	2.1606	6.97	V	Q			
8+30	2.2088	6.99	V	Q			
8+35	2.2578	7.13	V	Q			
8+40	2.3085	7.35	V	Q			
8+45	2.3595	7.41	V	Q			
8+50	2.4116	7.57	V	Q			
8+55	2.4654	7.81	V	Q			
9+ 0	2.5196	7.87	V	Q			
9+ 5	2.5758	8.17	V	Q			
9+10	2.6353	8.63	V	Q			
9+15	2.6956	8.75	V	Q			
9+20	2.7571	8.94	V	Q			
9+25	2.8205	9.19	V	Q			
9+30	2.8843	9.27	V	Q			
9+35	2.9492	9.43	V	Q			
9+40	3.0158	9.67	V	Q			
9+45	3.0829	9.74	V	Q			
9+50	3.1511	9.90	V	Q			
9+55	3.2209	10.14	V	Q			
10+ 0	3.2912	10.20	V	Q			
10+ 5	3.3552	9.30	V	Q			
10+10	3.4085	7.74	V	Q			
10+15	3.4591	7.34	V	Q			
10+20	3.5084	7.17	V	Q			
10+25	3.5571	7.07	V	Q			
10+30	3.6055	7.02	V	Q			
10+35	3.6582	7.66	V	Q			
10+40	3.7187	8.78	V	Q			
10+45	3.7812	9.07	V	Q			
10+50	3.8445	9.20	V	Q			
10+55	3.9084	9.27	V	Q			
11+ 0	3.9725	9.31	V	Q			
11+ 5	4.0358	9.19	V	Q			
11+10	4.0975	8.97	V	Q			
11+15	4.1589	8.91	V	Q			
11+20	4.2201	8.88	V	Q			
11+25	4.2811	8.87	V	Q			
11+30	4.3422	8.86	V	Q			
11+35	4.4013	8.59	V	Q			
11+40	4.4574	8.14	V	Q			
11+45	4.5127	8.03	V	Q			
11+50	4.5685	8.11	V	Q			
11+55	4.6257	8.31	V	Q			
12+ 0	4.6832	8.35	V	Q			
12+ 5	4.7480	9.40	V	Q			
12+10	4.8248	11.15	V	Q			
12+15	4.9048	11.62	V	Q			
12+20	4.9877	12.04	V	Q			
12+25	5.0737	12.49	V	Q			



17+15	9.1966	2.23	| Q	|	|	| V	|
17+20	9.2123	2.28	| Q	|	|	| V	|
17+25	9.2282	2.31	| Q	|	|	| V	|
17+30	9.2442	2.32	| Q	|	|	| V	|
17+35	9.2603	2.33	| Q	|	|	| V	|
17+40	9.2763	2.33	| Q	|	|	| V	|
17+45	9.2924	2.33	| Q	|	|	| V	|
17+50	9.3075	2.20	| Q	|	|	| V	|
17+55	9.3211	1.97	| Q	|	|	| V	|
18+ 0	9.3343	1.92	| Q	|	|	| V	|
18+ 5	9.3473	1.89	| Q	|	|	| V	|
18+10	9.3602	1.88	| Q	|	|	| V	|
18+15	9.3731	1.87	| Q	|	|	| V	|
18+20	9.3859	1.86	| Q	|	|	| V	|
18+25	9.3988	1.86	| Q	|	|	| V	|
18+30	9.4116	1.86	| Q	|	|	| V	|
18+35	9.4235	1.73	| Q	|	|	| V	|
18+40	9.4339	1.51	| Q	|	|	| V	|
18+45	9.4439	1.45	| Q	|	|	| V	|
18+50	9.4528	1.29	| Q	|	|	| V	|
18+55	9.4600	1.05	| Q	|	|	| V	|
19+ 0	9.4668	0.99	|Q	|	|	| V	|
19+ 5	9.4743	1.09	| Q	|	|	| V	|
19+10	9.4833	1.30	| Q	|	|	| V	|
19+15	9.4926	1.35	| Q	|	|	| V	|
19+20	9.5030	1.51	| Q	|	|	| V	|
19+25	9.5150	1.75	| Q	|	|	| V	|
19+30	9.5275	1.81	| Q	|	|	| V	|
19+35	9.5392	1.71	| Q	|	|	| V	|
19+40	9.5495	1.50	| Q	|	|	| V	|
19+45	9.5595	1.45	| Q	|	|	| V	|
19+50	9.5684	1.29	| Q	|	|	| V	|
19+55	9.5756	1.05	| Q	|	|	| V	|
20+ 0	9.5824	0.99	|Q	|	|	| V	|
20+ 5	9.5899	1.09	| Q	|	|	| V	|
20+10	9.5989	1.30	| Q	|	|	| V	|
20+15	9.6082	1.35	| Q	|	|	| V	|
20+20	9.6177	1.37	| Q	|	|	| V	|
20+25	9.6272	1.39	| Q	|	|	| V	|
20+30	9.6368	1.40	| Q	|	|	| V	|
20+35	9.6465	1.40	| Q	|	|	| V	|
20+40	9.6561	1.40	| Q	|	|	| V	|
20+45	9.6657	1.40	| Q	|	|	| V	|
20+50	9.6744	1.27	| Q	|	|	| V	|
20+55	9.6816	1.04	| Q	|	|	| V	|
21+ 0	9.6884	0.98	|Q	|	|	| V	|
21+ 5	9.6959	1.09	| Q	|	|	| V	|
21+10	9.7048	1.30	| Q	|	|	| V	|
21+15	9.7142	1.35	| Q	|	|	| V	|
21+20	9.7227	1.24	| Q	|	|	| V	|
21+25	9.7298	1.03	| Q	|	|	| V	|
21+30	9.7365	0.98	|Q	|	|	| V	|
21+35	9.7440	1.09	| Q	|	|	| V	|
21+40	9.7530	1.30	| Q	|	|	| V	|
21+45	9.7623	1.35	| Q	|	|	| V	|
21+50	9.7709	1.24	| Q	|	|	| V	|
21+55	9.7779	1.03	| Q	|	|	| V	|

22+ 0	9.7847	0.98	|Q	|	|	|	V|
22+ 5	9.7922	1.09	| Q	|	|	|	V|
22+10	9.8012	1.30	| Q	|	|	|	V|
22+15	9.8105	1.35	| Q	|	|	|	V|
22+20	9.8190	1.24	| Q	|	|	|	V|
22+25	9.8261	1.03	| Q	|	|	|	V|
22+30	9.8329	0.98	|Q	|	|	|	V|
22+35	9.8394	0.96	|Q	|	|	|	V|
22+40	9.8459	0.94	|Q	|	|	|	V|
22+45	9.8524	0.94	|Q	|	|	|	V|
22+50	9.8588	0.93	|Q	|	|	|	V|
22+55	9.8652	0.93	|Q	|	|	|	V|
23+ 0	9.8717	0.93	|Q	|	|	|	V|
23+ 5	9.8781	0.93	|Q	|	|	|	V|
23+10	9.8845	0.93	|Q	|	|	|	V|
23+15	9.8909	0.93	|Q	|	|	|	V|
23+20	9.8973	0.93	|Q	|	|	|	V|
23+25	9.9038	0.93	|Q	|	|	|	V|
23+30	9.9102	0.93	|Q	|	|	|	V|
23+35	9.9166	0.93	|Q	|	|	|	V|
23+40	9.9230	0.93	|Q	|	|	|	V|
23+45	9.9295	0.93	|Q	|	|	|	V|
23+50	9.9359	0.93	|Q	|	|	|	V|
23+55	9.9423	0.93	|Q	|	|	|	V|
24+ 0	9.9487	0.93	|Q	|	|	|	V|
24+ 5	9.9533	0.67	|Q	|	|	|	V|
24+10	9.9548	0.22	Q	|	|	|	V|
24+15	9.9555	0.10	Q	|	|	|	V|
24+20	9.9558	0.05	Q	|	|	|	V|
24+25	9.9560	0.02	Q	|	|	|	V|
24+30	9.9560	0.01	Q	|	|	|	V

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

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Study date 10/02/24 File: 100pquhb24100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPSOED CONDITION WATERSHED B
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 30.51(Ac.) = 0.048 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 30.51(Ac.) = 0.048 Sq. Mi.
Length along longest watercourse = 2861.00(Ft.)
Length along longest watercourse measured to centroid = 2131.00(Ft.)
Length along longest watercourse = 0.542 Mi.
Length along longest watercourse measured to centroid = 0.404 Mi.
Difference in elevation = 26.97(Ft.)
Slope along watercourse = 49.7734 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.096 Hr.
Lag time = 5.77 Min.
25% of lag time = 1.44 Min.
40% of lag time = 2.31 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
30.51	1.80	54.92

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
30.51	5.00	152.55

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.800(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
30.510	62.10	0.835

Total Area Entered = 30.51(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
62.1	62.1	0.447	0.835	0.111	1.000	0.111
					Sum (F) =	0.111

Area averaged mean soil loss (F) (In/Hr) = 0.111
Minimum soil loss rate ((In/Hr)) = 0.056
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.232

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	86.658	15.197	4.673
2	0.167	173.316	46.362	14.256
3	0.250	259.974	18.174	5.588
4	0.333	346.632	7.832	2.408
5	0.417	433.290	4.614	1.419
6	0.500	519.948	2.896	0.891
7	0.583	606.606	2.040	0.627
8	0.667	693.264	1.339	0.412
9	0.750	779.923	0.910	0.280
10	0.833	866.581	0.634	0.195
		Sum =	100.000 Sum=	30.748

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

Unit Time	Pattern	Storm Rain	Loss rate(In./Hr)	Effective

	(Hr.)	Percent	(In/Hr)	Max	Low	(In/Hr)
1	0.08	0.07	0.040	(0.197)	0.009	0.031
2	0.17	0.07	0.040	(0.196)	0.009	0.031
3	0.25	0.07	0.040	(0.196)	0.009	0.031
4	0.33	0.10	0.060	(0.195)	0.014	0.046
5	0.42	0.10	0.060	(0.194)	0.014	0.046
6	0.50	0.10	0.060	(0.193)	0.014	0.046
7	0.58	0.10	0.060	(0.193)	0.014	0.046
8	0.67	0.10	0.060	(0.192)	0.014	0.046
9	0.75	0.10	0.060	(0.191)	0.014	0.046
10	0.83	0.13	0.080	(0.190)	0.019	0.061
11	0.92	0.13	0.080	(0.190)	0.019	0.061
12	1.00	0.13	0.080	(0.189)	0.019	0.061
13	1.08	0.10	0.060	(0.188)	0.014	0.046
14	1.17	0.10	0.060	(0.187)	0.014	0.046
15	1.25	0.10	0.060	(0.187)	0.014	0.046
16	1.33	0.10	0.060	(0.186)	0.014	0.046
17	1.42	0.10	0.060	(0.185)	0.014	0.046
18	1.50	0.10	0.060	(0.184)	0.014	0.046
19	1.58	0.10	0.060	(0.184)	0.014	0.046
20	1.67	0.10	0.060	(0.183)	0.014	0.046
21	1.75	0.10	0.060	(0.182)	0.014	0.046
22	1.83	0.13	0.080	(0.181)	0.019	0.061
23	1.92	0.13	0.080	(0.181)	0.019	0.061
24	2.00	0.13	0.080	(0.180)	0.019	0.061
25	2.08	0.13	0.080	(0.179)	0.019	0.061
26	2.17	0.13	0.080	(0.178)	0.019	0.061
27	2.25	0.13	0.080	(0.178)	0.019	0.061
28	2.33	0.13	0.080	(0.177)	0.019	0.061
29	2.42	0.13	0.080	(0.176)	0.019	0.061
30	2.50	0.13	0.080	(0.176)	0.019	0.061
31	2.58	0.17	0.100	(0.175)	0.023	0.077
32	2.67	0.17	0.100	(0.174)	0.023	0.077
33	2.75	0.17	0.100	(0.173)	0.023	0.077
34	2.83	0.17	0.100	(0.173)	0.023	0.077
35	2.92	0.17	0.100	(0.172)	0.023	0.077
36	3.00	0.17	0.100	(0.171)	0.023	0.077
37	3.08	0.17	0.100	(0.171)	0.023	0.077
38	3.17	0.17	0.100	(0.170)	0.023	0.077
39	3.25	0.17	0.100	(0.169)	0.023	0.077
40	3.33	0.17	0.100	(0.168)	0.023	0.077
41	3.42	0.17	0.100	(0.168)	0.023	0.077
42	3.50	0.17	0.100	(0.167)	0.023	0.077
43	3.58	0.17	0.100	(0.166)	0.023	0.077
44	3.67	0.17	0.100	(0.166)	0.023	0.077
45	3.75	0.17	0.100	(0.165)	0.023	0.077
46	3.83	0.20	0.120	(0.164)	0.028	0.092
47	3.92	0.20	0.120	(0.164)	0.028	0.092
48	4.00	0.20	0.120	(0.163)	0.028	0.092
49	4.08	0.20	0.120	(0.162)	0.028	0.092
50	4.17	0.20	0.120	(0.161)	0.028	0.092
51	4.25	0.20	0.120	(0.161)	0.028	0.092
52	4.33	0.23	0.140	(0.160)	0.032	0.108
53	4.42	0.23	0.140	(0.159)	0.032	0.108
54	4.50	0.23	0.140	(0.159)	0.032	0.108
55	4.58	0.23	0.140	(0.158)	0.032	0.108
56	4.67	0.23	0.140	(0.157)	0.032	0.108

57	4.75	0.23	0.140	(0.157)	0.032	0.108
58	4.83	0.27	0.160	(0.156)	0.037	0.123
59	4.92	0.27	0.160	(0.155)	0.037	0.123
60	5.00	0.27	0.160	(0.155)	0.037	0.123
61	5.08	0.20	0.120	(0.154)	0.028	0.092
62	5.17	0.20	0.120	(0.153)	0.028	0.092
63	5.25	0.20	0.120	(0.153)	0.028	0.092
64	5.33	0.23	0.140	(0.152)	0.032	0.108
65	5.42	0.23	0.140	(0.151)	0.032	0.108
66	5.50	0.23	0.140	(0.151)	0.032	0.108
67	5.58	0.27	0.160	(0.150)	0.037	0.123
68	5.67	0.27	0.160	(0.149)	0.037	0.123
69	5.75	0.27	0.160	(0.149)	0.037	0.123
70	5.83	0.27	0.160	(0.148)	0.037	0.123
71	5.92	0.27	0.160	(0.147)	0.037	0.123
72	6.00	0.27	0.160	(0.147)	0.037	0.123
73	6.08	0.30	0.180	(0.146)	0.042	0.138
74	6.17	0.30	0.180	(0.145)	0.042	0.138
75	6.25	0.30	0.180	(0.145)	0.042	0.138
76	6.33	0.30	0.180	(0.144)	0.042	0.138
77	6.42	0.30	0.180	(0.143)	0.042	0.138
78	6.50	0.30	0.180	(0.143)	0.042	0.138
79	6.58	0.33	0.200	(0.142)	0.046	0.154
80	6.67	0.33	0.200	(0.142)	0.046	0.154
81	6.75	0.33	0.200	(0.141)	0.046	0.154
82	6.83	0.33	0.200	(0.140)	0.046	0.154
83	6.92	0.33	0.200	(0.140)	0.046	0.154
84	7.00	0.33	0.200	(0.139)	0.046	0.154
85	7.08	0.33	0.200	(0.138)	0.046	0.154
86	7.17	0.33	0.200	(0.138)	0.046	0.154
87	7.25	0.33	0.200	(0.137)	0.046	0.154
88	7.33	0.37	0.220	(0.137)	0.051	0.169
89	7.42	0.37	0.220	(0.136)	0.051	0.169
90	7.50	0.37	0.220	(0.135)	0.051	0.169
91	7.58	0.40	0.240	(0.135)	0.056	0.184
92	7.67	0.40	0.240	(0.134)	0.056	0.184
93	7.75	0.40	0.240	(0.133)	0.056	0.184
94	7.83	0.43	0.260	(0.133)	0.060	0.200
95	7.92	0.43	0.260	(0.132)	0.060	0.200
96	8.00	0.43	0.260	(0.132)	0.060	0.200
97	8.08	0.50	0.300	(0.131)	0.070	0.230
98	8.17	0.50	0.300	(0.130)	0.070	0.230
99	8.25	0.50	0.300	(0.130)	0.070	0.230
100	8.33	0.50	0.300	(0.129)	0.070	0.230
101	8.42	0.50	0.300	(0.129)	0.070	0.230
102	8.50	0.50	0.300	(0.128)	0.070	0.230
103	8.58	0.53	0.320	(0.127)	0.074	0.246
104	8.67	0.53	0.320	(0.127)	0.074	0.246
105	8.75	0.53	0.320	(0.126)	0.074	0.246
106	8.83	0.57	0.340	(0.126)	0.079	0.261
107	8.92	0.57	0.340	(0.125)	0.079	0.261
108	9.00	0.57	0.340	(0.124)	0.079	0.261
109	9.08	0.63	0.380	(0.124)	0.088	0.292
110	9.17	0.63	0.380	(0.123)	0.088	0.292
111	9.25	0.63	0.380	(0.123)	0.088	0.292
112	9.33	0.67	0.400	(0.122)	0.093	0.307
113	9.42	0.67	0.400	(0.121)	0.093	0.307

114	9.50	0.67	0.400	(0.121)	0.093	0.307
115	9.58	0.70	0.420	(0.120)	0.097	0.323
116	9.67	0.70	0.420	(0.120)	0.097	0.323
117	9.75	0.70	0.420	(0.119)	0.097	0.323
118	9.83	0.73	0.440	(0.119)	0.102	0.338
119	9.92	0.73	0.440	(0.118)	0.102	0.338
120	10.00	0.73	0.440	(0.117)	0.102	0.338
121	10.08	0.50	0.300	(0.117)	0.070	0.230
122	10.17	0.50	0.300	(0.116)	0.070	0.230
123	10.25	0.50	0.300	(0.116)	0.070	0.230
124	10.33	0.50	0.300	(0.115)	0.070	0.230
125	10.42	0.50	0.300	(0.115)	0.070	0.230
126	10.50	0.50	0.300	(0.114)	0.070	0.230
127	10.58	0.67	0.400	(0.113)	0.093	0.307
128	10.67	0.67	0.400	(0.113)	0.093	0.307
129	10.75	0.67	0.400	(0.112)	0.093	0.307
130	10.83	0.67	0.400	(0.112)	0.093	0.307
131	10.92	0.67	0.400	(0.111)	0.093	0.307
132	11.00	0.67	0.400	(0.111)	0.093	0.307
133	11.08	0.63	0.380	(0.110)	0.088	0.292
134	11.17	0.63	0.380	(0.110)	0.088	0.292
135	11.25	0.63	0.380	(0.109)	0.088	0.292
136	11.33	0.63	0.380	(0.109)	0.088	0.292
137	11.42	0.63	0.380	(0.108)	0.088	0.292
138	11.50	0.63	0.380	(0.107)	0.088	0.292
139	11.58	0.57	0.340	(0.107)	0.079	0.261
140	11.67	0.57	0.340	(0.106)	0.079	0.261
141	11.75	0.57	0.340	(0.106)	0.079	0.261
142	11.83	0.60	0.360	(0.105)	0.084	0.276
143	11.92	0.60	0.360	(0.105)	0.084	0.276
144	12.00	0.60	0.360	(0.104)	0.084	0.276
145	12.08	0.83	0.500	0.104	(0.116)	0.396
146	12.17	0.83	0.500	0.103	(0.116)	0.397
147	12.25	0.83	0.500	0.103	(0.116)	0.397
148	12.33	0.87	0.520	0.102	(0.121)	0.418
149	12.42	0.87	0.520	0.102	(0.121)	0.418
150	12.50	0.87	0.520	0.101	(0.121)	0.419
151	12.58	0.93	0.560	0.101	(0.130)	0.459
152	12.67	0.93	0.560	0.100	(0.130)	0.460
153	12.75	0.93	0.560	0.100	(0.130)	0.460
154	12.83	0.97	0.580	0.099	(0.135)	0.481
155	12.92	0.97	0.580	0.099	(0.135)	0.481
156	13.00	0.97	0.580	0.098	(0.135)	0.482
157	13.08	1.13	0.680	0.098	(0.158)	0.582
158	13.17	1.13	0.680	0.097	(0.158)	0.583
159	13.25	1.13	0.680	0.097	(0.158)	0.583
160	13.33	1.13	0.680	0.096	(0.158)	0.584
161	13.42	1.13	0.680	0.096	(0.158)	0.584
162	13.50	1.13	0.680	0.095	(0.158)	0.585
163	13.58	0.77	0.460	0.095	(0.107)	0.365
164	13.67	0.77	0.460	0.094	(0.107)	0.366
165	13.75	0.77	0.460	0.094	(0.107)	0.366
166	13.83	0.77	0.460	0.093	(0.107)	0.367
167	13.92	0.77	0.460	0.093	(0.107)	0.367
168	14.00	0.77	0.460	0.092	(0.107)	0.368
169	14.08	0.90	0.540	0.092	(0.125)	0.448
170	14.17	0.90	0.540	0.091	(0.125)	0.449

171	14.25	0.90	0.540	0.091	(0.125)	0.449
172	14.33	0.87	0.520	0.090	(0.121)	0.430
173	14.42	0.87	0.520	0.090	(0.121)	0.430
174	14.50	0.87	0.520	0.090	(0.121)	0.430
175	14.58	0.87	0.520	0.089	(0.121)	0.431
176	14.67	0.87	0.520	0.089	(0.121)	0.431
177	14.75	0.87	0.520	0.088	(0.121)	0.432
178	14.83	0.83	0.500	0.088	(0.116)	0.412
179	14.92	0.83	0.500	0.087	(0.116)	0.413
180	15.00	0.83	0.500	0.087	(0.116)	0.413
181	15.08	0.80	0.480	0.086	(0.111)	0.394
182	15.17	0.80	0.480	0.086	(0.111)	0.394
183	15.25	0.80	0.480	0.085	(0.111)	0.394
184	15.33	0.77	0.460	0.085	(0.107)	0.375
185	15.42	0.77	0.460	0.085	(0.107)	0.375
186	15.50	0.77	0.460	0.084	(0.107)	0.376
187	15.58	0.63	0.380	0.084	(0.088)	0.296
188	15.67	0.63	0.380	0.083	(0.088)	0.297
189	15.75	0.63	0.380	0.083	(0.088)	0.297
190	15.83	0.63	0.380	0.082	(0.088)	0.298
191	15.92	0.63	0.380	0.082	(0.088)	0.298
192	16.00	0.63	0.380	0.082	(0.088)	0.298
193	16.08	0.13	0.080	(0.081)	0.019	0.061
194	16.17	0.13	0.080	(0.081)	0.019	0.061
195	16.25	0.13	0.080	(0.080)	0.019	0.061
196	16.33	0.13	0.080	(0.080)	0.019	0.061
197	16.42	0.13	0.080	(0.080)	0.019	0.061
198	16.50	0.13	0.080	(0.079)	0.019	0.061
199	16.58	0.10	0.060	(0.079)	0.014	0.046
200	16.67	0.10	0.060	(0.078)	0.014	0.046
201	16.75	0.10	0.060	(0.078)	0.014	0.046
202	16.83	0.10	0.060	(0.078)	0.014	0.046
203	16.92	0.10	0.060	(0.077)	0.014	0.046
204	17.00	0.10	0.060	(0.077)	0.014	0.046
205	17.08	0.17	0.100	(0.076)	0.023	0.077
206	17.17	0.17	0.100	(0.076)	0.023	0.077
207	17.25	0.17	0.100	(0.076)	0.023	0.077
208	17.33	0.17	0.100	(0.075)	0.023	0.077
209	17.42	0.17	0.100	(0.075)	0.023	0.077
210	17.50	0.17	0.100	(0.074)	0.023	0.077
211	17.58	0.17	0.100	(0.074)	0.023	0.077
212	17.67	0.17	0.100	(0.074)	0.023	0.077
213	17.75	0.17	0.100	(0.073)	0.023	0.077
214	17.83	0.13	0.080	(0.073)	0.019	0.061
215	17.92	0.13	0.080	(0.073)	0.019	0.061
216	18.00	0.13	0.080	(0.072)	0.019	0.061
217	18.08	0.13	0.080	(0.072)	0.019	0.061
218	18.17	0.13	0.080	(0.072)	0.019	0.061
219	18.25	0.13	0.080	(0.071)	0.019	0.061
220	18.33	0.13	0.080	(0.071)	0.019	0.061
221	18.42	0.13	0.080	(0.071)	0.019	0.061
222	18.50	0.13	0.080	(0.070)	0.019	0.061
223	18.58	0.10	0.060	(0.070)	0.014	0.046
224	18.67	0.10	0.060	(0.070)	0.014	0.046
225	18.75	0.10	0.060	(0.069)	0.014	0.046
226	18.83	0.07	0.040	(0.069)	0.009	0.031
227	18.92	0.07	0.040	(0.069)	0.009	0.031

228	19.00	0.07	0.040	(0.068)	0.009	0.031
229	19.08	0.10	0.060	(0.068)	0.014	0.046
230	19.17	0.10	0.060	(0.068)	0.014	0.046
231	19.25	0.10	0.060	(0.067)	0.014	0.046
232	19.33	0.13	0.080	(0.067)	0.019	0.061
233	19.42	0.13	0.080	(0.067)	0.019	0.061
234	19.50	0.13	0.080	(0.066)	0.019	0.061
235	19.58	0.10	0.060	(0.066)	0.014	0.046
236	19.67	0.10	0.060	(0.066)	0.014	0.046
237	19.75	0.10	0.060	(0.065)	0.014	0.046
238	19.83	0.07	0.040	(0.065)	0.009	0.031
239	19.92	0.07	0.040	(0.065)	0.009	0.031
240	20.00	0.07	0.040	(0.065)	0.009	0.031
241	20.08	0.10	0.060	(0.064)	0.014	0.046
242	20.17	0.10	0.060	(0.064)	0.014	0.046
243	20.25	0.10	0.060	(0.064)	0.014	0.046
244	20.33	0.10	0.060	(0.063)	0.014	0.046
245	20.42	0.10	0.060	(0.063)	0.014	0.046
246	20.50	0.10	0.060	(0.063)	0.014	0.046
247	20.58	0.10	0.060	(0.063)	0.014	0.046
248	20.67	0.10	0.060	(0.062)	0.014	0.046
249	20.75	0.10	0.060	(0.062)	0.014	0.046
250	20.83	0.07	0.040	(0.062)	0.009	0.031
251	20.92	0.07	0.040	(0.062)	0.009	0.031
252	21.00	0.07	0.040	(0.061)	0.009	0.031
253	21.08	0.10	0.060	(0.061)	0.014	0.046
254	21.17	0.10	0.060	(0.061)	0.014	0.046
255	21.25	0.10	0.060	(0.061)	0.014	0.046
256	21.33	0.07	0.040	(0.060)	0.009	0.031
257	21.42	0.07	0.040	(0.060)	0.009	0.031
258	21.50	0.07	0.040	(0.060)	0.009	0.031
259	21.58	0.10	0.060	(0.060)	0.014	0.046
260	21.67	0.10	0.060	(0.060)	0.014	0.046
261	21.75	0.10	0.060	(0.059)	0.014	0.046
262	21.83	0.07	0.040	(0.059)	0.009	0.031
263	21.92	0.07	0.040	(0.059)	0.009	0.031
264	22.00	0.07	0.040	(0.059)	0.009	0.031
265	22.08	0.10	0.060	(0.058)	0.014	0.046
266	22.17	0.10	0.060	(0.058)	0.014	0.046
267	22.25	0.10	0.060	(0.058)	0.014	0.046
268	22.33	0.07	0.040	(0.058)	0.009	0.031
269	22.42	0.07	0.040	(0.058)	0.009	0.031
270	22.50	0.07	0.040	(0.058)	0.009	0.031
271	22.58	0.07	0.040	(0.057)	0.009	0.031
272	22.67	0.07	0.040	(0.057)	0.009	0.031
273	22.75	0.07	0.040	(0.057)	0.009	0.031
274	22.83	0.07	0.040	(0.057)	0.009	0.031
275	22.92	0.07	0.040	(0.057)	0.009	0.031
276	23.00	0.07	0.040	(0.057)	0.009	0.031
277	23.08	0.07	0.040	(0.057)	0.009	0.031
278	23.17	0.07	0.040	(0.056)	0.009	0.031
279	23.25	0.07	0.040	(0.056)	0.009	0.031
280	23.33	0.07	0.040	(0.056)	0.009	0.031
281	23.42	0.07	0.040	(0.056)	0.009	0.031
282	23.50	0.07	0.040	(0.056)	0.009	0.031
283	23.58	0.07	0.040	(0.056)	0.009	0.031
284	23.67	0.07	0.040	(0.056)	0.009	0.031

285	23.75	0.07	0.040	(0.056)	0.009	0.031
286	23.83	0.07	0.040	(0.056)	0.009	0.031
287	23.92	0.07	0.040	(0.056)	0.009	0.031
288	24.00	0.07	0.040	(0.056)	0.009	0.031

(Loss Rate Not Used)

Sum = 100.0 Sum = 47.4

Flood volume = Effective rainfall 3.95(In)
times area 30.5(Ac.)/[(In)/(Ft.)] = 10.0(Ac.Ft)
Total soil loss = 1.05(In)
Total soil loss = 2.676(Ac.Ft)
Total rainfall = 5.00(In)
Flood volume = 437166.1 Cubic Feet
Total soil loss = 116557.4 Cubic Feet

Peak flow rate of this hydrograph = 17.808(CFS)

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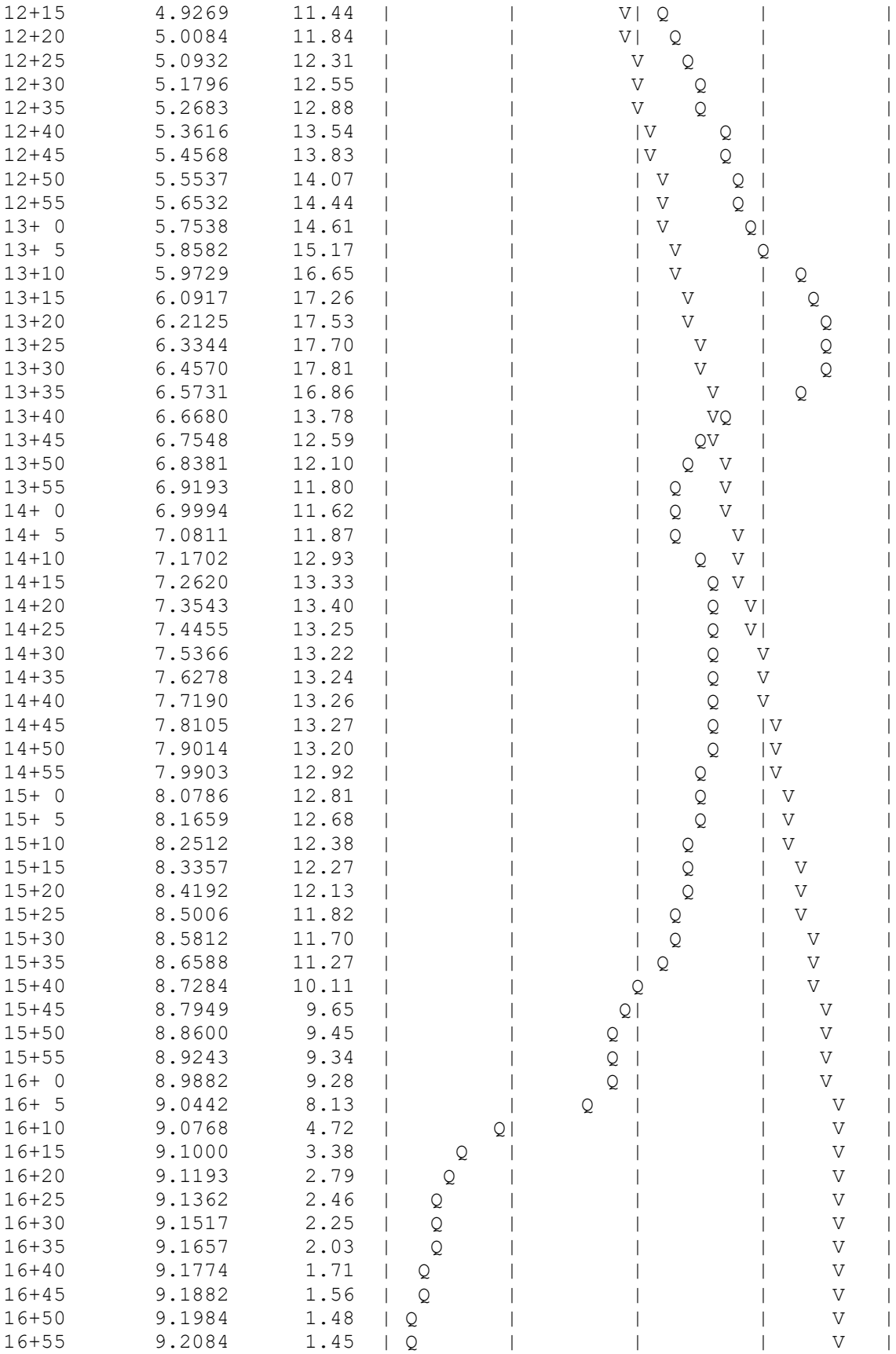
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0010	0.14	Q				
0+10	0.0050	0.58	VQ				
0+15	0.0102	0.75	VQ				
0+20	0.0164	0.90	VQ				
0+25	0.0244	1.16	V Q				
0+30	0.0332	1.28	V Q				
0+35	0.0423	1.33	V Q				
0+40	0.0517	1.37	V Q				
0+45	0.0613	1.39	V Q				
0+50	0.0715	1.48	V Q				
0+55	0.0832	1.70	V Q				
1+ 0	0.0955	1.79	V Q				
1+ 5	0.1076	1.76	V Q				
1+10	0.1184	1.56	V Q				
1+15	0.1287	1.49	V Q				
1+20	0.1387	1.46	V Q				
1+25	0.1487	1.45	V Q				
1+30	0.1586	1.44	V Q				
1+35	0.1685	1.43	V Q				
1+40	0.1783	1.42	V Q				
1+45	0.1881	1.42	V Q				
1+50	0.1983	1.49	V Q				
1+55	0.2101	1.71	V Q				
2+ 0	0.2224	1.79	V Q				
2+ 5	0.2350	1.83	V Q				
2+10	0.2478	1.85	V Q				
2+15	0.2607	1.87	|V Q				
2+20	0.2736	1.88	|V Q				
2+25	0.2866	1.88	|V Q				
2+30	0.2996	1.89	|V Q				
2+35	0.3131	1.96	|V Q				
2+40	0.3281	2.18	|V Q				

2+45	0.3437	2.27	V Q			
2+50	0.3596	2.30	V Q			
2+55	0.3756	2.33	V Q			
3+ 0	0.3917	2.34	V Q			
3+ 5	0.4079	2.35	V Q			
3+10	0.4241	2.36	V Q			
3+15	0.4403	2.36	V Q			
3+20	0.4566	2.36	V Q			
3+25	0.4729	2.36	V Q			
3+30	0.4891	2.36	V Q			
3+35	0.5054	2.36	V Q			
3+40	0.5217	2.36	V Q			
3+45	0.5380	2.36	V Q			
3+50	0.5547	2.43	V Q			
3+55	0.5730	2.65	V Q			
4+ 0	0.5919	2.74	V Q			
4+ 5	0.6110	2.78	V Q			
4+10	0.6303	2.80	V Q			
4+15	0.6496	2.81	V Q			
4+20	0.6695	2.89	V Q			
4+25	0.6910	3.12	V Q			
4+30	0.7131	3.21	V Q			
4+35	0.7355	3.25	V Q			
4+40	0.7580	3.27	V Q			
4+45	0.7806	3.28	V Q			
4+50	0.8038	3.37	V Q			
4+55	0.8286	3.59	V Q			
5+ 0	0.8539	3.68	V Q			
5+ 5	0.8786	3.58	V Q			
5+10	0.9003	3.16	V Q			
5+15	0.9210	3.00	V Q			
5+20	0.9417	3.01	V Q			
5+25	0.9637	3.19	V Q			
5+30	0.9862	3.26	V Q			
5+35	1.0092	3.35	V Q			
5+40	1.0338	3.58	V Q			
5+45	1.0591	3.67	V Q			
5+50	1.0846	3.71	V Q			
5+55	1.1104	3.74	V Q			
6+ 0	1.1362	3.75	V Q			
6+ 5	1.1626	3.84	V Q			
6+10	1.1906	4.06	V Q			
6+15	1.2192	4.15	V Q			
6+20	1.2481	4.19	V Q			
6+25	1.2772	4.22	V Q			
6+30	1.3063	4.23	V Q			
6+35	1.3360	4.31	V Q			
6+40	1.3672	4.54	V Q			
6+45	1.3991	4.63	V Q			
6+50	1.4312	4.67	V Q			
6+55	1.4635	4.69	V Q			
7+ 0	1.4959	4.70	V Q			
7+ 5	1.5283	4.71	V Q			
7+10	1.5608	4.72	V Q			
7+15	1.5933	4.72	V Q			
7+20	1.6264	4.80	V Q			
7+25	1.6609	5.02	V Q			

7+30	1.6961	5.10	V Q			
7+35	1.7319	5.21	V Q			
7+40	1.7695	5.45	V Q			
7+45	1.8077	5.55	V |Q			
7+50	1.8468	5.67	V |Q			
7+55	1.8875	5.92	V |Q			
8+ 0	1.9290	6.02	V | Q			
8+ 5	1.9718	6.21	V | Q			
8+10	2.0178	6.68	V | Q			
8+15	2.0651	6.87	V | Q			
8+20	2.1130	6.96	V | Q			
8+25	2.1613	7.01	V | Q			
8+30	2.2097	7.04	V | Q			
8+35	2.2589	7.13	V| Q			
8+40	2.3096	7.36	V| Q			
8+45	2.3609	7.46	V| Q			
8+50	2.4131	7.57	V| Q			
8+55	2.4669	7.81	V| Q			
9+ 0	2.5214	7.91	V Q			
9+ 5	2.5772	8.10	V Q			
9+10	2.6362	8.57	V Q			
9+15	2.6966	8.76	V Q			
9+20	2.7580	8.92	V Q			
9+25	2.8213	9.19	|V Q			
9+30	2.8854	9.30	|V Q			
9+35	2.9503	9.44	|V Q			
9+40	3.0171	9.69	| V Q|			
9+45	3.0846	9.80	| V Q|			
9+50	3.1529	9.92	| V Q|			
9+55	3.2229	10.17	| V Q			
10+ 0	3.2937	10.27	| V Q			
10+ 5	3.3613	9.82	| V Q|			
10+10	3.4186	8.31	| V Q			
10+15	3.4718	7.73	| V Q			
10+20	3.5234	7.49	| Q			
10+25	3.5739	7.34	| Q			
10+30	3.6238	7.25	| Q			
10+35	3.6758	7.54	| VQ			
10+40	3.7350	8.59	| V Q			
10+45	3.7969	8.99	| V Q			
10+50	3.8599	9.16	| V Q			
10+55	3.9238	9.27	| V Q			
11+ 0	3.9880	9.33	| V Q			
11+ 5	4.0522	9.31	| V Q			
11+10	4.1150	9.12	| V Q			
11+15	4.1774	9.06	| V Q			
11+20	4.2396	9.04	| V Q			
11+25	4.3017	9.01	| VQ			
11+30	4.3637	9.00	| VQ			
11+35	4.4246	8.85	| Q			
11+40	4.4825	8.40	| QV			
11+45	4.5392	8.23	| Q V			
11+50	4.5958	8.22	| Q V			
11+55	4.6536	8.40	| Q V			
12+ 0	4.7119	8.46	| Q V			
12+ 5	4.7741	9.03	| QV|			
12+10	4.8481	10.75	| V|Q			



17+ 0	9.2183	1.44	Q				V
17+ 5	9.2291	1.57	Q				V
17+10	9.2430	2.01	Q				V
17+15	9.2579	2.17	Q				V
17+20	9.2734	2.25	Q				V
17+25	9.2892	2.29	Q				V
17+30	9.3051	2.32	Q				V
17+35	9.3212	2.34	Q				V
17+40	9.3374	2.35	Q				V
17+45	9.3536	2.36	Q				V
17+50	9.3694	2.29	Q				V
17+55	9.3836	2.07	Q				V
18+ 0	9.3973	1.99	Q				V
18+ 5	9.4107	1.95	Q				V
18+10	9.4240	1.93	Q				V
18+15	9.4372	1.91	Q				V
18+20	9.4503	1.90	Q				V
18+25	9.4634	1.90	Q				V
18+30	9.4764	1.89	Q				V
18+35	9.4889	1.82	Q				V
18+40	9.4999	1.60	Q				V
18+45	9.5103	1.51	Q				V
18+50	9.5200	1.40	Q				V
18+55	9.5280	1.16	Q				V
19+ 0	9.5354	1.06	Q				V
19+ 5	9.5429	1.09	Q				V
19+10	9.5517	1.28	Q				V
19+15	9.5610	1.35	Q				V
19+20	9.5709	1.44	Q				V
19+25	9.5825	1.68	Q				V
19+30	9.5947	1.77	Q				V
19+35	9.6067	1.75	Q				V
19+40	9.6174	1.55	Q				V
19+45	9.6277	1.49	Q				V
19+50	9.6372	1.39	Q				V
19+55	9.6452	1.16	Q				V
20+ 0	9.6525	1.06	Q				V
20+ 5	9.6600	1.09	Q				V
20+10	9.6688	1.28	Q				V
20+15	9.6781	1.35	Q				V
20+20	9.6876	1.37	Q				V
20+25	9.6971	1.39	Q				V
20+30	9.7068	1.40	Q				V
20+35	9.7164	1.40	Q				V
20+40	9.7261	1.41	Q				V
20+45	9.7359	1.41	Q				V
20+50	9.7451	1.35	Q				V
20+55	9.7529	1.13	Q				V
21+ 0	9.7601	1.04	Q				V
21+ 5	9.7675	1.08	Q				V
21+10	9.7762	1.27	Q				V
21+15	9.7855	1.35	Q				V
21+20	9.7945	1.30	Q				V
21+25	9.8020	1.10	Q				V
21+30	9.8090	1.02	Q				V
21+35	9.8164	1.06	Q				V
21+40	9.8251	1.27	Q				V

21+45	9.8343	1.34	| Q	|	|	|	V|
21+50	9.8433	1.30	| Q	|	|	|	V|
21+55	9.8508	1.10	| Q	|	|	|	V|
22+ 0	9.8579	1.02	| Q	|	|	|	V|
22+ 5	9.8652	1.06	| Q	|	|	|	V|
22+10	9.8739	1.27	| Q	|	|	|	V|
22+15	9.8831	1.34	| Q	|	|	|	V|
22+20	9.8921	1.30	| Q	|	|	|	V|
22+25	9.8996	1.10	| Q	|	|	|	V|
22+30	9.9067	1.02	| Q	|	|	|	V|
22+35	9.9135	0.99	|Q	|	|	|	V|
22+40	9.9202	0.97	|Q	|	|	|	V|
22+45	9.9269	0.97	|Q	|	|	|	V|
22+50	9.9335	0.96	|Q	|	|	|	V|
22+55	9.9400	0.95	|Q	|	|	|	V|
23+ 0	9.9465	0.95	|Q	|	|	|	V|
23+ 5	9.9531	0.95	|Q	|	|	|	V|
23+10	9.9596	0.95	|Q	|	|	|	V|
23+15	9.9661	0.95	|Q	|	|	|	V|
23+20	9.9726	0.95	|Q	|	|	|	V|
23+25	9.9791	0.95	|Q	|	|	|	V|
23+30	9.9856	0.95	|Q	|	|	|	V|
23+35	9.9921	0.95	|Q	|	|	|	V|
23+40	9.9986	0.95	|Q	|	|	|	V|
23+45	10.0051	0.95	|Q	|	|	|	V|
23+50	10.0116	0.95	|Q	|	|	|	V|
23+55	10.0181	0.95	|Q	|	|	|	V|
24+ 0	10.0246	0.95	|Q	|	|	|	V|
24+ 5	10.0302	0.80	|Q	|	|	|	V|
24+10	10.0327	0.36	Q	|	|	|	V|
24+15	10.0340	0.19	Q	|	|	|	V|
24+20	10.0348	0.12	Q	|	|	|	V|
24+25	10.0353	0.07	Q	|	|	|	V|
24+30	10.0356	0.05	Q	|	|	|	V|
24+35	10.0358	0.03	Q	|	|	|	V|
24+40	10.0359	0.01	Q	|	|	|	V|
24+45	10.0360	0.01	Q	|	|	|	V|

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

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Study date 10/02/24 File: q1auh1006100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION WATERSHED A
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 33.45(Ac.) = 0.052 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 33.45(Ac.) = 0.052 Sq. Mi.
Length along longest watercourse = 1351.00(Ft.)
Length along longest watercourse measured to centroid = 643.00(Ft.)
Length along longest watercourse = 0.256 Mi.
Length along longest watercourse measured to centroid = 0.122 Mi.
Difference in elevation = 13.50(Ft.)
Slope along watercourse = 52.7609 Ft./Mi.
Average Manning's 'N' = 0.024
Lag time = 0.073 Hr.
Lag time = 4.35 Min.
25% of lag time = 1.09 Min.
40% of lag time = 1.74 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
33.45	1.20	40.14

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
33.45	2.50	83.63

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
33.450	61.30	0.500

Total Area Entered = 33.45(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
61.3	61.3	0.456	0.500	0.251	1.000	0.251
					Sum (F) =	0.251

Area averaged mean soil loss (F) (In/Hr) = 0.251
Minimum soil loss rate ((In/Hr)) = 0.125
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	114.833	23.683	7.984
2	0.167	229.667	48.833	16.462
3	0.250	344.500	13.786	4.647
4	0.333	459.334	6.296	2.122
5	0.417	574.167	3.503	1.181
6	0.500	689.000	2.103	0.709
7	0.583	803.834	1.796	0.605
			Sum = 100.000	Sum= 33.711

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

Unit Time		Pattern	Storm Rain	Loss rate(In./Hr)			Effective
	(Hr.)	Percent	(In/Hr)	Max		Low	(In/Hr)
1	0.08	0.50	0.150	(0.251)		0.075	0.075
2	0.17	0.60	0.180	(0.251)		0.090	0.090

3	0.25	0.60	0.180	(0.251)	0.090	0.090
4	0.33	0.60	0.180	(0.251)	0.090	0.090
5	0.42	0.60	0.180	(0.251)	0.090	0.090
6	0.50	0.70	0.210	(0.251)	0.105	0.105
7	0.58	0.70	0.210	(0.251)	0.105	0.105
8	0.67	0.70	0.210	(0.251)	0.105	0.105
9	0.75	0.70	0.210	(0.251)	0.105	0.105
10	0.83	0.70	0.210	(0.251)	0.105	0.105
11	0.92	0.70	0.210	(0.251)	0.105	0.105
12	1.00	0.80	0.240	(0.251)	0.120	0.120
13	1.08	0.80	0.240	(0.251)	0.120	0.120
14	1.17	0.80	0.240	(0.251)	0.120	0.120
15	1.25	0.80	0.240	(0.251)	0.120	0.120
16	1.33	0.80	0.240	(0.251)	0.120	0.120
17	1.42	0.80	0.240	(0.251)	0.120	0.120
18	1.50	0.80	0.240	(0.251)	0.120	0.120
19	1.58	0.80	0.240	(0.251)	0.120	0.120
20	1.67	0.80	0.240	(0.251)	0.120	0.120
21	1.75	0.80	0.240	(0.251)	0.120	0.120
22	1.83	0.80	0.240	(0.251)	0.120	0.120
23	1.92	0.80	0.240	(0.251)	0.120	0.120
24	2.00	0.90	0.270	(0.251)	0.135	0.135
25	2.08	0.80	0.240	(0.251)	0.120	0.120
26	2.17	0.90	0.270	(0.251)	0.135	0.135
27	2.25	0.90	0.270	(0.251)	0.135	0.135
28	2.33	0.90	0.270	(0.251)	0.135	0.135
29	2.42	0.90	0.270	(0.251)	0.135	0.135
30	2.50	0.90	0.270	(0.251)	0.135	0.135
31	2.58	0.90	0.270	(0.251)	0.135	0.135
32	2.67	0.90	0.270	(0.251)	0.135	0.135
33	2.75	1.00	0.300	(0.251)	0.150	0.150
34	2.83	1.00	0.300	(0.251)	0.150	0.150
35	2.92	1.00	0.300	(0.251)	0.150	0.150
36	3.00	1.00	0.300	(0.251)	0.150	0.150
37	3.08	1.00	0.300	(0.251)	0.150	0.150
38	3.17	1.10	0.330	(0.251)	0.165	0.165
39	3.25	1.10	0.330	(0.251)	0.165	0.165
40	3.33	1.10	0.330	(0.251)	0.165	0.165
41	3.42	1.20	0.360	(0.251)	0.180	0.180
42	3.50	1.30	0.390	(0.251)	0.195	0.195
43	3.58	1.40	0.420	(0.251)	0.210	0.210
44	3.67	1.40	0.420	(0.251)	0.210	0.210
45	3.75	1.50	0.450	(0.251)	0.225	0.225
46	3.83	1.50	0.450	(0.251)	0.225	0.225
47	3.92	1.60	0.480	(0.251)	0.240	0.240
48	4.00	1.60	0.480	(0.251)	0.240	0.240
49	4.08	1.70	0.510	0.251	(0.255)	0.259
50	4.17	1.80	0.540	0.251	(0.270)	0.289
51	4.25	1.90	0.570	0.251	(0.285)	0.319
52	4.33	2.00	0.600	0.251	(0.300)	0.349
53	4.42	2.10	0.630	0.251	(0.315)	0.379
54	4.50	2.10	0.630	0.251	(0.315)	0.379
55	4.58	2.20	0.660	0.251	(0.330)	0.409
56	4.67	2.30	0.690	0.251	(0.345)	0.439
57	4.75	2.40	0.720	0.251	(0.360)	0.469
58	4.83	2.40	0.720	0.251	(0.360)	0.469
59	4.92	2.50	0.750	0.251	(0.375)	0.499

60	5.00	2.60	0.780	0.251	(0.390)		0.529
61	5.08	3.10	0.930	0.251	(0.465)		0.679
62	5.17	3.60	1.080	0.251	(0.540)		0.829
63	5.25	3.90	1.170	0.251	(0.585)		0.919
64	5.33	4.20	1.260	0.251	(0.630)		1.009
65	5.42	4.70	1.410	0.251	(0.705)		1.159
66	5.50	5.60	1.680	0.251	(0.840)		1.429
67	5.58	1.90	0.570	0.251	(0.285)		0.319
68	5.67	0.90	0.270	(0.251)	0.135		0.135
69	5.75	0.60	0.180	(0.251)	0.090		0.090
70	5.83	0.50	0.150	(0.251)	0.075		0.075
71	5.92	0.30	0.090	(0.251)	0.045		0.045
72	6.00	0.20	0.060	(0.251)	0.030		0.030

(Loss Rate Not Used)

Sum = 100.0 Sum = 18.2

Flood volume = Effective rainfall 1.52(In)
times area 33.5(Ac.)/[(In)/(Ft.)] = 4.2(Ac.Ft)
Total soil loss = 0.98(In)
Total soil loss = 2.744(Ac.Ft)
Total rainfall = 2.50(In)
Flood volume = 183982.7 Cubic Feet
Total soil loss = 119541.1 Cubic Feet

Peak flow rate of this hydrograph = 38.931(CFS)

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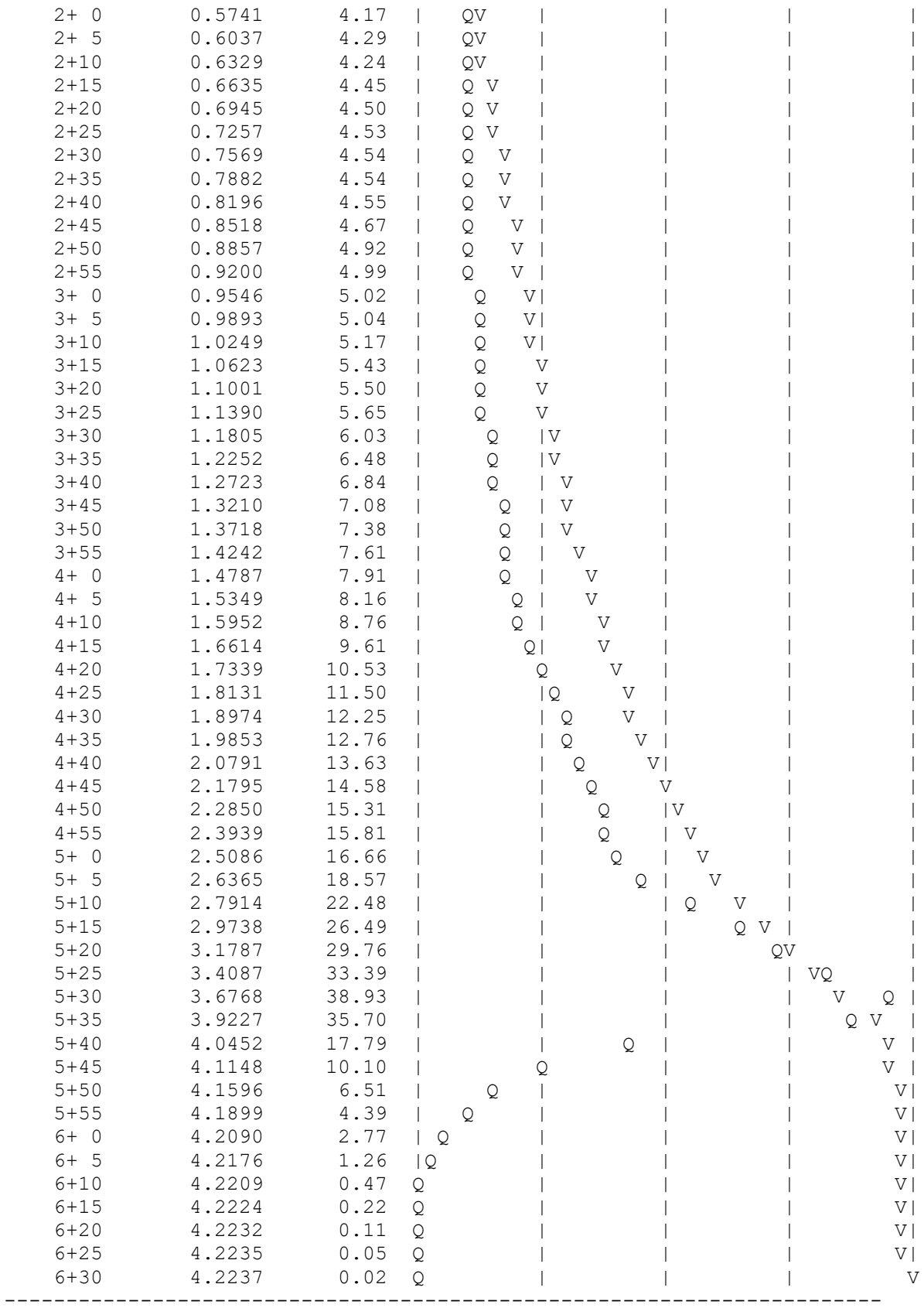
6 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	10.0	20.0	30.0	40.0
0+ 5	0.0041	0.60	Q				
0+10	0.0176	1.95	VQ				
0+15	0.0351	2.55	V Q				
0+20	0.0543	2.78	V Q				
0+25	0.0742	2.90	V Q				
0+30	0.0955	3.09	V Q				
0+35	0.1189	3.39	|V Q				
0+40	0.1428	3.47	|V Q				
0+45	0.1669	3.50	|V Q				
0+50	0.1912	3.52	|V Q				
0+55	0.2155	3.53	| VQ				
1+ 0	0.2407	3.66	| VQ				
1+ 5	0.2676	3.91	| VQ				
1+10	0.2950	3.98	| VQ				
1+15	0.3226	4.01	| VQ				
1+20	0.3504	4.03	| VQ				
1+25	0.3782	4.04	| VQ				
1+30	0.4061	4.05	| VQ				
1+35	0.4339	4.05	| Q				
1+40	0.4618	4.05	| Q				
1+45	0.4897	4.05	| Q				
1+50	0.5176	4.05	| Q				
1+55	0.5454	4.05	| QV				



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 10/02/24 File: qbuh1006100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION WATERSHED B
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 29.54(Ac.) = 0.046 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 29.54(Ac.) = 0.046 Sq. Mi.
Length along longest watercourse = 1353.00(Ft.)
Length along longest watercourse measured to centroid = 881.00(Ft.)
Length along longest watercourse = 0.256 Mi.
Length along longest watercourse measured to centroid = 0.167 Mi.
Difference in elevation = 17.20(Ft.)
Slope along watercourse = 67.1220 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.098 Hr.
Lag time = 5.86 Min.
25% of lag time = 1.47 Min.
40% of lag time = 2.35 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
29.54	1.20	35.45

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
29.54	2.50	73.85

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
29.540	61.60	0.500

Total Area Entered = 29.54(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
61.6	61.6	0.453	0.500	0.249	1.000	0.249
					Sum (F) =	0.249

Area averaged mean soil loss (F) (In/Hr) = 0.249
Minimum soil loss rate ((In/Hr)) = 0.124
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	85.272	14.796	4.405
2	0.167	170.545	46.014	13.699
3	0.250	255.817	18.512	5.511
4	0.333	341.089	7.912	2.356
5	0.417	426.362	4.692	1.397
6	0.500	511.634	2.929	0.872
7	0.583	596.907	2.085	0.621
8	0.667	682.179	1.387	0.413
9	0.750	767.451	0.919	0.274
10	0.833	852.724	0.752	0.224
		Sum =	100.000 Sum=	29.771

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

Unit Time	Pattern	Storm Rain	Loss rate(In./Hr)	Effective

	(Hr.)	Percent	(In/Hr)	Max		Low	(In/Hr)
1	0.08	0.50	0.150	(0.249)		0.075	0.075
2	0.17	0.60	0.180	(0.249)		0.090	0.090
3	0.25	0.60	0.180	(0.249)		0.090	0.090
4	0.33	0.60	0.180	(0.249)		0.090	0.090
5	0.42	0.60	0.180	(0.249)		0.090	0.090
6	0.50	0.70	0.210	(0.249)		0.105	0.105
7	0.58	0.70	0.210	(0.249)		0.105	0.105
8	0.67	0.70	0.210	(0.249)		0.105	0.105
9	0.75	0.70	0.210	(0.249)		0.105	0.105
10	0.83	0.70	0.210	(0.249)		0.105	0.105
11	0.92	0.70	0.210	(0.249)		0.105	0.105
12	1.00	0.80	0.240	(0.249)		0.120	0.120
13	1.08	0.80	0.240	(0.249)		0.120	0.120
14	1.17	0.80	0.240	(0.249)		0.120	0.120
15	1.25	0.80	0.240	(0.249)		0.120	0.120
16	1.33	0.80	0.240	(0.249)		0.120	0.120
17	1.42	0.80	0.240	(0.249)		0.120	0.120
18	1.50	0.80	0.240	(0.249)		0.120	0.120
19	1.58	0.80	0.240	(0.249)		0.120	0.120
20	1.67	0.80	0.240	(0.249)		0.120	0.120
21	1.75	0.80	0.240	(0.249)		0.120	0.120
22	1.83	0.80	0.240	(0.249)		0.120	0.120
23	1.92	0.80	0.240	(0.249)		0.120	0.120
24	2.00	0.90	0.270	(0.249)		0.135	0.135
25	2.08	0.80	0.240	(0.249)		0.120	0.120
26	2.17	0.90	0.270	(0.249)		0.135	0.135
27	2.25	0.90	0.270	(0.249)		0.135	0.135
28	2.33	0.90	0.270	(0.249)		0.135	0.135
29	2.42	0.90	0.270	(0.249)		0.135	0.135
30	2.50	0.90	0.270	(0.249)		0.135	0.135
31	2.58	0.90	0.270	(0.249)		0.135	0.135
32	2.67	0.90	0.270	(0.249)		0.135	0.135
33	2.75	1.00	0.300	(0.249)		0.150	0.150
34	2.83	1.00	0.300	(0.249)		0.150	0.150
35	2.92	1.00	0.300	(0.249)		0.150	0.150
36	3.00	1.00	0.300	(0.249)		0.150	0.150
37	3.08	1.00	0.300	(0.249)		0.150	0.150
38	3.17	1.10	0.330	(0.249)		0.165	0.165
39	3.25	1.10	0.330	(0.249)		0.165	0.165
40	3.33	1.10	0.330	(0.249)		0.165	0.165
41	3.42	1.20	0.360	(0.249)		0.180	0.180
42	3.50	1.30	0.390	(0.249)		0.195	0.195
43	3.58	1.40	0.420	(0.249)		0.210	0.210
44	3.67	1.40	0.420	(0.249)		0.210	0.210
45	3.75	1.50	0.450	(0.249)		0.225	0.225
46	3.83	1.50	0.450	(0.249)		0.225	0.225
47	3.92	1.60	0.480	(0.249)		0.240	0.240
48	4.00	1.60	0.480	(0.249)		0.240	0.240
49	4.08	1.70	0.510	0.249	(	0.255)	0.261
50	4.17	1.80	0.540	0.249	(	0.270)	0.291
51	4.25	1.90	0.570	0.249	(	0.285)	0.321
52	4.33	2.00	0.600	0.249	(	0.300)	0.351
53	4.42	2.10	0.630	0.249	(	0.315)	0.381
54	4.50	2.10	0.630	0.249	(	0.315)	0.381
55	4.58	2.20	0.660	0.249	(	0.330)	0.411

56	4.67	2.30	0.690	0.249	(0.345)		0.441
57	4.75	2.40	0.720	0.249	(0.360)		0.471
58	4.83	2.40	0.720	0.249	(0.360)		0.471
59	4.92	2.50	0.750	0.249	(0.375)		0.501
60	5.00	2.60	0.780	0.249	(0.390)		0.531
61	5.08	3.10	0.930	0.249	(0.465)		0.681
62	5.17	3.60	1.080	0.249	(0.540)		0.831
63	5.25	3.90	1.170	0.249	(0.585)		0.921
64	5.33	4.20	1.260	0.249	(0.630)		1.011
65	5.42	4.70	1.410	0.249	(0.705)		1.161
66	5.50	5.60	1.680	0.249	(0.840)		1.431
67	5.58	1.90	0.570	0.249	(0.285)		0.321
68	5.67	0.90	0.270	(0.249)	0.135		0.135
69	5.75	0.60	0.180	(0.249)	0.090		0.090
70	5.83	0.50	0.150	(0.249)	0.075		0.075
71	5.92	0.30	0.090	(0.249)	0.045		0.045
72	6.00	0.20	0.060	(0.249)	0.030		0.030

(Loss Rate Not Used)

Sum = 100.0 Sum = 18.2

Flood volume = Effective rainfall 1.52(In)
times area 29.5(Ac.)/[(In)/(Ft.)] = 3.7(Ac.Ft)
Total soil loss = 0.98(In)
Total soil loss = 2.417(Ac.Ft)
Total rainfall = 2.50(In)
Flood volume = 162782.1 Cubic Feet
Total soil loss = 105266.2 Cubic Feet

Peak flow rate of this hydrograph = 32.706(CFS)

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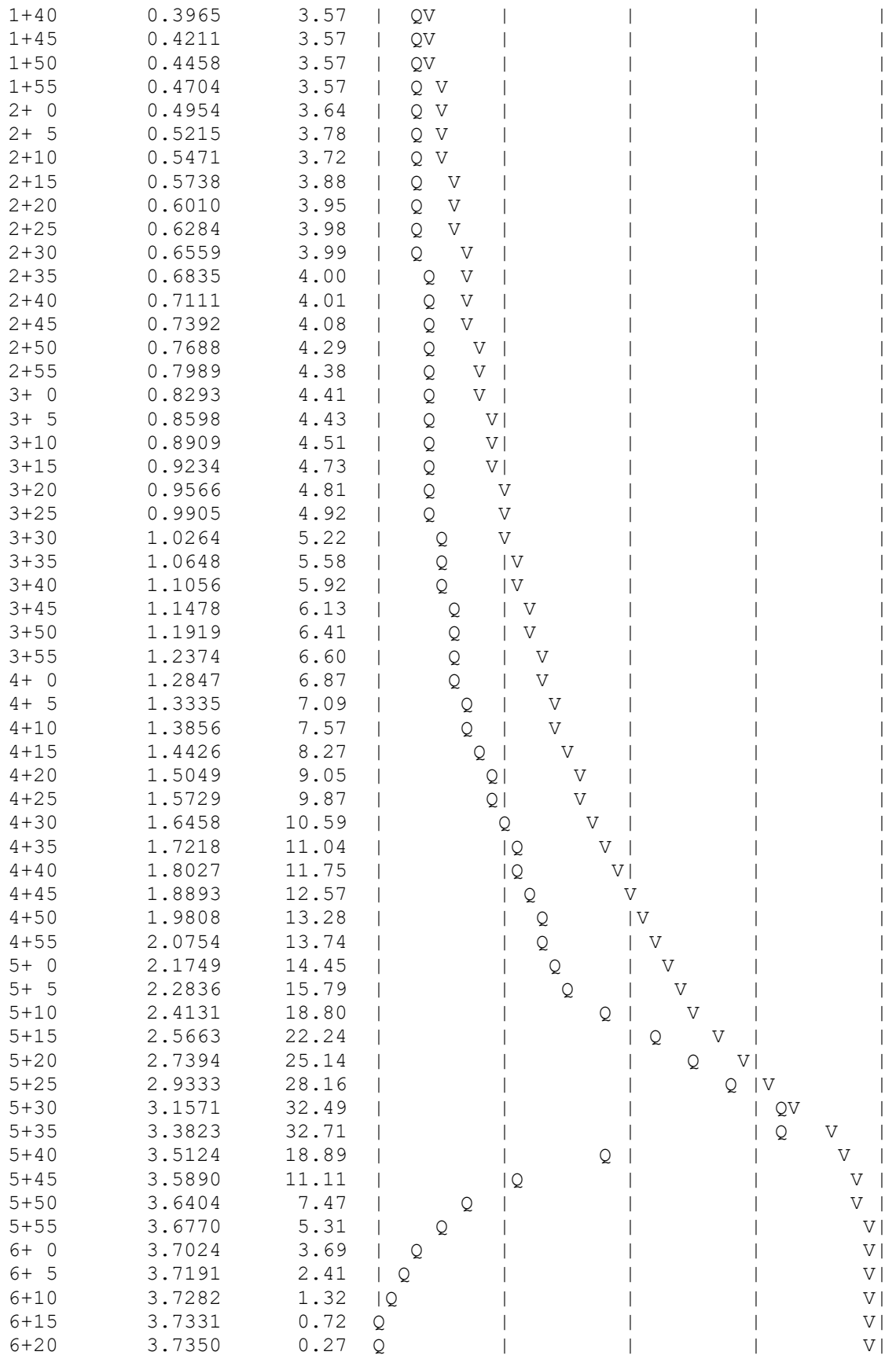
6 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	10.0	20.0	30.0	40.0
0+ 5	0.0023	0.33	Q				
0+10	0.0121	1.42	VQ				
0+15	0.0262	2.04	V Q				
0+20	0.0420	2.30	V Q				
0+25	0.0588	2.44	V Q				
0+30	0.0767	2.60	V Q				
0+35	0.0964	2.86	|VQ				
0+40	0.1170	2.98	|VQ				
0+45	0.1380	3.05	|V Q				
0+50	0.1592	3.09	|V Q				
0+55	0.1806	3.10	|V Q				
1+ 0	0.2025	3.18	| VQ				
1+ 5	0.2259	3.39	| VQ				
1+10	0.2498	3.48	| VQ				
1+15	0.2740	3.52	| VQ				
1+20	0.2984	3.54	| Q				
1+25	0.3229	3.55	| Q				
1+30	0.3474	3.56	| Q				
1+35	0.3719	3.57	| Q				



6+25	3.7360	0.14	Q	|	|	|	V|

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

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Study date 10/02/24 File: q100p1auh6100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION WATERSHED A
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 32.84(Ac.) = 0.051 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 32.84(Ac.) = 0.051 Sq. Mi.
Length along longest watercourse = 1812.00(Ft.)
Length along longest watercourse measured to centroid = 1348.00(Ft.)
Length along longest watercourse = 0.343 Mi.
Length along longest watercourse measured to centroid = 0.255 Mi.
Difference in elevation = 25.30(Ft.)
Slope along watercourse = 73.7219 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.063 Hr.
Lag time = 3.78 Min.
25% of lag time = 0.95 Min.
40% of lag time = 1.51 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

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

32.84 1.20 39.41

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
32.84	2.50	82.10

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
32.840	60.90	0.755

Total Area Entered = 32.84(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
60.9	60.9	0.460	0.755	0.148	1.000	0.148
					Sum (F) =	0.148

Area averaged mean soil loss (F) (In/Hr) = 0.148
Minimum soil loss rate ((In/Hr)) = 0.074
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.296

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	132.184	28.615	9.471
2	0.167	264.368	48.175	15.944
3	0.250	396.552	12.342	4.085
4	0.333	528.736	5.500	1.820
5	0.417	660.920	3.010	0.996
6	0.500	793.104	1.628	0.539
7	0.583	925.288	0.730	0.242
			Sum = 100.000	Sum= 33.097

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

Unit Time		Pattern	Storm Rain	Loss rate(In./Hr)			Effective
	(Hr.)	Percent	(In/Hr)	Max		Low	(In/Hr)
1	0.08	0.50	0.150	(0.148)		0.044	0.106

2	0.17	0.60	0.180	(0.148)	0.053	0.127
3	0.25	0.60	0.180	(0.148)	0.053	0.127
4	0.33	0.60	0.180	(0.148)	0.053	0.127
5	0.42	0.60	0.180	(0.148)	0.053	0.127
6	0.50	0.70	0.210	(0.148)	0.062	0.148
7	0.58	0.70	0.210	(0.148)	0.062	0.148
8	0.67	0.70	0.210	(0.148)	0.062	0.148
9	0.75	0.70	0.210	(0.148)	0.062	0.148
10	0.83	0.70	0.210	(0.148)	0.062	0.148
11	0.92	0.70	0.210	(0.148)	0.062	0.148
12	1.00	0.80	0.240	(0.148)	0.071	0.169
13	1.08	0.80	0.240	(0.148)	0.071	0.169
14	1.17	0.80	0.240	(0.148)	0.071	0.169
15	1.25	0.80	0.240	(0.148)	0.071	0.169
16	1.33	0.80	0.240	(0.148)	0.071	0.169
17	1.42	0.80	0.240	(0.148)	0.071	0.169
18	1.50	0.80	0.240	(0.148)	0.071	0.169
19	1.58	0.80	0.240	(0.148)	0.071	0.169
20	1.67	0.80	0.240	(0.148)	0.071	0.169
21	1.75	0.80	0.240	(0.148)	0.071	0.169
22	1.83	0.80	0.240	(0.148)	0.071	0.169
23	1.92	0.80	0.240	(0.148)	0.071	0.169
24	2.00	0.90	0.270	(0.148)	0.080	0.190
25	2.08	0.80	0.240	(0.148)	0.071	0.169
26	2.17	0.90	0.270	(0.148)	0.080	0.190
27	2.25	0.90	0.270	(0.148)	0.080	0.190
28	2.33	0.90	0.270	(0.148)	0.080	0.190
29	2.42	0.90	0.270	(0.148)	0.080	0.190
30	2.50	0.90	0.270	(0.148)	0.080	0.190
31	2.58	0.90	0.270	(0.148)	0.080	0.190
32	2.67	0.90	0.270	(0.148)	0.080	0.190
33	2.75	1.00	0.300	(0.148)	0.089	0.211
34	2.83	1.00	0.300	(0.148)	0.089	0.211
35	2.92	1.00	0.300	(0.148)	0.089	0.211
36	3.00	1.00	0.300	(0.148)	0.089	0.211
37	3.08	1.00	0.300	(0.148)	0.089	0.211
38	3.17	1.10	0.330	(0.148)	0.098	0.232
39	3.25	1.10	0.330	(0.148)	0.098	0.232
40	3.33	1.10	0.330	(0.148)	0.098	0.232
41	3.42	1.20	0.360	(0.148)	0.107	0.253
42	3.50	1.30	0.390	(0.148)	0.115	0.275
43	3.58	1.40	0.420	(0.148)	0.124	0.296
44	3.67	1.40	0.420	(0.148)	0.124	0.296
45	3.75	1.50	0.450	(0.148)	0.133	0.317
46	3.83	1.50	0.450	(0.148)	0.133	0.317
47	3.92	1.60	0.480	(0.148)	0.142	0.338
48	4.00	1.60	0.480	(0.148)	0.142	0.338
49	4.08	1.70	0.510	0.148	(0.151)	0.362
50	4.17	1.80	0.540	0.148	(0.160)	0.392
51	4.25	1.90	0.570	0.148	(0.169)	0.422
52	4.33	2.00	0.600	0.148	(0.178)	0.452
53	4.42	2.10	0.630	0.148	(0.186)	0.482
54	4.50	2.10	0.630	0.148	(0.186)	0.482
55	4.58	2.20	0.660	0.148	(0.195)	0.512
56	4.67	2.30	0.690	0.148	(0.204)	0.542
57	4.75	2.40	0.720	0.148	(0.213)	0.572
58	4.83	2.40	0.720	0.148	(0.213)	0.572

59	4.92	2.50	0.750	0.148	(0.222)		0.602
60	5.00	2.60	0.780	0.148	(0.231)		0.632
61	5.08	3.10	0.930	0.148	(0.275)		0.782
62	5.17	3.60	1.080	0.148	(0.320)		0.932
63	5.25	3.90	1.170	0.148	(0.346)		1.022
64	5.33	4.20	1.260	0.148	(0.373)		1.112
65	5.42	4.70	1.410	0.148	(0.417)		1.262
66	5.50	5.60	1.680	0.148	(0.497)		1.532
67	5.58	1.90	0.570	0.148	(0.169)		0.422
68	5.67	0.90	0.270	(0.148)	0.080		0.190
69	5.75	0.60	0.180	(0.148)	0.053		0.127
70	5.83	0.50	0.150	(0.148)	0.044		0.106
71	5.92	0.30	0.090	(0.148)	0.027		0.063
72	6.00	0.20	0.060	(0.148)	0.018		0.042

(Loss Rate Not Used)

Sum = 100.0 Sum = 23.0

Flood volume = Effective rainfall 1.92(In)
times area 32.8(Ac.)/[(In)/(Ft.)] = 5.2(Ac.Ft)
Total soil loss = 0.58(In)
Total soil loss = 1.591(Ac.Ft)
Total rainfall = 2.50(In)
Flood volume = 228689.0 Cubic Feet
Total soil loss = 69300.3 Cubic Feet

Peak flow rate of this hydrograph = 42.568(CFS)

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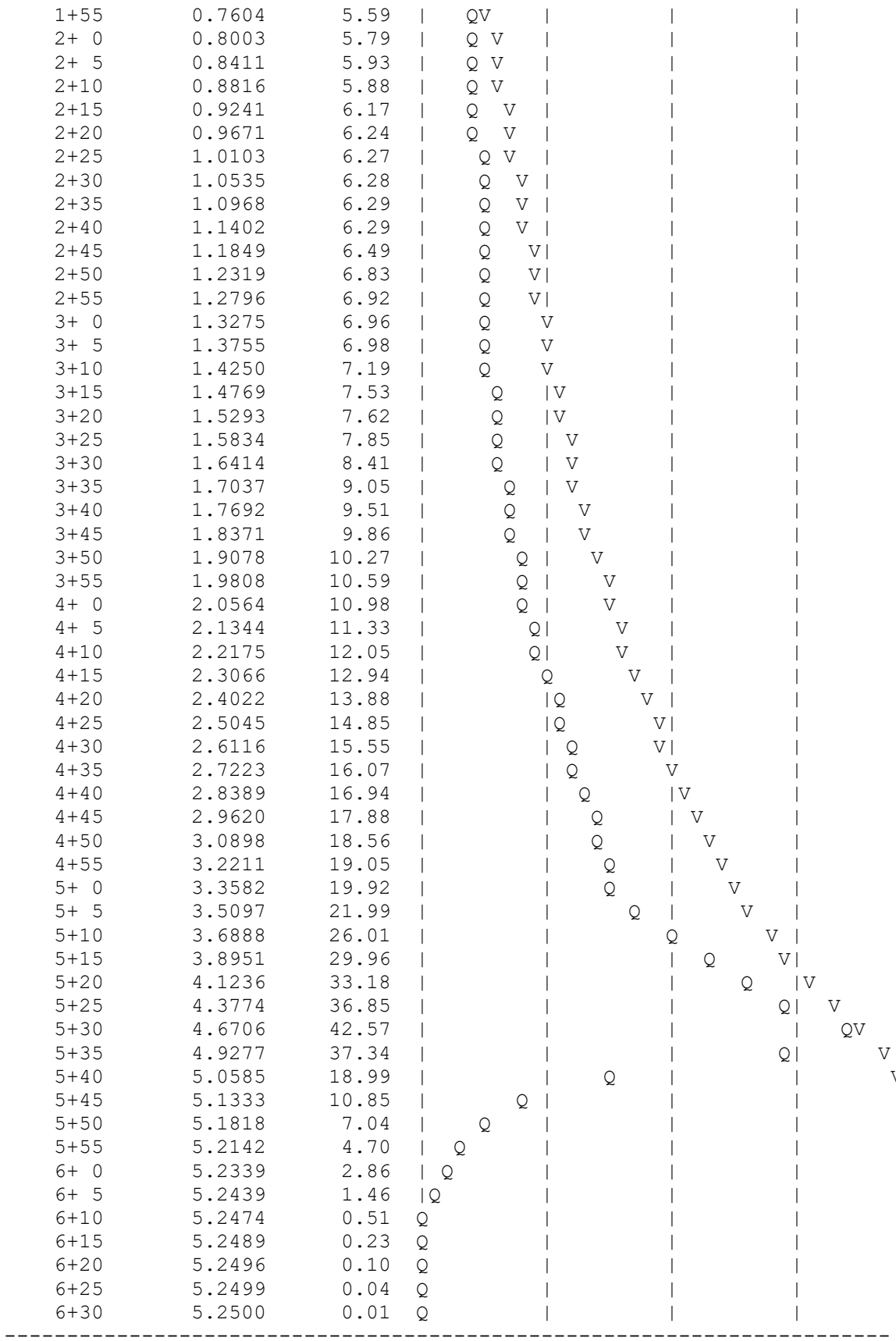
6 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	12.5	25.0	37.5	50.0
0+ 5	0.0069	1.00	Q				
0+10	0.0268	2.88	V Q				
0+15	0.0519	3.65	V Q				
0+20	0.0790	3.93	V Q				
0+25	0.1071	4.08	V Q				
0+30	0.1371	4.35	|V Q				
0+35	0.1696	4.73	|V Q				
0+40	0.2028	4.82	|V Q				
0+45	0.2363	4.86	|V Q				
0+50	0.2699	4.88	| VQ				
0+55	0.3035	4.89	| VQ				
1+ 0	0.3386	5.10	| V Q				
1+ 5	0.3760	5.43	| V Q				
1+10	0.4140	5.52	| VQ				
1+15	0.4523	5.56	| VQ				
1+20	0.4907	5.58	| VQ				
1+25	0.5292	5.59	| Q				
1+30	0.5677	5.59	| Q				
1+35	0.6063	5.59	| Q				
1+40	0.6448	5.59	| Q				
1+45	0.6833	5.59	| QV				
1+50	0.7219	5.59	| QV				



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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPSOED CONDITION WATERSHED B
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 30.51(Ac.) = 0.048 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 30.51(Ac.) = 0.048 Sq. Mi.
Length along longest watercourse = 2861.00(Ft.)
Length along longest watercourse measured to centroid = 2131.00(Ft.)
Length along longest watercourse = 0.542 Mi.
Length along longest watercourse measured to centroid = 0.404 Mi.
Difference in elevation = 26.97(Ft.)
Slope along watercourse = 49.7734 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.096 Hr.
Lag time = 5.77 Min.
25% of lag time = 1.44 Min.
40% of lag time = 2.31 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

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

30.51	1.20	36.61

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
30.51	2.50	76.28

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
30.510	62.10	0.835

Total Area Entered = 30.51(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
62.1	62.1	0.447	0.835	0.111	1.000	0.111
					Sum (F) =	0.111

Area averaged mean soil loss (F) (In/Hr) = 0.111
Minimum soil loss rate ((In/Hr)) = 0.056
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.232

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	86.658	15.197	4.673
2	0.167	173.316	46.362	14.256
3	0.250	259.974	18.174	5.588
4	0.333	346.632	7.832	2.408
5	0.417	433.290	4.614	1.419
6	0.500	519.948	2.896	0.891
7	0.583	606.606	2.040	0.627
8	0.667	693.264	1.339	0.412
9	0.750	779.923	0.910	0.280
10	0.833	866.581	0.634	0.195
			Sum = 100.000	Sum= 30.748

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.50	0.150	(0.111)	0.035	0.115
2	0.17	0.60	0.180	(0.111)	0.042	0.138
3	0.25	0.60	0.180	(0.111)	0.042	0.138
4	0.33	0.60	0.180	(0.111)	0.042	0.138
5	0.42	0.60	0.180	(0.111)	0.042	0.138
6	0.50	0.70	0.210	(0.111)	0.049	0.161
7	0.58	0.70	0.210	(0.111)	0.049	0.161
8	0.67	0.70	0.210	(0.111)	0.049	0.161
9	0.75	0.70	0.210	(0.111)	0.049	0.161
10	0.83	0.70	0.210	(0.111)	0.049	0.161
11	0.92	0.70	0.210	(0.111)	0.049	0.161
12	1.00	0.80	0.240	(0.111)	0.056	0.184
13	1.08	0.80	0.240	(0.111)	0.056	0.184
14	1.17	0.80	0.240	(0.111)	0.056	0.184
15	1.25	0.80	0.240	(0.111)	0.056	0.184
16	1.33	0.80	0.240	(0.111)	0.056	0.184
17	1.42	0.80	0.240	(0.111)	0.056	0.184
18	1.50	0.80	0.240	(0.111)	0.056	0.184
19	1.58	0.80	0.240	(0.111)	0.056	0.184
20	1.67	0.80	0.240	(0.111)	0.056	0.184
21	1.75	0.80	0.240	(0.111)	0.056	0.184
22	1.83	0.80	0.240	(0.111)	0.056	0.184
23	1.92	0.80	0.240	(0.111)	0.056	0.184
24	2.00	0.90	0.270	(0.111)	0.063	0.207
25	2.08	0.80	0.240	(0.111)	0.056	0.184
26	2.17	0.90	0.270	(0.111)	0.063	0.207
27	2.25	0.90	0.270	(0.111)	0.063	0.207
28	2.33	0.90	0.270	(0.111)	0.063	0.207
29	2.42	0.90	0.270	(0.111)	0.063	0.207
30	2.50	0.90	0.270	(0.111)	0.063	0.207
31	2.58	0.90	0.270	(0.111)	0.063	0.207
32	2.67	0.90	0.270	(0.111)	0.063	0.207
33	2.75	1.00	0.300	(0.111)	0.070	0.230
34	2.83	1.00	0.300	(0.111)	0.070	0.230
35	2.92	1.00	0.300	(0.111)	0.070	0.230
36	3.00	1.00	0.300	(0.111)	0.070	0.230
37	3.08	1.00	0.300	(0.111)	0.070	0.230
38	3.17	1.10	0.330	(0.111)	0.077	0.253
39	3.25	1.10	0.330	(0.111)	0.077	0.253
40	3.33	1.10	0.330	(0.111)	0.077	0.253
41	3.42	1.20	0.360	(0.111)	0.084	0.276
42	3.50	1.30	0.390	(0.111)	0.090	0.299
43	3.58	1.40	0.420	(0.111)	0.097	0.323
44	3.67	1.40	0.420	(0.111)	0.097	0.323
45	3.75	1.50	0.450	(0.111)	0.104	0.346
46	3.83	1.50	0.450	(0.111)	0.104	0.346
47	3.92	1.60	0.480	0.111	(0.111)	0.369
48	4.00	1.60	0.480	0.111	(0.111)	0.369
49	4.08	1.70	0.510	0.111	(0.118)	0.399
50	4.17	1.80	0.540	0.111	(0.125)	0.429
51	4.25	1.90	0.570	0.111	(0.132)	0.459
52	4.33	2.00	0.600	0.111	(0.139)	0.489
53	4.42	2.10	0.630	0.111	(0.146)	0.519
54	4.50	2.10	0.630	0.111	(0.146)	0.519

55	4.58	2.20	0.660	0.111	(0.153)		0.549
56	4.67	2.30	0.690	0.111	(0.160)		0.579
57	4.75	2.40	0.720	0.111	(0.167)		0.609
58	4.83	2.40	0.720	0.111	(0.167)		0.609
59	4.92	2.50	0.750	0.111	(0.174)		0.639
60	5.00	2.60	0.780	0.111	(0.181)		0.669
61	5.08	3.10	0.930	0.111	(0.216)		0.819
62	5.17	3.60	1.080	0.111	(0.251)		0.969
63	5.25	3.90	1.170	0.111	(0.271)		1.059
64	5.33	4.20	1.260	0.111	(0.292)		1.149
65	5.42	4.70	1.410	0.111	(0.327)		1.299
66	5.50	5.60	1.680	0.111	(0.390)		1.569
67	5.58	1.90	0.570	0.111	(0.132)		0.459
68	5.67	0.90	0.270	(0.111)	0.063		0.207
69	5.75	0.60	0.180	(0.111)	0.042		0.138
70	5.83	0.50	0.150	(0.111)	0.035		0.115
71	5.92	0.30	0.090	(0.111)	0.021		0.069
72	6.00	0.20	0.060	(0.111)	0.014		0.046

(Loss Rate Not Used)

Sum = 100.0 Sum = 24.6

Flood volume = Effective rainfall 2.05(In)
times area 30.5(Ac.)/[(In)/(Ft.)] = 5.2(Ac.Ft)
Total soil loss = 0.45(In)
Total soil loss = 1.140(Ac.Ft)
Total rainfall = 2.50(In)
Flood volume = 227172.6 Cubic Feet
Total soil loss = 49676.6 Cubic Feet

Peak flow rate of this hydrograph = 38.001(CFS)

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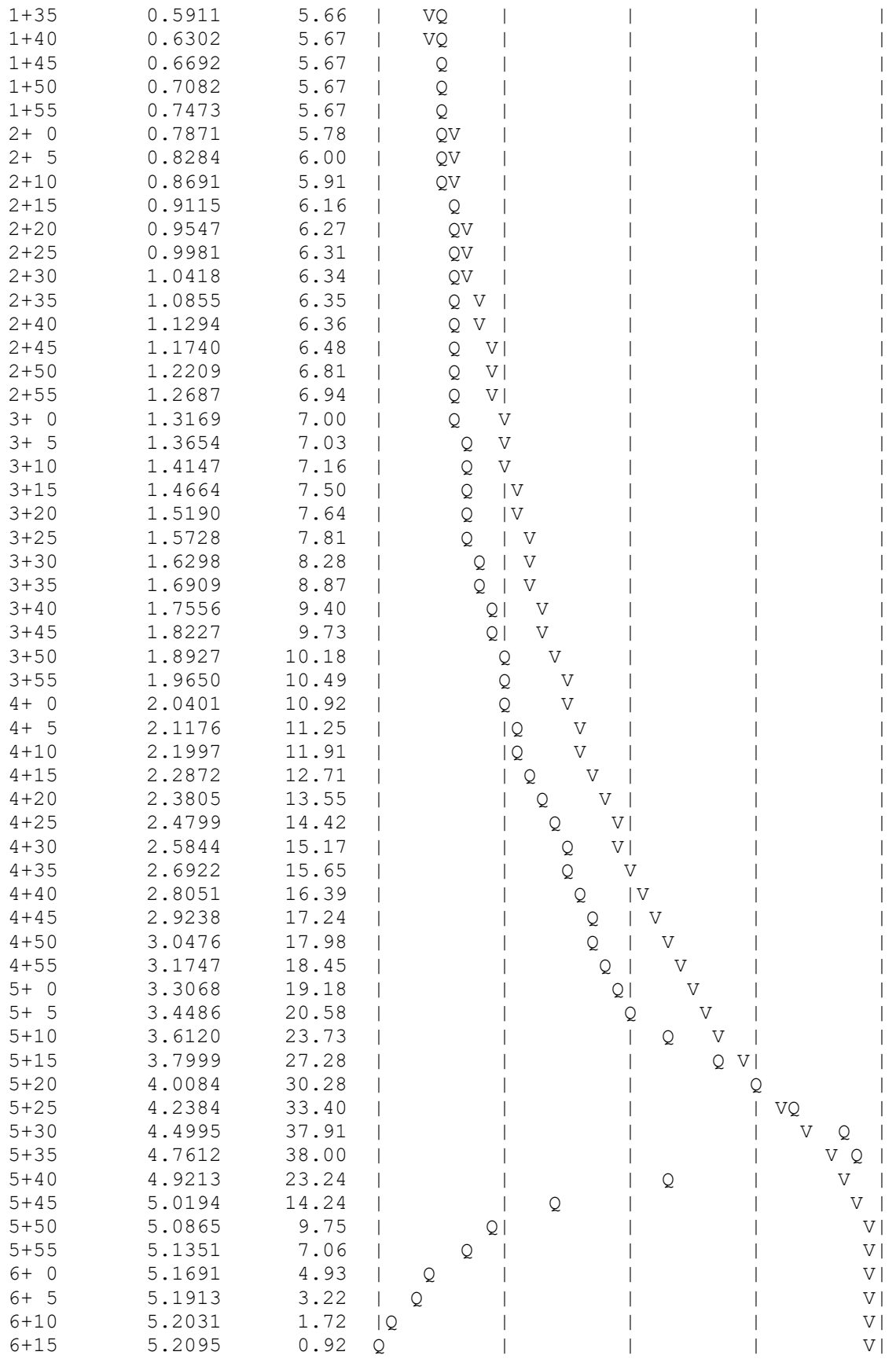
6 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	10.0	20.0	30.0	40.0
0+ 5	0.0037	0.54	Q				
0+10	0.0195	2.29	V Q				
0+15	0.0419	3.26	V Q				
0+20	0.0672	3.67	V Q				
0+25	0.0940	3.89	V Q				
0+30	0.1224	4.13	V Q				
0+35	0.1538	4.55	|V Q				
0+40	0.1864	4.74	|V Q				
0+45	0.2198	4.84	|V Q				
0+50	0.2535	4.90	|V Q				
0+55	0.2874	4.93	| V Q				
1+ 0	0.3222	5.05	| V Q				
1+ 5	0.3593	5.39	| V Q				
1+10	0.3973	5.52	| V Q				
1+15	0.4358	5.58	| V Q				
1+20	0.4744	5.61	| V Q				
1+25	0.5133	5.63	| V Q				
1+30	0.5522	5.65	| VQ				



6+20	5.2122	0.40	Q	|	|	|	V|
6+25	5.2137	0.21	Q	|	|	|	V|
6+30	5.2145	0.12	Q	|	|	|	V|
6+35	5.2149	0.06	Q	|	|	|	V|
6+40	5.2151	0.03	Q	|	|	|	V|
6+45	5.2152	0.01	Q	|	|	|	V|

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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION WATERSHED A
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 33.45(Ac.) = 0.052 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 33.45(Ac.) = 0.052 Sq. Mi.
Length along longest watercourse = 1351.00(Ft.)
Length along longest watercourse measured to centroid = 643.00(Ft.)
Length along longest watercourse = 0.256 Mi.
Length along longest watercourse measured to centroid = 0.122 Mi.
Difference in elevation = 13.50(Ft.)
Slope along watercourse = 52.7609 Ft./Mi.
Average Manning's 'N' = 0.024
Lag time = 0.073 Hr.
Lag time = 4.35 Min.
25% of lag time = 1.09 Min.
40% of lag time = 1.74 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

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

33.45	0.80	26.76

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
33.45	1.90	63.56

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 1.900(In)

Point rain (area averaged) = 1.900(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.900(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
33.450	61.30	0.500

Total Area Entered = 33.45(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
61.3	61.3	0.456	0.500	0.251	1.000	0.251
					Sum (F) =	0.251

Area averaged mean soil loss (F) (In/Hr) = 0.251
Minimum soil loss rate ((In/Hr)) = 0.125
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	114.833	23.683	7.984
2	0.167	229.667	48.833	16.462
3	0.250	344.500	13.786	4.647
4	0.333	459.334	6.296	2.122
5	0.417	574.167	3.503	1.181
6	0.500	689.000	2.103	0.709
7	0.583	803.834	1.796	0.605
			Sum = 100.000	Sum= 33.711

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.296	(0.251)	0.148	0.148

2	0.17	1.30	0.296	(0.251)	0.148		0.148
3	0.25	1.10	0.251	(0.251)	0.125		0.125
4	0.33	1.50	0.342	(0.251)	0.171		0.171
5	0.42	1.50	0.342	(0.251)	0.171		0.171
6	0.50	1.80	0.410	(0.251)	0.205		0.205
7	0.58	1.50	0.342	(0.251)	0.171		0.171
8	0.67	1.80	0.410	(0.251)	0.205		0.205
9	0.75	1.80	0.410	(0.251)	0.205		0.205
10	0.83	1.50	0.342	(0.251)	0.171		0.171
11	0.92	1.60	0.365	(0.251)	0.182		0.182
12	1.00	1.80	0.410	(0.251)	0.205		0.205
13	1.08	2.20	0.502	(0.251)	0.251		0.251
14	1.17	2.20	0.502	(0.251)	0.251		0.251
15	1.25	2.20	0.502	(0.251)	0.251		0.251
16	1.33	2.00	0.456	(0.251)	0.228		0.228
17	1.42	2.60	0.593	0.251	(0.296)		0.342
18	1.50	2.70	0.616	0.251	(0.308)		0.365
19	1.58	2.40	0.547	0.251	(0.274)		0.296
20	1.67	2.70	0.616	0.251	(0.308)		0.365
21	1.75	3.30	0.752	0.251	(0.376)		0.502
22	1.83	3.10	0.707	0.251	(0.353)		0.456
23	1.92	2.90	0.661	0.251	(0.331)		0.410
24	2.00	3.00	0.684	0.251	(0.342)		0.433
25	2.08	3.10	0.707	0.251	(0.353)		0.456
26	2.17	4.20	0.957	0.251	(0.479)		0.707
27	2.25	5.00	1.140	0.251	(0.570)		0.889
28	2.33	3.50	0.798	0.251	(0.399)		0.547
29	2.42	6.80	1.550	0.251	(0.775)		1.299
30	2.50	7.30	1.664	0.251	(0.832)		1.413
31	2.58	8.20	1.869	0.251	(0.935)		1.619
32	2.67	5.90	1.345	0.251	(0.673)		1.094
33	2.75	2.00	0.456	(0.251)	0.228		0.228
34	2.83	1.80	0.410	(0.251)	0.205		0.205
35	2.92	1.80	0.410	(0.251)	0.205		0.205
36	3.00	0.60	0.137	(0.251)	0.068		0.068

(Loss Rate Not Used)

Sum = 100.0 Sum = 15.0

Flood volume = Effective rainfall 1.25(In)
times area 33.5(Ac.)/[(In)/(Ft.)] = 3.5(Ac.Ft)
Total soil loss = 0.65(In)
Total soil loss = 1.814(Ac.Ft)
Total rainfall = 1.90(In)
Flood volume = 151663.7 Cubic Feet
Total soil loss = 79007.2 Cubic Feet

Peak flow rate of this hydrograph = 46.436(CFS)

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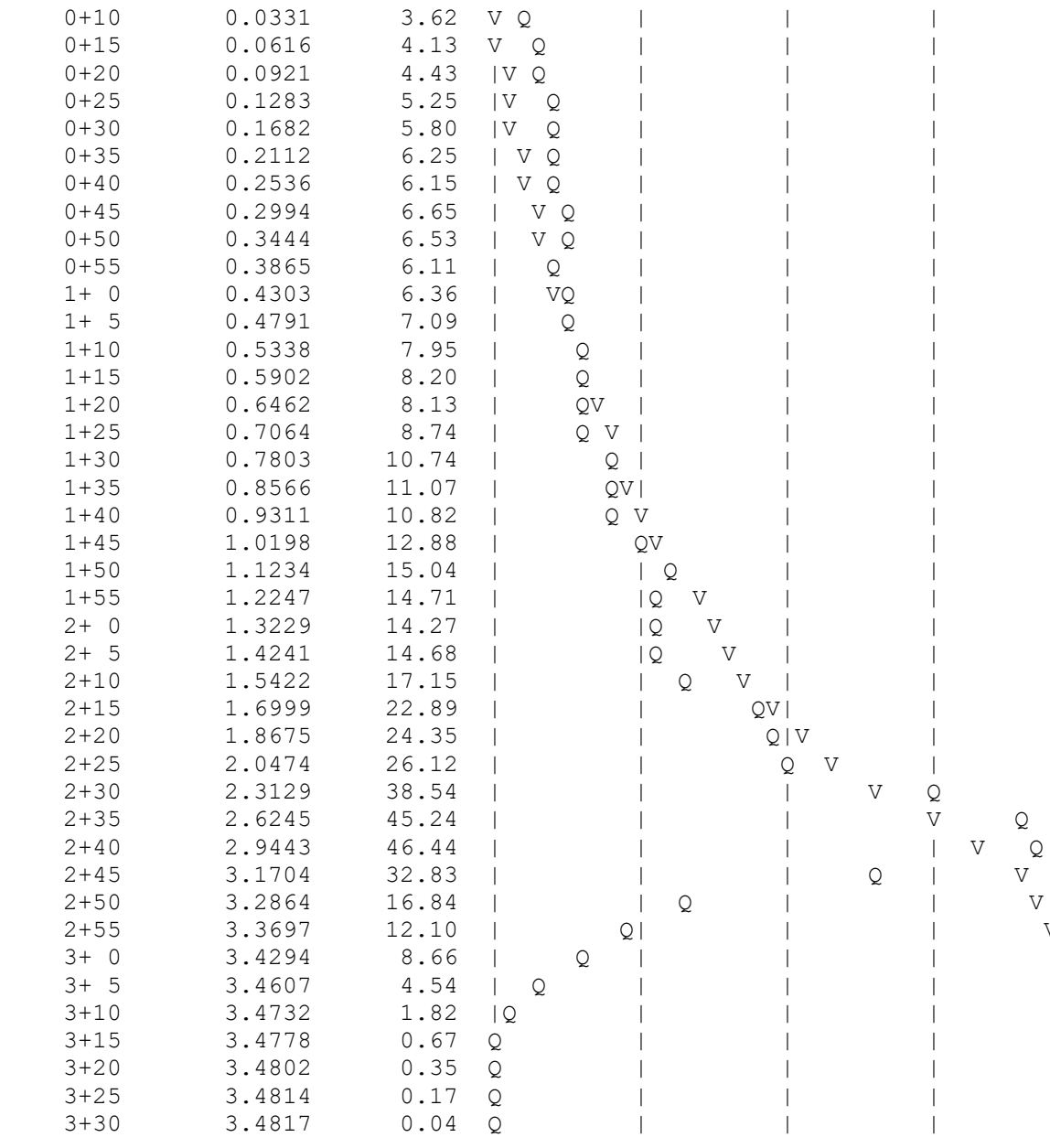
3 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	12.5	25.0	37.5	50.0
0+ 5	0.0082	1.18	Q	|	|	|	|



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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION WATERSHED B
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 29.54(Ac.) = 0.046 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 29.54(Ac.) = 0.046 Sq. Mi.
Length along longest watercourse = 1353.00(Ft.)
Length along longest watercourse measured to centroid = 881.00(Ft.)
Length along longest watercourse = 0.256 Mi.
Length along longest watercourse measured to centroid = 0.167 Mi.
Difference in elevation = 17.20(Ft.)
Slope along watercourse = 67.1220 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.098 Hr.
Lag time = 5.86 Min.
25% of lag time = 1.47 Min.
40% of lag time = 2.35 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

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

29.54	0.80	23.63

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
29.54	1.90	56.13

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 1.900(In)

Point rain (area averaged) = 1.900(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.900(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
29.540	61.60	0.500

Total Area Entered = 29.54(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
61.6	61.6	0.453	0.500	0.249	1.000	0.249
					Sum (F) =	0.249

Area averaged mean soil loss (F) (In/Hr) = 0.249
Minimum soil loss rate ((In/Hr)) = 0.124
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	85.272	14.796	4.405
2	0.167	170.545	46.014	13.699
3	0.250	255.817	18.512	5.511
4	0.333	341.089	7.912	2.356
5	0.417	426.362	4.692	1.397
6	0.500	511.634	2.929	0.872
7	0.583	596.907	2.085	0.621
8	0.667	682.179	1.387	0.413
9	0.750	767.451	0.919	0.274
10	0.833	852.724	0.752	0.224
			Sum = 100.000	Sum= 29.771

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.296	(0.249)	0.148	0.148
2	0.17	1.30	0.296	(0.249)	0.148	0.148
3	0.25	1.10	0.251	(0.249)	0.125	0.125
4	0.33	1.50	0.342	(0.249)	0.171	0.171
5	0.42	1.50	0.342	(0.249)	0.171	0.171
6	0.50	1.80	0.410	(0.249)	0.205	0.205
7	0.58	1.50	0.342	(0.249)	0.171	0.171
8	0.67	1.80	0.410	(0.249)	0.205	0.205
9	0.75	1.80	0.410	(0.249)	0.205	0.205
10	0.83	1.50	0.342	(0.249)	0.171	0.171
11	0.92	1.60	0.365	(0.249)	0.182	0.182
12	1.00	1.80	0.410	(0.249)	0.205	0.205
13	1.08	2.20	0.502	0.249	(0.251)	0.253
14	1.17	2.20	0.502	0.249	(0.251)	0.253
15	1.25	2.20	0.502	0.249	(0.251)	0.253
16	1.33	2.00	0.456	(0.249)	0.228	0.228
17	1.42	2.60	0.593	0.249	(0.296)	0.344
18	1.50	2.70	0.616	0.249	(0.308)	0.367
19	1.58	2.40	0.547	0.249	(0.274)	0.298
20	1.67	2.70	0.616	0.249	(0.308)	0.367
21	1.75	3.30	0.752	0.249	(0.376)	0.503
22	1.83	3.10	0.707	0.249	(0.353)	0.458
23	1.92	2.90	0.661	0.249	(0.331)	0.412
24	2.00	3.00	0.684	0.249	(0.342)	0.435
25	2.08	3.10	0.707	0.249	(0.353)	0.458
26	2.17	4.20	0.957	0.249	(0.479)	0.708
27	2.25	5.00	1.140	0.249	(0.570)	0.891
28	2.33	3.50	0.798	0.249	(0.399)	0.549
29	2.42	6.80	1.550	0.249	(0.775)	1.301
30	2.50	7.30	1.664	0.249	(0.832)	1.415
31	2.58	8.20	1.869	0.249	(0.935)	1.620
32	2.67	5.90	1.345	0.249	(0.673)	1.096
33	2.75	2.00	0.456	(0.249)	0.228	0.228
34	2.83	1.80	0.410	(0.249)	0.205	0.205
35	2.92	1.80	0.410	(0.249)	0.205	0.205
36	3.00	0.60	0.137	(0.249)	0.068	0.068

(Loss Rate Not Used)

Sum = 100.0 Sum = 15.0

Flood volume = Effective rainfall 1.25(In)
times area 29.5(Ac.)/[(In)/(Ft.)] = 3.1(Ac.Ft)
Total soil loss = 0.65(In)
Total soil loss = 1.595(Ac.Ft)
Total rainfall = 1.90(In)
Flood volume = 134240.8 Cubic Feet
Total soil loss = 69470.3 Cubic Feet

Peak flow rate of this hydrograph = 40.294(CFS)

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3 - 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	12.5	25.0	37.5	50.0
0+ 5	0.0045	0.65	Q				
0+10	0.0230	2.68	V Q				
0+15	0.0464	3.40	V Q				
0+20	0.0715	3.64	V Q				
0+25	0.1014	4.34	|V Q				
0+30	0.1346	4.82	|V Q				
0+35	0.1712	5.31	| V Q				
0+40	0.2075	5.28	| V Q				
0+45	0.2469	5.71	| VQ				
0+50	0.2866	5.77	| VQ				
0+55	0.3239	5.42	| Q				
1+ 0	0.3621	5.54	| Q				
1+ 5	0.4039	6.08	| QV				
1+10	0.4511	6.85	| Q				
1+15	0.5004	7.16	| QV				
1+20	0.5499	7.19	| Q V				
1+25	0.6012	7.45	| Q V				
1+30	0.6635	9.05	| QV				
1+35	0.7301	9.67	| Q V|				
1+40	0.7950	9.43	| Q V				
1+45	0.8694	10.81	| Q |V				
1+50	0.9578	12.82	| Q V				
1+55	1.0466	12.90	| Q V				
2+ 0	1.1329	12.54	| Q V				
2+ 5	1.2213	12.83	| Q V				
2+10	1.3203	14.37	| |Q V				
2+15	1.4497	18.79	| | Q V |				
2+20	1.5960	21.24	| | Q V				
2+25	1.7442	21.52	| | Q | V				
2+30	1.9596	31.27	| | | Q |			
2+35	2.2182	37.55	| | | V Q			
2+40	2.4957	40.29	| | | | Q			
2+45	2.7137	31.66	| | | Q | V |		
2+50	2.8378	18.01	| | Q | | V |		
2+55	2.9238	12.49	| Q| | | V |		
3+ 0	2.9892	9.49	| Q | | | V |		
3+ 5	3.0298	5.90	| Q | | | V|		
3+10	3.0531	3.38	| Q | | | V|		
3+15	3.0667	1.98	|Q | | | V|		
3+20	3.0747	1.16	Q | | | V|		
3+25	3.0787	0.58	Q | | | V|		
3+30	3.0803	0.23	Q | | | V|		
3+35	3.0812	0.13	Q | | | V|		
3+40	3.0816	0.06	Q | | | V|		
3+45	3.0817	0.02	Q | | | V		

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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION WATERSHED A
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 32.84(Ac.) = 0.051 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 32.84(Ac.) = 0.051 Sq. Mi.
Length along longest watercourse = 1812.00(Ft.)
Length along longest watercourse measured to centroid = 1348.00(Ft.)
Length along longest watercourse = 0.343 Mi.
Length along longest watercourse measured to centroid = 0.255 Mi.
Difference in elevation = 25.30(Ft.)
Slope along watercourse = 73.7219 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.063 Hr.
Lag time = 3.78 Min.
25% of lag time = 0.95 Min.
40% of lag time = 1.51 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

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

32.84 0.80 26.27

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
32.84	1.90	62.40

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 1.900(In)

Point rain (area averaged) = 1.900(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.900(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
32.840	60.90	0.755

Total Area Entered = 32.84(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
60.9	60.9	0.460	0.755	0.148	1.000	0.148
					Sum (F) =	0.148

Area averaged mean soil loss (F) (In/Hr) = 0.148
Minimum soil loss rate ((In/Hr)) = 0.074
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.296

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	132.184	28.615	9.471
2	0.167	264.368	48.175	15.944
3	0.250	396.552	12.342	4.085
4	0.333	528.736	5.500	1.820
5	0.417	660.920	3.010	0.996
6	0.500	793.104	1.628	0.539
7	0.583	925.288	0.730	0.242
			Sum = 100.000	Sum= 33.097

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

Unit Time		Pattern	Storm Rain	Loss rate(In./Hr)			Effective
	(Hr.)	Percent	(In/Hr)	Max		Low	(In/Hr)
1	0.08	1.30	0.296	(0.148)		0.088	0.209

2	0.17	1.30	0.296	(0.148)	0.088	0.209
3	0.25	1.10	0.251	(0.148)	0.074	0.177
4	0.33	1.50	0.342	(0.148)	0.101	0.241
5	0.42	1.50	0.342	(0.148)	0.101	0.241
6	0.50	1.80	0.410	(0.148)	0.121	0.289
7	0.58	1.50	0.342	(0.148)	0.101	0.241
8	0.67	1.80	0.410	(0.148)	0.121	0.289
9	0.75	1.80	0.410	(0.148)	0.121	0.289
10	0.83	1.50	0.342	(0.148)	0.101	0.241
11	0.92	1.60	0.365	(0.148)	0.108	0.257
12	1.00	1.80	0.410	(0.148)	0.121	0.289
13	1.08	2.20	0.502	0.148	(0.148)	0.354
14	1.17	2.20	0.502	0.148	(0.148)	0.354
15	1.25	2.20	0.502	0.148	(0.148)	0.354
16	1.33	2.00	0.456	(0.148)	0.135	0.321
17	1.42	2.60	0.593	0.148	(0.175)	0.445
18	1.50	2.70	0.616	0.148	(0.182)	0.468
19	1.58	2.40	0.547	0.148	(0.162)	0.400
20	1.67	2.70	0.616	0.148	(0.182)	0.468
21	1.75	3.30	0.752	0.148	(0.223)	0.605
22	1.83	3.10	0.707	0.148	(0.209)	0.559
23	1.92	2.90	0.661	0.148	(0.196)	0.514
24	2.00	3.00	0.684	0.148	(0.202)	0.536
25	2.08	3.10	0.707	0.148	(0.209)	0.559
26	2.17	4.20	0.957	0.148	(0.283)	0.810
27	2.25	5.00	1.140	0.148	(0.337)	0.992
28	2.33	3.50	0.798	0.148	(0.236)	0.650
29	2.42	6.80	1.550	0.148	(0.459)	1.403
30	2.50	7.30	1.664	0.148	(0.493)	1.517
31	2.58	8.20	1.869	0.148	(0.553)	1.722
32	2.67	5.90	1.345	0.148	(0.398)	1.197
33	2.75	2.00	0.456	(0.148)	0.135	0.321
34	2.83	1.80	0.410	(0.148)	0.121	0.289
35	2.92	1.80	0.410	(0.148)	0.121	0.289
36	3.00	0.60	0.137	(0.148)	0.040	0.096

(Loss Rate Not Used)

Sum = 100.0 Sum = 18.2

Flood volume = Effective rainfall 1.52(In)
times area 32.8(Ac.)/[(In)/(Ft.)] = 4.1(Ac.Ft)
Total soil loss = 0.38(In)
Total soil loss = 1.050(Ac.Ft)
Total rainfall = 1.90(In)
Flood volume = 180722.9 Cubic Feet
Total soil loss = 45742.0 Cubic Feet

Peak flow rate of this hydrograph = 48.987(CFS)

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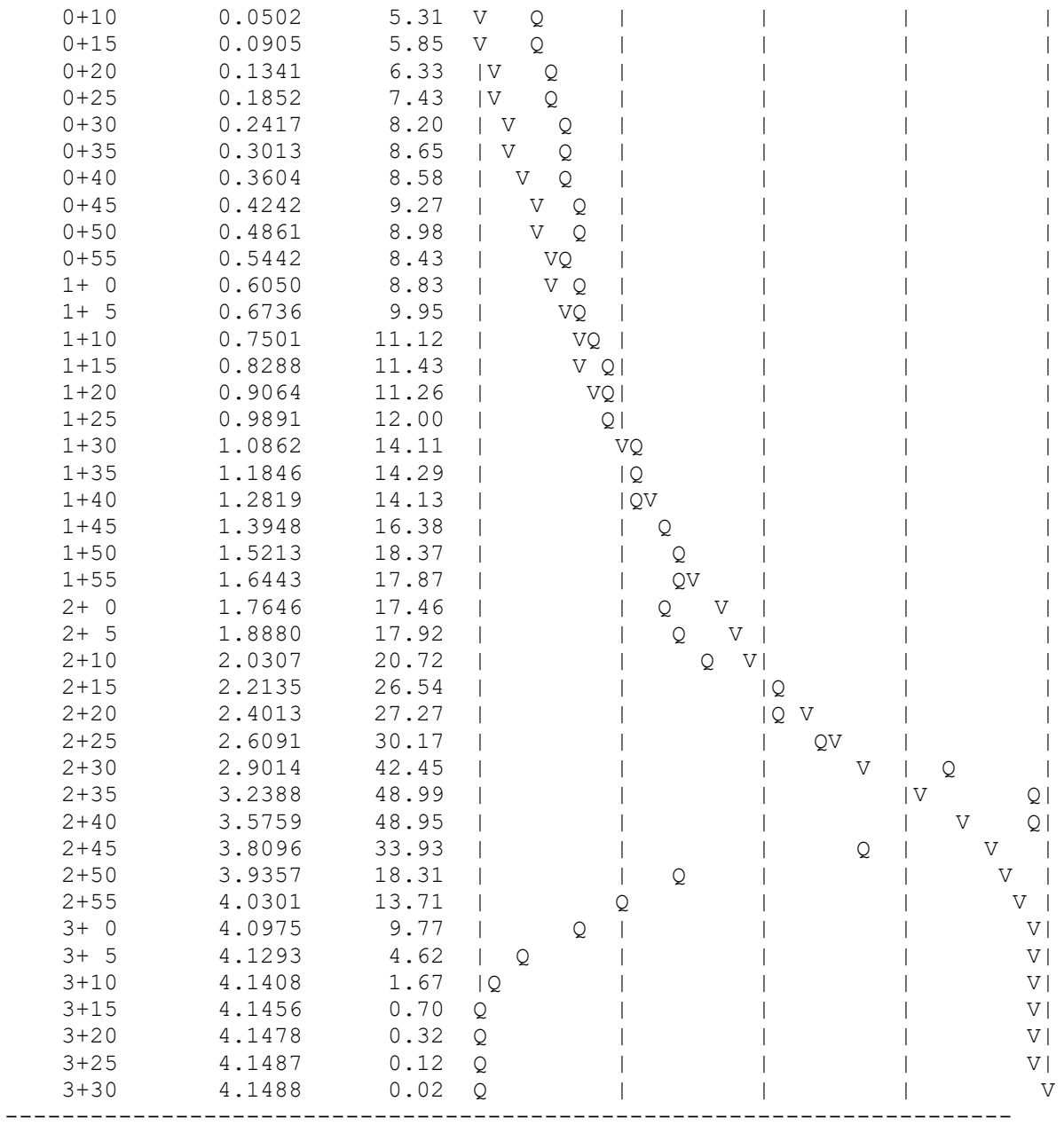
3 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	12.5	25.0	37.5	50.0
0+ 5	0.0136	1.98	VQ	|	|	|	|


0+10 0.0502 5.31
0+15 0.0905 5.85
0+20 0.1341 6.33
0+25 0.1852 7.43
0+30 0.2417 8.20
0+35 0.3013 8.65
0+40 0.3604 8.58
0+45 0.4242 9.27
0+50 0.4861 8.98
0+55 0.5442 8.43
1+ 0 0.6050 8.83
1+ 5 0.6736 9.95
1+10 0.7501 11.12
1+15 0.8288 11.43
1+20 0.9064 11.26
1+25 0.9891 12.00
1+30 1.0862 14.11
1+35 1.1846 14.29
1+40 1.2819 14.13
1+45 1.3948 16.38
1+50 1.5213 18.37
1+55 1.6443 17.87
2+ 0 1.7646 17.46
2+ 5 1.8880 17.92
2+10 2.0307 20.72
2+15 2.2135 26.54
2+20 2.4013 27.27
2+25 2.6091 30.17
2+30 2.9014 42.45
2+35 3.2388 48.99
2+40 3.5759 48.95
2+45 3.8096 33.93
2+50 3.9357 18.31
2+55 4.0301 13.71
3+ 0 4.0975 9.77
3+ 5 4.1293 4.62
3+10 4.1408 1.67
3+15 4.1456 0.70
3+20 4.1478 0.32
3+25 4.1487 0.12
3+30 4.1488 0.02

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION WATERSHED B
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 30.51(Ac.) = 0.048 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 30.51(Ac.) = 0.048 Sq. Mi.
Length along longest watercourse = 2861.00(Ft.)
Length along longest watercourse measured to centroid = 2131.00(Ft.)
Length along longest watercourse = 0.542 Mi.
Length along longest watercourse measured to centroid = 0.404 Mi.
Difference in elevation = 26.97(Ft.)
Slope along watercourse = 49.7734 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.096 Hr.
Lag time = 5.77 Min.
25% of lag time = 1.44 Min.
40% of lag time = 2.31 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
30.51	0.80	24.41

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
30.51	1.90	57.97

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 1.900(In)

Point rain (area averaged) = 1.900(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.900(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
30.510	62.10	0.835

Total Area Entered = 30.51(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
62.1	62.1	0.447	0.835	0.111	1.000	0.111
					Sum (F) =	0.111

Area averaged mean soil loss (F) (In/Hr) = 0.111
Minimum soil loss rate ((In/Hr)) = 0.056
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.232

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	86.658	15.197	4.673
2	0.167	173.316	46.362	14.256
3	0.250	259.974	18.174	5.588
4	0.333	346.632	7.832	2.408
5	0.417	433.290	4.614	1.419
6	0.500	519.948	2.896	0.891
7	0.583	606.606	2.040	0.627
8	0.667	693.264	1.339	0.412
9	0.750	779.923	0.910	0.280
10	0.833	866.581	0.634	0.195
		Sum = 100.000	Sum=	30.748

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

Unit Time	Pattern	Storm Rain	Loss rate(In./Hr)	Effective

	(Hr.)	Percent	(In/Hr)	Max		Low	(In/Hr)	
1	0.08	1.30	0.296	(	0.111)	0.069		0.228
2	0.17	1.30	0.296	(	0.111)	0.069		0.228
3	0.25	1.10	0.251	(	0.111)	0.058		0.193
4	0.33	1.50	0.342	(	0.111)	0.079		0.263
5	0.42	1.50	0.342	(	0.111)	0.079		0.263
6	0.50	1.80	0.410	(	0.111)	0.095		0.315
7	0.58	1.50	0.342	(	0.111)	0.079		0.263
8	0.67	1.80	0.410	(	0.111)	0.095		0.315
9	0.75	1.80	0.410	(	0.111)	0.095		0.315
10	0.83	1.50	0.342	(	0.111)	0.079		0.263
11	0.92	1.60	0.365	(	0.111)	0.085		0.280
12	1.00	1.80	0.410	(	0.111)	0.095		0.315
13	1.08	2.20	0.502		0.111	(0.116)		0.390
14	1.17	2.20	0.502		0.111	(0.116)		0.390
15	1.25	2.20	0.502		0.111	(0.116)		0.390
16	1.33	2.00	0.456	(	0.111)	0.106		0.350
17	1.42	2.60	0.593		0.111	(0.138)		0.482
18	1.50	2.70	0.616		0.111	(0.143)		0.504
19	1.58	2.40	0.547		0.111	(0.127)		0.436
20	1.67	2.70	0.616		0.111	(0.143)		0.504
21	1.75	3.30	0.752		0.111	(0.175)		0.641
22	1.83	3.10	0.707		0.111	(0.164)		0.596
23	1.92	2.90	0.661		0.111	(0.153)		0.550
24	2.00	3.00	0.684		0.111	(0.159)		0.573
25	2.08	3.10	0.707		0.111	(0.164)		0.596
26	2.17	4.20	0.957		0.111	(0.222)		0.846
27	2.25	5.00	1.140		0.111	(0.264)		1.029
28	2.33	3.50	0.798		0.111	(0.185)		0.687
29	2.42	6.80	1.550		0.111	(0.360)		1.439
30	2.50	7.30	1.664		0.111	(0.386)		1.553
31	2.58	8.20	1.869		0.111	(0.434)		1.758
32	2.67	5.90	1.345		0.111	(0.312)		1.234
33	2.75	2.00	0.456	(	0.111)	0.106		0.350
34	2.83	1.80	0.410	(	0.111)	0.095		0.315
35	2.92	1.80	0.410	(	0.111)	0.095		0.315
36	3.00	0.60	0.137	(	0.111)	0.032		0.105

(Loss Rate Not Used)

Sum = 100.0 Sum = 19.3

Flood volume = Effective rainfall 1.61(In)
times area 30.5(Ac.)/[(In)/(Ft.)] = 4.1(Ac.Ft)
Total soil loss = 0.29(In)
Total soil loss = 0.747(Ac.Ft)
Total rainfall = 1.90(In)
Flood volume = 177874.0 Cubic Feet
Total soil loss = 32525.4 Cubic Feet

Peak flow rate of this hydrograph = 45.932(CFS)

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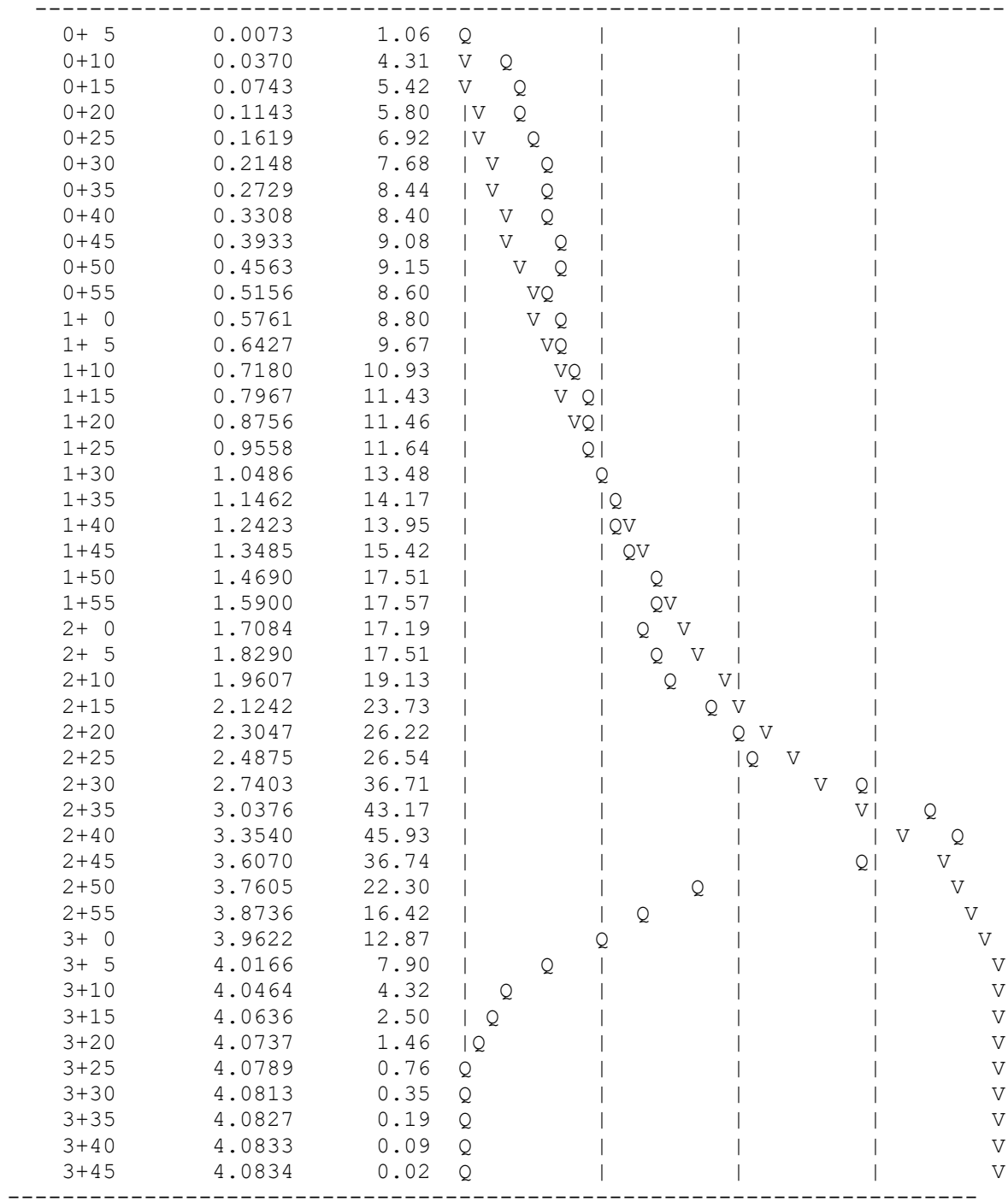
3 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m) Volume Ac.Ft Q(CFS) 0 12.5 25.0 37.5 50.0



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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION WATERSHED A
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 33.45(Ac.) = 0.052 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 33.45(Ac.) = 0.052 Sq. Mi.
Length along longest watercourse = 1351.00(Ft.)
Length along longest watercourse measured to centroid = 643.00(Ft.)
Length along longest watercourse = 0.256 Mi.
Length along longest watercourse measured to centroid = 0.122 Mi.
Difference in elevation = 13.50(Ft.)
Slope along watercourse = 52.7609 Ft./Mi.
Average Manning's 'N' = 0.024
Lag time = 0.073 Hr.
Lag time = 4.35 Min.
25% of lag time = 1.09 Min.
40% of lag time = 1.74 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

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

33.45	0.50	16.73

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
33.45	1.12	37.46

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.120(In)

Point rain (area averaged) = 1.120(In)
Areal adjustment factor = 99.97 %
Adjusted average point rain = 1.120(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
33.450	61.30	0.500

Total Area Entered = 33.45(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
61.3	61.3	0.456	0.500	0.251	1.000	0.251
					Sum (F) =	0.251

Area averaged mean soil loss (F) (In/Hr) = 0.251
Minimum soil loss rate ((In/Hr)) = 0.125
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	114.833	23.683	7.984
2	0.167	229.667	48.833	16.462
3	0.250	344.500	13.786	4.647
4	0.333	459.334	6.296	2.122
5	0.417	574.167	3.503	1.181
6	0.500	689.000	2.103	0.709
7	0.583	803.834	1.796	0.605
			Sum = 100.000	Sum= 33.711

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

Unit Time	Pattern	Storm Rain	Loss rate(In./Hr)	Effective

```
      (Hr.)  Percent   (In/Hr)         Max   |   Low        (In/Hr)
 1    0.08     4.20      0.564          0.251    (  0.282)        0.314
 2    0.17     4.30      0.578          0.251    (  0.289)        0.327
 3    0.25     5.00      0.672          0.251    (  0.336)        0.421
 4    0.33     5.00      0.672          0.251    (  0.336)        0.421
 5    0.42     5.80      0.779          0.251    (  0.390)        0.529
 6    0.50     6.50      0.873          0.251    (  0.437)        0.623
 7    0.58     7.40      0.994          0.251    (  0.497)        0.743
 8    0.67     8.60      1.155          0.251    (  0.578)        0.905
 9    0.75    12.30      1.653          0.251    (  0.826)        1.402
10    0.83    29.10      3.910          0.251    (  1.955)        3.659
11    0.92     6.80      0.914          0.251    (  0.457)        0.663
12    1.00     5.00      0.672          0.251    (  0.336)        0.421
            (Loss Rate Not Used)
   Sum =     100.0                                      Sum =    10.4
    Flood volume = Effective rainfall      0.87(In)
     times area      33.5(Ac.)/[(In)/(Ft.)] =       2.4(Ac.Ft)
    Total soil loss =      0.25(In)
    Total soil loss =     0.699(Ac.Ft)
    Total rainfall =      1.12(In)
    Flood volume =      105502.8 Cubic Feet
    Total soil loss =       30450.3 Cubic Feet
    ---------------------------------------------------------------------
     Peak flow rate of this hydrograph =     75.642(CFS)
    ---------------------------------------------------------------------
    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                       1 - 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       20.0      40.0      60.0      80.0
---------------------------------------------------------------------------
  0+ 5       0.0172      2.50  VQ        |         |         |         |
  0+10       0.0708      7.78  |V Q      |         |         |         |
  0+15       0.1411     10.21  | V  Q    |         |         |         |
  0+20       0.2271     12.48  |  V  Q   |         |         |         |
  0+25       0.3247     14.18  |    V Q  |         |         |         |
  0+30       0.4427     17.14  |      VQ |         |         |         |
  0+35       0.5837     20.46  |        VQ         |         |         |
  0+40       0.7523     24.48  |         | Q       |         |         |
  0+45       0.9731     32.06  |         |     Q   |         |         |
  0+50       1.3826     59.47  |         |         | V      Q|         |
  0+55       1.9036     75.64  |         |         |         |V     Q  |
  1+ 0       2.1532     36.25  |         |       Q |         |    V    |
  1+ 5       2.2946     20.54  |         Q         |         |      V  |
  1+10       2.3582      9.23  |   Q     |         |         |       V |
  1+15       2.3935      5.12  | Q       |         |         |        V|
  1+20       2.4154      3.18  |Q        |         |         |        V|
  1+25       2.4203      0.70  Q         |         |         |        V|
  1+30       2.4220      0.26  Q         |         |         |         V
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U n i t H y d r o g r a p h A n a l y s i s

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION WATERSHED B
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 29.54(Ac.) = 0.046 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 29.54(Ac.) = 0.046 Sq. Mi.
Length along longest watercourse = 1353.00(Ft.)
Length along longest watercourse measured to centroid = 881.00(Ft.)
Length along longest watercourse = 0.256 Mi.
Length along longest watercourse measured to centroid = 0.167 Mi.
Difference in elevation = 17.20(Ft.)
Slope along watercourse = 67.1220 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.098 Hr.
Lag time = 5.86 Min.
25% of lag time = 1.47 Min.
40% of lag time = 2.35 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

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

29.54	0.50	14.77

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
29.54	1.12	33.08

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.120(In)

Point rain (area averaged) = 1.120(In)
Areal adjustment factor = 99.97 %
Adjusted average point rain = 1.120(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
29.540	61.60	0.500

Total Area Entered = 29.54(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
61.6	61.6	0.453	0.500	0.249	1.000	0.249
					Sum (F) =	0.249

Area averaged mean soil loss (F) (In/Hr) = 0.249
Minimum soil loss rate ((In/Hr)) = 0.124
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	85.272	14.796	4.405
2	0.167	170.545	46.014	13.699
3	0.250	255.817	18.512	5.511
4	0.333	341.089	7.912	2.356
5	0.417	426.362	4.692	1.397
6	0.500	511.634	2.929	0.872
7	0.583	596.907	2.085	0.621
8	0.667	682.179	1.387	0.413
9	0.750	767.451	0.919	0.274
10	0.833	852.724	0.752	0.224
		Sum =	100.000 Sum=	29.771

The following loss rate calculations reflect use of the minimum calculated loss

rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	4.20	0.564	0.249	(0.282)	0.315
2	0.17	4.30	0.578	0.249	(0.289)	0.329
3	0.25	5.00	0.672	0.249	(0.336)	0.423
4	0.33	5.00	0.672	0.249	(0.336)	0.423
5	0.42	5.80	0.779	0.249	(0.390)	0.530
6	0.50	6.50	0.873	0.249	(0.437)	0.624
7	0.58	7.40	0.994	0.249	(0.497)	0.745
8	0.67	8.60	1.156	0.249	(0.578)	0.907
9	0.75	12.30	1.653	0.249	(0.826)	1.404
10	0.83	29.10	3.910	0.249	(1.955)	3.661
11	0.92	6.80	0.914	0.249	(0.457)	0.665
12	1.00	5.00	0.672	0.249	(0.336)	0.423

(Loss Rate Not Used)

Sum = 100.0 Sum = 10.4

Flood volume = Effective rainfall 0.87(In)
times area 29.5(Ac.)/[(In)/(Ft.)] = 2.1(Ac.Ft)
Total soil loss = 0.25(In)
Total soil loss = 0.613(Ac.Ft)
Total rainfall = 1.12(In)
Flood volume = 93365.8 Cubic Feet
Total soil loss = 26699.9 Cubic Feet

Peak flow rate of this hydrograph = 65.263(CFS)

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1 - 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	17.5	35.0	52.5	70.0
0+ 5	0.0096	1.39	Q				
0+10	0.0493	5.77	V Q				
0+15	0.1052	8.11	|V Q				
0+20	0.1755	10.21	| V Q				
0+25	0.2559	11.68	| V Q				
0+30	0.3529	14.08	| V Q				
0+35	0.4689	16.84	| VQ				
0+40	0.6080	20.20	| Q				
0+45	0.7856	25.79	| Q				
0+50	1.0890	44.06	| V Q				
0+55	1.5385	65.26	| V	Q			
1+ 0	1.7947	37.20	| Q	V			
1+ 5	1.9449	21.80	| Q	V			
1+10	2.0234	11.40	| Q	V			
1+15	2.0696	6.71	| Q	V			
1+20	2.1002	4.44	| Q	V			
1+25	2.1200	2.88	|Q	V			
1+30	2.1328	1.85	|Q	V			
1+35	2.1409	1.18	Q	V			
1+40	2.1427	0.26	Q	V			

1+45	2.1434	0.09	Q	|	|	|	V

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

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Study date 10/01/24 File: Q100P1AUH1100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION WATERSHED A
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 32.84(Ac.) = 0.051 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 32.84(Ac.) = 0.051 Sq. Mi.
Length along longest watercourse = 1812.00(Ft.)
Length along longest watercourse measured to centroid = 1348.00(Ft.)
Length along longest watercourse = 0.343 Mi.
Length along longest watercourse measured to centroid = 0.255 Mi.
Difference in elevation = 25.30(Ft.)
Slope along watercourse = 73.7219 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.063 Hr.
Lag time = 3.78 Min.
25% of lag time = 0.95 Min.
40% of lag time = 1.51 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

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

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       32.84              0.50                    16.42

 100 YEAR Area rainfall data:


 Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       32.84              1.12                    36.78

 STORM EVENT (YEAR) =  100.00
 Area Averaged 2-Year Rainfall =    0.500(In)
 Area Averaged 100-Year Rainfall =    1.120(In)

 Point rain (area averaged) =    1.120(In)
 Areal adjustment factor =   99.97 %
 Adjusted average point rain =    1.120(In)

 Sub-Area Data:
 Area(Ac.)         Runoff Index   Impervious %
     32.840           60.90         0.755
  Total Area Entered =     32.84(Ac.)


 RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
 AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)       (Dec.)    (In/Hr)
 60.9  60.9      0.460     0.755        0.148        1.000      0.148
                                                    Sum (F) =   0.148
 Area averaged mean soil loss (F) (In/Hr) =  0.148
 Minimum soil loss rate ((In/Hr)) =  0.074
 (for 24 hour storm duration)
 Soil low loss rate (decimal) =   0.296
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 Slope of intensity-duration curve for a 1 hour storm =0.5000
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             U n i t  H y d r o g r a p h
                   VALLEY S-Curve
 ------------------------------------------------------------------------
             Unit Hydrograph Data
 ------------------------------------------------------------------------
 Unit time period   Time % of lag   Distribution   Unit Hydrograph
     (hrs)                          Graph %            (CFS)
 ------------------------------------------------------------------------
     1   0.083        132.184         28.615              9.471
     2   0.167        264.368         48.175             15.944
     3   0.250        396.552         12.342              4.085
     4   0.333        528.736          5.500              1.820
     5   0.417        660.920          3.010              0.996
     6   0.500        793.104          1.628              0.539
     7   0.583        925.288          0.730              0.242
                               Sum = 100.000   Sum=      33.097
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         Storm Event 5   Effective Rainfall =   0.112(In)
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The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max		Low	Effective (In/Hr)
1	0.08	4.20	0.056	(0.148)		0.017	0.040
2	0.17	4.30	0.058	(0.148)		0.017	0.041
3	0.25	5.00	0.067	(0.148)		0.020	0.047
4	0.33	5.00	0.067	(0.148)		0.020	0.047
5	0.42	5.80	0.078	(0.148)		0.023	0.055
6	0.50	6.50	0.087	(0.148)		0.026	0.061
7	0.58	7.40	0.099	(0.148)		0.029	0.070
8	0.67	8.60	0.116	(0.148)		0.034	0.081
9	0.75	12.30	0.165	(0.148)		0.049	0.116
10	0.83	29.10	0.391	(0.148)		0.116	0.275
11	0.92	6.80	0.091	(0.148)		0.027	0.064
12	1.00	5.00	0.067	(0.148)		0.020	0.047

(Loss Rate Not Used)

Sum = 100.0 Sum = 0.9

Flood volume = Effective rainfall 0.08(In)
times area 32.8(Ac.)/[(In)/(Ft.)] = 0.2(Ac.Ft)
Total soil loss = 0.03(In)
Total soil loss = 0.091(Ac.Ft)
Total rainfall = 0.11(In)
Flood volume = 9396.6 Cubic Feet
Total soil loss = 3950.8 Cubic Feet

Storm Event 4 Effective Rainfall = 0.168(In)

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max		Low	Effective (In/Hr)
1	0.08	4.20	0.085	(0.148)		0.025	0.060
2	0.17	4.30	0.087	(0.148)		0.026	0.061
3	0.25	5.00	0.101	(0.148)		0.030	0.071
4	0.33	5.00	0.101	(0.148)		0.030	0.071
5	0.42	5.80	0.117	(0.148)		0.035	0.082
6	0.50	6.50	0.131	(0.148)		0.039	0.092
7	0.58	7.40	0.149	(0.148)		0.044	0.105
8	0.67	8.60	0.173	(0.148)		0.051	0.122
9	0.75	12.30	0.248	(0.148)		0.073	0.175
10	0.83	29.10	0.586	0.148	(	0.174)	0.439
11	0.92	6.80	0.137	(0.148)		0.041	0.096
12	1.00	5.00	0.101	(0.148)		0.030	0.071

(Loss Rate Not Used)

Sum = 100.0 Sum = 1.4

Flood volume = Effective rainfall 0.12(In)
times area 32.8(Ac.)/[(In)/(Ft.)] = 0.3(Ac.Ft)
Total soil loss = 0.05(In)
Total soil loss = 0.130(Ac.Ft)
Total rainfall = 0.17(In)
Flood volume = 14354.0 Cubic Feet
Total soil loss = 5667.2 Cubic Feet

Storm Event 3 Effective Rainfall = 0.213(In)

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	4.20	0.107	(0.148)	0.032	0.075
2	0.17	4.30	0.110	(0.148)	0.032	0.077
3	0.25	5.00	0.128	(0.148)	0.038	0.090
4	0.33	5.00	0.128	(0.148)	0.038	0.090
5	0.42	5.80	0.148	(0.148)	0.044	0.104
6	0.50	6.50	0.166	(0.148)	0.049	0.117
7	0.58	7.40	0.189	(0.148)	0.056	0.133
8	0.67	8.60	0.220	(0.148)	0.065	0.155
9	0.75	12.30	0.314	(0.148)	0.093	0.221
10	0.83	29.10	0.743	0.148	(0.220)	0.595
11	0.92	6.80	0.174	(0.148)	0.051	0.122
12	1.00	5.00	0.128	(0.148)	0.038	0.090

(Loss Rate Not Used)

Sum = 100.0 Sum = 1.9

Flood volume = Effective rainfall 0.16(In)
times area 32.8(Ac.)/[(In)/(Ft.)] = 0.4(Ac.Ft)
Total soil loss = 0.06(In)
Total soil loss = 0.156(Ac.Ft)
Total rainfall = 0.21(In)
Flood volume = 18572.5 Cubic Feet
Total soil loss = 6787.7 Cubic Feet

Storm Event 2 Effective Rainfall = 0.403(In)

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	4.20	0.203	(0.148)	0.060	0.143
2	0.17	4.30	0.208	(0.148)	0.062	0.146
3	0.25	5.00	0.242	(0.148)	0.072	0.170
4	0.33	5.00	0.242	(0.148)	0.072	0.170
5	0.42	5.80	0.281	(0.148)	0.083	0.198
6	0.50	6.50	0.314	(0.148)	0.093	0.221
7	0.58	7.40	0.358	(0.148)	0.106	0.252
8	0.67	8.60	0.416	(0.148)	0.123	0.293
9	0.75	12.30	0.595	0.148	(0.176)	0.447
10	0.83	29.10	1.408	0.148	(0.417)	1.260
11	0.92	6.80	0.329	(0.148)	0.097	0.232
12	1.00	5.00	0.242	(0.148)	0.072	0.170

(Loss Rate Not Used)

Sum = 100.0 Sum = 3.7

Flood volume = Effective rainfall 0.31(In)
times area 32.8(Ac.)/[(In)/(Ft.)] = 0.8(Ac.Ft)
Total soil loss = 0.09(In)
Total soil loss = 0.259(Ac.Ft)
Total rainfall = 0.40(In)

Flood volume = 36785.2 Cubic Feet
Total soil loss = 11265.7 Cubic Feet

Storm Event 1 Effective Rainfall = 1.120(In)

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max		Low	Effective (In/Hr)
1	0.08	4.20	0.564	0.148	(	0.167)	0.417
2	0.17	4.30	0.578	0.148	(	0.171)	0.430
3	0.25	5.00	0.672	0.148	(	0.199)	0.524
4	0.33	5.00	0.672	0.148	(	0.199)	0.524
5	0.42	5.80	0.779	0.148	(	0.231)	0.632
6	0.50	6.50	0.873	0.148	(	0.259)	0.726
7	0.58	7.40	0.994	0.148	(	0.294)	0.847
8	0.67	8.60	1.155	0.148	(	0.342)	1.008
9	0.75	12.30	1.653	0.148	(	0.489)	1.505
10	0.83	29.10	3.910	0.148	(	1.157)	3.762
11	0.92	6.80	0.914	0.148	(	0.270)	0.766
12	1.00	5.00	0.672	0.148	(	0.199)	0.524
	(Loss Rate Not Used)						
Sum =		100.0				Sum =	11.7

Flood volume = Effective rainfall 0.97(In)
times area 32.8(Ac.)/[(In)/(Ft.)] = 2.7(Ac.Ft)
Total soil loss = 0.15(In)
Total soil loss = 0.404(Ac.Ft)
Total rainfall = 1.12(In)
Flood volume = 115888.9 Cubic Feet
Total soil loss = 17585.7 Cubic Feet

Peak flow rate of this hydrograph = 76.654(CFS)

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TOTAL OF: 5 1 - H O U R S T O R M E V E N T S
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	20.0	40.0	60.0	80.0
0+ 5	0.0026	0.38	Q				
0+10	0.0096	1.02	Q				
0+15	0.0183	1.26	Q				
0+20	0.0282	1.44	Q				
0+25	0.0391	1.58	Q				
0+30	0.0515	1.80	Q				
0+35	0.0655	2.03	VQ				
0+40	0.0815	2.32	VQ				
0+45	0.1014	2.89	VQ				
0+50	0.1360	5.03	|VQ				
0+55	0.1755	5.74	|VQ				
1+ 0	0.1958	2.94	|Q				
1+ 5	0.1997	0.56	QV				

1+10	0.2102	1.53	QV	|	|	|	|
1+15	0.2232	1.89	Q V	|	|	|	|
1+20	0.2381	2.16	|QV	|	|	|	|
1+25	0.2545	2.37	|QV	|	|	|	|
1+30	0.2730	2.70	|QV	|	|	|	|
1+35	0.2941	3.05	|QV	|	|	|	|
1+40	0.3180	3.48	|QV	|	|	|	|
1+45	0.3479	4.33	| QV	|	|	|	|
1+50	0.4015	7.79	| Q	|	|	|	|
1+55	0.4637	9.03	| Q	|	|	|	|
2+ 0	0.4948	4.52	| Q V	|	|	|	|
2+ 5	0.4998	0.72	Q V	|	|	|	|
2+10	0.5131	1.94	Q V	|	|	|	|
2+15	0.5296	2.39	|Q V	|	|	|	|
2+20	0.5484	2.74	|Q V	|	|	|	|
2+25	0.5691	3.00	|Q V	|	|	|	|
2+30	0.5927	3.42	|Q V	|	|	|	|
2+35	0.6193	3.86	|Q V	|	|	|	|
2+40	0.6496	4.41	| Q V	|	|	|	|
2+45	0.6875	5.49	| Q V	|	|	|	|
2+50	0.7579	10.24	| Q V	|	|	|	|
2+55	0.8410	12.06	| QV	|	|	|	|
3+ 0	0.8816	5.89	| Q V	|	|	|	|
3+ 5	0.8909	1.36	Q V	|	|	|	|
3+10	0.9162	3.67	|Q V	|	|	|	|
3+15	0.9474	4.53	| Q V	|	|	|	|
3+20	0.9831	5.19	| Q V|				

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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPSOED CONDITION WATERSHED B
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 30.51(Ac.) = 0.048 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 30.51(Ac.) = 0.048 Sq. Mi.
Length along longest watercourse = 2861.00(Ft.)
Length along longest watercourse measured to centroid = 2131.00(Ft.)
Length along longest watercourse = 0.542 Mi.
Length along longest watercourse measured to centroid = 0.404 Mi.
Difference in elevation = 26.97(Ft.)
Slope along watercourse = 49.7734 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.096 Hr.
Lag time = 5.77 Min.
25% of lag time = 1.44 Min.
40% of lag time = 2.31 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
30.51	0.50	15.26

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
30.51	1.12	34.17

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.120(In)

Point rain (area averaged) = 1.120(In)
Areal adjustment factor = 99.97 %
Adjusted average point rain = 1.120(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
30.510	62.10	0.835

Total Area Entered = 30.51(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
62.1	62.1	0.447	0.835	0.111	1.000	0.111
					Sum (F) =	0.111

Area averaged mean soil loss (F) (In/Hr) = 0.111
Minimum soil loss rate ((In/Hr)) = 0.056
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.232

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	86.658	15.197	4.673
2	0.167	173.316	46.362	14.256
3	0.250	259.974	18.174	5.588
4	0.333	346.632	7.832	2.408
5	0.417	433.290	4.614	1.419
6	0.500	519.948	2.896	0.891
7	0.583	606.606	2.040	0.627
8	0.667	693.264	1.339	0.412
9	0.750	779.923	0.910	0.280
10	0.833	866.581	0.634	0.195
		Sum =	100.000 Sum=	30.748

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max		Low	Effective (In/Hr)
1	0.08	4.20	0.564	0.111	(	0.131)	0.453
2	0.17	4.30	0.578	0.111	(	0.134)	0.467
3	0.25	5.00	0.672	0.111	(	0.156)	0.561
4	0.33	5.00	0.672	0.111	(	0.156)	0.561
5	0.42	5.80	0.779	0.111	(	0.181)	0.668
6	0.50	6.50	0.873	0.111	(	0.203)	0.762
7	0.58	7.40	0.994	0.111	(	0.231)	0.883
8	0.67	8.60	1.156	0.111	(	0.268)	1.044
9	0.75	12.30	1.653	0.111	(	0.383)	1.542
10	0.83	29.10	3.910	0.111	(	0.907)	3.799
11	0.92	6.80	0.914	0.111	(	0.212)	0.803
12	1.00	5.00	0.672	0.111	(	0.156)	0.561

(Loss Rate Not Used)

Sum = 100.0 Sum = 12.1

Flood volume = Effective rainfall 1.01(In)
times area 30.5(Ac.)/[(In)/(Ft.)] = 2.6(Ac.Ft)
Total soil loss = 0.11(In)
Total soil loss = 0.283(Ac.Ft)
Total rainfall = 1.12(In)
Flood volume = 111696.2 Cubic Feet
Total soil loss = 12311.0 Cubic Feet

Peak flow rate of this hydrograph = 71.901(CFS)

++

1 - 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	20.0	40.0	60.0	80.0
0+ 5	0.0146	2.12	VQ				
0+10	0.0741	8.65	V Q				
0+15	0.1555	11.81	V Q				
0+20	0.2541	14.32	V Q				
0+25	0.3644	16.02	V Q				
0+30	0.4928	18.65	V Q				
0+35	0.6415	21.58	Q				
0+40	0.8145	25.13	Q				
0+45	1.0280	31.00	QV				
0+50	1.3737	50.19			V Q		
0+55	1.8689	71.90			V	Q	
1+ 0	2.1603	42.31			Q	V	
1+ 5	2.3388	25.92	Q			V	
1+10	2.4297	13.20	Q			V	
1+15	2.4825	7.67	Q			V	
1+20	2.5169	4.99	Q			V	
1+25	2.5389	3.20	Q			V	
1+30	2.5530	2.05	Q			V	
1+35	2.5613	1.20	Q			V	
1+40	2.5634	0.31	Q			V	
1+45	2.5642	0.11	Q			V	

SECTION 3 - REFERENCE DATA

USGS SOILS REPORT

PLATE D-4.1

INFILTRATION REPORT (EXCERPT)

CONTECH UNDERGROUND CHAMBER SYSTEM

DCV CALCULATIONS (WQMP)

PP190005 – HARVILL DISTRIBUTION CENTER OFFSITE DRAINAGE IMPROVEMENTS (HYDROLOGY MAPS)

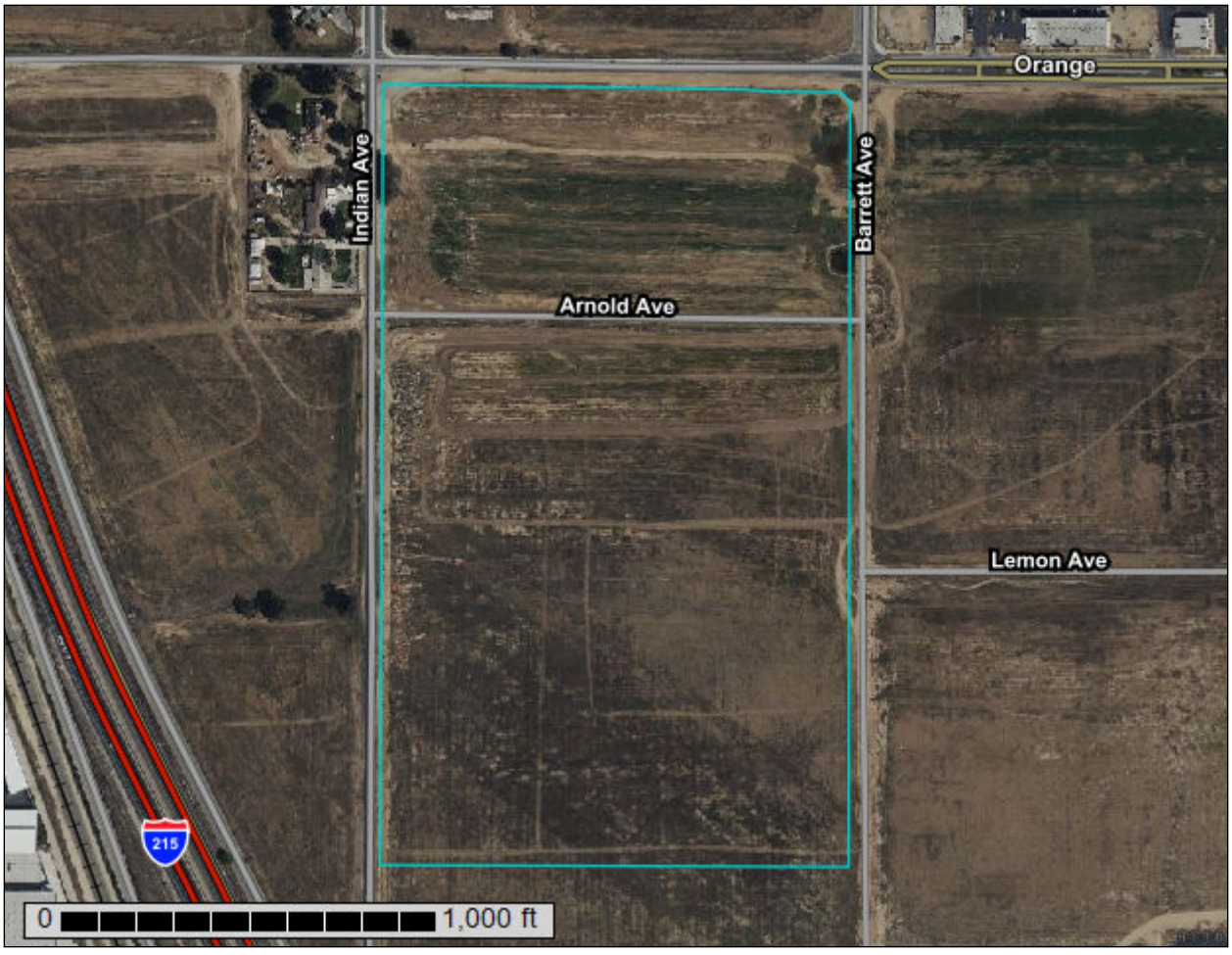
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Western Riverside Area, California



October 1, 2024

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

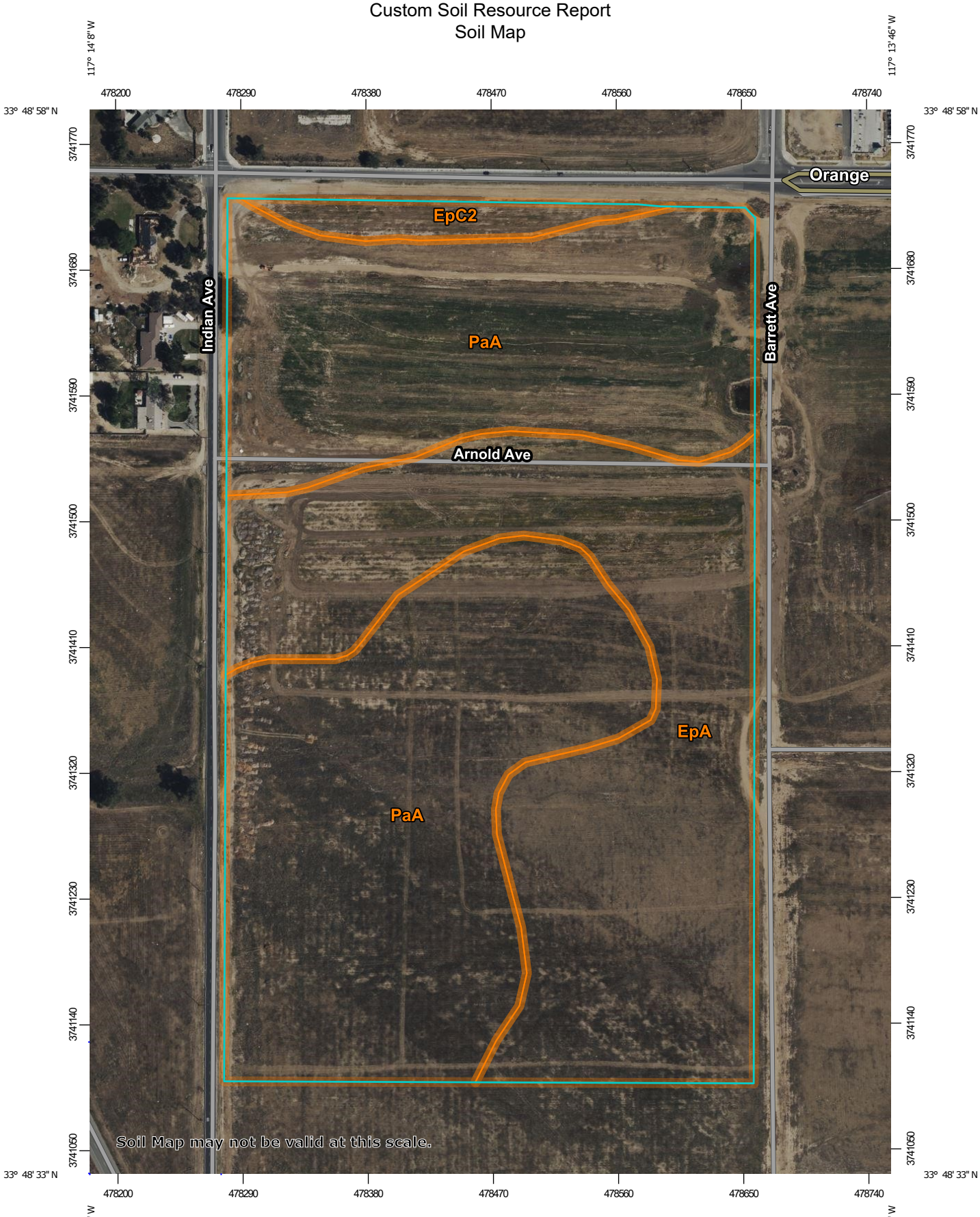
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:3,710 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 17, Aug 30, 2024

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

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
EpA	Exeter sandy loam, deep, 0 to 2 percent slopes	22.1	37.2%
EpC2	Exeter sandy loam, deep, 2 to 8 percent slopes, eroded	1.5	2.6%
PaA	Pachappa fine sandy loam, 0 to 2 percent slopes	35.7	60.2%
Totals for Area of Interest		**59.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Western Riverside Area, California

EpA—Exeter sandy loam, deep, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hctk
Elevation: 300 to 700 feet
Mean annual precipitation: 7 to 15 inches
Mean annual air temperature: 64 degrees F
Frost-free period: 250 to 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Exeter

Setting

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

Typical profile

H1 - 0 to 16 inches: sandy loam
H2 - 16 to 37 inches: sandy clay loam
H3 - 37 to 50 inches: indurated
H4 - 50 to 60 inches: stratified sandy loam to silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 35 to 60 inches to duripan
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Greenfield
Percent of map unit: 5 percent
Hydric soil rating: No

Ramona
Percent of map unit: 5 percent
Hydric soil rating: No

Monserate
Percent of map unit: 5 percent
Hydric soil rating: No

EpC2—Exeter sandy loam, deep, 2 to 8 percent slopes, eroded

Map Unit Setting
National map unit symbol: hctl
Elevation: 300 to 700 feet
Mean annual precipitation: 7 to 15 inches
Mean annual air temperature: 64 degrees F
Frost-free period: 250 to 300 days
Farmland classification: Prime farmland if irrigated

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

Description of Exeter

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

Typical profile
H1 - 0 to 16 inches: sandy loam
H2 - 16 to 37 inches: sandy clay loam
H3 - 37 to 50 inches: indurated
H4 - 50 to 60 inches: stratified sandy loam to silt loam

Properties and qualities
Slope: 2 to 8 percent
Depth to restrictive feature: 35 to 60 inches to duripan
Drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Ramona

Percent of map unit: 5 percent
Hydric soil rating: No

Monserate

Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

PaA—Pachappa fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hcxn
Elevation: 1,000 feet
Mean annual precipitation: 14 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 270 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Pachappa

Setting

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

Typical profile

H1 - 0 to 20 inches: fine sandy loam
H2 - 20 to 63 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

San emigdio

Percent of map unit: 5 percent
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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:

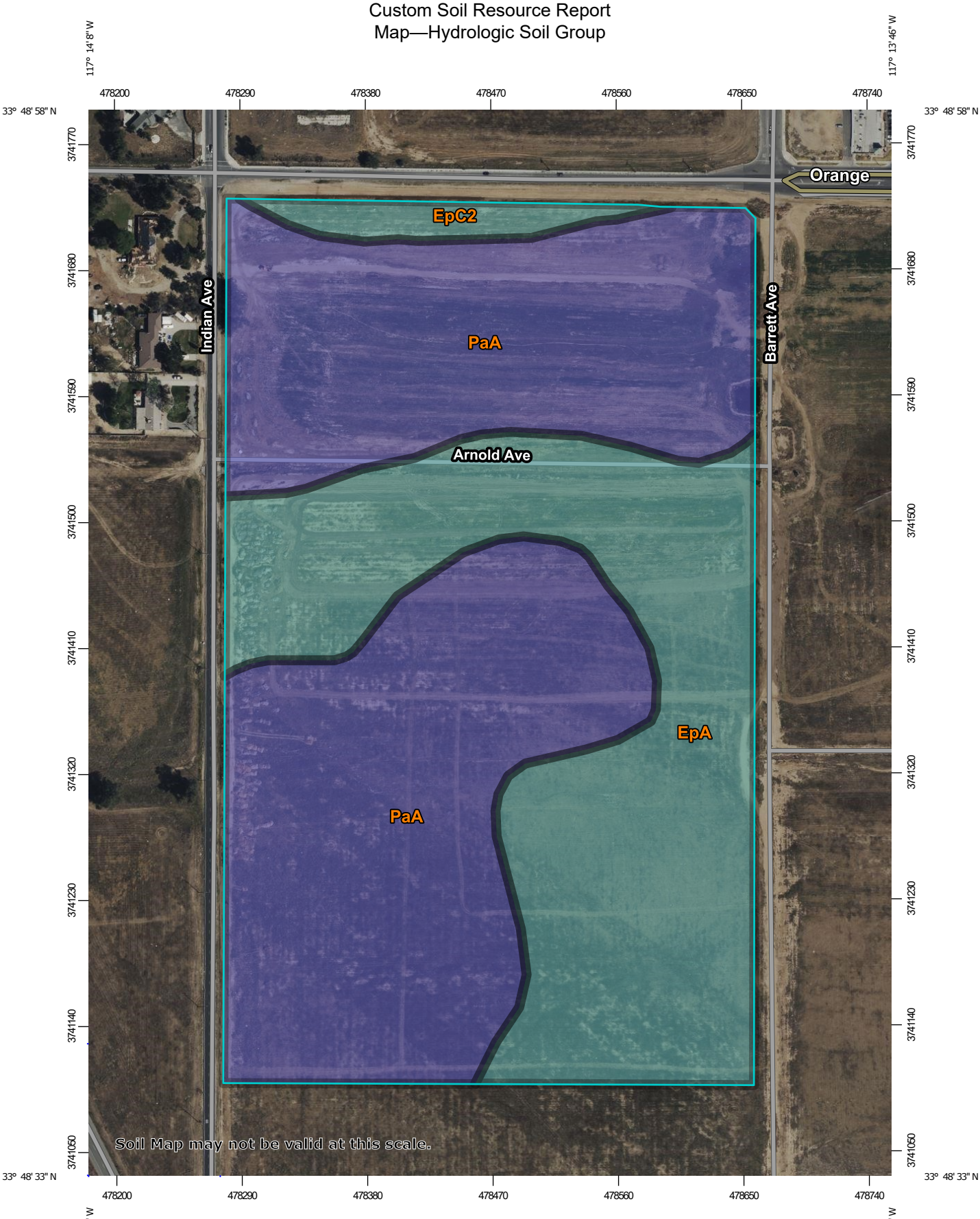
Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

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.



Map Scale: 1:3,710 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 150 300 600 900

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil 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 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 17, Aug 30, 2024

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

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

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.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
EpA	Exeter sandy loam, deep, 0 to 2 percent slopes	C	22.1	37.2%
EpC2	Exeter sandy loam, deep, 2 to 8 percent slopes, eroded	C	1.5	2.6%
PaA	Pachappa fine sandy loam, 0 to 2 percent slopes	B	35.7	60.2%
Totals for Area of Interest			**59.4**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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RAINFALL INTENSITY–INCHES PER HOUR

MIRA LOMA			MURRIETA - TEMECULA & RANCHO CALIFORNIA			NORCO			PALM SPRINGS			PERRIS VALLEY		
DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY	
	10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR
5	2.84	4.48	5	3.45	5.10	5	2.77	4.16	5	4.23	6.76	5	2.64	3.78
6	2.58	4.07	6	3.12	4.61	6	2.53	3.79	6	3.80	6.08	6	2.41	3.46
7	2.37	3.75	7	2.87	4.24	7	2.34	3.51	7	3.48	5.56	7	2.24	3.21
8	2.21	3.49	8	2.67	3.94	8	2.19	3.29	8	3.22	5.15	8	2.09	3.01
9	2.08	3.28	9	2.50	3.69	9	2.07	3.10	9	3.01	4.81	9	1.98	2.84
10	1.96	3.10	10	2.36	3.48	10	1.96	2.94	10	2.83	4.52	10	1.88	2.69
11	1.87	2.95	11	2.24	3.30	11	1.87	2.80	11	2.67	4.28	11	1.79	2.57
12	1.78	2.82	12	2.13	3.15	12	1.79	2.68	12	2.54	4.07	12	1.72	2.46
13	1.71	2.70	13	2.04	3.01	13	1.72	2.58	13	2.43	3.88	13	1.65	2.37
14	1.64	2.60	14	1.96	2.89	14	1.66	2.48	14	2.33	3.72	14	1.59	2.29
15	1.58	2.50	15	1.89	2.79	15	1.60	2.40	15	2.23	3.58	15	1.54	2.21
16	1.53	2.42	16	1.82	2.69	16	1.55	2.32	16	2.15	3.44	16	1.49	2.14
17	1.48	2.34	17	1.76	2.60	17	1.50	2.25	17	2.08	3.32	17	1.45	2.08
18	1.44	2.27	18	1.71	2.52	18	1.46	2.19	18	2.01	3.22	18	1.41	2.02
19	1.40	2.21	19	1.66	2.45	19	1.42	2.13	19	1.95	3.12	19	1.37	1.97
20	1.36	2.15	20	1.61	2.38	20	1.39	2.08	20	1.89	3.03	20	1.34	1.92
22	1.29	2.04	22	1.53	2.26	22	1.32	1.98	22	1.79	2.86	22	1.28	1.83
24	1.24	1.95	24	1.46	2.15	24	1.26	1.90	24	1.70	2.72	24	1.22	1.75
26	1.18	1.87	26	1.39	2.06	26	1.22	1.82	26	1.62	2.60	26	1.18	1.69
28	1.14	1.80	28	1.34	1.98	28	1.17	1.76	28	1.56	2.49	28	1.13	1.63
30	1.10	1.73	30	1.29	1.90	30	1.13	1.70	30	1.49	2.39	30	1.10	1.57
32	1.06	1.67	32	1.24	1.84	32	1.10	1.64	32	1.44	2.30	32	1.06	1.52
34	1.03	1.62	34	1.20	1.78	34	1.06	1.59	34	1.39	2.22	34	1.03	1.48
36	1.00	1.57	36	1.17	1.72	36	1.03	1.55	36	1.34	2.15	36	1.00	1.44
38	.97	1.53	38	1.13	1.67	38	1.01	1.51	38	1.30	2.09	38	.98	1.40
40	.94	1.49	40	1.10	1.62	40	.98	1.47	40	1.27	2.02	40	.95	1.37
45	.89	1.40	45	1.03	1.52	45	.92	1.39	45	1.18	1.89	45	.90	1.29
50	.84	1.32	50	.97	1.44	50	.88	1.31	50	1.11	1.78	50	.85	1.22
55	.80	1.26	55	.92	1.36	55	.84	1.25	55	1.05	1.68	55	.81	1.17
60	.76	1.20	60	.88	1.30	60	.80	1.20	60	1.00	1.60	60	.78	1.12
65	.73	1.15	65	.84	1.24	65	.77	1.15	65	.95	1.53	65	.75	1.08
70	.70	1.11	70	.81	1.19	70	.74	1.11	70	.91	1.46	70	.72	1.04
75	.68	1.07	75	.78	1.15	75	.72	1.07	75	.88	1.41	75	.70	1.00
80	.65	1.03	80	.75	1.11	80	.69	1.04	80	.85	1.35	80	.68	.97
85	.63	1.00	85	.73	1.07	85	.67	1.01	85	.82	1.31	85	.66	.94
SLOPE = .530			SLOPE = .550			SLOPE = .500			SLOPE = .580			SLOPE = .490		

RCFC & WCD

HYDROLOGY MANUAL

STANDARD INTENSITY-DURATION CURVES DATA

PLATE D-4.1 (4 of 6)

PROJECT SITE

NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI – California, 1973

RCFC & WCD
HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT

2-YEAR — 1-HOUR
PRECIPITATION

APPROVED: CHIEF ENGINEER R.E. NO. 8822	DRAWN BY: R.A.S.	SHEET No.
DATE	PLATE D-4.3	DR. No.
REVISED		

PROJECT SITE

NOTES
1. Isohyetals based on NOAA Atlas 2, Volume XI – California, 1973

RCFC & WCD
HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

100-YEAR — 1-HOUR PRECIPITATION

APPROVED: CHIEF ENGINEER R.E. NO. 8822
DATE
REVISED
DRAWN BY: A.A.S.
PLATE D-4.4
SHEET NO.
DR. NO.

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

September 20, 2023

Howard Industrial Partners
1944 North Tustin Street, Suite 122
Orange, California 92865

Attention: Mr. Mike Tunney
Vice President

Project No.: **22G183-4**

Subject: **Results of Additional Infiltration Testing**
Harvest Landing Industrial Development
Indian Avenue and Orange Avenue
Perris, California

Reference: 1) Geotechnical Investigation, Proposed Harvest Landing Industrial Development, Indian Avenue and Orange Avenue, Perris, California, prepared for Howard Industrial Partners, by Southern California Geotechnical, Inc. (SCG), SCG Project No. 22G183-1, dated June 13, 2022.

2) Results of Infiltration Testing, Proposed Harvest Landing Industrial Development, Indian Avenue and Orange Avenue, Perris, California, prepared by Southern California Geotechnical, Inc. (SCG), SCG Project No. 22G183-2, dated July 1, 2022.

3) Geotechnical Investigation, Harvest Landing Industrial Development, Indian Avenue and Orange Avenue, Perris, California, prepared for Howard Industrial Partners, by Southern California Geotechnical, Inc. (SCG), SCG Project No. 22G183-3, dated September 21, 2023.

Mr. Tunney:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

Scope of Services

The scope of services performed for this project was in general accordance with our Proposal No. 23P306R, dated August 9, 2023. The scope of services included site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the on-site soils. The infiltration testing was performed in general accordance with the guidelines published in Riverside County – Low Impact Development BMP Design Handbook – Section 2.3 of Appendix A, prepared for the Riverside County Department of Environmental Health (RCDEH), dated December, 2013.

Site and Project Description

The site is located at the southwest corner of North Perris Boulevard and Orange Avenue in Perris, California. The site is bounded to the north by Orange Avenue, West Water Avenue, and vacant land, to the west by Interstate 215 Frontage Road and Freeway I-215, to the south by an existing commercial development and a vacant land, and to the east by an existing commercial development, North Perris Boulevard and Barrett Avenue. The western portion of the site is partially transected by Indian Avenue (trending north-south). Orange Avenue (trending east-west) separates the northern portion of the overall site (designated as Phase 2 on the site plans) from Phase 1 in the central to southern portions of the western portion of the overall site. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 in Appendix A of this report.

The site consists of several parcels, which total 214.82± acres in size. The west-central area of the site, is developed with four (4) single-family residences (SFRs) which range from approximately 1,200 to 6,160 ft² in size. The residences are of wood-frame and stucco construction and are assumed to be supported on conventional shallow foundations, with slab-on-grade floors. Ground surface cover surrounding the SFRs includes asphaltic concrete with Portland cement concrete driveways, exposed soil, and trees. The remaining areas of the site are vacant and undeveloped. Ground surface cover consists of exposed soil with sparse to moderate native grass and weed growth and occasional trees. A water pump is present approximately 200 feet south of the intersection of Perris Boulevard and Orange Avenue, within the site's boundary. A 3- to 4-foot deep drainage rut is present in the central-eastern area of the site, trending east-west between a dirt road located and the east boundary of the site. Many small stockpiles of plant material and woodchips are located along the eastern side of Indian Avenue, approximately 2 to 4-feet in height. Based on historic aerial photographs obtained from Google Earth, the site was previously used for farming activities. Due to previous tilling activities, the ground surface throughout the site is generally hummocky.

Detailed topographic information was obtained from the Exhibit A-Infiltration Testing Locations plan, prepared by FM Civil Engineers, Inc. Based on this plan, the overall site topography slopes downward to the east at a gradient of 1.5± percent.

Proposed Development

Based on a site plan prepared by RGA, the site will be developed with the following industrial/commercial buildings, located throughout the site.

Building Type	Building Name	Location	Size (ft²)
Industrial	1	Northwest	380,000
Industrial	2	West-Central	88,400
Industrial	3	West-Central	50,000
Industrial	4	Southwest	18,800

Distribution	5	Central	440,000
Commercial	Big Box Retail	Southeast	165,000
Commercial	Shopping Center	Northeast	150,000
Retail	Pad 1	Northeast	6,500
Retail	Pad 2	Northeast	6,500
Restaurant	Pad 3	East	2,305
Retail	Pad 4	East	9,000
Restaurant	Pad 5	Southeast	3,172

Building Nos. 1 through 4 - Industrial Buildings

Dock-high doors will be constructed along a portion of at least one building wall for each of the industrial buildings. The buildings will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete pavements in the loading dock areas, and limited areas of concrete flatwork and landscape planters throughout.

Detailed structural information has not been provided. We assume the new industrial buildings will be single-story structures of tilt-up concrete construction, typically supported on conventional shallow foundation systems with concrete slab-on-grade floors. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 100 kips and 4 to 7 kips per linear foot, respectively.

Building No. 5 - Distribution Building

Dock-high doors will be constructed along portions of the east and west building walls. The building will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete pavements in the loading dock areas, and limited areas of concrete flatwork and landscape planters throughout. Two ancillary buildings, 15,300± ft² and 3,300± ft² in size are located to the south of the main distribution building.

Detailed structural information has not been provided. We assume the new main distribution building will be a two-story structure of tilt-up concrete construction, typically supported on conventional shallow foundation system with a concrete slab-on-grade floor. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 700 to 900 kips and 4 to 7 kips per linear foot, respectively.

Commercial – Big Box Retail

Dock-high doors will be constructed along a portion of the east building wall. The building will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete in the loading dock areas, and limited areas of concrete flatwork and landscape planters

throughout. This commercial development will include an automobile service station located east of the building. The service station will include a canopy, five (5) fuel pump islands, and underground storage tanks (USTs).

Detailed structural information has not been provided. We assume that the commercial building will be a single-story structure of tilt-up concrete construction, typically supported on conventional shallow foundation system with concrete slab-on-grade floors. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 100 kips and 4 to 7 kips per linear foot, respectively. The new pump island canopy is expected to be a steel frame structure, typically supported on deepened shallow foundations. Maximum column loads for the canopy are expected to be in the range of 20 kips, with significant overturning and/or uplift loads.

Commercial – Shopping Center

The shopping center building will consist of eight (8) suites ranging from 2,400± ft² to 54,000± ft² in size. Dock-high doors will be constructed along a portion of the west building walls for four (4) of the suites of the shopping center building. The building will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete in the loading dock areas, and limited areas of concrete flatwork and landscape planters throughout.

Detailed structural information has not been provided. We assume that the new shopping center building will be a single-story structure of wood frame or masonry block construction, typically supported on conventional shallow foundation systems with a concrete slab-on-grade floor. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 50 kips and 2 to 3 kips per linear foot, respectively.

Retail and Restaurant Buildings

The two fast-food restaurant buildings will include drive-thru lanes. Pad 4 will contain four (4) suites. The buildings will be surrounded by asphaltic concrete pavements in the parking and drive lanes, concrete flatwork, and limited areas of landscape planters throughout.

Detailed structural information has not been provided. We assume that the new retail and restaurant buildings will be single-story structures of wood frame construction, typically supported on conventional shallow foundation systems with concrete slab-on-grade floors. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 20 kips and 1 to 3 kips per linear foot, respectively.

Streets

Barrett Avenue and two access streets will be constructed at the site. It is assumed that the new streets will consist of asphaltic concrete pavements.

General

No significant amounts of below-grade construction, such as basements or crawl spaces, are expected to be included in the proposed development. Based on the assumed topography, cuts and fills of up to 8 to 10± feet are expected to be necessary to achieve the proposed site grades

throughout the site.

Streets

Barrett Avenue and two access streets will be constructed at the site. It is assumed that the new streets will consist of asphaltic concrete pavements.

Previous Studies

Southern California Geotechnical (SCG) previously conducted a geotechnical investigation at the subject site (Reference No. 1). As a part of this study, twenty-three (23) borings (Identified as Boring Nos. B-1 through B-23) were advanced to depths of 15 to 25± feet below the existing site grades. Native alluvium was encountered at each boring locations, extending to at least the maximum depth explored of 25± feet below existing site grades. The alluvium generally consists of medium dense to very dense silty sands to sandy silts, with trace to little clay content. Free water was not encountered during the drilling of the borings. Based on the lack of water within the borings and the moisture contents of the recovered soil samples, the static groundwater is considered to have existed at a depth in excess of 25± feet at the time of the subsurface exploration.

SCG also previously conducted infiltration testing at the subject site (Reference No. 2). The subsurface exploration performed for the infiltration testing consisted of six (6) shallow infiltration trenches (identified as Infiltration Trench Nos. I-1 through I-6) and four (4) deep infiltration borings (identified as Infiltration Boring Nos. I-7 through I-10). The infiltration trenches were excavated to a depth of 7± feet below existing site grades. The infiltration borings were extended to a depth of 50± feet below existing site grades. In addition, one (1) exploratory boring was extended to a depth of 60± feet below site grades. Artificial fill soils were encountered at the ground surface at Infiltration Test No. I-3, extending to a depth of 1± foot below existing site grades. The fill soils consisted of medium dense fine to medium sandy silts with trace quantities of clay and fine gravel. Native alluvium was encountered at the ground surface at all of the remaining boring and trench locations, extending to at least the maximum explored depth of 60± feet below existing site grades. The near-surface alluvium encountered at depths less than 25± feet below existing site grades consisted of medium dense to very dense fine to medium sandy silts, silty fine to medium sands, clayey fine to coarse sands, and hard fine to coarse sandy clays. At depths greater than 25± feet, the alluvium consisted of medium dense to very dense fine sandy silts, fine to medium sandy silts, silty fine to medium sands, and hard fine to medium sandy clays. Based on the results of the testing, SCG recommended infiltration rates of 0.9 to 3.6 inches per hour for the proposed chamber systems. Additionally, SCG did not recommend dry well infiltration at the subject site.

Concurrent Study

SCG concurrently conducted a geotechnical investigation at the subject site (Reference No. 3). As a part of this study, forty-three (43) borings (identified as Boring Nos. B-25 through B-67) were advanced to depths of 10 to 50± feet below the existing site grades.

Younger native alluvium was encountered at the ground surface at Boring Nos. B-25, B-28, B-29, B-31, B-32, B-50, B-55 through B-58, B-60, B-64, and B-67, extending to depths of 2½ to 5½± feet below existing site grades. The alluvium generally consists of loose to medium dense silty

fine sands, silty fine to medium sands, fine sandy silts, clayey fine sands. Occasional layers of very stiff fine sandy clays and silty clays. The younger native alluvial soils are classified as "alluvium" on the boring logs. Native older alluvium was encountered beneath the younger native alluvial soils (at the boring locations listed above) and at the ground surface at the remaining boring locations. All of the borings were terminated within the older alluvium, and the older alluvial soils extend to at least the maximum depth explored of 50± feet below ground surface. The older alluvial soils generally consist of medium dense to very dense well- to poorly-graded silty sands with varying clay content, well-graded to poorly-graded sandy silts with varying clay content, well-graded to poorly-graded clayey sands with varying silt content, and clayey silts. Additionally, layers of very stiff to hard fine sandy clays and silty clays were encountered. The older alluvium generally possesses weak to moderate cementation, and occasionally possesses trace to extensive calcareous nodules and veining.

Groundwater

Free water was not encountered during the drilling of any of the borings. Based on the moisture content of the recovered soil samples and the lack of free water in the borings, the static groundwater table is at a depth greater than the maximum explored depth of 50± feet below existing site grades for this project.

Recent water level data was obtained from the California Department of Water Resources website, http://www.water.ca.gov/waterdatalibrary/. The nearest monitoring well is located on the northeast corner of the site. Water level readings within this monitoring well indicates a groundwater level of 40± feet (March 2023) below the ground surface.

Subsurface Exploration

Scope of Exploration

The subsurface exploration conducted for the infiltration testing consisted of thirty-seven (37) infiltration test borings, advanced to depths of 3 to 10½± feet below the existing site grades. The infiltration borings were advanced using a truck-mounted drilling rig, equipped with 8-inch-diameter hollow stem augers and were logged during drilling by a member of our staff. The approximate locations of the infiltration test borings (identified as Infiltration Test Nos. I-11 through I-37) are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Upon the completion of the infiltration borings, the bottom of each test boring was covered with 2± inches of clean ¾-inch gravel. A sufficient length of 3-inch-diameter perforated PVC casing was then placed into each test hole so that the PVC casing extended from the bottom of the test hole to the ground surface. Clean ¾-inch gravel was then installed in the annulus surrounding the PVC casing.

Geotechnical Conditions

Native younger alluvium was encountered at the ground surface at Infiltration Test Nos. I-11, I-23, I-26 and I-39, extending to depths of 3 to 6± feet below the existing site grades. The younger alluvium generally consists of medium dense silty sands and sandy silts. Native older alluvium was encountered beneath the native younger alluvium and at the ground surface at the remaining

infiltration test locations, extending to at least the maximum depth explored of 10½± feet. The older alluvium generally consists of medium dense to very dense silty sands and sandy silts with trace to little clay content. The older alluvium occasionally possesses weak cementation. The Infiltration Boring Logs, which illustrate the conditions encountered at each of the borings, are included with this report.

Infiltration Testing

As previously mentioned, the infiltration testing was performed in general accordance with the Riverside County guidelines: Riverside County – Low Impact Development BMP Design Handbook – Section 2.3 of Appendix A.

Pre-soaking

In accordance with the county infiltration standards all of the infiltration test borings were pre-soaked prior to the infiltration testing. The pre-soaking process consisted of filling the test borings by inverting a full 5-gallon bottle of clear water supported over each hole so that the water level reaches a level of at least 5 times the hole's radius above the gravel at the bottom of each hole. The pre-soaking was completed after all of the water had percolated through each test hole or after 15 hours since initiating the pre-soak. Based on the results of the pre-soaking process, 30-minute readings were utilized during all of the infiltration tests, except for Infiltration Test Nos. I-24 and I-45. For Infiltration Test Nos. I-24 and I-45, 10-minute readings were utilized during the infiltration tests.

Infiltration Testing

Following the pre-soaking process of the infiltration test borings, SCG performed the infiltration testing. Each test hole was filled with water to a depth of at least 5 times the hole's radius above the gravel at the bottom of each test hole. In accordance with the Riverside County guidelines, in areas where "non-sandy soils" were encountered at the bottom of each infiltration test boring, (where 6 inches of water did not infiltrate into the surrounding soils in less than 25 minutes for two (2) consecutive readings), readings were taken at 30-minute intervals for a total of 6 hours at the test locations. At Infiltration Test Nos. I-24 and I-45, "sandy-soils" were encountered at the bottom of the test borings, (where 6 inches of water did infiltrate into the surrounding soils in less than 25 minutes for two (2) consecutive readings), therefore, readings were taken at 10-minute intervals for 1 hour at the test locations. The water level readings are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on the spreadsheets.

The infiltration rates from the test are tabulated in inches per hour. In accordance with the typically accepted practice, it is recommended that the most conservative reading from the latter part of the infiltration tests be used as the design infiltration rate. The rates are summarized below:

Infiltration Test No.	Depth (feet)	Soil Description	Measured Infiltration Rate (inches/hour)
I-11	4½	YOUNGER ALLUVIUM: Brown Silty fine to coarse Sand, trace Clay	0.2

I-12	4½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.2
I-13	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.2
I-14	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.2
I-15	10½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-16	9½	OLDER ALLUVIUM: Dark Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.2
I-17	10	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace to little Clay, trace coarse Sand	0.0
I-18	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace to little Clay, trace coarse Sand	0.0
I-19	3	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-20	3	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-21	3½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, little coarse Sand	0.4
I-22	4½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, little coarse Sand	0.3
I-23	9	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-24	9	OLDER ALLUVIUM: Brown Silty fine to coarse Sand	1.7
I-25	9	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-26	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-27	7	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace coarse Sand	0.1
I-28	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.0
I-29	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-30	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace Clay	0.1
I-31	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-32	6½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-33	6½	OLDER ALLUVIUM: Brown fine to medium Sandy Silt to Silty fine to medium Sand, trace Clay	0.1
I-34	5	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-35	4½	OLDER ALLUVIUM: Light Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-36	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.0
I-37	6½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1

I-38	6½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-39	7½	OLDER ALLUVIUM: Dark Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-40	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-41	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace Clay, trace coarse Sand	0.0
I-42	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace Clay, trace coarse Sand	0.0
I-43	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-44	4½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-45	5	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.8
I-46	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-47	7	OLDER ALLUVIUM: Brown fine to medium Sandy Silt, little Clay	0.1

Laboratory Testing

Moisture Content

The moisture contents for the recovered soil samples within the borings were determined in accordance with ASTM D-2216 and are expressed as a percentage of the dry weight. These test results are presented on the Boring Logs.

Grain Size Analysis

The grain size distribution of selected soils collected from the bottom of each infiltration test boring have been determined using a range of wire mesh screens. These tests were performed in general accordance with ASTM D-422 and/or ASTM D-1140. The weight of the portion of the sample retained on each screen is recorded and the percentage finer or coarser of the total weight is calculated. The results of these tests are presented on Plates C-1 through C-37 of this report.

Design Recommendations

Thirty-seven (37) infiltration tests were performed at the subject site. As noted above, the calculated infiltration rates at the infiltration test locations range between 0.0 and 1.7 inches per hour. The major factors affecting the lack of infiltration at these locations are the presence of very dense older alluvium with high contents of fine-grained soil. **Based on these conditions and the results of infiltration testing we recommend the following design infiltration rates to be utilized for the proposed infiltration systems:**

Infiltration System(s)	Infiltration Test Nos.	Infiltration Test Depth (ft)	Infiltration System Type	Infiltration System Location	Design Infiltration Rate (inches/hour)
"A"	I-11	4½	Bio-Retention Basin	West	Not Recommended
"B"	I-12	4½	Bio-Retention Basin	West	Not Recommended
"C"	I-13	5½	Below-Grade Chamber	West	Not Recommended
"D"	I-14	7½	Below-Grade Chamber	Northwest	Not Recommended
"E"	I-15 through I-17	9½ to 10½	Bio-Retention Basin	North	Not Recommended
"F"	I-18	7½	Below-Grade Chamber	North	Not Recommended
"G"	I-19 through I-22	3 to 4½	Bio-Retention Basin	South	Not Recommended
"H"	I-23, I-24	9	Bio-Retention Basin	South	Not Recommended
"I" & "J"	I-25 through I-33	5½ to 9	Bio-Retention Basin	Northeast	Not Recommended
"K"	I-34 through I-36	4½ to 5½	Below-Grade Chamber	Southeast	Not Recommended
"L"	I-37	6½	Below-Grade Chamber	Southeast	Not Recommended
"M"	I-38, I-39	6½ to 7½	Below-Grade Chamber	Southeast	Not Recommended
"N"	I-40	7½	Below-Grade Chamber	Northeast	Not Recommended
"O"	I-41	6	Below-Grade Chamber	Northeast	Not Recommended
"P"	I-42	6	Below-Grade Chamber	Northeast	Not Recommended
"Q"	I-43	6	Below-Grade Chamber	Northeast	Not Recommended
"R"	I-44	4½	Below-Grade Chamber	Northeast	Not Recommended*
"S"	I-45	5	Below-Grade Chamber	Northeast	Not Recommended
"T"	I-46	5½	Below-Grade Chamber	Northeast	Not Recommended
"U"	I-47	7	Below-Grade Chamber	Northeast	Not Recommended

*Although the test results indicate an infiltration rate of 0.8 in/hr at this location, the subsurface soil profile at this site includes many soil layers with low permeability. Soil layers with some capacity for infiltration, such as the silty sand layer encountered at Infiltration test-location I-44, are generally interbedded between low permeability soil layers, based on our review of the boring logs for the overall site. Therefore, long-term infiltration is not considered to feasible.

Although infiltration is not considered feasible, the client may desire to use storm water disposal systems that do not rely on infiltration at this site. The design of the proposed storm water

disposal systems should be performed by the project civil engineer, in accordance with the City of Perris, and/or County of Riverside guidelines. However, it is recommended that the system be constructed so as to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the system.

Infiltration Rate Considerations

The infiltration rates presented herein were determined in accordance with the Riverside County guidelines and are considered valid only for the time and place of the actual test. Varying subsurface conditions will exist in other areas of the site, which could alter the recommended infiltration rates presented above. The infiltration rates will decline over time between maintenance cycles as silt or clay particles accumulate on the BMP surface. The infiltration rate is highly dependent upon a number of factors, including density, silt and clay content, grainsize distribution throughout the range of particle sizes, and particle shape. Small changes in these factors can cause large changes in the infiltration rates.

Infiltration rates are based on unsaturated flow. As water is introduced into soils by infiltration, the soils become saturated and the wetting front advances from the unsaturated zone to the saturated zone. Once the soils become saturated, infiltration rates become zero, and water can only move through soils by hydraulic conductivity at a rate determined by pressure head and soil permeability. Changes in soil moisture content will affect the infiltration rate. Infiltration rates should be expected to decrease until the soils become saturated. Soil permeability values will then govern groundwater movement. Permeability values may be on the order of 10 to 20 times less than infiltration rates. The system designer should incorporate adequate factors of safety and allow for overflow design into appropriate traditional storm drain systems, which would transport storm water off-site.

Location of Infiltration Systems

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration area could potentially be damaged due to saturation of the subgrade soils. **Any proposed infiltration systems for this site should be located at least 25 feet away from any structures, including retaining walls.** Even with this provision of locating the infiltration system at least 25 feet from the building(s), it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration system.

The infiltration system designer should also give special consideration to the effect that the proposed infiltration systems may have on nearby subterranean structures, open excavations, or descending slopes. In particular, infiltration systems should not be located near the crest of descending slopes, particularly where the slopes are comprised of granular soils. Such systems will require specialized design and analysis to evaluate the potential for slope instability, piping failures and other phenomena that typically

apply to earthen dam design. This type of analysis is beyond the scope of this infiltration test report, but these factors should be considered by the infiltration system designer when locating the infiltration systems.

General Comments

This report has been prepared as an instrument of service for use by the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, structural engineer, and/or civil engineer. The design of the proposed storm water infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rate contained herein, the civil engineer agrees to indemnify, defend, and hold harmless the geotechnical engineer for all aspects of the design and performance of the proposed storm water infiltration system. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur.

The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between boring locations and testing depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted. The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

Closure

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

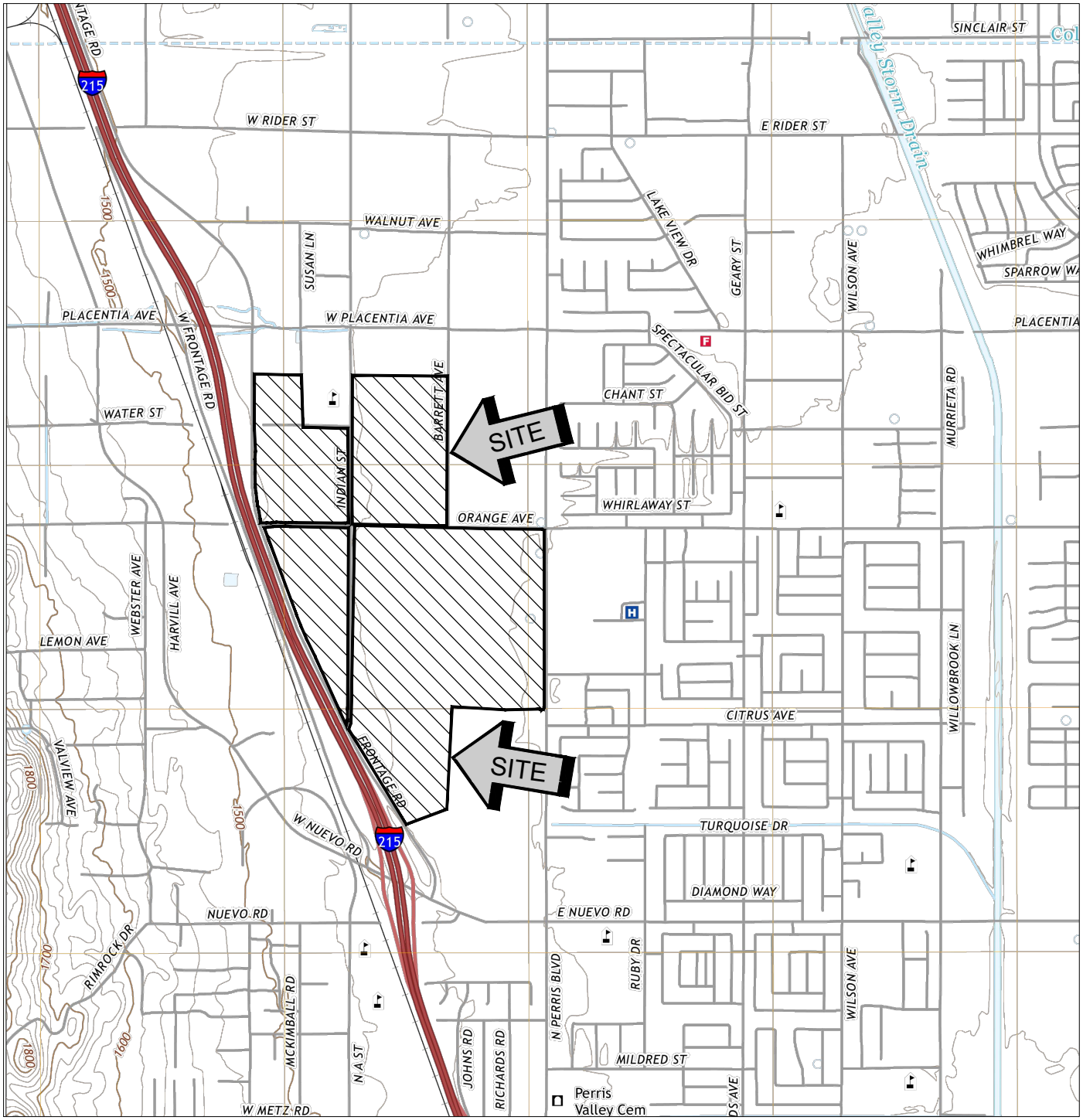
SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

Ryan Bremer
Staff Geologist

Daniel W. Nielsen, GE 3166
Senior Engineer

Distribution: (1) Addressee

Enclosures: Plate 1 - Site Location Map
Plate 2 - Infiltration Test Location Plan
Boring Log Legend and Logs (39 pages)
Infiltration Test Results Spreadsheets (37 pages)
Grain Size Distribution Graphs (37 pages)



SOURCE: USGS TOPOGRAPHIC MAP OF THE PERRIS QUADRANGLE, RIVERSIDE COUNTY, CALIFORNIA, 2021

SITE LOCATION MAP

HARVEST LANDING INDUSTRIAL DEVELOPMENT

PERRIS, CALIFORNIA

SCALE: 1" = 2000'	
DRAWN: RB CHKD: RGT	
SCG PROJECT 22G183-4	
PLATE 1	

SOUTHERN CALIFORNIA GEOTECHNICAL

GEOTECHNICAL LEGEND

- APPROXIMATE INFILTRATION TEST LOCATION
- CONCURRENT BORING LOCATION (SCG PROJECT NO. 22G183-3)
- PREVIOUS BORING LOCATION (SCG PROJECT NO. 22G183-1)
- PREVIOUS INFILTRATION LOCATION (SCG PROJECT NO. 22G183-2)
- PREVIOUS INFILTRATION LOCATION (SCG PROJECT NO. 22G183-2)
- PREVIOUS BORING LOCATION (SCG PROJECT NO. 22G183-2)
- PROPOSED BUILDING
- PROPOSED INFILTRATION SYSTEM LOCATION
- EXISTING STRUCTURE

NOTE: CONCEPTUAL GRADING PLAN PREPARED BY FMCIVIL ENGINEERING.

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SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

NORTH
SoCalGeo

SCALE: 1" = 200'
DRAWN: RB
CHKD: RGT
SCG PROJECT 22G183-4

INFILTRATION TEST LOCATION PLAN

HARVEST LANDING INDUSTRIAL DEVELOPMENT
PERRIS, CALIFORNIA

PLATE 2

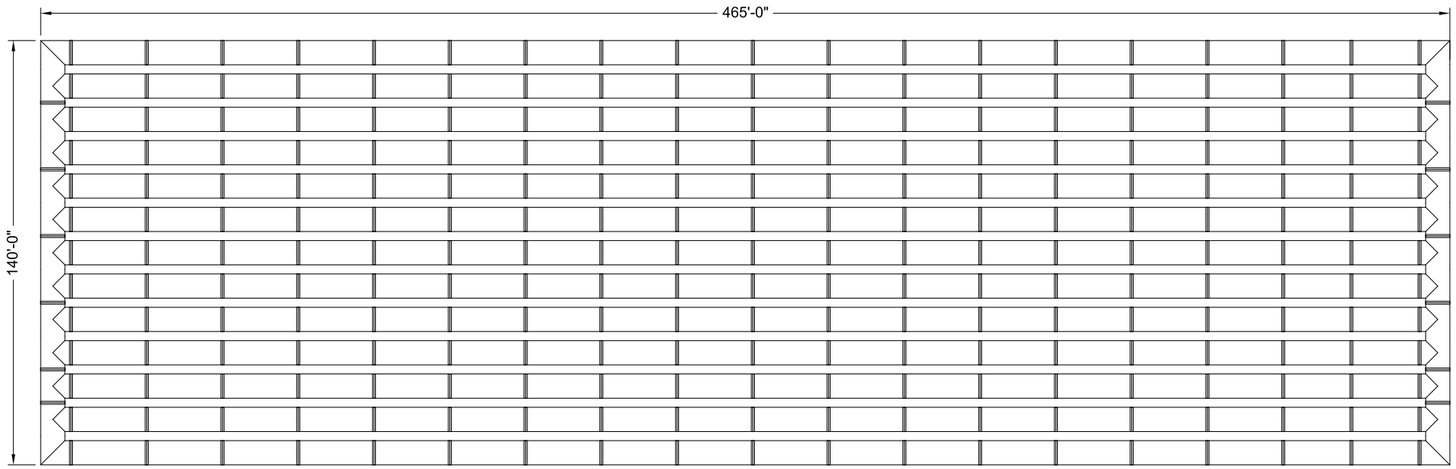
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 6,117 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 307,474 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 307,474 CF

PIPE DETAILS
- DIAMETER = 96"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 36"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"



NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2⅔" x ½" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

ASSEMBLY

SCALE: 1" = 50'

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DATE	REVISION DESCRIPTION	BY

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CONTECH® CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

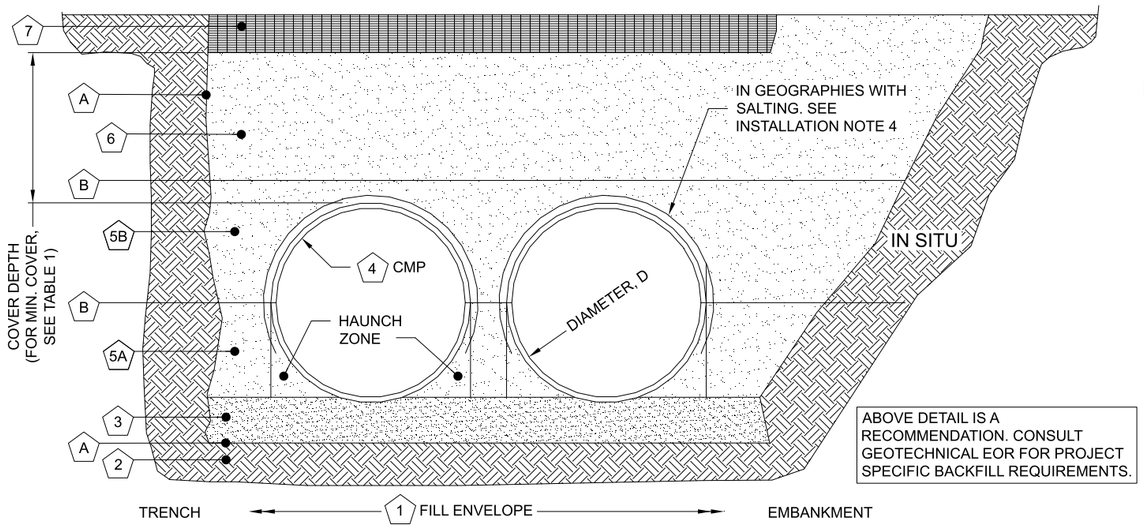
DYO36259 20-001 Harvest Landing Retail Center and Business Park
Site 1 - Northerly Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
24611	36259	10/4/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

TABLE 1:

DIAMETER, D	MIN. COVER	CORR. PROFILE
6"-10"	12"	1 1/2" x 1/4"
12"-48"	12"	2 2/3" x 1/2"
>48"-96"	12"	3" x 1", 5" x 1"
>96"	D/8	3" x 1", 5" x 1"

- STRUCTURAL BACKFILL MUST EXTEND TO LIMITS OF THE TABLE
- TOTAL HEIGHT OF COMPACTED COVER FOR CONVENTIONAL HIGHWAY LOADS IS MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TOP OF RIGID PAVEMENT
- ULTRAFLO ALSO AVAILABLE FOR SIZES 18" - 120" WITH 3/4"x 3/4"x 7 1/2" CORRUGATION



ABOVE DETAIL IS A RECOMMENDATION. CONSULT GEOTECHNICAL EOR FOR PROJECT SPECIFIC BACKFILL REQUIREMENTS.

MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT

INSTALLATION NOTES

1. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES.
2. OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.
3. BACKFILL USING CONTROLLED LOW-STRENGTH MATERIAL (CLSM, "FLASH FILL" OR "FLOWABLE FILL") MAY BE USED WHEN THE SPACING BETWEEN THE PIPES WILL NOT ALLOW FOR PLACEMENT AND ADEQUATE COMPACTION OF THE BACKFILL. CONTACT CONTECH FOR FURTHER EVALUATION.
4. IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, A GEOMEMBRANE BARRIER IS RECOMMENDED OVER THE UPPER HALF OF THE PIPE. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

TABLE 2: SOLID STANDARD

CMP DETENTION AND CMP DRAINAGE STANDARD BACKFILL SPECIFICATIONS

	MATERIAL LOCATION	MATERIAL SPECIFICATION	DESCRIPTION	
1	FILL ENVELOPE WIDTH	PER ENGINEER OF RECORD	MINIMUM TRENCH WIDTH MUST ALLOW ROOM FOR PROPER COMPACTION OF HAUNCH MATERIALS UNDER THE PIPE. THE SUGGESTED MINIMUM TRENCH WIDTH, OR EOR RECOMMENDATION: PIPE ≤ 12": D + 16" PIPE > 12": 1.5D + 12"	MINIMUM EMBANKMENT WIDTH (IN FEET) FOR INITIAL FILL ENVELOPE: PIPE < 24": 3.0D PIPE 24" - 144": D + 4'0" PIPE > 144": D + 10'0"
2	FOUNDATION	**AASHTO 26.5.2** OR PER ENGINEER OF RECORD	PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND FOUNDATION BROUGHT BACK TO GRADE WITH A FILL MATERIAL APPROVED BY THE ENGINEER OF RECORD.	
3	BEDDING	**AASHTO M 43: 3, 357, 4, 467, 5, 56, 57** (APPROVED REGIONAL EQUIVALENTS INCLUDE CA-7)	ENGINEER OF RECORD TO DETERMINE IF BEDDING IS REQUIRED. PIPE MAY BE PLACED ON THE TRENCH BOTTOM OF A RELATIVELY LOOSE, NATIVE SUITABLE WELL GRADED GRANULAR MATERIAL THAT IS ROUGHLY SHAPED TO FIT THE BOTTOM OF THE PIPE, 2" MIN DEPTH. THE BEDDING MATERIAL MAY BE SUITABLE FOUNDATION SOILS CONFORMING TO AASHTO SOIL CLASSIFICATIONS A1, A2, OR A3 WITH MAXIMUM PARTICLE SIZE OF 3" PER AASHTO 26.3.8.1	
4	CORRUGATED METAL PIPE			
5A	CRITICAL BACKFILL	**AASHTO M 145: A-1, A-2, A-3** *	HAUNCH ZONE MATERIAL SHALL BE HAND SHOVELED OR SHOVEL SLICED INTO PLACE TO ALLOW FOR PROPER COMPACTION WITHOUT SOFT SPOTS. BACKFILL SHALL BE PLACED IN 8" +/- LOOSE LIFTS AND COMPACTED TO 90% STANDARD PROCTOR PER AASHTO T 99. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A THREE LIFT (24") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHOULD BE ADVANCED ALONG THE LENGTH OF THE SYSTEM TO AVOID DIFFERENTIAL LOADING. WELL GRADED GRANULAR MATERIAL WHICH MAY CONTAIN SMALL AMOUNTS OF SILT OR CLAY AND MAXIMUM PARTICLE SIZE OF 3" (PER AASHTO 26.3.8.1 AND 12.4-1.3).	
5B	BACKFILL	**AASHTO M 145: A-1, A-2, A-3**		
6	COVER MATERIAL	UP TO MIN. COVER - SEE 5A AND 5B ABOVE ABOVE MIN. COVER - PER ENGINEER OF RECORD	COVER MATERIAL MAY INCLUDE NON-BITUMINOUS, GRANULAR ROAD BASE MATERIAL WITHIN MIN COVER LIMITS	
7	RIGID OR FLEXIBLE PAVEMENT (IF APPLICABLE)	PER ENGINEER OF RECORD	FLEXIBLE PAVEMENT SHOULD NOT BE COUNTED AS PART OF THE FILL HEIGHT OVER THE CMP. FINAL BACKFILL MATERIAL SELECTION AND COMPACTION REQUIREMENTS SHALL FOLLOW THE PROJECT PLANS AND SPECIFICATIONS PER THE ENGINEER OF RECORD.	
A	OPTIONAL SIDE GEOTEXTILE	NONE	GEOTEXTILE LAYER IS RECOMMENDED ON SIDES OF EXCAVATION TO PREVENT SOIL MIGRATION.	
B	OPTIONAL GEOTEXTILE BETWEEN LAYERS	NONE	IF SOIL TYPES DIFFER AT ANY POINT ABOVE PIPE INVERT, A GEOTEXTILE LAYER IS RECOMMENDED TO BE PLACED BETWEEN THE LAYERS TO PREVENT SOIL MIGRATION.	

NOTES:
- FOR MULTIPLE BARREL INSTALLATIONS, THE RECOMMENDED STANDARD SPACING BETWEEN PARALLEL PIPE RUNS SHALL BE THE PIPE DIAMETER /2 BUT NO LESS THAN 12" FOR DIAMETERS <72". FOR 72" AND LARGER DIAMETERS, THE MINIMUM SPACING IS 36". CONTACT YOUR CONTECH REPRESENTATIVE FOR NONSTANDARD SPACING.

* APPROVED REGIONAL EQUIVALENTS FOR SECTION 5A INCLUDE CA-7, CODOT #67, MIDOT 2G, 34G, OR 21AA STONE OR GRAVEL; #8; #57; MIDOT 6A, 2G, 3G, 34G.

MANUFACTURER RECOMMENDED BACKFILL

NOT TO SCALE

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CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO36259 20-001 Harvest Landing Retail Center and Business Park
Site 1 - Northerly Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
24611	36259	10/4/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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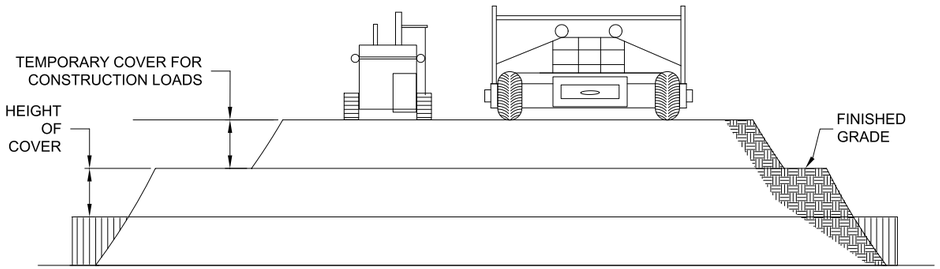


CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

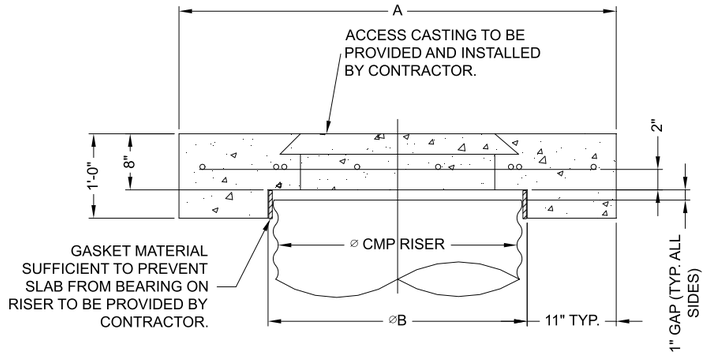
APPLICABLE POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

APPLICABLE
HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.
REQUIREMENTS
INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

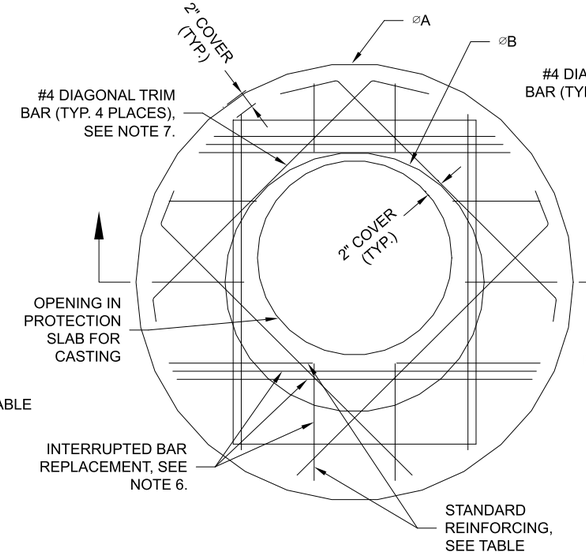
NOTE:
THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.



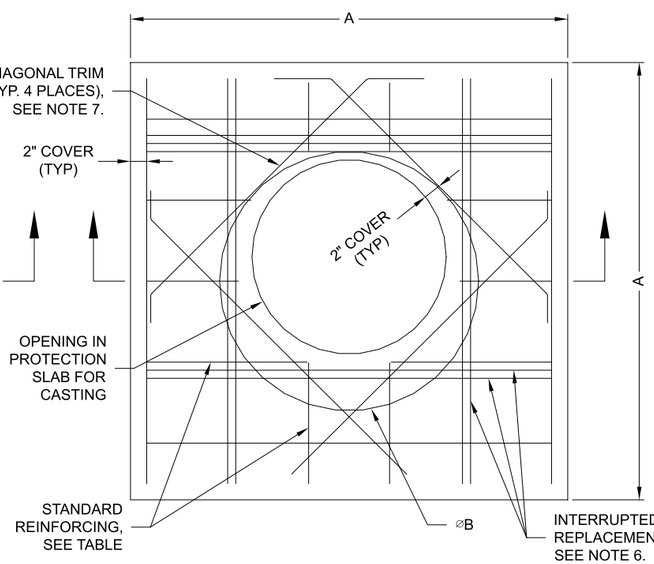
SECTION VIEW

REINFORCING TABLE				
⌀ CMP RISER	A	⌀ B	REINFORCING	**BEARING PRESSURE (PSF)
24"	⌀ 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	⌀ 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	⌀ 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	⌀ 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	⌀ 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

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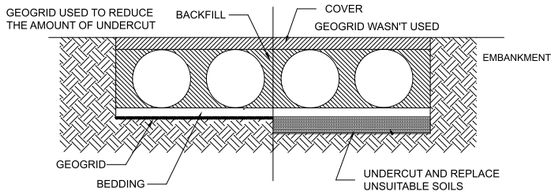
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

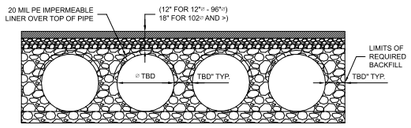
IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.



GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

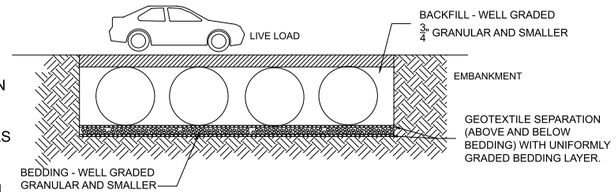
THE RESISTIVITY OF A PROJECT SITE MAY CHANGE OVER TIME DUE TO THE USE OF VARIOUS SALTING, DE-ICING, AND AGRICULTURAL AGENTS APPLIED ON OR NEAR THE AREA. TO MITIGATE THE POTENTIAL IMPACT OF THESE AGENTS, AN HDPE MEMBRANE LINER WILL BE INSTALLED ON THE CROWN OF EACH PIPE, CREATING AN IMPERMEABLE BARRIER. THIS MEASURE IS DESIGNED TO PROTECT THE SYSTEM FROM ENVIRONMENTAL CHANGES THAT COULD LEAD TO PREMATURE CORROSION AND REDUCE THE OVERALL SERVICE LIFE.



IN-SITU TRENCH WALL

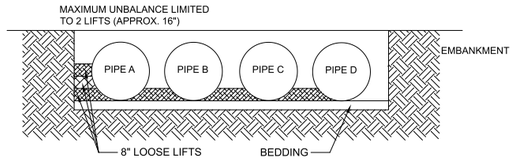
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



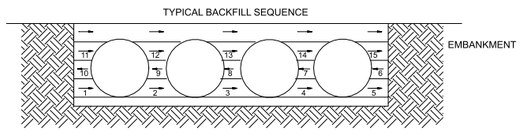
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

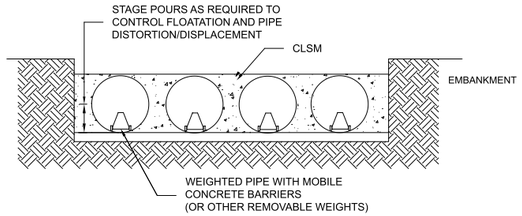


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

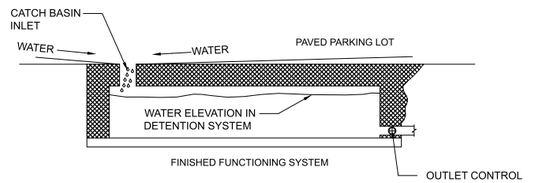


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

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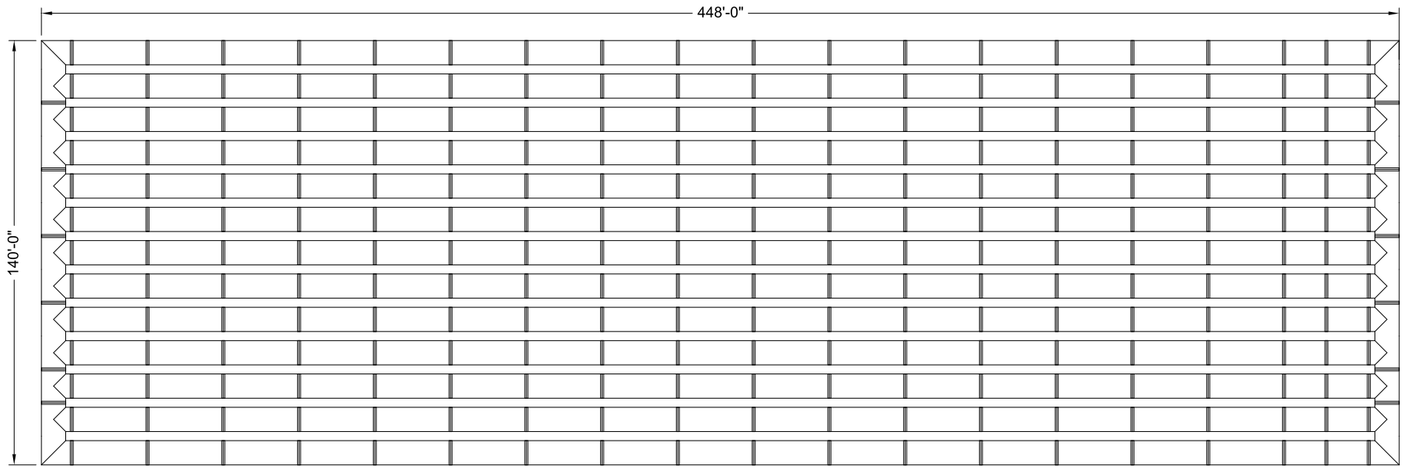
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 5,896 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 296,365 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 296,365 CF

PIPE DETAILS
- DIAMETER = 96"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 36"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"



NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE $2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
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ASSEMBLY
SCALE: 1" = 50'

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CONTECH® CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

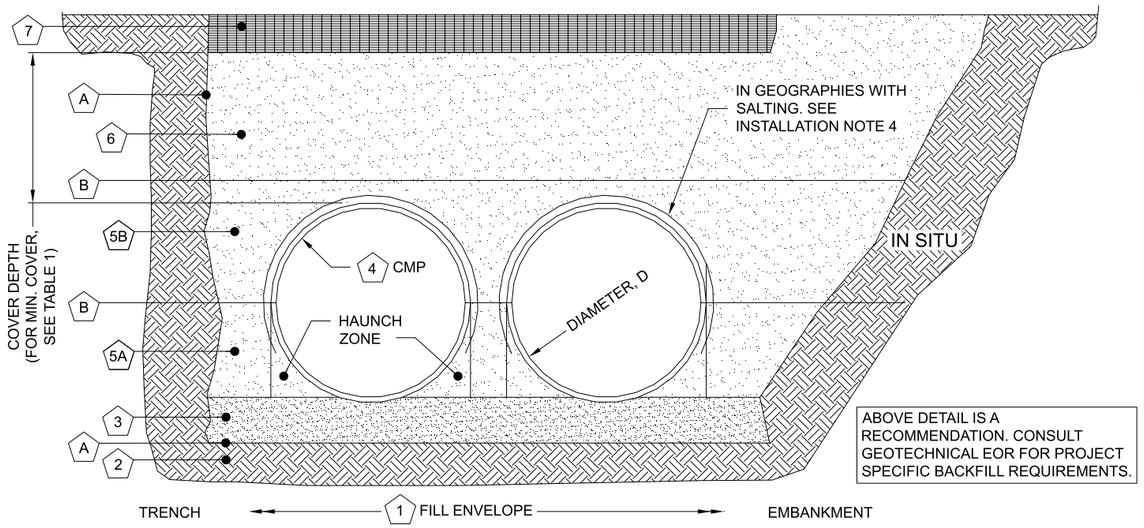
DYO36256 20-001 Harvest Landing Retail Center and Business Park
Site 1-Southerly Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
24609	36256	10/2/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

TABLE 1:

DIAMETER, D	MIN. COVER	CORR. PROFILE
6"-10"	12"	1 1/2" x 1/4"
12"-48"	12"	2 2/3" x 1/2"
>48"-96"	12"	3" x 1", 5" x 1"
>96"	D/8	3" x 1", 5" x 1"

- STRUCTURAL BACKFILL MUST EXTEND TO LIMITS OF THE TABLE
- TOTAL HEIGHT OF COMPACTED COVER FOR CONVENTIONAL HIGHWAY LOADS IS MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TOP OF RIGID PAVEMENT
- ULTRAFLO ALSO AVAILABLE FOR SIZES 18" - 120" WITH 3/4"x 3/4"x 7 1/2" CORRUGATION



MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT

INSTALLATION NOTES

1. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES.
2. OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.
3. BACKFILL USING CONTROLLED LOW-STRENGTH MATERIAL (CLSM, "FLASH FILL" OR "FLOWABLE FILL") MAY BE USED WHEN THE SPACING BETWEEN THE PIPES WILL NOT ALLOW FOR PLACEMENT AND ADEQUATE COMPACTION OF THE BACKFILL. CONTACT CONTECH FOR FURTHER EVALUATION.
4. IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, A GEOMEMBRANE BARRIER IS RECOMMENDED OVER THE UPPER HALF OF THE PIPE. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

TABLE 2: SOLID STANDARD

CMP DETENTION AND CMP DRAINAGE STANDARD BACKFILL SPECIFICATIONS

	MATERIAL LOCATION	MATERIAL SPECIFICATION	DESCRIPTION	
1	FILL ENVELOPE WIDTH	PER ENGINEER OF RECORD	MINIMUM TRENCH WIDTH MUST ALLOW ROOM FOR PROPER COMPACTION OF HAUNCH MATERIALS UNDER THE PIPE. THE SUGGESTED MINIMUM TRENCH WIDTH, OR EOR RECOMMENDATION: PIPE ≤ 12": D + 16" PIPE > 12": 1.5D + 12"	MINIMUM EMBANKMENT WIDTH (IN FEET) FOR INITIAL FILL ENVELOPE: PIPE < 24": 3.0D PIPE 24" - 144": D + 4'0" PIPE > 144": D + 10'0"
2	FOUNDATION	**AASHTO 26.5.2** OR PER ENGINEER OF RECORD	PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND FOUNDATION BROUGHT BACK TO GRADE WITH A FILL MATERIAL APPROVED BY THE ENGINEER OF RECORD.	
3	BEDDING	**AASHTO M 43: 3, 357, 4, 467, 5, 56, 57** (APPROVED REGIONAL EQUIVALENTS INCLUDE CA-7)	ENGINEER OF RECORD TO DETERMINE IF BEDDING IS REQUIRED. PIPE MAY BE PLACED ON THE TRENCH BOTTOM OF A RELATIVELY LOOSE, NATIVE SUITABLE WELL GRADED GRANULAR MATERIAL THAT IS ROUGHLY SHAPED TO FIT THE BOTTOM OF THE PIPE, 2" MIN DEPTH. THE BEDDING MATERIAL MAY BE SUITABLE FOUNDATION SOILS CONFORMING TO AASHTO SOIL CLASSIFICATIONS A1, A2, OR A3 WITH MAXIMUM PARTICLE SIZE OF 3" PER AASHTO 26.3.8.1	
4	CORRUGATED METAL PIPE			
5A	CRITICAL BACKFILL	**AASHTO M 145: A-1, A-2, A-3** *	HAUNCH ZONE MATERIAL SHALL BE HAND SHOVELED OR SHOVEL SLICED INTO PLACE TO ALLOW FOR PROPER COMPACTION WITHOUT SOFT SPOTS. BACKFILL SHALL BE PLACED IN 8" +/- LOOSE LIFTS AND COMPACTED TO 90% STANDARD PROCTOR PER AASHTO T 99. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A THREE LIFT (24") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHOULD BE ADVANCED ALONG THE LENGTH OF THE SYSTEM TO AVOID DIFFERENTIAL LOADING. WELL GRADED GRANULAR MATERIAL WHICH MAY CONTAIN SMALL AMOUNTS OF SILT OR CLAY AND MAXIMUM PARTICLE SIZE OF 3" (PER AASHTO 26.3.8.1 AND 12.4-1.3).	
5B	BACKFILL	**AASHTO M 145: A-1, A-2, A-3**		
6	COVER MATERIAL	UP TO MIN. COVER - SEE 5A AND 5B ABOVE ABOVE MIN. COVER - PER ENGINEER OF RECORD	COVER MATERIAL MAY INCLUDE NON-BITUMINOUS, GRANULAR ROAD BASE MATERIAL WITHIN MIN COVER LIMITS	
7	RIGID OR FLEXIBLE PAVEMENT (IF APPLICABLE)	PER ENGINEER OF RECORD	FLEXIBLE PAVEMENT SHOULD NOT BE COUNTED AS PART OF THE FILL HEIGHT OVER THE CMP. FINAL BACKFILL MATERIAL SELECTION AND COMPACTION REQUIREMENTS SHALL FOLLOW THE PROJECT PLANS AND SPECIFICATIONS PER THE ENGINEER OF RECORD.	
A	OPTIONAL SIDE GEOTEXTILE	NONE	GEOTEXTILE LAYER IS RECOMMENDED ON SIDES OF EXCAVATION TO PREVENT SOIL MIGRATION.	
B	OPTIONAL GEOTEXTILE BETWEEN LAYERS	NONE	IF SOIL TYPES DIFFER AT ANY POINT ABOVE PIPE INVERT, A GEOTEXTILE LAYER IS RECOMMENDED TO BE PLACED BETWEEN THE LAYERS TO PREVENT SOIL MIGRATION.	

NOTES:
- FOR MULTIPLE BARREL INSTALLATIONS, THE RECOMMENDED STANDARD SPACING BETWEEN PARALLEL PIPE RUNS SHALL BE THE PIPE DIAMETER /2 BUT NO LESS THAN 12" FOR DIAMETERS <72". FOR 72" AND LARGER DIAMETERS, THE MINIMUM SPACING IS 36". CONTACT YOUR CONTECH REPRESENTATIVE FOR NONSTANDARD SPACING.

* APPROVED REGIONAL EQUIVALENTS FOR SECTION 5A INCLUDE CA-7, CODOT #67, MIDOT 2G, 34G, OR 21AA STONE OR GRAVEL; #8; #57; MIDOT 6A, 2G, 3G, 34G.

MANUFACTURER RECOMMENDED BACKFILL

NOT TO SCALE

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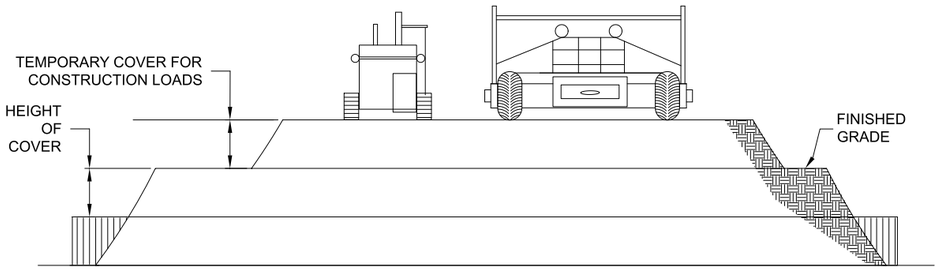


CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

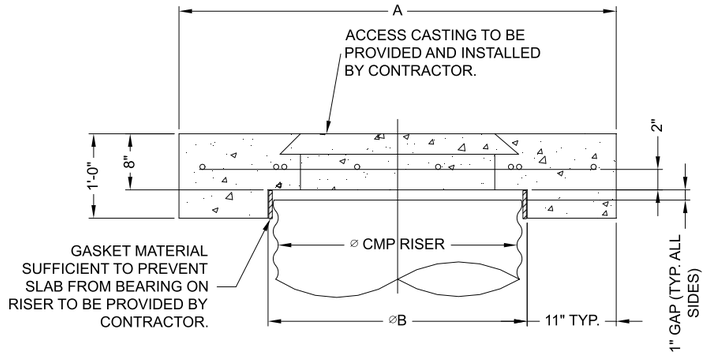
APPLICABLE POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

APPLICABLE
HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.
REQUIREMENTS
INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

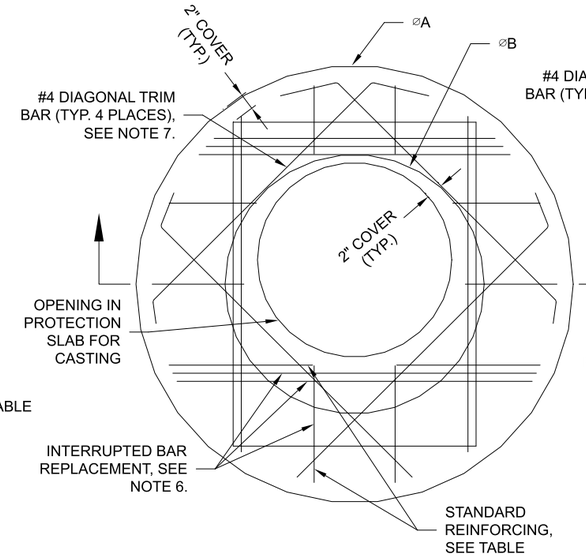
NOTE:
THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.



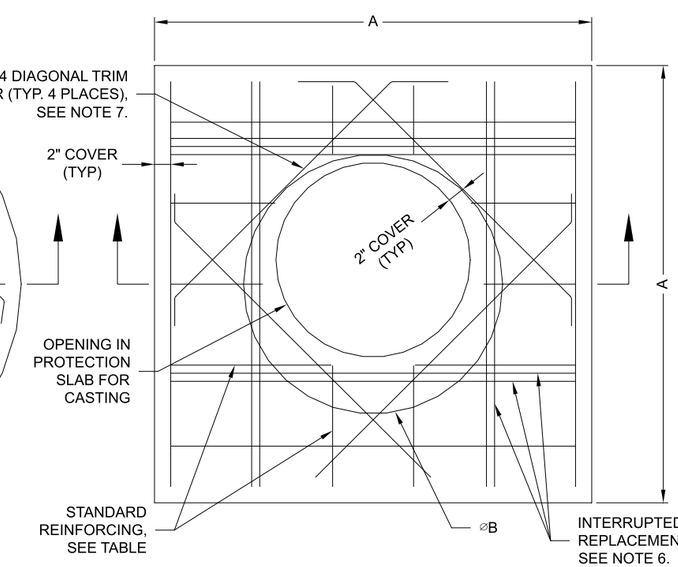
SECTION VIEW

REINFORCING TABLE				
⌀ CMP RISER	A	⌀ B	REINFORCING	**BEARING PRESSURE (PSF)
24"	⌀ 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	⌀ 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	⌀ 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	⌀ 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	⌀ 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

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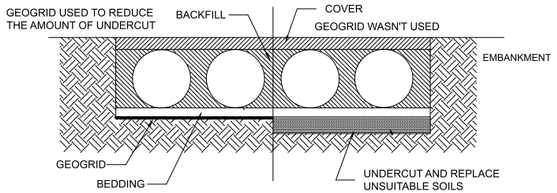
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

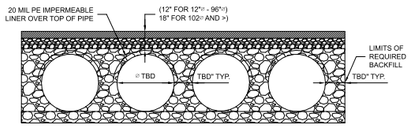
IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.



GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

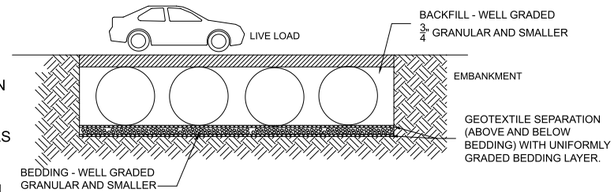
THE RESISTIVITY OF A PROJECT SITE MAY CHANGE OVER TIME DUE TO THE USE OF VARIOUS SALTING, DE-ICING, AND AGRICULTURAL AGENTS APPLIED ON OR NEAR THE AREA. TO MITIGATE THE POTENTIAL IMPACT OF THESE AGENTS, AN HDPE MEMBRANE LINER WILL BE INSTALLED ON THE CROWN OF EACH PIPE, CREATING AN IMPERMEABLE BARRIER. THIS MEASURE IS DESIGNED TO PROTECT THE SYSTEM FROM ENVIRONMENTAL CHANGES THAT COULD LEAD TO PREMATURE CORROSION AND REDUCE THE OVERALL SERVICE LIFE.



IN-SITU TRENCH WALL

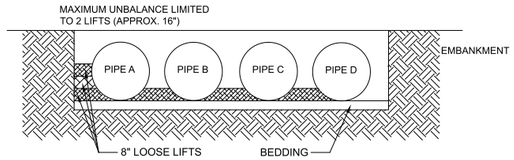
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



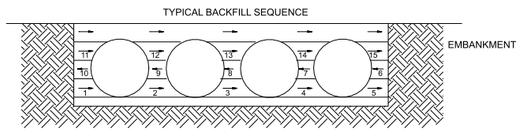
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

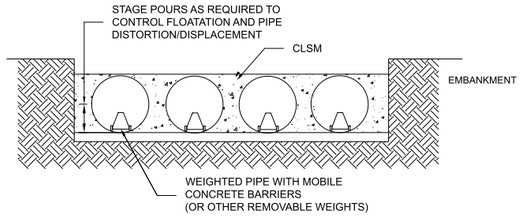


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

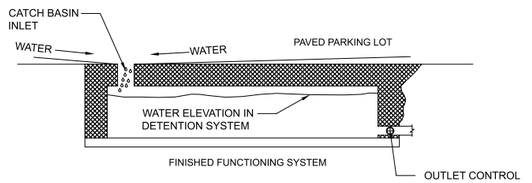


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

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DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS

CONTECH **DYODS** DRAWING

DYO36256 20-001 Harvest Landing Retail Center and Business Park
Site 1-Southerly Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
24609	36256	10/2/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

C:\EXPORTS\TEMPLATES\CMP_V10.DWG 10/18/2019 10:02 AM

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc | Date: 10/4/2024

Designed by: Hector Paez | Case No:

Company Project Number/Name: 20-001 - Site 1

BMP Identification

BMP NAME / ID: S1-1 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity: I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

	DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imprevious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
DMAs	*S1-1A*	*40526.29*	*Roofs*	*1*	*0.89*	*36149.5*			
	S1-1C	*277973.92*	*Concrete or Asphalt*	*1*	*0.892*	*247952.7*			
		318500.21	***Total***			**284102.2**	**0.20**	***1.30***	***1.386***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	FMCivil Engineers Inc	Date	10/4/2024
Designed by	Hector Paez	Case No	
Company Project Number/Name	20-001 - Site 1		

BMP Identification

BMP NAME / ID: S1-2 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S1-2A	*55315.38*	*Roofs*	*1*	*0.89*	*49341.3*			
S1-2C	*237178.68*	*Concrete or Asphalt*	*1*	*0.892*	*211563.4*			
	292494.06	***Total***			**260904.7**	**0.20**	***1.20***	***1.27***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc — Date: 10/4/2024

Designed by: Hector Paez — Case No:

Company Project Number/Name: 20-001 - Site 1

BMP Identification

BMP NAME / ID: S1-3 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity — I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S1-3A	*95990.6*	*Roofs*	*1*	*0.89*	*85623.6*			
S1-3C	*254184.8*	*Concrete or Asphalt*	*1*	*0.892*	*226732.8*			
	350175.4		***Total***		**312356.4**	**0.20**	***1.43***	***1.501***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc — Date: 10/4/2024

Designed by: Hector Paez — Case No:

Company Project Number/Name: 20-001 - Site 1

BMP Identification

BMP NAME / ID: S1-4 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

	DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Rainfall Intensity (in/hr)	Design Flow Rate (cfs)	Proposed Flow Rate (cfs)
DMAs	*S1-4A*	*0*	*Roofs*	*1*	*0.89*	*0*			
	S1-4C	*264175.33*	*Concrete or Asphalt*	*1*	*0.892*	*235644.4*			
		264175.33	***Total***			**235644.4**	**0.20**	***1.08***	***1.154***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries | Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc — Date: 10/4/2024

Designed by: Hector Paez — Case No:

Company Project Number/Name: 20-001 - Site 1

BMP Identification

BMP NAME / ID: S1-5 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

	DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
DMAs	*S1-5A*	*0*	*Roofs*	*1*	*0.89*	*0*			
	S1-5C	*117505*	*Concrete or Asphalt*	*1*	*0.892*	*104814.5*			
		117505	***Total***			**104814.5**	**0.20**	***0.48***	***0.577***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc — Date: 10/4/2024

Designed by: Hector Paez — Case No:

Company Project Number/Name: 20-001 - Site 1

BMP Identification

BMP NAME / ID: S1-6 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity — I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S1-6A	*0*	*Roofs*	*1*	*0.89*	*0*			
S1-6C	*130304.77*	*Concrete or Asphalt*	*1*	*0.892*	*116231.9*			
	130304.77	*Total*			116231.9	0.20	*0.53*	*0.577*

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc — Date: 10/4/2024

Designed by: Hector Paez — Case No:

Company Project Number/Name: 20-001 - Site 1

BMP Identification

BMP NAME / ID: S1-7 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity: I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S1-7A	*0*	*Roofs*	*1*	*0.89*	*0*			
S1-7C	*140627.27*	*Concrete or Asphalt*	*1*	*0.892*	*125439.5*			
	140627.27	***Total***			125439.5	0.20	*0.58*	*0.577*

Proposed Volume must be greater than the Design Capture Volume

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc | Date: 10/4/2024
Designed by: Hector Paez | Case No:
Company Project Number/Name: 20-001 - Site 1

BMP Identification

BMP NAME / ID: S1-8 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity: I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S1-8A	*0*	*Roofs*	*1*	*0.89*	*0*			
S1-8C	*124278.2*	*Concrete or Asphalt*	*1*	*0.892*	*110856.2*			
	124278.2	***Total***			**110856.2**	**0.20**	***0.51***	***0.577***

DMAs

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries | Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc | Date: 10/4/2024

Designed by: Hector Paez | Case No:

Company Project Number/Name: 20-001 - Site 1

BMP Identification

BMP NAME / ID: S1-9 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity: I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

	DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
DMAs	*S1-9A*	*0*	*Roofs*	*1*	*0.89*	*0*			
	S1-9C	*38340*	*Concrete or Asphalt*	*1*	*0.892*	*34199.3*			
		38340	***Total***			**34199.3**	**0.20**	***0.16***	***0.175***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	FMCivil Engineers Inc	Date	10/4/2024
Designed by	Hector Paez	Case No	
Company Project Number/Name	20-001 - Site 1		

BMP Identification

BMP NAME / ID: S1-10 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity: I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S1-10A	*36878.51*	*Roofs*	*1*	*0.89*	*32895.6*			
S1-10C	*60733.1*	*Concrete or Asphalt*	*1*	*0.892*	*54173.9*			
	97611.61		***Total***		**87069.5**	**0.20**	***0.40***	***0.462***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)

Company Name: FMCivil Engineers Inc | Date: 10/4/2024

Designed by: Hector Paez | Case No:

Company Project Number/Name: 20-001 - Site 1

BMP Identification

BMP NAME / ID: S1-11 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S1-11A	*70795.56*	*Roofs*	*1*	*0.89*	*63149.6*			
S1-11C	*29593.31*	*Concrete or Asphalt*	*1*	*0.892*	*26397.2*			
	100388.87	***Total***			**89546.8**	**0.20**	***0.41***	***0.462***

DMAs

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	FMCivil Engineers Inc	Date	10/4/2024
Designed by	Hector Paez	Case No	
Company Project Number/Name	20-001 - Site 1		

BMP Identification

BMP NAME / ID: S1-12 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S1-12A	*0*	*Roofs*	*1*	*0.89*	*0*			
S1-12C	*23273.88*	*Concrete or Asphalt*	*1*	*0.892*	*20760.3*			
	23273.88		***Total***		**20760.3**	**0.20**	***0.10***	***0.115***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc — Date: 10/4/2024
Designed by: Hector Paez — Case No:
Company Project Number/Name: 20-001 - Site 1

BMP Identification

BMP NAME / ID: S1-13 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity: I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imprevious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S1-13A	*0*	*Roofs*	*1*	*0.89*	*0*			
S1-13C	*28300.75*	*Concrete or Asphalt*	*1*	*0.892*	*25244.3*			
	28300.75	***Total***			**25244.3**	**0.20**	***0.12***	***0.144***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	FMCivil Engineers Inc	Date	10/4/2024
Designed by	Hector Paez	Case No	
Company Project Number/Name	20-001 - Site 1		

BMP Identification

BMP NAME / ID: S1-14 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S1-14A	*0*	*Roofs*	*1*	*0.89*	*0*			
S1-14C	*8629.3*	*Concrete or Asphalt*	*1*	*0.892*	*7697.3*			
	8629.3		***Total***		**7697.3**	**0.20**	***0.04***	***0.052***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries | Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc — Date: 10/4/2024

Designed by: Hector Paez — Case No:

Company Project Number/Name: 20-001 - Site 1

BMP Identification

BMP NAME / ID: S1-15 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity: I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S1-15A	*0*	*Roofs*	*1*	*0.89*	*0*			
S1-15C	*0*	*Concrete or Asphalt*	*1*	*0.892*	*0*			
	0	***Total***			**0**	**0.20**		

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc — Date: 10/4/2024

Designed by: Hector Paez — Case No:

Company Project Number/Name: 20-001 - Site 1

BMP Identification

BMP NAME / ID: S1-16 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity: I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

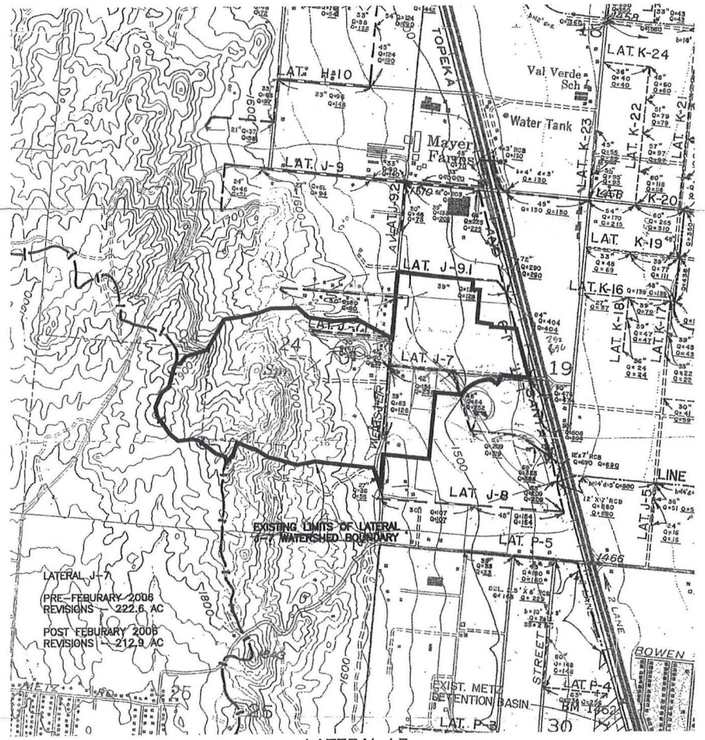
	DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
DMAs	*S1-16A*	*19615*	*Roofs*	*1*	*0.89*	*17496.6*			
	S1-16C	*337.89*	*Concrete or Asphalt*	*1*	*0.892*	*301.4*			
		19952.89	***Total***			**17798**	**0.20**	***0.08***	***0.115***

Notes:

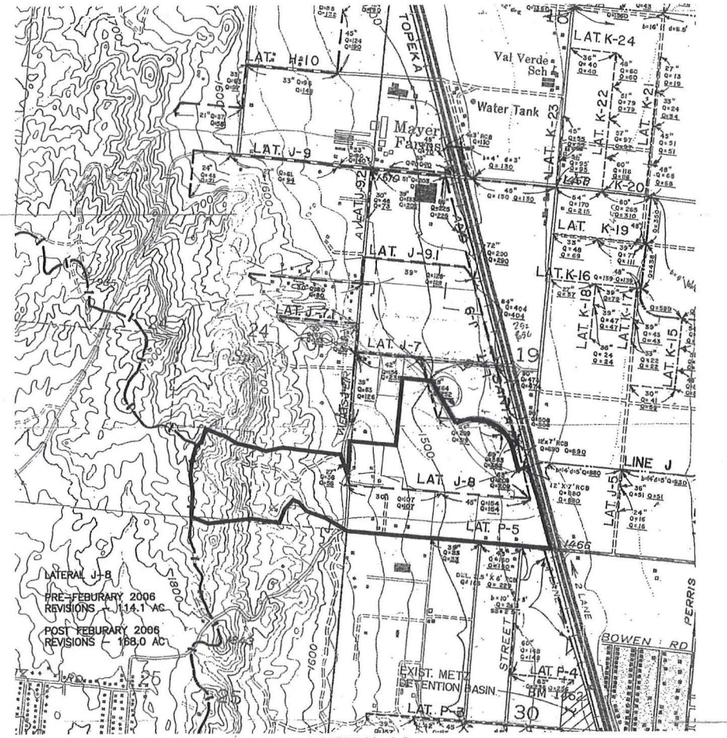
PORTION OF
8K3
1" = 1000'

REVISED HYDROLOGY MAP
PERRIS MASTER DRAINAGE PLAN

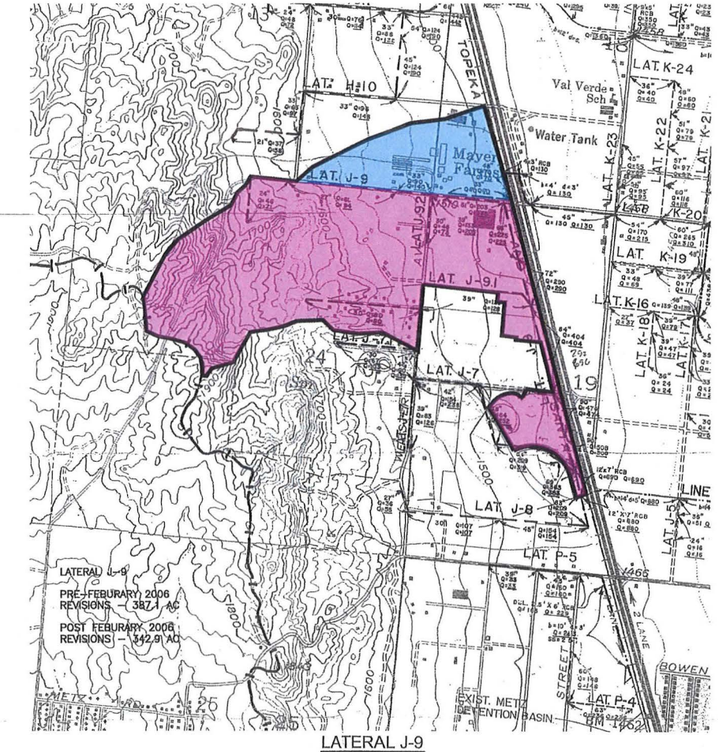
LATERALS J–7, J–8, & J–9



LATERAL J-7



LATERAL J-8



LATERAL J-9

LATERAL No.	PRE–FEBURARY 2006 REVISIONS	POST FEBURARY 2006 REVISIONS	INCREASE/DECREASE (ACRES)
LAT J–8	114.1	168.0	+53.9
LAT J–9	609.8	555.9	–53.9

LEGEND

PROPOSED LATERAL WATERSHED BOUNDARIES AFTER FEBRUARY 2006 REVISION

N

SCALE: 1"=1000'

B:\CAD\Nuevo Industrial Park - NV\PE\Exhibits\NV\P Perris MDP Hydrology map lat 7 and lat 9.dwg, 2/2/2007 1:10:00 PM, Donal Pearce

WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR GRADING PERMIT HAS BEEN ISSUED.

THE PRIVATE ENGINEER SIGNING THESE PLANS IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF THE DESIGN HEREON. IN THE EVENT OF DISCREPANCIES ARISING AFTER COUNTY APPROVAL OR DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISING THE PLANS FOR APPROVAL BY THE COUNTY.

DATE	BY	MARK	REVISIONS	APPR	DATE

ENGINEER — COUNTY

SEAL–COUNTY

REGISTERED PROFESSIONAL ENGINEER ALAN D. FRENCH No. 45702 Exp. 12–31–08 CIVIL STATE OF CALIFORNIA

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY:

ALAN D. FRENCH, P.E.
CIVIL ENGINEER, R.C.E. NO. 45702 — DATE

RECOMMENDED — DATE

SEAL–ENGINEER

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RECOMMENDED FOR APPROVAL — APPROVED BY:

PLANNING ENGINEER — CHIEF ENGINEER

DATE: — DATE:

ENGINEERING SOLUTIONS
ENGINEERING-LAND PLANNING-SURVEYING-MAPPING
2155 CHICAGO AVENUE, STE. 201
RIVERSIDE, CA. 92507
PHONE – (951) 784–0288
FAX – (951) 784–0287
PREPARED BY:

DATE EXP. 06–30–07

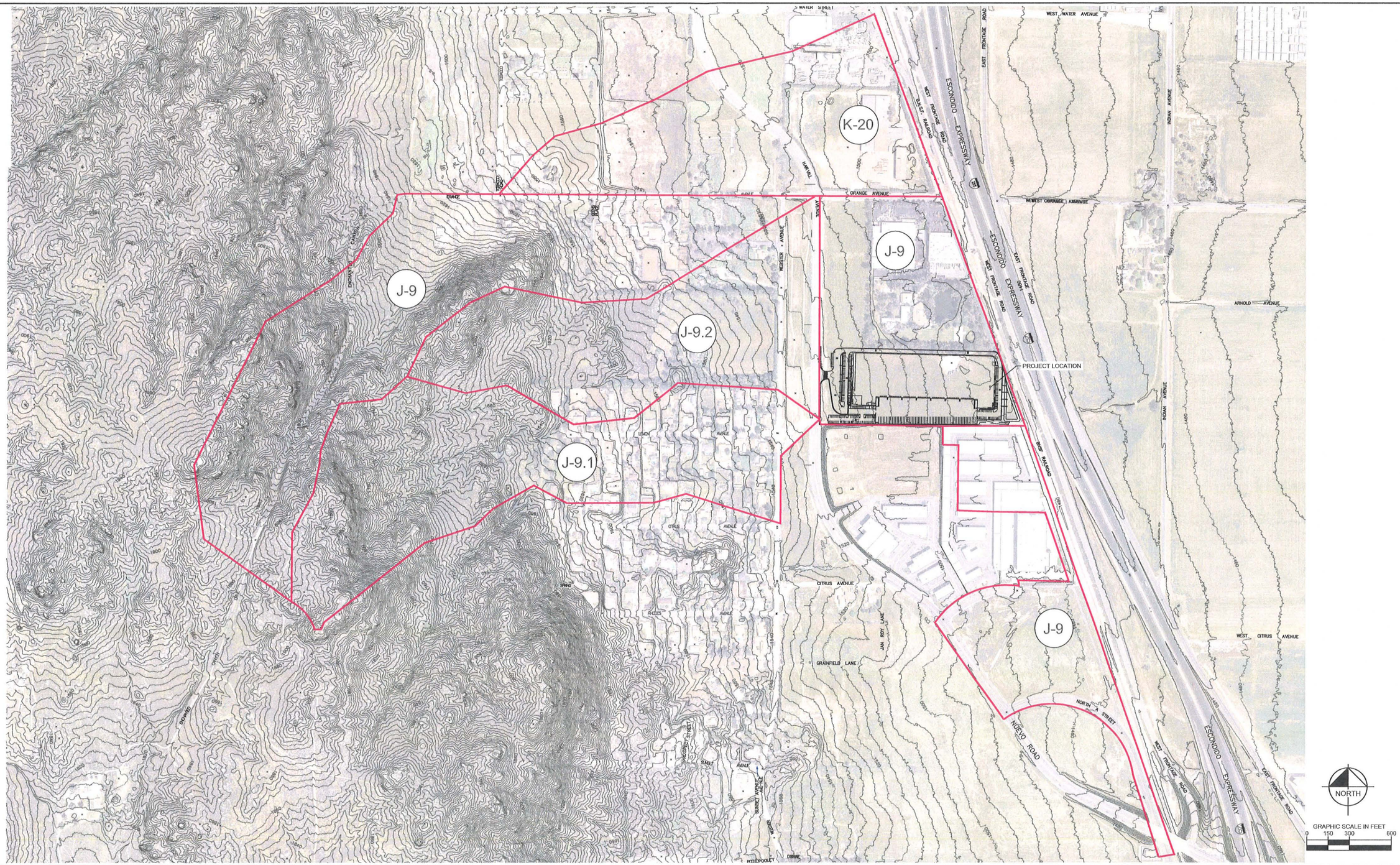
BENCHMARK:

SCALE:

I.P. No. XXXXX
COUNTY OF RIVERSIDE
REVISED HYDROLOGY MAP
PERRIS MASTER DRAINAGE PLAN
LATERALS J–7, J–8, & J–9

SHEET NO. 1 OF 1 SHTS.

FOR: | W.O. | COUNTY FILE NO.:



Kimley»Horn
401 B STREET, SUITE 600, SAN DIEGO, CA 92101
PHONE: 619-234-9411
WWW.KIMLEY-HORN.COM

RCFC MDP DRAINAGE AREA MAP LINE J-9
ROCKEFELLER HARVILL INDUSTRIAL PARK
October 9, 2020

k:\snd_ldev\rockefeller - riverside_harvill\to\rcfc\2020.10.08 - mdp letter\2020.10.09 - mdp drainage area.dwg 10/9/2020

EXHIBITS

EXHIBIT A: VICINITY MAP

EXHIBIT B: EXISTING HYDROLOGY MAP

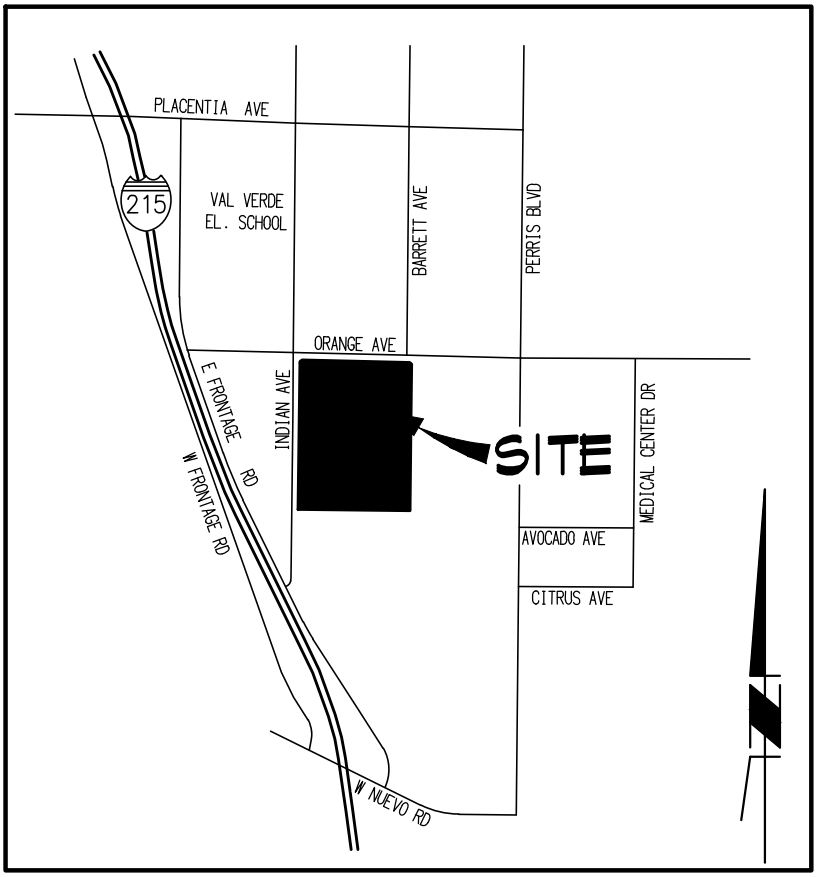
EXHIBIT C: PROPOSED HYDROLOGY MAP

EXHIBIT D: HYDROLOGIC SOILS GROUP MAP

EXHIBIT E: RCFCD MDP FACILITIES OVERLAY

EXHIBIT F: PHASE 1 OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM

EXHIBIT G: CONCEPTUAL GRADING



VICINITY MAP

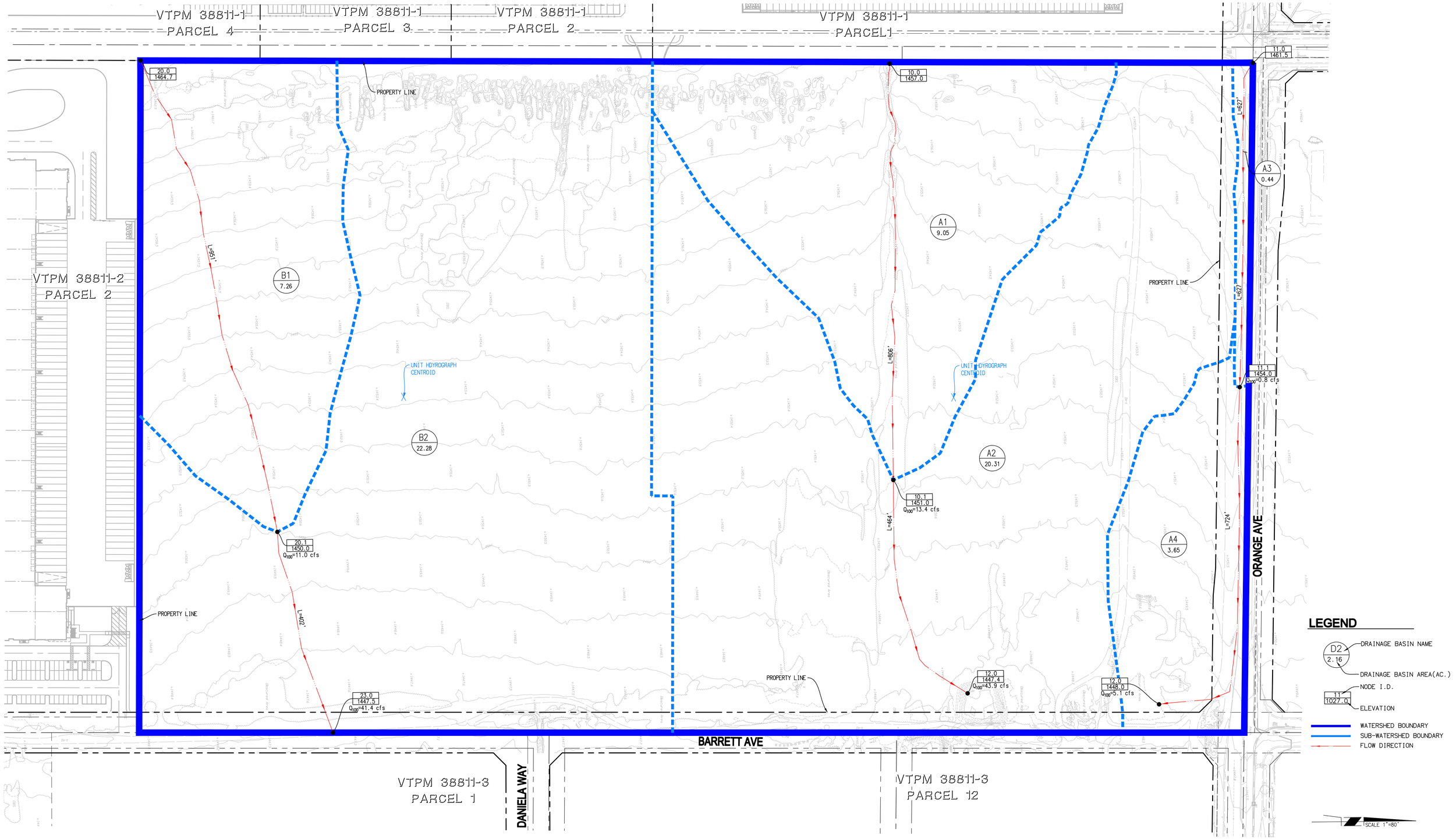
T4S, R3W, SEC 19
NOT TO SCALE

FMCIVIL ENGINEERS INC.
29995 TECHNOLOGY DRIVE, SUITE 306 | MURRIETA | CA 92563
951.331.9873 - FMCIVIL.COM

SITE 1 AT HARVEST LANDING

FIGURE 1
VICINITY MAP

H:\PDATA\20-001 HARVEST LANDING\DWGS\EXHIBITS\20-001-FEDEX-VICINITY-MAP .DWG DANNY 10/1/2024 11:02 AM



UNIT HYDROGRAPH PARAMETERS - AREA A			
L_{MC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
1,351	643	13.5	0.024

UNIT HYDROGRAPH PARAMETERS - AREA B			
L_{MC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
1,353	881	17.2	0.03

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MURRIETA | CA 92563
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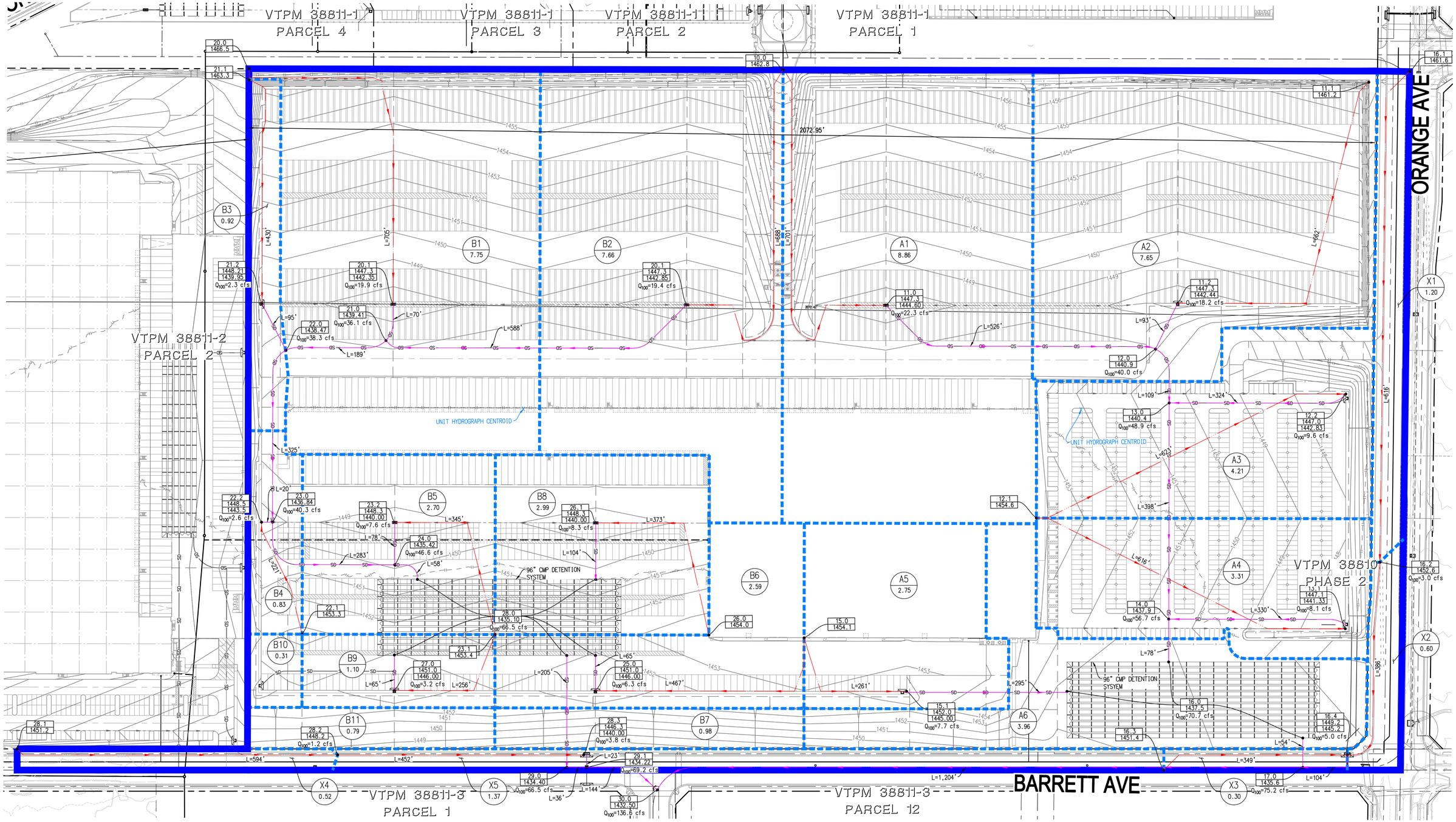
HARVEST LANDING

SITE 1 - EXISTING DRAINAGE



LEGEND

- D2 / 2.16 — DRAINAGE BASIN NAME / DRAINAGE BASIN AREA(AC.)
- 11 / 1027.0 — NODE I.D. / ELEVATION
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- FLOW DIRECTION
- PIPE FLOW DIRECTION

UNIT HYDROGRAPH PARAMETERS - AREA A

L_{WC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
1,812	1,348	25.30	0.015

UNIT HYDROGRAPH PARAMETERS - AREA B

L_{WC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
2,861	2,131	26.97	0.015

SCALE 1"=80'

80 40 0 80 160 240

SCALE: 1"=80'

FMCIVIL ENGINEERS INC.
29995 TECHNOLOGY DRIVE, SUITE 306
MURRIETA | CA 92563
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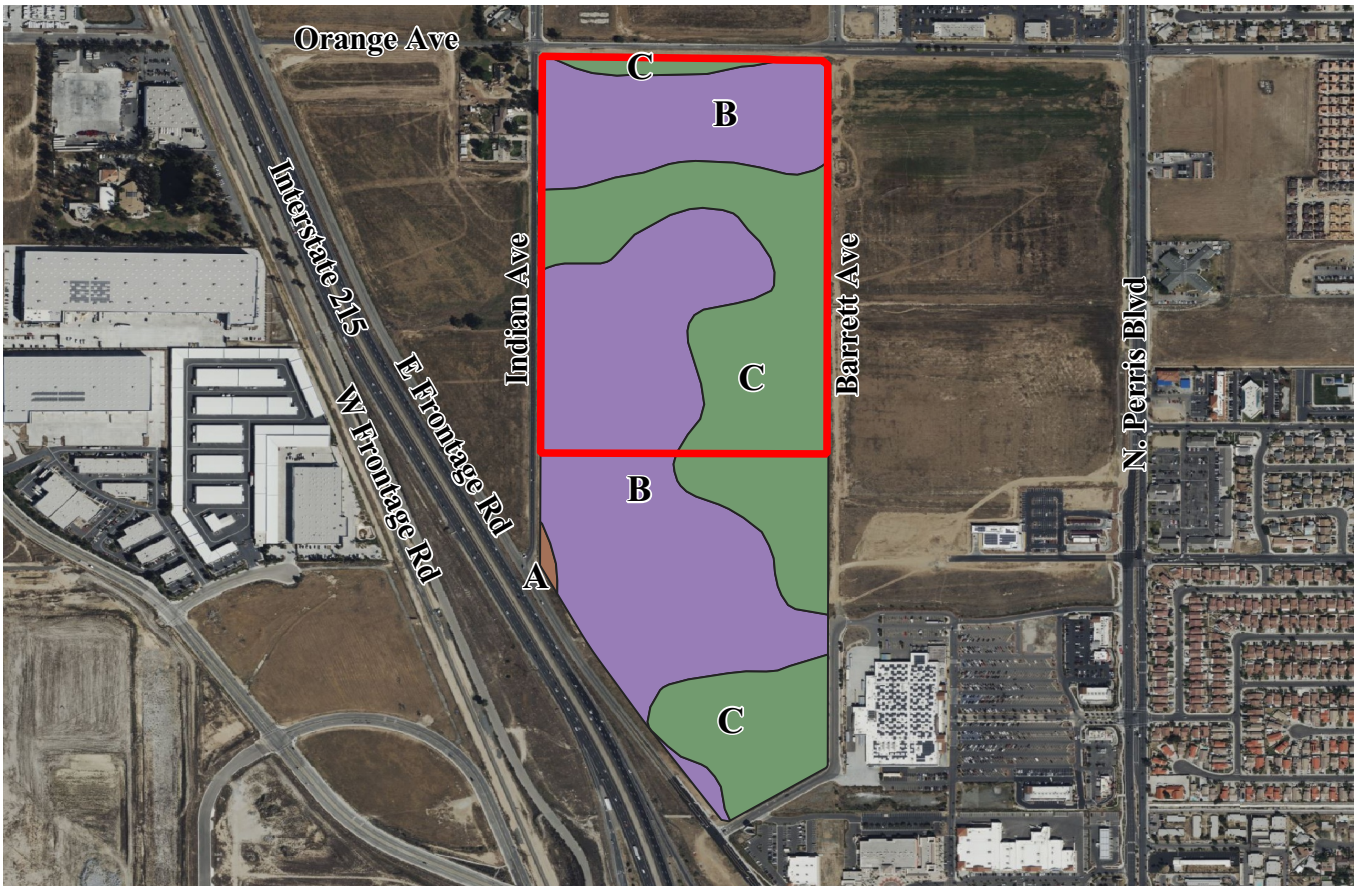
HARVEST LANDING

SITE 1 - PROPOSED DRAINAGE



LEGEND

- SITE 1 BOUNDARY
- HYDROLOGIC SOIL A
- HYDROLOGIC SOIL B
- HYDROLOGIC SOIL C

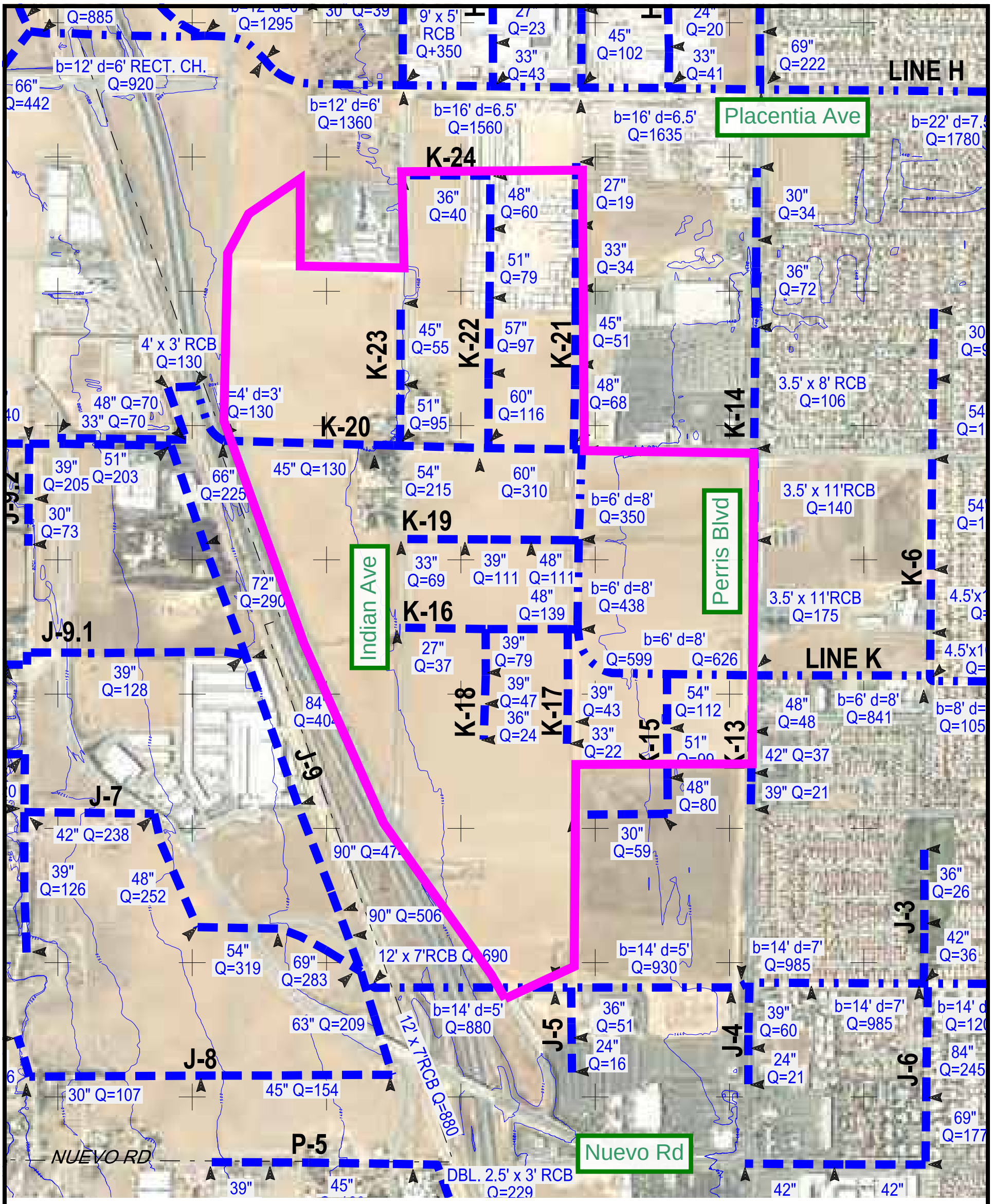
0 500 1,000 ft

FMCIVIL ENGINEERS INC.

Source: USDA Web Soil Survey

HARVEST LANDING

SITE 1 - HYDROLOGICAL SOIL GROUPS



N.T.S.

Site Boundary

MDP Facilities

Perris Harvest Landing MDP Exhibit

FMCIVIL ENGINEERS INC.

IN THE CITY OF PERRIS,
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM

VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

HOWARD INDUSTRIAL PARTNERS
1944 NORTH TUSTIN STREET, SUITE 122
ORANGE, CA 92865
CONTACT: TIM HOWARD
(TEL)714-769-9155

ENGINEER

FMCIVIL ENGINEERS INC.
29995 TECHNOLOGY DRIVE, SUITE 306
MURRIETA, CA 92563
CONTACT: FRANCISCO MARTINEZ
(TEL)951-331-9813

ARCHITECT

AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: STEPHEN PRZYBYLOWSKI
(TEL)714-639-9860

LEGEND

- RIGHT OF WAY
- (1025) EXISTING CONTOUR
- EASEMENT
- SD PROP. ONSITE STORM DRAIN SYSTEM
- SD PROP. OFFSITE STORM DRAIN SYSTEM
- PROP. STORM DRAIN LOW FLOW SYSTEM
- PROP. STORM DRAIN UNDER DRAIN SYSTEM
- W EXISTING WATER LINE
- W PROP. WATER LINE
- SS EXISTING SWR LINE
- SS PROP. SEWER LINE
- SD EXISTING STORM DRAIN PIPE
- E EXISTING OVERHEAD LINES

SCALE 1"=200'

200 100 0 200 400 600

SCALE: 1"=200'

CITY OF PERRIS

HARVEST LANDING INDUSTRIAL - PHASE I OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM EXHIBIT

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF.:	

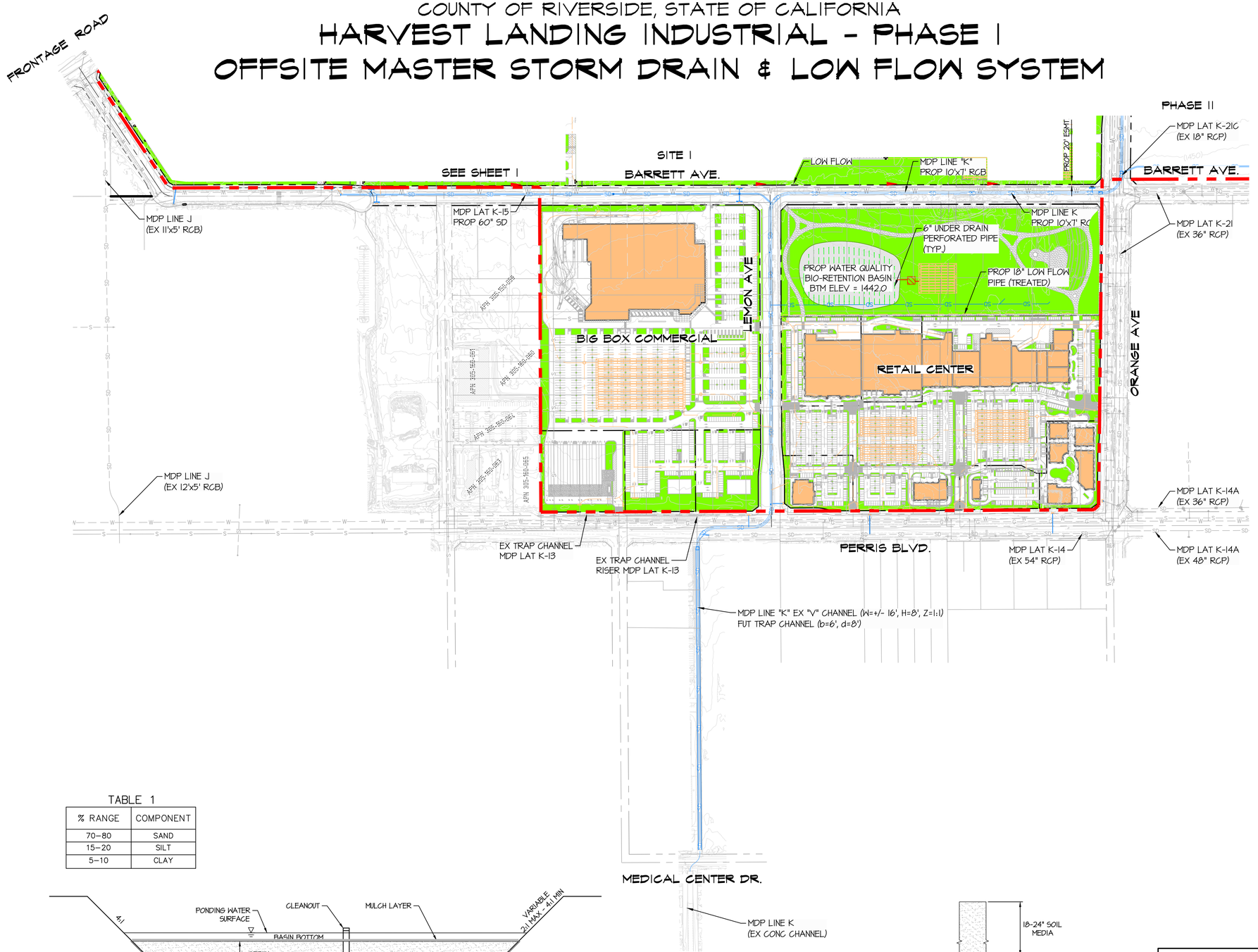
FMCIVIL ENGINEERS INC.
41870 KALMIA STREET, SUITE 120
MURRIETA, CA 92562
951.473.0202 - FMCIVIL.COM

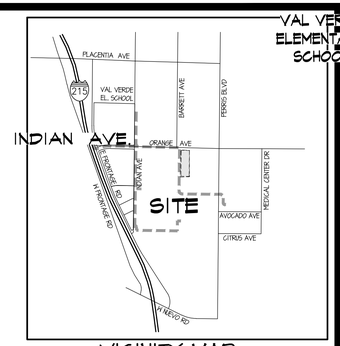
SHEET 1 OF 2 SHEETS

H:\PDATA\20-001 HARVEST LANDING\DWGS\PLDG\ENTITLEMENT\CUP\ALT-3\20-001-CUP_MSD3-01.DWG DANNY 10/7/2024 4:55 PM

COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM





VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

HOWARD INDUSTRIAL PARTNERS
1944 NORTH TUSTIN STREET, SUITE 122
ORANGE, CA 92865
CONTACT: TIM HOWARD
(TEL)714-769-9155

ENGINEER

FMCIVIL ENGINEERS INC.
29995 TECHNOLOGY DRIVE, SUITE 306
MURRIETA, CA 92563
CONTACT: FRANCISCO MARTINEZ
(TEL)951-331-9873

ARCHITECT

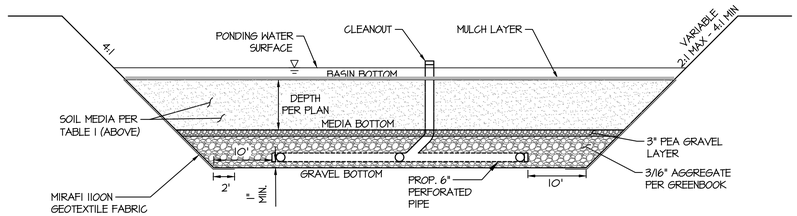
AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: STEPHEN PRZYBYLOWSKI
(TEL)714-639-9860

TABLE 1

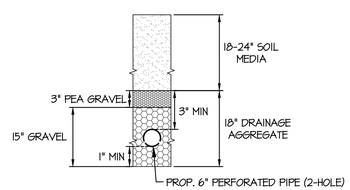
% RANGE	COMPONENT
70-80	SAND
15-20	SILT
5-10	CLAY

LEGEND

- RIGHT OF WAY
- (1025) EXISTING CONTOUR
- EASEMENT
- SD PROP. ONSITE STORM DRAIN SYSTEM
- SD PROP. OFFSITE STORM DRAIN SYSTEM
- PROP. STORM DRAIN LOW FLOW SYSTEM
- PROP. STORM DRAIN UNDER DRAIN SYSTEM
- W EXISTING WATER LINE
- W PROP. WATER LINE
- SS EXISTING SWR LINE
- SS PROP. SEWER LINE
- SD EXISTING STORM DRAIN PIPE
- E EXISTING OVERHEAD LINES



BASIN CROSS SECTION
N.T.S.



AGGREGATE CROSS SECTION
N.T.S.

SCALE 1"=200'

200 100 0 200 400 600
SCALE: 1"=200'

CITY OF PERRIS

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN
& LOW FLOW SYSTEM EXHIBIT

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF.:	

FMCIVIL ENGINEERS INC.
41870 KALMIA STREET, SUITE 120
MURRIETA | CA 92562
951.973.0202 - FMCIVIL.COM

SHEET 2 OF 2 SHEETS

H:\PDATA\20-001 HARVEST LANDING\DWGS\PLNCK\ENTITLEMENT\CUP\ALT-3\20-001-CUP_MSD3-01.DWG DANNY 10/8/2024 7:35 AM

IN THE CITY OF PERRIS,
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
SITE #1 CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-2 - PARCEL 1

LEGEND

- (1025) EXISTING CONTOUR
- 1025 PROPOSED CONTOUR
- A RETAINING WALL
- FENCE
- E SIGN
- MH MANHOLE
- RIGHT OF WAY
- EASEMENT
- PARCEL LINE
- PARCEL MAP BOUNDARY
- STREET CENTER LINE
- SCREEN WALL
- COMBINATION SCREEN/RETAINING WALL
- EXISTING LOT LINE
- RIDGE LINE
- RIBBON GUTTER
- FLOW ARROW
- PROPOSED EDGE OF PAVEMENT
- W EXISTING WATER LINE
- W PROPOSED WATER LINE
- SS EXISTING SWR LINE
- SS PROPOSED SEWER LINE
- SD EXISTING STORM DRAIN PIPE
- SD PROPOSED STORM DRAIN PIPE
- E EXISTING OVERHEAD LINES
- CUT/FILL LINE
- SLOPE SYMBOL

ZONING ORDINANCE

EXISTING ZONING:
HARVEST LANDING SPECIFIC PLANS - MULTIPLE BUSINESS USE (MBU)

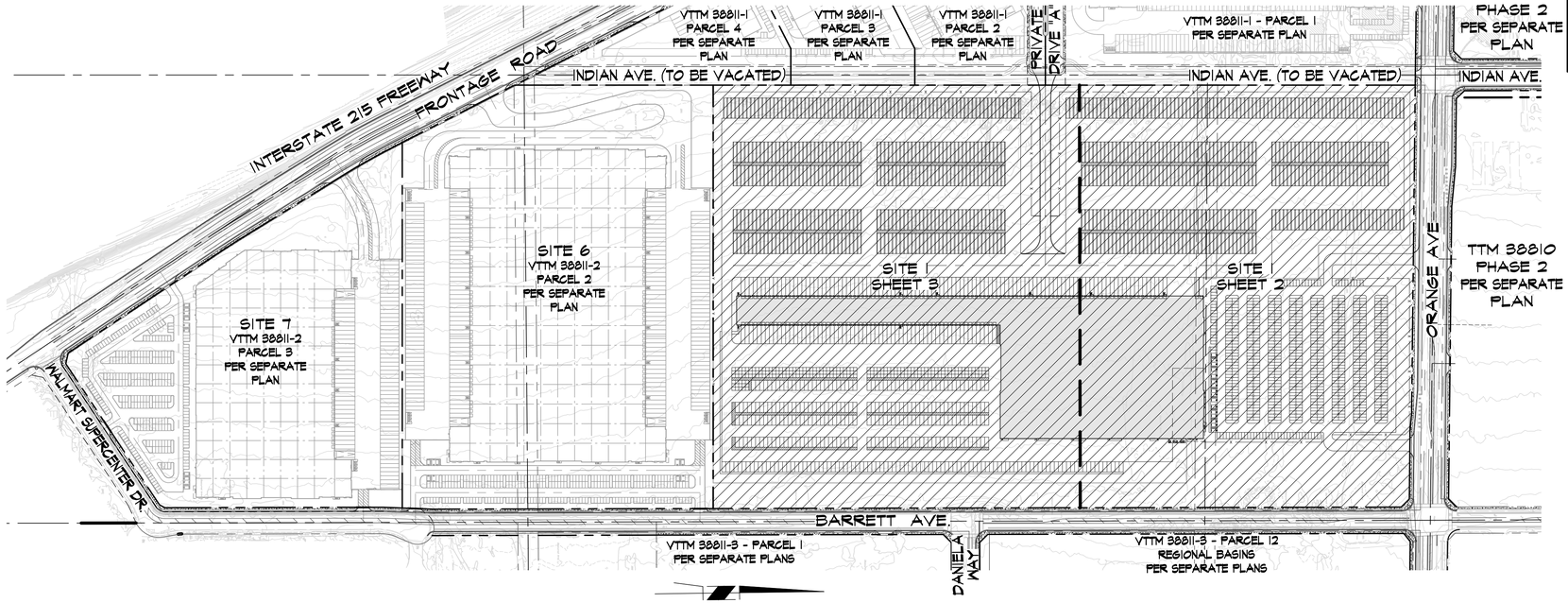
PROPOSED ZONING:
HARVEST LANDING SPECIFIC PLANS - MULTIPLE BUSINESS USE (MBU)

ASSESSOR'S PARCEL NUMBERS:

305-120-004 thru 008, 020 thru 026, &
305-130-001 thru 006, 009, &
305-160-001 thru 003, 025 thru 030, &
305-190-014, 019, 020, 028 thru 031, &
305-220-011, 054 thru 062

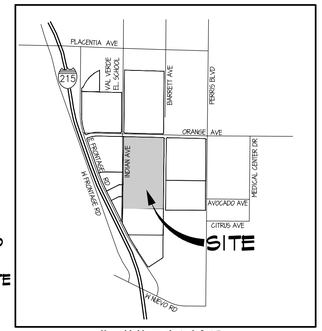
LEGAL DESCRIPTION

BLOCKS 1-4 OF FIGADOTA FARMS NO. 1A AS SHOWN BY MAP ON FILE IN THE OFFICE OF THE COUNTY RECORDER OF THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, IN BOOK 16 OF MAPS, PAGE 68 TOGETHER WITH LOTS 1-8, AND 13-20 OF FIGADOTA FARMS AS SHOWN BY MAP ON FILE IN THE OFFICE OF THE COUNTY RECORDER OF THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, IN BOOK 16 OF MAPS, PAGE 53 EXCEPTING THAT PORTION LYING WEST OF THE EASTERLY LINE OF THE FRONTAGE ROAD.



INDEX MAP

200 100 0 200 400 600
SCALE: 1"=200'



VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

HOWARD INDUSTRIAL PARTNERS
2244 NORTH PACIFIC STREET
ORANGE, CA 92865
CONTACT: TIM HOWARD
(TEL)714-637-3333

ENGINEER

FMCIVIL ENGINEERS INC.
41870 KALMIA ST., SUITE 120
MURRIETA, CA 92562
CONTACT: FRANCISCO MARTINEZ
(TEL)951-973-0202

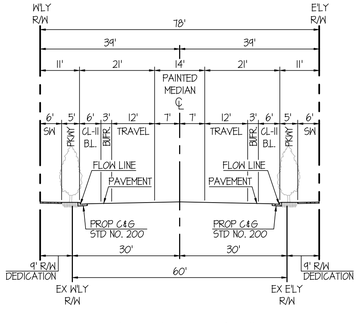
ARCHITECT

AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: DAN MACDAVID
(TEL)714-639-9860

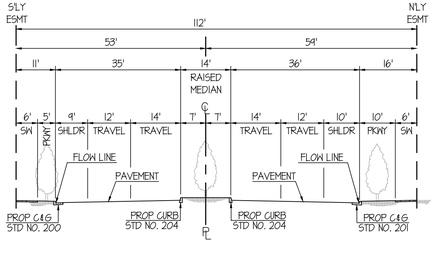
EARTHWORK ESTIMATE:

RAW CUT:	291,230 CY
RAW FILL:	93,330 CY
NET:	197,900 CY EXPORT

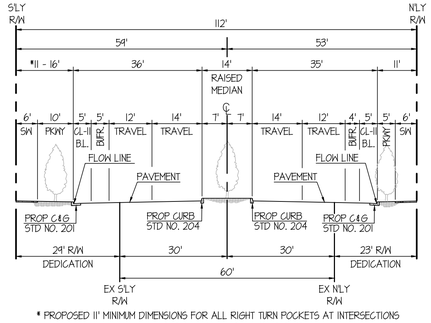
HAUL TRIPS:
ASSUMED (13 CY PER TRIP) = 15,223



BARRETT AVE
(N'LY WALMART DWY - ORANGE AVE)
MAJOR COLLECTOR
(78'/56')

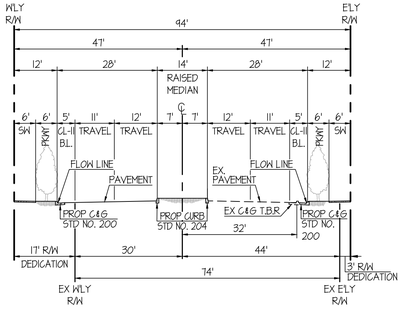


PRIVATE DRIVE "A"
SECONDARY ARTERIAL
(112'/85')



* PROPOSED 11' MINIMUM DIMENSIONS FOR ALL RIGHT TURN POCKETS AT INTERSECTIONS

ORANGE AVENUE
(WEST OF BARRETT AVE)
SECONDARY ARTERIAL
(112'/85')



INDIAN AVE
(NORTH OF ORANGE)
SECONDARY ARTERIAL
(94'/70')

CITY OF PERRIS

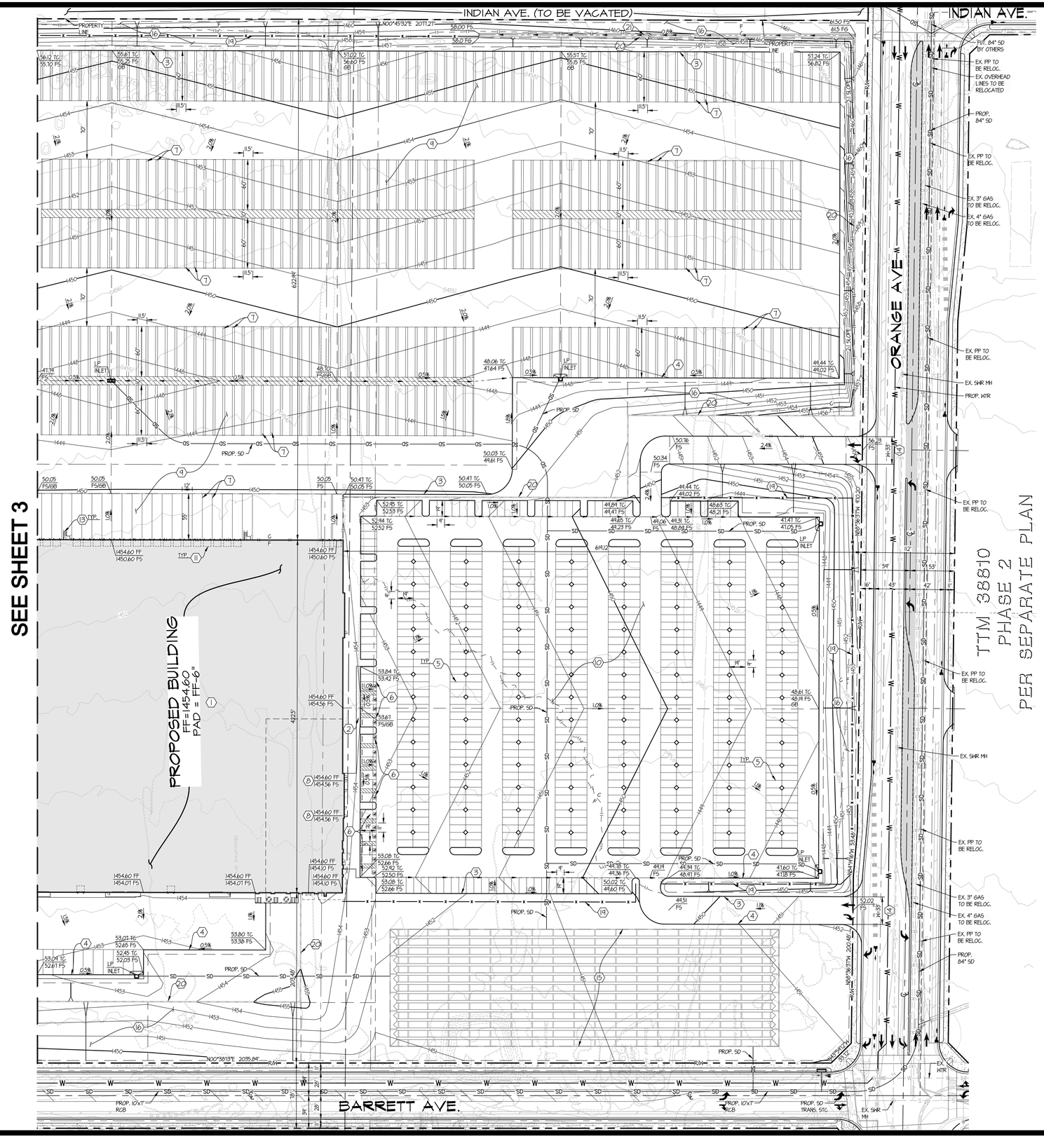
HARVEST LANDING RETAIL CENTER & BUSINESS PARK
SITE #1 CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-2 - PARCEL 1

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	A.J.
CHECKED:	FM
PLN CK REF:	

FMCIVIL ENGINEERS INC.
41870 KALMIA STREET, SUITE 120
MURRIETA | CA 92562
951.973.0202 - FMCIVIL.COM

SHEET 1 OF 3 SHEETS

H:\PDATA\20-001 HARVEST LANDING\DWGS\PLNG\ENTITLEMENT\[COP_ALT-3]BLDG-1-FEDEX\20-001-COP_BLDG1_FEDEX-CO-01.DWG JASON STOUFFER 10/7/2024 4:49 PM



SITE PLAN KEYNOTES

1. PAINTED CONCRETE TILT-UP WAREHOUSE / OFFICE / MANUFACTURING FACILITY. BUILDING TO BE DESIGNED PER ARCHITECT'S PLANS
2. ON SITE ACCESSIBLE SIDEWALK AND CURB RAMPS.
3. CONCRETE CURB
4. CONCRETE CURB & GUTTER
5. STANDARD PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
6. HANDICAP PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
7. TRAILER / TRACTOR PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
8. ACCESSIBLE BUILDING ENTRY WITH ADJACENT BICYCLE RACKS PER ARCHITECT'S PLANS
9. PORTLAND CONC. CEMENT (PCC) PAVED TRUCK YARD ARCHITECT'S PLANS
10. PORTLAND CONC. CEMENT (PCC) PAVED AUTO PARKING ARCHITECT'S PLANS
11. DOCK HIGH TRUCK DOOR PER ARCHITECT'S PLANS
12. GRADE LEVEL RAMP DOOR PER ARCHITECT'S PLANS
13. EXTERIOR MAN DOOR AND STAIRS W/GUARD POST PER ARCHITECT'S PLANS
14. COMMERCIAL DRIVEWAY APPROACH PER RIVERSIDE COUNTY STD.207A, WITH DECORATIVE CONCRETE PAVING PER ARCHITECT'S PLANS
15. UNDERGROUND STORM WATER CHAMBER SYSTEM
16. LANDSCAPE AREA PER LANDSCAPE ARCHITECT'S PLANS
17. APPROXIMATE LOCATION OF TRASH ENCLOSURE
18. ENTRY GATE PER ARCHITECT'S PLANS
19. CHAIN LINK FENCE PER ARCHITECT'S PLANS
20. SCREEN WALL PER ARCHITECT'S PLANS (COMBO RETAINING)
21. CONCRETE RIBBON GUTTER/SWALE

CITY OF PERRIS

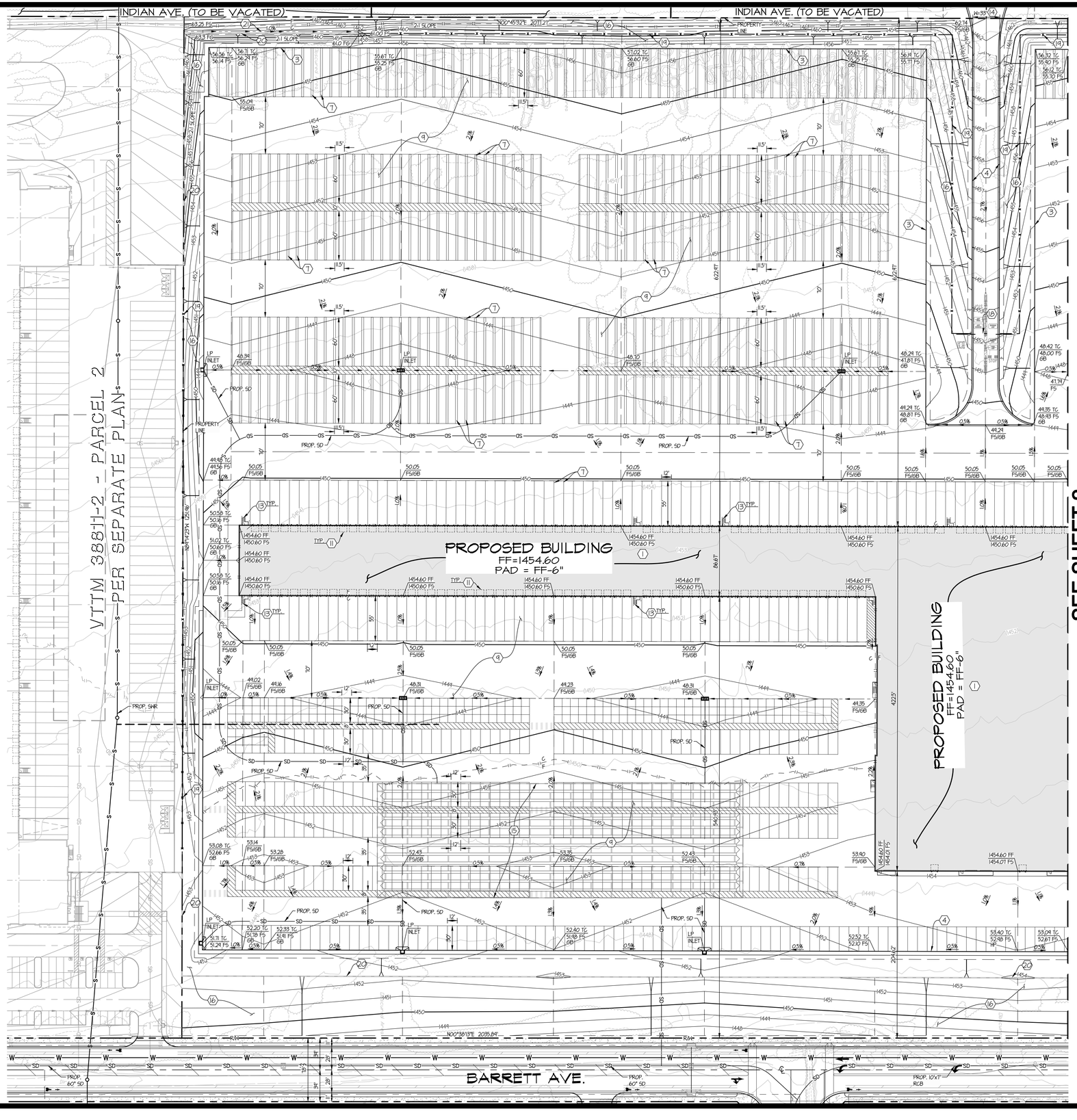
HARVEST LANDING RETAIL CENTER & BUSINESS PARK
SITE #1 CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-2 - PARCEL 1

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF:	

FMCIVIL ENGINEERS INC.
41810 KALMIA STREET, SUITE 120
MURRIETA | CA 92562
951.973.0202 - FMCIVIL.COM

SHEET 2 OF 3 SHEETS

H:\PDATA\20-001 HARVEST LANDING\DWGS\PLNG\ENTITLEMENT\CUP\ALT-3\BLDG-1-FEDEX\20-001-CUP_BLDG1_FEDEX-CG-01.DWG JASON STOUFFER 10/7/2024 4:09 PM



SITE PLAN KEYNOTES

1. PAINTED CONCRETE TILT-UP WAREHOUSE / OFFICE / MANUFACTURING FACILITY. BUILDING TO BE DESIGNED PER ARCHITECT'S PLANS
2. ON SITE ACCESSIBLE SIDEWALK AND CURB RAMPS.
3. CONCRETE CURB
4. CONCRETE CURB & GUTTER
5. STANDARD PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
6. HANDICAP PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
7. TRAILER / TRACTOR PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
8. ACCESSIBLE BUILDING ENTRY WITH ADJACENT BICYCLE RACKS PER ARCHITECT'S PLANS
9. PORTLAND CONC. CEMENT (PCC) PAVED TRUCK YARD ARCHITECT'S PLANS
10. PORTLAND CONC. CEMENT (PCC) PAVED AUTO PARKING ARCHITECT'S PLANS
11. DOCK HIGH TRUCK DOOR PER ARCHITECT'S PLANS
12. GRADE LEVEL RAMP DOOR PER ARCHITECT'S PLANS
13. EXTERIOR MAN DOOR AND STAIRS W/GUARD POST PER ARCHITECT'S PLANS
14. COMMERCIAL DRIVEWAY APPROACH PER RIVERSIDE COUNTY STD.207A, WITH DECORATIVE CONCRETE PAVING PER ARCHITECT'S PLANS
15. UNDERGROUND STORM WATER CHAMBER SYSTEM
16. LANDSCAPE AREA PER LANDSCAPE ARCHITECT'S PLANS
17. APPROXIMATE LOCATION OF TRASH ENCLOSURE
18. ENTRY GATE PER ARCHITECT'S PLANS
19. CHAIN LINK FENCE PER ARCHITECT'S PLANS
20. SCREEN WALL PER ARCHITECT'S PLANS (COMBO RETAINING)
21. CONCRETE RIBBON GUTTER/SWALE

SCALE 1"=60'

60 30 0 60 120 180

SCALE: 1"=60'

CITY OF PERRIS

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
SITE #1 CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-2 - PARCEL 1

SCALE: AS SHOWN	SHEET
DATE: OCT. 2024	3
DESIGNED: AJ	OF 3 SHEETS
CHECKED: FM	
PLN CK REF:	

FMCIVIL ENGINEERS INC.
41870 KALMIA STREET, SUITE 120
MURRIETA | CA 92562
951.413.0202 - FMCIVIL.COM

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DEVELOPMENT PLAN REVIEW - VTPM 38811-1
PARCEL 1 – SITE 2
CITY OF PERRIS
RIVERSIDE COUNTY, CALIFORNIA

Drainage Study Report

Prepared for:
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April 12, 2024
Revised: October 4, 2024

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SECTION 1 - GENERAL OVERVIEW

INTRODUCTION

The purpose of this study is to support the entitlement phase and determine minimum drainage improvements required for the proposed industrial development of approximately 25.5 acres and 389,000 square feet warehouse building with 38 truck docks, and parking lot that lays within the Harvest Landing Specific Plan, located in the City of Perris, County of Riverside CA. More specifically, the project site is bounded to the north by Orange Avenue and the 215 freeway is to the west and Indian Avenue to the east and vacant undeveloped land to the south.

The primary objectives of this report are as follows:

1. Delineate the drainage areas tributary to the onsite above/underground basin

2. Based on drainage patterns, ground slope, land use and soil type and using the Riverside County Rational Method, perform hydrologic and hydraulics of onsite drainage facilities.

3. Determine the 100-year peak storm flows based upon the pre-project and post-project condition for the 24-hour storm duration utilizing the Unit Hydrograph Method as outlined in the Riverside County Flood Control & Water Conservation District Hydrology Manual.

4. Determine the required underground detention facilities to mitigate the 100-year peak storm flows for the 24-hour storm duration in the post-project condition to flows less than or equal to the existing condition flow rates.

5. Determine the required the minimum storm drain infrastructure to flood protect the project site for the 100-year storm event.

6. Preparation of a hydrology report, which consist of hydrological and analytical results and exhibits.

BACKGROUND

EXISTING CONDITIONS

The project site is located within Riverside County Flood Control's Perris Valley Master Drainage Plan, and tributary to future MDP Line "K-16 and K-19" which extends about 2600 lineal feet between Perris Boulevard at the existing MDP Line K and Indian Avenue.

The site is in a relatively mild to flat sloping undeveloped terrain on a drainage area which drains easterly towards Indian Avenue; developed flows continue to travel easterly through vacant parcels where it ultimately reaches Perris Boulevard; storm drain flows are collected by an existing MDP Lateral K-14 which connects to existing MDP Line "K". Line "K" is an existing "V" channel (w= 16', H=8' & z=1:1), and planned for a new Trapezoidal Channel (b=6, d=8').

DEVELOPED CONDITIONS

The preliminary offsite design is shown on Exhibit H "Harvest Landing Industrial Phase 1 Offsite Master Storm Drain & Low Flow System". The offsite master storm drain system (backbone) will be a part of a

separate report and therefore excluded. The onsite storm water runoff will be collected and treated using proprietary devices to accommodate the water quality component of mitigation. The onsite storm water runoff will be conveyed to an underground chamber system to mitigate the increased storm runoff to be at or below the current MDP land use condition flow. See the table below for the rational method results:

Description	Q_{100} Peak Flow Rates
Onsite Proposed	51.1
Onsite Existing	24.1
Onsite MDP	37.6

For purposes of this preliminary drainage report, the 100-year 24-hour peak flow rates for the post developed condition, predeveloped condition and proposed developed condition per the land use on the MDP were the only storm events analyzed for mitigation. The project storm mitigation is provided by utilizing the underground storm drain detention system and the outlet control structures. The total mitigation volume required was determined by selecting the flow rates from the recess limb of the proposed unit hydrograph runs for the 100-year 24-hour storm event that are equal or less than the flow rates from existing conditions. Smaller storm events were analyzed, however, since the storm volume demand to mitigate the storm flows from the 100-year 24hour event are considerably larger than volumes produced by the smaller storm events, thus a conservative approach.

MDP Condition Volume: 1.69 ac-ft; $Q_{100\text{-}24hr}$: 12.00 cfs
Proposed Condition Volume: 5.21 ac-ft; $Q_{100\text{-}24hr}$: 14.46 cfs
Underground Chamber Volume: *7.80 ac-ft

*Since this volume is greater than 5.38 ac-ft the underground chambers (collectively) have enough storage to mitigate the volume of the 100 year 24 hour storm. The peak storm flows will be mitigated to the existing MDP levels. See the table below for the unit hydrograph results:

Storm Duration	SP Q_{peak}	SP V_{TOTAL}	MDP Q_{PEAK}	MDP V_{TOTAL}
1	67.48	2.3651	66.19	2.1254
3	41.55	3.5683	39.12	2.9505
6	32.36	4.2622	29.78	3.3571
24	14.46	8.07	12	5.96
Acreage	27.32		27.32	

METHODOLOGY

HYDROLOGY

Hydrologic calculations were performed using the Riverside County Rational Method from RCFCD & WCD Hydrology Manual, dated April 1978. The 100-year design discharge was computed by generating a hydrologic "link-node" model in which divides the area into drainage sub-areas, each tributary to a concentration point or hydrologic "node" point determined by the proposed layout. The computer results are included in section 2. The following assumptions/guidelines were applied for use of the Rational Method:

1. The map from the Riverside County Hydrology Manual indicates that the study area is primarily Group "B" soils, with smaller areas as "A" and "C". A USGS soils map for the project site is included as Exhibit E, under the Exhibit section.
2. Initial sub-areas were drawn to be less than 10-acres in size and less than 1,000 feet in length, per County guidelines. Time of concentration for the initial sub-area is based on Time of Concentration Nomograph for Initial Sub-area from the Hydrology Manual.
3. Antecedent Moisture Condition 2 was used for 100-year storm events.
4. Standard intensity-duration curve data for the project area was used for the Perris Valley area; Plate D-4.1.

HYDRAULICS

Civil Design hydrology module was used for preliminarily sizing the storm drainpipe system. The onsite storm drain infrastructure will consist of pipe sizes ranging from 12"-36" in diameter. A more detail analysis will be provided in subsequent submittals and a WSPG analysis for onsite storm drainpipe system will be performed during final engineering.

CONCLUSIONS & RECOMMENDATIONS

The hydrology analyses evaluated the proposed development to determine the necessary onsite drainage improvements required to mitigate flows for increased runoff and it has been concluded that:

1. The proposed drainage facilities will adequately convey the 100-year flows and provide flood protection to the project site.

2. The proposed underground pipe chamber system will have sufficient storage to adequately mitigate for increased runoff.

SECTION 2 - HYDROLOGY ANALYSIS

100-YEAR EXISTING ON-SITE HYDROLOGY WITH OFFSITES (RATIONAL METHOD)

100-YEAR EXISTING ON-SITE HYDROLOGY NO OFFSITES (RATIONAL METHOD)

100-YEAR PROPOSED LAND USE MDP ON-SITE HYDROLOGY (RATIONAL METHOD)

100-YEAR OFF-SITE HYDROLOGY WATERSHED A (RATIONAL METHOD)

100-YEAR OFF-SITE HYDROLOGY WATERSHED B (RATIONAL METHOD)

100-YEAR OFF-SITE HYDROLOGY WATERSHED X (RATIONAL METHOD)

100-YEAR PROPOSED ON-SITE HYDROLOGY WITH OFFSITES (RATIONAL METHOD)

100-YEAR PROPOSED ON-SITE HYDROLOGY WITH NO OFFSITES (RATIONAL METHOD)

100-YEAR-24 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-24 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-6 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-6 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-3 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-3 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/10/23 File:12.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
EXISTING CONDITION - WITH OFFSITES
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 868.000(Ft.)
Top (of initial area) elevation = 1481.500(Ft.)
Bottom (of initial area) elevation = 1464.800(Ft.)

```
Difference in elevation =    16.700(Ft.)
Slope =    0.01924  s(percent)=       1.92
TC = k(0.940)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   31.024 min.
Rainfall intensity =      1.547(In/Hr) for a   100.0 year storm
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.578
Decimal fraction soil group A = 0.010
Decimal fraction soil group B = 0.990
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  60.77
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      2.470(CFS)
Total initial stream area =        2.760(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       14.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      4.659(CFS)
Depth of flow =   0.222(Ft.), Average velocity =   0.943(Ft/s)
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2            100.00              0.00
        3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      4.659(CFS)
  '     '        flow top width =     44.466(Ft.)
  '     '    velocity=    0.943(Ft/s)
  '     '        area =      4.943(Sq.Ft)
  '     '        Froude number =     0.498

Upstream point elevation =  1464.800(Ft.)
Downstream point elevation =  1459.000(Ft.)
Flow length =   856.000(Ft.)
Travel time  =   15.14 min.
Time of concentration =   46.16 min.
Depth of flow =   0.222(Ft.)
Average velocity =   0.943(Ft/s)
Total irregular channel flow =     4.659(CFS)
Irregular channel normal depth above invert elev. =   0.222(Ft.)
Average velocity of channel(s) =   0.943(Ft/s)
 Adding area flow to channel
```

```
USER INPUT of soil data for subarea
Runoff Coefficient = 0.635
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  60.77
Pervious area fraction =  0.730; Impervious fraction =  0.270
Rainfall intensity =      1.274(In/Hr) for a   100.0 year storm
Subarea runoff =      4.319(CFS) for      5.340(Ac.)
Total runoff =      6.789(CFS)  Total area =       8.100(Ac.)
Depth of flow =   0.256(Ft.), Average velocity =   1.036(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      8.100(Ac.)
Runoff from this stream =      6.789(CFS)
Time of concentration =   46.16 min.
Rainfall intensity =     1.274(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   970.000(Ft.)
Top (of initial area) elevation =  1481.100(Ft.)
Bottom (of initial area) elevation =  1464.300(Ft.)
Difference in elevation =    16.800(Ft.)
Slope =    0.01732  s(percent)=       1.73
TC = k(0.940)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   33.123 min.
Rainfall intensity =      1.498(In/Hr) for a   100.0 year storm
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.574
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  61.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      1.865(CFS)
Total initial stream area =        2.170(Ac.)
Pervious area fraction = 1.000
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      2.170(Ac.)
Runoff from this stream =      1.865(CFS)
Time of concentration =   33.12 min.
Rainfall intensity =     1.498(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.100 to Point/Station       12.100
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------
Rainfall intensity =      2.290(In/Hr) for a   100.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.865
Decimal fraction soil group A = 0.420
Decimal fraction soil group B = 0.420
Decimal fraction soil group C = 0.160
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  47.90
Pervious area fraction =  0.100; Impervious fraction =  0.900
User specified values are as follows:
TC =  13.94 min.  Rain intensity =       2.29(In/Hr)
Total area =         3.06(Ac.)  Total runoff =      6.30(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.100 to Point/Station       13.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
------------------------------------------------------------------------
Estimated mean flow rate at midpoint of channel =      7.422(CFS)
Depth of flow =   0.220(Ft.), Average velocity =   1.529(Ft/s)
        ******* Irregular Channel Data ***********
----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2            100.00              0.00
        3            200.00              1.00
Manning's 'N' friction factor =   0.030
----------------------------------------------------------------
Sub-Channel flow  =      7.422(CFS)
  '     '        flow top width =     44.070(Ft.)
  '     '    velocity=    1.529(Ft/s)
  '     '        area =      4.856(Sq.Ft)
```

```
  '     '        Froude number =     0.812

Upstream point elevation =  1478.600(Ft.)
Downstream point elevation =  1464.300(Ft.)
Flow length =   793.000(Ft.)
Travel time  =    8.65 min.
Time of concentration =   22.59 min.
Depth of flow =   0.220(Ft.)
Average velocity =   1.529(Ft/s)
Total irregular channel flow =     7.422(CFS)
Irregular channel normal depth above invert elev. =   0.220(Ft.)
Average velocity of channel(s) =   1.529(Ft/s)
 Adding area flow to channel
USER INPUT of soil data for subarea
Runoff Coefficient = 0.532
Decimal fraction soil group A = 0.020
Decimal fraction soil group B = 0.980
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  47.00
Pervious area fraction =  0.900; Impervious fraction =  0.100
Rainfall intensity =      1.808(In/Hr) for a   100.0 year storm
Subarea runoff =      2.165(CFS) for      2.250(Ac.)
Total runoff =      8.465(CFS)  Total area =       5.310(Ac.)
Depth of flow =   0.231(Ft.), Average velocity =   1.580(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.100 to Point/Station       13.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      5.310(Ac.)
Runoff from this stream =      8.465(CFS)
Time of concentration =   22.59 min.
Rainfall intensity =     1.808(In/Hr)
Summary of stream data:

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


1        1.865     33.12                1.498
2        8.465     22.59                1.808
Largest stream flow has longer or shorter time of concentration
Qp =      8.465 + sum of
          Qa          Tb/Ta
           1.865 *    0.682 =      1.272
Qp =      9.737
```

```
Total of 2 streams to confluence:
Flow rates before confluence point:
       1.865       8.465
Area of streams before confluence:
        2.170        5.310
Results of confluence:
Total flow rate =      9.737(CFS)
Time of concentration =    22.586 min.
Effective stream area after confluence =      7.480(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     14.696(CFS)
Depth of flow =   0.326(Ft.), Average velocity =   1.385(Ft/s)
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2            100.00              0.00
        3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     14.696(CFS)
  '     '        flow top width =     65.150(Ft.)
  '     '    velocity=    1.385(Ft/s)
  '     '        area =     10.611(Sq.Ft)
  '     '        Froude number =     0.605

Upstream point elevation =  1464.300(Ft.)
Downstream point elevation =  1459.000(Ft.)
Flow length =   603.000(Ft.)
Travel time  =    7.26 min.
Time of concentration =   29.84 min.
Depth of flow =   0.326(Ft.)
Average velocity =   1.385(Ft/s)
Total irregular channel flow =    14.696(CFS)
Irregular channel normal depth above invert elev. =   0.326(Ft.)
Average velocity of channel(s) =   1.385(Ft/s)
 Adding area flow to channel
USER INPUT of soil data for subarea
Runoff Coefficient = 0.830
Decimal fraction soil group A = 0.240
Decimal fraction soil group B = 0.680
Decimal fraction soil group C = 0.080
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  90.00
```

```
Pervious area fraction =  0.900; Impervious fraction =  0.100
Rainfall intensity =      1.577(In/Hr) for a   100.0 year storm
Subarea runoff =      9.979(CFS) for      7.620(Ac.)
Total runoff =     19.716(CFS)  Total area =      15.100(Ac.)
Depth of flow =   0.364(Ft.), Average velocity =   1.491(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     15.100(Ac.)
Runoff from this stream =     19.716(CFS)
Time of concentration =   29.84 min.
Rainfall intensity =     1.577(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.100 to Point/Station       13.100
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
Rainfall intensity =      1.926(In/Hr) for a   100.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.827
Decimal fraction soil group A = 0.540
Decimal fraction soil group B = 0.360
Decimal fraction soil group C = 0.100
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  44.60
Pervious area fraction =  0.175; Impervious fraction =  0.825
User specified values are as follows:
TC =  19.84 min.  Rain intensity =       1.93(In/Hr)
Total area =        11.32(Ac.)  Total runoff =     17.00(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.100 to Point/Station       13.200
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     20.334(CFS)
Depth of flow =   0.363(Ft.), Average velocity =   1.543(Ft/s)
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2            100.00              0.00
```

```
        3            200.00              1.00
Manning's 'N' friction factor =   0.030
-----------------------------------------------------------------
Sub-Channel flow  =     20.334(CFS)
  '     '        flow top width =     72.595(Ft.)
  '     '    velocity=    1.543(Ft/s)
  '     '        area =     13.175(Sq.Ft)
  '     '        Froude number =     0.638

Upstream point elevation =  1470.000(Ft.)
Downstream point elevation =  1462.800(Ft.)
Flow length =   762.000(Ft.)
Travel time  =    8.23 min.
Time of concentration =   28.07 min.
Depth of flow =   0.363(Ft.)
Average velocity =   1.543(Ft/s)
Total irregular channel flow =    20.334(CFS)
Irregular channel normal depth above invert elev. =   0.363(Ft.)
Average velocity of channel(s) =   1.543(Ft/s)
 Adding area flow to channel
USER INPUT of soil data for subarea
Runoff Coefficient = 0.704
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.630
Decimal fraction soil group C = 0.370
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  72.00
Pervious area fraction =  0.900; Impervious fraction =  0.100
Rainfall intensity =      1.625(In/Hr) for a   100.0 year storm
Subarea runoff =      6.602(CFS) for      5.770(Ac.)
Total runoff =     23.602(CFS)  Total area =      17.090(Ac.)
Depth of flow =   0.384(Ft.), Average velocity =   1.602(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.200 to Point/Station       13.400
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
_________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     25.851(CFS)
Depth of flow =   0.447(Ft.), Average velocity =   1.294(Ft/s)
        ******* Irregular Channel Data ***********
-----------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2            100.00              0.00
        3            200.00              1.00
Manning's 'N' friction factor =   0.030
-----------------------------------------------------------------
Sub-Channel flow  =     25.852(CFS)
```

```
  '     '        flow top width =     89.408(Ft.)
  '     '    velocity=    1.294(Ft/s)
  '     '        area =     19.985(Sq.Ft)
  '     '        Froude number =     0.482

Upstream point elevation =  1462.800(Ft.)
Downstream point elevation =  1461.000(Ft.)
Flow length =   358.000(Ft.)
Travel time  =    4.61 min.
Time of concentration =   32.68 min.
Depth of flow =   0.447(Ft.)
Average velocity =   1.294(Ft/s)
Total irregular channel flow =    25.851(CFS)
Irregular channel normal depth above invert elev. =   0.447(Ft.)
Average velocity of channel(s) =   1.294(Ft/s)
 Adding area flow to channel
USER INPUT of soil data for subarea
Runoff Coefficient = 0.693
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.220
Decimal fraction soil group C = 0.780
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  72.00
Pervious area fraction =  0.900; Impervious fraction =  0.100
Rainfall intensity =      1.508(In/Hr) for a   100.0 year storm
Subarea runoff =      4.410(CFS) for      4.220(Ac.)
Total runoff =     28.012(CFS)  Total area =      21.310(Ac.)
Depth of flow =   0.461(Ft.), Average velocity =   1.320(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.200 to Point/Station       13.400
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =     21.310(Ac.)
Runoff from this stream =     28.012(CFS)
Time of concentration =   32.68 min.
Rainfall intensity =     1.508(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.300 to Point/Station       13.400
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   900.000(Ft.)
Top (of initial area) elevation =  1478.400(Ft.)
Bottom (of initial area) elevation =  1461.000(Ft.)
Difference in elevation =    17.400(Ft.)
Slope =    0.01933  s(percent)=       1.93
```

```
TC = k(0.940)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   31.446 min.
Rainfall intensity =      1.537(In/Hr) for a   100.0 year storm
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.533
Decimal fraction soil group A = 0.400
Decimal fraction soil group B = 0.300
Decimal fraction soil group C = 0.300
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  55.70
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      2.423(CFS)
Total initial stream area =        2.960(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.300 to Point/Station       13.400
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      2.960(Ac.)
Runoff from this stream =      2.423(CFS)
Time of concentration =   31.45 min.
Rainfall intensity =     1.537(In/Hr)
Summary of stream data:

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


1       28.012     32.68                1.508
2        2.423     31.45                1.537
Largest stream flow has longer time of concentration
Qp =     28.012 + sum of
          Qb         Ia/Ib
           2.423 *    0.981 =      2.378
Qp =     30.390

Total of 2 streams to confluence:
Flow rates before confluence point:
      28.012       2.423
Area of streams before confluence:
       21.310        2.960
Results of confluence:
Total flow rate =     30.390(CFS)
Time of concentration =    32.681 min.
Effective stream area after confluence =     24.270(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.400 to Point/Station       14.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Depth of flow =   0.378(Ft.), Average velocity =   2.131(Ft/s)
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2            100.00              0.00
        3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     30.390(CFS)
  '     '        flow top width =     75.521(Ft.)
  '     '    velocity=    2.131(Ft/s)
  '     '        area =     14.259(Sq.Ft)
  '     '        Froude number =     0.864

Upstream point elevation =  1461.000(Ft.)
Downstream point elevation =  1459.000(Ft.)
Flow length =   117.000(Ft.)
Travel time  =    0.91 min.
Time of concentration =   33.60 min.
Depth of flow =   0.378(Ft.)
Average velocity =   2.131(Ft/s)
Total irregular channel flow =    30.390(CFS)
Irregular channel normal depth above invert elev. =   0.378(Ft.)
Average velocity of channel(s) =   2.131(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.400 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     24.270(Ac.)
Runoff from this stream =     30.390(CFS)
Time of concentration =   33.60 min.
Rainfall intensity =     1.488(In/Hr)
Summary of stream data:

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


1        6.789     46.16                1.274
2       19.716     29.84                1.577
```

```
3       30.390     33.60                 1.488
Largest stream flow has longer or shorter time of concentration
Qp =     30.390 + sum of
          Qa          Tb/Ta
           6.789 *    0.728 =      4.941
          Qb         Ia/Ib
          19.716 *    0.944 =     18.604
Qp =     53.935

Total of 3 main streams to confluence:
Flow rates before confluence point:
       6.789      19.716      30.390
Area of streams before confluence:
        8.100       15.100       24.270


Results of confluence:
Total flow rate =     53.935(CFS)
Time of concentration =    33.596 min.
Effective stream area after confluence  =     47.470(Ac.)
End of computations, total study area =           47.47 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.673
Area averaged RI index number =  62.2
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/10/23 File:12.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
EXISTING CONDITION - NO OFFSITES
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 868.000(Ft.)
Top (of initial area) elevation = 1481.500(Ft.)
Bottom (of initial area) elevation = 1464.800(Ft.)

```
Difference in elevation =    16.700(Ft.)
Slope =    0.01924  s(percent)=       1.92
TC = k(0.940)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   31.024 min.
Rainfall intensity =      1.547(In/Hr) for a   100.0 year storm
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.578
Decimal fraction soil group A = 0.010
Decimal fraction soil group B = 0.990
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  60.77
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      2.470(CFS)
Total initial stream area =        2.760(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       14.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      4.659(CFS)
Depth of flow =   0.222(Ft.), Average velocity =   0.943(Ft/s)
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2            100.00              0.00
        3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      4.659(CFS)
  '     '        flow top width =     44.466(Ft.)
  '     '    velocity=    0.943(Ft/s)
  '     '        area =      4.943(Sq.Ft)
  '     '        Froude number =     0.498

Upstream point elevation =  1464.800(Ft.)
Downstream point elevation =  1459.000(Ft.)
Flow length =   856.000(Ft.)
Travel time  =   15.14 min.
Time of concentration =   46.16 min.
Depth of flow =   0.222(Ft.)
Average velocity =   0.943(Ft/s)
Total irregular channel flow =     4.659(CFS)
Irregular channel normal depth above invert elev. =   0.222(Ft.)
Average velocity of channel(s) =   0.943(Ft/s)
 Adding area flow to channel
```

```
USER INPUT of soil data for subarea
Runoff Coefficient = 0.635
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  60.77
Pervious area fraction =  0.730; Impervious fraction =  0.270
Rainfall intensity =      1.274(In/Hr) for a   100.0 year storm
Subarea runoff =      4.319(CFS) for      5.340(Ac.)
Total runoff =      6.789(CFS)  Total area =       8.100(Ac.)
Depth of flow =   0.256(Ft.), Average velocity =   1.036(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      8.100(Ac.)
Runoff from this stream =      6.789(CFS)
Time of concentration =   46.16 min.
Rainfall intensity =     1.274(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   970.000(Ft.)
Top (of initial area) elevation =  1481.100(Ft.)
Bottom (of initial area) elevation =  1464.300(Ft.)
Difference in elevation =    16.800(Ft.)
Slope =    0.01732  s(percent)=       1.73
TC = k(0.940)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   33.123 min.
Rainfall intensity =      1.498(In/Hr) for a   100.0 year storm
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.574
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  61.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      1.865(CFS)
Total initial stream area =        2.170(Ac.)
Pervious area fraction = 1.000
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      2.170(Ac.)
Runoff from this stream =      1.865(CFS)
Time of concentration =   33.12 min.
Rainfall intensity =     1.498(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.100 to Point/Station       13.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   793.000(Ft.)
Top (of initial area) elevation =  1478.600(Ft.)
Bottom (of initial area) elevation =  1464.300(Ft.)
Difference in elevation =    14.300(Ft.)
Slope =    0.01803  s(percent)=       1.80
TC = k(0.940)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   30.313 min.
Rainfall intensity =      1.565(In/Hr) for a   100.0 year storm
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.579
Decimal fraction soil group A = 0.020
Decimal fraction soil group B = 0.980
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  60.54
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      2.038(CFS)
Total initial stream area =        2.250(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.100 to Point/Station       13.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.250(Ac.)
Runoff from this stream =      2.038(CFS)
Time of concentration =   30.31 min.
Rainfall intensity =     1.565(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
```

```
 No.       (CFS)       (min)                (In/Hr)


1        1.865     33.12                 1.498
2        2.038     30.31                 1.565
Largest stream flow has longer or shorter time of concentration
Qp =      2.038 + sum of
          Qa          Tb/Ta
           1.865 *    0.915 =      1.707
Qp =      3.745

Total of 2 streams to confluence:
Flow rates before confluence point:
       1.865       2.038
Area of streams before confluence:
        2.170        2.250
Results of confluence:
Total flow rate =      3.745(CFS)
Time of concentration =    30.313 min.
Effective stream area after confluence =      4.420(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      8.053(CFS)
Depth of flow =   0.260(Ft.), Average velocity =   1.192(Ft/s)
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2            100.00              0.00
        3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      8.053(CFS)
  '     '        flow top width =     51.992(Ft.)
  '     '    velocity=    1.192(Ft/s)
  '     '        area =      6.758(Sq.Ft)
  '     '        Froude number =     0.582

Upstream point elevation =  1464.300(Ft.)
Downstream point elevation =  1459.000(Ft.)
Flow length =   603.000(Ft.)
Travel time  =    8.43 min.
Time of concentration =   38.75 min.
Depth of flow =   0.260(Ft.)
Average velocity =   1.192(Ft/s)
```

```
Total irregular channel flow =     8.053(CFS)
Irregular channel normal depth above invert elev. =   0.260(Ft.)
Average velocity of channel(s) =   1.192(Ft/s)
 Adding area flow to channel
USER INPUT of soil data for subarea
Runoff Coefficient = 0.822
Decimal fraction soil group A = 0.240
Decimal fraction soil group B = 0.680
Decimal fraction soil group C = 0.080
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  90.00
Pervious area fraction =  0.900; Impervious fraction =  0.100
Rainfall intensity =      1.388(In/Hr) for a   100.0 year storm
Subarea runoff =      8.690(CFS) for      7.620(Ac.)
Total runoff =     12.435(CFS)  Total area =      12.040(Ac.)
Depth of flow =   0.306(Ft.), Average velocity =   1.328(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     12.040(Ac.)
Runoff from this stream =     12.435(CFS)
Time of concentration =   38.75 min.
Rainfall intensity =     1.388(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.200 to Point/Station       13.400
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   358.000(Ft.)
Top (of initial area) elevation =  1462.800(Ft.)
Bottom (of initial area) elevation =  1461.000(Ft.)
Difference in elevation =     1.800(Ft.)
Slope =    0.00503  s(percent)=       0.50
TC = k(0.940)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   28.471 min.
Rainfall intensity =      1.614(In/Hr) for a   100.0 year storm
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.674
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.220
Decimal fraction soil group C = 0.780
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  71.14
```

```
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      4.591(CFS)
Total initial stream area =        4.220(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.200 to Point/Station       13.400
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      4.220(Ac.)
Runoff from this stream =      4.591(CFS)
Time of concentration =   28.47 min.
Rainfall intensity =     1.614(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.300 to Point/Station       13.400
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   900.000(Ft.)
Top (of initial area) elevation =  1478.400(Ft.)
Bottom (of initial area) elevation =  1461.000(Ft.)
Difference in elevation =    17.400(Ft.)
Slope =    0.01933  s(percent)=       1.93
TC = k(0.940)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   31.446 min.
Rainfall intensity =      1.537(In/Hr) for a   100.0 year storm
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.533
Decimal fraction soil group A = 0.400
Decimal fraction soil group B = 0.300
Decimal fraction soil group C = 0.300
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  55.70
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      2.423(CFS)
Total initial stream area =        2.960(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.300 to Point/Station       13.400
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      2.960(Ac.)
Runoff from this stream =      2.423(CFS)
Time of concentration =   31.45 min.
```

```
Rainfall intensity =     1.537(In/Hr)
Summary of stream data:

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


1        4.591     28.47                 1.614
2        2.423     31.45                 1.537
Largest stream flow has longer or shorter time of concentration
Qp =      4.591 + sum of
          Qa          Tb/Ta
           2.423 *    0.905 =      2.194
Qp =      6.785

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.591       2.423
Area of streams before confluence:
        4.220        2.960
Results of confluence:
Total flow rate =      6.785(CFS)
Time of concentration =    28.471 min.
Effective stream area after confluence =      7.180(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.400 to Point/Station       14.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Depth of flow =   0.215(Ft.), Average velocity =   1.465(Ft/s)
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2            100.00              0.00
        3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      6.785(CFS)
  '     '        flow top width =     43.040(Ft.)
  '     '    velocity=    1.465(Ft/s)
  '     '        area =      4.631(Sq.Ft)
  '     '        Froude number =     0.787

Upstream point elevation =  1461.000(Ft.)
Downstream point elevation =  1459.000(Ft.)
Flow length =   117.000(Ft.)
Travel time  =    1.33 min.
```

```
Time of concentration =   29.80 min.
Depth of flow =   0.215(Ft.)
Average velocity =   1.465(Ft/s)
Total irregular channel flow =     6.785(CFS)
Irregular channel normal depth above invert elev. =   0.215(Ft.)
Average velocity of channel(s) =   1.465(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.400 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      7.180(Ac.)
Runoff from this stream =      6.785(CFS)
Time of concentration =   29.80 min.
Rainfall intensity =     1.578(In/Hr)
Summary of stream data:

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


1        6.789     46.16                1.274
2       12.435     38.75                1.388
3        6.785     29.80                1.578
Largest stream flow has longer or shorter time of concentration
Qp =     12.435 + sum of
          Qa          Tb/Ta
           6.789 *    0.839 =      5.698
          Qb         Ia/Ib
           6.785 *    0.879 =      5.966
Qp =     24.099

Total of 3 main streams to confluence:
Flow rates before confluence point:
       6.789      12.435       6.785
Area of streams before confluence:
        8.100       12.040        7.180


Results of confluence:
Total flow rate =     24.099(CFS)
Time of concentration =    38.747 min.
Effective stream area after confluence  =     27.320(Ac.)
End of computations, total study area =           27.32 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
```

Area averaged pervious area fraction(Ap) = 0.919
Area averaged RI index number = 70.0

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/10/23 File:12.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 868.000(Ft.)
Top (of initial area) elevation = 1481.500(Ft.)
Bottom (of initial area) elevation = 1464.800(Ft.)
Difference in elevation = 16.700(Ft.)

```
Slope =    0.01924  s(percent)=       1.92
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.872 min.
Rainfall intensity =      2.381(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.762
Decimal fraction soil group A = 0.010
Decimal fraction soil group B = 0.990
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  55.76
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      5.005(CFS)
Total initial stream area =        2.760(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       14.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      8.313(CFS)
Depth of flow =   0.276(Ft.), Average velocity =   1.089(Ft/s)
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2            100.00              0.00
        3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      8.313(CFS)
  '     '        flow top width =     55.248(Ft.)
  '     '    velocity=    1.089(Ft/s)
  '     '        area =      7.631(Sq.Ft)
  '     '        Froude number =     0.517

Upstream point elevation =  1464.800(Ft.)
Downstream point elevation =  1459.000(Ft.)
Flow length =   856.000(Ft.)
Travel time  =   13.10 min.
Time of concentration =   25.97 min.
Depth of flow =   0.276(Ft.)
Average velocity =   1.089(Ft/s)
Total irregular channel flow =     8.313(CFS)
Irregular channel normal depth above invert elev. =   0.276(Ft.)
Average velocity of channel(s) =   1.089(Ft/s)
 Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
```

```
Runoff Coefficient = 0.728
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      1.688(In/Hr) for a   100.0 year storm
Subarea runoff =      6.560(CFS) for      5.340(Ac.)
Total runoff =     11.566(CFS)  Total area =       8.100(Ac.)
Depth of flow =   0.313(Ft.), Average velocity =   1.183(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      8.100(Ac.)
Runoff from this stream =     11.566(CFS)
Time of concentration =   25.97 min.
Rainfall intensity =     1.688(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   970.000(Ft.)
Top (of initial area) elevation =  1481.100(Ft.)
Bottom (of initial area) elevation =  1464.300(Ft.)
Difference in elevation =    16.800(Ft.)
Slope =    0.01732  s(percent)=       1.73
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.743 min.
Rainfall intensity =      2.306(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.759
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      3.800(CFS)
Total initial stream area =        2.170(Ac.)
Pervious area fraction = 0.500
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      2.170(Ac.)
Runoff from this stream =      3.800(CFS)
Time of concentration =   13.74 min.
Rainfall intensity =     2.306(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.100 to Point/Station       13.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________________
Initial area flow distance =   793.000(Ft.)
Top (of initial area) elevation =  1478.600(Ft.)
Bottom (of initial area) elevation =  1464.300(Ft.)
Difference in elevation =    14.300(Ft.)
Slope =    0.01803  s(percent)=       1.80
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.577 min.
Rainfall intensity =      2.408(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.762
Decimal fraction soil group A = 0.020
Decimal fraction soil group B = 0.980
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  55.52
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      4.128(CFS)
Total initial stream area =        2.250(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.100 to Point/Station       13.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.250(Ac.)
Runoff from this stream =      4.128(CFS)
Time of concentration =   12.58 min.
Rainfall intensity =     2.408(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)
```

```
1        3.800     13.74                 2.306
2        4.128     12.58                 2.408
Largest stream flow has longer or shorter time of concentration
Qp =      4.128 + sum of
          Qa          Tb/Ta
           3.800 *    0.915 =      3.478
Qp =      7.606

Total of 2 streams to confluence:
Flow rates before confluence point:
       3.800       4.128
Area of streams before confluence:
        2.170        2.250
Results of confluence:
Total flow rate =      7.606(CFS)
Time of concentration =    12.577 min.
Effective stream area after confluence =      4.420(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     12.910(CFS)
Depth of flow =   0.310(Ft.), Average velocity =   1.341(Ft/s)
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2            100.00              0.00
        3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     12.910(CFS)
  '     '        flow top width =     62.060(Ft.)
  '     '    velocity=    1.341(Ft/s)
  '     '        area =      9.629(Sq.Ft)
  '     '        Froude number =     0.600

Upstream point elevation =  1464.300(Ft.)
Downstream point elevation =  1459.000(Ft.)
Flow length =   603.000(Ft.)
Travel time  =    7.50 min.
Time of concentration =   20.07 min.
Depth of flow =   0.310(Ft.)
Average velocity =   1.341(Ft/s)
Total irregular channel flow =    12.910(CFS)
```

```
Irregular channel normal depth above invert elev. =   0.310(Ft.)
Average velocity of channel(s) =   1.341(Ft/s)
 Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.721
Decimal fraction soil group A = 0.240
Decimal fraction soil group B = 0.680
Decimal fraction soil group C = 0.080
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  51.28
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      1.915(In/Hr) for a   100.0 year storm
Subarea runoff =     10.521(CFS) for      7.620(Ac.)
Total runoff =     18.126(CFS)  Total area =      12.040(Ac.)
Depth of flow =   0.352(Ft.), Average velocity =   1.460(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     12.040(Ac.)
Runoff from this stream =     18.126(CFS)
Time of concentration =   20.07 min.
Rainfall intensity =     1.915(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.200 to Point/Station       13.400
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   358.000(Ft.)
Top (of initial area) elevation =  1462.800(Ft.)
Bottom (of initial area) elevation =  1461.000(Ft.)
Difference in elevation =     1.800(Ft.)
Slope =    0.00503  s(percent)=       0.50
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.812 min.
Rainfall intensity =      2.484(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.803
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.220
Decimal fraction soil group C = 0.780
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  66.14
Pervious area fraction =  0.500; Impervious fraction =  0.500
```

```
Initial subarea runoff =      8.416(CFS)
Total initial stream area =        4.220(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.200 to Point/Station       13.400
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 3 in normal stream number 1
Stream flow area =      4.220(Ac.)
Runoff from this stream =      8.416(CFS)
Time of concentration =   11.81 min.
Rainfall intensity =     2.484(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.300 to Point/Station       13.400
**** INITIAL AREA EVALUATION ****
____________________________________________________________________________
Initial area flow distance =   900.000(Ft.)
Top (of initial area) elevation =  1478.400(Ft.)
Bottom (of initial area) elevation =  1461.000(Ft.)
Difference in elevation =    17.400(Ft.)
Slope =    0.01933  s(percent)=       1.93
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.047 min.
Rainfall intensity =      2.365(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.739
Decimal fraction soil group A = 0.400
Decimal fraction soil group B = 0.300
Decimal fraction soil group C = 0.300
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  50.30
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      5.175(CFS)
Total initial stream area =        2.960(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.300 to Point/Station       13.400
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 3 in normal stream number 2
Stream flow area =      2.960(Ac.)
Runoff from this stream =      5.175(CFS)
Time of concentration =   13.05 min.
Rainfall intensity =     2.365(In/Hr)
```

```
Summary of stream data:

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


1        8.416     11.81                  2.484
2        5.175     13.05                  2.365
Largest stream flow has longer or shorter time of concentration
Qp =      8.416 + sum of
          Qa          Tb/Ta
           5.175 *    0.905 =      4.685
Qp =     13.101

Total of 2 streams to confluence:
Flow rates before confluence point:
       8.416       5.175
Area of streams before confluence:
        4.220        2.960
Results of confluence:
Total flow rate =     13.101(CFS)
Time of concentration =    11.812 min.
Effective stream area after confluence =      7.180(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.400 to Point/Station       14.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Depth of flow =   0.275(Ft.), Average velocity =   1.727(Ft/s)
        ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
        1              0.00              1.00
        2            100.00              0.00
        3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     13.101(CFS)
  '     '        flow top width =     55.085(Ft.)
  '     '    velocity=    1.727(Ft/s)
  '     '        area =      7.586(Sq.Ft)
  '     '        Froude number =     0.820

Upstream point elevation =  1461.000(Ft.)
Downstream point elevation =  1459.000(Ft.)
Flow length =   117.000(Ft.)
Travel time  =    1.13 min.
Time of concentration =   12.94 min.
```

```
Depth of flow =   0.275(Ft.)
Average velocity =   1.727(Ft/s)
Total irregular channel flow =    13.101(CFS)
Irregular channel normal depth above invert elev. =   0.275(Ft.)
Average velocity of channel(s) =   1.727(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.400 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      7.180(Ac.)
Runoff from this stream =     13.101(CFS)
Time of concentration =   12.94 min.
Rainfall intensity =     2.375(In/Hr)
Summary of stream data:

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


1       11.566     25.97                1.688
2       18.126     20.07                1.915
3       13.101     12.94                2.375
Largest stream flow has longer or shorter time of concentration
Qp =     18.126 + sum of
          Qa          Tb/Ta
          11.566 *    0.773 =      8.940
          Qb         Ia/Ib
          13.101 *    0.806 =     10.566
Qp =     37.632

Total of 3 main streams to confluence:
Flow rates before confluence point:
      11.566      18.126      13.101
Area of streams before confluence:
        8.100       12.040        7.180


Results of confluence:
Total flow rate =     37.632(CFS)
Time of concentration =    20.072 min.
Effective stream area after confluence  =     27.320(Ac.)
End of computations, total study area =           27.32 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
```

Area averaged RI index number = 55.6

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 08/14/23 File:1.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
EXISTING CONDITION OFFSITES - SUB AREA -AX
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 20.000 to Point/Station 21.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 979.000(Ft.)
Top (of initial area) elevation = 1493.800(Ft.)
Bottom (of initial area) elevation = 1486.400(Ft.)
Difference in elevation = 7.400(Ft.)
Slope = 0.00756 s(percent)= 0.76
TC = k(0.420)*[(length^3)/(elevation change)]^0.2

```
Initial area time of concentration =   17.534 min.
Rainfall intensity =      2.047(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.695
Decimal fraction soil group A = 0.440
Decimal fraction soil group B = 0.090
Decimal fraction soil group C = 0.470
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  51.55
Pervious area fraction =  0.600; Impervious fraction =  0.400
Initial subarea runoff =      2.219(CFS)
Total initial stream area =        1.560(Ac.)
Pervious area fraction = 0.600


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      3.604(CFS)
Depth of flow =   0.582(Ft.), Average velocity =   2.156(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              2.00
      2              4.00              0.00
      3              6.00              0.00
      4              8.00              2.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      3.604(CFS)
  '     '    flow top width =      3.745(Ft.)
  '     '    velocity=    2.156(Ft/s)
  '     '    area =      1.671(Sq.Ft)
  '     '    Froude number =     0.569

Upstream point elevation =  1486.400(Ft.)
Downstream point elevation =  1479.000(Ft.)
Flow length =  1171.000(Ft.)
Travel time  =    9.05 min.
Time of concentration =   26.58 min.
Depth of flow =   0.582(Ft.)
Average velocity =   2.156(Ft/s)
Total irregular channel flow =     3.604(CFS)
Irregular channel normal depth above invert elev. =   0.582(Ft.)
Average velocity of channel(s) =   2.156(Ft/s)
 Adding area flow to channel
USER INPUT of soil data for subarea
Runoff Coefficient = 0.759
Decimal fraction soil group A = 0.650
Decimal fraction soil group B = 0.350
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  80.00
Pervious area fraction =  0.940; Impervious fraction =  0.060
Rainfall intensity =      1.669(In/Hr) for a   100.0 year storm
```

```
Subarea runoff =      2.686(CFS) for      2.120(Ac.)
Total runoff =      4.905(CFS)      Total area =       3.680(Ac.)
Depth of flow =   0.687(Ft.), Average velocity =   2.354(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1479.000(Ft.)
Downstream point/station elevation =  1473.000(Ft.)
Pipe length  =    82.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.905(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.905(CFS)
Normal flow depth in pipe =    6.06(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =   10.94(In.)
Pipe flow velocity =     12.33(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    26.70 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      3.680(Ac.)
Runoff from this stream =      4.905(CFS)
Time of concentration =   26.70 min.
Rainfall intensity =     1.666(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.100 to Point/Station       22.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   951.000(Ft.)
Top (of initial area) elevation =  1492.000(Ft.)
Bottom (of initial area) elevation =  1483.700(Ft.)
Difference in elevation =     8.300(Ft.)
Slope =    0.00873  s(percent)=       0.87
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.951 min.
Rainfall intensity =      2.374(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.828
Decimal fraction soil group A = 0.570
Decimal fraction soil group B = 0.190
Decimal fraction soil group C = 0.240
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  45.44
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      3.340(CFS)
```

```
Total initial stream area =        1.700(Ac.)
Pervious area fraction = 0.200


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.200 to Point/Station       23.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      6.204(CFS)
Depth of flow =   0.692(Ft.), Average velocity =   2.950(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              2.00
      2              4.00              0.00
      3              6.00              0.00
      4              8.00              2.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      6.204(CFS)
  '     '    flow top width =      4.077(Ft.)

  '     '    velocity=    2.950(Ft/s)
  '     '    area =      2.103(Sq.Ft)
  '     '    Froude number =     0.724

Upstream point elevation =  1483.700(Ft.)
Downstream point elevation =  1473.000(Ft.)
Flow length =  1086.000(Ft.)
Travel time  =    6.14 min.
Time of concentration =   19.09 min.
Depth of flow =   0.692(Ft.)
Average velocity =   2.950(Ft/s)
Total irregular channel flow =     6.204(CFS)
Irregular channel normal depth above invert elev. =   0.692(Ft.)
Average velocity of channel(s) =   2.950(Ft/s)
 Adding area flow to channel
USER INPUT of soil data for subarea
Runoff Coefficient = 0.859
Decimal fraction soil group A = 0.440
Decimal fraction soil group B = 0.560
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  82.00
Pervious area fraction =  0.350; Impervious fraction =  0.650
Rainfall intensity =      1.963(In/Hr) for a   100.0 year storm
Subarea runoff =      5.667(CFS) for      3.360(Ac.)
Total runoff =      9.007(CFS)      Total area =       5.060(Ac.)
Depth of flow =   0.844(Ft.), Average velocity =   3.270(Ft/s)


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Process from Point/Station       22.200 to Point/Station       23.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
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```
In Main Stream number: 2
Stream flow area =      5.060(Ac.)
Runoff from this stream =      9.007(CFS)
Time of concentration =   19.09 min.
Rainfall intensity =     1.963(In/Hr)
Summary of stream data:

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


1        4.905     26.70               1.666
2        9.007     19.09               1.963
Largest stream flow has longer or shorter time of concentration
Qp =      9.007 + sum of
        Qa          Tb/Ta
         4.905 *    0.715 =      3.507
Qp =     12.513

Total of 2 main streams to confluence:
Flow rates before confluence point:
       4.905       9.007
Area of streams before confluence:
        3.680        5.060


Results of confluence:
Total flow rate =     12.513(CFS)
Time of concentration =    19.087 min.
Effective stream area after confluence  =      8.740(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1473.000(Ft.)
Downstream point/station elevation =  1471.800(Ft.)
Pipe length  =   228.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.513(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    12.513(CFS)
Normal flow depth in pipe =   15.68(In.)
Flow top width inside pipe =   22.84(In.)
Critical Depth =   15.26(In.)
Pipe flow velocity =      5.75(Ft/s)
Travel time through pipe =    0.66 min.
Time of concentration (TC) =    19.75 min.


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Process from Point/Station       23.000 to Point/Station       24.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      8.740(Ac.)
```

```
Runoff from this stream =     12.513(CFS)
Time of concentration =   19.75 min.
Rainfall intensity =     1.931(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.100 to Point/Station       23.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   500.000(Ft.)
Top (of initial area) elevation =  1484.600(Ft.)
Bottom (of initial area) elevation =  1477.300(Ft.)
Difference in elevation =     7.300(Ft.)
Slope =    0.01460  s(percent)=       1.46
TC = k(0.336)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.398 min.
Rainfall intensity =      2.778(In/Hr) for a   100.0 year storm
MOBILE HOME PARK subarea type
Runoff Coefficient = 0.789
Decimal fraction soil group A = 0.960
Decimal fraction soil group B = 0.040
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  32.96
Pervious area fraction =  0.250; Impervious fraction =  0.750
Initial subarea runoff =      1.994(CFS)
Total initial stream area =        0.910(Ac.)
Pervious area fraction = 0.250


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Process from Point/Station       23.200 to Point/Station       24.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1477.300(Ft.)
Downstream point elevation =  1475.200(Ft.)
Channel length thru subarea  =   782.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      3.605(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      3.605(CFS)
Depth of flow =   0.482(Ft.), Average velocity =   2.521(Ft/s)
Channel flow top width =    3.930(Ft.)
Flow Velocity =    2.52(Ft/s)
Travel time  =    5.17 min.
Time of concentration =   14.57 min.

Sub-Channel No. 1 Critical depth =      0.406(Ft.)
  '     '       '     Critical flow top width =      3.625(Ft.)
  '     '       '     Critical flow velocity=    3.155(Ft/s)
  '     '       '     Critical flow area =      1.143(Sq.Ft)

 Adding area flow to channel
```

```
USER INPUT of soil data for subarea
Runoff Coefficient = 0.843
Decimal fraction soil group A = 0.420
Decimal fraction soil group B = 0.580
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  65.00
Pervious area fraction =  0.260; Impervious fraction =  0.740
Rainfall intensity =      2.241(In/Hr) for a   100.0 year storm
Subarea runoff =      3.156(CFS) for      1.670(Ac.)
Total runoff =      5.150(CFS)      Total area =       2.580(Ac.)
Depth of flow =   0.583(Ft.), Average velocity =   2.790(Ft/s)

Sub-Channel No. 1 Critical depth =      0.496(Ft.)
  '     '       '     Critical flow top width =      3.984(Ft.)
  '     '       '     Critical flow velocity=    3.469(Ft/s)
  '     '       '     Critical flow area =      1.484(Sq.Ft)



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Process from Point/Station       23.200 to Point/Station       24.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.580(Ac.)
Runoff from this stream =      5.150(CFS)
Time of concentration =   14.57 min.
Rainfall intensity =     2.241(In/Hr)
Summary of stream data:

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


1       12.513     19.75               1.931
2        5.150     14.57               2.241
Largest stream flow has longer time of concentration
Qp =     12.513 + sum of
        Qb         Ia/Ib
         5.150 *    0.862 =      4.437
Qp =     16.950

Total of 2 main streams to confluence:
Flow rates before confluence point:
      12.513       5.150
Area of streams before confluence:
        8.740        2.580


Results of confluence:
Total flow rate =     16.950(CFS)
Time of concentration =    19.748 min.
Effective stream area after confluence  =     11.320(Ac.)
```

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Process from Point/Station       24.000 to Point/Station       25.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  1471.800(Ft.)
Downstream point/station elevation =  1470.000(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.950(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    16.950(CFS)
Normal flow depth in pipe =   14.30(In.)
Flow top width inside pipe =   14.55(In.)
Critical depth could not be calculated.
Pipe flow velocity =     11.27(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    19.84 min.
End of computations, total study area =           11.32 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.451
Area averaged RI index number =  65.5
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 08/16/23 File:b.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
EXISTING CONDITION OFFSITES - SUB AREA - BX
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 883.000(Ft.)
Top (of initial area) elevation = 1488.600(Ft.)
Bottom (of initial area) elevation = 1484.000(Ft.)
Difference in elevation = 4.600(Ft.)
Slope = 0.00521 s(percent)= 0.52

```
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.946 min.
Rainfall intensity =      2.374(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.867
Decimal fraction soil group A = 0.430
Decimal fraction soil group B = 0.340
Decimal fraction soil group C = 0.230
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  48.67
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.366(CFS)
Total initial stream area =        1.150(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1476.000(Ft.)
Downstream point/station elevation =  1475.800(Ft.)
Pipe length  =    75.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.366(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     2.366(CFS)
Normal flow depth in pipe =    9.33(In.)
Flow top width inside pipe =   14.55(In.)
Critical Depth =    7.38(In.)
Pipe flow velocity =      2.95(Ft/s)
Travel time through pipe =    0.42 min.
Time of concentration (TC) =    13.37 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      1.150(Ac.)
Runoff from this stream =      2.366(CFS)
Time of concentration =   13.37 min.
Rainfall intensity =     2.337(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.100 to Point/Station       12.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   794.000(Ft.)
Top (of initial area) elevation =  1489.000(Ft.)
Bottom (of initial area) elevation =  1484.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00630  s(percent)=       0.63
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
```

```
Initial area time of concentration =   11.946 min.
Rainfall intensity =      2.470(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.865
Decimal fraction soil group A = 0.530
Decimal fraction soil group B = 0.270
Decimal fraction soil group C = 0.200
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  45.88
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.307(CFS)
Total initial stream area =        1.080(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.100 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.080(Ac.)
Runoff from this stream =      2.307(CFS)
Time of concentration =   11.95 min.
Rainfall intensity =     2.470(In/Hr)
Summary of stream data:

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


1        2.366     13.37               2.337
2        2.307     11.95               2.470
Largest stream flow has longer time of concentration
Qp =      2.366 + sum of
        Qb         Ia/Ib
         2.307 *    0.946 =      2.183
Qp =      4.550

Total of 2 main streams to confluence:
Flow rates before confluence point:
       2.366       2.307
Area of streams before confluence:
        1.150        1.080


Results of confluence:
Total flow rate =      4.550(CFS)
Time of concentration =    13.370 min.
Effective stream area after confluence  =      2.230(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1475.800(Ft.)
```

```
Downstream point/station elevation =  1475.400(Ft.)
Pipe length  =    83.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.550(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     4.550(CFS)
Normal flow depth in pipe =   10.30(In.)
Flow top width inside pipe =   17.81(In.)
Critical Depth =    9.83(In.)
Pipe flow velocity =      4.35(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =    13.69 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      2.230(Ac.)
Runoff from this stream =      4.550(CFS)
Time of concentration =   13.69 min.
Rainfall intensity =     2.311(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.100 to Point/Station       13.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   457.000(Ft.)
Top (of initial area) elevation =  1486.700(Ft.)
Bottom (of initial area) elevation =  1478.700(Ft.)
Difference in elevation =     8.000(Ft.)
Slope =    0.01751  s(percent)=       1.75
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.806 min.
Rainfall intensity =      3.042(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.872
Decimal fraction soil group A = 0.270
Decimal fraction soil group B = 0.730
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  49.52
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.202(CFS)
Total initial stream area =        0.830(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.100 to Point/Station       13.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
```

```
Stream flow area =      0.830(Ac.)
Runoff from this stream =      2.202(CFS)
Time of concentration =    7.81 min.
Rainfall intensity =     3.042(In/Hr)
Summary of stream data:

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


1        4.550     13.69               2.311
2        2.202      7.81               3.042
Largest stream flow has longer time of concentration
Qp =      4.550 + sum of
        Qb          Ia/Ib
         2.202 *    0.759 =      1.673
Qp =      6.222

Total of 2 main streams to confluence:
Flow rates before confluence point:
       4.550       2.202
Area of streams before confluence:
        2.230        0.830


Results of confluence:
Total flow rate =      6.222(CFS)
Time of concentration =    13.688 min.
Effective stream area after confluence  =      3.060(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1475.400(Ft.)
Downstream point/station elevation =  1475.200(Ft.)
Pipe length  =    61.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.222(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     6.222(CFS)
Normal flow depth in pipe =   12.77(In.)
Flow top width inside pipe =   20.50(In.)
Critical Depth =   11.04(In.)
Pipe flow velocity =      4.06(Ft/s)
Travel time through pipe =    0.25 min.
Time of concentration (TC) =    13.94 min.
End of computations, total study area =            3.06 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  47.9
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 08/18/23 File:21.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
EXISTING CONDITION OFFSITES - AREA X
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 478.000(Ft.)
Top (of initial area) elevation = 1497.500(Ft.)
Bottom (of initial area) elevation = 1495.000(Ft.)
Difference in elevation = 2.500(Ft.)
Slope = 0.00523 s(percent)= 0.52
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 10.120 min.
Rainfall intensity = 2.679(In/Hr) for a 100.0 year storm

```
COMMERCIAL subarea type
Runoff Coefficient = 0.854
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  32.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.761(CFS)
Total initial stream area =        0.770(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      2.965(CFS)
Depth of flow =   0.392(Ft.), Average velocity =   1.543(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              2.00
      2             50.00              0.00
      3             10.00              5.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      2.965(CFS)
  '     '    flow top width =      9.801(Ft.)
  '     '    velocity=    1.543(Ft/s)
  '     '    area =      1.921(Sq.Ft)
  '     '    Froude number =     0.614

Upstream point elevation =  1495.000(Ft.)
Downstream point elevation =  1490.000(Ft.)
Flow length =   556.000(Ft.)
Travel time  =    6.00 min.
Time of concentration =   16.12 min.
Depth of flow =   0.392(Ft.)
Average velocity =   1.543(Ft/s)
Total irregular channel flow =     2.965(CFS)
Irregular channel normal depth above invert elev. =   0.392(Ft.)
Average velocity of channel(s) =   1.543(Ft/s)
 Adding area flow to channel
USER INPUT of soil data for subarea
Runoff Coefficient = 0.887
Decimal fraction soil group A = 0.730
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.270
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  78.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.132(In/Hr) for a   100.0 year storm
Subarea runoff =      2.344(CFS) for      1.240(Ac.)
Total runoff =      4.105(CFS)      Total area =       2.010(Ac.)
Depth of flow =   0.443(Ft.), Average velocity =   1.674(Ft/s)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1490.000(Ft.)
Downstream point/station elevation =  1486.000(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.105(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     4.105(CFS)
Normal flow depth in pipe =    6.54(In.)
Flow top width inside pipe =    8.02(In.)
Critical depth could not be calculated.
Pipe flow velocity =     11.95(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    16.19 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Depth of flow =   0.608(Ft.), Average velocity =   5.555(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              2.00
      2              4.00              0.00
      3              8.00              2.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      4.105(CFS)
  '     '    flow top width =      2.431(Ft.)
  '     '    velocity=    5.555(Ft/s)
  '     '    area =      0.739(Sq.Ft)
  '     '    Froude number =     1.776

Upstream point elevation =  1486.000(Ft.)
Downstream point elevation =  1484.000(Ft.)
Flow length =    28.000(Ft.)
Travel time  =    0.08 min.
Time of concentration =   16.28 min.
Depth of flow =   0.608(Ft.)
Average velocity =   5.555(Ft/s)
Total irregular channel flow =     4.105(CFS)
Irregular channel normal depth above invert elev. =   0.608(Ft.)
Average velocity of channel(s) =   5.555(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
```

```
In Main Stream number: 1
Stream flow area =      2.010(Ac.)
Runoff from this stream =      4.105(CFS)
Time of concentration =   16.28 min.
Rainfall intensity =     2.122(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.100 to Point/Station       14.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   802.000(Ft.)
Top (of initial area) elevation =  1495.000(Ft.)
Bottom (of initial area) elevation =  1484.000(Ft.)
Difference in elevation =    11.000(Ft.)
Slope =    0.01372  s(percent)=       1.37
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.344 min.
Rainfall intensity =      2.339(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.712
Decimal fraction soil group A = 0.670
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.330
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  44.21
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      3.364(CFS)
Total initial stream area =        2.020(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.100 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.020(Ac.)
Runoff from this stream =      3.364(CFS)
Time of concentration =   13.34 min.
Rainfall intensity =     2.339(In/Hr)
Summary of stream data:

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


1        4.105     16.28               2.122
2        3.364     13.34               2.339
Largest stream flow has longer time of concentration
Qp =      4.105 + sum of
        Qb         Ia/Ib
         3.364 *    0.907 =      3.051
Qp =      7.156
```

```
Total of 2 main streams to confluence:
Flow rates before confluence point:
       4.105       3.364
Area of streams before confluence:
        2.010        2.020


Results of confluence:
Total flow rate =      7.156(CFS)
Time of concentration =    16.278 min.
Effective stream area after confluence  =      4.030(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       15.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1484.000(Ft.)
Downstream point/station elevation =  1483.500(Ft.)
Pipe length  =    62.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.156(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     7.156(CFS)
Normal flow depth in pipe =   11.72(In.)
Flow top width inside pipe =   17.16(In.)
Critical Depth =   12.43(In.)
Pipe flow velocity =      5.87(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =    16.45 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       15.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      4.030(Ac.)
Runoff from this stream =      7.156(CFS)
Time of concentration =   16.45 min.
Rainfall intensity =     2.111(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.100 to Point/Station       15.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   598.000(Ft.)
Top (of initial area) elevation =  1493.000(Ft.)
Bottom (of initial area) elevation =  1487.000(Ft.)
Difference in elevation =     6.000(Ft.)
Slope =    0.01003  s(percent)=       1.00
TC = k(0.370)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.984 min.
Rainfall intensity =      2.466(In/Hr) for a   100.0 year storm
CONDOMINIUM subarea type
```

```
Runoff Coefficient = 0.783
Decimal fraction soil group A = 0.570
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.430
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  47.91
Pervious area fraction =  0.350; Impervious fraction =  0.650
Initial subarea runoff =      2.666(CFS)
Total initial stream area =        1.380(Ac.)
Pervious area fraction = 0.350


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.100 to Point/Station       15.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.380(Ac.)
Runoff from this stream =      2.666(CFS)
Time of concentration =   11.98 min.
Rainfall intensity =     2.466(In/Hr)
Summary of stream data:

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


1        7.156     16.45               2.111
2        2.666     11.98               2.466
Largest stream flow has longer time of concentration
Qp =      7.156 + sum of
        Qb         Ia/Ib
         2.666 *    0.856 =      2.282
Qp =      9.439

Total of 2 main streams to confluence:
Flow rates before confluence point:
       7.156       2.666
Area of streams before confluence:
        4.030        1.380


Results of confluence:
Total flow rate =      9.439(CFS)
Time of concentration =    16.454 min.
Effective stream area after confluence  =      5.410(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1483.500(Ft.)
Downstream point/station elevation =  1482.000(Ft.)
Pipe length  =   171.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.439(CFS)
```

```
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     9.439(CFS)
Normal flow depth in pipe =   14.13(In.)
Flow top width inside pipe =   14.79(In.)
Critical Depth =   14.25(In.)
Pipe flow velocity =      6.34(Ft/s)
Travel time through pipe =    0.45 min.
Time of concentration (TC) =    16.90 min.


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Process from Point/Station       16.000 to Point/Station       17.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =  1482.000(Ft.)
Downstream point elevation =  1480.600(Ft.)
Channel length thru subarea  =   157.000(Ft.)
Channel base width      =    0.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      9.849(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    5.000(Ft.)
Flow(q) thru subarea =      9.849(CFS)
Depth of flow =   0.961(Ft.), Average velocity =   5.329(Ft/s)
Channel flow top width =    3.845(Ft.)
Flow Velocity =    5.33(Ft/s)
Travel time  =    0.49 min.
Time of concentration =   17.39 min.

Sub-Channel No. 1 Critical depth =      1.086(Ft.)
  '     '       '     Critical flow top width =      4.344(Ft.)
  '     '       '     Critical flow velocity=    4.176(Ft/s)
  '     '       '     Critical flow area =      2.359(Sq.Ft)

 Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.798
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      2.054(In/Hr) for a   100.0 year storm
Subarea runoff =      0.771(CFS) for      0.470(Ac.)
Total runoff =     10.210(CFS)      Total area =       5.880(Ac.)
Depth of flow =   0.974(Ft.), Average velocity =   5.377(Ft/s)

Sub-Channel No. 1 Critical depth =      1.102(Ft.)
  '     '       '     Critical flow top width =      4.406(Ft.)
  '     '       '     Critical flow velocity=    4.207(Ft/s)
  '     '       '     Critical flow area =      2.427(Sq.Ft)



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Process from Point/Station       16.000 to Point/Station       17.000
**** CONFLUENCE OF MAIN STREAMS ****
--------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      5.880(Ac.)
Runoff from this stream =     10.210(CFS)
Time of concentration =   17.39 min.
Rainfall intensity =     2.054(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.100 to Point/Station       16.200
**** INITIAL AREA EVALUATION ****
--------------------------------------------------------------------------------
Initial area flow distance =   703.000(Ft.)
Top (of initial area) elevation =  1491.500(Ft.)
Bottom (of initial area) elevation =  1488.000(Ft.)
Difference in elevation =     3.500(Ft.)
Slope =    0.00498  s(percent)=       0.50
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.926 min.
Rainfall intensity =      2.472(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.876
Decimal fraction soil group A = 0.250
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.750
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  59.75
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.620(CFS)
Total initial stream area =        1.210(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.200 to Point/Station       17.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
--------------------------------------------------------------------------------
Upstream point/station elevation =  1488.000(Ft.)
Downstream point/station elevation =  1480.600(Ft.)
Pipe length  =    85.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.620(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.620(CFS)
Normal flow depth in pipe =    4.69(In.)
Flow top width inside pipe =    8.99(In.)
Critical Depth =    8.41(In.)
Pipe flow velocity =     11.24(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    12.05 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.200 to Point/Station       17.000
```

**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area = 1.210(Ac.)
Runoff from this stream = 2.620(CFS)
Time of concentration = 12.05 min.
Rainfall intensity = 2.459(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	10.210	17.39	2.054
2	2.620	12.05	2.459

Largest stream flow has longer time of concentration
Qp = 10.210 + sum of
Qb Ia/Ib
2.620 * 0.835 = 2.189
Qp = 12.399

Total of 2 main streams to confluence:
Flow rates before confluence point:
10.210 2.620
Area of streams before confluence:
5.880 1.210

Results of confluence:
Total flow rate = 12.399(CFS)
Time of concentration = 17.395 min.
Effective stream area after confluence = 7.090(Ac.)

++
Process from Point/Station 17.000 to Point/Station 18.000
**** IMPROVED CHANNEL TRAVEL TIME ****

Upstream point elevation = 1480.600(Ft.)
Downstream point elevation = 1478.000(Ft.)
Channel length thru subarea = 308.000(Ft.)
Channel base width = 0.000(Ft.)
Slope or 'Z' of left channel bank = 2.000
Slope or 'Z' of right channel bank = 2.000
Estimated mean flow rate at midpoint of channel = 13.037(CFS)
Manning's 'N' = 0.015
Maximum depth of channel = 5.000(Ft.)
Flow(q) thru subarea = 13.037(CFS)
Depth of flow = 1.079(Ft.), Average velocity = 5.599(Ft/s)
Channel flow top width = 4.316(Ft.)
Flow Velocity = 5.60(Ft/s)
Travel time = 0.92 min.
Time of concentration = 18.31 min.

Sub-Channel No. 1 Critical depth = 1.219(Ft.)
' ' Critical flow top width = 4.875(Ft.)

```
  '     '       '     Critical flow velocity=    4.389(Ft/s)
  '     '       '     Critical flow area =      2.971(Sq.Ft)

 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.867
Decimal fraction soil group A = 0.430
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.570
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  53.09
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.003(In/Hr) for a   100.0 year storm
Subarea runoff =      1.268(CFS) for      0.730(Ac.)
Total runoff =     13.666(CFS)      Total area =       7.820(Ac.)
Depth of flow =   1.098(Ft.), Average velocity =   5.666(Ft/s)

Sub-Channel No. 1 Critical depth =      1.234(Ft.)
  '     '       '     Critical flow top width =      4.938(Ft.)
  '     '       '     Critical flow velocity=    4.485(Ft/s)
  '     '       '     Critical flow area =      3.047(Sq.Ft)

End of computations, total study area =            7.82 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.271
Area averaged RI index number =  53.7
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 09/30/24 File:12.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WITH OFFSITES
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 600.000(Ft.)
Top (of initial area) elevation = 1479.800(Ft.)
Bottom (of initial area) elevation = 1471.300(Ft.)
Difference in elevation = 8.500(Ft.)

```
Slope =    0.01417  s(percent)=       1.42
TC = k(0.370)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.200 min.
Rainfall intensity =      2.549(In/Hr) for a   100.0 year storm
CONDOMINIUM subarea type
Runoff Coefficient = 0.804
Decimal fraction soil group A = 0.070
Decimal fraction soil group B = 0.930
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  54.32
Pervious area fraction =  0.350; Impervious fraction =  0.650
Initial subarea runoff =      6.803(CFS)
Total initial stream area =        3.320(Ac.)
Pervious area fraction = 0.350


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       11.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      3.320(Ac.)
Runoff from this stream =      6.803(CFS)
Time of concentration =   11.20 min.
Rainfall intensity =     2.549(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.100 to Point/Station       10.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   539.000(Ft.)
Top (of initial area) elevation =  1479.700(Ft.)
Bottom (of initial area) elevation =  1471.400(Ft.)
Difference in elevation =     8.300(Ft.)
Slope =    0.01540  s(percent)=       1.54
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.122 min.
Rainfall intensity =      2.558(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.695
Decimal fraction soil group A = 0.730
Decimal fraction soil group B = 0.270
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  38.48
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      2.188(CFS)
Total initial stream area =        1.230(Ac.)
Pervious area fraction = 0.500


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Process from Point/Station       10.200 to Point/Station       10.400
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```
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  1465.900(Ft.)
Downstream point/station elevation =  1463.700(Ft.)
Pipe length  =   178.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.188(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.188(CFS)
Normal flow depth in pipe =    6.37(In.)
Flow top width inside pipe =   11.98(In.)
Critical Depth =    7.58(In.)
Pipe flow velocity =      5.17(Ft/s)
Travel time through pipe =    0.57 min.
Time of concentration (TC) =    11.70 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.200 to Point/Station       10.400
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.230(Ac.)
Runoff from this stream =      2.188(CFS)
Time of concentration =   11.70 min.
Rainfall intensity =     2.496(In/Hr)


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Process from Point/Station       10.300 to Point/Station       10.400
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________
Initial area flow distance =   146.000(Ft.)
Top (of initial area) elevation =  1474.000(Ft.)
Bottom (of initial area) elevation =  1471.300(Ft.)
Difference in elevation =     2.700(Ft.)
Slope =    0.01849  s(percent)=       1.85
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Warning: TC computed to be less than 5 min.; program is assuming the
time of concentration is 5 minutes.
Initial area time of concentration =    5.000 min.
Rainfall intensity =      3.785(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.864
Decimal fraction soil group A = 0.880
Decimal fraction soil group B = 0.120
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  34.88
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.388(CFS)
Total initial stream area =        0.730(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       10.300 to Point/Station       10.400
**** CONFLUENCE OF MINOR STREAMS ****
```

```
_____________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.730(Ac.)
Runoff from this stream =      2.388(CFS)
Time of concentration =    5.00 min.
Rainfall intensity =     3.785(In/Hr)
Summary of stream data:

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


1        2.188     11.70                2.496
2        2.388      5.00                3.785
Largest stream flow has longer or shorter time of concentration
Qp =      2.388 + sum of
        Qa          Tb/Ta
         2.188 *    0.427 =      0.935
Qp =      3.323

Total of 2 streams to confluence:
Flow rates before confluence point:
       2.188       2.388
Area of streams before confluence:
        1.230        0.730
Results of confluence:
Total flow rate =      3.323(CFS)
Time of concentration =     5.000 min.
Effective stream area after confluence =      1.960(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.400 to Point/Station       10.600
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  1463.700(Ft.)
Downstream point/station elevation =  1461.400(Ft.)
Pipe length  =   180.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.323(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.323(CFS)
Normal flow depth in pipe =    8.31(In.)
Flow top width inside pipe =   11.08(In.)
Critical Depth =    9.37(In.)
Pipe flow velocity =      5.73(Ft/s)
Travel time through pipe =    0.52 min.
Time of concentration (TC) =     5.52 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.400 to Point/Station       10.600
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.960(Ac.)
Runoff from this stream =      3.323(CFS)
Time of concentration =    5.52 min.
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Rainfall intensity =     3.604(In/Hr)


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Process from Point/Station       10.500 to Point/Station       10.600
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   167.000(Ft.)
Top (of initial area) elevation =  1479.700(Ft.)
Bottom (of initial area) elevation =  1471.300(Ft.)
Difference in elevation =     8.400(Ft.)
Slope =    0.05030  s(percent)=       5.03
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Warning: TC computed to be less than 5 min.; program is assuming the
time of concentration is 5 minutes.
Initial area time of concentration =    5.000 min.
Rainfall intensity =      3.785(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.877
Decimal fraction soil group A = 0.250
Decimal fraction soil group B = 0.750
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  50.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.886(CFS)
Total initial stream area =        0.870(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.500 to Point/Station       10.600
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.870(Ac.)
Runoff from this stream =      2.886(CFS)
Time of concentration =    5.00 min.
Rainfall intensity =     3.785(In/Hr)
Summary of stream data:

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


1        3.323      5.52                3.604
2        2.886      5.00                3.785
Largest stream flow has longer time of concentration
Qp =      3.323 + sum of
        Qb         Ia/Ib
         2.886 *    0.952 =      2.749
Qp =      6.072

Total of 2 streams to confluence:
Flow rates before confluence point:
       3.323       2.886
Area of streams before confluence:
```

```
        1.960        0.870
Results of confluence:
Total flow rate =      6.072(CFS)
Time of concentration =     5.524 min.
Effective stream area after confluence =      2.830(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.600 to Point/Station       11.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1461.400(Ft.)
Downstream point/station elevation =  1459.100(Ft.)
Pipe length  =   183.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.072(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     6.072(CFS)
Normal flow depth in pipe =   10.51(In.)
Flow top width inside pipe =   13.74(In.)
Critical Depth =   11.94(In.)
Pipe flow velocity =      6.61(Ft/s)
Travel time through pipe =    0.46 min.
Time of concentration (TC) =     5.99 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.600 to Point/Station       11.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.830(Ac.)
Runoff from this stream =      6.072(CFS)
Time of concentration =    5.99 min.
Rainfall intensity =     3.465(In/Hr)
Summary of stream data:

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


1        6.803     11.20               2.549
2        6.072      5.99               3.465
Largest stream flow has longer time of concentration
Qp =      6.803 + sum of
        Qb         Ia/Ib
         6.072 *    0.736 =      4.467
Qp =     11.269

Total of 2 main streams to confluence:
Flow rates before confluence point:
       6.803       6.072
Area of streams before confluence:
        3.320        2.830


Results of confluence:
```

```
Total flow rate =     11.269(CFS)
Time of concentration =    11.200 min.
Effective stream area after confluence  =      6.150(Ac.)


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Process from Point/Station       11.000 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1459.100(Ft.)
Downstream point/station elevation =  1458.400(Ft.)
Pipe length  =    52.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.269(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    11.269(CFS)
Normal flow depth in pipe =   13.66(In.)
Flow top width inside pipe =   15.39(In.)
Critical Depth =   15.40(In.)
Pipe flow velocity =      7.83(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    11.31 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1458.400(Ft.)
Downstream point/station elevation =  1455.500(Ft.)
Pipe length  =   407.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.269(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    11.269(CFS)
Normal flow depth in pipe =   14.77(In.)
Flow top width inside pipe =   19.19(In.)
Critical Depth =   15.01(In.)
Pipe flow velocity =      6.23(Ft/s)
Travel time through pipe =    1.09 min.
Time of concentration (TC) =    12.40 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      6.150(Ac.)
Runoff from this stream =     11.269(CFS)
Time of concentration =   12.40 min.
Rainfall intensity =     2.425(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       12.100 to Point/Station       12.100
**** USER DEFINED FLOW INFORMATION AT A POINT ****
```

```
Rainfall intensity =      2.004(In/Hr) for a   100.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.811
Decimal fraction soil group A = 0.430
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.570
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  53.70
Pervious area fraction =  0.271; Impervious fraction =  0.729
User specified values are as follows:
TC =  18.31 min.  Rain intensity =       2.00(In/Hr)
Total area =         7.82(Ac.)  Total runoff =     13.70(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.100 to Point/Station       12.300
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1478.000(Ft.)
Downstream point/station elevation =  1458.500(Ft.)
Pipe length  =   173.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.700(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    13.700(CFS)
Normal flow depth in pipe =    8.65(In.)
Flow top width inside pipe =   14.82(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.69(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =    18.46 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.100 to Point/Station       12.300
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      7.820(Ac.)
Runoff from this stream =     13.700(CFS)
Time of concentration =   18.46 min.
Rainfall intensity =     1.995(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.200 to Point/Station       12.200
**** USER DEFINED FLOW INFORMATION AT A POINT ****
------------------------------------------------------------------------------
Rainfall intensity =      2.290(In/Hr) for a   100.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.865
Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.250
Decimal fraction soil group C = 0.250
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  47.90
Pervious area fraction =  0.100; Impervious fraction =  0.900
```

```
User specified values are as follows:
TC =  13.94 min.  Rain intensity =       2.29(In/Hr)
Total area =         3.06(Ac.)  Total runoff =      6.22(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.200 to Point/Station       12.300
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1479.500(Ft.)
Downstream point/station elevation =  1458.500(Ft.)
Pipe length  =   294.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.220(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     6.220(CFS)
Normal flow depth in pipe =    7.07(In.)
Flow top width inside pipe =   11.81(In.)
Critical depth could not be calculated.
Pipe flow velocity =     12.92(Ft/s)
Travel time through pipe =    0.38 min.
Time of concentration (TC) =    14.32 min.


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Process from Point/Station       12.200 to Point/Station       12.300
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      3.060(Ac.)
Runoff from this stream =      6.220(CFS)
Time of concentration =   14.32 min.
Rainfall intensity =     2.260(In/Hr)
Summary of stream data:

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


1       13.700     18.46                1.995
2        6.220     14.32                2.260
Largest stream flow has longer time of concentration
Qp =     13.700 + sum of
        Qb         Ia/Ib
         6.220 *    0.883 =      5.491
Qp =     19.191

Total of 2 streams to confluence:
Flow rates before confluence point:
      13.700       6.220
Area of streams before confluence:
        7.820        3.060
Results of confluence:
Total flow rate =     19.191(CFS)
Time of concentration =    18.464 min.
Effective stream area after confluence =     10.880(Ac.)
```

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Process from Point/Station       12.300 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1458.500(Ft.)
Downstream point/station elevation =  1455.500(Ft.)
Pipe length  =   430.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    19.191(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    19.191(CFS)
Normal flow depth in pipe =   20.02(In.)
Flow top width inside pipe =   17.86(In.)
Critical Depth =   18.92(In.)
Pipe flow velocity =      6.85(Ft/s)
Travel time through pipe =    1.05 min.
Time of concentration (TC) =    19.51 min.


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Process from Point/Station       12.300 to Point/Station       13.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     10.880(Ac.)
Runoff from this stream =     19.191(CFS)
Time of concentration =   19.51 min.
Rainfall intensity =     1.942(In/Hr)
Summary of stream data:

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


1       11.269     12.40               2.425
2       19.191     19.51               1.942
Largest stream flow has longer time of concentration
Qp =     19.191 + sum of
        Qb         Ia/Ib
        11.269 *    0.801 =      9.024
Qp =     28.216

Total of 2 main streams to confluence:
Flow rates before confluence point:
      11.269      19.191
Area of streams before confluence:
        6.150       10.880


Results of confluence:
Total flow rate =     28.216(CFS)
Time of concentration =    19.510 min.
Effective stream area after confluence  =     17.030(Ac.)


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Process from Point/Station       13.000 to Point/Station       21.000
```

```
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  1455.500(Ft.)
Downstream point/station elevation =  1449.300(Ft.)
Pipe length  =   623.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    28.216(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    28.216(CFS)
Normal flow depth in pipe =   20.27(In.)
Flow top width inside pipe =   23.36(In.)
Critical Depth =   22.17(In.)
Pipe flow velocity =      8.81(Ft/s)
Travel time through pipe =    1.18 min.
Time of concentration (TC) =    20.69 min.


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Process from Point/Station       13.000 to Point/Station       21.000
**** CONFLUENCE OF MAIN STREAMS ****
_____________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     17.030(Ac.)
Runoff from this stream =     28.216(CFS)
Time of concentration =   20.69 min.
Rainfall intensity =     1.887(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       14.000 to Point/Station       15.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________
Initial area flow distance =   469.000(Ft.)
Top (of initial area) elevation =  1473.700(Ft.)
Bottom (of initial area) elevation =  1468.400(Ft.)
Difference in elevation =     5.300(Ft.)
Slope =    0.01130  s(percent)=       1.13
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.609 min.
Rainfall intensity =      2.900(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.880
Decimal fraction soil group A = 0.010
Decimal fraction soil group B = 0.570
Decimal fraction soil group C = 0.420
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  61.22
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     13.010(CFS)
Total initial stream area =        5.100(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       15.000 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
```

```
Upstream point/station elevation =  1453.100(Ft.)
Downstream point/station elevation =  1451.900(Ft.)
Pipe length  =   244.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.010(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    13.010(CFS)
Normal flow depth in pipe =   16.55(In.)
Flow top width inside pipe =   22.21(In.)
Critical Depth =   15.58(In.)
Pipe flow velocity =      5.64(Ft/s)
Travel time through pipe =    0.72 min.
Time of concentration (TC) =     9.33 min.


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Process from Point/Station       15.000 to Point/Station       16.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      5.100(Ac.)
Runoff from this stream =     13.010(CFS)
Time of concentration =    9.33 min.
Rainfall intensity =     2.788(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.100 to Point/Station       15.200
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   333.000(Ft.)
Top (of initial area) elevation =  1470.700(Ft.)
Bottom (of initial area) elevation =  1467.800(Ft.)
Difference in elevation =     2.900(Ft.)
Slope =    0.00871  s(percent)=       0.87
TC = k(0.370)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.754 min.
Rainfall intensity =      2.728(In/Hr) for a   100.0 year storm
CONDOMINIUM subarea type
Runoff Coefficient = 0.813
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.350; Impervious fraction =  0.650
Initial subarea runoff =      6.495(CFS)
Total initial stream area =        2.930(Ac.)
Pervious area fraction = 0.350


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Process from Point/Station       15.200 to Point/Station       15.300
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1454.300(Ft.)
Downstream point/station elevation =  1452.400(Ft.)
```

```
Pipe length  =   384.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.495(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     6.495(CFS)
Normal flow depth in pipe =   13.10(In.)
Flow top width inside pipe =   16.02(In.)
Critical Depth =   11.83(In.)
Pipe flow velocity =      4.72(Ft/s)
Travel time through pipe =    1.36 min.
Time of concentration (TC) =    11.11 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.300 to Point/Station       15.300
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
CONDOMINIUM subarea type
Runoff Coefficient = 0.831
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.310
Decimal fraction soil group C = 0.690
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  64.97
Pervious area fraction =  0.350; Impervious fraction =  0.650
Time of concentration =    11.11 min.
Rainfall intensity =      2.559(In/Hr) for a   100.0 year storm
Subarea runoff =      5.614(CFS) for      2.640(Ac.)
Total runoff =     12.108(CFS)      Total area =       5.570(Ac.)


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Process from Point/Station       15.300 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  1452.400(Ft.)
Downstream point/station elevation =  1451.900(Ft.)
Pipe length  =   102.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.108(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    12.108(CFS)
Normal flow depth in pipe =   15.73(In.)
Flow top width inside pipe =   22.81(In.)
Critical Depth =   15.00(In.)
Pipe flow velocity =      5.55(Ft/s)
Travel time through pipe =    0.31 min.
Time of concentration (TC) =    11.42 min.


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Process from Point/Station       15.300 to Point/Station       16.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      5.570(Ac.)
Runoff from this stream =     12.108(CFS)
Time of concentration =   11.42 min.
Rainfall intensity =     2.525(In/Hr)
```

```
Summary of stream data:

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


1       13.010      9.33                2.788
2       12.108     11.42                2.525
Largest stream flow has longer or shorter time of concentration
Qp =     13.010 + sum of
        Qa          Tb/Ta
        12.108 *    0.817 =      9.896
Qp =     22.906

Total of 2 streams to confluence:
Flow rates before confluence point:
      13.010      12.108
Area of streams before confluence:
        5.100        5.570
Results of confluence:
Total flow rate =     22.906(CFS)
Time of concentration =     9.331 min.
Effective stream area after confluence =     10.670(Ac.)


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Process from Point/Station       16.000 to Point/Station       20.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1451.900(Ft.)
Downstream point/station elevation =  1451.700(Ft.)
Pipe length  =    35.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    22.906(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    22.906(CFS)
Normal flow depth in pipe =   21.61(In.)
Flow top width inside pipe =   21.59(In.)
Critical Depth =   20.10(In.)
Pipe flow velocity =      6.71(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =     9.42 min.


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Process from Point/Station       16.000 to Point/Station       20.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     10.670(Ac.)
Runoff from this stream =     22.906(CFS)
Time of concentration =    9.42 min.
Rainfall intensity =     2.775(In/Hr)


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Process from Point/Station       17.000 to Point/Station       18.000
**** INITIAL AREA EVALUATION ****
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Initial area flow distance =   642.000(Ft.)
Top (of initial area) elevation =  1474.000(Ft.)
Bottom (of initial area) elevation =  1464.700(Ft.)
Difference in elevation =     9.300(Ft.)
Slope =    0.01449  s(percent)=       1.45
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.289 min.
Rainfall intensity =      2.794(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.875
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     14.578(CFS)
Total initial stream area =        5.960(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       18.000 to Point/Station       20.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1458.000(Ft.)
Downstream point/station elevation =  1451.700(Ft.)
Pipe length  =   223.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.578(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    14.578(CFS)
Normal flow depth in pipe =   12.47(In.)
Flow top width inside pipe =   16.61(In.)
Critical Depth =   16.75(In.)
Pipe flow velocity =     11.16(Ft/s)
Travel time through pipe =    0.33 min.
Time of concentration (TC) =     9.62 min.


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Process from Point/Station       18.000 to Point/Station       20.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      5.960(Ac.)
Runoff from this stream =     14.578(CFS)
Time of concentration =    9.62 min.
Rainfall intensity =     2.746(In/Hr)
Summary of stream data:

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


1       22.906      9.42                2.775
2       14.578      9.62                2.746
```

```
Largest stream flow has longer or shorter time of concentration
Qp =     22.906 + sum of
        Qa          Tb/Ta
        14.578 *    0.979 =     14.270
Qp =     37.176

Total of 2 streams to confluence:
Flow rates before confluence point:
      22.906      14.578
Area of streams before confluence:
       10.670        5.960
Results of confluence:
Total flow rate =     37.176(CFS)
Time of concentration =     9.418 min.
Effective stream area after confluence =     16.630(Ac.)


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Process from Point/Station       20.000 to Point/Station       21.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1451.700(Ft.)
Downstream point/station elevation =  1449.300(Ft.)
Pipe length  =   343.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    37.176(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    37.176(CFS)
Normal flow depth in pipe =   23.16(In.)
Flow top width inside pipe =   30.20(In.)
Critical Depth =   24.36(In.)
Pipe flow velocity =      8.34(Ft/s)
Travel time through pipe =    0.69 min.
Time of concentration (TC) =    10.10 min.


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Process from Point/Station       20.000 to Point/Station       21.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     16.630(Ac.)
Runoff from this stream =     37.176(CFS)
Time of concentration =   10.10 min.
Rainfall intensity =     2.681(In/Hr)
Summary of stream data:

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


1       28.216     20.69               1.887
2       37.176     10.10               2.681
Largest stream flow has longer or shorter time of concentration
Qp =     37.176 + sum of
        Qa          Tb/Ta
        28.216 *    0.488 =     13.779
```

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Qp =     50.954

Total of 2 main streams to confluence:
Flow rates before confluence point:
      28.216      37.176
Area of streams before confluence:
       17.030       16.630


Results of confluence:
Total flow rate =     50.954(CFS)
Time of concentration =    10.103 min.
Effective stream area after confluence  =     33.660(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1449.300(Ft.)
Downstream point/station elevation =  1449.000(Ft.)
Pipe length  =    54.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    50.954(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    50.954(CFS)
Normal flow depth in pipe =   30.38(In.)
Flow top width inside pipe =   26.14(In.)
Critical Depth =   27.87(In.)
Pipe flow velocity =      8.01(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    10.22 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     33.660(Ac.)
Runoff from this stream =     50.954(CFS)
Time of concentration =   10.22 min.
Rainfall intensity =     2.667(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.100 to Point/Station       21.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   695.000(Ft.)
Top (of initial area) elevation =  1482.000(Ft.)
Bottom (of initial area) elevation =  1469.200(Ft.)
Difference in elevation =    12.800(Ft.)
Slope =    0.01842  s(percent)=       1.84
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.138 min.
```

```
Rainfall intensity =      2.816(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.876
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.145(CFS)
Total initial stream area =        0.870(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       21.200 to Point/Station       21.300
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1469.200(Ft.)
End of street segment elevation =  1461.800(Ft.)
Length of street segment  =   426.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  43.000(Ft.)
Distance from crown to crossfall grade break  =  41.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  16.000(Ft.)
Slope from curb to property line (v/hz) =   0.015
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 =      3.152(CFS)
Depth of flow =   0.321(Ft.), Average velocity =   2.937(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   9.729(Ft.)
Flow velocity =   2.94(Ft/s)
Travel time =    2.42 min.     TC =   11.56  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.874
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.510(In/Hr) for a   100.0 year storm
Subarea runoff =      1.952(CFS) for      0.890(Ac.)
Total runoff =      4.097(CFS)      Total area =       1.760(Ac.)
Street flow at end of street =      4.097(CFS)
Half street flow at end of street =      4.097(CFS)
Depth of flow =   0.345(Ft.), Average velocity =   3.119(Ft/s)
Flow width (from curb towards crown)=  10.894(Ft.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.300 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1456.000(Ft.)
Downstream point/station elevation =  1449.000(Ft.)
Pipe length  =    60.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.097(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     4.097(CFS)
Normal flow depth in pipe =    5.68(In.)
Flow top width inside pipe =    8.68(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.94(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    11.63 min.


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Process from Point/Station       21.300 to Point/Station       22.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.760(Ac.)
Runoff from this stream =      4.097(CFS)
Time of concentration =   11.63 min.
Rainfall intensity =     2.503(In/Hr)
Summary of stream data:

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


1       50.954     10.22               2.667
2        4.097     11.63               2.503
Largest stream flow has longer or shorter time of concentration
Qp =     50.954 + sum of
        Qa          Tb/Ta
         4.097 *    0.879 =      3.599
Qp =     54.554

Total of 2 main streams to confluence:
Flow rates before confluence point:
      50.954       4.097
Area of streams before confluence:
       33.660        1.760


Results of confluence:
Total flow rate =     54.554(CFS)
Time of concentration =    10.215 min.
Effective stream area after confluence  =     35.420(Ac.)


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Process from Point/Station       22.000 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1449.000(Ft.)
Downstream point/station elevation =  1441.790(Ft.)
Pipe length  =   120.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    54.554(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    54.554(CFS)
Normal flow depth in pipe =   19.31(In.)
Flow top width inside pipe =   19.03(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.12(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    10.31 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     35.420(Ac.)
Runoff from this stream =     54.554(CFS)
Time of concentration =   10.31 min.
Rainfall intensity =     2.654(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.100 to Point/Station       22.100
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   603.000(Ft.)
Top (of initial area) elevation =  1482.000(Ft.)
Bottom (of initial area) elevation =  1478.300(Ft.)
Difference in elevation =     3.700(Ft.)
Slope =    0.00614  s(percent)=       0.61
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.757 min.
Rainfall intensity =      2.600(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.874
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.727(CFS)
Total initial stream area =        0.760(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       22.100 to Point/Station       22.200
```

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**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1478.300(Ft.)
End of street segment elevation =  1475.800(Ft.)
Length of street segment  =   545.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  43.000(Ft.)
Distance from crown to crossfall grade break  =  41.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  12.000(Ft.)
Slope from curb to property line (v/hz) =   0.015
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 =      2.533(CFS)
Depth of flow =   0.301(Ft.), Average velocity =   1.428(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.717(Ft.)
Flow velocity =   1.43(Ft/s)
Travel time =    6.36 min.     TC =   17.12  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.870
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.071(In/Hr) for a   100.0 year storm
Subarea runoff =      1.423(CFS) for      0.790(Ac.)
Total runoff =      3.150(CFS)      Total area =       1.550(Ac.)
Street flow at end of street =      3.150(CFS)
Half street flow at end of street =      1.575(CFS)
Depth of flow =   0.319(Ft.), Average velocity =   1.500(Ft/s)
Flow width (from curb towards crown)=   9.610(Ft.)


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Process from Point/Station       22.200 to Point/Station       22.300
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of street segment elevation =  1475.800(Ft.)
End of street segment elevation =  1460.800(Ft.)
Length of street segment  =   659.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  43.000(Ft.)
Distance from crown to crossfall grade break  =  41.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
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  =  16.000(Ft.)
Slope from curb to property line (v/hz) =   0.015
```

```
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 =      4.235(CFS)
Depth of flow =   0.279(Ft.), Average velocity =   2.990(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   7.625(Ft.)
Flow velocity =   2.99(Ft/s)
Travel time =    3.67 min.     TC =   20.79  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.878
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      1.883(In/Hr) for a   100.0 year storm
Subarea runoff =      2.050(CFS) for      1.240(Ac.)
Total runoff =      5.201(CFS)      Total area =       2.790(Ac.)
Street flow at end of street =      5.201(CFS)
Half street flow at end of street =      2.600(CFS)
Depth of flow =   0.295(Ft.), Average velocity =   3.125(Ft/s)
Flow width (from curb towards crown)=   8.399(Ft.)


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Process from Point/Station       22.300 to Point/Station       22.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1455.000(Ft.)
Downstream point/station elevation =  1451.700(Ft.)
Pipe length  =    46.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.201(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     5.201(CFS)
Normal flow depth in pipe =    6.32(In.)
Flow top width inside pipe =   11.98(In.)
Critical Depth =   11.12(In.)
Pipe flow velocity =     12.41(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    20.85 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.300 to Point/Station       22.500
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      2.790(Ac.)
Runoff from this stream =      5.201(CFS)
Time of concentration =   20.85 min.
Rainfall intensity =     1.880(In/Hr)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.400 to Point/Station       22.400
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________________
Rainfall intensity =      1.926(In/Hr) for a   100.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.792
Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.500
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  65.50
Pervious area fraction =  0.451; Impervious fraction =  0.549
User specified values are as follows:
TC =  19.84 min.  Rain intensity =       1.93(In/Hr)
Total area =        11.32(Ac.)  Total runoff =     16.95(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.400 to Point/Station       22.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1470.500(Ft.)
Downstream point/station elevation =  1450.900(Ft.)
Pipe length  =  1011.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.950(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    16.950(CFS)
Normal flow depth in pipe =   13.80(In.)
Flow top width inside pipe =   19.93(In.)
Critical Depth =   18.13(In.)
Pipe flow velocity =     10.11(Ft/s)
Travel time through pipe =    1.67 min.
Time of concentration (TC) =    21.51 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.400 to Point/Station       22.500
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     11.320(Ac.)
Runoff from this stream =     16.950(CFS)
Time of concentration =   21.51 min.
Rainfall intensity =     1.852(In/Hr)
Summary of stream data:

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


1        5.201     20.85                1.880
2       16.950     21.51                1.852
Largest stream flow has longer time of concentration
Qp =     16.950 + sum of
        Qb         Ia/Ib
```

```
         5.201 *    0.985 =      5.122
Qp =     22.072

Total of 2 streams to confluence:
Flow rates before confluence point:
       5.201      16.950
Area of streams before confluence:
        2.790       11.320
Results of confluence:
Total flow rate =     22.072(CFS)
Time of concentration =    21.506 min.
Effective stream area after confluence =     14.110(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.500 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1451.700(Ft.)
Downstream point/station elevation =  1441.790(Ft.)
Pipe length  =  1259.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    22.072(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    22.072(CFS)
Normal flow depth in pipe =   18.33(In.)
Flow top width inside pipe =   25.21(In.)
Critical Depth =   19.72(In.)
Pipe flow velocity =      7.68(Ft/s)
Travel time through pipe =    2.73 min.
Time of concentration (TC) =    24.24 min.


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Process from Point/Station       22.500 to Point/Station       23.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     14.110(Ac.)
Runoff from this stream =     22.072(CFS)
Time of concentration =   24.24 min.
Rainfall intensity =     1.746(In/Hr)
Summary of stream data:

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


1       54.554     10.31               2.654
2       22.072     24.24               1.746
Largest stream flow has longer or shorter time of concentration
Qp =     54.554 + sum of
        Qa          Tb/Ta
        22.072 *    0.426 =      9.394
Qp =     63.947

Total of 2 main streams to confluence:
```

```
Flow rates before confluence point:
      54.554      22.072
Area of streams before confluence:
       35.420       14.110


Results of confluence:
Total flow rate =     63.947(CFS)
Time of concentration =    10.315 min.
Effective stream area after confluence  =     49.530(Ac.)
End of computations, total study area =           49.53 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.262
Area averaged RI index number =  57.7
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 09/30/24 File:12.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - NO OFFSITES
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 600.000(Ft.)
Top (of initial area) elevation = 1479.800(Ft.)
Bottom (of initial area) elevation = 1471.300(Ft.)
Difference in elevation = 8.500(Ft.)
Slope = 0.01417 s(percent)= 1.42

```
TC = k(0.370)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.200 min.
Rainfall intensity =      2.549(In/Hr) for a   100.0 year storm
CONDOMINIUM subarea type
Runoff Coefficient = 0.804
Decimal fraction soil group A = 0.070
Decimal fraction soil group B = 0.930
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  54.32
Pervious area fraction =  0.350; Impervious fraction =  0.650
Initial subarea runoff =      6.803(CFS)
Total initial stream area =        3.320(Ac.)
Pervious area fraction = 0.350


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Process from Point/Station       10.000 to Point/Station       11.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      3.320(Ac.)
Runoff from this stream =      6.803(CFS)
Time of concentration =   11.20 min.
Rainfall intensity =     2.549(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.100 to Point/Station       10.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   539.000(Ft.)
Top (of initial area) elevation =  1479.700(Ft.)
Bottom (of initial area) elevation =  1471.400(Ft.)
Difference in elevation =     8.300(Ft.)
Slope =    0.01540  s(percent)=       1.54
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.122 min.
Rainfall intensity =      2.558(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.695
Decimal fraction soil group A = 0.730
Decimal fraction soil group B = 0.270
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  38.48
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      2.188(CFS)
Total initial stream area =        1.230(Ac.)
Pervious area fraction = 0.500


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Process from Point/Station       10.200 to Point/Station       10.400
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
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```
Upstream point/station elevation =  1465.900(Ft.)
Downstream point/station elevation =  1463.700(Ft.)
Pipe length  =   178.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.188(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.188(CFS)
Normal flow depth in pipe =    6.37(In.)
Flow top width inside pipe =   11.98(In.)
Critical Depth =    7.58(In.)
Pipe flow velocity =      5.17(Ft/s)
Travel time through pipe =    0.57 min.
Time of concentration (TC) =    11.70 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.200 to Point/Station       10.400
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.230(Ac.)
Runoff from this stream =      2.188(CFS)
Time of concentration =   11.70 min.
Rainfall intensity =     2.496(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.300 to Point/Station       10.400
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   146.000(Ft.)
Top (of initial area) elevation =  1474.000(Ft.)
Bottom (of initial area) elevation =  1471.300(Ft.)
Difference in elevation =     2.700(Ft.)
Slope =    0.01849  s(percent)=       1.85
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Warning: TC computed to be less than 5 min.; program is assuming the
time of concentration is 5 minutes.
Initial area time of concentration =    5.000 min.
Rainfall intensity =      3.785(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.864
Decimal fraction soil group A = 0.880
Decimal fraction soil group B = 0.120
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  34.88
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.388(CFS)
Total initial stream area =        0.730(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.300 to Point/Station       10.400
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
```

```
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.730(Ac.)
Runoff from this stream =      2.388(CFS)
Time of concentration =    5.00 min.
Rainfall intensity =     3.785(In/Hr)
Summary of stream data:

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


1        2.188     11.70                 2.496
2        2.388      5.00                 3.785
Largest stream flow has longer or shorter time of concentration
Qp =      2.388 + sum of
        Qa          Tb/Ta
         2.188 *    0.427 =      0.935
Qp =      3.323

Total of 2 streams to confluence:
Flow rates before confluence point:
       2.188       2.388
Area of streams before confluence:
        1.230        0.730
Results of confluence:
Total flow rate =      3.323(CFS)
Time of concentration =     5.000 min.
Effective stream area after confluence =      1.960(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.400 to Point/Station       10.600
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1463.700(Ft.)
Downstream point/station elevation =  1461.400(Ft.)
Pipe length  =   180.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.323(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.323(CFS)
Normal flow depth in pipe =    8.31(In.)
Flow top width inside pipe =   11.08(In.)
Critical Depth =    9.37(In.)
Pipe flow velocity =      5.73(Ft/s)
Travel time through pipe =    0.52 min.
Time of concentration (TC) =     5.52 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.400 to Point/Station       10.600
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.960(Ac.)
Runoff from this stream =      3.323(CFS)
Time of concentration =    5.52 min.
Rainfall intensity =     3.604(In/Hr)
```

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Process from Point/Station       10.500 to Point/Station       10.600
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   167.000(Ft.)
Top (of initial area) elevation =  1479.700(Ft.)
Bottom (of initial area) elevation =  1471.300(Ft.)
Difference in elevation =     8.400(Ft.)
Slope =    0.05030  s(percent)=       5.03
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Warning: TC computed to be less than 5 min.; program is assuming the
time of concentration is 5 minutes.
Initial area time of concentration =    5.000 min.
Rainfall intensity =      3.785(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.877
Decimal fraction soil group A = 0.250
Decimal fraction soil group B = 0.750
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  50.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.886(CFS)
Total initial stream area =        0.870(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       10.500 to Point/Station       10.600
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.870(Ac.)
Runoff from this stream =      2.886(CFS)
Time of concentration =    5.00 min.
Rainfall intensity =     3.785(In/Hr)
Summary of stream data:

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


1        3.323      5.52                3.604
2        2.886      5.00                3.785
Largest stream flow has longer time of concentration
Qp =      3.323 + sum of
        Qb         Ia/Ib
         2.886 *    0.952 =      2.749
Qp =      6.072

Total of 2 streams to confluence:
Flow rates before confluence point:
       3.323       2.886
Area of streams before confluence:
        1.960        0.870
```

```
Results of confluence:
Total flow rate =      6.072(CFS)
Time of concentration =     5.524 min.
Effective stream area after confluence =      2.830(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.600 to Point/Station       11.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1461.400(Ft.)
Downstream point/station elevation =  1459.100(Ft.)
Pipe length  =   183.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.072(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     6.072(CFS)
Normal flow depth in pipe =   10.51(In.)
Flow top width inside pipe =   13.74(In.)
Critical Depth =   11.94(In.)
Pipe flow velocity =      6.61(Ft/s)
Travel time through pipe =    0.46 min.
Time of concentration (TC) =     5.99 min.


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Process from Point/Station       10.600 to Point/Station       11.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.830(Ac.)
Runoff from this stream =      6.072(CFS)
Time of concentration =    5.99 min.
Rainfall intensity =     3.465(In/Hr)
Summary of stream data:

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


1        6.803     11.20               2.549
2        6.072      5.99               3.465
Largest stream flow has longer time of concentration
Qp =      6.803 + sum of
        Qb         Ia/Ib
         6.072 *    0.736 =      4.467
Qp =     11.269

Total of 2 main streams to confluence:
Flow rates before confluence point:
       6.803       6.072
Area of streams before confluence:
        3.320        2.830


Results of confluence:
Total flow rate =     11.269(CFS)
```

```
Time of concentration =    11.200 min.
Effective stream area after confluence  =      6.150(Ac.)


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Process from Point/Station       11.000 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1459.100(Ft.)
Downstream point/station elevation =  1458.400(Ft.)
Pipe length  =    52.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.269(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    11.269(CFS)
Normal flow depth in pipe =   13.66(In.)
Flow top width inside pipe =   15.39(In.)
Critical Depth =   15.40(In.)
Pipe flow velocity =      7.83(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    11.31 min.


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Process from Point/Station       12.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1458.400(Ft.)
Downstream point/station elevation =  1455.500(Ft.)
Pipe length  =   407.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.269(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    11.269(CFS)
Normal flow depth in pipe =   14.77(In.)
Flow top width inside pipe =   19.19(In.)
Critical Depth =   15.01(In.)
Pipe flow velocity =      6.23(Ft/s)
Travel time through pipe =    1.09 min.
Time of concentration (TC) =    12.40 min.


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Process from Point/Station       13.000 to Point/Station       21.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1455.500(Ft.)
Downstream point/station elevation =  1449.300(Ft.)
Pipe length  =   623.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.269(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    11.269(CFS)
Normal flow depth in pipe =   13.10(In.)
Flow top width inside pipe =   20.35(In.)
Critical Depth =   15.01(In.)
Pipe flow velocity =      7.14(Ft/s)
Travel time through pipe =    1.45 min.
Time of concentration (TC) =    13.85 min.
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Process from Point/Station       13.000 to Point/Station       21.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      6.150(Ac.)
Runoff from this stream =     11.269(CFS)
Time of concentration =   13.85 min.
Rainfall intensity =     2.297(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       14.000 to Point/Station       15.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   469.000(Ft.)
Top (of initial area) elevation =  1473.700(Ft.)
Bottom (of initial area) elevation =  1468.400(Ft.)
Difference in elevation =     5.300(Ft.)
Slope =    0.01130  s(percent)=       1.13
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.609 min.
Rainfall intensity =      2.900(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.880
Decimal fraction soil group A = 0.010
Decimal fraction soil group B = 0.570
Decimal fraction soil group C = 0.420
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  61.22
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     13.010(CFS)
Total initial stream area =        5.100(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       15.000 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1453.100(Ft.)
Downstream point/station elevation =  1451.900(Ft.)
Pipe length  =   244.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.010(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    13.010(CFS)
Normal flow depth in pipe =   16.55(In.)
Flow top width inside pipe =   22.21(In.)
Critical Depth =   15.58(In.)
Pipe flow velocity =      5.64(Ft/s)
Travel time through pipe =    0.72 min.
Time of concentration (TC) =     9.33 min.
```

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Process from Point/Station       15.000 to Point/Station       16.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      5.100(Ac.)
Runoff from this stream =     13.010(CFS)
Time of concentration =    9.33 min.
Rainfall intensity =     2.788(In/Hr)


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Process from Point/Station       15.100 to Point/Station       15.200
**** INITIAL AREA EVALUATION ****
____________________________________________________________________________
Initial area flow distance =   333.000(Ft.)
Top (of initial area) elevation =  1470.700(Ft.)
Bottom (of initial area) elevation =  1467.800(Ft.)
Difference in elevation =     2.900(Ft.)
Slope =    0.00871  s(percent)=       0.87
TC = k(0.370)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.754 min.
Rainfall intensity =      2.728(In/Hr) for a   100.0 year storm
CONDOMINIUM subarea type
Runoff Coefficient = 0.813
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.350; Impervious fraction =  0.650
Initial subarea runoff =      6.495(CFS)
Total initial stream area =        2.930(Ac.)
Pervious area fraction = 0.350


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Process from Point/Station       15.200 to Point/Station       15.300
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________________
Upstream point/station elevation =  1454.300(Ft.)
Downstream point/station elevation =  1452.400(Ft.)
Pipe length  =   384.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.495(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     6.495(CFS)
Normal flow depth in pipe =   13.10(In.)
Flow top width inside pipe =   16.02(In.)
Critical Depth =   11.83(In.)
Pipe flow velocity =      4.72(Ft/s)
Travel time through pipe =    1.36 min.
Time of concentration (TC) =    11.11 min.


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Process from Point/Station       15.300 to Point/Station       15.300
**** SUBAREA FLOW ADDITION ****
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CONDOMINIUM subarea type
Runoff Coefficient = 0.831
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.310
Decimal fraction soil group C = 0.690
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  64.97
Pervious area fraction =  0.350; Impervious fraction =  0.650
Time of concentration =    11.11 min.
Rainfall intensity =      2.559(In/Hr) for a   100.0 year storm
Subarea runoff =      5.614(CFS) for      2.640(Ac.)
Total runoff =     12.108(CFS)      Total area =       5.570(Ac.)


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Process from Point/Station       15.300 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1452.400(Ft.)
Downstream point/station elevation =  1451.900(Ft.)
Pipe length  =   102.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.108(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    12.108(CFS)
Normal flow depth in pipe =   15.73(In.)
Flow top width inside pipe =   22.81(In.)
Critical Depth =   15.00(In.)
Pipe flow velocity =      5.55(Ft/s)
Travel time through pipe =    0.31 min.
Time of concentration (TC) =    11.42 min.


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Process from Point/Station       15.300 to Point/Station       16.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      5.570(Ac.)
Runoff from this stream =     12.108(CFS)
Time of concentration =   11.42 min.
Rainfall intensity =     2.525(In/Hr)
Summary of stream data:

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


1       13.010      9.33                2.788
2       12.108     11.42                2.525
Largest stream flow has longer or shorter time of concentration
Qp =     13.010 + sum of
        Qa          Tb/Ta
        12.108 *    0.817 =      9.896
Qp =     22.906

Total of 2 streams to confluence:
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```
Flow rates before confluence point:
      13.010      12.108
Area of streams before confluence:
        5.100        5.570
Results of confluence:
Total flow rate =     22.906(CFS)
Time of concentration =     9.331 min.
Effective stream area after confluence =     10.670(Ac.)


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Process from Point/Station       16.000 to Point/Station       20.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1451.900(Ft.)
Downstream point/station elevation =  1451.700(Ft.)
Pipe length  =    35.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    22.906(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    22.906(CFS)
Normal flow depth in pipe =   21.61(In.)
Flow top width inside pipe =   21.59(In.)
Critical Depth =   20.10(In.)
Pipe flow velocity =      6.71(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =     9.42 min.


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Process from Point/Station       16.000 to Point/Station       20.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     10.670(Ac.)
Runoff from this stream =     22.906(CFS)
Time of concentration =    9.42 min.
Rainfall intensity =     2.775(In/Hr)


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Process from Point/Station       17.000 to Point/Station       18.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   642.000(Ft.)
Top (of initial area) elevation =  1474.000(Ft.)
Bottom (of initial area) elevation =  1464.700(Ft.)
Difference in elevation =     9.300(Ft.)
Slope =    0.01449  s(percent)=       1.45
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.289 min.
Rainfall intensity =      2.794(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.875
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
```

```
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     14.578(CFS)
Total initial stream area =        5.960(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       18.000 to Point/Station       20.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1458.000(Ft.)
Downstream point/station elevation =  1451.700(Ft.)
Pipe length  =   223.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.578(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    14.578(CFS)
Normal flow depth in pipe =   12.47(In.)
Flow top width inside pipe =   16.61(In.)
Critical Depth =   16.75(In.)
Pipe flow velocity =     11.16(Ft/s)
Travel time through pipe =    0.33 min.
Time of concentration (TC) =     9.62 min.


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Process from Point/Station       18.000 to Point/Station       20.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      5.960(Ac.)
Runoff from this stream =     14.578(CFS)
Time of concentration =    9.62 min.
Rainfall intensity =     2.746(In/Hr)
Summary of stream data:

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


1       22.906      9.42                2.775
2       14.578      9.62                2.746
Largest stream flow has longer or shorter time of concentration
Qp =     22.906 + sum of
        Qa          Tb/Ta
        14.578 *    0.979 =     14.270
Qp =     37.176

Total of 2 streams to confluence:
Flow rates before confluence point:
      22.906      14.578
Area of streams before confluence:
       10.670        5.960
Results of confluence:
Total flow rate =     37.176(CFS)
Time of concentration =     9.418 min.
Effective stream area after confluence =     16.630(Ac.)
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Process from Point/Station       20.000 to Point/Station       21.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1451.700(Ft.)
Downstream point/station elevation =  1449.300(Ft.)
Pipe length  =   343.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    37.176(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    37.176(CFS)
Normal flow depth in pipe =   23.16(In.)
Flow top width inside pipe =   30.20(In.)
Critical Depth =   24.36(In.)
Pipe flow velocity =      8.34(Ft/s)
Travel time through pipe =    0.69 min.
Time of concentration (TC) =    10.10 min.


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Process from Point/Station       20.000 to Point/Station       21.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     16.630(Ac.)
Runoff from this stream =     37.176(CFS)
Time of concentration =   10.10 min.
Rainfall intensity =     2.681(In/Hr)
Summary of stream data:

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


1       11.269     13.85               2.297
2       37.176     10.10               2.681
Largest stream flow has longer or shorter time of concentration
Qp =     37.176 + sum of
        Qa          Tb/Ta
        11.269 *    0.729 =      8.218
Qp =     45.394

Total of 2 main streams to confluence:
Flow rates before confluence point:
      11.269      37.176
Area of streams before confluence:
        6.150       16.630


Results of confluence:
Total flow rate =     45.394(CFS)
Time of concentration =    10.103 min.
Effective stream area after confluence  =     22.780(Ac.)
```

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Process from Point/Station       21.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1449.300(Ft.)
Downstream point/station elevation =  1449.000(Ft.)
Pipe length  =    54.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    45.394(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    45.394(CFS)
Normal flow depth in pipe =   27.05(In.)
Flow top width inside pipe =   31.12(In.)
Critical Depth =   26.35(In.)
Pipe flow velocity =      7.97(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    10.22 min.


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Process from Point/Station       21.000 to Point/Station       22.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     22.780(Ac.)
Runoff from this stream =     45.394(CFS)
Time of concentration =   10.22 min.
Rainfall intensity =     2.667(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       21.100 to Point/Station       21.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   695.000(Ft.)
Top (of initial area) elevation =  1482.000(Ft.)
Bottom (of initial area) elevation =  1469.200(Ft.)
Difference in elevation =    12.800(Ft.)
Slope =    0.01842  s(percent)=       1.84
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.138 min.
Rainfall intensity =      2.816(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.876
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.145(CFS)
Total initial stream area =        0.870(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       21.200 to Point/Station       21.300
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
Top of street segment elevation =  1469.200(Ft.)
End of street segment elevation =  1461.800(Ft.)
Length of street segment  =   426.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  43.000(Ft.)
Distance from crown to crossfall grade break  =  41.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  16.000(Ft.)
Slope from curb to property line (v/hz) =   0.015
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 =      3.152(CFS)
Depth of flow =   0.321(Ft.), Average velocity =   2.937(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   9.729(Ft.)
Flow velocity =   2.94(Ft/s)
Travel time =    2.42 min.     TC =   11.56  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.874
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.510(In/Hr) for a   100.0 year storm
Subarea runoff =      1.952(CFS) for      0.890(Ac.)
Total runoff =      4.097(CFS)      Total area =       1.760(Ac.)
Street flow at end of street =      4.097(CFS)
Half street flow at end of street =      4.097(CFS)
Depth of flow =   0.345(Ft.), Average velocity =   3.119(Ft/s)
Flow width (from curb towards crown)=  10.894(Ft.)


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Process from Point/Station       21.300 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1456.000(Ft.)
Downstream point/station elevation =  1449.000(Ft.)
Pipe length  =    60.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.097(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     4.097(CFS)
Normal flow depth in pipe =    5.68(In.)
Flow top width inside pipe =    8.68(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.94(Ft/s)
```

```
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    11.63 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.300 to Point/Station       22.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.760(Ac.)
Runoff from this stream =      4.097(CFS)
Time of concentration =   11.63 min.
Rainfall intensity =     2.503(In/Hr)
Summary of stream data:

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


1       45.394     10.22               2.667
2        4.097     11.63               2.503
Largest stream flow has longer or shorter time of concentration
Qp =     45.394 + sum of
        Qa          Tb/Ta
         4.097 *    0.879 =      3.600
Qp =     48.994

Total of 2 main streams to confluence:
Flow rates before confluence point:
      45.394       4.097
Area of streams before confluence:
       22.780        1.760


Results of confluence:
Total flow rate =     48.994(CFS)
Time of concentration =    10.216 min.
Effective stream area after confluence  =     24.540(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1449.000(Ft.)
Downstream point/station elevation =  1441.790(Ft.)
Pipe length  =   120.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    48.994(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    48.994(CFS)
Normal flow depth in pipe =   17.53(In.)
Flow top width inside pipe =   21.30(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.93(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    10.32 min.
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     24.540(Ac.)
Runoff from this stream =     48.994(CFS)
Time of concentration =   10.32 min.
Rainfall intensity =     2.654(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.100 to Point/Station       22.100
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   603.000(Ft.)
Top (of initial area) elevation =  1482.000(Ft.)
Bottom (of initial area) elevation =  1478.300(Ft.)
Difference in elevation =     3.700(Ft.)
Slope =    0.00614  s(percent)=       0.61
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.757 min.
Rainfall intensity =      2.600(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.874
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.727(CFS)
Total initial stream area =        0.760(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.100 to Point/Station       22.200
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1478.300(Ft.)
End of street segment elevation =  1475.800(Ft.)
Length of street segment  =   545.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  43.000(Ft.)
Distance from crown to crossfall grade break  =  41.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  12.000(Ft.)
Slope from curb to property line (v/hz) =   0.015
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 =      2.533(CFS)
Depth of flow =   0.301(Ft.), Average velocity =   1.428(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.717(Ft.)
Flow velocity =   1.43(Ft/s)
Travel time =    6.36 min.     TC =   17.12  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.870
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.071(In/Hr) for a   100.0 year storm
Subarea runoff =      1.423(CFS) for      0.790(Ac.)
Total runoff =      3.150(CFS)      Total area =       1.550(Ac.)
Street flow at end of street =      3.150(CFS)
Half street flow at end of street =      1.575(CFS)
Depth of flow =   0.319(Ft.), Average velocity =   1.500(Ft/s)
Flow width (from curb towards crown)=   9.610(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.200 to Point/Station       22.300
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1475.800(Ft.)
End of street segment elevation =  1460.800(Ft.)
Length of street segment  =   659.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  43.000(Ft.)
Distance from crown to crossfall grade break  =  41.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
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  =  16.000(Ft.)
Slope from curb to property line (v/hz) =   0.015
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 =      4.235(CFS)
Depth of flow =   0.279(Ft.), Average velocity =   2.990(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   7.625(Ft.)
Flow velocity =   2.99(Ft/s)
Travel time =    3.67 min.     TC =   20.79  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.878
Decimal fraction soil group A = 0.000
```

```
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      1.883(In/Hr) for a   100.0 year storm
Subarea runoff =      2.050(CFS) for      1.240(Ac.)
Total runoff =      5.201(CFS)      Total area =       2.790(Ac.)
Street flow at end of street =      5.201(CFS)
Half street flow at end of street =      2.600(CFS)
Depth of flow =   0.295(Ft.), Average velocity =   3.125(Ft/s)
Flow width (from curb towards crown)=   8.399(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.300 to Point/Station       22.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1455.000(Ft.)
Downstream point/station elevation =  1451.700(Ft.)
Pipe length  =    46.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.201(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     5.201(CFS)
Normal flow depth in pipe =    6.32(In.)
Flow top width inside pipe =   11.98(In.)
Critical Depth =   11.12(In.)
Pipe flow velocity =     12.41(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    20.85 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.500 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1451.700(Ft.)
Downstream point/station elevation =  1441.790(Ft.)
Pipe length  =  1259.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.201(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     5.201(CFS)
Normal flow depth in pipe =   11.20(In.)
Flow top width inside pipe =   13.04(In.)
Critical Depth =   11.10(In.)
Pipe flow velocity =      5.29(Ft/s)
Travel time through pipe =    3.97 min.
Time of concentration (TC) =    24.82 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.500 to Point/Station       23.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.790(Ac.)
```

Runoff from this stream = 5.201(CFS)
Time of concentration = 24.82 min.
Rainfall intensity = 1.726(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	48.994	10.32	2.654
2	5.201	24.82	1.726

Largest stream flow has longer or shorter time of concentration
Qp = 48.994 + sum of

Qa		Tb/Ta		
5.201	*	0.416	=	2.162

Qp = 51.155

Total of 2 main streams to confluence:
Flow rates before confluence point:
48.994 5.201
Area of streams before confluence:
24.540 2.790

Results of confluence:
Total flow rate = 51.155(CFS)
Time of concentration = 10.316 min.
Effective stream area after confluence = 27.330(Ac.)
End of computations, total study area = 27.33 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.199
Area averaged RI index number = 56.7

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 10/10/23 File: Q100UHEX24100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 27.32(Ac.) = 0.043 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 27.32(Ac.) = 0.043 Sq. Mi.
Length along longest watercourse = 1724.00(Ft.)
Length along longest watercourse measured to centroid = 1620.00(Ft.)
Length along longest watercourse = 0.327 Mi.
Length along longest watercourse measured to centroid = 0.307 Mi.
Difference in elevation = 22.50(Ft.)
Slope along watercourse = 68.9095 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.090 Hr.
Lag time = 5.38 Min.
25% of lag time = 1.34 Min.
40% of lag time = 2.15 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
27.32	2.00	54.64

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
27.32	5.00	136.60

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 2.000(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
27.320	56.50	0.500

Total Area Entered = 27.32(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
56.5	56.5	0.506	0.500	0.278	1.000	0.278
					Sum (F) =	0.278

Area averaged mean soil loss (F) (In/Hr) = 0.278
Minimum soil loss rate ((In/Hr)) = 0.139
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	93.015	17.076	4.702
2	0.167	186.030	47.610	13.109
3	0.250	279.045	16.820	4.631
4	0.333	372.060	7.458	2.053
5	0.417	465.074	4.278	1.178
6	0.500	558.089	2.760	0.760

7	0.583	651.104	1.826		0.503
8	0.667	744.119	1.150		0.317
9	0.750	837.134	1.024		0.282
			Sum = 100.000	Sum=	27.533

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.040	(0.493)	0.020	0.020
2	0.17	0.07	0.040	(0.491)	0.020	0.020
3	0.25	0.07	0.040	(0.489)	0.020	0.020
4	0.33	0.10	0.060	(0.487)	0.030	0.030
5	0.42	0.10	0.060	(0.485)	0.030	0.030
6	0.50	0.10	0.060	(0.484)	0.030	0.030
7	0.58	0.10	0.060	(0.482)	0.030	0.030
8	0.67	0.10	0.060	(0.480)	0.030	0.030
9	0.75	0.10	0.060	(0.478)	0.030	0.030
10	0.83	0.13	0.080	(0.476)	0.040	0.040
11	0.92	0.13	0.080	(0.474)	0.040	0.040
12	1.00	0.13	0.080	(0.472)	0.040	0.040
13	1.08	0.10	0.060	(0.470)	0.030	0.030
14	1.17	0.10	0.060	(0.469)	0.030	0.030
15	1.25	0.10	0.060	(0.467)	0.030	0.030
16	1.33	0.10	0.060	(0.465)	0.030	0.030
17	1.42	0.10	0.060	(0.463)	0.030	0.030
18	1.50	0.10	0.060	(0.461)	0.030	0.030
19	1.58	0.10	0.060	(0.459)	0.030	0.030
20	1.67	0.10	0.060	(0.457)	0.030	0.030
21	1.75	0.10	0.060	(0.456)	0.030	0.030
22	1.83	0.13	0.080	(0.454)	0.040	0.040
23	1.92	0.13	0.080	(0.452)	0.040	0.040
24	2.00	0.13	0.080	(0.450)	0.040	0.040
25	2.08	0.13	0.080	(0.448)	0.040	0.040
26	2.17	0.13	0.080	(0.447)	0.040	0.040
27	2.25	0.13	0.080	(0.445)	0.040	0.040
28	2.33	0.13	0.080	(0.443)	0.040	0.040
29	2.42	0.13	0.080	(0.441)	0.040	0.040
30	2.50	0.13	0.080	(0.439)	0.040	0.040
31	2.58	0.17	0.100	(0.437)	0.050	0.050
32	2.67	0.17	0.100	(0.436)	0.050	0.050
33	2.75	0.17	0.100	(0.434)	0.050	0.050
34	2.83	0.17	0.100	(0.432)	0.050	0.050
35	2.92	0.17	0.100	(0.430)	0.050	0.050
36	3.00	0.17	0.100	(0.429)	0.050	0.050
37	3.08	0.17	0.100	(0.427)	0.050	0.050
38	3.17	0.17	0.100	(0.425)	0.050	0.050

39	3.25	0.17	0.100	(0.423)	0.050	0.050
40	3.33	0.17	0.100	(0.421)	0.050	0.050
41	3.42	0.17	0.100	(0.420)	0.050	0.050
42	3.50	0.17	0.100	(0.418)	0.050	0.050
43	3.58	0.17	0.100	(0.416)	0.050	0.050
44	3.67	0.17	0.100	(0.414)	0.050	0.050
45	3.75	0.17	0.100	(0.413)	0.050	0.050
46	3.83	0.20	0.120	(0.411)	0.060	0.060
47	3.92	0.20	0.120	(0.409)	0.060	0.060
48	4.00	0.20	0.120	(0.407)	0.060	0.060
49	4.08	0.20	0.120	(0.406)	0.060	0.060
50	4.17	0.20	0.120	(0.404)	0.060	0.060
51	4.25	0.20	0.120	(0.402)	0.060	0.060
52	4.33	0.23	0.140	(0.401)	0.070	0.070
53	4.42	0.23	0.140	(0.399)	0.070	0.070
54	4.50	0.23	0.140	(0.397)	0.070	0.070
55	4.58	0.23	0.140	(0.395)	0.070	0.070
56	4.67	0.23	0.140	(0.394)	0.070	0.070
57	4.75	0.23	0.140	(0.392)	0.070	0.070
58	4.83	0.27	0.160	(0.390)	0.080	0.080
59	4.92	0.27	0.160	(0.389)	0.080	0.080
60	5.00	0.27	0.160	(0.387)	0.080	0.080
61	5.08	0.20	0.120	(0.385)	0.060	0.060
62	5.17	0.20	0.120	(0.384)	0.060	0.060
63	5.25	0.20	0.120	(0.382)	0.060	0.060
64	5.33	0.23	0.140	(0.380)	0.070	0.070
65	5.42	0.23	0.140	(0.379)	0.070	0.070
66	5.50	0.23	0.140	(0.377)	0.070	0.070
67	5.58	0.27	0.160	(0.375)	0.080	0.080
68	5.67	0.27	0.160	(0.374)	0.080	0.080
69	5.75	0.27	0.160	(0.372)	0.080	0.080
70	5.83	0.27	0.160	(0.370)	0.080	0.080
71	5.92	0.27	0.160	(0.369)	0.080	0.080
72	6.00	0.27	0.160	(0.367)	0.080	0.080
73	6.08	0.30	0.180	(0.366)	0.090	0.090
74	6.17	0.30	0.180	(0.364)	0.090	0.090
75	6.25	0.30	0.180	(0.362)	0.090	0.090
76	6.33	0.30	0.180	(0.361)	0.090	0.090
77	6.42	0.30	0.180	(0.359)	0.090	0.090
78	6.50	0.30	0.180	(0.357)	0.090	0.090
79	6.58	0.33	0.200	(0.356)	0.100	0.100
80	6.67	0.33	0.200	(0.354)	0.100	0.100
81	6.75	0.33	0.200	(0.353)	0.100	0.100
82	6.83	0.33	0.200	(0.351)	0.100	0.100
83	6.92	0.33	0.200	(0.349)	0.100	0.100
84	7.00	0.33	0.200	(0.348)	0.100	0.100
85	7.08	0.33	0.200	(0.346)	0.100	0.100
86	7.17	0.33	0.200	(0.345)	0.100	0.100
87	7.25	0.33	0.200	(0.343)	0.100	0.100
88	7.33	0.37	0.220	(0.342)	0.110	0.110

89	7.42	0.37	0.220	(0.340)	0.110	0.110
90	7.50	0.37	0.220	(0.338)	0.110	0.110
91	7.58	0.40	0.240	(0.337)	0.120	0.120
92	7.67	0.40	0.240	(0.335)	0.120	0.120
93	7.75	0.40	0.240	(0.334)	0.120	0.120
94	7.83	0.43	0.260	(0.332)	0.130	0.130
95	7.92	0.43	0.260	(0.331)	0.130	0.130
96	8.00	0.43	0.260	(0.329)	0.130	0.130
97	8.08	0.50	0.300	(0.328)	0.150	0.150
98	8.17	0.50	0.300	(0.326)	0.150	0.150
99	8.25	0.50	0.300	(0.325)	0.150	0.150
100	8.33	0.50	0.300	(0.323)	0.150	0.150
101	8.42	0.50	0.300	(0.322)	0.150	0.150
102	8.50	0.50	0.300	(0.320)	0.150	0.150
103	8.58	0.53	0.320	(0.319)	0.160	0.160
104	8.67	0.53	0.320	(0.317)	0.160	0.160
105	8.75	0.53	0.320	(0.316)	0.160	0.160
106	8.83	0.57	0.340	(0.314)	0.170	0.170
107	8.92	0.57	0.340	(0.313)	0.170	0.170
108	9.00	0.57	0.340	(0.311)	0.170	0.170
109	9.08	0.63	0.380	(0.310)	0.190	0.190
110	9.17	0.63	0.380	(0.308)	0.190	0.190
111	9.25	0.63	0.380	(0.307)	0.190	0.190
112	9.33	0.67	0.400	(0.305)	0.200	0.200
113	9.42	0.67	0.400	(0.304)	0.200	0.200
114	9.50	0.67	0.400	(0.302)	0.200	0.200
115	9.58	0.70	0.420	(0.301)	0.210	0.210
116	9.67	0.70	0.420	(0.299)	0.210	0.210
117	9.75	0.70	0.420	(0.298)	0.210	0.210
118	9.83	0.73	0.440	(0.297)	0.220	0.220
119	9.92	0.73	0.440	(0.295)	0.220	0.220
120	10.00	0.73	0.440	(0.294)	0.220	0.220
121	10.08	0.50	0.300	(0.292)	0.150	0.150
122	10.17	0.50	0.300	(0.291)	0.150	0.150
123	10.25	0.50	0.300	(0.289)	0.150	0.150
124	10.33	0.50	0.300	(0.288)	0.150	0.150
125	10.42	0.50	0.300	(0.287)	0.150	0.150
126	10.50	0.50	0.300	(0.285)	0.150	0.150
127	10.58	0.67	0.400	(0.284)	0.200	0.200
128	10.67	0.67	0.400	(0.282)	0.200	0.200
129	10.75	0.67	0.400	(0.281)	0.200	0.200
130	10.83	0.67	0.400	(0.280)	0.200	0.200
131	10.92	0.67	0.400	(0.278)	0.200	0.200
132	11.00	0.67	0.400	(0.277)	0.200	0.200
133	11.08	0.63	0.380	(0.276)	0.190	0.190
134	11.17	0.63	0.380	(0.274)	0.190	0.190
135	11.25	0.63	0.380	(0.273)	0.190	0.190
136	11.33	0.63	0.380	(0.272)	0.190	0.190
137	11.42	0.63	0.380	(0.270)	0.190	0.190
138	11.50	0.63	0.380	(0.269)	0.190	0.190

139	11.58	0.57	0.340	(	0.268)	0.170		0.170
140	11.67	0.57	0.340	(	0.266)	0.170		0.170
141	11.75	0.57	0.340	(	0.265)	0.170		0.170
142	11.83	0.60	0.360	(	0.264)	0.180		0.180
143	11.92	0.60	0.360	(	0.262)	0.180		0.180
144	12.00	0.60	0.360	(	0.261)	0.180		0.180
145	12.08	0.83	0.500	(	0.260)	0.250		0.250
146	12.17	0.83	0.500	(	0.258)	0.250		0.250
147	12.25	0.83	0.500	(	0.257)	0.250		0.250
148	12.33	0.87	0.520		0.256	(	0.260)	0.264
149	12.42	0.87	0.520		0.254	(	0.260)	0.266
150	12.50	0.87	0.520		0.253	(	0.260)	0.267
151	12.58	0.93	0.560		0.252	(	0.280)	0.308
152	12.67	0.93	0.560		0.251	(	0.280)	0.309
153	12.75	0.93	0.560		0.249	(	0.280)	0.311
154	12.83	0.97	0.580		0.248	(	0.290)	0.332
155	12.92	0.97	0.580		0.247	(	0.290)	0.333
156	13.00	0.97	0.580		0.246	(	0.290)	0.334
157	13.08	1.13	0.680		0.244	(	0.340)	0.436
158	13.17	1.13	0.680		0.243	(	0.340)	0.437
159	13.25	1.13	0.680		0.242	(	0.340)	0.438
160	13.33	1.13	0.680		0.241	(	0.340)	0.439
161	13.42	1.13	0.680		0.239	(	0.340)	0.441
162	13.50	1.13	0.680		0.238	(	0.340)	0.442
163	13.58	0.77	0.460	(	0.237)	0.230		0.230
164	13.67	0.77	0.460	(	0.236)	0.230		0.230
165	13.75	0.77	0.460	(	0.235)	0.230		0.230
166	13.83	0.77	0.460	(	0.233)	0.230		0.230
167	13.92	0.77	0.460	(	0.232)	0.230		0.230
168	14.00	0.77	0.460	(	0.231)	0.230		0.230
169	14.08	0.90	0.540		0.230	(	0.270)	0.310
170	14.17	0.90	0.540		0.229	(	0.270)	0.311
171	14.25	0.90	0.540		0.228	(	0.270)	0.312
172	14.33	0.87	0.520		0.226	(	0.260)	0.294
173	14.42	0.87	0.520		0.225	(	0.260)	0.295
174	14.50	0.87	0.520		0.224	(	0.260)	0.296
175	14.58	0.87	0.520		0.223	(	0.260)	0.297
176	14.67	0.87	0.520		0.222	(	0.260)	0.298
177	14.75	0.87	0.520		0.221	(	0.260)	0.299
178	14.83	0.83	0.500		0.219	(	0.250)	0.280
179	14.92	0.83	0.500		0.218	(	0.250)	0.282
180	15.00	0.83	0.500		0.217	(	0.250)	0.283
181	15.08	0.80	0.480		0.216	(	0.240)	0.264
182	15.17	0.80	0.480		0.215	(	0.240)	0.265
183	15.25	0.80	0.480		0.214	(	0.240)	0.266
184	15.33	0.77	0.460		0.213	(	0.230)	0.247
185	15.42	0.77	0.460		0.212	(	0.230)	0.248
186	15.50	0.77	0.460		0.211	(	0.230)	0.249
187	15.58	0.63	0.380	(	0.210)	0.190		0.190
188	15.67	0.63	0.380	(	0.208)	0.190		0.190

189	15.75	0.63	0.380	(0.207)	0.190	0.190
190	15.83	0.63	0.380	(0.206)	0.190	0.190
191	15.92	0.63	0.380	(0.205)	0.190	0.190
192	16.00	0.63	0.380	(0.204)	0.190	0.190
193	16.08	0.13	0.080	(0.203)	0.040	0.040
194	16.17	0.13	0.080	(0.202)	0.040	0.040
195	16.25	0.13	0.080	(0.201)	0.040	0.040
196	16.33	0.13	0.080	(0.200)	0.040	0.040
197	16.42	0.13	0.080	(0.199)	0.040	0.040
198	16.50	0.13	0.080	(0.198)	0.040	0.040
199	16.58	0.10	0.060	(0.197)	0.030	0.030
200	16.67	0.10	0.060	(0.196)	0.030	0.030
201	16.75	0.10	0.060	(0.195)	0.030	0.030
202	16.83	0.10	0.060	(0.194)	0.030	0.030
203	16.92	0.10	0.060	(0.193)	0.030	0.030
204	17.00	0.10	0.060	(0.192)	0.030	0.030
205	17.08	0.17	0.100	(0.191)	0.050	0.050
206	17.17	0.17	0.100	(0.190)	0.050	0.050
207	17.25	0.17	0.100	(0.189)	0.050	0.050
208	17.33	0.17	0.100	(0.188)	0.050	0.050
209	17.42	0.17	0.100	(0.187)	0.050	0.050
210	17.50	0.17	0.100	(0.186)	0.050	0.050
211	17.58	0.17	0.100	(0.185)	0.050	0.050
212	17.67	0.17	0.100	(0.185)	0.050	0.050
213	17.75	0.17	0.100	(0.184)	0.050	0.050
214	17.83	0.13	0.080	(0.183)	0.040	0.040
215	17.92	0.13	0.080	(0.182)	0.040	0.040
216	18.00	0.13	0.080	(0.181)	0.040	0.040
217	18.08	0.13	0.080	(0.180)	0.040	0.040
218	18.17	0.13	0.080	(0.179)	0.040	0.040
219	18.25	0.13	0.080	(0.178)	0.040	0.040
220	18.33	0.13	0.080	(0.177)	0.040	0.040
221	18.42	0.13	0.080	(0.177)	0.040	0.040
222	18.50	0.13	0.080	(0.176)	0.040	0.040
223	18.58	0.10	0.060	(0.175)	0.030	0.030
224	18.67	0.10	0.060	(0.174)	0.030	0.030
225	18.75	0.10	0.060	(0.173)	0.030	0.030
226	18.83	0.07	0.040	(0.172)	0.020	0.020
227	18.92	0.07	0.040	(0.171)	0.020	0.020
228	19.00	0.07	0.040	(0.171)	0.020	0.020
229	19.08	0.10	0.060	(0.170)	0.030	0.030
230	19.17	0.10	0.060	(0.169)	0.030	0.030
231	19.25	0.10	0.060	(0.168)	0.030	0.030
232	19.33	0.13	0.080	(0.167)	0.040	0.040
233	19.42	0.13	0.080	(0.167)	0.040	0.040
234	19.50	0.13	0.080	(0.166)	0.040	0.040
235	19.58	0.10	0.060	(0.165)	0.030	0.030
236	19.67	0.10	0.060	(0.164)	0.030	0.030
237	19.75	0.10	0.060	(0.164)	0.030	0.030
238	19.83	0.07	0.040	(0.163)	0.020	0.020

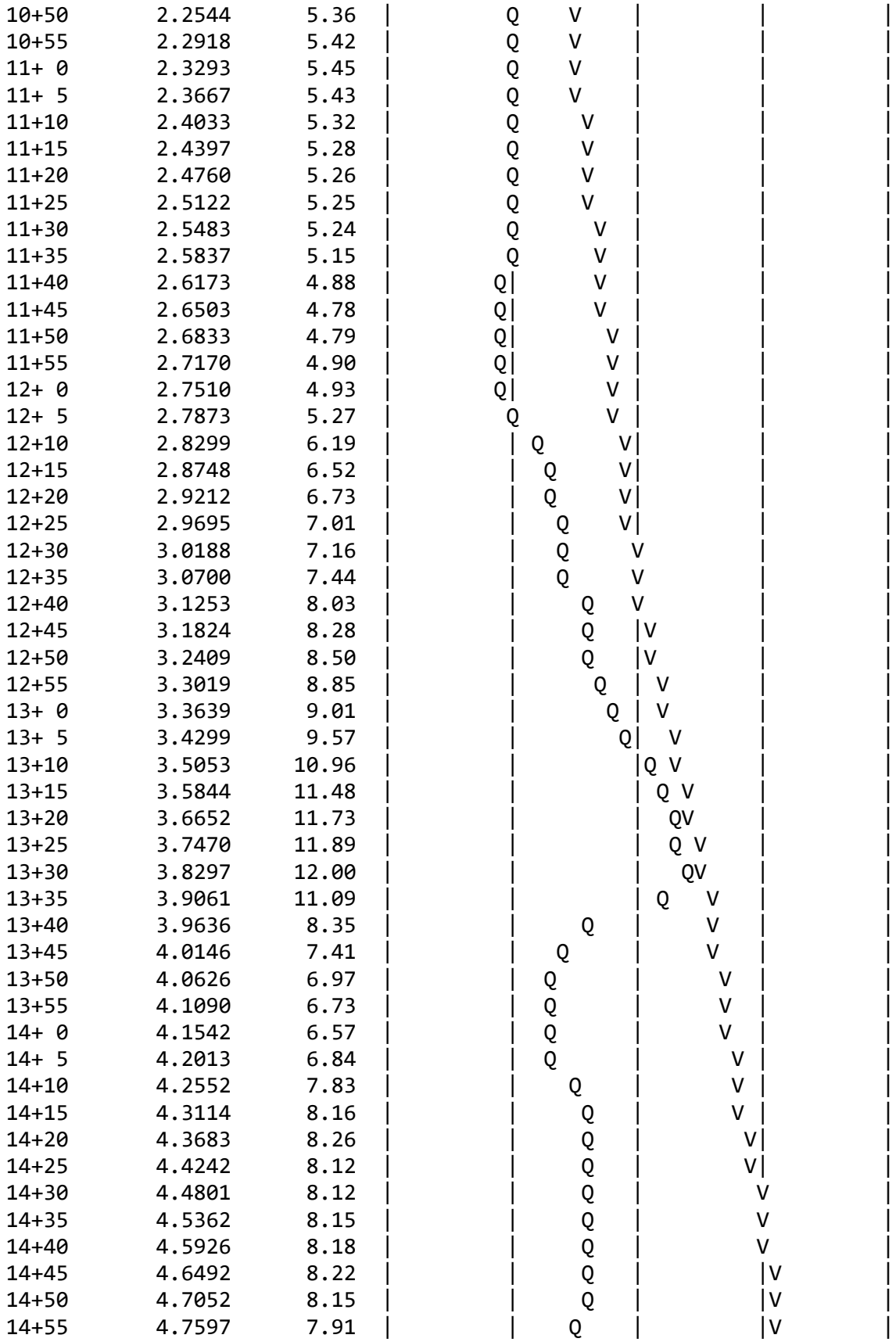
239	19.92	0.07	0.040	(0.162)	0.020	0.020
240	20.00	0.07	0.040	(0.162)	0.020	0.020
241	20.08	0.10	0.060	(0.161)	0.030	0.030
242	20.17	0.10	0.060	(0.160)	0.030	0.030
243	20.25	0.10	0.060	(0.159)	0.030	0.030
244	20.33	0.10	0.060	(0.159)	0.030	0.030
245	20.42	0.10	0.060	(0.158)	0.030	0.030
246	20.50	0.10	0.060	(0.157)	0.030	0.030
247	20.58	0.10	0.060	(0.157)	0.030	0.030
248	20.67	0.10	0.060	(0.156)	0.030	0.030
249	20.75	0.10	0.060	(0.155)	0.030	0.030
250	20.83	0.07	0.040	(0.155)	0.020	0.020
251	20.92	0.07	0.040	(0.154)	0.020	0.020
252	21.00	0.07	0.040	(0.154)	0.020	0.020
253	21.08	0.10	0.060	(0.153)	0.030	0.030
254	21.17	0.10	0.060	(0.152)	0.030	0.030
255	21.25	0.10	0.060	(0.152)	0.030	0.030
256	21.33	0.07	0.040	(0.151)	0.020	0.020
257	21.42	0.07	0.040	(0.151)	0.020	0.020
258	21.50	0.07	0.040	(0.150)	0.020	0.020
259	21.58	0.10	0.060	(0.149)	0.030	0.030
260	21.67	0.10	0.060	(0.149)	0.030	0.030
261	21.75	0.10	0.060	(0.148)	0.030	0.030
262	21.83	0.07	0.040	(0.148)	0.020	0.020
263	21.92	0.07	0.040	(0.147)	0.020	0.020
264	22.00	0.07	0.040	(0.147)	0.020	0.020
265	22.08	0.10	0.060	(0.146)	0.030	0.030
266	22.17	0.10	0.060	(0.146)	0.030	0.030
267	22.25	0.10	0.060	(0.145)	0.030	0.030
268	22.33	0.07	0.040	(0.145)	0.020	0.020
269	22.42	0.07	0.040	(0.145)	0.020	0.020
270	22.50	0.07	0.040	(0.144)	0.020	0.020
271	22.58	0.07	0.040	(0.144)	0.020	0.020
272	22.67	0.07	0.040	(0.143)	0.020	0.020
273	22.75	0.07	0.040	(0.143)	0.020	0.020
274	22.83	0.07	0.040	(0.143)	0.020	0.020
275	22.92	0.07	0.040	(0.142)	0.020	0.020
276	23.00	0.07	0.040	(0.142)	0.020	0.020
277	23.08	0.07	0.040	(0.141)	0.020	0.020
278	23.17	0.07	0.040	(0.141)	0.020	0.020
279	23.25	0.07	0.040	(0.141)	0.020	0.020
280	23.33	0.07	0.040	(0.141)	0.020	0.020
281	23.42	0.07	0.040	(0.140)	0.020	0.020
282	23.50	0.07	0.040	(0.140)	0.020	0.020
283	23.58	0.07	0.040	(0.140)	0.020	0.020
284	23.67	0.07	0.040	(0.140)	0.020	0.020
285	23.75	0.07	0.040	(0.139)	0.020	0.020
286	23.83	0.07	0.040	(0.139)	0.020	0.020
287	23.92	0.07	0.040	(0.139)	0.020	0.020
288	24.00	0.07	0.040	(0.139)	0.020	0.020

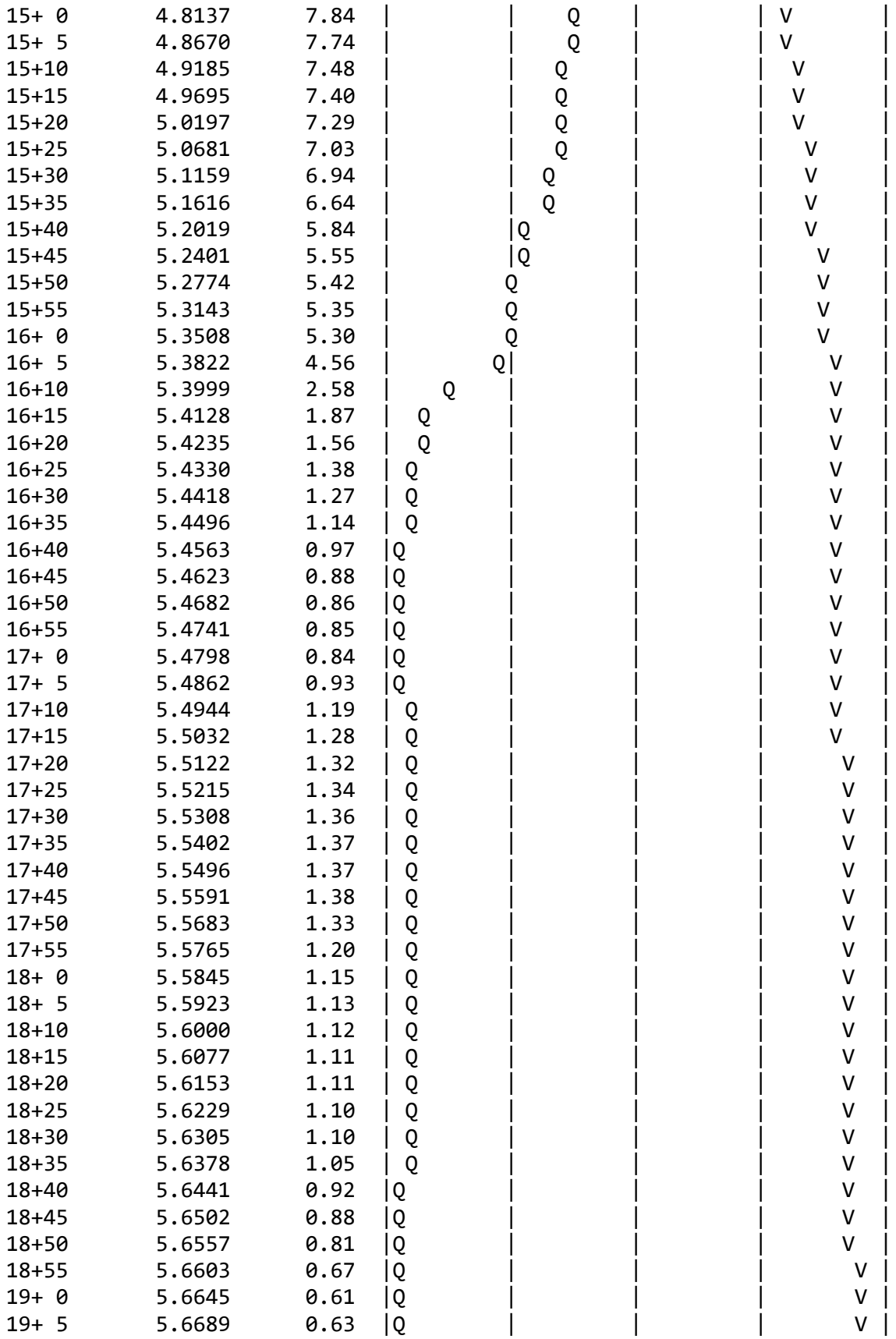
```
              (Loss Rate Not Used)
   Sum =     100.0                                    Sum =    31.4
      Flood volume = Effective rainfall      2.62(In)
       times area      27.3(Ac.)/[(In)/(Ft.)] =       6.0(Ac.Ft)
      Total soil loss =      2.38(In)
      Total soil loss =     5.427(Ac.Ft)
      Total rainfall =      5.00(In)
      Flood volume =      259434.0 Cubic Feet
      Total soil loss =      236397.5 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     12.004(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        5.0      10.0      15.0      20.0
-------------------------------------------------------------------------
  0+ 5       0.0006      0.09  Q         |         |         |         |
  0+10       0.0031      0.36  Q         |         |         |         |
  0+15       0.0062      0.45  Q         |         |         |         |
  0+20       0.0099      0.54  VQ        |         |         |         |
  0+25       0.0147      0.69  VQ        |         |         |         |
  0+30       0.0198      0.75  VQ        |         |         |         |
  0+35       0.0252      0.78  VQ        |         |         |         |
  0+40       0.0308      0.80  VQ        |         |         |         |
  0+45       0.0364      0.82  VQ        |         |         |         |
  0+50       0.0424      0.87  VQ        |         |         |         |
  0+55       0.0493      1.00  V Q       |         |         |         |
  1+ 0       0.0565      1.05  V Q       |         |         |         |
  1+ 5       0.0636      1.02  V Q       |         |         |         |
  1+10       0.0698      0.91  VQ        |         |         |         |
  1+15       0.0758      0.87  VQ        |         |         |         |
  1+20       0.0816      0.85  VQ        |         |         |         |
  1+25       0.0874      0.84  VQ        |         |         |         |
  1+30       0.0932      0.84  VQ        |         |         |         |
  1+35       0.0989      0.83  VQ        |         |         |         |
  1+40       0.1046      0.83  VQ        |         |         |         |
  1+45       0.1103      0.83  VQ        |         |         |         |
  1+50       0.1163      0.87  VQ        |         |         |         |
  1+55       0.1232      1.00  V Q       |         |         |         |
  2+ 0       0.1305      1.05  V Q       |         |         |         |
  2+ 5       0.1379      1.07  V Q       |         |         |         |
  2+10       0.1453      1.08  V Q       |         |         |         |
  2+15       0.1528      1.09  |VQ       |         |         |         |
  2+20       0.1604      1.10  |VQ       |         |         |         |
  2+25       0.1680      1.10  |VQ       |         |         |         |
```

2+30	0.1755	1.10	VQ				
2+35	0.1835	1.15	VQ				
2+40	0.1923	1.28	VQ				
2+45	0.2014	1.33	VQ				
2+50	0.2107	1.35	VQ				
2+55	0.2200	1.36	VQ				
3+ 0	0.2294	1.37	VQ				
3+ 5	0.2389	1.37	VQ				
3+10	0.2484	1.37	VQ				
3+15	0.2578	1.38	VQ				
3+20	0.2673	1.38	VQ				
3+25	0.2768	1.38	VQ				
3+30	0.2863	1.38	VQ				
3+35	0.2958	1.38	VQ				
3+40	0.3053	1.38	Q				
3+45	0.3148	1.38	Q				
3+50	0.3246	1.42	Q				
3+55	0.3353	1.56	VQ				
4+ 0	0.3463	1.60	VQ				
4+ 5	0.3575	1.62	VQ				
4+10	0.3687	1.63	VQ				
4+15	0.3800	1.64	VQ				
4+20	0.3917	1.69	VQ				
4+25	0.4043	1.83	VQ				
4+30	0.4172	1.88	VQ				
4+35	0.4303	1.90	VQ				
4+40	0.4435	1.91	VQ				
4+45	0.4567	1.92	Q				
4+50	0.4702	1.97	Q				
4+55	0.4847	2.10	VQ				
5+ 0	0.4995	2.15	VQ				
5+ 5	0.5139	2.08	VQ				
5+10	0.5264	1.83	Q				
5+15	0.5385	1.74	Q				
5+20	0.5505	1.75	Q				
5+25	0.5634	1.87	Q				
5+30	0.5765	1.90	Q				
5+35	0.5899	1.96	Q				
5+40	0.6044	2.09	Q				
5+45	0.6191	2.14	Q				
5+50	0.6340	2.17	Q				
5+55	0.6491	2.18	Q				
6+ 0	0.6642	2.19	Q				
6+ 5	0.6796	2.24	Q				
6+10	0.6960	2.38	Q				
6+15	0.7127	2.43	Q				
6+20	0.7296	2.45	Q				
6+25	0.7465	2.46	QV				
6+30	0.7635	2.47	QV				
6+35	0.7809	2.52	Q				

6+40	0.7992	2.65	Q				
6+45	0.8178	2.70	Q				
6+50	0.8366	2.72	Q				
6+55	0.8554	2.74	Q				
7+ 0	0.8743	2.74	Q				
7+ 5	0.8932	2.75	Q				
7+10	0.9122	2.75	QV				
7+15	0.9312	2.75	QV				
7+20	0.9505	2.80	QV				
7+25	0.9707	2.93	QV				
7+30	0.9912	2.98	QV				
7+35	1.0122	3.05	Q				
7+40	1.0341	3.19	Q				
7+45	1.0565	3.24	QV				
7+50	1.0793	3.32	QV				
7+55	1.1031	3.46	QV				
8+ 0	1.1274	3.52	Q				
8+ 5	1.1524	3.64	Q				
8+10	1.1794	3.92	Q				
8+15	1.2071	4.02	Q				
8+20	1.2351	4.07	Q				
8+25	1.2633	4.09	Q				
8+30	1.2916	4.11	Q				
8+35	1.3203	4.17	Q				
8+40	1.3499	4.30	QV				
8+45	1.3799	4.36	QV				
8+50	1.4104	4.42	QV				
8+55	1.4418	4.57	Q				
9+ 0	1.4737	4.62	Q				
9+ 5	1.5063	4.74	QV				
9+10	1.5409	5.02	Q				
9+15	1.5761	5.12	Q				
9+20	1.6120	5.21	Q				
9+25	1.6490	5.37	QV				
9+30	1.6865	5.44	QV				
9+35	1.7245	5.51	Q				
9+40	1.7635	5.66	Q				
9+45	1.8029	5.72	QV				
9+50	1.8428	5.80	QV				
9+55	1.8837	5.94	QV				
10+ 0	1.9250	6.00	QV				
10+ 5	1.9642	5.69	Q V				
10+10	1.9972	4.79	Q V				
10+15	2.0281	4.48	Q V				
10+20	2.0579	4.34	Q V				
10+25	2.0873	4.26	Q V				
10+30	2.1163	4.21	Q V				
10+35	2.1466	4.41	Q V				
10+40	2.1814	5.04	Q V				
10+45	2.2176	5.25	Q V				





19+10	5.6741	0.75	Q				V
19+15	5.6795	0.79	Q				V
19+20	5.6853	0.85	Q				V
19+25	5.6922	0.99	Q				V
19+30	5.6993	1.04	Q				V
19+35	5.7063	1.02	Q				V
19+40	5.7125	0.90	Q				V
19+45	5.7185	0.87	Q				V
19+50	5.7240	0.80	Q				V
19+55	5.7286	0.66	Q				V
20+ 0	5.7328	0.61	Q				V
20+ 5	5.7372	0.63	Q				V
20+10	5.7424	0.75	Q				V
20+15	5.7478	0.79	Q				V
20+20	5.7533	0.80	Q				V
20+25	5.7589	0.81	Q				V
20+30	5.7645	0.82	Q				V
20+35	5.7702	0.82	Q				V
20+40	5.7758	0.82	Q				V
20+45	5.7815	0.83	Q				V
20+50	5.7869	0.78	Q				V
20+55	5.7914	0.65	Q				V
21+ 0	5.7955	0.60	Q				V
21+ 5	5.7998	0.63	Q				V
21+10	5.8050	0.75	Q				V
21+15	5.8104	0.79	Q				V
21+20	5.8156	0.75	Q				V
21+25	5.8200	0.63	Q				V
21+30	5.8240	0.59	Q				V
21+35	5.8283	0.62	Q				V
21+40	5.8334	0.74	Q				V
21+45	5.8389	0.79	Q				V
21+50	5.8441	0.75	Q				V
21+55	5.8484	0.63	Q				V
22+ 0	5.8525	0.59	Q				V
22+ 5	5.8568	0.62	Q				V
22+10	5.8619	0.74	Q				V
22+15	5.8673	0.79	Q				V
22+20	5.8725	0.75	Q				V
22+25	5.8769	0.63	Q				V
22+30	5.8809	0.59	Q				V
22+35	5.8849	0.58	Q				V
22+40	5.8888	0.57	Q				V
22+45	5.8927	0.56	Q				V
22+50	5.8965	0.56	Q				V
22+55	5.9003	0.55	Q				V
23+ 0	5.9041	0.55	Q				V
23+ 5	5.9079	0.55	Q				V
23+10	5.9117	0.55	Q				V
23+15	5.9155	0.55	Q				V

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   23+20       5.9193      0.55  |Q        |         |         |        V|
   23+25       5.9231      0.55  |Q        |         |         |        V|
   23+30       5.9269      0.55  |Q        |         |         |        V|
   23+35       5.9307      0.55  |Q        |         |         |        V|
   23+40       5.9345      0.55  |Q        |         |         |        V|
   23+45       5.9383      0.55  |Q        |         |         |        V|
   23+50       5.9421      0.55  |Q        |         |         |        V|
   23+55       5.9459      0.55  |Q        |         |         |        V|
   24+ 0       5.9496      0.55  |Q        |         |         |        V|
   24+ 5       5.9528      0.46  Q         |         |         |        V|
   24+10       5.9541      0.19  Q         |         |         |        V|
   24+15       5.9548      0.10  Q         |         |         |        V|
   24+20       5.9553      0.06  Q         |         |         |        V|
   24+25       5.9555      0.04  Q         |         |         |        V|
   24+30       5.9557      0.02  Q         |         |         |        V|
   24+35       5.9557      0.01  Q         |         |         |        V|
   24+40       5.9558      0.01  Q         |         |         |         V
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U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/10/23 File: 100PUH24100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 27.32(Ac.) = 0.043 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 27.32(Ac.) = 0.043 Sq. Mi.
Length along longest watercourse = 3139.00(Ft.)
Length along longest watercourse measured to centroid = 2535.00(Ft.)
Length along longest watercourse = 0.595 Mi.
Length along longest watercourse measured to centroid = 0.480 Mi.
Difference in elevation = 39.71(Ft.)
Slope along watercourse = 66.7948 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.101 Hr.
Lag time = 6.04 Min.
25% of lag time = 1.51 Min.
40% of lag time = 2.41 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
27.32	2.00	54.64

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
27.32	5.00	136.60

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 2.000(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
27.320	54.50	0.746

Total Area Entered = 27.32(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
54.5	54.5	0.526	0.746	0.173	1.000	0.173
					Sum (F) =	0.173

Area averaged mean soil loss (F) (In/Hr) = 0.173
Minimum soil loss rate ((In/Hr)) = 0.086
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.303

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	82.818	14.093	3.880
2	0.167	165.637	45.327	12.480
3	0.250	248.455	19.148	5.272
4	0.333	331.274	8.063	2.220
5	0.417	414.092	4.819	1.327
6	0.500	496.910	3.000	0.826

7	0.583	579.729	2.172		0.598
8	0.667	662.547	1.461		0.402
9	0.750	745.366	0.957		0.264
10	0.833	828.184	0.960		0.264
			Sum = 100.000	Sum=	27.533

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.040	(0.306)	0.012	0.028
2	0.17	0.07	0.040	(0.305)	0.012	0.028
3	0.25	0.07	0.040	(0.304)	0.012	0.028
4	0.33	0.10	0.060	(0.303)	0.018	0.042
5	0.42	0.10	0.060	(0.302)	0.018	0.042
6	0.50	0.10	0.060	(0.301)	0.018	0.042
7	0.58	0.10	0.060	(0.299)	0.018	0.042
8	0.67	0.10	0.060	(0.298)	0.018	0.042
9	0.75	0.10	0.060	(0.297)	0.018	0.042
10	0.83	0.13	0.080	(0.296)	0.024	0.056
11	0.92	0.13	0.080	(0.295)	0.024	0.056
12	1.00	0.13	0.080	(0.294)	0.024	0.056
13	1.08	0.10	0.060	(0.292)	0.018	0.042
14	1.17	0.10	0.060	(0.291)	0.018	0.042
15	1.25	0.10	0.060	(0.290)	0.018	0.042
16	1.33	0.10	0.060	(0.289)	0.018	0.042
17	1.42	0.10	0.060	(0.288)	0.018	0.042
18	1.50	0.10	0.060	(0.287)	0.018	0.042
19	1.58	0.10	0.060	(0.285)	0.018	0.042
20	1.67	0.10	0.060	(0.284)	0.018	0.042
21	1.75	0.10	0.060	(0.283)	0.018	0.042
22	1.83	0.13	0.080	(0.282)	0.024	0.056
23	1.92	0.13	0.080	(0.281)	0.024	0.056
24	2.00	0.13	0.080	(0.280)	0.024	0.056
25	2.08	0.13	0.080	(0.279)	0.024	0.056
26	2.17	0.13	0.080	(0.278)	0.024	0.056
27	2.25	0.13	0.080	(0.276)	0.024	0.056
28	2.33	0.13	0.080	(0.275)	0.024	0.056
29	2.42	0.13	0.080	(0.274)	0.024	0.056
30	2.50	0.13	0.080	(0.273)	0.024	0.056
31	2.58	0.17	0.100	(0.272)	0.030	0.070
32	2.67	0.17	0.100	(0.271)	0.030	0.070
33	2.75	0.17	0.100	(0.270)	0.030	0.070
34	2.83	0.17	0.100	(0.269)	0.030	0.070
35	2.92	0.17	0.100	(0.267)	0.030	0.070
36	3.00	0.17	0.100	(0.266)	0.030	0.070
37	3.08	0.17	0.100	(0.265)	0.030	0.070

38	3.17	0.17	0.100	(0.264)	0.030	0.070
39	3.25	0.17	0.100	(0.263)	0.030	0.070
40	3.33	0.17	0.100	(0.262)	0.030	0.070
41	3.42	0.17	0.100	(0.261)	0.030	0.070
42	3.50	0.17	0.100	(0.260)	0.030	0.070
43	3.58	0.17	0.100	(0.259)	0.030	0.070
44	3.67	0.17	0.100	(0.258)	0.030	0.070
45	3.75	0.17	0.100	(0.257)	0.030	0.070
46	3.83	0.20	0.120	(0.255)	0.036	0.084
47	3.92	0.20	0.120	(0.254)	0.036	0.084
48	4.00	0.20	0.120	(0.253)	0.036	0.084
49	4.08	0.20	0.120	(0.252)	0.036	0.084
50	4.17	0.20	0.120	(0.251)	0.036	0.084
51	4.25	0.20	0.120	(0.250)	0.036	0.084
52	4.33	0.23	0.140	(0.249)	0.042	0.098
53	4.42	0.23	0.140	(0.248)	0.042	0.098
54	4.50	0.23	0.140	(0.247)	0.042	0.098
55	4.58	0.23	0.140	(0.246)	0.042	0.098
56	4.67	0.23	0.140	(0.245)	0.042	0.098
57	4.75	0.23	0.140	(0.244)	0.042	0.098
58	4.83	0.27	0.160	(0.243)	0.049	0.111
59	4.92	0.27	0.160	(0.242)	0.049	0.111
60	5.00	0.27	0.160	(0.241)	0.049	0.111
61	5.08	0.20	0.120	(0.240)	0.036	0.084
62	5.17	0.20	0.120	(0.238)	0.036	0.084
63	5.25	0.20	0.120	(0.237)	0.036	0.084
64	5.33	0.23	0.140	(0.236)	0.042	0.098
65	5.42	0.23	0.140	(0.235)	0.042	0.098
66	5.50	0.23	0.140	(0.234)	0.042	0.098
67	5.58	0.27	0.160	(0.233)	0.049	0.111
68	5.67	0.27	0.160	(0.232)	0.049	0.111
69	5.75	0.27	0.160	(0.231)	0.049	0.111
70	5.83	0.27	0.160	(0.230)	0.049	0.111
71	5.92	0.27	0.160	(0.229)	0.049	0.111
72	6.00	0.27	0.160	(0.228)	0.049	0.111
73	6.08	0.30	0.180	(0.227)	0.055	0.125
74	6.17	0.30	0.180	(0.226)	0.055	0.125
75	6.25	0.30	0.180	(0.225)	0.055	0.125
76	6.33	0.30	0.180	(0.224)	0.055	0.125
77	6.42	0.30	0.180	(0.223)	0.055	0.125
78	6.50	0.30	0.180	(0.222)	0.055	0.125
79	6.58	0.33	0.200	(0.221)	0.061	0.139
80	6.67	0.33	0.200	(0.220)	0.061	0.139
81	6.75	0.33	0.200	(0.219)	0.061	0.139
82	6.83	0.33	0.200	(0.218)	0.061	0.139
83	6.92	0.33	0.200	(0.217)	0.061	0.139
84	7.00	0.33	0.200	(0.216)	0.061	0.139
85	7.08	0.33	0.200	(0.215)	0.061	0.139
86	7.17	0.33	0.200	(0.214)	0.061	0.139
87	7.25	0.33	0.200	(0.213)	0.061	0.139

88	7.33	0.37	0.220	(0.212)	0.067	0.153
89	7.42	0.37	0.220	(0.211)	0.067	0.153
90	7.50	0.37	0.220	(0.210)	0.067	0.153
91	7.58	0.40	0.240	(0.209)	0.073	0.167
92	7.67	0.40	0.240	(0.208)	0.073	0.167
93	7.75	0.40	0.240	(0.207)	0.073	0.167
94	7.83	0.43	0.260	(0.207)	0.079	0.181
95	7.92	0.43	0.260	(0.206)	0.079	0.181
96	8.00	0.43	0.260	(0.205)	0.079	0.181
97	8.08	0.50	0.300	(0.204)	0.091	0.209
98	8.17	0.50	0.300	(0.203)	0.091	0.209
99	8.25	0.50	0.300	(0.202)	0.091	0.209
100	8.33	0.50	0.300	(0.201)	0.091	0.209
101	8.42	0.50	0.300	(0.200)	0.091	0.209
102	8.50	0.50	0.300	(0.199)	0.091	0.209
103	8.58	0.53	0.320	(0.198)	0.097	0.223
104	8.67	0.53	0.320	(0.197)	0.097	0.223
105	8.75	0.53	0.320	(0.196)	0.097	0.223
106	8.83	0.57	0.340	(0.195)	0.103	0.237
107	8.92	0.57	0.340	(0.194)	0.103	0.237
108	9.00	0.57	0.340	(0.193)	0.103	0.237
109	9.08	0.63	0.380	(0.192)	0.115	0.265
110	9.17	0.63	0.380	(0.192)	0.115	0.265
111	9.25	0.63	0.380	(0.191)	0.115	0.265
112	9.33	0.67	0.400	(0.190)	0.121	0.279
113	9.42	0.67	0.400	(0.189)	0.121	0.279
114	9.50	0.67	0.400	(0.188)	0.121	0.279
115	9.58	0.70	0.420	(0.187)	0.127	0.293
116	9.67	0.70	0.420	(0.186)	0.127	0.293
117	9.75	0.70	0.420	(0.185)	0.127	0.293
118	9.83	0.73	0.440	(0.184)	0.133	0.307
119	9.92	0.73	0.440	(0.183)	0.133	0.307
120	10.00	0.73	0.440	(0.183)	0.133	0.307
121	10.08	0.50	0.300	(0.182)	0.091	0.209
122	10.17	0.50	0.300	(0.181)	0.091	0.209
123	10.25	0.50	0.300	(0.180)	0.091	0.209
124	10.33	0.50	0.300	(0.179)	0.091	0.209
125	10.42	0.50	0.300	(0.178)	0.091	0.209
126	10.50	0.50	0.300	(0.177)	0.091	0.209
127	10.58	0.67	0.400	(0.176)	0.121	0.279
128	10.67	0.67	0.400	(0.176)	0.121	0.279
129	10.75	0.67	0.400	(0.175)	0.121	0.279
130	10.83	0.67	0.400	(0.174)	0.121	0.279
131	10.92	0.67	0.400	(0.173)	0.121	0.279
132	11.00	0.67	0.400	(0.172)	0.121	0.279
133	11.08	0.63	0.380	(0.171)	0.115	0.265
134	11.17	0.63	0.380	(0.170)	0.115	0.265
135	11.25	0.63	0.380	(0.170)	0.115	0.265
136	11.33	0.63	0.380	(0.169)	0.115	0.265
137	11.42	0.63	0.380	(0.168)	0.115	0.265

138	11.50	0.63	0.380	(0.167)	0.115	0.265
139	11.58	0.57	0.340	(0.166)	0.103	0.237
140	11.67	0.57	0.340	(0.165)	0.103	0.237
141	11.75	0.57	0.340	(0.165)	0.103	0.237
142	11.83	0.60	0.360	(0.164)	0.109	0.251
143	11.92	0.60	0.360	(0.163)	0.109	0.251
144	12.00	0.60	0.360	(0.162)	0.109	0.251
145	12.08	0.83	0.500	(0.161)	0.152	0.348
146	12.17	0.83	0.500	(0.161)	0.152	0.348
147	12.25	0.83	0.500	(0.160)	0.152	0.348
148	12.33	0.87	0.520	(0.159)	0.158	0.362
149	12.42	0.87	0.520	(0.158)	0.158	0.362
150	12.50	0.87	0.520	0.157	(0.158)	0.363
151	12.58	0.93	0.560	0.157	(0.170)	0.403
152	12.67	0.93	0.560	0.156	(0.170)	0.404
153	12.75	0.93	0.560	0.155	(0.170)	0.405
154	12.83	0.97	0.580	0.154	(0.176)	0.426
155	12.92	0.97	0.580	0.153	(0.176)	0.427
156	13.00	0.97	0.580	0.153	(0.176)	0.427
157	13.08	1.13	0.680	0.152	(0.206)	0.528
158	13.17	1.13	0.680	0.151	(0.206)	0.529
159	13.25	1.13	0.680	0.150	(0.206)	0.530
160	13.33	1.13	0.680	0.150	(0.206)	0.530
161	13.42	1.13	0.680	0.149	(0.206)	0.531
162	13.50	1.13	0.680	0.148	(0.206)	0.532
163	13.58	0.77	0.460	(0.147)	0.139	0.321
164	13.67	0.77	0.460	(0.147)	0.139	0.321
165	13.75	0.77	0.460	(0.146)	0.139	0.321
166	13.83	0.77	0.460	(0.145)	0.139	0.321
167	13.92	0.77	0.460	(0.144)	0.139	0.321
168	14.00	0.77	0.460	(0.144)	0.139	0.321
169	14.08	0.90	0.540	0.143	(0.164)	0.397
170	14.17	0.90	0.540	0.142	(0.164)	0.398
171	14.25	0.90	0.540	0.141	(0.164)	0.399
172	14.33	0.87	0.520	0.141	(0.158)	0.379
173	14.42	0.87	0.520	0.140	(0.158)	0.380
174	14.50	0.87	0.520	0.139	(0.158)	0.381
175	14.58	0.87	0.520	0.139	(0.158)	0.381
176	14.67	0.87	0.520	0.138	(0.158)	0.382
177	14.75	0.87	0.520	0.137	(0.158)	0.383
178	14.83	0.83	0.500	0.136	(0.152)	0.364
179	14.92	0.83	0.500	0.136	(0.152)	0.364
180	15.00	0.83	0.500	0.135	(0.152)	0.365
181	15.08	0.80	0.480	0.134	(0.146)	0.346
182	15.17	0.80	0.480	0.134	(0.146)	0.346
183	15.25	0.80	0.480	0.133	(0.146)	0.347
184	15.33	0.77	0.460	0.132	(0.139)	0.328
185	15.42	0.77	0.460	0.132	(0.139)	0.328
186	15.50	0.77	0.460	0.131	(0.139)	0.329
187	15.58	0.63	0.380	(0.130)	0.115	0.265

188	15.67	0.63	0.380	(0.130)	0.115	0.265
189	15.75	0.63	0.380	(0.129)	0.115	0.265
190	15.83	0.63	0.380	(0.128)	0.115	0.265
191	15.92	0.63	0.380	(0.128)	0.115	0.265
192	16.00	0.63	0.380	(0.127)	0.115	0.265
193	16.08	0.13	0.080	(0.126)	0.024	0.056
194	16.17	0.13	0.080	(0.126)	0.024	0.056
195	16.25	0.13	0.080	(0.125)	0.024	0.056
196	16.33	0.13	0.080	(0.124)	0.024	0.056
197	16.42	0.13	0.080	(0.124)	0.024	0.056
198	16.50	0.13	0.080	(0.123)	0.024	0.056
199	16.58	0.10	0.060	(0.122)	0.018	0.042
200	16.67	0.10	0.060	(0.122)	0.018	0.042
201	16.75	0.10	0.060	(0.121)	0.018	0.042
202	16.83	0.10	0.060	(0.121)	0.018	0.042
203	16.92	0.10	0.060	(0.120)	0.018	0.042
204	17.00	0.10	0.060	(0.119)	0.018	0.042
205	17.08	0.17	0.100	(0.119)	0.030	0.070
206	17.17	0.17	0.100	(0.118)	0.030	0.070
207	17.25	0.17	0.100	(0.118)	0.030	0.070
208	17.33	0.17	0.100	(0.117)	0.030	0.070
209	17.42	0.17	0.100	(0.116)	0.030	0.070
210	17.50	0.17	0.100	(0.116)	0.030	0.070
211	17.58	0.17	0.100	(0.115)	0.030	0.070
212	17.67	0.17	0.100	(0.115)	0.030	0.070
213	17.75	0.17	0.100	(0.114)	0.030	0.070
214	17.83	0.13	0.080	(0.114)	0.024	0.056
215	17.92	0.13	0.080	(0.113)	0.024	0.056
216	18.00	0.13	0.080	(0.112)	0.024	0.056
217	18.08	0.13	0.080	(0.112)	0.024	0.056
218	18.17	0.13	0.080	(0.111)	0.024	0.056
219	18.25	0.13	0.080	(0.111)	0.024	0.056
220	18.33	0.13	0.080	(0.110)	0.024	0.056
221	18.42	0.13	0.080	(0.110)	0.024	0.056
222	18.50	0.13	0.080	(0.109)	0.024	0.056
223	18.58	0.10	0.060	(0.109)	0.018	0.042
224	18.67	0.10	0.060	(0.108)	0.018	0.042
225	18.75	0.10	0.060	(0.108)	0.018	0.042
226	18.83	0.07	0.040	(0.107)	0.012	0.028
227	18.92	0.07	0.040	(0.107)	0.012	0.028
228	19.00	0.07	0.040	(0.106)	0.012	0.028
229	19.08	0.10	0.060	(0.106)	0.018	0.042
230	19.17	0.10	0.060	(0.105)	0.018	0.042
231	19.25	0.10	0.060	(0.105)	0.018	0.042
232	19.33	0.13	0.080	(0.104)	0.024	0.056
233	19.42	0.13	0.080	(0.104)	0.024	0.056
234	19.50	0.13	0.080	(0.103)	0.024	0.056
235	19.58	0.10	0.060	(0.103)	0.018	0.042
236	19.67	0.10	0.060	(0.102)	0.018	0.042
237	19.75	0.10	0.060	(0.102)	0.018	0.042

238	19.83	0.07	0.040	(0.101)	0.012	0.028
239	19.92	0.07	0.040	(0.101)	0.012	0.028
240	20.00	0.07	0.040	(0.100)	0.012	0.028
241	20.08	0.10	0.060	(0.100)	0.018	0.042
242	20.17	0.10	0.060	(0.100)	0.018	0.042
243	20.25	0.10	0.060	(0.099)	0.018	0.042
244	20.33	0.10	0.060	(0.099)	0.018	0.042
245	20.42	0.10	0.060	(0.098)	0.018	0.042
246	20.50	0.10	0.060	(0.098)	0.018	0.042
247	20.58	0.10	0.060	(0.097)	0.018	0.042
248	20.67	0.10	0.060	(0.097)	0.018	0.042
249	20.75	0.10	0.060	(0.097)	0.018	0.042
250	20.83	0.07	0.040	(0.096)	0.012	0.028
251	20.92	0.07	0.040	(0.096)	0.012	0.028
252	21.00	0.07	0.040	(0.095)	0.012	0.028
253	21.08	0.10	0.060	(0.095)	0.018	0.042
254	21.17	0.10	0.060	(0.095)	0.018	0.042
255	21.25	0.10	0.060	(0.094)	0.018	0.042
256	21.33	0.07	0.040	(0.094)	0.012	0.028
257	21.42	0.07	0.040	(0.094)	0.012	0.028
258	21.50	0.07	0.040	(0.093)	0.012	0.028
259	21.58	0.10	0.060	(0.093)	0.018	0.042
260	21.67	0.10	0.060	(0.093)	0.018	0.042
261	21.75	0.10	0.060	(0.092)	0.018	0.042
262	21.83	0.07	0.040	(0.092)	0.012	0.028
263	21.92	0.07	0.040	(0.092)	0.012	0.028
264	22.00	0.07	0.040	(0.091)	0.012	0.028
265	22.08	0.10	0.060	(0.091)	0.018	0.042
266	22.17	0.10	0.060	(0.091)	0.018	0.042
267	22.25	0.10	0.060	(0.090)	0.018	0.042
268	22.33	0.07	0.040	(0.090)	0.012	0.028
269	22.42	0.07	0.040	(0.090)	0.012	0.028
270	22.50	0.07	0.040	(0.090)	0.012	0.028
271	22.58	0.07	0.040	(0.089)	0.012	0.028
272	22.67	0.07	0.040	(0.089)	0.012	0.028
273	22.75	0.07	0.040	(0.089)	0.012	0.028
274	22.83	0.07	0.040	(0.089)	0.012	0.028
275	22.92	0.07	0.040	(0.088)	0.012	0.028
276	23.00	0.07	0.040	(0.088)	0.012	0.028
277	23.08	0.07	0.040	(0.088)	0.012	0.028
278	23.17	0.07	0.040	(0.088)	0.012	0.028
279	23.25	0.07	0.040	(0.088)	0.012	0.028
280	23.33	0.07	0.040	(0.087)	0.012	0.028
281	23.42	0.07	0.040	(0.087)	0.012	0.028
282	23.50	0.07	0.040	(0.087)	0.012	0.028
283	23.58	0.07	0.040	(0.087)	0.012	0.028
284	23.67	0.07	0.040	(0.087)	0.012	0.028
285	23.75	0.07	0.040	(0.087)	0.012	0.028
286	23.83	0.07	0.040	(0.087)	0.012	0.028
287	23.92	0.07	0.040	(0.087)	0.012	0.028

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288  24.00     0.07      0.040       (  0.086)       0.012        0.028
               (Loss Rate Not Used)
    Sum =     100.0                                    Sum =    42.5
       Flood volume = Effective rainfall      3.54(In)
        times area      27.3(Ac.)/[(In)/(Ft.)] =       8.1(Ac.Ft)
       Total soil loss =      1.46(In)
       Total soil loss =     3.313(Ac.Ft)
       Total rainfall =      5.00(In)
       Flood volume =      351534.9 Cubic Feet
       Total soil loss =      144296.6 Cubic Feet
       ---------------------------------------------------------------------
        Peak flow rate of this hydrograph =     14.456(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        5.0      10.0      15.0      20.0
 ----------------------------------------------------------------------
   0+ 5       0.0007      0.11  Q         |         |         |         |
   0+10       0.0039      0.46  Q         |         |         |         |
   0+15       0.0080      0.60  VQ        |         |         |         |
   0+20       0.0130      0.72  VQ        |         |         |         |
   0+25       0.0194      0.93  VQ        |         |         |         |
   0+30       0.0265      1.03  V Q       |         |         |         |
   0+35       0.0339      1.07  V Q       |         |         |         |
   0+40       0.0415      1.10  V Q       |         |         |         |
   0+45       0.0492      1.12  V Q       |         |         |         |
   0+50       0.0574      1.19  V Q       |         |         |         |
   0+55       0.0669      1.37  V Q       |         |         |         |
   1+ 0       0.0769      1.45  V Q       |         |         |         |
   1+ 5       0.0867      1.43  V Q       |         |         |         |
   1+10       0.0955      1.27  V Q       |         |         |         |
   1+15       0.1038      1.21  V Q       |         |         |         |
   1+20       0.1120      1.19  V Q       |         |         |         |
   1+25       0.1201      1.18  V Q       |         |         |         |
   1+30       0.1282      1.17  V Q       |         |         |         |
   1+35       0.1362      1.16  V Q       |         |         |         |
   1+40       0.1442      1.16  V Q       |         |         |         |
   1+45       0.1522      1.16  V Q       |         |         |         |
   1+50       0.1605      1.21  V Q       |         |         |         |
   1+55       0.1700      1.38  V Q       |         |         |         |
   2+ 0       0.1800      1.45  V Q       |         |         |         |
   2+ 5       0.1902      1.48  V Q       |         |         |         |
   2+10       0.2005      1.50  V  Q      |         |         |         |
   2+15       0.2110      1.51  |V Q      |         |         |         |
   2+20       0.2215      1.52  |V Q      |         |         |         |
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2+25       0.2320      1.53  |V Q      |          |          |          |
2+30       0.2425      1.53  |V Q      |          |          |          |
2+35       0.2535      1.59  |V Q      |          |          |          |
2+40       0.2656      1.76  |V Q      |          |          |          |
2+45       0.2783      1.84  |V Q      |          |          |          |
2+50       0.2911      1.87  |V Q      |          |          |          |
2+55       0.3041      1.89  |V Q      |          |          |          |
3+ 0       0.3172      1.90  |V Q      |          |          |          |
3+ 5       0.3303      1.91  |V Q      |          |          |          |
3+10       0.3435      1.91  |V Q      |          |          |          |
3+15       0.3567      1.92  |V Q      |          |          |          |
3+20       0.3699      1.92  |V Q      |          |          |          |
3+25       0.3831      1.92  |V Q      |          |          |          |
3+30       0.3964      1.92  |V Q      |          |          |          |
3+35       0.4096      1.92  | VQ      |          |          |          |
3+40       0.4228      1.92  | VQ      |          |          |          |
3+45       0.4360      1.92  | VQ      |          |          |          |
3+50       0.4496      1.97  | VQ      |          |          |          |
3+55       0.4644      2.15  | V Q     |          |          |          |
4+ 0       0.4797      2.22  | V Q     |          |          |          |
4+ 5       0.4952      2.25  | V Q     |          |          |          |
4+10       0.5108      2.27  | V Q     |          |          |          |
4+15       0.5266      2.28  | V Q     |          |          |          |
4+20       0.5427      2.34  | V Q     |          |          |          |
4+25       0.5601      2.52  | V  Q    |          |          |          |
4+30       0.5780      2.60  | V  Q    |          |          |          |
4+35       0.5962      2.64  | V  Q    |          |          |          |
4+40       0.6144      2.65  |  V Q    |          |          |          |
4+45       0.6328      2.67  |  V Q    |          |          |          |
4+50       0.6516      2.73  |  V Q    |          |          |          |
4+55       0.6716      2.91  |  V Q    |          |          |          |
5+ 0       0.6922      2.99  |  V Q    |          |          |          |
5+ 5       0.7122      2.91  |  V Q    |          |          |          |
5+10       0.7300      2.58  |  V Q    |          |          |          |
5+15       0.7469      2.45  |  VQ     |          |          |          |
5+20       0.7637      2.45  |  VQ     |          |          |          |
5+25       0.7815      2.59  |  V Q    |          |          |          |
5+30       0.7997      2.64  |  V Q    |          |          |          |
5+35       0.8185      2.72  |   VQ    |          |          |          |
5+40       0.8384      2.90  |   VQ    |          |          |          |
5+45       0.8589      2.97  |   VQ    |          |          |          |
5+50       0.8796      3.01  |   V Q   |          |          |          |
5+55       0.9005      3.03  |   V Q   |          |          |          |
6+ 0       0.9215      3.05  |   V Q   |          |          |          |
6+ 5       0.9429      3.11  |   V Q   |          |          |          |
6+10       0.9656      3.29  |   V Q   |          |          |          |
6+15       0.9888      3.37  |   V Q   |          |          |          |
6+20       1.0122      3.40  |    VQ   |          |          |          |
6+25       1.0358      3.42  |    VQ   |          |          |          |
6+30       1.0594      3.43  |    VQ   |          |          |          |
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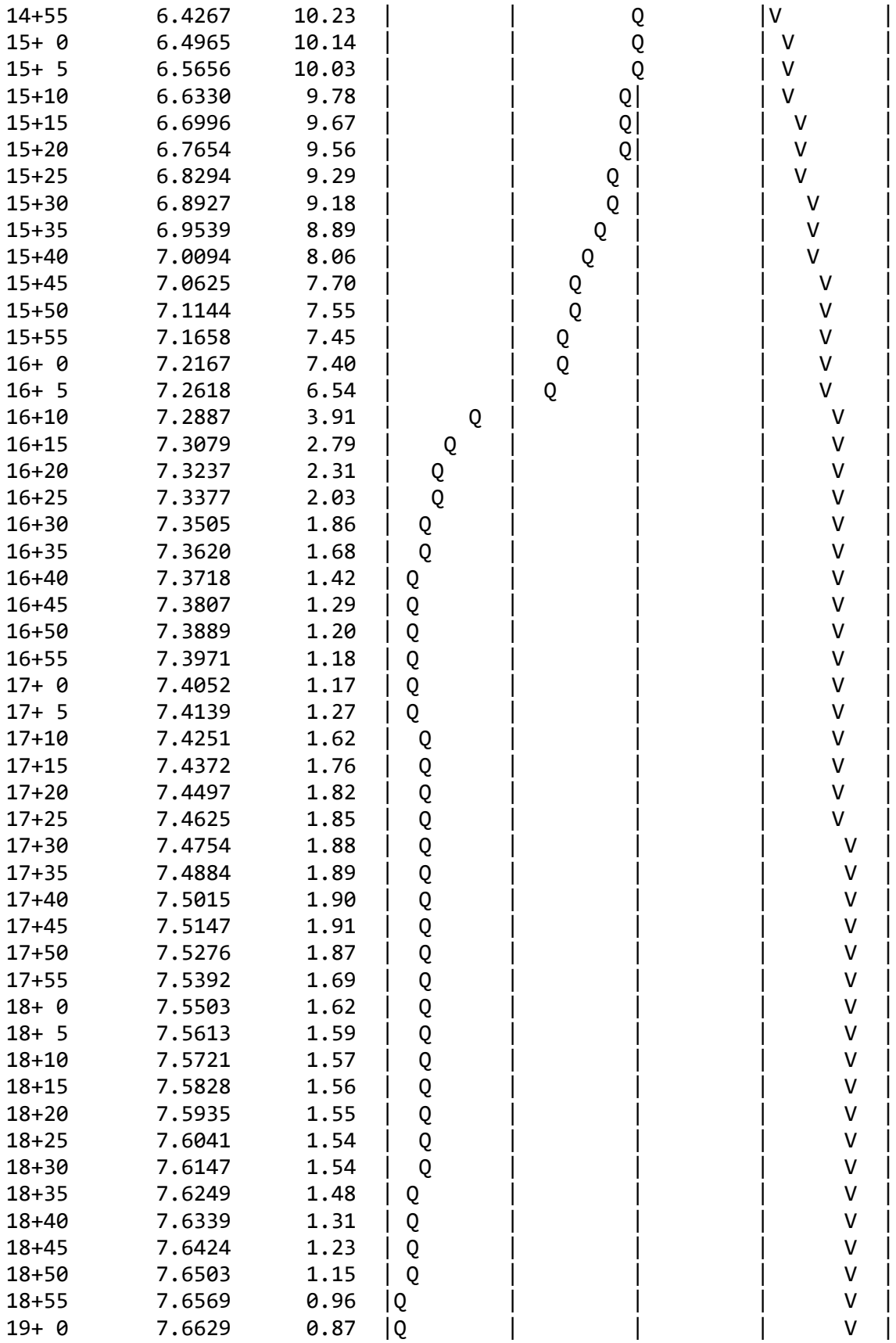
6+35	1.0835	3.50	VQ				
6+40	1.1088	3.68	V Q				
6+45	1.1347	3.75	V Q				
6+50	1.1607	3.79	V Q				
6+55	1.1870	3.81	V Q				
7+ 0	1.2132	3.82	VQ				
7+ 5	1.2396	3.83	VQ				
7+10	1.2660	3.83	VQ				
7+15	1.2924	3.84	VQ				
7+20	1.3192	3.89	VQ				
7+25	1.3472	4.07	V Q				
7+30	1.3757	4.14	V Q				
7+35	1.4048	4.23	V Q				
7+40	1.4353	4.42	VQ				
7+45	1.4663	4.50	V Q				
7+50	1.4979	4.60	V Q				
7+55	1.5309	4.79	V Q				
8+ 0	1.5646	4.88	V Q				
8+ 5	1.5993	5.03	V Q				
8+10	1.6365	5.41	V Q				
8+15	1.6748	5.57	V Q				
8+20	1.7137	5.64	V Q				
8+25	1.7529	5.69	V Q				
8+30	1.7922	5.71	V Q				
8+35	1.8320	5.79	V Q				
8+40	1.8732	5.97	V Q				
8+45	1.9149	6.05	V Q				
8+50	1.9572	6.14	V Q				
8+55	2.0008	6.34	V Q				
9+ 0	2.0451	6.42	V Q				
9+ 5	2.0903	6.57	V Q				
9+10	2.1381	6.94	V Q				
9+15	2.1870	7.10	V Q				
9+20	2.2368	7.23	V Q				
9+25	2.2881	7.45	V Q				
9+30	2.3401	7.55	V Q				
9+35	2.3929	7.65	V Q				
9+40	2.4470	7.86	V Q				
9+45	2.5017	7.95	V Q				
9+50	2.5572	8.05	V Q				
9+55	2.6140	8.25	V Q				
10+ 0	2.6714	8.34	V Q				
10+ 5	2.7265	8.00	V Q				
10+10	2.7734	6.81	Q				
10+15	2.8169	6.31	QV				
10+20	2.8589	6.10	Q V				
10+25	2.9001	5.98	Q V				
10+30	2.9408	5.90	Q V				
10+35	2.9829	6.12	Q V				
10+40	3.0308	6.95	Q V				

10+45	3.0810	7.29	|	| QV |	|	|
10+50	3.1321	7.42	|	| QV |	|	|
10+55	3.1839	7.51	|	| Q |	|	|
11+ 0	3.2360	7.57	|	| QV |	|	|
11+ 5	3.2881	7.56	|	| QV |	|	|
11+10	3.3391	7.41	|	| Q V |	|	|
11+15	3.3898	7.36	|	| Q V |	|	|
11+20	3.4404	7.35	|	| Q V |	|	|
11+25	3.4908	7.33	|	| Q V |	|	|
11+30	3.5412	7.32	|	| Q V |	|	|
11+35	3.5908	7.20	|	| Q V |	|	|
11+40	3.6379	6.84	|	| Q V |	|	|
11+45	3.6840	6.69	|	| Q V |	|	|
11+50	3.7301	6.68	|	| Q V |	|	|
11+55	3.7770	6.82	|	| Q V |	|	|
12+ 0	3.8243	6.87	|	| Q V |	|	|
12+ 5	3.8744	7.26	|	| Q V|	|	|
12+10	3.9328	8.49	|	| Q V|	|	|
12+15	3.9949	9.01	|	| QV|	|	|
12+20	4.0588	9.28	|	| Q V	|	|
12+25	4.1248	9.59	|	| QV	|	|
12+30	4.1919	9.75	|	| QV	|	|
12+35	4.2608	10.00	|	| QV	|	|
12+40	4.3336	10.57	|	| |Q	|	|
12+45	4.4083	10.84	|	| |Q	|	|
12+50	4.4844	11.06	|	| | Q	|	|
12+55	4.5629	11.39	|	| | Q	|	|
13+ 0	4.6424	11.55	|	| | Q	|	|
13+ 5	4.7253	12.03	|	| | VQ	|	|
13+10	4.8172	13.34	|	| | V Q	|	|
13+15	4.9130	13.92	|	| | V Q	|	|
13+20	5.0107	14.19	|	| | V Q	|	|
13+25	5.1096	14.35	|	| | V Q	|	|
13+30	5.2091	14.46	|	| | V Q	|	|
13+35	5.3036	13.72	|	| | VQ	|	|
13+40	5.3802	11.13	|	| | Q V	|	|
13+45	5.4494	10.04	|	| Q V	|	|
13+50	5.5155	9.60	|	| Q| V	|	|
13+55	5.5798	9.32	|	| Q | V	|	|
14+ 0	5.6428	9.15	|	| Q | V	|	|
14+ 5	5.7070	9.32	|	| Q | V	|	|
14+10	5.7772	10.20	|	| Q V	|	|
14+15	5.8499	10.56	|	| |Q V	|	|
14+20	5.9230	10.61	|	| |Q V|	|	|
14+25	5.9952	10.48	|	| Q V|	|	|
14+30	6.0672	10.46	|	| Q V	|	|
14+35	6.1393	10.48	|	| Q V	|	|
14+40	6.2116	10.50	|	| Q V	|	|
14+45	6.2841	10.52	|	| |Q |V	|	|
14+50	6.3562	10.47	|	| Q |V	|	|



19+ 5	7.6690	0.89	Q				V
19+10	7.6761	1.04	Q				V
19+15	7.6837	1.09	Q				V
19+20	7.6917	1.17	Q				V
19+25	7.7010	1.35	Q				V
19+30	7.7109	1.44	Q				V
19+35	7.7207	1.42	Q				V
19+40	7.7294	1.27	Q				V
19+45	7.7377	1.21	Q				V
19+50	7.7456	1.14	Q				V
19+55	7.7521	0.95	Q				V
20+ 0	7.7581	0.87	Q				V
20+ 5	7.7642	0.89	Q				V
20+10	7.7713	1.04	Q				V
20+15	7.7788	1.09	Q				V
20+20	7.7865	1.11	Q				V
20+25	7.7943	1.13	Q				V
20+30	7.8021	1.13	Q				V
20+35	7.8099	1.14	Q				V
20+40	7.8178	1.14	Q				V
20+45	7.8257	1.15	Q				V
20+50	7.8333	1.10	Q				V
20+55	7.8396	0.92	Q				V
21+ 0	7.8455	0.85	Q				V
21+ 5	7.8515	0.87	Q				V
21+10	7.8586	1.03	Q				V
21+15	7.8661	1.09	Q				V
21+20	7.8734	1.06	Q				V
21+25	7.8796	0.90	Q				V
21+30	7.8853	0.83	Q				V
21+35	7.8912	0.86	Q				V
21+40	7.8983	1.02	Q				V
21+45	7.9058	1.09	Q				V
21+50	7.9130	1.06	Q				V
21+55	7.9192	0.90	Q				V
22+ 0	7.9250	0.83	Q				V
22+ 5	7.9309	0.86	Q				V
22+10	7.9379	1.02	Q				V
22+15	7.9454	1.09	Q				V
22+20	7.9527	1.06	Q				V
22+25	7.9589	0.90	Q				V
22+30	7.9646	0.83	Q				V
22+35	7.9702	0.81	Q				V
22+40	7.9756	0.79	Q				V
22+45	7.9810	0.79	Q				V
22+50	7.9864	0.78	Q				V
22+55	7.9918	0.78	Q				V
23+ 0	7.9971	0.77	Q				V
23+ 5	8.0024	0.77	Q				V
23+10	8.0077	0.77	Q				V

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   23+15       8.0129      0.77  |Q        |         |         |        V|
   23+20       8.0182      0.77  |Q        |         |         |        V|
   23+25       8.0235      0.77  |Q        |         |         |        V|
   23+30       8.0288      0.77  |Q        |         |         |        V|
   23+35       8.0341      0.77  |Q        |         |         |        V|
   23+40       8.0394      0.77  |Q        |         |         |        V|
   23+45       8.0447      0.77  |Q        |         |         |        V|
   23+50       8.0500      0.77  |Q        |         |         |        V|
   23+55       8.0552      0.77  |Q        |         |         |        V|
   24+ 0       8.0605      0.77  |Q        |         |         |        V|
   24+ 5       8.0651      0.66  |Q        |         |         |        V|
   24+10       8.0672      0.31  Q         |         |         |        V|
   24+15       8.0683      0.16  Q         |         |         |        V|
   24+20       8.0691      0.10  Q         |         |         |        V|
   24+25       8.0695      0.07  Q         |         |         |        V|
   24+30       8.0698      0.04  Q         |         |         |        V|
   24+35       8.0700      0.03  Q         |         |         |        V|
   24+40       8.0701      0.01  Q         |         |         |        V|
   24+45       8.0701      0.01  Q         |         |         |         V
-------------------------------------------------------------------------
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U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/10/23 File: Q100UHEX6100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 27.32(Ac.) = 0.043 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 27.32(Ac.) = 0.043 Sq. Mi.
Length along longest watercourse = 1724.00(Ft.)
Length along longest watercourse measured to centroid = 1620.00(Ft.)
Length along longest watercourse = 0.327 Mi.
Length along longest watercourse measured to centroid = 0.307 Mi.
Difference in elevation = 22.50(Ft.)
Slope along watercourse = 68.9095 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.090 Hr.
Lag time = 5.38 Min.
25% of lag time = 1.34 Min.
40% of lag time = 2.15 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
27.32	1.20	32.78

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
27.32	2.50	68.30

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
27.320	56.50	0.500

Total Area Entered = 27.32(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
56.5	56.5	0.506	0.500	0.278	1.000	0.278
					Sum (F) =	0.278

Area averaged mean soil loss (F) (In/Hr) = 0.278
Minimum soil loss rate ((In/Hr)) = 0.139
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	93.015	17.076	4.702
2	0.167	186.030	47.610	13.109
3	0.250	279.045	16.820	4.631
4	0.333	372.060	7.458	2.053
5	0.417	465.074	4.278	1.178
6	0.500	558.089	2.760	0.760

7	0.583	651.104	1.826		0.503
8	0.667	744.119	1.150		0.317
9	0.750	837.134	1.024		0.282
			Sum = 100.000	Sum=	27.533

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.50	0.150	(0.278)	0.075	0.075
2	0.17	0.60	0.180	(0.278)	0.090	0.090
3	0.25	0.60	0.180	(0.278)	0.090	0.090
4	0.33	0.60	0.180	(0.278)	0.090	0.090
5	0.42	0.60	0.180	(0.278)	0.090	0.090
6	0.50	0.70	0.210	(0.278)	0.105	0.105
7	0.58	0.70	0.210	(0.278)	0.105	0.105
8	0.67	0.70	0.210	(0.278)	0.105	0.105
9	0.75	0.70	0.210	(0.278)	0.105	0.105
10	0.83	0.70	0.210	(0.278)	0.105	0.105
11	0.92	0.70	0.210	(0.278)	0.105	0.105
12	1.00	0.80	0.240	(0.278)	0.120	0.120
13	1.08	0.80	0.240	(0.278)	0.120	0.120
14	1.17	0.80	0.240	(0.278)	0.120	0.120
15	1.25	0.80	0.240	(0.278)	0.120	0.120
16	1.33	0.80	0.240	(0.278)	0.120	0.120
17	1.42	0.80	0.240	(0.278)	0.120	0.120
18	1.50	0.80	0.240	(0.278)	0.120	0.120
19	1.58	0.80	0.240	(0.278)	0.120	0.120
20	1.67	0.80	0.240	(0.278)	0.120	0.120
21	1.75	0.80	0.240	(0.278)	0.120	0.120
22	1.83	0.80	0.240	(0.278)	0.120	0.120
23	1.92	0.80	0.240	(0.278)	0.120	0.120
24	2.00	0.90	0.270	(0.278)	0.135	0.135
25	2.08	0.80	0.240	(0.278)	0.120	0.120
26	2.17	0.90	0.270	(0.278)	0.135	0.135
27	2.25	0.90	0.270	(0.278)	0.135	0.135
28	2.33	0.90	0.270	(0.278)	0.135	0.135
29	2.42	0.90	0.270	(0.278)	0.135	0.135
30	2.50	0.90	0.270	(0.278)	0.135	0.135
31	2.58	0.90	0.270	(0.278)	0.135	0.135
32	2.67	0.90	0.270	(0.278)	0.135	0.135
33	2.75	1.00	0.300	(0.278)	0.150	0.150
34	2.83	1.00	0.300	(0.278)	0.150	0.150
35	2.92	1.00	0.300	(0.278)	0.150	0.150
36	3.00	1.00	0.300	(0.278)	0.150	0.150
37	3.08	1.00	0.300	(0.278)	0.150	0.150
38	3.17	1.10	0.330	(0.278)	0.165	0.165

39	3.25	1.10	0.330	(0.278)	0.165	0.165	
40	3.33	1.10	0.330	(0.278)	0.165	0.165	
41	3.42	1.20	0.360	(0.278)	0.180	0.180	
42	3.50	1.30	0.390	(0.278)	0.195	0.195	
43	3.58	1.40	0.420	(0.278)	0.210	0.210	
44	3.67	1.40	0.420	(0.278)	0.210	0.210	
45	3.75	1.50	0.450	(0.278)	0.225	0.225	
46	3.83	1.50	0.450	(0.278)	0.225	0.225	
47	3.92	1.60	0.480	(0.278)	0.240	0.240	
48	4.00	1.60	0.480	(0.278)	0.240	0.240	
49	4.08	1.70	0.510	(0.278)	0.255	0.255	
50	4.17	1.80	0.540	(0.278)	0.270	0.270	
51	4.25	1.90	0.570	0.278	(0.285)	0.292	
52	4.33	2.00	0.600	0.278	(0.300)	0.322	
53	4.42	2.10	0.630	0.278	(0.315)	0.352	
54	4.50	2.10	0.630	0.278	(0.315)	0.352	
55	4.58	2.20	0.660	0.278	(0.330)	0.382	
56	4.67	2.30	0.690	0.278	(0.345)	0.412	
57	4.75	2.40	0.720	0.278	(0.360)	0.442	
58	4.83	2.40	0.720	0.278	(0.360)	0.442	
59	4.92	2.50	0.750	0.278	(0.375)	0.472	
60	5.00	2.60	0.780	0.278	(0.390)	0.502	
61	5.08	3.10	0.930	0.278	(0.465)	0.652	
62	5.17	3.60	1.080	0.278	(0.540)	0.802	
63	5.25	3.90	1.170	0.278	(0.585)	0.892	
64	5.33	4.20	1.260	0.278	(0.630)	0.982	
65	5.42	4.70	1.410	0.278	(0.705)	1.132	
66	5.50	5.60	1.680	0.278	(0.840)	1.402	
67	5.58	1.90	0.570	0.278	(0.285)	0.292	
68	5.67	0.90	0.270	(0.278)	0.135	0.135	
69	5.75	0.60	0.180	(0.278)	0.090	0.090	
70	5.83	0.50	0.150	(0.278)	0.075	0.075	
71	5.92	0.30	0.090	(0.278)	0.045	0.045	
72	6.00	0.20	0.060	(0.278)	0.030	0.030	

(Loss Rate Not Used)

Sum = 100.0 Sum = 17.7

Flood volume = Effective rainfall 1.47(In)
times area 27.3(Ac.)/[(In)/(Ft.)] = 3.4(Ac.Ft)
Total soil loss = 1.03(In)
Total soil loss = 2.334(Ac.Ft)
Total rainfall = 2.50(In)
Flood volume = 146233.5 Cubic Feet
Total soil loss = 101672.2 Cubic Feet

Peak flow rate of this hydrograph = 29.784(CFS)

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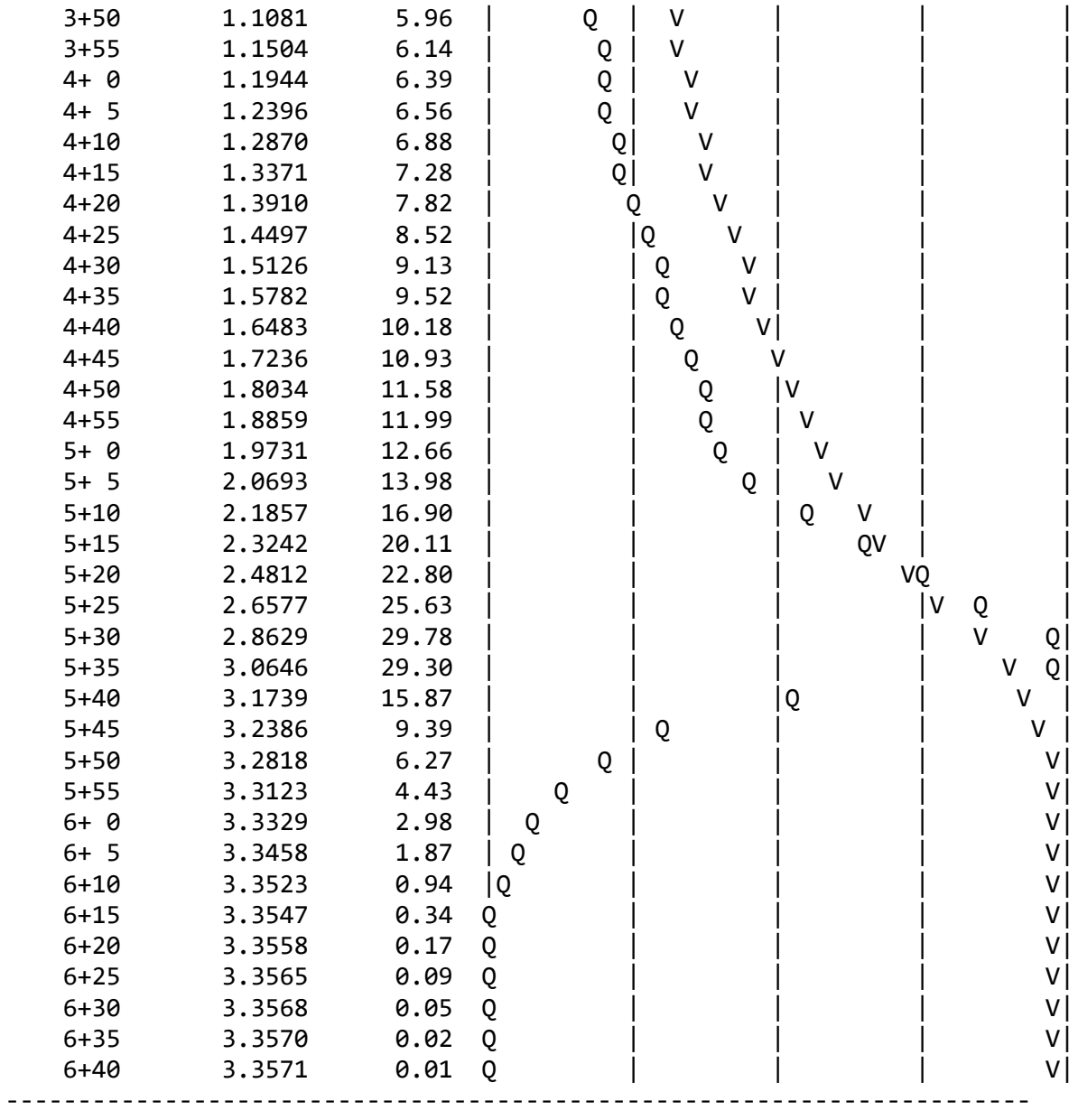
6 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	7.5	15.0	22.5	30.0
0+ 5	0.0024	0.35	Q				
0+10	0.0121	1.41	VQ				
0+15	0.0256	1.95	V Q				
0+20	0.0405	2.17	V Q				
0+25	0.0563	2.29	V Q				
0+30	0.0731	2.44	V Q				
0+35	0.0916	2.68	V Q				
0+40	0.1108	2.79	V Q				
0+45	0.1304	2.84	V Q				
0+50	0.1501	2.86	V Q				
0+55	0.1699	2.88	VQ				
1+ 0	0.1903	2.95	VQ				
1+ 5	0.2120	3.16	V Q				
1+10	0.2342	3.23	V Q				
1+15	0.2567	3.26	VQ				
1+20	0.2792	3.28	VQ				
1+25	0.3019	3.29	VQ				
1+30	0.3246	3.30	VQ				
1+35	0.3473	3.30	Q				
1+40	0.3701	3.31	Q				
1+45	0.3929	3.31	Q				
1+50	0.4156	3.31	Q				
1+55	0.4384	3.31	QV				
2+ 0	0.4616	3.38	QV				
2+ 5	0.4858	3.50	QV				
2+10	0.5095	3.45	Q V				
2+15	0.5343	3.60	Q V				
2+20	0.5595	3.66	Q V				
2+25	0.5849	3.68	Q V				
2+30	0.6104	3.70	Q V				
2+35	0.6359	3.71	Q V				
2+40	0.6615	3.71	Q V				
2+45	0.6875	3.78	Q V				
2+50	0.7150	3.99	Q V				
2+55	0.7429	4.06	Q V				
3+ 0	0.7711	4.09	Q V				
3+ 5	0.7993	4.10	Q V				
3+10	0.8281	4.19	Q V				
3+15	0.8584	4.39	Q V				
3+20	0.8891	4.46	Q V				
3+25	0.9206	4.57	Q V				
3+30	0.9540	4.85	Q V				
3+35	0.9899	5.20	Q V				
3+40	1.0278	5.51	Q V				
3+45	1.0671	5.70	Q V				



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

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Study date 10/10/23 File: 100PUH6100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 27.32(Ac.) = 0.043 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 27.32(Ac.) = 0.043 Sq. Mi.
Length along longest watercourse = 3139.00(Ft.)
Length along longest watercourse measured to centroid = 2535.00(Ft.)
Length along longest watercourse = 0.595 Mi.
Length along longest watercourse measured to centroid = 0.480 Mi.
Difference in elevation = 39.71(Ft.)
Slope along watercourse = 66.7948 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.101 Hr.
Lag time = 6.04 Min.
25% of lag time = 1.51 Min.
40% of lag time = 2.41 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
27.32	1.20	32.78

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
27.32	2.50	68.30

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
27.320	54.50	0.746

Total Area Entered = 27.32(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
54.5	54.5	0.526	0.746	0.173	1.000	0.173
					Sum (F) =	0.173

Area averaged mean soil loss (F) (In/Hr) = 0.173
Minimum soil loss rate ((In/Hr)) = 0.086
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.303

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	82.818	14.093	3.880
2	0.167	165.637	45.327	12.480
3	0.250	248.455	19.148	5.272
4	0.333	331.274	8.063	2.220
5	0.417	414.092	4.819	1.327
6	0.500	496.910	3.000	0.826

7	0.583	579.729	2.172	0.598
8	0.667	662.547	1.461	0.402
9	0.750	745.366	0.957	0.264
10	0.833	828.184	0.960	0.264
			Sum = 100.000 Sum=	27.533

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.50	0.150	(0.173)	0.045	0.105
2	0.17	0.60	0.180	(0.173)	0.055	0.125
3	0.25	0.60	0.180	(0.173)	0.055	0.125
4	0.33	0.60	0.180	(0.173)	0.055	0.125
5	0.42	0.60	0.180	(0.173)	0.055	0.125
6	0.50	0.70	0.210	(0.173)	0.064	0.146
7	0.58	0.70	0.210	(0.173)	0.064	0.146
8	0.67	0.70	0.210	(0.173)	0.064	0.146
9	0.75	0.70	0.210	(0.173)	0.064	0.146
10	0.83	0.70	0.210	(0.173)	0.064	0.146
11	0.92	0.70	0.210	(0.173)	0.064	0.146
12	1.00	0.80	0.240	(0.173)	0.073	0.167
13	1.08	0.80	0.240	(0.173)	0.073	0.167
14	1.17	0.80	0.240	(0.173)	0.073	0.167
15	1.25	0.80	0.240	(0.173)	0.073	0.167
16	1.33	0.80	0.240	(0.173)	0.073	0.167
17	1.42	0.80	0.240	(0.173)	0.073	0.167
18	1.50	0.80	0.240	(0.173)	0.073	0.167
19	1.58	0.80	0.240	(0.173)	0.073	0.167
20	1.67	0.80	0.240	(0.173)	0.073	0.167
21	1.75	0.80	0.240	(0.173)	0.073	0.167
22	1.83	0.80	0.240	(0.173)	0.073	0.167
23	1.92	0.80	0.240	(0.173)	0.073	0.167
24	2.00	0.90	0.270	(0.173)	0.082	0.188
25	2.08	0.80	0.240	(0.173)	0.073	0.167
26	2.17	0.90	0.270	(0.173)	0.082	0.188
27	2.25	0.90	0.270	(0.173)	0.082	0.188
28	2.33	0.90	0.270	(0.173)	0.082	0.188
29	2.42	0.90	0.270	(0.173)	0.082	0.188
30	2.50	0.90	0.270	(0.173)	0.082	0.188
31	2.58	0.90	0.270	(0.173)	0.082	0.188
32	2.67	0.90	0.270	(0.173)	0.082	0.188
33	2.75	1.00	0.300	(0.173)	0.091	0.209
34	2.83	1.00	0.300	(0.173)	0.091	0.209
35	2.92	1.00	0.300	(0.173)	0.091	0.209
36	3.00	1.00	0.300	(0.173)	0.091	0.209
37	3.08	1.00	0.300	(0.173)	0.091	0.209

38	3.17	1.10	0.330	(0.173)	0.100		0.230
39	3.25	1.10	0.330	(0.173)	0.100		0.230
40	3.33	1.10	0.330	(0.173)	0.100		0.230
41	3.42	1.20	0.360	(0.173)	0.109		0.251
42	3.50	1.30	0.390	(0.173)	0.118		0.272
43	3.58	1.40	0.420	(0.173)	0.127		0.293
44	3.67	1.40	0.420	(0.173)	0.127		0.293
45	3.75	1.50	0.450	(0.173)	0.136		0.314
46	3.83	1.50	0.450	(0.173)	0.136		0.314
47	3.92	1.60	0.480	(0.173)	0.146		0.334
48	4.00	1.60	0.480	(0.173)	0.146		0.334
49	4.08	1.70	0.510	(0.173)	0.155		0.355
50	4.17	1.80	0.540	(0.173)	0.164		0.376
51	4.25	1.90	0.570	(0.173)	0.173		0.397
52	4.33	2.00	0.600	0.173	(0.182)		0.427
53	4.42	2.10	0.630	0.173	(0.191)		0.457
54	4.50	2.10	0.630	0.173	(0.191)		0.457
55	4.58	2.20	0.660	0.173	(0.200)		0.487
56	4.67	2.30	0.690	0.173	(0.209)		0.517
57	4.75	2.40	0.720	0.173	(0.218)		0.547
58	4.83	2.40	0.720	0.173	(0.218)		0.547
59	4.92	2.50	0.750	0.173	(0.227)		0.577
60	5.00	2.60	0.780	0.173	(0.236)		0.607
61	5.08	3.10	0.930	0.173	(0.282)		0.757
62	5.17	3.60	1.080	0.173	(0.327)		0.907
63	5.25	3.90	1.170	0.173	(0.355)		0.997
64	5.33	4.20	1.260	0.173	(0.382)		1.087
65	5.42	4.70	1.410	0.173	(0.427)		1.237
66	5.50	5.60	1.680	0.173	(0.509)		1.507
67	5.58	1.90	0.570	(0.173)	0.173		0.397
68	5.67	0.90	0.270	(0.173)	0.082		0.188
69	5.75	0.60	0.180	(0.173)	0.055		0.125
70	5.83	0.50	0.150	(0.173)	0.045		0.105
71	5.92	0.30	0.090	(0.173)	0.027		0.063
72	6.00	0.20	0.060	(0.173)	0.018		0.042

(Loss Rate Not Used)

Sum = 100.0 Sum = 22.5

Flood volume = Effective rainfall 1.87(In)
times area 27.3(Ac.)/[(In)/(Ft.)] = 4.3(Ac.Ft)
Total soil loss = 0.63(In)
Total soil loss = 1.429(Ac.Ft)
Total rainfall = 2.50(In)
Flood volume = 185660.6 Cubic Feet
Total soil loss = 62245.1 Cubic Feet

Peak flow rate of this hydrograph = 32.365(CFS)

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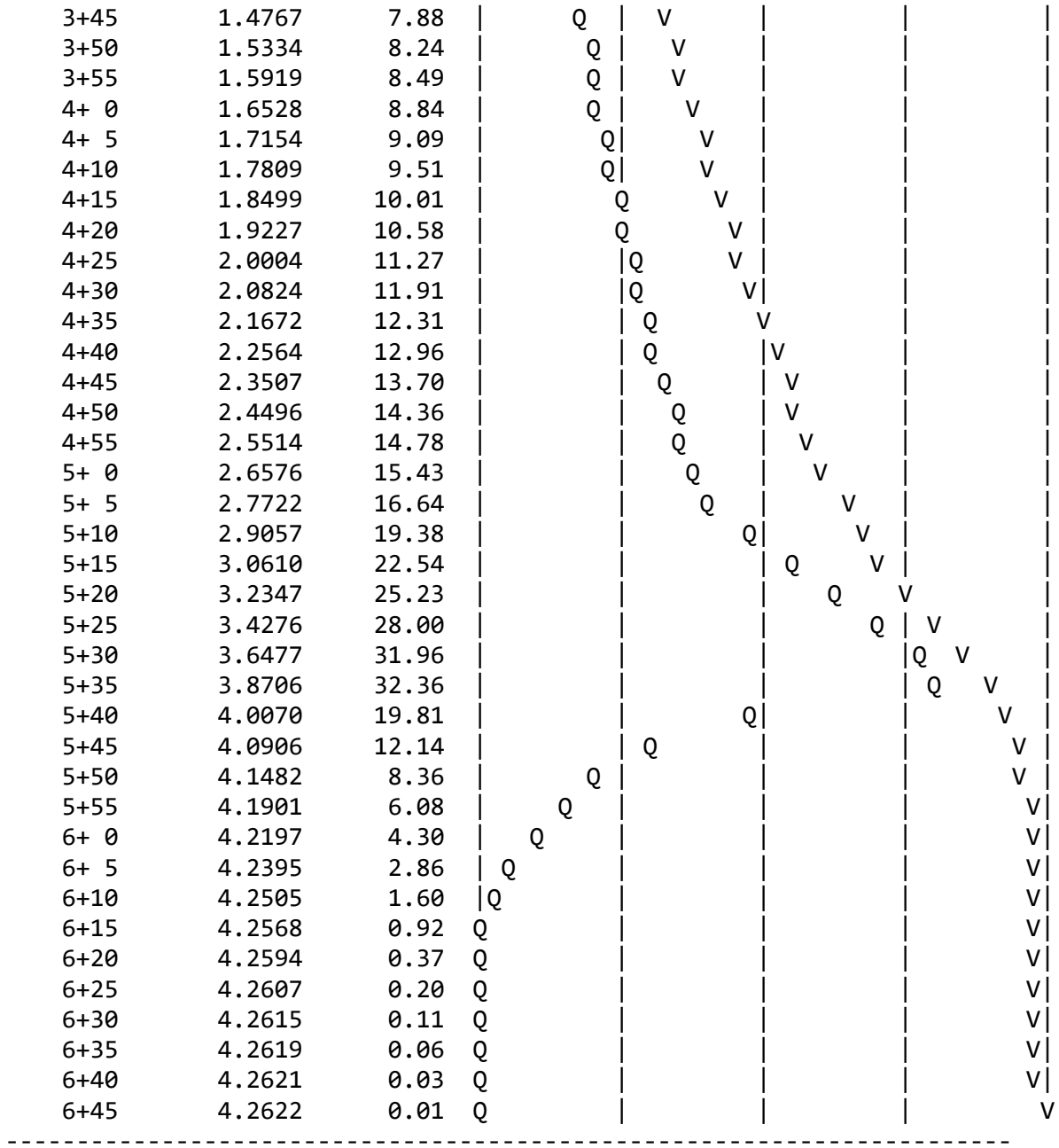
6 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0 10.0 20.0 30.0 40.0
0+ 5	0.0028	0.41	Q
0+10	0.0151	1.79	VQ
0+15	0.0331	2.60	V Q
0+20	0.0534	2.95	V Q
0+25	0.0749	3.13	V Q
0+30	0.0978	3.33	V Q
0+35	0.1231	3.67	V Q
0+40	0.1495	3.83	V Q
0+45	0.1765	3.91	V Q
0+50	0.2038	3.98	V Q
0+55	0.2314	4.00	VQ
1+ 0	0.2596	4.09	V Q
1+ 5	0.2896	4.36	V Q
1+10	0.3204	4.48	VQ
1+15	0.3516	4.53	VQ
1+20	0.3830	4.56	VQ
1+25	0.4145	4.57	VQ
1+30	0.4461	4.59	Q
1+35	0.4778	4.60	Q
1+40	0.5095	4.60	Q
1+45	0.5412	4.61	QV
1+50	0.5729	4.61	QV
1+55	0.6046	4.61	QV
2+ 0	0.6369	4.69	QV
2+ 5	0.6704	4.87	Q V
2+10	0.7035	4.80	Q V
2+15	0.7379	4.99	Q V
2+20	0.7729	5.09	Q V
2+25	0.8082	5.12	Q V
2+30	0.8436	5.15	Q V
2+35	0.8792	5.16	Q V
2+40	0.9147	5.17	Q V
2+45	0.9510	5.26	Q V
2+50	0.9890	5.52	Q V
2+55	1.0278	5.63	Q V
3+ 0	1.0669	5.68	Q V
3+ 5	1.1062	5.71	Q V
3+10	1.1462	5.81	Q V
3+15	1.1881	6.08	Q V
3+20	1.2308	6.20	Q V
3+25	1.2744	6.33	Q V
3+30	1.3206	6.71	Q V
3+35	1.3700	7.18	Q V
3+40	1.4224	7.61	Q V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4+35 2.1672 12.31
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4+45 2.3507 13.70
4+50 2.4496 14.36
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5+15 3.0610 22.54
5+20 3.2347 25.23
5+25 3.4276 28.00
5+30 3.6477 31.96
5+35 3.8706 32.36
5+40 4.0070 19.81
5+45 4.0906 12.14
5+50 4.1482 8.36
5+55 4.1901 6.08
6+ 0 4.2197 4.30
6+ 5 4.2395 2.86
6+10 4.2505 1.60
6+15 4.2568 0.92
6+20 4.2594 0.37
6+25 4.2607 0.20
6+30 4.2615 0.11
6+35 4.2619 0.06
6+40 4.2621 0.03
6+45 4.2622 0.01

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 10/10/23 File: Q100UHEX3100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 27.32(Ac.) = 0.043 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 27.32(Ac.) = 0.043 Sq. Mi.
Length along longest watercourse = 1724.00(Ft.)
Length along longest watercourse measured to centroid = 1620.00(Ft.)
Length along longest watercourse = 0.327 Mi.
Length along longest watercourse measured to centroid = 0.307 Mi.
Difference in elevation = 22.50(Ft.)
Slope along watercourse = 68.9095 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.090 Hr.
Lag time = 5.38 Min.
25% of lag time = 1.34 Min.
40% of lag time = 2.15 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
27.32	0.80	21.86

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
27.32	2.00	54.64

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 2.000(In)

Point rain (area averaged) = 2.000(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 2.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
27.320	56.50	0.500

Total Area Entered = 27.32(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
56.5	56.5	0.506	0.500	0.278	1.000	0.278
					Sum (F) =	0.278

Area averaged mean soil loss (F) (In/Hr) = 0.278
Minimum soil loss rate ((In/Hr)) = 0.139
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	93.015	17.076	4.702
2	0.167	186.030	47.610	13.109
3	0.250	279.045	16.820	4.631
4	0.333	372.060	7.458	2.053
5	0.417	465.074	4.278	1.178
6	0.500	558.089	2.760	0.760

7	0.583	651.104	1.826		0.503
8	0.667	744.119	1.150		0.317
9	0.750	837.134	1.024		0.282
			Sum = 100.000	Sum=	27.533

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.312	(0.278)	0.156	0.156
2	0.17	1.30	0.312	(0.278)	0.156	0.156
3	0.25	1.10	0.264	(0.278)	0.132	0.132
4	0.33	1.50	0.360	(0.278)	0.180	0.180
5	0.42	1.50	0.360	(0.278)	0.180	0.180
6	0.50	1.80	0.432	(0.278)	0.216	0.216
7	0.58	1.50	0.360	(0.278)	0.180	0.180
8	0.67	1.80	0.432	(0.278)	0.216	0.216
9	0.75	1.80	0.432	(0.278)	0.216	0.216
10	0.83	1.50	0.360	(0.278)	0.180	0.180
11	0.92	1.60	0.384	(0.278)	0.192	0.192
12	1.00	1.80	0.432	(0.278)	0.216	0.216
13	1.08	2.20	0.528	(0.278)	0.264	0.264
14	1.17	2.20	0.528	(0.278)	0.264	0.264
15	1.25	2.20	0.528	(0.278)	0.264	0.264
16	1.33	2.00	0.480	(0.278)	0.240	0.240
17	1.42	2.60	0.624	0.278	(0.312)	0.346
18	1.50	2.70	0.648	0.278	(0.324)	0.370
19	1.58	2.40	0.576	0.278	(0.288)	0.298
20	1.67	2.70	0.648	0.278	(0.324)	0.370
21	1.75	3.30	0.792	0.278	(0.396)	0.514
22	1.83	3.10	0.744	0.278	(0.372)	0.466
23	1.92	2.90	0.696	0.278	(0.348)	0.418
24	2.00	3.00	0.720	0.278	(0.360)	0.442
25	2.08	3.10	0.744	0.278	(0.372)	0.466
26	2.17	4.20	1.008	0.278	(0.504)	0.730
27	2.25	5.00	1.200	0.278	(0.600)	0.922
28	2.33	3.50	0.840	0.278	(0.420)	0.562
29	2.42	6.80	1.632	0.278	(0.816)	1.354
30	2.50	7.30	1.752	0.278	(0.876)	1.474
31	2.58	8.20	1.968	0.278	(0.984)	1.690
32	2.67	5.90	1.416	0.278	(0.708)	1.138
33	2.75	2.00	0.480	(0.278)	0.240	0.240
34	2.83	1.80	0.432	(0.278)	0.216	0.216
35	2.92	1.80	0.432	(0.278)	0.216	0.216
36	3.00	0.60	0.144	(0.278)	0.072	0.072
		(Loss Rate Not Used)				
	Sum =	100.0			Sum =	15.6

```
      Flood volume = Effective rainfall      1.30(In)
       times area      27.3(Ac.)/[(In)/(Ft.)] =       3.0(Ac.Ft)
      Total soil loss =      0.70(In)
      Total soil loss =     1.602(Ac.Ft)
      Total rainfall =      2.00(In)
      Flood volume =      128521.8 Cubic Feet
      Total soil loss =       69797.7 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     39.123(CFS)
      ---------------------------------------------------------------------
      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                           3 - H O U R    S T O R M
                      R u n o f f      H y d r o g r a p h
      ---------------------------------------------------------------------
                    Hydrograph in   5   Minute intervals ((CFS))

      ---------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0       10.0      20.0      30.0      40.0
-------------------------------------------------------------------------
  0+ 5       0.0051      0.73  Q         |         |         |         |
  0+10       0.0242      2.78  V Q       |         |         |         |
  0+15       0.0475      3.39  V  Q      |         |         |         |
  0+20       0.0725      3.62  V  Q      |         |         |         |
  0+25       0.1022      4.32  |V  Q     |         |         |         |
  0+30       0.1352      4.78  |V  Q     |         |         |         |
  0+35       0.1713      5.24  | V  Q    |         |         |         |
  0+40       0.2070      5.19  | V  Q    |         |         |         |
  0+45       0.2458      5.63  |  V Q    |         |         |         |
  0+50       0.2845      5.62  |  V Q    |         |         |         |
  0+55       0.3208      5.27  |   VQ    |         |         |         |
  1+ 0       0.3581      5.42  |   VQ    |         |         |         |
  1+ 5       0.3991      5.96  |    Q    |         |         |         |
  1+10       0.4453      6.70  |     Q   |         |         |         |
  1+15       0.4932      6.96  |     Q   |         |         |         |
  1+20       0.5413      6.98  |     QV  |         |         |         |
  1+25       0.5911      7.23  |      QV |         |         |         |
  1+30       0.6507      8.66  |       Q |         |         |         |
  1+35       0.7135      9.11  |        Q|         |         |         |
  1+40       0.7743      8.83  |       Q V         |         |         |
  1+45       0.8451     10.29  |         QV        |         |         |
  1+50       0.9294     12.23  |         | Q       |         |         |
  1+55       1.0132     12.17  |         | QV      |         |         |
  2+ 0       1.0944     11.80  |         |Q  V     |         |         |
  2+ 5       1.1780     12.13  |         | Q  V    |         |         |
  2+10       1.2728     13.77  |         |  Q   V  |         |         |
  2+15       1.3987     18.28  |         |       Q |         |         |
  2+20       1.5393     20.41  |         |         Q         |         |
  2+25       1.6831     20.89  |         |         Q V       |         |
  2+30       1.8958     30.88  |         |         |    V    Q         |
  2+35       2.1495     36.83  |         |         |        V|     Q   |
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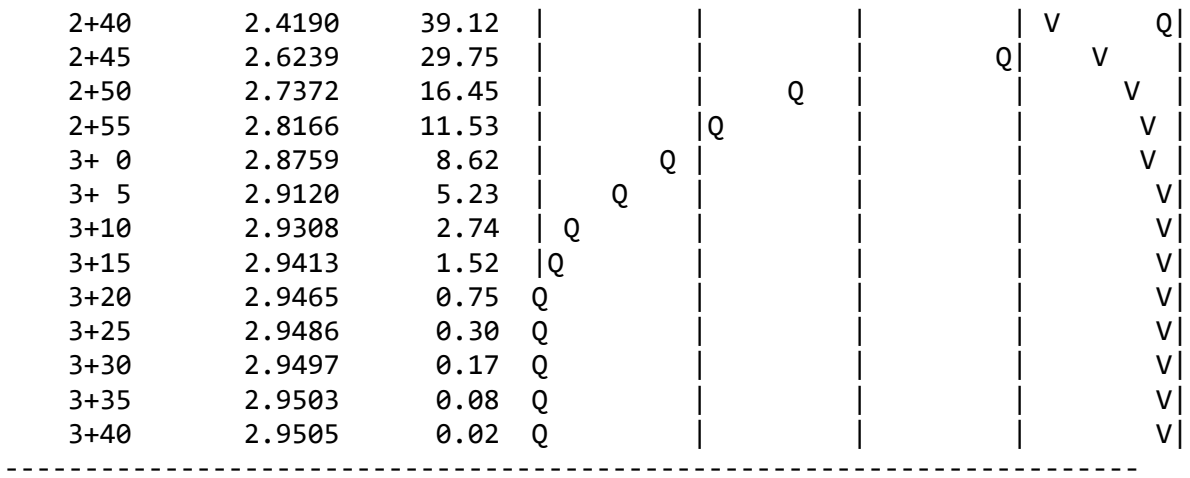
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U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/10/23 File: 100PUH3100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 27.32(Ac.) = 0.043 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 27.32(Ac.) = 0.043 Sq. Mi.
Length along longest watercourse = 3139.00(Ft.)
Length along longest watercourse measured to centroid = 2535.00(Ft.)
Length along longest watercourse = 0.595 Mi.
Length along longest watercourse measured to centroid = 0.480 Mi.
Difference in elevation = 39.71(Ft.)
Slope along watercourse = 66.7948 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.101 Hr.
Lag time = 6.04 Min.
25% of lag time = 1.51 Min.
40% of lag time = 2.41 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
27.32	0.80	21.86

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
27.32	2.00	54.64

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 2.000(In)

Point rain (area averaged) = 2.000(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 2.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
27.320	54.50	0.746

Total Area Entered = 27.32(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
54.5	54.5	0.526	0.746	0.173	1.000	0.173
					Sum (F) =	0.173

Area averaged mean soil loss (F) (In/Hr) = 0.173
Minimum soil loss rate ((In/Hr)) = 0.086
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.303

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	82.818	14.093	3.880
2	0.167	165.637	45.327	12.480
3	0.250	248.455	19.148	5.272
4	0.333	331.274	8.063	2.220
5	0.417	414.092	4.819	1.327
6	0.500	496.910	3.000	0.826

7	0.583	579.729	2.172	0.598
8	0.667	662.547	1.461	0.402
9	0.750	745.366	0.957	0.264
10	0.833	828.184	0.960	0.264
			Sum = 100.000 Sum=	27.533

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.312	(0.173)	0.095	0.217
2	0.17	1.30	0.312	(0.173)	0.095	0.217
3	0.25	1.10	0.264	(0.173)	0.080	0.184
4	0.33	1.50	0.360	(0.173)	0.109	0.251
5	0.42	1.50	0.360	(0.173)	0.109	0.251
6	0.50	1.80	0.432	(0.173)	0.131	0.301
7	0.58	1.50	0.360	(0.173)	0.109	0.251
8	0.67	1.80	0.432	(0.173)	0.131	0.301
9	0.75	1.80	0.432	(0.173)	0.131	0.301
10	0.83	1.50	0.360	(0.173)	0.109	0.251
11	0.92	1.60	0.384	(0.173)	0.116	0.268
12	1.00	1.80	0.432	(0.173)	0.131	0.301
13	1.08	2.20	0.528	(0.173)	0.160	0.368
14	1.17	2.20	0.528	(0.173)	0.160	0.368
15	1.25	2.20	0.528	(0.173)	0.160	0.368
16	1.33	2.00	0.480	(0.173)	0.146	0.334
17	1.42	2.60	0.624	0.173	(0.189)	0.451
18	1.50	2.70	0.648	0.173	(0.196)	0.475
19	1.58	2.40	0.576	0.173	(0.175)	0.403
20	1.67	2.70	0.648	0.173	(0.196)	0.475
21	1.75	3.30	0.792	0.173	(0.240)	0.619
22	1.83	3.10	0.744	0.173	(0.226)	0.571
23	1.92	2.90	0.696	0.173	(0.211)	0.523
24	2.00	3.00	0.720	0.173	(0.218)	0.547
25	2.08	3.10	0.744	0.173	(0.226)	0.571
26	2.17	4.20	1.008	0.173	(0.306)	0.835
27	2.25	5.00	1.200	0.173	(0.364)	1.027
28	2.33	3.50	0.840	0.173	(0.255)	0.667
29	2.42	6.80	1.632	0.173	(0.495)	1.459
30	2.50	7.30	1.752	0.173	(0.531)	1.579
31	2.58	8.20	1.968	0.173	(0.597)	1.795
32	2.67	5.90	1.416	0.173	(0.429)	1.243
33	2.75	2.00	0.480	(0.173)	0.146	0.334
34	2.83	1.80	0.432	(0.173)	0.131	0.301
35	2.92	1.80	0.432	(0.173)	0.131	0.301
36	3.00	0.60	0.144	(0.173)	0.044	0.100

(Loss Rate Not Used)

```
   Sum =     100.0                                    Sum =    18.8
      Flood volume = Effective rainfall      1.57(In)
       times area      27.3(Ac.)/[(In)/(Ft.)] =       3.6(Ac.Ft)
      Total soil loss =      0.43(In)
      Total soil loss =     0.984(Ac.Ft)
      Total rainfall =      2.00(In)
      Flood volume =      155436.8 Cubic Feet
      Total soil loss =       42882.7 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     41.553(CFS)
      ---------------------------------------------------------------------
      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          3 - 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       12.5      25.0      37.5      50.0
-------------------------------------------------------------------------
  0+ 5       0.0058      0.84  Q         |         |         |         |
  0+10       0.0303      3.56  V Q       |         |         |         |
  0+15       0.0618      4.57  V  Q      |         |         |         |
  0+20       0.0956      4.90  |V Q      |         |         |         |
  0+25       0.1358      5.85  |V  Q     |         |         |         |
  0+30       0.1806      6.50  | V  Q    |         |         |         |
  0+35       0.2300      7.17  | V  Q    |         |         |         |
  0+40       0.2792      7.15  |  V Q    |         |         |         |
  0+45       0.3323      7.71  |  V  Q   |         |         |         |
  0+50       0.3862      7.82  |   V Q   |         |         |         |
  0+55       0.4369      7.37  |   VQ    |         |         |         |
  1+ 0       0.4886      7.50  |    VQ   |         |         |         |
  1+ 5       0.5451      8.21  |     Q   |         |         |         |
  1+10       0.6085      9.21  |     VQ  |         |         |         |
  1+15       0.6749      9.64  |      Q  |         |         |         |
  1+20       0.7416      9.69  |      QV |         |         |         |
  1+25       0.8094      9.84  |      Q V|         |         |         |
  1+30       0.8871     11.28  |        Q|         |         |         |
  1+35       0.9690     11.89  |        QV         |         |         |
  1+40       1.0493     11.65  |        Q|V        |         |         |
  1+45       1.1383     12.94  |         Q V       |         |         |
  1+50       1.2409     14.89  |         |Q V      |         |         |
  1+55       1.3443     15.01  |         | Q  V    |         |         |
  2+ 0       1.4452     14.66  |         |Q    V   |         |         |
  2+ 5       1.5480     14.93  |         |Q     V  |         |         |
  2+10       1.6608     16.38  |         |  Q    V |         |         |
  2+15       1.8027     20.60  |         |     Q   V         |         |
  2+20       1.9616     23.07  |         |       Q |V        |         |
  2+25       2.1221     23.31  |         |       Q |  V      |         |
  2+30       2.3465     32.58  |         |         |     Q   |         |
```

```
    2+35       2.6134     38.76  |          |          |         V|Q         |
    2+40       2.8996     41.55  |          |          |          | VQ       |
    2+45       3.1305     33.53  |          |          |     Q    |    V     |
    2+50       3.2708     20.37  |          |     Q    |          |     V    |
    2+55       3.3726     14.77  |          |Q         |          |      V   |
    3+ 0       3.4524     11.59  |         Q|          |          |       V  |
    3+ 5       3.5023      7.25  |    Q     |          |          |        V |
    3+10       3.5308      4.14  |  Q       |          |          |        V |
    3+15       3.5478      2.46  |Q         |          |          |        V |
    3+20       3.5581      1.50  |Q         |          |          |        V |
    3+25       3.5636      0.80  Q          |          |          |        V |
    3+30       3.5661      0.35  Q          |          |          |        V |
    3+35       3.5674      0.20  Q          |          |          |        V |
    3+40       3.5682      0.11  Q          |          |          |        V |
    3+45       3.5683      0.03  Q          |          |          |         V
-------------------------------------------------------------------------
```

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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 27.32(Ac.) = 0.043 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 27.32(Ac.) = 0.043 Sq. Mi.
Length along longest watercourse = 1724.00(Ft.)
Length along longest watercourse measured to centroid = 1620.00(Ft.)
Length along longest watercourse = 0.327 Mi.
Length along longest watercourse measured to centroid = 0.307 Mi.
Difference in elevation = 22.50(Ft.)
Slope along watercourse = 68.9095 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.090 Hr.
Lag time = 5.38 Min.
25% of lag time = 1.34 Min.
40% of lag time = 2.15 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
27.32	0.50	13.66

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
27.32	1.21	33.11

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.212(In)

Point rain (area averaged) = 1.212(In)
Areal adjustment factor = 99.98 %
Adjusted average point rain = 1.212(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
27.320	56.50	0.500

Total Area Entered = 27.32(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
56.5	56.5	0.506	0.500	0.278	1.000	0.278
					Sum (F) =	0.278

Area averaged mean soil loss (F) (In/Hr) = 0.278
Minimum soil loss rate ((In/Hr)) = 0.139
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	93.015	17.076	4.702
2	0.167	186.030	47.610	13.109
3	0.250	279.045	16.820	4.631
4	0.333	372.060	7.458	2.053

5	0.417	465.074	4.278	1.178
6	0.500	558.089	2.760	0.760
7	0.583	651.104	1.826	0.503
8	0.667	744.119	1.150	0.317
9	0.750	837.134	1.024	0.282
		Sum = 100.000	Sum=	27.533

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	4.20	0.611	0.278	(0.305)	0.333
2	0.17	4.30	0.625	0.278	(0.313)	0.347
3	0.25	5.00	0.727	0.278	(0.364)	0.449
4	0.33	5.00	0.727	0.278	(0.364)	0.449
5	0.42	5.80	0.843	0.278	(0.422)	0.565
6	0.50	6.50	0.945	0.278	(0.473)	0.667
7	0.58	7.40	1.076	0.278	(0.538)	0.798
8	0.67	8.60	1.250	0.278	(0.625)	0.972
9	0.75	12.30	1.788	0.278	(0.894)	1.510
10	0.83	29.10	4.231	0.278	(2.116)	3.953
11	0.92	6.80	0.989	0.278	(0.494)	0.711
12	1.00	5.00	0.727	0.278	(0.364)	0.449
		(Loss Rate Not Used)				
Sum =		100.0			Sum =	11.2

Flood volume = Effective rainfall 0.93(In)
times area 27.3(Ac.)/[(In)/(Ft.)] = 2.1(Ac.Ft)
Total soil loss = 0.28(In)
Total soil loss = 0.633(Ac.Ft)
Total rainfall = 1.21(In)
Flood volume = 92583.1 Cubic Feet
Total soil loss = 27583.1 Cubic Feet

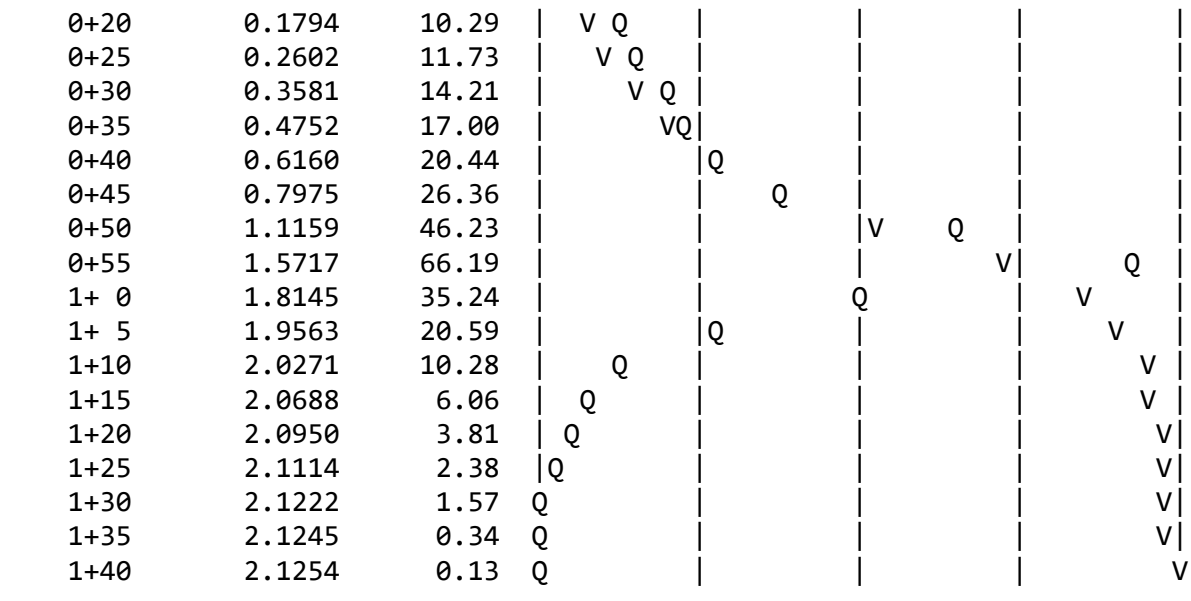
Peak flow rate of this hydrograph = 66.185(CFS)

++

1 - 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	17.5	35.0	52.5	70.0
0+ 5	0.0108	1.56	Q	|	|	|	|
0+10	0.0521	5.99	V Q	|	|	|	|
0+15	0.1086	8.20	| V Q	|	|	|	|


0+20 0.1794 10.29
0+25 0.2602 11.73
0+30 0.3581 14.21
0+35 0.4752 17.00
0+40 0.6160 20.44
0+45 0.7975 26.36
0+50 1.1159 46.23
0+55 1.5717 66.19
1+ 0 1.8145 35.24
1+ 5 1.9563 20.59
1+10 2.0271 10.28
1+15 2.0688 6.06
1+20 2.0950 3.81
1+25 2.1114 2.38
1+30 2.1222 1.57
1+35 2.1245 0.34
1+40 2.1254 0.13

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 27.32(Ac.) = 0.043 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 27.32(Ac.) = 0.043 Sq. Mi.
Length along longest watercourse = 3139.00(Ft.)
Length along longest watercourse measured to centroid = 2535.00(Ft.)
Length along longest watercourse = 0.595 Mi.
Length along longest watercourse measured to centroid = 0.480 Mi.
Difference in elevation = 39.71(Ft.)
Slope along watercourse = 66.7948 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.101 Hr.
Lag time = 6.04 Min.
25% of lag time = 1.51 Min.
40% of lag time = 2.41 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
27.32	0.80	21.86

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
27.32	1.21	33.11

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 1.212(In)

Point rain (area averaged) = 1.212(In)
Areal adjustment factor = 99.98 %
Adjusted average point rain = 1.212(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
27.320	54.50	0.746

Total Area Entered = 27.32(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
54.5	54.5	0.526	0.746	0.173	1.000	0.173
					Sum (F) =	0.173

Area averaged mean soil loss (F) (In/Hr) = 0.173
Minimum soil loss rate ((In/Hr)) = 0.086
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.303

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	82.818	14.093	3.880
2	0.167	165.637	45.327	12.480
3	0.250	248.455	19.148	5.272
4	0.333	331.274	8.063	2.220

5	0.417	414.092	4.819	1.327
6	0.500	496.910	3.000	0.826
7	0.583	579.729	2.172	0.598
8	0.667	662.547	1.461	0.402
9	0.750	745.366	0.957	0.264
10	0.833	828.184	0.960	0.264
			Sum = 100.000	Sum= 27.533

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	4.20	0.611	0.173	(0.185)	0.438
2	0.17	4.30	0.625	0.173	(0.190)	0.452
3	0.25	5.00	0.727	0.173	(0.220)	0.554
4	0.33	5.00	0.727	0.173	(0.220)	0.554
5	0.42	5.80	0.843	0.173	(0.256)	0.670
6	0.50	6.50	0.945	0.173	(0.287)	0.772
7	0.58	7.40	1.076	0.173	(0.326)	0.903
8	0.67	8.60	1.250	0.173	(0.379)	1.078
9	0.75	12.30	1.788	0.173	(0.542)	1.616
10	0.83	29.10	4.231	0.173	(1.283)	4.058
11	0.92	6.80	0.989	0.173	(0.300)	0.816
12	1.00	5.00	0.727	0.173	(0.220)	0.554
		(Loss Rate Not Used)				
Sum =		100.0			Sum =	12.5

Flood volume = Effective rainfall 1.04(In)
times area 27.3(Ac.)/[(In)/(Ft.)] = 2.4(Ac.Ft)
Total soil loss = 0.17(In)
Total soil loss = 0.394(Ac.Ft)
Total rainfall = 1.21(In)
Flood volume = 103021.8 Cubic Feet
Total soil loss = 17144.4 Cubic Feet

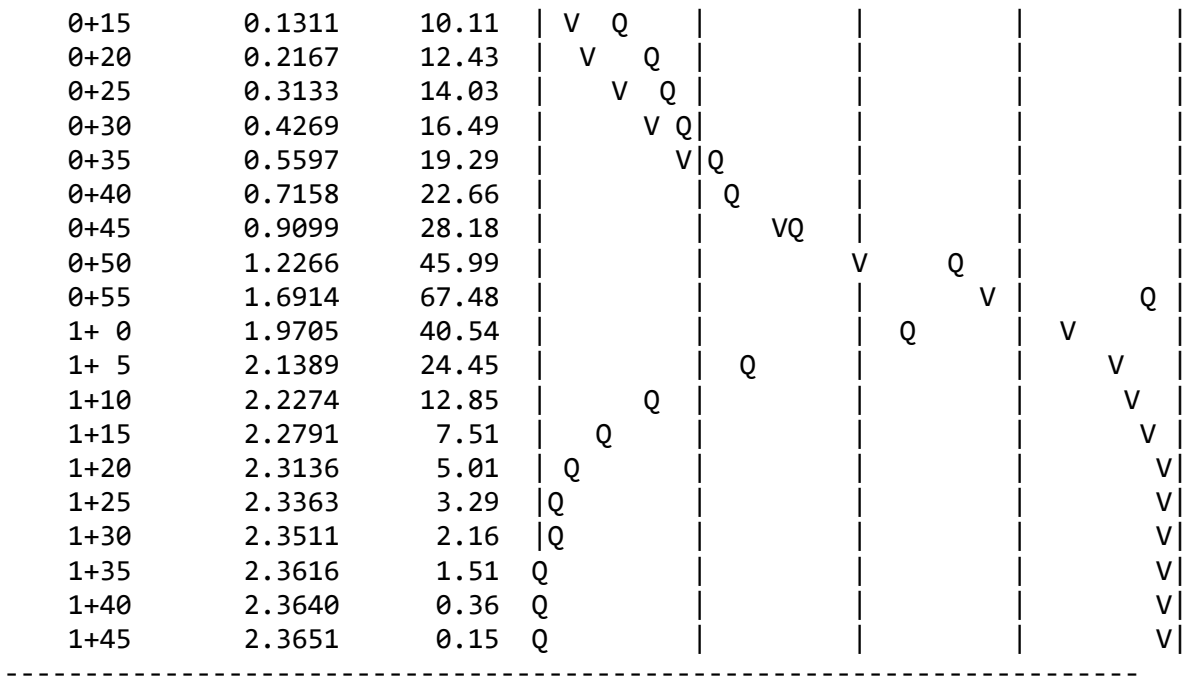
Peak flow rate of this hydrograph = 67.485(CFS)

++

1 - 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	17.5	35.0	52.5	70.0
0+ 5	0.0117	1.70	Q	|	|	|	|
0+10	0.0615	7.22	|V Q	|	|	|	|


0+15 0.1311 10.11
0+20 0.2167 12.43
0+25 0.3133 14.03
0+30 0.4269 16.49
0+35 0.5597 19.29
0+40 0.7158 22.66
0+45 0.9099 28.18
0+50 1.2266 45.99
0+55 1.6914 67.48
1+ 0 1.9705 40.54
1+ 5 2.1389 24.45
1+10 2.2274 12.85
1+15 2.2791 7.51
1+20 2.3136 5.01
1+25 2.3363 3.29
1+30 2.3511 2.16
1+35 2.3616 1.51
1+40 2.3640 0.36
1+45 2.3651 0.15

SECTION 3 - REFERENCE DATA

USGS SOILS REPORT

PLATE D-4.1

INFILTRATION REPORT (EXCERPT)

CONTECH UNDERGROUND CHAMBER SYSTEM

DCV CALCULATIONS (WQMP)

PP190005 – HARVILL DISTRIBUTION CENTER OFFSITE DRAINAGE IMPROVEMENTS (HYDROLOGY MAPS)

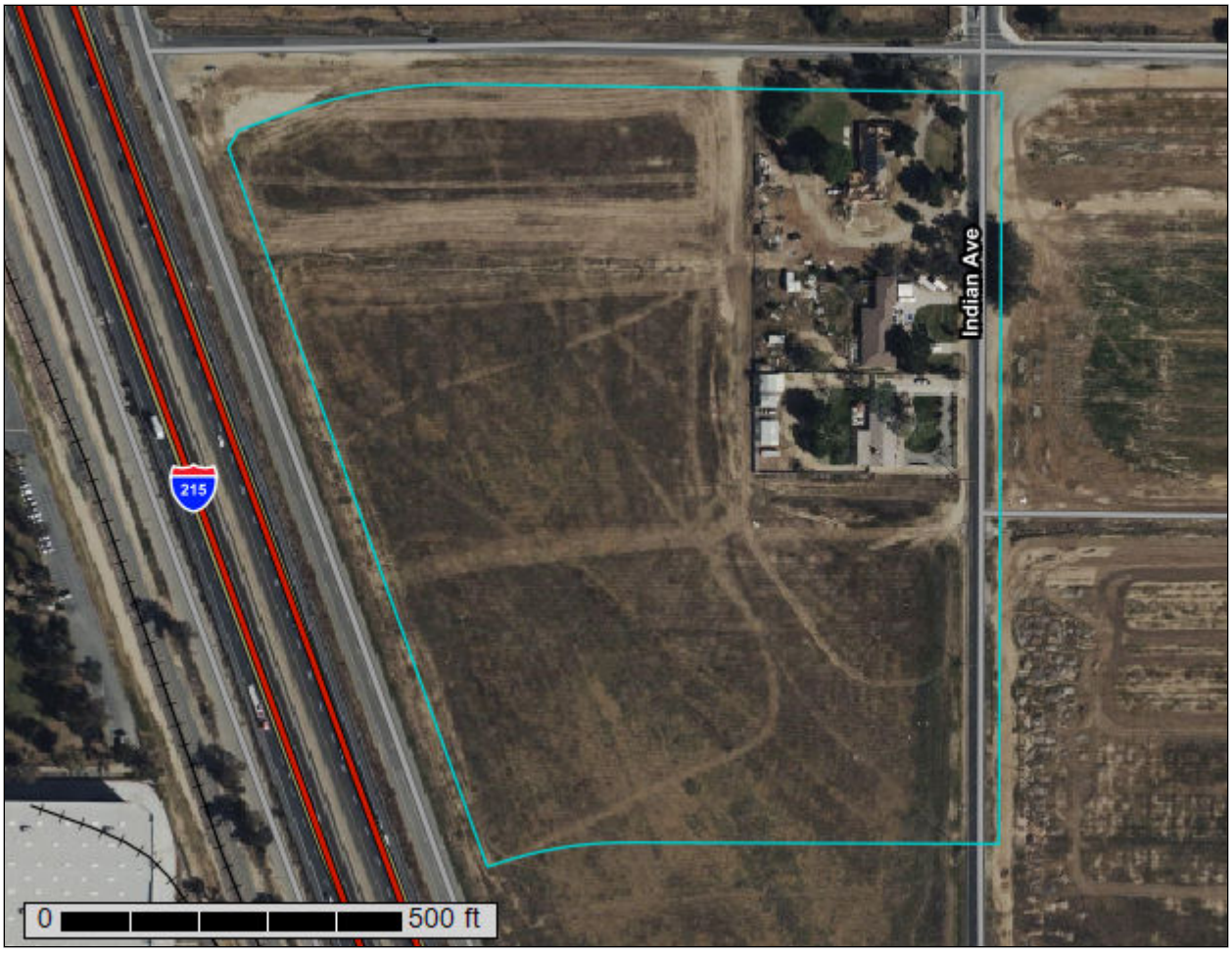
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Western Riverside Area, California



August 9, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:2,670 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 35 70 140 210

Feet
0 100 200 400 600

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 15, Sep 6, 2022

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

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
EpA	Exeter sandy loam, deep, 0 to 2 percent slopes	5.0	20.5%
GyC2	Greenfield sandy loam, 2 to 8 percent slopes, eroded	2.0	8.4%
PaA	Pachappa fine sandy loam, 0 to 2 percent slopes	17.2	71.0%
Totals for Area of Interest		**24.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Western Riverside Area, California

EpA—Exeter sandy loam, deep, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hctk
Elevation: 300 to 700 feet
Mean annual precipitation: 7 to 15 inches
Mean annual air temperature: 64 degrees F
Frost-free period: 250 to 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Exeter

Setting

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

Typical profile

H1 - 0 to 16 inches: sandy loam
H2 - 16 to 37 inches: sandy clay loam
H3 - 37 to 50 inches: indurated
H4 - 50 to 60 inches: stratified sandy loam to silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 35 to 60 inches to duripan
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Ramona
Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield
Percent of map unit: 5 percent
Hydric soil rating: No

Monserate
Percent of map unit: 5 percent
Hydric soil rating: No

GyC2—Greenfield sandy loam, 2 to 8 percent slopes, eroded

Map Unit Setting
National map unit symbol: hcvw
Elevation: 100 to 3,500 feet
Mean annual precipitation: 9 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Prime farmland if irrigated

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

Description of Greenfield

Setting
Landform: Terraces, alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile
H1 - 0 to 26 inches: sandy loam
H2 - 26 to 43 inches: fine sandy loam
H3 - 43 to 60 inches: loam
H4 - 60 to 72 inches: stratified loamy sand to sandy loam

Properties and qualities
Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Pachappa

Percent of map unit: 3 percent
Hydric soil rating: No

Arlington

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 3 percent
Hydric soil rating: No

Ramona

Percent of map unit: 3 percent
Hydric soil rating: No

Hanford

Percent of map unit: 3 percent
Hydric soil rating: No

PaA—Pachappa fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hcxn
Elevation: 1,000 feet
Mean annual precipitation: 14 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 270 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Pachappa

Setting

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

Typical profile

H1 - 0 to 20 inches: fine sandy loam
H2 - 20 to 63 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

San emigdio

Percent of map unit: 5 percent
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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:

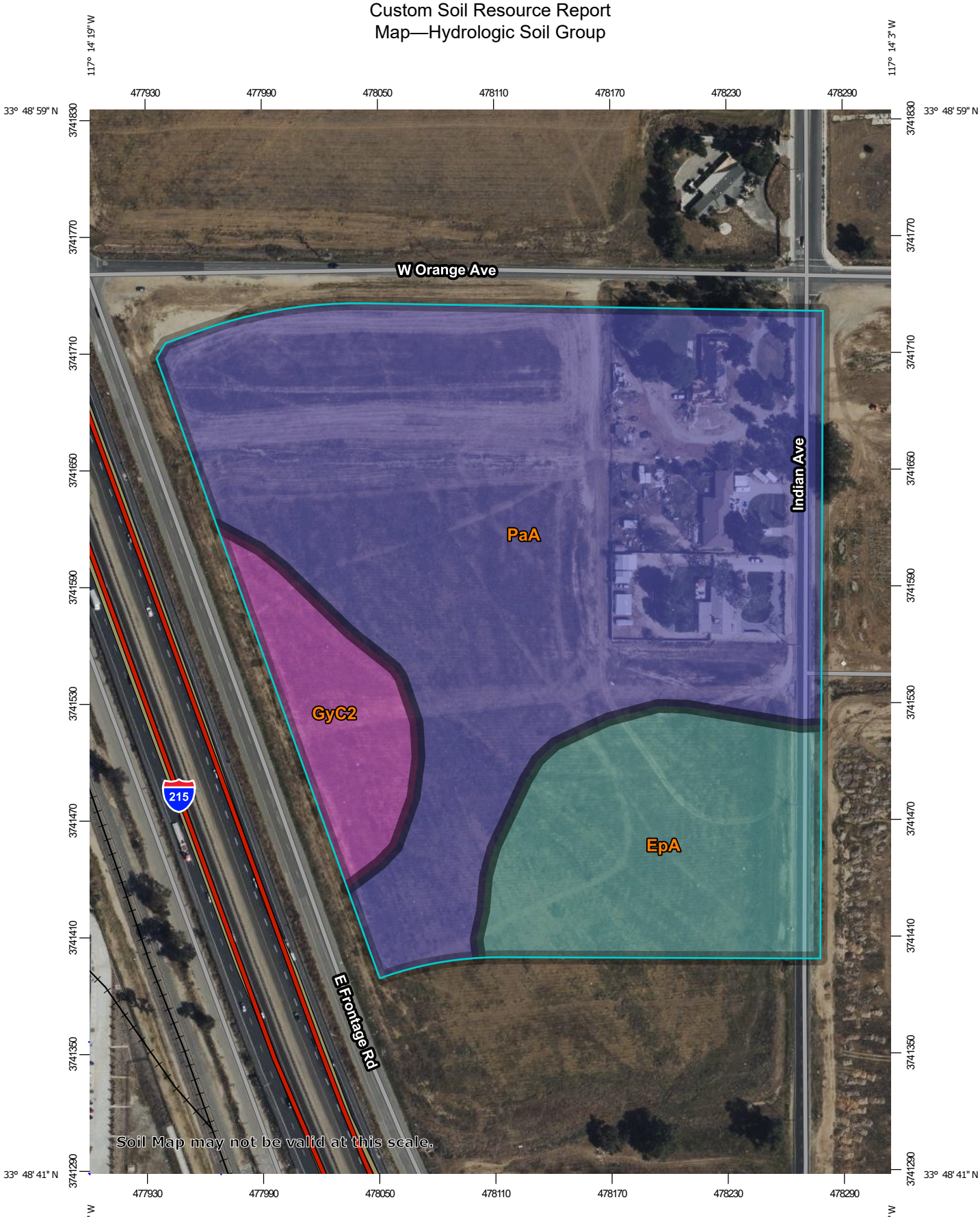
Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

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.



Map Scale: 1:2,670 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 35 70 140 210

Feet
0 100 200 400 600

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 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 15, Sep 6, 2022

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

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

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.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
EpA	Exeter sandy loam, deep, 0 to 2 percent slopes	C	5.0	20.5%
GyC2	Greenfield sandy loam, 2 to 8 percent slopes, eroded	A	2.0	8.4%
PaA	Pachappa fine sandy loam, 0 to 2 percent slopes	B	17.2	71.0%
Totals for Area of Interest			**24.2**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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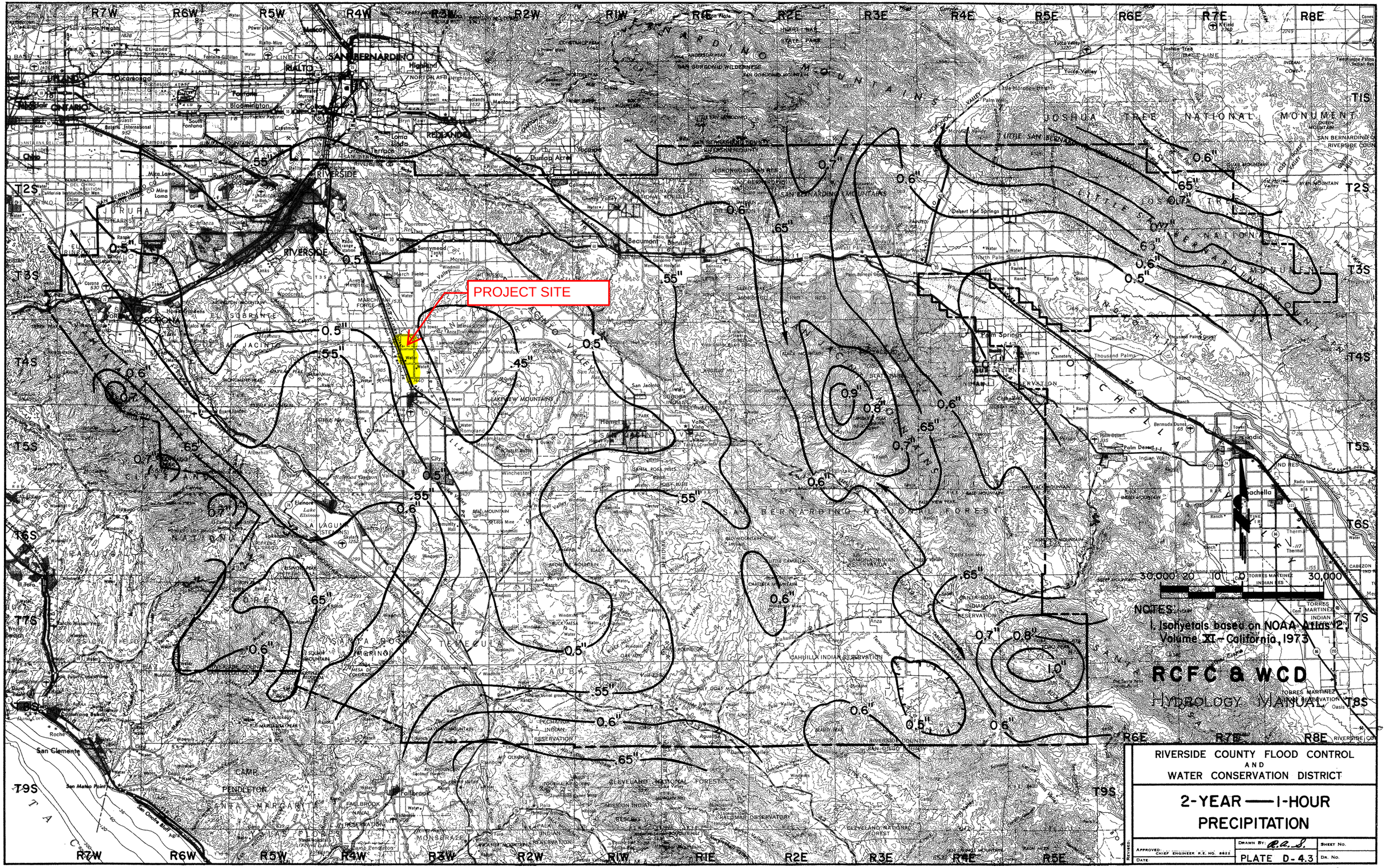
RAINFALL INTENSITY–INCHES PER HOUR

MIRA LOMA			MURRIETA - TEMECULA & RANCHO CALIFORNIA			NORCO			PALM SPRINGS			PERRIS VALLEY		
DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY	
	10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR
5	2.84	4.48	5	3.45	5.10	5	2.77	4.16	5	4.23	6.76	5	2.64	3.78
6	2.58	4.07	6	3.12	4.61	6	2.53	3.79	6	3.80	6.08	6	2.41	3.46
7	2.37	3.75	7	2.87	4.24	7	2.34	3.51	7	3.48	5.56	7	2.24	3.21
8	2.21	3.49	8	2.67	3.94	8	2.19	3.29	8	3.22	5.15	8	2.09	3.01
9	2.08	3.28	9	2.50	3.69	9	2.07	3.10	9	3.01	4.81	9	1.98	2.84
10	1.96	3.10	10	2.36	3.48	10	1.96	2.94	10	2.83	4.52	10	1.88	2.69
11	1.87	2.95	11	2.24	3.30	11	1.87	2.80	11	2.67	4.28	11	1.79	2.57
12	1.78	2.82	12	2.13	3.15	12	1.79	2.68	12	2.54	4.07	12	1.72	2.46
13	1.71	2.70	13	2.04	3.01	13	1.72	2.58	13	2.43	3.88	13	1.65	2.37
14	1.64	2.60	14	1.96	2.89	14	1.66	2.48	14	2.33	3.72	14	1.59	2.29
15	1.58	2.50	15	1.89	2.79	15	1.60	2.40	15	2.23	3.58	15	1.54	2.21
16	1.53	2.42	16	1.82	2.69	16	1.55	2.32	16	2.15	3.44	16	1.49	2.14
17	1.48	2.34	17	1.76	2.60	17	1.50	2.25	17	2.08	3.32	17	1.45	2.08
18	1.44	2.27	18	1.71	2.52	18	1.46	2.19	18	2.01	3.22	18	1.41	2.02
19	1.40	2.21	19	1.66	2.45	19	1.42	2.13	19	1.95	3.12	19	1.37	1.97
20	1.36	2.15	20	1.61	2.38	20	1.39	2.08	20	1.89	3.03	20	1.34	1.92
22	1.29	2.04	22	1.53	2.26	22	1.32	1.98	22	1.79	2.86	22	1.28	1.83
24	1.24	1.95	24	1.46	2.15	24	1.26	1.90	24	1.70	2.72	24	1.22	1.75
26	1.18	1.87	26	1.39	2.06	26	1.22	1.82	26	1.62	2.60	26	1.18	1.69
28	1.14	1.80	28	1.34	1.98	28	1.17	1.76	28	1.56	2.49	28	1.13	1.63
30	1.10	1.73	30	1.29	1.90	30	1.13	1.70	30	1.49	2.39	30	1.10	1.57
32	1.06	1.67	32	1.24	1.84	32	1.10	1.64	32	1.44	2.30	32	1.06	1.52
34	1.03	1.62	34	1.20	1.78	34	1.06	1.59	34	1.39	2.22	34	1.03	1.48
36	1.00	1.57	36	1.17	1.72	36	1.03	1.55	36	1.34	2.15	36	1.00	1.44
38	.97	1.53	38	1.13	1.67	38	1.01	1.51	38	1.30	2.09	38	.98	1.40
40	.94	1.49	40	1.10	1.62	40	.98	1.47	40	1.27	2.02	40	.95	1.37
45	.89	1.40	45	1.03	1.52	45	.92	1.39	45	1.18	1.89	45	.90	1.29
50	.84	1.32	50	.97	1.44	50	.88	1.31	50	1.11	1.78	50	.85	1.22
55	.80	1.26	55	.92	1.36	55	.84	1.25	55	1.05	1.68	55	.81	1.17
60	.76	1.20	60	.88	1.30	60	.80	1.20	60	1.00	1.60	60	.78	1.12
65	.73	1.15	65	.84	1.24	65	.77	1.15	65	.95	1.53	65	.75	1.08
70	.70	1.11	70	.81	1.19	70	.74	1.11	70	.91	1.46	70	.72	1.04
75	.68	1.07	75	.78	1.15	75	.72	1.07	75	.88	1.41	75	.70	1.00
80	.65	1.03	80	.75	1.11	80	.69	1.04	80	.85	1.35	80	.68	.97
85	.63	1.00	85	.73	1.07	85	.67	1.01	85	.82	1.31	85	.66	.94
SLOPE = .530			SLOPE = .550			SLOPE = .500			SLOPE = .580			SLOPE = .490		

STANDARD
INTENSITY–DURATION
CURVES DATA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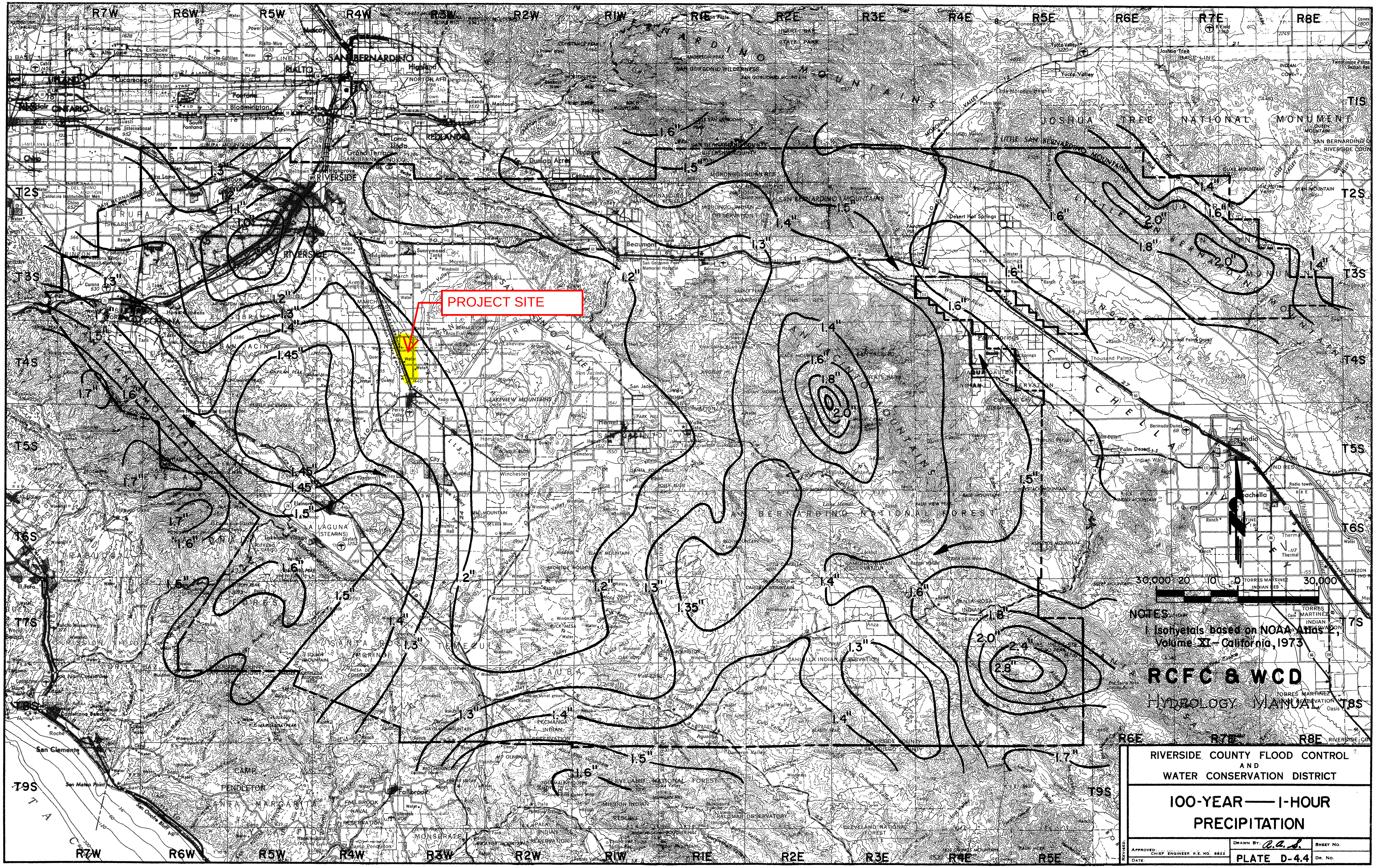
NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
2-YEAR — 1-HOUR PRECIPITATION
PLATE D-4.3
DRAWN BY: R.A.S.
APPROVED CHIEF ENGINEER R.E. NO. 8822
DATE
SHEET No.
DR. No.
REVISED:


PROJECT SITE
NOTES
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
30,000 20 10 0 30,000
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
100-YEAR —— 1-HOUR
PRECIPITATION
DRAWN BY: R.A.S.
APPROVED: CHIEF ENGINEER R.E. NO. 8822
DATE
REVISED
SHEET NO.
PLATE D-4.4
DR. NO.

July 1, 2022

Howard Industrial Partners
1944 North Tustin Street, Suite 122
Orange, California 92865

Attention: Mr. Mike Tunney
Vice President

Project No.: **22G183-2**

Subject: **Results of Infiltration Testing**
Proposed Harvest Landing Industrial Development
Indian Avenue and Orange Avenue
Perris, California

Reference: Geotechnical Investigation, Proposed Harvest Landing Industrial Development, Indian Avenue and Orange Avenue, Perris, California, prepared by Southern California Geotechnical, Inc. (SCG) for Howard Industrial Partners, SCG Project No. 22G183-1, dated June 13, 2022.

Mr. Tunney:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

Scope of Services

The scope of services performed for this project was in general accordance with our Proposal No. 22P206R, dated April 28, 2022 and Change Order No. 22G183-CO, dated June 8, 2022. The scope of services included visual site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the on-site soils for the stormwater disposal systems. The infiltration borings were tested using a modified constant-head infiltration test as requested by the project civil engineer. The double ring infiltration testing was performed in general accordance with ASTM Test Method D-3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer.

Site and Project Description

The site is located at the northwest and southwest corners of Indian Avenue and Orange Avenue in Perris, California. The site is bounded to the north by Val Verde Elementary School, to the west and south by Interstate 215 Frontage Road, and to the east by Indian Avenue. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 of this report.

The site consists of several parcels, which total 73.68± acres in size. The east-central area of the site is developed with four (4) single-family residences. These residences are assumed to be single-story structures of wood frame and stucco construction and supported on conventional

shallow foundations with concrete slab-on-grade floors. The residences are surrounded by concrete flatwork, turf grass, exposed soil, and trees. The remaining areas of the site are vacant and undeveloped. The ground surface in these areas consists of exposed soil with sparse to moderate native grass and weed growth.

Detailed topographic information was not available at the time of this report. Based on elevations obtained from Google Earth, and visual observations made at the time of the subsurface investigation, the overall site topography is generally flat and moderately slopes to the east at a gradient of approximately 2± percent.

Proposed Development

Based on the conceptual site plan provided to our office by the client, the site will be developed with five (5) industrial buildings:

Building No.	Location	Size (ft²)
1	North	647,000
2	North-Central	389,000
3	Central	91,000
4	South-Central	52,000
5	South	22,000

Each building includes a mezzanine and dock-high doors will be constructed along a portion of at least one building wall for each of the buildings. The building is anticipated to be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete pavements in the loading dock areas, and limited areas of concrete flatwork and landscape planters throughout.

The proposed development will include on-site infiltration for stormwater disposal. Based on the information provided by representatives of FMCivil Engineers, Inc., the project civil engineer, the infiltration systems will consist of four (4) shallow below-grade chamber systems (identified as Infiltration System "A" through Infiltration System "D") and/or four (4) deep dry-well systems (identified as Infiltration System "E" thought Infiltration System "H"). The infiltration systems will be located in the eastern area of the site. The bottoms of the below-grade chamber systems will extend to depths of 7± feet below existing site grades and the dry wells will extend to a depth of 50± feet below existing site grades.

Concurrent Studies

SCG performed a geotechnical investigation at the subject site, referenced above. As a part of this investigation, twenty-three (23) borings were advanced to depths of 15 to 25± feet below the previously existing site grades. Native alluvium was encountered at each boring location, extending to at least the maximum depth explored of 25± feet below existing site grades. The alluvium generally consists of medium dense to very dense silty sands to sandy silts, with trace to little clay content.

Free water was not encountered during the drilling of the borings. Based on the lack of water within the borings and the moisture contents of the recovered soil samples, the static groundwater is considered to have existed at a depth in excess of 25± feet at the time of the

subsurface exploration. Recent water level data was obtained from the California Department of Water Resources website, http://www.water.ca.gov/waterdatalibrary/. The nearest monitoring well is located approximately 0.5 miles east from the site. Water level readings within this monitoring well indicates a groundwater level of 44± feet below the ground surface in March 2022.

Subsurface Exploration

Scope of Exploration

The subsurface exploration performed for the infiltration testing consisted of six (6) shallow infiltration trenches (identified as Infiltration Trench Nos. I-1 through I-6) and four (4) deep infiltration borings (identified as Infiltration Boring Nos. I-7 through I-10). The infiltration trenches were excavated using a rubber-tire backhoe to a depth of 7± feet. The infiltration borings were extended to a depth of 50± feet below existing site grades. In addition to the infiltration testing, one (1) exploratory boring was extended to a depth of 60± feet below site grades to confirm the underlying soil types and verify that groundwater was at a depth greater than 10± feet below the bottom of the proposed dry well infiltration systems. The borings were advanced using a truck-mounted drilling rig, equipped with 8-inch-diameter hollow-stem augers and were logged during drilling by a member of our staff. The approximate locations of the boring, infiltration borings, and infiltration trenches are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Geotechnical Conditions

Artificial fill soils were encountered at the ground surface at Infiltration Test No. I-3, extending to a depth of 1± foot below existing site grades. The fill soils consist of medium dense fine to medium sandy silts with trace quantities of clay and fine gravel. Native alluvium was encountered at the ground surface at all of the remaining boring and trench locations, extending to at least the maximum explored depth of 60± feet below existing site grades. The near-surface alluvium encountered at depths less than 25± feet below existing site grades consists of medium dense to very dense fine to medium sandy silts, silty fine to medium sands, clayey fine to coarse sands, and hard fine to coarse sandy clays. At depths greater than 25± feet, the alluvium consists of medium dense to very dense fine sandy silts, fine to medium sandy silts, silty fine to medium sands, and hard fine to medium sandy clays. The Boring Logs and Trench Logs, which illustrate the conditions encountered at each of the borings, are included with this report.

Free water was not encountered during drilling of any of the borings. Based on the lack of water within the borings, the static groundwater table was considered to have existed at a depth in excess of 60± feet at the time of our subsurface exploration.

Shallow Infiltration Testing – Double Ring Infiltration

The infiltration testing for the proposed shallow infiltration chambers was performed in general accordance with ASTM Test Method D-3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer.

Two stainless steel infiltration rings were used for the infiltration testing. The outer infiltration ring is 2 feet in diameter and 20 inches in height. The inner infiltration ring is 1 foot in diameter

and 20 inches in height. At the test locations, the outer ring was driven 3± inches into the soil at the base of each trench. The inner ring was centered inside the outer ring and subsequently driven 3± inches into the soil at the base of the trench. The rings were driven into the soil using a ten-pound sledge hammer. The soil surrounding the wall of the infiltration rings was only slightly disturbed during the driving process.

Infiltration Testing Procedure

Infiltration testing was performed at all of the trench locations. The infiltration testing consisted of filling the inner ring and the annular space (the space between the inner and outer rings) with water, approximately 3 to 4 inches above the soil. To prevent the flow of water from one ring to the other, the water level in both the inner ring and the annular space between the rings was maintained using constant-head float valves. The volume of water that was added to maintain a constant head in the inner ring and the annular space during each time interval was determined and recorded. A cap was placed over the rings to minimize the evaporation of water during the tests.

The schedule for readings was determined based on the observed soil type at the base of each backhoe-excavated trench. Based on the existing soils at the trench locations, the volumetric measurements were made at 10-minute intervals at Infiltration Trench No I-3 and 15-minute increments at the remaining trench locations. The water volume measurements are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on these spreadsheets.

The infiltration rates for the infiltration tests are calculated in centimeters per hour and then converted to inches per hour. The rates are summarized below:

Infiltration Test No.	**Depth (feet)**	**Soil Description**	**Measured Infiltration Rate (inches/hour)**
I-1	7	Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.8
I-2	7	Brown Silty fine to medium Sand, trace coarse Sand, trace Clay	1.0
I-3	7	Brown Silty fine to medium Sand, little coarse Sand	6.8
I-4	7	Brown Silty fine to medium Sand, trace to little coarse Sand, trace Clay	0.3
I-5	7	Brown Silty fine to medium Sand, trace coarse Sand, trace Clay	0.9
I-6	7	Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	1.3

Percolation Testing – Dry Wells

The dry well infiltration testing was performed in accordance with a modified constant-head infiltration test as requested by the project civil engineer, the designer of the proposed dry well system.

Upon the completion of the drilling for the infiltration borings, a sufficient length of 3-inch-diameter perforated PVC casing was then placed into each test hole so that the PVC casing extended from the bottom of the test hole to the ground surface. Clean ¾-inch gravel was installed in the annulus surrounding the PVC casing.

Pre-soaking

The pre-soaking process consisted of filling the test borings with water to approximately 10± feet below the ground surface. The pre-soaking was completed after all of the water had percolated through the test hole, at least 15 hours since initiating the pre-soak.

Infiltration Testing Procedure

Following the pre-soaking process, the constant-head infiltration test method was utilized to test the infiltration rates of deeper soils. This method consisted of filling the borings to a maximum water level of 10± feet below the ground surface, based on the soil conditions encountered. Once the hole was filled, the inflow of water was controlled via a ball valve in order to maintain the water level constant below ground surface. It was necessary to constantly monitor this depth due to varying inflows from the water source and the change in infiltration rate with time. Readings were taken every ten minutes using a water level meter. The ball valve was used to make adjustments by increasing or decreasing the inflow of water when slight changes in depth occurred. The water level readings are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on the spreadsheets.

The infiltration rates from the deep infiltration tests are tabulated in gallons per square foot per day.

Infiltration Test No.	Depth (feet)	Measured Infiltration Rate (Inches per Hour)
I-7	51	<0.1
I-8	49	0.2
I-9	51	0.1
I-10	51	0.3

Laboratory Testing

Moisture Content

The moisture contents for the recovered soil samples within the borings were determined in accordance with ASTM D-2216 and are expressed as a percentage of the dry weight. These test results are presented on the Boring Logs.

Grain Size Analysis

The grain size distribution of selected soils collected from each infiltration test boring have been determined using a range of wire mesh screens. These tests were performed in general accordance with ASTM D-422 and/or ASTM D-1140. The weight of the portion of the sample retained on each screen is recorded and the percentage finer or coarser of the total weight is calculated. The results of these tests are presented on Plates C-1 through C-41 of this report.

Design Recommendations

A total of ten (10) total infiltration tests were performed at the subject site. As noted above, the double ring infiltration testing resulted in measured infiltration rates ranging from 0.3 to 6.8 inches per hour. The dry well infiltration testing resulted in measured infiltration rates ranging from 0.0 to 0.3 inches per hour. The primary factors affecting the infiltration rates are the silt content of the encountered soils, which vary at different depths and locations at the subject site. Based on the results of the infiltration testing, we recommend the following infiltration rates to be utilized for the design of the proposed infiltration systems:

Infiltration Test No.	Infiltration System	Infiltration System Type	Depth (feet)	Location	Infiltration Rate (inches per hour)
I-1 and I-2*	A	Chamber System	7	Northeast	0.9
I-3 and I-4*	B	Chamber System	7	Central-East	3.6
I-5	C	Chamber System	7	South-Central	0.9
I-6	D	Chamber System	7	Southeast	1.3

Infiltration Test No.	Infiltration System	Infiltration System Type	Depth (feet)	Location	Infiltration Rate (inches per hour)
I-7	E	Dry Well	50	Northeast	0.0
I-8	F	Dry Well	50	Central-East	0.2
I-9	G	Dry Well	50	Central-East	0.1
I-10	H	Dry Well	50	Southeast	0.3

NOTE: *Indicates an average infiltration rate was used in the design infiltration rate.

Due to the low infiltration rates for the deep dry well infiltration systems, dry well infiltration is not recommended for this project.

The design of the proposed storm water infiltration system should be performed by the project civil engineer, in accordance with the City of Perris and/or County of Riverside guidelines. However, it is recommended that the system be constructed so as to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the system. The presence of such materials would decrease the effective infiltration rate. **It is recommended that the project civil engineer apply an appropriate factor of safety. The infiltration rates recommended above are based on the assumption that only clean water will be introduced to the subsurface profile. Any fines, debris, or organic materials could significantly impact the infiltration rates.** It should be noted that the recommended infiltration rates are based on infiltration testing at ten (10) discrete locations and the overall infiltration rates of the storm water infiltration systems could vary considerably.

Infiltration Rate Considerations

The infiltration rates presented herein was determined in accordance with the Riverside County guidelines and are considered valid only for the time and place of the actual test. Varying subsurface conditions will exist in other areas of the site, which could alter the recommended infiltration rates presented above. The infiltration rates will decline over time between maintenance cycles as silt or clay particles accumulate on the BMP surface. The infiltration rate is highly dependent upon a number of factors, including density, silt and clay content, grainsize distribution throughout the range of particle sizes, and particle shape. Small changes in these factors can cause large changes in the infiltration rates.

Infiltration rates are based on unsaturated flow. As water is introduced into soils by infiltration, the soils become saturated and the wetting front advances from the unsaturated zone to the saturated zone. Once the soils become saturated, infiltration rates become zero, and water can only move through soils by hydraulic conductivity at a rate determined by pressure head and soil permeability. Changes in soil moisture content will affect the infiltration rate. Infiltration rates should be expected to decrease until the soils become saturated. Soil permeability values will then govern groundwater movement. Permeability values may be on the order of 10 to 20 times less than infiltration rates. The system designer should incorporate adequate factors of safety and allow for overflow design into appropriate traditional storm drain systems, which would transport storm water off-site.

Construction Considerations

The infiltration rates presented in this report are specific to the tested locations and tested depths. Infiltration rates can be significantly reduced if the soils are exposed to excessive disturbance or compaction during construction. Compaction of the soils at the bottom of the infiltration system can significantly reduce the infiltration ability of the basins. Therefore, the subgrade soils within proposed infiltration system areas should not be over-excavated, undercut or compacted in any significant manner. **It is recommended that a note to this effect be added to the project plans and/or specifications.**

We recommend that a representative from the geotechnical engineer be on-site during the construction of the proposed infiltration systems to identify the soil classification at the base of each system. It should be confirmed that the soils at the base of the proposed infiltration systems correspond with those presented in this report to ensure that the performance of the systems will be consistent with the rates reported herein.

We recommend that scrapers and other rubber-tired heavy equipment not be operated on the basin bottom, or at levels lower than 2 feet above the bottom of the system, particularly within basins. As such, the bottom 24 inches of the infiltration systems should be excavated with non-rubber-tired equipment, such as excavators.

Infiltration Chamber Maintenance

The proposed project may include infiltration chambers. Water flowing into chambers will carry some level of sediment. This layer has the potential to significantly reduce the infiltration rate of the chamber subgrade soils. Therefore, a formal chamber maintenance program should be established to ensure that these silt and clay deposits are removed from the chamber on a regular basis.

Location of Infiltration Systems

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration area could potentially be damaged due to saturation of the subgrade soils. **The proposed infiltration systems for this site should be located at least 25 feet away from any structures, including retaining walls.** Even with this provision of locating the infiltration system at least 25 feet from the building(s), it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration system.

The infiltration system designer should also give special consideration to the effect that the proposed infiltration systems may have on nearby subterranean structures, open excavations, or descending slopes. In particular, infiltration systems should not be located near the crest of descending slopes, particularly where the slopes are comprised of granular soils. Such systems will require specialized design and analysis to evaluate the potential for slope instability, piping failures and other phenomena that typically apply to earthen dam design. This type of analysis is beyond the scope of this infiltration test report, but these factors should be considered by the infiltration system designer when locating the infiltration systems.

General Comments

This report has been prepared as an instrument of service for use by the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, structural engineer, and/or civil engineer. The design of the infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rates contained herein, the civil engineer agrees to indemnify, defend, and hold harmless the geotechnical engineer for all aspects of the design and performance of the infiltration system. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur. The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between trench locations and testing depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to

our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted. The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

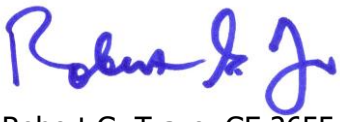
Closure

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

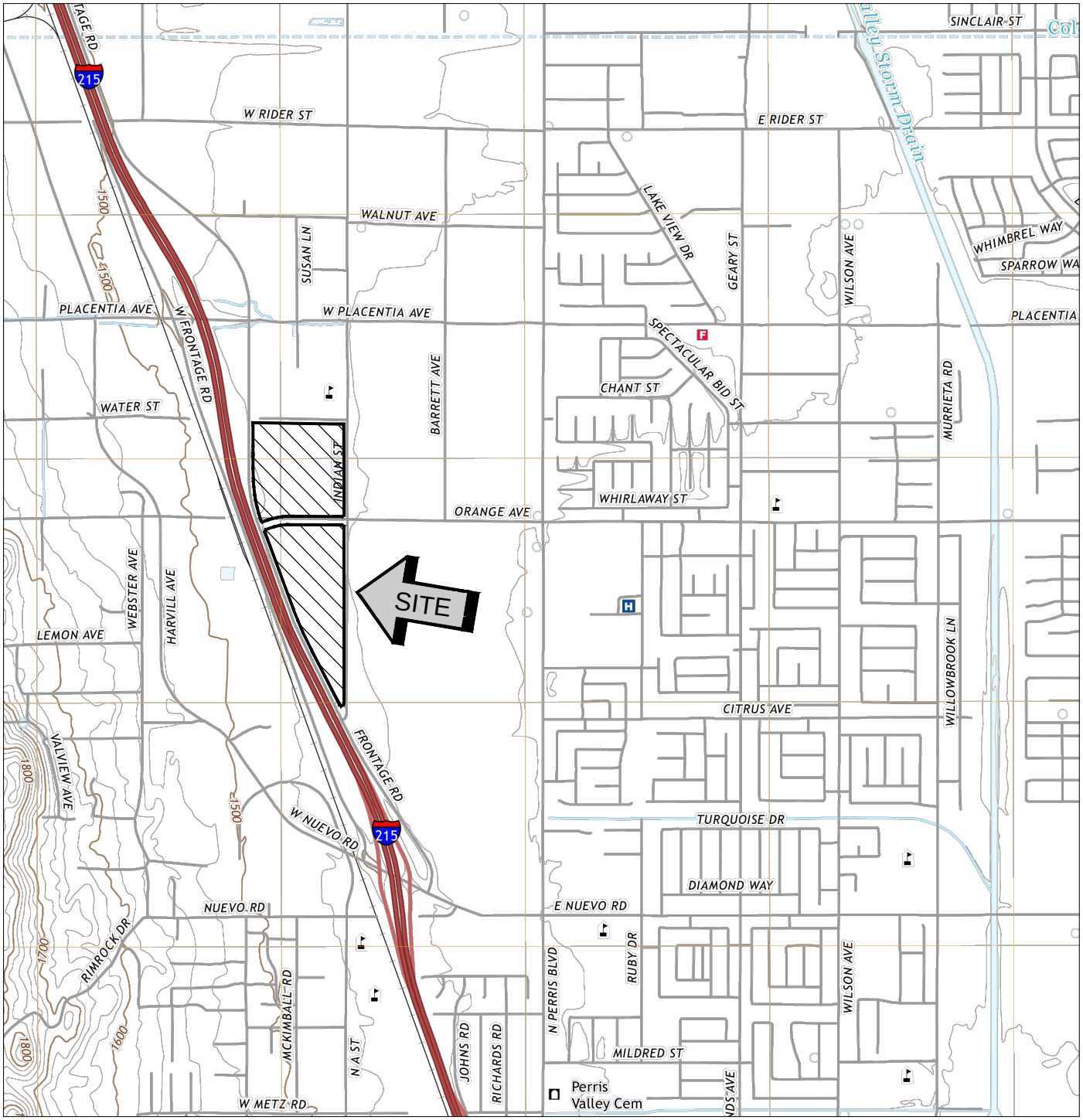
Ryan Bremer
Staff Geologist



Robert G. Trazo, GE 2655
Principal Engineer

Distribution: (1) Addressee

Enclosures: Plate 1 - Site Location Map
Plate 2 - Infiltration Test Location Plan
Trench Log Legend and Logs (8 pages)
Boring Log Legend and Logs (12 pages)
Infiltration Test Results Spreadsheets (10 pages)
Grain Size Distribution Graphs (41 pages)



SOURCE: USGS TOPOGRAPHIC MAP OF THE PERRIS QUADRANGLE, RIVERSIDE COUNTY, CALIFORNIA, 2021

SITE LOCATION MAP

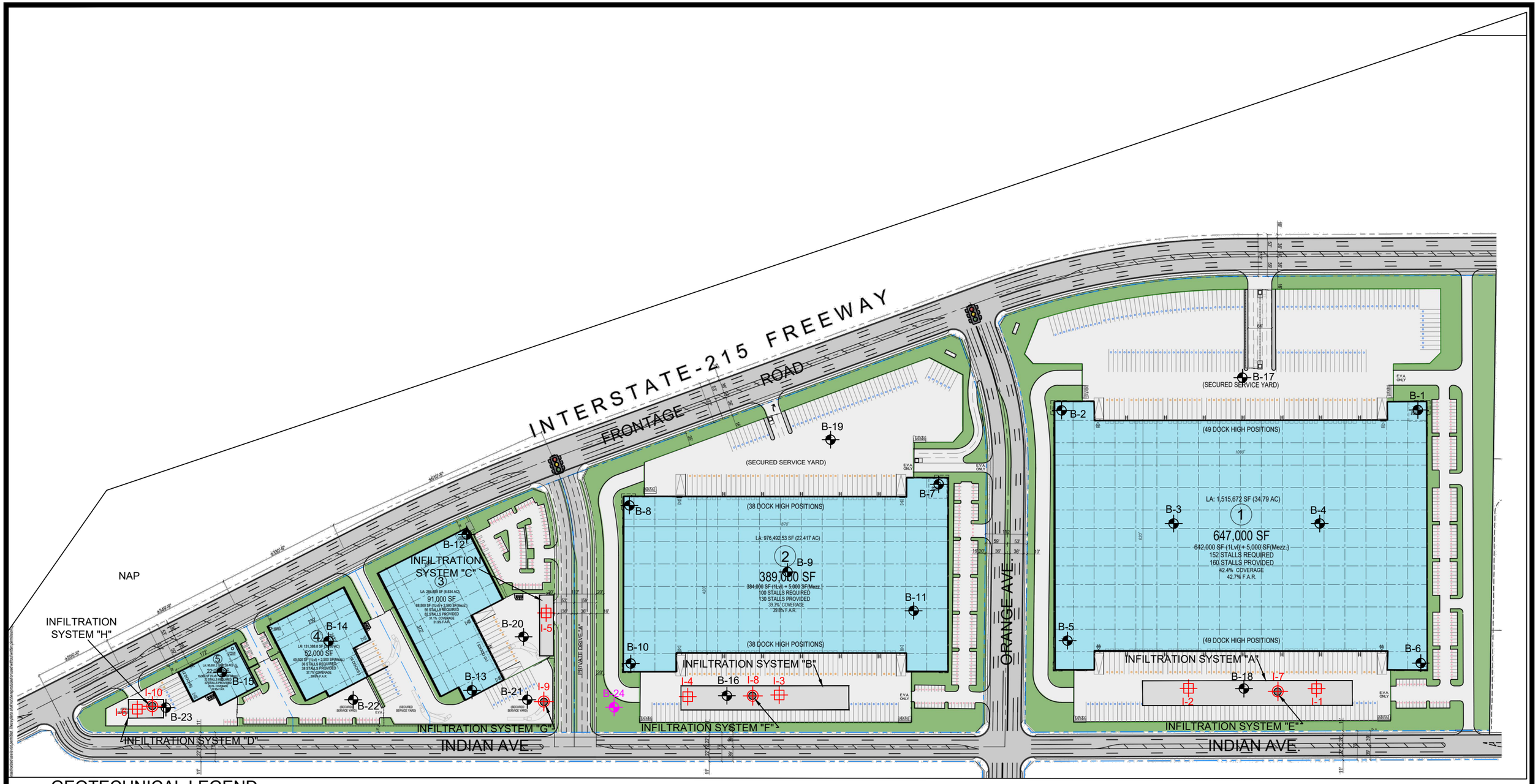
HARVEST LANDING INDUSTRIAL DEVELOPMENT

PERRIS, CALIFORNIA

SCALE: 1" = 2000'	
DRAWN: OS CHKD: RGT	
SCG PROJECT 22G183-2	
PLATE 1	

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



GEOTECHNICAL LEGEND

- APPROXIMATE SHALLOW-INFILTRATION TEST LOCATION (DOUBLE-RING INFILTROMETER)
- APPROXIMATE DEEP-INFILTRATION TEST LOCATION (CONSTANT-HEAD)
- APPROXIMATE BORING LOCATION
- APPROXIMATE BORING LOCATION (SCG PROJECT NO. 22G183-1)
- APPROXIMATE BELOW-GRADE CHAMBER LOCATION
- APPROXIMATE DRY WELL SYSTEM LOCATION

NORTH

SoCalGeo

NOTE: CONCEPTUAL PLAN PROVIDED BY AO ARCHITECTS

INFILTRATION TEST LOCATION PLAN

HARVEST LANDING INDUSTRIAL DEVELOPMENT

PERRIS, CALIFORNIA

SCALE: 1" = 250'	
DRAWN: RB CHKD: RGT	
SCG PROJECT 22G183-2	
PLATE 2	

SOUTHERN CALIFORNIA GEOTECHNICAL

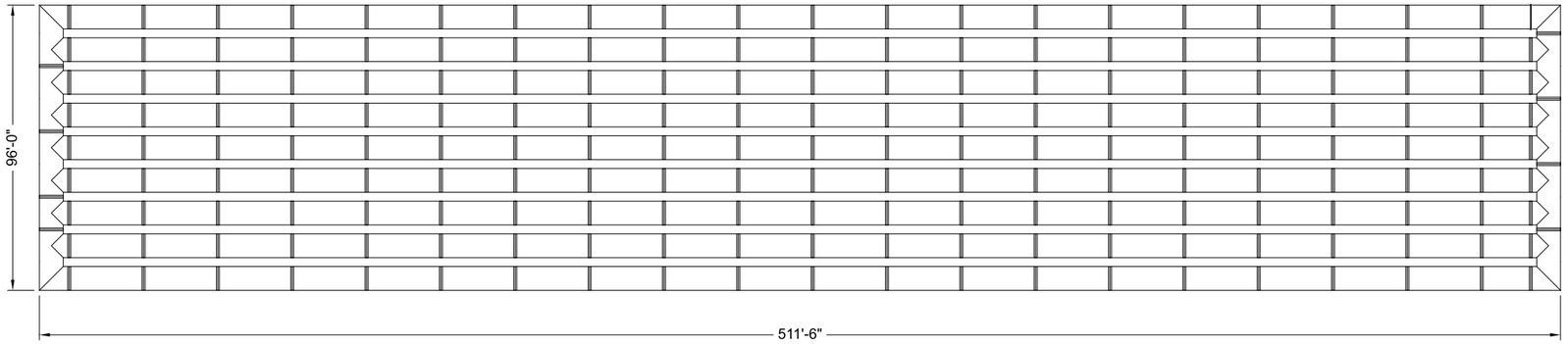
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 4,651 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 233,785 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 233,785 CF

PIPE DETAILS
- DIAMETER = 96"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 36"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"



NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2⅔" x ½" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

ASSEMBLY

SCALE: 1" = 50'

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DATE	REVISION DESCRIPTION	BY

CONTECH® ENGINEERED SOLUTIONS LLC
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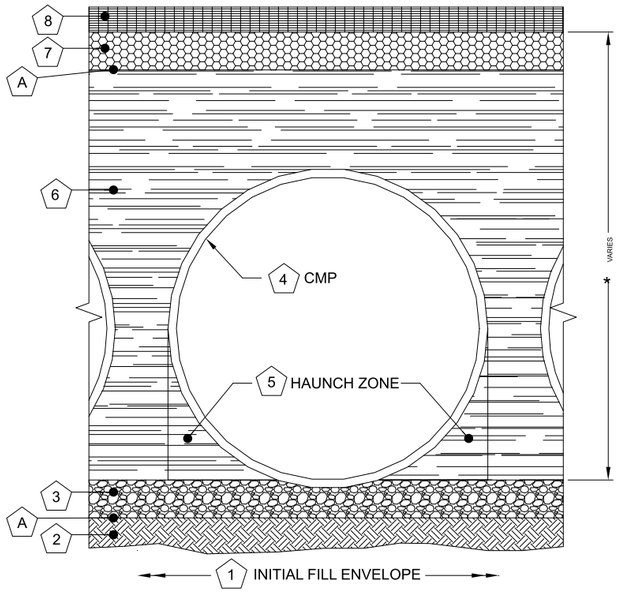
CONTECH® CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO19813 20-001 Harvest Landing Site 2
Easterly System
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
12847	19813	8/14/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		



	DETENTION SYSTEMS - CMP DETENTION / CMP DRAINAGE			
	Material Location	Description	Material Designation	Designation
8	Rigid or Flexible Pavement (if applicable)			
7	Road Base (if applicable)			
A	Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types
6	Backfill	Well graded granular material which may contain small amounts of silt or clay.	AASHTO M 145- A-1, A-2, A-3	Placed in 8" +/- loose lifts and compacted to 90% Standard Proctor Per AASHTO T 99
3	Bedding Stone	Well graded granular bedding material w/maximum particle size of 3"	AASHTO M43 - 3,357,4,467, 5, 56, 57	Engineer to determine if bedding is required. Pipe may be placed on the trench bottom of a relatively loose, native suitable well graded & granular material. For Arch pipes it is recommended to be shaped to a relatively flat bottom or fine-grade the foundation to a slight v-shape. Unsuitable material should be over-excavated and re-placed with a 4"-6" layer of well graded & granular stone per the material designation. See AASHTO 26.3.8.1 / 26.5.3 Bedding info.
A	Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types
*	*Note: Backfill using controlled low-strength material (CLSM, "flash fill" or "flowable fill") when the spacing between the pipes will not allow for placement and adequate compaction of the backfill.*			

1 MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT

FOUNDATION/BEDDING PREPARATION

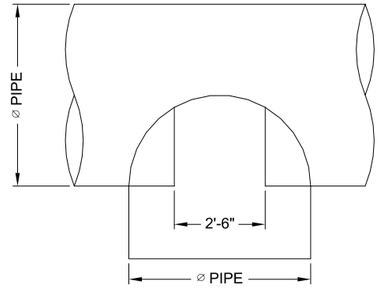
2 PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE ENGINEER.

5 HAUNCH ZONE MATERIAL SHALL BE PLACED AND UNIFORMALLY COMPACTED WITHOUT SOFT SPOTS.

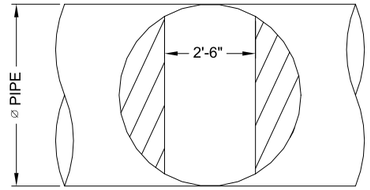
BACKFILL

WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO LIFT (16") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE DETENTION SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON THE PIPE.

OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.



PLAN

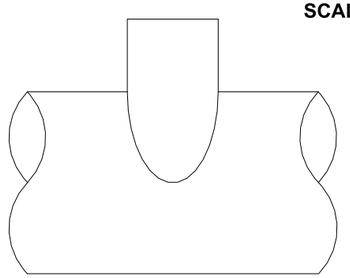


FRONT

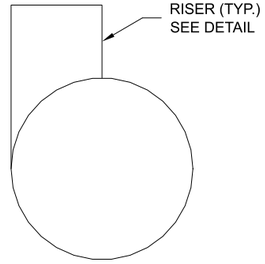
NOTE:
MANWAY DETAIL APPLICABLE FOR CMP SYSTEMS WITH DIAMETERS 48" AND LARGER. MANWAYS MAY BE REQUIRED ON SMALLER SYSTEMS DEPENDING ON ACTUAL SITE SPECIFIC CONDITIONS.

TYPICAL MANWAY DETAIL

SCALE: N.T.S.



ELEVATION

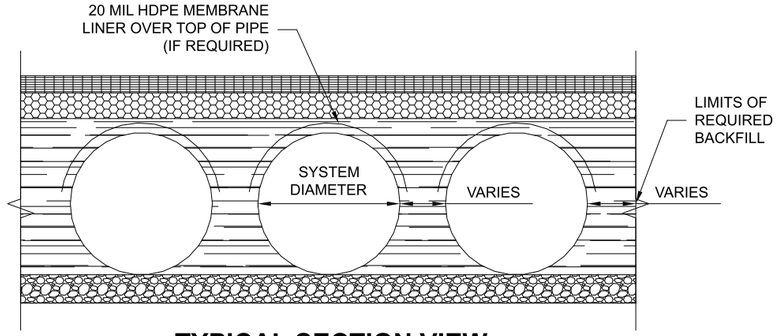


END

NOTE:
LADDERS ARE OPTIONAL AND ARE NOT REQUIRED FOR ALL SYSTEMS.

TYPICAL RISER DETAIL

SCALE: N.T.S.



TYPICAL SECTION VIEW

LINER OVER ROWS
SCALE: N.T.S.

NOTE: IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, AN HDPE MEMBRANE LINER IS RECOMMENDED WITH THE SYSTEM. THE IMPERMEABLE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

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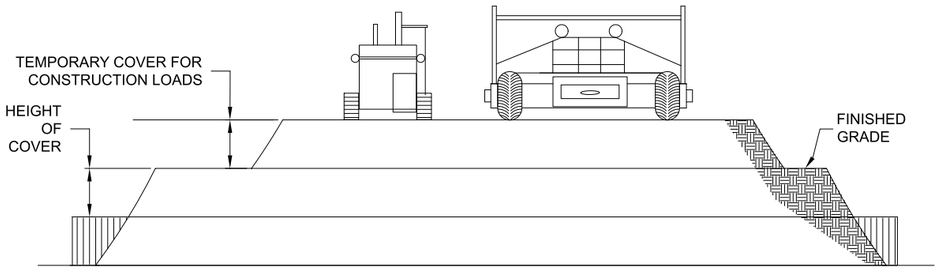


CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

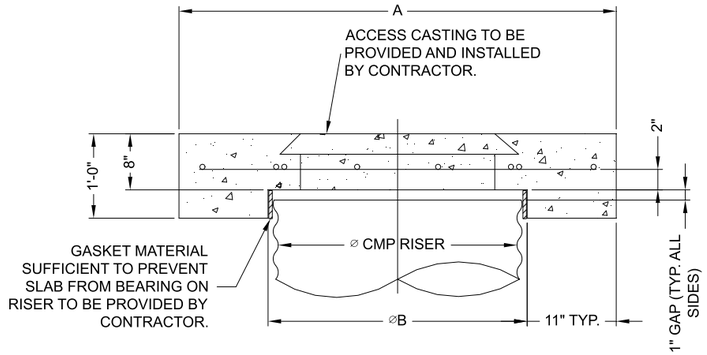
APPLICABLE POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

APPLICABLE
HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.
REQUIREMENTS
INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

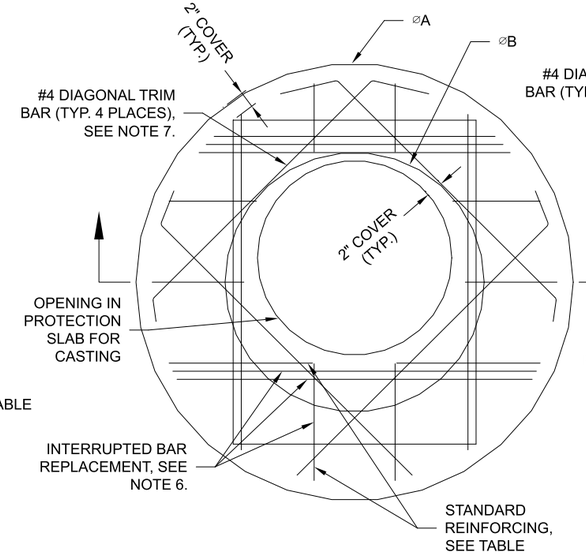
NOTE:
THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.



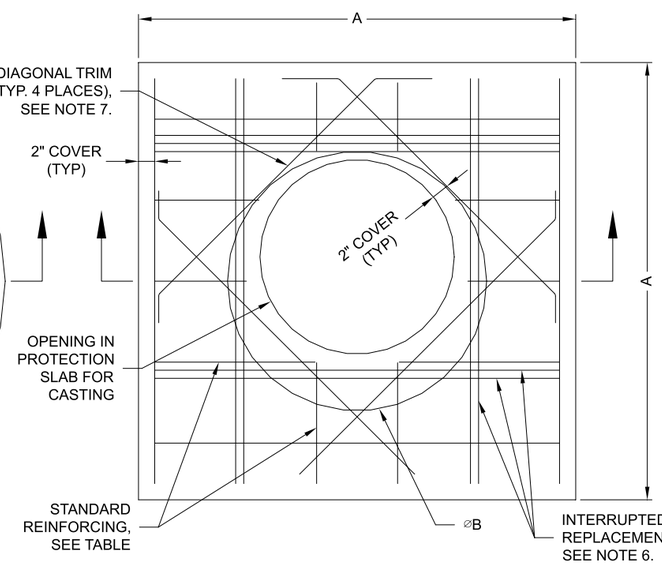
SECTION VIEW

REINFORCING TABLE				
⌀ CMP RISER	A	⌀ B	REINFORCING	**BEARING PRESSURE (PSF)
24"	⌀ 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	⌀ 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	⌀ 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	⌀ 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	⌀ 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

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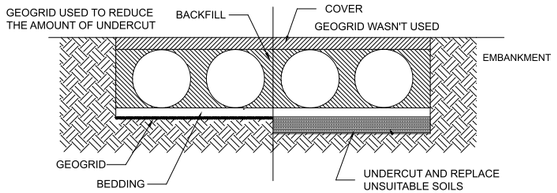
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.

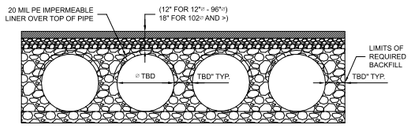


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

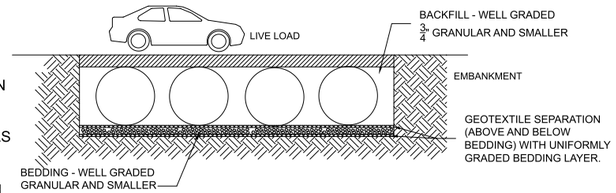
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

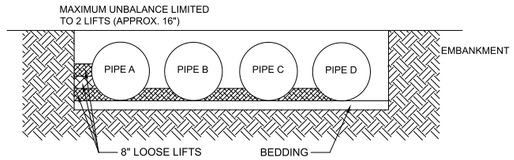
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



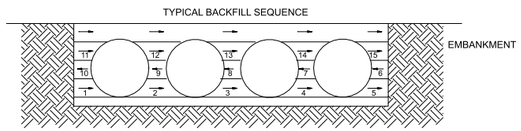
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

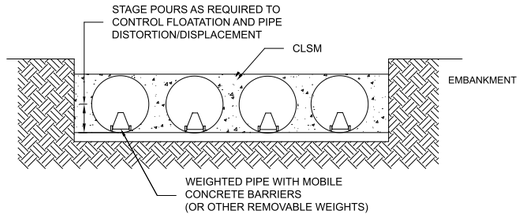


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

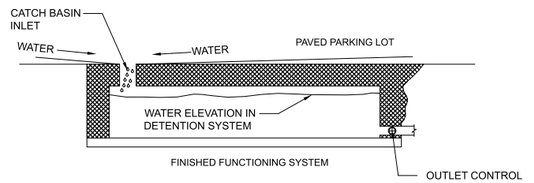


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

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CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO19813 20-001 Harvest Landing Site 2
Easterly System
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
12847	19813	8/14/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

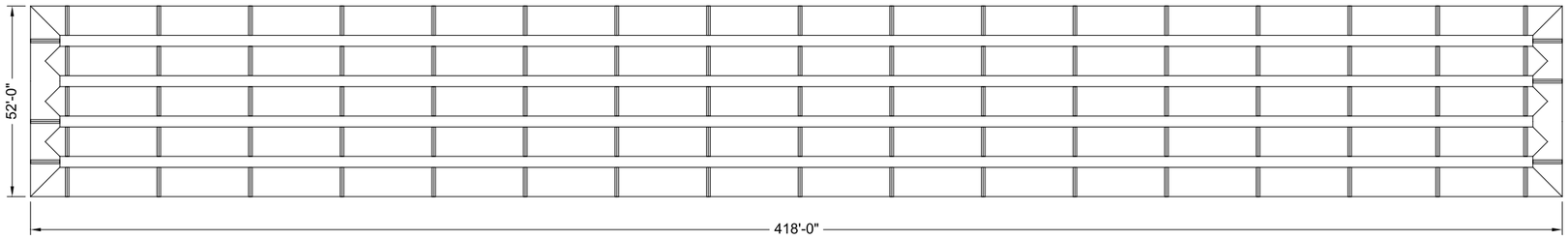
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 2,114 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 106,261 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 106,261 CF

PIPE DETAILS
- DIAMETER = 96"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 36"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"



NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE $2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

ASSEMBLY

SCALE: 1" = 40'

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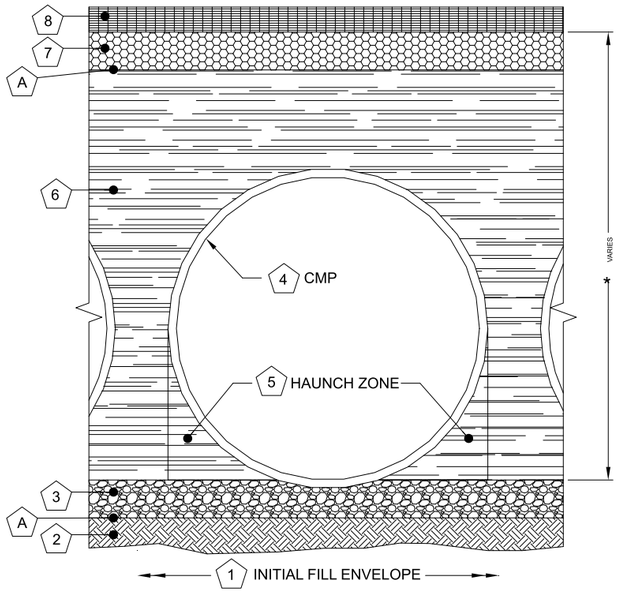
CONTECH® CMP DETENTION SYSTEMS
CONTECH **DYODS** DRAWING

DYO20080 20-001 Harvest Landing Site 2
Westerly System
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
13032	20080	8/9/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		



	DETENTION SYSTEMS - CMP DETENTION / CMP DRAINAGE			
	Material Location	Description	Material Designation	Designation
8	Rigid or Flexible Pavement (if applicable)			
7	Road Base (if applicable)			
A	Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types
6	Backfill	Well graded granular material which may contain small amounts of silt or clay.	AASHTO M 145- A-1, A-2, A-3	Placed in 8" +/- loose lifts and compacted to 90% Standard Proctor Per AASHTO T 99
3	Bedding Stone	Well graded granular bedding material w/maximum particle size of 3"	AASHTO M43 - 3,357,4,467, 5, 56, 57	Engineer to determine if bedding is required. Pipe may be placed on the trench bottom of a relatively loose, native suitable well graded & granular material. For Arch pipes it is recommended to be shaped to a relatively flat bottom or fine-grade the foundation to a slight v-shape. Unsuitable material should be over-excavated and re-placed with a 4"-6" layer of well graded & granular stone per the material designation. See AASHTO 26.3.8.1 / 26.5.3 Bedding info.
A	Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types
*	*Note: Backfill using controlled low-strength material (CLSM, "flash fill" or "flowable fill") when the spacing between the pipes will not allow for placement and adequate compaction of the backfill.*			

1 MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT

FOUNDATION/BEDDING PREPARATION

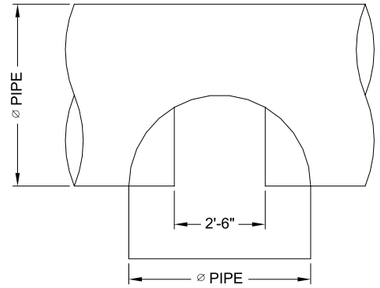
2 PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE ENGINEER.

5 HAUNCH ZONE MATERIAL SHALL BE PLACED AND UNIFORMALLY COMPACTED WITHOUT SOFT SPOTS.

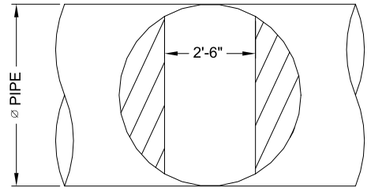
BACKFILL

WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO LIFT (16") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE DETENTION SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON THE PIPE.

OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.



PLAN

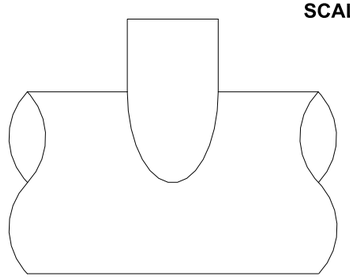


FRONT

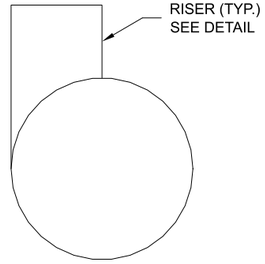
NOTE:
MANWAY DETAIL APPLICABLE FOR CMP SYSTEMS WITH DIAMETERS 48" AND LARGER. MANWAYS MAY BE REQUIRED ON SMALLER SYSTEMS DEPENDING ON ACTUAL SITE SPECIFIC CONDITIONS.

TYPICAL MANWAY DETAIL

SCALE: N.T.S.



ELEVATION

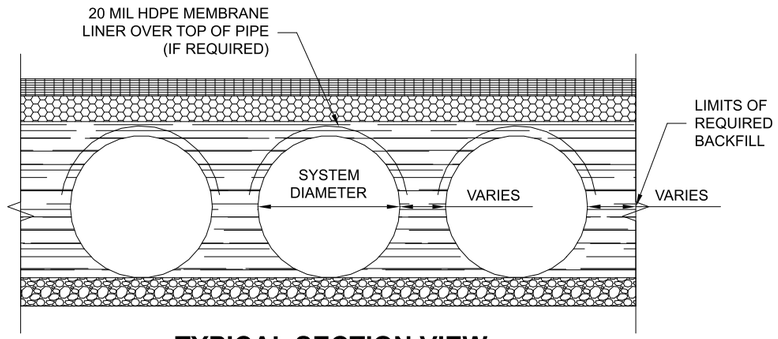


END

NOTE:
LADDERS ARE OPTIONAL AND ARE NOT REQUIRED FOR ALL SYSTEMS.

TYPICAL RISER DETAIL

SCALE: N.T.S.



TYPICAL SECTION VIEW

LINER OVER ROWS
SCALE: N.T.S.

NOTE: IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, AN HDPE MEMBRANE LINER IS RECOMMENDED WITH THE SYSTEM. THE IMPERMEABLE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

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DYO20080 20-001 Harvest Landing Site 2
Westerly System
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
13032	20080	8/9/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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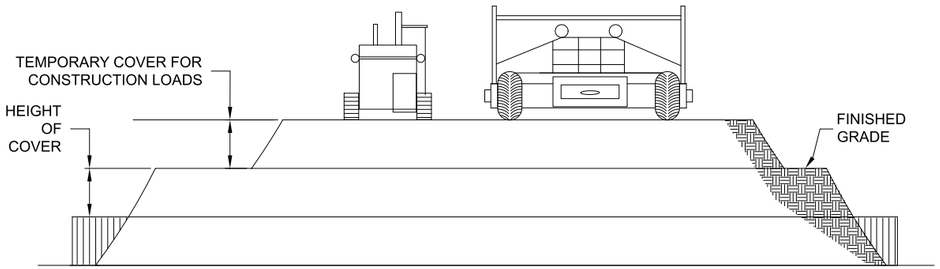

CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

APPLICABLE POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

APPLICABLE
HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.
REQUIREMENTS
INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

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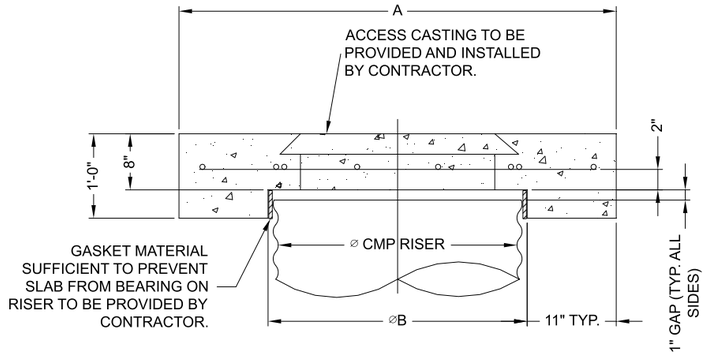
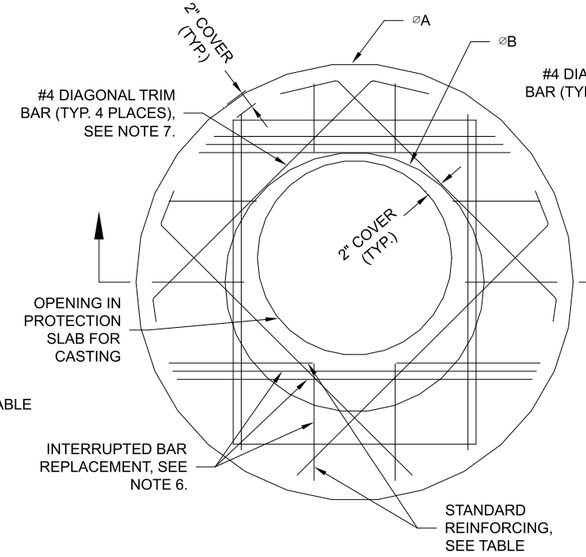


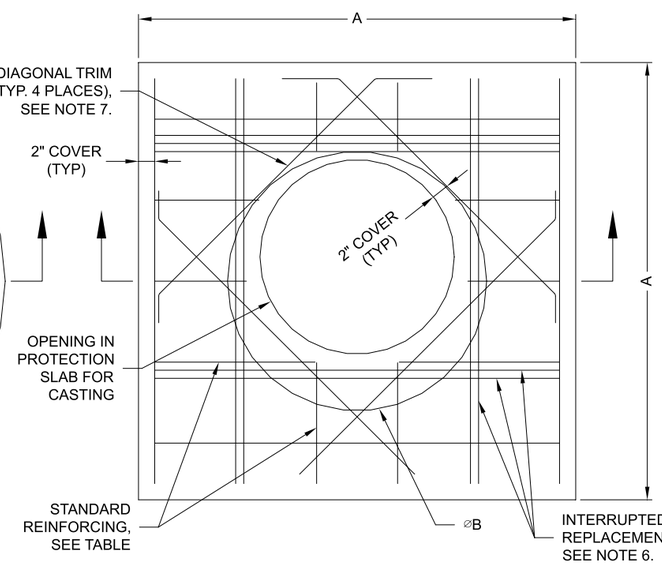
SECTION VIEW

REINFORCING TABLE				
⌀ CMP RISER	A	⌀ B	REINFORCING	**BEARING PRESSURE (PSF)
24"	⌀ 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	⌀ 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	⌀ 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	⌀ 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	⌀ 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

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Westerly System
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PROJECT No.:	SEQ. No.:	DATE:
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DESIGNED: DYO	DRAWN: DYO	
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SHEET NO.: 1		

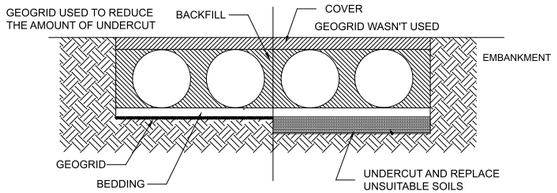
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.

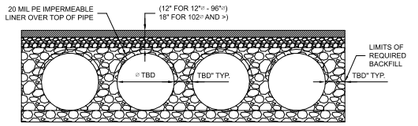


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

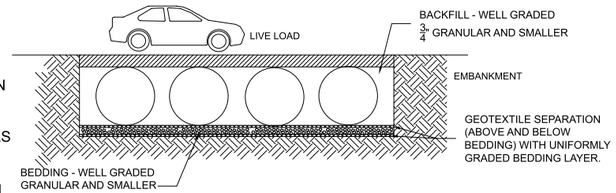
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

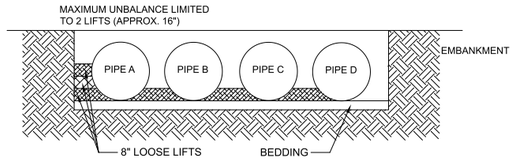
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



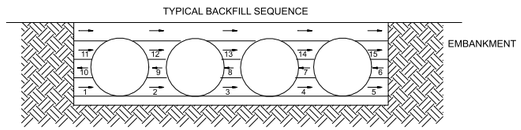
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

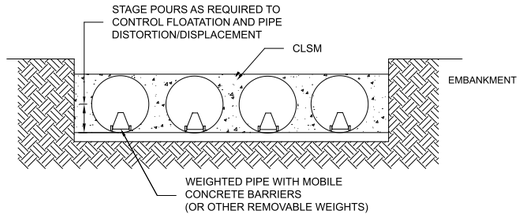


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

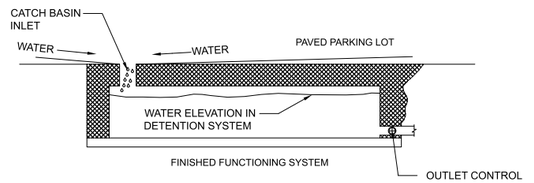


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

C:\EXPORTS\TEMPLATES\CMP_V8.DWG 10/18/2019 10:02 AM

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DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO20080 20-001 Harvest Landing Site 2
Westerly System
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
13032	20080	8/9/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc — Date: 10/4/2024

Designed by: Hector Paez — Case No:

Company Project Number/Name: 20-001 - Site 2

BMP Identification

BMP NAME / ID: S2-1 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S2-1A	*0*	*Roofs*	*1*	*0.89*	*0*			
S2-1C	*186366.61*	*Concrete or Asphalt*	*1*	*0.892*	*166239*			
	186366.61	***Total***			**166239**	**0.20**	***0.76***	***0.808***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	FMCivil Engineers Inc	Date	10/4/2024
Designed by	Hector Paez	Case No	
Company Project Number/Name	20-001 - Site 2		

BMP Identification

BMP NAME / ID: S2-2 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S2-2A	*190057.62*	*Roofs*	*1*	*0.89*	*169531.4*			
S2-2C	*23066.2*	*Concrete or Asphalt*	*1*	*0.892*	*20575.1*			
	213123.82	***Total***			**190106.5**	**0.20**	***0.87***	***0.924***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	FMCivil Engineers Inc	Date	10/4/2024
Designed by	Hector Paez	Case No	
Company Project Number/Name	20-001 - Site 2		

BMP Identification

BMP NAME / ID: S2-3 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S2-3A	*194209.17*	*Roofs*	*1*	*0.89*	*173234.6*			
S2-3C	*44222.67*	*Concrete or Asphalt*	*1*	*0.892*	*39446.6*			
	238431.84	***Total***			**212681.2**	**0.20**	***0.98***	***1.154***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc | Date: 10/4/2024

Designed by: Hector Paez | Case No:

Company Project Number/Name: 20-001 - Site 2

BMP Identification

BMP NAME / ID: S2-4 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

	DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imprevious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
DMAs	*S2-4A*	*0*	*Roofs*	*1*	*0.89*	*0*			
	S2-4C	*129874.52*	*Concrete or Asphalt*	*1*	*0.892*	*115848.1*			
		129874.52	***Total***			**115848.1**	**0.20**	***0.53***	***0.577***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

(Note this worksheet shall ***only*** *be used in conjunction with BMP designs from the* ***LID BMP Design Handbook*** *)*

Company Name: FMCivil Engineers Inc | Date: 10/4/2024

Designed by: Hector Paez | Case No:

Company Project Number/Name: 20-001 - Site 2

BMP Identification

BMP NAME / ID: S2-5 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S2-25	*0*	*Roofs*	*1*	*0.89*	*0*			
S2-5C	*17428.74*	*Concrete or Asphalt*	*1*	*0.892*	*15546.4*			
	17428.74	***Total***			15546.4	0.20	*0.07*	*0.073*

DMAs

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc — Date: 10/4/2024

Designed by: Hector Paez — Case No:

Company Project Number/Name: 20-001 - Site 2

BMP Identification

BMP NAME / ID: S2-6 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity — I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Rainfall Intensity (in/hr)	Design Flow Rate (cfs)	Proposed Flow Rate (cfs)
S2-6A	0	Roofs	1	0.89	0			
S2-6C	31142.53	Concrete or Asphalt	1	0.892	27779.1			
	31142.53	Total			27779.1	0.20	0.13	0.144

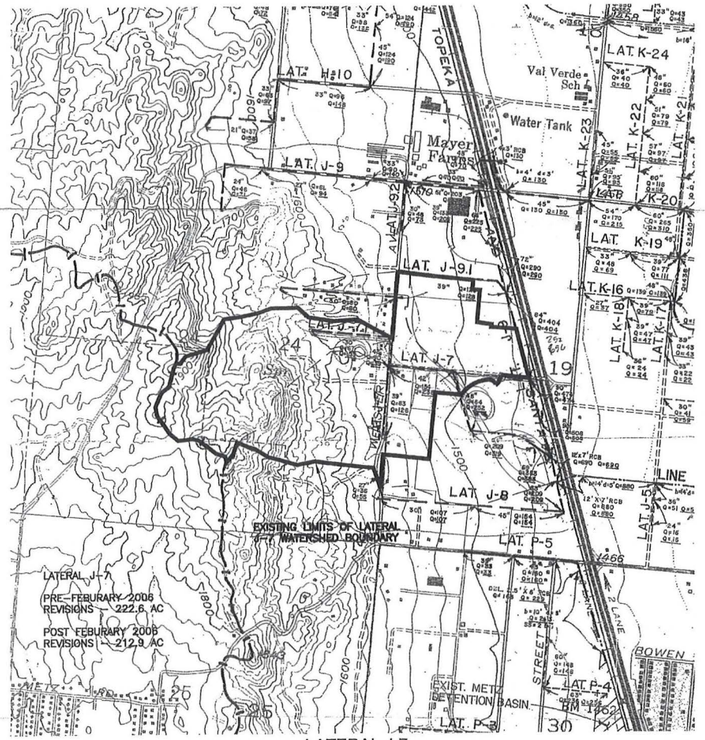
DMAs

Notes:

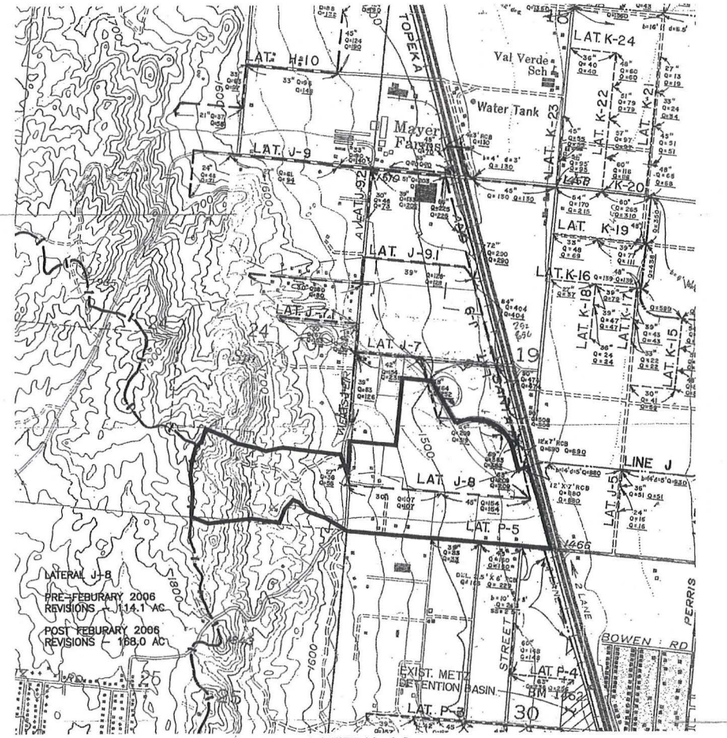
PORTION OF
8K3
1" = 1000'

REVISED HYDROLOGY MAP
PERRIS MASTER DRAINAGE PLAN

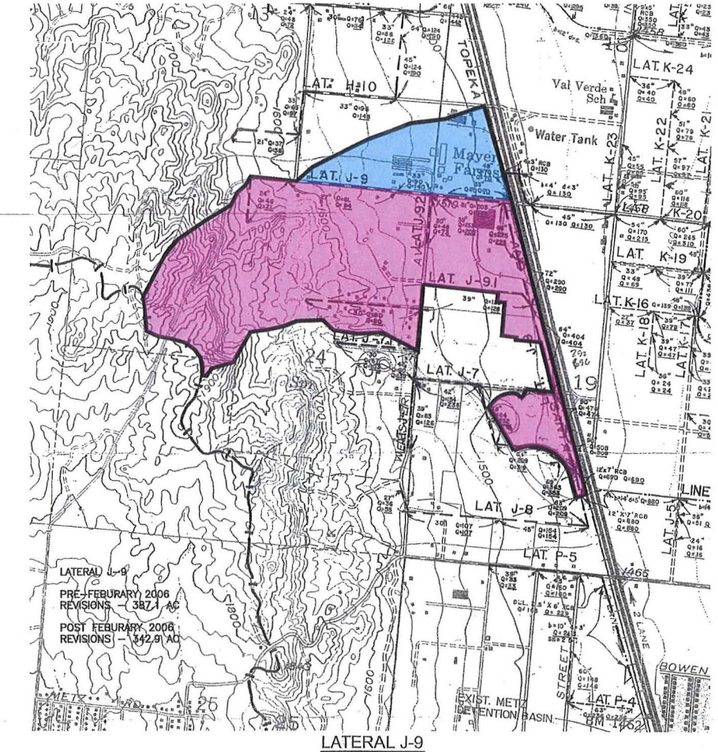
LATERALS J–7, J–8, & J–9



LATERAL J-7



LATERAL J-8



LATERAL J-9

LATERAL No.	PRE–FEBURARY 2006 REVISIONS	POST FEBURARY 2006 REVISIONS	INCREASE/DECREASE (ACRES)
LAT J–8	114.1	168.0	+53.9
LAT J–9	609.8	555.9	–53.9

LEGEND

PROPOSED LATERAL WATERSHED BOUNDARIES AFTER FEBRUARY 2006 REVISION

N

SCALE: 1"=1000'

B:\CAD\Nuevo Industrial Park - NV\PE\Exhibits\NV\P Perris MDP Hydrology map lat 7 and lat 9.dwg, 2/2/2007 1:10:00 PM, Donal Pearce

WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR GRADING PERMIT HAS BEEN ISSUED.

THE PRIVATE ENGINEER SIGNING THESE PLANS IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF THE DESIGN HEREON. IN THE EVENT OF DISCREPANCIES ARISING AFTER COUNTY APPROVAL OR DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISING THE PLANS FOR APPROVAL BY THE COUNTY.

DATE	BY	MARK	REVISIONS	APPR	DATE

ENGINEER — COUNTY

SEAL–COUNTY

REGISTERED PROFESSIONAL ENGINEER ALAN D. FRENCH No. 45702 Exp. 12–31–08 CIVIL STATE OF CALIFORNIA

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY:

ALAN D. FRENCH, P.E.
CIVIL ENGINEER, R.C.E. NO. 45702 — DATE

RECOMMENDED — DATE

SEAL–ENGINEER

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RECOMMENDED FOR APPROVAL — APPROVED BY:

PLANNING ENGINEER — CHIEF ENGINEER

DATE: — DATE:

ENGINEERING SOLUTIONS
ENGINEERING-LAND PLANNING-SURVEYING-MAPPING
2155 CHICAGO AVENUE, STE. 201
RIVERSIDE, CA. 92507
PHONE – (951) 784–0288
FAX – (951) 784–0287
PREPARED BY:

DATE EXP. 06–30–07

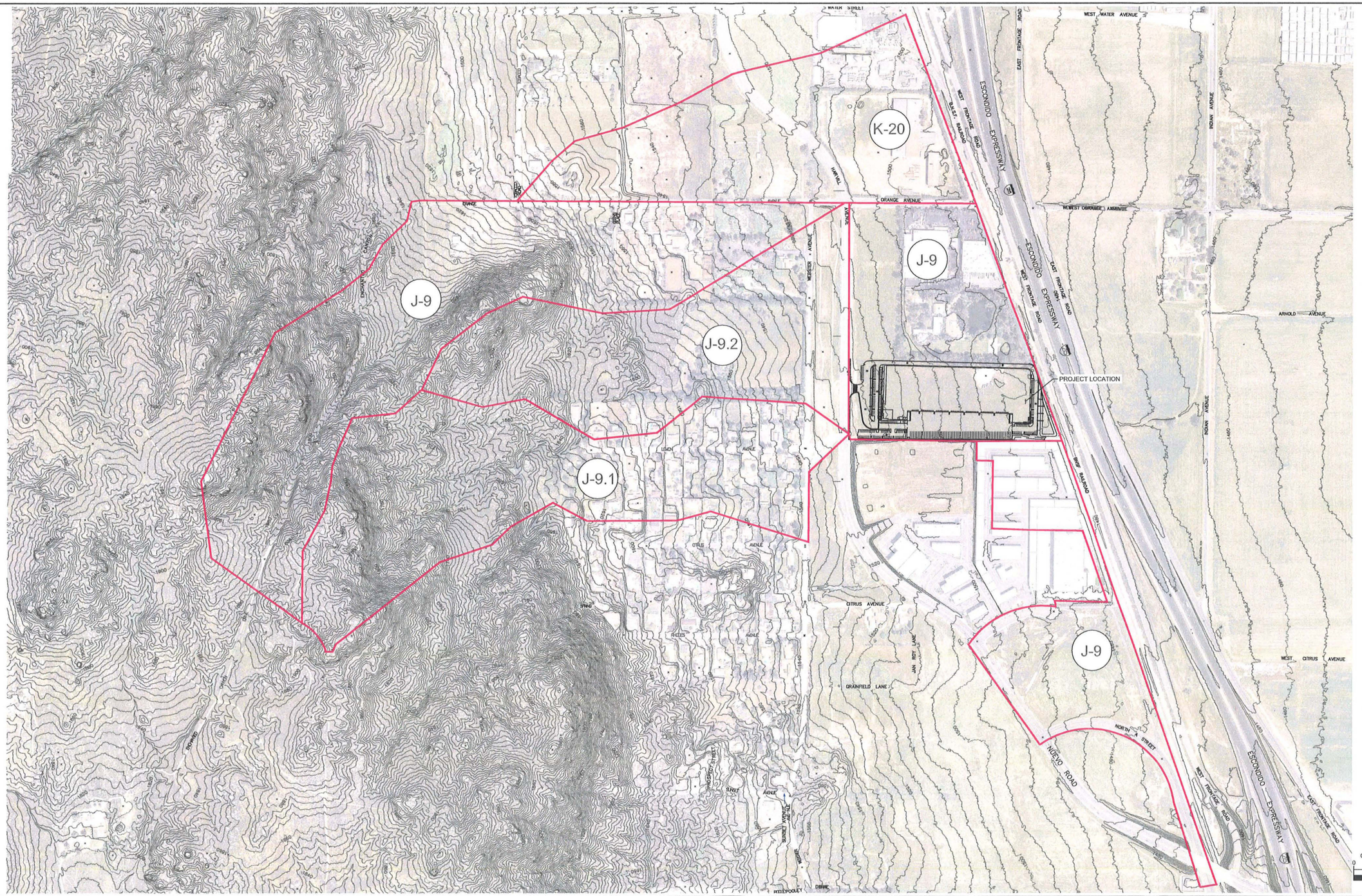
BENCHMARK:

SCALE:

I.P. No. XXXXX
COUNTY OF RIVERSIDE
REVISED HYDROLOGY MAP
PERRIS MASTER DRAINAGE PLAN
LATERALS J–7, J–8, & J–9

SHEET NO. 1 OF 1 SHTS.

FOR: | W.O. | COUNTY FILE NO.:



Kimley»Horn
401 B STREET, SUITE 600, SAN DIEGO, CA 92101
PHONE: 619-234-9411
WWW.KIMLEY-HORN.COM

RCFC MDP DRAINAGE AREA MAP LINE J-9
ROCKEFELLER HARVILL INDUSTRIAL PARK
October 9, 2020

EXHIBITS

EXHIBIT A: VICINITY MAP

EXHIBIT B: EXISTING OFFSITE HYDROLOGY MAP

EXHIBIT C: EXISTING HYDROLOGY MAP

EXHIBIT D: EXISTING HYDROLOGY MAP

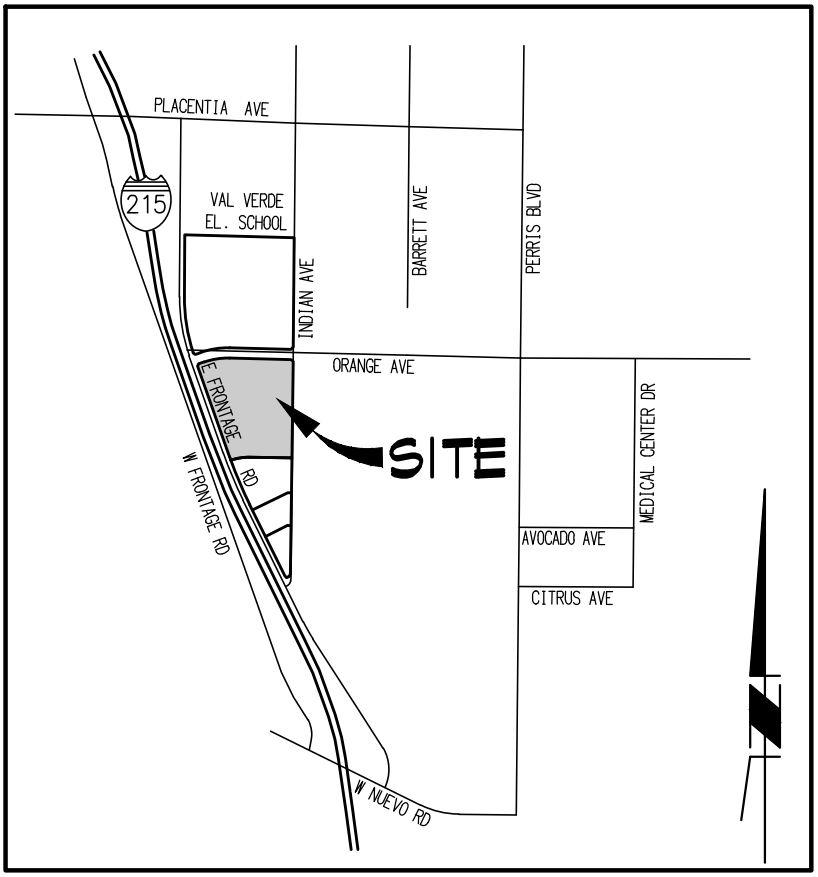
EXHIBIT E: PROPOSED HYDROLOGY MAP

EXHIBIT F: HYDROLOGIC SOILS GROUP MAP

EXHIBIT G: RCFCD MDP FACILITIES OVERLAY

EXHIBIT H: PHASE 1 OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM

EXHIBIT I: CONCEPTUAL GRADING



VICINITY MAP

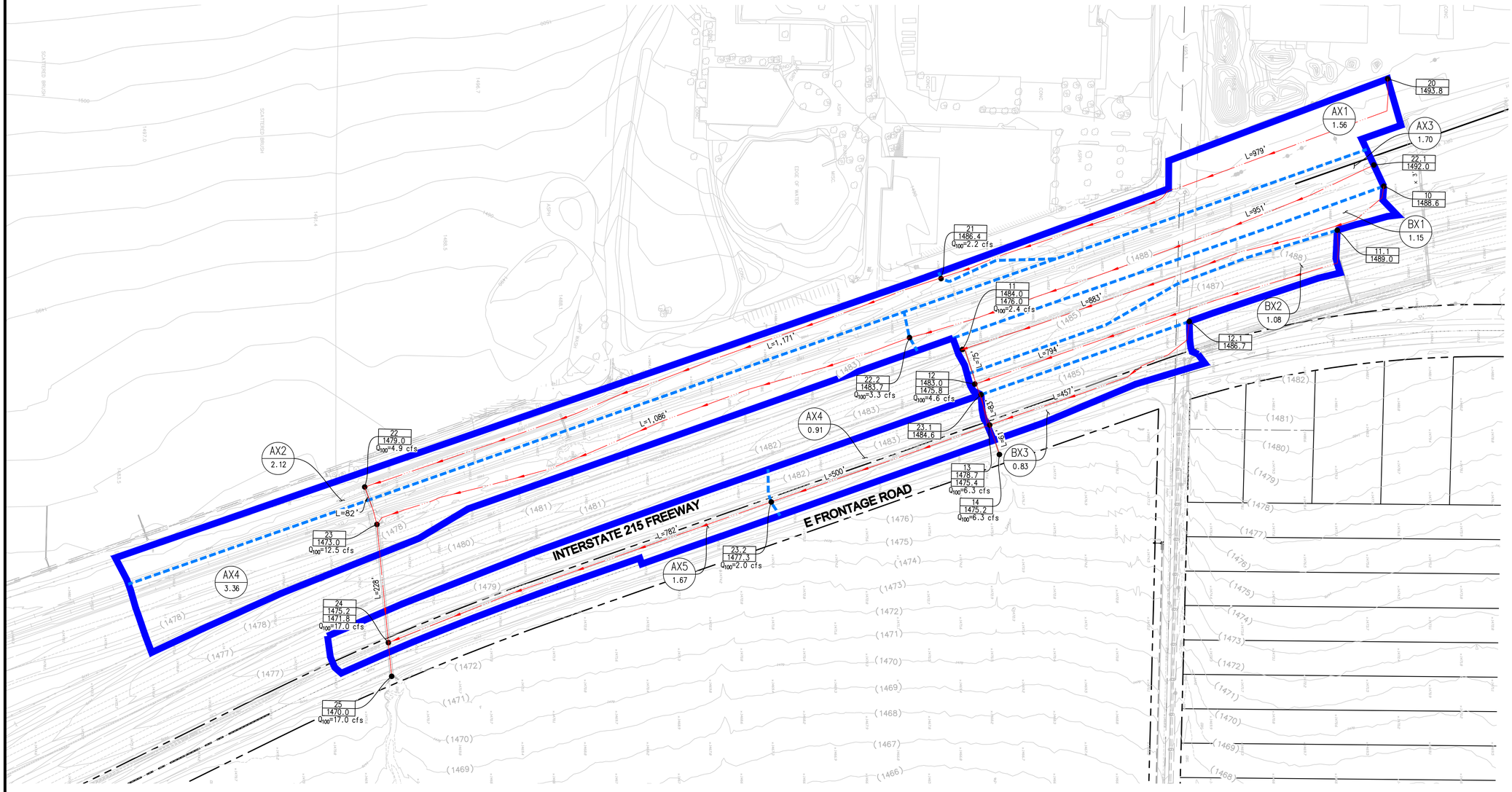
T4S, R3W, SEC 19
NOT TO SCALE

FMCIVIL ENGINEERS INC.
29995 TECHNOLOGY DRIVE, SUITE 306 | MURRIETA | CA 92563
951.331.9873 - FMCIVIL.COM

HARVEST LANDING SITE 2

FIGURE 1
VICINITY MAP

H:\PDATA\20-001 HARVEST LANDING\DWGS\EXHIBITS\20-001-VICINITY-MAP.DWG HECTOR 8/7/2022 11:37 PM



LEGEND

- D2 / 2.16 — DRAINAGE BASIN NAME
- DRAINAGE BASIN AREA(AC.)
- 11 / 1027.0 — NODE I.D. / ELEVATION
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- FLOW DIRECTION

SCALE 1"=100'

100 50 0 100 200 300

SCALE: 1"=100'

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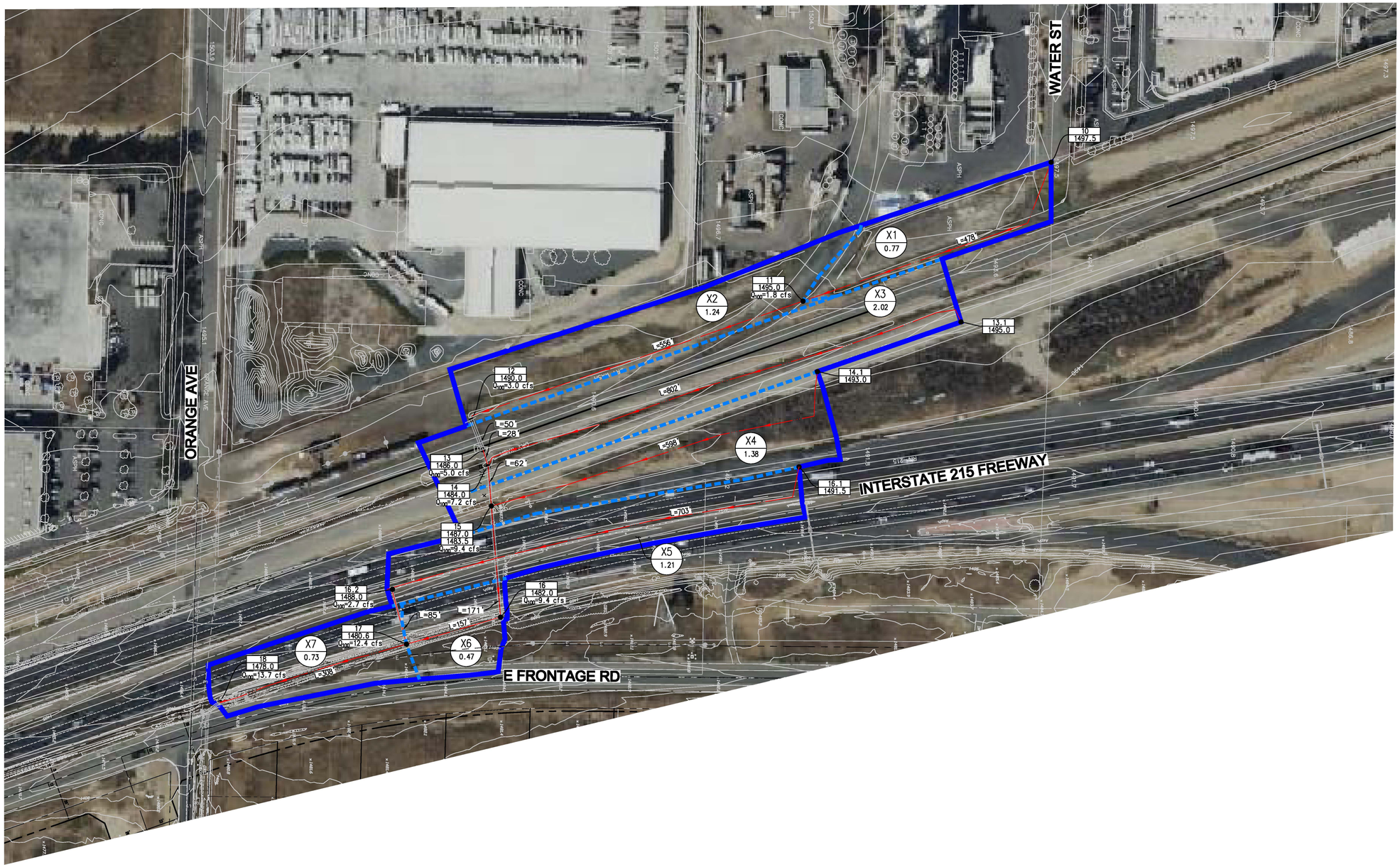
29995 TECHNOLOGY DRIVE, SUITE 306
MURRIETA | CA 92563
951.331.9873 - FMCIVIL.COM

HARVEST LANDING

SITE 2 - OFFSITE HYDROLOGY



LEGEND

- D2 / 2.16 — DRAINAGE BASIN NAME / DRAINAGE BASIN AREA(AC.)
- 11 / 1027.0 — NODE I.D. / ELEVATION
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- FLOW DIRECTION

SCALE 1"=80'

80 40 0 80 160 240

SCALE: 1"=80'

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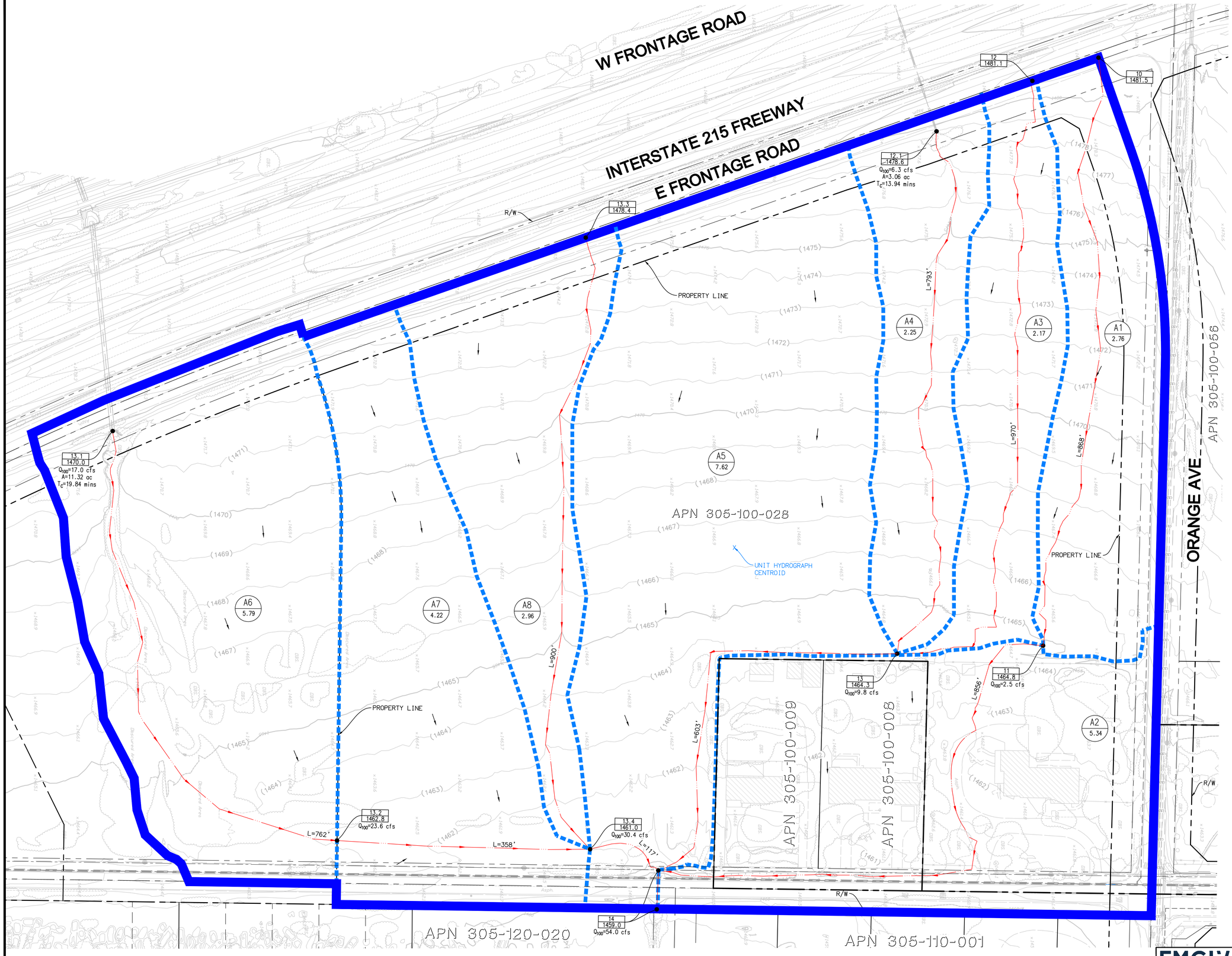
HARVEST LANDING

SITE 2 - PIPE OFFSITE FLOWS



UNIT HYDROGRAPH PARAMETERS			
L_{WC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
1,724	1,620	22.50	0.020

LEGEND

- D2 / 2.16 — DRAINAGE BASIN NAME / DRAINAGE BASIN AREA(AC.)
- 11 / 1027.0 — NODE I.D. / ELEVATION
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- FLOW DIRECTION

SCALE 1"=60'

60 30 0 60 120 180

SCALE: 1"=60'

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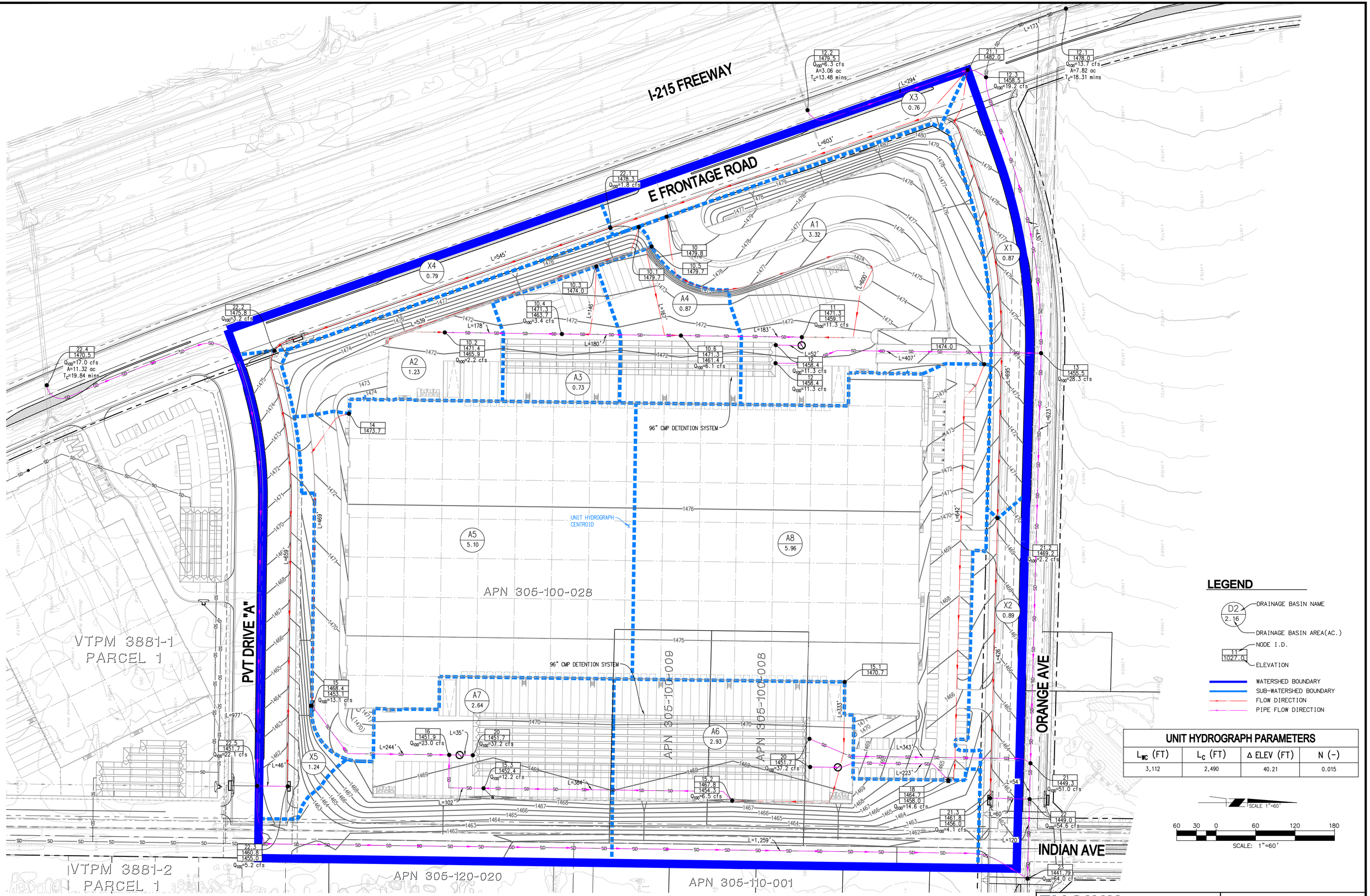
HARVEST LANDING

SITE 2 - EXISTING HYDROLOGY



LEGEND

- D2 / 2.16 — DRAINAGE BASIN NAME / DRAINAGE BASIN AREA(AC.)
- 11 / 1027.0 — NODE I.D. / ELEVATION
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- FLOW DIRECTION
- PIPE FLOW DIRECTION

UNIT HYDROGRAPH PARAMETERS			
L_{MC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
3,112	2,490	40.21	0.015

SCALE 1"=60'

60 30 0 60 120 180

SCALE: 1"=60'

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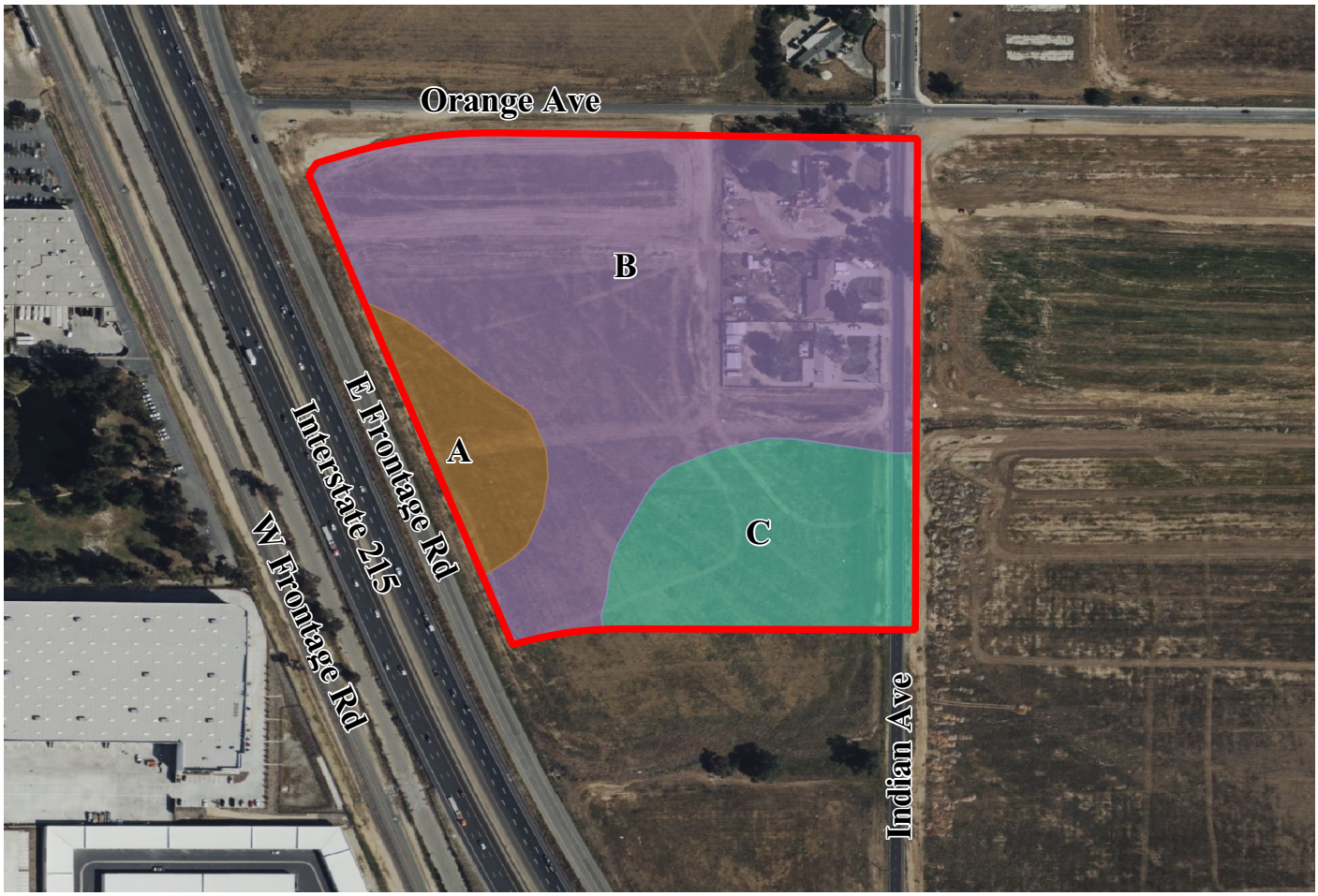
HARVEST LANDING

SITE 2 - PROPOSED DRAINAGE



LEGEND

- SITE 2 BOUNDARY
- HYDROLOGIC SOIL A
- HYDROLOGIC SOIL B
- HYDROLOGIC SOIL C

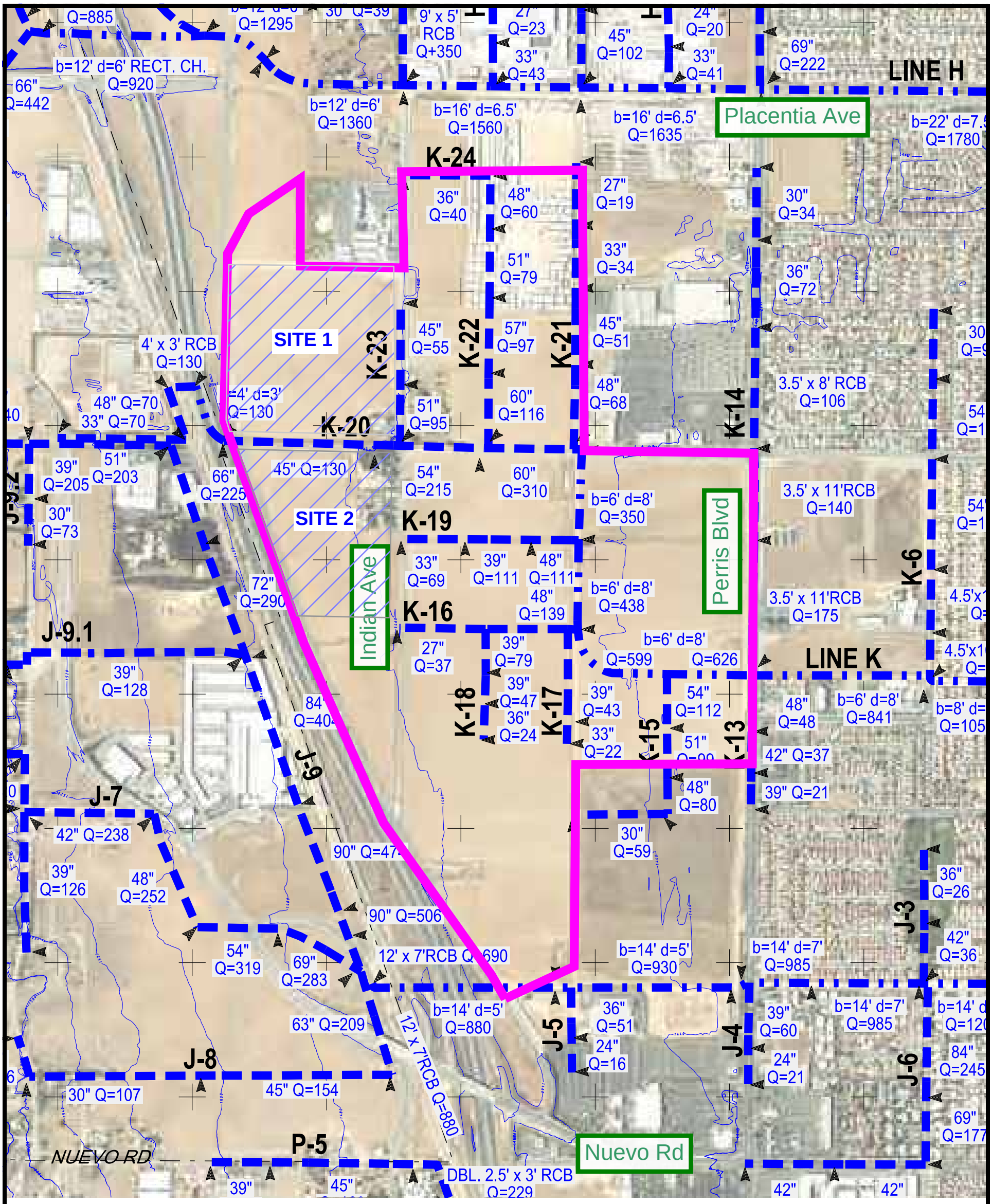
0 100 200 ft

FMCIVIL ENGINEERS INC.

Source: USDA Web Soil Survey

HARVEST LANDING

SITE 2 HYDROLOGICAL SOIL GROUPS



N.T.S.

Limits of master planned development - Howard Industrial

RCFC&WCD Master Drainage Plan Facilities for the Perris Valley Area, as shown in the digital exhibit map dated July 2014.

Site 1 and Site 2

RCFCD MDP FACILITIES OVERLAY

FMCIVIL ENGINEERS INC.

IN THE CITY OF PERRIS,
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM

VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

HOWARD INDUSTRIAL PARTNERS
1944 NORTH TUSTIN STREET, SUITE 122
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ENGINEER

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CONTACT: FRANCISCO MARTINEZ
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ARCHITECT

AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: STEPHEN PRZYBYLOWSKI
(TEL)714-639-9860

LEGEND

- RIGHT OF WAY
- (1025) EXISTING CONTOUR
- EASEMENT
- SD PROP. ONSITE STORM DRAIN SYSTEM
- SD PROP. OFFSITE STORM DRAIN SYSTEM
- PROP. STORM DRAIN LOW FLOW SYSTEM
- PROP. STORM DRAIN UNDER DRAIN SYSTEM
- W EXISTING WATER LINE
- W PROP. WATER LINE
- SS EXISTING SWR LINE
- SS PROP. SEWER LINE
- SD EXISTING STORM DRAIN PIPE
- E EXISTING OVERHEAD LINES

SCALE 1"=200'

200 100 0 200 400 600

SCALE: 1"=200'

CITY OF PERRIS

HARVEST LANDING INDUSTRIAL - PHASE I OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM EXHIBIT

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF.:	

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41870 KALMIA STREET, SUITE 120
MURRIETA, CA 92562
951.473.0202 - FMCIVIL.COM

SHEET 1 OF 2 SHEETS

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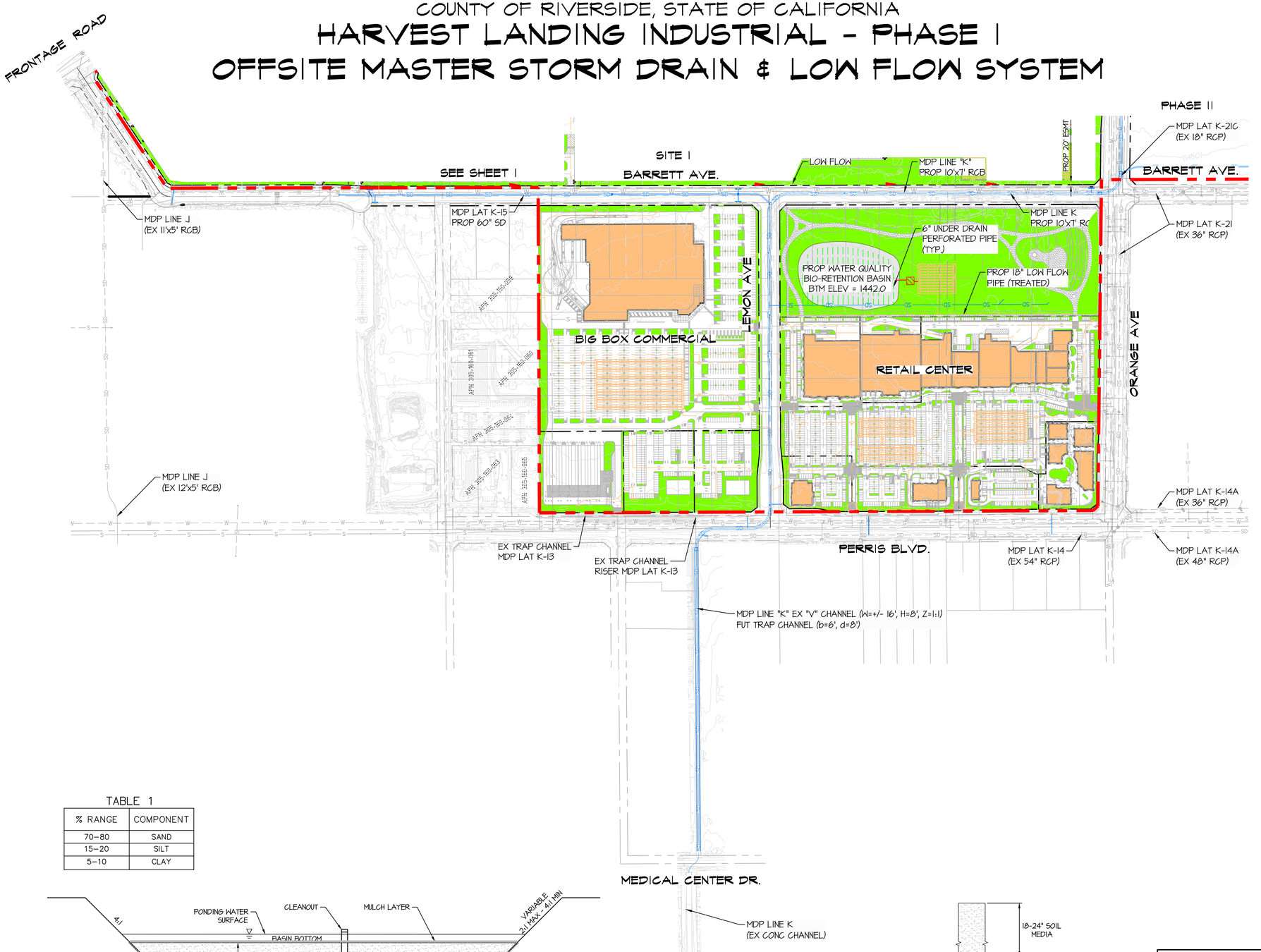
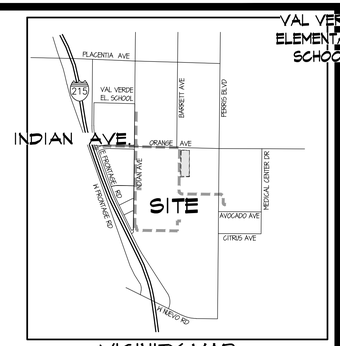
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM





VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

HOWARD INDUSTRIAL PARTNERS
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ARCHITECT

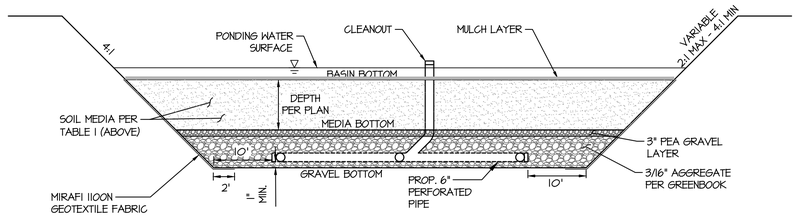
AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: STEPHEN PRZYBYLOWSKI
(TEL)714-639-9860

TABLE 1

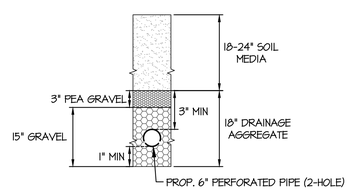
% RANGE	COMPONENT
70-80	SAND
15-20	SILT
5-10	CLAY

LEGEND

- RIGHT OF WAY
- (1025) EXISTING CONTOUR
- EASEMENT
- SD PROP. ONSITE STORM DRAIN SYSTEM
- SD PROP. OFFSITE STORM DRAIN SYSTEM
- PROP. STORM DRAIN LOW FLOW SYSTEM
- PROP. STORM DRAIN UNDER DRAIN SYSTEM
- W EXISTING WATER LINE
- W PROP. WATER LINE
- SS EXISTING SWR LINE
- SS PROP. SEWER LINE
- SD EXISTING STORM DRAIN PIPE
- E EXISTING OVERHEAD LINES



BASIN CROSS SECTION
N.T.S.



AGGREGATE CROSS SECTION
N.T.S.

SCALE 1"=200'

200 100 0 200 400 600
SCALE: 1"=200'

CITY OF PERRIS

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN
& LOW FLOW SYSTEM EXHIBIT

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF.:	

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SHEET 2 OF 2 SHEETS

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LEGEND

- (1025) — EXISTING CONTOUR
- 1025 — PROPOSED CONTOUR
- RETAINING WALL
- FENCE
- EDGE OF PAVEMENT
- SIGN
- MH — MANHOLE
- RIGHT OF WAY
- EASEMENT
- PARCEL LINE
- PARCEL MAP BOUNDARY
- STREET CENTER LINE
- SCREEN WALL
- COMBINATION SCREEN/RETAINING WALL
- EXISTING LOT LINE
- RIDGE LINE
- RIBBON GUTTER
- FLOW ARROW
- PROPOSED EDGE OF PAVEMENT
- EXISTING WATER LINE
- W — PROPOSED WATER LINE
- EXISTING SWR LINE
- SS — PROPOSED SEWER LINE
- EXISTING STORM DRAIN PIPE
- SD — PROPOSED STORM DRAIN PIPE
- EXISTING OVERHEAD LINES
- CUT/FILL LINE
- SLOPE SYMBOL

ZONING ORDINANCE

EXISTING ZONING:
HARVEST LANDING SPECIFIC PLANS - MULTIPLE BUSINESS USE (MBU)

PROPOSED ZONING:
HARVEST LANDING SPECIFIC PLANS - MULTIPLE BUSINESS USE (MBU)

ASSESSOR'S PARCEL NUMBERS:

305-100-028, 305-170-018, 305-100-008, & 305-100-009

LEGAL DESCRIPTION

PARCELS 2-5:
(APNS:305-100-028, 305-170-018, 305-100-008, 305-100-009)

THAT PORTION OF THE NORTHWEST QUARTER OF SECTION 19, TOWNSHIP 4 SOUTH, RANGE 3 WEST, SAN BERNARDINO BASE AND MERIDIAN, WHICH LIES EASTERLY OF STATE HIGHWAY 395 AS CONVEYED TO THE STATE OF CALIFORNIA BY DEED RECORDED APRIL 28, 1952 AS INSTRUMENT NO. 18008.

EXCEPTING THE NORTH 30 FEET IN ORANGE AVENUE, THE EAST 30 FEET IN INDIAN AVENUE AND THE SOUTH 30 FEET IN CITRUS AVENUE.

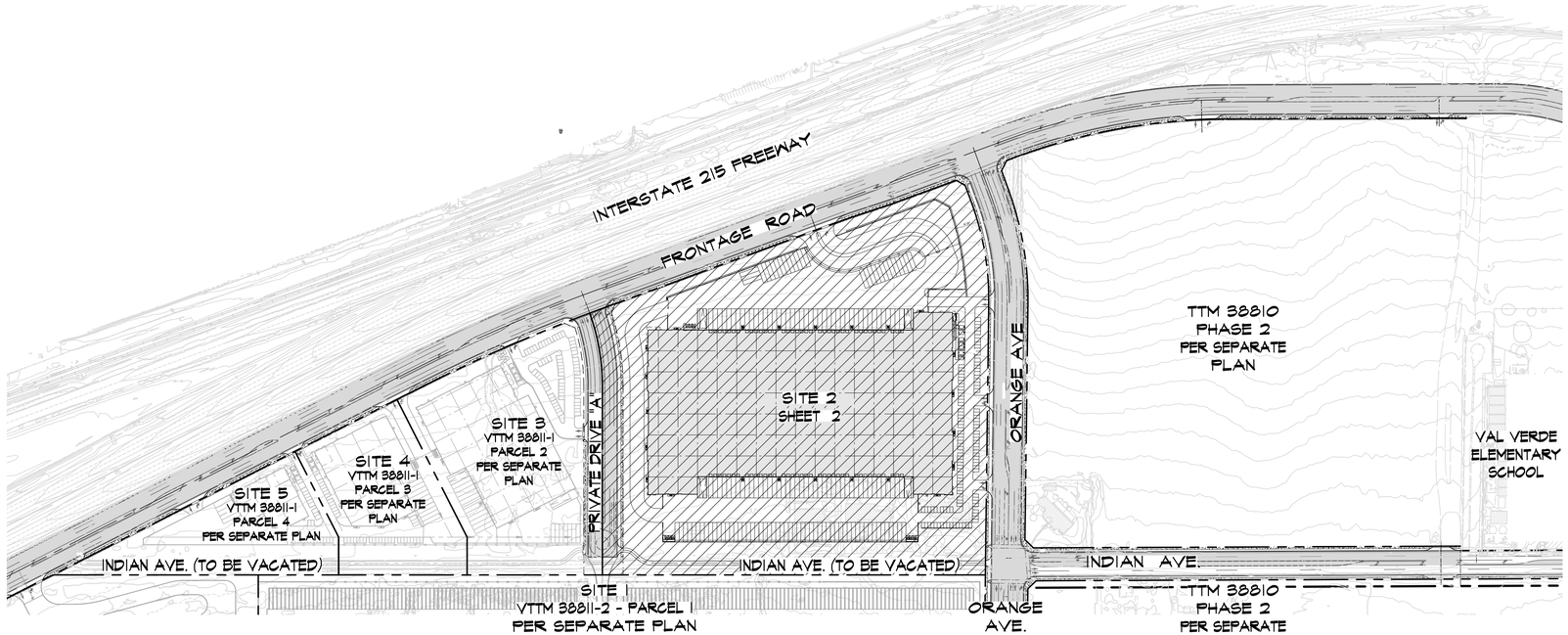
ALSO EXCEPTING THEREFROM THE PORTION DESCRIBED IN DEED RECORDED DECEMBER 21, 1965 AS INSTRUMENT NO. 142400 AND IN DEED RECORDED MARCH 13, 1969 AS INSTRUMENT NO. 24345, RECORDS OF RIVERSIDE COUNTY.

ALSO EXCEPTING THEREFROM THOSE PORTIONS CONVEYED TO THE STATE OF CALIFORNIA BY DEEDS RECORDED MARCH 22, 1992, AS INSTRUMENT NOS. 94602 AND 94603.

IN THE CITY OF PERRIS,
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

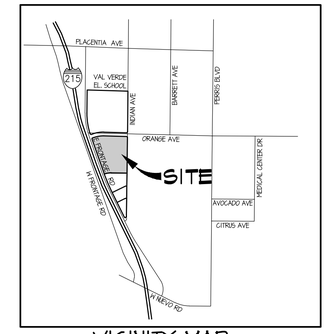
HARVEST LANDING RETAIL CENTER & BUSINESS PARK
SITE #2 CONCEPTUAL GRADING & DRAINAGE PLAN

VESTING TENTATIVE TRACT MAP 38811-1 - PARCEL 1



INDEX MAP

200 100 0 200 400 600
SCALE: 1"=200'



VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

HOWARD INDUSTRIAL PARTNERS
1944 NORTH TUSTIN STREET, SUITE 122
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CONTACT: TIM HOWARD
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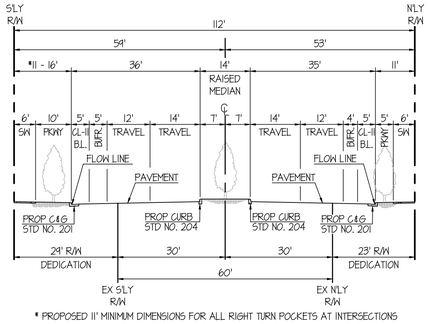
ARCHITECT

AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: DAN MACDAVID
(TEL)714-634-9860

EARTHWORK ESTIMATE:

RAW CUT:	2,780 CY
RAW FILL:	192,100 CY
NET:	189,320 CY IMPORT

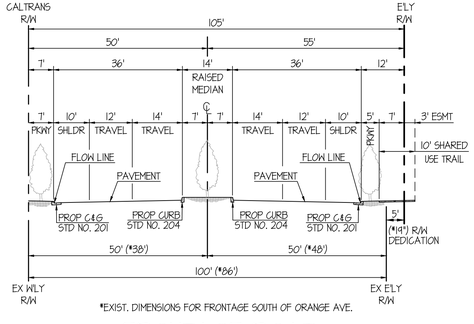
HAUL TRIPS:
ASSUMED (13 CY PER TRIP) = 14,564



* PROPOSED 11' MINIMUM DIMENSIONS FOR ALL RIGHT TURN POCKETS AT INTERSECTIONS

ORANGE AVENUE (WEST OF BARRETT AVE) SECONDARY ARTERIAL

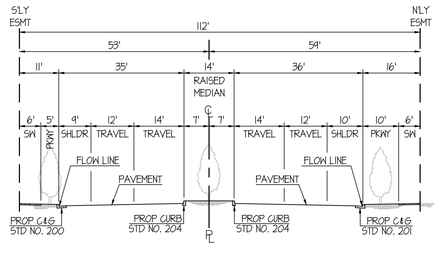
(112'/85')



*EXIST. DIMENSIONS FOR FRONTAGE SOUTH OF ORANGE AVE.

FRONTAGE ROAD SECONDARY ARTERIAL

(105'/84')



PRIVATE DRIVE "A" SECONDARY ARTERIAL

(112'/85')

CITY OF PERRIS

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
SITE #2 CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-1 - PARCEL 1

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF:	

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SHEET 1 OF 2 SHEETS

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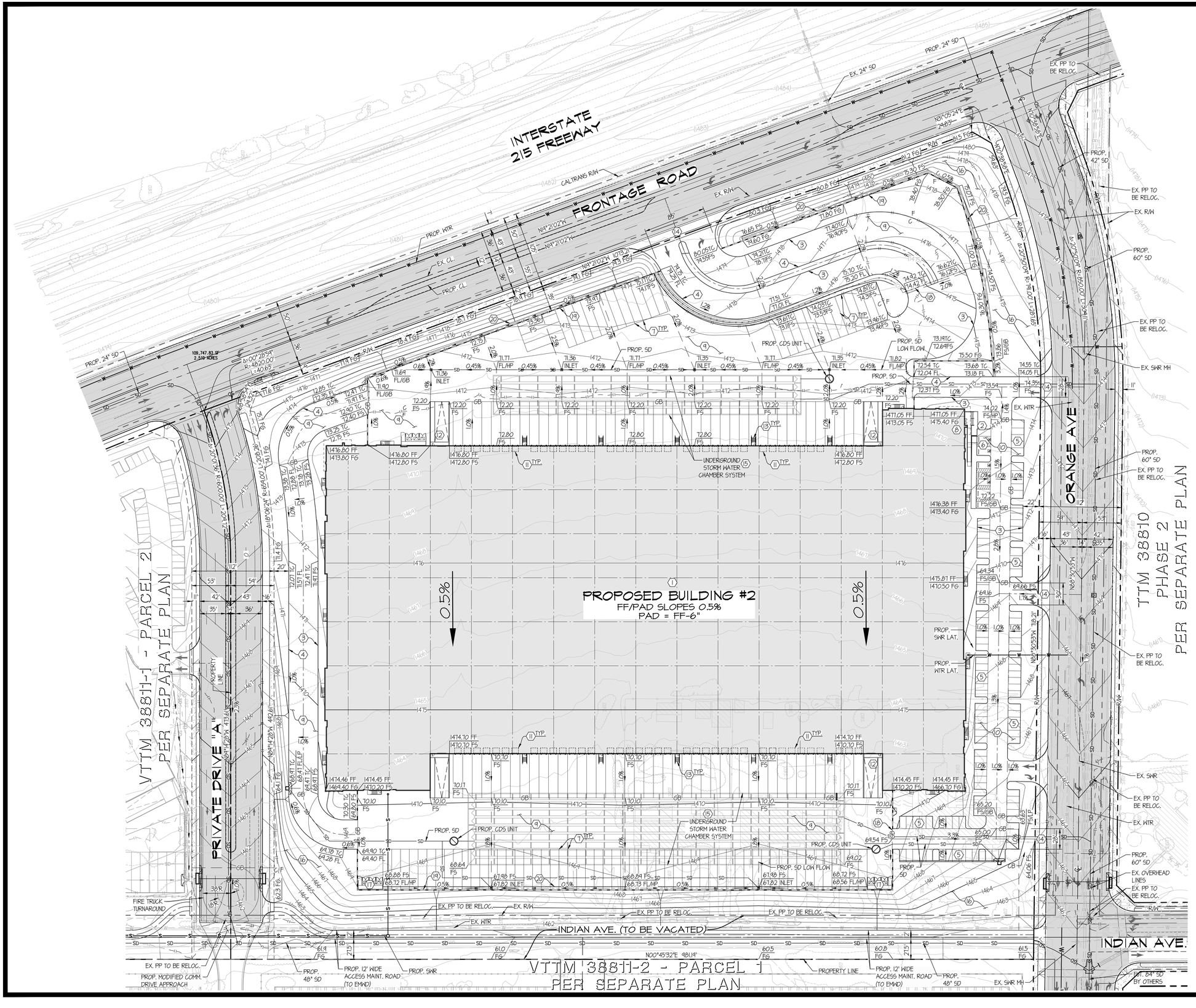

SITE PLAN KEYNOTES

1. PAINTED CONCRETE TILT-UP WAREHOUSE / OFFICE / MANUFACTURING FACILITY. BUILDING TO BE DESIGNED PER ARCHITECT'S PLANS
2. ON SITE ACCESSIBLE SIDEWALK AND CURB RAMPS.
3. CONCRETE CURB
4. CONCRETE CURB & GUTTER
5. STANDARD PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
6. HANDICAP PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
7. TRAILER / TRACTOR PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
8. ACCESSIBLE BUILDING ENTRY WITH ADJACENT BICYCLE RACKS PER ARCHITECT'S PLANS
9. PORTLAND CONC. CEMENT (PCC) PAVED TRUCK YARD ARCHITECT'S PLANS
10. PORTLAND CONC. CEMENT (PCC) PAVED AUTO PARKING ARCHITECT'S PLANS
11. DOCK HIGH TRUCK DOOR PER ARCHITECT'S PLANS
12. GRADE LEVEL RAMP DOOR PER ARCHITECT'S PLANS
13. EXTERIOR MAN DOOR AND STAIRS W/GUARD POST PER ARCHITECT'S PLANS
14. COMMERCIAL DRIVEWAY APPROACH PER RIVERSIDE COUNTY STD.207A, WITH DECORATIVE CONCRETE PAVING PER ARCHITECT'S PLANS
15. UNDERGROUND STORM WATER CHAMBER SYSTEM
16. LANDSCAPE AREA PER LANDSCAPE ARCHITECT'S PLANS
17. APPROXIMATE LOCATION OF TRASH ENCLOSURE
18. ENTRY GATE PER ARCHITECT'S PLANS
19. SCREEN WALL PER ARCHITECT'S PLANS (COMBO RETAINING)
20. CONCRETE RIBBON GUTTER/SWALE

SCALE 1"=60'

60 30 0 60 120 180

SCALE: 1"=60'

CITY OF PERRIS

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
SITE #2 CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-1 - PARCEL 1

SCALE: AS SHOWN	
DATE: OCT. 2024	
DESIGNED: AJ	
CHECKED: FM	
PLN CK REF.:	

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SHEET 2 OF 2 SHEETS

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DEVELOPMENT PLAN REVIEW VTPM 38811-1
PARCEL 2 – SITE 3
CITY OF PERRIS
RIVERSIDE COUNTY, CALIFORNIA

Drainage Study Report

Prepared for:
Howard Industrial Partners LLC
1944 North Tustin Street, Suite 122
Orange, CA 92865

Prepared By:

FM CIVIL ENGINEERS INC.

29995 Technology Drive, Suite 306
Murrieta, CA 92563

Engineer of Work/Contacts:

Francisco Martinez, Jr.

April 12, 2024
Revised: October 4, 2024

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CONCLUSIONS & RECOMMENDATIONS 3

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100-YEAR-1 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD) 2-1

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SECTION 1 - GENERAL OVERVIEW

INTRODUCTION

The purpose of this study is to support the entitlement phase and determine minimum drainage improvements required for the proposed industrial development of approximately 5.7 acres and 91,000 square feet warehouse building with 10 truck docks, and parking lot that lays within the Harvest Landing Specific Plan, located in the City of Perris, County of Riverside CA. More specifically, the project site is bounded to the north by the proposed Private Drive "A" and the 215 freeway is to the west and Indian Avenue to the east and vacant undeveloped land to the south.

The primary objectives of this report are as follows:

1. Delineate the drainage areas tributary to the onsite above/underground basin

2. Based on drainage patterns, ground slope, land use and soil type and using the Riverside County Rational Method, perform hydrologic and hydraulics of onsite drainage facilities.

3. Determine the 100-year peak storm flows based upon the pre-project and post-project condition for the 24-hour storm duration utilizing the Unit Hydrograph Method as outlined in the Riverside County Flood Control & Water Conservation District Hydrology Manual.

4. Determine the required underground detention facilities to mitigate the 100-year peak storm flows for the 24-hour storm duration in the post-project condition to flows less than or equal to the existing condition flow rates.

5. Determine the required the minimum storm drain infrastructure to flood protect the project site for the 100-year storm event.

6. Preparation of a hydrology report, which consist of hydrological and analytical results and exhibits.

BACKGROUND

EXISTING CONDITIONS

The project site is located within Riverside County Flood Control's Perris Valley Master Drainage Plan, and tributary to a low point in Perris Boulevard and the existing MDP Line "K" (earthen V-Channel) located about 2600 lineal feet east of Indian Avenue.

The site is in a relatively mild to flat sloping undeveloped terrain on a drainage area which drains easterly towards Indian Avenue; however, there are offsite flows that enter the site at Frontage Road on the westerly property boundary via an existing 6'x3' RCB, see Exhibit "B". This existing box traverses Caltrans right-of-way, it collects and conveys flows from the west side of the railroad tracks and the 215 freeway. All the developed storm flows continue to travel easterly through the property, to Indian Avenue and the vacant parcels to the east where it ultimately reaches a low point at Perris Boulevard; storm drain flows are intercepted by existing street inlets and the existing MDP Line "K". MDP Line "K" is an earthen "V" channel (w= 16', H=8' & z=1:1) and planned as a future Trapezoidal Channel (b=6, d=8').

DEVELOPED CONDITIONS

The preliminary offsite design is shown on Exhibit G "Harvest Landing Industrial Phase 1 Offsite Master Storm Drain & Low Flow System". The offsite master storm drain system (backbone) will be a part of a separate report and therefore excluded. The onsite storm water runoff will be collected and treated using proprietary devices to accommodate the water quality component of mitigation. The onsite storm water runoff will be conveyed to an underground chamber system to mitigate the increased storm runoff to be at or below the current MDP land use condition flow. See the table below for the rational method results:

Description	Q_{100} Peak Flow Rates
Proposed	16.2
Existing	11.0
Onsite MDP	13.8

For purposes of this preliminary drainage report, the 100-year 24-hour peak flow rates for the post developed condition, predeveloped condition and proposed developed condition per the land use on the MDP were the only storm events analyzed for mitigation. The project storm mitigation is provided by utilizing the underground storm drain detention system and the outlet control structures. The total mitigation volume required was determined by selecting the flow rates from the recess limb of the proposed unit hydrograph runs for the 100-year 24-hour storm event that are equal or less than the flow rates from existing conditions. Smaller storm events were analyzed, however, since the storm volume demand to mitigate the storm flows from the 100-year 24hour event are considerably larger than volumes produced by the smaller storm events, thus a conservative approach.

MDP Condition Volume: 0.71 ac-ft; $Q_{100\text{-}24hr}$: 3.99 cfs
Proposed Condition Volume: 1.38 ac-ft; $Q_{100\text{-}24hr}$: 3.92 cfs
Underground Chamber Volume: *1.96 ac-ft

*Since this volume is greater than 1.38 ac-ft the underground chambers (collectively) have enough storage to mitigate the volume of the 100 year 24 hour storm. The peak storm flows will be mitigated to the existing MDP levels. See the table below for the unit hydrograph results:

Storm Duration	SP Q_{peak}	SP V_{TOTAL}	MDP Q_{PEAK}	MDP V_{TOTAL}
1	18.80	0.5734	19.61	0.6355
3	12.12	0.9409	12.04	0.9496
6	9.93	1.1167	9.89	1.1214
24	3.92	2.1039	3.99	2.1089
Acreage	7.18		7.18	

METHODOLOGY

HYDROLOGY

Hydrologic calculations were performed using the Riverside County Rational Method from RCFCD & WCD Hydrology Manual, dated April 1978. The 100-year design discharge was computed by generating a hydrologic "link-node" model in which divides the area into drainage sub-areas, each tributary to a concentration point or hydrologic "node" point determined by the proposed layout. The computer results are included in section 2. The following assumptions/guidelines were applied for use of the Rational Method:

1. The map from the Riverside County Hydrology Manual indicates that the study area is primarily Group "B" soils, with smaller areas as "A". A USGS soils map for the project site is included as Exhibit E, under the Exhibit section.
2. Initial sub-areas were drawn to be less than 10-acres in size and less than 1,000 feet in length, per County guidelines. Time of concentration for the initial sub-area is based on Time of Concentration Nomograph for Initial Sub-area from the Hydrology Manual.
3. Antecedent Moisture Condition 2 was used for 100-year storm events.
4. Standard intensity-duration curve data for the project area was used for the Perris Valley area; Plate D-4.1.

HYDRAULICS

Civil Design hydrology module was used for preliminarily sizing the storm drainpipe system. The onsite storm drain infrastructure will consist of pipe sizes ranging from 12"-24" in diameter. A more detail analysis will be provided in subsequent submittals and a WSPG analysis for onsite storm drainpipe system will be performed during final engineering.

CONCLUSIONS & RECOMMENDATIONS

The hydrology analyses evaluated the proposed development to determine the necessary onsite drainage improvements required to mitigate flows for increased runoff and it has been concluded that:

1. The proposed drainage facilities will adequately convey the 100-year flows and provide flood protection to the project site.

2. The proposed underground pipe chamber system will have sufficient storage to adequately mitigate for increased runoff.

SECTION 2 - HYDROLOGY ANALYSIS

100-YEAR EXISTING ON-SITE HYDROLOGY WITH OFFSITES (RATIONAL METHOD)

100-YEAR EXISTING ON-SITE HYDROLOGY NO OFFSITES (RATIONAL METHOD)

100-YEAR PROPOSED LAND USE MDP ON-SITE HYDROLOGY (RATIONAL METHOD)

100-YEAR EXISTING OFF-SITE HYDROLOGY E FRONTAGE ROAD AREA A (RATIONAL METHOD)

100-YEAR EXISTING OFF-SITE HYDROLOGY E FRONTAGE ROAD AREA B (RATIONAL METHOD)

100-YEAR PROPOSED ON-SITE HYDROLOGY WITH OFFSITES (RATIONAL METHOD)

100-YEAR PROPOSED OFF-SITE HYDROLOGY E FRONTAGE ROAD (RATIONAL METHOD)

100-YEAR PROPOSED ON-SITE HYDROLOGY NO OFFSITES (RATIONAL METHOD)

100-YEAR-24 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-24 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-6 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-6 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-3 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-3 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 09/18/23
File:X100OVERALL.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
EXISTING CONDITION - WITH OFFSITES
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 10.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 1.926(In/Hr) for a 100.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.827
Decimal fraction soil group A = 0.540

```
Decimal fraction soil group B = 0.360
Decimal fraction soil group C = 0.100
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  44.60
Pervious area fraction =  0.175; Impervious fraction =  0.825
User specified values are as follows:
TC =  19.84 min.  Rain intensity =       1.93(In/Hr)
Total area =        11.32(Ac.)  Total runoff =     17.00(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       11.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     17.548(CFS)
Depth of flow =   0.310(Ft.), Average velocity =   1.824(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.00
      2            100.00              0.00
      3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     17.548(CFS)
  '     '    flow top width =     62.040(Ft.)
  '     '    velocity=    1.824(Ft/s)
  '     '    area =      9.622(Sq.Ft)
  '     '    Froude number =     0.816

Upstream point elevation =  1470.000(Ft.)
Downstream point elevation =  1466.600(Ft.)
Flow length =   209.000(Ft.)
Travel time  =    1.91 min.
Time of concentration =   21.75 min.
Depth of flow =   0.310(Ft.)
Average velocity =   1.824(Ft/s)
Total irregular channel flow =    17.548(CFS)
Irregular channel normal depth above invert elev. =   0.310(Ft.)
Average velocity of channel(s) =   1.824(Ft/s)
 Adding area flow to channel
USER INPUT of soil data for subarea
Runoff Coefficient = 0.819
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  88.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.841(In/Hr) for a   100.0 year storm
Subarea runoff =      1.101(CFS) for      0.730(Ac.)
Total runoff =     18.101(CFS)      Total area =      12.050(Ac.)
Depth of flow =   0.314(Ft.), Average velocity =   1.838(Ft/s)


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Process from Point/Station       11.000 to Point/Station       12.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
____________________________________________________________________
Estimated mean flow rate at midpoint of channel =     21.824(CFS)
Depth of flow =   0.396(Ft.), Average velocity =   1.394(Ft/s)
      ******* Irregular Channel Data ***********
--------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.00
      2            100.00              0.00
      3            200.00              1.00
Manning's 'N' friction factor =   0.030
--------------------------------------------------------------------
Sub-Channel flow  =     21.824(CFS)
  '     '    flow top width =     79.133(Ft.)
  '     '    velocity=    1.394(Ft/s)
  '     '    area =     15.655(Sq.Ft)
  '     '    Froude number =     0.552

Upstream point elevation =  1466.600(Ft.)
Downstream point elevation =  1462.800(Ft.)
Flow length =   553.000(Ft.)
Travel time  =    6.61 min.
Time of concentration =   28.36 min.
Depth of flow =   0.396(Ft.)
Average velocity =   1.394(Ft/s)
Total irregular channel flow =    21.824(CFS)
Irregular channel normal depth above invert elev. =   0.396(Ft.)
Average velocity of channel(s) =   1.394(Ft/s)
 Adding area flow to channel
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.622
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.700
Decimal fraction soil group C = 0.300
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  64.90
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.617(In/Hr) for a   100.0 year storm
Subarea runoff =      7.387(CFS) for      7.340(Ac.)
Total runoff =     25.488(CFS)      Total area =      19.390(Ac.)
Depth of flow =   0.419(Ft.), Average velocity =   1.449(Ft/s)
End of computations, total study area =           19.39 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.518
Area averaged RI index number =  53.9
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 09/19/23 File:x100uh.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
EXISTING CONDITION - NO OFFSITES
100 - YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 209.000(Ft.)
Top (of initial area) elevation = 1470.000(Ft.)
Bottom (of initial area) elevation = 1466.600(Ft.)
Difference in elevation = 3.400(Ft.)
Slope = 0.01627 s(percent)= 1.63
TC = k(0.530)*[(length^3)/(elevation change)]^0.2

```
Initial area time of concentration =   10.235 min.
Rainfall intensity =      2.664(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.789
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      1.534(CFS)
Total initial stream area =        0.730(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      6.281(CFS)
Depth of flow =   0.248(Ft.), Average velocity =   1.021(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.00
      2            100.00              0.00
      3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      6.281(CFS)
  '     '    flow top width =     49.604(Ft.)
  '     '    velocity=    1.021(Ft/s)
  '     '    area =      6.151(Sq.Ft)
  '     '    Froude number =     0.511

Upstream point elevation =  1466.600(Ft.)
Downstream point elevation =  1462.800(Ft.)
Flow length =   553.000(Ft.)
Travel time  =    9.03 min.
Time of concentration =   19.26 min.
Depth of flow =   0.248(Ft.)
Average velocity =   1.021(Ft/s)
Total irregular channel flow =     6.281(CFS)
Irregular channel normal depth above invert elev. =   0.248(Ft.)
Average velocity of channel(s) =   1.021(Ft/s)
 Adding area flow to channel
USER INPUT of soil data for subarea
Runoff Coefficient = 0.657
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.700
Decimal fraction soil group C = 0.300
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  64.90
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.954(In/Hr) for a   100.0 year storm
Subarea runoff =      9.431(CFS) for      7.340(Ac.)
```

Total runoff = 10.965(CFS) Total area = 8.070(Ac.)
Depth of flow = 0.306(Ft.), Average velocity = 1.174(Ft/s)
End of computations, total study area = 8.07 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 66.1

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 09/19/23 File:x100uh.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LANDUSE CONDITION
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 209.000(Ft.)
Top (of initial area) elevation = 1470.000(Ft.)
Bottom (of initial area) elevation = 1466.600(Ft.)
Difference in elevation = 3.400(Ft.)
Slope = 0.01627 s(percent)= 1.63

```
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.531 min.
Rainfall intensity =      3.096(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.786
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      1.777(CFS)
Total initial stream area =        0.730(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      7.822(CFS)
Depth of flow =   0.269(Ft.), Average velocity =   1.079(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.00
      2            100.00              0.00
      3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      7.822(CFS)
  '     '    flow top width =     53.858(Ft.)
  '     '    velocity=    1.079(Ft/s)
  '     '    area =      7.252(Sq.Ft)
  '     '    Froude number =     0.518

Upstream point elevation =  1466.600(Ft.)
Downstream point elevation =  1462.800(Ft.)
Flow length =   553.000(Ft.)
Travel time  =    8.54 min.
Time of concentration =   16.08 min.
Depth of flow =   0.269(Ft.)
Average velocity =   1.079(Ft/s)
Total irregular channel flow =     7.822(CFS)
Irregular channel normal depth above invert elev. =   0.269(Ft.)
Average velocity of channel(s) =   1.079(Ft/s)
 Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.767
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.700
Decimal fraction soil group C = 0.300
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  59.90
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      2.135(In/Hr) for a   100.0 year storm
```

```
Subarea runoff =     12.028(CFS) for      7.340(Ac.)
Total runoff =     13.805(CFS)      Total area =       8.070(Ac.)
Depth of flow =   0.333(Ft.), Average velocity =   1.243(Ft/s)
End of computations, total study area =            8.07 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged RI index number =  59.5
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 08/14/23 File:1.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
EXISTING CONDITION OFFSITES - SUB AREA -AX
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 20.000 to Point/Station 21.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 979.000(Ft.)
Top (of initial area) elevation = 1493.800(Ft.)
Bottom (of initial area) elevation = 1486.400(Ft.)
Difference in elevation = 7.400(Ft.)
Slope = 0.00756 s(percent)= 0.76
TC = k(0.420)*[(length^3)/(elevation change)]^0.2

```
Initial area time of concentration =   17.534 min.
Rainfall intensity =      2.047(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.695
Decimal fraction soil group A = 0.440
Decimal fraction soil group B = 0.090
Decimal fraction soil group C = 0.470
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  51.55
Pervious area fraction =  0.600; Impervious fraction =  0.400
Initial subarea runoff =      2.219(CFS)
Total initial stream area =        1.560(Ac.)
Pervious area fraction = 0.600


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      3.604(CFS)
Depth of flow =   0.582(Ft.), Average velocity =   2.156(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              2.00
      2              4.00              0.00
      3              6.00              0.00
      4              8.00              2.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      3.604(CFS)
  '     '    flow top width =      3.745(Ft.)
  '     '    velocity=    2.156(Ft/s)
  '     '    area =      1.671(Sq.Ft)
  '     '    Froude number =     0.569

Upstream point elevation =  1486.400(Ft.)
Downstream point elevation =  1479.000(Ft.)
Flow length =  1171.000(Ft.)
Travel time  =    9.05 min.
Time of concentration =   26.58 min.
Depth of flow =   0.582(Ft.)
Average velocity =   2.156(Ft/s)
Total irregular channel flow =     3.604(CFS)
Irregular channel normal depth above invert elev. =   0.582(Ft.)
Average velocity of channel(s) =   2.156(Ft/s)
 Adding area flow to channel
USER INPUT of soil data for subarea
Runoff Coefficient = 0.759
Decimal fraction soil group A = 0.650
Decimal fraction soil group B = 0.350
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  80.00
Pervious area fraction =  0.940; Impervious fraction =  0.060
Rainfall intensity =      1.669(In/Hr) for a   100.0 year storm
```

```
Subarea runoff =      2.686(CFS) for      2.120(Ac.)
Total runoff =      4.905(CFS)      Total area =       3.680(Ac.)
Depth of flow =   0.687(Ft.), Average velocity =   2.354(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1479.000(Ft.)
Downstream point/station elevation =  1473.000(Ft.)
Pipe length  =    82.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.905(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.905(CFS)
Normal flow depth in pipe =    6.06(In.)
Flow top width inside pipe =   12.00(In.)
Critical Depth =   10.94(In.)
Pipe flow velocity =     12.33(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    26.70 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      3.680(Ac.)
Runoff from this stream =      4.905(CFS)
Time of concentration =   26.70 min.
Rainfall intensity =     1.666(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.100 to Point/Station       22.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   951.000(Ft.)
Top (of initial area) elevation =  1492.000(Ft.)
Bottom (of initial area) elevation =  1483.700(Ft.)
Difference in elevation =     8.300(Ft.)
Slope =    0.00873  s(percent)=       0.87
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.951 min.
Rainfall intensity =      2.374(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.828
Decimal fraction soil group A = 0.570
Decimal fraction soil group B = 0.190
Decimal fraction soil group C = 0.240
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  45.44
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      3.340(CFS)
```

```
Total initial stream area =        1.700(Ac.)
Pervious area fraction = 0.200


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.200 to Point/Station       23.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      6.204(CFS)
Depth of flow =   0.692(Ft.), Average velocity =   2.950(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              2.00
      2              4.00              0.00
      3              6.00              0.00
      4              8.00              2.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      6.204(CFS)
  '     '    flow top width =      4.077(Ft.)

  '     '    velocity=    2.950(Ft/s)
  '     '    area =      2.103(Sq.Ft)
  '     '    Froude number =     0.724

Upstream point elevation =  1483.700(Ft.)
Downstream point elevation =  1473.000(Ft.)
Flow length =  1086.000(Ft.)
Travel time  =    6.14 min.
Time of concentration =   19.09 min.
Depth of flow =   0.692(Ft.)
Average velocity =   2.950(Ft/s)
Total irregular channel flow =     6.204(CFS)
Irregular channel normal depth above invert elev. =   0.692(Ft.)
Average velocity of channel(s) =   2.950(Ft/s)
 Adding area flow to channel
USER INPUT of soil data for subarea
Runoff Coefficient = 0.859
Decimal fraction soil group A = 0.440
Decimal fraction soil group B = 0.560
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  82.00
Pervious area fraction =  0.350; Impervious fraction =  0.650
Rainfall intensity =      1.963(In/Hr) for a   100.0 year storm
Subarea runoff =      5.667(CFS) for      3.360(Ac.)
Total runoff =      9.007(CFS)      Total area =       5.060(Ac.)
Depth of flow =   0.844(Ft.), Average velocity =   3.270(Ft/s)


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Process from Point/Station       22.200 to Point/Station       23.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
```

```
In Main Stream number: 2
Stream flow area =      5.060(Ac.)
Runoff from this stream =      9.007(CFS)
Time of concentration =   19.09 min.
Rainfall intensity =     1.963(In/Hr)
Summary of stream data:

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


1        4.905     26.70               1.666
2        9.007     19.09               1.963
Largest stream flow has longer or shorter time of concentration
Qp =      9.007 + sum of
        Qa          Tb/Ta
         4.905 *    0.715 =      3.507
Qp =     12.513

Total of 2 main streams to confluence:
Flow rates before confluence point:
       4.905       9.007
Area of streams before confluence:
        3.680        5.060


Results of confluence:
Total flow rate =     12.513(CFS)
Time of concentration =    19.087 min.
Effective stream area after confluence  =      8.740(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1473.000(Ft.)
Downstream point/station elevation =  1471.800(Ft.)
Pipe length  =   228.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.513(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    12.513(CFS)
Normal flow depth in pipe =   15.68(In.)
Flow top width inside pipe =   22.84(In.)
Critical Depth =   15.26(In.)
Pipe flow velocity =      5.75(Ft/s)
Travel time through pipe =    0.66 min.
Time of concentration (TC) =    19.75 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       24.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      8.740(Ac.)
```

```
Runoff from this stream =     12.513(CFS)
Time of concentration =   19.75 min.
Rainfall intensity =     1.931(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.100 to Point/Station       23.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   500.000(Ft.)
Top (of initial area) elevation =  1484.600(Ft.)
Bottom (of initial area) elevation =  1477.300(Ft.)
Difference in elevation =     7.300(Ft.)
Slope =    0.01460  s(percent)=       1.46
TC = k(0.336)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.398 min.
Rainfall intensity =      2.778(In/Hr) for a   100.0 year storm
MOBILE HOME PARK subarea type
Runoff Coefficient = 0.789
Decimal fraction soil group A = 0.960
Decimal fraction soil group B = 0.040
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  32.96
Pervious area fraction =  0.250; Impervious fraction =  0.750
Initial subarea runoff =      1.994(CFS)
Total initial stream area =        0.910(Ac.)
Pervious area fraction = 0.250


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Process from Point/Station       23.200 to Point/Station       24.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1477.300(Ft.)
Downstream point elevation =  1475.200(Ft.)
Channel length thru subarea  =   782.000(Ft.)
Channel base width      =    2.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Estimated mean flow rate at midpoint of channel =      3.605(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    2.000(Ft.)
Flow(q) thru subarea =      3.605(CFS)
Depth of flow =   0.482(Ft.), Average velocity =   2.521(Ft/s)
Channel flow top width =    3.930(Ft.)
Flow Velocity =    2.52(Ft/s)
Travel time  =    5.17 min.
Time of concentration =   14.57 min.

Sub-Channel No. 1 Critical depth =      0.406(Ft.)
  '     '       '     Critical flow top width =      3.625(Ft.)
  '     '       '     Critical flow velocity=    3.155(Ft/s)
  '     '       '     Critical flow area =      1.143(Sq.Ft)

 Adding area flow to channel
```

```
USER INPUT of soil data for subarea
Runoff Coefficient = 0.843
Decimal fraction soil group A = 0.420
Decimal fraction soil group B = 0.580
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  65.00
Pervious area fraction =  0.260; Impervious fraction =  0.740
Rainfall intensity =      2.241(In/Hr) for a   100.0 year storm
Subarea runoff =      3.156(CFS) for      1.670(Ac.)
Total runoff =      5.150(CFS)      Total area =       2.580(Ac.)
Depth of flow =   0.583(Ft.), Average velocity =   2.790(Ft/s)

Sub-Channel No. 1 Critical depth =      0.496(Ft.)
  '     '       '     Critical flow top width =      3.984(Ft.)
  '     '       '     Critical flow velocity=    3.469(Ft/s)
  '     '       '     Critical flow area =      1.484(Sq.Ft)



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Process from Point/Station       23.200 to Point/Station       24.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.580(Ac.)
Runoff from this stream =      5.150(CFS)
Time of concentration =   14.57 min.
Rainfall intensity =     2.241(In/Hr)
Summary of stream data:

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


1       12.513     19.75               1.931
2        5.150     14.57               2.241
Largest stream flow has longer time of concentration
Qp =     12.513 + sum of
        Qb         Ia/Ib
         5.150 *    0.862 =      4.437
Qp =     16.950

Total of 2 main streams to confluence:
Flow rates before confluence point:
      12.513       5.150
Area of streams before confluence:
        8.740        2.580


Results of confluence:
Total flow rate =     16.950(CFS)
Time of concentration =    19.748 min.
Effective stream area after confluence  =     11.320(Ac.)
```

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Process from Point/Station       24.000 to Point/Station       25.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  1471.800(Ft.)
Downstream point/station elevation =  1470.000(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.950(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    16.950(CFS)
Normal flow depth in pipe =   14.30(In.)
Flow top width inside pipe =   14.55(In.)
Critical depth could not be calculated.
Pipe flow velocity =     11.27(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    19.84 min.
End of computations, total study area =           11.32 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.451
Area averaged RI index number =  65.5
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 08/16/23 File:b.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
EXISTING CONDITION OFFSITES - SUB AREA - BX
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 883.000(Ft.)
Top (of initial area) elevation = 1488.600(Ft.)
Bottom (of initial area) elevation = 1484.000(Ft.)
Difference in elevation = 4.600(Ft.)
Slope = 0.00521 s(percent)= 0.52

```
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.946 min.
Rainfall intensity =      2.374(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.867
Decimal fraction soil group A = 0.430
Decimal fraction soil group B = 0.340
Decimal fraction soil group C = 0.230
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  48.67
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.366(CFS)
Total initial stream area =        1.150(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1476.000(Ft.)
Downstream point/station elevation =  1475.800(Ft.)
Pipe length  =    75.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.366(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     2.366(CFS)
Normal flow depth in pipe =    9.33(In.)
Flow top width inside pipe =   14.55(In.)
Critical Depth =    7.38(In.)
Pipe flow velocity =      2.95(Ft/s)
Travel time through pipe =    0.42 min.
Time of concentration (TC) =    13.37 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      1.150(Ac.)
Runoff from this stream =      2.366(CFS)
Time of concentration =   13.37 min.
Rainfall intensity =     2.337(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.100 to Point/Station       12.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   794.000(Ft.)
Top (of initial area) elevation =  1489.000(Ft.)
Bottom (of initial area) elevation =  1484.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00630  s(percent)=       0.63
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
```

```
Initial area time of concentration =   11.946 min.
Rainfall intensity =      2.470(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.865
Decimal fraction soil group A = 0.530
Decimal fraction soil group B = 0.270
Decimal fraction soil group C = 0.200
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  45.88
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.307(CFS)
Total initial stream area =        1.080(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.100 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.080(Ac.)
Runoff from this stream =      2.307(CFS)
Time of concentration =   11.95 min.
Rainfall intensity =     2.470(In/Hr)
Summary of stream data:

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


1        2.366     13.37               2.337
2        2.307     11.95               2.470
Largest stream flow has longer time of concentration
Qp =      2.366 + sum of
        Qb         Ia/Ib
         2.307 *    0.946 =      2.183
Qp =      4.550

Total of 2 main streams to confluence:
Flow rates before confluence point:
       2.366       2.307
Area of streams before confluence:
        1.150        1.080


Results of confluence:
Total flow rate =      4.550(CFS)
Time of concentration =    13.370 min.
Effective stream area after confluence  =      2.230(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1475.800(Ft.)
```

```
Downstream point/station elevation =  1475.400(Ft.)
Pipe length  =    83.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.550(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     4.550(CFS)
Normal flow depth in pipe =   10.30(In.)
Flow top width inside pipe =   17.81(In.)
Critical Depth =    9.83(In.)
Pipe flow velocity =      4.35(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =    13.69 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      2.230(Ac.)
Runoff from this stream =      4.550(CFS)
Time of concentration =   13.69 min.
Rainfall intensity =     2.311(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.100 to Point/Station       13.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   457.000(Ft.)
Top (of initial area) elevation =  1486.700(Ft.)
Bottom (of initial area) elevation =  1478.700(Ft.)
Difference in elevation =     8.000(Ft.)
Slope =    0.01751  s(percent)=       1.75
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.806 min.
Rainfall intensity =      3.042(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.872
Decimal fraction soil group A = 0.270
Decimal fraction soil group B = 0.730
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  49.52
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.202(CFS)
Total initial stream area =        0.830(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.100 to Point/Station       13.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
```

```
Stream flow area =      0.830(Ac.)
Runoff from this stream =      2.202(CFS)
Time of concentration =    7.81 min.
Rainfall intensity =     3.042(In/Hr)
Summary of stream data:

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


1        4.550     13.69               2.311
2        2.202      7.81               3.042
Largest stream flow has longer time of concentration
Qp =      4.550 + sum of
        Qb          Ia/Ib
         2.202 *    0.759 =      1.673
Qp =      6.222

Total of 2 main streams to confluence:
Flow rates before confluence point:
       4.550       2.202
Area of streams before confluence:
        2.230        0.830


Results of confluence:
Total flow rate =      6.222(CFS)
Time of concentration =    13.688 min.
Effective stream area after confluence  =      3.060(Ac.)


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Process from Point/Station       13.000 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1475.400(Ft.)
Downstream point/station elevation =  1475.200(Ft.)
Pipe length  =    61.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.222(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     6.222(CFS)
Normal flow depth in pipe =   12.77(In.)
Flow top width inside pipe =   20.50(In.)
Critical Depth =   11.04(In.)
Pipe flow velocity =      4.06(Ft/s)
Travel time through pipe =    0.25 min.
Time of concentration (TC) =    13.94 min.
End of computations, total study area =            3.06 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  47.9
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Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 09/30/24
File:100PONSITE3.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WITH OFFSITES
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 10.300
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 744.000(Ft.)
Top (of initial area) elevation = 1471.300(Ft.)
Bottom (of initial area) elevation = 1463.100(Ft.)

```
Difference in elevation =     8.200(Ft.)
Slope =    0.01102  s(percent)=       1.10
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.406 min.
Rainfall intensity =      2.643(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.875
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.950
Decimal fraction soil group C = 0.050
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.65
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      5.850(CFS)
Total initial stream area =        2.530(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       10.000 to Point/Station       10.300
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      2.530(Ac.)
Runoff from this stream =      5.850(CFS)
Time of concentration =   10.41 min.
Rainfall intensity =     2.643(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       10.100 to Point/Station       10.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   281.000(Ft.)
Top (of initial area) elevation =  1467.800(Ft.)
Bottom (of initial area) elevation =  1461.600(Ft.)
Difference in elevation =     6.200(Ft.)
Slope =    0.02206  s(percent)=       2.21
TC = k(0.370)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.567 min.
Rainfall intensity =      3.089(In/Hr) for a   100.0 year storm
CONDOMINIUM subarea type
Runoff Coefficient = 0.846
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.110
Decimal fraction soil group C = 0.890
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  67.57
Pervious area fraction =  0.350; Impervious fraction =  0.650
Initial subarea runoff =      2.143(CFS)
Total initial stream area =        0.820(Ac.)
Pervious area fraction = 0.350


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Process from Point/Station       10.200 to Point/Station       10.200
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.706
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.990
Decimal fraction soil group C = 0.010
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  61.13
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =     7.57 min.
Rainfall intensity =      3.089(In/Hr) for a   100.0 year storm
Subarea runoff =      1.527(CFS) for      0.700(Ac.)
Total runoff =      3.670(CFS)      Total area =       1.520(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.200 to Point/Station       10.300
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  1459.300(Ft.)
Downstream point/station elevation =  1459.100(Ft.)
Pipe length  =     2.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.670(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     3.670(CFS)
Normal flow depth in pipe =    5.55(In.)
Flow top width inside pipe =    8.75(In.)
Critical depth could not be calculated.
Pipe flow velocity =     12.82(Ft/s)
Travel time through pipe =    0.00 min.
Time of concentration (TC) =     7.57 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.200 to Point/Station       10.300
**** CONFLUENCE OF MAIN STREAMS ****
_____________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.520(Ac.)
Runoff from this stream =      3.670(CFS)
Time of concentration =    7.57 min.
Rainfall intensity =     3.089(In/Hr)
Summary of stream data:

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


1        5.850     10.41               2.643
2        3.670      7.57               3.089
Largest stream flow has longer time of concentration
Qp =      5.850 + sum of
        Qb         Ia/Ib
         3.670 *    0.856 =      3.140
```

```
Qp =      8.990

Total of 2 main streams to confluence:
Flow rates before confluence point:
       5.850       3.670
Area of streams before confluence:
        2.530        1.520


Results of confluence:
Total flow rate =      8.990(CFS)
Time of concentration =    10.406 min.
Effective stream area after confluence  =      4.050(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.300 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1459.100(Ft.)
Downstream point/station elevation =  1458.680(Ft.)
Pipe length  =    20.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.990(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     8.990(CFS)
Normal flow depth in pipe =   11.79(In.)
Flow top width inside pipe =   12.31(In.)
Critical Depth =   13.86(In.)
Pipe flow velocity =      8.69(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    10.44 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.300 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      4.050(Ac.)
Runoff from this stream =      8.990(CFS)
Time of concentration =   10.44 min.
Rainfall intensity =     2.638(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       11.300
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   416.000(Ft.)
Top (of initial area) elevation =  1476.800(Ft.)
Bottom (of initial area) elevation =  1467.300(Ft.)
Difference in elevation =     9.500(Ft.)
Slope =    0.02284  s(percent)=       2.28
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.676 min.
```

```
Rainfall intensity =      3.068(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.860
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.670
Decimal fraction soil group C = 0.330
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  60.29
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      5.065(CFS)
Total initial stream area =        1.920(Ac.)
Pervious area fraction = 0.200


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.300 to Point/Station       11.300
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.704
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  61.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =     7.68 min.
Rainfall intensity =      3.068(In/Hr) for a   100.0 year storm
Subarea runoff =      0.583(CFS) for      0.270(Ac.)
Total runoff =      5.648(CFS)      Total area =       2.190(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.300 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1461.500(Ft.)
Downstream point/station elevation =  1458.680(Ft.)
Pipe length  =   265.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.648(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     5.648(CFS)
Normal flow depth in pipe =   10.59(In.)
Flow top width inside pipe =   13.66(In.)
Critical Depth =   11.54(In.)
Pipe flow velocity =      6.09(Ft/s)
Travel time through pipe =    0.73 min.
Time of concentration (TC) =     8.40 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.300 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.190(Ac.)
```

```
Runoff from this stream =      5.648(CFS)
Time of concentration =    8.40 min.
Rainfall intensity =     2.935(In/Hr)
Summary of stream data:

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


1        8.990     10.44               2.638
2        5.648      8.40               2.935
Largest stream flow has longer time of concentration
Qp =      8.990 + sum of
        Qb         Ia/Ib
         5.648 *    0.899 =      5.077
Qp =     14.066

Total of 2 main streams to confluence:
Flow rates before confluence point:
       8.990       5.648
Area of streams before confluence:
        4.050        2.190


Results of confluence:
Total flow rate =     14.066(CFS)
Time of concentration =    10.445 min.
Effective stream area after confluence  =      6.240(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1458.680(Ft.)
Downstream point/station elevation =  1452.850(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.066(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    14.066(CFS)
Normal flow depth in pipe =    8.71(In.)
Flow top width inside pipe =   14.80(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.06(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    10.49 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1452.850(Ft.)
Downstream point/station elevation =  1451.910(Ft.)
Pipe length  =   101.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.066(CFS)
Nearest computed pipe diameter  =     21.00(In.)
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Calculated individual pipe flow  =    14.066(CFS)
Normal flow depth in pipe =   15.87(In.)
Flow top width inside pipe =   18.05(In.)
Critical Depth =   16.72(In.)
Pipe flow velocity =      7.21(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =    10.72 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1451.910(Ft.)
Downstream point/station elevation =  1448.600(Ft.)
Pipe length  =   261.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.066(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    14.066(CFS)
Normal flow depth in pipe =   14.06(In.)
Flow top width inside pipe =   19.75(In.)
Critical Depth =   16.72(In.)
Pipe flow velocity =      8.22(Ft/s)
Travel time through pipe =    0.53 min.
Time of concentration (TC) =    11.25 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      6.240(Ac.)
Runoff from this stream =     14.066(CFS)
Time of concentration =   11.25 min.
Rainfall intensity =     2.543(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       15.200 to Point/Station       15.200
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________________
Rainfall intensity =      1.926(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.858
Decimal fraction soil group A = 0.540
Decimal fraction soil group B = 0.360
Decimal fraction soil group C = 0.100
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  44.34
Pervious area fraction =  0.100; Impervious fraction =  0.900
User specified values are as follows:
TC =  19.84 min.  Rain intensity =       1.93(In/Hr)
Total area =        11.32(Ac.)  Total runoff =     17.00(CFS)
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Process from Point/Station       15.200 to Point/Station       15.300
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1470.500(Ft.)
Downstream point/station elevation =  1450.800(Ft.)
Pipe length  =   977.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    17.000(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    17.000(CFS)
Normal flow depth in pipe =   13.64(In.)
Flow top width inside pipe =   20.04(In.)
Critical Depth =   18.13(In.)
Pipe flow velocity =     10.28(Ft/s)
Travel time through pipe =    1.58 min.
Time of concentration (TC) =    21.42 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.200 to Point/Station       15.300
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     11.320(Ac.)
Runoff from this stream =     17.000(CFS)
Time of concentration =   21.42 min.
Rainfall intensity =     1.855(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       15.100
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   684.000(Ft.)
Top (of initial area) elevation =  1477.400(Ft.)
Bottom (of initial area) elevation =  1460.800(Ft.)
Difference in elevation =    16.600(Ft.)
Slope =    0.02427  s(percent)=       2.43
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.593 min.
Rainfall intensity =      2.903(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.250
Decimal fraction soil group C = 0.750
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  65.75
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.408(CFS)
Total initial stream area =        0.940(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.100 to Point/Station       15.300
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**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  1452.200(Ft.)
Downstream point/station elevation =  1450.800(Ft.)
Pipe length  =    40.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.408(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.408(CFS)
Normal flow depth in pipe =    5.96(In.)
Flow top width inside pipe =    8.51(In.)
Critical Depth =    8.22(In.)
Pipe flow velocity =      7.74(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =     8.68 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.100 to Point/Station       15.300
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.940(Ac.)
Runoff from this stream =      2.408(CFS)
Time of concentration =    8.68 min.
Rainfall intensity =     2.888(In/Hr)
Summary of stream data:

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


1       17.000     21.42                 1.855
2        2.408      8.68                 2.888
Largest stream flow has longer time of concentration
Qp =     17.000 + sum of
        Qb         Ia/Ib
         2.408 *    0.642 =      1.547
Qp =     18.547

Total of 2 streams to confluence:
Flow rates before confluence point:
      17.000       2.408
Area of streams before confluence:
       11.320        0.940
Results of confluence:
Total flow rate =     18.547(CFS)
Time of concentration =    21.424 min.
Effective stream area after confluence =     12.260(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.300 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  1450.800(Ft.)
Downstream point/station elevation =  1448.600(Ft.)
Pipe length  =    89.00(Ft.)   Manning's N = 0.013
```

```
No. of pipes = 1  Required pipe flow  =    18.547(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    18.547(CFS)
Normal flow depth in pipe =   13.50(In.)
Flow top width inside pipe =   20.12(In.)
Critical Depth =   18.72(In.)
Pipe flow velocity =     11.35(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    21.55 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.300 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     12.260(Ac.)
Runoff from this stream =     18.547(CFS)
Time of concentration =   21.55 min.
Rainfall intensity =     1.850(In/Hr)
Summary of stream data:

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


1       14.066     11.25               2.543
2       18.547     21.55               1.850
Largest stream flow has longer time of concentration
Qp =     18.547 + sum of
        Qb         Ia/Ib
        14.066 *    0.727 =     10.229
Qp =     28.776

Total of 2 main streams to confluence:
Flow rates before confluence point:
      14.066      18.547
Area of streams before confluence:
        6.240       12.260


Results of confluence:
Total flow rate =     28.776(CFS)
Time of concentration =    21.554 min.
Effective stream area after confluence  =     18.500(Ac.)
End of computations, total study area =           18.50 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.169
Area averaged RI index number =  50.7
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 09/30/24
File:100frontage.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - OFFSITE E FRONTAGE ROAD
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 15.000 to Point/Station 20.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 624.000(Ft.)
Top (of initial area) elevation = 1477.400(Ft.)
Bottom (of initial area) elevation = 1473.900(Ft.)

```
Difference in elevation =     3.500(Ft.)
Slope =    0.00561  s(percent)=       0.56
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.102 min.
Rainfall intensity =      2.560(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.874
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.656(CFS)
Total initial stream area =        0.740(Ac.)
Pervious area fraction = 0.100
End of computations, total study area =            0.74 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  56.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 09/30/24
File:100PONSITE3.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - NO OFFSITES
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 10.300
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 744.000(Ft.)
Top (of initial area) elevation = 1471.300(Ft.)
Bottom (of initial area) elevation = 1463.100(Ft.)

```
Difference in elevation =     8.200(Ft.)
Slope =    0.01102  s(percent)=       1.10
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.406 min.
Rainfall intensity =      2.643(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.875
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.950
Decimal fraction soil group C = 0.050
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.65
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      5.850(CFS)
Total initial stream area =        2.530(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       10.000 to Point/Station       10.300
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      2.530(Ac.)
Runoff from this stream =      5.850(CFS)
Time of concentration =   10.41 min.
Rainfall intensity =     2.643(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.100 to Point/Station       10.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   281.000(Ft.)
Top (of initial area) elevation =  1467.800(Ft.)
Bottom (of initial area) elevation =  1461.600(Ft.)
Difference in elevation =     6.200(Ft.)
Slope =    0.02206  s(percent)=       2.21
TC = k(0.370)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.567 min.
Rainfall intensity =      3.089(In/Hr) for a   100.0 year storm
CONDOMINIUM subarea type
Runoff Coefficient = 0.846
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.110
Decimal fraction soil group C = 0.890
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  67.57
Pervious area fraction =  0.350; Impervious fraction =  0.650
Initial subarea runoff =      2.143(CFS)
Total initial stream area =        0.820(Ac.)
Pervious area fraction = 0.350


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Process from Point/Station       10.200 to Point/Station       10.200
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.706
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.990
Decimal fraction soil group C = 0.010
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  61.13
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =     7.57 min.
Rainfall intensity =      3.089(In/Hr) for a   100.0 year storm
Subarea runoff =      1.527(CFS) for      0.700(Ac.)
Total runoff =      3.670(CFS)      Total area =       1.520(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.200 to Point/Station       10.300
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  1459.300(Ft.)
Downstream point/station elevation =  1459.100(Ft.)
Pipe length  =     2.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.670(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     3.670(CFS)
Normal flow depth in pipe =    5.55(In.)
Flow top width inside pipe =    8.75(In.)
Critical depth could not be calculated.
Pipe flow velocity =     12.82(Ft/s)
Travel time through pipe =    0.00 min.
Time of concentration (TC) =     7.57 min.


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Process from Point/Station       10.200 to Point/Station       10.300
**** CONFLUENCE OF MAIN STREAMS ****
_____________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.520(Ac.)
Runoff from this stream =      3.670(CFS)
Time of concentration =    7.57 min.
Rainfall intensity =     3.089(In/Hr)
Summary of stream data:

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


1        5.850     10.41               2.643
2        3.670      7.57               3.089
Largest stream flow has longer time of concentration
Qp =      5.850 + sum of
        Qb         Ia/Ib
         3.670 *    0.856 =      3.140
```

```
Qp =      8.990

Total of 2 main streams to confluence:
Flow rates before confluence point:
       5.850       3.670
Area of streams before confluence:
        2.530        1.520


Results of confluence:
Total flow rate =      8.990(CFS)
Time of concentration =    10.406 min.
Effective stream area after confluence  =      4.050(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.300 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1459.100(Ft.)
Downstream point/station elevation =  1458.680(Ft.)
Pipe length  =    20.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.990(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     8.990(CFS)
Normal flow depth in pipe =   11.79(In.)
Flow top width inside pipe =   12.31(In.)
Critical Depth =   13.86(In.)
Pipe flow velocity =      8.69(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    10.44 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.300 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      4.050(Ac.)
Runoff from this stream =      8.990(CFS)
Time of concentration =   10.44 min.
Rainfall intensity =     2.638(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       11.300
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   416.000(Ft.)
Top (of initial area) elevation =  1476.800(Ft.)
Bottom (of initial area) elevation =  1467.300(Ft.)
Difference in elevation =     9.500(Ft.)
Slope =    0.02284  s(percent)=       2.28
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.676 min.
```

```
Rainfall intensity =      3.068(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.860
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.670
Decimal fraction soil group C = 0.330
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  60.29
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      5.065(CFS)
Total initial stream area =        1.920(Ac.)
Pervious area fraction = 0.200


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.300 to Point/Station       11.300
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.704
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  61.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =     7.68 min.
Rainfall intensity =      3.068(In/Hr) for a   100.0 year storm
Subarea runoff =      0.583(CFS) for      0.270(Ac.)
Total runoff =      5.648(CFS)      Total area =       2.190(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.300 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1461.500(Ft.)
Downstream point/station elevation =  1458.680(Ft.)
Pipe length  =   265.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.648(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     5.648(CFS)
Normal flow depth in pipe =   10.59(In.)
Flow top width inside pipe =   13.66(In.)
Critical Depth =   11.54(In.)
Pipe flow velocity =      6.09(Ft/s)
Travel time through pipe =    0.73 min.
Time of concentration (TC) =     8.40 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.300 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.190(Ac.)
```

```
Runoff from this stream =      5.648(CFS)
Time of concentration =    8.40 min.
Rainfall intensity =     2.935(In/Hr)
Summary of stream data:

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


1        8.990     10.44               2.638
2        5.648      8.40               2.935
Largest stream flow has longer time of concentration
Qp =      8.990 + sum of
        Qb         Ia/Ib
         5.648 *    0.899 =      5.077
Qp =     14.066

Total of 2 main streams to confluence:
Flow rates before confluence point:
       8.990       5.648
Area of streams before confluence:
        4.050        2.190


Results of confluence:
Total flow rate =     14.066(CFS)
Time of concentration =    10.445 min.
Effective stream area after confluence  =      6.240(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1458.680(Ft.)
Downstream point/station elevation =  1452.850(Ft.)
Pipe length  =    50.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.066(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    14.066(CFS)
Normal flow depth in pipe =    8.71(In.)
Flow top width inside pipe =   14.80(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.06(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    10.49 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1452.850(Ft.)
Downstream point/station elevation =  1451.910(Ft.)
Pipe length  =   101.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.066(CFS)
Nearest computed pipe diameter  =     21.00(In.)
```

```
Calculated individual pipe flow  =    14.066(CFS)
Normal flow depth in pipe =   15.87(In.)
Flow top width inside pipe =   18.05(In.)
Critical Depth =   16.72(In.)
Pipe flow velocity =      7.21(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =    10.72 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1451.910(Ft.)
Downstream point/station elevation =  1448.600(Ft.)
Pipe length  =   261.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.066(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    14.066(CFS)
Normal flow depth in pipe =   14.06(In.)
Flow top width inside pipe =   19.75(In.)
Critical Depth =   16.72(In.)
Pipe flow velocity =      8.22(Ft/s)
Travel time through pipe =    0.53 min.
Time of concentration (TC) =    11.25 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      6.240(Ac.)
Runoff from this stream =     14.066(CFS)
Time of concentration =   11.25 min.
Rainfall intensity =     2.543(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       15.100
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   684.000(Ft.)
Top (of initial area) elevation =  1477.400(Ft.)
Bottom (of initial area) elevation =  1460.800(Ft.)
Difference in elevation =    16.600(Ft.)
Slope =    0.02427  s(percent)=       2.43
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.593 min.
Rainfall intensity =      2.903(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.250
Decimal fraction soil group C = 0.750
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```
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  65.75
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.408(CFS)
Total initial stream area =        0.940(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.100 to Point/Station       15.300
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1452.200(Ft.)
Downstream point/station elevation =  1450.800(Ft.)
Pipe length  =    40.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.408(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.408(CFS)
Normal flow depth in pipe =    5.96(In.)
Flow top width inside pipe =    8.51(In.)
Critical Depth =    8.22(In.)
Pipe flow velocity =      7.74(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =     8.68 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.300 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1450.800(Ft.)
Downstream point/station elevation =  1448.600(Ft.)
Pipe length  =    89.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.408(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.408(CFS)
Normal flow depth in pipe =    6.84(In.)
Flow top width inside pipe =    7.68(In.)
Critical Depth =    8.22(In.)
Pipe flow velocity =      6.68(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =     8.90 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.300 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.940(Ac.)
Runoff from this stream =      2.408(CFS)
Time of concentration =    8.90 min.
Rainfall intensity =     2.853(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
```

```
 No.       (CFS)       (min)                 (In/Hr)


1       14.066     11.25               2.543
2        2.408      8.90               2.853
Largest stream flow has longer time of concentration
Qp =     14.066 + sum of
        Qb         Ia/Ib
         2.408 *    0.892 =      2.147
Qp =     16.213

Total of 2 main streams to confluence:
Flow rates before confluence point:
      14.066       2.408
Area of streams before confluence:
        6.240        0.940


Results of confluence:
Total flow rate =     16.213(CFS)
Time of concentration =    11.251 min.
Effective stream area after confluence  =      7.180(Ac.)
End of computations, total study area =           7.18 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.277
Area averaged RI index number =  60.7
```

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 10/10/23 File: 100XUH24100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 7.18(Ac.) = 0.011 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 7.18(Ac.) = 0.011 Sq. Mi.
Length along longest watercourse = 762.00(Ft.)
Length along longest watercourse measured to centroid = 327.00(Ft.)
Length along longest watercourse = 0.144 Mi.
Length along longest watercourse measured to centroid = 0.062 Mi.
Difference in elevation = 7.20(Ft.)
Slope along watercourse = 49.8898 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.038 Hr.
Lag time = 2.28 Min.
25% of lag time = 0.57 Min.
40% of lag time = 0.91 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
7.18	2.00	14.36

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
7.18	5.00	35.90

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 2.000(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
7.180	65.10	0.710

Total Area Entered = 7.18(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
65.1	65.1	0.415	0.710	0.150	1.000	0.150
					Sum (F) =	0.150

Area averaged mean soil loss (F) (In/Hr) = 0.150
Minimum soil loss rate ((In/Hr)) = 0.075
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.332

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	219.144	46.524	3.367
2	0.167	438.289	42.054	3.043
3	0.250	657.433	8.069	0.584
4	0.333	876.578	3.353	0.243
		Sum = 100.000	Sum=	7.236

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.040	(0.266)	0.013	0.027
2	0.17	0.07	0.040	(0.265)	0.013	0.027
3	0.25	0.07	0.040	(0.263)	0.013	0.027
4	0.33	0.10	0.060	(0.262)	0.020	0.040
5	0.42	0.10	0.060	(0.261)	0.020	0.040
6	0.50	0.10	0.060	(0.260)	0.020	0.040
7	0.58	0.10	0.060	(0.259)	0.020	0.040
8	0.67	0.10	0.060	(0.258)	0.020	0.040
9	0.75	0.10	0.060	(0.257)	0.020	0.040
10	0.83	0.13	0.080	(0.256)	0.027	0.053
11	0.92	0.13	0.080	(0.255)	0.027	0.053
12	1.00	0.13	0.080	(0.254)	0.027	0.053
13	1.08	0.10	0.060	(0.253)	0.020	0.040
14	1.17	0.10	0.060	(0.252)	0.020	0.040
15	1.25	0.10	0.060	(0.251)	0.020	0.040
16	1.33	0.10	0.060	(0.250)	0.020	0.040
17	1.42	0.10	0.060	(0.249)	0.020	0.040
18	1.50	0.10	0.060	(0.248)	0.020	0.040
19	1.58	0.10	0.060	(0.247)	0.020	0.040
20	1.67	0.10	0.060	(0.246)	0.020	0.040
21	1.75	0.10	0.060	(0.245)	0.020	0.040
22	1.83	0.13	0.080	(0.244)	0.027	0.053
23	1.92	0.13	0.080	(0.243)	0.027	0.053
24	2.00	0.13	0.080	(0.242)	0.027	0.053
25	2.08	0.13	0.080	(0.241)	0.027	0.053
26	2.17	0.13	0.080	(0.240)	0.027	0.053
27	2.25	0.13	0.080	(0.239)	0.027	0.053
28	2.33	0.13	0.080	(0.239)	0.027	0.053
29	2.42	0.13	0.080	(0.238)	0.027	0.053
30	2.50	0.13	0.080	(0.237)	0.027	0.053
31	2.58	0.17	0.100	(0.236)	0.033	0.067
32	2.67	0.17	0.100	(0.235)	0.033	0.067
33	2.75	0.17	0.100	(0.234)	0.033	0.067
34	2.83	0.17	0.100	(0.233)	0.033	0.067
35	2.92	0.17	0.100	(0.232)	0.033	0.067
36	3.00	0.17	0.100	(0.231)	0.033	0.067
37	3.08	0.17	0.100	(0.230)	0.033	0.067
38	3.17	0.17	0.100	(0.229)	0.033	0.067
39	3.25	0.17	0.100	(0.228)	0.033	0.067
40	3.33	0.17	0.100	(0.227)	0.033	0.067
41	3.42	0.17	0.100	(0.226)	0.033	0.067
42	3.50	0.17	0.100	(0.225)	0.033	0.067
43	3.58	0.17	0.100	(0.224)	0.033	0.067

44	3.67	0.17	0.100	(0.223)	0.033	0.067
45	3.75	0.17	0.100	(0.222)	0.033	0.067
46	3.83	0.20	0.120	(0.221)	0.040	0.080
47	3.92	0.20	0.120	(0.220)	0.040	0.080
48	4.00	0.20	0.120	(0.219)	0.040	0.080
49	4.08	0.20	0.120	(0.219)	0.040	0.080
50	4.17	0.20	0.120	(0.218)	0.040	0.080
51	4.25	0.20	0.120	(0.217)	0.040	0.080
52	4.33	0.23	0.140	(0.216)	0.046	0.094
53	4.42	0.23	0.140	(0.215)	0.046	0.094
54	4.50	0.23	0.140	(0.214)	0.046	0.094
55	4.58	0.23	0.140	(0.213)	0.046	0.094
56	4.67	0.23	0.140	(0.212)	0.046	0.094
57	4.75	0.23	0.140	(0.211)	0.046	0.094
58	4.83	0.27	0.160	(0.210)	0.053	0.107
59	4.92	0.27	0.160	(0.209)	0.053	0.107
60	5.00	0.27	0.160	(0.208)	0.053	0.107
61	5.08	0.20	0.120	(0.208)	0.040	0.080
62	5.17	0.20	0.120	(0.207)	0.040	0.080
63	5.25	0.20	0.120	(0.206)	0.040	0.080
64	5.33	0.23	0.140	(0.205)	0.046	0.094
65	5.42	0.23	0.140	(0.204)	0.046	0.094
66	5.50	0.23	0.140	(0.203)	0.046	0.094
67	5.58	0.27	0.160	(0.202)	0.053	0.107
68	5.67	0.27	0.160	(0.201)	0.053	0.107
69	5.75	0.27	0.160	(0.200)	0.053	0.107
70	5.83	0.27	0.160	(0.199)	0.053	0.107
71	5.92	0.27	0.160	(0.199)	0.053	0.107
72	6.00	0.27	0.160	(0.198)	0.053	0.107
73	6.08	0.30	0.180	(0.197)	0.060	0.120
74	6.17	0.30	0.180	(0.196)	0.060	0.120
75	6.25	0.30	0.180	(0.195)	0.060	0.120
76	6.33	0.30	0.180	(0.194)	0.060	0.120
77	6.42	0.30	0.180	(0.193)	0.060	0.120
78	6.50	0.30	0.180	(0.192)	0.060	0.120
79	6.58	0.33	0.200	(0.192)	0.066	0.134
80	6.67	0.33	0.200	(0.191)	0.066	0.134
81	6.75	0.33	0.200	(0.190)	0.066	0.134
82	6.83	0.33	0.200	(0.189)	0.066	0.134
83	6.92	0.33	0.200	(0.188)	0.066	0.134
84	7.00	0.33	0.200	(0.187)	0.066	0.134
85	7.08	0.33	0.200	(0.186)	0.066	0.134
86	7.17	0.33	0.200	(0.186)	0.066	0.134
87	7.25	0.33	0.200	(0.185)	0.066	0.134
88	7.33	0.37	0.220	(0.184)	0.073	0.147
89	7.42	0.37	0.220	(0.183)	0.073	0.147
90	7.50	0.37	0.220	(0.182)	0.073	0.147
91	7.58	0.40	0.240	(0.181)	0.080	0.160
92	7.67	0.40	0.240	(0.181)	0.080	0.160
93	7.75	0.40	0.240	(0.180)	0.080	0.160

94	7.83	0.43	0.260	(0.179)	0.086	0.174
95	7.92	0.43	0.260	(0.178)	0.086	0.174
96	8.00	0.43	0.260	(0.177)	0.086	0.174
97	8.08	0.50	0.300	(0.176)	0.100	0.200
98	8.17	0.50	0.300	(0.176)	0.100	0.200
99	8.25	0.50	0.300	(0.175)	0.100	0.200
100	8.33	0.50	0.300	(0.174)	0.100	0.200
101	8.42	0.50	0.300	(0.173)	0.100	0.200
102	8.50	0.50	0.300	(0.172)	0.100	0.200
103	8.58	0.53	0.320	(0.172)	0.106	0.214
104	8.67	0.53	0.320	(0.171)	0.106	0.214
105	8.75	0.53	0.320	(0.170)	0.106	0.214
106	8.83	0.57	0.340	(0.169)	0.113	0.227
107	8.92	0.57	0.340	(0.168)	0.113	0.227
108	9.00	0.57	0.340	(0.168)	0.113	0.227
109	9.08	0.63	0.380	(0.167)	0.126	0.254
110	9.17	0.63	0.380	(0.166)	0.126	0.254
111	9.25	0.63	0.380	(0.165)	0.126	0.254
112	9.33	0.67	0.400	(0.164)	0.133	0.267
113	9.42	0.67	0.400	(0.164)	0.133	0.267
114	9.50	0.67	0.400	(0.163)	0.133	0.267
115	9.58	0.70	0.420	(0.162)	0.139	0.281
116	9.67	0.70	0.420	(0.161)	0.139	0.281
117	9.75	0.70	0.420	(0.160)	0.139	0.281
118	9.83	0.73	0.440	(0.160)	0.146	0.294
119	9.92	0.73	0.440	(0.159)	0.146	0.294
120	10.00	0.73	0.440	(0.158)	0.146	0.294
121	10.08	0.50	0.300	(0.157)	0.100	0.200
122	10.17	0.50	0.300	(0.157)	0.100	0.200
123	10.25	0.50	0.300	(0.156)	0.100	0.200
124	10.33	0.50	0.300	(0.155)	0.100	0.200
125	10.42	0.50	0.300	(0.154)	0.100	0.200
126	10.50	0.50	0.300	(0.154)	0.100	0.200
127	10.58	0.67	0.400	(0.153)	0.133	0.267
128	10.67	0.67	0.400	(0.152)	0.133	0.267
129	10.75	0.67	0.400	(0.151)	0.133	0.267
130	10.83	0.67	0.400	(0.151)	0.133	0.267
131	10.92	0.67	0.400	(0.150)	0.133	0.267
132	11.00	0.67	0.400	(0.149)	0.133	0.267
133	11.08	0.63	0.380	(0.148)	0.126	0.254
134	11.17	0.63	0.380	(0.148)	0.126	0.254
135	11.25	0.63	0.380	(0.147)	0.126	0.254
136	11.33	0.63	0.380	(0.146)	0.126	0.254
137	11.42	0.63	0.380	(0.146)	0.126	0.254
138	11.50	0.63	0.380	(0.145)	0.126	0.254
139	11.58	0.57	0.340	(0.144)	0.113	0.227
140	11.67	0.57	0.340	(0.143)	0.113	0.227
141	11.75	0.57	0.340	(0.143)	0.113	0.227
142	11.83	0.60	0.360	(0.142)	0.120	0.240
143	11.92	0.60	0.360	(0.141)	0.120	0.240

144	12.00	0.60	0.360	(	0.141)	0.120	0.240
145	12.08	0.83	0.500		0.140	(0.166)	0.360
146	12.17	0.83	0.500		0.139	(0.166)	0.361
147	12.25	0.83	0.500		0.138	(0.166)	0.362
148	12.33	0.87	0.520		0.138	(0.173)	0.382
149	12.42	0.87	0.520		0.137	(0.173)	0.383
150	12.50	0.87	0.520		0.136	(0.173)	0.384
151	12.58	0.93	0.560		0.136	(0.186)	0.424
152	12.67	0.93	0.560		0.135	(0.186)	0.425
153	12.75	0.93	0.560		0.134	(0.186)	0.426
154	12.83	0.97	0.580		0.134	(0.193)	0.446
155	12.92	0.97	0.580		0.133	(0.193)	0.447
156	13.00	0.97	0.580		0.132	(0.193)	0.448
157	13.08	1.13	0.680		0.132	(0.226)	0.548
158	13.17	1.13	0.680		0.131	(0.226)	0.549
159	13.25	1.13	0.680		0.130	(0.226)	0.550
160	13.33	1.13	0.680		0.130	(0.226)	0.550
161	13.42	1.13	0.680		0.129	(0.226)	0.551
162	13.50	1.13	0.680		0.128	(0.226)	0.552
163	13.58	0.77	0.460		0.128	(0.153)	0.332
164	13.67	0.77	0.460		0.127	(0.153)	0.333
165	13.75	0.77	0.460		0.126	(0.153)	0.334
166	13.83	0.77	0.460		0.126	(0.153)	0.334
167	13.92	0.77	0.460		0.125	(0.153)	0.335
168	14.00	0.77	0.460		0.124	(0.153)	0.336
169	14.08	0.90	0.540		0.124	(0.179)	0.416
170	14.17	0.90	0.540		0.123	(0.179)	0.417
171	14.25	0.90	0.540		0.123	(0.179)	0.417
172	14.33	0.87	0.520		0.122	(0.173)	0.398
173	14.42	0.87	0.520		0.121	(0.173)	0.399
174	14.50	0.87	0.520		0.121	(0.173)	0.399
175	14.58	0.87	0.520		0.120	(0.173)	0.400
176	14.67	0.87	0.520		0.119	(0.173)	0.401
177	14.75	0.87	0.520		0.119	(0.173)	0.401
178	14.83	0.83	0.500		0.118	(0.166)	0.382
179	14.92	0.83	0.500		0.118	(0.166)	0.382
180	15.00	0.83	0.500		0.117	(0.166)	0.383
181	15.08	0.80	0.480		0.116	(0.159)	0.364
182	15.17	0.80	0.480		0.116	(0.159)	0.364
183	15.25	0.80	0.480		0.115	(0.159)	0.365
184	15.33	0.77	0.460		0.115	(0.153)	0.345
185	15.42	0.77	0.460		0.114	(0.153)	0.346
186	15.50	0.77	0.460		0.113	(0.153)	0.347
187	15.58	0.63	0.380		0.113	(0.126)	0.267
188	15.67	0.63	0.380		0.112	(0.126)	0.268
189	15.75	0.63	0.380		0.112	(0.126)	0.268
190	15.83	0.63	0.380		0.111	(0.126)	0.269
191	15.92	0.63	0.380		0.111	(0.126)	0.269
192	16.00	0.63	0.380		0.110	(0.126)	0.270
193	16.08	0.13	0.080	(	0.109)	0.027	0.053

194	16.17	0.13	0.080	(0.109)	0.027	0.053
195	16.25	0.13	0.080	(0.108)	0.027	0.053
196	16.33	0.13	0.080	(0.108)	0.027	0.053
197	16.42	0.13	0.080	(0.107)	0.027	0.053
198	16.50	0.13	0.080	(0.107)	0.027	0.053
199	16.58	0.10	0.060	(0.106)	0.020	0.040
200	16.67	0.10	0.060	(0.106)	0.020	0.040
201	16.75	0.10	0.060	(0.105)	0.020	0.040
202	16.83	0.10	0.060	(0.105)	0.020	0.040
203	16.92	0.10	0.060	(0.104)	0.020	0.040
204	17.00	0.10	0.060	(0.103)	0.020	0.040
205	17.08	0.17	0.100	(0.103)	0.033	0.067
206	17.17	0.17	0.100	(0.102)	0.033	0.067
207	17.25	0.17	0.100	(0.102)	0.033	0.067
208	17.33	0.17	0.100	(0.101)	0.033	0.067
209	17.42	0.17	0.100	(0.101)	0.033	0.067
210	17.50	0.17	0.100	(0.100)	0.033	0.067
211	17.58	0.17	0.100	(0.100)	0.033	0.067
212	17.67	0.17	0.100	(0.099)	0.033	0.067
213	17.75	0.17	0.100	(0.099)	0.033	0.067
214	17.83	0.13	0.080	(0.098)	0.027	0.053
215	17.92	0.13	0.080	(0.098)	0.027	0.053
216	18.00	0.13	0.080	(0.097)	0.027	0.053
217	18.08	0.13	0.080	(0.097)	0.027	0.053
218	18.17	0.13	0.080	(0.096)	0.027	0.053
219	18.25	0.13	0.080	(0.096)	0.027	0.053
220	18.33	0.13	0.080	(0.096)	0.027	0.053
221	18.42	0.13	0.080	(0.095)	0.027	0.053
222	18.50	0.13	0.080	(0.095)	0.027	0.053
223	18.58	0.10	0.060	(0.094)	0.020	0.040
224	18.67	0.10	0.060	(0.094)	0.020	0.040
225	18.75	0.10	0.060	(0.093)	0.020	0.040
226	18.83	0.07	0.040	(0.093)	0.013	0.027
227	18.92	0.07	0.040	(0.092)	0.013	0.027
228	19.00	0.07	0.040	(0.092)	0.013	0.027
229	19.08	0.10	0.060	(0.091)	0.020	0.040
230	19.17	0.10	0.060	(0.091)	0.020	0.040
231	19.25	0.10	0.060	(0.091)	0.020	0.040
232	19.33	0.13	0.080	(0.090)	0.027	0.053
233	19.42	0.13	0.080	(0.090)	0.027	0.053
234	19.50	0.13	0.080	(0.089)	0.027	0.053
235	19.58	0.10	0.060	(0.089)	0.020	0.040
236	19.67	0.10	0.060	(0.089)	0.020	0.040
237	19.75	0.10	0.060	(0.088)	0.020	0.040
238	19.83	0.07	0.040	(0.088)	0.013	0.027
239	19.92	0.07	0.040	(0.087)	0.013	0.027
240	20.00	0.07	0.040	(0.087)	0.013	0.027
241	20.08	0.10	0.060	(0.087)	0.020	0.040
242	20.17	0.10	0.060	(0.086)	0.020	0.040
243	20.25	0.10	0.060	(0.086)	0.020	0.040

244	20.33	0.10	0.060	(0.085)	0.020	0.040
245	20.42	0.10	0.060	(0.085)	0.020	0.040
246	20.50	0.10	0.060	(0.085)	0.020	0.040
247	20.58	0.10	0.060	(0.084)	0.020	0.040
248	20.67	0.10	0.060	(0.084)	0.020	0.040
249	20.75	0.10	0.060	(0.084)	0.020	0.040
250	20.83	0.07	0.040	(0.083)	0.013	0.027
251	20.92	0.07	0.040	(0.083)	0.013	0.027
252	21.00	0.07	0.040	(0.083)	0.013	0.027
253	21.08	0.10	0.060	(0.082)	0.020	0.040
254	21.17	0.10	0.060	(0.082)	0.020	0.040
255	21.25	0.10	0.060	(0.082)	0.020	0.040
256	21.33	0.07	0.040	(0.081)	0.013	0.027
257	21.42	0.07	0.040	(0.081)	0.013	0.027
258	21.50	0.07	0.040	(0.081)	0.013	0.027
259	21.58	0.10	0.060	(0.080)	0.020	0.040
260	21.67	0.10	0.060	(0.080)	0.020	0.040
261	21.75	0.10	0.060	(0.080)	0.020	0.040
262	21.83	0.07	0.040	(0.080)	0.013	0.027
263	21.92	0.07	0.040	(0.079)	0.013	0.027
264	22.00	0.07	0.040	(0.079)	0.013	0.027
265	22.08	0.10	0.060	(0.079)	0.020	0.040
266	22.17	0.10	0.060	(0.079)	0.020	0.040
267	22.25	0.10	0.060	(0.078)	0.020	0.040
268	22.33	0.07	0.040	(0.078)	0.013	0.027
269	22.42	0.07	0.040	(0.078)	0.013	0.027
270	22.50	0.07	0.040	(0.078)	0.013	0.027
271	22.58	0.07	0.040	(0.077)	0.013	0.027
272	22.67	0.07	0.040	(0.077)	0.013	0.027
273	22.75	0.07	0.040	(0.077)	0.013	0.027
274	22.83	0.07	0.040	(0.077)	0.013	0.027
275	22.92	0.07	0.040	(0.077)	0.013	0.027
276	23.00	0.07	0.040	(0.076)	0.013	0.027
277	23.08	0.07	0.040	(0.076)	0.013	0.027
278	23.17	0.07	0.040	(0.076)	0.013	0.027
279	23.25	0.07	0.040	(0.076)	0.013	0.027
280	23.33	0.07	0.040	(0.076)	0.013	0.027
281	23.42	0.07	0.040	(0.076)	0.013	0.027
282	23.50	0.07	0.040	(0.075)	0.013	0.027
283	23.58	0.07	0.040	(0.075)	0.013	0.027
284	23.67	0.07	0.040	(0.075)	0.013	0.027
285	23.75	0.07	0.040	(0.075)	0.013	0.027
286	23.83	0.07	0.040	(0.075)	0.013	0.027
287	23.92	0.07	0.040	(0.075)	0.013	0.027
288	24.00	0.07	0.040	(0.075)	0.013	0.027

(Loss Rate Not Used)

Sum = 100.0 Sum = 42.3

Flood volume = Effective rainfall 3.52(In)
times area 7.2(Ac.)/[(In)/(Ft.)] = 2.1(Ac.Ft)
Total soil loss = 1.48(In)

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      Total soil loss =     0.883(Ac.Ft)
      Total rainfall =      5.00(In)
      Flood volume =       91865.0 Cubic Feet
      Total soil loss =       38450.2 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =      3.991(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        2.5       5.0       7.5      10.0
-------------------------------------------------------------------------
  0+ 5       0.0006      0.09  Q         |         |         |         |
  0+10       0.0018      0.17  Q         |         |         |         |
  0+15       0.0031      0.19  Q         |         |         |         |
  0+20       0.0047      0.24  Q         |         |         |         |
  0+25       0.0067      0.28  VQ        |         |         |         |
  0+30       0.0086      0.29  VQ        |         |         |         |
  0+35       0.0106      0.29  VQ        |         |         |         |
  0+40       0.0126      0.29  VQ        |         |         |         |
  0+45       0.0146      0.29  VQ        |         |         |         |
  0+50       0.0169      0.34  VQ        |         |         |         |
  0+55       0.0195      0.38  VQ        |         |         |         |
  1+ 0       0.0222      0.38  VQ        |         |         |         |
  1+ 5       0.0245      0.34  VQ        |         |         |         |
  1+10       0.0266      0.30  VQ        |         |         |         |
  1+15       0.0286      0.29  VQ        |         |         |         |
  1+20       0.0306      0.29  VQ        |         |         |         |
  1+25       0.0326      0.29  VQ        |         |         |         |
  1+30       0.0346      0.29  VQ        |         |         |         |
  1+35       0.0366      0.29  VQ        |         |         |         |
  1+40       0.0386      0.29  VQ        |         |         |         |
  1+45       0.0406      0.29  VQ        |         |         |         |
  1+50       0.0429      0.34  VQ        |         |         |         |
  1+55       0.0455      0.38  VQ        |         |         |         |
  2+ 0       0.0481      0.38  VQ        |         |         |         |
  2+ 5       0.0508      0.39  VQ        |         |         |         |
  2+10       0.0535      0.39  |Q        |         |         |         |
  2+15       0.0561      0.39  |Q        |         |         |         |
  2+20       0.0588      0.39  |Q        |         |         |         |
  2+25       0.0615      0.39  |Q        |         |         |         |
  2+30       0.0641      0.39  |Q        |         |         |         |
  2+35       0.0671      0.43  |Q        |         |         |         |
  2+40       0.0704      0.47  |Q        |         |         |         |
  2+45       0.0737      0.48  |Q        |         |         |         |
  2+50       0.0770      0.48  |Q        |         |         |         |
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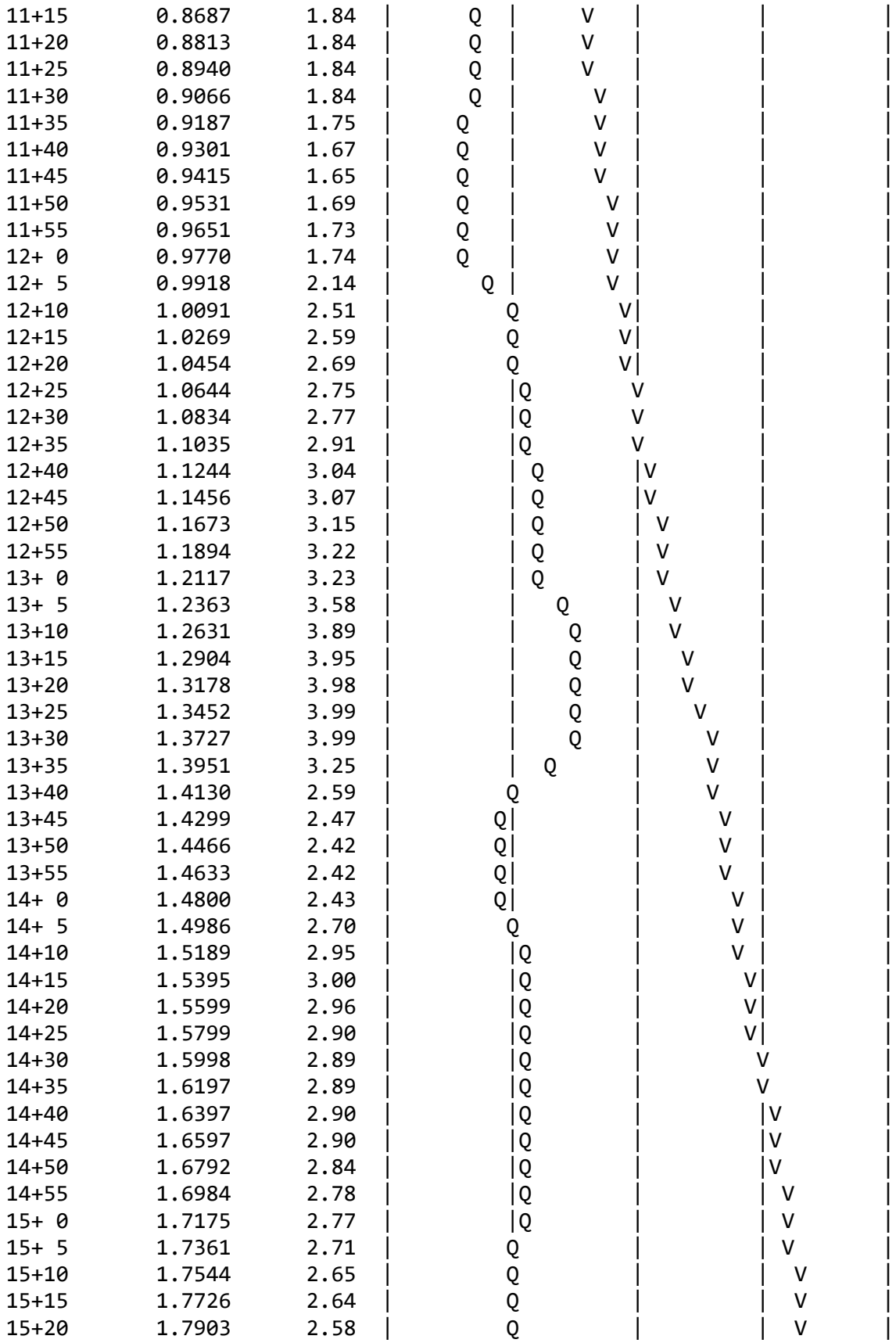
2+55	0.0803	0.48	Q				
3+ 0	0.0837	0.48	Q				
3+ 5	0.0870	0.48	Q				
3+10	0.0903	0.48	Q				
3+15	0.0937	0.48	Q				
3+20	0.0970	0.48	Q				
3+25	0.1003	0.48	Q				
3+30	0.1036	0.48	Q				
3+35	0.1070	0.48	QV				
3+40	0.1103	0.48	QV				
3+45	0.1136	0.48	QV				
3+50	0.1173	0.53	Q				
3+55	0.1212	0.57	Q				
4+ 0	0.1252	0.58	Q				
4+ 5	0.1292	0.58	Q				
4+10	0.1332	0.58	Q				
4+15	0.1372	0.58	Q				
4+20	0.1415	0.63	Q				
4+25	0.1461	0.67	Q				
4+30	0.1507	0.67	Q				
4+35	0.1554	0.68	Q				
4+40	0.1600	0.68	QV				
4+45	0.1647	0.68	QV				
4+50	0.1697	0.72	QV				
4+55	0.1749	0.76	Q				
5+ 0	0.1802	0.77	Q				
5+ 5	0.1849	0.68	QV				
5+10	0.1891	0.60	QV				
5+15	0.1931	0.59	QV				
5+20	0.1974	0.63	QV				
5+25	0.2020	0.67	QV				
5+30	0.2067	0.67	QV				
5+35	0.2116	0.72	Q V				
5+40	0.2169	0.76	QV				
5+45	0.2222	0.77	QV				
5+50	0.2275	0.77	QV				
5+55	0.2328	0.77	QV				
6+ 0	0.2382	0.77	QV				
6+ 5	0.2438	0.82	QV				
6+10	0.2497	0.86	QV				
6+15	0.2557	0.87	QV				
6+20	0.2617	0.87	QV				
6+25	0.2677	0.87	Q V				
6+30	0.2737	0.87	Q V				
6+35	0.2800	0.92	Q V				
6+40	0.2866	0.96	Q V				
6+45	0.2932	0.96	Q V				
6+50	0.2999	0.97	Q V				
6+55	0.3065	0.97	Q V				
7+ 0	0.3132	0.97	Q V				

7+ 5	0.3199	0.97	Q V				
7+10	0.3265	0.97	Q V				
7+15	0.3332	0.97	Q V				
7+20	0.3402	1.01	Q V				
7+25	0.3474	1.05	Q V				
7+30	0.3547	1.06	Q V				
7+35	0.3623	1.11	Q V				
7+40	0.3703	1.15	Q V				
7+45	0.3782	1.16	Q V				
7+50	0.3865	1.21	Q V				
7+55	0.3951	1.25	Q V				
8+ 0	0.4038	1.25	Q V				
8+ 5	0.4130	1.35	Q V				
8+10	0.4229	1.43	Q V				
8+15	0.4328	1.44	Q V				
8+20	0.4428	1.45	Q V				
8+25	0.4528	1.45	Q V				
8+30	0.4628	1.45	Q V				
8+35	0.4731	1.50	Q V				
8+40	0.4837	1.54	Q V				
8+45	0.4943	1.54	Q V				
8+50	0.5053	1.59	Q V				
8+55	0.5165	1.63	Q V				
9+ 0	0.5278	1.64	Q V				
9+ 5	0.5398	1.73	Q V				
9+10	0.5523	1.82	Q V				
9+15	0.5649	1.83	Q V				
9+20	0.5779	1.88	Q V				
9+25	0.5911	1.92	Q V				
9+30	0.6044	1.93	Q V				
9+35	0.6181	1.98	Q V				
9+40	0.6320	2.02	Q V				
9+45	0.6459	2.03	Q V				
9+50	0.6602	2.08	Q V				
9+55	0.6748	2.12	Q V				
10+ 0	0.6894	2.12	Q V				
10+ 5	0.7019	1.81	Q V				
10+10	0.7124	1.53	Q V				
10+15	0.7226	1.47	Q V				
10+20	0.7326	1.45	Q V				
10+25	0.7426	1.45	Q V				
10+30	0.7526	1.45	Q V				
10+35	0.7641	1.68	Q V				
10+40	0.7771	1.88	Q V				
10+45	0.7903	1.92	Q V				
10+50	0.8036	1.93	Q V				
10+55	0.8169	1.93	Q V				
11+ 0	0.8302	1.93	Q V				
11+ 5	0.8433	1.89	Q V				
11+10	0.8560	1.85	Q V				



15+25	1.8077	2.52	| Q |	| |	| V |
15+30	1.8249	2.51	| Q |	| |	| V |
15+35	1.8404	2.24	| Q |	| |	| V |
15+40	1.8542	2.00	| Q |	| |	| V |
15+45	1.8677	1.96	| Q |	| |	| V |
15+50	1.8810	1.94	| Q |	| |	| V |
15+55	1.8945	1.95	| Q |	| |	| V |
16+ 0	1.9079	1.95	| Q |	| |	| V |
16+ 5	1.9163	1.22	| Q |	| |	| V |
16+10	1.9202	0.57	| Q |	| |	| V |
16+15	1.9233	0.44	|Q |	| |	| V |
16+20	1.9259	0.39	|Q |	| |	| V |
16+25	1.9286	0.39	|Q |	| |	| V |
16+30	1.9313	0.39	|Q |	| |	| V |
16+35	1.9336	0.34	|Q |	| |	| V |
16+40	1.9357	0.30	|Q |	| |	| V |
16+45	1.9377	0.29	|Q |	| |	| V |
16+50	1.9397	0.29	|Q |	| |	| V |
16+55	1.9417	0.29	|Q |	| |	| V |
17+ 0	1.9437	0.29	|Q |	| |	| V |
17+ 5	1.9463	0.38	|Q |	| |	| V |
17+10	1.9495	0.46	|Q |	| |	| V |
17+15	1.9528	0.48	|Q |	| |	| V |
17+20	1.9561	0.48	|Q |	| |	| V |
17+25	1.9594	0.48	|Q |	| |	| V |
17+30	1.9628	0.48	|Q |	| |	| V |
17+35	1.9661	0.48	|Q |	| |	| V |
17+40	1.9694	0.48	|Q |	| |	| V |
17+45	1.9728	0.48	|Q |	| |	| V |
17+50	1.9758	0.44	|Q |	| |	| V |
17+55	1.9785	0.40	|Q |	| |	| V |
18+ 0	1.9812	0.39	|Q |	| |	| V |
18+ 5	1.9839	0.39	|Q |	| |	| V |
18+10	1.9865	0.39	|Q |	| |	| V |
18+15	1.9892	0.39	|Q |	| |	| V |
18+20	1.9919	0.39	|Q |	| |	| V |
18+25	1.9945	0.39	|Q |	| |	| V |
18+30	1.9972	0.39	|Q |	| |	| V |
18+35	1.9996	0.34	|Q |	| |	| V |
18+40	2.0016	0.30	|Q |	| |	| V |
18+45	2.0036	0.29	|Q |	| |	| V |
18+50	2.0053	0.25	Q |	| |	| V |
18+55	2.0067	0.20	Q |	| |	| V |
19+ 0	2.0081	0.20	Q |	| |	| V |
19+ 5	2.0097	0.24	Q |	| |	| V |
19+10	2.0117	0.28	|Q |	| |	| V |
19+15	2.0136	0.29	|Q |	| |	| V |
19+20	2.0159	0.34	|Q |	| |	| V |
19+25	2.0185	0.38	|Q |	| |	| V |
19+30	2.0212	0.38	|Q |	| |	| V |

19+35	2.0235	0.34	|Q	|	|	|	V |
19+40	2.0256	0.30	|Q	|	|	|	V |
19+45	2.0276	0.29	|Q	|	|	|	V |
19+50	2.0293	0.25	Q	|	|	|	V |
19+55	2.0307	0.20	Q	|	|	|	V |
20+ 0	2.0321	0.20	Q	|	|	|	V |
20+ 5	2.0337	0.24	Q	|	|	|	V |
20+10	2.0356	0.28	|Q	|	|	|	V |
20+15	2.0376	0.29	|Q	|	|	|	V |
20+20	2.0396	0.29	|Q	|	|	|	V |
20+25	2.0416	0.29	|Q	|	|	|	V |
20+30	2.0436	0.29	|Q	|	|	|	V |
20+35	2.0456	0.29	|Q	|	|	|	V |
20+40	2.0476	0.29	|Q	|	|	|	V |
20+45	2.0496	0.29	|Q	|	|	|	V |
20+50	2.0513	0.25	Q	|	|	|	V |
20+55	2.0527	0.20	Q	|	|	|	V |
21+ 0	2.0541	0.20	Q	|	|	|	V |
21+ 5	2.0557	0.24	Q	|	|	|	V |
21+10	2.0576	0.28	|Q	|	|	|	V|
21+15	2.0596	0.29	|Q	|	|	|	V|
21+20	2.0613	0.25	Q	|	|	|	V|
21+25	2.0627	0.20	Q	|	|	|	V|
21+30	2.0641	0.20	Q	|	|	|	V|
21+35	2.0657	0.24	Q	|	|	|	V|
21+40	2.0676	0.28	|Q	|	|	|	V|
21+45	2.0696	0.29	|Q	|	|	|	V|
21+50	2.0713	0.25	Q	|	|	|	V|
21+55	2.0727	0.20	Q	|	|	|	V|
22+ 0	2.0740	0.20	Q	|	|	|	V|
22+ 5	2.0757	0.24	Q	|	|	|	V|
22+10	2.0776	0.28	|Q	|	|	|	V|
22+15	2.0796	0.29	|Q	|	|	|	V|
22+20	2.0813	0.25	Q	|	|	|	V|
22+25	2.0827	0.20	Q	|	|	|	V|
22+30	2.0840	0.20	Q	|	|	|	V|
22+35	2.0854	0.19	Q	|	|	|	V|
22+40	2.0867	0.19	Q	|	|	|	V|
22+45	2.0880	0.19	Q	|	|	|	V|
22+50	2.0894	0.19	Q	|	|	|	V|
22+55	2.0907	0.19	Q	|	|	|	V|
23+ 0	2.0920	0.19	Q	|	|	|	V|
23+ 5	2.0934	0.19	Q	|	|	|	V|
23+10	2.0947	0.19	Q	|	|	|	V|
23+15	2.0960	0.19	Q	|	|	|	V|
23+20	2.0974	0.19	Q	|	|	|	V|
23+25	2.0987	0.19	Q	|	|	|	V|
23+30	2.1000	0.19	Q	|	|	|	V|
23+35	2.1014	0.19	Q	|	|	|	V|
23+40	2.1027	0.19	Q	|	|	|	V|

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   23+45       2.1040      0.19  Q         |          |          |         V|
   23+50       2.1054      0.19  Q         |          |          |         V|
   23+55       2.1067      0.19  Q         |          |          |         V|
   24+ 0       2.1080      0.19  Q         |          |          |         V|
   24+ 5       2.1087      0.10  Q         |          |          |         V|
   24+10       2.1089      0.02  Q         |          |          |         V|
   24+15       2.1089      0.01  Q         |          |          |          V
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U n i t H y d r o g r a p h A n a l y s i s

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Study date 09/30/24 File: 100PUH24100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 7.18(Ac.) = 0.011 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 7.18(Ac.) = 0.011 Sq. Mi.
Length along longest watercourse = 1187.00(Ft.)
Length along longest watercourse measured to centroid = 501.00(Ft.)
Length along longest watercourse = 0.225 Mi.
Length along longest watercourse measured to centroid = 0.095 Mi.
Difference in elevation = 28.80(Ft.)
Slope along watercourse = 128.1078 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.033 Hr.
Lag time = 1.99 Min.
25% of lag time = 0.50 Min.
40% of lag time = 0.80 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

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

7.18 2.00 14.36

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
7.18	5.00	35.90

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 2.000(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
7.180	60.70	0.723

Total Area Entered = 7.18(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
60.7	60.7	0.462	0.723	0.162	1.000	0.162
					Sum (F) =	0.162

Area averaged mean soil loss (F) (In/Hr) = 0.162
Minimum soil loss rate ((In/Hr)) = 0.081
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.322

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	251.147	51.045	3.694
2	0.167	502.294	39.983	2.893
3	0.250	753.441	6.982	0.505
4	0.333	1004.588	1.989	0.144
		Sum = 100.000	Sum=	7.236

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.040	(0.286)	0.013	0.027
2	0.17	0.07	0.040	(0.285)	0.013	0.027
3	0.25	0.07	0.040	(0.284)	0.013	0.027
4	0.33	0.10	0.060	(0.283)	0.019	0.041

5	0.42	0.10	0.060	(0.282)	0.019	0.041
6	0.50	0.10	0.060	(0.281)	0.019	0.041
7	0.58	0.10	0.060	(0.280)	0.019	0.041
8	0.67	0.10	0.060	(0.279)	0.019	0.041
9	0.75	0.10	0.060	(0.278)	0.019	0.041
10	0.83	0.13	0.080	(0.276)	0.026	0.054
11	0.92	0.13	0.080	(0.275)	0.026	0.054
12	1.00	0.13	0.080	(0.274)	0.026	0.054
13	1.08	0.10	0.060	(0.273)	0.019	0.041
14	1.17	0.10	0.060	(0.272)	0.019	0.041
15	1.25	0.10	0.060	(0.271)	0.019	0.041
16	1.33	0.10	0.060	(0.270)	0.019	0.041
17	1.42	0.10	0.060	(0.269)	0.019	0.041
18	1.50	0.10	0.060	(0.268)	0.019	0.041
19	1.58	0.10	0.060	(0.267)	0.019	0.041
20	1.67	0.10	0.060	(0.266)	0.019	0.041
21	1.75	0.10	0.060	(0.265)	0.019	0.041
22	1.83	0.13	0.080	(0.264)	0.026	0.054
23	1.92	0.13	0.080	(0.262)	0.026	0.054
24	2.00	0.13	0.080	(0.261)	0.026	0.054
25	2.08	0.13	0.080	(0.260)	0.026	0.054
26	2.17	0.13	0.080	(0.259)	0.026	0.054
27	2.25	0.13	0.080	(0.258)	0.026	0.054
28	2.33	0.13	0.080	(0.257)	0.026	0.054
29	2.42	0.13	0.080	(0.256)	0.026	0.054
30	2.50	0.13	0.080	(0.255)	0.026	0.054
31	2.58	0.17	0.100	(0.254)	0.032	0.068
32	2.67	0.17	0.100	(0.253)	0.032	0.068
33	2.75	0.17	0.100	(0.252)	0.032	0.068
34	2.83	0.17	0.100	(0.251)	0.032	0.068
35	2.92	0.17	0.100	(0.250)	0.032	0.068
36	3.00	0.17	0.100	(0.249)	0.032	0.068
37	3.08	0.17	0.100	(0.248)	0.032	0.068
38	3.17	0.17	0.100	(0.247)	0.032	0.068
39	3.25	0.17	0.100	(0.246)	0.032	0.068
40	3.33	0.17	0.100	(0.245)	0.032	0.068
41	3.42	0.17	0.100	(0.244)	0.032	0.068
42	3.50	0.17	0.100	(0.243)	0.032	0.068
43	3.58	0.17	0.100	(0.242)	0.032	0.068
44	3.67	0.17	0.100	(0.241)	0.032	0.068
45	3.75	0.17	0.100	(0.240)	0.032	0.068
46	3.83	0.20	0.120	(0.239)	0.039	0.081
47	3.92	0.20	0.120	(0.238)	0.039	0.081
48	4.00	0.20	0.120	(0.237)	0.039	0.081
49	4.08	0.20	0.120	(0.236)	0.039	0.081
50	4.17	0.20	0.120	(0.235)	0.039	0.081
51	4.25	0.20	0.120	(0.234)	0.039	0.081
52	4.33	0.23	0.140	(0.233)	0.045	0.095
53	4.42	0.23	0.140	(0.232)	0.045	0.095
54	4.50	0.23	0.140	(0.231)	0.045	0.095
55	4.58	0.23	0.140	(0.230)	0.045	0.095
56	4.67	0.23	0.140	(0.229)	0.045	0.095
57	4.75	0.23	0.140	(0.228)	0.045	0.095
58	4.83	0.27	0.160	(0.227)	0.051	0.109
59	4.92	0.27	0.160	(0.226)	0.051	0.109
60	5.00	0.27	0.160	(0.225)	0.051	0.109
61	5.08	0.20	0.120	(0.224)	0.039	0.081

62	5.17	0.20	0.120	(0.223)	0.039	0.081
63	5.25	0.20	0.120	(0.222)	0.039	0.081
64	5.33	0.23	0.140	(0.221)	0.045	0.095
65	5.42	0.23	0.140	(0.220)	0.045	0.095
66	5.50	0.23	0.140	(0.219)	0.045	0.095
67	5.58	0.27	0.160	(0.218)	0.051	0.109
68	5.67	0.27	0.160	(0.217)	0.051	0.109
69	5.75	0.27	0.160	(0.216)	0.051	0.109
70	5.83	0.27	0.160	(0.215)	0.051	0.109
71	5.92	0.27	0.160	(0.214)	0.051	0.109
72	6.00	0.27	0.160	(0.213)	0.051	0.109
73	6.08	0.30	0.180	(0.212)	0.058	0.122
74	6.17	0.30	0.180	(0.211)	0.058	0.122
75	6.25	0.30	0.180	(0.210)	0.058	0.122
76	6.33	0.30	0.180	(0.209)	0.058	0.122
77	6.42	0.30	0.180	(0.209)	0.058	0.122
78	6.50	0.30	0.180	(0.208)	0.058	0.122
79	6.58	0.33	0.200	(0.207)	0.064	0.136
80	6.67	0.33	0.200	(0.206)	0.064	0.136
81	6.75	0.33	0.200	(0.205)	0.064	0.136
82	6.83	0.33	0.200	(0.204)	0.064	0.136
83	6.92	0.33	0.200	(0.203)	0.064	0.136
84	7.00	0.33	0.200	(0.202)	0.064	0.136
85	7.08	0.33	0.200	(0.201)	0.064	0.136
86	7.17	0.33	0.200	(0.200)	0.064	0.136
87	7.25	0.33	0.200	(0.199)	0.064	0.136
88	7.33	0.37	0.220	(0.198)	0.071	0.149
89	7.42	0.37	0.220	(0.197)	0.071	0.149
90	7.50	0.37	0.220	(0.197)	0.071	0.149
91	7.58	0.40	0.240	(0.196)	0.077	0.163
92	7.67	0.40	0.240	(0.195)	0.077	0.163
93	7.75	0.40	0.240	(0.194)	0.077	0.163
94	7.83	0.43	0.260	(0.193)	0.084	0.176
95	7.92	0.43	0.260	(0.192)	0.084	0.176
96	8.00	0.43	0.260	(0.191)	0.084	0.176
97	8.08	0.50	0.300	(0.190)	0.096	0.204
98	8.17	0.50	0.300	(0.189)	0.096	0.204
99	8.25	0.50	0.300	(0.189)	0.096	0.204
100	8.33	0.50	0.300	(0.188)	0.096	0.204
101	8.42	0.50	0.300	(0.187)	0.096	0.204
102	8.50	0.50	0.300	(0.186)	0.096	0.204
103	8.58	0.53	0.320	(0.185)	0.103	0.217
104	8.67	0.53	0.320	(0.184)	0.103	0.217
105	8.75	0.53	0.320	(0.183)	0.103	0.217
106	8.83	0.57	0.340	(0.182)	0.109	0.231
107	8.92	0.57	0.340	(0.182)	0.109	0.231
108	9.00	0.57	0.340	(0.181)	0.109	0.231
109	9.08	0.63	0.380	(0.180)	0.122	0.258
110	9.17	0.63	0.380	(0.179)	0.122	0.258
111	9.25	0.63	0.380	(0.178)	0.122	0.258
112	9.33	0.67	0.400	(0.177)	0.129	0.271
113	9.42	0.67	0.400	(0.176)	0.129	0.271
114	9.50	0.67	0.400	(0.176)	0.129	0.271
115	9.58	0.70	0.420	(0.175)	0.135	0.285
116	9.67	0.70	0.420	(0.174)	0.135	0.285
117	9.75	0.70	0.420	(0.173)	0.135	0.285
118	9.83	0.73	0.440	(0.172)	0.142	0.298

119	9.92	0.73	0.440	(0.171)	0.142	0.298
120	10.00	0.73	0.440	(0.171)	0.142	0.298
121	10.08	0.50	0.300	(0.170)	0.096	0.204
122	10.17	0.50	0.300	(0.169)	0.096	0.204
123	10.25	0.50	0.300	(0.168)	0.096	0.204
124	10.33	0.50	0.300	(0.167)	0.096	0.204
125	10.42	0.50	0.300	(0.166)	0.096	0.204
126	10.50	0.50	0.300	(0.166)	0.096	0.204
127	10.58	0.67	0.400	(0.165)	0.129	0.271
128	10.67	0.67	0.400	(0.164)	0.129	0.271
129	10.75	0.67	0.400	(0.163)	0.129	0.271
130	10.83	0.67	0.400	(0.162)	0.129	0.271
131	10.92	0.67	0.400	(0.162)	0.129	0.271
132	11.00	0.67	0.400	(0.161)	0.129	0.271
133	11.08	0.63	0.380	(0.160)	0.122	0.258
134	11.17	0.63	0.380	(0.159)	0.122	0.258
135	11.25	0.63	0.380	(0.158)	0.122	0.258
136	11.33	0.63	0.380	(0.158)	0.122	0.258
137	11.42	0.63	0.380	(0.157)	0.122	0.258
138	11.50	0.63	0.380	(0.156)	0.122	0.258
139	11.58	0.57	0.340	(0.155)	0.109	0.231
140	11.67	0.57	0.340	(0.155)	0.109	0.231
141	11.75	0.57	0.340	(0.154)	0.109	0.231
142	11.83	0.60	0.360	(0.153)	0.116	0.244
143	11.92	0.60	0.360	(0.152)	0.116	0.244
144	12.00	0.60	0.360	(0.152)	0.116	0.244
145	12.08	0.83	0.500	0.151	(0.161)	0.349
146	12.17	0.83	0.500	0.150	(0.161)	0.350
147	12.25	0.83	0.500	0.149	(0.161)	0.351
148	12.33	0.87	0.520	0.149	(0.167)	0.371
149	12.42	0.87	0.520	0.148	(0.167)	0.372
150	12.50	0.87	0.520	0.147	(0.167)	0.373
151	12.58	0.93	0.560	0.146	(0.180)	0.414
152	12.67	0.93	0.560	0.146	(0.180)	0.414
153	12.75	0.93	0.560	0.145	(0.180)	0.415
154	12.83	0.97	0.580	0.144	(0.187)	0.436
155	12.92	0.97	0.580	0.143	(0.187)	0.437
156	13.00	0.97	0.580	0.143	(0.187)	0.437
157	13.08	1.13	0.680	0.142	(0.219)	0.538
158	13.17	1.13	0.680	0.141	(0.219)	0.539
159	13.25	1.13	0.680	0.140	(0.219)	0.540
160	13.33	1.13	0.680	0.140	(0.219)	0.540
161	13.42	1.13	0.680	0.139	(0.219)	0.541
162	13.50	1.13	0.680	0.138	(0.219)	0.542
163	13.58	0.77	0.460	0.138	(0.148)	0.322
164	13.67	0.77	0.460	0.137	(0.148)	0.323
165	13.75	0.77	0.460	0.136	(0.148)	0.324
166	13.83	0.77	0.460	0.136	(0.148)	0.324
167	13.92	0.77	0.460	0.135	(0.148)	0.325
168	14.00	0.77	0.460	0.134	(0.148)	0.326
169	14.08	0.90	0.540	0.133	(0.174)	0.407
170	14.17	0.90	0.540	0.133	(0.174)	0.407
171	14.25	0.90	0.540	0.132	(0.174)	0.408
172	14.33	0.87	0.520	0.131	(0.167)	0.389
173	14.42	0.87	0.520	0.131	(0.167)	0.389
174	14.50	0.87	0.520	0.130	(0.167)	0.390
175	14.58	0.87	0.520	0.129	(0.167)	0.391

176	14.67	0.87	0.520	0.129	(0.167)	0.391
177	14.75	0.87	0.520	0.128	(0.167)	0.392
178	14.83	0.83	0.500	0.127	(0.161)	0.373
179	14.92	0.83	0.500	0.127	(0.161)	0.373
180	15.00	0.83	0.500	0.126	(0.161)	0.374
181	15.08	0.80	0.480	0.126	(0.154)	0.354
182	15.17	0.80	0.480	0.125	(0.154)	0.355
183	15.25	0.80	0.480	0.124	(0.154)	0.356
184	15.33	0.77	0.460	0.124	(0.148)	0.336
185	15.42	0.77	0.460	0.123	(0.148)	0.337
186	15.50	0.77	0.460	0.122	(0.148)	0.338
187	15.58	0.63	0.380	0.122	(0.122)	0.258
188	15.67	0.63	0.380	0.121	(0.122)	0.259
189	15.75	0.63	0.380	0.120	(0.122)	0.260
190	15.83	0.63	0.380	0.120	(0.122)	0.260
191	15.92	0.63	0.380	0.119	(0.122)	0.261
192	16.00	0.63	0.380	0.119	(0.122)	0.261
193	16.08	0.13	0.080	(0.118)	0.026	0.054
194	16.17	0.13	0.080	(0.117)	0.026	0.054
195	16.25	0.13	0.080	(0.117)	0.026	0.054
196	16.33	0.13	0.080	(0.116)	0.026	0.054
197	16.42	0.13	0.080	(0.116)	0.026	0.054
198	16.50	0.13	0.080	(0.115)	0.026	0.054
199	16.58	0.10	0.060	(0.114)	0.019	0.041
200	16.67	0.10	0.060	(0.114)	0.019	0.041
201	16.75	0.10	0.060	(0.113)	0.019	0.041
202	16.83	0.10	0.060	(0.113)	0.019	0.041
203	16.92	0.10	0.060	(0.112)	0.019	0.041
204	17.00	0.10	0.060	(0.112)	0.019	0.041
205	17.08	0.17	0.100	(0.111)	0.032	0.068
206	17.17	0.17	0.100	(0.110)	0.032	0.068
207	17.25	0.17	0.100	(0.110)	0.032	0.068
208	17.33	0.17	0.100	(0.109)	0.032	0.068
209	17.42	0.17	0.100	(0.109)	0.032	0.068
210	17.50	0.17	0.100	(0.108)	0.032	0.068
211	17.58	0.17	0.100	(0.108)	0.032	0.068
212	17.67	0.17	0.100	(0.107)	0.032	0.068
213	17.75	0.17	0.100	(0.107)	0.032	0.068
214	17.83	0.13	0.080	(0.106)	0.026	0.054
215	17.92	0.13	0.080	(0.106)	0.026	0.054
216	18.00	0.13	0.080	(0.105)	0.026	0.054
217	18.08	0.13	0.080	(0.105)	0.026	0.054
218	18.17	0.13	0.080	(0.104)	0.026	0.054
219	18.25	0.13	0.080	(0.104)	0.026	0.054
220	18.33	0.13	0.080	(0.103)	0.026	0.054
221	18.42	0.13	0.080	(0.103)	0.026	0.054
222	18.50	0.13	0.080	(0.102)	0.026	0.054
223	18.58	0.10	0.060	(0.102)	0.019	0.041
224	18.67	0.10	0.060	(0.101)	0.019	0.041
225	18.75	0.10	0.060	(0.101)	0.019	0.041
226	18.83	0.07	0.040	(0.100)	0.013	0.027
227	18.92	0.07	0.040	(0.100)	0.013	0.027
228	19.00	0.07	0.040	(0.099)	0.013	0.027
229	19.08	0.10	0.060	(0.099)	0.019	0.041
230	19.17	0.10	0.060	(0.098)	0.019	0.041
231	19.25	0.10	0.060	(0.098)	0.019	0.041
232	19.33	0.13	0.080	(0.097)	0.026	0.054

233	19.42	0.13	0.080	(0.097)	0.026	0.054
234	19.50	0.13	0.080	(0.096)	0.026	0.054
235	19.58	0.10	0.060	(0.096)	0.019	0.041
236	19.67	0.10	0.060	(0.096)	0.019	0.041
237	19.75	0.10	0.060	(0.095)	0.019	0.041
238	19.83	0.07	0.040	(0.095)	0.013	0.027
239	19.92	0.07	0.040	(0.094)	0.013	0.027
240	20.00	0.07	0.040	(0.094)	0.013	0.027
241	20.08	0.10	0.060	(0.093)	0.019	0.041
242	20.17	0.10	0.060	(0.093)	0.019	0.041
243	20.25	0.10	0.060	(0.093)	0.019	0.041
244	20.33	0.10	0.060	(0.092)	0.019	0.041
245	20.42	0.10	0.060	(0.092)	0.019	0.041
246	20.50	0.10	0.060	(0.091)	0.019	0.041
247	20.58	0.10	0.060	(0.091)	0.019	0.041
248	20.67	0.10	0.060	(0.091)	0.019	0.041
249	20.75	0.10	0.060	(0.090)	0.019	0.041
250	20.83	0.07	0.040	(0.090)	0.013	0.027
251	20.92	0.07	0.040	(0.090)	0.013	0.027
252	21.00	0.07	0.040	(0.089)	0.013	0.027
253	21.08	0.10	0.060	(0.089)	0.019	0.041
254	21.17	0.10	0.060	(0.088)	0.019	0.041
255	21.25	0.10	0.060	(0.088)	0.019	0.041
256	21.33	0.07	0.040	(0.088)	0.013	0.027
257	21.42	0.07	0.040	(0.087)	0.013	0.027
258	21.50	0.07	0.040	(0.087)	0.013	0.027
259	21.58	0.10	0.060	(0.087)	0.019	0.041
260	21.67	0.10	0.060	(0.086)	0.019	0.041
261	21.75	0.10	0.060	(0.086)	0.019	0.041
262	21.83	0.07	0.040	(0.086)	0.013	0.027
263	21.92	0.07	0.040	(0.086)	0.013	0.027
264	22.00	0.07	0.040	(0.085)	0.013	0.027
265	22.08	0.10	0.060	(0.085)	0.019	0.041
266	22.17	0.10	0.060	(0.085)	0.019	0.041
267	22.25	0.10	0.060	(0.084)	0.019	0.041
268	22.33	0.07	0.040	(0.084)	0.013	0.027
269	22.42	0.07	0.040	(0.084)	0.013	0.027
270	22.50	0.07	0.040	(0.084)	0.013	0.027
271	22.58	0.07	0.040	(0.083)	0.013	0.027
272	22.67	0.07	0.040	(0.083)	0.013	0.027
273	22.75	0.07	0.040	(0.083)	0.013	0.027
274	22.83	0.07	0.040	(0.083)	0.013	0.027
275	22.92	0.07	0.040	(0.083)	0.013	0.027
276	23.00	0.07	0.040	(0.082)	0.013	0.027
277	23.08	0.07	0.040	(0.082)	0.013	0.027
278	23.17	0.07	0.040	(0.082)	0.013	0.027
279	23.25	0.07	0.040	(0.082)	0.013	0.027
280	23.33	0.07	0.040	(0.082)	0.013	0.027
281	23.42	0.07	0.040	(0.081)	0.013	0.027
282	23.50	0.07	0.040	(0.081)	0.013	0.027
283	23.58	0.07	0.040	(0.081)	0.013	0.027
284	23.67	0.07	0.040	(0.081)	0.013	0.027
285	23.75	0.07	0.040	(0.081)	0.013	0.027
286	23.83	0.07	0.040	(0.081)	0.013	0.027
287	23.92	0.07	0.040	(0.081)	0.013	0.027
288	24.00	0.07	0.040	(0.081)	0.013	0.027

(Loss Rate Not Used)

Sum = 100.0 Sum = 42.2

Flood volume = Effective rainfall 3.52(In)
times area 7.2(Ac.)/[(In)/(Ft.)] = 2.1(Ac.Ft)
Total soil loss = 1.48(In)
Total soil loss = 0.888(Ac.Ft)
Total rainfall = 5.00(In)
Flood volume = 91646.5 Cubic Feet
Total soil loss = 38668.6 Cubic Feet

Peak flow rate of this hydrograph = 3.918(CFS)

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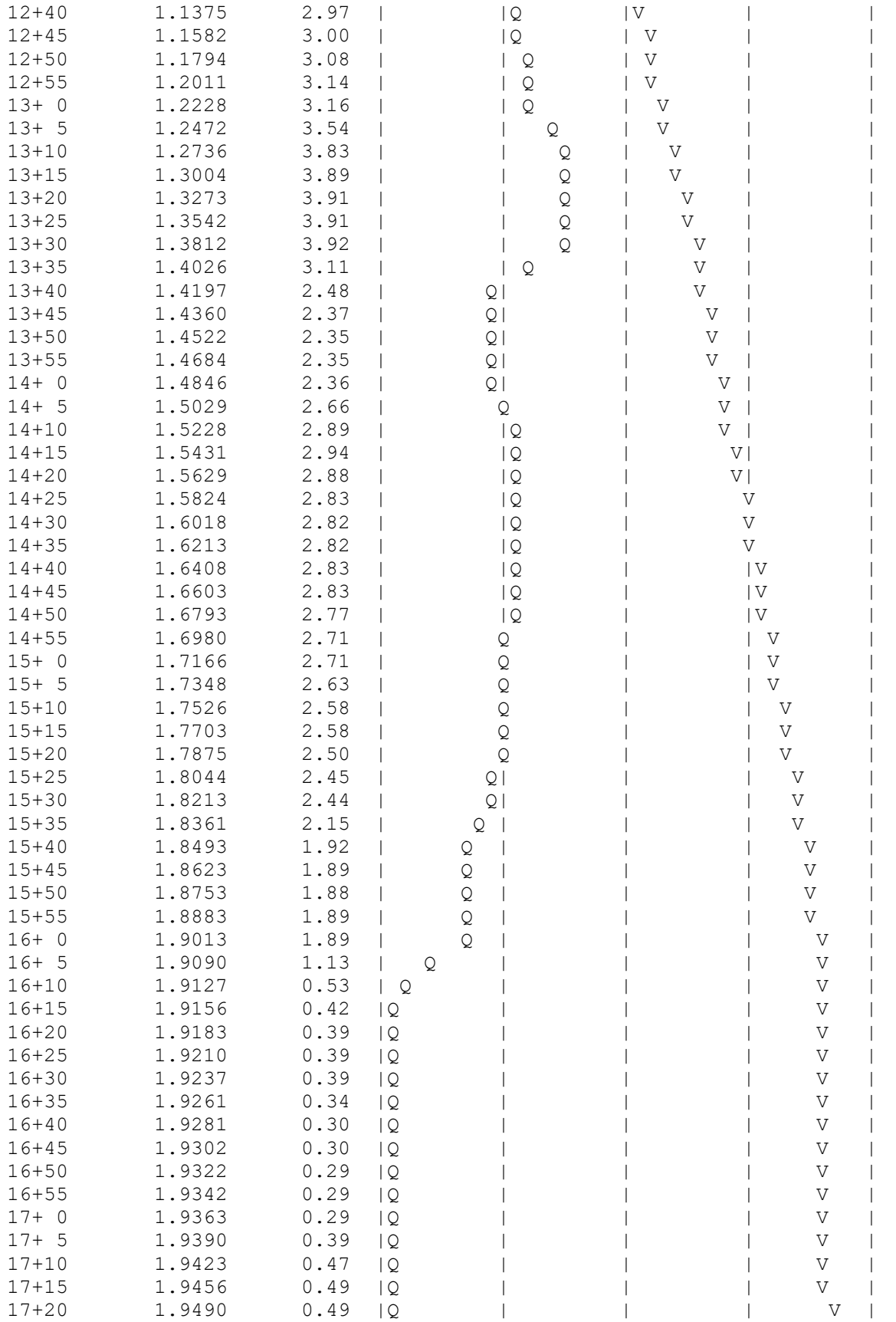
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0007	0.10	Q				
0+10	0.0019	0.18	Q				
0+15	0.0032	0.19	Q				
0+20	0.0049	0.25	Q				
0+25	0.0069	0.29	VQ				
0+30	0.0089	0.29	VQ				
0+35	0.0110	0.29	VQ				
0+40	0.0130	0.29	VQ				
0+45	0.0150	0.29	VQ				
0+50	0.0174	0.34	VQ				
0+55	0.0200	0.38	VQ				
1+ 0	0.0227	0.39	VQ				
1+ 5	0.0251	0.34	VQ				
1+10	0.0272	0.30	VQ				
1+15	0.0292	0.30	VQ				
1+20	0.0313	0.29	VQ				
1+25	0.0333	0.29	VQ				
1+30	0.0353	0.29	VQ				
1+35	0.0373	0.29	VQ				
1+40	0.0394	0.29	VQ				
1+45	0.0414	0.29	VQ				
1+50	0.0438	0.34	VQ				
1+55	0.0464	0.38	VQ				
2+ 0	0.0491	0.39	VQ				
2+ 5	0.0518	0.39	VQ				
2+10	0.0545	0.39	|Q				
2+15	0.0572	0.39	|Q				
2+20	0.0599	0.39	|Q				
2+25	0.0626	0.39	|Q				
2+30	0.0654	0.39	|Q				
2+35	0.0684	0.44	|Q				
2+40	0.0717	0.48	|Q				
2+45	0.0751	0.49	|Q				
2+50	0.0785	0.49	|Q				
2+55	0.0819	0.49	|Q				
3+ 0	0.0852	0.49	|Q				
3+ 5	0.0886	0.49	|Q				

3+10	0.0920	0.49	|Q	|	|	|	|
3+15	0.0954	0.49	|Q	|	|	|	|
3+20	0.0988	0.49	|Q	|	|	|	|
3+25	0.1022	0.49	|Q	|	|	|	|
3+30	0.1055	0.49	|QV	|	|	|	|
3+35	0.1089	0.49	|QV	|	|	|	|
3+40	0.1123	0.49	|QV	|	|	|	|
3+45	0.1157	0.49	|QV	|	|	|	|
3+50	0.1194	0.54	| Q	|	|	|	|
3+55	0.1234	0.58	| Q	|	|	|	|
4+ 0	0.1275	0.59	| Q	|	|	|	|
4+ 5	0.1315	0.59	| Q	|	|	|	|
4+10	0.1356	0.59	| Q	|	|	|	|
4+15	0.1396	0.59	| Q	|	|	|	|
4+20	0.1440	0.64	| Q	|	|	|	|
4+25	0.1487	0.68	| Q	|	|	|	|
4+30	0.1534	0.69	| Q	|	|	|	|
4+35	0.1582	0.69	| QV	|	|	|	|
4+40	0.1629	0.69	| QV	|	|	|	|
4+45	0.1676	0.69	| QV	|	|	|	|
4+50	0.1727	0.74	| QV	|	|	|	|
4+55	0.1781	0.78	| Q	|	|	|	|
5+ 0	0.1835	0.78	| Q	|	|	|	|
5+ 5	0.1882	0.69	| QV	|	|	|	|
5+10	0.1924	0.61	| QV	|	|	|	|
5+15	0.1965	0.59	| QV	|	|	|	|
5+20	0.2009	0.64	| QV	|	|	|	|
5+25	0.2055	0.68	| QV	|	|	|	|
5+30	0.2103	0.69	| QV	|	|	|	|
5+35	0.2153	0.74	| Q V	|	|	|	|
5+40	0.2207	0.78	| QV	|	|	|	|
5+45	0.2261	0.78	| QV	|	|	|	|
5+50	0.2315	0.79	| QV	|	|	|	|
5+55	0.2369	0.79	| QV	|	|	|	|
6+ 0	0.2423	0.79	| QV	|	|	|	|
6+ 5	0.2481	0.84	| QV	|	|	|	|
6+10	0.2541	0.88	| QV	|	|	|	|
6+15	0.2602	0.88	| QV	|	|	|	|
6+20	0.2663	0.88	| Q V	|	|	|	|
6+25	0.2724	0.88	| Q V	|	|	|	|
6+30	0.2785	0.88	| Q V	|	|	|	|
6+35	0.2849	0.93	| Q V	|	|	|	|
6+40	0.2916	0.97	| Q V	|	|	|	|
6+45	0.2983	0.98	| Q V	|	|	|	|
6+50	0.3051	0.98	| Q V	|	|	|	|
6+55	0.3119	0.98	| Q V	|	|	|	|
7+ 0	0.3186	0.98	| Q V	|	|	|	|
7+ 5	0.3254	0.98	| Q V	|	|	|	|
7+10	0.3322	0.98	| Q V	|	|	|	|
7+15	0.3389	0.98	| Q V	|	|	|	|
7+20	0.3460	1.03	| Q V	|	|	|	|
7+25	0.3534	1.07	| Q V	|	|	|	|
7+30	0.3609	1.08	| Q V	|	|	|	|
7+35	0.3686	1.13	| Q V	|	|	|	|
7+40	0.3767	1.17	| Q V	|	|	|	|
7+45	0.3848	1.18	| Q V	|	|	|	|
7+50	0.3933	1.23	| Q V	|	|	|	|

7+55	0.4020	1.27	Q V				
8+ 0	0.4108	1.28	Q V				
8+ 5	0.4203	1.38	Q V				
8+10	0.4303	1.46	Q V				
8+15	0.4404	1.47	Q V				
8+20	0.4506	1.47	Q V				
8+25	0.4607	1.47	Q V				
8+30	0.4709	1.47	Q V				
8+35	0.4813	1.52	Q V				
8+40	0.4921	1.56	Q V				
8+45	0.5029	1.57	Q V				
8+50	0.5141	1.62	Q V				
8+55	0.5255	1.66	Q V				
9+ 0	0.5370	1.67	Q V				
9+ 5	0.5492	1.77	Q V				
9+10	0.5619	1.85	Q V				
9+15	0.5748	1.86	Q V				
9+20	0.5880	1.92	Q V				
9+25	0.6014	1.96	Q V				
9+30	0.6150	1.96	Q V				
9+35	0.6288	2.01	Q V				
9+40	0.6430	2.05	Q V				
9+45	0.6572	2.06	Q V				
9+50	0.6717	2.11	Q V				
9+55	0.6865	2.15	Q V				
10+ 0	0.7014	2.16	Q V				
10+ 5	0.7139	1.81	Q V				
10+10	0.7245	1.54	Q V				
10+15	0.7347	1.49	Q V				
10+20	0.7448	1.47	Q V				
10+25	0.7550	1.47	Q V				
10+30	0.7651	1.47	Q V				
10+35	0.7770	1.72	Q V				
10+40	0.7902	1.92	Q V				
10+45	0.8037	1.95	Q V				
10+50	0.8172	1.96	Q V				
10+55	0.8308	1.96	Q V				
11+ 0	0.8443	1.96	Q V				
11+ 5	0.8575	1.91	Q V				
11+10	0.8704	1.88	Q V				
11+15	0.8833	1.87	Q V				
11+20	0.8961	1.87	Q V				
11+25	0.9090	1.87	Q V				
11+30	0.9218	1.87	Q V				
11+35	0.9340	1.77	Q V				
11+40	0.9456	1.69	Q V				
11+45	0.9571	1.67	Q V				
11+50	0.9690	1.72	Q V				
11+55	0.9811	1.76	Q V				
12+ 0	0.9933	1.77	Q V				
12+ 5	1.0081	2.16	Q V				
12+10	1.0251	2.46	Q V				
12+15	1.0424	2.52	Q V				
12+20	1.0604	2.62	Q V				
12+25	1.0789	2.68	Q V				
12+30	1.0974	2.69	Q V				
12+35	1.1171	2.85	Q V				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12+45 1.1582 3.00
12+50 1.1794 3.08
12+55 1.2011 3.14
13+ 0 1.2228 3.16
13+ 5 1.2472 3.54
13+10 1.2736 3.83
13+15 1.3004 3.89
13+20 1.3273 3.91
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14+ 0 1.4846 2.36
14+ 5 1.5029 2.66
14+10 1.5228 2.89
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14+20 1.5629 2.88
14+25 1.5824 2.83
14+30 1.6018 2.82
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14+40 1.6408 2.83
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15+ 0 1.7166 2.71
15+ 5 1.7348 2.63
15+10 1.7526 2.58
15+15 1.7703 2.58
15+20 1.7875 2.50
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15+35 1.8361 2.15
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15+45 1.8623 1.89
15+50 1.8753 1.88
15+55 1.8883 1.89
16+ 0 1.9013 1.89
16+ 5 1.9090 1.13
16+10 1.9127 0.53
16+15 1.9156 0.42
16+20 1.9183 0.39
16+25 1.9210 0.39
16+30 1.9237 0.39
16+35 1.9261 0.34
16+40 1.9281 0.30
16+45 1.9302 0.30
16+50 1.9322 0.29
16+55 1.9342 0.29
17+ 0 1.9363 0.29
17+ 5 1.9390 0.39
17+10 1.9423 0.47
17+15 1.9456 0.49
17+20 1.9490 0.49

17+25	1.9524	0.49	|Q	|	|	|	V |
17+30	1.9558	0.49	|Q	|	|	|	V |
17+35	1.9591	0.49	|Q	|	|	|	V |
17+40	1.9625	0.49	|Q	|	|	|	V |
17+45	1.9659	0.49	|Q	|	|	|	V |
17+50	1.9689	0.44	|Q	|	|	|	V |
17+55	1.9717	0.40	|Q	|	|	|	V |
18+ 0	1.9744	0.39	|Q	|	|	|	V |
18+ 5	1.9771	0.39	|Q	|	|	|	V |
18+10	1.9798	0.39	|Q	|	|	|	V |
18+15	1.9826	0.39	|Q	|	|	|	V |
18+20	1.9853	0.39	|Q	|	|	|	V |
18+25	1.9880	0.39	|Q	|	|	|	V |
18+30	1.9907	0.39	|Q	|	|	|	V |
18+35	1.9930	0.34	|Q	|	|	|	V |
18+40	1.9951	0.30	|Q	|	|	|	V |
18+45	1.9972	0.30	|Q	|	|	|	V |
18+50	1.9988	0.24	Q	|	|	|	V |
18+55	2.0003	0.21	Q	|	|	|	V |
19+ 0	2.0016	0.20	Q	|	|	|	V |
19+ 5	2.0033	0.25	Q	|	|	|	V |
19+10	2.0053	0.29	|Q	|	|	|	V |
19+15	2.0073	0.29	|Q	|	|	|	V |
19+20	2.0097	0.34	|Q	|	|	|	V |
19+25	2.0123	0.38	|Q	|	|	|	V |
19+30	2.0150	0.39	|Q	|	|	|	V |
19+35	2.0174	0.34	|Q	|	|	|	V |
19+40	2.0195	0.30	|Q	|	|	|	V |
19+45	2.0215	0.30	|Q	|	|	|	V |
19+50	2.0232	0.24	Q	|	|	|	V |
19+55	2.0246	0.21	Q	|	|	|	V |
20+ 0	2.0260	0.20	Q	|	|	|	V |
20+ 5	2.0277	0.25	Q	|	|	|	V |
20+10	2.0296	0.29	|Q	|	|	|	V |
20+15	2.0317	0.29	|Q	|	|	|	V |
20+20	2.0337	0.29	|Q	|	|	|	V |
20+25	2.0357	0.29	|Q	|	|	|	V |
20+30	2.0378	0.29	|Q	|	|	|	V |
20+35	2.0398	0.29	|Q	|	|	|	V |
20+40	2.0418	0.29	|Q	|	|	|	V |
20+45	2.0438	0.29	|Q	|	|	|	V |
20+50	2.0455	0.24	Q	|	|	|	V |
20+55	2.0469	0.21	Q	|	|	|	V |
21+ 0	2.0483	0.20	Q	|	|	|	V |
21+ 5	2.0500	0.25	Q	|	|	|	V |
21+10	2.0520	0.29	|Q	|	|	|	V|
21+15	2.0540	0.29	|Q	|	|	|	V|
21+20	2.0557	0.24	Q	|	|	|	V|
21+25	2.0571	0.21	Q	|	|	|	V|
21+30	2.0585	0.20	Q	|	|	|	V|
21+35	2.0602	0.25	Q	|	|	|	V|
21+40	2.0621	0.29	|Q	|	|	|	V|
21+45	2.0641	0.29	|Q	|	|	|	V|
21+50	2.0658	0.24	Q	|	|	|	V|
21+55	2.0672	0.21	Q	|	|	|	V|
22+ 0	2.0686	0.20	Q	|	|	|	V|
22+ 5	2.0703	0.25	Q	|	|	|	V|

22+10	2.0723	0.29	|Q	|	|	|	V|
22+15	2.0743	0.29	|Q	|	|	|	V|
22+20	2.0760	0.24	Q	|	|	|	V|
22+25	2.0774	0.21	Q	|	|	|	V|
22+30	2.0788	0.20	Q	|	|	|	V|
22+35	2.0801	0.20	Q	|	|	|	V|
22+40	2.0815	0.20	Q	|	|	|	V|
22+45	2.0828	0.20	Q	|	|	|	V|
22+50	2.0842	0.20	Q	|	|	|	V|
22+55	2.0855	0.20	Q	|	|	|	V|
23+ 0	2.0869	0.20	Q	|	|	|	V|
23+ 5	2.0882	0.20	Q	|	|	|	V|
23+10	2.0896	0.20	Q	|	|	|	V|
23+15	2.0909	0.20	Q	|	|	|	V|
23+20	2.0923	0.20	Q	|	|	|	V|
23+25	2.0936	0.20	Q	|	|	|	V|
23+30	2.0950	0.20	Q	|	|	|	V|
23+35	2.0963	0.20	Q	|	|	|	V|
23+40	2.0977	0.20	Q	|	|	|	V|
23+45	2.0990	0.20	Q	|	|	|	V|
23+50	2.1004	0.20	Q	|	|	|	V|
23+55	2.1018	0.20	Q	|	|	|	V|
24+ 0	2.1031	0.20	Q	|	|	|	V|
24+ 5	2.1038	0.10	Q	|	|	|	V|
24+10	2.1039	0.02	Q	|	|	|	V|
24+15	2.1039	0.00	Q	|	|	|	V|

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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 7.18(Ac.) = 0.011 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 7.18(Ac.) = 0.011 Sq. Mi.
Length along longest watercourse = 762.00(Ft.)
Length along longest watercourse measured to centroid = 327.00(Ft.)
Length along longest watercourse = 0.144 Mi.
Length along longest watercourse measured to centroid = 0.062 Mi.
Difference in elevation = 7.20(Ft.)
Slope along watercourse = 49.8898 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.038 Hr.
Lag time = 2.28 Min.
25% of lag time = 0.57 Min.
40% of lag time = 0.91 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
7.18	1.20	8.62

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
7.18	2.50	17.95

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
7.180	65.10	0.710

Total Area Entered = 7.18(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
65.1	65.1	0.415	0.710	0.150	1.000	0.150
					Sum (F) =	0.150

Area averaged mean soil loss (F) (In/Hr) = 0.150
Minimum soil loss rate ((In/Hr)) = 0.075
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.332

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	219.144	46.524	3.367
2	0.167	438.289	42.054	3.043
3	0.250	657.433	8.069	0.584
4	0.333	876.578	3.353	0.243
			Sum = 100.000 Sum=	7.236

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.50	0.150	(0.150)	0.050	0.100
2	0.17	0.60	0.180	(0.150)	0.060	0.120
3	0.25	0.60	0.180	(0.150)	0.060	0.120
4	0.33	0.60	0.180	(0.150)	0.060	0.120
5	0.42	0.60	0.180	(0.150)	0.060	0.120
6	0.50	0.70	0.210	(0.150)	0.070	0.140
7	0.58	0.70	0.210	(0.150)	0.070	0.140
8	0.67	0.70	0.210	(0.150)	0.070	0.140
9	0.75	0.70	0.210	(0.150)	0.070	0.140
10	0.83	0.70	0.210	(0.150)	0.070	0.140
11	0.92	0.70	0.210	(0.150)	0.070	0.140
12	1.00	0.80	0.240	(0.150)	0.080	0.160
13	1.08	0.80	0.240	(0.150)	0.080	0.160
14	1.17	0.80	0.240	(0.150)	0.080	0.160
15	1.25	0.80	0.240	(0.150)	0.080	0.160
16	1.33	0.80	0.240	(0.150)	0.080	0.160
17	1.42	0.80	0.240	(0.150)	0.080	0.160
18	1.50	0.80	0.240	(0.150)	0.080	0.160
19	1.58	0.80	0.240	(0.150)	0.080	0.160
20	1.67	0.80	0.240	(0.150)	0.080	0.160
21	1.75	0.80	0.240	(0.150)	0.080	0.160
22	1.83	0.80	0.240	(0.150)	0.080	0.160
23	1.92	0.80	0.240	(0.150)	0.080	0.160
24	2.00	0.90	0.270	(0.150)	0.090	0.180
25	2.08	0.80	0.240	(0.150)	0.080	0.160
26	2.17	0.90	0.270	(0.150)	0.090	0.180
27	2.25	0.90	0.270	(0.150)	0.090	0.180
28	2.33	0.90	0.270	(0.150)	0.090	0.180
29	2.42	0.90	0.270	(0.150)	0.090	0.180
30	2.50	0.90	0.270	(0.150)	0.090	0.180
31	2.58	0.90	0.270	(0.150)	0.090	0.180
32	2.67	0.90	0.270	(0.150)	0.090	0.180
33	2.75	1.00	0.300	(0.150)	0.100	0.200
34	2.83	1.00	0.300	(0.150)	0.100	0.200
35	2.92	1.00	0.300	(0.150)	0.100	0.200
36	3.00	1.00	0.300	(0.150)	0.100	0.200
37	3.08	1.00	0.300	(0.150)	0.100	0.200
38	3.17	1.10	0.330	(0.150)	0.110	0.220
39	3.25	1.10	0.330	(0.150)	0.110	0.220
40	3.33	1.10	0.330	(0.150)	0.110	0.220
41	3.42	1.20	0.360	(0.150)	0.120	0.240
42	3.50	1.30	0.390	(0.150)	0.129	0.261
43	3.58	1.40	0.420	(0.150)	0.139	0.281

```
44   3.67     1.40      0.420       (  0.150)       0.139        0.281
45   3.75     1.50      0.450       (  0.150)       0.149        0.301
46   3.83     1.50      0.450       (  0.150)       0.149        0.301
47   3.92     1.60      0.480          0.150    (  0.159)        0.330
48   4.00     1.60      0.480          0.150    (  0.159)        0.330
49   4.08     1.70      0.510          0.150    (  0.169)        0.360
50   4.17     1.80      0.540          0.150    (  0.179)        0.390
51   4.25     1.90      0.570          0.150    (  0.189)        0.420
52   4.33     2.00      0.600          0.150    (  0.199)        0.450
53   4.42     2.10      0.630          0.150    (  0.209)        0.480
54   4.50     2.10      0.630          0.150    (  0.209)        0.480
55   4.58     2.20      0.660          0.150    (  0.219)        0.510
56   4.67     2.30      0.690          0.150    (  0.229)        0.540
57   4.75     2.40      0.720          0.150    (  0.239)        0.570
58   4.83     2.40      0.720          0.150    (  0.239)        0.570
59   4.92     2.50      0.750          0.150    (  0.249)        0.600
60   5.00     2.60      0.780          0.150    (  0.259)        0.630
61   5.08     3.10      0.930          0.150    (  0.309)        0.780
62   5.17     3.60      1.080          0.150    (  0.359)        0.930
63   5.25     3.90      1.170          0.150    (  0.388)        1.020
64   5.33     4.20      1.260          0.150    (  0.418)        1.110
65   5.42     4.70      1.410          0.150    (  0.468)        1.260
66   5.50     5.60      1.680          0.150    (  0.558)        1.530
67   5.58     1.90      0.570          0.150    (  0.189)        0.420
68   5.67     0.90      0.270       (  0.150)       0.090        0.180
69   5.75     0.60      0.180       (  0.150)       0.060        0.120
70   5.83     0.50      0.150       (  0.150)       0.050        0.100
71   5.92     0.30      0.090       (  0.150)       0.030        0.060
72   6.00     0.20      0.060       (  0.150)       0.020        0.040
               (Loss Rate Not Used)
   Sum =     100.0                                    Sum =    22.5
      Flood volume = Effective rainfall      1.87(In)
       times area       7.2(Ac.)/[(In)/(Ft.)] =       1.1(Ac.Ft)
      Total soil loss =      0.63(In)
      Total soil loss =     0.374(Ac.Ft)
      Total rainfall =      2.50(In)
      Flood volume =       48850.1 Cubic Feet
      Total soil loss =       16306.7 Cubic Feet
      ---------------------------------------------------------------
       Peak flow rate of this hydrograph =      9.887(CFS)
      ---------------------------------------------------------------
      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          6 - 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        2.5       5.0       7.5      10.0
-------------------------------------------------------------------
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```
0+ 5       0.0023      0.34  VQ        |         |         |         |
0+10       0.0072      0.71  V Q       |         |         |         |
0+15       0.0129      0.83  V  Q      |         |         |         |
0+20       0.0189      0.87  V  Q      |         |         |         |
0+25       0.0249      0.87  V  Q      |         |         |         |
0+30       0.0313      0.94  |V Q      |         |         |         |
0+35       0.0382      1.00  |V Q      |         |         |         |
0+40       0.0452      1.01  |V  Q     |         |         |         |
0+45       0.0522      1.02  |V  Q     |         |         |         |
0+50       0.0592      1.02  | V Q     |         |         |         |
0+55       0.0662      1.02  | V Q     |         |         |         |
1+ 0       0.0736      1.08  | V Q     |         |         |         |
1+ 5       0.0815      1.14  | V Q     |         |         |         |
1+10       0.0895      1.16  |  VQ     |         |         |         |
1+15       0.0975      1.16  |  VQ     |         |         |         |
1+20       0.1055      1.16  |  VQ     |         |         |         |
1+25       0.1134      1.16  |   Q     |         |         |         |
1+30       0.1214      1.16  |   Q     |         |         |         |
1+35       0.1294      1.16  |   Q     |         |         |         |
1+40       0.1374      1.16  |   Q     |         |         |         |
1+45       0.1454      1.16  |   QV    |         |         |         |
1+50       0.1534      1.16  |   QV    |         |         |         |
1+55       0.1614      1.16  |   QV    |         |         |         |
2+ 0       0.1699      1.23  |   Q V   |         |         |         |
2+ 5       0.1783      1.22  |   Q V   |         |         |         |
2+10       0.1868      1.24  |   Q V   |         |         |         |
2+15       0.1957      1.29  |    QV   |         |         |         |
2+20       0.2047      1.30  |    Q V  |         |         |         |
2+25       0.2137      1.31  |    Q V  |         |         |         |
2+30       0.2227      1.31  |    Q V  |         |         |         |
2+35       0.2317      1.31  |    Q  V |         |         |         |
2+40       0.2407      1.31  |    Q  V |         |         |         |
2+45       0.2501      1.37  |    Q  V |         |         |         |
2+50       0.2600      1.43  |    Q   V|         |         |         |
2+55       0.2700      1.45  |    Q   V|         |         |         |
3+ 0       0.2799      1.45  |    Q   V|         |         |         |
3+ 5       0.2899      1.45  |    Q    V         |         |         |
3+10       0.3004      1.52  |     Q   V         |         |         |
3+15       0.3113      1.58  |     Q   |V        |         |         |
3+20       0.3222      1.59  |     Q   |V        |         |         |
3+25       0.3337      1.66  |     Q   |V        |         |         |
3+30       0.3460      1.79  |      Q  | V       |         |         |
3+35       0.3593      1.93  |      Q  | V       |         |         |
3+40       0.3732      2.01  |       Q |  V      |         |         |
3+45       0.3876      2.09  |       Q |  V      |         |         |
3+50       0.4025      2.16  |       Q |   V     |         |         |
3+55       0.4181      2.27  |        Q|   V     |         |         |
4+ 0       0.4344      2.37  |        Q|    V    |         |         |
4+ 5       0.4515      2.48  |        Q|     V   |         |         |
4+10       0.4700      2.68  |         Q     V   |         |         |
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   4+15       0.4899      2.89  |         |Q     V  |         |         |
   4+20       0.5114      3.11  |         | Q     V |         |         |
   4+25       0.5343      3.33  |         |  Q     V|         |         |
   4+30       0.5580      3.44  |         |  Q     V|         |         |
   4+35       0.5826      3.57  |         |   Q     V         |         |
   4+40       0.6086      3.77  |         |    Q    |V        |         |
   4+45       0.6360      3.98  |         |    Q    | V       |         |
   4+50       0.6642      4.10  |         |     Q   |  V      |         |
   4+55       0.6933      4.22  |         |     Q   |   V     |         |
   5+ 0       0.7237      4.42  |         |      Q  |    V    |         |
   5+ 5       0.7584      5.04  |         |         Q      V  |         |
   5+10       0.7999      6.02  |         |          |   Q   V |         |
   5+15       0.8472      6.88  |         |          |      Q  V         |
   5+20       0.8994      7.58  |         |          |         Q V       |
   5+25       0.9576      8.45  |         |          |          |  QV    |
   5+30       1.0257      9.89  |         |          |          |     V  Q|
   5+35       1.0744      7.08  |         |          |       Q  |       V |
   5+40       1.0957      3.09  |         | Q        |          |        V|
   5+45       1.1065      1.57  |     Q   |          |          |        V|
   5+50       1.1128      0.91  |  Q      |          |          |        V|
   5+55       1.1171      0.62  | Q       |          |          |        V|
   6+ 0       1.1199      0.41  |Q        |          |          |        V|
   6+ 5       1.1211      0.18  Q         |          |          |        V|
   6+10       1.1214      0.04  Q         |          |          |        V|
   6+15       1.1214      0.01  Q         |          |          |         V
-------------------------------------------------------------------------
```

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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 7.18(Ac.) = 0.011 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 7.18(Ac.) = 0.011 Sq. Mi.
Length along longest watercourse = 1187.00(Ft.)
Length along longest watercourse measured to centroid = 501.00(Ft.)
Length along longest watercourse = 0.225 Mi.
Length along longest watercourse measured to centroid = 0.095 Mi.
Difference in elevation = 28.80(Ft.)
Slope along watercourse = 128.1078 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.033 Hr.
Lag time = 1.99 Min.
25% of lag time = 0.50 Min.
40% of lag time = 0.80 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

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

7.18 1.20 8.62

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
7.18	2.50	17.95

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
7.180	60.70	0.723

Total Area Entered = 7.18(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
60.7	60.7	0.462	0.723	0.162	1.000	0.162
					Sum (F) =	0.162

Area averaged mean soil loss (F) (In/Hr) = 0.162
Minimum soil loss rate ((In/Hr)) = 0.081
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.322

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	251.147	51.045	3.694
2	0.167	502.294	39.983	2.893
3	0.250	753.441	6.982	0.505
4	0.333	1004.588	1.989	0.144
		Sum = 100.000	Sum=	7.236

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.50	0.150	(0.162)	0.048	0.102
2	0.17	0.60	0.180	(0.162)	0.058	0.122
3	0.25	0.60	0.180	(0.162)	0.058	0.122
4	0.33	0.60	0.180	(0.162)	0.058	0.122

5	0.42	0.60	0.180	(0.162)	0.058	0.122
6	0.50	0.70	0.210	(0.162)	0.068	0.142
7	0.58	0.70	0.210	(0.162)	0.068	0.142
8	0.67	0.70	0.210	(0.162)	0.068	0.142
9	0.75	0.70	0.210	(0.162)	0.068	0.142
10	0.83	0.70	0.210	(0.162)	0.068	0.142
11	0.92	0.70	0.210	(0.162)	0.068	0.142
12	1.00	0.80	0.240	(0.162)	0.077	0.163
13	1.08	0.80	0.240	(0.162)	0.077	0.163
14	1.17	0.80	0.240	(0.162)	0.077	0.163
15	1.25	0.80	0.240	(0.162)	0.077	0.163
16	1.33	0.80	0.240	(0.162)	0.077	0.163
17	1.42	0.80	0.240	(0.162)	0.077	0.163
18	1.50	0.80	0.240	(0.162)	0.077	0.163
19	1.58	0.80	0.240	(0.162)	0.077	0.163
20	1.67	0.80	0.240	(0.162)	0.077	0.163
21	1.75	0.80	0.240	(0.162)	0.077	0.163
22	1.83	0.80	0.240	(0.162)	0.077	0.163
23	1.92	0.80	0.240	(0.162)	0.077	0.163
24	2.00	0.90	0.270	(0.162)	0.087	0.183
25	2.08	0.80	0.240	(0.162)	0.077	0.163
26	2.17	0.90	0.270	(0.162)	0.087	0.183
27	2.25	0.90	0.270	(0.162)	0.087	0.183
28	2.33	0.90	0.270	(0.162)	0.087	0.183
29	2.42	0.90	0.270	(0.162)	0.087	0.183
30	2.50	0.90	0.270	(0.162)	0.087	0.183
31	2.58	0.90	0.270	(0.162)	0.087	0.183
32	2.67	0.90	0.270	(0.162)	0.087	0.183
33	2.75	1.00	0.300	(0.162)	0.096	0.204
34	2.83	1.00	0.300	(0.162)	0.096	0.204
35	2.92	1.00	0.300	(0.162)	0.096	0.204
36	3.00	1.00	0.300	(0.162)	0.096	0.204
37	3.08	1.00	0.300	(0.162)	0.096	0.204
38	3.17	1.10	0.330	(0.162)	0.106	0.224
39	3.25	1.10	0.330	(0.162)	0.106	0.224
40	3.33	1.10	0.330	(0.162)	0.106	0.224
41	3.42	1.20	0.360	(0.162)	0.116	0.244
42	3.50	1.30	0.390	(0.162)	0.125	0.265
43	3.58	1.40	0.420	(0.162)	0.135	0.285
44	3.67	1.40	0.420	(0.162)	0.135	0.285
45	3.75	1.50	0.450	(0.162)	0.145	0.305
46	3.83	1.50	0.450	(0.162)	0.145	0.305
47	3.92	1.60	0.480	(0.162)	0.154	0.326
48	4.00	1.60	0.480	(0.162)	0.154	0.326
49	4.08	1.70	0.510	0.162	(0.164)	0.348
50	4.17	1.80	0.540	0.162	(0.174)	0.378
51	4.25	1.90	0.570	0.162	(0.183)	0.408
52	4.33	2.00	0.600	0.162	(0.193)	0.438
53	4.42	2.10	0.630	0.162	(0.203)	0.468
54	4.50	2.10	0.630	0.162	(0.203)	0.468
55	4.58	2.20	0.660	0.162	(0.212)	0.498
56	4.67	2.30	0.690	0.162	(0.222)	0.528
57	4.75	2.40	0.720	0.162	(0.232)	0.558
58	4.83	2.40	0.720	0.162	(0.232)	0.558
59	4.92	2.50	0.750	0.162	(0.241)	0.588
60	5.00	2.60	0.780	0.162	(0.251)	0.618
61	5.08	3.10	0.930	0.162	(0.299)	0.768

62	5.17	3.60	1.080	0.162	(0.347)		0.918
63	5.25	3.90	1.170	0.162	(0.376)		1.008
64	5.33	4.20	1.260	0.162	(0.405)		1.098
65	5.42	4.70	1.410	0.162	(0.453)		1.248
66	5.50	5.60	1.680	0.162	(0.540)		1.518
67	5.58	1.90	0.570	0.162	(0.183)		0.408
68	5.67	0.90	0.270	(0.162)	0.087		0.183
69	5.75	0.60	0.180	(0.162)	0.058		0.122
70	5.83	0.50	0.150	(0.162)	0.048		0.102
71	5.92	0.30	0.090	(0.162)	0.029		0.061
72	6.00	0.20	0.060	(0.162)	0.019		0.041

(Loss Rate Not Used)

Sum = 100.0 Sum = 22.4

Flood volume = Effective rainfall 1.87(In)
times area 7.2(Ac.)/[(In)/(Ft.)] = 1.1(Ac.Ft)
Total soil loss = 0.63(In)
Total soil loss = 0.379(Ac.Ft)
Total rainfall = 2.50(In)
Flood volume = 48642.4 Cubic Feet
Total soil loss = 16514.5 Cubic Feet

Peak flow rate of this hydrograph = 9.926(CFS)

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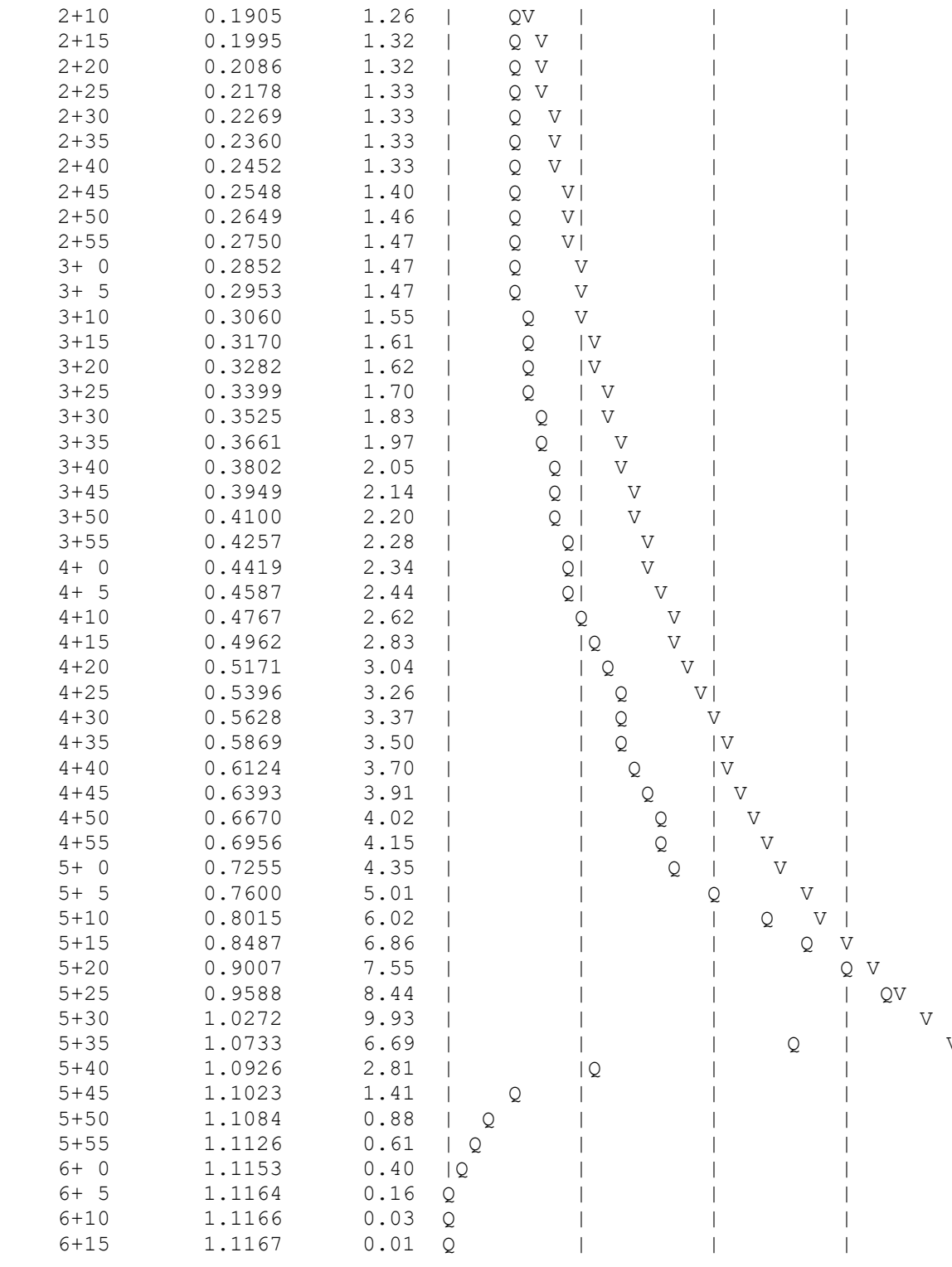
6 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0026	0.38	VQ				
0+10	0.0077	0.75	V Q				
0+15	0.0136	0.86	V Q				
0+20	0.0197	0.88	V Q				
0+25	0.0258	0.88	V Q				
0+30	0.0324	0.96	|V Q				
0+35	0.0394	1.02	|V Q				
0+40	0.0465	1.03	|V Q				
0+45	0.0536	1.03	|V Q				
0+50	0.0607	1.03	| V Q				
0+55	0.0678	1.03	| V Q				
1+ 0	0.0754	1.11	| V Q				
1+ 5	0.0834	1.17	| V Q				
1+10	0.0915	1.18	| VQ				
1+15	0.0997	1.18	| VQ				
1+20	0.1078	1.18	| VQ				
1+25	0.1159	1.18	| Q				
1+30	0.1240	1.18	| Q				
1+35	0.1321	1.18	| Q				
1+40	0.1402	1.18	| QV				
1+45	0.1484	1.18	| QV				
1+50	0.1565	1.18	| QV				
1+55	0.1646	1.18	| QV				
2+ 0	0.1732	1.25	| QV				
2+ 5	0.1818	1.24	| Q V				



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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 7.18(Ac.) = 0.011 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 7.18(Ac.) = 0.011 Sq. Mi.
Length along longest watercourse = 762.00(Ft.)
Length along longest watercourse measured to centroid = 327.00(Ft.)
Length along longest watercourse = 0.144 Mi.
Length along longest watercourse measured to centroid = 0.062 Mi.
Difference in elevation = 7.20(Ft.)
Slope along watercourse = 49.8898 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.038 Hr.
Lag time = 2.28 Min.
25% of lag time = 0.57 Min.
40% of lag time = 0.91 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
7.18	0.80	5.74

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
7.18	2.00	14.36

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 2.000(In)

Point rain (area averaged) = 2.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
7.180	65.10	0.710

Total Area Entered = 7.18(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
65.1	65.1	0.415	0.710	0.150	1.000	0.150
					Sum (F) =	0.150

Area averaged mean soil loss (F) (In/Hr) = 0.150
Minimum soil loss rate ((In/Hr)) = 0.075
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.332

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	219.144	46.524	3.367
2	0.167	438.289	42.054	3.043
3	0.250	657.433	8.069	0.584
4	0.333	876.578	3.353	0.243
		Sum = 100.000	Sum=	7.236

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.312	(0.150)	0.104	0.208
2	0.17	1.30	0.312	(0.150)	0.104	0.208
3	0.25	1.10	0.264	(0.150)	0.088	0.176
4	0.33	1.50	0.360	(0.150)	0.120	0.240
5	0.42	1.50	0.360	(0.150)	0.120	0.240
6	0.50	1.80	0.432	(0.150)	0.143	0.289
7	0.58	1.50	0.360	(0.150)	0.120	0.240
8	0.67	1.80	0.432	(0.150)	0.143	0.289
9	0.75	1.80	0.432	(0.150)	0.143	0.289
10	0.83	1.50	0.360	(0.150)	0.120	0.240
11	0.92	1.60	0.384	(0.150)	0.127	0.257
12	1.00	1.80	0.432	(0.150)	0.143	0.289
13	1.08	2.20	0.528	0.150	(0.175)	0.378
14	1.17	2.20	0.528	0.150	(0.175)	0.378
15	1.25	2.20	0.528	0.150	(0.175)	0.378
16	1.33	2.00	0.480	0.150	(0.159)	0.330
17	1.42	2.60	0.624	0.150	(0.207)	0.474
18	1.50	2.70	0.648	0.150	(0.215)	0.498
19	1.58	2.40	0.576	0.150	(0.191)	0.426
20	1.67	2.70	0.648	0.150	(0.215)	0.498
21	1.75	3.30	0.792	0.150	(0.263)	0.642
22	1.83	3.10	0.744	0.150	(0.247)	0.594
23	1.92	2.90	0.696	0.150	(0.231)	0.546
24	2.00	3.00	0.720	0.150	(0.239)	0.570
25	2.08	3.10	0.744	0.150	(0.247)	0.594
26	2.17	4.20	1.008	0.150	(0.335)	0.858
27	2.25	5.00	1.200	0.150	(0.398)	1.050
28	2.33	3.50	0.840	0.150	(0.279)	0.690
29	2.42	6.80	1.632	0.150	(0.542)	1.482
30	2.50	7.30	1.752	0.150	(0.582)	1.602
31	2.58	8.20	1.968	0.150	(0.653)	1.818
32	2.67	5.90	1.416	0.150	(0.470)	1.266
33	2.75	2.00	0.480	0.150	(0.159)	0.330
34	2.83	1.80	0.432	(0.150)	0.143	0.289
35	2.92	1.80	0.432	(0.150)	0.143	0.289
36	3.00	0.60	0.144	(0.150)	0.048	0.096
		(Loss Rate Not Used)				
	Sum =	100.0			Sum =	19.0

Flood volume = Effective rainfall 1.59(In)
times area 7.2(Ac.)/[(In)/(Ft.)] = 0.9(Ac.Ft)
Total soil loss = 0.41(In)
Total soil loss = 0.247(Ac.Ft)
Total rainfall = 2.00(In)

Flood volume = 41364.9 Cubic Feet
Total soil loss = 10760.2 Cubic Feet

Peak flow rate of this hydrograph = 12.035(CFS)

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3 - 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 5.0 10.0 15.0 20.0
0+ 5	0.0048	0.70	VQ | | | |
0+10	0.0140	1.34	V Q | | | |
0+15	0.0233	1.35	V Q | | | |
0+20	0.0338	1.52	|V Q | | | |
0+25	0.0455	1.70	|V Q | | | |
0+30	0.0585	1.89	| VQ | | | |
0+35	0.0715	1.89	| Q | | | |
0+40	0.0848	1.93	| Q | | | |
0+45	0.0990	2.06	| Q | | | |
0+50	0.1122	1.92	| QV | | | |
0+55	0.1248	1.83	| Q V | | | |
1+ 0	0.1383	1.96	| Q V | | | |
1+ 5	0.1546	2.36	| Q V | | | |
1+10	0.1729	2.66	| Q V | | | |
1+15	0.1916	2.72	| Q V | | | |
1+20	0.2093	2.58	| Q V | | | |
1+25	0.2294	2.92	| Q V| | | |
1+30	0.2529	3.41	| Q V | | |
1+35	0.2757	3.31	| Q |V | | |
1+40	0.2989	3.38	| Q | V | | |
1+45	0.3268	4.05	| Q | V | | |
1+50	0.3568	4.35	| Q | V | | |
1+55	0.3854	4.14	| Q | V | | |
2+ 0	0.4135	4.09	| Q | V | | |
2+ 5	0.4424	4.20	| Q | V | | |
2+10	0.4780	5.17	| Q V | | |
2+15	0.5237	6.64	| | Q | V | | |
2+20	0.5662	6.17	| | Q | V | | |
2+25	0.6207	7.92	| | Q | V | |
2+30	0.6935	10.57	| | | Q V| |
2+35	0.7764	12.04	| | | Q | V |
2+40	0.8528	11.10	| | | Q | V |
2+45	0.8970	6.42	| | Q | | V |
2+50	0.9187	3.16	| Q | | | V |
2+55	0.9349	2.35	| Q | | | V|
3+ 0	0.9449	1.45	| Q | | | V|

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    3+ 5       0.9486      0.53  |Q        |         |         |        V|
    3+10       0.9494      0.13  Q         |         |         |        V|
    3+15       0.9496      0.02  Q         |         |         |         V
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U n i t H y d r o g r a p h A n a l y s i s

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100-YEAR, 3 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 7.18(Ac.) = 0.011 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 7.18(Ac.) = 0.011 Sq. Mi.
Length along longest watercourse = 1187.00(Ft.)
Length along longest watercourse measured to centroid = 501.00(Ft.)
Length along longest watercourse = 0.225 Mi.
Length along longest watercourse measured to centroid = 0.095 Mi.
Difference in elevation = 28.80(Ft.)
Slope along watercourse = 128.1078 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.033 Hr.
Lag time = 1.99 Min.
25% of lag time = 0.50 Min.
40% of lag time = 0.80 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

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

7.18	0.80	5.74

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
7.18	2.00	14.36

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 2.000(In)

Point rain (area averaged) = 2.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
7.180	60.70	0.723

Total Area Entered = 7.18(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
60.7	60.7	0.462	0.723	0.162	1.000	0.162
					Sum (F) =	0.162

Area averaged mean soil loss (F) (In/Hr) = 0.162
Minimum soil loss rate ((In/Hr)) = 0.081
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.322

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	251.147	51.045	3.694
2	0.167	502.294	39.983	2.893
3	0.250	753.441	6.982	0.505
4	0.333	1004.588	1.989	0.144
		Sum = 100.000	Sum=	7.236

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.312	(0.162)	0.100	0.212
2	0.17	1.30	0.312	(0.162)	0.100	0.212
3	0.25	1.10	0.264	(0.162)	0.085	0.179
4	0.33	1.50	0.360	(0.162)	0.116	0.244

5	0.42	1.50	0.360	(0.162)	0.116	0.244
6	0.50	1.80	0.432	(0.162)	0.139	0.293
7	0.58	1.50	0.360	(0.162)	0.116	0.244
8	0.67	1.80	0.432	(0.162)	0.139	0.293
9	0.75	1.80	0.432	(0.162)	0.139	0.293
10	0.83	1.50	0.360	(0.162)	0.116	0.244
11	0.92	1.60	0.384	(0.162)	0.123	0.260
12	1.00	1.80	0.432	(0.162)	0.139	0.293
13	1.08	2.20	0.528	0.162	(0.170)	0.366
14	1.17	2.20	0.528	0.162	(0.170)	0.366
15	1.25	2.20	0.528	0.162	(0.170)	0.366
16	1.33	2.00	0.480	(0.162)	0.154	0.326
17	1.42	2.60	0.624	0.162	(0.201)	0.462
18	1.50	2.70	0.648	0.162	(0.208)	0.486
19	1.58	2.40	0.576	0.162	(0.185)	0.414
20	1.67	2.70	0.648	0.162	(0.208)	0.486
21	1.75	3.30	0.792	0.162	(0.255)	0.630
22	1.83	3.10	0.744	0.162	(0.239)	0.582
23	1.92	2.90	0.696	0.162	(0.224)	0.534
24	2.00	3.00	0.720	0.162	(0.232)	0.558
25	2.08	3.10	0.744	0.162	(0.239)	0.582
26	2.17	4.20	1.008	0.162	(0.324)	0.846
27	2.25	5.00	1.200	0.162	(0.386)	1.038
28	2.33	3.50	0.840	0.162	(0.270)	0.678
29	2.42	6.80	1.632	0.162	(0.525)	1.470
30	2.50	7.30	1.752	0.162	(0.563)	1.590
31	2.58	8.20	1.968	0.162	(0.633)	1.806
32	2.67	5.90	1.416	0.162	(0.455)	1.254
33	2.75	2.00	0.480	(0.162)	0.154	0.326
34	2.83	1.80	0.432	(0.162)	0.139	0.293
35	2.92	1.80	0.432	(0.162)	0.139	0.293
36	3.00	0.60	0.144	(0.162)	0.046	0.098

(Loss Rate Not Used)

Sum = 100.0 Sum = 18.9

Flood volume = Effective rainfall 1.57(In)
times area 7.2(Ac.)/[(In)/(Ft.)] = 0.9(Ac.Ft)
Total soil loss = 0.43(In)
Total soil loss = 0.256(Ac.Ft)
Total rainfall = 2.00(In)
Flood volume = 40983.4 Cubic Feet
Total soil loss = 11141.7 Cubic Feet

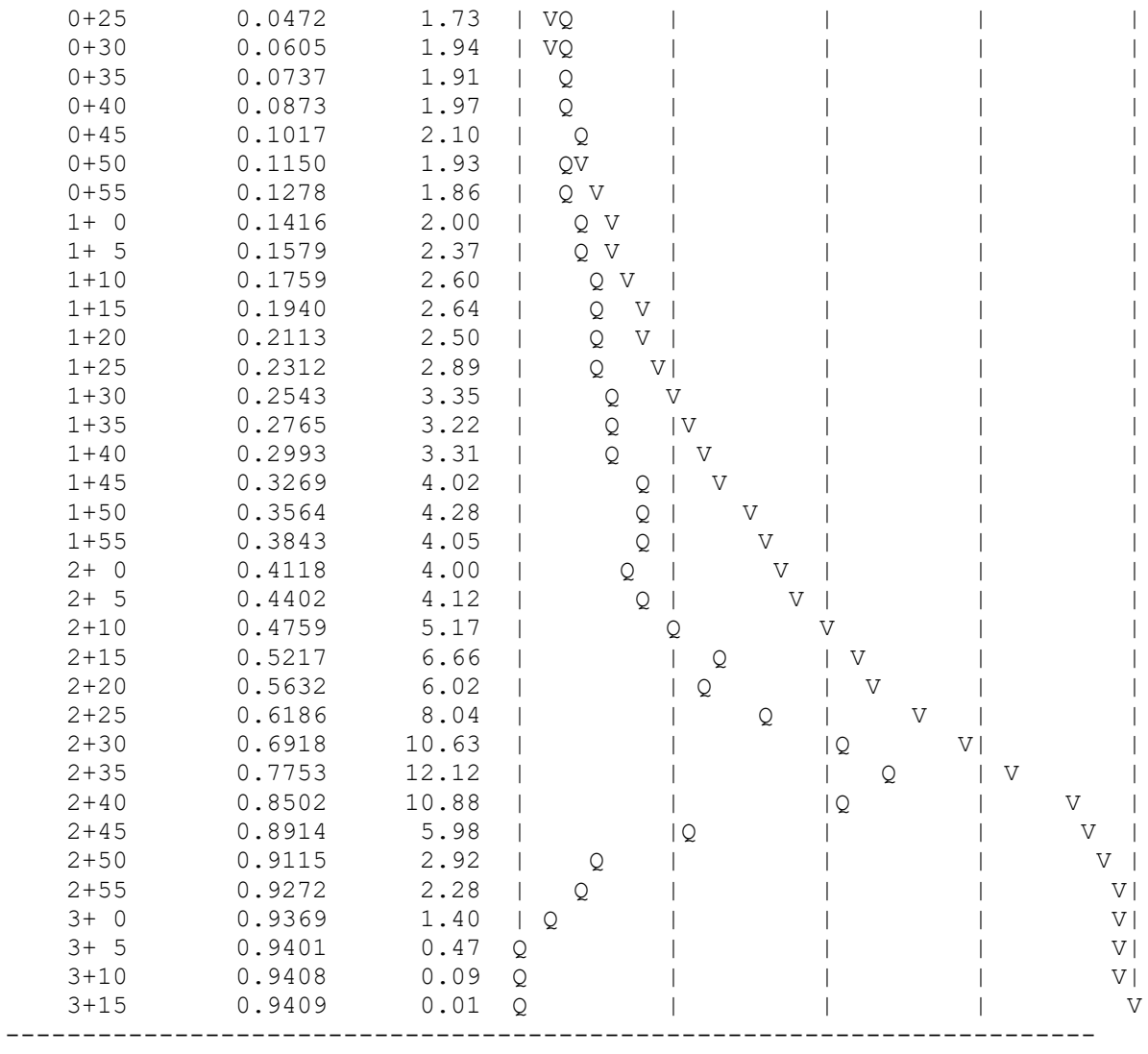
Peak flow rate of this hydrograph = 12.121(CFS)

++

3 - 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	5.0	10.0	15.0	20.0
0+ 5	0.0054	0.78	VQ				
0+10	0.0150	1.39	V Q				
0+15	0.0245	1.38	|VQ				
0+20	0.0352	1.56	|V Q				



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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 7.18(Ac.) = 0.011 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 7.18(Ac.) = 0.011 Sq. Mi.
Length along longest watercourse = 762.00(Ft.)
Length along longest watercourse measured to centroid = 327.00(Ft.)
Length along longest watercourse = 0.144 Mi.
Length along longest watercourse measured to centroid = 0.062 Mi.
Difference in elevation = 7.20(Ft.)
Slope along watercourse = 49.8898 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.038 Hr.
Lag time = 2.28 Min.
25% of lag time = 0.57 Min.
40% of lag time = 0.91 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
7.18	0.50	3.59

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
7.18	1.21	8.70

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.212(In)

Point rain (area averaged) = 1.212(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.212(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
7.180	65.10	0.710

Total Area Entered = 7.18(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
65.1	65.1	0.415	0.710	0.150	1.000	0.150
					Sum (F) =	0.150

Area averaged mean soil loss (F) (In/Hr) = 0.150
Minimum soil loss rate ((In/Hr)) = 0.075
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.332

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	219.144	46.524	3.367
2	0.167	438.289	42.054	3.043
3	0.250	657.433	8.069	0.584
4	0.333	876.578	3.353	0.243

```
                                    Sum = 100.000   Sum=       7.236
-----------------------------------------------------------------------
```

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	4.20	0.611	0.150	(0.203)	0.461
2	0.17	4.30	0.625	0.150	(0.208)	0.476
3	0.25	5.00	0.727	0.150	(0.241)	0.577
4	0.33	5.00	0.727	0.150	(0.241)	0.577
5	0.42	5.80	0.843	0.150	(0.280)	0.694
6	0.50	6.50	0.945	0.150	(0.314)	0.796
7	0.58	7.40	1.076	0.150	(0.357)	0.926
8	0.67	8.60	1.251	0.150	(0.415)	1.101
9	0.75	12.30	1.789	0.150	(0.594)	1.639
10	0.83	29.10	4.232	0.150	(1.405)	4.082
11	0.92	6.80	0.989	0.150	(0.328)	0.839
12	1.00	5.00	0.727	0.150	(0.241)	0.577

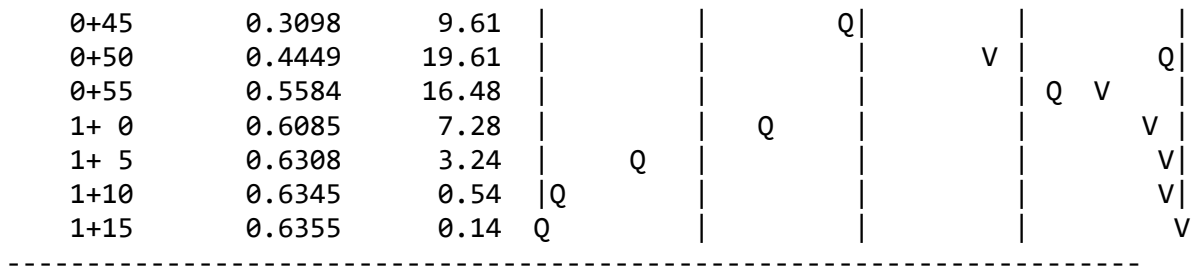
(Loss Rate Not Used)

Sum = 100.0 Sum = 12.7

```
   Flood volume = Effective rainfall      1.06(In)
    times area       7.2(Ac.)/[(In)/(Ft.)] =       0.6(Ac.Ft)
   Total soil loss =      0.15(In)
   Total soil loss =     0.090(Ac.Ft)
   Total rainfall =      1.21(In)
   Flood volume =       27682.8 Cubic Feet
   Total soil loss =        3903.9 Cubic Feet
   ---------------------------------------------------------------------
    Peak flow rate of this hydrograph =     19.608(CFS)
   ---------------------------------------------------------------------
   +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                      1 - 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 5.0 10.0 15.0 20.0
0+ 5	0.0107	1.55	V Q | | | |
0+10	0.0314	3.01	|V Q | | | |
0+15	0.0566	3.66	| V Q | | | |
0+20	0.0848	4.09	| V Q | | | |
0+25	0.1161	4.55	| V Q| | | |
0+30	0.1524	5.27	| VQ | | |
0+35	0.1943	6.09	| | Q | | |
0+40	0.2437	7.16	| | QV | | |


0+45 0.3098 9.61
0+50 0.4449 19.61
0+55 0.5584 16.48
1+ 0 0.6085 7.28
1+ 5 0.6308 3.24
1+10 0.6345 0.54
1+15 0.6355 0.14

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100-YEAR, 1 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 7.18(Ac.) = 0.011 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 7.18(Ac.) = 0.011 Sq. Mi.
Length along longest watercourse = 1187.00(Ft.)
Length along longest watercourse measured to centroid = 501.00(Ft.)
Length along longest watercourse = 0.225 Mi.
Length along longest watercourse measured to centroid = 0.095 Mi.
Difference in elevation = 28.80(Ft.)
Slope along watercourse = 128.1078 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.033 Hr.
Lag time = 1.99 Min.
25% of lag time = 0.50 Min.
40% of lag time = 0.80 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

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

```
        7.18              0.50                    3.59

 100 YEAR Area rainfall data:


 Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
        7.18              1.12                    8.04

 STORM EVENT (YEAR) =  100.00
 Area Averaged 2-Year Rainfall =    0.500(In)
 Area Averaged 100-Year Rainfall =    1.120(In)

 Point rain (area averaged) =    1.120(In)
 Areal adjustment factor =   99.99 %
 Adjusted average point rain =    1.120(In)

 Sub-Area Data:
 Area(Ac.)         Runoff Index   Impervious %
      7.180           60.70         0.723
  Total Area Entered =      7.18(Ac.)


 RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
 AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
 60.7  60.7      0.462     0.723        0.162       1.000      0.162
                                                   Sum (F) =   0.162
 Area averaged mean soil loss (F) (In/Hr) =  0.162
 Minimum soil loss rate ((In/Hr)) =  0.081
 (for 24 hour storm duration)
 Soil low loss rate (decimal) =   0.322
 ------------------------------------------------------------------------
 Slope of intensity-duration curve for a 1 hour storm =0.5000
 ------------------------------------------------------------------------

             U n i t  H y d r o g r a p h
                   VALLEY S-Curve
 ------------------------------------------------------------------------
             Unit Hydrograph Data
 ------------------------------------------------------------------------
 Unit time period   Time % of lag   Distribution   Unit Hydrograph
     (hrs)                          Graph %            (CFS)
 ------------------------------------------------------------------------
     1   0.083        251.147         51.045              3.694
     2   0.167        502.294         39.983              2.893
     3   0.250        753.441          6.982              0.505
     4   0.333       1004.588          1.989              0.144
                               Sum = 100.000   Sum=       7.236
------------------------------------------------------------------------


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

  Unit Time   Pattern   Storm Rain     Loss rate(In./Hr)     Effective
       (Hr.)  Percent   (In/Hr)         Max   |   Low         (In/Hr)
    1   0.08     4.20      0.564          0.162    (  0.182)        0.403
    2   0.17     4.30      0.578          0.162    (  0.186)        0.416
```

```
  3   0.25     5.00      0.672          0.162    (  0.216)        0.510
  4   0.33     5.00      0.672          0.162    (  0.216)        0.510
  5   0.42     5.80      0.779          0.162    (  0.251)        0.618
  6   0.50     6.50      0.874          0.162    (  0.281)        0.712
  7   0.58     7.40      0.994          0.162    (  0.320)        0.833
  8   0.67     8.60      1.156          0.162    (  0.372)        0.994
  9   0.75    12.30      1.653          0.162    (  0.532)        1.491
 10   0.83    29.10      3.911          0.162    (  1.258)        3.749
 11   0.92     6.80      0.914          0.162    (  0.294)        0.752
 12   1.00     5.00      0.672          0.162    (  0.216)        0.510
           (Loss Rate Not Used)
    Sum =     100.0                                    Sum =    11.5
     Flood volume = Effective rainfall      0.96(In)
      times area       7.2(Ac.)/[(In)/(Ft.)] =       0.6(Ac.Ft)
     Total soil loss =      0.16(In)
     Total soil loss =     0.097(Ac.Ft)
     Total rainfall =      1.12(In)
     Flood volume =       24979.1 Cubic Feet
     Total soil loss =        4210.0 Cubic Feet
     ---------------------------------------------------------------------
      Peak flow rate of this hydrograph =     18.796(CFS)
     ---------------------------------------------------------------------
     +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                        1 - 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        5.0      10.0      15.0      20.0
 ---------------------------------------------------------------------------
   0+ 5       0.0103      1.49  V Q       |         |         |         |
   0+10       0.0289      2.70  | V  Q    |         |         |         |
   0+15       0.0516      3.30  |  V  Q   |         |         |         |
   0+20       0.0766      3.63  |    V Q  |         |         |         |
   0+25       0.1047      4.08  |      VQ |         |         |         |
   0+30       0.1374      4.75  |        Q|         |         |         |
   0+35       0.1755      5.53  |         |QV       |         |         |
   0+40       0.2205      6.53  |         |  Q V    |         |         |
   0+45       0.2819      8.91  |         |      Q V|         |         |
   0+50       0.4113     18.80  |         |         |       V |      Q  |
   0+55       0.5114     14.53  |         |         |        Q|    V    |
   1+ 0       0.5539      6.17  |         | Q       |         |       V |
   1+ 5       0.5704      2.40  |   Q     |         |         |        V|
   1+10       0.5729      0.37  Q         |         |         |        V|
   1+15       0.5734      0.07  Q         |         |         |         V
---------------------------------------------------------------------------
```

SECTION 3 - REFERENCE DATA

USGS SOILS REPORT

PLATE D-4.1

INFILTRATION REPORT (EXCERPT)

CONTECH UNDERGROUND CHAMBER SYSTEM

DCV CALCULATIONS (WQMP)

PP190005 – HARVILL DISTRIBUTION CENTER OFFSITE DRAINAGE IMPROVEMENTS (HYDROLOGY MAPS)

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Western Riverside Area, California

August 9, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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PaA—Pachappa fine sandy loam, 0 to 2 percent slopes.....14
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Soil Qualities and Features.....16
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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:1,520 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 15, Sep 6, 2022

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

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
EpA	Exeter sandy loam, deep, 0 to 2 percent slopes	2.2	30.6%
PaA	Pachappa fine sandy loam, 0 to 2 percent slopes	5.0	69.4%
Totals for Area of Interest		**7.1**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Western Riverside Area, California

EpA—Exeter sandy loam, deep, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hctk
Elevation: 300 to 700 feet
Mean annual precipitation: 7 to 15 inches
Mean annual air temperature: 64 degrees F
Frost-free period: 250 to 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Exeter

Setting

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

Typical profile

H1 - 0 to 16 inches: sandy loam
H2 - 16 to 37 inches: sandy clay loam
H3 - 37 to 50 inches: indurated
H4 - 50 to 60 inches: stratified sandy loam to silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 35 to 60 inches to duripan
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Ramona
Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield
Percent of map unit: 5 percent
Hydric soil rating: No

Monserate
Percent of map unit: 5 percent
Hydric soil rating: No

PaA—Pachappa fine sandy loam, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: hcxn
Elevation: 1,000 feet
Mean annual precipitation: 14 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 270 days
Farmland classification: Prime farmland if irrigated

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

Description of Pachappa

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

Typical profile
H1 - 0 to 20 inches: fine sandy loam
H2 - 20 to 63 inches: loam

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare

Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

San emigdio

Percent of map unit: 5 percent
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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.

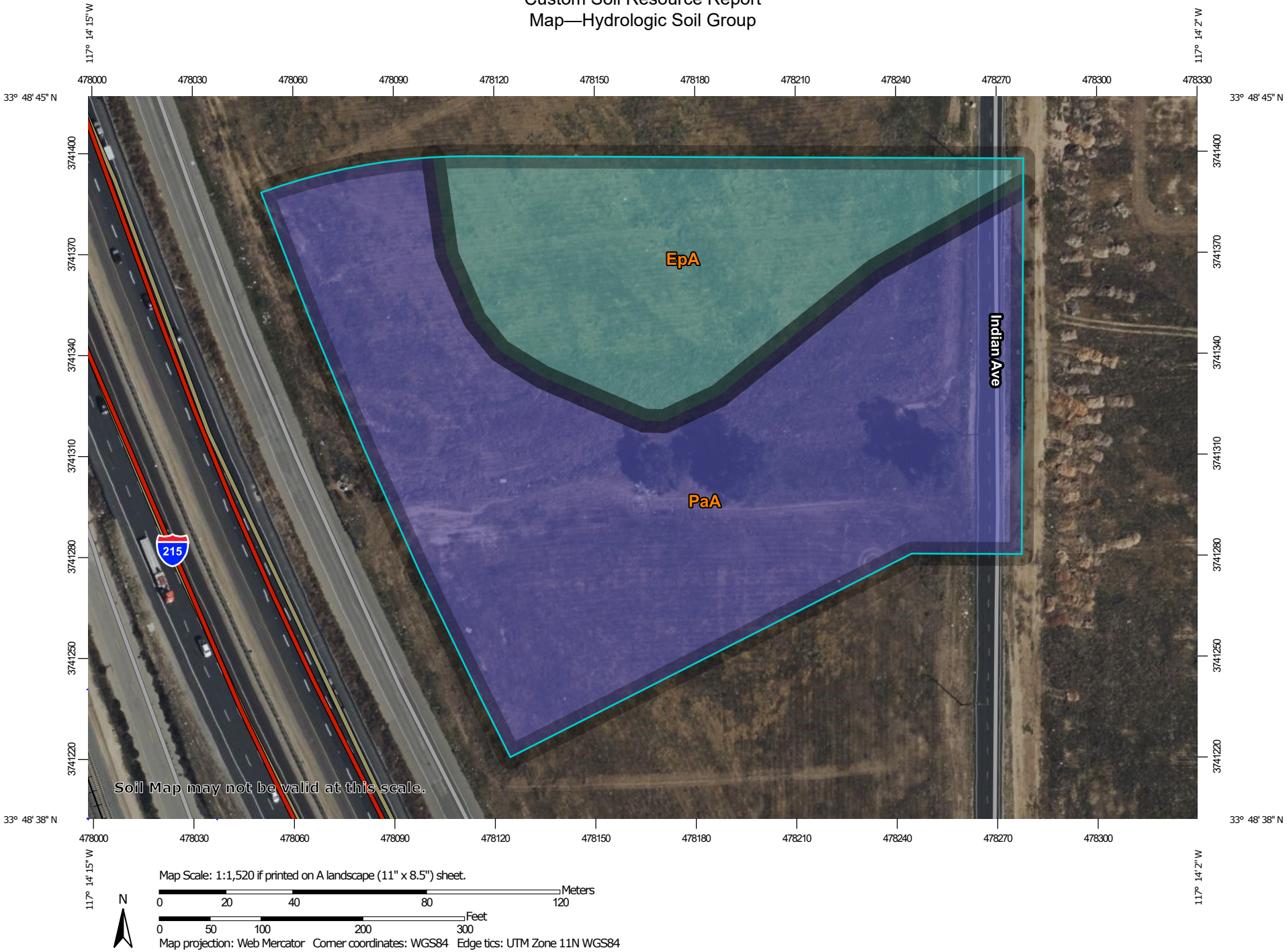
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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.

Custom Soil Resource Report
Map—Hydrologic Soil Group



Map Scale: 1:1,520 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 20 40 80 120

Feet: 0 50 100 200 300

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

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Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

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Survey Area Data: Version 15, Sep 6, 2022

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Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
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PaA	Pachappa fine sandy loam, 0 to 2 percent slopes	B	5.0	69.4%
Totals for Area of Interest			**7.1**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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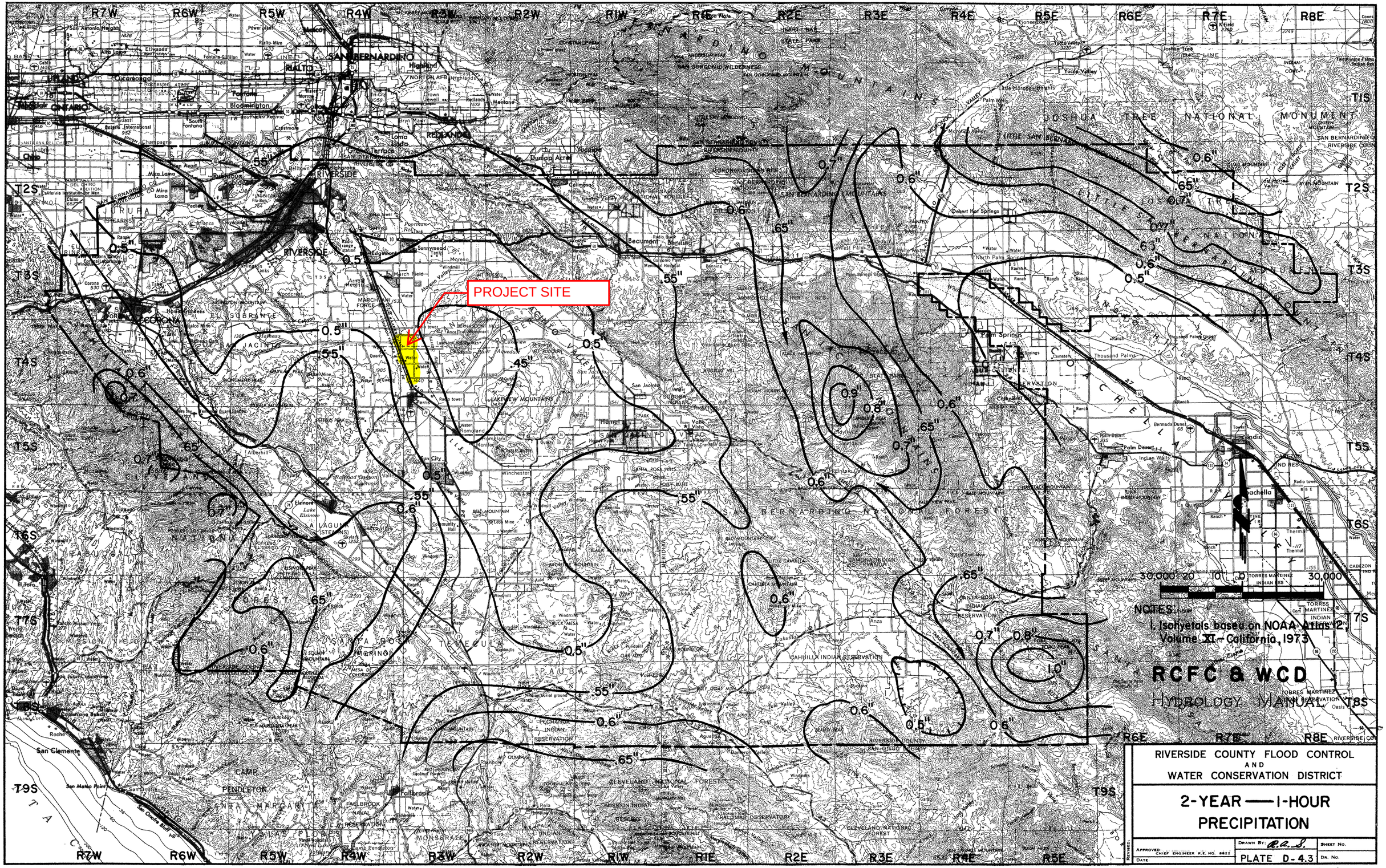
RAINFALL INTENSITY–INCHES PER HOUR

MIRA LOMA			MURRIETA - TEMECULA & RANCHO CALIFORNIA			NORCO			PALM SPRINGS			PERRIS VALLEY		
DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY	
	10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR
5	2.84	4.48	5	3.45	5.10	5	2.77	4.16	5	4.23	6.76	5	2.64	3.78
6	2.58	4.07	6	3.12	4.61	6	2.53	3.79	6	3.80	6.08	6	2.41	3.46
7	2.37	3.75	7	2.87	4.24	7	2.34	3.51	7	3.48	5.56	7	2.24	3.21
8	2.21	3.49	8	2.67	3.94	8	2.19	3.29	8	3.22	5.15	8	2.09	3.01
9	2.08	3.28	9	2.50	3.69	9	2.07	3.10	9	3.01	4.81	9	1.98	2.84
10	1.96	3.10	10	2.36	3.48	10	1.96	2.94	10	2.83	4.52	10	1.88	2.69
11	1.87	2.95	11	2.24	3.30	11	1.87	2.80	11	2.67	4.28	11	1.79	2.57
12	1.78	2.82	12	2.13	3.15	12	1.79	2.68	12	2.54	4.07	12	1.72	2.46
13	1.71	2.70	13	2.04	3.01	13	1.72	2.58	13	2.43	3.88	13	1.65	2.37
14	1.64	2.60	14	1.96	2.89	14	1.66	2.48	14	2.33	3.72	14	1.59	2.29
15	1.58	2.50	15	1.89	2.79	15	1.60	2.40	15	2.23	3.58	15	1.54	2.21
16	1.53	2.42	16	1.82	2.69	16	1.55	2.32	16	2.15	3.44	16	1.49	2.14
17	1.48	2.34	17	1.76	2.60	17	1.50	2.25	17	2.08	3.32	17	1.45	2.08
18	1.44	2.27	18	1.71	2.52	18	1.46	2.19	18	2.01	3.22	18	1.41	2.02
19	1.40	2.21	19	1.66	2.45	19	1.42	2.13	19	1.95	3.12	19	1.37	1.97
20	1.36	2.15	20	1.61	2.38	20	1.39	2.08	20	1.89	3.03	20	1.34	1.92
22	1.29	2.04	22	1.53	2.26	22	1.32	1.98	22	1.79	2.86	22	1.28	1.83
24	1.24	1.95	24	1.46	2.15	24	1.26	1.90	24	1.70	2.72	24	1.22	1.75
26	1.18	1.87	26	1.39	2.06	26	1.22	1.82	26	1.62	2.60	26	1.18	1.69
28	1.14	1.80	28	1.34	1.98	28	1.17	1.76	28	1.56	2.49	28	1.13	1.63
30	1.10	1.73	30	1.29	1.90	30	1.13	1.70	30	1.49	2.39	30	1.10	1.57
32	1.06	1.67	32	1.24	1.84	32	1.10	1.64	32	1.44	2.30	32	1.06	1.52
34	1.03	1.62	34	1.20	1.78	34	1.06	1.59	34	1.39	2.22	34	1.03	1.48
36	1.00	1.57	36	1.17	1.72	36	1.03	1.55	36	1.34	2.15	36	1.00	1.44
38	.97	1.53	38	1.13	1.67	38	1.01	1.51	38	1.30	2.09	38	.98	1.40
40	.94	1.49	40	1.10	1.62	40	.98	1.47	40	1.27	2.02	40	.95	1.37
45	.89	1.40	45	1.03	1.52	45	.92	1.39	45	1.18	1.89	45	.90	1.29
50	.84	1.32	50	.97	1.44	50	.88	1.31	50	1.11	1.78	50	.85	1.22
55	.80	1.26	55	.92	1.36	55	.84	1.25	55	1.05	1.68	55	.81	1.17
60	.76	1.20	60	.88	1.30	60	.80	1.20	60	1.00	1.60	60	.78	1.12
65	.73	1.15	65	.84	1.24	65	.77	1.15	65	.95	1.53	65	.75	1.08
70	.70	1.11	70	.81	1.19	70	.74	1.11	70	.91	1.46	70	.72	1.04
75	.68	1.07	75	.78	1.15	75	.72	1.07	75	.88	1.41	75	.70	1.00
80	.65	1.03	80	.75	1.11	80	.69	1.04	80	.85	1.35	80	.68	.97
85	.63	1.00	85	.73	1.07	85	.67	1.01	85	.82	1.31	85	.66	.94
SLOPE = .530			SLOPE = .550			SLOPE = .500			SLOPE = .580			SLOPE = .490		

STANDARD
INTENSITY–DURATION
CURVES DATA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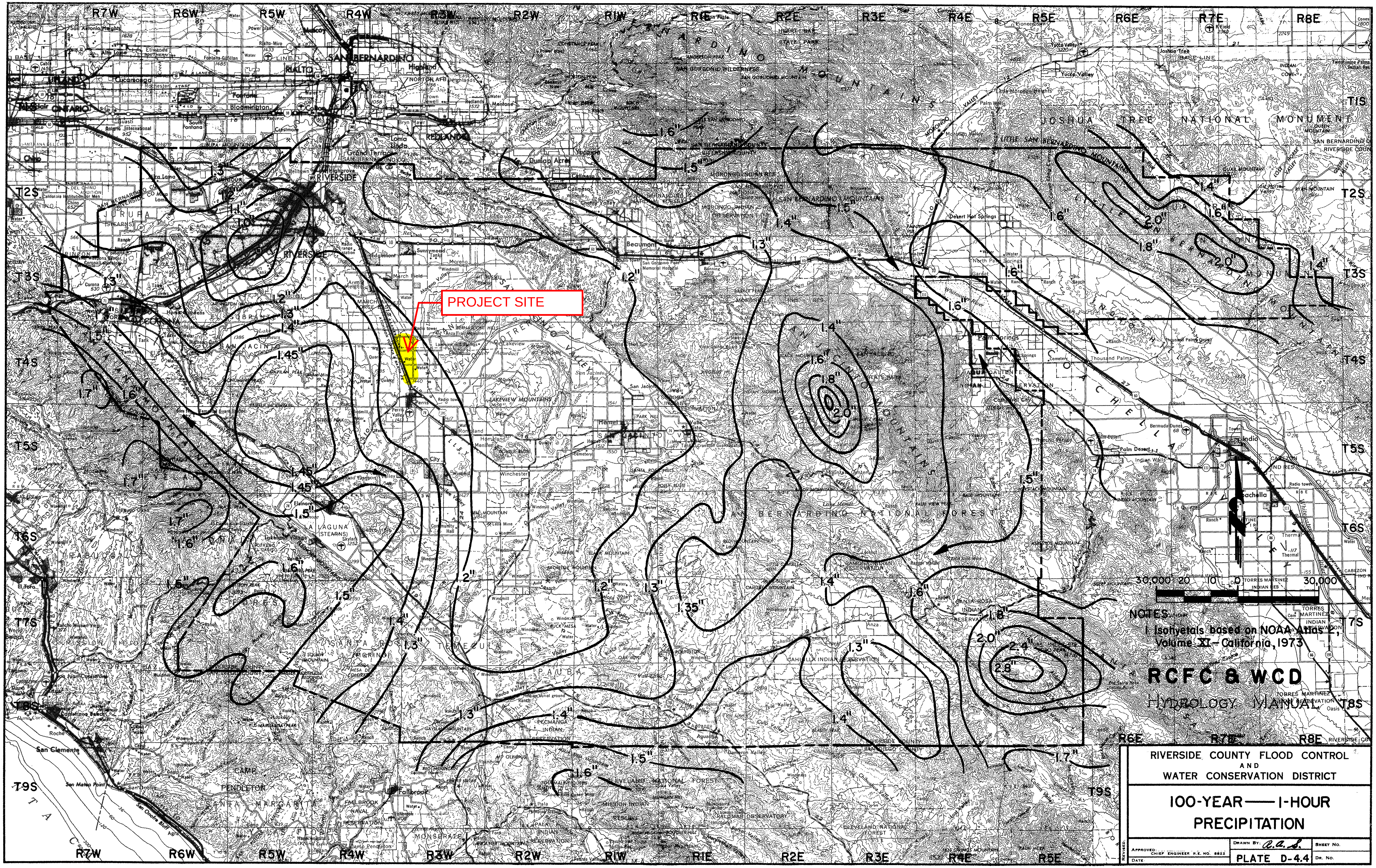
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
2-YEAR — 1-HOUR PRECIPITATION
PLATE D-4.3
DRAWN BY: R.A.S.
APPROVED CHIEF ENGINEER R.E. NO. 8822
DATE
SHEET No.
DR. No.
REVISED:


PROJECT SITE
R7W
R6W
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R2W
R1W
R1E
R2E
R3E
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R6E
R7E
R8E
T1S
T2S
T3S
T4S
T5S
T6S
T7S
T8S
T9S
SAN BERNARDINO MOUNTAINS
JOSHUA TREE NATIONAL MONUMENT
LITTLE SAN BERNARDINO MOUNTAINS
SAN JACINTO MOUNTAINS
SAN BERNARDINO NATIONAL FOREST
CLEVELAND NATIONAL FOREST
SANTA ANA MOUNTAINS
COACHELLA VALLEY
SAN JACINTO VALLEY
RIVERSIDE
SAN BERNARDINO
REDLANDS
ONTARIO
CORONA
PERRIS
HEMET
SAN JACINTO
BEAUMONT
BANNING
PALM SPRINGS
INDIO
ELSINORE
FALLBROOK
SAN CLEMENTE
CAMP PENDLETON
1.0"
1.1"
1.2"
1.3"
1.35"
1.4"
1.45"
1.5"
1.6"
1.7"
1.8"
2.0"
2.4"
2.8"
30,000 20 10 0 30,000
NOTES
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
100-YEAR —— 1-HOUR
PRECIPITATION
APPROVED: CHIEF ENGINEER R.E. NO. 8822
DATE
REVISED
DRAWN BY: R.A.S.
SHEET NO.
PLATE D-4.4
DR. NO.

July 1, 2022

Howard Industrial Partners
1944 North Tustin Street, Suite 122
Orange, California 92865

Attention: Mr. Mike Tunney
Vice President

Project No.: **22G183-2**

Subject: **Results of Infiltration Testing**
Proposed Harvest Landing Industrial Development
Indian Avenue and Orange Avenue
Perris, California

Reference: Geotechnical Investigation, Proposed Harvest Landing Industrial Development, Indian Avenue and Orange Avenue, Perris, California, prepared by Southern California Geotechnical, Inc. (SCG) for Howard Industrial Partners, SCG Project No. 22G183-1, dated June 13, 2022.

Mr. Tunney:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

Scope of Services

The scope of services performed for this project was in general accordance with our Proposal No. 22P206R, dated April 28, 2022 and Change Order No. 22G183-CO, dated June 8, 2022. The scope of services included visual site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the on-site soils for the stormwater disposal systems. The infiltration borings were tested using a modified constant-head infiltration test as requested by the project civil engineer. The double ring infiltration testing was performed in general accordance with ASTM Test Method D-3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer.

Site and Project Description

The site is located at the northwest and southwest corners of Indian Avenue and Orange Avenue in Perris, California. The site is bounded to the north by Val Verde Elementary School, to the west and south by Interstate 215 Frontage Road, and to the east by Indian Avenue. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 of this report.

The site consists of several parcels, which total 73.68± acres in size. The east-central area of the site is developed with four (4) single-family residences. These residences are assumed to be single-story structures of wood frame and stucco construction and supported on conventional

shallow foundations with concrete slab-on-grade floors. The residences are surrounded by concrete flatwork, turf grass, exposed soil, and trees. The remaining areas of the site are vacant and undeveloped. The ground surface in these areas consists of exposed soil with sparse to moderate native grass and weed growth.

Detailed topographic information was not available at the time of this report. Based on elevations obtained from Google Earth, and visual observations made at the time of the subsurface investigation, the overall site topography is generally flat and moderately slopes to the east at a gradient of approximately 2± percent.

Proposed Development

Based on the conceptual site plan provided to our office by the client, the site will be developed with five (5) industrial buildings:

Building No.	Location	Size (ft²)
1	North	647,000
2	North-Central	389,000
3	Central	91,000
4	South-Central	52,000
5	South	22,000

Each building includes a mezzanine and dock-high doors will be constructed along a portion of at least one building wall for each of the buildings. The building is anticipated to be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete pavements in the loading dock areas, and limited areas of concrete flatwork and landscape planters throughout.

The proposed development will include on-site infiltration for stormwater disposal. Based on the information provided by representatives of FMCivil Engineers, Inc., the project civil engineer, the infiltration systems will consist of four (4) shallow below-grade chamber systems (identified as Infiltration System "A" through Infiltration System "D") and/or four (4) deep dry-well systems (identified as Infiltration System "E" thought Infiltration System "H"). The infiltration systems will be located in the eastern area of the site. The bottoms of the below-grade chamber systems will extend to depths of 7± feet below existing site grades and the dry wells will extend to a depth of 50± feet below existing site grades.

Concurrent Studies

SCG performed a geotechnical investigation at the subject site, referenced above. As a part of this investigation, twenty-three (23) borings were advanced to depths of 15 to 25± feet below the previously existing site grades. Native alluvium was encountered at each boring location, extending to at least the maximum depth explored of 25± feet below existing site grades. The alluvium generally consists of medium dense to very dense silty sands to sandy silts, with trace to little clay content.

Free water was not encountered during the drilling of the borings. Based on the lack of water within the borings and the moisture contents of the recovered soil samples, the static groundwater is considered to have existed at a depth in excess of 25± feet at the time of the

subsurface exploration. Recent water level data was obtained from the California Department of Water Resources website, http://www.water.ca.gov/waterdatalibrary/. The nearest monitoring well is located approximately 0.5 miles east from the site. Water level readings within this monitoring well indicates a groundwater level of 44± feet below the ground surface in March 2022.

Subsurface Exploration

Scope of Exploration

The subsurface exploration performed for the infiltration testing consisted of six (6) shallow infiltration trenches (identified as Infiltration Trench Nos. I-1 through I-6) and four (4) deep infiltration borings (identified as Infiltration Boring Nos. I-7 through I-10). The infiltration trenches were excavated using a rubber-tire backhoe to a depth of 7± feet. The infiltration borings were extended to a depth of 50± feet below existing site grades. In addition to the infiltration testing, one (1) exploratory boring was extended to a depth of 60± feet below site grades to confirm the underlying soil types and verify that groundwater was at a depth greater than 10± feet below the bottom of the proposed dry well infiltration systems. The borings were advanced using a truck-mounted drilling rig, equipped with 8-inch-diameter hollow-stem augers and were logged during drilling by a member of our staff. The approximate locations of the boring, infiltration borings, and infiltration trenches are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Geotechnical Conditions

Artificial fill soils were encountered at the ground surface at Infiltration Test No. I-3, extending to a depth of 1± foot below existing site grades. The fill soils consist of medium dense fine to medium sandy silts with trace quantities of clay and fine gravel. Native alluvium was encountered at the ground surface at all of the remaining boring and trench locations, extending to at least the maximum explored depth of 60± feet below existing site grades. The near-surface alluvium encountered at depths less than 25± feet below existing site grades consists of medium dense to very dense fine to medium sandy silts, silty fine to medium sands, clayey fine to coarse sands, and hard fine to coarse sandy clays. At depths greater than 25± feet, the alluvium consists of medium dense to very dense fine sandy silts, fine to medium sandy silts, silty fine to medium sands, and hard fine to medium sandy clays. The Boring Logs and Trench Logs, which illustrate the conditions encountered at each of the borings, are included with this report.

Free water was not encountered during drilling of any of the borings. Based on the lack of water within the borings, the static groundwater table was considered to have existed at a depth in excess of 60± feet at the time of our subsurface exploration.

Shallow Infiltration Testing – Double Ring Infiltration

The infiltration testing for the proposed shallow infiltration chambers was performed in general accordance with ASTM Test Method D-3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer.

Two stainless steel infiltration rings were used for the infiltration testing. The outer infiltration ring is 2 feet in diameter and 20 inches in height. The inner infiltration ring is 1 foot in diameter

and 20 inches in height. At the test locations, the outer ring was driven 3± inches into the soil at the base of each trench. The inner ring was centered inside the outer ring and subsequently driven 3± inches into the soil at the base of the trench. The rings were driven into the soil using a ten-pound sledge hammer. The soil surrounding the wall of the infiltration rings was only slightly disturbed during the driving process.

Infiltration Testing Procedure

Infiltration testing was performed at all of the trench locations. The infiltration testing consisted of filling the inner ring and the annular space (the space between the inner and outer rings) with water, approximately 3 to 4 inches above the soil. To prevent the flow of water from one ring to the other, the water level in both the inner ring and the annular space between the rings was maintained using constant-head float valves. The volume of water that was added to maintain a constant head in the inner ring and the annular space during each time interval was determined and recorded. A cap was placed over the rings to minimize the evaporation of water during the tests.

The schedule for readings was determined based on the observed soil type at the base of each backhoe-excavated trench. Based on the existing soils at the trench locations, the volumetric measurements were made at 10-minute intervals at Infiltration Trench No I-3 and 15-minute increments at the remaining trench locations. The water volume measurements are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on these spreadsheets.

The infiltration rates for the infiltration tests are calculated in centimeters per hour and then converted to inches per hour. The rates are summarized below:

Infiltration Test No.	**Depth (feet)**	**Soil Description**	**Measured Infiltration Rate (inches/hour)**
I-1	7	Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.8
I-2	7	Brown Silty fine to medium Sand, trace coarse Sand, trace Clay	1.0
I-3	7	Brown Silty fine to medium Sand, little coarse Sand	6.8
I-4	7	Brown Silty fine to medium Sand, trace to little coarse Sand, trace Clay	0.3
I-5	7	Brown Silty fine to medium Sand, trace coarse Sand, trace Clay	0.9
I-6	7	Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	1.3

Percolation Testing – Dry Wells

The dry well infiltration testing was performed in accordance with a modified constant-head infiltration test as requested by the project civil engineer, the designer of the proposed dry well system.

Upon the completion of the drilling for the infiltration borings, a sufficient length of 3-inch-diameter perforated PVC casing was then placed into each test hole so that the PVC casing extended from the bottom of the test hole to the ground surface. Clean ¾-inch gravel was installed in the annulus surrounding the PVC casing.

Pre-soaking

The pre-soaking process consisted of filling the test borings with water to approximately 10± feet below the ground surface. The pre-soaking was completed after all of the water had percolated through the test hole, at least 15 hours since initiating the pre-soak.

Infiltration Testing Procedure

Following the pre-soaking process, the constant-head infiltration test method was utilized to test the infiltration rates of deeper soils. This method consisted of filling the borings to a maximum water level of 10± feet below the ground surface, based on the soil conditions encountered. Once the hole was filled, the inflow of water was controlled via a ball valve in order to maintain the water level constant below ground surface. It was necessary to constantly monitor this depth due to varying inflows from the water source and the change in infiltration rate with time. Readings were taken every ten minutes using a water level meter. The ball valve was used to make adjustments by increasing or decreasing the inflow of water when slight changes in depth occurred. The water level readings are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on the spreadsheets.

The infiltration rates from the deep infiltration tests are tabulated in gallons per square foot per day.

Infiltration Test No.	Depth (feet)	Measured Infiltration Rate (Inches per Hour)
I-7	51	<0.1
I-8	49	0.2
I-9	51	0.1
I-10	51	0.3

Laboratory Testing

Moisture Content

The moisture contents for the recovered soil samples within the borings were determined in accordance with ASTM D-2216 and are expressed as a percentage of the dry weight. These test results are presented on the Boring Logs.

Grain Size Analysis

The grain size distribution of selected soils collected from each infiltration test boring have been determined using a range of wire mesh screens. These tests were performed in general accordance with ASTM D-422 and/or ASTM D-1140. The weight of the portion of the sample retained on each screen is recorded and the percentage finer or coarser of the total weight is calculated. The results of these tests are presented on Plates C-1 through C-41 of this report.

Design Recommendations

A total of ten (10) total infiltration tests were performed at the subject site. As noted above, the double ring infiltration testing resulted in measured infiltration rates ranging from 0.3 to 6.8 inches per hour. The dry well infiltration testing resulted in measured infiltration rates ranging from 0.0 to 0.3 inches per hour. The primary factors affecting the infiltration rates are the silt content of the encountered soils, which vary at different depths and locations at the subject site. Based on the results of the infiltration testing, we recommend the following infiltration rates to be utilized for the design of the proposed infiltration systems:

Infiltration Test No.	Infiltration System	Infiltration System Type	Depth (feet)	Location	Infiltration Rate (inches per hour)
I-1 and I-2*	A	Chamber System	7	Northeast	0.9
I-3 and I-4*	B	Chamber System	7	Central-East	3.6
I-5	C	Chamber System	7	South-Central	0.9
I-6	D	Chamber System	7	Southeast	1.3

Infiltration Test No.	Infiltration System	Infiltration System Type	Depth (feet)	Location	Infiltration Rate (inches per hour)
I-7	E	Dry Well	50	Northeast	0.0
I-8	F	Dry Well	50	Central-East	0.2
I-9	G	Dry Well	50	Central-East	0.1
I-10	H	Dry Well	50	Southeast	0.3

NOTE: *Indicates an average infiltration rate was used in the design infiltration rate.

Due to the low infiltration rates for the deep dry well infiltration systems, dry well infiltration is not recommended for this project.

The design of the proposed storm water infiltration system should be performed by the project civil engineer, in accordance with the City of Perris and/or County of Riverside guidelines. However, it is recommended that the system be constructed so as to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the system. The presence of such materials would decrease the effective infiltration rate. **It is recommended that the project civil engineer apply an appropriate factor of safety. The infiltration rates recommended above are based on the assumption that only clean water will be introduced to the subsurface profile. Any fines, debris, or organic materials could significantly impact the infiltration rates.** It should be noted that the recommended infiltration rates are based on infiltration testing at ten (10) discrete locations and the overall infiltration rates of the storm water infiltration systems could vary considerably.

Infiltration Rate Considerations

The infiltration rates presented herein was determined in accordance with the Riverside County guidelines and are considered valid only for the time and place of the actual test. Varying subsurface conditions will exist in other areas of the site, which could alter the recommended infiltration rates presented above. The infiltration rates will decline over time between maintenance cycles as silt or clay particles accumulate on the BMP surface. The infiltration rate is highly dependent upon a number of factors, including density, silt and clay content, grainsize distribution throughout the range of particle sizes, and particle shape. Small changes in these factors can cause large changes in the infiltration rates.

Infiltration rates are based on unsaturated flow. As water is introduced into soils by infiltration, the soils become saturated and the wetting front advances from the unsaturated zone to the saturated zone. Once the soils become saturated, infiltration rates become zero, and water can only move through soils by hydraulic conductivity at a rate determined by pressure head and soil permeability. Changes in soil moisture content will affect the infiltration rate. Infiltration rates should be expected to decrease until the soils become saturated. Soil permeability values will then govern groundwater movement. Permeability values may be on the order of 10 to 20 times less than infiltration rates. The system designer should incorporate adequate factors of safety and allow for overflow design into appropriate traditional storm drain systems, which would transport storm water off-site.

Construction Considerations

The infiltration rates presented in this report are specific to the tested locations and tested depths. Infiltration rates can be significantly reduced if the soils are exposed to excessive disturbance or compaction during construction. Compaction of the soils at the bottom of the infiltration system can significantly reduce the infiltration ability of the basins. Therefore, the subgrade soils within proposed infiltration system areas should not be over-excavated, undercut or compacted in any significant manner. **It is recommended that a note to this effect be added to the project plans and/or specifications.**

We recommend that a representative from the geotechnical engineer be on-site during the construction of the proposed infiltration systems to identify the soil classification at the base of each system. It should be confirmed that the soils at the base of the proposed infiltration systems correspond with those presented in this report to ensure that the performance of the systems will be consistent with the rates reported herein.

We recommend that scrapers and other rubber-tired heavy equipment not be operated on the basin bottom, or at levels lower than 2 feet above the bottom of the system, particularly within basins. As such, the bottom 24 inches of the infiltration systems should be excavated with non-rubber-tired equipment, such as excavators.

Infiltration Chamber Maintenance

The proposed project may include infiltration chambers. Water flowing into chambers will carry some level of sediment. This layer has the potential to significantly reduce the infiltration rate of the chamber subgrade soils. Therefore, a formal chamber maintenance program should be established to ensure that these silt and clay deposits are removed from the chamber on a regular basis.

Location of Infiltration Systems

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration area could potentially be damaged due to saturation of the subgrade soils. **The proposed infiltration systems for this site should be located at least 25 feet away from any structures, including retaining walls.** Even with this provision of locating the infiltration system at least 25 feet from the building(s), it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration system.

The infiltration system designer should also give special consideration to the effect that the proposed infiltration systems may have on nearby subterranean structures, open excavations, or descending slopes. In particular, infiltration systems should not be located near the crest of descending slopes, particularly where the slopes are comprised of granular soils. Such systems will require specialized design and analysis to evaluate the potential for slope instability, piping failures and other phenomena that typically apply to earthen dam design. This type of analysis is beyond the scope of this infiltration test report, but these factors should be considered by the infiltration system designer when locating the infiltration systems.

General Comments

This report has been prepared as an instrument of service for use by the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, structural engineer, and/or civil engineer. The design of the infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rates contained herein, the civil engineer agrees to indemnify, defend, and hold harmless the geotechnical engineer for all aspects of the design and performance of the infiltration system. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur. The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between trench locations and testing depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to

our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted. The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

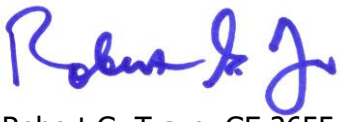
Closure

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

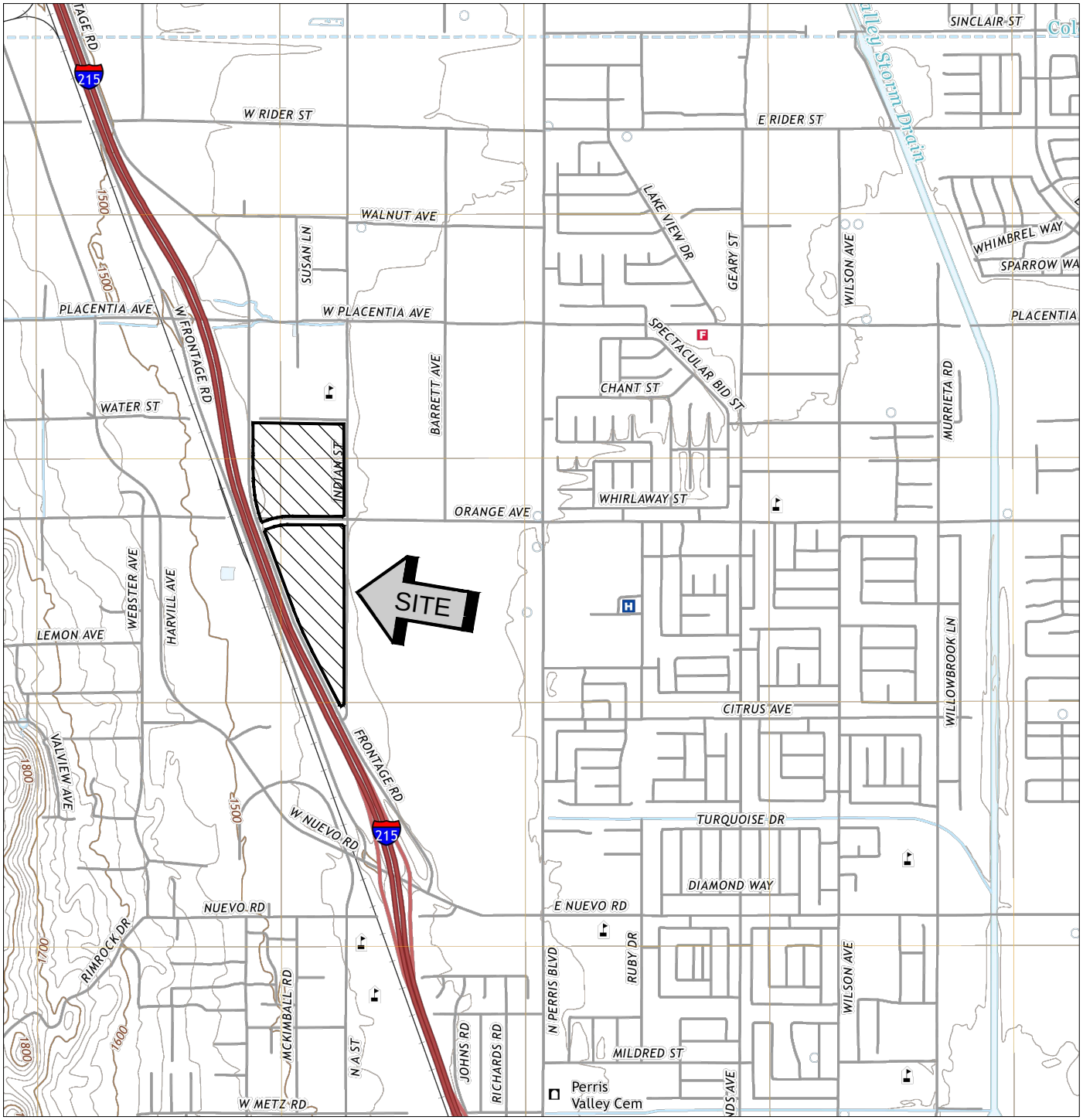
Ryan Bremer
Staff Geologist



Robert G. Trazo, GE 2655
Principal Engineer

Distribution: (1) Addressee

Enclosures: Plate 1 - Site Location Map
Plate 2 - Infiltration Test Location Plan
Trench Log Legend and Logs (8 pages)
Boring Log Legend and Logs (12 pages)
Infiltration Test Results Spreadsheets (10 pages)
Grain Size Distribution Graphs (41 pages)



SOURCE: USGS TOPOGRAPHIC MAP OF THE PERRIS QUADRANGLE, RIVERSIDE COUNTY, CALIFORNIA, 2021

SITE LOCATION MAP

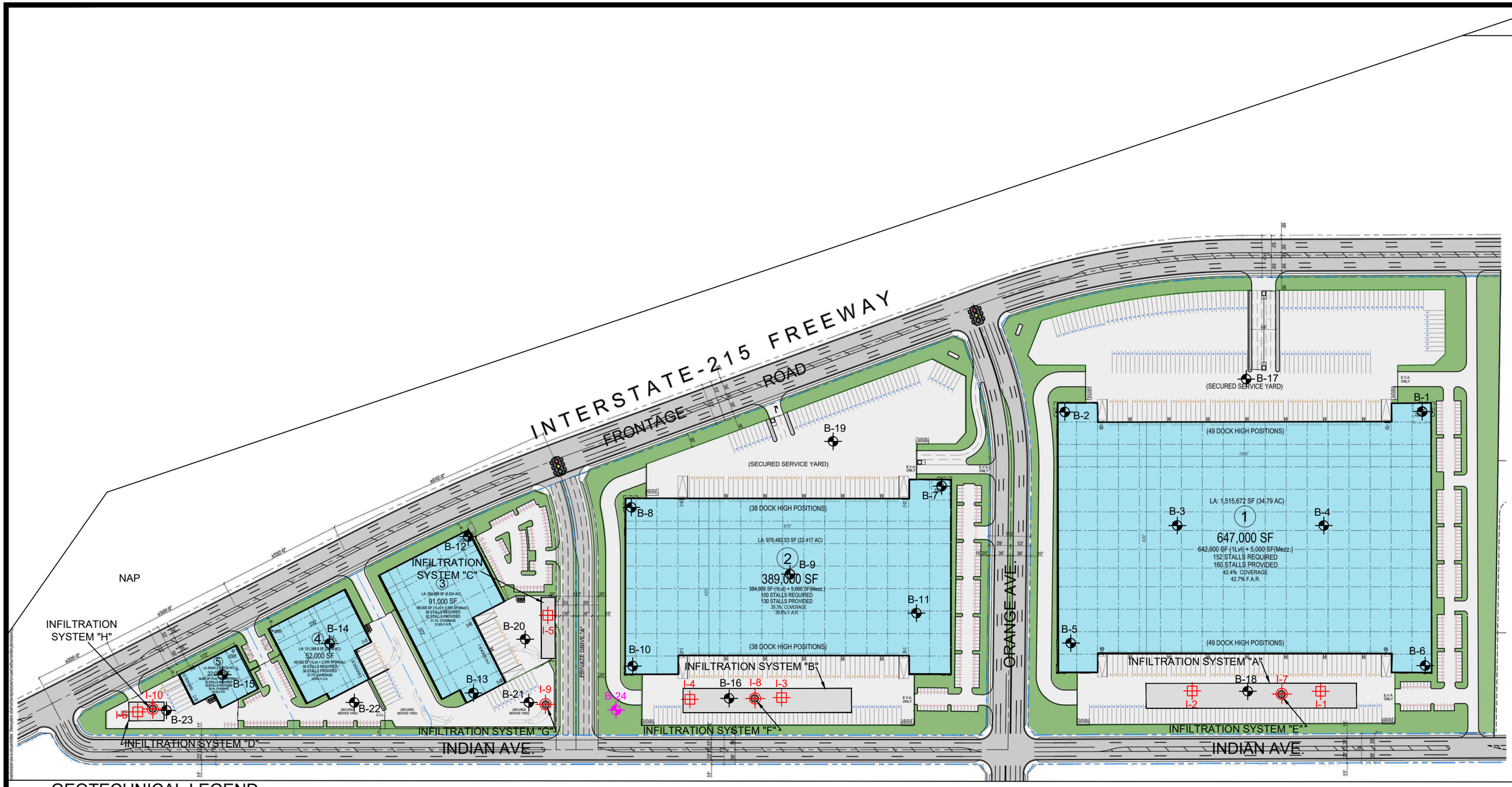
HARVEST LANDING INDUSTRIAL DEVELOPMENT

PERRIS, CALIFORNIA

SCALE: 1" = 2000'	
DRAWN: OS CHKD: RGT	
SCG PROJECT 22G183-2	
PLATE 1	

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



GEOTECHNICAL LEGEND

- APPROXIMATE SHALLOW-INFILTRATION TEST LOCATION (DOUBLE-RING INFILTROMETER)
- APPROXIMATE DEEP-INFILTRATION TEST LOCATION (CONSTANT-HEAD)
- APPROXIMATE BORING LOCATION
- APPROXIMATE BORING LOCATION (SCG PROJECT NO. 22G183-1)
- APPROXIMATE BELOW-GRADE CHAMBER LOCATION
- APPROXIMATE DRY WELL SYSTEM LOCATION

NORTH

SoCalGeo

NOTE: CONCEPTUAL PLAN PROVIDED BY AO ARCHITECTS

INFILTRATION TEST LOCATION PLAN

HARVEST LANDING INDUSTRIAL DEVELOPMENT

PERRIS, CALIFORNIA

SCALE: 1" = 250'	
DRAWN: RB CHKD: RGT	
SCG PROJECT 22G183-2	
PLATE 2	

SOUTHERN CALIFORNIA GEOTECHNICAL

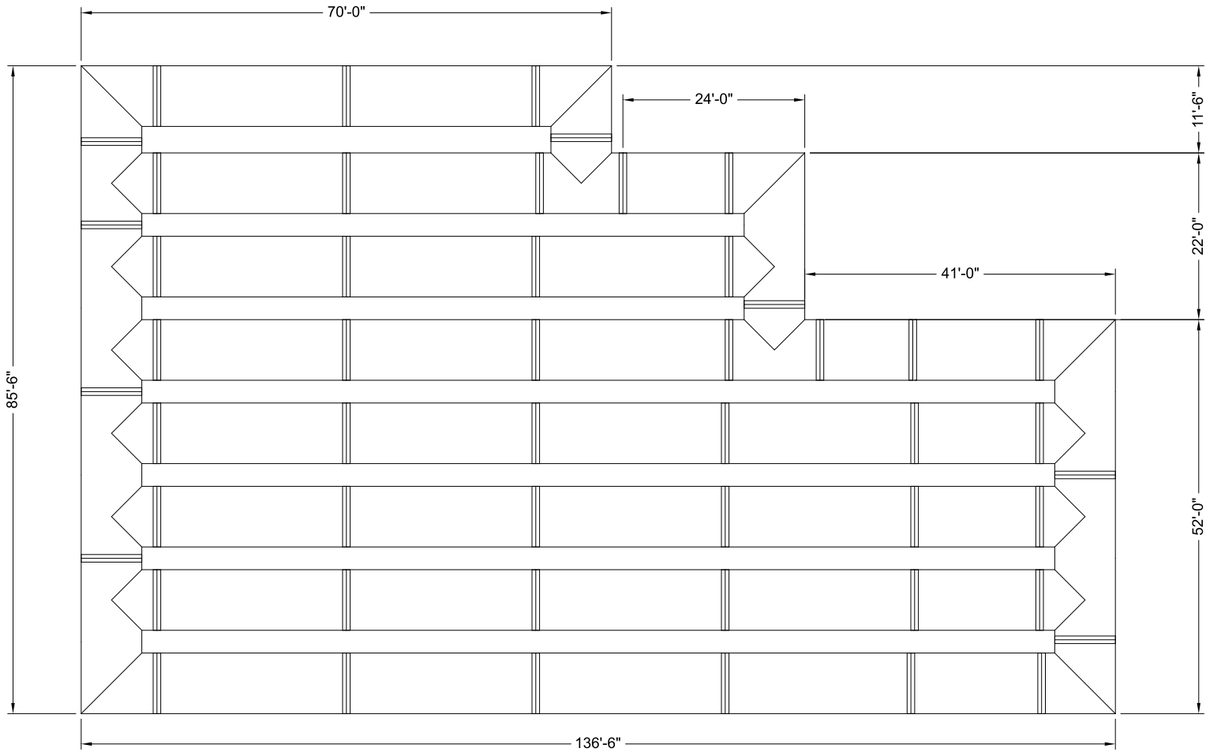
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 986 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 49,574 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 49,574 CF

PIPE DETAILS
- DIAMETER = 96"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 36"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"



NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE $2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

ASSEMBLY
SCALE: 1" = 20'

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DATE	REVISION DESCRIPTION	BY

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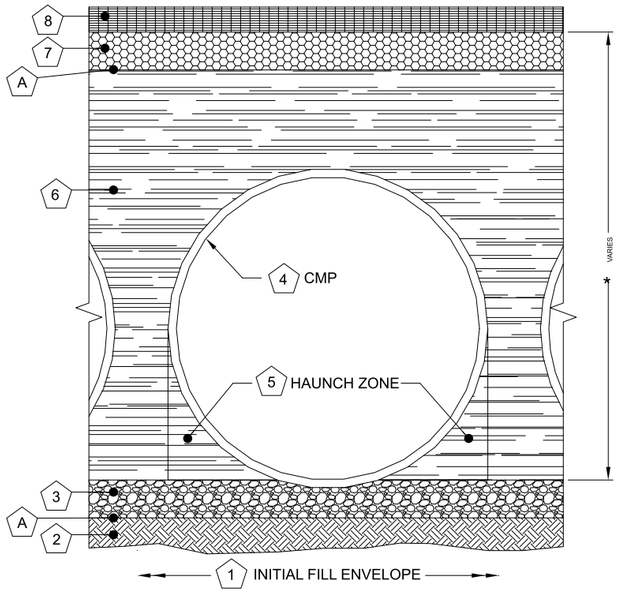
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH® CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO19773 20-001 Harvest Landing Site 3
Easterly System
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
12816	19773	8/16/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		



	DETENTION SYSTEMS - CMP DETENTION / CMP DRAINAGE			
	Material Location	Description	Material Designation	Designation
8	Rigid or Flexible Pavement (if applicable)			
7	Road Base (if applicable)			
A	Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types
6	Backfill	Well graded granular material which may contain small amounts of silt or clay.	AASHTO M 145- A-1, A-2, A-3	Placed in 8" +/- loose lifts and compacted to 90% Standard Proctor Per AASHTO T 99
3	Bedding Stone	Well graded granular bedding material w/maximum particle size of 3"	AASHTO M43 - 3,357,4,467, 5, 56, 57	Engineer to determine if bedding is required. Pipe may be placed on the trench bottom of a relatively loose, native suitable well graded & granular material. For Arch pipes it is recommended to be shaped to a relatively flat bottom or fine-grade the foundation to a slight v-shape. Unsuitable material should be over-excavated and re-placed with a 4"-6" layer of well graded & granular stone per the material designation. See AASHTO 26.3.8.1 / 26.5.3 Bedding info.
A	Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types
*	*Note: Backfill using controlled low-strength material (CLSM, "flash fill" or "flowable fill") when the spacing between the pipes will not allow for placement and adequate compaction of the backfill.*			

1 MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT

FOUNDATION/BEDDING PREPARATION

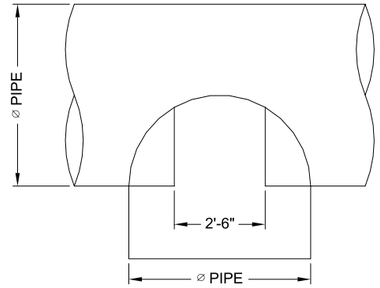
2 PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE ENGINEER.

5 HAUNCH ZONE MATERIAL SHALL BE PLACED AND UNIFORMALLY COMPACTED WITHOUT SOFT SPOTS.

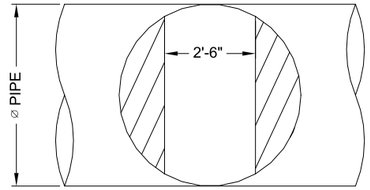
BACKFILL

WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO LIFT (16") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE DETENTION SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON THE PIPE.

OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.



PLAN

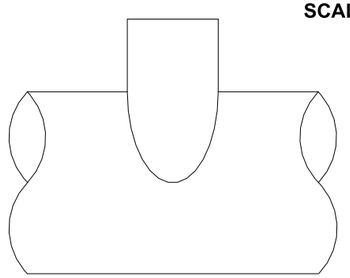


FRONT

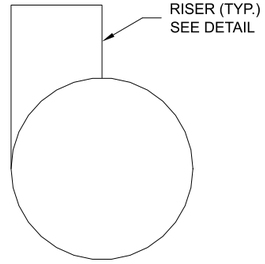
NOTE:
MANWAY DETAIL APPLICABLE FOR CMP SYSTEMS WITH DIAMETERS 48" AND LARGER. MANWAYS MAY BE REQUIRED ON SMALLER SYSTEMS DEPENDING ON ACTUAL SITE SPECIFIC CONDITIONS.

TYPICAL MANWAY DETAIL

SCALE: N.T.S.



ELEVATION

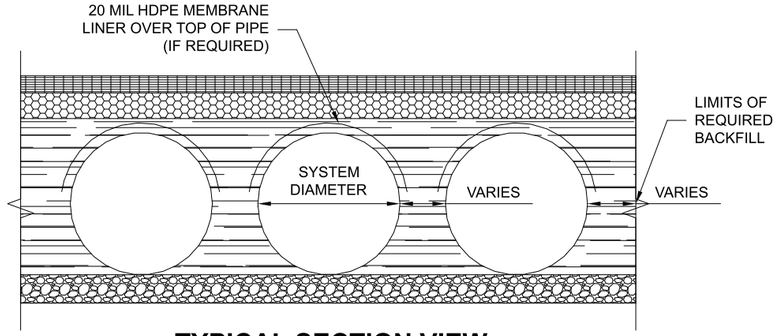


END

NOTE:
LADDERS ARE OPTIONAL AND ARE NOT REQUIRED FOR ALL SYSTEMS.

TYPICAL RISER DETAIL

SCALE: N.T.S.



TYPICAL SECTION VIEW

LINER OVER ROWS
SCALE: N.T.S.

NOTE: IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, AN HDPE MEMBRANE LINER IS RECOMMENDED WITH THE SYSTEM. THE IMPERMEABLE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

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CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO19773 20-001 Harvest Landing Site 3
Easterly System
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
12816	19773	8/16/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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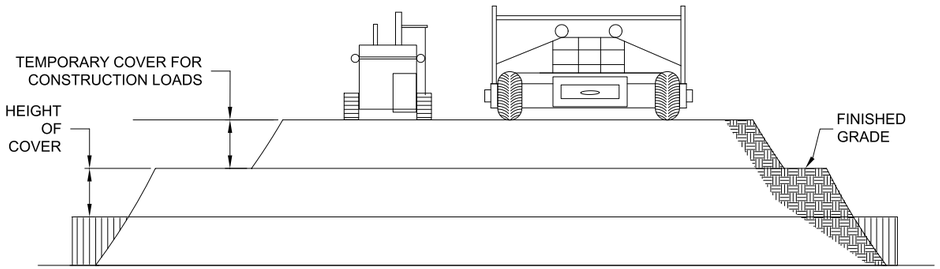


CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

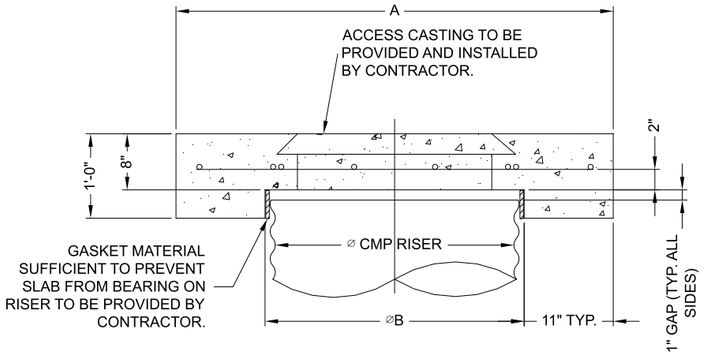
APPLICABLE POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

APPLICABLE
HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.
REQUIREMENTS
INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

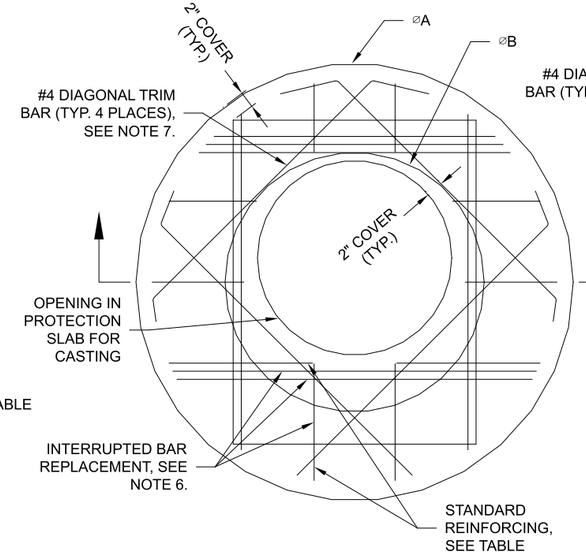
NOTE:
THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.



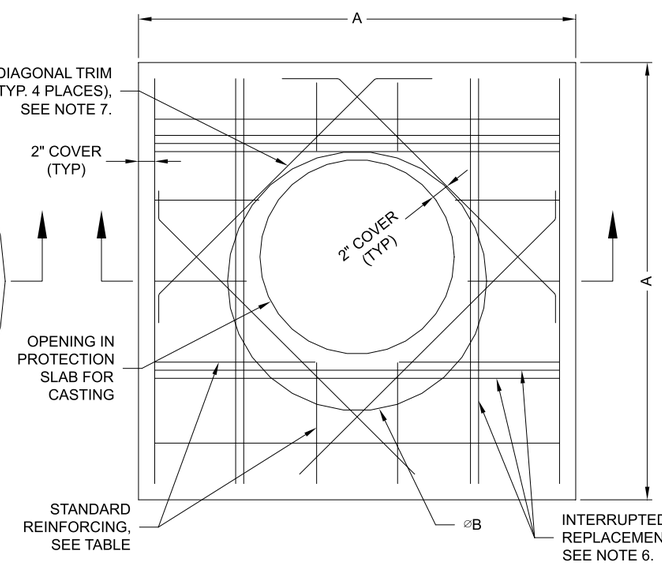
SECTION VIEW

REINFORCING TABLE				
⌀ CMP RISER	A	⌀ B	REINFORCING	**BEARING PRESSURE (PSF)
24"	⌀ 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	⌀ 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	⌀ 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	⌀ 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	⌀ 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

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CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO19773 20-001 Harvest Landing Site 3
Easterly System
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
12816	19773	8/16/2022
DESIGNED: DYO	DRAWN: DYO	
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SHEET NO.: 1		

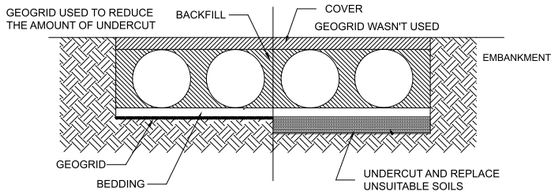
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.

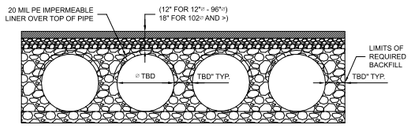


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

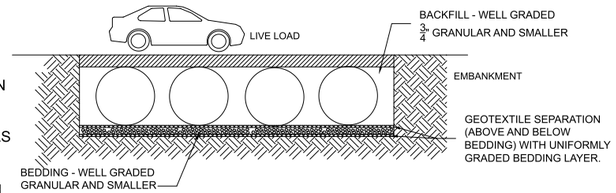
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

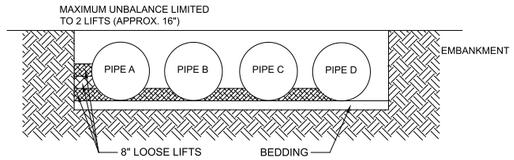
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



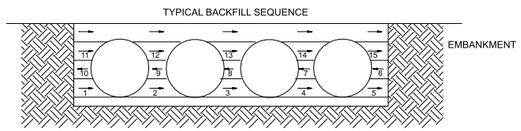
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

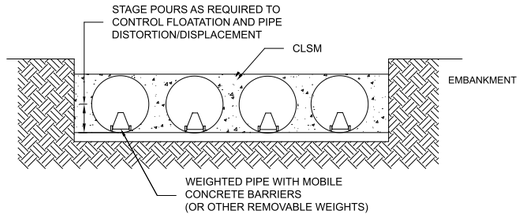


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

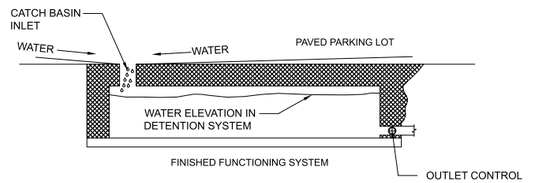


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

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CONTECH CMP DETENTION SYSTEMS

CONTECH **DYODS** DRAWING

DYO19773 20-001 Harvest Landing Site 3
Easterly System
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
12816	19773	8/16/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 714 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 35,890 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 35,890 CF

PIPE DETAILS
- DIAMETER = 96"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 36"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"

NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2⅔" x ½" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

ASSEMBLY
SCALE: 1" = 20'

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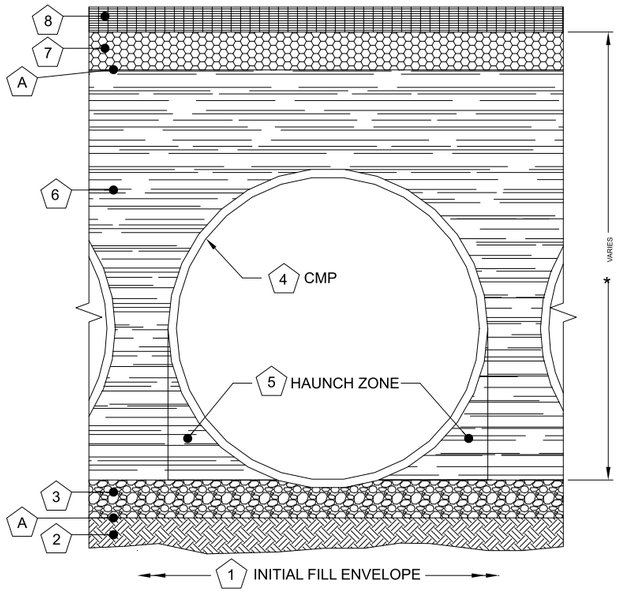
CONTECH® CMP DETENTION SYSTEMS
CONTECH **DYODS** DRAWING

DYO19755 20-001 Harvest Landing Site 3
Westerly System
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
12801	19755	8/16/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		



	DETENTION SYSTEMS - CMP DETENTION / CMP DRAINAGE			
	Material Location	Description	Material Designation	Designation
8	Rigid or Flexible Pavement (if applicable)			
7	Road Base (if applicable)			
A	Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types
6	Backfill	Well graded granular material which may contain small amounts of silt or clay.	AASHTO M 145- A-1, A-2, A-3	Placed in 8" +/- loose lifts and compacted to 90% Standard Proctor Per AASHTO T 99
3	Bedding Stone	Well graded granular bedding material w/maximum particle size of 3"	AASHTO M43 - 3,357,4,467, 5, 56, 57	Engineer to determine if bedding is required. Pipe may be placed on the trench bottom of a relatively loose, native suitable well graded & granular material. For Arch pipes it is recommended to be shaped to a relatively flat bottom or fine-grade the foundation to a slight v-shape. Unsuitable material should be over-excavated and re-placed with a 4"-6" layer of well graded & granular stone per the material designation. See AASHTO 26.3.8.1 / 26.5.3 Bedding info.
A	Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types
*	*Note: Backfill using controlled low-strength material (CLSM, "flash fill" or "flowable fill") when the spacing between the pipes will not allow for placement and adequate compaction of the backfill.*			

1 MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT

FOUNDATION/BEDDING PREPARATION

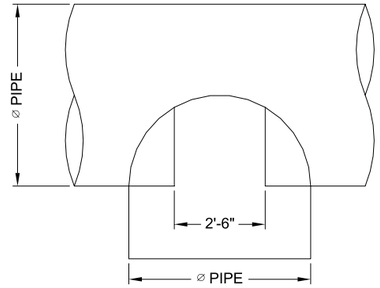
2 PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE ENGINEER.

5 HAUNCH ZONE MATERIAL SHALL BE PLACED AND UNIFORMALLY COMPACTED WITHOUT SOFT SPOTS.

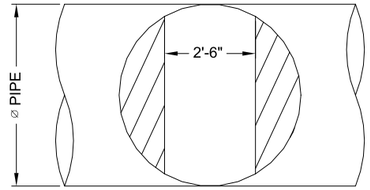
BACKFILL

WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO LIFT (16") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE DETENTION SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON THE PIPE.

OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.



PLAN

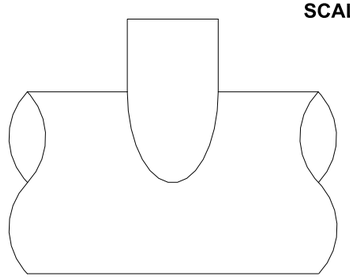


FRONT

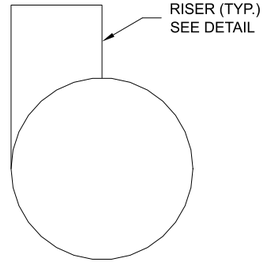
NOTE:
MANWAY DETAIL APPLICABLE FOR CMP SYSTEMS WITH DIAMETERS 48" AND LARGER. MANWAYS MAY BE REQUIRED ON SMALLER SYSTEMS DEPENDING ON ACTUAL SITE SPECIFIC CONDITIONS.

TYPICAL MANWAY DETAIL

SCALE: N.T.S.



ELEVATION

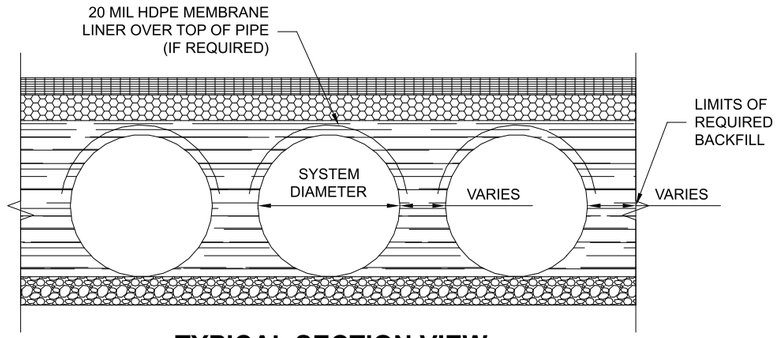


END

NOTE:
LADDERS ARE OPTIONAL AND ARE NOT REQUIRED FOR ALL SYSTEMS.

TYPICAL RISER DETAIL

SCALE: N.T.S.



TYPICAL SECTION VIEW

LINER OVER ROWS
SCALE: N.T.S.

NOTE: IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, AN HDPE MEMBRANE LINER IS RECOMMENDED WITH THE SYSTEM. THE IMPERMEABLE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

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Westerly System
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DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
12801	19755	8/16/2022
DESIGNED: DYO	DRAWN: DYO	
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SHEET NO.: 1		

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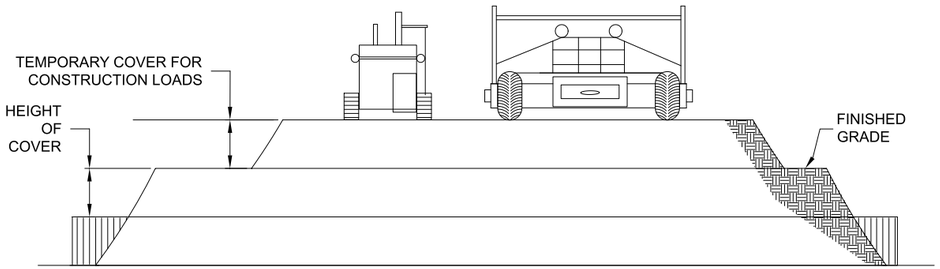

CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

APPLICABLE POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

APPLICABLE
HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.
REQUIREMENTS
INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

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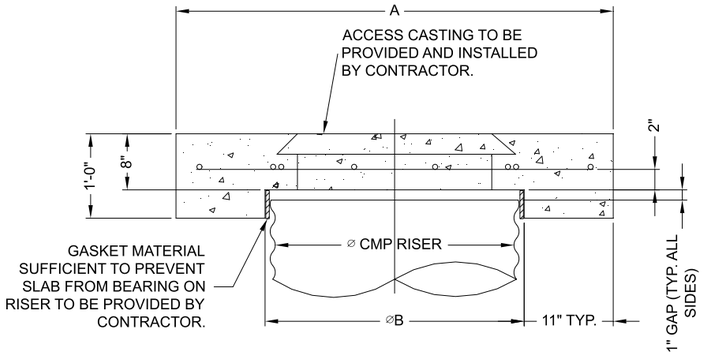
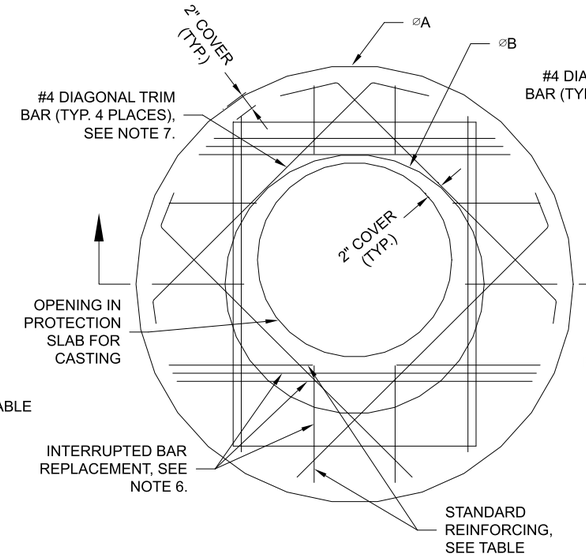


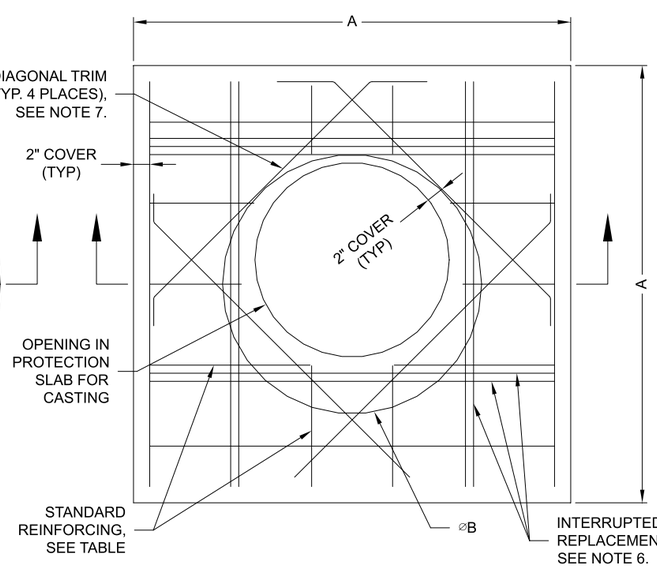
SECTION VIEW

REINFORCING TABLE				
⌀ CMP RISER	A	⌀ B	REINFORCING	**BEARING PRESSURE (PSF)
24"	⌀ 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	⌀ 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	⌀ 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	⌀ 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	⌀ 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

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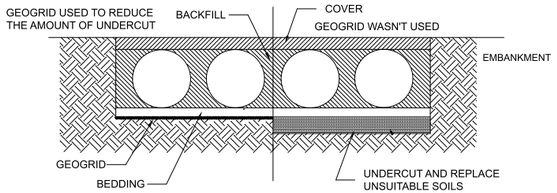
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.

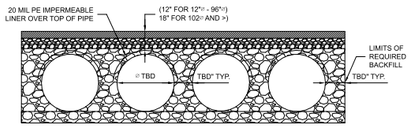


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

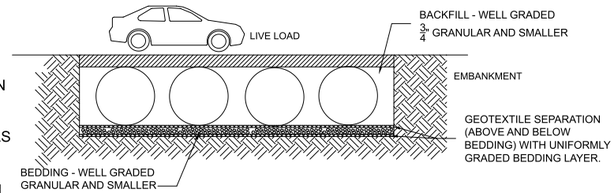
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

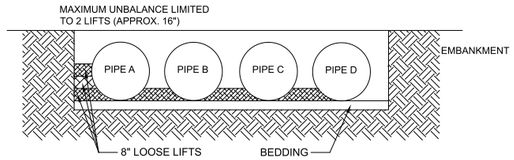
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



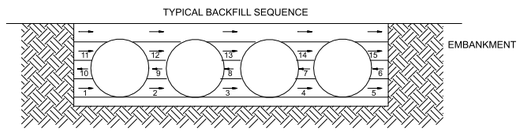
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

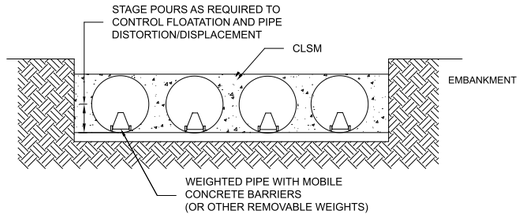


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

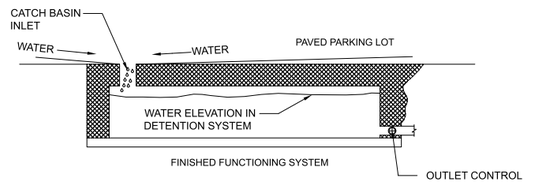


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

C:\EXPORTS\TEMPLATES\CMP_V8.DWG 10/18/2019 10:02 AM

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DATE	REVISION DESCRIPTION	BY

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www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO19755 20-001 Harvest Landing Site 3
Westerly System
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
12801	19755	8/16/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	FMCivil Engineers Inc	Date	10/4/2024
Designed by	Hector Paez	Case No	
Company Project Number/Name	20-001 - Site 3		

BMP Identification

BMP NAME / ID: S3-1 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S3-1A	*82323.47*	*Roofs*	*1*	*0.89*	*73432.5*			
S3-1C	*49531.63*	*Concrete or Asphalt*	*1*	*0.892*	*44182.2*			
	131855.1		***Total***		**117614.7**	**0.20**	***0.54***	***0.577***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries | Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc — Date: 10/4/2024

Designed by: Hector Paez — Case No:

Company Project Number/Name: 20-001 - Site 3

BMP Identification

BMP NAME / ID: S3-2 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity — I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S3-2A	*28787.68*	*Roofs*	*1*	*0.89*	*25678.6*			
S3-2C	*43453.31*	*Concrete or Asphalt*	*1*	*0.892*	*38760.4*			
	72240.99	***Total***			**64439**	**0.20**	***0.30***	***0.346***

DMAs

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries | Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc | Date: 10/4/2024
Designed by: Hector Paez | Case No:
Company Project Number/Name: 20-001 - Site 3

BMP Identification

BMP NAME / ID: S3-3 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity: I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S3-3A	*0*	*Roofs*	*1*	*0.89*	*0*			
S3-3C	*116.28*	*Concrete or Asphalt*	*1*	*0.892*	*103.7*			
	116.28	***Total***			**103.7**	**0.20**	**0.00**	**0**

Proposed Volume must be greater than the Design Capture Volume

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc — Date: 10/4/2024

Designed by: Hector Paez — Case No:

Company Project Number/Name: 20-001 - Site 3

BMP Identification

BMP NAME / ID: S3-4 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity — I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S3-4A	*0*	*Roofs*	*1*	*0.89*	*0*			
S3-4C	*4363.5*	*Concrete or Asphalt*	*1*	*0.892*	*3892.2*			
	4363.5	**Total**			3892.2	0.20	*0.02*	*0.052*

DMAs

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries | Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc | Date: 10/4/2024

Designed by: Hector Paez | Case No:

Company Project Number/Name: 20-001 - Site 3

BMP Identification

BMP NAME / ID: S3-5 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity: I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

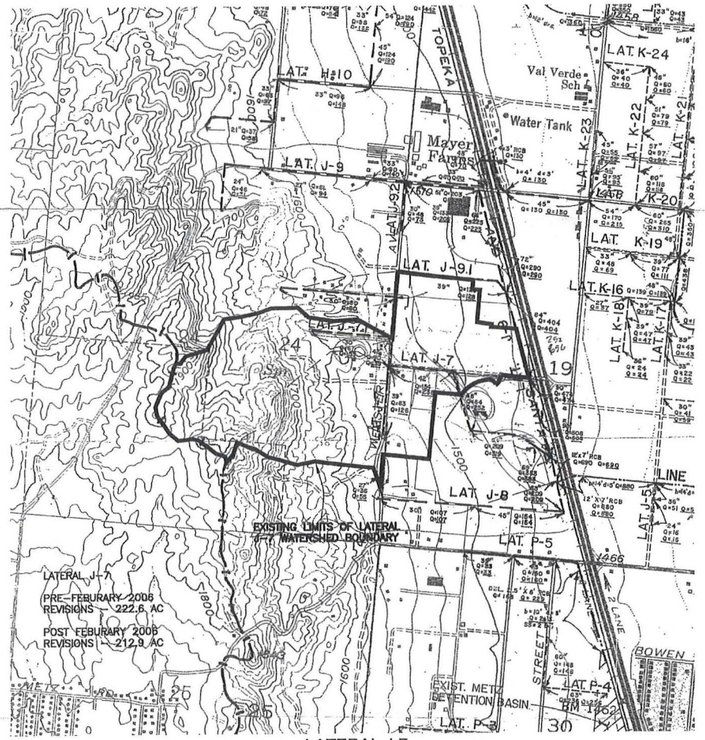
	DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Rainfall Intensity (in/hr)	Design Flow Rate (cfs)	Proposed Flow Rate (cfs)
DMAs	S3-5A	0	Roofs	1	0.89	0			
	S3-5C	28679.95	Concrete or Asphalt	1	0.892	25582.5			
		28679.95	Total			25582.5	0.20	0.12	0.144

Notes:

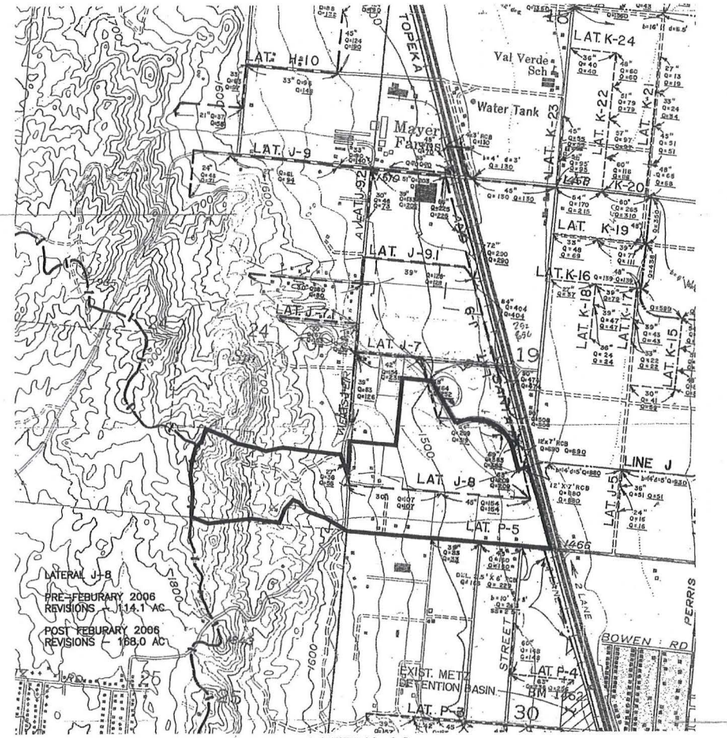
PORTION OF
8K3
1" = 1000'

REVISED HYDROLOGY MAP
PERRIS MASTER DRAINAGE PLAN

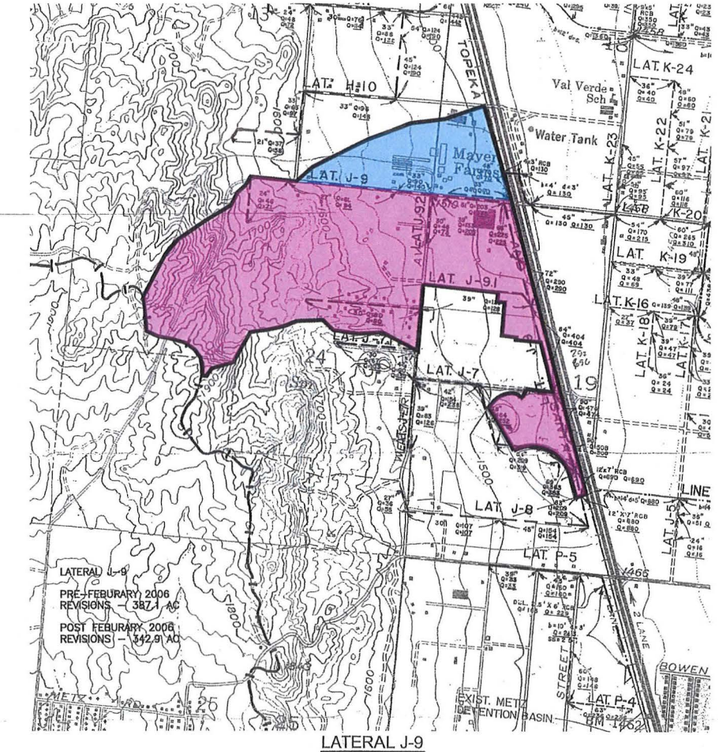
LATERALS J–7, J–8, & J–9



LATERAL J-7



LATERAL J-8



LATERAL J-9

LATERAL No.	PRE–FEBURARY 2006 REVISIONS	POST FEBURARY 2006 REVISIONS	INCREASE/DECREASE (ACRES)
LAT J–8	114.1	168.0	+53.9
LAT J–9	609.8	555.9	–53.9

LEGEND

PROPOSED LATERAL WATERSHED BOUNDARIES AFTER FEBRUARY 2006 REVISION

N

SCALE: 1"=1000'

B:\CAD\Nuevo Industrial Park - NV\PE\Exhibits\NV\P Perris MDP Hydrology map lat 7 and lat 9.dwg, 2/2/2007 1:10:00 PM, Donal Pearce

WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR GRADING PERMIT HAS BEEN ISSUED.

THE PRIVATE ENGINEER SIGNING THESE PLANS IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF THE DESIGN HEREON. IN THE EVENT OF DISCREPANCIES ARISING AFTER COUNTY APPROVAL OR DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISING THE PLANS FOR APPROVAL BY THE COUNTY.

DATE	BY	MARK	REVISIONS	APPR	DATE

ENGINEER — COUNTY

SEAL–COUNTY

REGISTERED PROFESSIONAL ENGINEER ALAN D. FRENCH No. 45702 Exp. 12–31–08 CIVIL STATE OF CALIFORNIA

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY:

ALAN D. FRENCH, P.E.
CIVIL ENGINEER, R.C.E. NO. 45702 — DATE

RECOMMENDED — DATE

SEAL–ENGINEER

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RECOMMENDED FOR APPROVAL — APPROVED BY:

PLANNING ENGINEER — CHIEF ENGINEER

DATE: — DATE:

ENGINEERING SOLUTIONS
ENGINEERING-LAND PLANNING-SURVEYING-MAPPING
2155 CHICAGO AVENUE, STE. 201
RIVERSIDE, CA. 92507
PHONE – (951) 784–0288
FAX – (951) 784–0287
PREPARED BY:

DATE EXP. 06–30–07

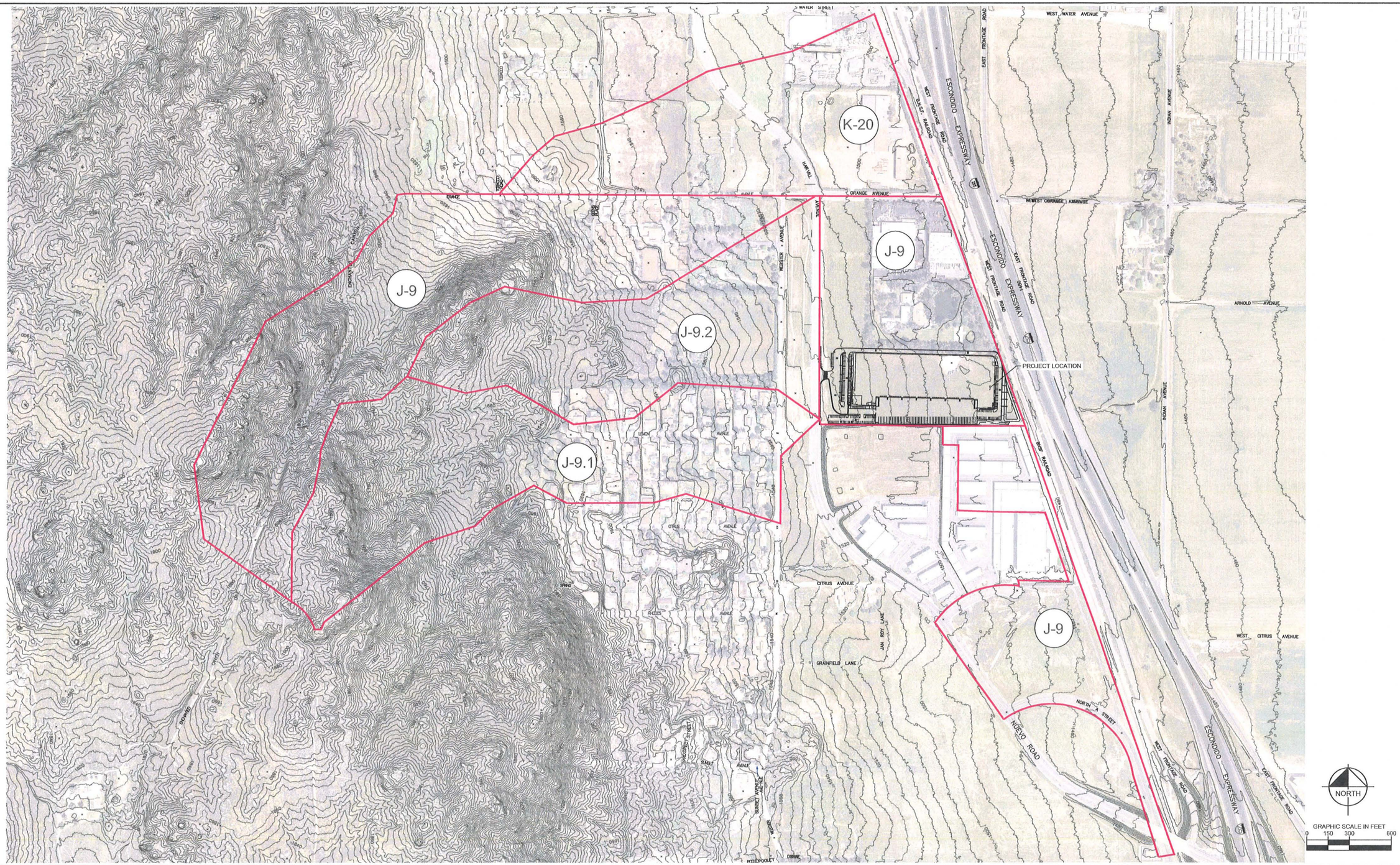
BENCHMARK:

SCALE:

I.P. No. XXXXX
COUNTY OF RIVERSIDE
REVISED HYDROLOGY MAP
PERRIS MASTER DRAINAGE PLAN
LATERALS J–7, J–8, & J–9

SHEET NO. 1 OF 1 SHTS.

FOR: | W.O. | COUNTY FILE NO.:



Kimley»Horn
401 B STREET, SUITE 600, SAN DIEGO, CA 92101
PHONE: 619-234-9411
WWW.KIMLEY-HORN.COM

RCFC MDP DRAINAGE AREA MAP LINE J-9
ROCKEFELLER HARVILL INDUSTRIAL PARK
October 9, 2020

k:\snd_ldev\rockefeller - riverside_harvill\to\rcfc\2020.10.08 - mdp letter\2020.10.09 - mdp drainage area.dwg 10/9/2020

EXHIBITS

EXHIBIT A: VICINITY MAP

EXHIBIT B: EXISTING OFFSITE HYDROLOGY MAP

EXHIBIT C: EXISTING HYDROLOGY MAP

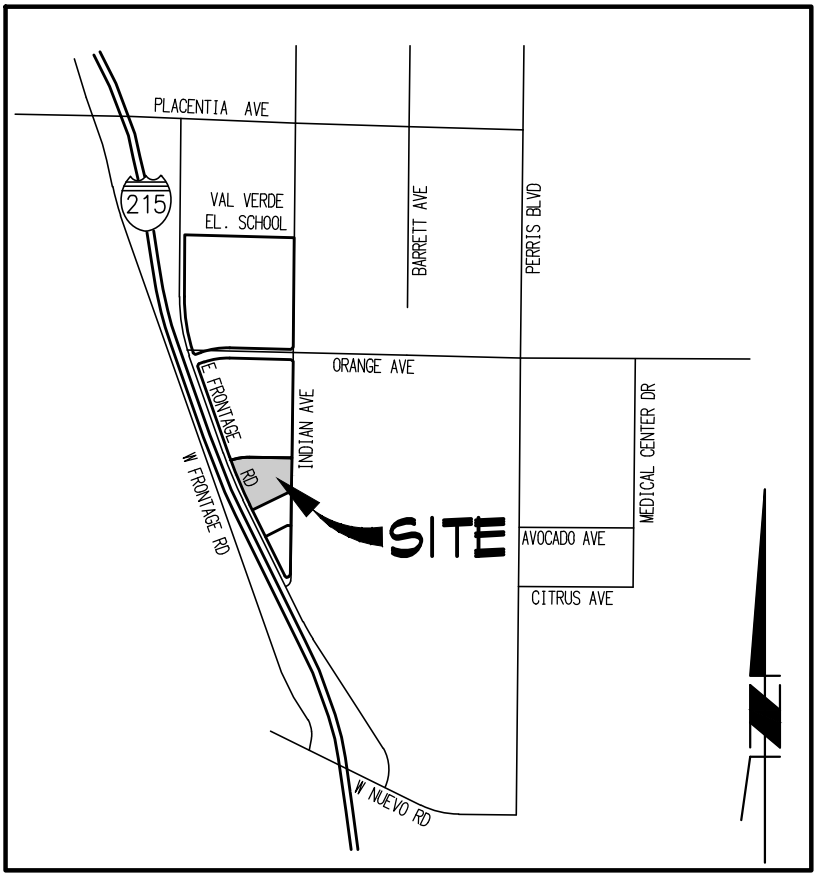
EXHIBIT D: PROPOSED HYDROLOGY MAP

EXHIBIT E: HYDROLOGIC SOILS GROUP MAP

EXHIBIT F: RCFCD MDP FACILITIES OVERLAY

EXHIBIT G: PHASE 1 OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM

EXHIBIT H: CONCEPTUAL GRADING



VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

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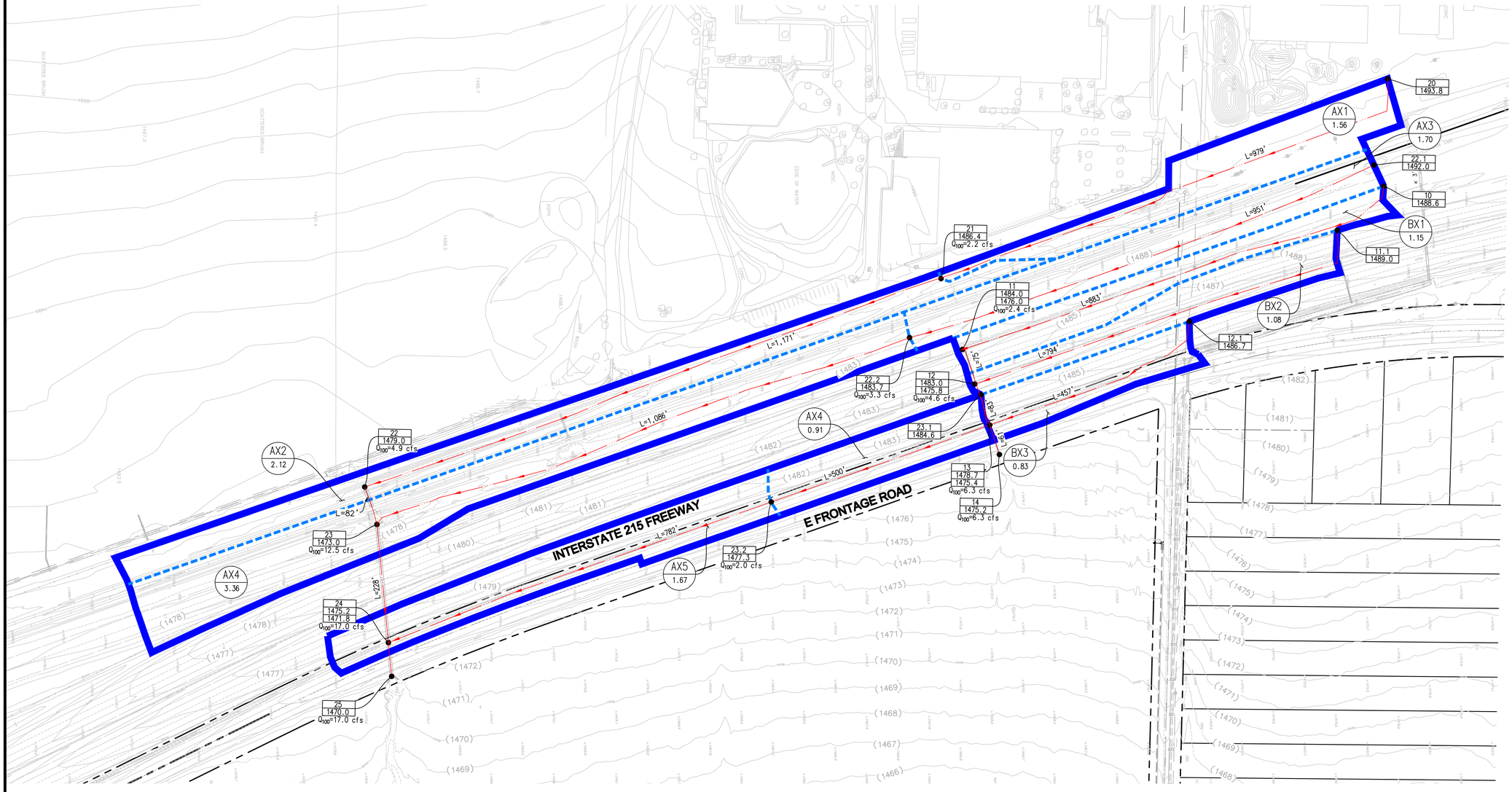
HARVEST LANDING SITE 3

FIGURE 1
VICINITY MAP

H:\PDATA\20-001 HARVEST LANDING\DWGS\EXHIBITS\20-001-VICINITY-MAP.DWG HECTOR 8/7/2022 11:37 PM



LEGEND

- D2 / 2.16 — DRAINAGE BASIN NAME
- DRAINAGE BASIN AREA(AC.)
- 11 / 1027.0 — NODE I.D. / ELEVATION
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- FLOW DIRECTION

SCALE 1"=100'

100 50 0 100 200 300

SCALE: 1"=100'

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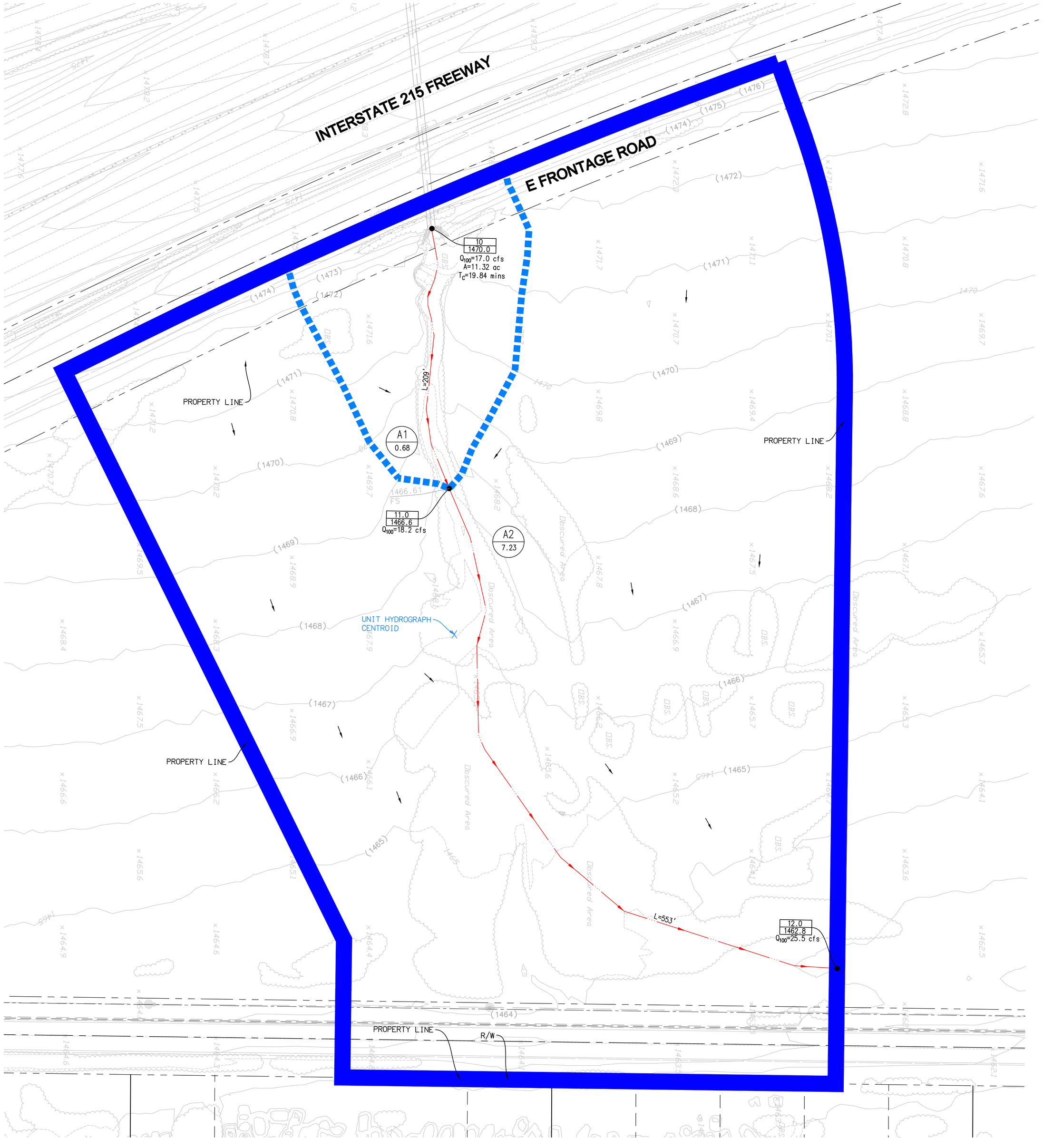
HARVEST LANDING

SITE 2 - OFFSITE HYDROLOGY



UNIT HYDROGRAPH PARAMETERS			
L_{WC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
762	327	7.20	0.020

LEGEND

- D2 / 2.16 — DRAINAGE BASIN NAME / DRAINAGE BASIN AREA(AC.)
- 11 / 1027.0 — NODE I.D. / ELEVATION
- WATERSHED BOUNDARY
- FLOW DIRECTION

SCALE 1"=40'

40 20 0 40 80 120

SCALE: 1"=40'

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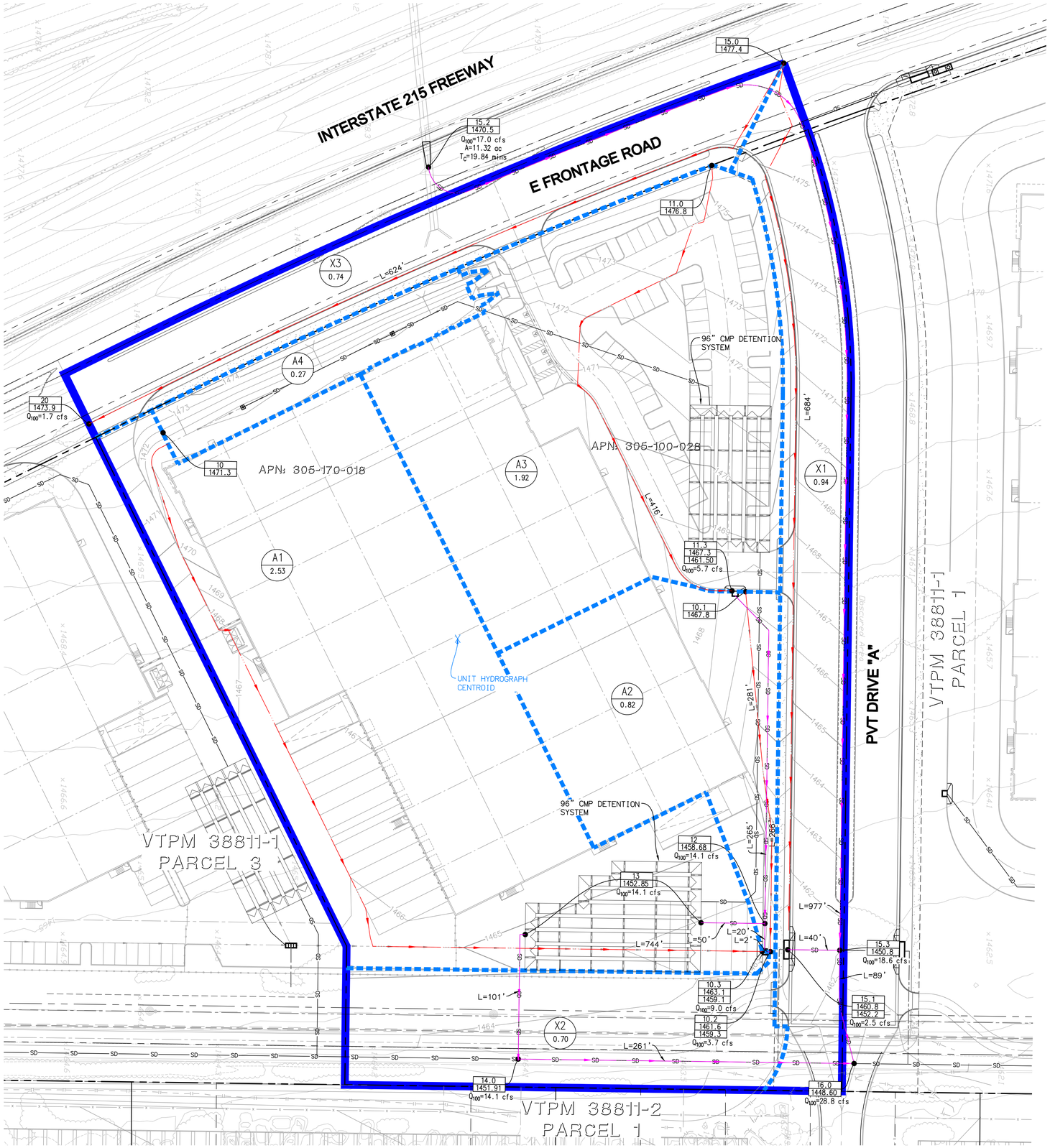
HARVEST LANDING

SITE 3 - EXISTING HYDROLOGY



UNIT HYDROGRAPH PARAMETERS			
L_{WC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
1,187	501	28.8	0.015

LEGEND

- D2 / 2.16 — DRAINAGE BASIN NAME / DRAINAGE BASIN AREA(AC.)
- 11 / 1027.0 — NODE I.D. / ELEVATION
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- FLOW DIRECTION
- PIPE FLOW DIRECTION

SCALE 1"=40'

40 20 0 40 80 120

SCALE: 1"=40'

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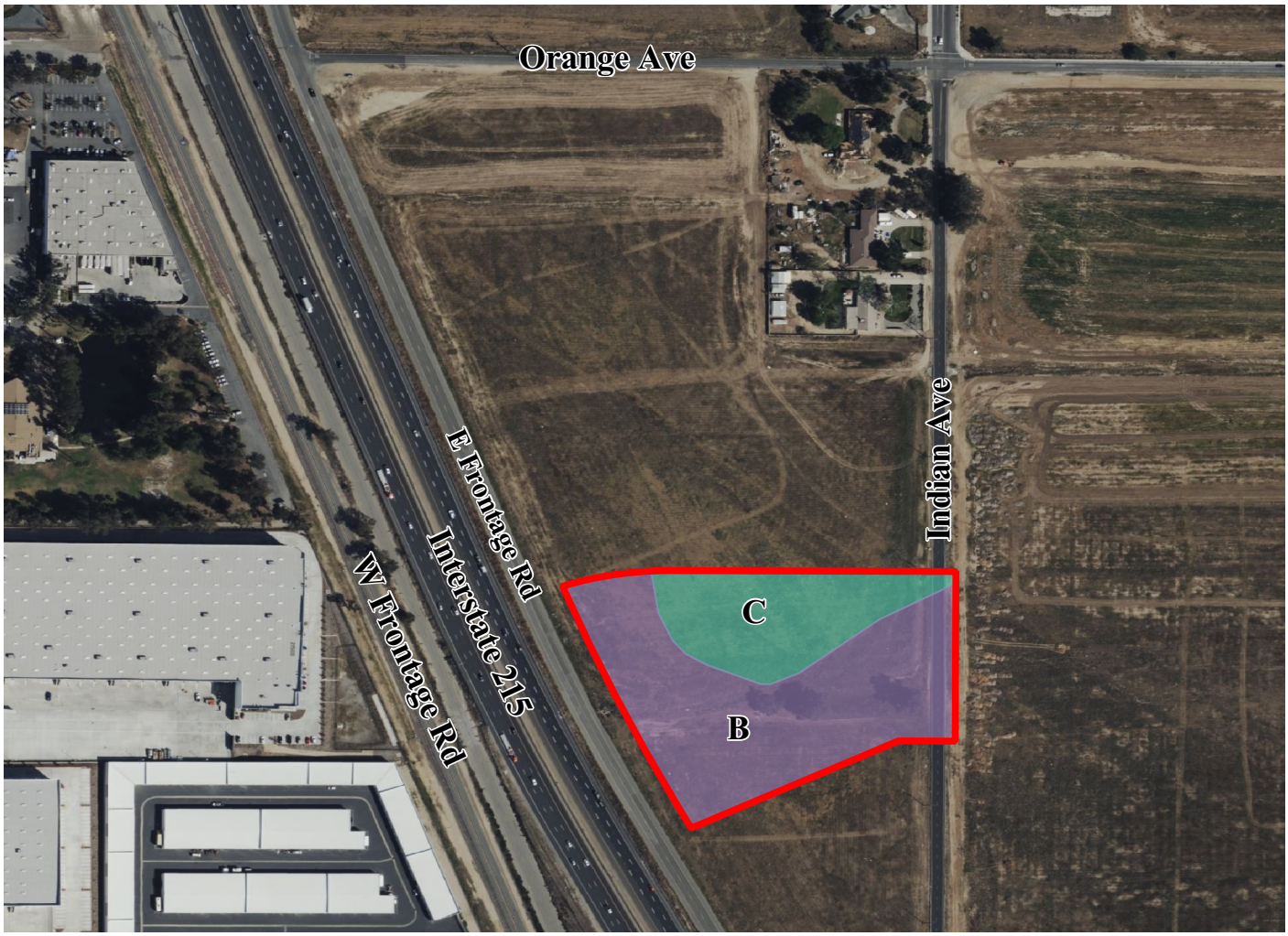
HARVEST LANDING

SITE 3 - PROPOSED HYDROLOGY



LEGEND

- SITE 3 BOUNDARY
- HYDROLOGIC SOIL B
- HYDROLOGIC SOIL C

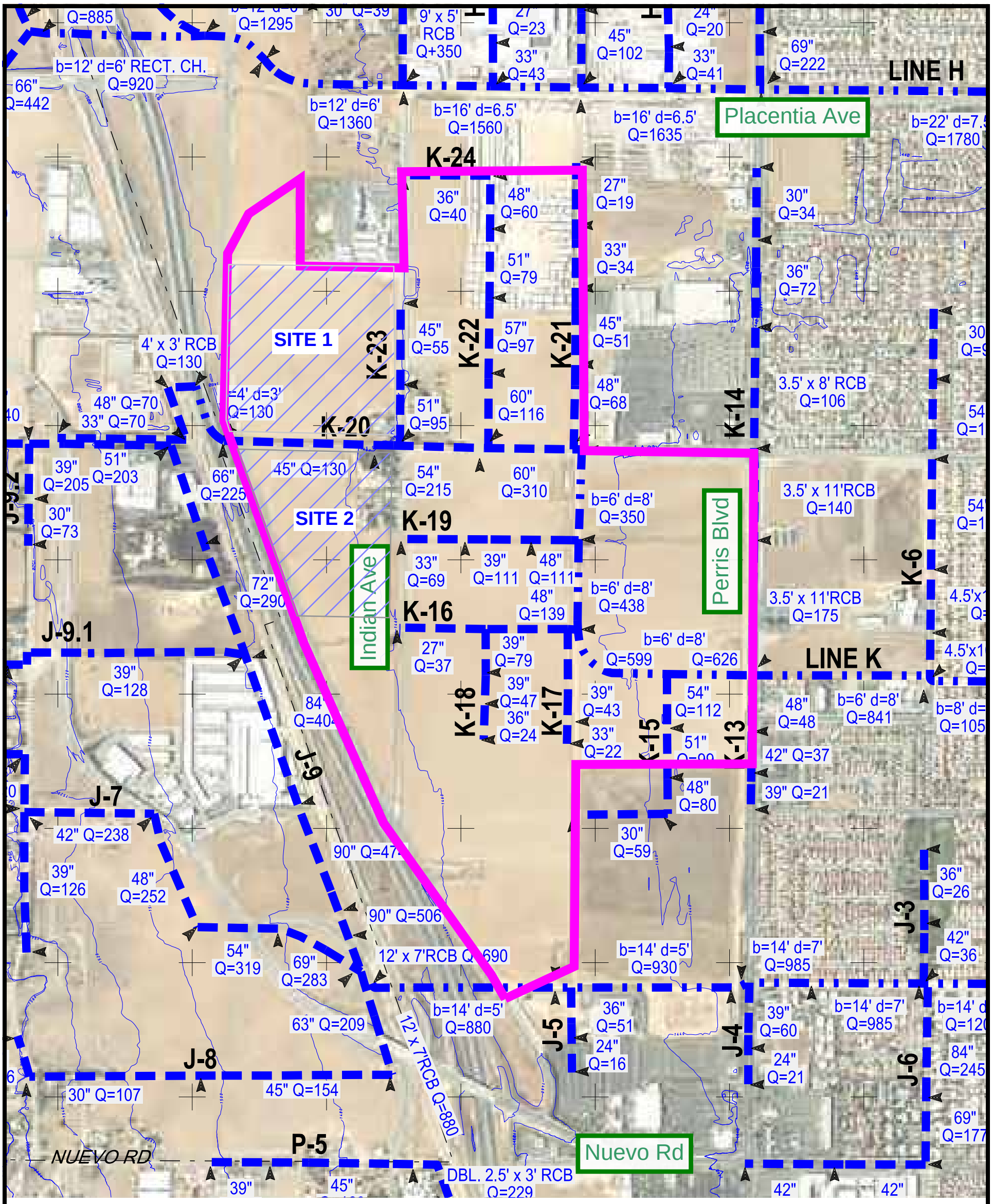
0 100 200 ft

FMCIVIL ENGINEERS INC.

Source: USDA Web Soil Survey

HARVEST LANDING

SITE 3 HYDROLOGICAL SOIL GROUPS



N.T.S.

Limits of master planned development - Howard Industrial

RCFC&WCD Master Drainage Plan Facilities for the Perris Valley Area, as shown in the digital exhibit map dated July 2014.

Site 1 and Site 2

RCFCD MDP FACILITIES OVERLAY

FMCIVIL ENGINEERS INC.

IN THE CITY OF PERRIS,
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM

VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

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CONTACT: FRANCISCO MARTINEZ
(TEL)951-331-9813

ARCHITECT

AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: STEPHEN PRZYBYLOWSKI
(TEL)714-639-9860

LEGEND

- RIGHT OF WAY
- (1025) EXISTING CONTOUR
- EASEMENT
- SD PROP. ONSITE STORM DRAIN SYSTEM
- SD PROP. OFFSITE STORM DRAIN SYSTEM
- PROP. STORM DRAIN LOW FLOW SYSTEM
- PROP. STORM DRAIN UNDER DRAIN SYSTEM
- W EXISTING WATER LINE
- W PROP. WATER LINE
- SS EXISTING SWR LINE
- SS PROP. SEWER LINE
- SD EXISTING STORM DRAIN PIPE
- E EXISTING OVERHEAD LINES

SCALE 1"=200'

200 100 0 200 400 600

SCALE: 1"=200'

CITY OF PERRIS

HARVEST LANDING INDUSTRIAL - PHASE I OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM EXHIBIT

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF.:	

FMCIVIL ENGINEERS INC.
41870 KALMIA STREET, SUITE 120
MURRIETA, CA 92562
951.473.0202 - FMCIVIL.COM

SHEET 1 OF 2 SHEETS

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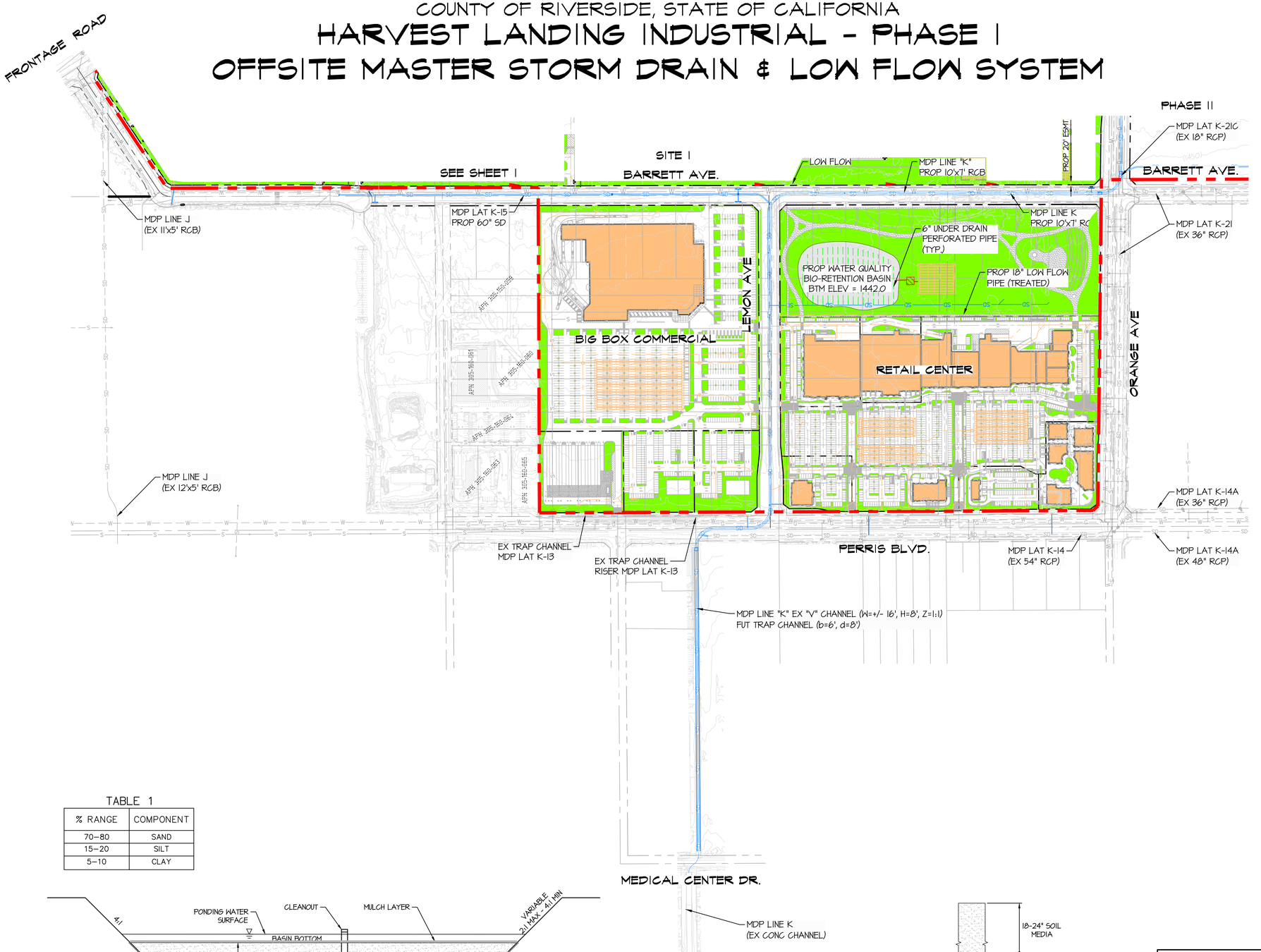
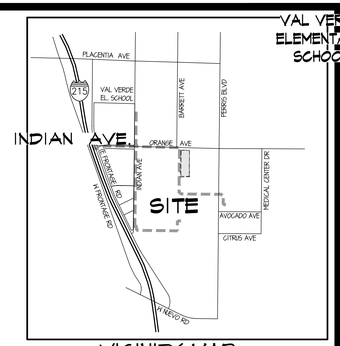
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM





VICINITY MAP

T4S, R3W, SEC 19
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CONTACT: STEPHEN PRZYBYLOWSKI
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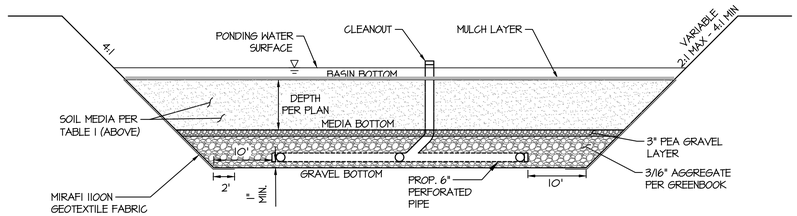
TABLE 1

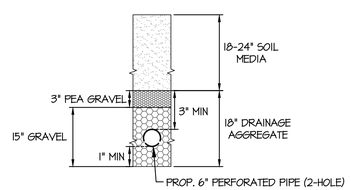
% RANGE	COMPONENT
70-80	SAND
15-20	SILT
5-10	CLAY

LEGEND

- RIGHT OF WAY
- (1025) EXISTING CONTOUR
- EASEMENT
- SD PROP. ONSITE STORM DRAIN SYSTEM
- SD PROP. OFFSITE STORM DRAIN SYSTEM
- PROP. STORM DRAIN LOW FLOW SYSTEM
- PROP. STORM DRAIN UNDER DRAIN SYSTEM
- W EXISTING WATER LINE
- W PROP. WATER LINE
- SS EXISTING SWR LINE
- SS PROP. SEWER LINE
- SD EXISTING STORM DRAIN PIPE
- E EXISTING OVERHEAD LINES



BASIN CROSS SECTION
N.T.S.



AGGREGATE CROSS SECTION
N.T.S.

SCALE 1"=200'

200 100 0 200 400 600
SCALE: 1"=200'

CITY OF PERRIS

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN
& LOW FLOW SYSTEM EXHIBIT

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SHEET 2 OF 2 SHEETS

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IN THE CITY OF PERRIS,
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
SITE #3 CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-1 - PARCEL 2

LEGEND

- (1025) EXISTING CONTOUR
- 1025 PROPOSED CONTOUR
- RETAINING WALL
- FENCE
- EDGE OF PAVEMENT
- SIGN
- MH MANHOLE
- RIGHT OF WAY
- EASEMENT
- PARCEL LINE
- PARCEL MAP BOUNDARY
- STREET CENTER LINE
- SCREEN WALL
- COMBINATION SCREEN/RETAINING WALL
- EXISTING LOT LINE
- RIDGE LINE
- RIBBON GUTTER
- FLOW ARROW
- PROPOSED EDGE OF PAVEMENT
- EXISTING WATER LINE
- W PROPOSED WATER LINE
- EXISTING SWR LINE
- SS PROPOSED SEWER LINE
- EXISTING STORM DRAIN PIPE
- SD PROPOSED STORM DRAIN PIPE
- EXISTING OVERHEAD LINES
- CUT/FILL LINE
- SLOPE SYMBOL

ZONING ORDINANCE

EXISTING ZONING:
HARVEST LANDING SPECIFIC PLANS - MULTIPLE BUSINESS USE (MBU)

PROPOSED ZONING:
HARVEST LANDING SPECIFIC PLANS - MULTIPLE BUSINESS USE (MBU)

ASSESSOR'S PARCEL NUMBERS:

305-100-028, 305-170-018, 305-100-008, & 305-100-009

LEGAL DESCRIPTION

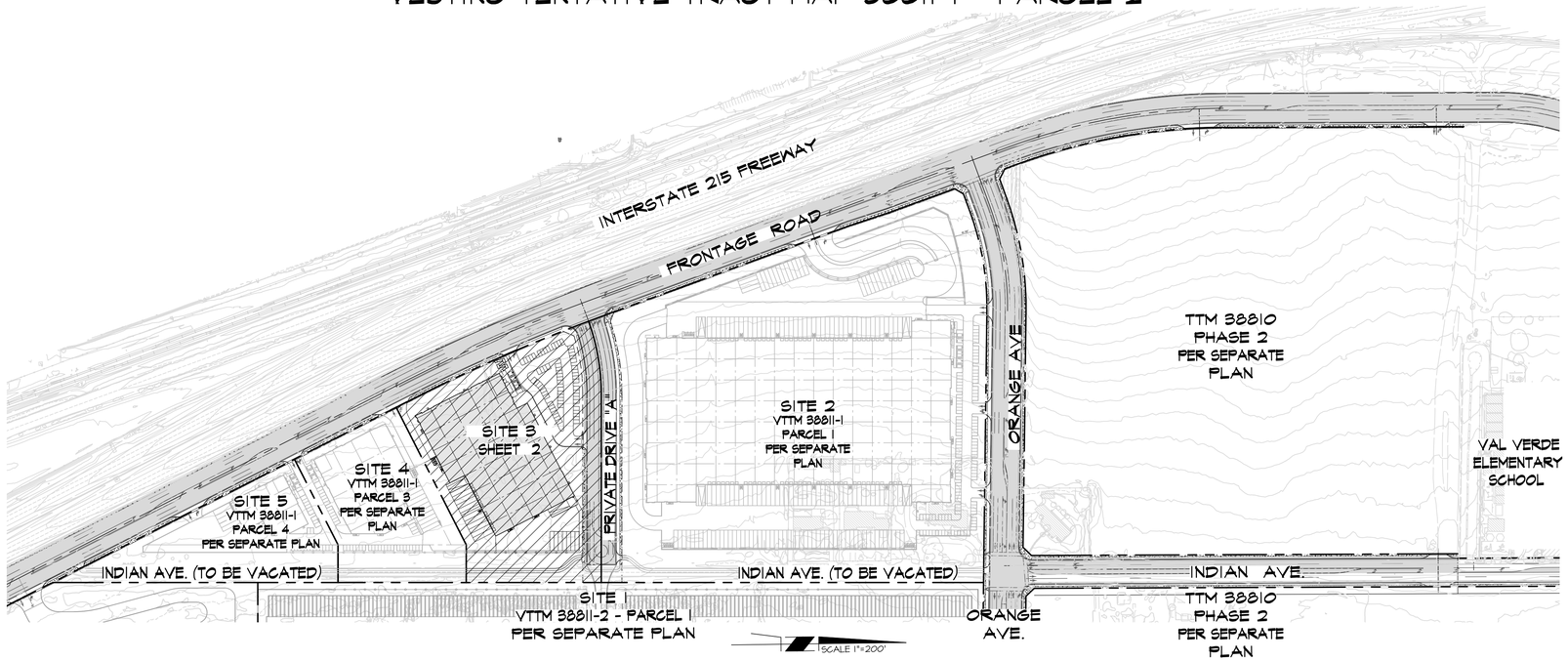
PARCELS 2-5:
(APNS:305-100-028, 305-170-018, 305-100-008, 305-100-009)

THAT PORTION OF THE NORTHWEST QUARTER OF SECTION 19, TOWNSHIP 4 SOUTH, RANGE 3 WEST, SAN BERNARDINO BASE AND MERIDIAN, WHICH LIES EASTERLY OF STATE HIGHWAY 395 AS CONVEYED TO THE STATE OF CALIFORNIA BY DEED RECORDED APRIL 28, 1952 AS INSTRUMENT NO. 18008.

EXCEPTING THE NORTH 30 FEET IN ORANGE AVENUE, THE EAST 30 FEET IN INDIAN AVENUE AND THE SOUTH 30 FEET IN CITRUS AVENUE.

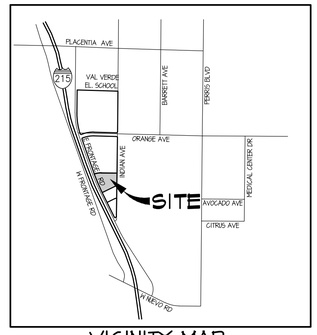
ALSO EXCEPTING THEREFROM THE PORTION DESCRIBED IN DEED RECORDED DECEMBER 21, 1965 AS INSTRUMENT NO. 142400 AND IN DEED RECORDED MARCH 13, 1969 AS INSTRUMENT NO. 24345, RECORDS OF RIVERSIDE COUNTY.

ALSO EXCEPTING THEREFROM THOSE PORTIONS CONVEYED TO THE STATE OF CALIFORNIA BY DEEDS RECORDED MARCH 22, 1992, AS INSTRUMENT NOS. 94602 AND 94603.



INDEX MAP

200 100 0 200 400 600
SCALE: 1"=200'



VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

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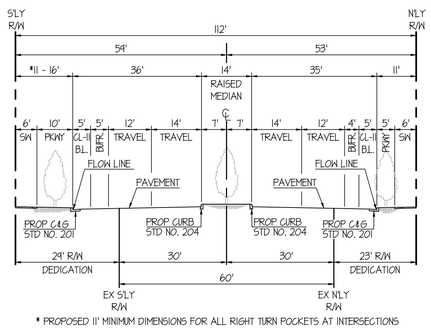
ARCHITECT

AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: DAN MACDAVID
(TEL)714-634-9860

EARTHWORK ESTIMATE:

RAW CUT:	640 CY
RAW FILL:	18,850 CY
NET:	18,210 CY IMPORT

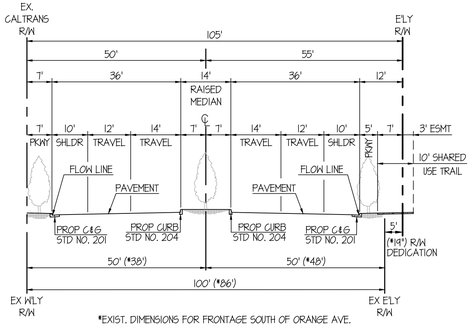
HAUL TRIPS:
ASSUMED (13 CY PER TRIP) = 1,401



* PROPOSED 11' MINIMUM DIMENSIONS FOR ALL RIGHT TURN POCKETS AT INTERSECTIONS

ORANGE AVENUE (WEST OF BARRETT AVE) SECONDARY ARTERIAL

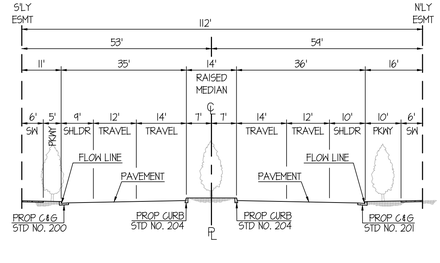
(112'/85')



*EXIST. DIMENSIONS FOR FRONTAGE SOUTH OF ORANGE AVE.

FRONTAGE ROAD SECONDARY ARTERIAL

(105'/84')



PRIVATE DRIVE "A" SECONDARY ARTERIAL

(112'/85')

CITY OF PERRIS

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
SITE #3 CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-1 - PARCEL 2

SCALE:	AS SHOWN
DATE:	OCT. 2024
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CHECKED:	FM
PLN CK REF:	

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SHEET 1 OF 2 SHEETS

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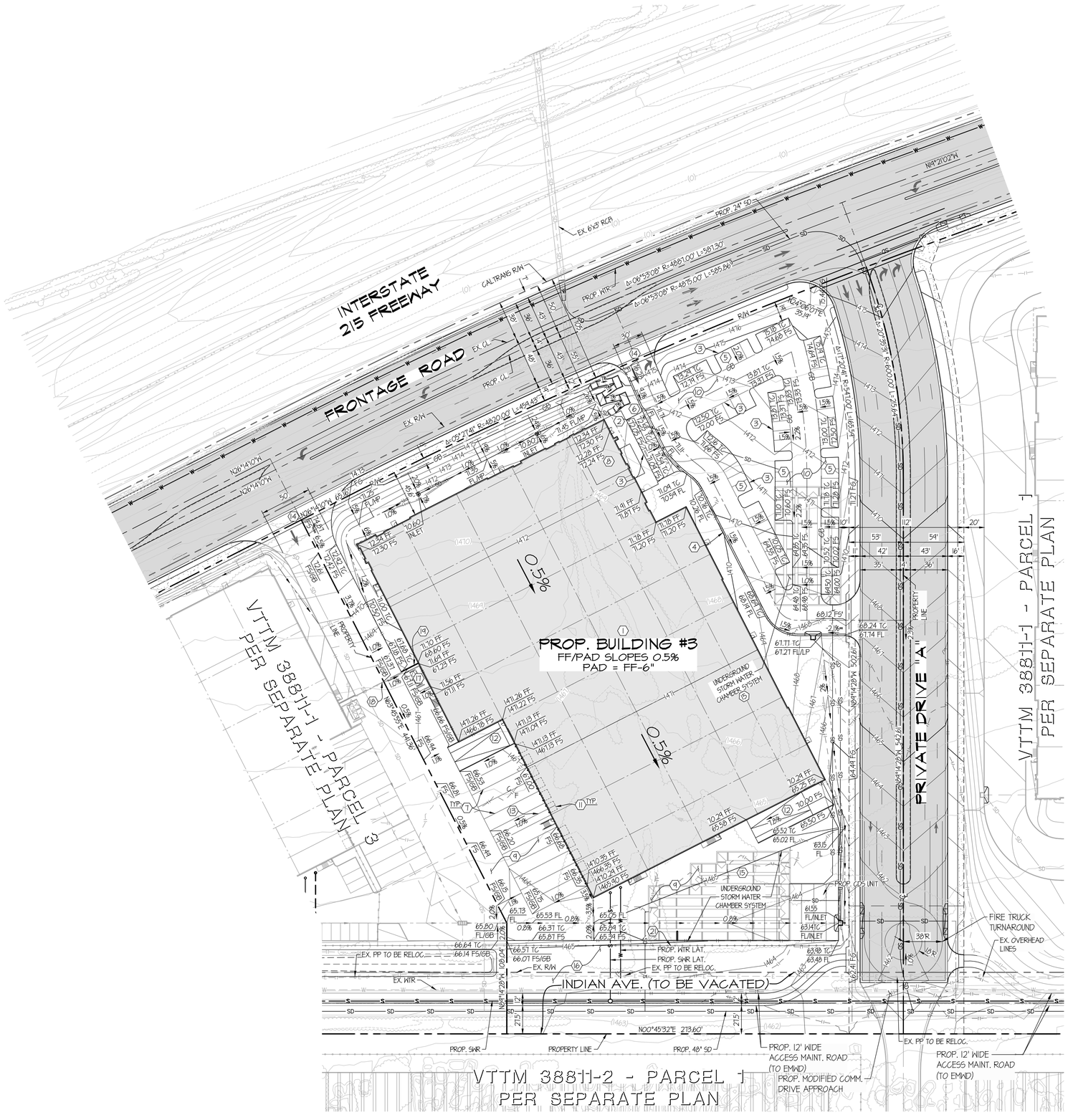

SITE PLAN KEYNOTES

1. PAINTED CONCRETE TILT-UP WAREHOUSE / OFFICE / MANUFACTURING FACILITY. BUILDING TO BE DESIGNED PER ARCHITECT'S PLANS
2. ON SITE ACCESSIBLE SIDEWALK AND CURB RAMPS.
3. CONCRETE CURB
4. CONCRETE CURB & GUTTER
5. STANDARD PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
6. HANDICAP PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
7. TRAILER / TRACTOR PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
8. ACCESSIBLE BUILDING ENTRY WITH ADJACENT BICYCLE RACKS PER ARCHITECT'S PLANS
9. PORTLAND CONC. CEMENT (PCC) PAVED TRUCK YARD ARCHITECT'S PLANS
10. PORTLAND CONC. CEMENT (PCC) PAVED AUTO PARKING ARCHITECT'S PLANS
11. DOCK HIGH TRUCK DOOR PER ARCHITECT'S PLANS
12. GRADE LEVEL RAMP DOOR PER ARCHITECT'S PLANS
13. EXTERIOR MAN DOOR AND STAIRS W/GUARD POST PER ARCHITECT'S PLANS
14. COMMERCIAL DRIVEWAY APPROACH PER RIVERSIDE COUNTY STD.207A, WITH DECORATIVE CONCRETE PAVING PER ARCHITECT'S PLANS
15. UNDERGROUND STORM WATER CHAMBER SYSTEM
16. LANDSCAPE AREA PER LANDSCAPE ARCHITECT'S PLANS
17. APPROXIMATE LOCATION OF TRASH ENCLOSURE
18. ENTRY GATE PER ARCHITECT'S PLANS
19. SCREEN WALL PER ARCHITECT'S PLANS (COMBO RETAINING)
20. CONCRETE RIBBON GUTTER/SWALE

SCALE 1"=50'

50 25 0 50 100 150

SCALE: 1"=50'

CITY OF PERRIS

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
SITE #3 CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-1 - PARCEL 2

SCALE:	AS SHOWN
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41870 KALMIA STREET, SUITE 120
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SHEET 2 OF 2 SHEETS

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DEVELOPMENT PLAN REVIEW – VTPM 38811-1
PARCEL 3 - SITE 4
CITY OF PERRIS
RIVERSIDE COUNTY, CALIFORNIA

Drainage Study Report

Prepared for:
Howard Industrial Partners LLC
1944 North Tustin Street, Suite 122
Orange, CA 92865

Prepared By:

FM CIVIL ENGINEERS INC.

29995 Technology Drive, Suite 306
Murrieta, CA 92563

Engineer of Work/Contacts:

Francisco Martinez, Jr.

April 12, 2024
Revised: October 4, 2024

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BACKGROUND 2
EXISTING CONDITIONS *2*
DEVELOPED CONDITIONS *3*
METHODOLOGY 4
CONCLUSIONS & RECOMMENDATIONS 4

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100-YEAR PROPOSED LAND USE MDP ON-SITE HYDROLOGY (RATIONAL METHOD) 2-1
100-YEAR PROPOSED ON-SITE HYDROLOGY (RATIONAL METHOD) 2-1
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100-YEAR-6 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD) 2-1
100-YEAR-3 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD) 2-1
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EXHIBITS

EXHIBIT A: VICINITY MAP 3-1
EXHIBIT B: EXISTING HYDROLOGY MAP 3-1
EXHIBIT C: PROPOSED HYDROLOGY MAP 3-1
EXHIBIT D: HYDROLOGIC SOILS GROUP MAP 3-1
EXHIBIT E: RCFCD MDP FACILITIES OVERLAY 3-1
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EXHIBIT G: CONCEPTUAL GRADING 3-1

SECTION 1 - GENERAL OVERVIEW

INTRODUCTION

The purpose of this study is to support the entitlement phase and determine minimum drainage improvements required for the proposed industrial development of approximately 3 acres and 52,000 square feet warehouse building with 6 truck docks, and parking lot that lays within the Harvest Landing Specific Plan, located in the City of Perris, County of Riverside CA. More specifically, the project site is bounded to the north by Orange Avenue and the 215 freeway is to the west and Indian Avenue to the east and vacant undeveloped land to the south.

The primary objectives of this report are as follows:

1. Delineate the drainage areas tributary to the onsite above/underground basin

2. Based on drainage patterns, ground slope, land use and soil type and using the Riverside County Rational Method, perform hydrologic and hydraulics of onsite drainage facilities.

3. Determine the 100-year peak storm flows based upon the pre-project and post-project condition for the 24-hour storm duration utilizing the Unit Hydrograph Method as outlined in the Riverside County Flood Control & Water Conservation District Hydrology Manual.

4. Determine the required underground detention facilities to mitigate the 100-year peak storm flows for the 24-hour storm duration in the post-project condition to flows less than or equal to the existing condition flow rates.

5. Determine the required the minimum storm drain infrastructure to flood protect the project site for the 100-year storm event.

6. Preparation of a hydrology report, which consist of hydrological and analytical results and exhibits.

BACKGROUND

EXISTING CONDITIONS

The project site is located within Riverside County Flood Control's Perris Valley Master Drainage Plan, and tributary to a low point in Perris Boulevard and the existing MDP Line "K" (earthen V-Channel) located about 2600 lineal feet east of Indian Avenue.

The site is in a relatively mild to flat sloping undeveloped terrain on a drainage area which drains easterly towards Indian Avenue; however, there are offsite flows that enter the site at Frontage Road on the westerly property boundary via an existing 6'x3' RCB, see Exhibit "B". This existing box traverses Caltrans right-of-way, it collects and conveys flows from the west side of the railroad tracks and the 215 freeway. All the developed storm flows continue to travel easterly through the property, to Indian Avenue and the vacant parcels to the east where it ultimately reaches a low point at Perris Boulevard; storm drain flows are intercepted by existing street inlets and the existing MDP Line "K". MDP Line "K" is an earthen "V" channel (w= 16', H=8' & z=1:1) and planned as a future Trapezoidal Channel (b=6, d=8').

DEVELOPED CONDITIONS

No offsite flows will enter the project site. All onsite storm water runoff will be collected via onsite storm drain system and conveyed to a CDS unit for pretreatment and directed to an above ground bio-retention basin for water quality mitigation. However, the higher flow rates will be directed to an on-site underground pipe chamber which will mitigate the 100-year frequency storm event and release flows to be at or below the predeveloped conditions flow rates.

Onsite storm water mitigated flows will be directed to an offsite master storm drain system (backbone). The preliminary offsite design is shown on Exhibit G "Harvest Landing Industrial Phase 1 Offsite Master Storm Drain & Low Flow System". The offsite master storm drain and low flow system (backbone) will be part of a separate report and therefore excluded. See the table below for the rational method results:

Description	Q_{100} Peak Flow Rates
Proposed	8.3
Existing	6.7
Onsite MDP	10.1

For purposes of this preliminary drainage report, the 100-year 24-hour peak flow rates for the post developed condition, predeveloped condition and proposed developed condition per the land use on the MDP were the only storm events analyzed for mitigation. The project storm mitigation is provided by utilizing the underground storm drain detention system and the outlet control structures. The total mitigation volume required was determined by selecting the flow rates from the recess limb of the proposed unit hydrograph runs for the 100-year 24-hour storm event that are equal or less than the flow rates from existing conditions. Smaller storm events were analyzed, however, since the storm volume demand to mitigate the storm flows from the 100-year 24hour event are considerably larger than volumes produced by the smaller storm events, thus a conservative approach.

MDP Condition Volume: 0.83 ac-ft; $Q_{100\text{-}24hr}$: 2.17 cfs
Proposed Condition Volume: 0.65 ac-ft; $Q_{100\text{-}24hr}$: 1.78 cfs
Underground Chamber Volume: *0.76 ac-ft

*Since the peak storm flows for the proposed condition hydrology are less than the existing MDP condition no mitigation is required. Contech chambers were provided as a place holder in case the district wants us to provide mitigation. See the table below for the unit hydrograph results:

Storm Duration	SP Q_{peak}	SP V_{TOTAL}	MDP Q_{PEAK}	MDP V_{TOTAL}
1	11.48	0.2942	10.63	0.3345
3	6.08	0.4419	6.34	0.5252
6	4.97	0.524	5.23	0.6406
24	1.78	0.9807	2.17	1.2448
Acreage	3.6		3.6	

METHODOLOGY

HYDROLOGY

Hydrologic calculations were performed using the Riverside County Rational Method from RCFCD & WCD Hydrology Manual, dated April 1978. The 100-year design discharge was computed by generating a hydrologic "link-node" model in which divides the area into drainage sub-areas, each tributary to a concentration point or hydrologic "node" point determined by the proposed layout. The computer results are included in section 2. The following assumptions/guidelines were applied for use of the Rational Method:

1. The map from the Riverside County Hydrology Manual indicates that the study area is primarily Group "B" soils, with smaller areas as "A" and "C". A USGS soils map for the project site is included as Exhibit E, under the Exhibit section.
2. Initial sub-areas were drawn to be less than 10-acres in size and less than 1,000 feet in length, per County guidelines. Time of concentration for the initial sub-area is based on Time of Concentration Nomograph for Initial Sub-area from the Hydrology Manual.
3. Antecedent Moisture Condition 2 was used for 100-year storm events.
4. Standard intensity-duration curve data for the project area was used for the Perris Valley area; Plate D-4.1.

HYDRAULICS

Civil Design hydrology module was used for preliminarily sizing the storm drainpipe system. The onsite storm drain infrastructure will consist of pipe sizes ranging from 12"-24" in diameter. A more detailed analysis will be provided in subsequent submittals and a WSPG analysis for onsite storm drainpipe system will be performed during final engineering.

CONCLUSIONS & RECOMMENDATIONS

The hydrology analyses evaluated the proposed development to determine the necessary onsite drainage improvements required to mitigate flows for increased runoff and it has been concluded that:

1. The proposed drainage facilities will adequately convey the 100-year flows and provide flood protection to the project site.

2. The proposed underground pipe chamber system will have sufficient storage to adequately mitigate for increased runoff.

SECTION 2 - HYDROLOGY ANALYSIS

100-YEAR EXISTING ON-SITE HYDROLOGY (RATIONAL METHOD)

100-YEAR PROPOSED LAND USE MDP ON-SITE HYDROLOGY (RATIONAL METHOD)

100-YEAR PROPOSED ON-SITE HYDROLOGY (RATIONAL METHOD)

100-YEAR PROPOSED OFF-SITE HYDROLOGY E FRONTAGE RD (RATIONAL METHOD)

100-YEAR-24 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-24 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-6 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-6 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-3 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-3 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 08/22/23 File:x100.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
EXISTING CONDITION
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 656.000(Ft.)
Top (of initial area) elevation = 1474.700(Ft.)
Bottom (of initial area) elevation = 1464.000(Ft.)
Difference in elevation = 10.700(Ft.)

```
Slope =    0.01631  s(percent)=       1.63
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   16.164 min.
Rainfall intensity =      2.130(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.765
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      6.679(CFS)
Total initial stream area =        4.100(Ac.)
Pervious area fraction = 1.000
End of computations, total study area =            4.10 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number =  78.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 09/18/23 File:x100.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LANDUSE CONDITION
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 656.000(Ft.)
Top (of initial area) elevation = 1474.700(Ft.)
Bottom (of initial area) elevation = 1464.000(Ft.)
Difference in elevation = 10.700(Ft.)
Slope = 0.01631 s(percent)= 1.63

```
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.149 min.
Rainfall intensity =      2.815(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.876
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     10.105(CFS)
Total initial stream area =        4.100(Ac.)
Pervious area fraction = 0.100
End of computations, total study area =            4.10 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  56.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 09/30/24
File:100PONSITE4.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - ONSITE
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 590.000(Ft.)
Top (of initial area) elevation = 1473.400(Ft.)
Bottom (of initial area) elevation = 1465.600(Ft.)

```
Difference in elevation =     7.800(Ft.)
Slope =    0.01322  s(percent)=       1.32
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.146 min.
Rainfall intensity =      2.815(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.876
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      3.402(CFS)
Total initial stream area =        1.380(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       11.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      1.380(Ac.)
Runoff from this stream =      3.402(CFS)
Time of concentration =    9.15 min.
Rainfall intensity =     2.815(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.100 to Point/Station       11.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   427.000(Ft.)
Top (of initial area) elevation =  1473.900(Ft.)
Bottom (of initial area) elevation =  1465.600(Ft.)
Difference in elevation =     8.300(Ft.)
Slope =    0.01944  s(percent)=       1.94
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.440 min.
Rainfall intensity =      3.115(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.877
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      3.525(CFS)
Total initial stream area =        1.290(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       10.100 to Point/Station       11.000
**** CONFLUENCE OF MAIN STREAMS ****
--------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.290(Ac.)
Runoff from this stream =      3.525(CFS)
Time of concentration =    7.44 min.
Rainfall intensity =     3.115(In/Hr)
Summary of stream data:

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


1        3.402      9.15               2.815
2        3.525      7.44               3.115
Largest stream flow has longer or shorter time of concentration
Qp =      3.525 + sum of
        Qa          Tb/Ta
         3.402 *    0.813 =      2.767
Qp =      6.293

Total of 2 main streams to confluence:
Flow rates before confluence point:
       3.402       3.525
Area of streams before confluence:
        1.380        1.290


Results of confluence:
Total flow rate =      6.293(CFS)
Time of concentration =     7.440 min.
Effective stream area after confluence  =      2.670(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       11.000
**** SUBAREA FLOW ADDITION ****
--------------------------------------------------------------------------------
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.707
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  61.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =     7.44 min.
Rainfall intensity =      3.115(In/Hr) for a   100.0 year storm
Subarea runoff =      0.352(CFS) for      0.160(Ac.)
Total runoff =      6.645(CFS)      Total area =       2.830(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
```

```
Upstream point/station elevation =  1461.500(Ft.)
Downstream point/station elevation =  1457.400(Ft.)
Pipe length  =    28.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.645(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     6.645(CFS)
Normal flow depth in pipe =    5.91(In.)
Flow top width inside pipe =   12.00(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.25(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     7.47 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1457.400(Ft.)
Downstream point/station elevation =  1453.700(Ft.)
Pipe length  =   125.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.645(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     6.645(CFS)
Normal flow depth in pipe =    8.36(In.)
Flow top width inside pipe =   14.90(In.)
Critical Depth =   12.45(In.)
Pipe flow velocity =      9.46(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =     7.69 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       13.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.704
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  61.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =     7.69 min.
Rainfall intensity =      3.065(In/Hr) for a   100.0 year storm
Subarea runoff =      1.662(CFS) for      0.770(Ac.)
Total runoff =      8.307(CFS)      Total area =       3.600(Ac.)
End of computations, total study area =            3.60 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.333
Area averaged RI index number =  57.3
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/11/24
File:100pfrontageroad4.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - OFFSITE E FRONTAGE ROAD
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 20.000 to Point/Station 20.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 2.560(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.874

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
User specified values are as follows:
TC =  11.10 min.  Rain intensity =       2.56(In/Hr)
Total area =         0.74(Ac.)  Total runoff =      1.70(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       21.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1473.900(Ft.)
End of street segment elevation =  1472.400(Ft.)
Length of street segment  =   326.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  43.000(Ft.)
Distance from crown to crossfall grade break  =  41.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  12.000(Ft.)
Slope from curb to property line (v/hz) =   0.015
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0130
 Manning's N from gutter to grade break =  0.0130
 Manning's N from grade break to crown =  0.0130
Estimated mean flow rate at midpoint of street =      2.139(CFS)
Depth of flow =   0.333(Ft.), Average velocity =   1.798(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.309(Ft.)
Flow velocity =   1.80(Ft/s)
Travel time =    3.02 min.     TC =   14.12  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.872
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.275(In/Hr) for a   100.0 year storm
Subarea runoff =      0.813(CFS) for      0.410(Ac.)
Total runoff =      2.513(CFS)      Total area =       1.150(Ac.)
Street flow at end of street =      2.513(CFS)
Half street flow at end of street =      2.513(CFS)
Depth of flow =   0.348(Ft.), Average velocity =   1.866(Ft/s)
Flow width (from curb towards crown)=  11.044(Ft.)
End of computations, total study area =            1.15 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
```

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 56.0

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

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Study date 10/10/23 File: X100UH24100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 3.60(Ac.) = 0.006 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 3.60(Ac.) = 0.006 Sq. Mi.
Length along longest watercourse = 656.00(Ft.)
Length along longest watercourse measured to centroid = 308.00(Ft.)
Length along longest watercourse = 0.124 Mi.
Length along longest watercourse measured to centroid = 0.058 Mi.
Difference in elevation = 10.70(Ft.)
Slope along watercourse = 86.1220 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.032 Hr.
Lag time = 1.90 Min.
25% of lag time = 0.47 Min.
40% of lag time = 0.76 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.60	2.00	7.20

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.60	5.00	18.00

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 2.000(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
3.600	56.00	0.900

Total Area Entered = 3.60(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
56.0	56.0	0.511	0.900	0.097	1.000	0.097
					Sum (F) =	0.097

Area averaged mean soil loss (F) (In/Hr) = 0.097
Minimum soil loss rate ((In/Hr)) = 0.049
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	263.256	52.567	1.907
2	0.167	526.512	39.246	1.424
3	0.250	789.768	6.607	0.240
4	0.333	1053.024	1.580	0.057
			Sum = 100.000	Sum= 3.628

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.040	(0.172)	0.007	0.033
2	0.17	0.07	0.040	(0.171)	0.007	0.033
3	0.25	0.07	0.040	(0.171)	0.007	0.033
4	0.33	0.10	0.060	(0.170)	0.011	0.049
5	0.42	0.10	0.060	(0.169)	0.011	0.049
6	0.50	0.10	0.060	(0.169)	0.011	0.049
7	0.58	0.10	0.060	(0.168)	0.011	0.049
8	0.67	0.10	0.060	(0.167)	0.011	0.049
9	0.75	0.10	0.060	(0.167)	0.011	0.049
10	0.83	0.13	0.080	(0.166)	0.014	0.066
11	0.92	0.13	0.080	(0.165)	0.014	0.066
12	1.00	0.13	0.080	(0.165)	0.014	0.066
13	1.08	0.10	0.060	(0.164)	0.011	0.049
14	1.17	0.10	0.060	(0.163)	0.011	0.049
15	1.25	0.10	0.060	(0.163)	0.011	0.049
16	1.33	0.10	0.060	(0.162)	0.011	0.049
17	1.42	0.10	0.060	(0.162)	0.011	0.049
18	1.50	0.10	0.060	(0.161)	0.011	0.049
19	1.58	0.10	0.060	(0.160)	0.011	0.049
20	1.67	0.10	0.060	(0.160)	0.011	0.049
21	1.75	0.10	0.060	(0.159)	0.011	0.049
22	1.83	0.13	0.080	(0.158)	0.014	0.066
23	1.92	0.13	0.080	(0.158)	0.014	0.066
24	2.00	0.13	0.080	(0.157)	0.014	0.066
25	2.08	0.13	0.080	(0.156)	0.014	0.066
26	2.17	0.13	0.080	(0.156)	0.014	0.066
27	2.25	0.13	0.080	(0.155)	0.014	0.066
28	2.33	0.13	0.080	(0.155)	0.014	0.066
29	2.42	0.13	0.080	(0.154)	0.014	0.066
30	2.50	0.13	0.080	(0.153)	0.014	0.066
31	2.58	0.17	0.100	(0.153)	0.018	0.082
32	2.67	0.17	0.100	(0.152)	0.018	0.082
33	2.75	0.17	0.100	(0.151)	0.018	0.082
34	2.83	0.17	0.100	(0.151)	0.018	0.082
35	2.92	0.17	0.100	(0.150)	0.018	0.082
36	3.00	0.17	0.100	(0.150)	0.018	0.082
37	3.08	0.17	0.100	(0.149)	0.018	0.082
38	3.17	0.17	0.100	(0.148)	0.018	0.082
39	3.25	0.17	0.100	(0.148)	0.018	0.082
40	3.33	0.17	0.100	(0.147)	0.018	0.082
41	3.42	0.17	0.100	(0.146)	0.018	0.082
42	3.50	0.17	0.100	(0.146)	0.018	0.082
43	3.58	0.17	0.100	(0.145)	0.018	0.082

44	3.67	0.17	0.100	(0.145)	0.018	0.082
45	3.75	0.17	0.100	(0.144)	0.018	0.082
46	3.83	0.20	0.120	(0.143)	0.022	0.098
47	3.92	0.20	0.120	(0.143)	0.022	0.098
48	4.00	0.20	0.120	(0.142)	0.022	0.098
49	4.08	0.20	0.120	(0.142)	0.022	0.098
50	4.17	0.20	0.120	(0.141)	0.022	0.098
51	4.25	0.20	0.120	(0.140)	0.022	0.098
52	4.33	0.23	0.140	(0.140)	0.025	0.115
53	4.42	0.23	0.140	(0.139)	0.025	0.115
54	4.50	0.23	0.140	(0.139)	0.025	0.115
55	4.58	0.23	0.140	(0.138)	0.025	0.115
56	4.67	0.23	0.140	(0.137)	0.025	0.115
57	4.75	0.23	0.140	(0.137)	0.025	0.115
58	4.83	0.27	0.160	(0.136)	0.029	0.131
59	4.92	0.27	0.160	(0.136)	0.029	0.131
60	5.00	0.27	0.160	(0.135)	0.029	0.131
61	5.08	0.20	0.120	(0.134)	0.022	0.098
62	5.17	0.20	0.120	(0.134)	0.022	0.098
63	5.25	0.20	0.120	(0.133)	0.022	0.098
64	5.33	0.23	0.140	(0.133)	0.025	0.115
65	5.42	0.23	0.140	(0.132)	0.025	0.115
66	5.50	0.23	0.140	(0.132)	0.025	0.115
67	5.58	0.27	0.160	(0.131)	0.029	0.131
68	5.67	0.27	0.160	(0.130)	0.029	0.131
69	5.75	0.27	0.160	(0.130)	0.029	0.131
70	5.83	0.27	0.160	(0.129)	0.029	0.131
71	5.92	0.27	0.160	(0.129)	0.029	0.131
72	6.00	0.27	0.160	(0.128)	0.029	0.131
73	6.08	0.30	0.180	(0.128)	0.032	0.148
74	6.17	0.30	0.180	(0.127)	0.032	0.148
75	6.25	0.30	0.180	(0.126)	0.032	0.148
76	6.33	0.30	0.180	(0.126)	0.032	0.148
77	6.42	0.30	0.180	(0.125)	0.032	0.148
78	6.50	0.30	0.180	(0.125)	0.032	0.148
79	6.58	0.33	0.200	(0.124)	0.036	0.164
80	6.67	0.33	0.200	(0.124)	0.036	0.164
81	6.75	0.33	0.200	(0.123)	0.036	0.164
82	6.83	0.33	0.200	(0.122)	0.036	0.164
83	6.92	0.33	0.200	(0.122)	0.036	0.164
84	7.00	0.33	0.200	(0.121)	0.036	0.164
85	7.08	0.33	0.200	(0.121)	0.036	0.164
86	7.17	0.33	0.200	(0.120)	0.036	0.164
87	7.25	0.33	0.200	(0.120)	0.036	0.164
88	7.33	0.37	0.220	(0.119)	0.040	0.180
89	7.42	0.37	0.220	(0.119)	0.040	0.180
90	7.50	0.37	0.220	(0.118)	0.040	0.180
91	7.58	0.40	0.240	(0.118)	0.043	0.197
92	7.67	0.40	0.240	(0.117)	0.043	0.197
93	7.75	0.40	0.240	(0.116)	0.043	0.197

94	7.83	0.43	0.260	(0.116)	0.047	0.213
95	7.92	0.43	0.260	(0.115)	0.047	0.213
96	8.00	0.43	0.260	(0.115)	0.047	0.213
97	8.08	0.50	0.300	(0.114)	0.054	0.246
98	8.17	0.50	0.300	(0.114)	0.054	0.246
99	8.25	0.50	0.300	(0.113)	0.054	0.246
100	8.33	0.50	0.300	(0.113)	0.054	0.246
101	8.42	0.50	0.300	(0.112)	0.054	0.246
102	8.50	0.50	0.300	(0.112)	0.054	0.246
103	8.58	0.53	0.320	(0.111)	0.058	0.262
104	8.67	0.53	0.320	(0.111)	0.058	0.262
105	8.75	0.53	0.320	(0.110)	0.058	0.262
106	8.83	0.57	0.340	(0.110)	0.061	0.279
107	8.92	0.57	0.340	(0.109)	0.061	0.279
108	9.00	0.57	0.340	(0.109)	0.061	0.279
109	9.08	0.63	0.380	(0.108)	0.068	0.312
110	9.17	0.63	0.380	(0.108)	0.068	0.312
111	9.25	0.63	0.380	(0.107)	0.068	0.312
112	9.33	0.67	0.400	(0.107)	0.072	0.328
113	9.42	0.67	0.400	(0.106)	0.072	0.328
114	9.50	0.67	0.400	(0.105)	0.072	0.328
115	9.58	0.70	0.420	(0.105)	0.076	0.344
116	9.67	0.70	0.420	(0.104)	0.076	0.344
117	9.75	0.70	0.420	(0.104)	0.076	0.344
118	9.83	0.73	0.440	(0.103)	0.079	0.361
119	9.92	0.73	0.440	(0.103)	0.079	0.361
120	10.00	0.73	0.440	(0.102)	0.079	0.361
121	10.08	0.50	0.300	(0.102)	0.054	0.246
122	10.17	0.50	0.300	(0.101)	0.054	0.246
123	10.25	0.50	0.300	(0.101)	0.054	0.246
124	10.33	0.50	0.300	(0.101)	0.054	0.246
125	10.42	0.50	0.300	(0.100)	0.054	0.246
126	10.50	0.50	0.300	(0.100)	0.054	0.246
127	10.58	0.67	0.400	(0.099)	0.072	0.328
128	10.67	0.67	0.400	(0.099)	0.072	0.328
129	10.75	0.67	0.400	(0.098)	0.072	0.328
130	10.83	0.67	0.400	(0.098)	0.072	0.328
131	10.92	0.67	0.400	(0.097)	0.072	0.328
132	11.00	0.67	0.400	(0.097)	0.072	0.328
133	11.08	0.63	0.380	(0.096)	0.068	0.312
134	11.17	0.63	0.380	(0.096)	0.068	0.312
135	11.25	0.63	0.380	(0.095)	0.068	0.312
136	11.33	0.63	0.380	(0.095)	0.068	0.312
137	11.42	0.63	0.380	(0.094)	0.068	0.312
138	11.50	0.63	0.380	(0.094)	0.068	0.312
139	11.58	0.57	0.340	(0.093)	0.061	0.279
140	11.67	0.57	0.340	(0.093)	0.061	0.279
141	11.75	0.57	0.340	(0.092)	0.061	0.279
142	11.83	0.60	0.360	(0.092)	0.065	0.295
143	11.92	0.60	0.360	(0.092)	0.065	0.295

144	12.00	0.60	0.360	(0.091)	0.065	0.295
145	12.08	0.83	0.500	(0.091)	0.090	0.410
146	12.17	0.83	0.500	(0.090)	0.090	0.410
147	12.25	0.83	0.500	0.090	(0.090)	0.410
148	12.33	0.87	0.520	0.089	(0.094)	0.431
149	12.42	0.87	0.520	0.089	(0.094)	0.431
150	12.50	0.87	0.520	0.088	(0.094)	0.432
151	12.58	0.93	0.560	0.088	(0.101)	0.472
152	12.67	0.93	0.560	0.087	(0.101)	0.473
153	12.75	0.93	0.560	0.087	(0.101)	0.473
154	12.83	0.97	0.580	0.087	(0.104)	0.493
155	12.92	0.97	0.580	0.086	(0.104)	0.494
156	13.00	0.97	0.580	0.086	(0.104)	0.494
157	13.08	1.13	0.680	0.085	(0.122)	0.595
158	13.17	1.13	0.680	0.085	(0.122)	0.595
159	13.25	1.13	0.680	0.084	(0.122)	0.596
160	13.33	1.13	0.680	0.084	(0.122)	0.596
161	13.42	1.13	0.680	0.084	(0.122)	0.596
162	13.50	1.13	0.680	0.083	(0.122)	0.597
163	13.58	0.77	0.460	0.083	(0.083)	0.377
164	13.67	0.77	0.460	0.082	(0.083)	0.378
165	13.75	0.77	0.460	0.082	(0.083)	0.378
166	13.83	0.77	0.460	0.081	(0.083)	0.379
167	13.92	0.77	0.460	0.081	(0.083)	0.379
168	14.00	0.77	0.460	0.081	(0.083)	0.379
169	14.08	0.90	0.540	0.080	(0.097)	0.460
170	14.17	0.90	0.540	0.080	(0.097)	0.460
171	14.25	0.90	0.540	0.079	(0.097)	0.461
172	14.33	0.87	0.520	0.079	(0.094)	0.441
173	14.42	0.87	0.520	0.079	(0.094)	0.441
174	14.50	0.87	0.520	0.078	(0.094)	0.442
175	14.58	0.87	0.520	0.078	(0.094)	0.442
176	14.67	0.87	0.520	0.077	(0.094)	0.443
177	14.75	0.87	0.520	0.077	(0.094)	0.443
178	14.83	0.83	0.500	0.077	(0.090)	0.423
179	14.92	0.83	0.500	0.076	(0.090)	0.424
180	15.00	0.83	0.500	0.076	(0.090)	0.424
181	15.08	0.80	0.480	0.075	(0.086)	0.405
182	15.17	0.80	0.480	0.075	(0.086)	0.405
183	15.25	0.80	0.480	0.075	(0.086)	0.405
184	15.33	0.77	0.460	0.074	(0.083)	0.386
185	15.42	0.77	0.460	0.074	(0.083)	0.386
186	15.50	0.77	0.460	0.073	(0.083)	0.386
187	15.58	0.63	0.380	(0.073)	0.068	0.312
188	15.67	0.63	0.380	(0.073)	0.068	0.312
189	15.75	0.63	0.380	(0.072)	0.068	0.312
190	15.83	0.63	0.380	(0.072)	0.068	0.312
191	15.92	0.63	0.380	(0.072)	0.068	0.312
192	16.00	0.63	0.380	(0.071)	0.068	0.312
193	16.08	0.13	0.080	(0.071)	0.014	0.066

194	16.17	0.13	0.080	(0.071)	0.014	0.066
195	16.25	0.13	0.080	(0.070)	0.014	0.066
196	16.33	0.13	0.080	(0.070)	0.014	0.066
197	16.42	0.13	0.080	(0.069)	0.014	0.066
198	16.50	0.13	0.080	(0.069)	0.014	0.066
199	16.58	0.10	0.060	(0.069)	0.011	0.049
200	16.67	0.10	0.060	(0.068)	0.011	0.049
201	16.75	0.10	0.060	(0.068)	0.011	0.049
202	16.83	0.10	0.060	(0.068)	0.011	0.049
203	16.92	0.10	0.060	(0.067)	0.011	0.049
204	17.00	0.10	0.060	(0.067)	0.011	0.049
205	17.08	0.17	0.100	(0.067)	0.018	0.082
206	17.17	0.17	0.100	(0.066)	0.018	0.082
207	17.25	0.17	0.100	(0.066)	0.018	0.082
208	17.33	0.17	0.100	(0.066)	0.018	0.082
209	17.42	0.17	0.100	(0.065)	0.018	0.082
210	17.50	0.17	0.100	(0.065)	0.018	0.082
211	17.58	0.17	0.100	(0.065)	0.018	0.082
212	17.67	0.17	0.100	(0.064)	0.018	0.082
213	17.75	0.17	0.100	(0.064)	0.018	0.082
214	17.83	0.13	0.080	(0.064)	0.014	0.066
215	17.92	0.13	0.080	(0.063)	0.014	0.066
216	18.00	0.13	0.080	(0.063)	0.014	0.066
217	18.08	0.13	0.080	(0.063)	0.014	0.066
218	18.17	0.13	0.080	(0.063)	0.014	0.066
219	18.25	0.13	0.080	(0.062)	0.014	0.066
220	18.33	0.13	0.080	(0.062)	0.014	0.066
221	18.42	0.13	0.080	(0.062)	0.014	0.066
222	18.50	0.13	0.080	(0.061)	0.014	0.066
223	18.58	0.10	0.060	(0.061)	0.011	0.049
224	18.67	0.10	0.060	(0.061)	0.011	0.049
225	18.75	0.10	0.060	(0.060)	0.011	0.049
226	18.83	0.07	0.040	(0.060)	0.007	0.033
227	18.92	0.07	0.040	(0.060)	0.007	0.033
228	19.00	0.07	0.040	(0.060)	0.007	0.033
229	19.08	0.10	0.060	(0.059)	0.011	0.049
230	19.17	0.10	0.060	(0.059)	0.011	0.049
231	19.25	0.10	0.060	(0.059)	0.011	0.049
232	19.33	0.13	0.080	(0.058)	0.014	0.066
233	19.42	0.13	0.080	(0.058)	0.014	0.066
234	19.50	0.13	0.080	(0.058)	0.014	0.066
235	19.58	0.10	0.060	(0.058)	0.011	0.049
236	19.67	0.10	0.060	(0.057)	0.011	0.049
237	19.75	0.10	0.060	(0.057)	0.011	0.049
238	19.83	0.07	0.040	(0.057)	0.007	0.033
239	19.92	0.07	0.040	(0.057)	0.007	0.033
240	20.00	0.07	0.040	(0.056)	0.007	0.033
241	20.08	0.10	0.060	(0.056)	0.011	0.049
242	20.17	0.10	0.060	(0.056)	0.011	0.049
243	20.25	0.10	0.060	(0.056)	0.011	0.049

244	20.33	0.10	0.060	(0.055)	0.011	0.049
245	20.42	0.10	0.060	(0.055)	0.011	0.049
246	20.50	0.10	0.060	(0.055)	0.011	0.049
247	20.58	0.10	0.060	(0.055)	0.011	0.049
248	20.67	0.10	0.060	(0.054)	0.011	0.049
249	20.75	0.10	0.060	(0.054)	0.011	0.049
250	20.83	0.07	0.040	(0.054)	0.007	0.033
251	20.92	0.07	0.040	(0.054)	0.007	0.033
252	21.00	0.07	0.040	(0.054)	0.007	0.033
253	21.08	0.10	0.060	(0.053)	0.011	0.049
254	21.17	0.10	0.060	(0.053)	0.011	0.049
255	21.25	0.10	0.060	(0.053)	0.011	0.049
256	21.33	0.07	0.040	(0.053)	0.007	0.033
257	21.42	0.07	0.040	(0.053)	0.007	0.033
258	21.50	0.07	0.040	(0.052)	0.007	0.033
259	21.58	0.10	0.060	(0.052)	0.011	0.049
260	21.67	0.10	0.060	(0.052)	0.011	0.049
261	21.75	0.10	0.060	(0.052)	0.011	0.049
262	21.83	0.07	0.040	(0.052)	0.007	0.033
263	21.92	0.07	0.040	(0.051)	0.007	0.033
264	22.00	0.07	0.040	(0.051)	0.007	0.033
265	22.08	0.10	0.060	(0.051)	0.011	0.049
266	22.17	0.10	0.060	(0.051)	0.011	0.049
267	22.25	0.10	0.060	(0.051)	0.011	0.049
268	22.33	0.07	0.040	(0.051)	0.007	0.033
269	22.42	0.07	0.040	(0.050)	0.007	0.033
270	22.50	0.07	0.040	(0.050)	0.007	0.033
271	22.58	0.07	0.040	(0.050)	0.007	0.033
272	22.67	0.07	0.040	(0.050)	0.007	0.033
273	22.75	0.07	0.040	(0.050)	0.007	0.033
274	22.83	0.07	0.040	(0.050)	0.007	0.033
275	22.92	0.07	0.040	(0.050)	0.007	0.033
276	23.00	0.07	0.040	(0.049)	0.007	0.033
277	23.08	0.07	0.040	(0.049)	0.007	0.033
278	23.17	0.07	0.040	(0.049)	0.007	0.033
279	23.25	0.07	0.040	(0.049)	0.007	0.033
280	23.33	0.07	0.040	(0.049)	0.007	0.033
281	23.42	0.07	0.040	(0.049)	0.007	0.033
282	23.50	0.07	0.040	(0.049)	0.007	0.033
283	23.58	0.07	0.040	(0.049)	0.007	0.033
284	23.67	0.07	0.040	(0.049)	0.007	0.033
285	23.75	0.07	0.040	(0.049)	0.007	0.033
286	23.83	0.07	0.040	(0.049)	0.007	0.033
287	23.92	0.07	0.040	(0.049)	0.007	0.033
288	24.00	0.07	0.040	(0.049)	0.007	0.033

(Loss Rate Not Used)

Sum = 100.0 Sum = 49.8

Flood volume = Effective rainfall 4.15(In)
times area 3.6(Ac.)/[(In)/(Ft.)] = 1.2(Ac.Ft)
Total soil loss = 0.85(In)

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      Total soil loss =     0.255(Ac.Ft)
      Total rainfall =      5.00(In)
      Flood volume =       54225.1 Cubic Feet
      Total soil loss =       11114.4 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =      2.166(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        2.5       5.0       7.5      10.0
-------------------------------------------------------------------------
  0+ 5       0.0004      0.06  Q         |         |         |         |
  0+10       0.0012      0.11  Q         |         |         |         |
  0+15       0.0020      0.12  Q         |         |         |         |
  0+20       0.0030      0.15  Q         |         |         |         |
  0+25       0.0042      0.17  Q         |         |         |         |
  0+30       0.0054      0.18  Q         |         |         |         |
  0+35       0.0067      0.18  Q         |         |         |         |
  0+40       0.0079      0.18  Q         |         |         |         |
  0+45       0.0091      0.18  Q         |         |         |         |
  0+50       0.0106      0.21  Q         |         |         |         |
  0+55       0.0122      0.23  Q         |         |         |         |
  1+ 0       0.0138      0.24  Q         |         |         |         |
  1+ 5       0.0152      0.21  Q         |         |         |         |
  1+10       0.0165      0.18  Q         |         |         |         |
  1+15       0.0177      0.18  Q         |         |         |         |
  1+20       0.0190      0.18  Q         |         |         |         |
  1+25       0.0202      0.18  Q         |         |         |         |
  1+30       0.0214      0.18  Q         |         |         |         |
  1+35       0.0227      0.18  Q         |         |         |         |
  1+40       0.0239      0.18  Q         |         |         |         |
  1+45       0.0251      0.18  Q         |         |         |         |
  1+50       0.0266      0.21  Q         |         |         |         |
  1+55       0.0282      0.23  Q         |         |         |         |
  2+ 0       0.0298      0.24  Q         |         |         |         |
  2+ 5       0.0315      0.24  QV        |         |         |         |
  2+10       0.0331      0.24  QV        |         |         |         |
  2+15       0.0347      0.24  QV        |         |         |         |
  2+20       0.0364      0.24  QV        |         |         |         |
  2+25       0.0380      0.24  QV        |         |         |         |
  2+30       0.0397      0.24  QV        |         |         |         |
  2+35       0.0415      0.27  |Q        |         |         |         |
  2+40       0.0435      0.29  |Q        |         |         |         |
  2+45       0.0456      0.30  |Q        |         |         |         |
  2+50       0.0476      0.30  |Q        |         |         |         |
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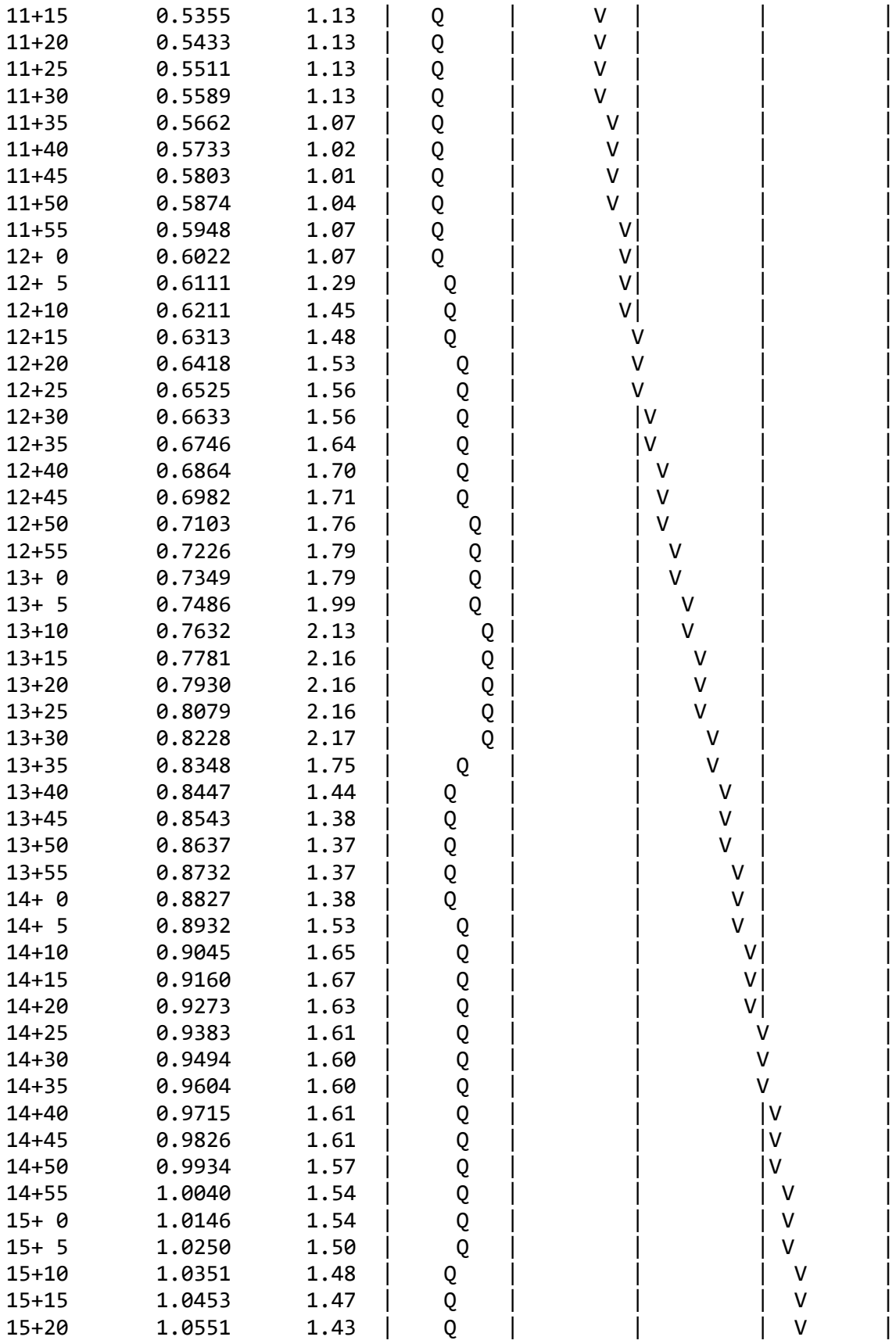
2+55       0.0497      0.30  |Q         |          |          |          |
3+ 0       0.0517      0.30  |Q         |          |          |          |
3+ 5       0.0538      0.30  |Q         |          |          |          |
3+10       0.0558      0.30  |Q         |          |          |          |
3+15       0.0579      0.30  |Q         |          |          |          |
3+20       0.0599      0.30  |Q         |          |          |          |
3+25       0.0620      0.30  |Q         |          |          |          |
3+30       0.0640      0.30  |QV        |          |          |          |
3+35       0.0661      0.30  |QV        |          |          |          |
3+40       0.0681      0.30  |QV        |          |          |          |
3+45       0.0702      0.30  |QV        |          |          |          |
3+50       0.0724      0.33  |QV        |          |          |          |
3+55       0.0749      0.35  |QV        |          |          |          |
4+ 0       0.0773      0.36  |QV        |          |          |          |
4+ 5       0.0798      0.36  |QV        |          |          |          |
4+10       0.0822      0.36  |QV        |          |          |          |
4+15       0.0847      0.36  |QV        |          |          |          |
4+20       0.0874      0.39  |QV        |          |          |          |
4+25       0.0902      0.41  |QV        |          |          |          |
4+30       0.0931      0.42  |QV        |          |          |          |
4+35       0.0959      0.42  |Q V       |          |          |          |
4+40       0.0988      0.42  |Q V       |          |          |          |
4+45       0.1017      0.42  |Q V       |          |          |          |
4+50       0.1048      0.45  |Q V       |          |          |          |
4+55       0.1080      0.47  |Q V       |          |          |          |
5+ 0       0.1113      0.48  |Q V       |          |          |          |
5+ 5       0.1141      0.41  |Q V       |          |          |          |
5+10       0.1167      0.37  |Q V       |          |          |          |
5+15       0.1191      0.36  |Q V       |          |          |          |
5+20       0.1218      0.39  |Q V       |          |          |          |
5+25       0.1246      0.41  |Q  V      |          |          |          |
5+30       0.1275      0.42  |Q  V      |          |          |          |
5+35       0.1306      0.45  |Q  V      |          |          |          |
5+40       0.1338      0.47  |Q  V      |          |          |          |
5+45       0.1371      0.48  |Q  V      |          |          |          |
5+50       0.1404      0.48  |Q  V      |          |          |          |
5+55       0.1437      0.48  |Q  V      |          |          |          |
6+ 0       0.1470      0.48  |Q  V      |          |          |          |
6+ 5       0.1504      0.51  | Q V      |          |          |          |
6+10       0.1541      0.53  | Q V      |          |          |          |
6+15       0.1578      0.53  | Q  V     |          |          |          |
6+20       0.1615      0.54  | Q  V     |          |          |          |
6+25       0.1652      0.54  | Q  V     |          |          |          |
6+30       0.1689      0.54  | Q  V     |          |          |          |
6+35       0.1728      0.57  | Q  V     |          |          |          |
6+40       0.1768      0.59  | Q  V     |          |          |          |
6+45       0.1809      0.59  | Q  V     |          |          |          |
6+50       0.1850      0.60  | Q  V     |          |          |          |
6+55       0.1891      0.60  | Q   V    |          |          |          |
7+ 0       0.1932      0.60  | Q   V    |          |          |          |
```

7+ 5	0.1973	0.60	Q V			
7+10	0.2014	0.60	Q V			
7+15	0.2055	0.60	Q V			
7+20	0.2098	0.63	Q V			
7+25	0.2143	0.65	Q V			
7+30	0.2188	0.65	Q V			
7+35	0.2235	0.69	Q V			
7+40	0.2284	0.71	Q V			
7+45	0.2333	0.71	Q V			
7+50	0.2385	0.75	Q V			
7+55	0.2438	0.77	Q V			
8+ 0	0.2491	0.77	Q V			
8+ 5	0.2549	0.84	Q V			
8+10	0.2609	0.88	Q V			
8+15	0.2671	0.89	Q V			
8+20	0.2732	0.89	Q V			
8+25	0.2794	0.89	Q V			
8+30	0.2855	0.89	Q V			
8+35	0.2919	0.92	Q V			
8+40	0.2984	0.95	Q V			
8+45	0.3050	0.95	Q V			
8+50	0.3118	0.98	Q V			
8+55	0.3187	1.01	Q V			
9+ 0	0.3257	1.01	Q V			
9+ 5	0.3331	1.07	Q V			
9+10	0.3408	1.12	Q V			
9+15	0.3486	1.13	Q V			
9+20	0.3566	1.16	Q V			
9+25	0.3647	1.19	Q V			
9+30	0.3729	1.19	Q V			
9+35	0.3813	1.22	Q V			
9+40	0.3899	1.25	Q V			
9+45	0.3985	1.25	Q V			
9+50	0.4073	1.28	Q V			
9+55	0.4163	1.30	Q V			
10+ 0	0.4253	1.31	Q V			
10+ 5	0.4328	1.09	Q V			
10+10	0.4392	0.93	Q V			
10+15	0.4454	0.90	Q V			
10+20	0.4516	0.89	Q V			
10+25	0.4577	0.89	Q V			
10+30	0.4639	0.89	Q V			
10+35	0.4711	1.05	Q V			
10+40	0.4791	1.17	Q V			
10+45	0.4873	1.19	Q V			
10+50	0.4955	1.19	Q V			
10+55	0.5037	1.19	Q V			
11+ 0	0.5119	1.19	Q V			
11+ 5	0.5199	1.16	Q V			
11+10	0.5277	1.14	Q V			


11+15 0.5355 1.13
11+20 0.5433 1.13
11+25 0.5511 1.13
11+30 0.5589 1.13
11+35 0.5662 1.07
11+40 0.5733 1.02
11+45 0.5803 1.01
11+50 0.5874 1.04
11+55 0.5948 1.07
12+ 0 0.6022 1.07
12+ 5 0.6111 1.29
12+10 0.6211 1.45
12+15 0.6313 1.48
12+20 0.6418 1.53
12+25 0.6525 1.56
12+30 0.6633 1.56
12+35 0.6746 1.64
12+40 0.6864 1.70
12+45 0.6982 1.71
12+50 0.7103 1.76
12+55 0.7226 1.79
13+ 0 0.7349 1.79
13+ 5 0.7486 1.99
13+10 0.7632 2.13
13+15 0.7781 2.16
13+20 0.7930 2.16
13+25 0.8079 2.16
13+30 0.8228 2.17
13+35 0.8348 1.75
13+40 0.8447 1.44
13+45 0.8543 1.38
13+50 0.8637 1.37
13+55 0.8732 1.37
14+ 0 0.8827 1.38
14+ 5 0.8932 1.53
14+10 0.9045 1.65
14+15 0.9160 1.67
14+20 0.9273 1.63
14+25 0.9383 1.61
14+30 0.9494 1.60
14+35 0.9604 1.60
14+40 0.9715 1.61
14+45 0.9826 1.61
14+50 0.9934 1.57
14+55 1.0040 1.54
15+ 0 1.0146 1.54
15+ 5 1.0250 1.50
15+10 1.0351 1.48
15+15 1.0453 1.47
15+20 1.0551 1.43

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15+25       1.0648      1.41  |    Q    |         |         |   V     |
15+30       1.0745      1.40  |    Q    |         |         |   V     |
15+35       1.0832      1.26  |    Q    |         |         |   V     |
15+40       1.0911      1.15  |   Q     |         |         |    V    |
15+45       1.0989      1.14  |   Q     |         |         |    V    |
15+50       1.1067      1.13  |   Q     |         |         |    V    |
15+55       1.1145      1.13  |   Q     |         |         |    V    |
16+ 0       1.1223      1.13  |   Q     |         |         |     V   |
16+ 5       1.1269      0.66  | Q       |         |         |     V   |
16+10       1.1290      0.31  |Q        |         |         |     V   |
16+15       1.1307      0.25  |Q        |         |         |     V   |
16+20       1.1324      0.24  Q         |         |         |     V   |
16+25       1.1340      0.24  Q         |         |         |     V   |
16+30       1.1357      0.24  Q         |         |         |     V   |
16+35       1.1371      0.21  Q         |         |         |     V   |
16+40       1.1383      0.18  Q         |         |         |     V   |
16+45       1.1396      0.18  Q         |         |         |     V   |
16+50       1.1408      0.18  Q         |         |         |     V   |
16+55       1.1420      0.18  Q         |         |         |     V   |
17+ 0       1.1433      0.18  Q         |         |         |     V   |
17+ 5       1.1449      0.24  Q         |         |         |     V   |
17+10       1.1469      0.29  |Q        |         |         |     V   |
17+15       1.1490      0.30  |Q        |         |         |     V   |
17+20       1.1510      0.30  |Q        |         |         |     V   |
17+25       1.1531      0.30  |Q        |         |         |      V  |
17+30       1.1551      0.30  |Q        |         |         |      V  |
17+35       1.1572      0.30  |Q        |         |         |      V  |
17+40       1.1592      0.30  |Q        |         |         |      V  |
17+45       1.1613      0.30  |Q        |         |         |      V  |
17+50       1.1631      0.27  |Q        |         |         |      V  |
17+55       1.1648      0.24  Q         |         |         |      V  |
18+ 0       1.1664      0.24  Q         |         |         |      V  |
18+ 5       1.1681      0.24  Q         |         |         |      V  |
18+10       1.1697      0.24  Q         |         |         |      V  |
18+15       1.1713      0.24  Q         |         |         |      V  |
18+20       1.1730      0.24  Q         |         |         |      V  |
18+25       1.1746      0.24  Q         |         |         |      V  |
18+30       1.1763      0.24  Q         |         |         |      V  |
18+35       1.1777      0.21  Q         |         |         |      V  |
18+40       1.1789      0.18  Q         |         |         |      V  |
18+45       1.1802      0.18  Q         |         |         |      V  |
18+50       1.1812      0.15  Q         |         |         |      V  |
18+55       1.1820      0.12  Q         |         |         |      V  |
19+ 0       1.1829      0.12  Q         |         |         |       V |
19+ 5       1.1839      0.15  Q         |         |         |       V |
19+10       1.1851      0.17  Q         |         |         |       V |
19+15       1.1863      0.18  Q         |         |         |       V |
19+20       1.1878      0.21  Q         |         |         |       V |
19+25       1.1894      0.23  Q         |         |         |       V |
19+30       1.1910      0.24  Q         |         |         |       V |
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19+35	1.1924	0.21	Q	|	|	|	V |
19+40	1.1937	0.18	Q	|	|	|	V |
19+45	1.1949	0.18	Q	|	|	|	V |
19+50	1.1959	0.15	Q	|	|	|	V |
19+55	1.1968	0.12	Q	|	|	|	V |
20+ 0	1.1976	0.12	Q	|	|	|	V |
20+ 5	1.1987	0.15	Q	|	|	|	V |
20+10	1.1999	0.17	Q	|	|	|	V |
20+15	1.2011	0.18	Q	|	|	|	V |
20+20	1.2023	0.18	Q	|	|	|	V |
20+25	1.2035	0.18	Q	|	|	|	V |
20+30	1.2048	0.18	Q	|	|	|	V |
20+35	1.2060	0.18	Q	|	|	|	V |
20+40	1.2072	0.18	Q	|	|	|	V |
20+45	1.2085	0.18	Q	|	|	|	V |
20+50	1.2095	0.15	Q	|	|	|	V |
20+55	1.2103	0.12	Q	|	|	|	V |
21+ 0	1.2112	0.12	Q	|	|	|	V |
21+ 5	1.2122	0.15	Q	|	|	|	V |
21+10	1.2134	0.17	Q	|	|	|	V |
21+15	1.2146	0.18	Q	|	|	|	V|
21+20	1.2156	0.15	Q	|	|	|	V|
21+25	1.2165	0.12	Q	|	|	|	V|
21+30	1.2173	0.12	Q	|	|	|	V|
21+35	1.2183	0.15	Q	|	|	|	V|
21+40	1.2195	0.17	Q	|	|	|	V|
21+45	1.2208	0.18	Q	|	|	|	V|
21+50	1.2218	0.15	Q	|	|	|	V|
21+55	1.2226	0.12	Q	|	|	|	V|
22+ 0	1.2235	0.12	Q	|	|	|	V|
22+ 5	1.2245	0.15	Q	|	|	|	V|
22+10	1.2257	0.17	Q	|	|	|	V|
22+15	1.2269	0.18	Q	|	|	|	V|
22+20	1.2279	0.15	Q	|	|	|	V|
22+25	1.2288	0.12	Q	|	|	|	V|
22+30	1.2296	0.12	Q	|	|	|	V|
22+35	1.2304	0.12	Q	|	|	|	V|
22+40	1.2312	0.12	Q	|	|	|	V|
22+45	1.2321	0.12	Q	|	|	|	V|
22+50	1.2329	0.12	Q	|	|	|	V|
22+55	1.2337	0.12	Q	|	|	|	V|
23+ 0	1.2345	0.12	Q	|	|	|	V|
23+ 5	1.2353	0.12	Q	|	|	|	V|
23+10	1.2362	0.12	Q	|	|	|	V|
23+15	1.2370	0.12	Q	|	|	|	V|
23+20	1.2378	0.12	Q	|	|	|	V|
23+25	1.2386	0.12	Q	|	|	|	V|
23+30	1.2394	0.12	Q	|	|	|	V|
23+35	1.2403	0.12	Q	|	|	|	V|
23+40	1.2411	0.12	Q	|	|	|	V|

23+45	1.2419	0.12	Q	|	|	|	V|
23+50	1.2427	0.12	Q	|	|	|	V|
23+55	1.2435	0.12	Q	|	|	|	V|
24+ 0	1.2444	0.12	Q	|	|	|	V|
24+ 5	1.2448	0.06	Q	|	|	|	V|
24+10	1.2448	0.01	Q	|	|	|	V|
24+15	1.2448	0.00	Q	|	|	|	V|

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

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Study date 08/30/23 File: 100puh24100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 3.60(Ac.) = 0.006 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 3.60(Ac.) = 0.006 Sq. Mi.
Length along longest watercourse = 761.00(Ft.)
Length along longest watercourse measured to centroid = 201.00(Ft.)
Length along longest watercourse = 0.144 Mi.
Length along longest watercourse measured to centroid = 0.038 Mi.
Difference in elevation = 19.20(Ft.)
Slope along watercourse = 133.2142 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.020 Hr.
Lag time = 1.18 Min.
25% of lag time = 0.29 Min.
40% of lag time = 0.47 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

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

3.60	2.00	7.20

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.60	5.00	18.00

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 2.000(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
3.600	50.00	0.684

Total Area Entered = 3.60(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
50.0	50.0	0.572	0.684	0.220	1.000	0.220
					Sum (F) =	0.220

Area averaged mean soil loss (F) (In/Hr) = 0.220
Minimum soil loss rate ((In/Hr)) = 0.110
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.353

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	423.879	66.662	2.419
2	0.167	847.758	33.338	1.210
		Sum = 100.000	Sum=	3.628

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.040	(0.390)	0.014	0.026
2	0.17	0.07	0.040	(0.388)	0.014	0.026
3	0.25	0.07	0.040	(0.387)	0.014	0.026
4	0.33	0.10	0.060	(0.385)	0.021	0.039
5	0.42	0.10	0.060	(0.384)	0.021	0.039
6	0.50	0.10	0.060	(0.382)	0.021	0.039

7	0.58	0.10	0.060	(0.381)	0.021	0.039
8	0.67	0.10	0.060	(0.379)	0.021	0.039
9	0.75	0.10	0.060	(0.378)	0.021	0.039
10	0.83	0.13	0.080	(0.376)	0.028	0.052
11	0.92	0.13	0.080	(0.375)	0.028	0.052
12	1.00	0.13	0.080	(0.373)	0.028	0.052
13	1.08	0.10	0.060	(0.372)	0.021	0.039
14	1.17	0.10	0.060	(0.370)	0.021	0.039
15	1.25	0.10	0.060	(0.369)	0.021	0.039
16	1.33	0.10	0.060	(0.367)	0.021	0.039
17	1.42	0.10	0.060	(0.366)	0.021	0.039
18	1.50	0.10	0.060	(0.365)	0.021	0.039
19	1.58	0.10	0.060	(0.363)	0.021	0.039
20	1.67	0.10	0.060	(0.362)	0.021	0.039
21	1.75	0.10	0.060	(0.360)	0.021	0.039
22	1.83	0.13	0.080	(0.359)	0.028	0.052
23	1.92	0.13	0.080	(0.357)	0.028	0.052
24	2.00	0.13	0.080	(0.356)	0.028	0.052
25	2.08	0.13	0.080	(0.354)	0.028	0.052
26	2.17	0.13	0.080	(0.353)	0.028	0.052
27	2.25	0.13	0.080	(0.352)	0.028	0.052
28	2.33	0.13	0.080	(0.350)	0.028	0.052
29	2.42	0.13	0.080	(0.349)	0.028	0.052
30	2.50	0.13	0.080	(0.347)	0.028	0.052
31	2.58	0.17	0.100	(0.346)	0.035	0.065
32	2.67	0.17	0.100	(0.344)	0.035	0.065
33	2.75	0.17	0.100	(0.343)	0.035	0.065
34	2.83	0.17	0.100	(0.342)	0.035	0.065
35	2.92	0.17	0.100	(0.340)	0.035	0.065
36	3.00	0.17	0.100	(0.339)	0.035	0.065
37	3.08	0.17	0.100	(0.337)	0.035	0.065
38	3.17	0.17	0.100	(0.336)	0.035	0.065
39	3.25	0.17	0.100	(0.335)	0.035	0.065
40	3.33	0.17	0.100	(0.333)	0.035	0.065
41	3.42	0.17	0.100	(0.332)	0.035	0.065
42	3.50	0.17	0.100	(0.330)	0.035	0.065
43	3.58	0.17	0.100	(0.329)	0.035	0.065
44	3.67	0.17	0.100	(0.328)	0.035	0.065
45	3.75	0.17	0.100	(0.326)	0.035	0.065
46	3.83	0.20	0.120	(0.325)	0.042	0.078
47	3.92	0.20	0.120	(0.324)	0.042	0.078
48	4.00	0.20	0.120	(0.322)	0.042	0.078
49	4.08	0.20	0.120	(0.321)	0.042	0.078
50	4.17	0.20	0.120	(0.319)	0.042	0.078
51	4.25	0.20	0.120	(0.318)	0.042	0.078
52	4.33	0.23	0.140	(0.317)	0.049	0.091
53	4.42	0.23	0.140	(0.315)	0.049	0.091
54	4.50	0.23	0.140	(0.314)	0.049	0.091
55	4.58	0.23	0.140	(0.313)	0.049	0.091
56	4.67	0.23	0.140	(0.311)	0.049	0.091
57	4.75	0.23	0.140	(0.310)	0.049	0.091
58	4.83	0.27	0.160	(0.309)	0.056	0.104
59	4.92	0.27	0.160	(0.307)	0.056	0.104
60	5.00	0.27	0.160	(0.306)	0.056	0.104
61	5.08	0.20	0.120	(0.305)	0.042	0.078
62	5.17	0.20	0.120	(0.303)	0.042	0.078
63	5.25	0.20	0.120	(0.302)	0.042	0.078

64	5.33	0.23	0.140	(0.301)	0.049	0.091
65	5.42	0.23	0.140	(0.299)	0.049	0.091
66	5.50	0.23	0.140	(0.298)	0.049	0.091
67	5.58	0.27	0.160	(0.297)	0.056	0.104
68	5.67	0.27	0.160	(0.295)	0.056	0.104
69	5.75	0.27	0.160	(0.294)	0.056	0.104
70	5.83	0.27	0.160	(0.293)	0.056	0.104
71	5.92	0.27	0.160	(0.292)	0.056	0.104
72	6.00	0.27	0.160	(0.290)	0.056	0.104
73	6.08	0.30	0.180	(0.289)	0.064	0.116
74	6.17	0.30	0.180	(0.288)	0.064	0.116
75	6.25	0.30	0.180	(0.286)	0.064	0.116
76	6.33	0.30	0.180	(0.285)	0.064	0.116
77	6.42	0.30	0.180	(0.284)	0.064	0.116
78	6.50	0.30	0.180	(0.283)	0.064	0.116
79	6.58	0.33	0.200	(0.281)	0.071	0.129
80	6.67	0.33	0.200	(0.280)	0.071	0.129
81	6.75	0.33	0.200	(0.279)	0.071	0.129
82	6.83	0.33	0.200	(0.277)	0.071	0.129
83	6.92	0.33	0.200	(0.276)	0.071	0.129
84	7.00	0.33	0.200	(0.275)	0.071	0.129
85	7.08	0.33	0.200	(0.274)	0.071	0.129
86	7.17	0.33	0.200	(0.272)	0.071	0.129
87	7.25	0.33	0.200	(0.271)	0.071	0.129
88	7.33	0.37	0.220	(0.270)	0.078	0.142
89	7.42	0.37	0.220	(0.269)	0.078	0.142
90	7.50	0.37	0.220	(0.268)	0.078	0.142
91	7.58	0.40	0.240	(0.266)	0.085	0.155
92	7.67	0.40	0.240	(0.265)	0.085	0.155
93	7.75	0.40	0.240	(0.264)	0.085	0.155
94	7.83	0.43	0.260	(0.263)	0.092	0.168
95	7.92	0.43	0.260	(0.261)	0.092	0.168
96	8.00	0.43	0.260	(0.260)	0.092	0.168
97	8.08	0.50	0.300	(0.259)	0.106	0.194
98	8.17	0.50	0.300	(0.258)	0.106	0.194
99	8.25	0.50	0.300	(0.257)	0.106	0.194
100	8.33	0.50	0.300	(0.255)	0.106	0.194
101	8.42	0.50	0.300	(0.254)	0.106	0.194
102	8.50	0.50	0.300	(0.253)	0.106	0.194
103	8.58	0.53	0.320	(0.252)	0.113	0.207
104	8.67	0.53	0.320	(0.251)	0.113	0.207
105	8.75	0.53	0.320	(0.249)	0.113	0.207
106	8.83	0.57	0.340	(0.248)	0.120	0.220
107	8.92	0.57	0.340	(0.247)	0.120	0.220
108	9.00	0.57	0.340	(0.246)	0.120	0.220
109	9.08	0.63	0.380	(0.245)	0.134	0.246
110	9.17	0.63	0.380	(0.244)	0.134	0.246
111	9.25	0.63	0.380	(0.242)	0.134	0.246
112	9.33	0.67	0.400	(0.241)	0.141	0.259
113	9.42	0.67	0.400	(0.240)	0.141	0.259
114	9.50	0.67	0.400	(0.239)	0.141	0.259
115	9.58	0.70	0.420	(0.238)	0.148	0.272
116	9.67	0.70	0.420	(0.237)	0.148	0.272
117	9.75	0.70	0.420	(0.236)	0.148	0.272
118	9.83	0.73	0.440	(0.234)	0.155	0.285
119	9.92	0.73	0.440	(0.233)	0.155	0.285
120	10.00	0.73	0.440	(0.232)	0.155	0.285

121	10.08	0.50	0.300	(0.231)	0.106	0.194
122	10.17	0.50	0.300	(0.230)	0.106	0.194
123	10.25	0.50	0.300	(0.229)	0.106	0.194
124	10.33	0.50	0.300	(0.228)	0.106	0.194
125	10.42	0.50	0.300	(0.227)	0.106	0.194
126	10.50	0.50	0.300	(0.226)	0.106	0.194
127	10.58	0.67	0.400	(0.224)	0.141	0.259
128	10.67	0.67	0.400	(0.223)	0.141	0.259
129	10.75	0.67	0.400	(0.222)	0.141	0.259
130	10.83	0.67	0.400	(0.221)	0.141	0.259
131	10.92	0.67	0.400	(0.220)	0.141	0.259
132	11.00	0.67	0.400	(0.219)	0.141	0.259
133	11.08	0.63	0.380	(0.218)	0.134	0.246
134	11.17	0.63	0.380	(0.217)	0.134	0.246
135	11.25	0.63	0.380	(0.216)	0.134	0.246
136	11.33	0.63	0.380	(0.215)	0.134	0.246
137	11.42	0.63	0.380	(0.214)	0.134	0.246
138	11.50	0.63	0.380	(0.213)	0.134	0.246
139	11.58	0.57	0.340	(0.211)	0.120	0.220
140	11.67	0.57	0.340	(0.210)	0.120	0.220
141	11.75	0.57	0.340	(0.209)	0.120	0.220
142	11.83	0.60	0.360	(0.208)	0.127	0.233
143	11.92	0.60	0.360	(0.207)	0.127	0.233
144	12.00	0.60	0.360	(0.206)	0.127	0.233
145	12.08	0.83	0.500	(0.205)	0.176	0.323
146	12.17	0.83	0.500	(0.204)	0.176	0.323
147	12.25	0.83	0.500	(0.203)	0.176	0.323
148	12.33	0.87	0.520	(0.202)	0.184	0.336
149	12.42	0.87	0.520	(0.201)	0.184	0.336
150	12.50	0.87	0.520	(0.200)	0.184	0.336
151	12.58	0.93	0.560	(0.199)	0.198	0.362
152	12.67	0.93	0.560	(0.198)	0.198	0.362
153	12.75	0.93	0.560	0.197	(0.198)	0.363
154	12.83	0.97	0.580	0.196	(0.205)	0.384
155	12.92	0.97	0.580	0.195	(0.205)	0.385
156	13.00	0.97	0.580	0.194	(0.205)	0.386
157	13.08	1.13	0.680	0.193	(0.240)	0.487
158	13.17	1.13	0.680	0.192	(0.240)	0.488
159	13.25	1.13	0.680	0.191	(0.240)	0.489
160	13.33	1.13	0.680	0.190	(0.240)	0.490
161	13.42	1.13	0.680	0.189	(0.240)	0.491
162	13.50	1.13	0.680	0.188	(0.240)	0.492
163	13.58	0.77	0.460	(0.187)	0.162	0.298
164	13.67	0.77	0.460	(0.186)	0.162	0.298
165	13.75	0.77	0.460	(0.185)	0.162	0.298
166	13.83	0.77	0.460	(0.185)	0.162	0.298
167	13.92	0.77	0.460	(0.184)	0.162	0.298
168	14.00	0.77	0.460	(0.183)	0.162	0.298
169	14.08	0.90	0.540	0.182	(0.191)	0.358
170	14.17	0.90	0.540	0.181	(0.191)	0.359
171	14.25	0.90	0.540	0.180	(0.191)	0.360
172	14.33	0.87	0.520	0.179	(0.184)	0.341
173	14.42	0.87	0.520	0.178	(0.184)	0.342
174	14.50	0.87	0.520	0.177	(0.184)	0.343
175	14.58	0.87	0.520	0.176	(0.184)	0.344
176	14.67	0.87	0.520	0.175	(0.184)	0.345
177	14.75	0.87	0.520	0.174	(0.184)	0.346

178	14.83	0.83	0.500	0.174	(0.176)	0.326
179	14.92	0.83	0.500	0.173	(0.176)	0.327
180	15.00	0.83	0.500	0.172	(0.176)	0.328
181	15.08	0.80	0.480	(0.171)	0.169	0.311
182	15.17	0.80	0.480	(0.170)	0.169	0.311
183	15.25	0.80	0.480	0.169	(0.169)	0.311
184	15.33	0.77	0.460	(0.168)	0.162	0.298
185	15.42	0.77	0.460	(0.167)	0.162	0.298
186	15.50	0.77	0.460	(0.167)	0.162	0.298
187	15.58	0.63	0.380	(0.166)	0.134	0.246
188	15.67	0.63	0.380	(0.165)	0.134	0.246
189	15.75	0.63	0.380	(0.164)	0.134	0.246
190	15.83	0.63	0.380	(0.163)	0.134	0.246
191	15.92	0.63	0.380	(0.162)	0.134	0.246
192	16.00	0.63	0.380	(0.161)	0.134	0.246
193	16.08	0.13	0.080	(0.161)	0.028	0.052
194	16.17	0.13	0.080	(0.160)	0.028	0.052
195	16.25	0.13	0.080	(0.159)	0.028	0.052
196	16.33	0.13	0.080	(0.158)	0.028	0.052
197	16.42	0.13	0.080	(0.157)	0.028	0.052
198	16.50	0.13	0.080	(0.157)	0.028	0.052
199	16.58	0.10	0.060	(0.156)	0.021	0.039
200	16.67	0.10	0.060	(0.155)	0.021	0.039
201	16.75	0.10	0.060	(0.154)	0.021	0.039
202	16.83	0.10	0.060	(0.153)	0.021	0.039
203	16.92	0.10	0.060	(0.153)	0.021	0.039
204	17.00	0.10	0.060	(0.152)	0.021	0.039
205	17.08	0.17	0.100	(0.151)	0.035	0.065
206	17.17	0.17	0.100	(0.150)	0.035	0.065
207	17.25	0.17	0.100	(0.150)	0.035	0.065
208	17.33	0.17	0.100	(0.149)	0.035	0.065
209	17.42	0.17	0.100	(0.148)	0.035	0.065
210	17.50	0.17	0.100	(0.147)	0.035	0.065
211	17.58	0.17	0.100	(0.147)	0.035	0.065
212	17.67	0.17	0.100	(0.146)	0.035	0.065
213	17.75	0.17	0.100	(0.145)	0.035	0.065
214	17.83	0.13	0.080	(0.144)	0.028	0.052
215	17.92	0.13	0.080	(0.144)	0.028	0.052
216	18.00	0.13	0.080	(0.143)	0.028	0.052
217	18.08	0.13	0.080	(0.142)	0.028	0.052
218	18.17	0.13	0.080	(0.142)	0.028	0.052
219	18.25	0.13	0.080	(0.141)	0.028	0.052
220	18.33	0.13	0.080	(0.140)	0.028	0.052
221	18.42	0.13	0.080	(0.140)	0.028	0.052
222	18.50	0.13	0.080	(0.139)	0.028	0.052
223	18.58	0.10	0.060	(0.138)	0.021	0.039
224	18.67	0.10	0.060	(0.138)	0.021	0.039
225	18.75	0.10	0.060	(0.137)	0.021	0.039
226	18.83	0.07	0.040	(0.136)	0.014	0.026
227	18.92	0.07	0.040	(0.136)	0.014	0.026
228	19.00	0.07	0.040	(0.135)	0.014	0.026
229	19.08	0.10	0.060	(0.134)	0.021	0.039
230	19.17	0.10	0.060	(0.134)	0.021	0.039
231	19.25	0.10	0.060	(0.133)	0.021	0.039
232	19.33	0.13	0.080	(0.132)	0.028	0.052
233	19.42	0.13	0.080	(0.132)	0.028	0.052
234	19.50	0.13	0.080	(0.131)	0.028	0.052

235	19.58	0.10	0.060	(0.131)	0.021	0.039
236	19.67	0.10	0.060	(0.130)	0.021	0.039
237	19.75	0.10	0.060	(0.129)	0.021	0.039
238	19.83	0.07	0.040	(0.129)	0.014	0.026
239	19.92	0.07	0.040	(0.128)	0.014	0.026
240	20.00	0.07	0.040	(0.128)	0.014	0.026
241	20.08	0.10	0.060	(0.127)	0.021	0.039
242	20.17	0.10	0.060	(0.127)	0.021	0.039
243	20.25	0.10	0.060	(0.126)	0.021	0.039
244	20.33	0.10	0.060	(0.125)	0.021	0.039
245	20.42	0.10	0.060	(0.125)	0.021	0.039
246	20.50	0.10	0.060	(0.124)	0.021	0.039
247	20.58	0.10	0.060	(0.124)	0.021	0.039
248	20.67	0.10	0.060	(0.123)	0.021	0.039
249	20.75	0.10	0.060	(0.123)	0.021	0.039
250	20.83	0.07	0.040	(0.122)	0.014	0.026
251	20.92	0.07	0.040	(0.122)	0.014	0.026
252	21.00	0.07	0.040	(0.121)	0.014	0.026
253	21.08	0.10	0.060	(0.121)	0.021	0.039
254	21.17	0.10	0.060	(0.120)	0.021	0.039
255	21.25	0.10	0.060	(0.120)	0.021	0.039
256	21.33	0.07	0.040	(0.119)	0.014	0.026
257	21.42	0.07	0.040	(0.119)	0.014	0.026
258	21.50	0.07	0.040	(0.119)	0.014	0.026
259	21.58	0.10	0.060	(0.118)	0.021	0.039
260	21.67	0.10	0.060	(0.118)	0.021	0.039
261	21.75	0.10	0.060	(0.117)	0.021	0.039
262	21.83	0.07	0.040	(0.117)	0.014	0.026
263	21.92	0.07	0.040	(0.116)	0.014	0.026
264	22.00	0.07	0.040	(0.116)	0.014	0.026
265	22.08	0.10	0.060	(0.116)	0.021	0.039
266	22.17	0.10	0.060	(0.115)	0.021	0.039
267	22.25	0.10	0.060	(0.115)	0.021	0.039
268	22.33	0.07	0.040	(0.115)	0.014	0.026
269	22.42	0.07	0.040	(0.114)	0.014	0.026
270	22.50	0.07	0.040	(0.114)	0.014	0.026
271	22.58	0.07	0.040	(0.114)	0.014	0.026
272	22.67	0.07	0.040	(0.113)	0.014	0.026
273	22.75	0.07	0.040	(0.113)	0.014	0.026
274	22.83	0.07	0.040	(0.113)	0.014	0.026
275	22.92	0.07	0.040	(0.112)	0.014	0.026
276	23.00	0.07	0.040	(0.112)	0.014	0.026
277	23.08	0.07	0.040	(0.112)	0.014	0.026
278	23.17	0.07	0.040	(0.112)	0.014	0.026
279	23.25	0.07	0.040	(0.111)	0.014	0.026
280	23.33	0.07	0.040	(0.111)	0.014	0.026
281	23.42	0.07	0.040	(0.111)	0.014	0.026
282	23.50	0.07	0.040	(0.111)	0.014	0.026
283	23.58	0.07	0.040	(0.111)	0.014	0.026
284	23.67	0.07	0.040	(0.110)	0.014	0.026
285	23.75	0.07	0.040	(0.110)	0.014	0.026
286	23.83	0.07	0.040	(0.110)	0.014	0.026
287	23.92	0.07	0.040	(0.110)	0.014	0.026
288	24.00	0.07	0.040	(0.110)	0.014	0.026

(Loss Rate Not Used)

Sum = 100.0 Sum = 39.2

Flood volume = Effective rainfall 3.27(In)

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 times area       3.6(Ac.)/[(In)/(Ft.)] =       1.0(Ac.Ft)
Total soil loss =      1.73(In)
Total soil loss =     0.519(Ac.Ft)
Total rainfall =      5.00(In)
Flood volume =       42718.9 Cubic Feet
Total soil loss =       22620.7 Cubic Feet
--------------------------------------------------------------------
 Peak flow rate of this hydrograph =      1.784(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))

--------------------------------------------------------------------
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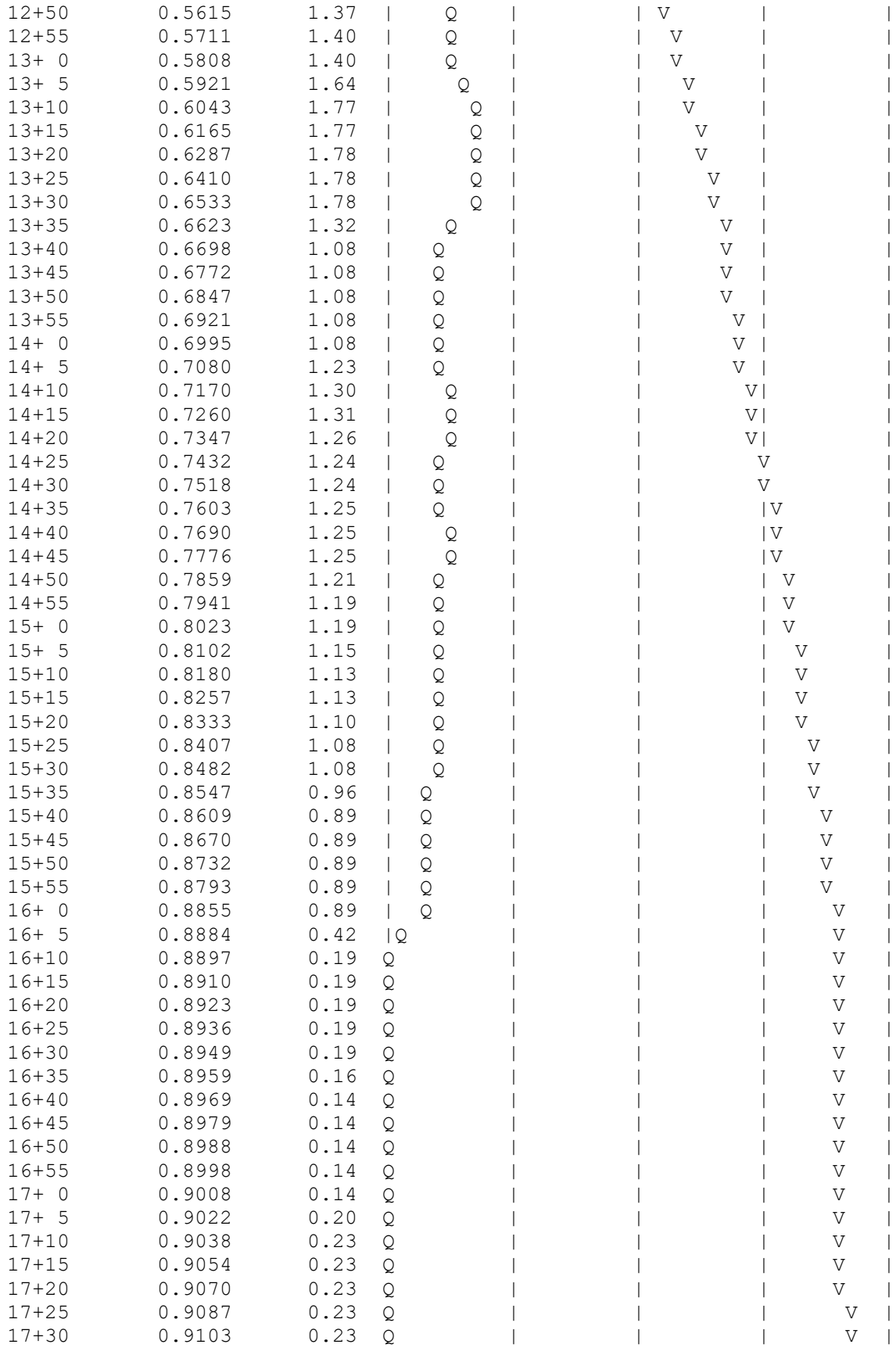
Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0004	0.06	Q				
0+10	0.0011	0.09	Q				
0+15	0.0017	0.09	Q				
0+20	0.0026	0.13	Q				
0+25	0.0036	0.14	Q				
0+30	0.0045	0.14	Q				
0+35	0.0055	0.14	Q				
0+40	0.0065	0.14	Q				
0+45	0.0074	0.14	Q				
0+50	0.0086	0.17	Q				
0+55	0.0099	0.19	Q				
1+ 0	0.0112	0.19	Q				
1+ 5	0.0123	0.16	Q				
1+10	0.0133	0.14	Q				
1+15	0.0142	0.14	Q				
1+20	0.0152	0.14	Q				
1+25	0.0162	0.14	Q				
1+30	0.0171	0.14	Q				
1+35	0.0181	0.14	Q				
1+40	0.0191	0.14	Q				
1+45	0.0201	0.14	Q				
1+50	0.0212	0.17	Q				
1+55	0.0225	0.19	Q				
2+ 0	0.0238	0.19	Q				
2+ 5	0.0251	0.19	QV				
2+10	0.0264	0.19	QV				
2+15	0.0277	0.19	QV				
2+20	0.0290	0.19	QV				
2+25	0.0303	0.19	QV				
2+30	0.0316	0.19	QV				
2+35	0.0331	0.22	QV				
2+40	0.0347	0.23	QV				
2+45	0.0363	0.23	QV				
2+50	0.0380	0.23	QV				
2+55	0.0396	0.23	QV				
3+ 0	0.0412	0.23	QV				
3+ 5	0.0428	0.23	QV				
3+10	0.0444	0.23	QV				
3+15	0.0460	0.23	QV				

3+20	0.0477	0.23	QV	|	|	|	|
3+25	0.0493	0.23	Q V	|	|	|	|
3+30	0.0509	0.23	Q V	|	|	|	|
3+35	0.0525	0.23	Q V	|	|	|	|
3+40	0.0541	0.23	Q V	|	|	|	|
3+45	0.0557	0.23	Q V	|	|	|	|
3+50	0.0576	0.27	|QV	|	|	|	|
3+55	0.0595	0.28	|QV	|	|	|	|
4+ 0	0.0615	0.28	|QV	|	|	|	|
4+ 5	0.0634	0.28	|QV	|	|	|	|
4+10	0.0653	0.28	|QV	|	|	|	|
4+15	0.0673	0.28	|QV	|	|	|	|
4+20	0.0694	0.31	|QV	|	|	|	|
4+25	0.0717	0.33	|QV	|	|	|	|
4+30	0.0740	0.33	|Q V	|	|	|	|
4+35	0.0762	0.33	|Q V	|	|	|	|
4+40	0.0785	0.33	|Q V	|	|	|	|
4+45	0.0808	0.33	|Q V	|	|	|	|
4+50	0.0832	0.36	|Q V	|	|	|	|
4+55	0.0858	0.38	|Q V	|	|	|	|
5+ 0	0.0884	0.38	|Q V	|	|	|	|
5+ 5	0.0906	0.31	|Q V	|	|	|	|
5+10	0.0925	0.28	|Q V	|	|	|	|
5+15	0.0945	0.28	|Q V	|	|	|	|
5+20	0.0966	0.31	|Q V	|	|	|	|
5+25	0.0989	0.33	|Q V	|	|	|	|
5+30	0.1011	0.33	|Q V	|	|	|	|
5+35	0.1036	0.36	|Q V	|	|	|	|
5+40	0.1062	0.38	|Q V	|	|	|	|
5+45	0.1088	0.38	|Q V	|	|	|	|
5+50	0.1114	0.38	|Q V	|	|	|	|
5+55	0.1140	0.38	|Q V	|	|	|	|
6+ 0	0.1166	0.38	|Q V	|	|	|	|
6+ 5	0.1194	0.41	|Q V	|	|	|	|
6+10	0.1223	0.42	|Q V	|	|	|	|
6+15	0.1252	0.42	|Q V	|	|	|	|
6+20	0.1281	0.42	|Q V	|	|	|	|
6+25	0.1310	0.42	|Q V	|	|	|	|
6+30	0.1339	0.42	|Q V	|	|	|	|
6+35	0.1371	0.45	|Q V	|	|	|	|
6+40	0.1403	0.47	|Q V	|	|	|	|
6+45	0.1435	0.47	|Q V	|	|	|	|
6+50	0.1468	0.47	|Q V	|	|	|	|
6+55	0.1500	0.47	|Q V	|	|	|	|
7+ 0	0.1532	0.47	|Q V	|	|	|	|
7+ 5	0.1565	0.47	|Q V	|	|	|	|
7+10	0.1597	0.47	|Q V	|	|	|	|
7+15	0.1629	0.47	|Q V	|	|	|	|
7+20	0.1664	0.50	| Q V	|	|	|	|
7+25	0.1699	0.52	| Q V	|	|	|	|
7+30	0.1735	0.52	| Q V	|	|	|	|
7+35	0.1773	0.55	| Q V	|	|	|	|
7+40	0.1812	0.56	| Q V	|	|	|	|
7+45	0.1850	0.56	| Q V	|	|	|	|
7+50	0.1891	0.59	| Q V	|	|	|	|
7+55	0.1933	0.61	| Q V	|	|	|	|
8+ 0	0.1975	0.61	| Q V	|	|	|	|

8+ 5	0.2022	0.67	Q V				
8+10	0.2070	0.70	Q V				
8+15	0.2119	0.70	Q V				
8+20	0.2167	0.70	Q V				
8+25	0.2216	0.70	Q V				
8+30	0.2264	0.70	Q V				
8+35	0.2315	0.74	Q V				
8+40	0.2367	0.75	Q V				
8+45	0.2419	0.75	Q V				
8+50	0.2473	0.78	Q V				
8+55	0.2528	0.80	Q V				
9+ 0	0.2583	0.80	Q V				
9+ 5	0.2642	0.86	Q V				
9+10	0.2703	0.89	Q V				
9+15	0.2765	0.89	Q V				
9+20	0.2828	0.92	Q V				
9+25	0.2893	0.94	Q V				
9+30	0.2958	0.94	Q V				
9+35	0.3025	0.97	Q V				
9+40	0.3093	0.99	Q V				
9+45	0.3161	0.99	Q V				
9+50	0.3231	1.02	Q V				
9+55	0.3302	1.03	Q V				
10+ 0	0.3373	1.03	Q V				
10+ 5	0.3429	0.81	Q V				
10+10	0.3478	0.70	Q V				
10+15	0.3526	0.70	Q V				
10+20	0.3575	0.70	Q V				
10+25	0.3623	0.70	Q V				
10+30	0.3672	0.70	Q V				
10+35	0.3731	0.86	Q V				
10+40	0.3796	0.94	Q V				
10+45	0.3860	0.94	Q V				
10+50	0.3925	0.94	Q V				
10+55	0.3990	0.94	Q V				
11+ 0	0.4055	0.94	Q V				
11+ 5	0.4117	0.91	Q V				
11+10	0.4179	0.89	Q V				
11+15	0.4240	0.89	Q V				
11+20	0.4301	0.89	Q V				
11+25	0.4363	0.89	Q V				
11+30	0.4424	0.89	Q V				
11+35	0.4482	0.83	Q V				
11+40	0.4537	0.80	Q V				
11+45	0.4592	0.80	Q V				
11+50	0.4649	0.83	Q V				
11+55	0.4707	0.85	Q V				
12+ 0	0.4765	0.85	Q V				
12+ 5	0.4838	1.06	Q V				
12+10	0.4919	1.17	Q V				
12+15	0.5000	1.17	Q V				
12+20	0.5083	1.21	Q V				
12+25	0.5167	1.22	Q V				
12+30	0.5251	1.22	Q V				
12+35	0.5340	1.28	Q V				
12+40	0.5430	1.32	Q V				
12+45	0.5521	1.32	Q V				


12+50 0.5615 1.37
12+55 0.5711 1.40
13+ 0 0.5808 1.40
13+ 5 0.5921 1.64
13+10 0.6043 1.77
13+15 0.6165 1.77
13+20 0.6287 1.78
13+25 0.6410 1.78
13+30 0.6533 1.78
13+35 0.6623 1.32
13+40 0.6698 1.08
13+45 0.6772 1.08
13+50 0.6847 1.08
13+55 0.6921 1.08
14+ 0 0.6995 1.08
14+ 5 0.7080 1.23
14+10 0.7170 1.30
14+15 0.7260 1.31
14+20 0.7347 1.26
14+25 0.7432 1.24
14+30 0.7518 1.24
14+35 0.7603 1.25
14+40 0.7690 1.25
14+45 0.7776 1.25
14+50 0.7859 1.21
14+55 0.7941 1.19
15+ 0 0.8023 1.19
15+ 5 0.8102 1.15
15+10 0.8180 1.13
15+15 0.8257 1.13
15+20 0.8333 1.10
15+25 0.8407 1.08
15+30 0.8482 1.08
15+35 0.8547 0.96
15+40 0.8609 0.89
15+45 0.8670 0.89
15+50 0.8732 0.89
15+55 0.8793 0.89
16+ 0 0.8855 0.89
16+ 5 0.8884 0.42
16+10 0.8897 0.19
16+15 0.8910 0.19
16+20 0.8923 0.19
16+25 0.8936 0.19
16+30 0.8949 0.19
16+35 0.8959 0.16
16+40 0.8969 0.14
16+45 0.8979 0.14
16+50 0.8988 0.14
16+55 0.8998 0.14
17+ 0 0.9008 0.14
17+ 5 0.9022 0.20
17+10 0.9038 0.23
17+15 0.9054 0.23
17+20 0.9070 0.23
17+25 0.9087 0.23
17+30 0.9103 0.23

17+35	0.9119	0.23	Q	|	|	|	V |
17+40	0.9135	0.23	Q	|	|	|	V |
17+45	0.9151	0.23	Q	|	|	|	V |
17+50	0.9165	0.20	Q	|	|	|	V |
17+55	0.9178	0.19	Q	|	|	|	V |
18+ 0	0.9191	0.19	Q	|	|	|	V |
18+ 5	0.9204	0.19	Q	|	|	|	V |
18+10	0.9217	0.19	Q	|	|	|	V |
18+15	0.9230	0.19	Q	|	|	|	V |
18+20	0.9243	0.19	Q	|	|	|	V |
18+25	0.9256	0.19	Q	|	|	|	V |
18+30	0.9269	0.19	Q	|	|	|	V |
18+35	0.9280	0.16	Q	|	|	|	V |
18+40	0.9289	0.14	Q	|	|	|	V |
18+45	0.9299	0.14	Q	|	|	|	V |
18+50	0.9307	0.11	Q	|	|	|	V |
18+55	0.9313	0.09	Q	|	|	|	V |
19+ 0	0.9320	0.09	Q	|	|	|	V |
19+ 5	0.9328	0.13	Q	|	|	|	V |
19+10	0.9338	0.14	Q	|	|	|	V |
19+15	0.9348	0.14	Q	|	|	|	V |
19+20	0.9359	0.17	Q	|	|	|	V |
19+25	0.9372	0.19	Q	|	|	|	V |
19+30	0.9385	0.19	Q	|	|	|	V |
19+35	0.9396	0.16	Q	|	|	|	V |
19+40	0.9406	0.14	Q	|	|	|	V |
19+45	0.9415	0.14	Q	|	|	|	V |
19+50	0.9423	0.11	Q	|	|	|	V |
19+55	0.9429	0.09	Q	|	|	|	V |
20+ 0	0.9436	0.09	Q	|	|	|	V |
20+ 5	0.9445	0.13	Q	|	|	|	V |
20+10	0.9454	0.14	Q	|	|	|	V |
20+15	0.9464	0.14	Q	|	|	|	V |
20+20	0.9474	0.14	Q	|	|	|	V |
20+25	0.9483	0.14	Q	|	|	|	V |
20+30	0.9493	0.14	Q	|	|	|	V |
20+35	0.9503	0.14	Q	|	|	|	V |
20+40	0.9513	0.14	Q	|	|	|	V |
20+45	0.9522	0.14	Q	|	|	|	V |
20+50	0.9530	0.11	Q	|	|	|	V |
20+55	0.9536	0.09	Q	|	|	|	V |
21+ 0	0.9543	0.09	Q	|	|	|	V |
21+ 5	0.9551	0.13	Q	|	|	|	V |
21+10	0.9561	0.14	Q	|	|	|	V |
21+15	0.9571	0.14	Q	|	|	|	V|
21+20	0.9578	0.11	Q	|	|	|	V|
21+25	0.9585	0.09	Q	|	|	|	V|
21+30	0.9591	0.09	Q	|	|	|	V|
21+35	0.9600	0.13	Q	|	|	|	V|
21+40	0.9610	0.14	Q	|	|	|	V|
21+45	0.9619	0.14	Q	|	|	|	V|
21+50	0.9627	0.11	Q	|	|	|	V|
21+55	0.9633	0.09	Q	|	|	|	V|
22+ 0	0.9640	0.09	Q	|	|	|	V|
22+ 5	0.9648	0.13	Q	|	|	|	V|
22+10	0.9658	0.14	Q	|	|	|	V|
22+15	0.9668	0.14	Q	|	|	|	V|

22+20	0.9675	0.11	Q	|	|	|	V|
22+25	0.9682	0.09	Q	|	|	|	V|
22+30	0.9688	0.09	Q	|	|	|	V|
22+35	0.9695	0.09	Q	|	|	|	V|
22+40	0.9701	0.09	Q	|	|	|	V|
22+45	0.9708	0.09	Q	|	|	|	V|
22+50	0.9714	0.09	Q	|	|	|	V|
22+55	0.9721	0.09	Q	|	|	|	V|
23+ 0	0.9727	0.09	Q	|	|	|	V|
23+ 5	0.9734	0.09	Q	|	|	|	V|
23+10	0.9740	0.09	Q	|	|	|	V|
23+15	0.9747	0.09	Q	|	|	|	V|
23+20	0.9753	0.09	Q	|	|	|	V|
23+25	0.9759	0.09	Q	|	|	|	V|
23+30	0.9766	0.09	Q	|	|	|	V|
23+35	0.9772	0.09	Q	|	|	|	V|
23+40	0.9779	0.09	Q	|	|	|	V|
23+45	0.9785	0.09	Q	|	|	|	V|
23+50	0.9792	0.09	Q	|	|	|	V|
23+55	0.9798	0.09	Q	|	|	|	V|
24+ 0	0.9805	0.09	Q	|	|	|	V|
24+ 5	0.9807	0.03	Q	|	|	|	V

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

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Study date 10/10/23 File: X100UH6100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 3.60(Ac.) = 0.006 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 3.60(Ac.) = 0.006 Sq. Mi.
Length along longest watercourse = 656.00(Ft.)
Length along longest watercourse measured to centroid = 308.00(Ft.)
Length along longest watercourse = 0.124 Mi.
Length along longest watercourse measured to centroid = 0.058 Mi.
Difference in elevation = 10.70(Ft.)
Slope along watercourse = 86.1220 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.032 Hr.
Lag time = 1.90 Min.
25% of lag time = 0.47 Min.
40% of lag time = 0.76 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.60	1.20	4.32

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.60	2.50	9.00

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
3.600	56.00	0.900

Total Area Entered = 3.60(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
56.0	56.0	0.511	0.900	0.097	1.000	0.097
					Sum (F) =	0.097

Area averaged mean soil loss (F) (In/Hr) = 0.097
Minimum soil loss rate ((In/Hr)) = 0.049
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	263.256	52.567	1.907
2	0.167	526.512	39.246	1.424
3	0.250	789.768	6.607	0.240
4	0.333	1053.024	1.580	0.057
			Sum = 100.000	Sum= 3.628

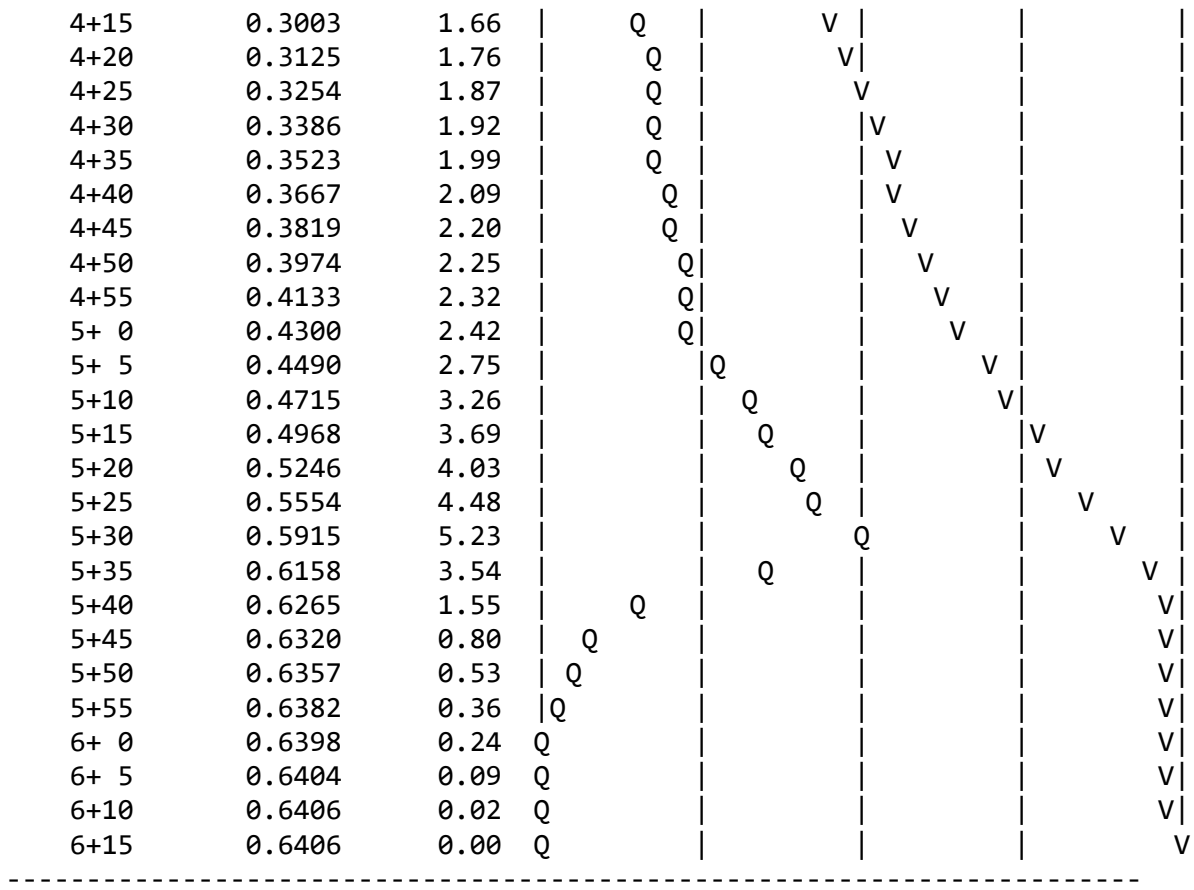
The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.50	0.150	(0.097)	0.027	0.123
2	0.17	0.60	0.180	(0.097)	0.032	0.148
3	0.25	0.60	0.180	(0.097)	0.032	0.148
4	0.33	0.60	0.180	(0.097)	0.032	0.148
5	0.42	0.60	0.180	(0.097)	0.032	0.148
6	0.50	0.70	0.210	(0.097)	0.038	0.172
7	0.58	0.70	0.210	(0.097)	0.038	0.172
8	0.67	0.70	0.210	(0.097)	0.038	0.172
9	0.75	0.70	0.210	(0.097)	0.038	0.172
10	0.83	0.70	0.210	(0.097)	0.038	0.172
11	0.92	0.70	0.210	(0.097)	0.038	0.172
12	1.00	0.80	0.240	(0.097)	0.043	0.197
13	1.08	0.80	0.240	(0.097)	0.043	0.197
14	1.17	0.80	0.240	(0.097)	0.043	0.197
15	1.25	0.80	0.240	(0.097)	0.043	0.197
16	1.33	0.80	0.240	(0.097)	0.043	0.197
17	1.42	0.80	0.240	(0.097)	0.043	0.197
18	1.50	0.80	0.240	(0.097)	0.043	0.197
19	1.58	0.80	0.240	(0.097)	0.043	0.197
20	1.67	0.80	0.240	(0.097)	0.043	0.197
21	1.75	0.80	0.240	(0.097)	0.043	0.197
22	1.83	0.80	0.240	(0.097)	0.043	0.197
23	1.92	0.80	0.240	(0.097)	0.043	0.197
24	2.00	0.90	0.270	(0.097)	0.049	0.221
25	2.08	0.80	0.240	(0.097)	0.043	0.197
26	2.17	0.90	0.270	(0.097)	0.049	0.221
27	2.25	0.90	0.270	(0.097)	0.049	0.221
28	2.33	0.90	0.270	(0.097)	0.049	0.221
29	2.42	0.90	0.270	(0.097)	0.049	0.221
30	2.50	0.90	0.270	(0.097)	0.049	0.221
31	2.58	0.90	0.270	(0.097)	0.049	0.221
32	2.67	0.90	0.270	(0.097)	0.049	0.221
33	2.75	1.00	0.300	(0.097)	0.054	0.246
34	2.83	1.00	0.300	(0.097)	0.054	0.246
35	2.92	1.00	0.300	(0.097)	0.054	0.246
36	3.00	1.00	0.300	(0.097)	0.054	0.246
37	3.08	1.00	0.300	(0.097)	0.054	0.246
38	3.17	1.10	0.330	(0.097)	0.059	0.271
39	3.25	1.10	0.330	(0.097)	0.059	0.271
40	3.33	1.10	0.330	(0.097)	0.059	0.271
41	3.42	1.20	0.360	(0.097)	0.065	0.295
42	3.50	1.30	0.390	(0.097)	0.070	0.320
43	3.58	1.40	0.420	(0.097)	0.076	0.344

```
44   3.67     1.40      0.420       (  0.097)       0.076        0.344
45   3.75     1.50      0.450       (  0.097)       0.081        0.369
46   3.83     1.50      0.450       (  0.097)       0.081        0.369
47   3.92     1.60      0.480       (  0.097)       0.086        0.394
48   4.00     1.60      0.480       (  0.097)       0.086        0.394
49   4.08     1.70      0.510       (  0.097)       0.092        0.418
50   4.17     1.80      0.540          0.097    (  0.097)       0.443
51   4.25     1.90      0.570          0.097    (  0.103)       0.473
52   4.33     2.00      0.600          0.097    (  0.108)       0.503
53   4.42     2.10      0.630          0.097    (  0.113)       0.533
54   4.50     2.10      0.630          0.097    (  0.113)       0.533
55   4.58     2.20      0.660          0.097    (  0.119)       0.563
56   4.67     2.30      0.690          0.097    (  0.124)       0.593
57   4.75     2.40      0.720          0.097    (  0.130)       0.623
58   4.83     2.40      0.720          0.097    (  0.130)       0.623
59   4.92     2.50      0.750          0.097    (  0.135)       0.653
60   5.00     2.60      0.780          0.097    (  0.140)       0.683
61   5.08     3.10      0.930          0.097    (  0.167)       0.833
62   5.17     3.60      1.080          0.097    (  0.194)       0.983
63   5.25     3.90      1.170          0.097    (  0.211)       1.073
64   5.33     4.20      1.260          0.097    (  0.227)       1.163
65   5.42     4.70      1.410          0.097    (  0.254)       1.313
66   5.50     5.60      1.680          0.097    (  0.302)       1.583
67   5.58     1.90      0.570          0.097    (  0.103)       0.473
68   5.67     0.90      0.270       (  0.097)       0.049        0.221
69   5.75     0.60      0.180       (  0.097)       0.032        0.148
70   5.83     0.50      0.150       (  0.097)       0.027        0.123
71   5.92     0.30      0.090       (  0.097)       0.016        0.074
72   6.00     0.20      0.060       (  0.097)       0.011        0.049
               (Loss Rate Not Used)
   Sum =     100.0                                    Sum =    25.6
      Flood volume = Effective rainfall      2.14(In)
       times area       3.6(Ac.)/[(In)/(Ft.)] =       0.6(Ac.Ft)
      Total soil loss =      0.36(In)
      Total soil loss =     0.109(Ac.Ft)
      Total rainfall =      2.50(In)
      Flood volume =       27903.4 Cubic Feet
      Total soil loss =        4766.2 Cubic Feet
      ---------------------------------------------------------------
       Peak flow rate of this hydrograph =      5.231(CFS)
      ---------------------------------------------------------------
      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          6 - 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        2.5       5.0       7.5      10.0
-------------------------------------------------------------------
```

```
0+ 5       0.0016      0.23  Q         |         |         |         |
0+10       0.0048      0.46  VQ        |         |         |         |
0+15       0.0084      0.52  V Q       |         |         |         |
0+20       0.0120      0.53  V Q       |         |         |         |
0+25       0.0157      0.54  V Q       |         |         |         |
0+30       0.0197      0.58  |VQ       |         |         |         |
0+35       0.0240      0.62  |VQ       |         |         |         |
0+40       0.0283      0.62  |VQ       |         |         |         |
0+45       0.0326      0.63  | Q       |         |         |         |
0+50       0.0369      0.63  | Q       |         |         |         |
0+55       0.0412      0.63  | Q       |         |         |         |
1+ 0       0.0458      0.67  | Q       |         |         |         |
1+ 5       0.0507      0.71  | QV      |         |         |         |
1+10       0.0556      0.71  | QV      |         |         |         |
1+15       0.0605      0.71  | QV      |         |         |         |
1+20       0.0654      0.71  | Q V     |         |         |         |
1+25       0.0704      0.71  | Q V     |         |         |         |
1+30       0.0753      0.71  | Q V     |         |         |         |
1+35       0.0802      0.71  | Q  V    |         |         |         |
1+40       0.0851      0.71  | Q  V    |         |         |         |
1+45       0.0900      0.71  | Q  V    |         |         |         |
1+50       0.0950      0.71  | Q  V    |         |         |         |
1+55       0.0999      0.71  | Q   V   |         |         |         |
2+ 0       0.1051      0.76  |  Q  V   |         |         |         |
2+ 5       0.1103      0.75  | Q   V   |         |         |         |
2+10       0.1156      0.77  |  Q   V  |         |         |         |
2+15       0.1211      0.80  |  Q   V  |         |         |         |
2+20       0.1266      0.80  |  Q   V  |         |         |         |
2+25       0.1321      0.80  |  Q    V |         |         |         |
2+30       0.1377      0.80  |  Q    V |         |         |         |
2+35       0.1432      0.80  |  Q    V |         |         |         |
2+40       0.1487      0.80  |  Q     V|         |         |         |
2+45       0.1546      0.85  |  Q     V|         |         |         |
2+50       0.1607      0.89  |  Q      V         |         |         |
2+55       0.1668      0.89  |  Q      V         |         |         |
3+ 0       0.1730      0.89  |  Q      V         |         |         |
3+ 5       0.1791      0.89  |  Q      |V        |         |         |
3+10       0.1856      0.94  |  Q      |V        |         |         |
3+15       0.1923      0.97  |  Q      | V       |         |         |
3+20       0.1991      0.98  |  Q      | V       |         |         |
3+25       0.2062      1.03  |   Q     | V       |         |         |
3+30       0.2138      1.11  |   Q     |  V      |         |         |
3+35       0.2221      1.20  |   Q     |  V      |         |         |
3+40       0.2306      1.24  |   Q     |   V     |         |         |
3+45       0.2396      1.30  |    Q    |   V     |         |         |
3+50       0.2487      1.33  |    Q    |    V    |         |         |
3+55       0.2583      1.38  |    Q    |     V   |         |         |
4+ 0       0.2681      1.42  |    Q    |     V   |         |         |
4+ 5       0.2782      1.47  |    Q    |      V  |         |         |
4+10       0.2889      1.56  |     Q   |       V |         |         |
```


4+15 0.3003 1.66
4+20 0.3125 1.76
4+25 0.3254 1.87
4+30 0.3386 1.92
4+35 0.3523 1.99
4+40 0.3667 2.09
4+45 0.3819 2.20
4+50 0.3974 2.25
4+55 0.4133 2.32
5+ 0 0.4300 2.42
5+ 5 0.4490 2.75
5+10 0.4715 3.26
5+15 0.4968 3.69
5+20 0.5246 4.03
5+25 0.5554 4.48
5+30 0.5915 5.23
5+35 0.6158 3.54
5+40 0.6265 1.55
5+45 0.6320 0.80
5+50 0.6357 0.53
5+55 0.6382 0.36
6+ 0 0.6398 0.24
6+ 5 0.6404 0.09
6+10 0.6406 0.02
6+15 0.6406 0.00

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 10/06/23 File: 100puh6100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100-YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 3.60(Ac.) = 0.006 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 3.60(Ac.) = 0.006 Sq. Mi.
Length along longest watercourse = 761.00(Ft.)
Length along longest watercourse measured to centroid = 201.00(Ft.)
Length along longest watercourse = 0.144 Mi.
Length along longest watercourse measured to centroid = 0.038 Mi.
Difference in elevation = 19.20(Ft.)
Slope along watercourse = 133.2142 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.020 Hr.
Lag time = 1.18 Min.
25% of lag time = 0.29 Min.
40% of lag time = 0.47 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.60	1.20	4.32

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.60	2.50	9.00

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
3.600	50.00	0.684

Total Area Entered = 3.60(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
50.0	50.0	0.572	0.684	0.220	1.000	0.220
					Sum (F) =	0.220

Area averaged mean soil loss (F) (In/Hr) = 0.220
Minimum soil loss rate ((In/Hr)) = 0.110
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.353

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	423.879	66.662	2.419
2	0.167	847.758	33.338	1.210
		Sum = 100.000	Sum=	3.628

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.50	0.150	(0.220)	0.053	0.097
2	0.17	0.60	0.180	(0.220)	0.064	0.116
3	0.25	0.60	0.180	(0.220)	0.064	0.116
4	0.33	0.60	0.180	(0.220)	0.064	0.116
5	0.42	0.60	0.180	(0.220)	0.064	0.116
6	0.50	0.70	0.210	(0.220)	0.074	0.136
7	0.58	0.70	0.210	(0.220)	0.074	0.136
8	0.67	0.70	0.210	(0.220)	0.074	0.136
9	0.75	0.70	0.210	(0.220)	0.074	0.136
10	0.83	0.70	0.210	(0.220)	0.074	0.136
11	0.92	0.70	0.210	(0.220)	0.074	0.136
12	1.00	0.80	0.240	(0.220)	0.085	0.155
13	1.08	0.80	0.240	(0.220)	0.085	0.155
14	1.17	0.80	0.240	(0.220)	0.085	0.155
15	1.25	0.80	0.240	(0.220)	0.085	0.155
16	1.33	0.80	0.240	(0.220)	0.085	0.155
17	1.42	0.80	0.240	(0.220)	0.085	0.155
18	1.50	0.80	0.240	(0.220)	0.085	0.155
19	1.58	0.80	0.240	(0.220)	0.085	0.155
20	1.67	0.80	0.240	(0.220)	0.085	0.155
21	1.75	0.80	0.240	(0.220)	0.085	0.155
22	1.83	0.80	0.240	(0.220)	0.085	0.155
23	1.92	0.80	0.240	(0.220)	0.085	0.155
24	2.00	0.90	0.270	(0.220)	0.095	0.175
25	2.08	0.80	0.240	(0.220)	0.085	0.155
26	2.17	0.90	0.270	(0.220)	0.095	0.175
27	2.25	0.90	0.270	(0.220)	0.095	0.175
28	2.33	0.90	0.270	(0.220)	0.095	0.175
29	2.42	0.90	0.270	(0.220)	0.095	0.175
30	2.50	0.90	0.270	(0.220)	0.095	0.175
31	2.58	0.90	0.270	(0.220)	0.095	0.175
32	2.67	0.90	0.270	(0.220)	0.095	0.175
33	2.75	1.00	0.300	(0.220)	0.106	0.194
34	2.83	1.00	0.300	(0.220)	0.106	0.194
35	2.92	1.00	0.300	(0.220)	0.106	0.194
36	3.00	1.00	0.300	(0.220)	0.106	0.194
37	3.08	1.00	0.300	(0.220)	0.106	0.194
38	3.17	1.10	0.330	(0.220)	0.116	0.214
39	3.25	1.10	0.330	(0.220)	0.116	0.214
40	3.33	1.10	0.330	(0.220)	0.116	0.214
41	3.42	1.20	0.360	(0.220)	0.127	0.233
42	3.50	1.30	0.390	(0.220)	0.138	0.252
43	3.58	1.40	0.420	(0.220)	0.148	0.272
44	3.67	1.40	0.420	(0.220)	0.148	0.272
45	3.75	1.50	0.450	(0.220)	0.159	0.291

```
46   3.83     1.50      0.450       (  0.220)       0.159        0.291
47   3.92     1.60      0.480       (  0.220)       0.169        0.311
48   4.00     1.60      0.480       (  0.220)       0.169        0.311
49   4.08     1.70      0.510       (  0.220)       0.180        0.330
50   4.17     1.80      0.540       (  0.220)       0.191        0.349
51   4.25     1.90      0.570       (  0.220)       0.201        0.369
52   4.33     2.00      0.600       (  0.220)       0.212        0.388
53   4.42     2.10      0.630          0.220    (  0.222)       0.410
54   4.50     2.10      0.630          0.220    (  0.222)       0.410
55   4.58     2.20      0.660          0.220    (  0.233)       0.440
56   4.67     2.30      0.690          0.220    (  0.244)       0.470
57   4.75     2.40      0.720          0.220    (  0.254)       0.500
58   4.83     2.40      0.720          0.220    (  0.254)       0.500
59   4.92     2.50      0.750          0.220    (  0.265)       0.530
60   5.00     2.60      0.780          0.220    (  0.275)       0.560
61   5.08     3.10      0.930          0.220    (  0.328)       0.710
62   5.17     3.60      1.080          0.220    (  0.381)       0.860
63   5.25     3.90      1.170          0.220    (  0.413)       0.950
64   5.33     4.20      1.260          0.220    (  0.445)       1.040
65   5.42     4.70      1.410          0.220    (  0.498)       1.190
66   5.50     5.60      1.680          0.220    (  0.593)       1.460
67   5.58     1.90      0.570       (  0.220)       0.201        0.369
68   5.67     0.90      0.270       (  0.220)       0.095        0.175
69   5.75     0.60      0.180       (  0.220)       0.064        0.116
70   5.83     0.50      0.150       (  0.220)       0.053        0.097
71   5.92     0.30      0.090       (  0.220)       0.032        0.058
72   6.00     0.20      0.060       (  0.220)       0.021        0.039
               (Loss Rate Not Used)
   Sum =     100.0                                   Sum =    21.0
      Flood volume = Effective rainfall      1.75(In)
       times area       3.6(Ac.)/[(In)/(Ft.)] =       0.5(Ac.Ft)
      Total soil loss =      0.75(In)
      Total soil loss =     0.226(Ac.Ft)
      Total rainfall =      2.50(In)
      Flood volume =       22824.6 Cubic Feet
      Total soil loss =        9845.0 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =      4.973(CFS)
      ---------------------------------------------------------------------
      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          6 - 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        2.5       5.0       7.5      10.0
-------------------------------------------------------------------------
  0+ 5       0.0016      0.23  Q         |         |         |         |
  0+10       0.0044      0.40  VQ        |         |         |         |
```

```
0+15       0.0073      0.42  VQ        |         |         |         |
0+20       0.0102      0.42  VQ        |         |         |         |
0+25       0.0131      0.42  |Q        |         |         |         |
0+30       0.0163      0.47  |Q        |         |         |         |
0+35       0.0197      0.49  |Q        |         |         |         |
0+40       0.0231      0.49  |Q        |         |         |         |
0+45       0.0265      0.49  |QV       |         |         |         |
0+50       0.0299      0.49  |QV       |         |         |         |
0+55       0.0333      0.49  |QV       |         |         |         |
1+ 0       0.0370      0.54  | Q       |         |         |         |
1+ 5       0.0409      0.56  | QV      |         |         |         |
1+10       0.0448      0.56  | QV      |         |         |         |
1+15       0.0487      0.56  | QV      |         |         |         |
1+20       0.0526      0.56  | Q V     |         |         |         |
1+25       0.0564      0.56  | Q V     |         |         |         |
1+30       0.0603      0.56  | Q V     |         |         |         |
1+35       0.0642      0.56  | Q V     |         |         |         |
1+40       0.0681      0.56  | Q  V    |         |         |         |
1+45       0.0720      0.56  | Q  V    |         |         |         |
1+50       0.0759      0.56  | Q  V    |         |         |         |
1+55       0.0797      0.56  | Q   V   |         |         |         |
2+ 0       0.0839      0.61  | Q   V   |         |         |         |
2+ 5       0.0880      0.59  | Q   V   |         |         |         |
2+10       0.0922      0.61  | Q    V  |         |         |         |
2+15       0.0966      0.63  | Q    V  |         |         |         |
2+20       0.1009      0.63  | Q    V  |         |         |         |
2+25       0.1053      0.63  | Q     V |         |         |         |
2+30       0.1097      0.63  | Q     V |         |         |         |
2+35       0.1140      0.63  | Q     V |         |         |         |
2+40       0.1184      0.63  | Q      V|         |         |         |
2+45       0.1231      0.68  | Q      V|         |         |         |
2+50       0.1279      0.70  | Q      V|         |         |         |
2+55       0.1328      0.70  | Q       V         |         |         |
3+ 0       0.1376      0.70  | Q       V         |         |         |
3+ 5       0.1425      0.70  | Q       V         |         |         |
3+10       0.1477      0.75  |  Q      |V        |         |         |
3+15       0.1530      0.78  |  Q      |V        |         |         |
3+20       0.1584      0.78  |  Q      | V       |         |         |
3+25       0.1640      0.82  |  Q      | V       |         |         |
3+30       0.1702      0.89  |  Q      | V       |         |         |
3+35       0.1768      0.96  |  Q      |  V      |         |         |
3+40       0.1836      0.99  |  Q      |   V     |         |         |
3+45       0.1907      1.03  |   Q     |   V     |         |         |
3+50       0.1980      1.06  |   Q     |    V    |         |         |
3+55       0.2056      1.10  |   Q     |    V    |         |         |
4+ 0       0.2133      1.13  |   Q     |     V   |         |         |
4+ 5       0.2214      1.17  |   Q     |     V   |         |         |
4+10       0.2300      1.24  |   Q     |      V  |         |         |
4+15       0.2391      1.32  |    Q    |       V |         |         |
4+20       0.2486      1.39  |    Q    |       V |         |         |
```

4+25	0.2587	1.46	| Q |	| V|	|	|
4+30	0.2689	1.49	| Q |	| V	|	|
4+35	0.2797	1.56	| Q |	| |V	|	|
4+40	0.2912	1.67	| Q |	| | V	|	|
4+45	0.3034	1.78	| Q |	| | V	|	|
4+50	0.3159	1.82	| Q |	| | V	|	|
4+55	0.3289	1.89	| Q |	| | V	|	|
5+ 0	0.3427	2.00	| Q |	| | V	|	|
5+ 5	0.3592	2.40	| Q|	| | V	|	|
5+10	0.3795	2.94	| |Q	| | V	|	|
5+15	0.4025	3.34	| | Q	| | V	|	|
5+20	0.4277	3.67	| | Q	| | V	|	|
5+25	0.4562	4.14	| | Q	| | V	|	|
5+30	0.4905	4.97	| | Q|	| | V	|	|
5+35	0.5088	2.66	| Q |	| | V	|	|
5+40	0.5148	0.87	| Q |	| | V	|	|
5+45	0.5182	0.49	|Q |	| | V	|	|
5+50	0.5207	0.38	|Q |	| | V	|	|
5+55	0.5225	0.26	|Q |	| | V	|	|
6+ 0	0.5237	0.16	Q |	| | V	|	|
6+ 5	0.5240	0.05	Q |	| | V	|	|

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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 3.60(Ac.) = 0.006 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 3.60(Ac.) = 0.006 Sq. Mi.
Length along longest watercourse = 656.00(Ft.)
Length along longest watercourse measured to centroid = 308.00(Ft.)
Length along longest watercourse = 0.124 Mi.
Length along longest watercourse measured to centroid = 0.058 Mi.
Difference in elevation = 10.70(Ft.)
Slope along watercourse = 86.1220 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.032 Hr.
Lag time = 1.90 Min.
25% of lag time = 0.47 Min.
40% of lag time = 0.76 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.60	0.80	2.88

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.60	2.00	7.20

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 2.000(In)

Point rain (area averaged) = 2.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
3.600	56.00	0.900

Total Area Entered = 3.60(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
56.0	56.0	0.511	0.900	0.097	1.000	0.097
					Sum (F) =	0.097

Area averaged mean soil loss (F) (In/Hr) = 0.097
Minimum soil loss rate ((In/Hr)) = 0.049
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	263.256	52.567	1.907
2	0.167	526.512	39.246	1.424
3	0.250	789.768	6.607	0.240
4	0.333	1053.024	1.580	0.057
			Sum = 100.000	Sum= 3.628

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.312	(0.097)	0.056	0.256
2	0.17	1.30	0.312	(0.097)	0.056	0.256
3	0.25	1.10	0.264	(0.097)	0.048	0.216
4	0.33	1.50	0.360	(0.097)	0.065	0.295
5	0.42	1.50	0.360	(0.097)	0.065	0.295
6	0.50	1.80	0.432	(0.097)	0.078	0.354
7	0.58	1.50	0.360	(0.097)	0.065	0.295
8	0.67	1.80	0.432	(0.097)	0.078	0.354
9	0.75	1.80	0.432	(0.097)	0.078	0.354
10	0.83	1.50	0.360	(0.097)	0.065	0.295
11	0.92	1.60	0.384	(0.097)	0.069	0.315
12	1.00	1.80	0.432	(0.097)	0.078	0.354
13	1.08	2.20	0.528	(0.097)	0.095	0.433
14	1.17	2.20	0.528	(0.097)	0.095	0.433
15	1.25	2.20	0.528	(0.097)	0.095	0.433
16	1.33	2.00	0.480	(0.097)	0.086	0.394
17	1.42	2.60	0.624	0.097	(0.112)	0.527
18	1.50	2.70	0.648	0.097	(0.117)	0.551
19	1.58	2.40	0.576	0.097	(0.104)	0.479
20	1.67	2.70	0.648	0.097	(0.117)	0.551
21	1.75	3.30	0.792	0.097	(0.143)	0.695
22	1.83	3.10	0.744	0.097	(0.134)	0.647
23	1.92	2.90	0.696	0.097	(0.125)	0.599
24	2.00	3.00	0.720	0.097	(0.130)	0.623
25	2.08	3.10	0.744	0.097	(0.134)	0.647
26	2.17	4.20	1.008	0.097	(0.181)	0.911
27	2.25	5.00	1.200	0.097	(0.216)	1.103
28	2.33	3.50	0.840	0.097	(0.151)	0.743
29	2.42	6.80	1.632	0.097	(0.294)	1.535
30	2.50	7.30	1.752	0.097	(0.315)	1.655
31	2.58	8.20	1.968	0.097	(0.354)	1.871
32	2.67	5.90	1.416	0.097	(0.255)	1.319
33	2.75	2.00	0.480	(0.097)	0.086	0.394
34	2.83	1.80	0.432	(0.097)	0.078	0.354
35	2.92	1.80	0.432	(0.097)	0.078	0.354
36	3.00	0.60	0.144	(0.097)	0.026	0.118
		(Loss Rate Not Used)				
	Sum =	100.0			Sum =	21.0

Flood volume = Effective rainfall 1.75(In)
times area 3.6(Ac.)/[(In)/(Ft.)] = 0.5(Ac.Ft)
Total soil loss = 0.25(In)
Total soil loss = 0.075(Ac.Ft)
Total rainfall = 2.00(In)

Flood volume = 22878.0 Cubic Feet
Total soil loss = 3257.6 Cubic Feet

Peak flow rate of this hydrograph = 6.338(CFS)

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3 - 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 2.5 5.0 7.5 10.0
0+ 5	0.0034	0.49	VQ
0+10	0.0092	0.85	V Q
0+15	0.0150	0.84	V Q
0+20	0.0215	0.95	V Q
0+25	0.0288	1.05	V Q
0+30	0.0369	1.18	V Q
0+35	0.0449	1.16	VQ
0+40	0.0531	1.20	Q
0+45	0.0619	1.27	VQ
0+50	0.0699	1.17	QV
0+55	0.0777	1.13	QV
1+ 0	0.0861	1.22	Q V
1+ 5	0.0959	1.42	Q V
1+10	0.1065	1.55	Q V
1+15	0.1173	1.57	Q V
1+20	0.1276	1.50	Q V
1+25	0.1393	1.69	Q V
1+30	0.1525	1.92	Q V
1+35	0.1652	1.85	Q V
1+40	0.1783	1.90	Q V
1+45	0.1938	2.26	Q V
1+50	0.2103	2.38	Q V
1+55	0.2258	2.26	Q V
2+ 0	0.2412	2.24	Q V
2+ 5	0.2571	2.30	Q V
2+10	0.2767	2.84	Q V
2+15	0.3014	3.59	Q V
2+20	0.3238	3.24	Q V
2+25	0.3534	4.30	Q V
2+30	0.3919	5.59	Q V
2+35	0.4356	6.34	Q V
2+40	0.4746	5.67	Q V
2+45	0.4964	3.17	Q V
2+50	0.5079	1.66	Q V
2+55	0.5172	1.35	Q V
3+ 0	0.5229	0.84	Q V

```
    3+ 5       0.5248      0.27  |Q        |         |         |        V|
    3+10       0.5252      0.05  Q         |         |         |        V|
    3+15       0.5252      0.01  Q         |         |         |        V|
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U n i t H y d r o g r a p h A n a l y s i s

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100-YEAR, 3 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 3.60(Ac.) = 0.006 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 3.60(Ac.) = 0.006 Sq. Mi.
Length along longest watercourse = 761.00(Ft.)
Length along longest watercourse measured to centroid = 201.00(Ft.)
Length along longest watercourse = 0.144 Mi.
Length along longest watercourse measured to centroid = 0.038 Mi.
Difference in elevation = 19.20(Ft.)
Slope along watercourse = 133.2142 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.020 Hr.
Lag time = 1.18 Min.
25% of lag time = 0.29 Min.
40% of lag time = 0.47 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.60	0.80	2.88

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.60	2.00	7.20

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 2.000(In)

Point rain (area averaged) = 2.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
3.600	50.00	0.684

Total Area Entered = 3.60(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
50.0	50.0	0.572	0.684	0.220	1.000	0.220
					Sum (F) =	0.220

Area averaged mean soil loss (F) (In/Hr) = 0.220
Minimum soil loss rate ((In/Hr)) = 0.110
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.353

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	423.879	66.662	2.419
2	0.167	847.758	33.338	1.210
		Sum = 100.000	Sum=	3.628

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.312	(0.220)	0.110	0.202
2	0.17	1.30	0.312	(0.220)	0.110	0.202
3	0.25	1.10	0.264	(0.220)	0.093	0.171
4	0.33	1.50	0.360	(0.220)	0.127	0.233
5	0.42	1.50	0.360	(0.220)	0.127	0.233
6	0.50	1.80	0.432	(0.220)	0.152	0.279
7	0.58	1.50	0.360	(0.220)	0.127	0.233
8	0.67	1.80	0.432	(0.220)	0.152	0.279
9	0.75	1.80	0.432	(0.220)	0.152	0.279
10	0.83	1.50	0.360	(0.220)	0.127	0.233
11	0.92	1.60	0.384	(0.220)	0.136	0.248
12	1.00	1.80	0.432	(0.220)	0.152	0.279
13	1.08	2.20	0.528	(0.220)	0.186	0.342
14	1.17	2.20	0.528	(0.220)	0.186	0.342
15	1.25	2.20	0.528	(0.220)	0.186	0.342
16	1.33	2.00	0.480	(0.220)	0.169	0.311
17	1.42	2.60	0.624	0.220	(0.220)	0.404
18	1.50	2.70	0.648	0.220	(0.229)	0.428
19	1.58	2.40	0.576	(0.220)	0.203	0.373
20	1.67	2.70	0.648	0.220	(0.229)	0.428
21	1.75	3.30	0.792	0.220	(0.280)	0.572
22	1.83	3.10	0.744	0.220	(0.263)	0.524
23	1.92	2.90	0.696	0.220	(0.246)	0.476
24	2.00	3.00	0.720	0.220	(0.254)	0.500
25	2.08	3.10	0.744	0.220	(0.263)	0.524
26	2.17	4.20	1.008	0.220	(0.356)	0.788
27	2.25	5.00	1.200	0.220	(0.424)	0.980
28	2.33	3.50	0.840	0.220	(0.297)	0.620
29	2.42	6.80	1.632	0.220	(0.576)	1.412
30	2.50	7.30	1.752	0.220	(0.618)	1.532
31	2.58	8.20	1.968	0.220	(0.695)	1.748
32	2.67	5.90	1.416	0.220	(0.500)	1.196
33	2.75	2.00	0.480	(0.220)	0.169	0.311
34	2.83	1.80	0.432	(0.220)	0.152	0.279
35	2.92	1.80	0.432	(0.220)	0.152	0.279
36	3.00	0.60	0.144	(0.220)	0.051	0.093
		(Loss Rate Not Used)				
Sum =		100.0			Sum =	17.7

Flood volume = Effective rainfall 1.47(In)
times area 3.6(Ac.)/[(In)/(Ft.)] = 0.4(Ac.Ft)
Total soil loss = 0.53(In)
Total soil loss = 0.158(Ac.Ft)
Total rainfall = 2.00(In)
Flood volume = 19250.3 Cubic Feet
Total soil loss = 6885.3 Cubic Feet

```
 Peak flow rate of this hydrograph =      6.084(CFS)
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                    3 - 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))
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Time(h+m)	Volume Ac.Ft	Q(CFS)	0 2.5 5.0 7.5 10.0
0+ 5	0.0034	0.49	VQ
0+10	0.0084	0.73	V Q
0+15	0.0129	0.66	|VQ
0+20	0.0182	0.77	|V Q
0+25	0.0241	0.85	| VQ
0+30	0.0307	0.96	| VQ
0+35	0.0369	0.90	| Q
0+40	0.0435	0.96	| Q
0+45	0.0505	1.01	| Q
0+50	0.0567	0.90	| Q V
0+55	0.0628	0.88	| Q V
1+ 0	0.0695	0.98	| Q V
1+ 5	0.0775	1.16	| Q V
1+10	0.0860	1.24	| Q V
1+15	0.0946	1.24	| Q V
1+20	0.1026	1.16	| Q V
1+25	0.1119	1.35	| Q V
1+30	0.1224	1.53	| Q |V
1+35	0.1322	1.42	| Q |V
1+40	0.1425	1.49	| Q | V
1+45	0.1556	1.90	| Q | V
1+50	0.1691	1.96	| Q | V
1+55	0.1814	1.79	| Q | V
2+ 0	0.1937	1.79	| Q | V
2+ 5	0.2066	1.87	| Q | V
2+10	0.2241	2.54	| Q V
2+15	0.2470	3.33	| | Q | V
2+20	0.2655	2.69	| Q | V
2+25	0.2942	4.17	| | Q | V
2+30	0.3315	5.42	| | |Q V
2+35	0.3734	6.08	| | | Q | V
2+40	0.4079	5.01	| | Q | V
2+45	0.4230	2.20	| Q | | V
2+50	0.4303	1.05	| Q | | V
2+55	0.4373	1.01	| Q | | V|
3+ 0	0.4411	0.56	| Q | | V|
3+ 5	0.4419	0.11	Q | | | V

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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 3.60(Ac.) = 0.006 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 3.60(Ac.) = 0.006 Sq. Mi.
Length along longest watercourse = 656.00(Ft.)
Length along longest watercourse measured to centroid = 308.00(Ft.)
Length along longest watercourse = 0.124 Mi.
Length along longest watercourse measured to centroid = 0.058 Mi.
Difference in elevation = 10.70(Ft.)
Slope along watercourse = 86.1220 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.032 Hr.
Lag time = 1.90 Min.
25% of lag time = 0.47 Min.
40% of lag time = 0.76 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.60	0.50	1.80

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.60	1.21	4.36

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.212(In)

Point rain (area averaged) = 1.212(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 1.212(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
3.600	56.00	0.900

Total Area Entered = 3.60(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
56.0	56.0	0.511	0.900	0.097	1.000	0.097
					Sum (F) =	0.097

Area averaged mean soil loss (F) (In/Hr) = 0.097
Minimum soil loss rate ((In/Hr)) = 0.049
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	263.256	52.567	1.907
2	0.167	526.512	39.246	1.424
3	0.250	789.768	6.607	0.240
4	0.333	1053.024	1.580	0.057

```
                                    Sum = 100.000   Sum=       3.628
-------------------------------------------------------------------------
```

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	4.20	0.611	0.097	(0.110)	0.514
2	0.17	4.30	0.625	0.097	(0.113)	0.528
3	0.25	5.00	0.727	0.097	(0.131)	0.630
4	0.33	5.00	0.727	0.097	(0.131)	0.630
5	0.42	5.80	0.844	0.097	(0.152)	0.746
6	0.50	6.50	0.945	0.097	(0.170)	0.848
7	0.58	7.40	1.076	0.097	(0.194)	0.979
8	0.67	8.60	1.251	0.097	(0.225)	1.154
9	0.75	12.30	1.789	0.097	(0.322)	1.692
10	0.83	29.10	4.232	0.097	(0.762)	4.135
11	0.92	6.80	0.989	0.097	(0.178)	0.892
12	1.00	5.00	0.727	0.097	(0.131)	0.630

(Loss Rate Not Used)

Sum = 100.0 Sum = 13.4

Flood volume = Effective rainfall 1.11(In)
times area 3.6(Ac.)/[(In)/(Ft.)] = 0.3(Ac.Ft)
Total soil loss = 0.10(In)
Total soil loss = 0.029(Ac.Ft)
Total rainfall = 1.21(In)
Flood volume = 14569.6 Cubic Feet
Total soil loss = 1268.3 Cubic Feet

Peak flow rate of this hydrograph = 10.634(CFS)

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1 - 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	5.0	10.0	15.0	20.0
0+ 5	0.0068	0.98	VQ				
0+10	0.0187	1.74	| VQ				
0+15	0.0330	2.08	| VQ				
0+20	0.0486	2.26	| QV				
0+25	0.0658	2.50	| Q V				
0+30	0.0856	2.87	| Q V				
0+35	0.1083	3.29	| Q | V				
0+40	0.1347	3.84	| Q | V				

```
    0+45       0.1702      5.16  |         Q         V         |         |
    0+50       0.2435     10.63  |         |         |Q       V|         |
    0+55       0.2990      8.06  |         |     Q   |         |    V    |
    1+ 0       0.3235      3.56  |      Q  |         |         |       V |
    1+ 5       0.3328      1.35  | Q       |         |         |        V|
    1+10       0.3342      0.20  Q         |         |         |        V|
    1+15       0.3345      0.04  Q         |         |         |         V
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U n i t H y d r o g r a p h A n a l y s i s

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100-YEAR, 1 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 3.60(Ac.) = 0.006 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 3.60(Ac.) = 0.006 Sq. Mi.
Length along longest watercourse = 761.00(Ft.)
Length along longest watercourse measured to centroid = 201.00(Ft.)
Length along longest watercourse = 0.144 Mi.
Length along longest watercourse measured to centroid = 0.038 Mi.
Difference in elevation = 19.20(Ft.)
Slope along watercourse = 133.2142 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.020 Hr.
Lag time = 1.18 Min.
25% of lag time = 0.29 Min.
40% of lag time = 0.47 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.60	0.50	1.80

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.60	1.20	4.32

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.200(In)

Point rain (area averaged) = 1.200(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 1.200(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
3.600	50.00	0.684

Total Area Entered = 3.60(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
50.0	50.0	0.572	0.684	0.220	1.000	0.220
					Sum (F) =	0.220

Area averaged mean soil loss (F) (In/Hr) = 0.220
Minimum soil loss rate ((In/Hr)) = 0.110
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.353

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	423.879	66.662	2.419
2	0.167	847.758	33.338	1.210
			Sum = 100.000 Sum=	3.628

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	4.20	0.605	(0.220)	0.213	0.391
2	0.17	4.30	0.619	(0.220)	0.219	0.401
3	0.25	5.00	0.720	0.220	(0.254)	0.500
4	0.33	5.00	0.720	0.220	(0.254)	0.500
5	0.42	5.80	0.835	0.220	(0.295)	0.615
6	0.50	6.50	0.936	0.220	(0.330)	0.716
7	0.58	7.40	1.066	0.220	(0.376)	0.846
8	0.67	8.60	1.238	0.220	(0.437)	1.018
9	0.75	12.30	1.771	0.220	(0.625)	1.551
10	0.83	29.10	4.190	0.220	(1.479)	3.970
11	0.92	6.80	0.979	0.220	(0.346)	0.759
12	1.00	5.00	0.720	0.220	(0.254)	0.500
		(Loss Rate Not Used)				
Sum =		100.0			Sum =	11.8

Flood volume = Effective rainfall 0.98(In)
times area 3.6(Ac.)/[(In)/(Ft.)] = 0.3(Ac.Ft)
Total soil loss = 0.22(In)
Total soil loss = 0.066(Ac.Ft)
Total rainfall = 1.20(In)
Flood volume = 12816.1 Cubic Feet
Total soil loss = 2865.0 Cubic Feet

Peak flow rate of this hydrograph = 11.485(CFS)

++

1 - 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	5.0	10.0	15.0	20.0
0+ 5	0.0065	0.95	VQ				
0+10	0.0165	1.44	| Q				
0+15	0.0281	1.69	| Q				
0+20	0.0406	1.82	| Q V				
0+25	0.0551	2.09	| Q V				
0+30	0.0721	2.48	| Q V				
0+35	0.0922	2.91	| Q | V				
0+40	0.1162	3.49	| Q | V				
0+45	0.1505	4.99	| Q| V				
0+50	0.2296	11.48	| | | Q |V				

```
    0+55       0.2754      6.64  |         |  Q      |         |      V  |
    1+ 0       0.2900      2.13  |   Q     |         |         |        V|
    1+ 5       0.2942      0.61  |Q        |         |         |         V
-------------------------------------------------------------------------
```

SECTION 3 - REFERENCE DATA

USGS SOILS REPORT

PLATE D-4.1

INFILTRATION REPORT (EXCERPT)

CONTECH UNDERGROUND CHAMBER SYSTEM

DCV CALCULATIONS (WQMP)

PP190005 – HARVILL DISTRIBUTION CENTER OFFSITE DRAINAGE IMPROVEMENTS (HYDROLOGY MAPS)

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Western Riverside Area, California

August 9, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Soil Qualities and Features.....15
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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:1,270 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 15 30 60 90

Feet
0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 15, Sep 6, 2022

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

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
PaA	Pachappa fine sandy loam, 0 to 2 percent slopes	3.6	100.0%
Totals for Area of Interest		**3.6**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Western Riverside Area, California

PaA—Pachappa fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hcxn
Elevation: 1,000 feet
Mean annual precipitation: 14 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 270 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Pachappa

Setting

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

Typical profile

H1 - 0 to 20 inches: fine sandy loam
H2 - 20 to 63 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

San emigdio

Percent of map unit: 5 percent
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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.

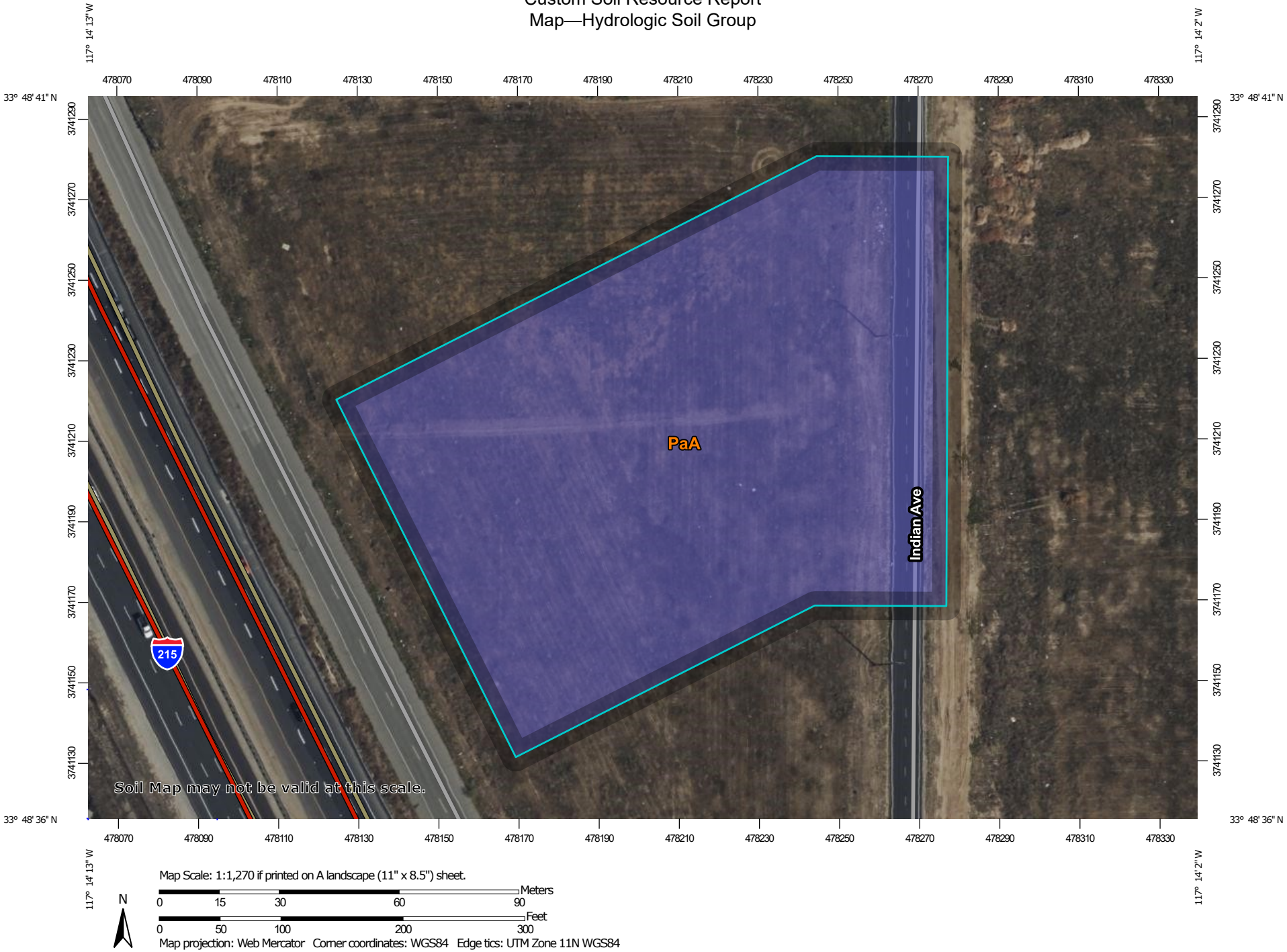
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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.

Custom Soil Resource Report
Map—Hydrologic Soil Group



Map Scale: 1:1,270 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 15 30 60 90

Feet
0 50 100 200 300

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 1:15,800.

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

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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)

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Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

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Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
PaA	Pachappa fine sandy loam, 0 to 2 percent slopes	B	3.6	100.0%
Totals for Area of Interest			**3.6**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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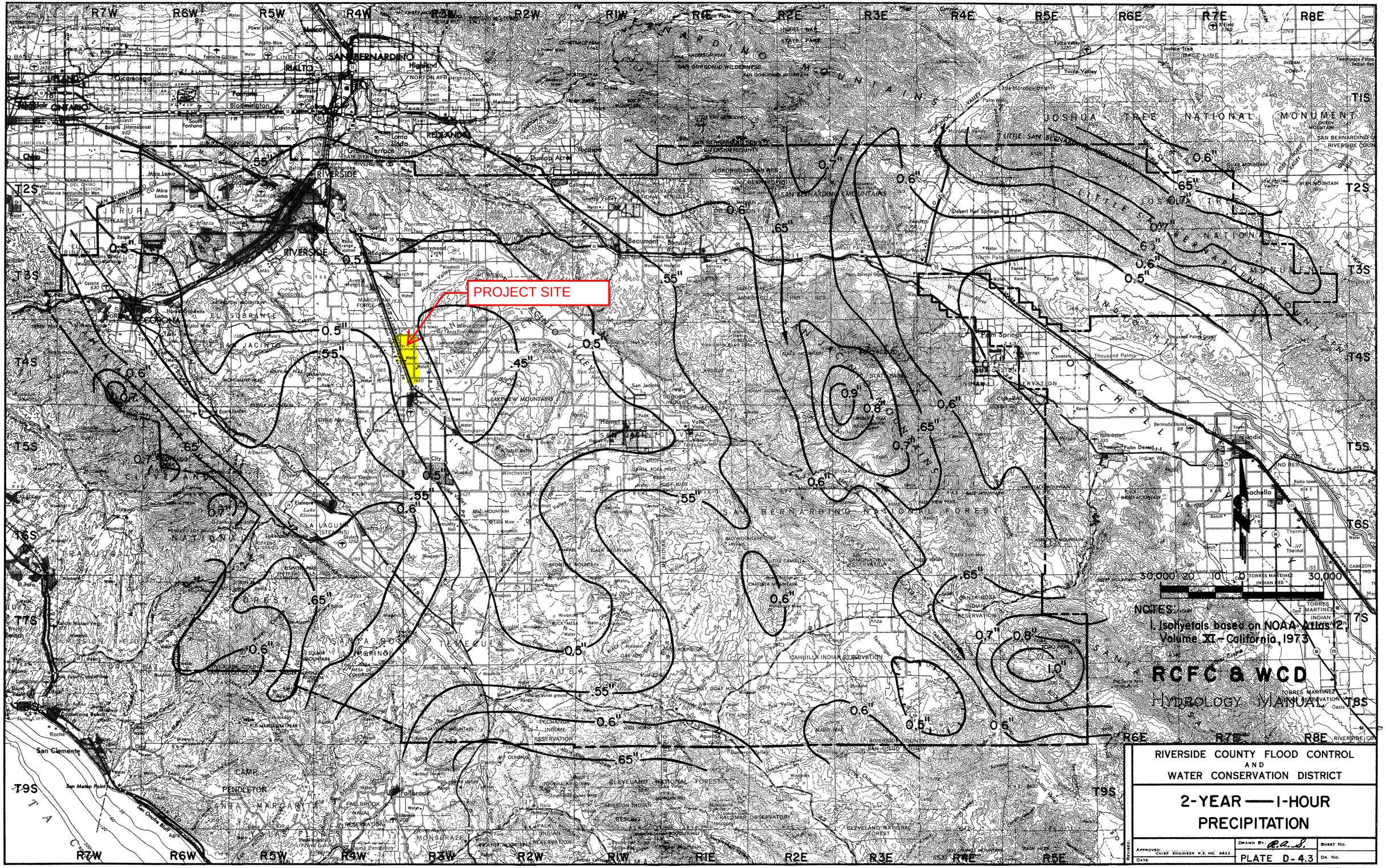
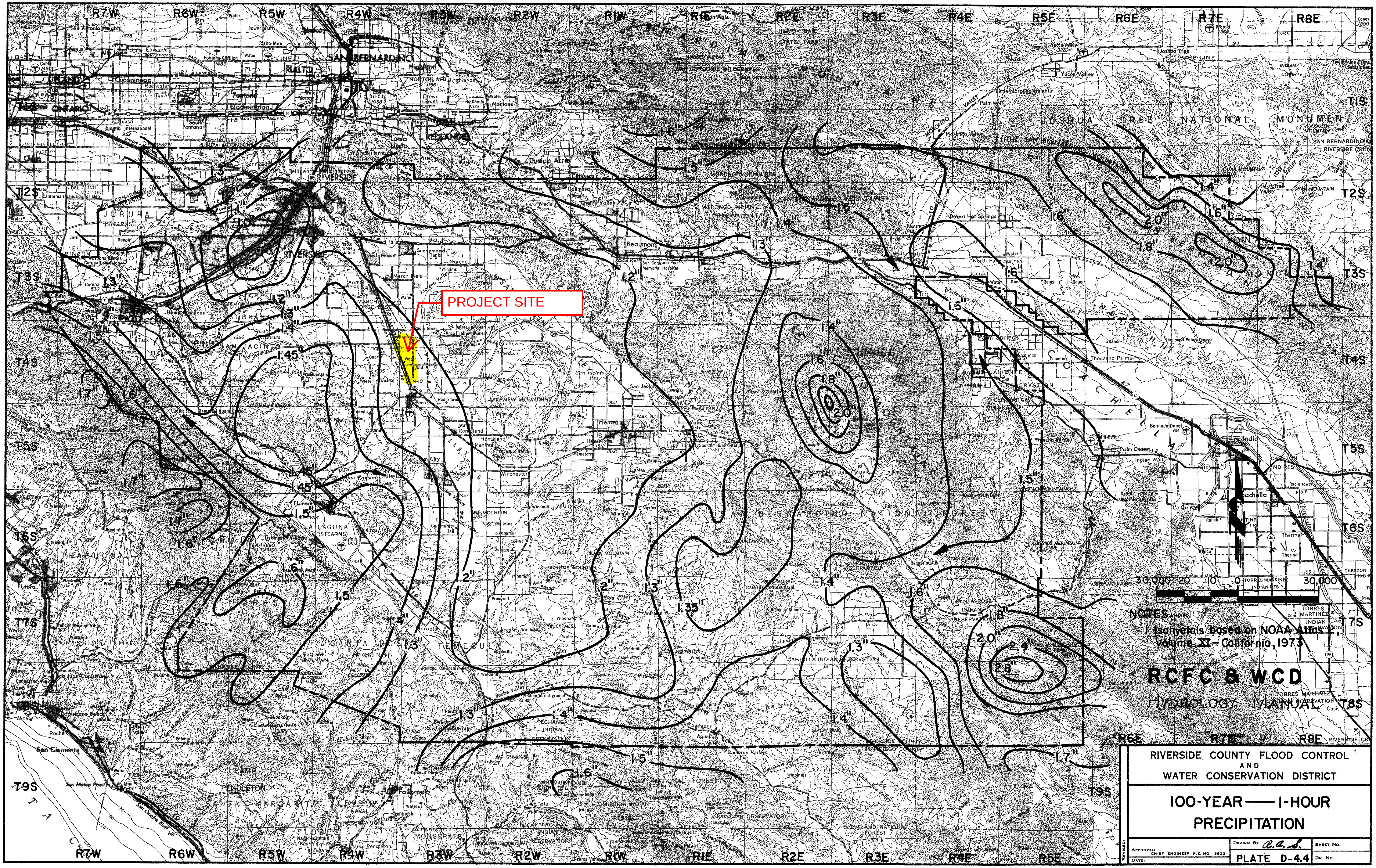
RAINFALL INTENSITY–INCHES PER HOUR

MIRA LOMA			MURRIETA - TEMECULA & RANCHO CALIFORNIA			NORCO			PALM SPRINGS			PERRIS VALLEY		
DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY	
	10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR
5	2.84	4.48	5	3.45	5.10	5	2.77	4.16	5	4.23	6.76	5	2.64	3.78
6	2.58	4.07	6	3.12	4.61	6	2.53	3.79	6	3.80	6.08	6	2.41	3.46
7	2.37	3.75	7	2.87	4.24	7	2.34	3.51	7	3.48	5.56	7	2.24	3.21
8	2.21	3.49	8	2.67	3.94	8	2.19	3.29	8	3.22	5.15	8	2.09	3.01
9	2.08	3.28	9	2.50	3.69	9	2.07	3.10	9	3.01	4.81	9	1.98	2.84
10	1.96	3.10	10	2.36	3.48	10	1.96	2.94	10	2.83	4.52	10	1.88	2.69
11	1.87	2.95	11	2.24	3.30	11	1.87	2.80	11	2.67	4.28	11	1.79	2.57
12	1.78	2.82	12	2.13	3.15	12	1.79	2.68	12	2.54	4.07	12	1.72	2.46
13	1.71	2.70	13	2.04	3.01	13	1.72	2.58	13	2.43	3.88	13	1.65	2.37
14	1.64	2.60	14	1.96	2.89	14	1.66	2.48	14	2.33	3.72	14	1.59	2.29
15	1.58	2.50	15	1.89	2.79	15	1.60	2.40	15	2.23	3.58	15	1.54	2.21
16	1.53	2.42	16	1.82	2.69	16	1.55	2.32	16	2.15	3.44	16	1.49	2.14
17	1.48	2.34	17	1.76	2.60	17	1.50	2.25	17	2.08	3.32	17	1.45	2.08
18	1.44	2.27	18	1.71	2.52	18	1.46	2.19	18	2.01	3.22	18	1.41	2.02
19	1.40	2.21	19	1.66	2.45	19	1.42	2.13	19	1.95	3.12	19	1.37	1.97
20	1.36	2.15	20	1.61	2.38	20	1.39	2.08	20	1.89	3.03	20	1.34	1.92
22	1.29	2.04	22	1.53	2.26	22	1.32	1.98	22	1.79	2.86	22	1.28	1.83
24	1.24	1.95	24	1.46	2.15	24	1.26	1.90	24	1.70	2.72	24	1.22	1.75
26	1.18	1.87	26	1.39	2.06	26	1.22	1.82	26	1.62	2.60	26	1.18	1.69
28	1.14	1.80	28	1.34	1.98	28	1.17	1.76	28	1.56	2.49	28	1.13	1.63
30	1.10	1.73	30	1.29	1.90	30	1.13	1.70	30	1.49	2.39	30	1.10	1.57
32	1.06	1.67	32	1.24	1.84	32	1.10	1.64	32	1.44	2.30	32	1.06	1.52
34	1.03	1.62	34	1.20	1.78	34	1.06	1.59	34	1.39	2.22	34	1.03	1.48
36	1.00	1.57	36	1.17	1.72	36	1.03	1.55	36	1.34	2.15	36	1.00	1.44
38	.97	1.53	38	1.13	1.67	38	1.01	1.51	38	1.30	2.09	38	.98	1.40
40	.94	1.49	40	1.10	1.62	40	.98	1.47	40	1.27	2.02	40	.95	1.37
45	.89	1.40	45	1.03	1.52	45	.92	1.39	45	1.18	1.89	45	.90	1.29
50	.84	1.32	50	.97	1.44	50	.88	1.31	50	1.11	1.78	50	.85	1.22
55	.80	1.26	55	.92	1.36	55	.84	1.25	55	1.05	1.68	55	.81	1.17
60	.76	1.20	60	.88	1.30	60	.80	1.20	60	1.00	1.60	60	.78	1.12
65	.73	1.15	65	.84	1.24	65	.77	1.15	65	.95	1.53	65	.75	1.08
70	.70	1.11	70	.81	1.19	70	.74	1.11	70	.91	1.46	70	.72	1.04
75	.68	1.07	75	.78	1.15	75	.72	1.07	75	.88	1.41	75	.70	1.00
80	.65	1.03	80	.75	1.11	80	.69	1.04	80	.85	1.35	80	.68	.97
85	.63	1.00	85	.73	1.07	85	.67	1.01	85	.82	1.31	85	.66	.94
SLOPE = .530			SLOPE = .550			SLOPE = .500			SLOPE = .580			SLOPE = .490		

STANDARD
INTENSITY–DURATION
CURVES DATA


PROJECT SITE
NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
2-YEAR — 1-HOUR PRECIPITATION
PLATE D-4.3
DRAWN BY: R.A.S.
APPROVED CHIEF ENGINEER R.E. NO. 8822
DATE
SHEET No.
DR. No.
REVISED:


RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
100-YEAR —— 1-HOUR
PRECIPITATION
PLATE D-4.4
DRAWN BY: R.A.S.
SHEET NO.
DR. NO.
APPROVED: CHIEF ENGINEER R.E. NO. 8822
DATE
REVISED
RCFC & WCD
HYDROLOGY MANUAL
NOTES
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
30,000 20 10 0 30,000
PROJECT SITE
R7W
R6W
R5W
R4W
R3W
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R1W
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R5E
R6E
R7E
R8E
T1S
T2S
T3S
T4S
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T6S
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T8S
T9S
SAN BERNARDINO
RIVERSIDE
REDLANDS
ONTARIO
CORONA
Perris
Elsinore
Beaumont
Banning
Hemet
San Jacinto
Palm Springs
Indio
Coachella
Fallbrook
San Clemente
JOSHUA TREE NATIONAL MONUMENT
SAN BERNARDINO MOUNTAINS
CLEVELAND NATIONAL FOREST
SAN BERNARDINO NATIONAL FOREST
1.0"
1.1"
1.2"
1.3"
1.35"
1.4"
1.45"
1.5"
1.6"
1.7"
1.8"
2.0"
2.4"
2.8"

July 1, 2022

Howard Industrial Partners
1944 North Tustin Street, Suite 122
Orange, California 92865

Attention: Mr. Mike Tunney
Vice President

Project No.: **22G183-2**

Subject: **Results of Infiltration Testing**
Proposed Harvest Landing Industrial Development
Indian Avenue and Orange Avenue
Perris, California

Reference: Geotechnical Investigation, Proposed Harvest Landing Industrial Development, Indian Avenue and Orange Avenue, Perris, California, prepared by Southern California Geotechnical, Inc. (SCG) for Howard Industrial Partners, SCG Project No. 22G183-1, dated June 13, 2022.

Mr. Tunney:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

Scope of Services

The scope of services performed for this project was in general accordance with our Proposal No. 22P206R, dated April 28, 2022 and Change Order No. 22G183-CO, dated June 8, 2022. The scope of services included visual site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the on-site soils for the stormwater disposal systems. The infiltration borings were tested using a modified constant-head infiltration test as requested by the project civil engineer. The double ring infiltration testing was performed in general accordance with ASTM Test Method D-3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer.

Site and Project Description

The site is located at the northwest and southwest corners of Indian Avenue and Orange Avenue in Perris, California. The site is bounded to the north by Val Verde Elementary School, to the west and south by Interstate 215 Frontage Road, and to the east by Indian Avenue. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 of this report.

The site consists of several parcels, which total 73.68± acres in size. The east-central area of the site is developed with four (4) single-family residences. These residences are assumed to be single-story structures of wood frame and stucco construction and supported on conventional

shallow foundations with concrete slab-on-grade floors. The residences are surrounded by concrete flatwork, turf grass, exposed soil, and trees. The remaining areas of the site are vacant and undeveloped. The ground surface in these areas consists of exposed soil with sparse to moderate native grass and weed growth.

Detailed topographic information was not available at the time of this report. Based on elevations obtained from Google Earth, and visual observations made at the time of the subsurface investigation, the overall site topography is generally flat and moderately slopes to the east at a gradient of approximately 2± percent.

Proposed Development

Based on the conceptual site plan provided to our office by the client, the site will be developed with five (5) industrial buildings:

Building No.	Location	Size (ft²)
1	North	647,000
2	North-Central	389,000
3	Central	91,000
4	South-Central	52,000
5	South	22,000

Each building includes a mezzanine and dock-high doors will be constructed along a portion of at least one building wall for each of the buildings. The building is anticipated to be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete pavements in the loading dock areas, and limited areas of concrete flatwork and landscape planters throughout.

The proposed development will include on-site infiltration for stormwater disposal. Based on the information provided by representatives of FMCivil Engineers, Inc., the project civil engineer, the infiltration systems will consist of four (4) shallow below-grade chamber systems (identified as Infiltration System "A" through Infiltration System "D") and/or four (4) deep dry-well systems (identified as Infiltration System "E" thought Infiltration System "H"). The infiltration systems will be located in the eastern area of the site. The bottoms of the below-grade chamber systems will extend to depths of 7± feet below existing site grades and the dry wells will extend to a depth of 50± feet below existing site grades.

Concurrent Studies

SCG performed a geotechnical investigation at the subject site, referenced above. As a part of this investigation, twenty-three (23) borings were advanced to depths of 15 to 25± feet below the previously existing site grades. Native alluvium was encountered at each boring location, extending to at least the maximum depth explored of 25± feet below existing site grades. The alluvium generally consists of medium dense to very dense silty sands to sandy silts, with trace to little clay content.

Free water was not encountered during the drilling of the borings. Based on the lack of water within the borings and the moisture contents of the recovered soil samples, the static groundwater is considered to have existed at a depth in excess of 25± feet at the time of the

subsurface exploration. Recent water level data was obtained from the California Department of Water Resources website, http://www.water.ca.gov/waterdatalibrary/. The nearest monitoring well is located approximately 0.5 miles east from the site. Water level readings within this monitoring well indicates a groundwater level of 44± feet below the ground surface in March 2022.

Subsurface Exploration

Scope of Exploration

The subsurface exploration performed for the infiltration testing consisted of six (6) shallow infiltration trenches (identified as Infiltration Trench Nos. I-1 through I-6) and four (4) deep infiltration borings (identified as Infiltration Boring Nos. I-7 through I-10). The infiltration trenches were excavated using a rubber-tire backhoe to a depth of 7± feet. The infiltration borings were extended to a depth of 50± feet below existing site grades. In addition to the infiltration testing, one (1) exploratory boring was extended to a depth of 60± feet below site grades to confirm the underlying soil types and verify that groundwater was at a depth greater than 10± feet below the bottom of the proposed dry well infiltration systems. The borings were advanced using a truck-mounted drilling rig, equipped with 8-inch-diameter hollow-stem augers and were logged during drilling by a member of our staff. The approximate locations of the boring, infiltration borings, and infiltration trenches are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Geotechnical Conditions

Artificial fill soils were encountered at the ground surface at Infiltration Test No. I-3, extending to a depth of 1± foot below existing site grades. The fill soils consist of medium dense fine to medium sandy silts with trace quantities of clay and fine gravel. Native alluvium was encountered at the ground surface at all of the remaining boring and trench locations, extending to at least the maximum explored depth of 60± feet below existing site grades. The near-surface alluvium encountered at depths less than 25± feet below existing site grades consists of medium dense to very dense fine to medium sandy silts, silty fine to medium sands, clayey fine to coarse sands, and hard fine to coarse sandy clays. At depths greater than 25± feet, the alluvium consists of medium dense to very dense fine sandy silts, fine to medium sandy silts, silty fine to medium sands, and hard fine to medium sandy clays. The Boring Logs and Trench Logs, which illustrate the conditions encountered at each of the borings, are included with this report.

Free water was not encountered during drilling of any of the borings. Based on the lack of water within the borings, the static groundwater table was considered to have existed at a depth in excess of 60± feet at the time of our subsurface exploration.

Shallow Infiltration Testing – Double Ring Infiltration

The infiltration testing for the proposed shallow infiltration chambers was performed in general accordance with ASTM Test Method D-3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer.

Two stainless steel infiltration rings were used for the infiltration testing. The outer infiltration ring is 2 feet in diameter and 20 inches in height. The inner infiltration ring is 1 foot in diameter

and 20 inches in height. At the test locations, the outer ring was driven 3± inches into the soil at the base of each trench. The inner ring was centered inside the outer ring and subsequently driven 3± inches into the soil at the base of the trench. The rings were driven into the soil using a ten-pound sledge hammer. The soil surrounding the wall of the infiltration rings was only slightly disturbed during the driving process.

Infiltration Testing Procedure

Infiltration testing was performed at all of the trench locations. The infiltration testing consisted of filling the inner ring and the annular space (the space between the inner and outer rings) with water, approximately 3 to 4 inches above the soil. To prevent the flow of water from one ring to the other, the water level in both the inner ring and the annular space between the rings was maintained using constant-head float valves. The volume of water that was added to maintain a constant head in the inner ring and the annular space during each time interval was determined and recorded. A cap was placed over the rings to minimize the evaporation of water during the tests.

The schedule for readings was determined based on the observed soil type at the base of each backhoe-excavated trench. Based on the existing soils at the trench locations, the volumetric measurements were made at 10-minute intervals at Infiltration Trench No I-3 and 15-minute increments at the remaining trench locations. The water volume measurements are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on these spreadsheets.

The infiltration rates for the infiltration tests are calculated in centimeters per hour and then converted to inches per hour. The rates are summarized below:

Infiltration Test No.	**Depth (feet)**	**Soil Description**	**Measured Infiltration Rate (inches/hour)**
I-1	7	Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.8
I-2	7	Brown Silty fine to medium Sand, trace coarse Sand, trace Clay	1.0
I-3	7	Brown Silty fine to medium Sand, little coarse Sand	6.8
I-4	7	Brown Silty fine to medium Sand, trace to little coarse Sand, trace Clay	0.3
I-5	7	Brown Silty fine to medium Sand, trace coarse Sand, trace Clay	0.9
I-6	7	Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	1.3

Percolation Testing – Dry Wells

The dry well infiltration testing was performed in accordance with a modified constant-head infiltration test as requested by the project civil engineer, the designer of the proposed dry well system.

Upon the completion of the drilling for the infiltration borings, a sufficient length of 3-inch-diameter perforated PVC casing was then placed into each test hole so that the PVC casing extended from the bottom of the test hole to the ground surface. Clean ¾-inch gravel was installed in the annulus surrounding the PVC casing.

Pre-soaking

The pre-soaking process consisted of filling the test borings with water to approximately 10± feet below the ground surface. The pre-soaking was completed after all of the water had percolated through the test hole, at least 15 hours since initiating the pre-soak.

Infiltration Testing Procedure

Following the pre-soaking process, the constant-head infiltration test method was utilized to test the infiltration rates of deeper soils. This method consisted of filling the borings to a maximum water level of 10± feet below the ground surface, based on the soil conditions encountered. Once the hole was filled, the inflow of water was controlled via a ball valve in order to maintain the water level constant below ground surface. It was necessary to constantly monitor this depth due to varying inflows from the water source and the change in infiltration rate with time. Readings were taken every ten minutes using a water level meter. The ball valve was used to make adjustments by increasing or decreasing the inflow of water when slight changes in depth occurred. The water level readings are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on the spreadsheets.

The infiltration rates from the deep infiltration tests are tabulated in gallons per square foot per day.

Infiltration Test No.	Depth (feet)	Measured Infiltration Rate (Inches per Hour)
I-7	51	<0.1
I-8	49	0.2
I-9	51	0.1
I-10	51	0.3

Laboratory Testing

Moisture Content

The moisture contents for the recovered soil samples within the borings were determined in accordance with ASTM D-2216 and are expressed as a percentage of the dry weight. These test results are presented on the Boring Logs.

Grain Size Analysis

The grain size distribution of selected soils collected from each infiltration test boring have been determined using a range of wire mesh screens. These tests were performed in general accordance with ASTM D-422 and/or ASTM D-1140. The weight of the portion of the sample retained on each screen is recorded and the percentage finer or coarser of the total weight is calculated. The results of these tests are presented on Plates C-1 through C-41 of this report.

Design Recommendations

A total of ten (10) total infiltration tests were performed at the subject site. As noted above, the double ring infiltration testing resulted in measured infiltration rates ranging from 0.3 to 6.8 inches per hour. The dry well infiltration testing resulted in measured infiltration rates ranging from 0.0 to 0.3 inches per hour. The primary factors affecting the infiltration rates are the silt content of the encountered soils, which vary at different depths and locations at the subject site. Based on the results of the infiltration testing, we recommend the following infiltration rates to be utilized for the design of the proposed infiltration systems:

Infiltration Test No.	Infiltration System	Infiltration System Type	Depth (feet)	Location	Infiltration Rate (inches per hour)
I-1 and I-2*	A	Chamber System	7	Northeast	0.9
I-3 and I-4*	B	Chamber System	7	Central-East	3.6
I-5	C	Chamber System	7	South-Central	0.9
I-6	D	Chamber System	7	Southeast	1.3

Infiltration Test No.	Infiltration System	Infiltration System Type	Depth (feet)	Location	Infiltration Rate (inches per hour)
I-7	E	Dry Well	50	Northeast	0.0
I-8	F	Dry Well	50	Central-East	0.2
I-9	G	Dry Well	50	Central-East	0.1
I-10	H	Dry Well	50	Southeast	0.3

NOTE: *Indicates an average infiltration rate was used in the design infiltration rate.

Due to the low infiltration rates for the deep dry well infiltration systems, dry well infiltration is not recommended for this project.

The design of the proposed storm water infiltration system should be performed by the project civil engineer, in accordance with the City of Perris and/or County of Riverside guidelines. However, it is recommended that the system be constructed so as to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the system. The presence of such materials would decrease the effective infiltration rate. **It is recommended that the project civil engineer apply an appropriate factor of safety. The infiltration rates recommended above are based on the assumption that only clean water will be introduced to the subsurface profile. Any fines, debris, or organic materials could significantly impact the infiltration rates.** It should be noted that the recommended infiltration rates are based on infiltration testing at ten (10) discrete locations and the overall infiltration rates of the storm water infiltration systems could vary considerably.

Infiltration Rate Considerations

The infiltration rates presented herein was determined in accordance with the Riverside County guidelines and are considered valid only for the time and place of the actual test. Varying subsurface conditions will exist in other areas of the site, which could alter the recommended infiltration rates presented above. The infiltration rates will decline over time between maintenance cycles as silt or clay particles accumulate on the BMP surface. The infiltration rate is highly dependent upon a number of factors, including density, silt and clay content, grainsize distribution throughout the range of particle sizes, and particle shape. Small changes in these factors can cause large changes in the infiltration rates.

Infiltration rates are based on unsaturated flow. As water is introduced into soils by infiltration, the soils become saturated and the wetting front advances from the unsaturated zone to the saturated zone. Once the soils become saturated, infiltration rates become zero, and water can only move through soils by hydraulic conductivity at a rate determined by pressure head and soil permeability. Changes in soil moisture content will affect the infiltration rate. Infiltration rates should be expected to decrease until the soils become saturated. Soil permeability values will then govern groundwater movement. Permeability values may be on the order of 10 to 20 times less than infiltration rates. The system designer should incorporate adequate factors of safety and allow for overflow design into appropriate traditional storm drain systems, which would transport storm water off-site.

Construction Considerations

The infiltration rates presented in this report are specific to the tested locations and tested depths. Infiltration rates can be significantly reduced if the soils are exposed to excessive disturbance or compaction during construction. Compaction of the soils at the bottom of the infiltration system can significantly reduce the infiltration ability of the basins. Therefore, the subgrade soils within proposed infiltration system areas should not be over-excavated, undercut or compacted in any significant manner. **It is recommended that a note to this effect be added to the project plans and/or specifications.**

We recommend that a representative from the geotechnical engineer be on-site during the construction of the proposed infiltration systems to identify the soil classification at the base of each system. It should be confirmed that the soils at the base of the proposed infiltration systems correspond with those presented in this report to ensure that the performance of the systems will be consistent with the rates reported herein.

We recommend that scrapers and other rubber-tired heavy equipment not be operated on the basin bottom, or at levels lower than 2 feet above the bottom of the system, particularly within basins. As such, the bottom 24 inches of the infiltration systems should be excavated with non-rubber-tired equipment, such as excavators.

Infiltration Chamber Maintenance

The proposed project may include infiltration chambers. Water flowing into chambers will carry some level of sediment. This layer has the potential to significantly reduce the infiltration rate of the chamber subgrade soils. Therefore, a formal chamber maintenance program should be established to ensure that these silt and clay deposits are removed from the chamber on a regular basis.

Location of Infiltration Systems

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration area could potentially be damaged due to saturation of the subgrade soils. **The proposed infiltration systems for this site should be located at least 25 feet away from any structures, including retaining walls.** Even with this provision of locating the infiltration system at least 25 feet from the building(s), it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration system.

The infiltration system designer should also give special consideration to the effect that the proposed infiltration systems may have on nearby subterranean structures, open excavations, or descending slopes. In particular, infiltration systems should not be located near the crest of descending slopes, particularly where the slopes are comprised of granular soils. Such systems will require specialized design and analysis to evaluate the potential for slope instability, piping failures and other phenomena that typically apply to earthen dam design. This type of analysis is beyond the scope of this infiltration test report, but these factors should be considered by the infiltration system designer when locating the infiltration systems.

General Comments

This report has been prepared as an instrument of service for use by the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, structural engineer, and/or civil engineer. The design of the infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rates contained herein, the civil engineer agrees to indemnify, defend, and hold harmless the geotechnical engineer for all aspects of the design and performance of the infiltration system. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur. The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between trench locations and testing depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to

our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted. The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

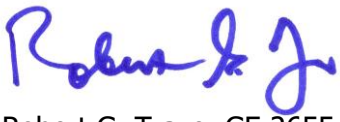
Closure

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

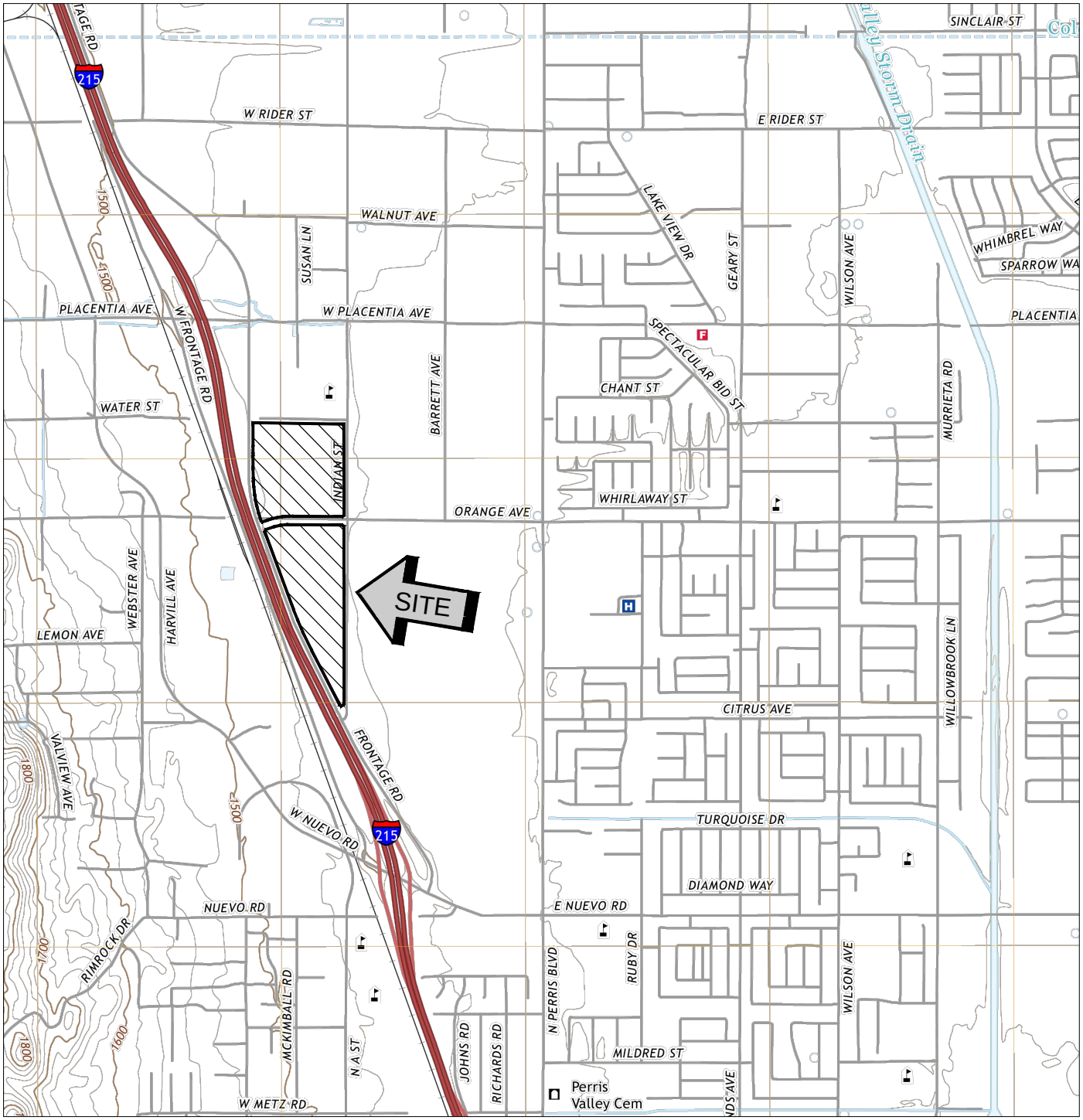
Ryan Bremer
Staff Geologist



Robert G. Trazo, GE 2655
Principal Engineer

Distribution: (1) Addressee

Enclosures: Plate 1 - Site Location Map
Plate 2 - Infiltration Test Location Plan
Trench Log Legend and Logs (8 pages)
Boring Log Legend and Logs (12 pages)
Infiltration Test Results Spreadsheets (10 pages)
Grain Size Distribution Graphs (41 pages)



SOURCE: USGS TOPOGRAPHIC MAP OF THE PERRIS QUADRANGLE, RIVERSIDE COUNTY, CALIFORNIA, 2021

SITE LOCATION MAP

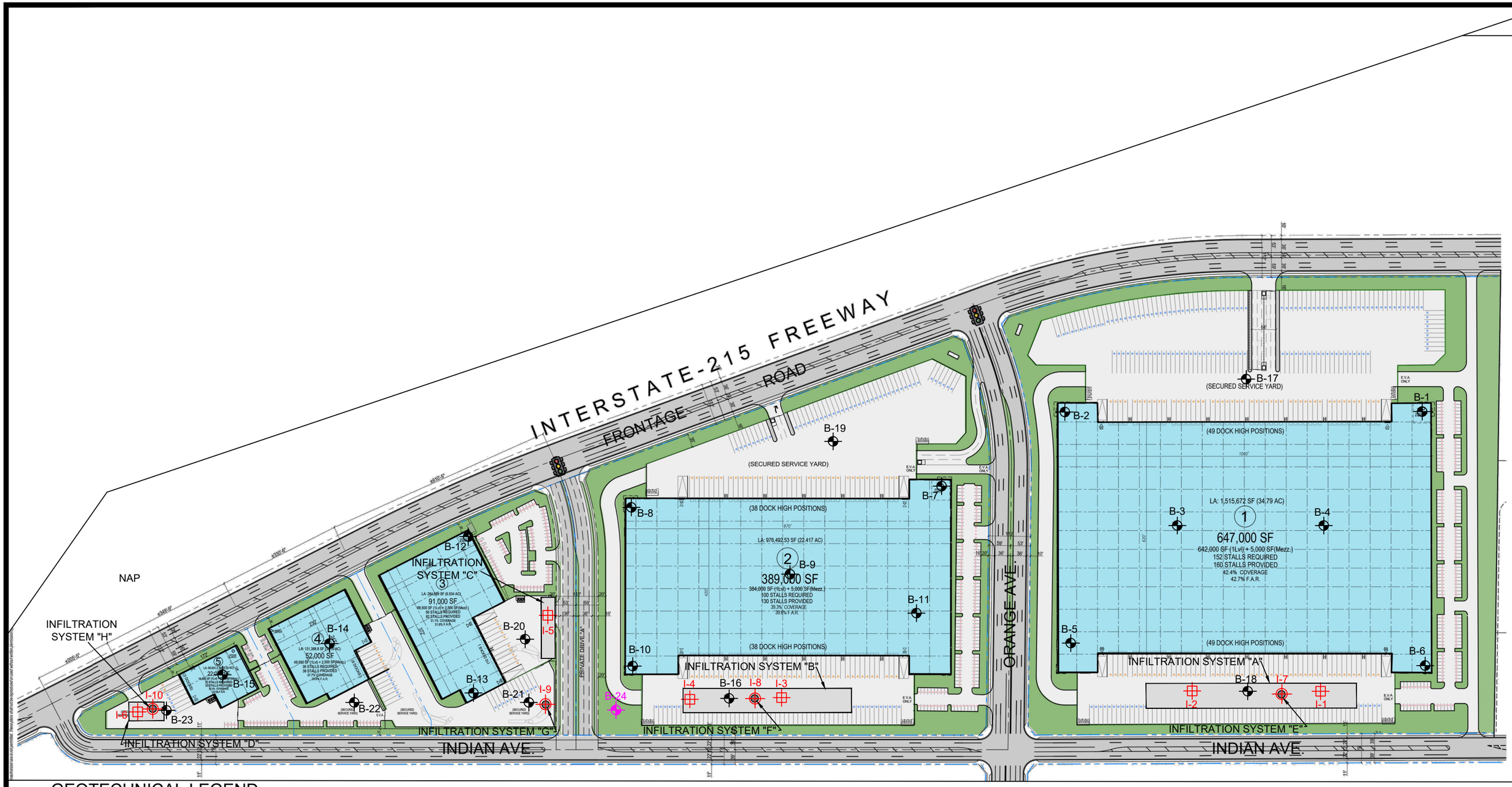
HARVEST LANDING INDUSTRIAL DEVELOPMENT

PERRIS, CALIFORNIA

SCALE: 1" = 2000'	
DRAWN: OS CHKD: RGT	
SCG PROJECT 22G183-2	
PLATE 1	

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



GEOTECHNICAL LEGEND

- APPROXIMATE SHALLOW-INFILTRATION TEST LOCATION (DOUBLE-RING INFILTROMETER)
- APPROXIMATE DEEP-INFILTRATION TEST LOCATION (CONSTANT-HEAD)
- APPROXIMATE BORING LOCATION
- APPROXIMATE BORING LOCATION (SCG PROJECT NO. 22G183-1)
- APPROXIMATE BELOW-GRADE CHAMBER LOCATION
- APPROXIMATE DRY WELL SYSTEM LOCATION

NORTH

SoCalGeo

NOTE: CONCEPTUAL PLAN PROVIDED BY AO ARCHITECTS

INFILTRATION TEST LOCATION PLAN

HARVEST LANDING INDUSTRIAL DEVELOPMENT

PERRIS, CALIFORNIA

SCALE: 1" = 250'	
DRAWN: RB CHKD: RGT	
SCG PROJECT 22G183-2	
PLATE 2	

SOUTHERN CALIFORNIA GEOTECHNICAL

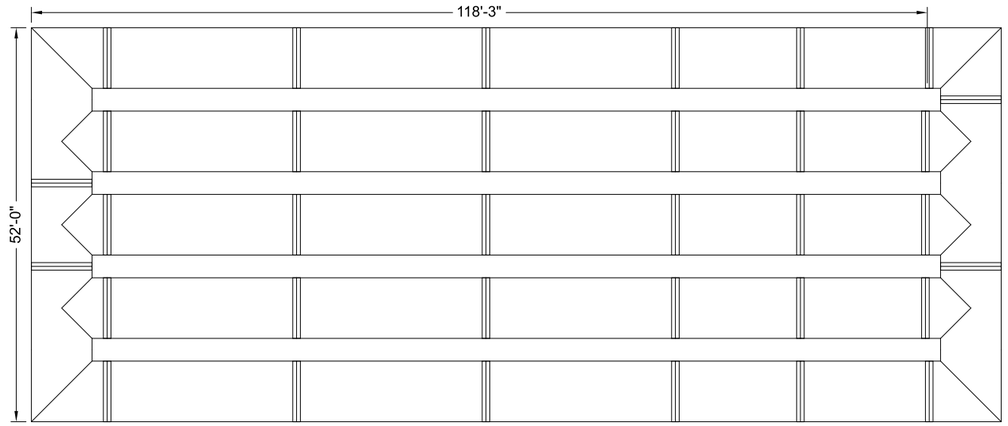
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 664 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 33,376 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 33,376 CF

PIPE DETAILS
- DIAMETER = 96"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 36"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"



ASSEMBLY
SCALE: 1" = 20'

NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE $2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

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CONTECH CMP DETENTION SYSTEMS
CONTECH **DYODS** DRAWING

DYO19778 20-001 Harvest Landing Site 4
Site 4 Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
12820	19778	8/2/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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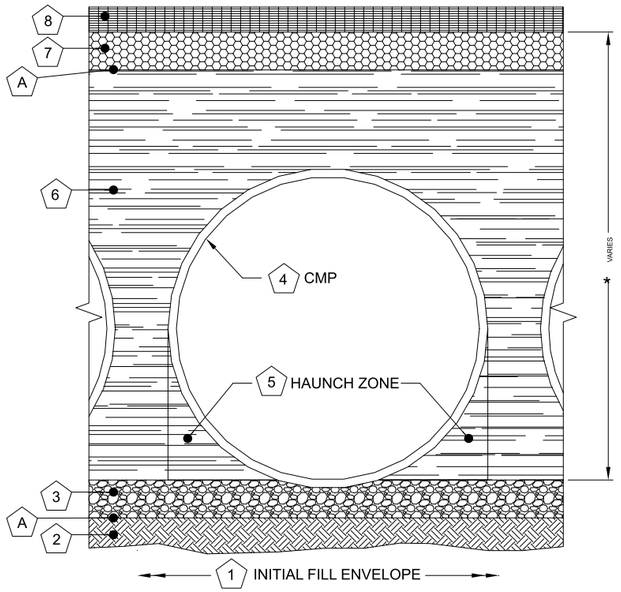


	DETENTION SYSTEMS - CMP DETENTION / CMP DRAINAGE			
	Material Location	Description	Material Designation	Designation
8	Rigid or Flexible Pavement (if applicable)			
7	Road Base (if applicable)			
A	Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types
6	Backfill	Well graded granular material which may contain small amounts of silt or clay.	AASHTO M 145- A-1, A-2, A-3	Placed in 8" +/- loose lifts and compacted to 90% Standard Proctor Per AASHTO T 99
3	Bedding Stone	Well graded granular bedding material w/maximum particle size of 3"	AASHTO M43 - 3,357,4,467, 5, 56, 57	Engineer to determine if bedding is required. Pipe may be placed on the trench bottom of a relatively loose, native suitable well graded & granular material. For Arch pipes it is recommended to be shaped to a relatively flat bottom or fine-grade the foundation to a slight v-shape. Unsuitable material should be over-excavated and re-placed with a 4"-6" layer of well graded & granular stone per the material designation. See AASHTO 26.3.8.1 / 26.5.3 Bedding info.
A	Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types
*	*Note: Backfill using controlled low-strength material (CLSM, "flash fill" or "flowable fill") when the spacing between the pipes will not allow for placement and adequate compaction of the backfill.*			

1 MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT

FOUNDATION/BEDDING PREPARATION

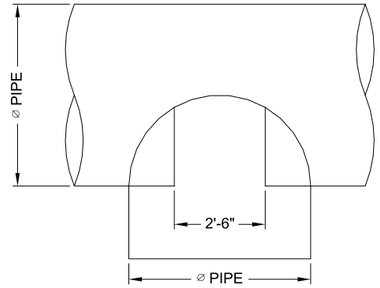
2 PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE ENGINEER.

5 HAUNCH ZONE MATERIAL SHALL BE PLACED AND UNIFORMALLY COMPACTED WITHOUT SOFT SPOTS.

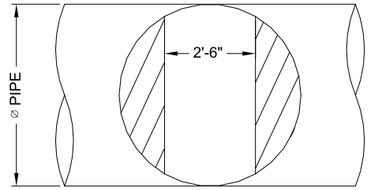
BACKFILL

WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO LIFT (16") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE DETENTION SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON THE PIPE.

OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.



PLAN

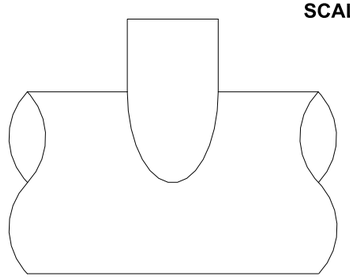


FRONT

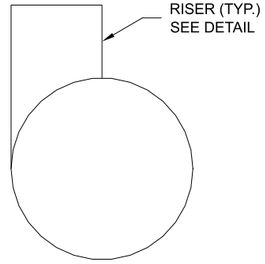
NOTE:
MANWAY DETAIL APPLICABLE FOR CMP SYSTEMS WITH DIAMETERS 48" AND LARGER. MANWAYS MAY BE REQUIRED ON SMALLER SYSTEMS DEPENDING ON ACTUAL SITE SPECIFIC CONDITIONS.

TYPICAL MANWAY DETAIL

SCALE: N.T.S.



ELEVATION

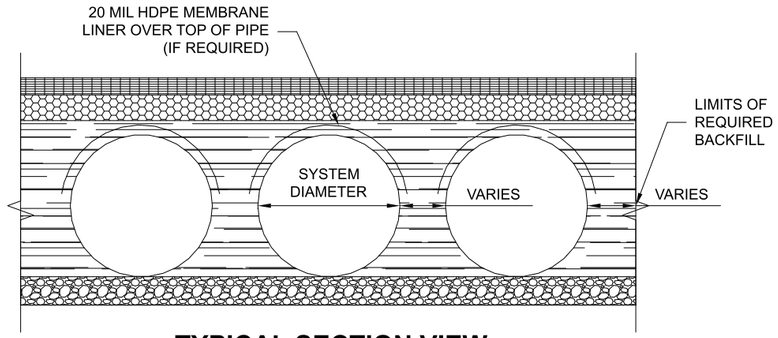


END

NOTE:
LADDERS ARE OPTIONAL AND ARE NOT REQUIRED FOR ALL SYSTEMS.

TYPICAL RISER DETAIL

SCALE: N.T.S.



TYPICAL SECTION VIEW

LINER OVER ROWS
SCALE: N.T.S.

NOTE: IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, AN HDPE MEMBRANE LINER IS RECOMMENDED WITH THE SYSTEM. THE IMPERMEABLE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

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CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO19778 20-001 Harvest Landing Site 4
Site 4 Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
12820	19778	8/2/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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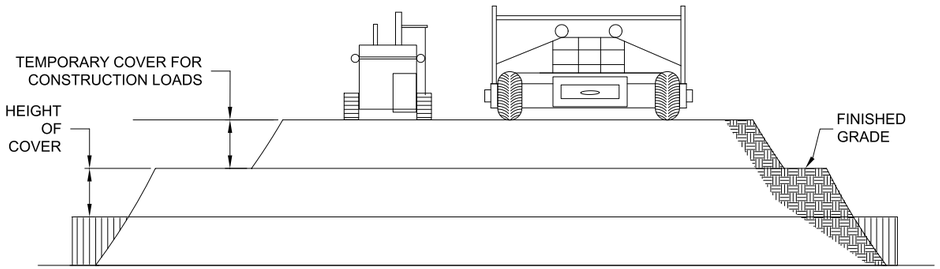

CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

APPLICABLE POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

APPLICABLE
HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.
REQUIREMENTS
INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

NOTE:
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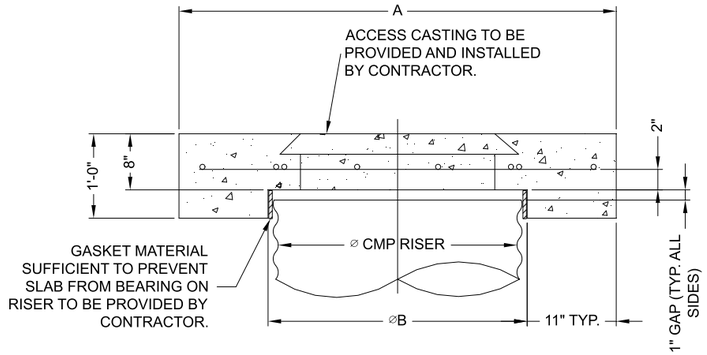
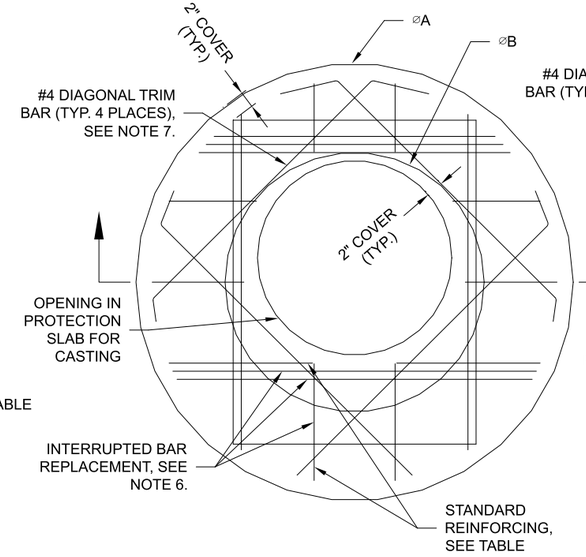


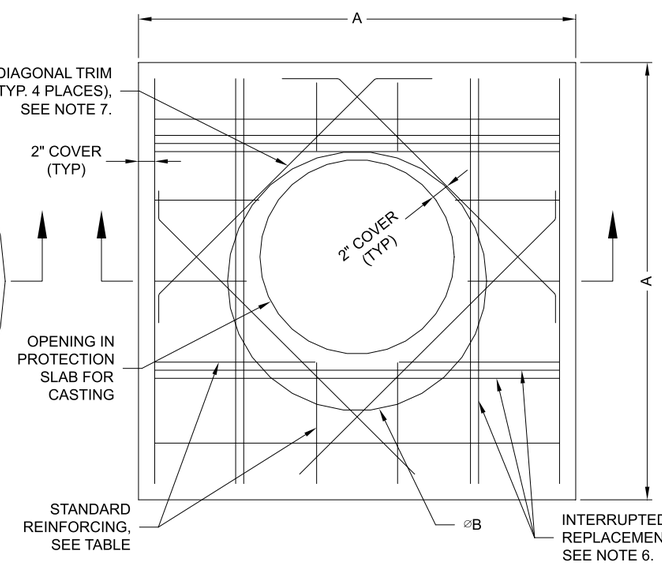
SECTION VIEW

REINFORCING TABLE				
⌀ CMP RISER	A	⌀ B	REINFORCING	**BEARING PRESSURE (PSF)
24"	⌀ 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	⌀ 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	⌀ 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	⌀ 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	⌀ 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

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DYO19778 20-001 Harvest Landing Site 4
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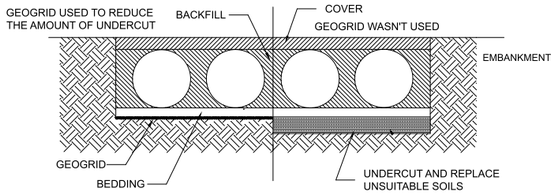
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.

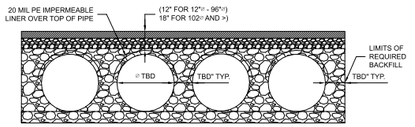


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

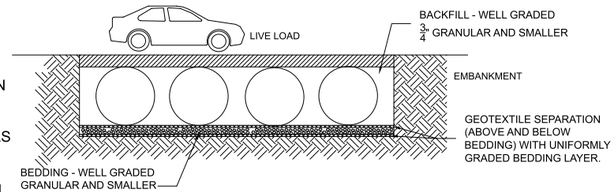
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

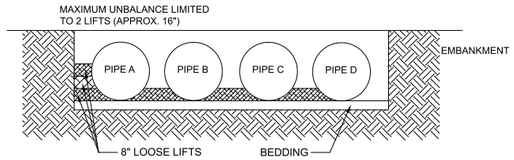
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



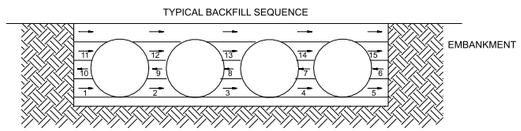
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

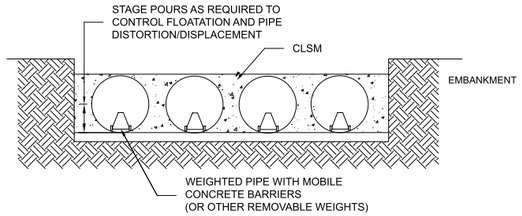


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

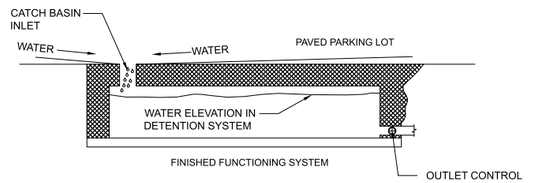


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

C:\EXPORTS\TEMPLATES\CMP_V8.DWG 10/18/2019 10:02 AM

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DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO19778 20-001 Harvest Landing Site 4
Site 4 Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
12820	19778	8/2/2022
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

Santa Ana Watershed - BMP Design Volume, V_{BMP} (Rev. 10-2011)	Legend:	Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	FMCivil Engineers Inc	Date	10/4/2024
Designed by	Hector Paez	Case No	
Company Project Number/Name	20-001 - Site 4		

BMP Identification

BMP NAME / ID: S4 Onsite Bioretention Basin

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E — D_{85}= 0.60 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

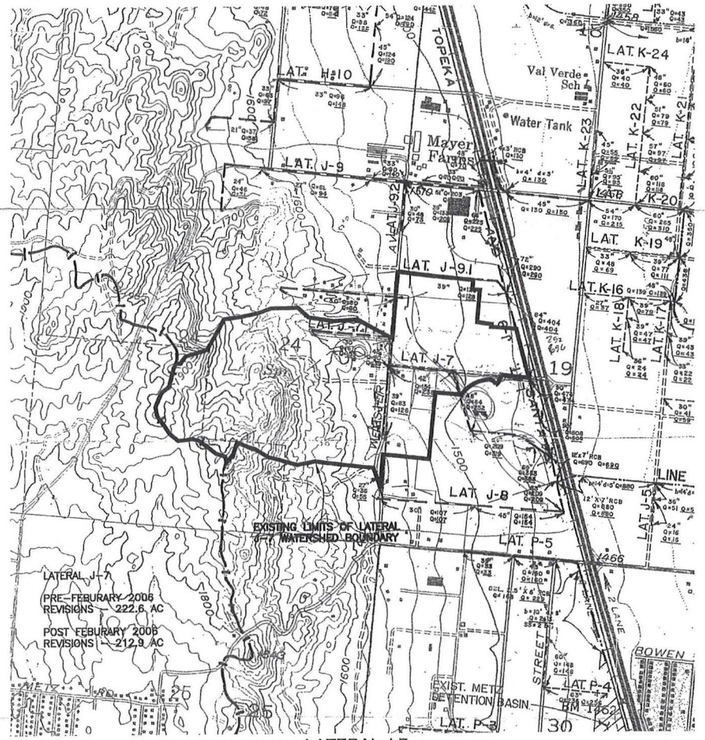
DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
4-1A	*57919.51*	*Roofs*	*1*	*0.89*	*51664.2*			
4-1C	*56064.51*	*Concrete or Asphalt*	*1*	*0.89*	*50009.5*			
	113984.02	***Total***			**101673.7**	**0.60**	***5083.7***	***5498***

Notes:

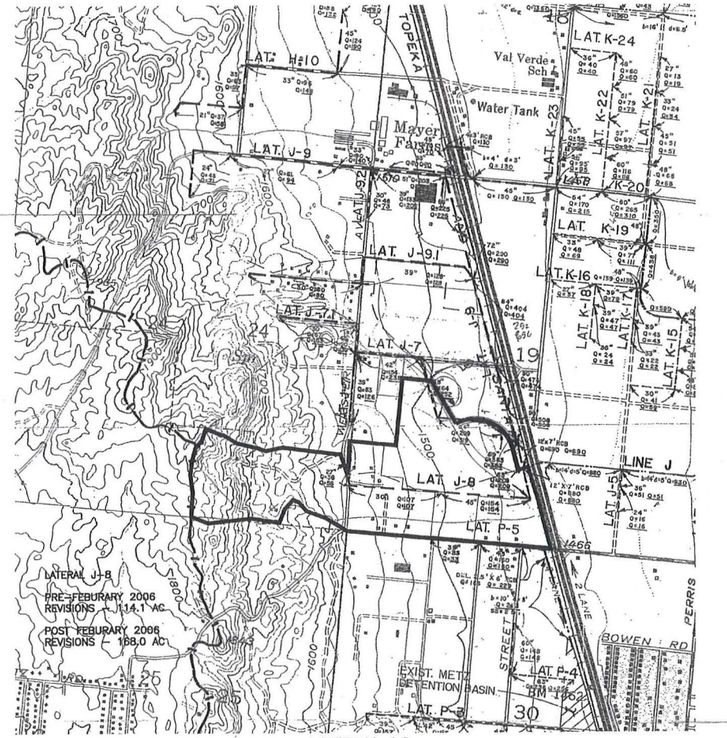
PORTION OF
8K3
1" = 1000'

REVISED HYDROLOGY MAP
PERRIS MASTER DRAINAGE PLAN

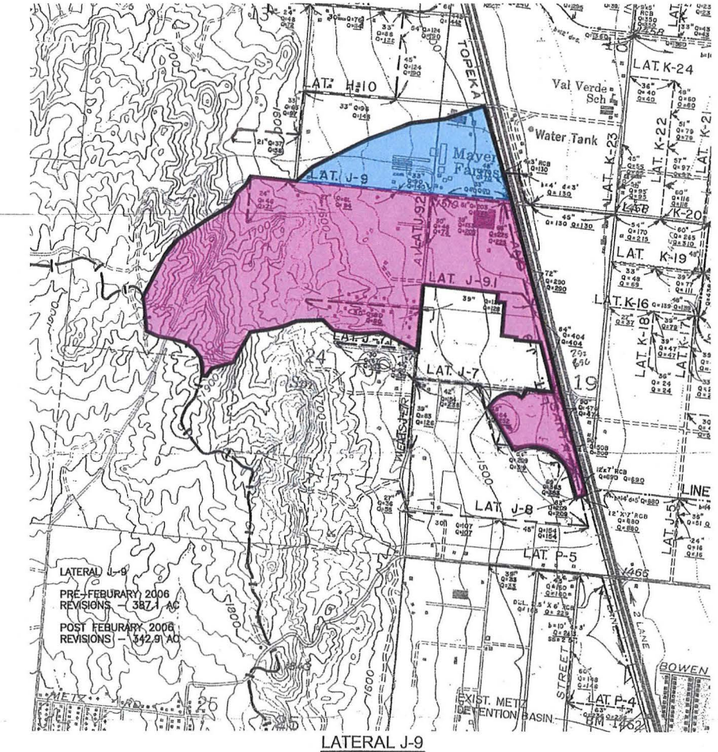
LATERALS J–7, J–8, & J–9



LATERAL J-7



LATERAL J-8



LATERAL J-9

LATERAL No.	PRE–FEBURARY 2006 REVISIONS	POST FEBURARY 2006 REVISIONS	INCREASE/DECREASE (ACRES)
LAT J–8	114.1	168.0	+53.9
LAT J–9	609.8	555.9	–53.9

LEGEND

PROPOSED LATERAL WATERSHED BOUNDARIES AFTER FEBRUARY 2006 REVISION

N

SCALE: 1"=1000'

B:\CAD\Nuevo Industrial Park - NV\PE\Exhibits\NV\P Perris MDP Hydrology map lat 7 and lat 9.dwg, 2/2/2007 1:10:00 PM, Donal Pearce

WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR GRADING PERMIT HAS BEEN ISSUED.

THE PRIVATE ENGINEER SIGNING THESE PLANS IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF THE DESIGN HEREON. IN THE EVENT OF DISCREPANCIES ARISING AFTER COUNTY APPROVAL OR DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISING THE PLANS FOR APPROVAL BY THE COUNTY.

DATE	BY	MARK	REVISIONS	APPR	DATE

ENGINEER — COUNTY

SEAL–COUNTY

REGISTERED PROFESSIONAL ENGINEER ALAN D. FRENCH No. 45702 Exp. 12–31–08 CIVIL STATE OF CALIFORNIA

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY:

ALAN D. FRENCH, P.E.
CIVIL ENGINEER, R.C.E. NO. 45702 — DATE

RECOMMENDED — DATE

SEAL–ENGINEER

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RECOMMENDED FOR APPROVAL — APPROVED BY:

PLANNING ENGINEER — CHIEF ENGINEER

DATE: — DATE:

ENGINEERING SOLUTIONS
ENGINEERING-LAND PLANNING-SURVEYING-MAPPING
2155 CHICAGO AVENUE, STE. 201
RIVERSIDE, CA. 92507
PHONE – (951) 784–0288
FAX – (951) 784–0287
PREPARED BY:

DATE EXP. 06–30–07

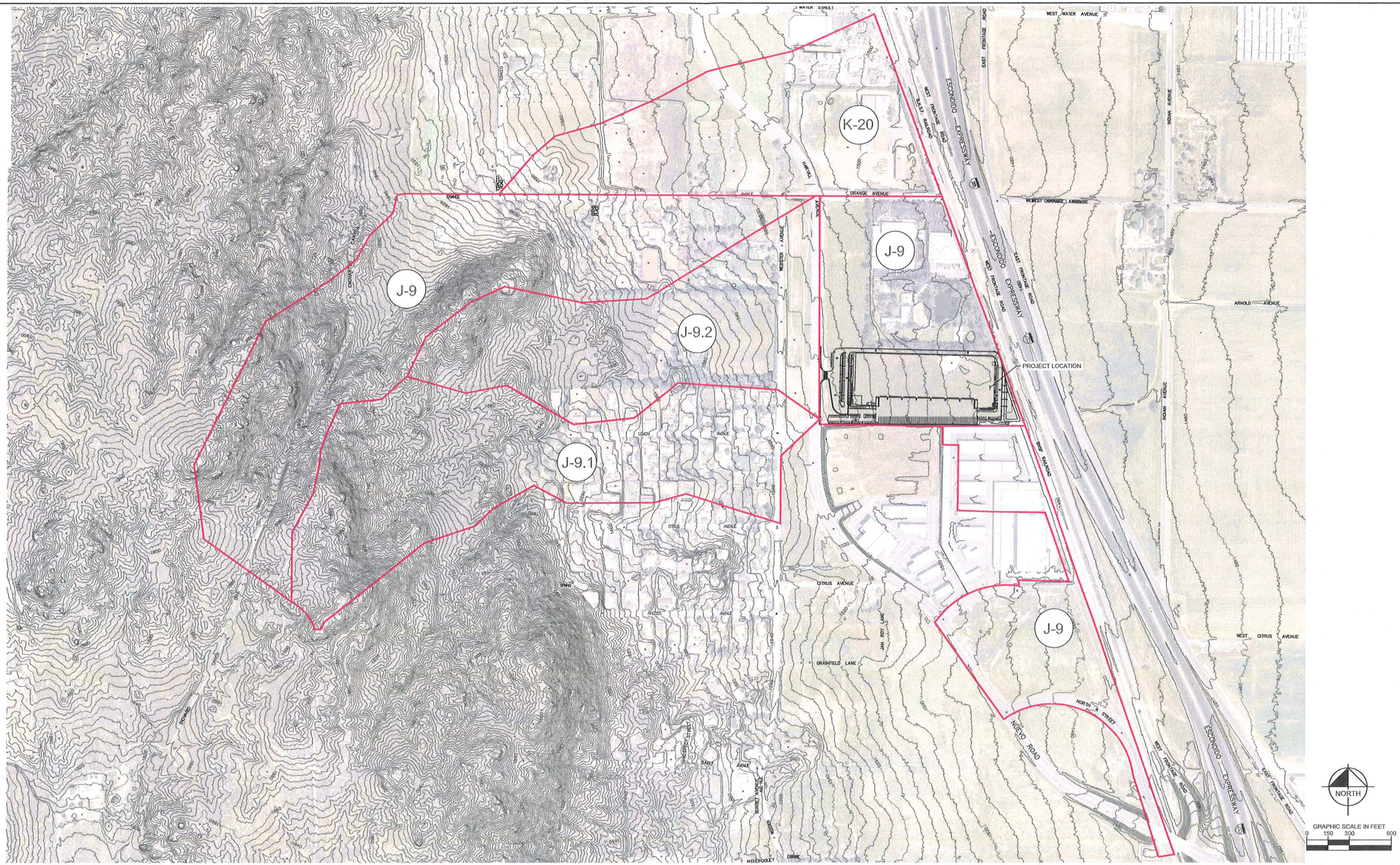
BENCHMARK:

SCALE:

I.P. No. XXXXX
COUNTY OF RIVERSIDE
REVISED HYDROLOGY MAP
PERRIS MASTER DRAINAGE PLAN
LATERALS J–7, J–8, & J–9

SHEET NO. 1 OF 1 SHTS.

FOR: | W.O. | COUNTY FILE NO.:



Kimley»Horn
401 B STREET, SUITE 600, SAN DIEGO, CA 92101
PHONE: 619-234-9411
WWW.KIMLEY-HORN.COM

RCFC MDP DRAINAGE AREA MAP LINE J-9
ROCKEFELLER HARVILL INDUSTRIAL PARK
October 9, 2020

k:\snd_ldev\rockefeller - riverside_harvill\to\rcfc\2020.10.08 - mdp letter\2020.10.09 - mdp drainage area.dwg 10/9/2020

EXHIBITS

EXHIBIT A: VICINITY MAP

EXHIBIT B: EXISTING HYDROLOGY MAP

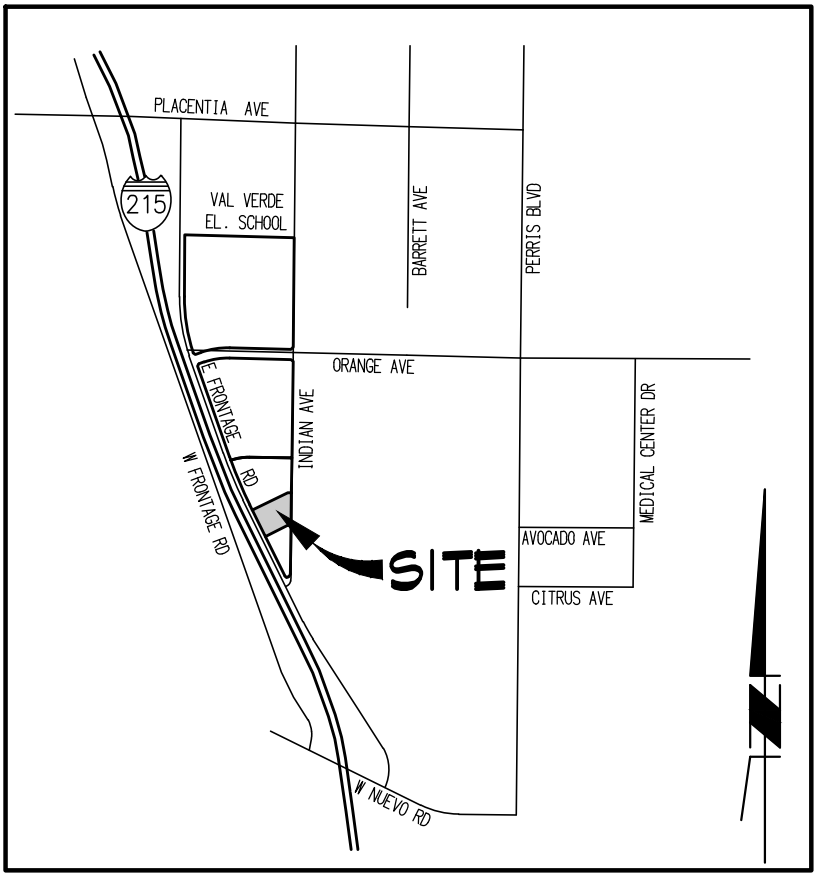
EXHIBIT C: PROPOSED HYDROLOGY MAP

EXHIBIT D: HYDROLOGIC SOILS GROUP MAP

EXHIBIT E: RCFCD MDP FACILITIES OVERLAY

EXHIBIT F: PHASE 1 OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM

EXHIBIT G: CONCEPTUAL GRADING



VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

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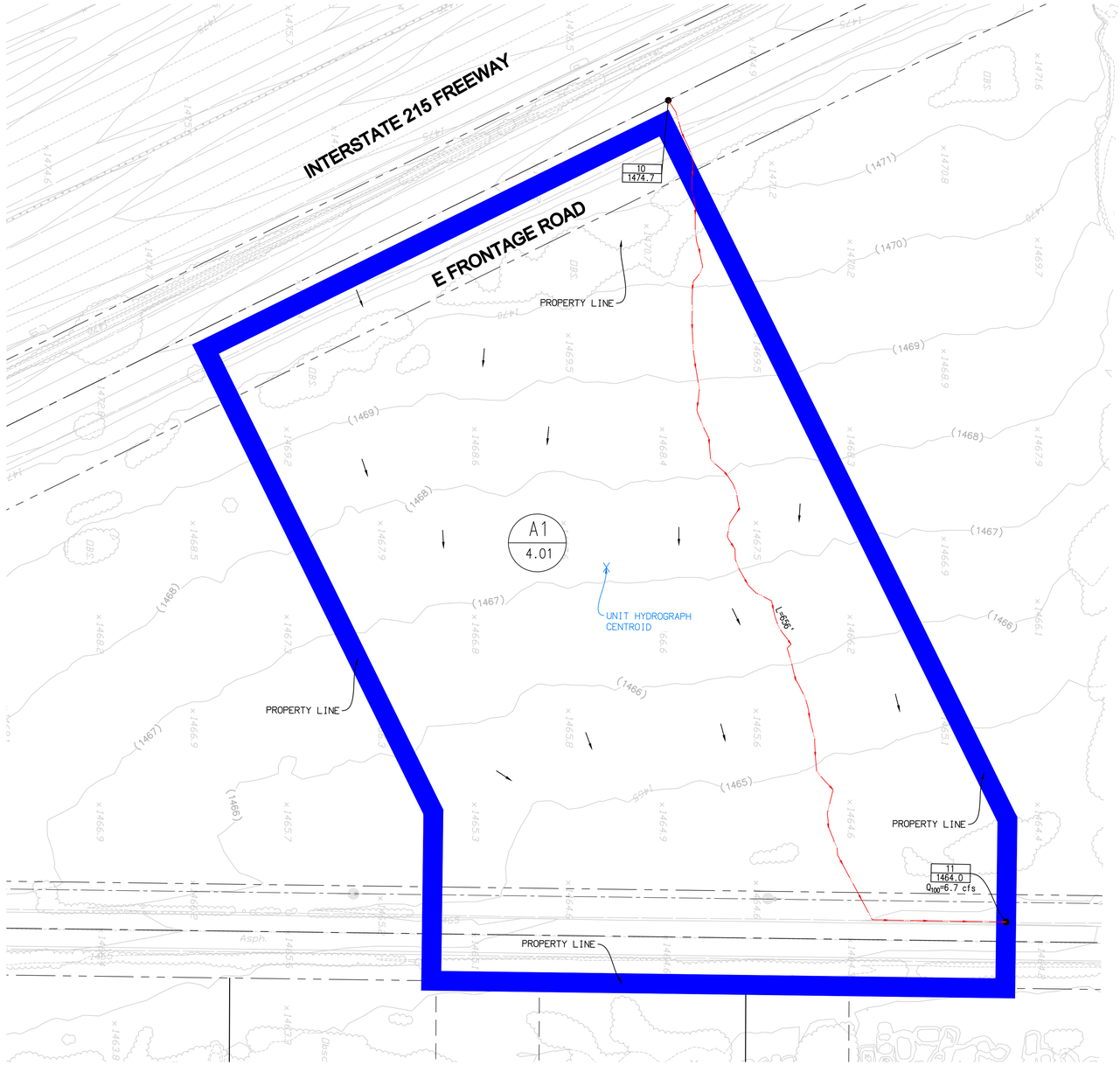
29995 TECHNOLOGY DRIVE, SUITE 306 | MURRIETA | CA 92563
951.331.9873 - FMCIVIL.COM

HARVEST LANDING SITE 4

FIGURE 1
VICINITY MAP

H:\PDATA\20-001 HARVEST LANDING\DWGS\EXHIBITS\20-001-VICINITY-MAP.DWG HECTOR 8/7/2022 11:37 PM



UNIT HYDROGRAPH PARAMETERS			
L_{HC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
656	308	10.70	0.020

LEGEND

- D2 / 2.16 — DRAINAGE BASIN NAME / DRAINAGE BASIN AREA(AC.)
- 11 / 1027.0 — NODE I.D. / ELEVATION
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- FLOW DIRECTION

SCALE 1"=40'

40 20 0 40 80 120

SCALE: 1"=40'

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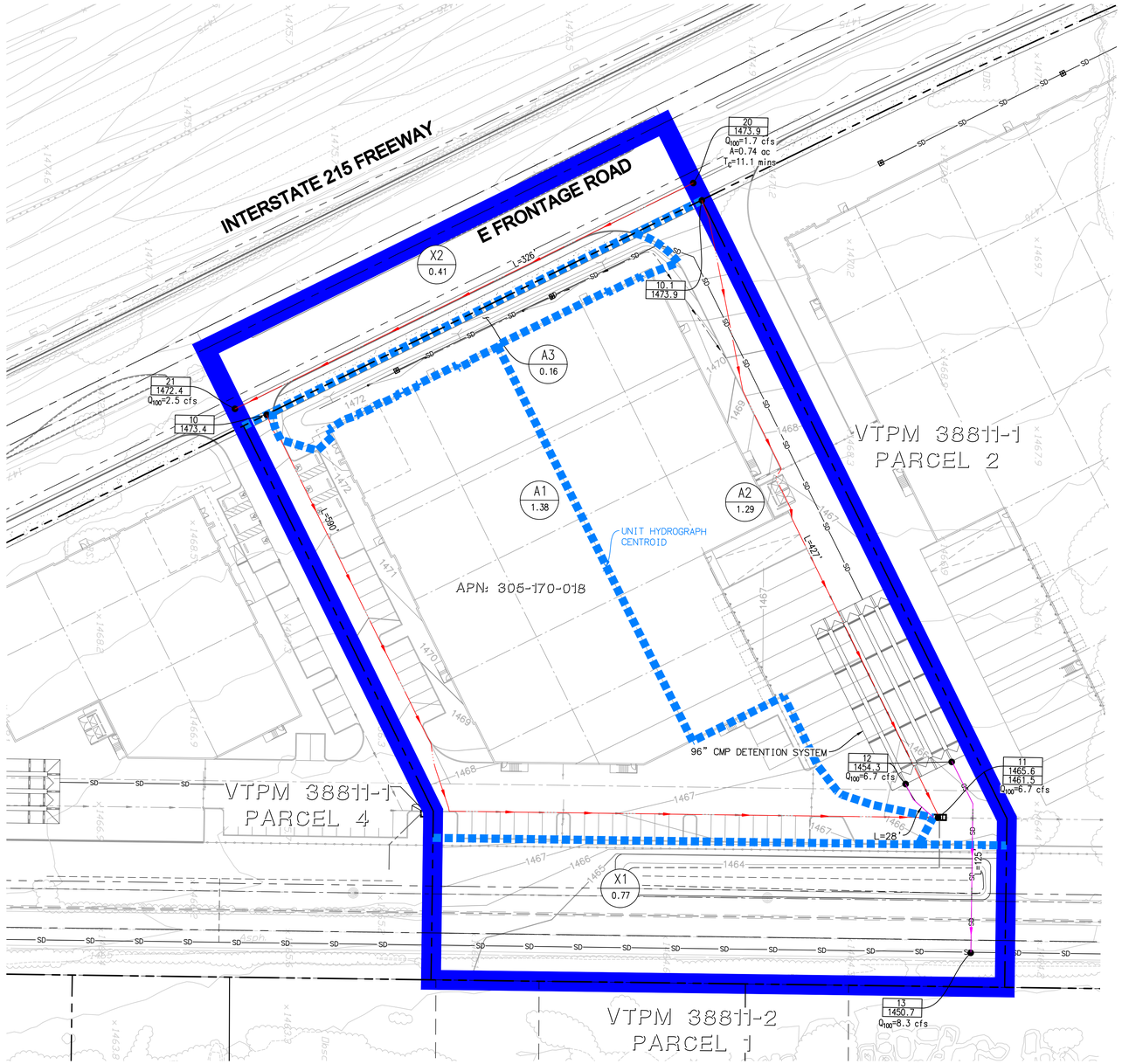
HARVEST LANDING

SITE 4 - EXISTING HYDROLOGY



UNIT HYDROGRAPH PARAMETERS			
L_{WC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
743	379	20.20	0.015

LEGEND

- D2 / 2.16 — DRAINAGE BASIN NAME / DRAINAGE BASIN AREA(AC.)
- 11 / 1027.0 — NODE I.D. / ELEVATION
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- FLOW DIRECTION
- PIPE FLOW DIRECTION

SCALE 1"=40'

40 20 0 40 80 120

SCALE: 1"=40'

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HARVEST LANDING

SITE 4 - PROPOSED HYDROLOGY

LEGEND

- SITE 4 BOUNDARY
- HYDROLOGIC SOIL B

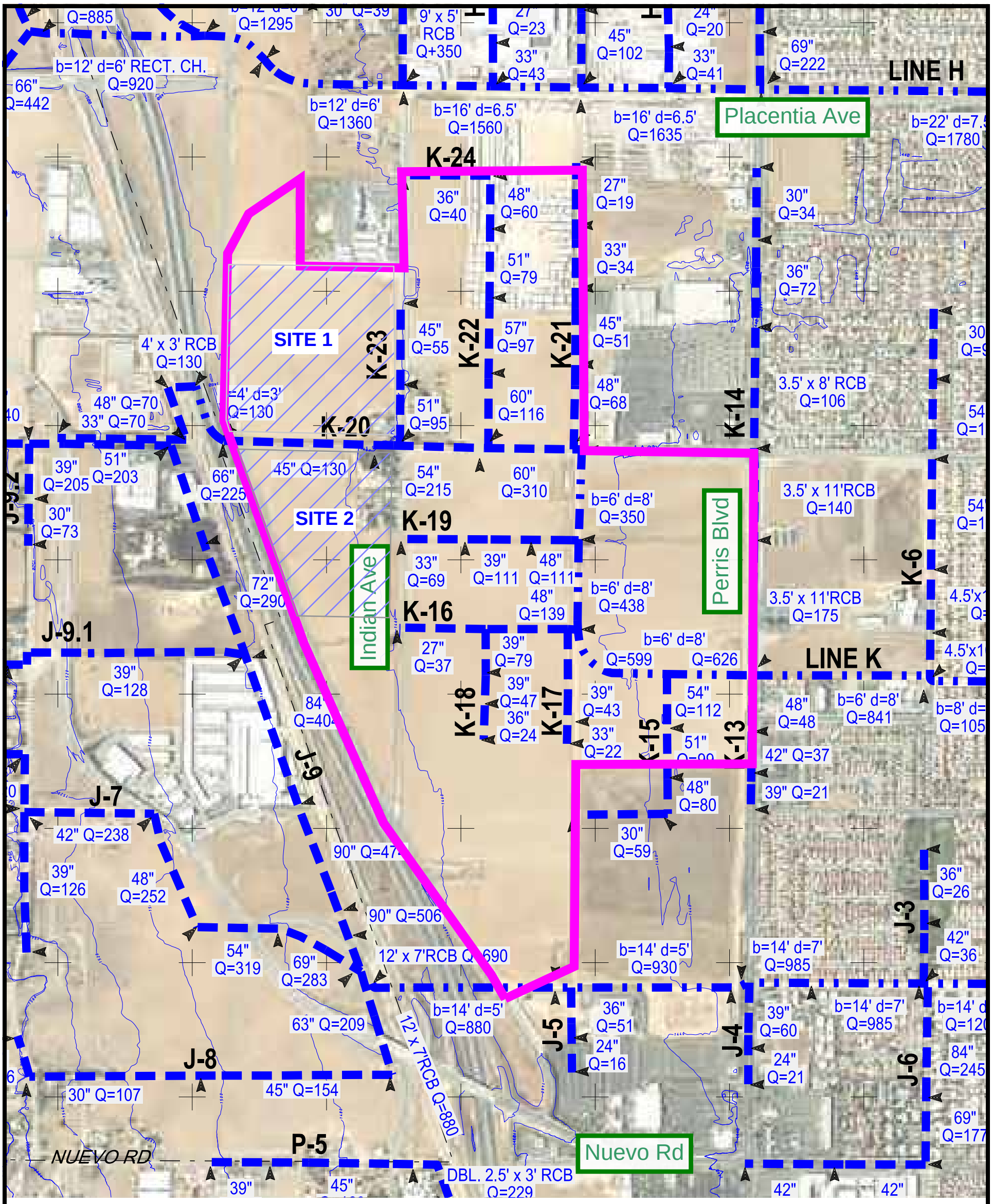
0 100 200 ft

FMCIVIL ENGINEERS INC.

Source: USDA Web Soil Survey

HARVEST LANDING

SITE 4 HYDROLOGICAL SOIL GROUPS



N.T.S.

Limits of master planned development - Howard Industrial

RCFC&WCD Master Drainage Plan Facilities for the Perris Valley Area, as shown in the digital exhibit map dated July 2014.

Site 1 and Site 2

RCFCD MDP FACILITIES OVERLAY

FMCIVIL ENGINEERS INC.

IN THE CITY OF PERRIS,
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM

VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

HOWARD INDUSTRIAL PARTNERS
1944 NORTH TUSTIN STREET, SUITE 122
ORANGE, CA 92865
CONTACT: TIM HOWARD
(TEL)714-769-9155

ENGINEER

FMCIVIL ENGINEERS INC.
29995 TECHNOLOGY DRIVE, SUITE 306
MURRIETA, CA 92563
CONTACT: FRANCISCO MARTINEZ
(TEL)951-331-9813

ARCHITECT

AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: STEPHEN PRZYBYLOWSKI
(TEL)714-639-9860

LEGEND

- RIGHT OF WAY
- (1025) EXISTING CONTOUR
- EASEMENT
- SD PROP. ONSITE STORM DRAIN SYSTEM
- SD PROP. OFFSITE STORM DRAIN SYSTEM
- PROP. STORM DRAIN LOW FLOW SYSTEM
- PROP. STORM DRAIN UNDER DRAIN SYSTEM
- W EXISTING WATER LINE
- W PROP. WATER LINE
- SS EXISTING SWR LINE
- SS PROP. SEWER LINE
- SD EXISTING STORM DRAIN PIPE
- E EXISTING OVERHEAD LINES

SCALE 1"=200'

200 100 0 200 400 600

SCALE: 1"=200'

CITY OF PERRIS

HARVEST LANDING INDUSTRIAL - PHASE I OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM EXHIBIT

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF.:	

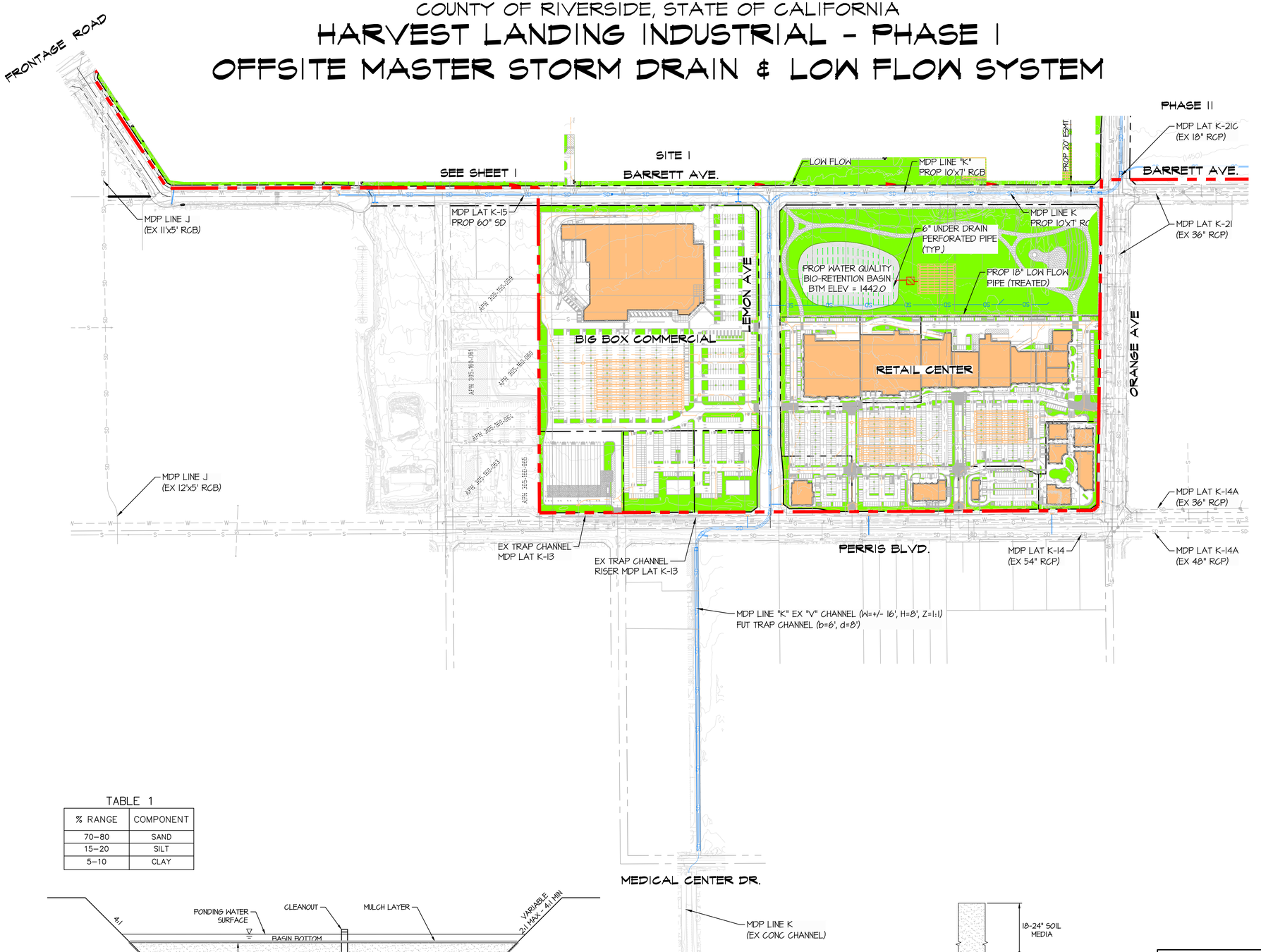
FMCIVIL ENGINEERS INC.
41870 KALMIA STREET, SUITE 120
MURRIETA, CA 92562
951.473.0202 - FMCIVIL.COM

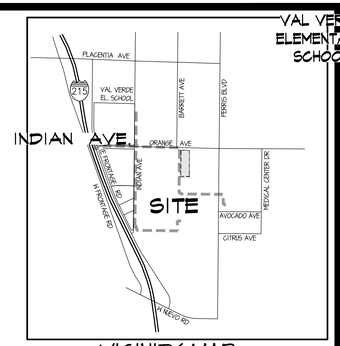
SHEET 1 OF 2 SHEETS

H:\PDATA\20-001 HARVEST LANDING\DWGS\PLDG\ENTITLEMENT\CUP\ALT-3\20-001-CUP_MSD3-01.DWG DANNY 10/7/2024 4:55 PM

COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM





VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

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ARCHITECT

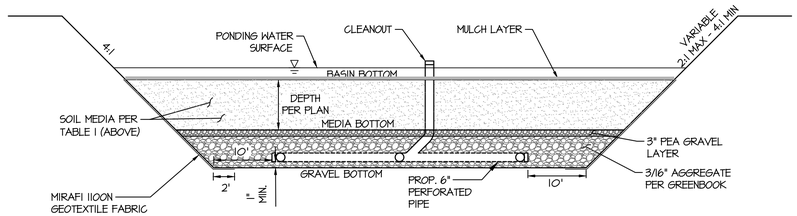
AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: STEPHEN PRZYBYLOWSKI
(TEL)714-639-9860

TABLE 1

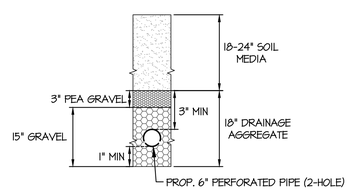
% RANGE	COMPONENT
70-80	SAND
15-20	SILT
5-10	CLAY

LEGEND

- RIGHT OF WAY
- (1025) EXISTING CONTOUR
- EASEMENT
- SD PROP. ONSITE STORM DRAIN SYSTEM
- SD PROP. OFFSITE STORM DRAIN SYSTEM
- PROP. STORM DRAIN LOW FLOW SYSTEM
- PROP. STORM DRAIN UNDER DRAIN SYSTEM
- W EXISTING WATER LINE
- W PROP. WATER LINE
- SS EXISTING SWR LINE
- SS PROP. SEWER LINE
- SD EXISTING STORM DRAIN PIPE
- E EXISTING OVERHEAD LINES



BASIN CROSS SECTION
N.T.S.



AGGREGATE CROSS SECTION
N.T.S.

SCALE 1"=200'

200 100 0 200 400 600
SCALE: 1"=200'

CITY OF PERRIS

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN
& LOW FLOW SYSTEM EXHIBIT

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF.:	

FMCIVIL ENGINEERS INC.
41870 KALMIA STREET, SUITE 120
MURRIETA | CA 92562
951.973.0202 - FMCIVIL.COM

SHEET 2 OF 2 SHEETS

H:\PDATA\20-001 HARVEST LANDING\DWGS\PLNCK\ENTITLEMENT\CUP\ALT-3\20-001-CUP_MSD3-01.DWG DANNY 10/8/2024 7:35 AM

IN THE CITY OF PERRIS,
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
SITE #4 CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-1 - PARCEL 3

LEGEND

- (1025) EXISTING CONTOUR
- 1025 PROPOSED CONTOUR
- RETAINING WALL
- FENCE
- EDGE OF PAVEMENT
- SIGN
- MH MANHOLE
- RIGHT OF WAY
- EASEMENT
- PARCEL LINE
- PARCEL MAP BOUNDARY
- STREET CENTER LINE
- SCREEN WALL
- COMBINATION SCREEN/RETAINING WALL
- EXISTING LOT LINE
- RIDGE LINE
- RIBBON GUTTER
- FLOW ARROW
- PROPOSED EDGE OF PAVEMENT
- W EXISTING WATER LINE
- W PROPOSED WATER LINE
- SS EXISTING SWR LINE
- SS PROPOSED SEWER LINE
- SD EXISTING STORM DRAIN PIPE
- SD PROPOSED STORM DRAIN PIPE
- E EXISTING OVERHEAD LINES
- CUT/FILL LINE
- SLOPE SYMBOL

ZONING ORDINANCE

EXISTING ZONING:
HARVEST LANDING SPECIFIC PLANS - MULTIPLE BUSINESS USE (MBU)

PROPOSED ZONING:
HARVEST LANDING SPECIFIC PLANS - MULTIPLE BUSINESS USE (MBU)

ASSESSOR'S PARCEL NUMBERS:

305-100-028, 305-170-018, 305-100-008, & 305-100-009

LEGAL DESCRIPTION

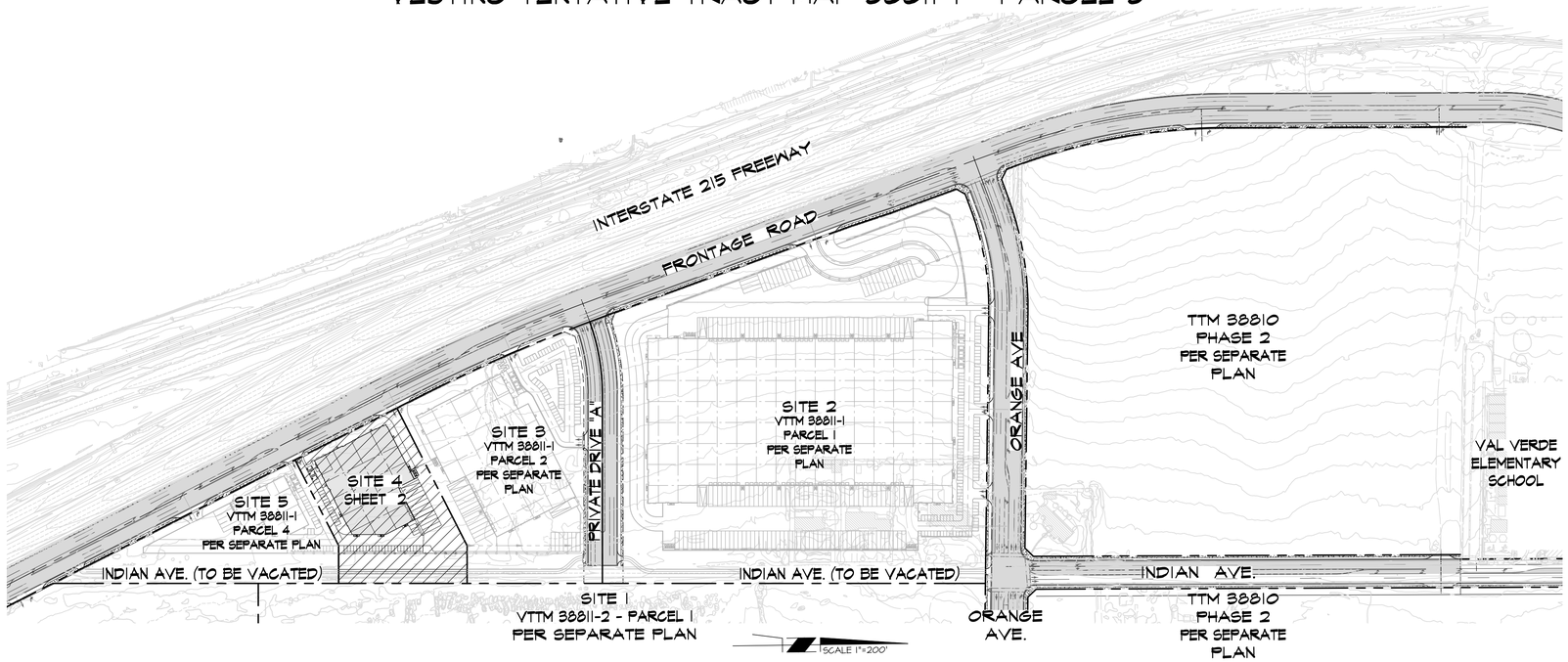
PARCELS 2-5:
(APNS:305-100-028, 305-170-018, 305-100-008, 305-100-009)

THAT PORTION OF THE NORTHWEST QUARTER OF SECTION 19, TOWNSHIP 4 SOUTH, RANGE 3 WEST, SAN BERNARDINO BASE AND MERIDIAN, WHICH LIES EASTERLY OF STATE HIGHWAY 395 AS CONVEYED TO THE STATE OF CALIFORNIA BY DEED RECORDED APRIL 28, 1952 AS INSTRUMENT NO. 18008.

EXCEPTING THE NORTH 30 FEET IN ORANGE AVENUE, THE EAST 30 FEET IN INDIAN AVENUE AND THE SOUTH 30 FEET IN CITRUS AVENUE.

ALSO EXCEPTING THEREFROM THE PORTION DESCRIBED IN DEED RECORDED DECEMBER 21, 1965 AS INSTRUMENT NO. 142400 AND IN DEED RECORDED MARCH 13, 1969 AS INSTRUMENT NO. 24345, RECORDS OF RIVERSIDE COUNTY.

ALSO EXCEPTING THEREFROM THOSE PORTIONS CONVEYED TO THE STATE OF CALIFORNIA BY DEEDS RECORDED MARCH 22, 1992, AS INSTRUMENT NOS. 94602 AND 94603.



SCALE 1"=200'

INDEX MAP

200 100 0 200 400 600

SCALE: 1"=200'

VICINITY MAP
T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

HOWARD INDUSTRIAL PARTNERS
1944 NORTH TUSTIN STREET, SUITE 122
ORANGE, CA 92865
CONTACT: TIM HOWARD
(TEL)714-769-9155

ENGINEER

FMCIVIL ENGINEERS INC.
41870 KALMIA ST., SUITE 120
MURRIETA, CA 92562
CONTACT: FRANCISCO MARTINEZ
(TEL)951-973-0202

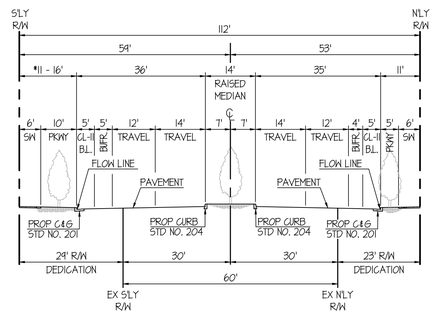
ARCHITECT

AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: DAN MACDAVID
(TEL)714-634-9860

EARTHWORK ESTIMATE:

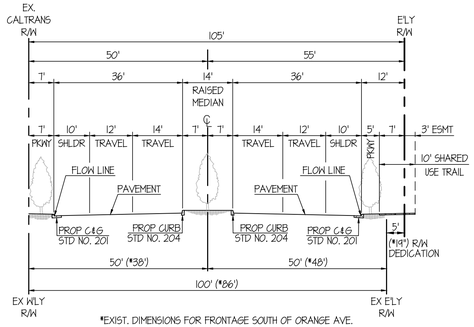
RAW CUT:	440 CY	
RAW FILL:	11,840 CY	
NET:	11,400 CY	IMPORT

HAUL TRIPS:
ASSUMED (13 CY PER TRIP) = 877



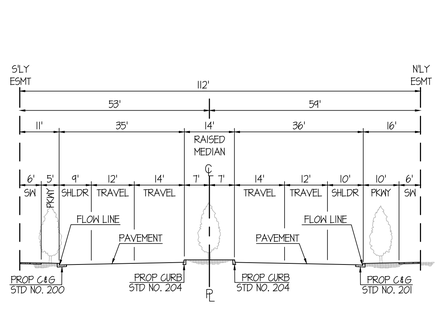
* PROPOSED 11' MINIMUM DIMENSIONS FOR ALL RIGHT TURN POCKETS AT INTERSECTIONS

ORANGE AVENUE
(WEST OF BARRETT AVE)
SECONDARY ARTERIAL
(112'/85')



*EXIST. DIMENSIONS FOR FRONTAGE SOUTH OF ORANGE AVE.

FRONTAGE ROAD
SECONDARY ARTERIAL
(105'/84')



PRIVATE DRIVE "A"
SECONDARY ARTERIAL
(112'/85')

CITY OF PERRIS

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
SITE #4 CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-1 - PARCEL 3

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF:	

FMCIVIL ENGINEERS INC.
41870 KALMIA STREET, SUITE 120
MURRIETA, CA 92562
951.973.0202 - FMCIVIL.COM

SHEET 1 OF 2 SHEETS

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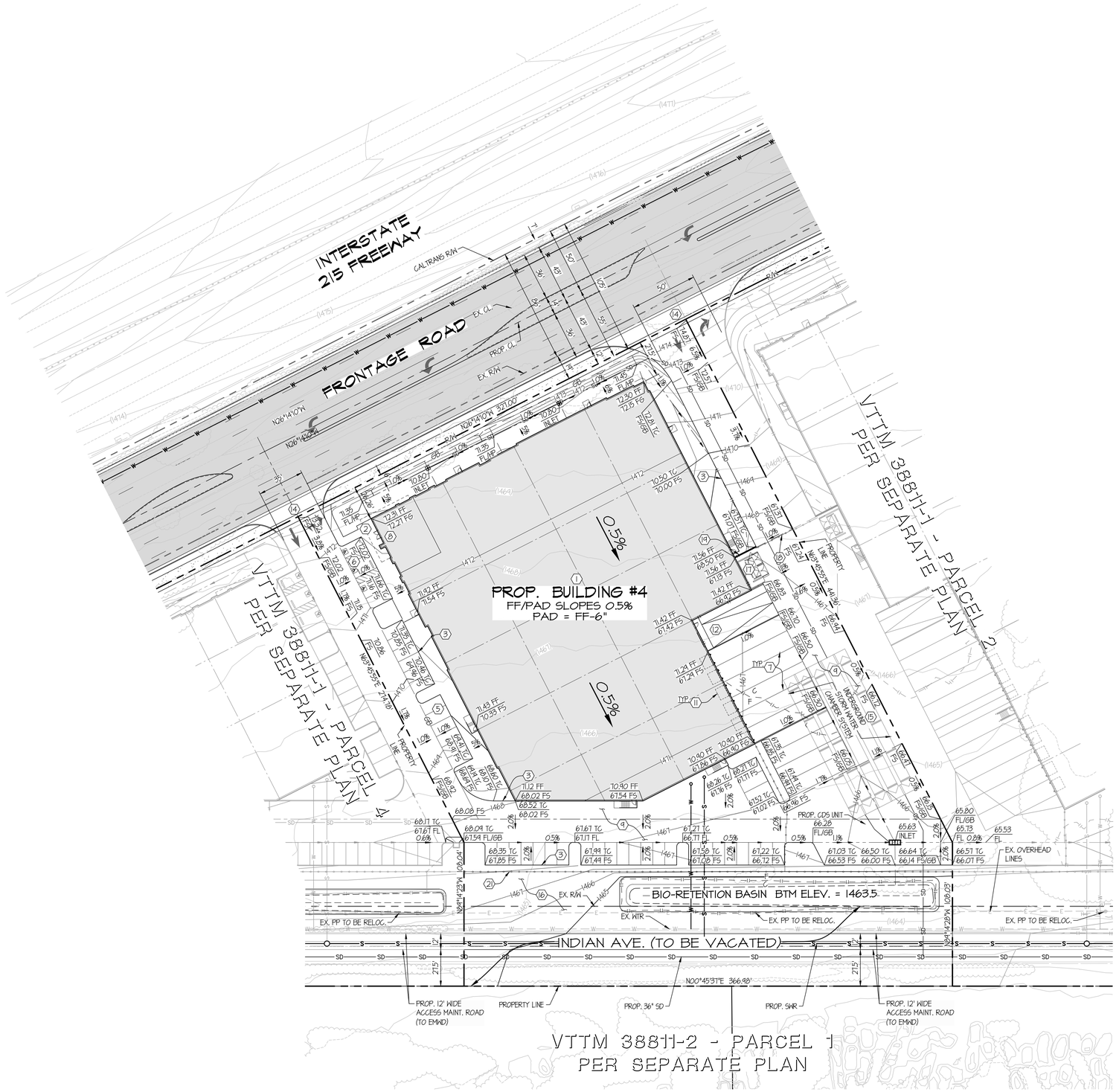

SITE PLAN KEYNOTES

1. PAINTED CONCRETE TILT-UP WAREHOUSE / OFFICE / MANUFACTURING FACILITY. BUILDING TO BE DESIGNED PER ARCHITECT'S PLANS
2. ON SITE ACCESSIBLE SIDEWALK AND CURB RAMPS.
3. CONCRETE CURB
4. CONCRETE CURB & GUTTER
5. STANDARD PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
6. HANDICAP PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
7. TRAILER / TRACTOR PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
8. ACCESSIBLE BUILDING ENTRY WITH ADJACENT BICYCLE RACKS PER ARCHITECT'S PLANS
9. PORTLAND CONC. CEMENT (PCC) PAVED TRUCK YARD ARCHITECT'S PLANS
10. PORTLAND CONC. CEMENT (PCC) PAVED AUTO PARKING ARCHITECT'S PLANS
11. DOCK HIGH TRUCK DOOR PER ARCHITECT'S PLANS
12. GRADE LEVEL RAMP DOOR PER ARCHITECT'S PLANS
13. EXTERIOR MAN DOOR AND STAIRS W/GUARD POST PER ARCHITECT'S PLANS
14. COMMERCIAL DRIVEWAY APPROACH PER RIVERSIDE COUNTY STD.207A, WITH DECORATIVE CONCRETE PAVING PER ARCHITECT'S PLANS
15. UNDERGROUND STORM WATER CHAMBER SYSTEM
16. LANDSCAPE AREA PER LANDSCAPE ARCHITECT'S PLANS
17. APPROXIMATE LOCATION OF TRASH ENCLOSURE
18. ENTRY GATE PER ARCHITECT'S PLANS
19. SCREEN WALL PER ARCHITECT'S PLANS (COMBO RETAINING)
20. CONCRETE RIBBON GUTTER/SWALE
21. CHAIN LINK FENCE PER ARCHITECT'S PLANS

SCALE 1"=40'

40 20 0 40 80 120

SCALE: 1"=40'

CITY OF PERRIS

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
SITE #4 CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-1 - PARCEL 3

SCALE:	AS SHOWN
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PLN CK REF:	

FMCIVIL ENGINEERS INC.
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MURRIETA, CA 92562
951.419.0202 - FMCIVIL.COM

SHEET 2 OF 2 SHEETS

H:\PDATA\20-001 HARVEST LANDING\DWGS\PLOT\ENTITLEMENT\CUP\ALT-3\BLDG-4\20-001-CUP_BLDG4-CG-01.DWG TOM BURNSIDE 10/2/2024 8:25 AM

DEVELOPMENT PLAN REVIEW VTPM 38811-1
PARCEL 4 - Site 5
CITY OF PERRIS
RIVERSIDE COUNTY, CALIFORNIA

Drainage Study Report

Prepared for:
Howard Industrial Partners LLC
1944 North Tustin Street, Suite 122
Orange, CA 92865

Prepared By:

FM CIVIL ENGINEERS INC.

29995 Technology Drive, Suite 306
Murrieta, CA 92563

Engineer of Work/Contacts:

Francisco Martinez, Jr.

April 12, 2024
Revised: October 4, 2024

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SECTION 1 - GENERAL OVERVIEW

INTRODUCTION

The purpose of this study is to support the entitlement phase and determine minimum drainage improvements required for the proposed industrial development of approximately 2.2 acres and 22,000 square feet warehouse building with 2 truck docks, and parking lot that lays within the Harvest Landing Specific Plan, located in the City of Perris, County of Riverside CA. More specifically, the project site is bounded to the north by Orange Avenue and the 215 freeway is to the west and Indian Avenue to the east and vacant undeveloped land to the south.

The primary objectives of this report are as follows:

1. Delineate the drainage areas tributary to the onsite above/underground basin

2. Based on drainage patterns, ground slope, land use and soil type and using the Riverside County Rational Method, perform hydrologic and hydraulics of onsite drainage facilities.

3. Determine the 100-year peak storm flows based upon the pre-project and post-project condition for the 24-hour storm duration utilizing the Unit Hydrograph Method as outlined in the Riverside County Flood Control & Water Conservation District Hydrology Manual.

4. Determine the required underground detention facilities to mitigate the 100-year peak storm flows for the 24-hour storm duration in the post-project condition to flows less than or equal to the existing condition flow rates.

5. Determine the required the minimum storm drain infrastructure to flood protect the project site for the 100-year storm event.

6. Preparation of a hydrology report, which consist of hydrological and analytical results and exhibits.

BACKGROUND

EXISTING CONDITIONS

The project site is located within Riverside County Flood Control's Perris Valley Master Drainage Plan, and tributary to a low point in Perris Boulevard and the existing MDP Line "K" (earthen V-Channel) located about 2600 lineal feet east of Indian Avenue.

The site is in a relatively mild to flat sloping undeveloped terrain on a drainage area which drains easterly towards Indian Avenue; however, there are offsite flows that enter the site at Frontage Road on the westerly property boundary via an existing 6'x3' RCB, see Exhibit "B". This existing box traverses Caltrans right-of-way, it collects and conveys flows from the west side of the railroad tracks and the 215 freeway. All the developed storm flows continue to travel easterly through the property, to Indian Avenue and the vacant parcels to the east where it ultimately reaches a low point at Perris Boulevard; storm drain flows are intercepted by existing street inlets and the existing MDP Line "K". MDP Line "K" is an earthen "V" channel (w= 16', H=8' & z=1:1) and planned as a future Trapezoidal Channel (b=6, d=8').

DEVELOPED CONDITIONS

No offsite flows will enter the project site. All onsite storm water runoff will be collected via onsite storm drain system and conveyed to a CDS unit for pretreatment and directed to an above ground bio-retention basin for water quality mitigation. However, the higher flow rates will be directed to an on-site underground pipe chamber which will mitigate the 100-year frequency storm event and release flows to be at or below the predeveloped conditions flow rates.

Onsite storm water mitigated flows will be directed to an offsite master storm drain system (backbone). The preliminary offsite design is shown on Exhibit G "Harvest Landing Industrial Phase 1 Offsite Master Storm Drain & Low Flow System". The offsite master storm drain and low flow system (backbone) will be part of a separate report and therefore excluded. See the table below for the rational method results:

Description	Q_{100} Peak Flow Rates
Proposed	7.6
Existing	8.5
Onsite MDP	12.7

For purposes of this preliminary drainage report, the 100-year 24-hour peak flow rates for the post developed condition, predeveloped condition and proposed developed condition per the land use on the MDP were the only storm events analyzed for mitigation. The project storm mitigation is provided by utilizing the underground storm drain detention system and the outlet control structures. The total mitigation volume required was determined by selecting the flow rates from the recess limb of the proposed unit hydrograph runs for the 100-year 24-hour storm event that are equal or less than the flow rates from existing conditions. Smaller storm events were analyzed, however, since the storm volume demand to mitigate the storm flows from the 100-year 24hour event are considerably larger than volumes produced by the smaller storm events, thus a conservative approach.

MDP Condition Volume: 0.79 ac-ft; $Q_{100\text{-}24hr}$: 2.06 cfs
Proposed Condition Volume: 0.51 ac-ft; $Q_{100\text{-}24hr}$: 1.51 cfs
Underground Chamber Volume: *0.74 ac-ft

*Since the peak storm flows for the proposed condition hydrology are less than the existing MDP condition, no mitigation is required. Contech chambers were provided as a place holder in case the district wants us to provide mitigation. See the table below for the unit hydrograph results:

Storm Duration	SP Q_{peak}	SP V_{TOTAL}	MDP Q_{PEAK}	MDP V_{TOTAL}
1	9.50	0.2635	11.6	0.3196
3	5.44	0.3742	6.26	0.5022
6	4.38	0.3941	5.19	0.613
24	1.51	0.7674	2.06	1.192
Acreage	3.46		3.46	

METHODOLOGY

HYDROLOGY

Hydrologic calculations were performed using the Riverside County Rational Method from RCFCD & WCD Hydrology Manual, dated April 1978. The 100-year design discharge was computed by generating a hydrologic "link-node" model in which divides the area into drainage sub-areas, each tributary to a concentration point or hydrologic "node" point determined by the proposed layout. The computer results are included in section 2. The following assumptions/guidelines were applied for use of the Rational Method:

1. The map from the Riverside County Hydrology Manual indicates that the study area is primarily Group "B" soils, with smaller areas as "A" and "C". A USGS soils map for the project site is included as Exhibit E, under the Exhibit section.
2. Initial sub-areas were drawn to be less than 10-acres in size and less than 1,000 feet in length, per County guidelines. Time of concentration for the initial sub-area is based on Time of Concentration Nomograph for Initial Sub-area from the Hydrology Manual.
3. Antecedent Moisture Condition 2 was used for 100-year storm events.
4. Standard intensity-duration curve data for the project area was used for the Perris Valley area; Plate D-4.1.

HYDRAULICS

Civil Design hydrology module was used for preliminarily sizing the storm drainpipe system. The onsite storm drain infrastructure will consist of pipe sizes ranging from 12"-24". A more detailed analysis will be provided in subsequent submittals and a WSPG analysis for onsite storm drainpipe system will be performed during final engineering.

CONCLUSIONS & RECOMMENDATIONS

The hydrology analyses evaluated the proposed development to determine the necessary onsite drainage improvements required to mitigate flows for increased runoff and it has been concluded that:

1. The proposed drainage facilities will adequately convey the 100-year flows and provide flood protection to the project site.

2. The proposed underground pipe chamber system will have sufficient storage to adequately mitigate for increased runoff.

SECTION 2 - HYDROLOGY ANALYSIS

100-YEAR EXISTING ON-SITE HYDROLOGY (RATIONAL METHOD)

100-YEAR PROPOSED LAND USE MDP ON-SITE HYDROLOGY (RATIONAL METHOD)

100-YEAR PROPOSED ON-SITE HYDROLOGY (RATIONAL METHOD)

100-YEAR PROPOSED OFF-SITE HYDROLOGY – E FRONTAGE ROAD (RATIONAL METHOD)

100-YEAR-24 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-24 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-6 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-6 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-3 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-3 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 08/22/23 File:100x5.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER BUSINESS PARK
EXISTING CONDITION
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 365.000(Ft.)
Top (of initial area) elevation = 1473.200(Ft.)
Bottom (of initial area) elevation = 1465.200(Ft.)
Difference in elevation = 8.000(Ft.)
Slope = 0.02192 s(percent)= 2.19

```
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.051 min.
Rainfall intensity =      2.459(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.771
Decimal fraction soil group A = 0.140
Decimal fraction soil group B = 0.860
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  76.46
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      8.440(CFS)
Total initial stream area =        4.450(Ac.)
Pervious area fraction = 1.000
End of computations, total study area =            4.45 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number =  76.5
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 09/18/23 File:100x5.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CEENTER & BUSINESS PARK
PROPOSED LANDUSE CONDITION
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 365.000(Ft.)
Top (of initial area) elevation = 1473.200(Ft.)
Bottom (of initial area) elevation = 1465.200(Ft.)
Difference in elevation = 8.000(Ft.)
Slope = 0.02192 s(percent)= 2.19
TC = k(0.300)*[(length^3)/(elevation change)]^0.2

```
Initial area time of concentration =    6.821 min.
Rainfall intensity =      3.250(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.876
Decimal fraction soil group A = 0.140
Decimal fraction soil group B = 0.860
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  52.64
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     12.666(CFS)
Total initial stream area =        4.450(Ac.)
Pervious area fraction = 0.100
End of computations, total study area =            4.45 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  52.6
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 09/30/24 File:P1005.out

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

English (in-lb) Units used in input data file

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100-YEAR STORM ANALYSIS

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 336.000(Ft.)
Top (of initial area) elevation = 1471.400(Ft.)
Bottom (of initial area) elevation = 1467.600(Ft.)
Difference in elevation = 3.800(Ft.)

```
Slope =    0.01131  s(percent)=       1.13
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.533 min.
Rainfall intensity =      3.096(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.877
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.738(CFS)
Total initial stream area =        0.640(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       11.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      0.640(Ac.)
Runoff from this stream =      1.738(CFS)
Time of concentration =    7.53 min.
Rainfall intensity =     3.096(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.100 to Point/Station       11.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   267.000(Ft.)
Top (of initial area) elevation =  1473.400(Ft.)
Bottom (of initial area) elevation =  1467.600(Ft.)
Difference in elevation =     5.800(Ft.)
Slope =    0.02172  s(percent)=       2.17
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.030 min.
Rainfall intensity =      3.453(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.879
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.669(CFS)
Total initial stream area =        0.550(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.100 to Point/Station       11.000
```

**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area = 0.550(Ac.)
Runoff from this stream = 1.669(CFS)
Time of concentration = 6.03 min.
Rainfall intensity = 3.453(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	1.738	7.53	3.096
2	1.669	6.03	3.453

Largest stream flow has longer time of concentration
Qp = 1.738 + sum of
Qb Ia/Ib
1.669 * 0.897 = 1.497
Qp = 3.235

Total of 2 main streams to confluence:
Flow rates before confluence point:
1.738 1.669
Area of streams before confluence:
0.640 0.550

Results of confluence:
Total flow rate = 3.235(CFS)
Time of concentration = 7.533 min.
Effective stream area after confluence = 1.190(Ac.)

++
Process from Point/Station 11.000 to Point/Station 12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 1464.090(Ft.)
Downstream point/station elevation = 1459.680(Ft.)
Pipe length = 239.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.235(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 3.235(CFS)
Normal flow depth in pipe = 7.17(In.)
Flow top width inside pipe = 11.77(In.)
Critical Depth = 9.24(In.)
Pipe flow velocity = 6.60(Ft/s)
Travel time through pipe = 0.60 min.
Time of concentration (TC) = 8.14 min.

++
Process from Point/Station 11.000 to Point/Station 12.000
**** CONFLUENCE OF MAIN STREAMS ****

```
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      1.190(Ac.)
Runoff from this stream =      3.235(CFS)
Time of concentration =    8.14 min.
Rainfall intensity =     2.981(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.100 to Point/Station       11.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   125.000(Ft.)
Top (of initial area) elevation =  1470.900(Ft.)
Bottom (of initial area) elevation =  1469.200(Ft.)
Difference in elevation =     1.700(Ft.)
Slope =    0.01360  s(percent)=       1.36
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Warning: TC computed to be less than 5 min.; program is assuming the
time of concentration is 5 minutes.
Initial area time of concentration =    5.000 min.
Rainfall intensity =      3.785(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.879
Decimal fraction soil group A = 0.120
Decimal fraction soil group B = 0.880
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  53.12
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.696(CFS)
Total initial stream area =        0.510(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.200 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1466.240(Ft.)
Downstream point/station elevation =  1459.680(Ft.)
Pipe length  =    21.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.696(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.696(CFS)
Normal flow depth in pipe =    3.14(In.)
Flow top width inside pipe =    5.99(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.28(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =     5.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       12.000
**** SUBAREA FLOW ADDITION ****
```

```
SINGLE FAMILY (1 Acre Lot)
Runoff Coefficient = 0.717
Decimal fraction soil group A = 0.210
Decimal fraction soil group B = 0.790
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  50.96
Pervious area fraction =  0.800; Impervious fraction =  0.200
Time of concentration =     5.02 min.
Rainfall intensity =      3.777(In/Hr) for a   100.0 year storm
Subarea runoff =      3.766(CFS) for      1.390(Ac.)
Total runoff =      5.462(CFS)      Total area =       1.900(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.900(Ac.)
Runoff from this stream =      5.462(CFS)
Time of concentration =    5.02 min.
Rainfall intensity =     3.777(In/Hr)
Summary of stream data:

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


1        3.235      8.14               2.981
2        5.462      5.02               3.777
Largest stream flow has longer or shorter time of concentration
Qp =      5.462 + sum of
        Qa          Tb/Ta
         3.235 *    0.617 =      1.996
Qp =      7.458

Total of 2 main streams to confluence:
Flow rates before confluence point:
       3.235       5.462
Area of streams before confluence:
        1.190        1.900


Results of confluence:
Total flow rate =      7.458(CFS)
Time of concentration =     5.021 min.
Effective stream area after confluence  =      3.090(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1459.680(Ft.)
```

```
Downstream point/station elevation =  1457.700(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.458(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     7.458(CFS)
Normal flow depth in pipe =   10.34(In.)
Flow top width inside pipe =   13.89(In.)
Critical Depth =   13.04(In.)
Pipe flow velocity =      8.27(Ft/s)
Travel time through pipe =    0.20 min.
Time of concentration (TC) =     5.22 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      3.090(Ac.)
Runoff from this stream =      7.458(CFS)
Time of concentration =    5.22 min.
Rainfall intensity =     3.704(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       13.100
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   475.000(Ft.)
Top (of initial area) elevation =  1472.300(Ft.)
Bottom (of initial area) elevation =  1464.700(Ft.)
Difference in elevation =     7.600(Ft.)
Slope =    0.01600  s(percent)=       1.60
TC = k(0.940)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   25.292 min.
Rainfall intensity =      1.710(In/Hr) for a   100.0 year storm
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.495
Decimal fraction soil group A = 0.530
Decimal fraction soil group B = 0.470
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  48.81
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      0.322(CFS)
Total initial stream area =        0.380(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.100 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1462.000(Ft.)
Downstream point/station elevation =  1457.700(Ft.)
```

```
Pipe length  =   237.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.322(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.322(CFS)
Normal flow depth in pipe =    2.74(In.)
Flow top width inside pipe =    5.98(In.)
Critical Depth =    3.45(In.)
Pipe flow velocity =      3.70(Ft/s)
Travel time through pipe =    1.07 min.
Time of concentration (TC) =    26.36 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.100 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.380(Ac.)
Runoff from this stream =      0.322(CFS)
Time of concentration =   26.36 min.
Rainfall intensity =     1.676(In/Hr)
Summary of stream data:

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


1        7.458      5.22               3.704
2        0.322     26.36               1.676
Largest stream flow has longer or shorter time of concentration
Qp =      7.458 + sum of
        Qa          Tb/Ta
         0.322 *    0.198 =      0.064
Qp =      7.522

Total of 2 main streams to confluence:
Flow rates before confluence point:
       7.458       0.322
Area of streams before confluence:
        3.090        0.380


Results of confluence:
Total flow rate =      7.522(CFS)
Time of concentration =     5.223 min.
Effective stream area after confluence  =      3.470(Ac.)
End of computations, total study area =            3.47 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.479
Area averaged RI index number =  52.8
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/11/24
File:100pfrontage5.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - OFFSITE - E FRONTAGE ROAD
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 20.000 to Point/Station 20.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 2.276(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.872

```
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
User specified values are as follows:
TC =  14.12 min.  Rain intensity =       2.28(In/Hr)
Total area =         1.15(Ac.)  Total runoff =      2.50(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       21.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1472.400(Ft.)
End of street segment elevation =  1468.500(Ft.)
Length of street segment  =   778.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  43.000(Ft.)
Distance from crown to crossfall grade break  =  41.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  12.000(Ft.)
Slope from curb to property line (v/hz) =   0.015
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0130
 Manning's N from gutter to grade break =  0.0130
 Manning's N from grade break to crown =  0.0130
Estimated mean flow rate at midpoint of street =      3.341(CFS)
Depth of flow =   0.371(Ft.), Average velocity =   2.062(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  12.222(Ft.)
Flow velocity =   2.06(Ft/s)
Travel time =    6.29 min.     TC =   20.41  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.868
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      1.900(In/Hr) for a   100.0 year storm
Subarea runoff =      1.616(CFS) for      0.980(Ac.)
Total runoff =      4.116(CFS)      Total area =       2.130(Ac.)
Street flow at end of street =      4.116(CFS)
Half street flow at end of street =      4.116(CFS)
Depth of flow =   0.393(Ft.), Average velocity =   2.166(Ft/s)
Flow width (from curb towards crown)=  13.316(Ft.)
End of computations, total study area =            2.13 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
```

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 56.0

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

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Study date 10/10/23 File: 100XUH24100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 3.46(Ac.) = 0.005 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 3.46(Ac.) = 0.005 Sq. Mi.
Length along longest watercourse = 365.00(Ft.)
Length along longest watercourse measured to centroid = 176.00(Ft.)
Length along longest watercourse = 0.069 Mi.
Length along longest watercourse measured to centroid = 0.033 Mi.
Difference in elevation = 8.00(Ft.)
Slope along watercourse = 115.7260 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.019 Hr.
Lag time = 1.16 Min.
25% of lag time = 0.29 Min.
40% of lag time = 0.46 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.46	2.00	6.92

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.46	5.00	17.30

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 2.000(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
3.460	52.60	0.900

Total Area Entered = 3.46(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
52.6	52.6	0.545	0.900	0.104	1.000	0.104
					Sum (F) =	0.104

Area averaged mean soil loss (F) (In/Hr) = 0.104
Minimum soil loss rate ((In/Hr)) = 0.052
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	430.393	67.069	2.339
2	0.167	860.786	32.931	1.148
		Sum = 100.000	Sum=	3.487

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.040	(0.184)	0.007	0.033
2	0.17	0.07	0.040	(0.183)	0.007	0.033
3	0.25	0.07	0.040	(0.182)	0.007	0.033
4	0.33	0.10	0.060	(0.182)	0.011	0.049
5	0.42	0.10	0.060	(0.181)	0.011	0.049
6	0.50	0.10	0.060	(0.180)	0.011	0.049
7	0.58	0.10	0.060	(0.179)	0.011	0.049
8	0.67	0.10	0.060	(0.179)	0.011	0.049
9	0.75	0.10	0.060	(0.178)	0.011	0.049
10	0.83	0.13	0.080	(0.177)	0.014	0.066
11	0.92	0.13	0.080	(0.177)	0.014	0.066
12	1.00	0.13	0.080	(0.176)	0.014	0.066
13	1.08	0.10	0.060	(0.175)	0.011	0.049
14	1.17	0.10	0.060	(0.175)	0.011	0.049
15	1.25	0.10	0.060	(0.174)	0.011	0.049
16	1.33	0.10	0.060	(0.173)	0.011	0.049
17	1.42	0.10	0.060	(0.173)	0.011	0.049
18	1.50	0.10	0.060	(0.172)	0.011	0.049
19	1.58	0.10	0.060	(0.171)	0.011	0.049
20	1.67	0.10	0.060	(0.170)	0.011	0.049
21	1.75	0.10	0.060	(0.170)	0.011	0.049
22	1.83	0.13	0.080	(0.169)	0.014	0.066
23	1.92	0.13	0.080	(0.168)	0.014	0.066
24	2.00	0.13	0.080	(0.168)	0.014	0.066
25	2.08	0.13	0.080	(0.167)	0.014	0.066
26	2.17	0.13	0.080	(0.166)	0.014	0.066
27	2.25	0.13	0.080	(0.166)	0.014	0.066
28	2.33	0.13	0.080	(0.165)	0.014	0.066
29	2.42	0.13	0.080	(0.164)	0.014	0.066
30	2.50	0.13	0.080	(0.164)	0.014	0.066
31	2.58	0.17	0.100	(0.163)	0.018	0.082
32	2.67	0.17	0.100	(0.162)	0.018	0.082
33	2.75	0.17	0.100	(0.162)	0.018	0.082
34	2.83	0.17	0.100	(0.161)	0.018	0.082
35	2.92	0.17	0.100	(0.160)	0.018	0.082
36	3.00	0.17	0.100	(0.160)	0.018	0.082
37	3.08	0.17	0.100	(0.159)	0.018	0.082
38	3.17	0.17	0.100	(0.158)	0.018	0.082
39	3.25	0.17	0.100	(0.158)	0.018	0.082
40	3.33	0.17	0.100	(0.157)	0.018	0.082
41	3.42	0.17	0.100	(0.156)	0.018	0.082
42	3.50	0.17	0.100	(0.156)	0.018	0.082
43	3.58	0.17	0.100	(0.155)	0.018	0.082
44	3.67	0.17	0.100	(0.154)	0.018	0.082
45	3.75	0.17	0.100	(0.154)	0.018	0.082

46	3.83	0.20	0.120	(0.153)	0.022	0.098
47	3.92	0.20	0.120	(0.152)	0.022	0.098
48	4.00	0.20	0.120	(0.152)	0.022	0.098
49	4.08	0.20	0.120	(0.151)	0.022	0.098
50	4.17	0.20	0.120	(0.151)	0.022	0.098
51	4.25	0.20	0.120	(0.150)	0.022	0.098
52	4.33	0.23	0.140	(0.149)	0.025	0.115
53	4.42	0.23	0.140	(0.149)	0.025	0.115
54	4.50	0.23	0.140	(0.148)	0.025	0.115
55	4.58	0.23	0.140	(0.147)	0.025	0.115
56	4.67	0.23	0.140	(0.147)	0.025	0.115
57	4.75	0.23	0.140	(0.146)	0.025	0.115
58	4.83	0.27	0.160	(0.145)	0.029	0.131
59	4.92	0.27	0.160	(0.145)	0.029	0.131
60	5.00	0.27	0.160	(0.144)	0.029	0.131
61	5.08	0.20	0.120	(0.144)	0.022	0.098
62	5.17	0.20	0.120	(0.143)	0.022	0.098
63	5.25	0.20	0.120	(0.142)	0.022	0.098
64	5.33	0.23	0.140	(0.142)	0.025	0.115
65	5.42	0.23	0.140	(0.141)	0.025	0.115
66	5.50	0.23	0.140	(0.140)	0.025	0.115
67	5.58	0.27	0.160	(0.140)	0.029	0.131
68	5.67	0.27	0.160	(0.139)	0.029	0.131
69	5.75	0.27	0.160	(0.139)	0.029	0.131
70	5.83	0.27	0.160	(0.138)	0.029	0.131
71	5.92	0.27	0.160	(0.137)	0.029	0.131
72	6.00	0.27	0.160	(0.137)	0.029	0.131
73	6.08	0.30	0.180	(0.136)	0.032	0.148
74	6.17	0.30	0.180	(0.136)	0.032	0.148
75	6.25	0.30	0.180	(0.135)	0.032	0.148
76	6.33	0.30	0.180	(0.134)	0.032	0.148
77	6.42	0.30	0.180	(0.134)	0.032	0.148
78	6.50	0.30	0.180	(0.133)	0.032	0.148
79	6.58	0.33	0.200	(0.133)	0.036	0.164
80	6.67	0.33	0.200	(0.132)	0.036	0.164
81	6.75	0.33	0.200	(0.131)	0.036	0.164
82	6.83	0.33	0.200	(0.131)	0.036	0.164
83	6.92	0.33	0.200	(0.130)	0.036	0.164
84	7.00	0.33	0.200	(0.130)	0.036	0.164
85	7.08	0.33	0.200	(0.129)	0.036	0.164
86	7.17	0.33	0.200	(0.128)	0.036	0.164
87	7.25	0.33	0.200	(0.128)	0.036	0.164
88	7.33	0.37	0.220	(0.127)	0.040	0.180
89	7.42	0.37	0.220	(0.127)	0.040	0.180
90	7.50	0.37	0.220	(0.126)	0.040	0.180
91	7.58	0.40	0.240	(0.126)	0.043	0.197
92	7.67	0.40	0.240	(0.125)	0.043	0.197
93	7.75	0.40	0.240	(0.124)	0.043	0.197
94	7.83	0.43	0.260	(0.124)	0.047	0.213
95	7.92	0.43	0.260	(0.123)	0.047	0.213

96	8.00	0.43	0.260	(0.123)	0.047	0.213
97	8.08	0.50	0.300	(0.122)	0.054	0.246
98	8.17	0.50	0.300	(0.122)	0.054	0.246
99	8.25	0.50	0.300	(0.121)	0.054	0.246
100	8.33	0.50	0.300	(0.120)	0.054	0.246
101	8.42	0.50	0.300	(0.120)	0.054	0.246
102	8.50	0.50	0.300	(0.119)	0.054	0.246
103	8.58	0.53	0.320	(0.119)	0.058	0.262
104	8.67	0.53	0.320	(0.118)	0.058	0.262
105	8.75	0.53	0.320	(0.118)	0.058	0.262
106	8.83	0.57	0.340	(0.117)	0.061	0.279
107	8.92	0.57	0.340	(0.116)	0.061	0.279
108	9.00	0.57	0.340	(0.116)	0.061	0.279
109	9.08	0.63	0.380	(0.115)	0.068	0.312
110	9.17	0.63	0.380	(0.115)	0.068	0.312
111	9.25	0.63	0.380	(0.114)	0.068	0.312
112	9.33	0.67	0.400	(0.114)	0.072	0.328
113	9.42	0.67	0.400	(0.113)	0.072	0.328
114	9.50	0.67	0.400	(0.113)	0.072	0.328
115	9.58	0.70	0.420	(0.112)	0.076	0.344
116	9.67	0.70	0.420	(0.112)	0.076	0.344
117	9.75	0.70	0.420	(0.111)	0.076	0.344
118	9.83	0.73	0.440	(0.111)	0.079	0.361
119	9.92	0.73	0.440	(0.110)	0.079	0.361
120	10.00	0.73	0.440	(0.109)	0.079	0.361
121	10.08	0.50	0.300	(0.109)	0.054	0.246
122	10.17	0.50	0.300	(0.108)	0.054	0.246
123	10.25	0.50	0.300	(0.108)	0.054	0.246
124	10.33	0.50	0.300	(0.107)	0.054	0.246
125	10.42	0.50	0.300	(0.107)	0.054	0.246
126	10.50	0.50	0.300	(0.106)	0.054	0.246
127	10.58	0.67	0.400	(0.106)	0.072	0.328
128	10.67	0.67	0.400	(0.105)	0.072	0.328
129	10.75	0.67	0.400	(0.105)	0.072	0.328
130	10.83	0.67	0.400	(0.104)	0.072	0.328
131	10.92	0.67	0.400	(0.104)	0.072	0.328
132	11.00	0.67	0.400	(0.103)	0.072	0.328
133	11.08	0.63	0.380	(0.103)	0.068	0.312
134	11.17	0.63	0.380	(0.102)	0.068	0.312
135	11.25	0.63	0.380	(0.102)	0.068	0.312
136	11.33	0.63	0.380	(0.101)	0.068	0.312
137	11.42	0.63	0.380	(0.101)	0.068	0.312
138	11.50	0.63	0.380	(0.100)	0.068	0.312
139	11.58	0.57	0.340	(0.100)	0.061	0.279
140	11.67	0.57	0.340	(0.099)	0.061	0.279
141	11.75	0.57	0.340	(0.099)	0.061	0.279
142	11.83	0.60	0.360	(0.098)	0.065	0.295
143	11.92	0.60	0.360	(0.098)	0.065	0.295
144	12.00	0.60	0.360	(0.097)	0.065	0.295
145	12.08	0.83	0.500	(0.097)	0.090	0.410

146	12.17	0.83	0.500	(0.096)	0.090	0.410
147	12.25	0.83	0.500	(0.096)	0.090	0.410
148	12.33	0.87	0.520	(0.095)	0.094	0.426
149	12.42	0.87	0.520	(0.095)	0.094	0.426
150	12.50	0.87	0.520	(0.094)	0.094	0.426
151	12.58	0.93	0.560	0.094	(0.101)	0.466
152	12.67	0.93	0.560	0.093	(0.101)	0.467
153	12.75	0.93	0.560	0.093	(0.101)	0.467
154	12.83	0.97	0.580	0.092	(0.104)	0.488
155	12.92	0.97	0.580	0.092	(0.104)	0.488
156	13.00	0.97	0.580	0.092	(0.104)	0.488
157	13.08	1.13	0.680	0.091	(0.122)	0.589
158	13.17	1.13	0.680	0.091	(0.122)	0.589
159	13.25	1.13	0.680	0.090	(0.122)	0.590
160	13.33	1.13	0.680	0.090	(0.122)	0.590
161	13.42	1.13	0.680	0.089	(0.122)	0.591
162	13.50	1.13	0.680	0.089	(0.122)	0.591
163	13.58	0.77	0.460	(0.088)	0.083	0.377
164	13.67	0.77	0.460	(0.088)	0.083	0.377
165	13.75	0.77	0.460	(0.087)	0.083	0.377
166	13.83	0.77	0.460	(0.087)	0.083	0.377
167	13.92	0.77	0.460	(0.087)	0.083	0.377
168	14.00	0.77	0.460	(0.086)	0.083	0.377
169	14.08	0.90	0.540	0.086	(0.097)	0.454
170	14.17	0.90	0.540	0.085	(0.097)	0.455
171	14.25	0.90	0.540	0.085	(0.097)	0.455
172	14.33	0.87	0.520	0.084	(0.094)	0.436
173	14.42	0.87	0.520	0.084	(0.094)	0.436
174	14.50	0.87	0.520	0.083	(0.094)	0.437
175	14.58	0.87	0.520	0.083	(0.094)	0.437
176	14.67	0.87	0.520	0.083	(0.094)	0.437
177	14.75	0.87	0.520	0.082	(0.094)	0.438
178	14.83	0.83	0.500	0.082	(0.090)	0.418
179	14.92	0.83	0.500	0.081	(0.090)	0.419
180	15.00	0.83	0.500	0.081	(0.090)	0.419
181	15.08	0.80	0.480	0.081	(0.086)	0.399
182	15.17	0.80	0.480	0.080	(0.086)	0.400
183	15.25	0.80	0.480	0.080	(0.086)	0.400
184	15.33	0.77	0.460	0.079	(0.083)	0.381
185	15.42	0.77	0.460	0.079	(0.083)	0.381
186	15.50	0.77	0.460	0.078	(0.083)	0.382
187	15.58	0.63	0.380	(0.078)	0.068	0.312
188	15.67	0.63	0.380	(0.078)	0.068	0.312
189	15.75	0.63	0.380	(0.077)	0.068	0.312
190	15.83	0.63	0.380	(0.077)	0.068	0.312
191	15.92	0.63	0.380	(0.077)	0.068	0.312
192	16.00	0.63	0.380	(0.076)	0.068	0.312
193	16.08	0.13	0.080	(0.076)	0.014	0.066
194	16.17	0.13	0.080	(0.075)	0.014	0.066
195	16.25	0.13	0.080	(0.075)	0.014	0.066

196	16.33	0.13	0.080	(0.075)	0.014	0.066
197	16.42	0.13	0.080	(0.074)	0.014	0.066
198	16.50	0.13	0.080	(0.074)	0.014	0.066
199	16.58	0.10	0.060	(0.073)	0.011	0.049
200	16.67	0.10	0.060	(0.073)	0.011	0.049
201	16.75	0.10	0.060	(0.073)	0.011	0.049
202	16.83	0.10	0.060	(0.072)	0.011	0.049
203	16.92	0.10	0.060	(0.072)	0.011	0.049
204	17.00	0.10	0.060	(0.072)	0.011	0.049
205	17.08	0.17	0.100	(0.071)	0.018	0.082
206	17.17	0.17	0.100	(0.071)	0.018	0.082
207	17.25	0.17	0.100	(0.071)	0.018	0.082
208	17.33	0.17	0.100	(0.070)	0.018	0.082
209	17.42	0.17	0.100	(0.070)	0.018	0.082
210	17.50	0.17	0.100	(0.069)	0.018	0.082
211	17.58	0.17	0.100	(0.069)	0.018	0.082
212	17.67	0.17	0.100	(0.069)	0.018	0.082
213	17.75	0.17	0.100	(0.068)	0.018	0.082
214	17.83	0.13	0.080	(0.068)	0.014	0.066
215	17.92	0.13	0.080	(0.068)	0.014	0.066
216	18.00	0.13	0.080	(0.067)	0.014	0.066
217	18.08	0.13	0.080	(0.067)	0.014	0.066
218	18.17	0.13	0.080	(0.067)	0.014	0.066
219	18.25	0.13	0.080	(0.066)	0.014	0.066
220	18.33	0.13	0.080	(0.066)	0.014	0.066
221	18.42	0.13	0.080	(0.066)	0.014	0.066
222	18.50	0.13	0.080	(0.065)	0.014	0.066
223	18.58	0.10	0.060	(0.065)	0.011	0.049
224	18.67	0.10	0.060	(0.065)	0.011	0.049
225	18.75	0.10	0.060	(0.065)	0.011	0.049
226	18.83	0.07	0.040	(0.064)	0.007	0.033
227	18.92	0.07	0.040	(0.064)	0.007	0.033
228	19.00	0.07	0.040	(0.064)	0.007	0.033
229	19.08	0.10	0.060	(0.063)	0.011	0.049
230	19.17	0.10	0.060	(0.063)	0.011	0.049
231	19.25	0.10	0.060	(0.063)	0.011	0.049
232	19.33	0.13	0.080	(0.062)	0.014	0.066
233	19.42	0.13	0.080	(0.062)	0.014	0.066
234	19.50	0.13	0.080	(0.062)	0.014	0.066
235	19.58	0.10	0.060	(0.062)	0.011	0.049
236	19.67	0.10	0.060	(0.061)	0.011	0.049
237	19.75	0.10	0.060	(0.061)	0.011	0.049
238	19.83	0.07	0.040	(0.061)	0.007	0.033
239	19.92	0.07	0.040	(0.060)	0.007	0.033
240	20.00	0.07	0.040	(0.060)	0.007	0.033
241	20.08	0.10	0.060	(0.060)	0.011	0.049
242	20.17	0.10	0.060	(0.060)	0.011	0.049
243	20.25	0.10	0.060	(0.059)	0.011	0.049
244	20.33	0.10	0.060	(0.059)	0.011	0.049
245	20.42	0.10	0.060	(0.059)	0.011	0.049

246	20.50	0.10	0.060	(0.059)	0.011	0.049
247	20.58	0.10	0.060	(0.058)	0.011	0.049
248	20.67	0.10	0.060	(0.058)	0.011	0.049
249	20.75	0.10	0.060	(0.058)	0.011	0.049
250	20.83	0.07	0.040	(0.058)	0.007	0.033
251	20.92	0.07	0.040	(0.057)	0.007	0.033
252	21.00	0.07	0.040	(0.057)	0.007	0.033
253	21.08	0.10	0.060	(0.057)	0.011	0.049
254	21.17	0.10	0.060	(0.057)	0.011	0.049
255	21.25	0.10	0.060	(0.057)	0.011	0.049
256	21.33	0.07	0.040	(0.056)	0.007	0.033
257	21.42	0.07	0.040	(0.056)	0.007	0.033
258	21.50	0.07	0.040	(0.056)	0.007	0.033
259	21.58	0.10	0.060	(0.056)	0.011	0.049
260	21.67	0.10	0.060	(0.055)	0.011	0.049
261	21.75	0.10	0.060	(0.055)	0.011	0.049
262	21.83	0.07	0.040	(0.055)	0.007	0.033
263	21.92	0.07	0.040	(0.055)	0.007	0.033
264	22.00	0.07	0.040	(0.055)	0.007	0.033
265	22.08	0.10	0.060	(0.055)	0.011	0.049
266	22.17	0.10	0.060	(0.054)	0.011	0.049
267	22.25	0.10	0.060	(0.054)	0.011	0.049
268	22.33	0.07	0.040	(0.054)	0.007	0.033
269	22.42	0.07	0.040	(0.054)	0.007	0.033
270	22.50	0.07	0.040	(0.054)	0.007	0.033
271	22.58	0.07	0.040	(0.054)	0.007	0.033
272	22.67	0.07	0.040	(0.053)	0.007	0.033
273	22.75	0.07	0.040	(0.053)	0.007	0.033
274	22.83	0.07	0.040	(0.053)	0.007	0.033
275	22.92	0.07	0.040	(0.053)	0.007	0.033
276	23.00	0.07	0.040	(0.053)	0.007	0.033
277	23.08	0.07	0.040	(0.053)	0.007	0.033
278	23.17	0.07	0.040	(0.053)	0.007	0.033
279	23.25	0.07	0.040	(0.052)	0.007	0.033
280	23.33	0.07	0.040	(0.052)	0.007	0.033
281	23.42	0.07	0.040	(0.052)	0.007	0.033
282	23.50	0.07	0.040	(0.052)	0.007	0.033
283	23.58	0.07	0.040	(0.052)	0.007	0.033
284	23.67	0.07	0.040	(0.052)	0.007	0.033
285	23.75	0.07	0.040	(0.052)	0.007	0.033
286	23.83	0.07	0.040	(0.052)	0.007	0.033
287	23.92	0.07	0.040	(0.052)	0.007	0.033
288	24.00	0.07	0.040	(0.052)	0.007	0.033

(Loss Rate Not Used)

Sum = 100.0 Sum = 49.6

Flood volume = Effective rainfall 4.13(In)
times area 3.5(Ac.)/[(In)/(Ft.)] = 1.2(Ac.Ft)
Total soil loss = 0.87(In)
Total soil loss = 0.250(Ac.Ft)
Total rainfall = 5.00(In)

Flood volume = 51922.7 Cubic Feet
Total soil loss = 10875.9 Cubic Feet

Peak flow rate of this hydrograph = 2.062(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	2.5	5.0	7.5	10.0
0+ 5	0.0005	0.08	Q				
0+10	0.0013	0.11	Q				
0+15	0.0021	0.11	Q				
0+20	0.0032	0.15	Q				
0+25	0.0043	0.17	Q				
0+30	0.0055	0.17	Q				
0+35	0.0067	0.17	Q				
0+40	0.0079	0.17	Q				
0+45	0.0091	0.17	Q				
0+50	0.0105	0.21	Q				
0+55	0.0121	0.23	Q				
1+ 0	0.0137	0.23	Q				
1+ 5	0.0150	0.19	Q				
1+10	0.0162	0.17	Q				
1+15	0.0173	0.17	Q				
1+20	0.0185	0.17	Q				
1+25	0.0197	0.17	Q				
1+30	0.0209	0.17	Q				
1+35	0.0221	0.17	Q				
1+40	0.0233	0.17	Q				
1+45	0.0244	0.17	Q				
1+50	0.0259	0.21	Q				
1+55	0.0275	0.23	Q				
2+ 0	0.0290	0.23	Q				
2+ 5	0.0306	0.23	QV				
2+10	0.0322	0.23	QV				
2+15	0.0338	0.23	QV				
2+20	0.0353	0.23	QV				
2+25	0.0369	0.23	QV				
2+30	0.0385	0.23	QV				
2+35	0.0403	0.27	|Q				
2+40	0.0423	0.29	|Q				
2+45	0.0443	0.29	|Q				
2+50	0.0462	0.29	|Q				
2+55	0.0482	0.29	|Q				
3+ 0	0.0502	0.29	|Q				

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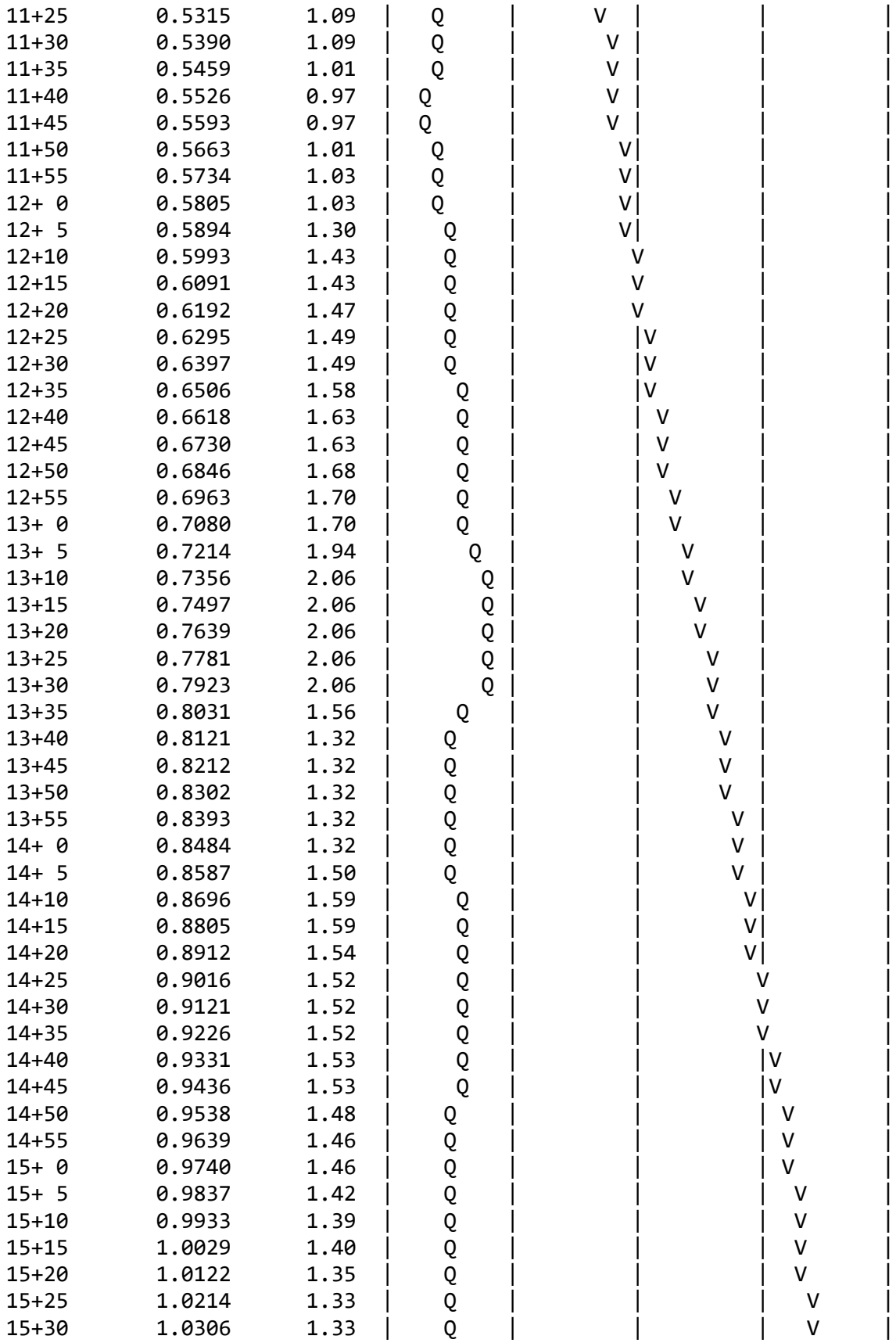
3+ 5       0.0522      0.29  |Q        |         |         |         |
3+10       0.0541      0.29  |Q        |         |         |         |
3+15       0.0561      0.29  |Q        |         |         |         |
3+20       0.0581      0.29  |Q        |         |         |         |
3+25       0.0600      0.29  |QV       |         |         |         |
3+30       0.0620      0.29  |QV       |         |         |         |
3+35       0.0640      0.29  |QV       |         |         |         |
3+40       0.0659      0.29  |QV       |         |         |         |
3+45       0.0679      0.29  |QV       |         |         |         |
3+50       0.0702      0.32  |QV       |         |         |         |
3+55       0.0725      0.34  |QV       |         |         |         |
4+ 0       0.0749      0.34  |QV       |         |         |         |
4+ 5       0.0772      0.34  |QV       |         |         |         |
4+10       0.0796      0.34  |QV       |         |         |         |
4+15       0.0820      0.34  |QV       |         |         |         |
4+20       0.0846      0.38  |QV       |         |         |         |
4+25       0.0874      0.40  |QV       |         |         |         |
4+30       0.0901      0.40  |Q V      |         |         |         |
4+35       0.0929      0.40  |Q V      |         |         |         |
4+40       0.0956      0.40  |Q V      |         |         |         |
4+45       0.0984      0.40  |Q V      |         |         |         |
4+50       0.1014      0.44  |Q V      |         |         |         |
4+55       0.1046      0.46  |Q V      |         |         |         |
5+ 0       0.1077      0.46  |Q V      |         |         |         |
5+ 5       0.1103      0.38  |Q V      |         |         |         |
5+10       0.1127      0.34  |Q V      |         |         |         |
5+15       0.1151      0.34  |Q V      |         |         |         |
5+20       0.1177      0.38  |Q V      |         |         |         |
5+25       0.1205      0.40  |Q  V     |         |         |         |
5+30       0.1232      0.40  |Q  V     |         |         |         |
5+35       0.1262      0.44  |Q  V     |         |         |         |
5+40       0.1294      0.46  |Q  V     |         |         |         |
5+45       0.1325      0.46  |Q  V     |         |         |         |
5+50       0.1357      0.46  |Q  V     |         |         |         |
5+55       0.1389      0.46  |Q  V     |         |         |         |
6+ 0       0.1420      0.46  |Q  V     |         |         |         |
6+ 5       0.1454      0.50  |Q  V     |         |         |         |
6+10       0.1490      0.51  | Q V     |         |         |         |
6+15       0.1525      0.51  | Q  V    |         |         |         |
6+20       0.1561      0.51  | Q  V    |         |         |         |
6+25       0.1596      0.51  | Q  V    |         |         |         |
6+30       0.1632      0.51  | Q  V    |         |         |         |
6+35       0.1670      0.55  | Q  V    |         |         |         |
6+40       0.1709      0.57  | Q  V    |         |         |         |
6+45       0.1748      0.57  | Q  V    |         |         |         |
6+50       0.1788      0.57  | Q  V    |         |         |         |
6+55       0.1827      0.57  | Q   V   |         |         |         |
7+ 0       0.1867      0.57  | Q   V   |         |         |         |
7+ 5       0.1906      0.57  | Q   V   |         |         |         |
7+10       0.1945      0.57  | Q   V   |         |         |         |
```

7+15	0.1985	0.57	Q V			
7+20	0.2027	0.61	Q V			
7+25	0.2070	0.63	Q V			
7+30	0.2114	0.63	Q V			
7+35	0.2160	0.67	Q V			
7+40	0.2207	0.69	Q V			
7+45	0.2254	0.69	Q V			
7+50	0.2304	0.72	Q V			
7+55	0.2355	0.74	Q V			
8+ 0	0.2407	0.74	Q V			
8+ 5	0.2463	0.82	Q V			
8+10	0.2522	0.86	Q V			
8+15	0.2581	0.86	Q V			
8+20	0.2640	0.86	Q V			
8+25	0.2700	0.86	Q V			
8+30	0.2759	0.86	Q V			
8+35	0.2820	0.90	Q V			
8+40	0.2883	0.92	Q V			
8+45	0.2946	0.92	Q V			
8+50	0.3012	0.95	Q V			
8+55	0.3079	0.97	Q V			
9+ 0	0.3146	0.97	Q V			
9+ 5	0.3218	1.05	Q V			
9+10	0.3293	1.09	Q V			
9+15	0.3368	1.09	Q V			
9+20	0.3446	1.13	Q V			
9+25	0.3524	1.14	Q V			
9+30	0.3603	1.14	Q V			
9+35	0.3685	1.18	Q V			
9+40	0.3767	1.20	Q V			
9+45	0.3850	1.20	Q V			
9+50	0.3936	1.24	Q V			
9+55	0.4022	1.26	Q V			
10+ 0	0.4109	1.26	Q V			
10+ 5	0.4177	0.99	Q V			
10+10	0.4236	0.86	Q V			
10+15	0.4295	0.86	Q V			
10+20	0.4355	0.86	Q V			
10+25	0.4414	0.86	Q V			
10+30	0.4473	0.86	Q V			
10+35	0.4545	1.05	Q V			
10+40	0.4624	1.14	Q V			
10+45	0.4703	1.14	Q V			
10+50	0.4781	1.14	Q V			
10+55	0.4860	1.14	Q V			
11+ 0	0.4939	1.14	Q V			
11+ 5	0.5015	1.11	Q V			
11+10	0.5090	1.09	Q V			
11+15	0.5165	1.09	Q V			
11+20	0.5240	1.09	Q V			



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15+35       1.0386      1.17  |   Q     |         |         |   V     |
15+40       1.0461      1.09  |   Q     |         |         |    V    |
15+45       1.0536      1.09  |   Q     |         |         |    V    |
15+50       1.0611      1.09  |   Q     |         |         |    V    |
15+55       1.0685      1.09  |   Q     |         |         |    V    |
16+ 0       1.0760      1.09  |   Q     |         |         |     V   |
16+ 5       1.0795      0.51  | Q       |         |         |     V   |
16+10       1.0811      0.23  Q         |         |         |     V   |
16+15       1.0827      0.23  Q         |         |         |     V   |
16+20       1.0843      0.23  Q         |         |         |     V   |
16+25       1.0859      0.23  Q         |         |         |     V   |
16+30       1.0874      0.23  Q         |         |         |     V   |
16+35       1.0887      0.19  Q         |         |         |     V   |
16+40       1.0899      0.17  Q         |         |         |     V   |
16+45       1.0911      0.17  Q         |         |         |     V   |
16+50       1.0923      0.17  Q         |         |         |     V   |
16+55       1.0935      0.17  Q         |         |         |     V   |
17+ 0       1.0947      0.17  Q         |         |         |     V   |
17+ 5       1.0964      0.25  Q         |         |         |     V   |
17+10       1.0983      0.29  |Q        |         |         |     V   |
17+15       1.1003      0.29  |Q        |         |         |     V   |
17+20       1.1023      0.29  |Q        |         |         |     V   |
17+25       1.1042      0.29  |Q        |         |         |      V  |
17+30       1.1062      0.29  |Q        |         |         |      V  |
17+35       1.1082      0.29  |Q        |         |         |      V  |
17+40       1.1102      0.29  |Q        |         |         |      V  |
17+45       1.1121      0.29  |Q        |         |         |      V  |
17+50       1.1138      0.25  Q         |         |         |      V  |
17+55       1.1154      0.23  Q         |         |         |      V  |
18+ 0       1.1170      0.23  Q         |         |         |      V  |
18+ 5       1.1186      0.23  Q         |         |         |      V  |
18+10       1.1201      0.23  Q         |         |         |      V  |
18+15       1.1217      0.23  Q         |         |         |      V  |
18+20       1.1233      0.23  Q         |         |         |      V  |
18+25       1.1249      0.23  Q         |         |         |      V  |
18+30       1.1264      0.23  Q         |         |         |      V  |
18+35       1.1278      0.19  Q         |         |         |      V  |
18+40       1.1289      0.17  Q         |         |         |      V  |
18+45       1.1301      0.17  Q         |         |         |      V  |
18+50       1.1310      0.13  Q         |         |         |      V  |
18+55       1.1318      0.11  Q         |         |         |      V  |
19+ 0       1.1326      0.11  Q         |         |         |       V |
19+ 5       1.1337      0.15  Q         |         |         |       V |
19+10       1.1348      0.17  Q         |         |         |       V |
19+15       1.1360      0.17  Q         |         |         |       V |
19+20       1.1375      0.21  Q         |         |         |       V |
19+25       1.1391      0.23  Q         |         |         |       V |
19+30       1.1406      0.23  Q         |         |         |       V |
19+35       1.1419      0.19  Q         |         |         |       V |
19+40       1.1431      0.17  Q         |         |         |       V |
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19+45	1.1443	0.17	Q	|	|	|	V |
19+50	1.1452	0.13	Q	|	|	|	V |
19+55	1.1460	0.11	Q	|	|	|	V |
20+ 0	1.1468	0.11	Q	|	|	|	V |
20+ 5	1.1479	0.15	Q	|	|	|	V |
20+10	1.1490	0.17	Q	|	|	|	V |
20+15	1.1502	0.17	Q	|	|	|	V |
20+20	1.1514	0.17	Q	|	|	|	V |
20+25	1.1526	0.17	Q	|	|	|	V |
20+30	1.1538	0.17	Q	|	|	|	V |
20+35	1.1549	0.17	Q	|	|	|	V |
20+40	1.1561	0.17	Q	|	|	|	V |
20+45	1.1573	0.17	Q	|	|	|	V |
20+50	1.1582	0.13	Q	|	|	|	V |
20+55	1.1590	0.11	Q	|	|	|	V |
21+ 0	1.1598	0.11	Q	|	|	|	V |
21+ 5	1.1609	0.15	Q	|	|	|	V |
21+10	1.1620	0.17	Q	|	|	|	V |
21+15	1.1632	0.17	Q	|	|	|	V|
21+20	1.1641	0.13	Q	|	|	|	V|
21+25	1.1649	0.11	Q	|	|	|	V|
21+30	1.1657	0.11	Q	|	|	|	V|
21+35	1.1668	0.15	Q	|	|	|	V|
21+40	1.1679	0.17	Q	|	|	|	V|
21+45	1.1691	0.17	Q	|	|	|	V|
21+50	1.1700	0.13	Q	|	|	|	V|
21+55	1.1708	0.11	Q	|	|	|	V|
22+ 0	1.1716	0.11	Q	|	|	|	V|
22+ 5	1.1727	0.15	Q	|	|	|	V|
22+10	1.1739	0.17	Q	|	|	|	V|
22+15	1.1750	0.17	Q	|	|	|	V|
22+20	1.1760	0.13	Q	|	|	|	V|
22+25	1.1767	0.11	Q	|	|	|	V|
22+30	1.1775	0.11	Q	|	|	|	V|
22+35	1.1783	0.11	Q	|	|	|	V|
22+40	1.1791	0.11	Q	|	|	|	V|
22+45	1.1799	0.11	Q	|	|	|	V|
22+50	1.1807	0.11	Q	|	|	|	V|
22+55	1.1815	0.11	Q	|	|	|	V|
23+ 0	1.1823	0.11	Q	|	|	|	V|
23+ 5	1.1831	0.11	Q	|	|	|	V|
23+10	1.1838	0.11	Q	|	|	|	V|
23+15	1.1846	0.11	Q	|	|	|	V|
23+20	1.1854	0.11	Q	|	|	|	V|
23+25	1.1862	0.11	Q	|	|	|	V|
23+30	1.1870	0.11	Q	|	|	|	V|
23+35	1.1878	0.11	Q	|	|	|	V|
23+40	1.1886	0.11	Q	|	|	|	V|
23+45	1.1894	0.11	Q	|	|	|	V|
23+50	1.1901	0.11	Q	|	|	|	V|

23+55	1.1909	0.11	Q	|	|	|	V|
24+ 0	1.1917	0.11	Q	|	|	|	V|
24+ 5	1.1920	0.04	Q	|	|	|	V|

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

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Study date 09/30/24 File: 100PUH24100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 3.47(Ac.) = 0.005 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 3.47(Ac.) = 0.005 Sq. Mi.
Length along longest watercourse = 742.00(Ft.)
Length along longest watercourse measured to centroid = 624.00(Ft.)
Length along longest watercourse = 0.141 Mi.
Length along longest watercourse measured to centroid = 0.118 Mi.
Difference in elevation = 14.60(Ft.)
Slope along watercourse = 103.8922 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.031 Hr.
Lag time = 1.88 Min.
25% of lag time = 0.47 Min.
40% of lag time = 0.75 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

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

3.47	2.00	6.94

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.47	5.00	17.35

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 2.000(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
3.470	52.80	0.521

Total Area Entered = 3.47(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
52.8	52.8	0.543	0.521	0.289	1.000	0.289
					Sum (F) =	0.289

Area averaged mean soil loss (F) (In/Hr) = 0.289
Minimum soil loss rate ((In/Hr)) = 0.144
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.483

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	265.427	52.830	1.848
2	0.167	530.854	39.116	1.368
3	0.250	796.281	6.543	0.229
4	0.333	1061.708	1.510	0.053
		Sum = 100.000	Sum=	3.497

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.040	(0.512)	0.019	0.021
2	0.17	0.07	0.040	(0.510)	0.019	0.021
3	0.25	0.07	0.040	(0.508)	0.019	0.021
4	0.33	0.10	0.060	(0.506)	0.029	0.031

5	0.42	0.10	0.060	(0.504)	0.029	0.031
6	0.50	0.10	0.060	(0.502)	0.029	0.031
7	0.58	0.10	0.060	(0.500)	0.029	0.031
8	0.67	0.10	0.060	(0.498)	0.029	0.031
9	0.75	0.10	0.060	(0.496)	0.029	0.031
10	0.83	0.13	0.080	(0.494)	0.039	0.041
11	0.92	0.13	0.080	(0.492)	0.039	0.041
12	1.00	0.13	0.080	(0.490)	0.039	0.041
13	1.08	0.10	0.060	(0.488)	0.029	0.031
14	1.17	0.10	0.060	(0.486)	0.029	0.031
15	1.25	0.10	0.060	(0.484)	0.029	0.031
16	1.33	0.10	0.060	(0.482)	0.029	0.031
17	1.42	0.10	0.060	(0.480)	0.029	0.031
18	1.50	0.10	0.060	(0.479)	0.029	0.031
19	1.58	0.10	0.060	(0.477)	0.029	0.031
20	1.67	0.10	0.060	(0.475)	0.029	0.031
21	1.75	0.10	0.060	(0.473)	0.029	0.031
22	1.83	0.13	0.080	(0.471)	0.039	0.041
23	1.92	0.13	0.080	(0.469)	0.039	0.041
24	2.00	0.13	0.080	(0.467)	0.039	0.041
25	2.08	0.13	0.080	(0.465)	0.039	0.041
26	2.17	0.13	0.080	(0.463)	0.039	0.041
27	2.25	0.13	0.080	(0.461)	0.039	0.041
28	2.33	0.13	0.080	(0.460)	0.039	0.041
29	2.42	0.13	0.080	(0.458)	0.039	0.041
30	2.50	0.13	0.080	(0.456)	0.039	0.041
31	2.58	0.17	0.100	(0.454)	0.048	0.052
32	2.67	0.17	0.100	(0.452)	0.048	0.052
33	2.75	0.17	0.100	(0.450)	0.048	0.052
34	2.83	0.17	0.100	(0.448)	0.048	0.052
35	2.92	0.17	0.100	(0.447)	0.048	0.052
36	3.00	0.17	0.100	(0.445)	0.048	0.052
37	3.08	0.17	0.100	(0.443)	0.048	0.052
38	3.17	0.17	0.100	(0.441)	0.048	0.052
39	3.25	0.17	0.100	(0.439)	0.048	0.052
40	3.33	0.17	0.100	(0.437)	0.048	0.052
41	3.42	0.17	0.100	(0.436)	0.048	0.052
42	3.50	0.17	0.100	(0.434)	0.048	0.052
43	3.58	0.17	0.100	(0.432)	0.048	0.052
44	3.67	0.17	0.100	(0.430)	0.048	0.052
45	3.75	0.17	0.100	(0.428)	0.048	0.052
46	3.83	0.20	0.120	(0.426)	0.058	0.062
47	3.92	0.20	0.120	(0.425)	0.058	0.062
48	4.00	0.20	0.120	(0.423)	0.058	0.062
49	4.08	0.20	0.120	(0.421)	0.058	0.062
50	4.17	0.20	0.120	(0.419)	0.058	0.062
51	4.25	0.20	0.120	(0.417)	0.058	0.062
52	4.33	0.23	0.140	(0.416)	0.068	0.072
53	4.42	0.23	0.140	(0.414)	0.068	0.072
54	4.50	0.23	0.140	(0.412)	0.068	0.072
55	4.58	0.23	0.140	(0.410)	0.068	0.072
56	4.67	0.23	0.140	(0.409)	0.068	0.072
57	4.75	0.23	0.140	(0.407)	0.068	0.072
58	4.83	0.27	0.160	(0.405)	0.077	0.083
59	4.92	0.27	0.160	(0.403)	0.077	0.083
60	5.00	0.27	0.160	(0.402)	0.077	0.083
61	5.08	0.20	0.120	(0.400)	0.058	0.062

62	5.17	0.20	0.120	(0.398)	0.058	0.062
63	5.25	0.20	0.120	(0.396)	0.058	0.062
64	5.33	0.23	0.140	(0.395)	0.068	0.072
65	5.42	0.23	0.140	(0.393)	0.068	0.072
66	5.50	0.23	0.140	(0.391)	0.068	0.072
67	5.58	0.27	0.160	(0.390)	0.077	0.083
68	5.67	0.27	0.160	(0.388)	0.077	0.083
69	5.75	0.27	0.160	(0.386)	0.077	0.083
70	5.83	0.27	0.160	(0.384)	0.077	0.083
71	5.92	0.27	0.160	(0.383)	0.077	0.083
72	6.00	0.27	0.160	(0.381)	0.077	0.083
73	6.08	0.30	0.180	(0.379)	0.087	0.093
74	6.17	0.30	0.180	(0.378)	0.087	0.093
75	6.25	0.30	0.180	(0.376)	0.087	0.093
76	6.33	0.30	0.180	(0.374)	0.087	0.093
77	6.42	0.30	0.180	(0.373)	0.087	0.093
78	6.50	0.30	0.180	(0.371)	0.087	0.093
79	6.58	0.33	0.200	(0.369)	0.097	0.103
80	6.67	0.33	0.200	(0.368)	0.097	0.103
81	6.75	0.33	0.200	(0.366)	0.097	0.103
82	6.83	0.33	0.200	(0.364)	0.097	0.103
83	6.92	0.33	0.200	(0.363)	0.097	0.103
84	7.00	0.33	0.200	(0.361)	0.097	0.103
85	7.08	0.33	0.200	(0.359)	0.097	0.103
86	7.17	0.33	0.200	(0.358)	0.097	0.103
87	7.25	0.33	0.200	(0.356)	0.097	0.103
88	7.33	0.37	0.220	(0.354)	0.106	0.114
89	7.42	0.37	0.220	(0.353)	0.106	0.114
90	7.50	0.37	0.220	(0.351)	0.106	0.114
91	7.58	0.40	0.240	(0.350)	0.116	0.124
92	7.67	0.40	0.240	(0.348)	0.116	0.124
93	7.75	0.40	0.240	(0.346)	0.116	0.124
94	7.83	0.43	0.260	(0.345)	0.126	0.134
95	7.92	0.43	0.260	(0.343)	0.126	0.134
96	8.00	0.43	0.260	(0.342)	0.126	0.134
97	8.08	0.50	0.300	(0.340)	0.145	0.155
98	8.17	0.50	0.300	(0.338)	0.145	0.155
99	8.25	0.50	0.300	(0.337)	0.145	0.155
100	8.33	0.50	0.300	(0.335)	0.145	0.155
101	8.42	0.50	0.300	(0.334)	0.145	0.155
102	8.50	0.50	0.300	(0.332)	0.145	0.155
103	8.58	0.53	0.320	(0.331)	0.155	0.165
104	8.67	0.53	0.320	(0.329)	0.155	0.165
105	8.75	0.53	0.320	(0.327)	0.155	0.165
106	8.83	0.57	0.340	(0.326)	0.164	0.176
107	8.92	0.57	0.340	(0.324)	0.164	0.176
108	9.00	0.57	0.340	(0.323)	0.164	0.176
109	9.08	0.63	0.380	(0.321)	0.184	0.196
110	9.17	0.63	0.380	(0.320)	0.184	0.196
111	9.25	0.63	0.380	(0.318)	0.184	0.196
112	9.33	0.67	0.400	(0.317)	0.193	0.207
113	9.42	0.67	0.400	(0.315)	0.193	0.207
114	9.50	0.67	0.400	(0.314)	0.193	0.207
115	9.58	0.70	0.420	(0.312)	0.203	0.217
116	9.67	0.70	0.420	(0.311)	0.203	0.217
117	9.75	0.70	0.420	(0.309)	0.203	0.217
118	9.83	0.73	0.440	(0.308)	0.213	0.227

119	9.92	0.73	0.440	(0.306)	0.213	0.227
120	10.00	0.73	0.440	(0.305)	0.213	0.227
121	10.08	0.50	0.300	(0.303)	0.145	0.155
122	10.17	0.50	0.300	(0.302)	0.145	0.155
123	10.25	0.50	0.300	(0.300)	0.145	0.155
124	10.33	0.50	0.300	(0.299)	0.145	0.155
125	10.42	0.50	0.300	(0.297)	0.145	0.155
126	10.50	0.50	0.300	(0.296)	0.145	0.155
127	10.58	0.67	0.400	(0.295)	0.193	0.207
128	10.67	0.67	0.400	(0.293)	0.193	0.207
129	10.75	0.67	0.400	(0.292)	0.193	0.207
130	10.83	0.67	0.400	(0.290)	0.193	0.207
131	10.92	0.67	0.400	(0.289)	0.193	0.207
132	11.00	0.67	0.400	(0.287)	0.193	0.207
133	11.08	0.63	0.380	(0.286)	0.184	0.196
134	11.17	0.63	0.380	(0.285)	0.184	0.196
135	11.25	0.63	0.380	(0.283)	0.184	0.196
136	11.33	0.63	0.380	(0.282)	0.184	0.196
137	11.42	0.63	0.380	(0.280)	0.184	0.196
138	11.50	0.63	0.380	(0.279)	0.184	0.196
139	11.58	0.57	0.340	(0.278)	0.164	0.176
140	11.67	0.57	0.340	(0.276)	0.164	0.176
141	11.75	0.57	0.340	(0.275)	0.164	0.176
142	11.83	0.60	0.360	(0.273)	0.174	0.186
143	11.92	0.60	0.360	(0.272)	0.174	0.186
144	12.00	0.60	0.360	(0.271)	0.174	0.186
145	12.08	0.83	0.500	(0.269)	0.242	0.258
146	12.17	0.83	0.500	(0.268)	0.242	0.258
147	12.25	0.83	0.500	(0.267)	0.242	0.258
148	12.33	0.87	0.520	(0.265)	0.251	0.269
149	12.42	0.87	0.520	(0.264)	0.251	0.269
150	12.50	0.87	0.520	(0.263)	0.251	0.269
151	12.58	0.93	0.560	0.261	(0.271)	0.299
152	12.67	0.93	0.560	0.260	(0.271)	0.300
153	12.75	0.93	0.560	0.259	(0.271)	0.301
154	12.83	0.97	0.580	0.257	(0.280)	0.323
155	12.92	0.97	0.580	0.256	(0.280)	0.324
156	13.00	0.97	0.580	0.255	(0.280)	0.325
157	13.08	1.13	0.680	0.254	(0.329)	0.426
158	13.17	1.13	0.680	0.252	(0.329)	0.428
159	13.25	1.13	0.680	0.251	(0.329)	0.429
160	13.33	1.13	0.680	0.250	(0.329)	0.430
161	13.42	1.13	0.680	0.248	(0.329)	0.432
162	13.50	1.13	0.680	0.247	(0.329)	0.433
163	13.58	0.77	0.460	(0.246)	0.222	0.238
164	13.67	0.77	0.460	(0.245)	0.222	0.238
165	13.75	0.77	0.460	(0.243)	0.222	0.238
166	13.83	0.77	0.460	(0.242)	0.222	0.238
167	13.92	0.77	0.460	(0.241)	0.222	0.238
168	14.00	0.77	0.460	(0.240)	0.222	0.238
169	14.08	0.90	0.540	0.239	(0.261)	0.301
170	14.17	0.90	0.540	0.237	(0.261)	0.303
171	14.25	0.90	0.540	0.236	(0.261)	0.304
172	14.33	0.87	0.520	0.235	(0.251)	0.285
173	14.42	0.87	0.520	0.234	(0.251)	0.286
174	14.50	0.87	0.520	0.232	(0.251)	0.288
175	14.58	0.87	0.520	0.231	(0.251)	0.289

176	14.67	0.87	0.520	0.230	(0.251)	0.290
177	14.75	0.87	0.520	0.229	(0.251)	0.291
178	14.83	0.83	0.500	0.228	(0.242)	0.272
179	14.92	0.83	0.500	0.227	(0.242)	0.273
180	15.00	0.83	0.500	0.225	(0.242)	0.275
181	15.08	0.80	0.480	0.224	(0.232)	0.256
182	15.17	0.80	0.480	0.223	(0.232)	0.257
183	15.25	0.80	0.480	0.222	(0.232)	0.258
184	15.33	0.77	0.460	0.221	(0.222)	0.239
185	15.42	0.77	0.460	0.220	(0.222)	0.240
186	15.50	0.77	0.460	0.219	(0.222)	0.241
187	15.58	0.63	0.380	(0.217)	0.184	0.196
188	15.67	0.63	0.380	(0.216)	0.184	0.196
189	15.75	0.63	0.380	(0.215)	0.184	0.196
190	15.83	0.63	0.380	(0.214)	0.184	0.196
191	15.92	0.63	0.380	(0.213)	0.184	0.196
192	16.00	0.63	0.380	(0.212)	0.184	0.196
193	16.08	0.13	0.080	(0.211)	0.039	0.041
194	16.17	0.13	0.080	(0.210)	0.039	0.041
195	16.25	0.13	0.080	(0.209)	0.039	0.041
196	16.33	0.13	0.080	(0.208)	0.039	0.041
197	16.42	0.13	0.080	(0.207)	0.039	0.041
198	16.50	0.13	0.080	(0.206)	0.039	0.041
199	16.58	0.10	0.060	(0.204)	0.029	0.031
200	16.67	0.10	0.060	(0.203)	0.029	0.031
201	16.75	0.10	0.060	(0.202)	0.029	0.031
202	16.83	0.10	0.060	(0.201)	0.029	0.031
203	16.92	0.10	0.060	(0.200)	0.029	0.031
204	17.00	0.10	0.060	(0.199)	0.029	0.031
205	17.08	0.17	0.100	(0.198)	0.048	0.052
206	17.17	0.17	0.100	(0.197)	0.048	0.052
207	17.25	0.17	0.100	(0.196)	0.048	0.052
208	17.33	0.17	0.100	(0.195)	0.048	0.052
209	17.42	0.17	0.100	(0.194)	0.048	0.052
210	17.50	0.17	0.100	(0.193)	0.048	0.052
211	17.58	0.17	0.100	(0.192)	0.048	0.052
212	17.67	0.17	0.100	(0.192)	0.048	0.052
213	17.75	0.17	0.100	(0.191)	0.048	0.052
214	17.83	0.13	0.080	(0.190)	0.039	0.041
215	17.92	0.13	0.080	(0.189)	0.039	0.041
216	18.00	0.13	0.080	(0.188)	0.039	0.041
217	18.08	0.13	0.080	(0.187)	0.039	0.041
218	18.17	0.13	0.080	(0.186)	0.039	0.041
219	18.25	0.13	0.080	(0.185)	0.039	0.041
220	18.33	0.13	0.080	(0.184)	0.039	0.041
221	18.42	0.13	0.080	(0.183)	0.039	0.041
222	18.50	0.13	0.080	(0.182)	0.039	0.041
223	18.58	0.10	0.060	(0.181)	0.029	0.031
224	18.67	0.10	0.060	(0.181)	0.029	0.031
225	18.75	0.10	0.060	(0.180)	0.029	0.031
226	18.83	0.07	0.040	(0.179)	0.019	0.021
227	18.92	0.07	0.040	(0.178)	0.019	0.021
228	19.00	0.07	0.040	(0.177)	0.019	0.021
229	19.08	0.10	0.060	(0.176)	0.029	0.031
230	19.17	0.10	0.060	(0.175)	0.029	0.031
231	19.25	0.10	0.060	(0.175)	0.029	0.031
232	19.33	0.13	0.080	(0.174)	0.039	0.041

233	19.42	0.13	0.080	(0.173)	0.039	0.041
234	19.50	0.13	0.080	(0.172)	0.039	0.041
235	19.58	0.10	0.060	(0.171)	0.029	0.031
236	19.67	0.10	0.060	(0.171)	0.029	0.031
237	19.75	0.10	0.060	(0.170)	0.029	0.031
238	19.83	0.07	0.040	(0.169)	0.019	0.021
239	19.92	0.07	0.040	(0.168)	0.019	0.021
240	20.00	0.07	0.040	(0.168)	0.019	0.021
241	20.08	0.10	0.060	(0.167)	0.029	0.031
242	20.17	0.10	0.060	(0.166)	0.029	0.031
243	20.25	0.10	0.060	(0.165)	0.029	0.031
244	20.33	0.10	0.060	(0.165)	0.029	0.031
245	20.42	0.10	0.060	(0.164)	0.029	0.031
246	20.50	0.10	0.060	(0.163)	0.029	0.031
247	20.58	0.10	0.060	(0.163)	0.029	0.031
248	20.67	0.10	0.060	(0.162)	0.029	0.031
249	20.75	0.10	0.060	(0.161)	0.029	0.031
250	20.83	0.07	0.040	(0.161)	0.019	0.021
251	20.92	0.07	0.040	(0.160)	0.019	0.021
252	21.00	0.07	0.040	(0.159)	0.019	0.021
253	21.08	0.10	0.060	(0.159)	0.029	0.031
254	21.17	0.10	0.060	(0.158)	0.029	0.031
255	21.25	0.10	0.060	(0.157)	0.029	0.031
256	21.33	0.07	0.040	(0.157)	0.019	0.021
257	21.42	0.07	0.040	(0.156)	0.019	0.021
258	21.50	0.07	0.040	(0.156)	0.019	0.021
259	21.58	0.10	0.060	(0.155)	0.029	0.031
260	21.67	0.10	0.060	(0.155)	0.029	0.031
261	21.75	0.10	0.060	(0.154)	0.029	0.031
262	21.83	0.07	0.040	(0.153)	0.019	0.021
263	21.92	0.07	0.040	(0.153)	0.019	0.021
264	22.00	0.07	0.040	(0.152)	0.019	0.021
265	22.08	0.10	0.060	(0.152)	0.029	0.031
266	22.17	0.10	0.060	(0.151)	0.029	0.031
267	22.25	0.10	0.060	(0.151)	0.029	0.031
268	22.33	0.07	0.040	(0.150)	0.019	0.021
269	22.42	0.07	0.040	(0.150)	0.019	0.021
270	22.50	0.07	0.040	(0.150)	0.019	0.021
271	22.58	0.07	0.040	(0.149)	0.019	0.021
272	22.67	0.07	0.040	(0.149)	0.019	0.021
273	22.75	0.07	0.040	(0.148)	0.019	0.021
274	22.83	0.07	0.040	(0.148)	0.019	0.021
275	22.92	0.07	0.040	(0.148)	0.019	0.021
276	23.00	0.07	0.040	(0.147)	0.019	0.021
277	23.08	0.07	0.040	(0.147)	0.019	0.021
278	23.17	0.07	0.040	(0.146)	0.019	0.021
279	23.25	0.07	0.040	(0.146)	0.019	0.021
280	23.33	0.07	0.040	(0.146)	0.019	0.021
281	23.42	0.07	0.040	(0.146)	0.019	0.021
282	23.50	0.07	0.040	(0.145)	0.019	0.021
283	23.58	0.07	0.040	(0.145)	0.019	0.021
284	23.67	0.07	0.040	(0.145)	0.019	0.021
285	23.75	0.07	0.040	(0.145)	0.019	0.021
286	23.83	0.07	0.040	(0.145)	0.019	0.021
287	23.92	0.07	0.040	(0.144)	0.019	0.021
288	24.00	0.07	0.040	(0.144)	0.019	0.021

(Loss Rate Not Used)

Sum = 100.0 Sum = 31.8

Flood volume = Effective rainfall 2.65(In)
times area 3.5(Ac.)/[(In)/(Ft.)] = 0.8(Ac.Ft)
Total soil loss = 2.35(In)
Total soil loss = 0.678(Ac.Ft)
Total rainfall = 5.00(In)
Flood volume = 33428.9 Cubic Feet
Total soil loss = 29551.2 Cubic Feet

Peak flow rate of this hydrograph = 1.512(CFS)

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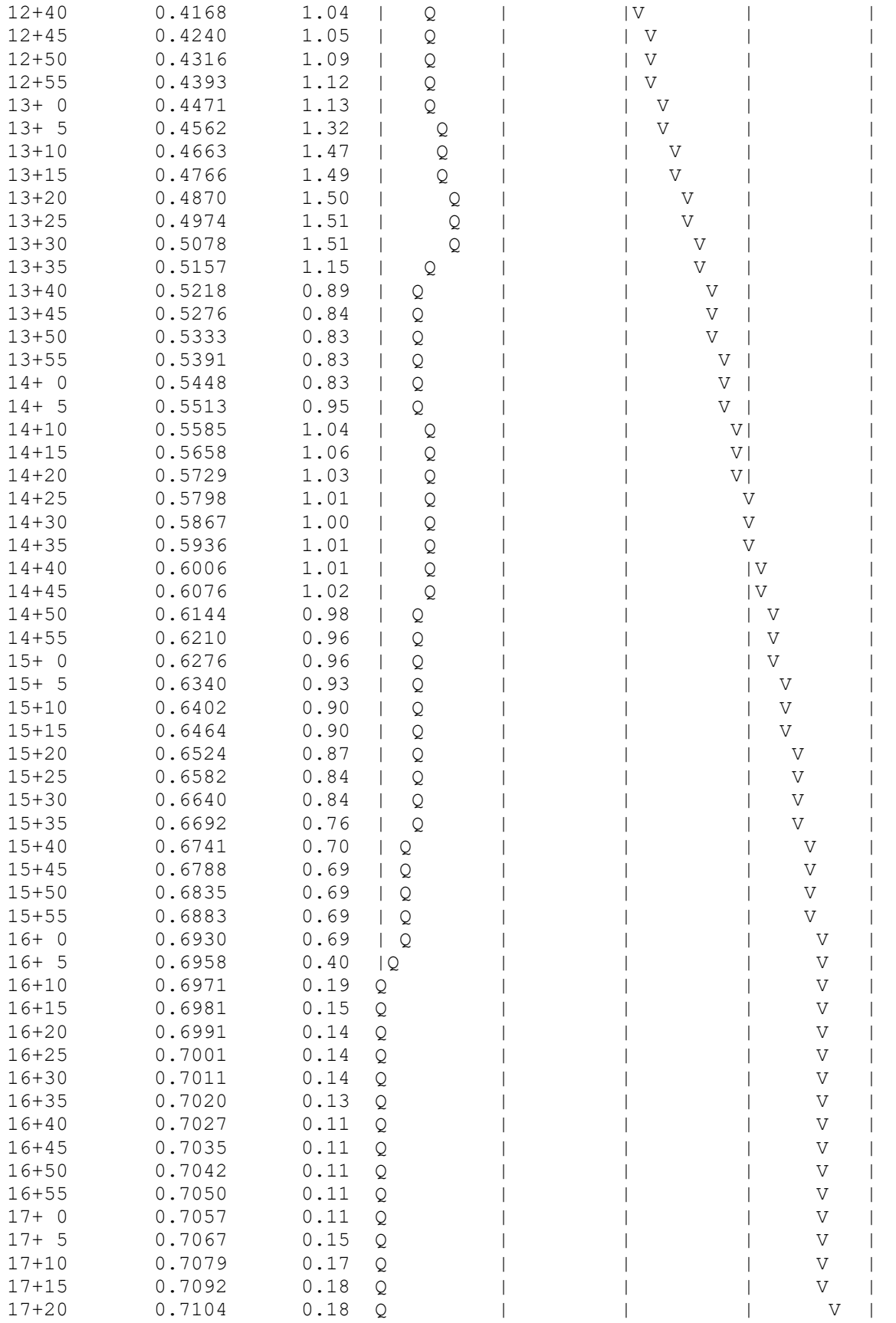
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0003	0.04	Q				
0+10	0.0007	0.07	Q				
0+15	0.0012	0.07	Q				
0+20	0.0018	0.09	Q				
0+25	0.0026	0.11	Q				
0+30	0.0033	0.11	Q				
0+35	0.0041	0.11	Q				
0+40	0.0048	0.11	Q				
0+45	0.0056	0.11	Q				
0+50	0.0064	0.13	Q				
0+55	0.0074	0.14	Q				
1+ 0	0.0084	0.14	Q				
1+ 5	0.0093	0.13	Q				
1+10	0.0100	0.11	Q				
1+15	0.0108	0.11	Q				
1+20	0.0115	0.11	Q				
1+25	0.0123	0.11	Q				
1+30	0.0130	0.11	Q				
1+35	0.0138	0.11	Q				
1+40	0.0145	0.11	Q				
1+45	0.0153	0.11	Q				
1+50	0.0161	0.13	Q				
1+55	0.0171	0.14	Q				
2+ 0	0.0181	0.14	Q				
2+ 5	0.0191	0.14	Q				
2+10	0.0201	0.14	QV				
2+15	0.0211	0.14	QV				
2+20	0.0221	0.14	QV				
2+25	0.0231	0.14	QV				
2+30	0.0241	0.14	QV				
2+35	0.0252	0.16	QV				
2+40	0.0264	0.18	QV				
2+45	0.0277	0.18	QV				
2+50	0.0289	0.18	QV				
2+55	0.0302	0.18	QV				
3+ 0	0.0314	0.18	QV				
3+ 5	0.0327	0.18	QV				

3+10	0.0339	0.18	QV	|	|	|	|
3+15	0.0352	0.18	QV	|	|	|	|
3+20	0.0364	0.18	QV	|	|	|	|
3+25	0.0376	0.18	QV	|	|	|	|
3+30	0.0389	0.18	Q V	|	|	|	|
3+35	0.0401	0.18	Q V	|	|	|	|
3+40	0.0414	0.18	Q V	|	|	|	|
3+45	0.0426	0.18	Q V	|	|	|	|
3+50	0.0440	0.20	Q V	|	|	|	|
3+55	0.0455	0.21	Q V	|	|	|	|
4+ 0	0.0470	0.22	Q V	|	|	|	|
4+ 5	0.0485	0.22	Q V	|	|	|	|
4+10	0.0500	0.22	Q V	|	|	|	|
4+15	0.0515	0.22	Q V	|	|	|	|
4+20	0.0531	0.24	Q V	|	|	|	|
4+25	0.0548	0.25	|QV	|	|	|	|
4+30	0.0565	0.25	|QV	|	|	|	|
4+35	0.0583	0.25	|Q V	|	|	|	|
4+40	0.0600	0.25	|Q V	|	|	|	|
4+45	0.0618	0.25	|Q V	|	|	|	|
4+50	0.0637	0.27	|Q V	|	|	|	|
4+55	0.0656	0.29	|Q V	|	|	|	|
5+ 0	0.0676	0.29	|Q V	|	|	|	|
5+ 5	0.0693	0.25	|Q V	|	|	|	|
5+10	0.0709	0.22	Q V	|	|	|	|
5+15	0.0724	0.22	Q V	|	|	|	|
5+20	0.0740	0.24	Q V	|	|	|	|
5+25	0.0757	0.25	|Q V	|	|	|	|
5+30	0.0775	0.25	|Q V	|	|	|	|
5+35	0.0793	0.27	|Q V	|	|	|	|
5+40	0.0813	0.29	|Q V	|	|	|	|
5+45	0.0833	0.29	|Q V	|	|	|	|
5+50	0.0853	0.29	|Q V	|	|	|	|
5+55	0.0873	0.29	|Q V	|	|	|	|
6+ 0	0.0893	0.29	|Q V	|	|	|	|
6+ 5	0.0914	0.31	|Q V	|	|	|	|
6+10	0.0936	0.32	|Q V	|	|	|	|
6+15	0.0959	0.32	|Q V	|	|	|	|
6+20	0.0981	0.33	|Q V	|	|	|	|
6+25	0.1003	0.33	|Q V	|	|	|	|
6+30	0.1026	0.33	|Q V	|	|	|	|
6+35	0.1050	0.34	|Q V	|	|	|	|
6+40	0.1074	0.36	|Q V	|	|	|	|
6+45	0.1099	0.36	|Q V	|	|	|	|
6+50	0.1124	0.36	|Q V	|	|	|	|
6+55	0.1149	0.36	|Q V	|	|	|	|
7+ 0	0.1174	0.36	|Q V	|	|	|	|
7+ 5	0.1199	0.36	|Q V	|	|	|	|
7+10	0.1224	0.36	|Q V	|	|	|	|
7+15	0.1249	0.36	|Q V	|	|	|	|
7+20	0.1275	0.38	|Q V	|	|	|	|
7+25	0.1302	0.39	|Q V	|	|	|	|
7+30	0.1329	0.40	|Q V	|	|	|	|
7+35	0.1358	0.42	|Q V	|	|	|	|
7+40	0.1388	0.43	|Q V	|	|	|	|
7+45	0.1418	0.43	|Q V	|	|	|	|
7+50	0.1449	0.45	|Q V	|	|	|	|

7+55	0.1481	0.47	Q	V			
8+ 0	0.1513	0.47	Q	V			
8+ 5	0.1548	0.51	Q	V			
8+10	0.1585	0.54	Q	V			
8+15	0.1623	0.54	Q	V			
8+20	0.1660	0.54	Q	V			
8+25	0.1697	0.54	Q	V			
8+30	0.1735	0.54	Q	V			
8+35	0.1773	0.56	Q	V			
8+40	0.1813	0.58	Q	V			
8+45	0.1853	0.58	Q	V			
8+50	0.1894	0.60	Q	V			
8+55	0.1936	0.61	Q	V			
9+ 0	0.1978	0.61	Q	V			
9+ 5	0.2023	0.65	Q	V			
9+10	0.2070	0.68	Q	V			
9+15	0.2118	0.69	Q	V			
9+20	0.2166	0.71	Q	V			
9+25	0.2216	0.72	Q	V			
9+30	0.2266	0.72	Q	V			
9+35	0.2317	0.74	Q	V			
9+40	0.2369	0.76	Q	V			
9+45	0.2421	0.76	Q	V			
9+50	0.2475	0.78	Q	V			
9+55	0.2529	0.79	Q	V			
10+ 0	0.2584	0.80	Q	V			
10+ 5	0.2630	0.66	Q	V			
10+10	0.2668	0.56	Q	V			
10+15	0.2706	0.55	Q	V			
10+20	0.2743	0.54	Q	V			
10+25	0.2781	0.54	Q	V			
10+30	0.2818	0.54	Q	V			
10+35	0.2862	0.64	Q	V			
10+40	0.2911	0.71	Q	V			
10+45	0.2961	0.72	Q	V			
10+50	0.3010	0.72	Q	V			
10+55	0.3060	0.72	Q	V			
11+ 0	0.3110	0.72	Q	V			
11+ 5	0.3158	0.70	Q	V			
11+10	0.3206	0.69	Q	V			
11+15	0.3253	0.69	Q	V			
11+20	0.3301	0.69	Q	V			
11+25	0.3348	0.69	Q	V			
11+30	0.3395	0.69	Q	V			
11+35	0.3440	0.65	Q	V			
11+40	0.3483	0.62	Q	V			
11+45	0.3525	0.62	Q	V			
11+50	0.3569	0.63	Q	V			
11+55	0.3613	0.65	Q	V			
12+ 0	0.3658	0.65	Q	V			
12+ 5	0.3712	0.78	Q	V			
12+10	0.3773	0.88	Q	V			
12+15	0.3835	0.90	Q	V			
12+20	0.3899	0.92	Q	V			
12+25	0.3963	0.94	Q	V			
12+30	0.4028	0.94	Q	V			
12+35	0.4097	1.00	Q	V			



17+25	0.7117	0.18	Q				V
17+30	0.7129	0.18	Q				V
17+35	0.7142	0.18	Q				V
17+40	0.7154	0.18	Q				V
17+45	0.7167	0.18	Q				V
17+50	0.7178	0.16	Q				V
17+55	0.7188	0.15	Q				V
18+ 0	0.7198	0.15	Q				V
18+ 5	0.7208	0.14	Q				V
18+10	0.7218	0.14	Q				V
18+15	0.7228	0.14	Q				V
18+20	0.7238	0.14	Q				V
18+25	0.7248	0.14	Q				V
18+30	0.7258	0.14	Q				V
18+35	0.7266	0.13	Q				V
18+40	0.7274	0.11	Q				V
18+45	0.7281	0.11	Q				V
18+50	0.7288	0.09	Q				V
18+55	0.7293	0.08	Q				V
19+ 0	0.7298	0.07	Q				V
19+ 5	0.7304	0.09	Q				V
19+10	0.7311	0.11	Q				V
19+15	0.7319	0.11	Q				V
19+20	0.7328	0.13	Q				V
19+25	0.7337	0.14	Q				V
19+30	0.7347	0.14	Q				V
19+35	0.7356	0.13	Q				V
19+40	0.7364	0.11	Q				V
19+45	0.7371	0.11	Q				V
19+50	0.7377	0.09	Q				V
19+55	0.7382	0.08	Q				V
20+ 0	0.7387	0.07	Q				V
20+ 5	0.7394	0.09	Q				V
20+10	0.7401	0.11	Q				V
20+15	0.7408	0.11	Q				V
20+20	0.7416	0.11	Q				V
20+25	0.7423	0.11	Q				V
20+30	0.7431	0.11	Q				V
20+35	0.7438	0.11	Q				V
20+40	0.7446	0.11	Q				V
20+45	0.7453	0.11	Q				V
20+50	0.7459	0.09	Q				V
20+55	0.7465	0.08	Q				V
21+ 0	0.7470	0.07	Q				V
21+ 5	0.7476	0.09	Q				V
21+10	0.7483	0.11	Q				V
21+15	0.7491	0.11	Q				V
21+20	0.7497	0.09	Q				V
21+25	0.7502	0.08	Q				V
21+30	0.7507	0.07	Q				V
21+35	0.7513	0.09	Q				V
21+40	0.7521	0.11	Q				V
21+45	0.7528	0.11	Q				V
21+50	0.7534	0.09	Q				V
21+55	0.7539	0.08	Q				V
22+ 0	0.7544	0.07	Q				V
22+ 5	0.7551	0.09	Q				V

22+10	0.7558	0.11	Q	|	|	|	V|
22+15	0.7565	0.11	Q	|	|	|	V|
22+20	0.7572	0.09	Q	|	|	|	V|
22+25	0.7577	0.08	Q	|	|	|	V|
22+30	0.7582	0.07	Q	|	|	|	V|
22+35	0.7587	0.07	Q	|	|	|	V|
22+40	0.7592	0.07	Q	|	|	|	V|
22+45	0.7597	0.07	Q	|	|	|	V|
22+50	0.7602	0.07	Q	|	|	|	V|
22+55	0.7607	0.07	Q	|	|	|	V|
23+ 0	0.7612	0.07	Q	|	|	|	V|
23+ 5	0.7617	0.07	Q	|	|	|	V|
23+10	0.7622	0.07	Q	|	|	|	V|
23+15	0.7627	0.07	Q	|	|	|	V|
23+20	0.7632	0.07	Q	|	|	|	V|
23+25	0.7637	0.07	Q	|	|	|	V|
23+30	0.7642	0.07	Q	|	|	|	V|
23+35	0.7646	0.07	Q	|	|	|	V|
23+40	0.7651	0.07	Q	|	|	|	V|
23+45	0.7656	0.07	Q	|	|	|	V|
23+50	0.7661	0.07	Q	|	|	|	V|
23+55	0.7666	0.07	Q	|	|	|	V|
24+ 0	0.7671	0.07	Q	|	|	|	V|
24+ 5	0.7674	0.03	Q	|	|	|	V|
24+10	0.7674	0.01	Q	|	|	|	V|
24+15	0.7674	0.00	Q	|	|	|	V

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

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Study date 10/10/23 File: 100XUH6100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 3.46(Ac.) = 0.005 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 3.46(Ac.) = 0.005 Sq. Mi.
Length along longest watercourse = 365.00(Ft.)
Length along longest watercourse measured to centroid = 176.00(Ft.)
Length along longest watercourse = 0.069 Mi.
Length along longest watercourse measured to centroid = 0.033 Mi.
Difference in elevation = 8.00(Ft.)
Slope along watercourse = 115.7260 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.019 Hr.
Lag time = 1.16 Min.
25% of lag time = 0.29 Min.
40% of lag time = 0.46 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.46	1.20	4.15

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.46	2.50	8.65

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
3.460	52.60	0.900

Total Area Entered = 3.46(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
52.6	52.6	0.545	0.900	0.104	1.000	0.104
					Sum (F) =	0.104

Area averaged mean soil loss (F) (In/Hr) = 0.104
Minimum soil loss rate ((In/Hr)) = 0.052
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	430.393	67.069	2.339
2	0.167	860.786	32.931	1.148
		Sum = 100.000	Sum=	3.487

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.50	0.150	(0.104)	0.027	0.123
2	0.17	0.60	0.180	(0.104)	0.032	0.148
3	0.25	0.60	0.180	(0.104)	0.032	0.148
4	0.33	0.60	0.180	(0.104)	0.032	0.148
5	0.42	0.60	0.180	(0.104)	0.032	0.148
6	0.50	0.70	0.210	(0.104)	0.038	0.172
7	0.58	0.70	0.210	(0.104)	0.038	0.172
8	0.67	0.70	0.210	(0.104)	0.038	0.172
9	0.75	0.70	0.210	(0.104)	0.038	0.172
10	0.83	0.70	0.210	(0.104)	0.038	0.172
11	0.92	0.70	0.210	(0.104)	0.038	0.172
12	1.00	0.80	0.240	(0.104)	0.043	0.197
13	1.08	0.80	0.240	(0.104)	0.043	0.197
14	1.17	0.80	0.240	(0.104)	0.043	0.197
15	1.25	0.80	0.240	(0.104)	0.043	0.197
16	1.33	0.80	0.240	(0.104)	0.043	0.197
17	1.42	0.80	0.240	(0.104)	0.043	0.197
18	1.50	0.80	0.240	(0.104)	0.043	0.197
19	1.58	0.80	0.240	(0.104)	0.043	0.197
20	1.67	0.80	0.240	(0.104)	0.043	0.197
21	1.75	0.80	0.240	(0.104)	0.043	0.197
22	1.83	0.80	0.240	(0.104)	0.043	0.197
23	1.92	0.80	0.240	(0.104)	0.043	0.197
24	2.00	0.90	0.270	(0.104)	0.049	0.221
25	2.08	0.80	0.240	(0.104)	0.043	0.197
26	2.17	0.90	0.270	(0.104)	0.049	0.221
27	2.25	0.90	0.270	(0.104)	0.049	0.221
28	2.33	0.90	0.270	(0.104)	0.049	0.221
29	2.42	0.90	0.270	(0.104)	0.049	0.221
30	2.50	0.90	0.270	(0.104)	0.049	0.221
31	2.58	0.90	0.270	(0.104)	0.049	0.221
32	2.67	0.90	0.270	(0.104)	0.049	0.221
33	2.75	1.00	0.300	(0.104)	0.054	0.246
34	2.83	1.00	0.300	(0.104)	0.054	0.246
35	2.92	1.00	0.300	(0.104)	0.054	0.246
36	3.00	1.00	0.300	(0.104)	0.054	0.246
37	3.08	1.00	0.300	(0.104)	0.054	0.246
38	3.17	1.10	0.330	(0.104)	0.059	0.271
39	3.25	1.10	0.330	(0.104)	0.059	0.271
40	3.33	1.10	0.330	(0.104)	0.059	0.271
41	3.42	1.20	0.360	(0.104)	0.065	0.295
42	3.50	1.30	0.390	(0.104)	0.070	0.320
43	3.58	1.40	0.420	(0.104)	0.076	0.344
44	3.67	1.40	0.420	(0.104)	0.076	0.344
45	3.75	1.50	0.450	(0.104)	0.081	0.369

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46   3.83     1.50      0.450       (  0.104)       0.081        0.369
47   3.92     1.60      0.480       (  0.104)       0.086        0.394
48   4.00     1.60      0.480       (  0.104)       0.086        0.394
49   4.08     1.70      0.510       (  0.104)       0.092        0.418
50   4.17     1.80      0.540       (  0.104)       0.097        0.443
51   4.25     1.90      0.570       (  0.104)       0.103        0.467
52   4.33     2.00      0.600          0.104    (  0.108)       0.496
53   4.42     2.10      0.630          0.104    (  0.113)       0.526
54   4.50     2.10      0.630          0.104    (  0.113)       0.526
55   4.58     2.20      0.660          0.104    (  0.119)       0.556
56   4.67     2.30      0.690          0.104    (  0.124)       0.586
57   4.75     2.40      0.720          0.104    (  0.130)       0.616
58   4.83     2.40      0.720          0.104    (  0.130)       0.616
59   4.92     2.50      0.750          0.104    (  0.135)       0.646
60   5.00     2.60      0.780          0.104    (  0.140)       0.676
61   5.08     3.10      0.930          0.104    (  0.167)       0.826
62   5.17     3.60      1.080          0.104    (  0.194)       0.976
63   5.25     3.90      1.170          0.104    (  0.211)       1.066
64   5.33     4.20      1.260          0.104    (  0.227)       1.156
65   5.42     4.70      1.410          0.104    (  0.254)       1.306
66   5.50     5.60      1.680          0.104    (  0.302)       1.576
67   5.58     1.90      0.570       (  0.104)       0.103        0.467
68   5.67     0.90      0.270       (  0.104)       0.049        0.221
69   5.75     0.60      0.180       (  0.104)       0.032        0.148
70   5.83     0.50      0.150       (  0.104)       0.027        0.123
71   5.92     0.30      0.090       (  0.104)       0.016        0.074
72   6.00     0.20      0.060       (  0.104)       0.011        0.049
               (Loss Rate Not Used)
   Sum =     100.0                                    Sum =    25.5
      Flood volume = Effective rainfall      2.13(In)
       times area       3.5(Ac.)/[(In)/(Ft.)] =       0.6(Ac.Ft)
      Total soil loss =      0.37(In)
      Total soil loss =     0.108(Ac.Ft)
      Total rainfall =      2.50(In)
      Flood volume =       26703.0 Cubic Feet
      Total soil loss =        4696.1 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =      5.189(CFS)
      ---------------------------------------------------------------------
      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          6 - 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        2.5       5.0       7.5      10.0
-------------------------------------------------------------------------
  0+ 5       0.0020      0.29  VQ        |         |         |         |
  0+10       0.0053      0.49  VQ        |         |         |         |
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0+15       0.0089      0.51  V Q       |         |         |         |
0+20       0.0124      0.51  V Q       |         |         |         |
0+25       0.0160      0.51  |VQ       |         |         |         |
0+30       0.0199      0.57  |VQ       |         |         |         |
0+35       0.0241      0.60  |VQ       |         |         |         |
0+40       0.0282      0.60  |VQ       |         |         |         |
0+45       0.0323      0.60  | Q       |         |         |         |
0+50       0.0365      0.60  | Q       |         |         |         |
0+55       0.0406      0.60  | Q       |         |         |         |
1+ 0       0.0451      0.66  | Q       |         |         |         |
1+ 5       0.0499      0.69  | QV      |         |         |         |
1+10       0.0546      0.69  | QV      |         |         |         |
1+15       0.0593      0.69  | QV      |         |         |         |
1+20       0.0641      0.69  | Q V     |         |         |         |
1+25       0.0688      0.69  | Q V     |         |         |         |
1+30       0.0735      0.69  | Q V     |         |         |         |
1+35       0.0782      0.69  | Q  V    |         |         |         |
1+40       0.0830      0.69  | Q  V    |         |         |         |
1+45       0.0877      0.69  | Q  V    |         |         |         |
1+50       0.0924      0.69  | Q   V   |         |         |         |
1+55       0.0972      0.69  | Q   V   |         |         |         |
2+ 0       0.1023      0.74  | Q   V   |         |         |         |
2+ 5       0.1072      0.71  | Q   V   |         |         |         |
2+10       0.1123      0.74  | Q    V  |         |         |         |
2+15       0.1176      0.77  |  Q   V  |         |         |         |
2+20       0.1230      0.77  |  Q    V |         |         |         |
2+25       0.1283      0.77  |  Q    V |         |         |         |
2+30       0.1336      0.77  |  Q    V |         |         |         |
2+35       0.1389      0.77  |  Q     V|         |         |         |
2+40       0.1442      0.77  |  Q     V|         |         |         |
2+45       0.1500      0.83  |  Q     V|         |         |         |
2+50       0.1559      0.86  |  Q      V         |         |         |
2+55       0.1618      0.86  |  Q      V         |         |         |
3+ 0       0.1677      0.86  |  Q      V         |         |         |
3+ 5       0.1736      0.86  |  Q      |V        |         |         |
3+10       0.1799      0.92  |  Q      |V        |         |         |
3+15       0.1864      0.94  |  Q      | V       |         |         |
3+20       0.1929      0.94  |  Q      | V       |         |         |
3+25       0.1998      1.00  |   Q     |  V      |         |         |
3+30       0.2073      1.09  |   Q     |  V      |         |         |
3+35       0.2154      1.17  |   Q     |   V     |         |         |
3+40       0.2237      1.20  |   Q     |   V     |         |         |
3+45       0.2323      1.26  |    Q    |    V    |         |         |
3+50       0.2412      1.29  |    Q    |    V    |         |         |
3+55       0.2505      1.34  |    Q    |     V   |         |         |
4+ 0       0.2599      1.37  |    Q    |     V   |         |         |
4+ 5       0.2698      1.43  |    Q    |      V  |         |         |
4+10       0.2802      1.52  |     Q   |       V |         |         |
4+15       0.2912      1.60  |     Q   |        V|         |         |
4+20       0.3029      1.70  |     Q   |        V|         |         |
```

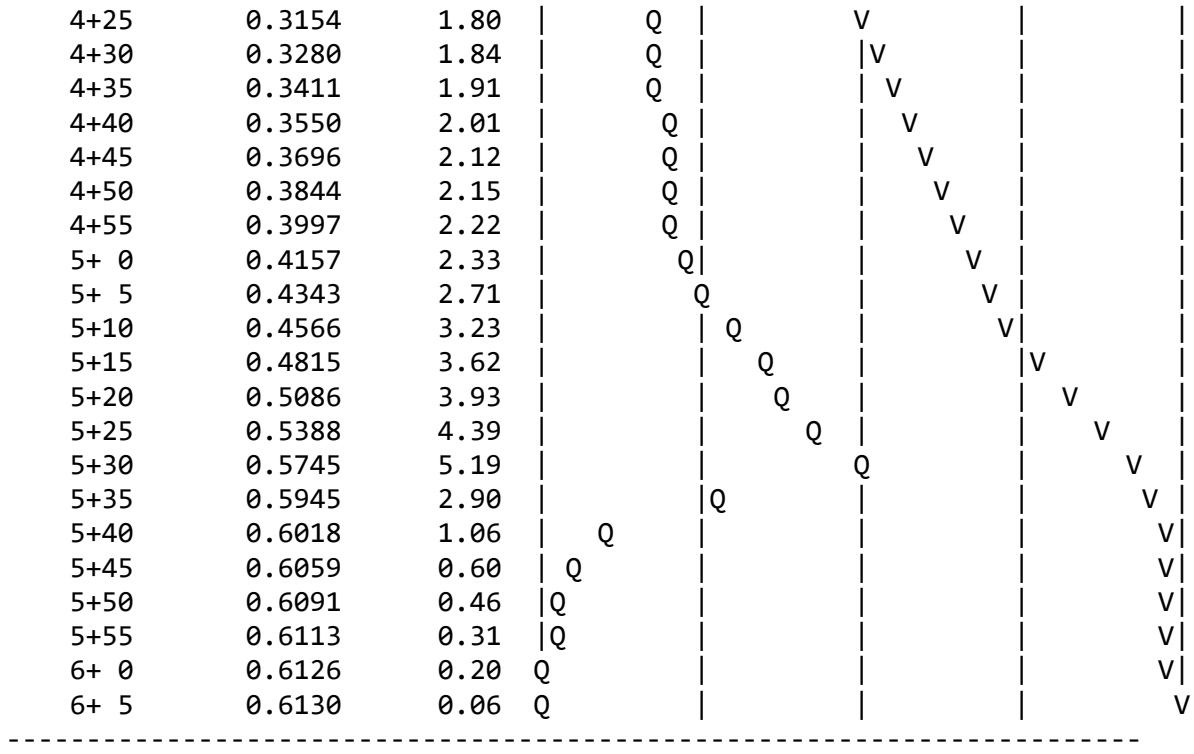
4+25 0.3154 1.80
4+30 0.3280 1.84
4+35 0.3411 1.91
4+40 0.3550 2.01
4+45 0.3696 2.12
4+50 0.3844 2.15
4+55 0.3997 2.22
5+ 0 0.4157 2.33
5+ 5 0.4343 2.71
5+10 0.4566 3.23
5+15 0.4815 3.62
5+20 0.5086 3.93
5+25 0.5388 4.39
5+30 0.5745 5.19
5+35 0.5945 2.90
5+40 0.6018 1.06
5+45 0.6059 0.60
5+50 0.6091 0.46
5+55 0.6113 0.31
6+ 0 0.6126 0.20
6+ 5 0.6130 0.06

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100-YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 3.47(Ac.) = 0.005 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 3.47(Ac.) = 0.005 Sq. Mi.
Length along longest watercourse = 742.00(Ft.)
Length along longest watercourse measured to centroid = 624.00(Ft.)
Length along longest watercourse = 0.141 Mi.
Length along longest watercourse measured to centroid = 0.118 Mi.
Difference in elevation = 14.60(Ft.)
Slope along watercourse = 103.8922 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.031 Hr.
Lag time = 1.88 Min.
25% of lag time = 0.47 Min.
40% of lag time = 0.75 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

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

3.47	1.20	4.16

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.47	2.50	8.68

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
3.470	52.80	0.521

Total Area Entered = 3.47(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
52.8	52.8	0.543	0.521	0.289	1.000	0.289
					Sum (F) =	0.289

Area averaged mean soil loss (F) (In/Hr) = 0.289
Minimum soil loss rate ((In/Hr)) = 0.144
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.483

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	265.427	52.830	1.848
2	0.167	530.854	39.116	1.368
3	0.250	796.281	6.543	0.229
4	0.333	1061.708	1.510	0.053
		Sum = 100.000	Sum=	3.497

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.50	0.150	(0.289)	0.072	0.078
2	0.17	0.60	0.180	(0.289)	0.087	0.093
3	0.25	0.60	0.180	(0.289)	0.087	0.093
4	0.33	0.60	0.180	(0.289)	0.087	0.093

5	0.42	0.60	0.180	(0.289)	0.087	0.093
6	0.50	0.70	0.210	(0.289)	0.101	0.109
7	0.58	0.70	0.210	(0.289)	0.101	0.109
8	0.67	0.70	0.210	(0.289)	0.101	0.109
9	0.75	0.70	0.210	(0.289)	0.101	0.109
10	0.83	0.70	0.210	(0.289)	0.101	0.109
11	0.92	0.70	0.210	(0.289)	0.101	0.109
12	1.00	0.80	0.240	(0.289)	0.116	0.124
13	1.08	0.80	0.240	(0.289)	0.116	0.124
14	1.17	0.80	0.240	(0.289)	0.116	0.124
15	1.25	0.80	0.240	(0.289)	0.116	0.124
16	1.33	0.80	0.240	(0.289)	0.116	0.124
17	1.42	0.80	0.240	(0.289)	0.116	0.124
18	1.50	0.80	0.240	(0.289)	0.116	0.124
19	1.58	0.80	0.240	(0.289)	0.116	0.124
20	1.67	0.80	0.240	(0.289)	0.116	0.124
21	1.75	0.80	0.240	(0.289)	0.116	0.124
22	1.83	0.80	0.240	(0.289)	0.116	0.124
23	1.92	0.80	0.240	(0.289)	0.116	0.124
24	2.00	0.90	0.270	(0.289)	0.130	0.140
25	2.08	0.80	0.240	(0.289)	0.116	0.124
26	2.17	0.90	0.270	(0.289)	0.130	0.140
27	2.25	0.90	0.270	(0.289)	0.130	0.140
28	2.33	0.90	0.270	(0.289)	0.130	0.140
29	2.42	0.90	0.270	(0.289)	0.130	0.140
30	2.50	0.90	0.270	(0.289)	0.130	0.140
31	2.58	0.90	0.270	(0.289)	0.130	0.140
32	2.67	0.90	0.270	(0.289)	0.130	0.140
33	2.75	1.00	0.300	(0.289)	0.145	0.155
34	2.83	1.00	0.300	(0.289)	0.145	0.155
35	2.92	1.00	0.300	(0.289)	0.145	0.155
36	3.00	1.00	0.300	(0.289)	0.145	0.155
37	3.08	1.00	0.300	(0.289)	0.145	0.155
38	3.17	1.10	0.330	(0.289)	0.159	0.171
39	3.25	1.10	0.330	(0.289)	0.159	0.171
40	3.33	1.10	0.330	(0.289)	0.159	0.171
41	3.42	1.20	0.360	(0.289)	0.174	0.186
42	3.50	1.30	0.390	(0.289)	0.188	0.202
43	3.58	1.40	0.420	(0.289)	0.203	0.217
44	3.67	1.40	0.420	(0.289)	0.203	0.217
45	3.75	1.50	0.450	(0.289)	0.217	0.233
46	3.83	1.50	0.450	(0.289)	0.217	0.233
47	3.92	1.60	0.480	(0.289)	0.232	0.248
48	4.00	1.60	0.480	(0.289)	0.232	0.248
49	4.08	1.70	0.510	(0.289)	0.246	0.264
50	4.17	1.80	0.540	(0.289)	0.261	0.279
51	4.25	1.90	0.570	(0.289)	0.275	0.295
52	4.33	2.00	0.600	0.289	(0.290)	0.311
53	4.42	2.10	0.630	0.289	(0.304)	0.341
54	4.50	2.10	0.630	0.289	(0.304)	0.341
55	4.58	2.20	0.660	0.289	(0.319)	0.371
56	4.67	2.30	0.690	0.289	(0.333)	0.401
57	4.75	2.40	0.720	0.289	(0.348)	0.431
58	4.83	2.40	0.720	0.289	(0.348)	0.431
59	4.92	2.50	0.750	0.289	(0.362)	0.461
60	5.00	2.60	0.780	0.289	(0.377)	0.491
61	5.08	3.10	0.930	0.289	(0.449)	0.641

62	5.17	3.60	1.080	0.289	(0.522)		0.791
63	5.25	3.90	1.170	0.289	(0.565)		0.881
64	5.33	4.20	1.260	0.289	(0.609)		0.971
65	5.42	4.70	1.410	0.289	(0.681)		1.121
66	5.50	5.60	1.680	0.289	(0.812)		1.391
67	5.58	1.90	0.570	(0.289)	0.275		0.295
68	5.67	0.90	0.270	(0.289)	0.130		0.140
69	5.75	0.60	0.180	(0.289)	0.087		0.093
70	5.83	0.50	0.150	(0.289)	0.072		0.078
71	5.92	0.30	0.090	(0.289)	0.043		0.047
72	6.00	0.20	0.060	(0.289)	0.029		0.031

(Loss Rate Not Used)

Sum = 100.0 Sum = 17.8

Flood volume = Effective rainfall 1.48(In)
times area 3.5(Ac.)/[(In)/(Ft.)] = 0.4(Ac.Ft)
Total soil loss = 1.02(In)
Total soil loss = 0.294(Ac.Ft)
Total rainfall = 2.50(In)
Flood volume = 18683.3 Cubic Feet
Total soil loss = 12806.6 Cubic Feet

Peak flow rate of this hydrograph = 4.376(CFS)

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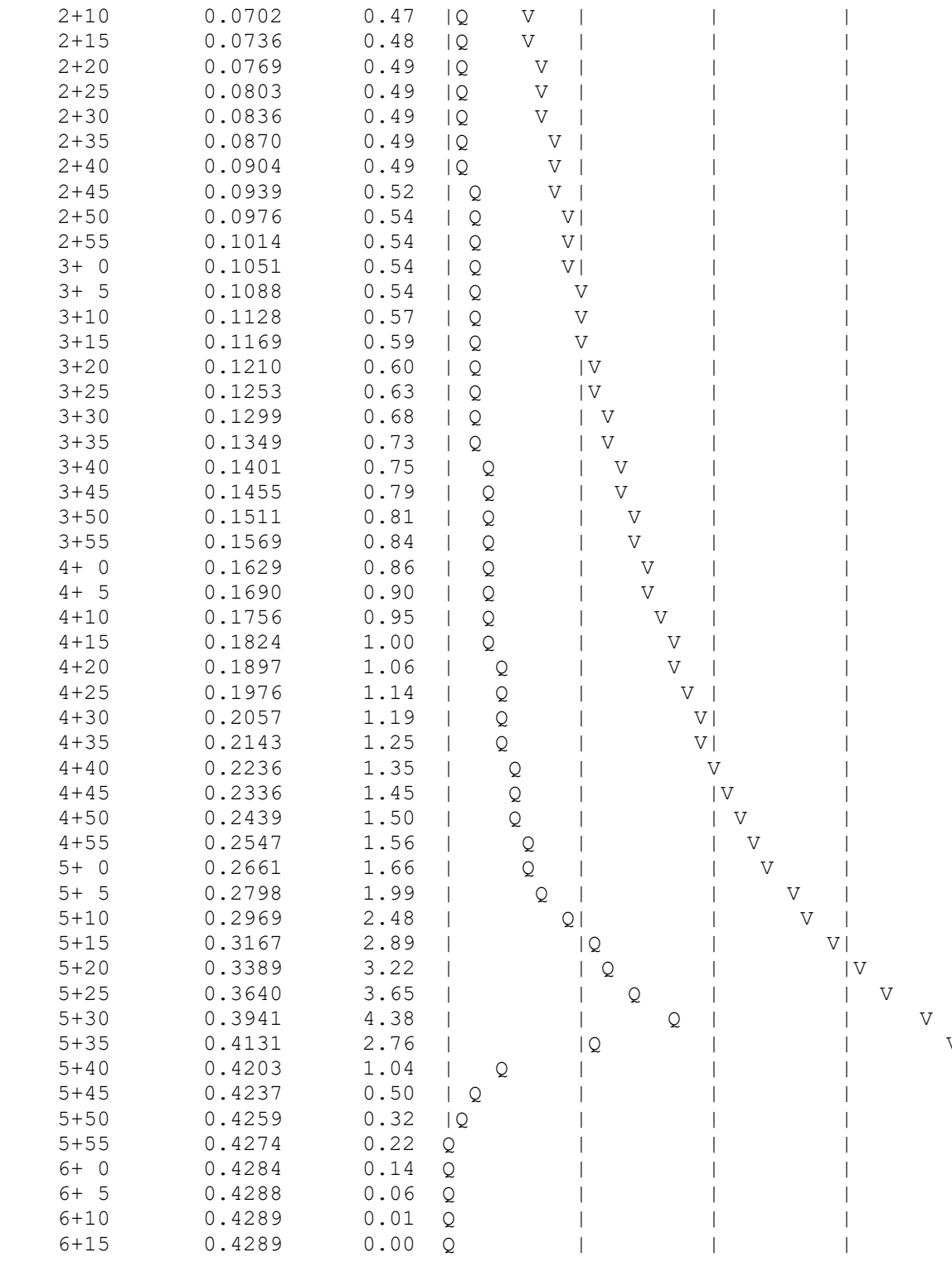
6 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0010	0.14	Q				
0+10	0.0029	0.28	VQ				
0+15	0.0051	0.32	VQ				
0+20	0.0073	0.32	VQ				
0+25	0.0096	0.33	VQ				
0+30	0.0120	0.35	|Q				
0+35	0.0146	0.38	|Q				
0+40	0.0172	0.38	|Q				
0+45	0.0198	0.38	|Q				
0+50	0.0224	0.38	|QV				
0+55	0.0250	0.38	|QV				
1+ 0	0.0279	0.41	|QV				
1+ 5	0.0308	0.43	|QV				
1+10	0.0338	0.43	|Q V				
1+15	0.0368	0.43	|Q V				
1+20	0.0398	0.43	|Q V				
1+25	0.0428	0.43	|Q V				
1+30	0.0458	0.43	|Q V				
1+35	0.0487	0.43	|Q V				
1+40	0.0517	0.43	|Q V				
1+45	0.0547	0.43	|Q V				
1+50	0.0577	0.43	|Q V				
1+55	0.0607	0.43	|Q V				
2+ 0	0.0639	0.46	|Q V				
2+ 5	0.0670	0.46	|Q V				



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

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Study date 10/10/23 File: 100XUH3100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 3.46(Ac.) = 0.005 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 3.46(Ac.) = 0.005 Sq. Mi.
Length along longest watercourse = 365.00(Ft.)
Length along longest watercourse measured to centroid = 176.00(Ft.)
Length along longest watercourse = 0.069 Mi.
Length along longest watercourse measured to centroid = 0.033 Mi.
Difference in elevation = 8.00(Ft.)
Slope along watercourse = 115.7260 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.019 Hr.
Lag time = 1.16 Min.
25% of lag time = 0.29 Min.
40% of lag time = 0.46 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.46	0.80	2.77

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.46	2.00	6.92

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 2.000(In)

Point rain (area averaged) = 2.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
3.460	52.60	0.900

Total Area Entered = 3.46(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
52.6	52.6	0.545	0.900	0.104	1.000	0.104
					Sum (F) =	0.104

Area averaged mean soil loss (F) (In/Hr) = 0.104
Minimum soil loss rate ((In/Hr)) = 0.052
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	430.393	67.069	2.339
2	0.167	860.786	32.931	1.148
		Sum = 100.000	Sum=	3.487

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.312	(0.104)	0.056	0.256
2	0.17	1.30	0.312	(0.104)	0.056	0.256
3	0.25	1.10	0.264	(0.104)	0.048	0.216
4	0.33	1.50	0.360	(0.104)	0.065	0.295
5	0.42	1.50	0.360	(0.104)	0.065	0.295
6	0.50	1.80	0.432	(0.104)	0.078	0.354
7	0.58	1.50	0.360	(0.104)	0.065	0.295
8	0.67	1.80	0.432	(0.104)	0.078	0.354
9	0.75	1.80	0.432	(0.104)	0.078	0.354
10	0.83	1.50	0.360	(0.104)	0.065	0.295
11	0.92	1.60	0.384	(0.104)	0.069	0.315
12	1.00	1.80	0.432	(0.104)	0.078	0.354
13	1.08	2.20	0.528	(0.104)	0.095	0.433
14	1.17	2.20	0.528	(0.104)	0.095	0.433
15	1.25	2.20	0.528	(0.104)	0.095	0.433
16	1.33	2.00	0.480	(0.104)	0.086	0.394
17	1.42	2.60	0.624	0.104	(0.112)	0.520
18	1.50	2.70	0.648	0.104	(0.117)	0.544
19	1.58	2.40	0.576	0.104	(0.104)	0.472
20	1.67	2.70	0.648	0.104	(0.117)	0.544
21	1.75	3.30	0.792	0.104	(0.143)	0.688
22	1.83	3.10	0.744	0.104	(0.134)	0.640
23	1.92	2.90	0.696	0.104	(0.125)	0.592
24	2.00	3.00	0.720	0.104	(0.130)	0.616
25	2.08	3.10	0.744	0.104	(0.134)	0.640
26	2.17	4.20	1.008	0.104	(0.181)	0.904
27	2.25	5.00	1.200	0.104	(0.216)	1.096
28	2.33	3.50	0.840	0.104	(0.151)	0.736
29	2.42	6.80	1.632	0.104	(0.294)	1.528
30	2.50	7.30	1.752	0.104	(0.315)	1.648
31	2.58	8.20	1.968	0.104	(0.354)	1.864
32	2.67	5.90	1.416	0.104	(0.255)	1.312
33	2.75	2.00	0.480	(0.104)	0.086	0.394
34	2.83	1.80	0.432	(0.104)	0.078	0.354
35	2.92	1.80	0.432	(0.104)	0.078	0.354
36	3.00	0.60	0.144	(0.104)	0.026	0.118
		(Loss Rate Not Used)				
Sum =		100.0			Sum =	20.9

Flood volume = Effective rainfall 1.74(In)
times area 3.5(Ac.)/[(In)/(Ft.)] = 0.5(Ac.Ft)
Total soil loss = 0.26(In)
Total soil loss = 0.074(Ac.Ft)
Total rainfall = 2.00(In)
Flood volume = 21878.0 Cubic Feet
Total soil loss = 3241.3 Cubic Feet

Peak flow rate of this hydrograph = 6.256(CFS)

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3 - 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 2.5 5.0 7.5 10.0
0+ 5	0.0041	0.60	V Q
0+10	0.0103	0.89	V Q
0+15	0.0158	0.80	V Q
0+20	0.0223	0.94	V Q
0+25	0.0293	1.03	V Q
0+30	0.0374	1.17	V Q
0+35	0.0450	1.10	VQ
0+40	0.0530	1.17	Q
0+45	0.0615	1.24	Q
0+50	0.0691	1.10	QV
0+55	0.0765	1.08	Q V
1+ 0	0.0847	1.19	Q V
1+ 5	0.0945	1.42	Q V
1+10	0.1049	1.51	Q V
1+15	0.1153	1.51	Q V
1+20	0.1250	1.42	Q V
1+25	0.1365	1.67	Q V
1+30	0.1494	1.87	Q V
1+35	0.1613	1.73	Q V
1+40	0.1738	1.82	Q V
1+45	0.1892	2.24	Q V
1+50	0.2050	2.29	Q V
1+55	0.2196	2.12	Q V
2+ 0	0.2342	2.12	Q V
2+ 5	0.2494	2.21	Q V
2+10	0.2691	2.85	Q V
2+15	0.2939	3.60	Q V
2+20	0.3144	2.98	Q V
2+25	0.3449	4.42	Q V
2+30	0.3836	5.61	Q V
2+35	0.4266	6.26	Q V
2+40	0.4625	5.21	Q V
2+45	0.4793	2.43	Q V
2+50	0.4881	1.28	Q V
2+55	0.4966	1.24	Q V
3+ 0	0.5013	0.68	Q V
3+ 5	0.5022	0.14	Q V

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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100-YEAR, STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 3.47(Ac.) = 0.005 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 3.47(Ac.) = 0.005 Sq. Mi.
Length along longest watercourse = 742.00(Ft.)
Length along longest watercourse measured to centroid = 624.00(Ft.)
Length along longest watercourse = 0.141 Mi.
Length along longest watercourse measured to centroid = 0.118 Mi.
Difference in elevation = 14.60(Ft.)
Slope along watercourse = 103.8922 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.031 Hr.
Lag time = 1.88 Min.
25% of lag time = 0.47 Min.
40% of lag time = 0.75 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.47	0.80	2.78

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.47	2.00	6.94

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 2.000(In)

Point rain (area averaged) = 2.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
3.470	52.80	0.521

Total Area Entered = 3.47(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
52.8	52.8	0.543	0.521	0.289	1.000	0.289
					Sum (F) =	0.289

Area averaged mean soil loss (F) (In/Hr) = 0.289
Minimum soil loss rate ((In/Hr)) = 0.144
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.483

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

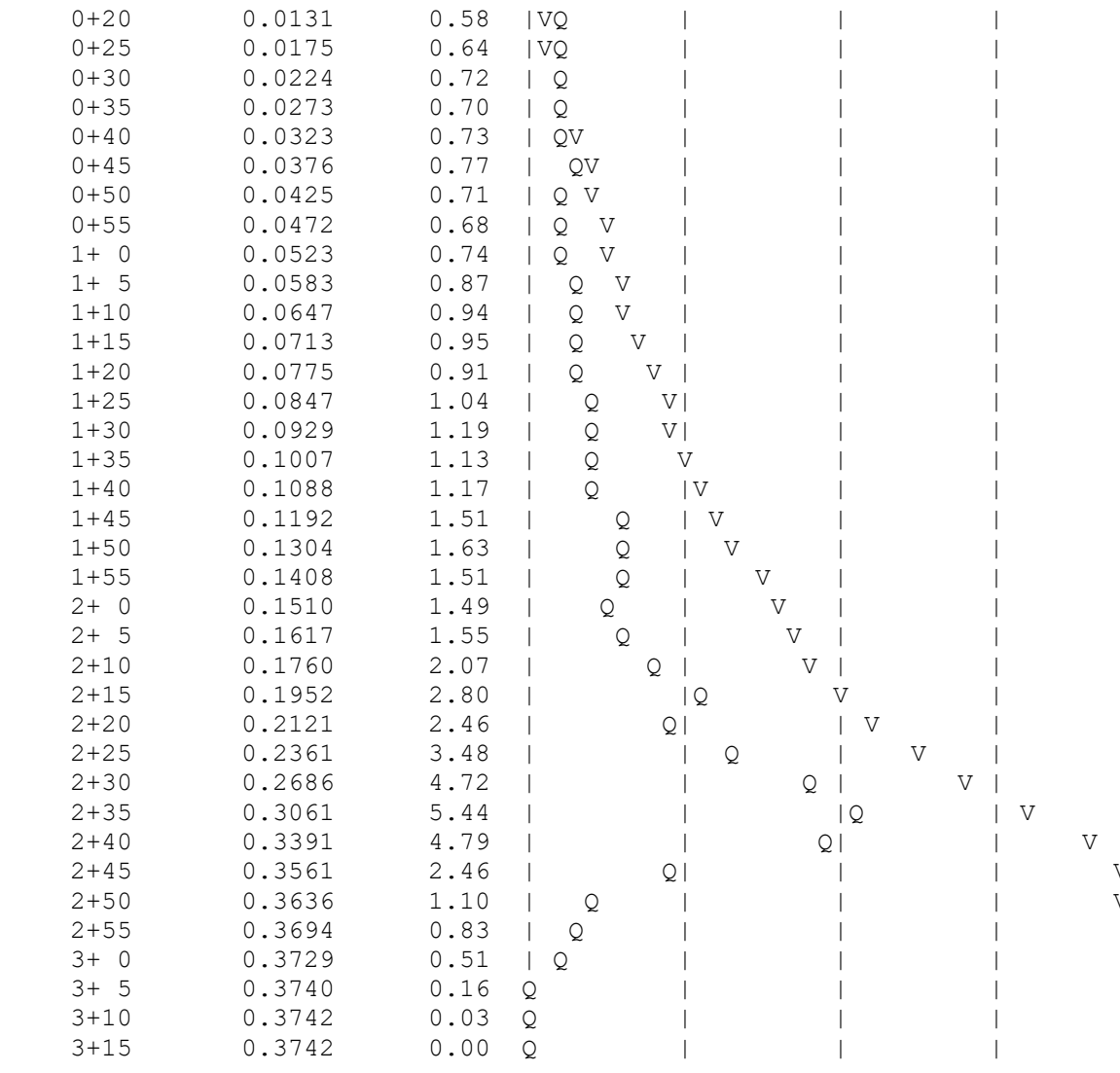
Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	265.427	52.830	1.848
2	0.167	530.854	39.116	1.368
3	0.250	796.281	6.543	0.229
4	0.333	1061.708	1.510	0.053
		Sum = 100.000	Sum=	3.497

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.312	(0.289)	0.151	0.161
2	0.17	1.30	0.312	(0.289)	0.151	0.161
3	0.25	1.10	0.264	(0.289)	0.128	0.136

```
 4   0.33     1.50      0.360       (  0.289)       0.174        0.186
 5   0.42     1.50      0.360       (  0.289)       0.174        0.186
 6   0.50     1.80      0.432       (  0.289)       0.209        0.223
 7   0.58     1.50      0.360       (  0.289)       0.174        0.186
 8   0.67     1.80      0.432       (  0.289)       0.209        0.223
 9   0.75     1.80      0.432       (  0.289)       0.209        0.223
10   0.83     1.50      0.360       (  0.289)       0.174        0.186
11   0.92     1.60      0.384       (  0.289)       0.186        0.198
12   1.00     1.80      0.432       (  0.289)       0.209        0.223
13   1.08     2.20      0.528       (  0.289)       0.255        0.273
14   1.17     2.20      0.528       (  0.289)       0.255        0.273
15   1.25     2.20      0.528       (  0.289)       0.255        0.273
16   1.33     2.00      0.480       (  0.289)       0.232        0.248
17   1.42     2.60      0.624          0.289    (  0.302)        0.335
18   1.50     2.70      0.648          0.289    (  0.313)        0.359
19   1.58     2.40      0.576       (  0.289)       0.278        0.298
20   1.67     2.70      0.648          0.289    (  0.313)        0.359
21   1.75     3.30      0.792          0.289    (  0.383)        0.503
22   1.83     3.10      0.744          0.289    (  0.359)        0.455
23   1.92     2.90      0.696          0.289    (  0.336)        0.407
24   2.00     3.00      0.720          0.289    (  0.348)        0.431
25   2.08     3.10      0.744          0.289    (  0.359)        0.455
26   2.17     4.20      1.008          0.289    (  0.487)        0.719
27   2.25     5.00      1.200          0.289    (  0.580)        0.911
28   2.33     3.50      0.840          0.289    (  0.406)        0.551
29   2.42     6.80      1.632          0.289    (  0.789)        1.343
30   2.50     7.30      1.752          0.289    (  0.847)        1.463
31   2.58     8.20      1.968          0.289    (  0.951)        1.679
32   2.67     5.90      1.416          0.289    (  0.684)        1.127
33   2.75     2.00      0.480       (  0.289)       0.232        0.248
34   2.83     1.80      0.432       (  0.289)       0.209        0.223
35   2.92     1.80      0.432       (  0.289)       0.209        0.223
36   3.00     0.60      0.144       (  0.289)       0.070        0.074
          (Loss Rate Not Used)
   Sum =     100.0                                    Sum =    15.5
    Flood volume = Effective rainfall      1.29(In)
     times area       3.5(Ac.)/[(In)/(Ft.)] =       0.4(Ac.Ft)
    Total soil loss =      0.71(In)
    Total soil loss =     0.204(Ac.Ft)
    Total rainfall =      2.00(In)
    Flood volume =       16301.8 Cubic Feet
    Total soil loss =        8890.0 Cubic Feet
    ---------------------------------------------------------------------
     Peak flow rate of this hydrograph =      5.444(CFS)
    ---------------------------------------------------------------------
    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                        3 - 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        2.5       5.0       7.5      10.0
-------------------------------------------------------------------------
  0+ 5       0.0021      0.30  VQ        |         |         |         |
  0+10       0.0056      0.52  V Q       |         |         |         |
  0+15       0.0091      0.51  V Q       |         |         |         |
```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0+25 0.0175 0.64
0+30 0.0224 0.72
0+35 0.0273 0.70
0+40 0.0323 0.73
0+45 0.0376 0.77
0+50 0.0425 0.71
0+55 0.0472 0.68
1+ 0 0.0523 0.74
1+ 5 0.0583 0.87
1+10 0.0647 0.94
1+15 0.0713 0.95
1+20 0.0775 0.91
1+25 0.0847 1.04
1+30 0.0929 1.19
1+35 0.1007 1.13
1+40 0.1088 1.17
1+45 0.1192 1.51
1+50 0.1304 1.63
1+55 0.1408 1.51
2+ 0 0.1510 1.49
2+ 5 0.1617 1.55
2+10 0.1760 2.07
2+15 0.1952 2.80
2+20 0.2121 2.46
2+25 0.2361 3.48
2+30 0.2686 4.72
2+35 0.3061 5.44
2+40 0.3391 4.79
2+45 0.3561 2.46
2+50 0.3636 1.10
2+55 0.3694 0.83
3+ 0 0.3729 0.51
3+ 5 0.3740 0.16
3+10 0.3742 0.03
3+15 0.3742 0.00

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 3.46(Ac.) = 0.005 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 3.46(Ac.) = 0.005 Sq. Mi.
Length along longest watercourse = 365.00(Ft.)
Length along longest watercourse measured to centroid = 176.00(Ft.)
Length along longest watercourse = 0.069 Mi.
Length along longest watercourse measured to centroid = 0.033 Mi.
Difference in elevation = 8.00(Ft.)
Slope along watercourse = 115.7260 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.019 Hr.
Lag time = 1.16 Min.
25% of lag time = 0.29 Min.
40% of lag time = 0.46 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.46	0.50	1.73

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.46	1.21	4.19

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.212(In)

Point rain (area averaged) = 1.212(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 1.212(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
3.460	52.60	0.900

Total Area Entered = 3.46(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
52.6	52.6	0.545	0.900	0.104	1.000	0.104
					Sum (F) =	0.104

Area averaged mean soil loss (F) (In/Hr) = 0.104
Minimum soil loss rate ((In/Hr)) = 0.052
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	430.393	67.069	2.339
2	0.167	860.786	32.931	1.148
			Sum = 100.000 Sum=	3.487

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	4.20	0.611	0.104	(0.110)	0.507
2	0.17	4.30	0.625	0.104	(0.113)	0.522
3	0.25	5.00	0.727	0.104	(0.131)	0.624
4	0.33	5.00	0.727	0.104	(0.131)	0.624
5	0.42	5.80	0.844	0.104	(0.152)	0.740
6	0.50	6.50	0.945	0.104	(0.170)	0.842
7	0.58	7.40	1.076	0.104	(0.194)	0.973
8	0.67	8.60	1.251	0.104	(0.225)	1.147
9	0.75	12.30	1.789	0.104	(0.322)	1.685
10	0.83	29.10	4.232	0.104	(0.762)	4.129
11	0.92	6.80	0.989	0.104	(0.178)	0.885
12	1.00	5.00	0.727	0.104	(0.131)	0.624
		(Loss Rate Not Used)				
Sum =		100.0			Sum =	13.3

Flood volume = Effective rainfall 1.11(In)
times area 3.5(Ac.)/[(In)/(Ft.)] = 0.3(Ac.Ft)
Total soil loss = 0.10(In)
Total soil loss = 0.030(Ac.Ft)
Total rainfall = 1.21(In)
Flood volume = 13920.3 Cubic Feet
Total soil loss = 1301.7 Cubic Feet

Peak flow rate of this hydrograph = 11.597(CFS)

++

1 - 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 5.0 10.0 15.0 20.0
0+ 5	0.0082	1.19	VQ
0+10	0.0206	1.80	VQ
0+15	0.0348	2.06	Q
0+20	0.0498	2.18	Q V
0+25	0.0666	2.45	Q V
0+30	0.0860	2.82	Q V
0+35	0.1084	3.24	Q V
0+40	0.1345	3.80	Q V
0+45	0.1708	5.26	Q V
0+50	0.2506	11.60	Q V

```
    0+55       0.2976      6.81  |         |  Q      |         |      V  |
    1+ 0       0.3146      2.48  |   Q     |         |         |        V|
    1+ 5       0.3196      0.72  |Q        |         |         |         V
-------------------------------------------------------------------------
```

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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100-YEAR, 1 HOUR STORM EVEN ANALYSIS

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

English Units used in output format

Drainage Area = 3.47(Ac.) = 0.005 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 3.47(Ac.) = 0.005 Sq. Mi.
Length along longest watercourse = 742.00(Ft.)
Length along longest watercourse measured to centroid = 624.00(Ft.)
Length along longest watercourse = 0.141 Mi.
Length along longest watercourse measured to centroid = 0.118 Mi.
Difference in elevation = 14.60(Ft.)
Slope along watercourse = 103.8922 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.031 Hr.
Lag time = 1.88 Min.
25% of lag time = 0.47 Min.
40% of lag time = 0.75 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

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

3.47	0.50	1.74

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
3.47	1.20	4.16

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.200(In)

Point rain (area averaged) = 1.200(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 1.200(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
3.470	52.80	0.521

Total Area Entered = 3.47(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
52.8	52.8	0.543	0.521	0.289	1.000	0.289
					Sum (F) =	0.289

Area averaged mean soil loss (F) (In/Hr) = 0.289
Minimum soil loss rate ((In/Hr)) = 0.144
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.483

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	265.427	52.830	1.848
2	0.167	530.854	39.116	1.368
3	0.250	796.281	6.543	0.229
4	0.333	1061.708	1.510	0.053
		Sum = 100.000	Sum=	3.497

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	4.20	0.605	0.289	(0.292)	0.316
2	0.17	4.30	0.619	0.289	(0.299)	0.331

```
  3   0.25     5.00      0.720          0.289    (  0.348)        0.431
  4   0.33     5.00      0.720          0.289    (  0.348)        0.431
  5   0.42     5.80      0.835          0.289    (  0.404)        0.547
  6   0.50     6.50      0.936          0.289    (  0.452)        0.647
  7   0.58     7.40      1.066          0.289    (  0.515)        0.777
  8   0.67     8.60      1.238          0.289    (  0.598)        0.950
  9   0.75    12.30      1.771          0.289    (  0.856)        1.483
 10   0.83    29.10      4.190          0.289    (  2.025)        3.902
 11   0.92     6.80      0.979          0.289    (  0.473)        0.691
 12   1.00     5.00      0.720          0.289    (  0.348)        0.431
           (Loss Rate Not Used)
    Sum =     100.0                                    Sum =    10.9
     Flood volume = Effective rainfall      0.91(In)
      times area       3.5(Ac.)/[(In)/(Ft.)] =       0.3(Ac.Ft)
     Total soil loss =      0.29(In)
     Total soil loss =     0.083(Ac.Ft)
     Total rainfall =      1.20(In)
     Flood volume =       11479.3 Cubic Feet
     Total soil loss =        3635.5 Cubic Feet
     ---------------------------------------------------------------------
      Peak flow rate of this hydrograph =      9.500(CFS)
     ---------------------------------------------------------------------
     +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                        1 - 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        2.5       5.0       7.5      10.0
 ------------------------------------------------------------------------
   0+ 5       0.0040      0.58  V Q       |         |         |         |
   0+10       0.0112      1.04  |V  Q     |         |         |         |
   0+15       0.0203      1.32  |  V Q    |         |         |         |
   0+20       0.0305      1.48  |   VQ    |         |         |         |
   0+25       0.0423      1.72  |     Q   |         |         |         |
   0+30       0.0566      2.07  |       Q |         |         |         |
   0+35       0.0736      2.47  |        Q|V        |         |         |
   0+40       0.0942      3.00  |         |Q  V     |         |         |
   0+45       0.1235      4.25  |         |      QV |         |         |
   0+50       0.1889      9.50  |         |         |       V |      Q  |
   0+55       0.2372      7.01  |         |         |       Q |    V    |
   1+ 0       0.2559      2.71  |         Q         |         |       V |
   1+ 5       0.2624      0.95  |  Q      |         |         |        V|
   1+10       0.2634      0.14  Q         |         |         |        V|
   1+15       0.2635      0.02  Q         |         |         |         V
------------------------------------------------------------------------
```

SECTION 3 - REFERENCE DATA

USGS SOILS REPORT

PLATE D-4.1

INFILTRATION REPORT (EXCERPT)

CONTECH UNDERGROUND CHAMBER SYSTEM

DCV CALCULATIONS (WQMP)

PP190005 – HARVILL DISTRIBUTION CENTER OFFSITE DRAINAGE IMPROVEMENTS (HYDROLOGY MAPS)

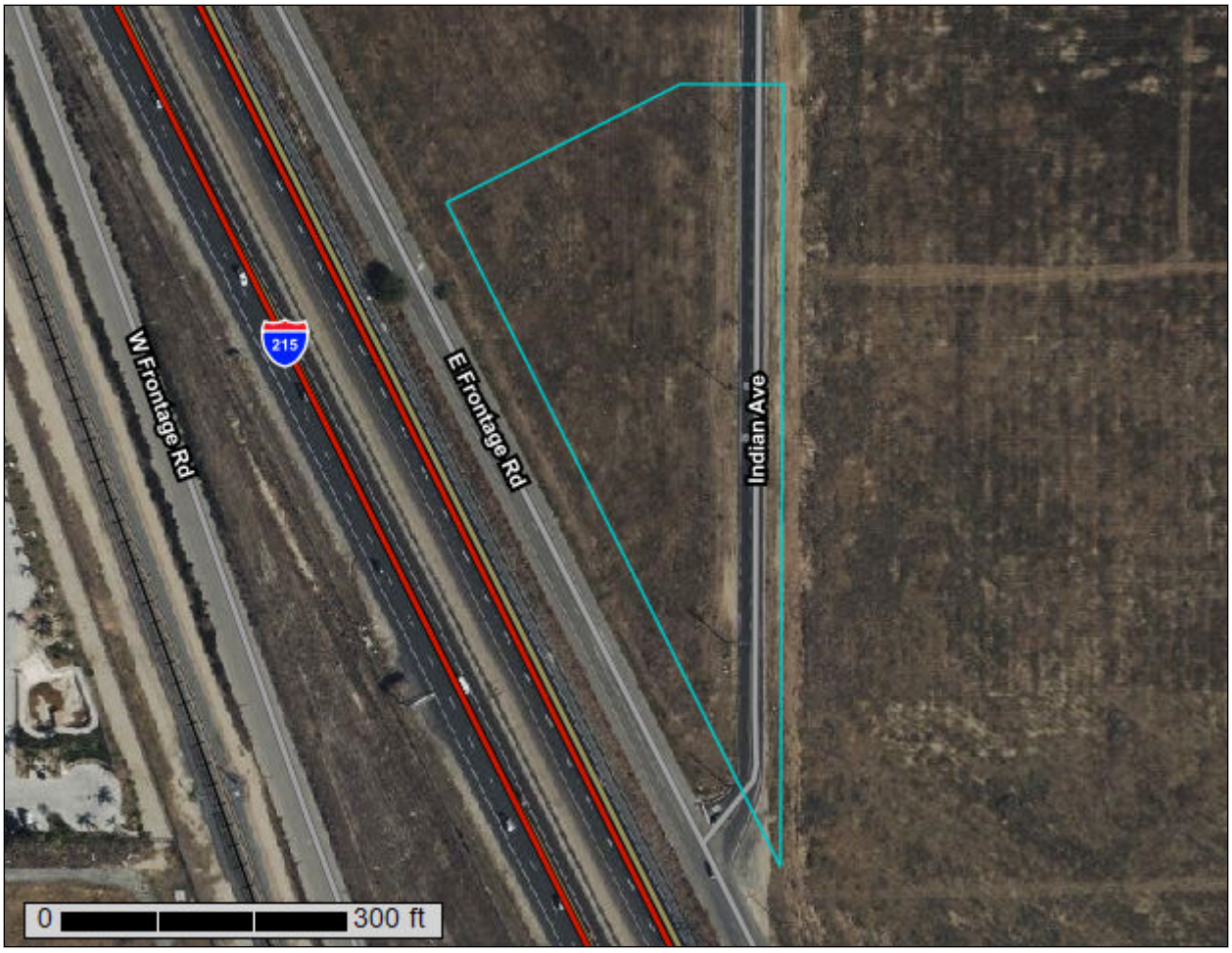
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Western Riverside Area, California



August 9, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:1,460 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 15, Sep 6, 2022

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

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
GyC2	Greenfield sandy loam, 2 to 8 percent slopes, eroded	0.6	15.9%
PaA	Pachappa fine sandy loam, 0 to 2 percent slopes	2.9	84.1%
Totals for Area of Interest		**3.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Western Riverside Area, California

GyC2—Greenfield sandy loam, 2 to 8 percent slopes, eroded

Map Unit Setting

National map unit symbol: hcvw
Elevation: 100 to 3,500 feet
Mean annual precipitation: 9 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Greenfield

Setting

Landform: Terraces, alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 26 inches: sandy loam
H2 - 26 to 43 inches: fine sandy loam
H3 - 43 to 60 inches: loam
H4 - 60 to 72 inches: stratified loamy sand to sandy loam

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Pachappa

Percent of map unit: 3 percent

Hydric soil rating: No

Arlington

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 3 percent
Hydric soil rating: No

Ramona

Percent of map unit: 3 percent
Hydric soil rating: No

Hanford

Percent of map unit: 3 percent
Hydric soil rating: No

PaA—Pachappa fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hcxn
Elevation: 1,000 feet
Mean annual precipitation: 14 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 270 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Pachappa

Setting

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

Typical profile

H1 - 0 to 20 inches: fine sandy loam
H2 - 20 to 63 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

San emigdio

Percent of map unit: 5 percent
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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.

Custom Soil Resource Report
Map—Hydrologic Soil Group

Map Scale: 1:1,460 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

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 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 15, Sep 6, 2022

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

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

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.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
GyC2	Greenfield sandy loam, 2 to 8 percent slopes, eroded	A	0.6	15.9%
PaA	Pachappa fine sandy loam, 0 to 2 percent slopes	B	2.9	84.1%
Totals for Area of Interest			**3.5**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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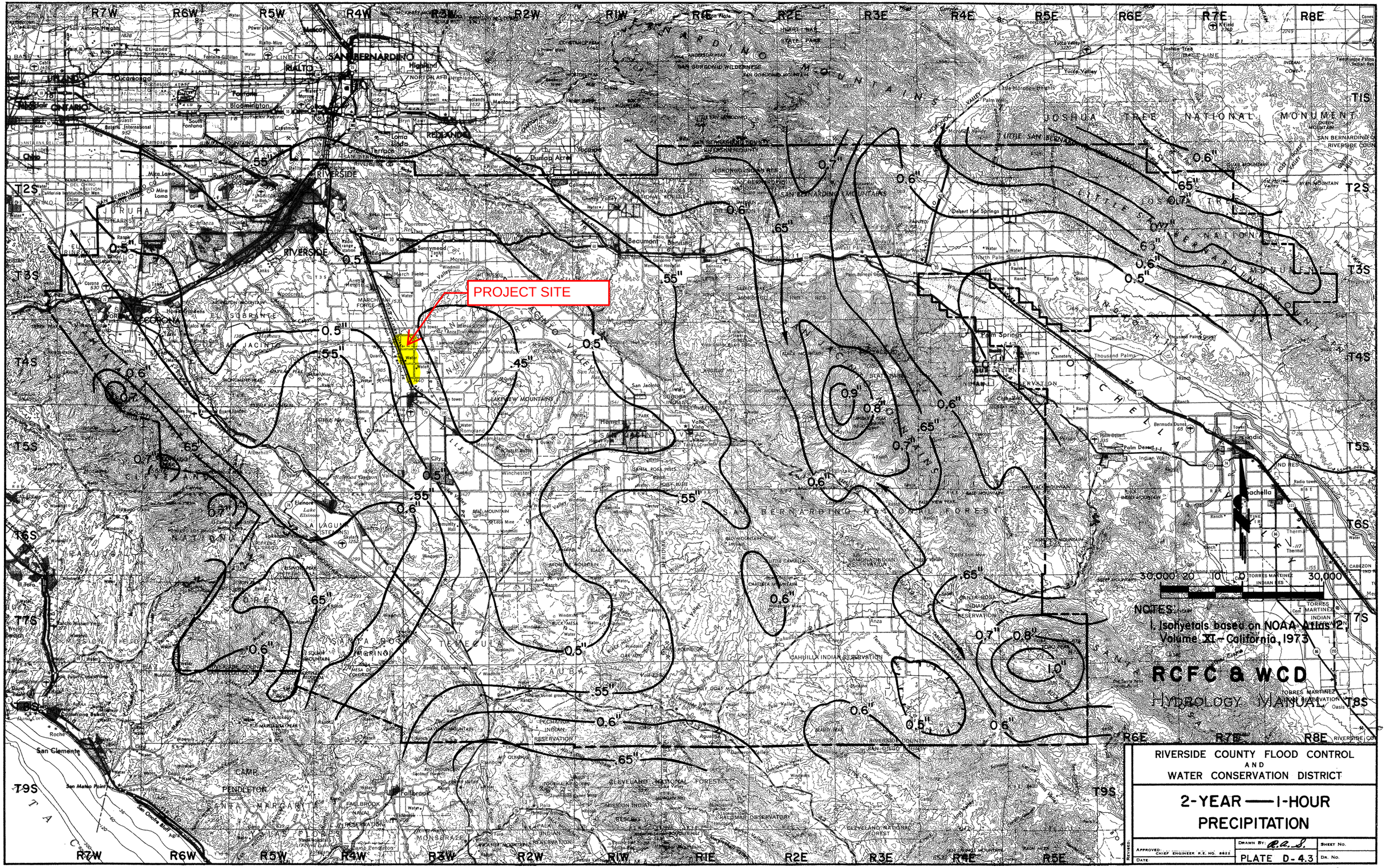
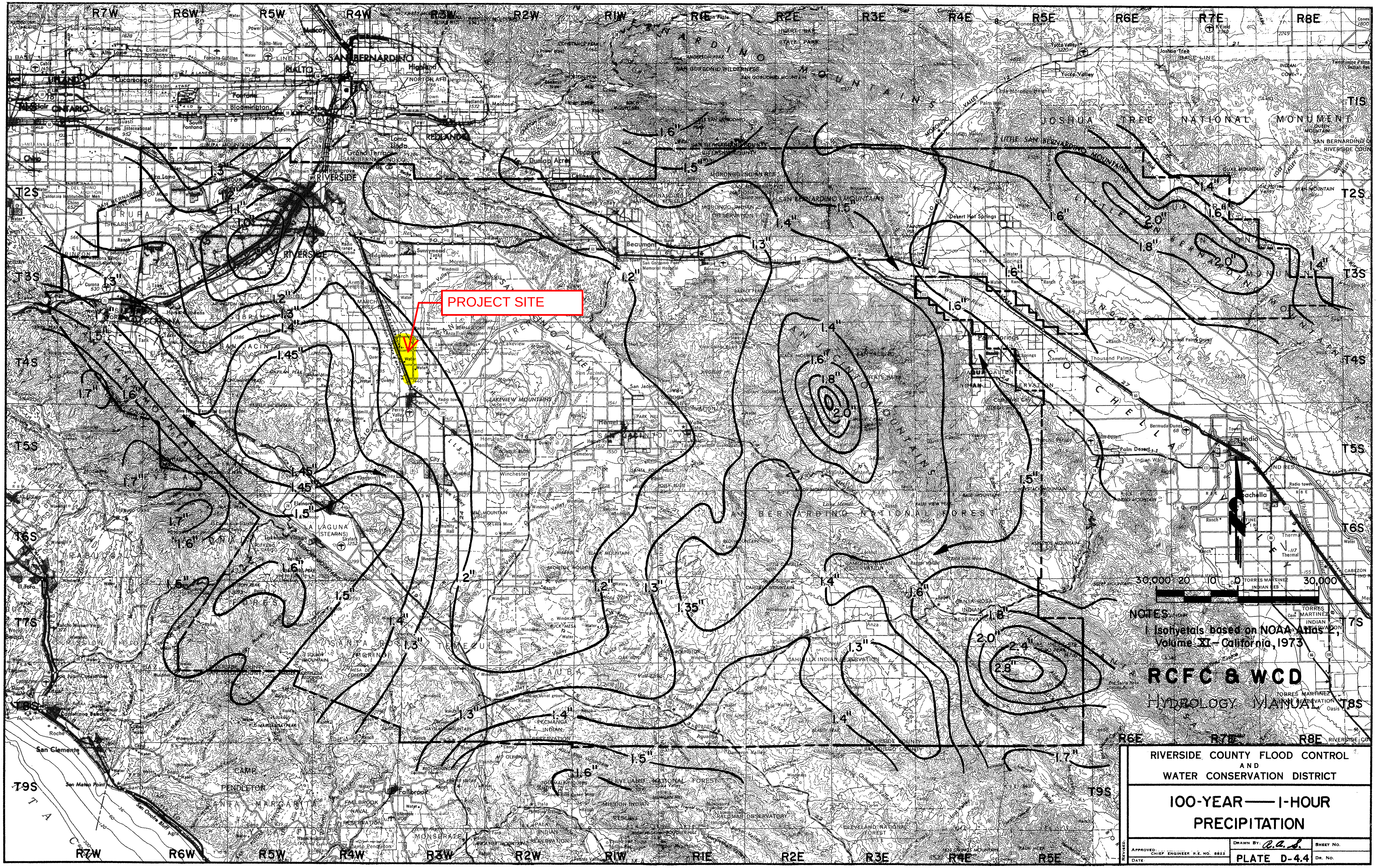
RAINFALL INTENSITY–INCHES PER HOUR

MIRA LOMA			MURRIETA - TEMECULA & RANCHO CALIFORNIA			NORCO			PALM SPRINGS			PERRIS VALLEY		
DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY	
	10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR
5	2.84	4.48	5	3.45	5.10	5	2.77	4.16	5	4.23	6.76	5	2.64	3.78
6	2.58	4.07	6	3.12	4.61	6	2.53	3.79	6	3.80	6.08	6	2.41	3.46
7	2.37	3.75	7	2.87	4.24	7	2.34	3.51	7	3.48	5.56	7	2.24	3.21
8	2.21	3.49	8	2.67	3.94	8	2.19	3.29	8	3.22	5.15	8	2.09	3.01
9	2.08	3.28	9	2.50	3.69	9	2.07	3.10	9	3.01	4.81	9	1.98	2.84
10	1.96	3.10	10	2.36	3.48	10	1.96	2.94	10	2.83	4.52	10	1.88	2.69
11	1.87	2.95	11	2.24	3.30	11	1.87	2.80	11	2.67	4.28	11	1.79	2.57
12	1.78	2.82	12	2.13	3.15	12	1.79	2.68	12	2.54	4.07	12	1.72	2.46
13	1.71	2.70	13	2.04	3.01	13	1.72	2.58	13	2.43	3.88	13	1.65	2.37
14	1.64	2.60	14	1.96	2.89	14	1.66	2.48	14	2.33	3.72	14	1.59	2.29
15	1.58	2.50	15	1.89	2.79	15	1.60	2.40	15	2.23	3.58	15	1.54	2.21
16	1.53	2.42	16	1.82	2.69	16	1.55	2.32	16	2.15	3.44	16	1.49	2.14
17	1.48	2.34	17	1.76	2.60	17	1.50	2.25	17	2.08	3.32	17	1.45	2.08
18	1.44	2.27	18	1.71	2.52	18	1.46	2.19	18	2.01	3.22	18	1.41	2.02
19	1.40	2.21	19	1.66	2.45	19	1.42	2.13	19	1.95	3.12	19	1.37	1.97
20	1.36	2.15	20	1.61	2.38	20	1.39	2.08	20	1.89	3.03	20	1.34	1.92
22	1.29	2.04	22	1.53	2.26	22	1.32	1.98	22	1.79	2.86	22	1.28	1.83
24	1.24	1.95	24	1.46	2.15	24	1.26	1.90	24	1.70	2.72	24	1.22	1.75
26	1.18	1.87	26	1.39	2.06	26	1.22	1.82	26	1.62	2.60	26	1.18	1.69
28	1.14	1.80	28	1.34	1.98	28	1.17	1.76	28	1.56	2.49	28	1.13	1.63
30	1.10	1.73	30	1.29	1.90	30	1.13	1.70	30	1.49	2.39	30	1.10	1.57
32	1.06	1.67	32	1.24	1.84	32	1.10	1.64	32	1.44	2.30	32	1.06	1.52
34	1.03	1.62	34	1.20	1.78	34	1.06	1.59	34	1.39	2.22	34	1.03	1.48
36	1.00	1.57	36	1.17	1.72	36	1.03	1.55	36	1.34	2.15	36	1.00	1.44
38	.97	1.53	38	1.13	1.67	38	1.01	1.51	38	1.30	2.09	38	.98	1.40
40	.94	1.49	40	1.10	1.62	40	.98	1.47	40	1.27	2.02	40	.95	1.37
45	.89	1.40	45	1.03	1.52	45	.92	1.39	45	1.18	1.89	45	.90	1.29
50	.84	1.32	50	.97	1.44	50	.88	1.31	50	1.11	1.78	50	.85	1.22
55	.80	1.26	55	.92	1.36	55	.84	1.25	55	1.05	1.68	55	.81	1.17
60	.76	1.20	60	.88	1.30	60	.80	1.20	60	1.00	1.60	60	.78	1.12
65	.73	1.15	65	.84	1.24	65	.77	1.15	65	.95	1.53	65	.75	1.08
70	.70	1.11	70	.81	1.19	70	.74	1.11	70	.91	1.46	70	.72	1.04
75	.68	1.07	75	.78	1.15	75	.72	1.07	75	.88	1.41	75	.70	1.00
80	.65	1.03	80	.75	1.11	80	.69	1.04	80	.85	1.35	80	.68	.97
85	.63	1.00	85	.73	1.07	85	.67	1.01	85	.82	1.31	85	.66	.94
SLOPE = .530			SLOPE = .550			SLOPE = .500			SLOPE = .580			SLOPE = .490		

STANDARD
INTENSITY–DURATION
CURVES DATA


PROJECT SITE
NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
2-YEAR — 1-HOUR PRECIPITATION
PLATE D-4.3
DRAWN BY: R.A.S.
APPROVED CHIEF ENGINEER R.E. NO. 8822
DATE
SHEET No.
DR. No.
REVISED:



PROJECT SITE
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
100-YEAR —— 1-HOUR
PRECIPITATION
PLATE D-4.4
DRAWN BY: R.A.S.
SHEET NO.
APPROVED: CHIEF ENGINEER R.E. NO. 8822
DATE
DR. NO.
REVISED:
NOTES
1. Isohyetals based on NOAA Atlas 2, Volume XI – California, 1973
RCFC & WCD
HYDROLOGY MANUAL
30,000 20 10 0 30,000
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E
R3E
R4E
R5E
R6E
R7E
R8E
T1S
T2S
T3S
T4S
T5S
T6S
T7S
T8S
T9S
SAN BERNARDINO
RIVERSIDE
REDLANDS
ONTARIO
UPLAND
RIALTO
Perris
Beaumont
Banning
San Jacinto
Hemet
Palm Springs
Indio
Coachella
Elsinore
Fallbrook
San Clemente
JOSHUA TREE NATIONAL MONUMENT
SAN BERNARDINO MOUNTAINS
SAN BERNARDINO NATIONAL FOREST
CLEVELAND NATIONAL FOREST
CAMP PENDLETON
1.0"
1.1"
1.2"
1.3"
1.35"
1.4"
1.45"
1.5"
1.6"
1.7"
1.8"
2.0"
2.4"
2.8"

July 1, 2022

Howard Industrial Partners
1944 North Tustin Street, Suite 122
Orange, California 92865

Attention: Mr. Mike Tunney
Vice President

Project No.: **22G183-2**

Subject: **Results of Infiltration Testing**
Proposed Harvest Landing Industrial Development
Indian Avenue and Orange Avenue
Perris, California

Reference: Geotechnical Investigation, Proposed Harvest Landing Industrial Development, Indian Avenue and Orange Avenue, Perris, California, prepared by Southern California Geotechnical, Inc. (SCG) for Howard Industrial Partners, SCG Project No. 22G183-1, dated June 13, 2022.

Mr. Tunney:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

Scope of Services

The scope of services performed for this project was in general accordance with our Proposal No. 22P206R, dated April 28, 2022 and Change Order No. 22G183-CO, dated June 8, 2022. The scope of services included visual site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the on-site soils for the stormwater disposal systems. The infiltration borings were tested using a modified constant-head infiltration test as requested by the project civil engineer. The double ring infiltration testing was performed in general accordance with ASTM Test Method D-3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer.

Site and Project Description

The site is located at the northwest and southwest corners of Indian Avenue and Orange Avenue in Perris, California. The site is bounded to the north by Val Verde Elementary School, to the west and south by Interstate 215 Frontage Road, and to the east by Indian Avenue. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 of this report.

The site consists of several parcels, which total 73.68± acres in size. The east-central area of the site is developed with four (4) single-family residences. These residences are assumed to be single-story structures of wood frame and stucco construction and supported on conventional

shallow foundations with concrete slab-on-grade floors. The residences are surrounded by concrete flatwork, turf grass, exposed soil, and trees. The remaining areas of the site are vacant and undeveloped. The ground surface in these areas consists of exposed soil with sparse to moderate native grass and weed growth.

Detailed topographic information was not available at the time of this report. Based on elevations obtained from Google Earth, and visual observations made at the time of the subsurface investigation, the overall site topography is generally flat and moderately slopes to the east at a gradient of approximately 2± percent.

Proposed Development

Based on the conceptual site plan provided to our office by the client, the site will be developed with five (5) industrial buildings:

Building No.	Location	Size (ft²)
1	North	647,000
2	North-Central	389,000
3	Central	91,000
4	South-Central	52,000
5	South	22,000

Each building includes a mezzanine and dock-high doors will be constructed along a portion of at least one building wall for each of the buildings. The building is anticipated to be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete pavements in the loading dock areas, and limited areas of concrete flatwork and landscape planters throughout.

The proposed development will include on-site infiltration for stormwater disposal. Based on the information provided by representatives of FMCivil Engineers, Inc., the project civil engineer, the infiltration systems will consist of four (4) shallow below-grade chamber systems (identified as Infiltration System "A" through Infiltration System "D") and/or four (4) deep dry-well systems (identified as Infiltration System "E" thought Infiltration System "H"). The infiltration systems will be located in the eastern area of the site. The bottoms of the below-grade chamber systems will extend to depths of 7± feet below existing site grades and the dry wells will extend to a depth of 50± feet below existing site grades.

Concurrent Studies

SCG performed a geotechnical investigation at the subject site, referenced above. As a part of this investigation, twenty-three (23) borings were advanced to depths of 15 to 25± feet below the previously existing site grades. Native alluvium was encountered at each boring location, extending to at least the maximum depth explored of 25± feet below existing site grades. The alluvium generally consists of medium dense to very dense silty sands to sandy silts, with trace to little clay content.

Free water was not encountered during the drilling of the borings. Based on the lack of water within the borings and the moisture contents of the recovered soil samples, the static groundwater is considered to have existed at a depth in excess of 25± feet at the time of the

subsurface exploration. Recent water level data was obtained from the California Department of Water Resources website, http://www.water.ca.gov/waterdatalibrary/. The nearest monitoring well is located approximately 0.5 miles east from the site. Water level readings within this monitoring well indicates a groundwater level of 44± feet below the ground surface in March 2022.

Subsurface Exploration

Scope of Exploration

The subsurface exploration performed for the infiltration testing consisted of six (6) shallow infiltration trenches (identified as Infiltration Trench Nos. I-1 through I-6) and four (4) deep infiltration borings (identified as Infiltration Boring Nos. I-7 through I-10). The infiltration trenches were excavated using a rubber-tire backhoe to a depth of 7± feet. The infiltration borings were extended to a depth of 50± feet below existing site grades. In addition to the infiltration testing, one (1) exploratory boring was extended to a depth of 60± feet below site grades to confirm the underlying soil types and verify that groundwater was at a depth greater than 10± feet below the bottom of the proposed dry well infiltration systems. The borings were advanced using a truck-mounted drilling rig, equipped with 8-inch-diameter hollow-stem augers and were logged during drilling by a member of our staff. The approximate locations of the boring, infiltration borings, and infiltration trenches are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Geotechnical Conditions

Artificial fill soils were encountered at the ground surface at Infiltration Test No. I-3, extending to a depth of 1± foot below existing site grades. The fill soils consist of medium dense fine to medium sandy silts with trace quantities of clay and fine gravel. Native alluvium was encountered at the ground surface at all of the remaining boring and trench locations, extending to at least the maximum explored depth of 60± feet below existing site grades. The near-surface alluvium encountered at depths less than 25± feet below existing site grades consists of medium dense to very dense fine to medium sandy silts, silty fine to medium sands, clayey fine to coarse sands, and hard fine to coarse sandy clays. At depths greater than 25± feet, the alluvium consists of medium dense to very dense fine sandy silts, fine to medium sandy silts, silty fine to medium sands, and hard fine to medium sandy clays. The Boring Logs and Trench Logs, which illustrate the conditions encountered at each of the borings, are included with this report.

Free water was not encountered during drilling of any of the borings. Based on the lack of water within the borings, the static groundwater table was considered to have existed at a depth in excess of 60± feet at the time of our subsurface exploration.

Shallow Infiltration Testing – Double Ring Infiltration

The infiltration testing for the proposed shallow infiltration chambers was performed in general accordance with ASTM Test Method D-3385-03, Standard Test Method for Infiltration Rate of Soils in Field Using Double Ring Infiltrometer.

Two stainless steel infiltration rings were used for the infiltration testing. The outer infiltration ring is 2 feet in diameter and 20 inches in height. The inner infiltration ring is 1 foot in diameter

and 20 inches in height. At the test locations, the outer ring was driven 3± inches into the soil at the base of each trench. The inner ring was centered inside the outer ring and subsequently driven 3± inches into the soil at the base of the trench. The rings were driven into the soil using a ten-pound sledge hammer. The soil surrounding the wall of the infiltration rings was only slightly disturbed during the driving process.

Infiltration Testing Procedure

Infiltration testing was performed at all of the trench locations. The infiltration testing consisted of filling the inner ring and the annular space (the space between the inner and outer rings) with water, approximately 3 to 4 inches above the soil. To prevent the flow of water from one ring to the other, the water level in both the inner ring and the annular space between the rings was maintained using constant-head float valves. The volume of water that was added to maintain a constant head in the inner ring and the annular space during each time interval was determined and recorded. A cap was placed over the rings to minimize the evaporation of water during the tests.

The schedule for readings was determined based on the observed soil type at the base of each backhoe-excavated trench. Based on the existing soils at the trench locations, the volumetric measurements were made at 10-minute intervals at Infiltration Trench No I-3 and 15-minute increments at the remaining trench locations. The water volume measurements are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on these spreadsheets.

The infiltration rates for the infiltration tests are calculated in centimeters per hour and then converted to inches per hour. The rates are summarized below:

Infiltration Test No.	**Depth (feet)**	**Soil Description**	**Measured Infiltration Rate (inches/hour)**
I-1	7	Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.8
I-2	7	Brown Silty fine to medium Sand, trace coarse Sand, trace Clay	1.0
I-3	7	Brown Silty fine to medium Sand, little coarse Sand	6.8
I-4	7	Brown Silty fine to medium Sand, trace to little coarse Sand, trace Clay	0.3
I-5	7	Brown Silty fine to medium Sand, trace coarse Sand, trace Clay	0.9
I-6	7	Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	1.3

Percolation Testing – Dry Wells

The dry well infiltration testing was performed in accordance with a modified constant-head infiltration test as requested by the project civil engineer, the designer of the proposed dry well system.

Upon the completion of the drilling for the infiltration borings, a sufficient length of 3-inch-diameter perforated PVC casing was then placed into each test hole so that the PVC casing extended from the bottom of the test hole to the ground surface. Clean ¾-inch gravel was installed in the annulus surrounding the PVC casing.

Pre-soaking

The pre-soaking process consisted of filling the test borings with water to approximately 10± feet below the ground surface. The pre-soaking was completed after all of the water had percolated through the test hole, at least 15 hours since initiating the pre-soak.

Infiltration Testing Procedure

Following the pre-soaking process, the constant-head infiltration test method was utilized to test the infiltration rates of deeper soils. This method consisted of filling the borings to a maximum water level of 10± feet below the ground surface, based on the soil conditions encountered. Once the hole was filled, the inflow of water was controlled via a ball valve in order to maintain the water level constant below ground surface. It was necessary to constantly monitor this depth due to varying inflows from the water source and the change in infiltration rate with time. Readings were taken every ten minutes using a water level meter. The ball valve was used to make adjustments by increasing or decreasing the inflow of water when slight changes in depth occurred. The water level readings are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on the spreadsheets.

The infiltration rates from the deep infiltration tests are tabulated in gallons per square foot per day.

Infiltration Test No.	Depth (feet)	Measured Infiltration Rate (Inches per Hour)
I-7	51	<0.1
I-8	49	0.2
I-9	51	0.1
I-10	51	0.3

Laboratory Testing

Moisture Content

The moisture contents for the recovered soil samples within the borings were determined in accordance with ASTM D-2216 and are expressed as a percentage of the dry weight. These test results are presented on the Boring Logs.

Grain Size Analysis

The grain size distribution of selected soils collected from each infiltration test boring have been determined using a range of wire mesh screens. These tests were performed in general accordance with ASTM D-422 and/or ASTM D-1140. The weight of the portion of the sample retained on each screen is recorded and the percentage finer or coarser of the total weight is calculated. The results of these tests are presented on Plates C-1 through C-41 of this report.

Design Recommendations

A total of ten (10) total infiltration tests were performed at the subject site. As noted above, the double ring infiltration testing resulted in measured infiltration rates ranging from 0.3 to 6.8 inches per hour. The dry well infiltration testing resulted in measured infiltration rates ranging from 0.0 to 0.3 inches per hour. The primary factors affecting the infiltration rates are the silt content of the encountered soils, which vary at different depths and locations at the subject site. Based on the results of the infiltration testing, we recommend the following infiltration rates to be utilized for the design of the proposed infiltration systems:

Infiltration Test No.	Infiltration System	Infiltration System Type	Depth (feet)	Location	Infiltration Rate (inches per hour)
I-1 and I-2*	A	Chamber System	7	Northeast	0.9
I-3 and I-4*	B	Chamber System	7	Central-East	3.6
I-5	C	Chamber System	7	South-Central	0.9
I-6	D	Chamber System	7	Southeast	1.3

Infiltration Test No.	Infiltration System	Infiltration System Type	Depth (feet)	Location	Infiltration Rate (inches per hour)
I-7	E	Dry Well	50	Northeast	0.0
I-8	F	Dry Well	50	Central-East	0.2
I-9	G	Dry Well	50	Central-East	0.1
I-10	H	Dry Well	50	Southeast	0.3

NOTE: *Indicates an average infiltration rate was used in the design infiltration rate.

Due to the low infiltration rates for the deep dry well infiltration systems, dry well infiltration is not recommended for this project.

The design of the proposed storm water infiltration system should be performed by the project civil engineer, in accordance with the City of Perris and/or County of Riverside guidelines. However, it is recommended that the system be constructed so as to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the system. The presence of such materials would decrease the effective infiltration rate. **It is recommended that the project civil engineer apply an appropriate factor of safety. The infiltration rates recommended above are based on the assumption that only clean water will be introduced to the subsurface profile. Any fines, debris, or organic materials could significantly impact the infiltration rates.** It should be noted that the recommended infiltration rates are based on infiltration testing at ten (10) discrete locations and the overall infiltration rates of the storm water infiltration systems could vary considerably.

Infiltration Rate Considerations

The infiltration rates presented herein was determined in accordance with the Riverside County guidelines and are considered valid only for the time and place of the actual test. Varying subsurface conditions will exist in other areas of the site, which could alter the recommended infiltration rates presented above. The infiltration rates will decline over time between maintenance cycles as silt or clay particles accumulate on the BMP surface. The infiltration rate is highly dependent upon a number of factors, including density, silt and clay content, grainsize distribution throughout the range of particle sizes, and particle shape. Small changes in these factors can cause large changes in the infiltration rates.

Infiltration rates are based on unsaturated flow. As water is introduced into soils by infiltration, the soils become saturated and the wetting front advances from the unsaturated zone to the saturated zone. Once the soils become saturated, infiltration rates become zero, and water can only move through soils by hydraulic conductivity at a rate determined by pressure head and soil permeability. Changes in soil moisture content will affect the infiltration rate. Infiltration rates should be expected to decrease until the soils become saturated. Soil permeability values will then govern groundwater movement. Permeability values may be on the order of 10 to 20 times less than infiltration rates. The system designer should incorporate adequate factors of safety and allow for overflow design into appropriate traditional storm drain systems, which would transport storm water off-site.

Construction Considerations

The infiltration rates presented in this report are specific to the tested locations and tested depths. Infiltration rates can be significantly reduced if the soils are exposed to excessive disturbance or compaction during construction. Compaction of the soils at the bottom of the infiltration system can significantly reduce the infiltration ability of the basins. Therefore, the subgrade soils within proposed infiltration system areas should not be over-excavated, undercut or compacted in any significant manner. **It is recommended that a note to this effect be added to the project plans and/or specifications.**

We recommend that a representative from the geotechnical engineer be on-site during the construction of the proposed infiltration systems to identify the soil classification at the base of each system. It should be confirmed that the soils at the base of the proposed infiltration systems correspond with those presented in this report to ensure that the performance of the systems will be consistent with the rates reported herein.

We recommend that scrapers and other rubber-tired heavy equipment not be operated on the basin bottom, or at levels lower than 2 feet above the bottom of the system, particularly within basins. As such, the bottom 24 inches of the infiltration systems should be excavated with non-rubber-tired equipment, such as excavators.

Infiltration Chamber Maintenance

The proposed project may include infiltration chambers. Water flowing into chambers will carry some level of sediment. This layer has the potential to significantly reduce the infiltration rate of the chamber subgrade soils. Therefore, a formal chamber maintenance program should be established to ensure that these silt and clay deposits are removed from the chamber on a regular basis.

Location of Infiltration Systems

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration area could potentially be damaged due to saturation of the subgrade soils. **The proposed infiltration systems for this site should be located at least 25 feet away from any structures, including retaining walls.** Even with this provision of locating the infiltration system at least 25 feet from the building(s), it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration system.

The infiltration system designer should also give special consideration to the effect that the proposed infiltration systems may have on nearby subterranean structures, open excavations, or descending slopes. In particular, infiltration systems should not be located near the crest of descending slopes, particularly where the slopes are comprised of granular soils. Such systems will require specialized design and analysis to evaluate the potential for slope instability, piping failures and other phenomena that typically apply to earthen dam design. This type of analysis is beyond the scope of this infiltration test report, but these factors should be considered by the infiltration system designer when locating the infiltration systems.

General Comments

This report has been prepared as an instrument of service for use by the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, structural engineer, and/or civil engineer. The design of the infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rates contained herein, the civil engineer agrees to indemnify, defend, and hold harmless the geotechnical engineer for all aspects of the design and performance of the infiltration system. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur. The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between trench locations and testing depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to

our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted. The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

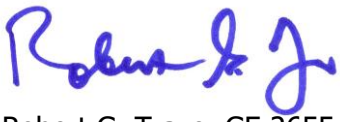
Closure

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

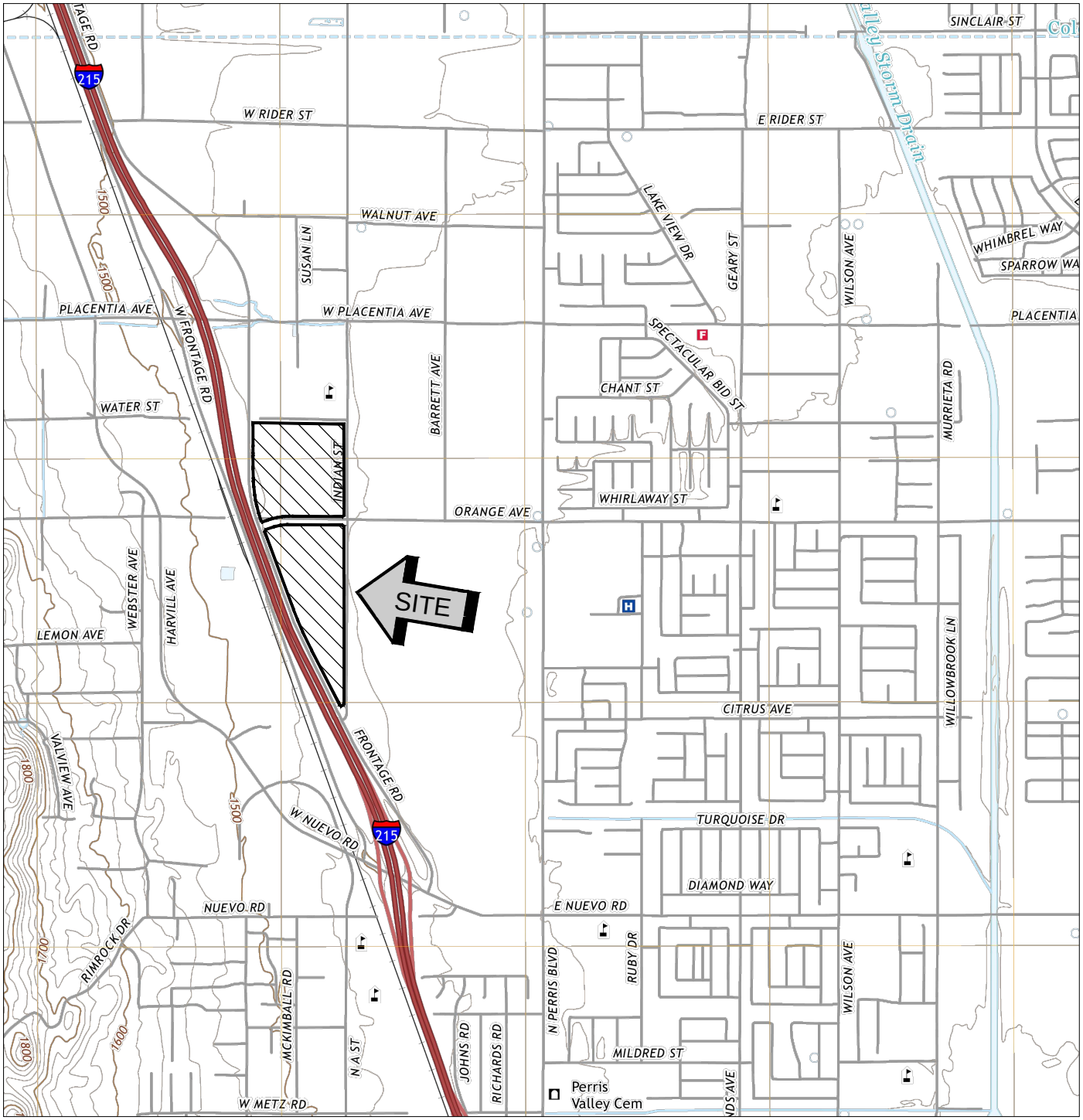
Ryan Bremer
Staff Geologist



Robert G. Trazo, GE 2655
Principal Engineer

Distribution: (1) Addressee

Enclosures: Plate 1 - Site Location Map
Plate 2 - Infiltration Test Location Plan
Trench Log Legend and Logs (8 pages)
Boring Log Legend and Logs (12 pages)
Infiltration Test Results Spreadsheets (10 pages)
Grain Size Distribution Graphs (41 pages)



SOURCE: USGS TOPOGRAPHIC MAP OF THE PERRIS QUADRANGLE, RIVERSIDE COUNTY, CALIFORNIA, 2021

SITE LOCATION MAP

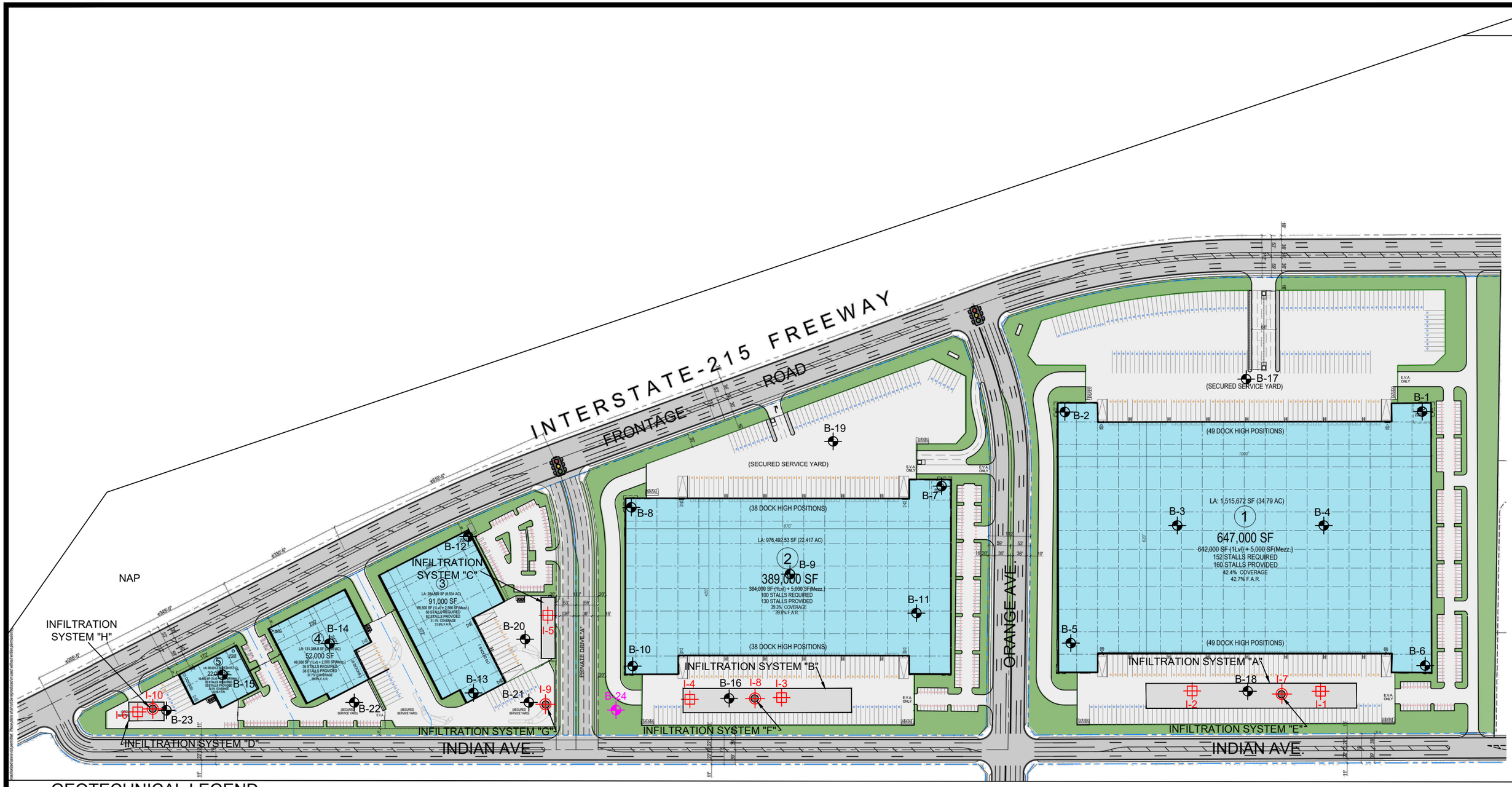
HARVEST LANDING INDUSTRIAL DEVELOPMENT

PERRIS, CALIFORNIA

SCALE: 1" = 2000'	
DRAWN: OS CHKD: RGT	
SCG PROJECT 22G183-2	
PLATE 1	

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL



GEOTECHNICAL LEGEND

- APPROXIMATE SHALLOW-INFILTRATION TEST LOCATION (DOUBLE-RING INFILTROMETER)
- APPROXIMATE DEEP-INFILTRATION TEST LOCATION (CONSTANT-HEAD)
- APPROXIMATE BORING LOCATION
- APPROXIMATE BORING LOCATION (SCG PROJECT NO. 22G183-1)
- APPROXIMATE BELOW-GRADE CHAMBER LOCATION
- APPROXIMATE DRY WELL SYSTEM LOCATION

NORTH

SoCalGeo

NOTE: CONCEPTUAL PLAN PROVIDED BY AO ARCHITECTS

INFILTRATION TEST LOCATION PLAN

HARVEST LANDING INDUSTRIAL DEVELOPMENT

PERRIS, CALIFORNIA

SCALE: 1" = 250'	
DRAWN: RB CHKD: RGT	
SCG PROJECT 22G183-2	
PLATE 2	

SOUTHERN CALIFORNIA GEOTECHNICAL

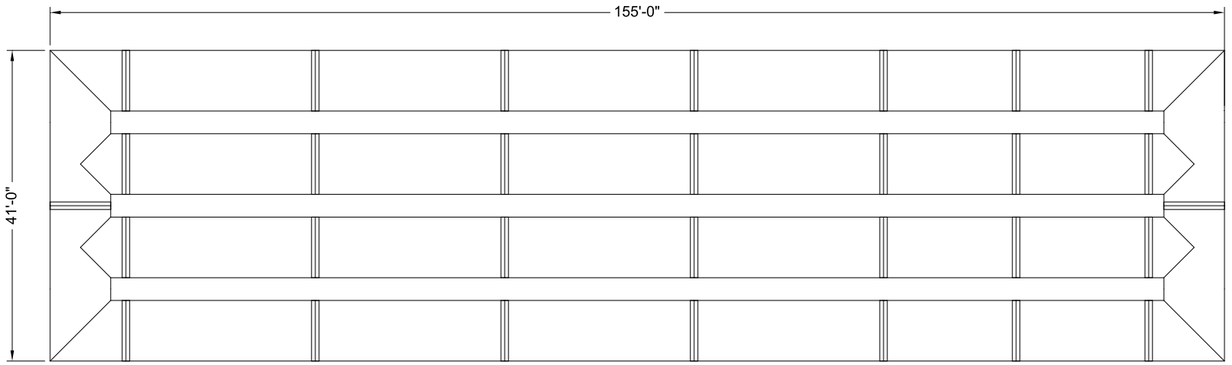
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 638 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 32,069 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 32,069 CF

PIPE DETAILS
- DIAMETER = 96"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 36"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"



NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2⅔" x ½" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

ASSEMBLY
SCALE: 1" = 20'

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DATE	REVISION DESCRIPTION	BY

CONTECH® ENGINEERED SOLUTIONS LLC
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9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH® CMP DETENTION SYSTEMS
CONTECH **DYODS** DRAWING

DYO19782 20-001 Harvest Landing Site 5
Site 5 Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
12823	19782	10/1/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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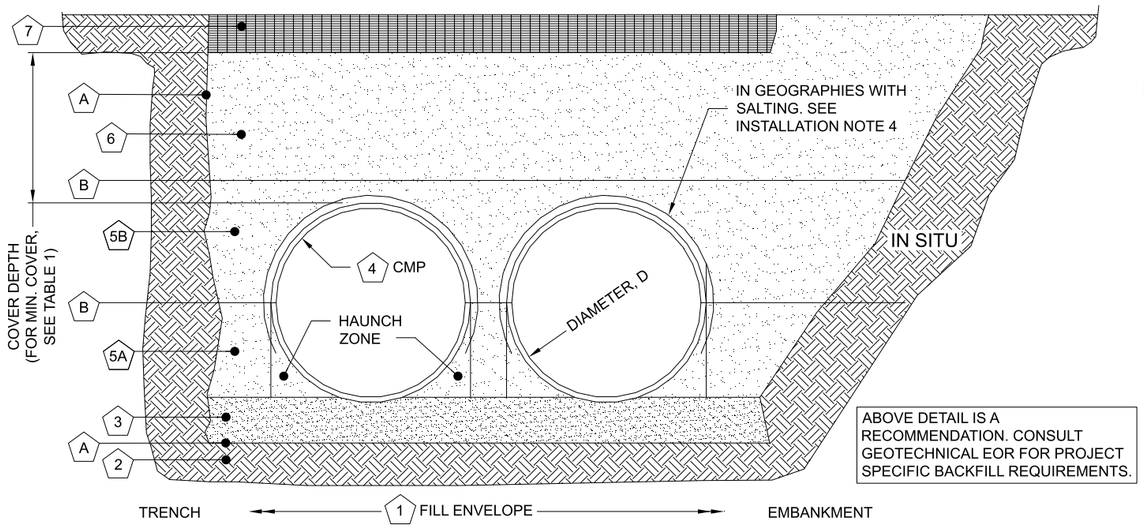
TABLE 1:

DIAMETER, D	MIN. COVER	CORR. PROFILE
6"-10"	12"	1 1/2" x 1/4"
12"-48"	12"	2 2/3" x 1/2"
>48"-96"	12"	3" x 1", 5" x 1"
>96"	D/8	3" x 1", 5" x 1"

- STRUCTURAL BACKFILL MUST EXTEND TO LIMITS OF THE TABLE
- TOTAL HEIGHT OF COMPACTED COVER FOR CONVENTIONAL HIGHWAY LOADS IS MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TOP OF RIGID PAVEMENT
- ULTRAFLO ALSO AVAILABLE FOR SIZES 18" - 120" WITH 3/4"x 3/4"x 7 1/2" CORRUGATION



MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT

INSTALLATION NOTES

1. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES.
2. OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.
3. BACKFILL USING CONTROLLED LOW-STRENGTH MATERIAL (CLSM, "FLASH FILL" OR "FLOWABLE FILL") MAY BE USED WHEN THE SPACING BETWEEN THE PIPES WILL NOT ALLOW FOR PLACEMENT AND ADEQUATE COMPACTION OF THE BACKFILL. CONTACT CONTECH FOR FURTHER EVALUATION.
4. IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, A GEOMEMBRANE BARRIER IS RECOMMENDED OVER THE UPPER HALF OF THE PIPE. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

TABLE 2: SOLID STANDARD

CMP DETENTION AND CMP DRAINAGE STANDARD BACKFILL SPECIFICATIONS

	MATERIAL LOCATION	MATERIAL SPECIFICATION	DESCRIPTION	
1	FILL ENVELOPE WIDTH	PER ENGINEER OF RECORD	MINIMUM TRENCH WIDTH MUST ALLOW ROOM FOR PROPER COMPACTION OF HAUNCH MATERIALS UNDER THE PIPE. THE SUGGESTED MINIMUM TRENCH WIDTH, OR EOR RECOMMENDATION: PIPE ≤ 12": D + 16" PIPE > 12": 1.5D + 12"	MINIMUM EMBANKMENT WIDTH (IN FEET) FOR INITIAL FILL ENVELOPE: PIPE < 24": 3.0D PIPE 24" - 144": D + 4'0" PIPE > 144": D + 10'0"
2	FOUNDATION	**AASHTO 26.5.2** OR PER ENGINEER OF RECORD	PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND FOUNDATION BROUGHT BACK TO GRADE WITH A FILL MATERIAL APPROVED BY THE ENGINEER OF RECORD.	
3	BEDDING	**AASHTO M 43: 3, 357, 4, 467, 5, 56, 57** (APPROVED REGIONAL EQUIVALENTS INCLUDE CA-7)	ENGINEER OF RECORD TO DETERMINE IF BEDDING IS REQUIRED. PIPE MAY BE PLACED ON THE TRENCH BOTTOM OF A RELATIVELY LOOSE, NATIVE SUITABLE WELL GRADED GRANULAR MATERIAL THAT IS ROUGHLY SHAPED TO FIT THE BOTTOM OF THE PIPE, 2" MIN DEPTH. THE BEDDING MATERIAL MAY BE SUITABLE FOUNDATION SOILS CONFORMING TO AASHTO SOIL CLASSIFICATIONS A1, A2, OR A3 WITH MAXIMUM PARTICLE SIZE OF 3" PER AASHTO 26.3.8.1	
4	CORRUGATED METAL PIPE			
5A	CRITICAL BACKFILL	**AASHTO M 145: A-1, A-2, A-3** *	HAUNCH ZONE MATERIAL SHALL BE HAND SHOVELED OR SHOVEL SLICED INTO PLACE TO ALLOW FOR PROPER COMPACTION WITHOUT SOFT SPOTS. BACKFILL SHALL BE PLACED IN 8" +/- LOOSE LIFTS AND COMPACTED TO 90% STANDARD PROCTOR PER AASHTO T 99. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A THREE LIFT (24") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHOULD BE ADVANCED ALONG THE LENGTH OF THE SYSTEM TO AVOID DIFFERENTIAL LOADING. WELL GRADED GRANULAR MATERIAL WHICH MAY CONTAIN SMALL AMOUNTS OF SILT OR CLAY AND MAXIMUM PARTICLE SIZE OF 3" (PER AASHTO 26.3.8.1 AND 12.4-1.3).	
5B	BACKFILL	**AASHTO M 145: A-1, A-2, A-3**		
6	COVER MATERIAL	UP TO MIN. COVER - SEE 5A AND 5B ABOVE ABOVE MIN. COVER - PER ENGINEER OF RECORD	COVER MATERIAL MAY INCLUDE NON-BITUMINOUS, GRANULAR ROAD BASE MATERIAL WITHIN MIN COVER LIMITS	
7	RIGID OR FLEXIBLE PAVEMENT (IF APPLICABLE)	PER ENGINEER OF RECORD	FLEXIBLE PAVEMENT SHOULD NOT BE COUNTED AS PART OF THE FILL HEIGHT OVER THE CMP. FINAL BACKFILL MATERIAL SELECTION AND COMPACTION REQUIREMENTS SHALL FOLLOW THE PROJECT PLANS AND SPECIFICATIONS PER THE ENGINEER OF RECORD.	
A	OPTIONAL SIDE GEOTEXTILE	NONE	GEOTEXTILE LAYER IS RECOMMENDED ON SIDES OF EXCAVATION TO PREVENT SOIL MIGRATION.	
B	OPTIONAL GEOTEXTILE BETWEEN LAYERS	NONE	IF SOIL TYPES DIFFER AT ANY POINT ABOVE PIPE INVERT, A GEOTEXTILE LAYER IS RECOMMENDED TO BE PLACED BETWEEN THE LAYERS TO PREVENT SOIL MIGRATION.	

NOTES:
- FOR MULTIPLE BARREL INSTALLATIONS, THE RECOMMENDED STANDARD SPACING BETWEEN PARALLEL PIPE RUNS SHALL BE THE PIPE DIAMETER /2 BUT NO LESS THAN 12" FOR DIAMETERS <72". FOR 72" AND LARGER DIAMETERS, THE MINIMUM SPACING IS 36". CONTACT YOUR CONTECH REPRESENTATIVE FOR NONSTANDARD SPACING.

* APPROVED REGIONAL EQUIVALENTS FOR SECTION 5A INCLUDE CA-7, CODOT #67, MIDOT 2G, 34G, OR 21AA STONE OR GRAVEL; #8; #57; MIDOT 6A, 2G, 3G, 34G.

MANUFACTURER RECOMMENDED BACKFILL

NOT TO SCALE

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CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO19782 20-001 Harvest Landing Site 5
Site 5 Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
12823	19782	10/1/2024
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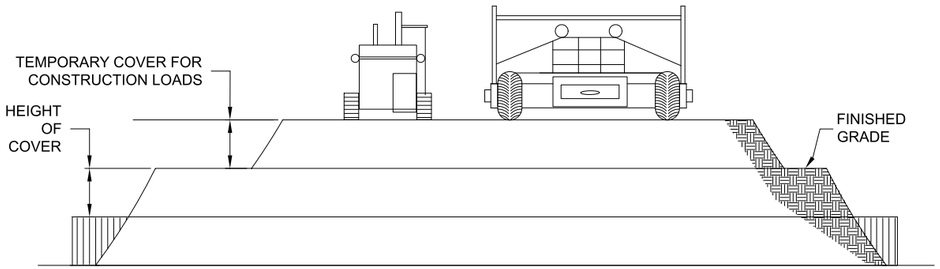


CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

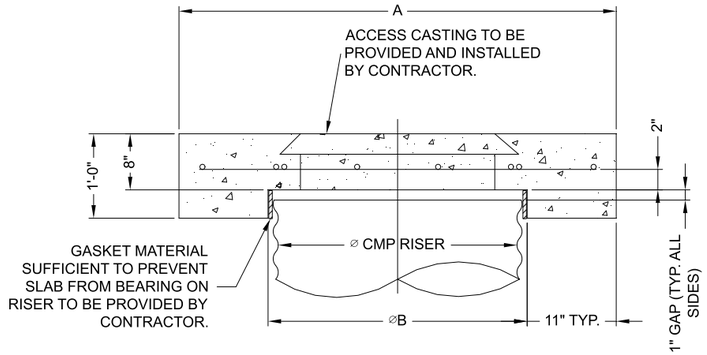
APPLICABLE POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

APPLICABLE
HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.
REQUIREMENTS
INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

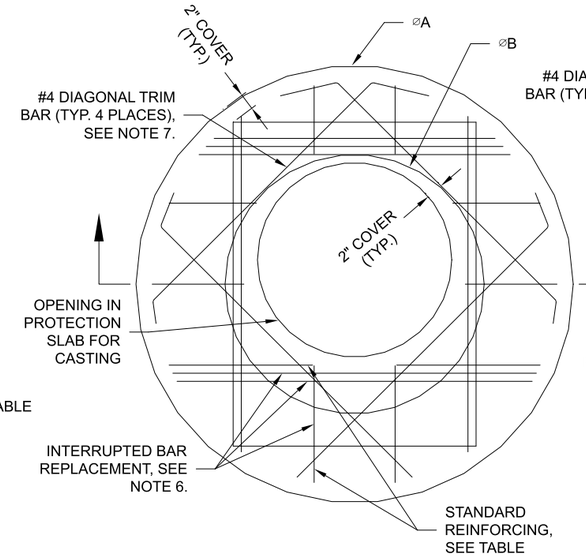
NOTE:
THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.



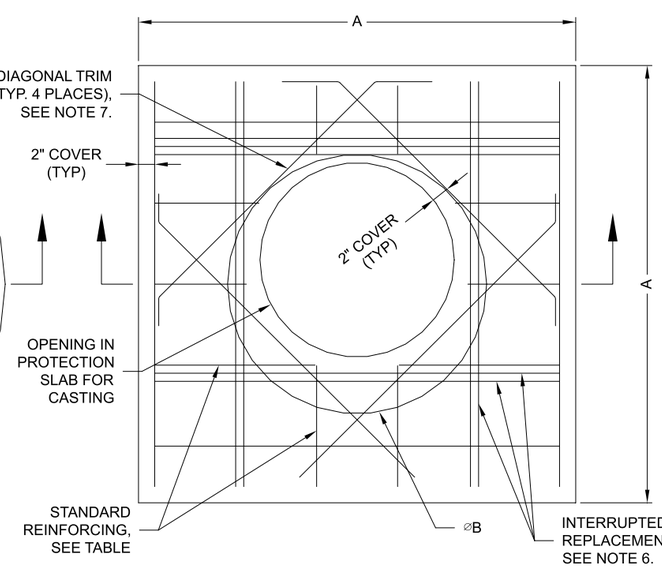
SECTION VIEW

REINFORCING TABLE				
⌀ CMP RISER	A	⌀ B	REINFORCING	**BEARING PRESSURE (PSF)
24"	⌀ 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	⌀ 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	⌀ 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	⌀ 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	⌀ 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

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CONTECH CMP DETENTION SYSTEMS
CONTECH **DYODS** DRAWING

DYO19782 20-001 Harvest Landing Site 5
Site 5 Chambers
Perris, CA
DETENTION SYSTEM

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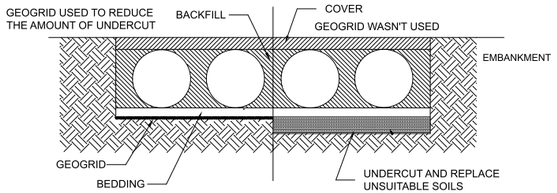
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.

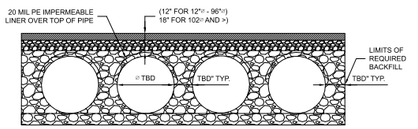


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

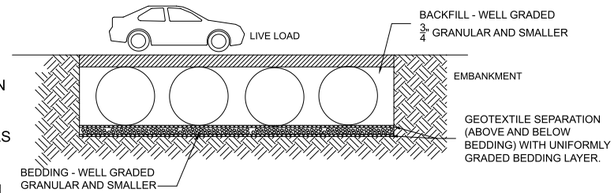
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

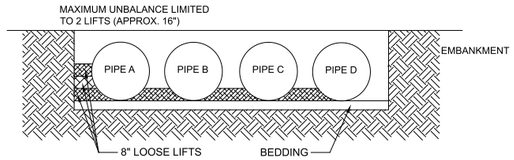
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



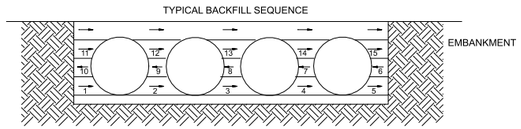
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

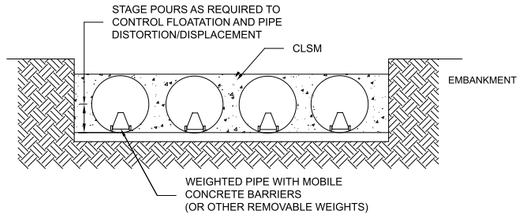


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

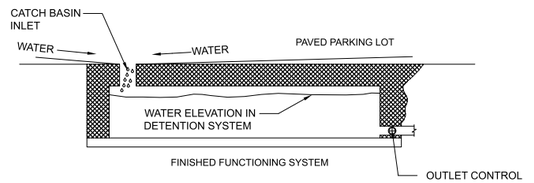


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

C:\USERS\JEREMY.JOHNSON\DOCUMENTS\DYO\CMP_V10.DWG 10/18/2019 10:02 AM

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If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Contech immediately for re-evaluation of the design. Contech accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO19782 20-001 Harvest Landing Site 5
Site 5 Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
12823	19782	10/1/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	FMCivil Engineers Inc	Date	10/4/2024
Designed by	Hector Paez	Case No	
Company Project Number/Name	20-001 - Site 5 DMA 1		

BMP Identification

BMP NAME / ID: Onsite Bioretention Basin 5-1

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.60 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
5-1A	*18981.97*	*Roofs*	*1*	*0.89*	*16931.9*			
5-1C	*38716.49*	*Concrete or Asphalt*	*1*	*0.89*	*34535.1*			
	57698.46	***Total***			**51467**	**0.60**	***2573.4***	***4321***

Notes:

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries | Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc — Date: 10/4/2024

Designed by: Hector Paez — Case No:

Company Project Number/Name: 20-001 - Site 5 DMA 2

BMP Identification

BMP NAME / ID: Onsite Bioretention Basin 5-2

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E — D_{85}= 0.60 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

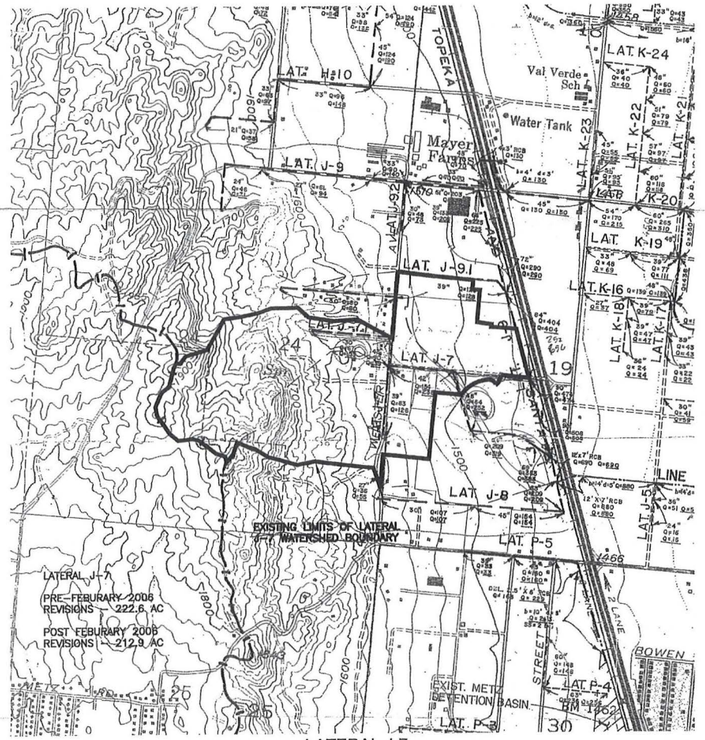
DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
5-2A	*3619.4*	*Roofs*	*1*	*0.89*	*3228.5*			
5-2C	*19057.84*	*Concrete or Asphalt*	*1*	*0.89*	*16999.6*			
	22677.24	***Total***			**20228.1**	**0.60**	***1011.4***	***1708***

Notes:

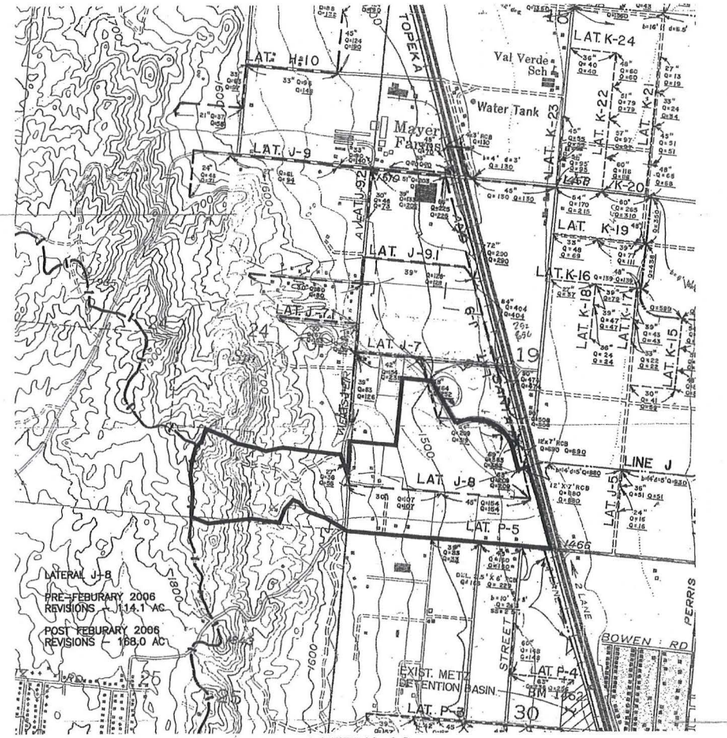
PORTION OF
8K3
1" = 1000'

REVISED HYDROLOGY MAP
PERRIS MASTER DRAINAGE PLAN

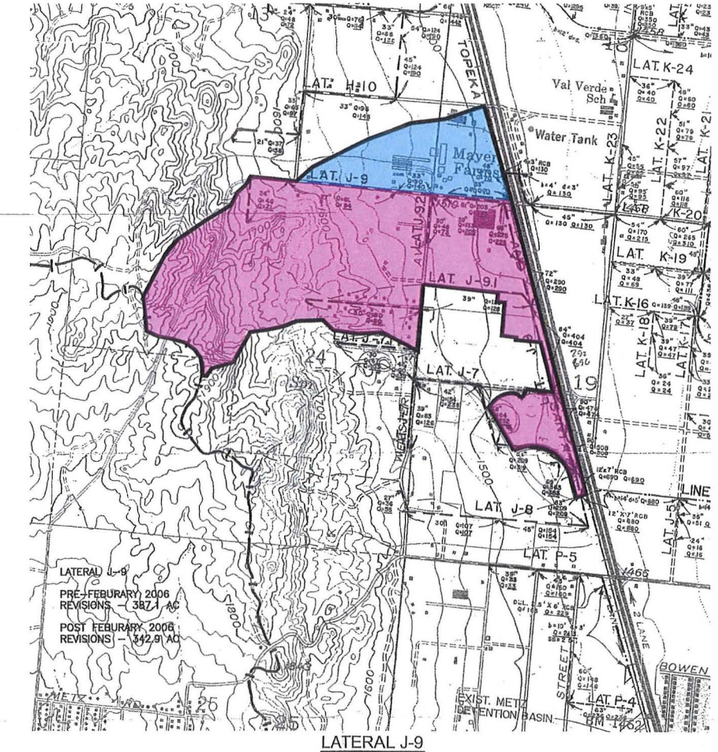
LATERALS J–7, J–8, & J–9



LATERAL J-7



LATERAL J-8



LATERAL J-9

LATERAL No.	PRE–FEBURARY 2006 REVISIONS	POST FEBURARY 2006 REVISIONS	INCREASE/DECREASE (ACRES)
LAT J–8	114.1	168.0	+53.9
LAT J–9	609.8	555.9	–53.9

LEGEND

PROPOSED LATERAL WATERSHED BOUNDARIES AFTER FEBRUARY 2006 REVISION

N

SCALE: 1"=1000'

B:\CAD\Nuevo Industrial Park - NV\PE\Exhibits\NV\P Perris MDP Hydrology map lat 7 and lat 9.dwg, 2/2/2007 1:10:00 PM, Donal Pearce

WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR GRADING PERMIT HAS BEEN ISSUED.

THE PRIVATE ENGINEER SIGNING THESE PLANS IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF THE DESIGN HEREON. IN THE EVENT OF DISCREPANCIES ARISING AFTER COUNTY APPROVAL OR DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISING THE PLANS FOR APPROVAL BY THE COUNTY.

DATE	BY	MARK	REVISIONS	APPR	DATE

ENGINEER — COUNTY

SEAL–COUNTY

REGISTERED PROFESSIONAL ENGINEER ALAN D. FRENCH No. 45702 Exp. 12–31–08 CIVIL STATE OF CALIFORNIA

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY:

ALAN D. FRENCH, P.E.
CIVIL ENGINEER, R.C.E. NO. 45702 — DATE

RECOMMENDED — DATE

SEAL–ENGINEER

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RECOMMENDED FOR APPROVAL — APPROVED BY:

PLANNING ENGINEER — CHIEF ENGINEER

DATE: — DATE:

ENGINEERING SOLUTIONS
ENGINEERING-LAND PLANNING-SURVEYING-MAPPING
2155 CHICAGO AVENUE, STE. 201
RIVERSIDE, CA. 92507
PHONE – (951) 784–0288
FAX – (951) 784–0287
PREPARED BY:

DATE EXP. 06–30–07

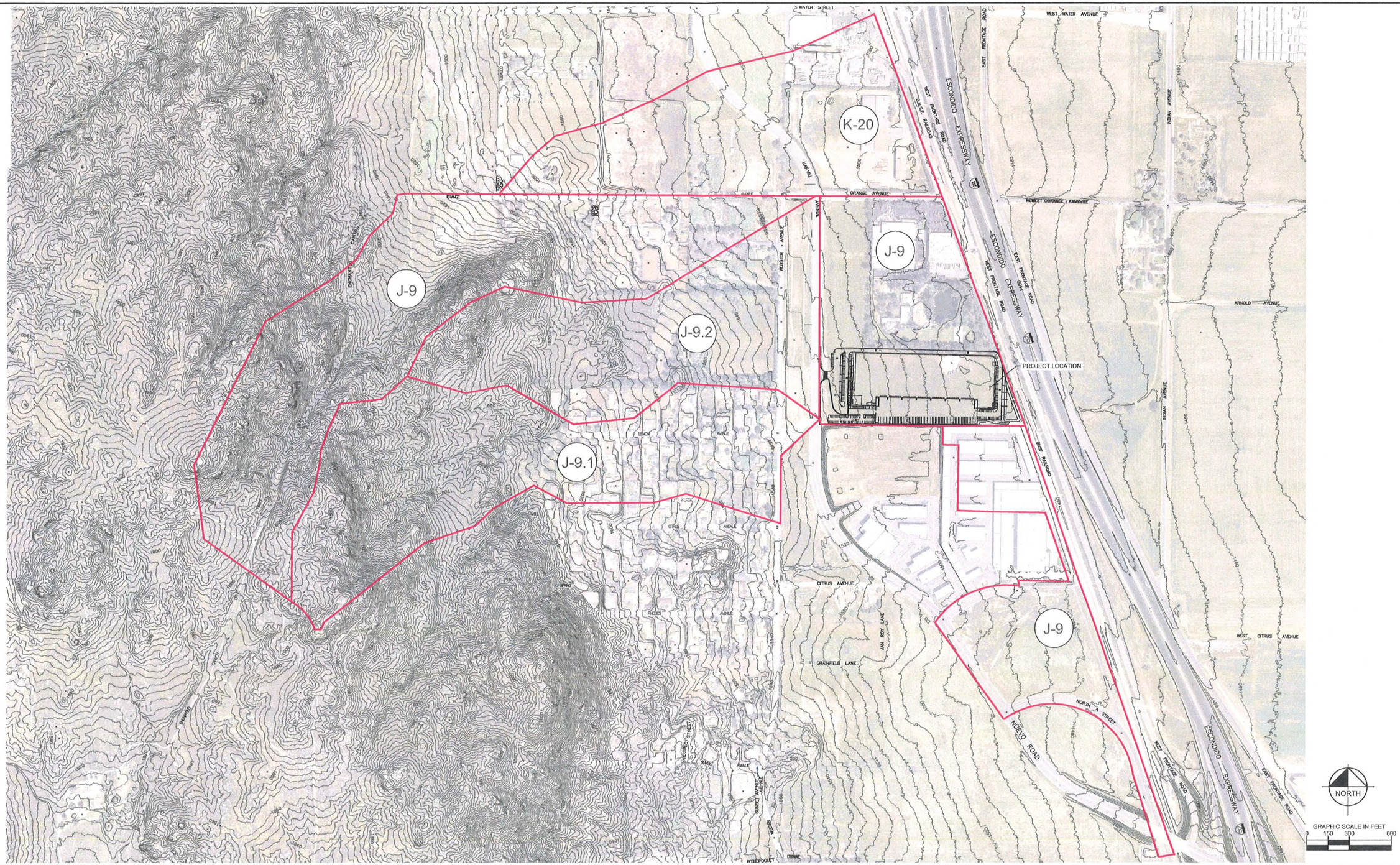
BENCHMARK:

SCALE:

I.P. No. XXXXX
COUNTY OF RIVERSIDE
REVISED HYDROLOGY MAP
PERRIS MASTER DRAINAGE PLAN
LATERALS J–7, J–8, & J–9

SHEET NO. 1 OF 1 SHTS.

FOR: | W.O. | COUNTY FILE NO.:



Kimley»Horn
401 B STREET, SUITE 600, SAN DIEGO, CA 92101
PHONE: 619-234-9411
WWW.KIMLEY-HORN.COM

RCFC MDP DRAINAGE AREA MAP LINE J-9
ROCKEFELLER HARVILL INDUSTRIAL PARK
October 9, 2020

k:\snd_ldev\rockefeller - riverside_harvill\to\rcfc\2020.10.08 - mdp letter\2020.10.09 - mdp drainage area.dwg 10/9/2020

EXHIBITS

EXHIBIT A: VICINITY MAP

EXHIBIT B: EXISTING HYDROLOGY MAP

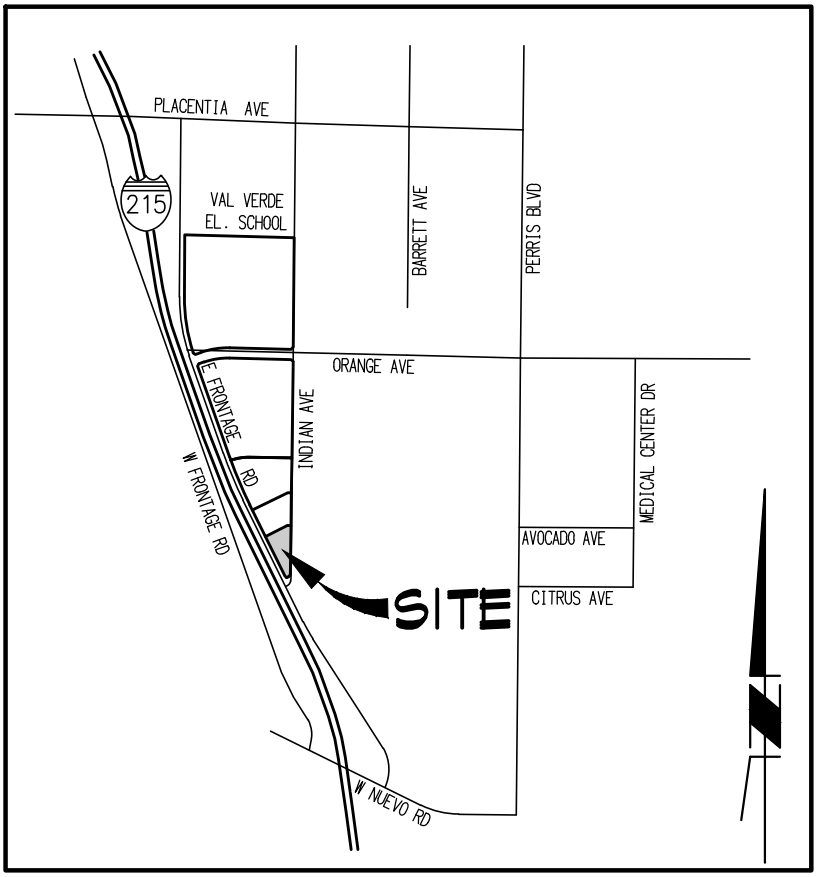
EXHIBIT C: PROPOSED HYDROLOGY MAP

EXHIBIT D: HYDROLOGIC SOILS GROUP MAP

EXHIBIT E: RCFCD MDP FACILITIES OVERLAY

EXHIBIT F: PHASE 1 OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM

EXHIBIT G: CONCEPTUAL GRADING



VICINITY MAP

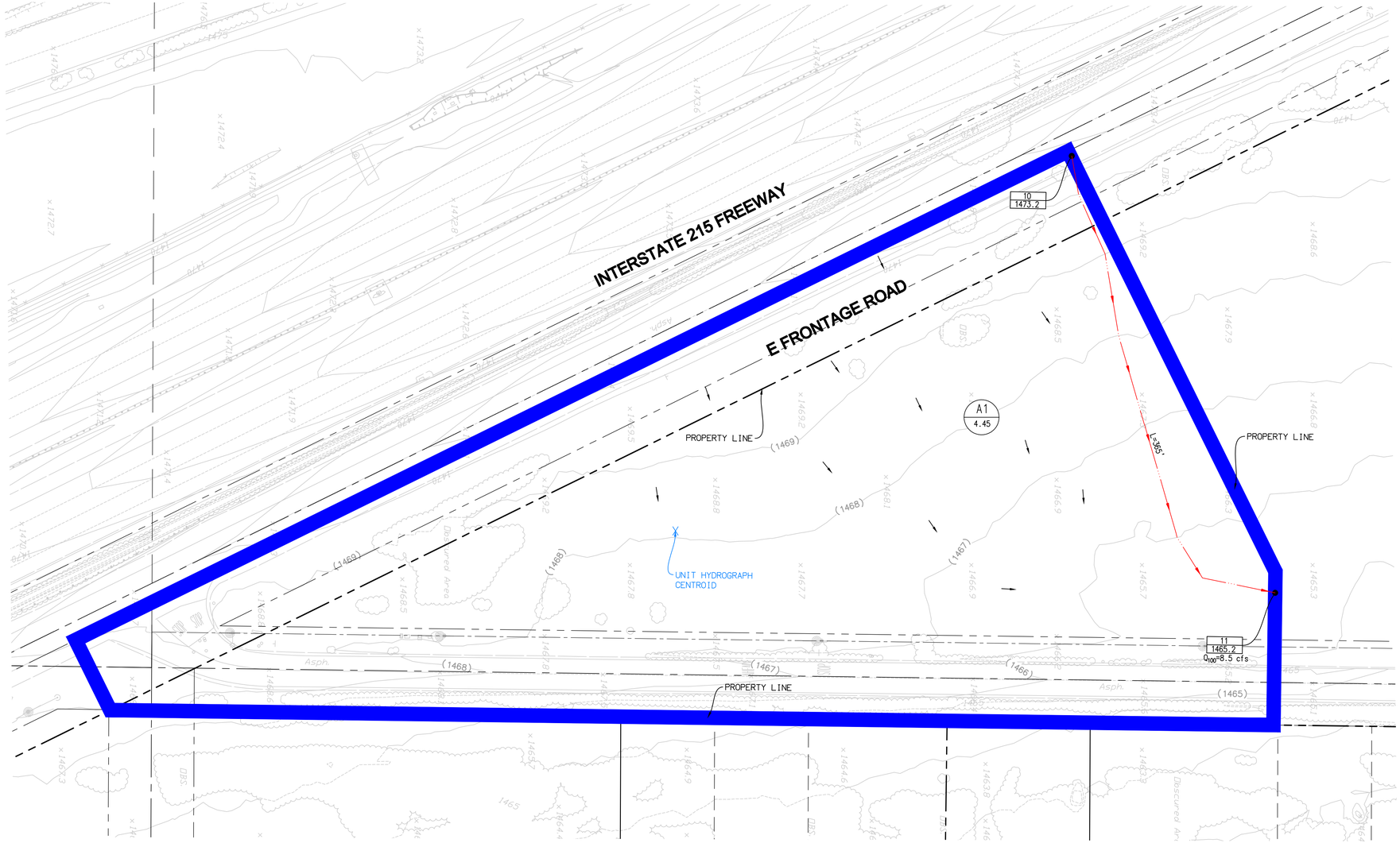
T4S, R3W, SEC 19
NOT TO SCALE

FMCIVIL ENGINEERS INC.
29995 TECHNOLOGY DRIVE, SUITE 306 | MURRIETA | CA 92563
951.331.9873 - FMCIVIL.COM

HARVEST LANDING SITE 5

FIGURE 1
VICINITY MAP

H:\PDATA\20-001 HARVEST LANDING\DWGS\EXHIBITS\20-001-VICINITY-MAP.DWG HECTOR 8/7/2022 11:37 PM



UNIT HYDROGRAPH PARAMETERS			
L_{WC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
365	176	8.00	0.020

LEGEND

D2 / 2.16 — DRAINAGE BASIN NAME / DRAINAGE BASIN AREA(AC.)

11 / 1027.0 — NODE I.D. / ELEVATION

WATERSHED BOUNDARY

SUB-WATERSHED BOUNDARY

FLOW DIRECTION

SCALE 1"=40'

40 20 0 40 80 120

SCALE: 1"=40'

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MURRIETA | CA 92563
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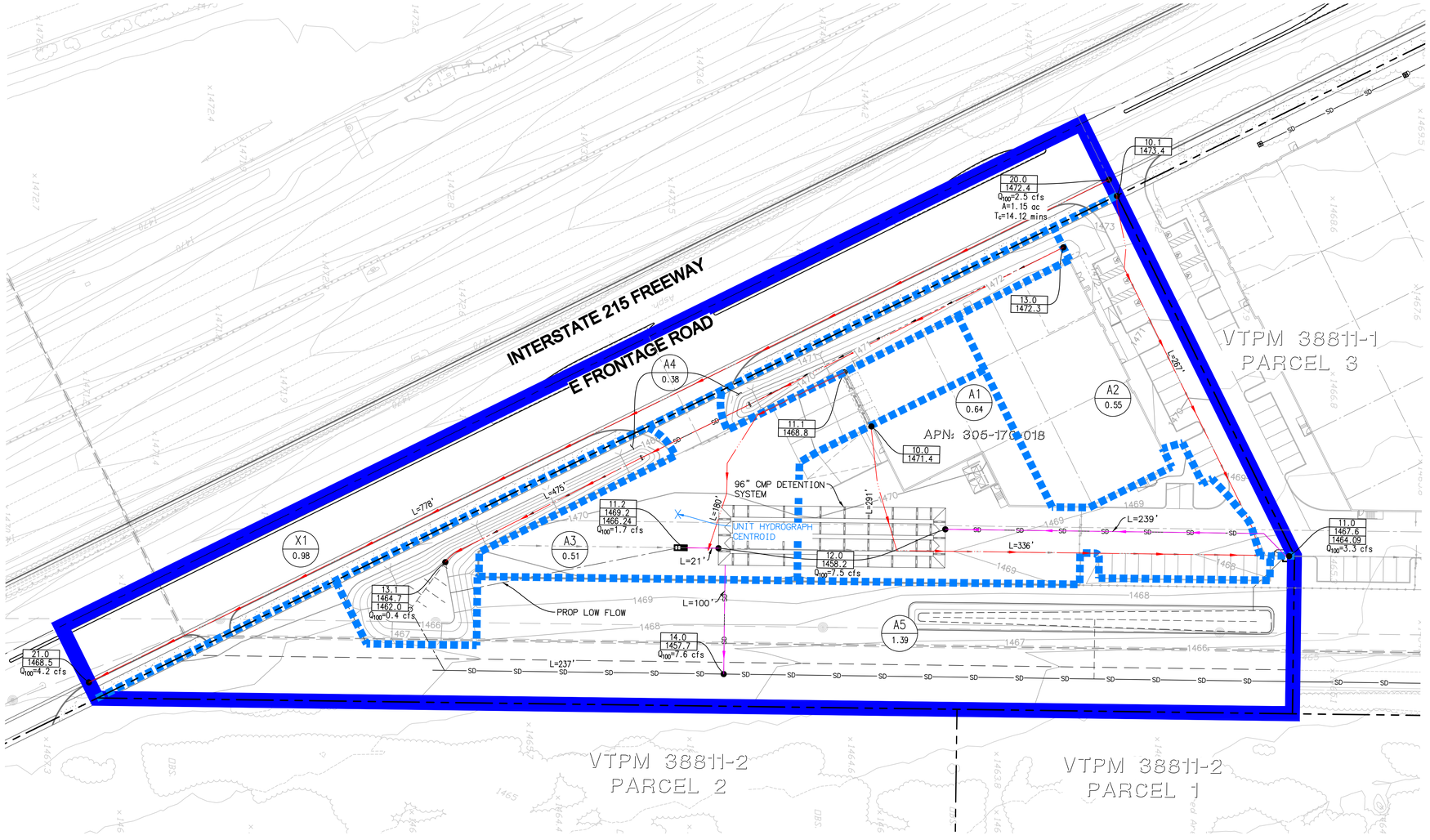
HARVEST LANDING

SITE 5 - EXISTING HYDROLOGY



UNIT HYDROGRAPH PARAMETERS			
L_{WC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
742	624	14.60	0.015

LEGEND

- D2 / 2.16 — DRAINAGE BASIN NAME / DRAINAGE BASIN AREA(AC.)
- 11 / 1027.0 — NODE I.D. / ELEVATION
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- FLOW DIRECTION
- PIPE FLOW DIRECTION

SCALE 1"=40'

40 20 0 40 80 120

SCALE: 1"=40'

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HARVEST LANDING

SITE 5 - PROPOSED HYDROLOGY

LEGEND

- SITE 5 BOUNDARY
- HYDROLOGIC SOIL A
- HYDROLOGIC SOIL GROUP B

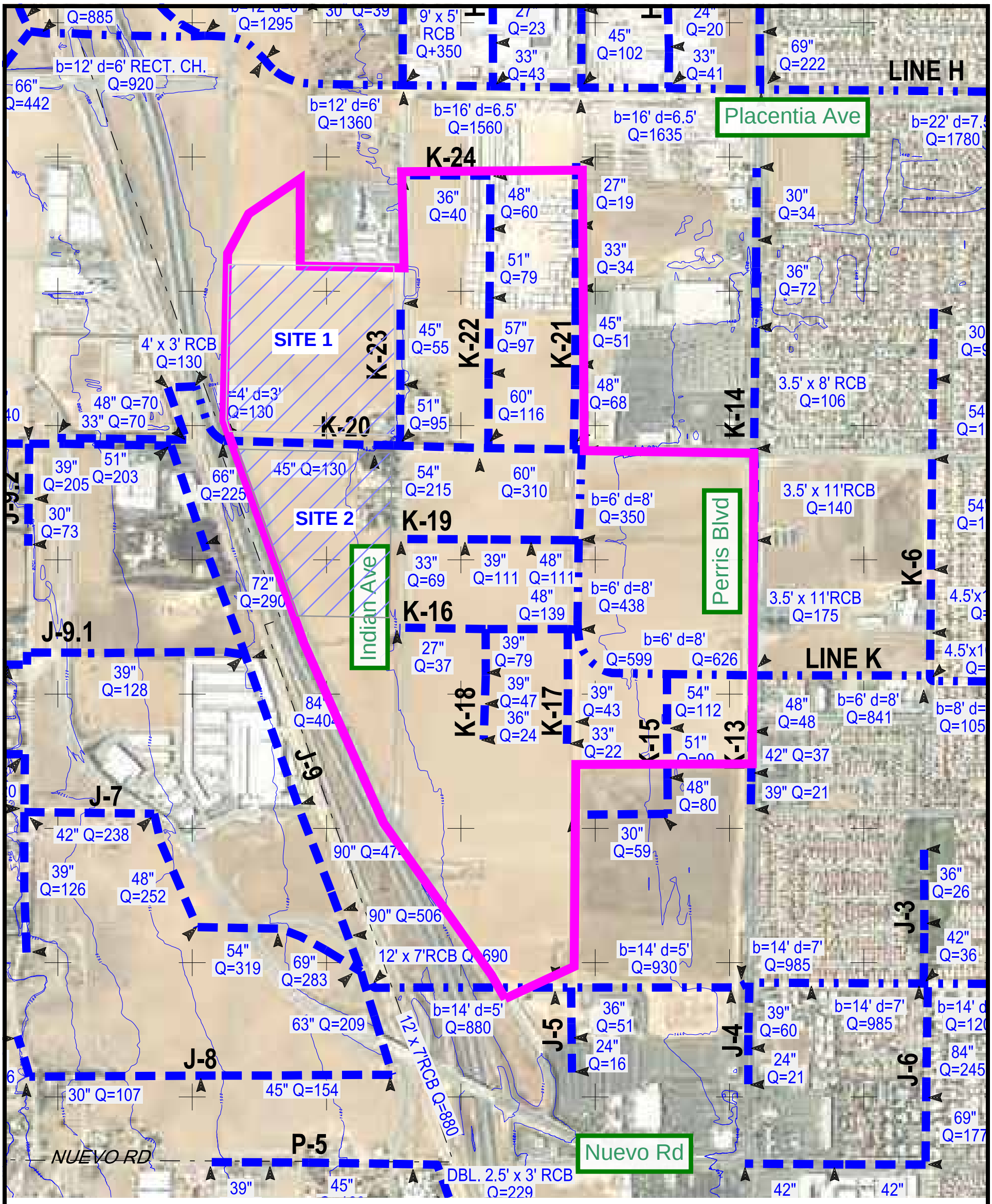
0 100 200 ft

FMCIVIL ENGINEERS INC.

Source: USDA Web Soil Survey

HARVEST LANDING

SITE 5 HYDROLOGICAL SOIL GROUPS



N.T.S.

Limits of master planned development - Howard Industrial

RCFC&WCD Master Drainage Plan Facilities for the Perris Valley Area, as shown in the digital exhibit map dated July 2014.

Site 1 and Site 2

RCFCD MDP FACILITIES OVERLAY

FMCIVIL ENGINEERS INC.

IN THE CITY OF PERRIS,
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM

VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

HOWARD INDUSTRIAL PARTNERS
1944 NORTH TUSTIN STREET, SUITE 122
ORANGE, CA 92865
CONTACT: TIM HOWARD
(TEL)714-769-9155

ENGINEER

FMCIVIL ENGINEERS INC.
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MURRIETA, CA 92563
CONTACT: FRANCISCO MARTINEZ
(TEL)951-331-9813

ARCHITECT

AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: STEPHEN PRZYBYLOWSKI
(TEL)714-639-9860

LEGEND

- RIGHT OF WAY
- (1025) EXISTING CONTOUR
- EASEMENT
- SD PROP. ONSITE STORM DRAIN SYSTEM
- SD PROP. OFFSITE STORM DRAIN SYSTEM
- PROP. STORM DRAIN LOW FLOW SYSTEM
- PROP. STORM DRAIN UNDER DRAIN SYSTEM
- W EXISTING WATER LINE
- W PROP. WATER LINE
- SS EXISTING SWR LINE
- SS PROP. SEWER LINE
- SD EXISTING STORM DRAIN PIPE
- E EXISTING OVERHEAD LINES

SCALE 1"=200'

200 100 0 200 400 600

SCALE: 1"=200'

CITY OF PERRIS

HARVEST LANDING INDUSTRIAL - PHASE I OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM EXHIBIT

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF.:	

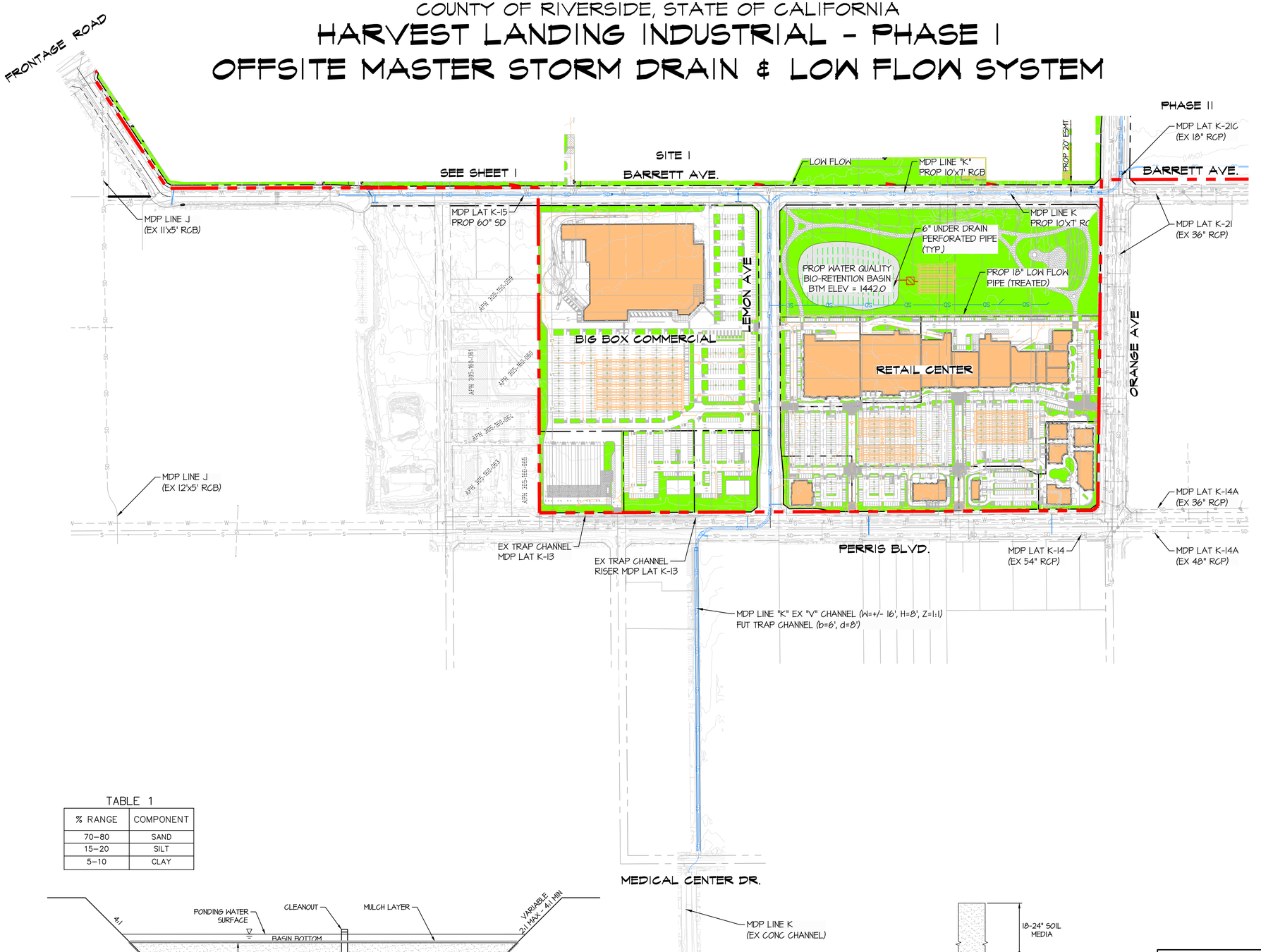
FMCIVIL ENGINEERS INC.
41870 KALMIA STREET, SUITE 120
MURRIETA, CA 92562
951.473.0202 - FMCIVIL.COM

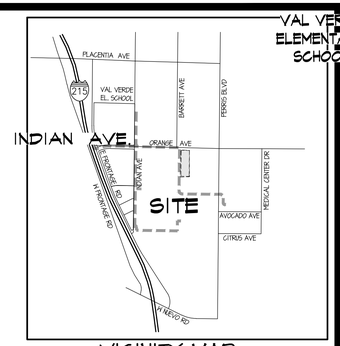
SHEET 1 OF 2 SHEETS

H:\PDATA\20-001 HARVEST LANDING\DWGS\PLDG\ENTITLEMENT\CUP\ALT-3\20-001-CUP_MSD3-01.DWG DANNY 10/7/2024 4:55 PM

COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM





VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

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ARCHITECT

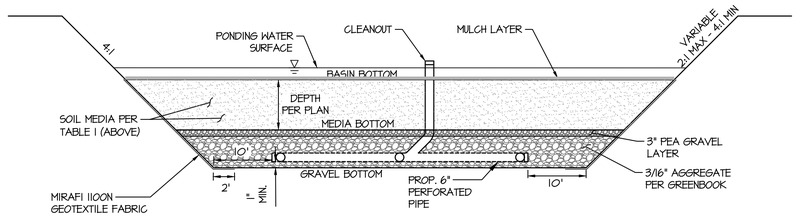
AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: STEPHEN PRZYBYLOWSKI
(TEL)714-639-9860

TABLE 1

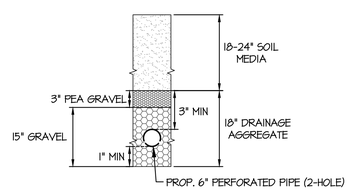
% RANGE	COMPONENT
70-80	SAND
15-20	SILT
5-10	CLAY

LEGEND

- RIGHT OF WAY
- (1025) EXISTING CONTOUR
- EASEMENT
- SD PROP. ONSITE STORM DRAIN SYSTEM
- SD PROP. OFFSITE STORM DRAIN SYSTEM
- PROP. STORM DRAIN LOW FLOW SYSTEM
- PROP. STORM DRAIN UNDER DRAIN SYSTEM
- W EXISTING WATER LINE
- W PROP. WATER LINE
- SS EXISTING SWR LINE
- SS PROP. SEWER LINE
- SD EXISTING STORM DRAIN PIPE
- E EXISTING OVERHEAD LINES



BASIN CROSS SECTION
N.T.S.



AGGREGATE CROSS SECTION
N.T.S.

SCALE 1"=200'

200 100 0 200 400 600
SCALE: 1"=200'

CITY OF PERRIS

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN
& LOW FLOW SYSTEM EXHIBIT

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF.:	

FMCIVIL ENGINEERS INC.
41870 KALMIA STREET, SUITE 120
MURRIETA | CA 92562
951.973.0202 - FMCIVIL.COM

SHEET 2 OF 2 SHEETS

H:\PDATA\20-001 HARVEST LANDING\DWGS\PLNCK\ENTITLEMENT\CUP\ALT-3\20-001-CUP_MSD3-01.DWG DANNY 10/8/2024 7:35 AM

LEGEND

- (1025) EXISTING CONTOUR
- 1025 PROPOSED CONTOUR
- RETAINING WALL
- FENCE
- EDGE OF PAVEMENT
- SIGN
- MH MANHOLE
- RIGHT OF WAY
- EASEMENT
- PARCEL LINE
- PARCEL MAP BOUNDARY
- STREET CENTER LINE
- SCREEN WALL
- COMBINATION SCREEN/RETAINING WALL
- EXISTING LOT LINE
- RIDGE LINE
- RIBBON GUTTER
- FLOW ARROW
- PROPOSED EDGE OF PAVEMENT
- EXISTING WATER LINE
- W PROPOSED WATER LINE
- EXISTING SWR LINE
- SS PROPOSED SEWER LINE
- EXISTING STORM DRAIN PIPE
- SD PROPOSED STORM DRAIN PIPE
- EXISTING OVERHEAD LINES
- CUT/FILL LINE
- SLOPE SYMBOL

ZONING ORDINANCE

EXISTING ZONING:
HARVEST LANDING SPECIFIC PLANS - MULTIPLE BUSINESS USE (MBU)

PROPOSED ZONING:
HARVEST LANDING SPECIFIC PLANS - MULTIPLE BUSINESS USE (MBU)

ASSESSOR'S PARCEL NUMBERS:

305-100-028, 305-170-018, 305-100-008, & 305-100-009

LEGAL DESCRIPTION

PARCELS 2-5:
(APNS:305-100-028, 305-170-018, 305-100-008, 305-100-009)

THAT PORTION OF THE NORTHWEST QUARTER OF SECTION 19, TOWNSHIP 4 SOUTH, RANGE 3 WEST, SAN BERNARDINO BASE AND MERIDIAN, WHICH LIES EASTERLY OF STATE HIGHWAY 395 AS CONVEYED TO THE STATE OF CALIFORNIA BY DEED RECORDED APRIL 28, 1952 AS INSTRUMENT NO. 18008.

EXCEPTING THE NORTH 30 FEET IN ORANGE AVENUE, THE EAST 30 FEET IN INDIAN AVENUE AND THE SOUTH 30 FEET IN CITRUS AVENUE.

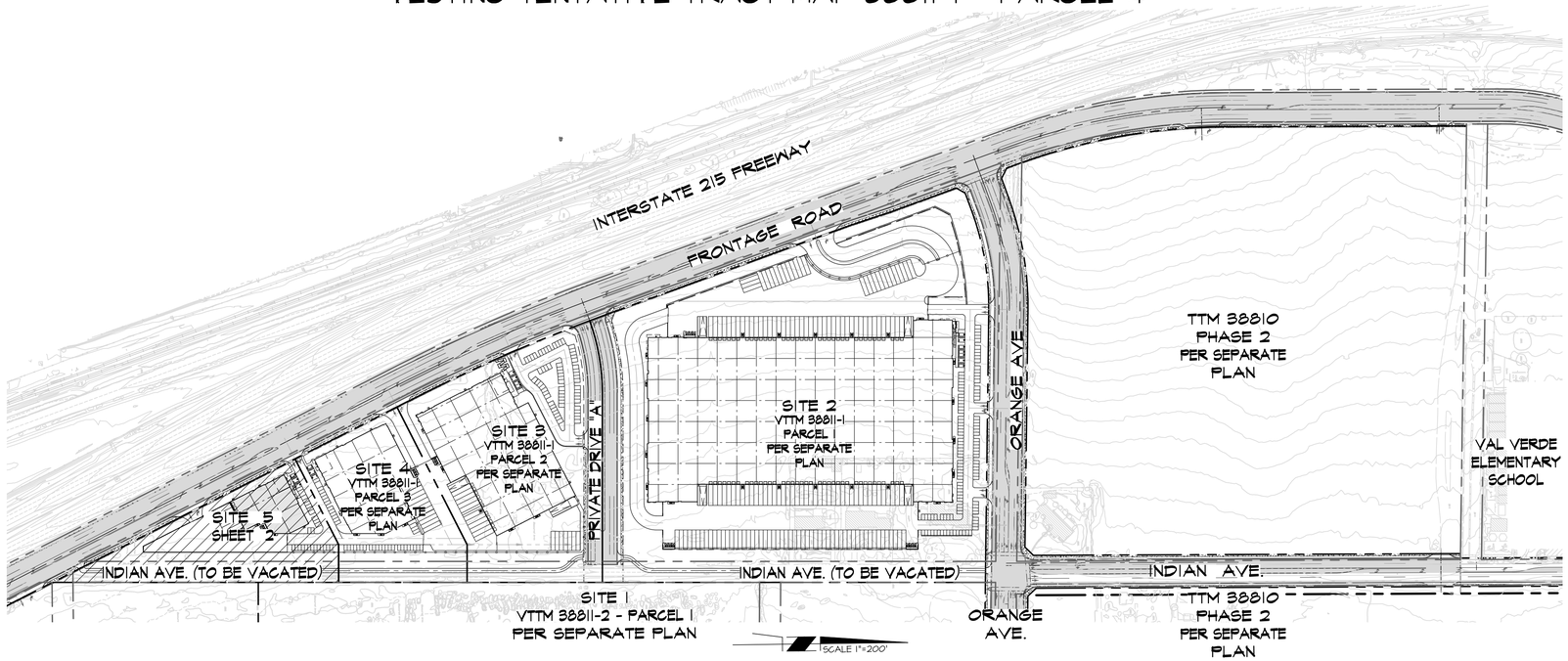
ALSO EXCEPTING THEREFROM THE PORTION DESCRIBED IN DEED RECORDED DECEMBER 21, 1965 AS INSTRUMENT NO. 142400 AND IN DEED RECORDED MARCH 13, 1969 AS INSTRUMENT NO. 24345, RECORDS OF RIVERSIDE COUNTY.

ALSO EXCEPTING THEREFROM THOSE PORTIONS CONVEYED TO THE STATE OF CALIFORNIA BY DEEDS RECORDED MARCH 22, 1982, AS INSTRUMENT NOS. 94602 AND 94603.

IN THE CITY OF PERRIS,
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
SITE #5 CONCEPTUAL GRADING & DRAINAGE PLAN

VESTING TENTATIVE TRACT MAP 38811-1 - PARCEL 4



INDEX MAP

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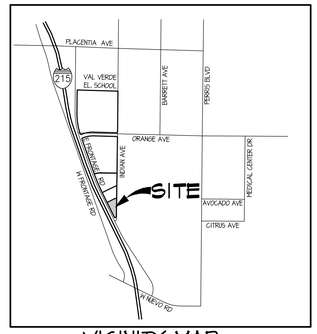
SCALE: 1"=200'



VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

HOWARD INDUSTRIAL PARTNERS
1944 NORTH TUSTIN STREET, SUITE 122
ORANGE, CA 92865
CONTACT: TIM HOWARD
(TEL)714-769-9155

ENGINEER

FMCIVIL ENGINEERS INC.
41870 KALMIA ST., SUITE 120
MURRIETA, CA 92562
CONTACT: FRANCISCO MARTINEZ
(TEL)951-973-0202

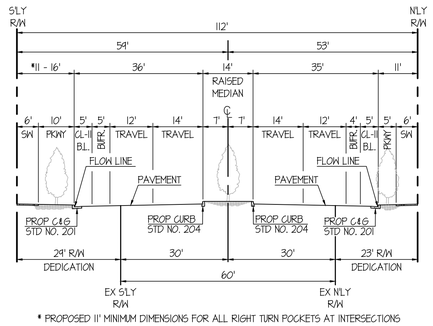
ARCHITECT

AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: DAN MACDAVID
(TEL)714-639-9860

EARTHWORK ESTIMATE:

RAW CUT:	575 CY
RAW FILL:	9,075 CY
NET:	8,500 CY IMPORT

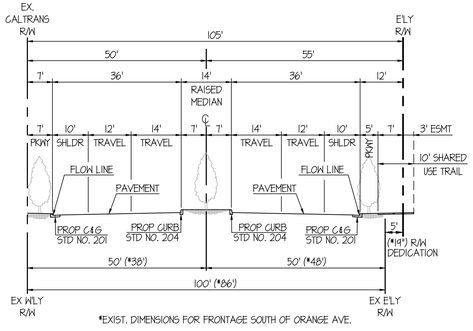
HAUL TRIPS:
ASSUMED (13 CY PER TRIP) = 654



* PROPOSED 11' MINIMUM DIMENSIONS FOR ALL RIGHT TURN POCKETS AT INTERSECTIONS

ORANGE AVENUE
(WEST OF BARRETT AVE)
SECONDARY ARTERIAL

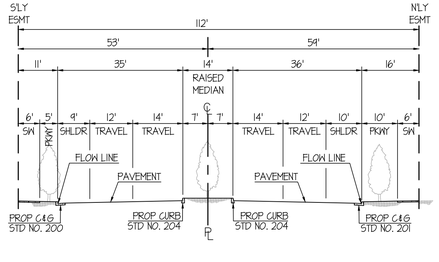
(112'/85')



*EXIST. DIMENSIONS FOR FRONTAGE SOUTH OF ORANGE AVE.

FRONTAGE ROAD
SECONDARY ARTERIAL

(105'/84')



PRIVATE DRIVE "A"
SECONDARY ARTERIAL

(112'/85')

CITY OF PERRIS

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
SITE #5 CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-1 - PARCEL 4

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF:	

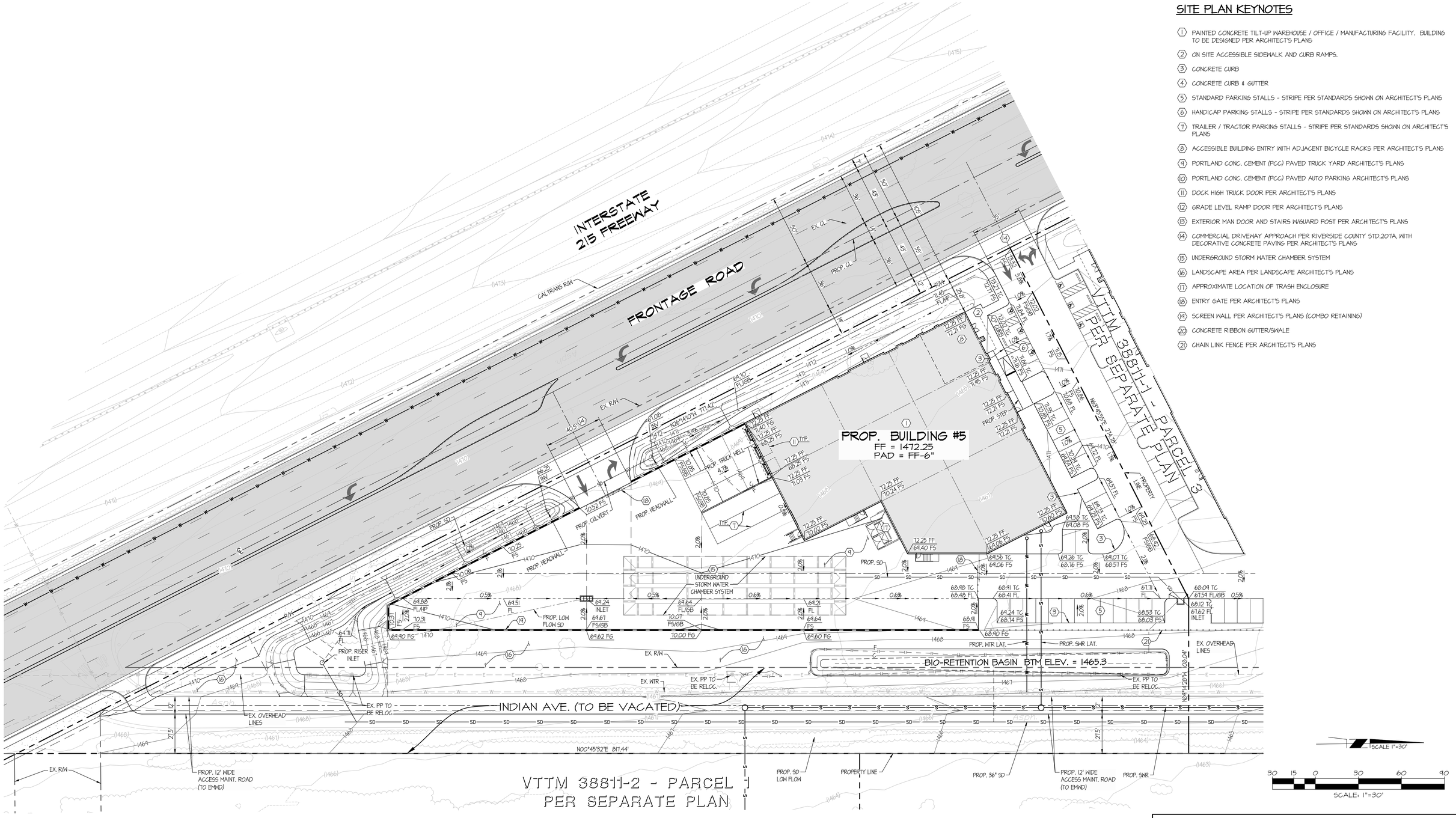
FMCIVIL ENGINEERS INC.
41870 KALMIA STREET, SUITE 120
MURRIETA | CA 92562
951.973.0202 - FMCIVIL.COM

SHEET 1 OF 2 SHEETS

H:\PDATA\20-001 HARVEST LANDING\DWGS\PLNG\ENTITLEMENT\CUP\ALT-3\BLDG-5\20-001-CUP_BLDG5-01.DWG JASON STOUFFER 10/1/2024 3:35 PM

SITE PLAN KEYNOTES

1. PAINTED CONCRETE TILT-UP WAREHOUSE / OFFICE / MANUFACTURING FACILITY. BUILDING TO BE DESIGNED PER ARCHITECT'S PLANS
2. ON SITE ACCESSIBLE SIDEWALK AND CURB RAMPS.
3. CONCRETE CURB
4. CONCRETE CURB & GUTTER
5. STANDARD PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
6. HANDICAP PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
7. TRAILER / TRACTOR PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
8. ACCESSIBLE BUILDING ENTRY WITH ADJACENT BICYCLE RACKS PER ARCHITECT'S PLANS
9. PORTLAND CONC. CEMENT (PCC) PAVED TRUCK YARD ARCHITECT'S PLANS
10. PORTLAND CONC. CEMENT (PCC) PAVED AUTO PARKING ARCHITECT'S PLANS
11. DOCK HIGH TRUCK DOOR PER ARCHITECT'S PLANS
12. GRADE LEVEL RAMP DOOR PER ARCHITECT'S PLANS
13. EXTERIOR MAN DOOR AND STAIRS W/GUARD POST PER ARCHITECT'S PLANS
14. COMMERCIAL DRIVEWAY APPROACH PER RIVERSIDE COUNTY STD.207A, WITH DECORATIVE CONCRETE PAVING PER ARCHITECT'S PLANS
15. UNDERGROUND STORM WATER CHAMBER SYSTEM
16. LANDSCAPE AREA PER LANDSCAPE ARCHITECT'S PLANS
17. APPROXIMATE LOCATION OF TRASH ENCLOSURE
18. ENTRY GATE PER ARCHITECT'S PLANS
19. SCREEN WALL PER ARCHITECT'S PLANS (COMBO RETAINING)
20. CONCRETE RIBBON GUTTER/SWALE
21. CHAIN LINK FENCE PER ARCHITECT'S PLANS



CITY OF PERRIS

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
SITE #5 CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-1 - PARCEL 4

SCALE:	AS SHOWN
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PLN CK REF:	

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41870 KALMIA STREET, SUITE 120
MURRIETA | CA 92562
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SHEET 2 OF 2 SHEETS

H:\PDATA\20-001 HARVEST LANDING\DWGS\PLNG\EXHIBIT\ELEMENT\CUP\ALT-3\BLDG-5\20-001-CUP_BLDG5-CG-01.DWG TOM BURNSIDE 10/2/2024 8:41 AM

DEVELOPMENT PLAN REVIEW – VTPM 38811-2
PARCEL 2 - SITE 6
CITY OF PERRIS
RIVERSIDE COUNTY, CALIFORNIA

Drainage Study Report

Prepared for:
Howard Industrial Partners LLC
1944 North Tustin Street, Suite 122
Orange, CA 92865

Prepared By:

FM CIVIL ENGINEERS INC.

29995 Technology Drive, Suite 306
Murrieta, CA 92563

Engineer of Work/Contacts:

Francisco Martinez, Jr.

October 4, 2024

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SECTION 1 - GENERAL OVERVIEW

INTRODUCTION

The purpose of this study is to support the entitlement phase and determine minimum drainage improvements required for the proposed industrial development of approximately 26 acres and 509,000 square feet warehouse building with 78 truck docks, and parking lot that lays within the Harvest Landing Specific Plan, located in the City of Perris, County of Riverside CA. More specifically, the project site is bounded to the north by vacant land, the vacated Indian Avenue to the west, vacant land to the south and Barrett Avenue to the east.

The primary objectives of this report are as follows:

1. Delineate the drainage areas tributary to the onsite above/underground basin

2. Based on drainage patterns, ground slope, land use and soil type and using the Riverside County Rational Method, perform hydrologic and hydraulics of onsite drainage facilities.

3. Determine the 100-year peak storm flows based upon the pre-project, proposed land use per the MDP and post-project condition for the 24-hour storm duration utilizing the Unit Hydrograph Method as outlined in the Riverside County Flood Control & Water Conservation District Hydrology Manual.

4. Determine the required underground detention facilities to mitigate the 100-year peak storm flows for the 24-hour storm duration in the post-project condition to flows less than or equal to the proposed land use condition flow rates.

5. Determine the required the minimum storm drain infrastructure to flood protect the project site for the 100-year storm event.

6. Preparation of a hydrology report, which consist of hydrological and analytical results and exhibits.

BACKGROUND

EXISTING CONDITIONS

The project site is located within Riverside County Flood Control's Perris Valley Master Drainage Plan, and tributary to a low point in Perris Boulevard and the existing MDP Line "K" (earthen V-Channel) located about 2600 lineal feet east of Indian Avenue.

The site is in a relatively mild to flat sloping undeveloped terrain on a drainage area which drains easterly towards Barrett Avenue with no offsite flows. All the developed storm flows continue to travel easterly through the property, to Barrett Avenue and the vacant parcels to the east where it ultimately reaches a low point at Perris Boulevard; storm drain flows are intercepted by existing street inlets and the existing MDP Line "K". MDP Line "K" is an earthen "V" channel (w= 16', H=8' & z=1:1) and planned as a future Trapezoidal Channel (b=6', d=8').

DEVELOPED CONDITIONS

The preliminary offsite design is shown on Exhibit F "Harvest Landing Industrial Phase 1 Offsite Master Storm Drain & Low Flow System". The offsite master storm drain system (backbone) will be part of a separate report and therefore excluded. The onsite storm water runoff will be collected and treated using proprietary devices to accommodate the water quality component of mitigation. The onsite storm water runoff will be conveyed to an underground chamber system to mitigate the increased storm runoff to be at or below the current MDP land use condition flow. See the table below for the rational method results:

Description	**Q100 Peak Flow Rates**		
Watershed Area	**A**	B	**A+B**
Proposed	23.51	31.02	47.37
Existing	18.11	18.13	36.24
Onsite MDP	20.24	20.37	40.61

For purposes of this preliminary drainage report, the 100-year 24-hour peak flow rates for the post developed condition, predeveloped condition and proposed developed condition per the land use on the MDP were the only storm events analyzed for mitigation. The project storm mitigation is provided by utilizing the underground storm drain detention system and the outlet control structures. The total mitigation volume required was determined by selecting the flow rates from the recess limb of the proposed unit hydrograph runs for the 100-year 24-hour storm event that are equal or less than the flow rates from the proposed land use conditions. Smaller storm events were analyzed in this, however, since the storm volume demand to mitigate the storm flows from the 100-year 24hour event are considerably larger than volumes produced by the smaller storm events, thus a conservative approach.

MDP Condition Watershed A Volume: 1.89 ac-ft; $Q_{100\text{-}24hr}$: 6.13 cfs
Proposed Condition Watershed A Volume: 2.52 ac-ft; $Q_{100\text{-}24hr}$: 7.16 cfs
Underground Chamber Watershed A Volume: *2.63 ac-ft

MDP Watershed B Volume: 1.78 ac-ft; $Q_{100\text{-}24hr}$: 5.63 cfs
Proposed Condition Watershed B Volume: 2.69 ac-ft; $Q_{100\text{-}24hr}$: 7.27 cfs
Underground Chamber Watershed B Volume: *3.09 ac-ft

*For watershed "A" since this volume is greater than 2.56 ac-ft the underground chambers have enough storage to mitigate peak storm flows to the proposed land use levels. Similarly for watershed "B" since the volume provided by the underground chambers exceeds 2.76 ac-ft, there is enough storage to mitigate peak storm flows to the proposed land use levels. See the table on the following page for the unit hydrograph results:

Watershed A

Storm Duration	SP Q_{peak}	SP V_{TOTAL}	MDP Q_{PEAK}	MDP V_{TOTAL}
1	32.86	1.0485	29.75	0.9574
3	20.66	1.6199	18.19	1.3762
6	17.93	2.0409	14.83	1.6694
24	7.16	3.8446	6.13	2.9684
Acreage	13.13		13.22	

Watershed B

Storm Duration	SP Q_{peak}	SP V_{TOTAL}	MDP Q_{PEAK}	MDP V_{TOTAL}
1	35.37	1.0460	28.24	0.8901
3	21.01	1.6607	17.18	1.2815
6	18.19	2.1206	14.27	1.5568
24	7.27	4.0671	5.63	2.7613
Acreage	12.68		12.58	

METHODOLOGY

HYDROLOGY

Hydrologic calculations were performed using the Riverside County Rational Method from RCFCD & WCD Hydrology Manual, dated April 1978. The 100-year design discharge was computed by generating a hydrologic "link-node" model in which divides the area into drainage sub-areas, each tributary to a concentration point or hydrologic "node" point determined by the proposed layout. The computer results are included in section 2. The following assumptions/guidelines were applied for use of the Rational Method:

1. The map from the Riverside County Hydrology Manual indicates that the study area is primarily Group "B" and "C" soils. A USGS soils map for the project site is included as Exhibit D, under the Exhibit section.
2. Initial sub-areas were drawn to be less than 10-acres in size and less than 1,000 feet in length, per County guidelines. Time of concentration for the initial sub-area is based on Time of Concentration Nomograph for Initial Sub-area from the Hydrology Manual.
3. Antecedent Moisture Condition 2 was used for 100-year storm events.
4. Standard intensity-duration curve data for the project area was used for the Perris Valley area; Plate D-4.1.

HYDRAULICS

Civil Design hydrology module was used for preliminarily sizing the storm drainpipe system. The onsite storm drain infrastructure will consist of pipe sizes ranging from 12"-30" in diameter. A more detailed analysis will be provided in subsequent submittals and a WSPG analysis for onsite storm drainpipe system will be performed during final engineering.

CONCLUSIONS & RECOMMENDATIONS

The hydrology analyses evaluated the proposed development to determine the necessary onsite drainage improvements required to mitigate flows for increased runoff and it has been concluded that:

1. The proposed drainage facilities will adequately convey the 100-year flows and provide flood protection to the project site.
2. The proposed underground pipe chamber system will have sufficient storage to adequately mitigate for increased runoff.

SECTION 2 - HYDROLOGY ANALYSIS

100-YEAR EXISTING ON-SITE HYDROLOGY WATERSHED A (RATIONAL METHOD)

100-YEAR EXISTING ON-SITE HYDROLOGY WATERSHED B (RATIONAL METHOD)

100-YEAR PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED A (RATIONAL METHOD)

100-YEAR PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED B (RATIONAL METHOD)

100-YEAR PROPOSED ON-SITE HYDROLOGY WATERSHED A (RATIONAL METHOD)

100-YEAR PROPOSED ON-SITE HYDROLOGY WATERSHED B (RATIONAL METHOD)

100-YEAR PROPOSED ON-SITE HYDROLOGY WATERSHED A + B (RATIONAL METHOD)

100-YEAR PROPOSED OFF-SITE HYDROLOGY WATERSHED X - E FRONTAGE RD (RATIONAL METHOD)

100-YEAR-24 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

100-YEAR-24 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

100-YEAR-24 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

100-YEAR-24 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

100-YEAR-6 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

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100-YEAR-6 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

100-YEAR-6 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

100-YEAR-3 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

100-YEAR-3 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

100-YEAR-3 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

100-YEAR-3 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/01/24 File:qx1006a.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
EXISTING CONDITION - WATERSHED A
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 731.000(Ft.)
Top (of initial area) elevation = 1467.000(Ft.)
Bottom (of initial area) elevation = 1456.000(Ft.)
Difference in elevation = 11.000(Ft.)
Slope = 0.01505 s(percent)= 1.50

```
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.153 min.
Rainfall intensity =      2.069(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.761
Decimal fraction soil group A = 0.010
Decimal fraction soil group B = 0.990
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  77.89
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      2.817(CFS)
Total initial stream area =        1.790(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     10.509(CFS)
Depth of flow =   0.270(Ft.), Average velocity =   1.443(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.00
      2            100.00              0.00
      3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     10.509(CFS)
  '     '    flow top width =     53.976(Ft.)
  '     '    velocity=    1.443(Ft/s)
  '     '    area =      7.283(Sq.Ft)
  '     '    Froude number =     0.692

Upstream point elevation =  1456.000(Ft.)
Downstream point elevation =  1448.300(Ft.)
Flow length =   628.000(Ft.)
Travel time  =    7.25 min.
Time of concentration =   24.41 min.
Depth of flow =   0.270(Ft.)
Average velocity =   1.443(Ft/s)
Total irregular channel flow =    10.509(CFS)
Irregular channel normal depth above invert elev. =   0.270(Ft.)
Average velocity of channel(s) =   1.443(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.769
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.530
Decimal fraction soil group C = 0.470
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  81.76
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.740(In/Hr) for a   100.0 year storm
```

```
Subarea runoff =     15.289(CFS) for     11.430(Ac.)
Total runoff =     18.106(CFS)      Total area =      13.220(Ac.)
Depth of flow =   0.331(Ft.), Average velocity =   1.653(Ft/s)
End of computations, total study area =           13.22 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number =  81.2
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/01/24 File:qx1006b.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
EXISTING CONDITION - WATERSHED B
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 20.000 to Point/Station 21.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 587.000(Ft.)
Top (of initial area) elevation = 1466.800(Ft.)
Bottom (of initial area) elevation = 1457.500(Ft.)
Difference in elevation = 9.300(Ft.)

```
Slope =    0.01584  s(percent)=       1.58
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.551 min.
Rainfall intensity =      2.170(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.766
Decimal fraction soil group A = 0.010
Decimal fraction soil group B = 0.990
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  77.89
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      4.408(CFS)
Total initial stream area =        2.650(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     11.316(CFS)
Depth of flow =   0.277(Ft.), Average velocity =   1.474(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.00
      2            100.00              0.00
      3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     11.316(CFS)
  '     '    flow top width =     55.418(Ft.)
  '     '    velocity=    1.474(Ft/s)
  '     '    area =      7.678(Sq.Ft)
  '     '    Froude number =     0.698

Upstream point elevation =  1457.500(Ft.)
Downstream point elevation =  1450.300(Ft.)
Flow length =   583.000(Ft.)
Travel time  =    6.59 min.
Time of concentration =   22.14 min.
Depth of flow =   0.277(Ft.)
Average velocity =   1.474(Ft/s)
Total irregular channel flow =    11.316(CFS)
Irregular channel normal depth above invert elev. =   0.277(Ft.)
Average velocity of channel(s) =   1.474(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.757
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.820
Decimal fraction soil group C = 0.180
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.44
Pervious area fraction =  1.000; Impervious fraction =  0.000
```

Rainfall intensity = 1.825(In/Hr) for a 100.0 year storm
Subarea runoff = 13.719(CFS) for 9.930(Ac.)
Total runoff = 18.127(CFS) Total area = 12.580(Ac.)
Depth of flow = 0.331(Ft.), Average velocity = 1.658(Ft/s)
End of computations, total study area = 12.58 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 79.1

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/01/24 File:qx1006a.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION - WATERSHED A
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 731.000(Ft.)
Top (of initial area) elevation = 1467.000(Ft.)
Bottom (of initial area) elevation = 1456.000(Ft.)
Difference in elevation = 11.000(Ft.)
Slope = 0.01505 s(percent)= 1.50

```
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.622 min.
Rainfall intensity =      2.404(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.762
Decimal fraction soil group A = 0.010
Decimal fraction soil group B = 0.990
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  55.76
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      3.281(CFS)
Total initial stream area =        1.790(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     11.795(CFS)
Depth of flow =   0.282(Ft.), Average velocity =   1.485(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.00
      2            100.00              0.00
      3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     11.795(CFS)
  '     '    flow top width =     56.364(Ft.)
  '     '    velocity=    1.485(Ft/s)
  '     '    area =      7.942(Sq.Ft)
  '     '    Froude number =     0.697

Upstream point elevation =  1456.000(Ft.)
Downstream point elevation =  1448.300(Ft.)
Flow length =   628.000(Ft.)
Travel time  =    7.05 min.
Time of concentration =   19.67 min.
Depth of flow =   0.282(Ft.)
Average velocity =   1.485(Ft/s)
Total irregular channel flow =    11.795(CFS)
Irregular channel normal depth above invert elev. =   0.282(Ft.)
Average velocity of channel(s) =   1.485(Ft/s)
 Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.767
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.530
Decimal fraction soil group C = 0.470
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  62.11
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      1.934(In/Hr) for a   100.0 year storm
```

Subarea runoff = 16.954(CFS) for 11.430(Ac.)
Total runoff = 20.235(CFS) Total area = 13.220(Ac.)
Depth of flow = 0.345(Ft.), Average velocity = 1.700(Ft/s)
End of computations, total study area = 13.22 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged RI index number = 61.3

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/01/24 File:qx1006b.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION - WATERSHED B
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 20.000 to Point/Station 21.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 587.000(Ft.)
Top (of initial area) elevation = 1466.800(Ft.)
Bottom (of initial area) elevation = 1457.500(Ft.)
Difference in elevation = 9.300(Ft.)
Slope = 0.01584 s(percent)= 1.58

```
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.443 min.
Rainfall intensity =      2.522(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.767
Decimal fraction soil group A = 0.010
Decimal fraction soil group B = 0.990
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  55.76
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      5.127(CFS)
Total initial stream area =        2.650(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     12.783(CFS)
Depth of flow =   0.290(Ft.), Average velocity =   1.519(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.00
      2            100.00              0.00
      3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     12.783(CFS)
  '     '    flow top width =     58.011(Ft.)
  '     '    velocity=    1.519(Ft/s)
  '     '    area =      8.413(Sq.Ft)
  '     '    Froude number =     0.703

Upstream point elevation =  1457.500(Ft.)
Downstream point elevation =  1450.300(Ft.)
Flow length =   583.000(Ft.)
Travel time  =    6.40 min.
Time of concentration =   17.84 min.
Depth of flow =   0.290(Ft.)
Average velocity =   1.519(Ft/s)
Total irregular channel flow =    12.783(CFS)
Irregular channel normal depth above invert elev. =   0.290(Ft.)
Average velocity of channel(s) =   1.519(Ft/s)
 Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.756
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.820
Decimal fraction soil group C = 0.180
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  58.34
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      2.029(In/Hr) for a   100.0 year storm
```

```
Subarea runoff =     15.240(CFS) for      9.930(Ac.)
Total runoff =     20.367(CFS)      Total area =      12.580(Ac.)
Depth of flow =   0.345(Ft.), Average velocity =   1.707(Ft/s)
End of computations, total study area =           12.58 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged RI index number =  57.8
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/01/24 File:q100p6.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPSOED CONDITION - WATERSHED A
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 759.000(Ft.)
Top (of initial area) elevation = 1469.500(Ft.)
Bottom (of initial area) elevation = 1453.800(Ft.)
Difference in elevation = 15.700(Ft.)
Slope = 0.02069 s(percent)= 2.07

```
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.023 min.
Rainfall intensity =      2.462(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.755
Decimal fraction soil group A = 0.110
Decimal fraction soil group B = 0.890
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  53.36
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      5.654(CFS)
Total initial stream area =        3.040(Ac.)
Pervious area fraction = 0.500


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Process from Point/Station       11.000 to Point/Station       12.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1453.800(Ft.)
Downstream point elevation =  1452.200(Ft.)
Channel length thru subarea  =   259.000(Ft.)
Channel base width      =    0.000(Ft.)
Slope or 'Z' of left channel bank =   1.000
Slope or 'Z' of right channel bank = 100.000
Estimated mean flow rate at midpoint of channel =     10.007(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =     10.007(CFS)
Depth of flow =   0.300(Ft.), Average velocity =   2.195(Ft/s)
Channel flow top width =   30.350(Ft.)
Flow Velocity =    2.19(Ft/s)
Travel time  =    1.97 min.
Time of concentration =   13.99 min.

Sub-Channel No. 1 Critical depth =      0.301(Ft.)
  '     '       '     Critical flow top width =     30.379(Ft.)
  '     '       '     Critical flow velocity=    2.190(Ft/s)
  '     '       '     Critical flow area =      4.569(Sq.Ft)

 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.873
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.860
Decimal fraction soil group C = 0.140
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  57.82
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.286(In/Hr) for a   100.0 year storm
Subarea runoff =      8.782(CFS) for      4.400(Ac.)
Total runoff =     14.436(CFS)      Total area =       7.440(Ac.)
Depth of flow =   0.345(Ft.), Average velocity =   2.405(Ft/s)

Sub-Channel No. 1 Critical depth =      0.348(Ft.)
  '     '       '     Critical flow top width =     35.113(Ft.)
```

```
  '     '       '     Critical flow velocity=    2.365(Ft/s)
  '     '       '     Critical flow area =      6.104(Sq.Ft)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1446.420(Ft.)
Downstream point/station elevation =  1443.240(Ft.)
Pipe length  =    85.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.436(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    14.436(CFS)
Normal flow depth in pipe =   11.20(In.)
Flow top width inside pipe =   17.45(In.)
Critical Depth =   16.71(In.)
Pipe flow velocity =     12.48(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    14.10 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      7.440(Ac.)
Runoff from this stream =     14.436(CFS)
Time of concentration =   14.10 min.
Rainfall intensity =     2.277(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   370.000(Ft.)
Top (of initial area) elevation =  1455.200(Ft.)
Bottom (of initial area) elevation =  1452.200(Ft.)
Difference in elevation =     3.000(Ft.)
Slope =    0.00811  s(percent)=       0.81
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.368 min.
Rainfall intensity =      2.941(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.250
Decimal fraction soil group C = 0.750
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  65.75
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      8.982(CFS)
```

```
Total initial stream area =        3.460(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       15.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1444.470(Ft.)
Downstream point/station elevation =  1443.820(Ft.)
Pipe length  =    29.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.982(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     8.982(CFS)
Normal flow depth in pipe =   11.44(In.)
Flow top width inside pipe =   12.77(In.)
Critical Depth =   13.86(In.)
Pipe flow velocity =      8.95(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     8.42 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       15.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      3.460(Ac.)
Runoff from this stream =      8.982(CFS)
Time of concentration =    8.42 min.
Rainfall intensity =     2.931(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.100 to Point/Station       14.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   546.000(Ft.)
Top (of initial area) elevation =  1455.200(Ft.)
Bottom (of initial area) elevation =  1449.400(Ft.)
Difference in elevation =     5.800(Ft.)
Slope =    0.01062  s(percent)=       1.06
TC = k(0.420)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.968 min.
Rainfall intensity =      2.372(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.791
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.600; Impervious fraction =  0.400
Initial subarea runoff =      4.186(CFS)
Total initial stream area =        2.230(Ac.)
Pervious area fraction = 0.600
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.200 to Point/Station       15.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1446.120(Ft.)
Downstream point/station elevation =  1443.820(Ft.)
Pipe length  =   321.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.186(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     4.186(CFS)
Normal flow depth in pipe =    9.83(In.)
Flow top width inside pipe =   14.26(In.)
Critical Depth =    9.94(In.)
Pipe flow velocity =      4.91(Ft/s)
Travel time through pipe =    1.09 min.
Time of concentration (TC) =    14.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.200 to Point/Station       15.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.230(Ac.)
Runoff from this stream =      4.186(CFS)
Time of concentration =   14.06 min.
Rainfall intensity =     2.281(In/Hr)
Summary of stream data:

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


1        8.982      8.42                2.931
2        4.186     14.06                2.281
Largest stream flow has longer or shorter time of concentration
Qp =      8.982 + sum of
        Qa          Tb/Ta
         4.186 *    0.599 =      2.508
Qp =     11.489

Total of 2 streams to confluence:
Flow rates before confluence point:
       8.982       4.186
Area of streams before confluence:
        3.460        2.230
Results of confluence:
Total flow rate =     11.489(CFS)
Time of concentration =     8.422 min.
Effective stream area after confluence =      5.690(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
```

```
Upstream point/station elevation =  1443.820(Ft.)
Downstream point/station elevation =  1443.240(Ft.)
Pipe length  =    97.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.489(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    11.489(CFS)
Normal flow depth in pipe =   16.15(In.)
Flow top width inside pipe =   17.70(In.)
Critical Depth =   15.16(In.)
Pipe flow velocity =      5.79(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =     8.70 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      5.690(Ac.)
Runoff from this stream =     11.489(CFS)
Time of concentration =    8.70 min.
Rainfall intensity =     2.885(In/Hr)
Summary of stream data:

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


1       14.436     14.10               2.277
2       11.489      8.70               2.885
Largest stream flow has longer time of concentration
Qp =     14.436 + sum of
        Qb         Ia/Ib
        11.489 *    0.789 =      9.068
Qp =     23.504

Total of 2 main streams to confluence:
Flow rates before confluence point:
      14.436      11.489
Area of streams before confluence:
        7.440        5.690


Results of confluence:
Total flow rate =     23.504(CFS)
Time of concentration =    14.104 min.
Effective stream area after confluence  =     13.130(Ac.)
End of computations, total study area =           13.13 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.278
Area averaged RI index number =  60.8
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/01/24 File:q100p6.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPSOED CONDITION - WATERSHED B
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

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Process from Point/Station 17.000 to Point/Station 18.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 527.000(Ft.)
Top (of initial area) elevation = 1469.500(Ft.)
Bottom (of initial area) elevation = 1452.700(Ft.)
Difference in elevation = 16.800(Ft.)
Slope = 0.03188 s(percent)= 3.19

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TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.893 min.
Rainfall intensity =      3.026(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.853
Decimal fraction soil group A = 0.010
Decimal fraction soil group B = 0.990
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  55.76
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =     18.334(CFS)
Total initial stream area =        7.100(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station       18.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1448.200(Ft.)
Downstream point/station elevation =  1443.900(Ft.)
Pipe length  =    61.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    18.334(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    18.334(CFS)
Normal flow depth in pipe =   10.65(In.)
Flow top width inside pipe =   17.69(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.85(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     7.95 min.


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Process from Point/Station       18.000 to Point/Station       22.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      7.100(Ac.)
Runoff from this stream =     18.334(CFS)
Time of concentration =    7.95 min.
Rainfall intensity =     3.015(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       19.000 to Point/Station       20.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   303.000(Ft.)
Top (of initial area) elevation =  1455.200(Ft.)
Bottom (of initial area) elevation =  1452.700(Ft.)
Difference in elevation =     2.500(Ft.)
Slope =    0.00825  s(percent)=       0.83
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
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Initial area time of concentration =    7.698 min.
Rainfall intensity =      3.063(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.877
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.960
Decimal fraction soil group C = 0.040
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.52
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      9.407(CFS)
Total initial stream area =        3.500(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       20.000 to Point/Station       21.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1445.000(Ft.)
Downstream point/station elevation =  1444.130(Ft.)
Pipe length  =    23.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.407(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     9.407(CFS)
Normal flow depth in pipe =    9.68(In.)
Flow top width inside pipe =   14.35(In.)
Critical Depth =   14.02(In.)
Pipe flow velocity =     11.23(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     7.73 min.


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Process from Point/Station       20.000 to Point/Station       21.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      3.500(Ac.)
Runoff from this stream =      9.407(CFS)
Time of concentration =    7.73 min.
Rainfall intensity =     3.057(In/Hr)


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Process from Point/Station       14.100 to Point/Station       20.100
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   475.000(Ft.)
Top (of initial area) elevation =  1455.200(Ft.)
Bottom (of initial area) elevation =  1450.100(Ft.)
Difference in elevation =     5.100(Ft.)
Slope =    0.01074  s(percent)=       1.07
TC = k(0.336)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.791 min.
Rainfall intensity =      2.723(In/Hr) for a   100.0 year storm
MOBILE HOME PARK subarea type
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Runoff Coefficient = 0.854
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.250
Decimal fraction soil group C = 0.750
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  65.75
Pervious area fraction =  0.250; Impervious fraction =  0.750
Initial subarea runoff =      4.838(CFS)
Total initial stream area =        2.080(Ac.)
Pervious area fraction = 0.250


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Process from Point/Station       20.100 to Point/Station       21.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1446.730(Ft.)
Downstream point/station elevation =  1444.130(Ft.)
Pipe length  =   343.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.838(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     4.838(CFS)
Normal flow depth in pipe =   10.72(In.)
Flow top width inside pipe =   13.54(In.)
Critical Depth =   10.70(In.)
Pipe flow velocity =      5.15(Ft/s)
Travel time through pipe =    1.11 min.
Time of concentration (TC) =    10.90 min.


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Process from Point/Station       20.100 to Point/Station       21.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.080(Ac.)
Runoff from this stream =      4.838(CFS)
Time of concentration =   10.90 min.
Rainfall intensity =     2.583(In/Hr)
Summary of stream data:

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


1        9.407      7.73                3.057
2        4.838     10.90                2.583
Largest stream flow has longer or shorter time of concentration
Qp =      9.407 + sum of
        Qa          Tb/Ta
         4.838 *    0.709 =      3.432
Qp =     12.839

Total of 2 streams to confluence:
Flow rates before confluence point:
       9.407       4.838
Area of streams before confluence:
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        3.500        2.080
Results of confluence:
Total flow rate =     12.839(CFS)
Time of concentration =     7.733 min.
Effective stream area after confluence =      5.580(Ac.)


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Process from Point/Station       21.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1444.130(Ft.)
Downstream point/station elevation =  1443.900(Ft.)
Pipe length  =    14.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.839(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    12.839(CFS)
Normal flow depth in pipe =   14.06(In.)
Flow top width inside pipe =   14.88(In.)
Critical Depth =   16.16(In.)
Pipe flow velocity =      8.67(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     7.76 min.


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Process from Point/Station       21.000 to Point/Station       22.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      5.580(Ac.)
Runoff from this stream =     12.839(CFS)
Time of concentration =    7.76 min.
Rainfall intensity =     3.051(In/Hr)
Summary of stream data:

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


1       18.334      7.95               3.015
2       12.839      7.76               3.051
Largest stream flow has longer time of concentration
Qp =     18.334 + sum of
        Qb         Ia/Ib
        12.839 *    0.988 =     12.685
Qp =     31.019

Total of 2 main streams to confluence:
Flow rates before confluence point:
      18.334      12.839
Area of streams before confluence:
        7.100        5.580


Results of confluence:
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Total flow rate = 31.019(CFS)
Time of concentration = 7.953 min.
Effective stream area after confluence = 12.680(Ac.)
End of computations, total study area = 12.68 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.181
Area averaged RI index number = 57.6

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/01/24 File:q100ap6.out

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PROPOSED CONDITION - WATERSHED A + B
100-YEAR ANALYSIS

Program License Serial Number 6405

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Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

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Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 759.000(Ft.)
Top (of initial area) elevation = 1469.500(Ft.)
Bottom (of initial area) elevation = 1453.800(Ft.)
Difference in elevation = 15.700(Ft.)
Slope = 0.02069 s(percent)= 2.07

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TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.023 min.
Rainfall intensity =      2.462(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.755
Decimal fraction soil group A = 0.110
Decimal fraction soil group B = 0.890
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  53.36
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      5.654(CFS)
Total initial stream area =        3.040(Ac.)
Pervious area fraction = 0.500


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Process from Point/Station       11.000 to Point/Station       12.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1453.800(Ft.)
Downstream point elevation =  1452.200(Ft.)
Channel length thru subarea  =   259.000(Ft.)
Channel base width      =    0.000(Ft.)
Slope or 'Z' of left channel bank =   1.000
Slope or 'Z' of right channel bank = 100.000
Estimated mean flow rate at midpoint of channel =     10.007(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =     10.007(CFS)
Depth of flow =   0.300(Ft.), Average velocity =   2.195(Ft/s)
Channel flow top width =   30.350(Ft.)
Flow Velocity =    2.19(Ft/s)
Travel time  =    1.97 min.
Time of concentration =   13.99 min.

Sub-Channel No. 1 Critical depth =      0.301(Ft.)
  '     '       '     Critical flow top width =     30.379(Ft.)
  '     '       '     Critical flow velocity=    2.190(Ft/s)
  '     '       '     Critical flow area =      4.569(Sq.Ft)

 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.873
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.860
Decimal fraction soil group C = 0.140
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  57.82
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.286(In/Hr) for a   100.0 year storm
Subarea runoff =      8.782(CFS) for      4.400(Ac.)
Total runoff =     14.436(CFS)      Total area =       7.440(Ac.)
Depth of flow =   0.345(Ft.), Average velocity =   2.405(Ft/s)

Sub-Channel No. 1 Critical depth =      0.348(Ft.)
  '     '       '     Critical flow top width =     35.113(Ft.)
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  '     '       '     Critical flow velocity=    2.365(Ft/s)
  '     '       '     Critical flow area =      6.104(Sq.Ft)


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Process from Point/Station       12.000 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1446.420(Ft.)
Downstream point/station elevation =  1443.240(Ft.)
Pipe length  =    85.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.436(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    14.436(CFS)
Normal flow depth in pipe =   11.20(In.)
Flow top width inside pipe =   17.45(In.)
Critical Depth =   16.71(In.)
Pipe flow velocity =     12.48(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    14.10 min.


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Process from Point/Station       12.000 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      7.440(Ac.)
Runoff from this stream =     14.436(CFS)
Time of concentration =   14.10 min.
Rainfall intensity =     2.277(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       13.000 to Point/Station       14.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   370.000(Ft.)
Top (of initial area) elevation =  1455.200(Ft.)
Bottom (of initial area) elevation =  1452.200(Ft.)
Difference in elevation =     3.000(Ft.)
Slope =    0.00811  s(percent)=       0.81
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.368 min.
Rainfall intensity =      2.941(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.250
Decimal fraction soil group C = 0.750
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  65.75
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      8.982(CFS)
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Total initial stream area =        3.460(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       14.000 to Point/Station       15.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1444.470(Ft.)
Downstream point/station elevation =  1443.820(Ft.)
Pipe length  =    29.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.982(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     8.982(CFS)
Normal flow depth in pipe =   11.44(In.)
Flow top width inside pipe =   12.77(In.)
Critical Depth =   13.86(In.)
Pipe flow velocity =      8.95(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     8.42 min.


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Process from Point/Station       14.000 to Point/Station       15.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      3.460(Ac.)
Runoff from this stream =      8.982(CFS)
Time of concentration =    8.42 min.
Rainfall intensity =     2.931(In/Hr)


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Process from Point/Station       14.100 to Point/Station       14.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   546.000(Ft.)
Top (of initial area) elevation =  1455.200(Ft.)
Bottom (of initial area) elevation =  1449.400(Ft.)
Difference in elevation =     5.800(Ft.)
Slope =    0.01062  s(percent)=       1.06
TC = k(0.420)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.968 min.
Rainfall intensity =      2.372(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.791
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.600; Impervious fraction =  0.400
Initial subarea runoff =      4.186(CFS)
Total initial stream area =        2.230(Ac.)
Pervious area fraction = 0.600
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Process from Point/Station       14.200 to Point/Station       15.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1446.120(Ft.)
Downstream point/station elevation =  1443.820(Ft.)
Pipe length  =   321.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.186(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     4.186(CFS)
Normal flow depth in pipe =    9.83(In.)
Flow top width inside pipe =   14.26(In.)
Critical Depth =    9.94(In.)
Pipe flow velocity =      4.91(Ft/s)
Travel time through pipe =    1.09 min.
Time of concentration (TC) =    14.06 min.


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Process from Point/Station       14.200 to Point/Station       15.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.230(Ac.)
Runoff from this stream =      4.186(CFS)
Time of concentration =   14.06 min.
Rainfall intensity =     2.281(In/Hr)
Summary of stream data:

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


1        8.982      8.42                2.931
2        4.186     14.06                2.281
Largest stream flow has longer or shorter time of concentration
Qp =      8.982 + sum of
        Qa          Tb/Ta
         4.186 *    0.599 =      2.508
Qp =     11.489

Total of 2 streams to confluence:
Flow rates before confluence point:
       8.982       4.186
Area of streams before confluence:
        3.460        2.230
Results of confluence:
Total flow rate =     11.489(CFS)
Time of concentration =     8.422 min.
Effective stream area after confluence =      5.690(Ac.)


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Process from Point/Station       15.000 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
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Upstream point/station elevation =  1443.820(Ft.)
Downstream point/station elevation =  1443.240(Ft.)
Pipe length  =    97.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.489(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    11.489(CFS)
Normal flow depth in pipe =   16.15(In.)
Flow top width inside pipe =   17.70(In.)
Critical Depth =   15.16(In.)
Pipe flow velocity =      5.79(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =     8.70 min.


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Process from Point/Station       15.000 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      5.690(Ac.)
Runoff from this stream =     11.489(CFS)
Time of concentration =    8.70 min.
Rainfall intensity =     2.885(In/Hr)
Summary of stream data:

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


1       14.436     14.10               2.277
2       11.489      8.70               2.885
Largest stream flow has longer time of concentration
Qp =     14.436 + sum of
        Qb         Ia/Ib
        11.489 *    0.789 =      9.068
Qp =     23.504

Total of 2 main streams to confluence:
Flow rates before confluence point:
      14.436      11.489
Area of streams before confluence:
        7.440        5.690


Results of confluence:
Total flow rate =     23.504(CFS)
Time of concentration =    14.104 min.
Effective stream area after confluence  =     13.130(Ac.)


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Process from Point/Station       16.000 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1443.240(Ft.)
Downstream point/station elevation =  1437.880(Ft.)
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Pipe length  =   423.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =    23.504(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    23.504(CFS)
Normal flow depth in pipe =   21.60(In.)
Flow top width inside pipe =   14.40(In.)
Critical Depth =   20.64(In.)
Pipe flow velocity =      7.90(Ft/s)
Travel time through pipe =    0.89 min.
Time of concentration (TC) =    15.00 min.


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Process from Point/Station       16.000 to Point/Station       24.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     13.130(Ac.)
Runoff from this stream =     23.504(CFS)
Time of concentration =   15.00 min.
Rainfall intensity =     2.209(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       22.000 to Point/Station       22.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________________
Rainfall intensity =      3.015(In/Hr) for a   100.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.860
Decimal fraction soil group A = 0.010
Decimal fraction soil group B = 0.860
Decimal fraction soil group C = 0.130
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  57.60
Pervious area fraction =  0.181; Impervious fraction =  0.819
User specified values are as follows:
TC =   7.95 min.  Rain intensity =       3.01(In/Hr)
Total area =        12.68(Ac.)  Total runoff =     31.02(CFS)


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Process from Point/Station       22.000 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1443.900(Ft.)
Downstream point/station elevation =  1441.340(Ft.)
Pipe length  =   383.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    31.019(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    31.019(CFS)
Normal flow depth in pipe =   22.78(In.)
Flow top width inside pipe =   25.65(In.)
Critical Depth =   22.76(In.)
Pipe flow velocity =      7.76(Ft/s)
```

```
Travel time through pipe =    0.82 min.
Time of concentration (TC) =     8.78 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1441.340(Ft.)
Downstream point/station elevation =  1437.880(Ft.)
Pipe length  =   673.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    31.019(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    31.019(CFS)
Normal flow depth in pipe =   26.44(In.)
Flow top width inside pipe =   19.41(In.)
Critical Depth =   22.76(In.)
Pipe flow velocity =      6.77(Ft/s)
Travel time through pipe =    1.66 min.
Time of concentration (TC) =    10.43 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       24.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     12.680(Ac.)
Runoff from this stream =     31.019(CFS)
Time of concentration =   10.43 min.
Rainfall intensity =     2.639(In/Hr)
Summary of stream data:

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


1       23.504     15.00               2.209
2       31.019     10.43               2.639
Largest stream flow has longer or shorter time of concentration
Qp =     31.019 + sum of
        Qa          Tb/Ta
        23.504 *    0.696 =     16.350
Qp =     47.369

Total of 2 main streams to confluence:
Flow rates before confluence point:
      23.504      31.019
Area of streams before confluence:
       13.130       12.680


Results of confluence:
Total flow rate =     47.369(CFS)
Time of concentration =    10.432 min.
Effective stream area after confluence  =     25.810(Ac.)
```

End of computations, total study area = 25.81 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.230
Area averaged RI index number = 59.2

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/11/24 File:q100frnt6.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - FRONTAGE RD
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 30.000 to Point/Station 30.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 1.900(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.868
Decimal fraction soil group A = 0.000

```
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
User specified values are as follows:
TC =  20.41 min.  Rain intensity =       1.90(In/Hr)
Total area =         2.13(Ac.)  Total runoff =      4.20(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       31.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1468.500(Ft.)
End of street segment elevation =  1467.200(Ft.)
Length of street segment  =   372.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  43.000(Ft.)
Distance from crown to crossfall grade break  =  41.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  12.000(Ft.)
Slope from curb to property line (v/hz) =   0.015
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0130
 Manning's N from gutter to grade break =  0.0130
 Manning's N from grade break to crown =  0.0130
Estimated mean flow rate at midpoint of street =      4.583(CFS)
Depth of flow =   0.426(Ft.), Average velocity =   1.938(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  14.960(Ft.)
Flow velocity =   1.94(Ft/s)
Travel time =    3.20 min.     TC =   23.61  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.856
Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.500
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  44.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      1.769(In/Hr) for a   100.0 year storm
Subarea runoff =      0.712(CFS) for      0.470(Ac.)
Total runoff =      4.912(CFS)      Total area =       2.600(Ac.)
Street flow at end of street =      4.912(CFS)
Half street flow at end of street =      4.912(CFS)
Depth of flow =   0.434(Ft.), Average velocity =   1.971(Ft/s)
Flow width (from curb towards crown)=  15.381(Ft.)
End of computations, total study area =            2.60 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
```

Area averaged RI index number = 53.8

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 10/01/24 File: pq100uha24100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION - WATERSHED A
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 13.22(Ac.) = 0.021 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 13.22(Ac.) =
0.021 Sq. Mi.
Length along longest watercourse = 1359.00(Ft.)
Length along longest watercourse measured to centroid = 693.00(Ft.)
Length along longest watercourse = 0.257 Mi.
Length along longest watercourse measured to centroid = 0.131 Mi.
Difference in elevation = 18.70(Ft.)
Slope along watercourse = 72.6534 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.088 Hr.
Lag time = 5.28 Min.
25% of lag time = 1.32 Min.
40% of lag time = 2.11 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
13.22	1.80	23.80

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
13.22	5.00	66.10

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.800(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
13.220	61.30	0.500

Total Area Entered = 13.22(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
61.3	61.3	0.456	0.500	0.251	1.000	0.251
					Sum (F) =	0.251

Area averaged mean soil loss (F) (In/Hr) = 0.251
Minimum soil loss rate ((In/Hr)) = 0.125
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	94.673	17.575	2.342
2	0.167	189.345	47.848	6.375
3	0.250	284.018	16.514	2.200
4	0.333	378.691	7.359	0.980
5	0.417	473.363	4.203	0.560
6	0.500	568.036	2.720	0.362
7	0.583	662.709	1.772	0.236
8	0.667	757.381	1.110	0.148
9	0.750	852.054	0.900	0.120
			Sum = 100.000	Sum= 13.323

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.040	(0.445)	0.020	0.020
2	0.17	0.07	0.040	(0.443)	0.020	0.020
3	0.25	0.07	0.040	(0.441)	0.020	0.020
4	0.33	0.10	0.060	(0.439)	0.030	0.030
5	0.42	0.10	0.060	(0.438)	0.030	0.030
6	0.50	0.10	0.060	(0.436)	0.030	0.030
7	0.58	0.10	0.060	(0.434)	0.030	0.030
8	0.67	0.10	0.060	(0.433)	0.030	0.030
9	0.75	0.10	0.060	(0.431)	0.030	0.030
10	0.83	0.13	0.080	(0.429)	0.040	0.040
11	0.92	0.13	0.080	(0.428)	0.040	0.040
12	1.00	0.13	0.080	(0.426)	0.040	0.040
13	1.08	0.10	0.060	(0.424)	0.030	0.030
14	1.17	0.10	0.060	(0.422)	0.030	0.030
15	1.25	0.10	0.060	(0.421)	0.030	0.030
16	1.33	0.10	0.060	(0.419)	0.030	0.030
17	1.42	0.10	0.060	(0.417)	0.030	0.030
18	1.50	0.10	0.060	(0.416)	0.030	0.030
19	1.58	0.10	0.060	(0.414)	0.030	0.030
20	1.67	0.10	0.060	(0.412)	0.030	0.030
21	1.75	0.10	0.060	(0.411)	0.030	0.030
22	1.83	0.13	0.080	(0.409)	0.040	0.040
23	1.92	0.13	0.080	(0.408)	0.040	0.040
24	2.00	0.13	0.080	(0.406)	0.040	0.040
25	2.08	0.13	0.080	(0.404)	0.040	0.040
26	2.17	0.13	0.080	(0.403)	0.040	0.040
27	2.25	0.13	0.080	(0.401)	0.040	0.040
28	2.33	0.13	0.080	(0.399)	0.040	0.040
29	2.42	0.13	0.080	(0.398)	0.040	0.040
30	2.50	0.13	0.080	(0.396)	0.040	0.040
31	2.58	0.17	0.100	(0.394)	0.050	0.050
32	2.67	0.17	0.100	(0.393)	0.050	0.050
33	2.75	0.17	0.100	(0.391)	0.050	0.050
34	2.83	0.17	0.100	(0.390)	0.050	0.050
35	2.92	0.17	0.100	(0.388)	0.050	0.050
36	3.00	0.17	0.100	(0.386)	0.050	0.050
37	3.08	0.17	0.100	(0.385)	0.050	0.050
38	3.17	0.17	0.100	(0.383)	0.050	0.050
39	3.25	0.17	0.100	(0.382)	0.050	0.050
40	3.33	0.17	0.100	(0.380)	0.050	0.050
41	3.42	0.17	0.100	(0.378)	0.050	0.050
42	3.50	0.17	0.100	(0.377)	0.050	0.050
43	3.58	0.17	0.100	(0.375)	0.050	0.050
44	3.67	0.17	0.100	(0.374)	0.050	0.050
45	3.75	0.17	0.100	(0.372)	0.050	0.050
46	3.83	0.20	0.120	(0.371)	0.060	0.060
47	3.92	0.20	0.120	(0.369)	0.060	0.060
48	4.00	0.20	0.120	(0.367)	0.060	0.060
49	4.08	0.20	0.120	(0.366)	0.060	0.060
50	4.17	0.20	0.120	(0.364)	0.060	0.060
51	4.25	0.20	0.120	(0.363)	0.060	0.060
52	4.33	0.23	0.140	(0.361)	0.070	0.070
53	4.42	0.23	0.140	(0.360)	0.070	0.070
54	4.50	0.23	0.140	(0.358)	0.070	0.070
55	4.58	0.23	0.140	(0.357)	0.070	0.070

56	4.67	0.23	0.140	(0.355)	0.070	0.070
57	4.75	0.23	0.140	(0.354)	0.070	0.070
58	4.83	0.27	0.160	(0.352)	0.080	0.080
59	4.92	0.27	0.160	(0.350)	0.080	0.080
60	5.00	0.27	0.160	(0.349)	0.080	0.080
61	5.08	0.20	0.120	(0.347)	0.060	0.060
62	5.17	0.20	0.120	(0.346)	0.060	0.060
63	5.25	0.20	0.120	(0.344)	0.060	0.060
64	5.33	0.23	0.140	(0.343)	0.070	0.070
65	5.42	0.23	0.140	(0.341)	0.070	0.070
66	5.50	0.23	0.140	(0.340)	0.070	0.070
67	5.58	0.27	0.160	(0.338)	0.080	0.080
68	5.67	0.27	0.160	(0.337)	0.080	0.080
69	5.75	0.27	0.160	(0.335)	0.080	0.080
70	5.83	0.27	0.160	(0.334)	0.080	0.080
71	5.92	0.27	0.160	(0.332)	0.080	0.080
72	6.00	0.27	0.160	(0.331)	0.080	0.080
73	6.08	0.30	0.180	(0.330)	0.090	0.090
74	6.17	0.30	0.180	(0.328)	0.090	0.090
75	6.25	0.30	0.180	(0.327)	0.090	0.090
76	6.33	0.30	0.180	(0.325)	0.090	0.090
77	6.42	0.30	0.180	(0.324)	0.090	0.090
78	6.50	0.30	0.180	(0.322)	0.090	0.090
79	6.58	0.33	0.200	(0.321)	0.100	0.100
80	6.67	0.33	0.200	(0.319)	0.100	0.100
81	6.75	0.33	0.200	(0.318)	0.100	0.100
82	6.83	0.33	0.200	(0.316)	0.100	0.100
83	6.92	0.33	0.200	(0.315)	0.100	0.100
84	7.00	0.33	0.200	(0.314)	0.100	0.100
85	7.08	0.33	0.200	(0.312)	0.100	0.100
86	7.17	0.33	0.200	(0.311)	0.100	0.100
87	7.25	0.33	0.200	(0.309)	0.100	0.100
88	7.33	0.37	0.220	(0.308)	0.110	0.110
89	7.42	0.37	0.220	(0.307)	0.110	0.110
90	7.50	0.37	0.220	(0.305)	0.110	0.110
91	7.58	0.40	0.240	(0.304)	0.120	0.120
92	7.67	0.40	0.240	(0.302)	0.120	0.120
93	7.75	0.40	0.240	(0.301)	0.120	0.120
94	7.83	0.43	0.260	(0.300)	0.130	0.130
95	7.92	0.43	0.260	(0.298)	0.130	0.130
96	8.00	0.43	0.260	(0.297)	0.130	0.130
97	8.08	0.50	0.300	(0.295)	0.150	0.150
98	8.17	0.50	0.300	(0.294)	0.150	0.150
99	8.25	0.50	0.300	(0.293)	0.150	0.150
100	8.33	0.50	0.300	(0.291)	0.150	0.150
101	8.42	0.50	0.300	(0.290)	0.150	0.150
102	8.50	0.50	0.300	(0.289)	0.150	0.150
103	8.58	0.53	0.320	(0.287)	0.160	0.160
104	8.67	0.53	0.320	(0.286)	0.160	0.160
105	8.75	0.53	0.320	(0.285)	0.160	0.160
106	8.83	0.57	0.340	(0.283)	0.170	0.170
107	8.92	0.57	0.340	(0.282)	0.170	0.170
108	9.00	0.57	0.340	(0.281)	0.170	0.170
109	9.08	0.63	0.380	(0.279)	0.190	0.190
110	9.17	0.63	0.380	(0.278)	0.190	0.190
111	9.25	0.63	0.380	(0.277)	0.190	0.190
112	9.33	0.67	0.400	(0.275)	0.200	0.200

113	9.42	0.67	0.400	(0.274)	0.200	0.200
114	9.50	0.67	0.400	(0.273)	0.200	0.200
115	9.58	0.70	0.420	(0.271)	0.210	0.210
116	9.67	0.70	0.420	(0.270)	0.210	0.210
117	9.75	0.70	0.420	(0.269)	0.210	0.210
118	9.83	0.73	0.440	(0.267)	0.220	0.220
119	9.92	0.73	0.440	(0.266)	0.220	0.220
120	10.00	0.73	0.440	(0.265)	0.220	0.220
121	10.08	0.50	0.300	(0.264)	0.150	0.150
122	10.17	0.50	0.300	(0.262)	0.150	0.150
123	10.25	0.50	0.300	(0.261)	0.150	0.150
124	10.33	0.50	0.300	(0.260)	0.150	0.150
125	10.42	0.50	0.300	(0.258)	0.150	0.150
126	10.50	0.50	0.300	(0.257)	0.150	0.150
127	10.58	0.67	0.400	(0.256)	0.200	0.200
128	10.67	0.67	0.400	(0.255)	0.200	0.200
129	10.75	0.67	0.400	(0.253)	0.200	0.200
130	10.83	0.67	0.400	(0.252)	0.200	0.200
131	10.92	0.67	0.400	(0.251)	0.200	0.200
132	11.00	0.67	0.400	(0.250)	0.200	0.200
133	11.08	0.63	0.380	(0.249)	0.190	0.190
134	11.17	0.63	0.380	(0.247)	0.190	0.190
135	11.25	0.63	0.380	(0.246)	0.190	0.190
136	11.33	0.63	0.380	(0.245)	0.190	0.190
137	11.42	0.63	0.380	(0.244)	0.190	0.190
138	11.50	0.63	0.380	(0.242)	0.190	0.190
139	11.58	0.57	0.340	(0.241)	0.170	0.170
140	11.67	0.57	0.340	(0.240)	0.170	0.170
141	11.75	0.57	0.340	(0.239)	0.170	0.170
142	11.83	0.60	0.360	(0.238)	0.180	0.180
143	11.92	0.60	0.360	(0.236)	0.180	0.180
144	12.00	0.60	0.360	(0.235)	0.180	0.180
145	12.08	0.83	0.500	0.234	(0.250)	0.266
146	12.17	0.83	0.500	0.233	(0.250)	0.267
147	12.25	0.83	0.500	0.232	(0.250)	0.268
148	12.33	0.87	0.520	0.231	(0.260)	0.289
149	12.42	0.87	0.520	0.229	(0.260)	0.291
150	12.50	0.87	0.520	0.228	(0.260)	0.292
151	12.58	0.93	0.560	0.227	(0.280)	0.333
152	12.67	0.93	0.560	0.226	(0.280)	0.334
153	12.75	0.93	0.560	0.225	(0.280)	0.335
154	12.83	0.97	0.580	0.224	(0.290)	0.356
155	12.92	0.97	0.580	0.223	(0.290)	0.357
156	13.00	0.97	0.580	0.221	(0.290)	0.359
157	13.08	1.13	0.680	0.220	(0.340)	0.460
158	13.17	1.13	0.680	0.219	(0.340)	0.461
159	13.25	1.13	0.680	0.218	(0.340)	0.462
160	13.33	1.13	0.680	0.217	(0.340)	0.463
161	13.42	1.13	0.680	0.216	(0.340)	0.464
162	13.50	1.13	0.680	0.215	(0.340)	0.465
163	13.58	0.77	0.460	0.214	(0.230)	0.246
164	13.67	0.77	0.460	0.213	(0.230)	0.247
165	13.75	0.77	0.460	0.212	(0.230)	0.248
166	13.83	0.77	0.460	0.210	(0.230)	0.250
167	13.92	0.77	0.460	0.209	(0.230)	0.251
168	14.00	0.77	0.460	0.208	(0.230)	0.252
169	14.08	0.90	0.540	0.207	(0.270)	0.333

170	14.17	0.90	0.540	0.206	(0.270)	0.334
171	14.25	0.90	0.540	0.205	(0.270)	0.335
172	14.33	0.87	0.520	0.204	(0.260)	0.316
173	14.42	0.87	0.520	0.203	(0.260)	0.317
174	14.50	0.87	0.520	0.202	(0.260)	0.318
175	14.58	0.87	0.520	0.201	(0.260)	0.319
176	14.67	0.87	0.520	0.200	(0.260)	0.320
177	14.75	0.87	0.520	0.199	(0.260)	0.321
178	14.83	0.83	0.500	0.198	(0.250)	0.302
179	14.92	0.83	0.500	0.197	(0.250)	0.303
180	15.00	0.83	0.500	0.196	(0.250)	0.304
181	15.08	0.80	0.480	0.195	(0.240)	0.285
182	15.17	0.80	0.480	0.194	(0.240)	0.286
183	15.25	0.80	0.480	0.193	(0.240)	0.287
184	15.33	0.77	0.460	0.192	(0.230)	0.268
185	15.42	0.77	0.460	0.191	(0.230)	0.269
186	15.50	0.77	0.460	0.190	(0.230)	0.270
187	15.58	0.63	0.380	0.189	(0.190)	0.191
188	15.67	0.63	0.380	0.188	(0.190)	0.192
189	15.75	0.63	0.380	0.187	(0.190)	0.193
190	15.83	0.63	0.380	0.186	(0.190)	0.194
191	15.92	0.63	0.380	0.185	(0.190)	0.195
192	16.00	0.63	0.380	0.184	(0.190)	0.196
193	16.08	0.13	0.080	(0.183)	0.040	0.040
194	16.17	0.13	0.080	(0.182)	0.040	0.040
195	16.25	0.13	0.080	(0.181)	0.040	0.040
196	16.33	0.13	0.080	(0.180)	0.040	0.040
197	16.42	0.13	0.080	(0.180)	0.040	0.040
198	16.50	0.13	0.080	(0.179)	0.040	0.040
199	16.58	0.10	0.060	(0.178)	0.030	0.030
200	16.67	0.10	0.060	(0.177)	0.030	0.030
201	16.75	0.10	0.060	(0.176)	0.030	0.030
202	16.83	0.10	0.060	(0.175)	0.030	0.030
203	16.92	0.10	0.060	(0.174)	0.030	0.030
204	17.00	0.10	0.060	(0.173)	0.030	0.030
205	17.08	0.17	0.100	(0.172)	0.050	0.050
206	17.17	0.17	0.100	(0.171)	0.050	0.050
207	17.25	0.17	0.100	(0.171)	0.050	0.050
208	17.33	0.17	0.100	(0.170)	0.050	0.050
209	17.42	0.17	0.100	(0.169)	0.050	0.050
210	17.50	0.17	0.100	(0.168)	0.050	0.050
211	17.58	0.17	0.100	(0.167)	0.050	0.050
212	17.67	0.17	0.100	(0.166)	0.050	0.050
213	17.75	0.17	0.100	(0.166)	0.050	0.050
214	17.83	0.13	0.080	(0.165)	0.040	0.040
215	17.92	0.13	0.080	(0.164)	0.040	0.040
216	18.00	0.13	0.080	(0.163)	0.040	0.040
217	18.08	0.13	0.080	(0.162)	0.040	0.040
218	18.17	0.13	0.080	(0.162)	0.040	0.040
219	18.25	0.13	0.080	(0.161)	0.040	0.040
220	18.33	0.13	0.080	(0.160)	0.040	0.040
221	18.42	0.13	0.080	(0.159)	0.040	0.040
222	18.50	0.13	0.080	(0.158)	0.040	0.040
223	18.58	0.10	0.060	(0.158)	0.030	0.030
224	18.67	0.10	0.060	(0.157)	0.030	0.030
225	18.75	0.10	0.060	(0.156)	0.030	0.030
226	18.83	0.07	0.040	(0.155)	0.020	0.020

227	18.92	0.07	0.040	(0.155)	0.020	0.020
228	19.00	0.07	0.040	(0.154)	0.020	0.020
229	19.08	0.10	0.060	(0.153)	0.030	0.030
230	19.17	0.10	0.060	(0.152)	0.030	0.030
231	19.25	0.10	0.060	(0.152)	0.030	0.030
232	19.33	0.13	0.080	(0.151)	0.040	0.040
233	19.42	0.13	0.080	(0.150)	0.040	0.040
234	19.50	0.13	0.080	(0.150)	0.040	0.040
235	19.58	0.10	0.060	(0.149)	0.030	0.030
236	19.67	0.10	0.060	(0.148)	0.030	0.030
237	19.75	0.10	0.060	(0.148)	0.030	0.030
238	19.83	0.07	0.040	(0.147)	0.020	0.020
239	19.92	0.07	0.040	(0.146)	0.020	0.020
240	20.00	0.07	0.040	(0.146)	0.020	0.020
241	20.08	0.10	0.060	(0.145)	0.030	0.030
242	20.17	0.10	0.060	(0.144)	0.030	0.030
243	20.25	0.10	0.060	(0.144)	0.030	0.030
244	20.33	0.10	0.060	(0.143)	0.030	0.030
245	20.42	0.10	0.060	(0.142)	0.030	0.030
246	20.50	0.10	0.060	(0.142)	0.030	0.030
247	20.58	0.10	0.060	(0.141)	0.030	0.030
248	20.67	0.10	0.060	(0.141)	0.030	0.030
249	20.75	0.10	0.060	(0.140)	0.030	0.030
250	20.83	0.07	0.040	(0.140)	0.020	0.020
251	20.92	0.07	0.040	(0.139)	0.020	0.020
252	21.00	0.07	0.040	(0.138)	0.020	0.020
253	21.08	0.10	0.060	(0.138)	0.030	0.030
254	21.17	0.10	0.060	(0.137)	0.030	0.030
255	21.25	0.10	0.060	(0.137)	0.030	0.030
256	21.33	0.07	0.040	(0.136)	0.020	0.020
257	21.42	0.07	0.040	(0.136)	0.020	0.020
258	21.50	0.07	0.040	(0.135)	0.020	0.020
259	21.58	0.10	0.060	(0.135)	0.030	0.030
260	21.67	0.10	0.060	(0.134)	0.030	0.030
261	21.75	0.10	0.060	(0.134)	0.030	0.030
262	21.83	0.07	0.040	(0.133)	0.020	0.020
263	21.92	0.07	0.040	(0.133)	0.020	0.020
264	22.00	0.07	0.040	(0.132)	0.020	0.020
265	22.08	0.10	0.060	(0.132)	0.030	0.030
266	22.17	0.10	0.060	(0.132)	0.030	0.030
267	22.25	0.10	0.060	(0.131)	0.030	0.030
268	22.33	0.07	0.040	(0.131)	0.020	0.020
269	22.42	0.07	0.040	(0.130)	0.020	0.020
270	22.50	0.07	0.040	(0.130)	0.020	0.020
271	22.58	0.07	0.040	(0.130)	0.020	0.020
272	22.67	0.07	0.040	(0.129)	0.020	0.020
273	22.75	0.07	0.040	(0.129)	0.020	0.020
274	22.83	0.07	0.040	(0.129)	0.020	0.020
275	22.92	0.07	0.040	(0.128)	0.020	0.020
276	23.00	0.07	0.040	(0.128)	0.020	0.020
277	23.08	0.07	0.040	(0.128)	0.020	0.020
278	23.17	0.07	0.040	(0.127)	0.020	0.020
279	23.25	0.07	0.040	(0.127)	0.020	0.020
280	23.33	0.07	0.040	(0.127)	0.020	0.020
281	23.42	0.07	0.040	(0.127)	0.020	0.020
282	23.50	0.07	0.040	(0.126)	0.020	0.020
283	23.58	0.07	0.040	(0.126)	0.020	0.020

284	23.67	0.07	0.040	(0.126)	0.020	0.020
285	23.75	0.07	0.040	(0.126)	0.020	0.020
286	23.83	0.07	0.040	(0.126)	0.020	0.020
287	23.92	0.07	0.040	(0.125)	0.020	0.020
288	24.00	0.07	0.040	(0.125)	0.020	0.020

(Loss Rate Not Used)

Sum = 100.0 Sum = 32.3

Flood volume = Effective rainfall 2.69(In)
times area 13.2(Ac.)/[(In)/(Ft.)] = 3.0(Ac.Ft)
Total soil loss = 2.31(In)
Total soil loss = 2.540(Ac.Ft)
Total rainfall = 5.00(In)
Flood volume = 129301.7 Cubic Feet
Total soil loss = 110635.1 Cubic Feet

Peak flow rate of this hydrograph = 6.127(CFS)

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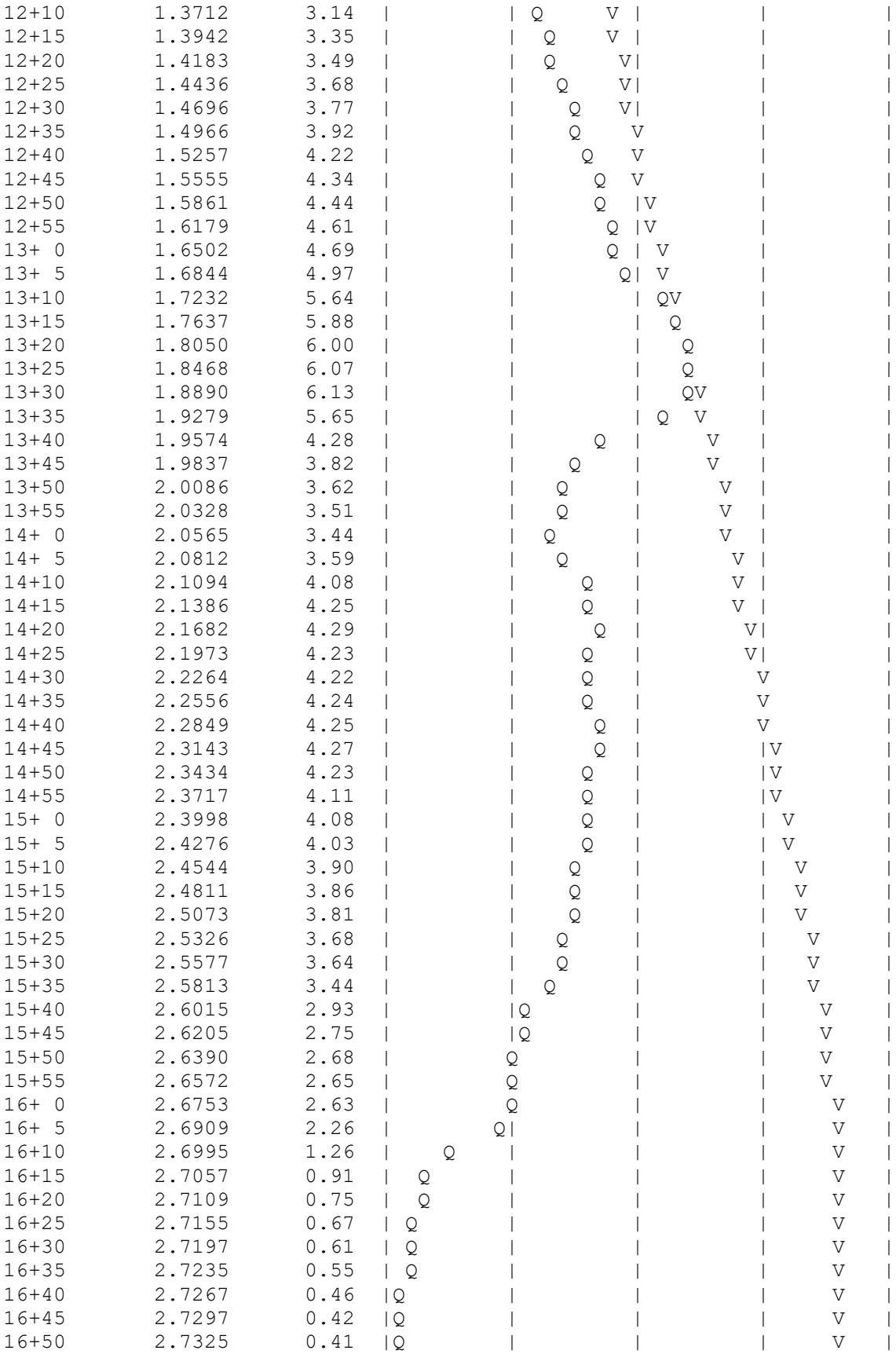
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0003	0.05	Q				
0+10	0.0015	0.17	Q				
0+15	0.0030	0.22	Q				
0+20	0.0048	0.26	VQ				
0+25	0.0071	0.34	VQ				
0+30	0.0097	0.37	VQ				
0+35	0.0123	0.38	VQ				
0+40	0.0150	0.39	VQ				
0+45	0.0177	0.39	VQ				
0+50	0.0206	0.42	VQ				
0+55	0.0239	0.49	VQ				
1+ 0	0.0274	0.51	V Q				
1+ 5	0.0308	0.50	VQ				
1+10	0.0339	0.44	VQ				
1+15	0.0367	0.42	VQ				
1+20	0.0396	0.41	VQ				
1+25	0.0424	0.41	VQ				
1+30	0.0452	0.40	VQ				
1+35	0.0479	0.40	VQ				
1+40	0.0507	0.40	VQ				
1+45	0.0535	0.40	VQ				
1+50	0.0564	0.42	VQ				
1+55	0.0597	0.49	VQ				
2+ 0	0.0632	0.51	V Q				
2+ 5	0.0668	0.52	V Q				
2+10	0.0704	0.52	V Q				
2+15	0.0741	0.53	V Q				
2+20	0.0777	0.53	|VQ				
2+25	0.0814	0.53	|VQ				
2+30	0.0850	0.53	|VQ				
2+35	0.0889	0.56	|VQ				

2+40	0.0932	0.62	VQ				
2+45	0.0976	0.64	VQ				
2+50	0.1021	0.65	VQ				
2+55	0.1066	0.66	VQ				
3+ 0	0.1112	0.66	VQ				
3+ 5	0.1157	0.66	VQ				
3+10	0.1203	0.67	VQ				
3+15	0.1249	0.67	VQ				
3+20	0.1295	0.67	VQ				
3+25	0.1341	0.67	VQ				
3+30	0.1387	0.67	VQ				
3+35	0.1433	0.67	VQ				
3+40	0.1479	0.67	VQ				
3+45	0.1524	0.67	Q				
3+50	0.1572	0.69	Q				
3+55	0.1624	0.75	VQ				
4+ 0	0.1677	0.78	VQ				
4+ 5	0.1731	0.79	VQ				
4+10	0.1786	0.79	VQ				
4+15	0.1841	0.79	VQ				
4+20	0.1897	0.82	VQ				
4+25	0.1958	0.89	VQ				
4+30	0.2021	0.91	VQ				
4+35	0.2084	0.92	VQ				
4+40	0.2148	0.92	VQ				
4+45	0.2212	0.93	VQ				
4+50	0.2277	0.95	Q				
4+55	0.2347	1.02	VQ				
5+ 0	0.2419	1.04	VQ				
5+ 5	0.2488	1.01	VQ				
5+10	0.2549	0.88	Q				
5+15	0.2607	0.84	Q				
5+20	0.2666	0.85	Q				
5+25	0.2728	0.90	Q				
5+30	0.2791	0.92	Q				
5+35	0.2857	0.95	Q				
5+40	0.2926	1.01	VQ				
5+45	0.2998	1.04	Q				
5+50	0.3070	1.05	Q				
5+55	0.3143	1.06	Q				
6+ 0	0.3216	1.06	Q				
6+ 5	0.3291	1.09	Q				
6+10	0.3370	1.15	Q				
6+15	0.3451	1.18	Q				
6+20	0.3533	1.19	Q				
6+25	0.3615	1.19	Q				
6+30	0.3697	1.19	Q				
6+35	0.3781	1.22	QV				
6+40	0.3870	1.29	Q				
6+45	0.3960	1.31	Q				
6+50	0.4051	1.32	Q				
6+55	0.4142	1.32	Q				
7+ 0	0.4233	1.33	Q				
7+ 5	0.4325	1.33	Q				
7+10	0.4417	1.33	Q				
7+15	0.4508	1.33	QV				
7+20	0.4602	1.36	QV				

7+25	0.4700	1.42	QV				
7+30	0.4799	1.44	QV				
7+35	0.4901	1.48	QV				
7+40	0.5007	1.54	Q				
7+45	0.5115	1.57	Q				
7+50	0.5226	1.61	QV				
7+55	0.5341	1.68	QV				
8+ 0	0.5459	1.70	QV				
8+ 5	0.5580	1.76	Q				
8+10	0.5711	1.90	Q				
8+15	0.5845	1.95	Q				
8+20	0.5980	1.97	QV				
8+25	0.6117	1.98	QV				
8+30	0.6254	1.99	QV				
8+35	0.6393	2.02	Q				
8+40	0.6536	2.08	Q				
8+45	0.6681	2.11	QV				
8+50	0.6829	2.14	QV				
8+55	0.6981	2.21	QV				
9+ 0	0.7135	2.24	QV				
9+ 5	0.7293	2.30	Q				
9+10	0.7461	2.43	QV				
9+15	0.7632	2.48	QV				
9+20	0.7806	2.52	Q				
9+25	0.7985	2.60	Q				
9+30	0.8166	2.63	QV				
9+35	0.8350	2.67	QV				
9+40	0.8539	2.74	QV				
9+45	0.8729	2.77	Q				
9+50	0.8923	2.81	QV				
9+55	0.9121	2.88	QV				
10+ 0	0.9321	2.90	QV				
10+ 5	0.9510	2.75	QV				
10+10	0.9669	2.31	Q	V			
10+15	0.9818	2.16	Q	V			
10+20	0.9963	2.10	Q	V			
10+25	1.0105	2.06	Q	V			
10+30	1.0245	2.03	Q	V			
10+35	1.0392	2.14	Q	V			
10+40	1.0560	2.44	Q	V			
10+45	1.0735	2.55	Q	V			
10+50	1.0914	2.59	Q	V			
10+55	1.1095	2.62	Q	V			
11+ 0	1.1277	2.64	Q	V			
11+ 5	1.1458	2.63	Q	V			
11+10	1.1635	2.57	Q	V			
11+15	1.1811	2.56	Q	V			
11+20	1.1986	2.55	Q	V			
11+25	1.2161	2.54	Q	V			
11+30	1.2336	2.54	Q	V			
11+35	1.2508	2.49	Q	V			
11+40	1.2670	2.36	Q	V			
11+45	1.2829	2.31	Q	V			
11+50	1.2989	2.32	Q	V			
11+55	1.3152	2.37	Q	V			
12+ 0	1.3317	2.39	Q	V			
12+ 5	1.3495	2.59	Q	V			



16+55	2.7353	0.41	Q				V
17+ 0	2.7381	0.40	Q				V
17+ 5	2.7412	0.45	Q				V
17+10	2.7452	0.58	Q				V
17+15	2.7494	0.62	Q				V
17+20	2.7538	0.64	Q				V
17+25	2.7583	0.65	Q				V
17+30	2.7628	0.66	Q				V
17+35	2.7674	0.66	Q				V
17+40	2.7719	0.66	Q				V
17+45	2.7765	0.67	Q				V
17+50	2.7810	0.64	Q				V
17+55	2.7850	0.58	Q				V
18+ 0	2.7888	0.56	Q				V
18+ 5	2.7926	0.55	Q				V
18+10	2.7963	0.54	Q				V
18+15	2.8000	0.54	Q				V
18+20	2.8037	0.54	Q				V
18+25	2.8074	0.53	Q				V
18+30	2.8110	0.53	Q				V
18+35	2.8146	0.51	Q				V
18+40	2.8176	0.45	Q				V
18+45	2.8205	0.42	Q				V
18+50	2.8232	0.39	Q				V
18+55	2.8255	0.32	Q				V
19+ 0	2.8275	0.30	Q				V
19+ 5	2.8296	0.31	Q				V
19+10	2.8321	0.36	Q				V
19+15	2.8347	0.38	Q				V
19+20	2.8376	0.41	Q				V
19+25	2.8409	0.48	Q				V
19+30	2.8443	0.50	Q				V
19+35	2.8477	0.49	Q				V
19+40	2.8507	0.44	Q				V
19+45	2.8536	0.42	Q				V
19+50	2.8563	0.39	Q				V
19+55	2.8585	0.32	Q				V
20+ 0	2.8605	0.30	Q				V
20+ 5	2.8627	0.31	Q				V
20+10	2.8652	0.36	Q				V
20+15	2.8678	0.38	Q				V
20+20	2.8705	0.39	Q				V
20+25	2.8732	0.39	Q				V
20+30	2.8759	0.39	Q				V
20+35	2.8786	0.40	Q				V
20+40	2.8814	0.40	Q				V
20+45	2.8841	0.40	Q				V
20+50	2.8867	0.38	Q				V
20+55	2.8889	0.31	Q				V
21+ 0	2.8909	0.29	Q				V
21+ 5	2.8930	0.30	Q				V
21+10	2.8955	0.36	Q				V
21+15	2.8981	0.38	Q				V
21+20	2.9006	0.36	Q				V
21+25	2.9027	0.31	Q				V
21+30	2.9047	0.29	Q				V
21+35	2.9067	0.30	Q				V

21+40	2.9092	0.36	|Q	|	|	|	V|
21+45	2.9118	0.38	|Q	|	|	|	V|
21+50	2.9144	0.36	|Q	|	|	|	V|
21+55	2.9165	0.31	|Q	|	|	|	V|
22+ 0	2.9184	0.29	|Q	|	|	|	V|
22+ 5	2.9205	0.30	|Q	|	|	|	V|
22+10	2.9230	0.36	|Q	|	|	|	V|
22+15	2.9256	0.38	|Q	|	|	|	V|
22+20	2.9281	0.36	|Q	|	|	|	V|
22+25	2.9302	0.31	|Q	|	|	|	V|
22+30	2.9322	0.29	|Q	|	|	|	V|
22+35	2.9341	0.28	|Q	|	|	|	V|
22+40	2.9360	0.27	|Q	|	|	|	V|
22+45	2.9379	0.27	|Q	|	|	|	V|
22+50	2.9397	0.27	|Q	|	|	|	V|
22+55	2.9416	0.27	|Q	|	|	|	V|
23+ 0	2.9434	0.27	|Q	|	|	|	V|
23+ 5	2.9452	0.27	|Q	|	|	|	V|
23+10	2.9471	0.27	|Q	|	|	|	V|
23+15	2.9489	0.27	|Q	|	|	|	V|
23+20	2.9508	0.27	|Q	|	|	|	V|
23+25	2.9526	0.27	|Q	|	|	|	V|
23+30	2.9544	0.27	|Q	|	|	|	V|
23+35	2.9563	0.27	|Q	|	|	|	V|
23+40	2.9581	0.27	|Q	|	|	|	V|
23+45	2.9599	0.27	|Q	|	|	|	V|
23+50	2.9618	0.27	|Q	|	|	|	V|
23+55	2.9636	0.27	|Q	|	|	|	V|
24+ 0	2.9654	0.27	|Q	|	|	|	V|
24+ 5	2.9670	0.22	Q	|	|	|	V|
24+10	2.9676	0.09	Q	|	|	|	V|
24+15	2.9679	0.05	Q	|	|	|	V|
24+20	2.9681	0.03	Q	|	|	|	V|
24+25	2.9682	0.02	Q	|	|	|	V|
24+30	2.9683	0.01	Q	|	|	|	V|
24+35	2.9683	0.01	Q	|	|	|	V|
24+40	2.9684	0.00	Q	|	|	|	V|

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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION - WATERSHED B
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 12.58(Ac.) = 0.020 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 12.58(Ac.) = 0.020 Sq. Mi.
Length along longest watercourse = 1170.00(Ft.)
Length along longest watercourse measured to centroid = 550.00(Ft.)
Length along longest watercourse = 0.222 Mi.
Length along longest watercourse measured to centroid = 0.104 Mi.
Difference in elevation = 16.50(Ft.)
Slope along watercourse = 74.4615 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.076 Hr.
Lag time = 4.55 Min.
25% of lag time = 1.14 Min.
40% of lag time = 1.82 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

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

12.58	1.80	22.64

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
12.58	5.00	62.90

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.800(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
12.580	57.80	0.500

Total Area Entered = 12.58(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
57.8	57.8	0.492	0.500	0.271	1.000	0.271
					Sum (F) =	0.271

Area averaged mean soil loss (F) (In/Hr) = 0.271
Minimum soil loss rate ((In/Hr)) = 0.135
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	109.928	22.218	2.817
2	0.167	219.855	48.832	6.191
3	0.250	329.783	14.316	1.815
4	0.333	439.710	6.548	0.830
5	0.417	549.638	3.637	0.461
6	0.500	659.565	2.267	0.287
7	0.583	769.493	1.329	0.168
8	0.667	879.421	0.855	0.108
		Sum =	100.000 Sum=	12.678

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)

1	0.08	0.07	0.040	(0.480)	0.020	0.020
2	0.17	0.07	0.040	(0.478)	0.020	0.020
3	0.25	0.07	0.040	(0.476)	0.020	0.020
4	0.33	0.10	0.060	(0.475)	0.030	0.030
5	0.42	0.10	0.060	(0.473)	0.030	0.030
6	0.50	0.10	0.060	(0.471)	0.030	0.030
7	0.58	0.10	0.060	(0.469)	0.030	0.030
8	0.67	0.10	0.060	(0.467)	0.030	0.030
9	0.75	0.10	0.060	(0.465)	0.030	0.030
10	0.83	0.13	0.080	(0.464)	0.040	0.040
11	0.92	0.13	0.080	(0.462)	0.040	0.040
12	1.00	0.13	0.080	(0.460)	0.040	0.040
13	1.08	0.10	0.060	(0.458)	0.030	0.030
14	1.17	0.10	0.060	(0.456)	0.030	0.030
15	1.25	0.10	0.060	(0.454)	0.030	0.030
16	1.33	0.10	0.060	(0.453)	0.030	0.030
17	1.42	0.10	0.060	(0.451)	0.030	0.030
18	1.50	0.10	0.060	(0.449)	0.030	0.030
19	1.58	0.10	0.060	(0.447)	0.030	0.030
20	1.67	0.10	0.060	(0.445)	0.030	0.030
21	1.75	0.10	0.060	(0.444)	0.030	0.030
22	1.83	0.13	0.080	(0.442)	0.040	0.040
23	1.92	0.13	0.080	(0.440)	0.040	0.040
24	2.00	0.13	0.080	(0.438)	0.040	0.040
25	2.08	0.13	0.080	(0.437)	0.040	0.040
26	2.17	0.13	0.080	(0.435)	0.040	0.040
27	2.25	0.13	0.080	(0.433)	0.040	0.040
28	2.33	0.13	0.080	(0.431)	0.040	0.040
29	2.42	0.13	0.080	(0.430)	0.040	0.040
30	2.50	0.13	0.080	(0.428)	0.040	0.040
31	2.58	0.17	0.100	(0.426)	0.050	0.050
32	2.67	0.17	0.100	(0.424)	0.050	0.050
33	2.75	0.17	0.100	(0.423)	0.050	0.050
34	2.83	0.17	0.100	(0.421)	0.050	0.050
35	2.92	0.17	0.100	(0.419)	0.050	0.050
36	3.00	0.17	0.100	(0.417)	0.050	0.050
37	3.08	0.17	0.100	(0.416)	0.050	0.050
38	3.17	0.17	0.100	(0.414)	0.050	0.050
39	3.25	0.17	0.100	(0.412)	0.050	0.050
40	3.33	0.17	0.100	(0.410)	0.050	0.050
41	3.42	0.17	0.100	(0.409)	0.050	0.050
42	3.50	0.17	0.100	(0.407)	0.050	0.050
43	3.58	0.17	0.100	(0.405)	0.050	0.050
44	3.67	0.17	0.100	(0.404)	0.050	0.050
45	3.75	0.17	0.100	(0.402)	0.050	0.050
46	3.83	0.20	0.120	(0.400)	0.060	0.060
47	3.92	0.20	0.120	(0.398)	0.060	0.060
48	4.00	0.20	0.120	(0.397)	0.060	0.060
49	4.08	0.20	0.120	(0.395)	0.060	0.060
50	4.17	0.20	0.120	(0.393)	0.060	0.060
51	4.25	0.20	0.120	(0.392)	0.060	0.060
52	4.33	0.23	0.140	(0.390)	0.070	0.070
53	4.42	0.23	0.140	(0.388)	0.070	0.070
54	4.50	0.23	0.140	(0.387)	0.070	0.070
55	4.58	0.23	0.140	(0.385)	0.070	0.070
56	4.67	0.23	0.140	(0.383)	0.070	0.070
57	4.75	0.23	0.140	(0.382)	0.070	0.070

58	4.83	0.27	0.160	(0.380)	0.080	0.080
59	4.92	0.27	0.160	(0.379)	0.080	0.080
60	5.00	0.27	0.160	(0.377)	0.080	0.080
61	5.08	0.20	0.120	(0.375)	0.060	0.060
62	5.17	0.20	0.120	(0.374)	0.060	0.060
63	5.25	0.20	0.120	(0.372)	0.060	0.060
64	5.33	0.23	0.140	(0.370)	0.070	0.070
65	5.42	0.23	0.140	(0.369)	0.070	0.070
66	5.50	0.23	0.140	(0.367)	0.070	0.070
67	5.58	0.27	0.160	(0.366)	0.080	0.080
68	5.67	0.27	0.160	(0.364)	0.080	0.080
69	5.75	0.27	0.160	(0.362)	0.080	0.080
70	5.83	0.27	0.160	(0.361)	0.080	0.080
71	5.92	0.27	0.160	(0.359)	0.080	0.080
72	6.00	0.27	0.160	(0.358)	0.080	0.080
73	6.08	0.30	0.180	(0.356)	0.090	0.090
74	6.17	0.30	0.180	(0.354)	0.090	0.090
75	6.25	0.30	0.180	(0.353)	0.090	0.090
76	6.33	0.30	0.180	(0.351)	0.090	0.090
77	6.42	0.30	0.180	(0.350)	0.090	0.090
78	6.50	0.30	0.180	(0.348)	0.090	0.090
79	6.58	0.33	0.200	(0.346)	0.100	0.100
80	6.67	0.33	0.200	(0.345)	0.100	0.100
81	6.75	0.33	0.200	(0.343)	0.100	0.100
82	6.83	0.33	0.200	(0.342)	0.100	0.100
83	6.92	0.33	0.200	(0.340)	0.100	0.100
84	7.00	0.33	0.200	(0.339)	0.100	0.100
85	7.08	0.33	0.200	(0.337)	0.100	0.100
86	7.17	0.33	0.200	(0.336)	0.100	0.100
87	7.25	0.33	0.200	(0.334)	0.100	0.100
88	7.33	0.37	0.220	(0.333)	0.110	0.110
89	7.42	0.37	0.220	(0.331)	0.110	0.110
90	7.50	0.37	0.220	(0.330)	0.110	0.110
91	7.58	0.40	0.240	(0.328)	0.120	0.120
92	7.67	0.40	0.240	(0.327)	0.120	0.120
93	7.75	0.40	0.240	(0.325)	0.120	0.120
94	7.83	0.43	0.260	(0.324)	0.130	0.130
95	7.92	0.43	0.260	(0.322)	0.130	0.130
96	8.00	0.43	0.260	(0.321)	0.130	0.130
97	8.08	0.50	0.300	(0.319)	0.150	0.150
98	8.17	0.50	0.300	(0.318)	0.150	0.150
99	8.25	0.50	0.300	(0.316)	0.150	0.150
100	8.33	0.50	0.300	(0.315)	0.150	0.150
101	8.42	0.50	0.300	(0.313)	0.150	0.150
102	8.50	0.50	0.300	(0.312)	0.150	0.150
103	8.58	0.53	0.320	(0.310)	0.160	0.160
104	8.67	0.53	0.320	(0.309)	0.160	0.160
105	8.75	0.53	0.320	(0.307)	0.160	0.160
106	8.83	0.57	0.340	(0.306)	0.170	0.170
107	8.92	0.57	0.340	(0.304)	0.170	0.170
108	9.00	0.57	0.340	(0.303)	0.170	0.170
109	9.08	0.63	0.380	(0.302)	0.190	0.190
110	9.17	0.63	0.380	(0.300)	0.190	0.190
111	9.25	0.63	0.380	(0.299)	0.190	0.190
112	9.33	0.67	0.400	(0.297)	0.200	0.200
113	9.42	0.67	0.400	(0.296)	0.200	0.200
114	9.50	0.67	0.400	(0.294)	0.200	0.200

115	9.58	0.70	0.420	(0.293)	0.210	0.210
116	9.67	0.70	0.420	(0.292)	0.210	0.210
117	9.75	0.70	0.420	(0.290)	0.210	0.210
118	9.83	0.73	0.440	(0.289)	0.220	0.220
119	9.92	0.73	0.440	(0.287)	0.220	0.220
120	10.00	0.73	0.440	(0.286)	0.220	0.220
121	10.08	0.50	0.300	(0.285)	0.150	0.150
122	10.17	0.50	0.300	(0.283)	0.150	0.150
123	10.25	0.50	0.300	(0.282)	0.150	0.150
124	10.33	0.50	0.300	(0.281)	0.150	0.150
125	10.42	0.50	0.300	(0.279)	0.150	0.150
126	10.50	0.50	0.300	(0.278)	0.150	0.150
127	10.58	0.67	0.400	(0.276)	0.200	0.200
128	10.67	0.67	0.400	(0.275)	0.200	0.200
129	10.75	0.67	0.400	(0.274)	0.200	0.200
130	10.83	0.67	0.400	(0.272)	0.200	0.200
131	10.92	0.67	0.400	(0.271)	0.200	0.200
132	11.00	0.67	0.400	(0.270)	0.200	0.200
133	11.08	0.63	0.380	(0.268)	0.190	0.190
134	11.17	0.63	0.380	(0.267)	0.190	0.190
135	11.25	0.63	0.380	(0.266)	0.190	0.190
136	11.33	0.63	0.380	(0.264)	0.190	0.190
137	11.42	0.63	0.380	(0.263)	0.190	0.190
138	11.50	0.63	0.380	(0.262)	0.190	0.190
139	11.58	0.57	0.340	(0.261)	0.170	0.170
140	11.67	0.57	0.340	(0.259)	0.170	0.170
141	11.75	0.57	0.340	(0.258)	0.170	0.170
142	11.83	0.60	0.360	(0.257)	0.180	0.180
143	11.92	0.60	0.360	(0.255)	0.180	0.180
144	12.00	0.60	0.360	(0.254)	0.180	0.180
145	12.08	0.83	0.500	(0.253)	0.250	0.250
146	12.17	0.83	0.500	(0.252)	0.250	0.250
147	12.25	0.83	0.500	(0.250)	0.250	0.250
148	12.33	0.87	0.520	0.249	(0.260)	0.271
149	12.42	0.87	0.520	0.248	(0.260)	0.272
150	12.50	0.87	0.520	0.247	(0.260)	0.273
151	12.58	0.93	0.560	0.245	(0.280)	0.315
152	12.67	0.93	0.560	0.244	(0.280)	0.316
153	12.75	0.93	0.560	0.243	(0.280)	0.317
154	12.83	0.97	0.580	0.242	(0.290)	0.338
155	12.92	0.97	0.580	0.240	(0.290)	0.340
156	13.00	0.97	0.580	0.239	(0.290)	0.341
157	13.08	1.13	0.680	0.238	(0.340)	0.442
158	13.17	1.13	0.680	0.237	(0.340)	0.443
159	13.25	1.13	0.680	0.236	(0.340)	0.444
160	13.33	1.13	0.680	0.234	(0.340)	0.446
161	13.42	1.13	0.680	0.233	(0.340)	0.447
162	13.50	1.13	0.680	0.232	(0.340)	0.448
163	13.58	0.77	0.460	(0.231)	0.230	0.230
164	13.67	0.77	0.460	0.230	(0.230)	0.230
165	13.75	0.77	0.460	0.228	(0.230)	0.232
166	13.83	0.77	0.460	0.227	(0.230)	0.233
167	13.92	0.77	0.460	0.226	(0.230)	0.234
168	14.00	0.77	0.460	0.225	(0.230)	0.235
169	14.08	0.90	0.540	0.224	(0.270)	0.316
170	14.17	0.90	0.540	0.223	(0.270)	0.317
171	14.25	0.90	0.540	0.222	(0.270)	0.318

172	14.33	0.87	0.520	0.220	(0.260)	0.300
173	14.42	0.87	0.520	0.219	(0.260)	0.301
174	14.50	0.87	0.520	0.218	(0.260)	0.302
175	14.58	0.87	0.520	0.217	(0.260)	0.303
176	14.67	0.87	0.520	0.216	(0.260)	0.304
177	14.75	0.87	0.520	0.215	(0.260)	0.305
178	14.83	0.83	0.500	0.214	(0.250)	0.286
179	14.92	0.83	0.500	0.213	(0.250)	0.287
180	15.00	0.83	0.500	0.212	(0.250)	0.288
181	15.08	0.80	0.480	0.210	(0.240)	0.270
182	15.17	0.80	0.480	0.209	(0.240)	0.271
183	15.25	0.80	0.480	0.208	(0.240)	0.272
184	15.33	0.77	0.460	0.207	(0.230)	0.253
185	15.42	0.77	0.460	0.206	(0.230)	0.254
186	15.50	0.77	0.460	0.205	(0.230)	0.255
187	15.58	0.63	0.380	(0.204)	0.190	0.190
188	15.67	0.63	0.380	(0.203)	0.190	0.190
189	15.75	0.63	0.380	(0.202)	0.190	0.190
190	15.83	0.63	0.380	(0.201)	0.190	0.190
191	15.92	0.63	0.380	(0.200)	0.190	0.190
192	16.00	0.63	0.380	(0.199)	0.190	0.190
193	16.08	0.13	0.080	(0.198)	0.040	0.040
194	16.17	0.13	0.080	(0.197)	0.040	0.040
195	16.25	0.13	0.080	(0.196)	0.040	0.040
196	16.33	0.13	0.080	(0.195)	0.040	0.040
197	16.42	0.13	0.080	(0.194)	0.040	0.040
198	16.50	0.13	0.080	(0.193)	0.040	0.040
199	16.58	0.10	0.060	(0.192)	0.030	0.030
200	16.67	0.10	0.060	(0.191)	0.030	0.030
201	16.75	0.10	0.060	(0.190)	0.030	0.030
202	16.83	0.10	0.060	(0.189)	0.030	0.030
203	16.92	0.10	0.060	(0.188)	0.030	0.030
204	17.00	0.10	0.060	(0.187)	0.030	0.030
205	17.08	0.17	0.100	(0.186)	0.050	0.050
206	17.17	0.17	0.100	(0.185)	0.050	0.050
207	17.25	0.17	0.100	(0.184)	0.050	0.050
208	17.33	0.17	0.100	(0.183)	0.050	0.050
209	17.42	0.17	0.100	(0.182)	0.050	0.050
210	17.50	0.17	0.100	(0.182)	0.050	0.050
211	17.58	0.17	0.100	(0.181)	0.050	0.050
212	17.67	0.17	0.100	(0.180)	0.050	0.050
213	17.75	0.17	0.100	(0.179)	0.050	0.050
214	17.83	0.13	0.080	(0.178)	0.040	0.040
215	17.92	0.13	0.080	(0.177)	0.040	0.040
216	18.00	0.13	0.080	(0.176)	0.040	0.040
217	18.08	0.13	0.080	(0.175)	0.040	0.040
218	18.17	0.13	0.080	(0.174)	0.040	0.040
219	18.25	0.13	0.080	(0.174)	0.040	0.040
220	18.33	0.13	0.080	(0.173)	0.040	0.040
221	18.42	0.13	0.080	(0.172)	0.040	0.040
222	18.50	0.13	0.080	(0.171)	0.040	0.040
223	18.58	0.10	0.060	(0.170)	0.030	0.030
224	18.67	0.10	0.060	(0.169)	0.030	0.030
225	18.75	0.10	0.060	(0.169)	0.030	0.030
226	18.83	0.07	0.040	(0.168)	0.020	0.020
227	18.92	0.07	0.040	(0.167)	0.020	0.020
228	19.00	0.07	0.040	(0.166)	0.020	0.020

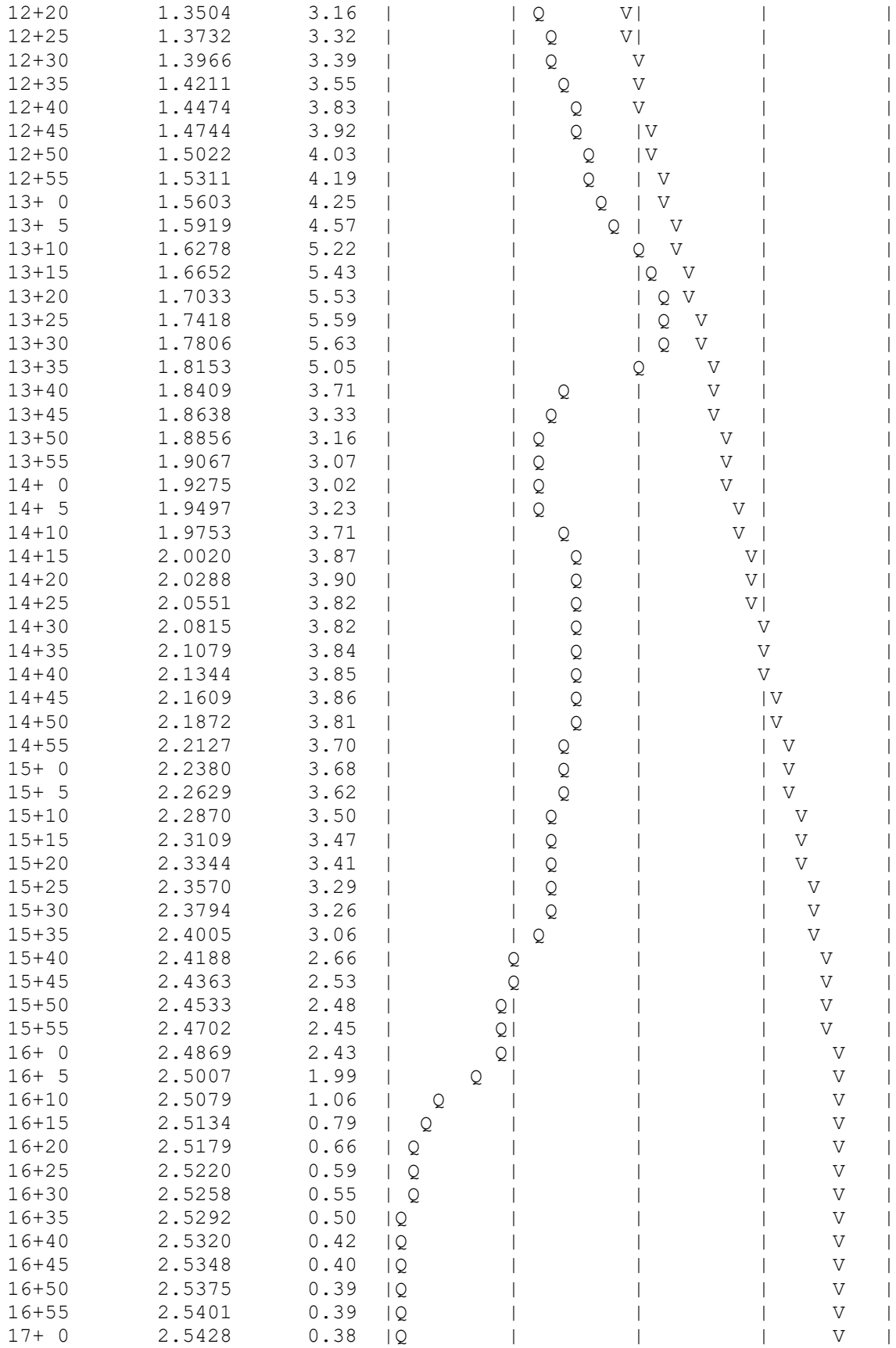
229	19.08	0.10	0.060	(0.165)	0.030	0.030
230	19.17	0.10	0.060	(0.165)	0.030	0.030
231	19.25	0.10	0.060	(0.164)	0.030	0.030
232	19.33	0.13	0.080	(0.163)	0.040	0.040
233	19.42	0.13	0.080	(0.162)	0.040	0.040
234	19.50	0.13	0.080	(0.162)	0.040	0.040
235	19.58	0.10	0.060	(0.161)	0.030	0.030
236	19.67	0.10	0.060	(0.160)	0.030	0.030
237	19.75	0.10	0.060	(0.159)	0.030	0.030
238	19.83	0.07	0.040	(0.159)	0.020	0.020
239	19.92	0.07	0.040	(0.158)	0.020	0.020
240	20.00	0.07	0.040	(0.157)	0.020	0.020
241	20.08	0.10	0.060	(0.157)	0.030	0.030
242	20.17	0.10	0.060	(0.156)	0.030	0.030
243	20.25	0.10	0.060	(0.155)	0.030	0.030
244	20.33	0.10	0.060	(0.155)	0.030	0.030
245	20.42	0.10	0.060	(0.154)	0.030	0.030
246	20.50	0.10	0.060	(0.153)	0.030	0.030
247	20.58	0.10	0.060	(0.153)	0.030	0.030
248	20.67	0.10	0.060	(0.152)	0.030	0.030
249	20.75	0.10	0.060	(0.151)	0.030	0.030
250	20.83	0.07	0.040	(0.151)	0.020	0.020
251	20.92	0.07	0.040	(0.150)	0.020	0.020
252	21.00	0.07	0.040	(0.149)	0.020	0.020
253	21.08	0.10	0.060	(0.149)	0.030	0.030
254	21.17	0.10	0.060	(0.148)	0.030	0.030
255	21.25	0.10	0.060	(0.148)	0.030	0.030
256	21.33	0.07	0.040	(0.147)	0.020	0.020
257	21.42	0.07	0.040	(0.147)	0.020	0.020
258	21.50	0.07	0.040	(0.146)	0.020	0.020
259	21.58	0.10	0.060	(0.146)	0.030	0.030
260	21.67	0.10	0.060	(0.145)	0.030	0.030
261	21.75	0.10	0.060	(0.144)	0.030	0.030
262	21.83	0.07	0.040	(0.144)	0.020	0.020
263	21.92	0.07	0.040	(0.143)	0.020	0.020
264	22.00	0.07	0.040	(0.143)	0.020	0.020
265	22.08	0.10	0.060	(0.143)	0.030	0.030
266	22.17	0.10	0.060	(0.142)	0.030	0.030
267	22.25	0.10	0.060	(0.142)	0.030	0.030
268	22.33	0.07	0.040	(0.141)	0.020	0.020
269	22.42	0.07	0.040	(0.141)	0.020	0.020
270	22.50	0.07	0.040	(0.140)	0.020	0.020
271	22.58	0.07	0.040	(0.140)	0.020	0.020
272	22.67	0.07	0.040	(0.140)	0.020	0.020
273	22.75	0.07	0.040	(0.139)	0.020	0.020
274	22.83	0.07	0.040	(0.139)	0.020	0.020
275	22.92	0.07	0.040	(0.138)	0.020	0.020
276	23.00	0.07	0.040	(0.138)	0.020	0.020
277	23.08	0.07	0.040	(0.138)	0.020	0.020
278	23.17	0.07	0.040	(0.137)	0.020	0.020
279	23.25	0.07	0.040	(0.137)	0.020	0.020
280	23.33	0.07	0.040	(0.137)	0.020	0.020
281	23.42	0.07	0.040	(0.137)	0.020	0.020
282	23.50	0.07	0.040	(0.136)	0.020	0.020
283	23.58	0.07	0.040	(0.136)	0.020	0.020
284	23.67	0.07	0.040	(0.136)	0.020	0.020
285	23.75	0.07	0.040	(0.136)	0.020	0.020

```
286  23.83     0.07      0.040       (  0.136)       0.020        0.020
287  23.92     0.07      0.040       (  0.136)       0.020        0.020
288  24.00     0.07      0.040       (  0.135)       0.020        0.020
            (Loss Rate Not Used)
    Sum =     100.0                                  Sum =    31.6
     Flood volume = Effective rainfall      2.63(In)
      times area      12.6(Ac.)/[(In)/(Ft.)] =       2.8(Ac.Ft)
     Total soil loss =      2.37(In)
     Total soil loss =     2.480(Ac.Ft)
     Total rainfall =      5.00(In)
     Flood volume =      120281.7 Cubic Feet
     Total soil loss =      108039.6 Cubic Feet
     ---------------------------------------------------------------------
      Peak flow rate of this hydrograph =      5.634(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         2.5        5.0        7.5       10.0
 ----------------------------------------------------------------------------
   0+ 5       0.0004      0.06  Q          |          |          |          |
   0+10       0.0016      0.18  Q          |          |          |          |
   0+15       0.0031      0.22  Q          |          |          |          |
   0+20       0.0049      0.26  VQ         |          |          |          |
   0+25       0.0072      0.33  VQ         |          |          |          |
   0+30       0.0097      0.36  VQ         |          |          |          |
   0+35       0.0122      0.37  VQ         |          |          |          |
   0+40       0.0148      0.37  VQ         |          |          |          |
   0+45       0.0174      0.38  VQ         |          |          |          |
   0+50       0.0202      0.41  VQ         |          |          |          |
   0+55       0.0234      0.47  VQ         |          |          |          |
   1+ 0       0.0268      0.49  VQ         |          |          |          |
   1+ 5       0.0300      0.47  VQ         |          |          |          |
   1+10       0.0329      0.41  VQ         |          |          |          |
   1+15       0.0356      0.40  VQ         |          |          |          |
   1+20       0.0383      0.39  VQ         |          |          |          |
   1+25       0.0409      0.39  VQ         |          |          |          |
   1+30       0.0436      0.38  VQ         |          |          |          |
   1+35       0.0462      0.38  VQ         |          |          |          |
   1+40       0.0488      0.38  VQ         |          |          |          |
   1+45       0.0514      0.38  VQ         |          |          |          |
   1+50       0.0543      0.41  VQ         |          |          |          |
   1+55       0.0575      0.47  VQ         |          |          |          |
   2+ 0       0.0609      0.49  VQ         |          |          |          |
   2+ 5       0.0643      0.50  VQ         |          |          |          |
   2+10       0.0677      0.50  V Q        |          |          |          |
   2+15       0.0712      0.50  |VQ        |          |          |          |
   2+20       0.0747      0.51  |VQ        |          |          |          |
   2+25       0.0782      0.51  |VQ        |          |          |          |
   2+30       0.0817      0.51  |VQ        |          |          |          |
   2+35       0.0854      0.54  |VQ        |          |          |          |
   2+40       0.0895      0.60  |VQ        |          |          |          |
   2+45       0.0937      0.62  |VQ        |          |          |          |
```

2+50	0.0980	0.62	|VQ	|	|	|	|
2+55	0.1024	0.63	|VQ	|	|	|	|
3+ 0	0.1067	0.63	|VQ	|	|	|	|
3+ 5	0.1111	0.63	|VQ	|	|	|	|
3+10	0.1154	0.63	|VQ	|	|	|	|
3+15	0.1198	0.63	|VQ	|	|	|	|
3+20	0.1242	0.63	|VQ	|	|	|	|
3+25	0.1286	0.63	|VQ	|	|	|	|
3+30	0.1329	0.63	|VQ	|	|	|	|
3+35	0.1373	0.63	|VQ	|	|	|	|
3+40	0.1417	0.63	| Q	|	|	|	|
3+45	0.1460	0.63	| Q	|	|	|	|
3+50	0.1506	0.66	| Q	|	|	|	|
3+55	0.1556	0.72	| Q	|	|	|	|
4+ 0	0.1607	0.74	| Q	|	|	|	|
4+ 5	0.1659	0.75	| VQ	|	|	|	|
4+10	0.1711	0.76	| VQ	|	|	|	|
4+15	0.1763	0.76	| VQ	|	|	|	|
4+20	0.1817	0.79	| VQ	|	|	|	|
4+25	0.1876	0.85	| VQ	|	|	|	|
4+30	0.1936	0.87	| VQ	|	|	|	|
4+35	0.1996	0.88	| VQ	|	|	|	|
4+40	0.2057	0.88	| VQ	|	|	|	|
4+45	0.2118	0.89	| Q	|	|	|	|
4+50	0.2181	0.92	| Q	|	|	|	|
4+55	0.2248	0.98	| Q	|	|	|	|
5+ 0	0.2317	1.00	| Q	|	|	|	|
5+ 5	0.2382	0.95	| Q	|	|	|	|
5+10	0.2439	0.83	| Q	|	|	|	|
5+15	0.2494	0.80	| Q	|	|	|	|
5+20	0.2550	0.81	| Q	|	|	|	|
5+25	0.2609	0.86	| Q	|	|	|	|
5+30	0.2669	0.87	| Q	|	|	|	|
5+35	0.2732	0.91	| Q	|	|	|	|
5+40	0.2799	0.97	| QV	|	|	|	|
5+45	0.2867	0.99	| QV	|	|	|	|
5+50	0.2936	1.00	| Q	|	|	|	|
5+55	0.3006	1.01	| Q	|	|	|	|
6+ 0	0.3075	1.01	| Q	|	|	|	|
6+ 5	0.3147	1.04	| Q	|	|	|	|
6+10	0.3223	1.10	| Q	|	|	|	|
6+15	0.3301	1.12	| Q	|	|	|	|
6+20	0.3379	1.13	| Q	|	|	|	|
6+25	0.3457	1.14	| QV	|	|	|	|
6+30	0.3535	1.14	| QV	|	|	|	|
6+35	0.3616	1.17	| QV	|	|	|	|
6+40	0.3701	1.23	| QV	|	|	|	|
6+45	0.3787	1.25	| QV	|	|	|	|
6+50	0.3873	1.26	| Q	|	|	|	|
6+55	0.3960	1.26	| Q	|	|	|	|
7+ 0	0.4047	1.27	| Q	|	|	|	|
7+ 5	0.4135	1.27	| Q	|	|	|	|
7+10	0.4222	1.27	| QV	|	|	|	|
7+15	0.4309	1.27	| QV	|	|	|	|
7+20	0.4399	1.30	| QV	|	|	|	|
7+25	0.4492	1.36	| QV	|	|	|	|
7+30	0.4587	1.38	| QV	|	|	|	|

7+35	0.4684	1.41	QV			
7+40	0.4786	1.48	QV			
7+45	0.4890	1.50	QV			
7+50	0.4996	1.54	QV			
7+55	0.5106	1.61	QV			
8+ 0	0.5218	1.63	QV			
8+ 5	0.5335	1.69	QV			
8+10	0.5461	1.82	Q			
8+15	0.5589	1.86	QV			
8+20	0.5719	1.88	QV			
8+25	0.5849	1.89	QV			
8+30	0.5980	1.90	QV			
8+35	0.6112	1.93	QV			
8+40	0.6250	1.99	Q V			
8+45	0.6388	2.01	QV			
8+50	0.6529	2.05	QV			
8+55	0.6675	2.11	QV			
9+ 0	0.6822	2.14	QV			
9+ 5	0.6973	2.20	Q V			
9+10	0.7134	2.33	QV			
9+15	0.7297	2.37	QV			
9+20	0.7464	2.42	QV			
9+25	0.7635	2.49	Q V			
9+30	0.7808	2.51	QV			
9+35	0.7984	2.55	QV			
9+40	0.8164	2.62	QV			
9+45	0.8346	2.64	Q V			
9+50	0.8531	2.68	Q V			
9+55	0.8720	2.75	Q V			
10+ 0	0.8911	2.77	QV			
10+ 5	0.9089	2.58	Q V			
10+10	0.9237	2.15	Q V			
10+15	0.9377	2.03	Q V			
10+20	0.9513	1.97	Q V			
10+25	0.9647	1.94	Q V			
10+30	0.9779	1.92	Q V			
10+35	0.9920	2.05	Q V			
10+40	1.0082	2.35	Q V			
10+45	1.0251	2.44	Q V			
10+50	1.0422	2.49	Q V			
10+55	1.0595	2.51	Q V			
11+ 0	1.0768	2.52	Q V			
11+ 5	1.0941	2.50	Q V			
11+10	1.1109	2.45	Q V			
11+15	1.1277	2.43	Q V			
11+20	1.1443	2.42	Q V			
11+25	1.1610	2.42	Q V			
11+30	1.1776	2.41	Q V			
11+35	1.1938	2.35	Q V			
11+40	1.2091	2.23	Q V			
11+45	1.2243	2.19	Q V			
11+50	1.2394	2.21	Q V			
11+55	1.2550	2.26	Q V			
12+ 0	1.2706	2.27	Q V			
12+ 5	1.2877	2.47	Q V			
12+10	1.3077	2.91	Q V			
12+15	1.3286	3.04	Q V			



17+ 5	2.5458	0.44	Q				V
17+10	2.5497	0.56	Q				V
17+15	2.5538	0.60	Q				V
17+20	2.5580	0.61	Q				V
17+25	2.5623	0.62	Q				V
17+30	2.5666	0.63	Q				V
17+35	2.5710	0.63	Q				V
17+40	2.5753	0.63	Q				V
17+45	2.5797	0.63	Q				V
17+50	2.5839	0.61	Q				V
17+55	2.5876	0.54	Q				V
18+ 0	2.5913	0.53	Q				V
18+ 5	2.5948	0.52	Q				V
18+10	2.5984	0.51	Q				V
18+15	2.6019	0.51	Q				V
18+20	2.6054	0.51	Q				V
18+25	2.6089	0.51	Q				V
18+30	2.6124	0.51	Q				V
18+35	2.6157	0.48	Q				V
18+40	2.6185	0.42	Q				V
18+45	2.6213	0.40	Q				V
18+50	2.6238	0.36	Q				V
18+55	2.6258	0.30	Q				V
19+ 0	2.6277	0.28	Q				V
19+ 5	2.6297	0.29	Q				V
19+10	2.6321	0.35	Q				V
19+15	2.6347	0.36	Q				V
19+20	2.6374	0.40	Q				V
19+25	2.6406	0.47	Q				V
19+30	2.6440	0.49	Q				V
19+35	2.6472	0.47	Q				V
19+40	2.6500	0.41	Q				V
19+45	2.6527	0.40	Q				V
19+50	2.6552	0.36	Q				V
19+55	2.6573	0.30	Q				V
20+ 0	2.6592	0.28	Q				V
20+ 5	2.6612	0.29	Q				V
20+10	2.6636	0.35	Q				V
20+15	2.6661	0.36	Q				V
20+20	2.6687	0.37	Q				V
20+25	2.6712	0.37	Q				V
20+30	2.6738	0.38	Q				V
20+35	2.6765	0.38	Q				V
20+40	2.6791	0.38	Q				V
20+45	2.6817	0.38	Q				V
20+50	2.6841	0.35	Q				V
20+55	2.6861	0.29	Q				V
21+ 0	2.6880	0.27	Q				V
21+ 5	2.6900	0.29	Q				V
21+10	2.6924	0.35	Q				V
21+15	2.6949	0.36	Q				V
21+20	2.6973	0.34	Q				V
21+25	2.6993	0.28	Q				V
21+30	2.7011	0.27	Q				V
21+35	2.7031	0.29	Q				V
21+40	2.7055	0.35	Q				V
21+45	2.7080	0.36	Q				V

21+50	2.7104	0.34	|Q	|	|	|	V|
21+55	2.7124	0.28	|Q	|	|	|	V|
22+ 0	2.7142	0.27	|Q	|	|	|	V|
22+ 5	2.7162	0.29	|Q	|	|	|	V|
22+10	2.7186	0.35	|Q	|	|	|	V|
22+15	2.7211	0.36	|Q	|	|	|	V|
22+20	2.7235	0.34	|Q	|	|	|	V|
22+25	2.7255	0.28	|Q	|	|	|	V|
22+30	2.7273	0.27	|Q	|	|	|	V|
22+35	2.7291	0.26	|Q	|	|	|	V|
22+40	2.7309	0.26	|Q	|	|	|	V|
22+45	2.7327	0.26	|Q	|	|	|	V|
22+50	2.7344	0.25	|Q	|	|	|	V|
22+55	2.7362	0.25	|Q	|	|	|	V|
23+ 0	2.7379	0.25	|Q	|	|	|	V|
23+ 5	2.7397	0.25	|Q	|	|	|	V|
23+10	2.7414	0.25	|Q	|	|	|	V|
23+15	2.7432	0.25	|Q	|	|	|	V|
23+20	2.7449	0.25	|Q	|	|	|	V|
23+25	2.7467	0.25	|Q	|	|	|	V|
23+30	2.7484	0.25	|Q	|	|	|	V|
23+35	2.7502	0.25	|Q	|	|	|	V|
23+40	2.7519	0.25	|Q	|	|	|	V|
23+45	2.7537	0.25	|Q	|	|	|	V|
23+50	2.7554	0.25	|Q	|	|	|	V|
23+55	2.7571	0.25	|Q	|	|	|	V|
24+ 0	2.7589	0.25	|Q	|	|	|	V|
24+ 5	2.7603	0.20	Q	|	|	|	V|
24+10	2.7608	0.07	Q	|	|	|	V|
24+15	2.7610	0.04	Q	|	|	|	V|
24+20	2.7612	0.02	Q	|	|	|	V|
24+25	2.7612	0.01	Q	|	|	|	V|
24+30	2.7613	0.01	Q	|	|	|	V|
24+35	2.7613	0.00	Q	|	|	|	V|

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

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Study date 10/02/24 File: pq6100uh24100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED A
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 13.13(Ac.) = 0.021 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 13.13(Ac.) = 0.021 Sq. Mi.
Length along longest watercourse = 1103.00(Ft.)
Length along longest watercourse measured to centroid = 759.00(Ft.)
Length along longest watercourse = 0.209 Mi.
Length along longest watercourse measured to centroid = 0.144 Mi.
Difference in elevation = 26.26(Ft.)
Slope along watercourse = 125.7052 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.038 Hr.
Lag time = 2.28 Min.
25% of lag time = 0.57 Min.
40% of lag time = 0.91 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
13.13	1.80	23.63

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
13.13	5.00	65.65

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.800(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
13.130	60.80	0.722

Total Area Entered = 13.13(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
60.8	60.8	0.461	0.722	0.162	1.000	0.162
					Sum (F) =	0.162

Area averaged mean soil loss (F) (In/Hr) = 0.162
Minimum soil loss rate ((In/Hr)) = 0.081
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.322

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	219.748	46.617	6.169
2	0.167	439.496	42.013	5.559
3	0.250	659.243	8.048	1.065
4	0.333	878.991	3.322	0.440
		Sum =	100.000 Sum=	13.233

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.040	(0.286)	0.013	0.027
2	0.17	0.07	0.040	(0.285)	0.013	0.027
3	0.25	0.07	0.040	(0.284)	0.013	0.027
4	0.33	0.10	0.060	(0.283)	0.019	0.041
5	0.42	0.10	0.060	(0.282)	0.019	0.041

6	0.50	0.10	0.060	(0.281)	0.019	0.041
7	0.58	0.10	0.060	(0.280)	0.019	0.041
8	0.67	0.10	0.060	(0.279)	0.019	0.041
9	0.75	0.10	0.060	(0.278)	0.019	0.041
10	0.83	0.13	0.080	(0.277)	0.026	0.054
11	0.92	0.13	0.080	(0.275)	0.026	0.054
12	1.00	0.13	0.080	(0.274)	0.026	0.054
13	1.08	0.10	0.060	(0.273)	0.019	0.041
14	1.17	0.10	0.060	(0.272)	0.019	0.041
15	1.25	0.10	0.060	(0.271)	0.019	0.041
16	1.33	0.10	0.060	(0.270)	0.019	0.041
17	1.42	0.10	0.060	(0.269)	0.019	0.041
18	1.50	0.10	0.060	(0.268)	0.019	0.041
19	1.58	0.10	0.060	(0.267)	0.019	0.041
20	1.67	0.10	0.060	(0.266)	0.019	0.041
21	1.75	0.10	0.060	(0.265)	0.019	0.041
22	1.83	0.13	0.080	(0.264)	0.026	0.054
23	1.92	0.13	0.080	(0.263)	0.026	0.054
24	2.00	0.13	0.080	(0.261)	0.026	0.054
25	2.08	0.13	0.080	(0.260)	0.026	0.054
26	2.17	0.13	0.080	(0.259)	0.026	0.054
27	2.25	0.13	0.080	(0.258)	0.026	0.054
28	2.33	0.13	0.080	(0.257)	0.026	0.054
29	2.42	0.13	0.080	(0.256)	0.026	0.054
30	2.50	0.13	0.080	(0.255)	0.026	0.054
31	2.58	0.17	0.100	(0.254)	0.032	0.068
32	2.67	0.17	0.100	(0.253)	0.032	0.068
33	2.75	0.17	0.100	(0.252)	0.032	0.068
34	2.83	0.17	0.100	(0.251)	0.032	0.068
35	2.92	0.17	0.100	(0.250)	0.032	0.068
36	3.00	0.17	0.100	(0.249)	0.032	0.068
37	3.08	0.17	0.100	(0.248)	0.032	0.068
38	3.17	0.17	0.100	(0.247)	0.032	0.068
39	3.25	0.17	0.100	(0.246)	0.032	0.068
40	3.33	0.17	0.100	(0.245)	0.032	0.068
41	3.42	0.17	0.100	(0.244)	0.032	0.068
42	3.50	0.17	0.100	(0.243)	0.032	0.068
43	3.58	0.17	0.100	(0.242)	0.032	0.068
44	3.67	0.17	0.100	(0.241)	0.032	0.068
45	3.75	0.17	0.100	(0.240)	0.032	0.068
46	3.83	0.20	0.120	(0.239)	0.039	0.081
47	3.92	0.20	0.120	(0.238)	0.039	0.081
48	4.00	0.20	0.120	(0.237)	0.039	0.081
49	4.08	0.20	0.120	(0.236)	0.039	0.081
50	4.17	0.20	0.120	(0.235)	0.039	0.081
51	4.25	0.20	0.120	(0.234)	0.039	0.081
52	4.33	0.23	0.140	(0.233)	0.045	0.095
53	4.42	0.23	0.140	(0.232)	0.045	0.095
54	4.50	0.23	0.140	(0.231)	0.045	0.095
55	4.58	0.23	0.140	(0.230)	0.045	0.095
56	4.67	0.23	0.140	(0.229)	0.045	0.095
57	4.75	0.23	0.140	(0.228)	0.045	0.095
58	4.83	0.27	0.160	(0.227)	0.052	0.108
59	4.92	0.27	0.160	(0.226)	0.052	0.108
60	5.00	0.27	0.160	(0.225)	0.052	0.108
61	5.08	0.20	0.120	(0.224)	0.039	0.081
62	5.17	0.20	0.120	(0.223)	0.039	0.081

63	5.25	0.20	0.120	(0.222)	0.039	0.081
64	5.33	0.23	0.140	(0.221)	0.045	0.095
65	5.42	0.23	0.140	(0.220)	0.045	0.095
66	5.50	0.23	0.140	(0.219)	0.045	0.095
67	5.58	0.27	0.160	(0.218)	0.052	0.108
68	5.67	0.27	0.160	(0.217)	0.052	0.108
69	5.75	0.27	0.160	(0.216)	0.052	0.108
70	5.83	0.27	0.160	(0.215)	0.052	0.108
71	5.92	0.27	0.160	(0.214)	0.052	0.108
72	6.00	0.27	0.160	(0.213)	0.052	0.108
73	6.08	0.30	0.180	(0.212)	0.058	0.122
74	6.17	0.30	0.180	(0.211)	0.058	0.122
75	6.25	0.30	0.180	(0.210)	0.058	0.122
76	6.33	0.30	0.180	(0.209)	0.058	0.122
77	6.42	0.30	0.180	(0.209)	0.058	0.122
78	6.50	0.30	0.180	(0.208)	0.058	0.122
79	6.58	0.33	0.200	(0.207)	0.064	0.136
80	6.67	0.33	0.200	(0.206)	0.064	0.136
81	6.75	0.33	0.200	(0.205)	0.064	0.136
82	6.83	0.33	0.200	(0.204)	0.064	0.136
83	6.92	0.33	0.200	(0.203)	0.064	0.136
84	7.00	0.33	0.200	(0.202)	0.064	0.136
85	7.08	0.33	0.200	(0.201)	0.064	0.136
86	7.17	0.33	0.200	(0.200)	0.064	0.136
87	7.25	0.33	0.200	(0.199)	0.064	0.136
88	7.33	0.37	0.220	(0.198)	0.071	0.149
89	7.42	0.37	0.220	(0.197)	0.071	0.149
90	7.50	0.37	0.220	(0.197)	0.071	0.149
91	7.58	0.40	0.240	(0.196)	0.077	0.163
92	7.67	0.40	0.240	(0.195)	0.077	0.163
93	7.75	0.40	0.240	(0.194)	0.077	0.163
94	7.83	0.43	0.260	(0.193)	0.084	0.176
95	7.92	0.43	0.260	(0.192)	0.084	0.176
96	8.00	0.43	0.260	(0.191)	0.084	0.176
97	8.08	0.50	0.300	(0.190)	0.097	0.203
98	8.17	0.50	0.300	(0.189)	0.097	0.203
99	8.25	0.50	0.300	(0.189)	0.097	0.203
100	8.33	0.50	0.300	(0.188)	0.097	0.203
101	8.42	0.50	0.300	(0.187)	0.097	0.203
102	8.50	0.50	0.300	(0.186)	0.097	0.203
103	8.58	0.53	0.320	(0.185)	0.103	0.217
104	8.67	0.53	0.320	(0.184)	0.103	0.217
105	8.75	0.53	0.320	(0.183)	0.103	0.217
106	8.83	0.57	0.340	(0.182)	0.110	0.230
107	8.92	0.57	0.340	(0.182)	0.110	0.230
108	9.00	0.57	0.340	(0.181)	0.110	0.230
109	9.08	0.63	0.380	(0.180)	0.123	0.257
110	9.17	0.63	0.380	(0.179)	0.123	0.257
111	9.25	0.63	0.380	(0.178)	0.123	0.257
112	9.33	0.67	0.400	(0.177)	0.129	0.271
113	9.42	0.67	0.400	(0.176)	0.129	0.271
114	9.50	0.67	0.400	(0.176)	0.129	0.271
115	9.58	0.70	0.420	(0.175)	0.135	0.285
116	9.67	0.70	0.420	(0.174)	0.135	0.285
117	9.75	0.70	0.420	(0.173)	0.135	0.285
118	9.83	0.73	0.440	(0.172)	0.142	0.298
119	9.92	0.73	0.440	(0.171)	0.142	0.298

120	10.00	0.73	0.440	(0.171)	0.142	0.298
121	10.08	0.50	0.300	(0.170)	0.097	0.203
122	10.17	0.50	0.300	(0.169)	0.097	0.203
123	10.25	0.50	0.300	(0.168)	0.097	0.203
124	10.33	0.50	0.300	(0.167)	0.097	0.203
125	10.42	0.50	0.300	(0.167)	0.097	0.203
126	10.50	0.50	0.300	(0.166)	0.097	0.203
127	10.58	0.67	0.400	(0.165)	0.129	0.271
128	10.67	0.67	0.400	(0.164)	0.129	0.271
129	10.75	0.67	0.400	(0.163)	0.129	0.271
130	10.83	0.67	0.400	(0.162)	0.129	0.271
131	10.92	0.67	0.400	(0.162)	0.129	0.271
132	11.00	0.67	0.400	(0.161)	0.129	0.271
133	11.08	0.63	0.380	(0.160)	0.123	0.257
134	11.17	0.63	0.380	(0.159)	0.123	0.257
135	11.25	0.63	0.380	(0.159)	0.123	0.257
136	11.33	0.63	0.380	(0.158)	0.123	0.257
137	11.42	0.63	0.380	(0.157)	0.123	0.257
138	11.50	0.63	0.380	(0.156)	0.123	0.257
139	11.58	0.57	0.340	(0.155)	0.110	0.230
140	11.67	0.57	0.340	(0.155)	0.110	0.230
141	11.75	0.57	0.340	(0.154)	0.110	0.230
142	11.83	0.60	0.360	(0.153)	0.116	0.244
143	11.92	0.60	0.360	(0.152)	0.116	0.244
144	12.00	0.60	0.360	(0.152)	0.116	0.244
145	12.08	0.83	0.500	0.151	(0.161)	0.349
146	12.17	0.83	0.500	0.150	(0.161)	0.350
147	12.25	0.83	0.500	0.149	(0.161)	0.351
148	12.33	0.87	0.520	0.149	(0.168)	0.371
149	12.42	0.87	0.520	0.148	(0.168)	0.372
150	12.50	0.87	0.520	0.147	(0.168)	0.373
151	12.58	0.93	0.560	0.146	(0.181)	0.414
152	12.67	0.93	0.560	0.146	(0.181)	0.414
153	12.75	0.93	0.560	0.145	(0.181)	0.415
154	12.83	0.97	0.580	0.144	(0.187)	0.436
155	12.92	0.97	0.580	0.143	(0.187)	0.437
156	13.00	0.97	0.580	0.143	(0.187)	0.437
157	13.08	1.13	0.680	0.142	(0.219)	0.538
158	13.17	1.13	0.680	0.141	(0.219)	0.539
159	13.25	1.13	0.680	0.141	(0.219)	0.539
160	13.33	1.13	0.680	0.140	(0.219)	0.540
161	13.42	1.13	0.680	0.139	(0.219)	0.541
162	13.50	1.13	0.680	0.138	(0.219)	0.542
163	13.58	0.77	0.460	0.138	(0.148)	0.322
164	13.67	0.77	0.460	0.137	(0.148)	0.323
165	13.75	0.77	0.460	0.136	(0.148)	0.324
166	13.83	0.77	0.460	0.136	(0.148)	0.324
167	13.92	0.77	0.460	0.135	(0.148)	0.325
168	14.00	0.77	0.460	0.134	(0.148)	0.326
169	14.08	0.90	0.540	0.134	(0.174)	0.406
170	14.17	0.90	0.540	0.133	(0.174)	0.407
171	14.25	0.90	0.540	0.132	(0.174)	0.408
172	14.33	0.87	0.520	0.131	(0.168)	0.389
173	14.42	0.87	0.520	0.131	(0.168)	0.389
174	14.50	0.87	0.520	0.130	(0.168)	0.390
175	14.58	0.87	0.520	0.129	(0.168)	0.391
176	14.67	0.87	0.520	0.129	(0.168)	0.391

177	14.75	0.87	0.520	0.128	(0.168)	0.392
178	14.83	0.83	0.500	0.127	(0.161)	0.372
179	14.92	0.83	0.500	0.127	(0.161)	0.373
180	15.00	0.83	0.500	0.126	(0.161)	0.374
181	15.08	0.80	0.480	0.126	(0.155)	0.354
182	15.17	0.80	0.480	0.125	(0.155)	0.355
183	15.25	0.80	0.480	0.124	(0.155)	0.356
184	15.33	0.77	0.460	0.124	(0.148)	0.336
185	15.42	0.77	0.460	0.123	(0.148)	0.337
186	15.50	0.77	0.460	0.122	(0.148)	0.338
187	15.58	0.63	0.380	0.122	(0.123)	0.258
188	15.67	0.63	0.380	0.121	(0.123)	0.259
189	15.75	0.63	0.380	0.120	(0.123)	0.260
190	15.83	0.63	0.380	0.120	(0.123)	0.260
191	15.92	0.63	0.380	0.119	(0.123)	0.261
192	16.00	0.63	0.380	0.119	(0.123)	0.261
193	16.08	0.13	0.080	(0.118)	0.026	0.054
194	16.17	0.13	0.080	(0.117)	0.026	0.054
195	16.25	0.13	0.080	(0.117)	0.026	0.054
196	16.33	0.13	0.080	(0.116)	0.026	0.054
197	16.42	0.13	0.080	(0.116)	0.026	0.054
198	16.50	0.13	0.080	(0.115)	0.026	0.054
199	16.58	0.10	0.060	(0.114)	0.019	0.041
200	16.67	0.10	0.060	(0.114)	0.019	0.041
201	16.75	0.10	0.060	(0.113)	0.019	0.041
202	16.83	0.10	0.060	(0.113)	0.019	0.041
203	16.92	0.10	0.060	(0.112)	0.019	0.041
204	17.00	0.10	0.060	(0.112)	0.019	0.041
205	17.08	0.17	0.100	(0.111)	0.032	0.068
206	17.17	0.17	0.100	(0.110)	0.032	0.068
207	17.25	0.17	0.100	(0.110)	0.032	0.068
208	17.33	0.17	0.100	(0.109)	0.032	0.068
209	17.42	0.17	0.100	(0.109)	0.032	0.068
210	17.50	0.17	0.100	(0.108)	0.032	0.068
211	17.58	0.17	0.100	(0.108)	0.032	0.068
212	17.67	0.17	0.100	(0.107)	0.032	0.068
213	17.75	0.17	0.100	(0.107)	0.032	0.068
214	17.83	0.13	0.080	(0.106)	0.026	0.054
215	17.92	0.13	0.080	(0.106)	0.026	0.054
216	18.00	0.13	0.080	(0.105)	0.026	0.054
217	18.08	0.13	0.080	(0.105)	0.026	0.054
218	18.17	0.13	0.080	(0.104)	0.026	0.054
219	18.25	0.13	0.080	(0.104)	0.026	0.054
220	18.33	0.13	0.080	(0.103)	0.026	0.054
221	18.42	0.13	0.080	(0.103)	0.026	0.054
222	18.50	0.13	0.080	(0.102)	0.026	0.054
223	18.58	0.10	0.060	(0.102)	0.019	0.041
224	18.67	0.10	0.060	(0.101)	0.019	0.041
225	18.75	0.10	0.060	(0.101)	0.019	0.041
226	18.83	0.07	0.040	(0.100)	0.013	0.027
227	18.92	0.07	0.040	(0.100)	0.013	0.027
228	19.00	0.07	0.040	(0.099)	0.013	0.027
229	19.08	0.10	0.060	(0.099)	0.019	0.041
230	19.17	0.10	0.060	(0.098)	0.019	0.041
231	19.25	0.10	0.060	(0.098)	0.019	0.041
232	19.33	0.13	0.080	(0.097)	0.026	0.054
233	19.42	0.13	0.080	(0.097)	0.026	0.054

234	19.50	0.13	0.080	(0.096)	0.026	0.054
235	19.58	0.10	0.060	(0.096)	0.019	0.041
236	19.67	0.10	0.060	(0.096)	0.019	0.041
237	19.75	0.10	0.060	(0.095)	0.019	0.041
238	19.83	0.07	0.040	(0.095)	0.013	0.027
239	19.92	0.07	0.040	(0.094)	0.013	0.027
240	20.00	0.07	0.040	(0.094)	0.013	0.027
241	20.08	0.10	0.060	(0.093)	0.019	0.041
242	20.17	0.10	0.060	(0.093)	0.019	0.041
243	20.25	0.10	0.060	(0.093)	0.019	0.041
244	20.33	0.10	0.060	(0.092)	0.019	0.041
245	20.42	0.10	0.060	(0.092)	0.019	0.041
246	20.50	0.10	0.060	(0.091)	0.019	0.041
247	20.58	0.10	0.060	(0.091)	0.019	0.041
248	20.67	0.10	0.060	(0.091)	0.019	0.041
249	20.75	0.10	0.060	(0.090)	0.019	0.041
250	20.83	0.07	0.040	(0.090)	0.013	0.027
251	20.92	0.07	0.040	(0.090)	0.013	0.027
252	21.00	0.07	0.040	(0.089)	0.013	0.027
253	21.08	0.10	0.060	(0.089)	0.019	0.041
254	21.17	0.10	0.060	(0.088)	0.019	0.041
255	21.25	0.10	0.060	(0.088)	0.019	0.041
256	21.33	0.07	0.040	(0.088)	0.013	0.027
257	21.42	0.07	0.040	(0.087)	0.013	0.027
258	21.50	0.07	0.040	(0.087)	0.013	0.027
259	21.58	0.10	0.060	(0.087)	0.019	0.041
260	21.67	0.10	0.060	(0.087)	0.019	0.041
261	21.75	0.10	0.060	(0.086)	0.019	0.041
262	21.83	0.07	0.040	(0.086)	0.013	0.027
263	21.92	0.07	0.040	(0.086)	0.013	0.027
264	22.00	0.07	0.040	(0.085)	0.013	0.027
265	22.08	0.10	0.060	(0.085)	0.019	0.041
266	22.17	0.10	0.060	(0.085)	0.019	0.041
267	22.25	0.10	0.060	(0.084)	0.019	0.041
268	22.33	0.07	0.040	(0.084)	0.013	0.027
269	22.42	0.07	0.040	(0.084)	0.013	0.027
270	22.50	0.07	0.040	(0.084)	0.013	0.027
271	22.58	0.07	0.040	(0.083)	0.013	0.027
272	22.67	0.07	0.040	(0.083)	0.013	0.027
273	22.75	0.07	0.040	(0.083)	0.013	0.027
274	22.83	0.07	0.040	(0.083)	0.013	0.027
275	22.92	0.07	0.040	(0.083)	0.013	0.027
276	23.00	0.07	0.040	(0.082)	0.013	0.027
277	23.08	0.07	0.040	(0.082)	0.013	0.027
278	23.17	0.07	0.040	(0.082)	0.013	0.027
279	23.25	0.07	0.040	(0.082)	0.013	0.027
280	23.33	0.07	0.040	(0.082)	0.013	0.027
281	23.42	0.07	0.040	(0.082)	0.013	0.027
282	23.50	0.07	0.040	(0.081)	0.013	0.027
283	23.58	0.07	0.040	(0.081)	0.013	0.027
284	23.67	0.07	0.040	(0.081)	0.013	0.027
285	23.75	0.07	0.040	(0.081)	0.013	0.027
286	23.83	0.07	0.040	(0.081)	0.013	0.027
287	23.92	0.07	0.040	(0.081)	0.013	0.027
288	24.00	0.07	0.040	(0.081)	0.013	0.027
		(Loss Rate Not Used)				
	Sum =	100.0			Sum =	42.2

Flood volume = Effective rainfall 3.51(In)
times area 13.1(Ac.)/[(In)/(Ft.)] = 3.8(Ac.Ft)
Total soil loss = 1.49(In)
Total soil loss = 1.626(Ac.Ft)
Total rainfall = 5.00(In)
Flood volume = 167472.6 Cubic Feet
Total soil loss = 70830.8 Cubic Feet

Peak flow rate of this hydrograph = 7.164(CFS)

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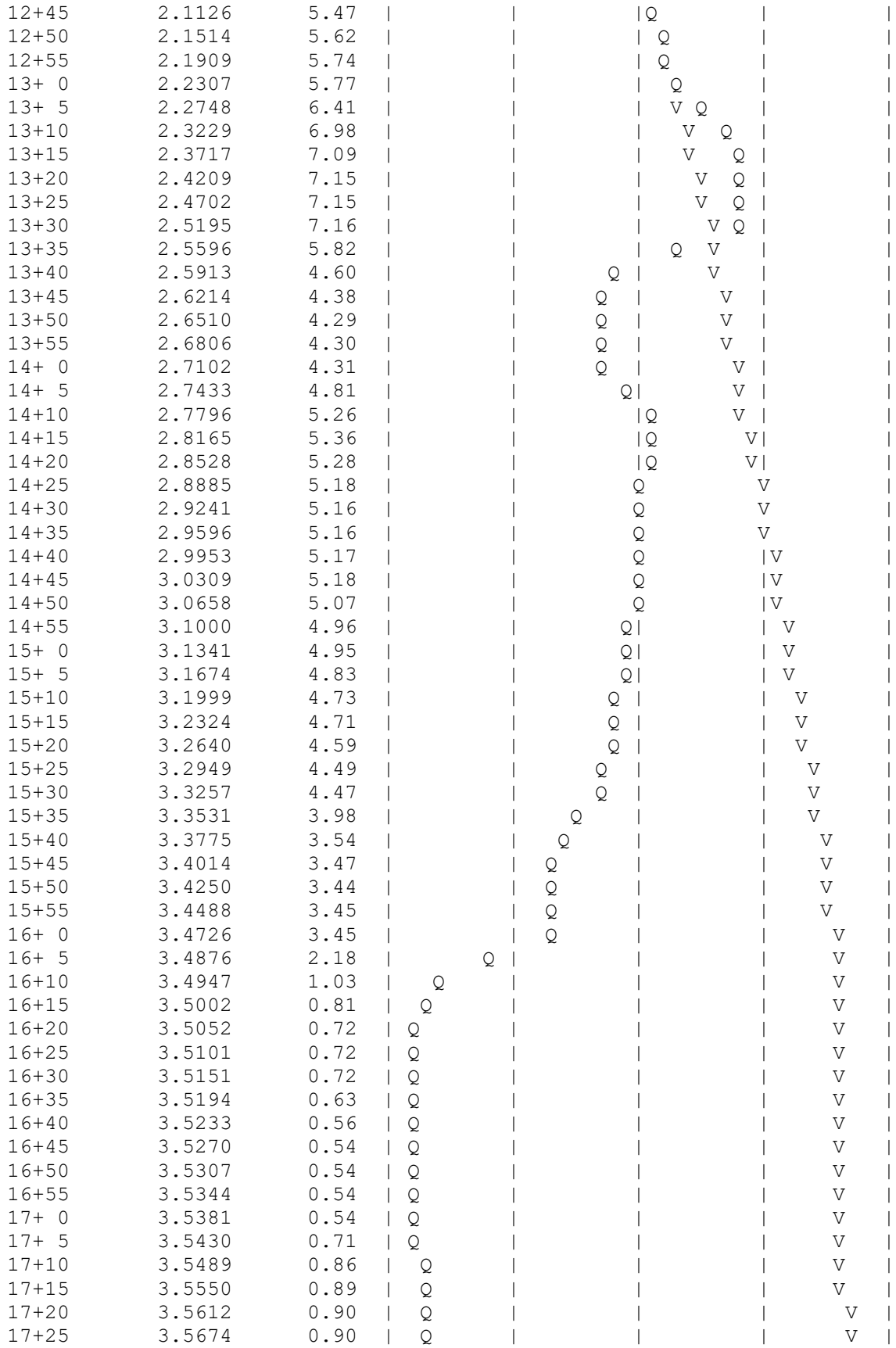
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0012	0.17	Q				
0+10	0.0033	0.32	VQ				
0+15	0.0057	0.35	VQ				
0+20	0.0088	0.44	VQ				
0+25	0.0123	0.52	V Q				
0+30	0.0160	0.53	V Q				
0+35	0.0197	0.54	V Q				
0+40	0.0234	0.54	V Q				
0+45	0.0271	0.54	V Q				
0+50	0.0314	0.62	V Q				
0+55	0.0362	0.70	V Q				
1+ 0	0.0411	0.71	V Q				
1+ 5	0.0455	0.63	V Q				
1+10	0.0493	0.56	V Q				
1+15	0.0531	0.54	V Q				
1+20	0.0568	0.54	V Q				
1+25	0.0605	0.54	V Q				
1+30	0.0642	0.54	V Q				
1+35	0.0679	0.54	V Q				
1+40	0.0716	0.54	V Q				
1+45	0.0753	0.54	V Q				
1+50	0.0796	0.62	V Q				
1+55	0.0844	0.70	V Q				
2+ 0	0.0893	0.71	V Q				
2+ 5	0.0943	0.72	V Q				
2+10	0.0992	0.72	|VQ				
2+15	0.1041	0.72	|VQ				
2+20	0.1091	0.72	|VQ				
2+25	0.1140	0.72	|VQ				
2+30	0.1190	0.72	|VQ				
2+35	0.1245	0.80	|V Q				
2+40	0.1305	0.88	|V Q				
2+45	0.1367	0.89	|V Q				
2+50	0.1428	0.90	|V Q				
2+55	0.1490	0.90	|V Q				
3+ 0	0.1552	0.90	|V Q				
3+ 5	0.1614	0.90	|V Q				
3+10	0.1675	0.90	|V Q				

3+15	0.1737	0.90	V Q			
3+20	0.1799	0.90	V Q			
3+25	0.1861	0.90	V Q			
3+30	0.1923	0.90	VQ			
3+35	0.1984	0.90	VQ			
3+40	0.2046	0.90	VQ			
3+45	0.2108	0.90	VQ			
3+50	0.2176	0.98	VQ			
3+55	0.2248	1.06	V Q			
4+ 0	0.2322	1.07	V Q			
4+ 5	0.2396	1.08	V Q			
4+10	0.2470	1.08	V Q			
4+15	0.2544	1.08	V Q			
4+20	0.2624	1.16	V Q			
4+25	0.2709	1.24	V Q			
4+30	0.2795	1.25	V Q			
4+35	0.2882	1.26	V Q			
4+40	0.2968	1.26	V Q			
4+45	0.3055	1.26	V Q			
4+50	0.3147	1.34	V Q			
4+55	0.3245	1.41	V Q			
5+ 0	0.3343	1.43	V Q			
5+ 5	0.3430	1.27	V Q			
5+10	0.3507	1.12	VQ			
5+15	0.3582	1.09	VQ			
5+20	0.3662	1.16	VQ			
5+25	0.3747	1.24	VQ			
5+30	0.3833	1.25	VQ			
5+35	0.3926	1.34	VQ			
5+40	0.4023	1.41	VQ			
5+45	0.4122	1.43	VQ			
5+50	0.4220	1.44	VQ			
5+55	0.4319	1.44	VQ			
6+ 0	0.4418	1.44	VQ			
6+ 5	0.4523	1.52	V Q			
6+10	0.4633	1.59	V Q			
6+15	0.4743	1.61	V Q			
6+20	0.4855	1.61	VQ			
6+25	0.4966	1.61	VQ			
6+30	0.5077	1.61	VQ			
6+35	0.5194	1.70	VQ			
6+40	0.5316	1.77	V Q			
6+45	0.5439	1.79	V Q			
6+50	0.5563	1.79	V Q			
6+55	0.5686	1.79	V Q			
7+ 0	0.5810	1.79	VQ			
7+ 5	0.5933	1.79	VQ			
7+10	0.6057	1.79	VQ			
7+15	0.6181	1.79	VQ			
7+20	0.6310	1.88	VQ			
7+25	0.6444	1.95	VQ			
7+30	0.6580	1.97	VQ			
7+35	0.6722	2.06	V Q			
7+40	0.6869	2.13	VQ			
7+45	0.7016	2.15	VQ			
7+50	0.7170	2.24	VQ			
7+55	0.7330	2.31	V Q			

8+ 0	0.7490	2.33	V Q|			
8+ 5	0.7662	2.50	V Q|			
8+10	0.7845	2.65	V Q			
8+15	0.8029	2.68	V Q			
8+20	0.8214	2.69	V Q			
8+25	0.8400	2.69	V Q			
8+30	0.8585	2.69	V Q			
8+35	0.8776	2.77	V|Q			
8+40	0.8973	2.85	V|Q			
8+45	0.9170	2.86	V|Q			
8+50	0.9373	2.95	V|Q			
8+55	0.9582	3.03	V| Q			
9+ 0	0.9792	3.04	V Q			
9+ 5	1.0013	3.22	V Q			
9+10	1.0245	3.37	V Q			
9+15	1.0479	3.40	V Q			
9+20	1.0720	3.49	|V Q			
9+25	1.0965	3.57	|V Q			
9+30	1.1212	3.58	|V Q			
9+35	1.1465	3.67	|V Q			
9+40	1.1723	3.75	| V Q			
9+45	1.1982	3.76	| V Q			
9+50	1.2247	3.85	| V Q			
9+55	1.2518	3.93	| V Q			
10+ 0	1.2789	3.94	| V Q			
10+ 5	1.3021	3.36	| Q			
10+10	1.3216	2.83	|Q V			
10+15	1.3404	2.73	Q V			
10+20	1.3590	2.69	Q V			
10+25	1.3775	2.69	Q V			
10+30	1.3960	2.69	Q V			
10+35	1.4174	3.11	| Q V			
10+40	1.4414	3.49	| QV			
10+45	1.4660	3.56	| QV			
10+50	1.4907	3.59	| QV			
10+55	1.5154	3.59	| QV			
11+ 0	1.5401	3.59	| Q V			
11+ 5	1.5642	3.50	| Q V			
11+10	1.5878	3.43	| Q V			
11+15	1.6114	3.41	| Q V			
11+20	1.6348	3.41	| Q V			
11+25	1.6583	3.41	| Q V			
11+30	1.6818	3.41	| Q V			
11+35	1.7041	3.24	| Q V			
11+40	1.7254	3.09	| Q V			
11+45	1.7465	3.06	| Q V			
11+50	1.7681	3.13	| Q V			
11+55	1.7902	3.21	| Q V			
12+ 0	1.8124	3.22	| Q V			
12+ 5	1.8391	3.88	| Q V|			
12+10	1.8699	4.47	| Q V|			
12+15	1.9015	4.59	| QV|			
12+20	1.9343	4.77	| QV			
12+25	1.9680	4.89	| QV			
12+30	2.0019	4.92	| QV			
12+35	2.0376	5.19	| QV			
12+40	2.0750	5.42	| |Q			



17+30	3.5735	0.90	| Q	|	|	|	V |
17+35	3.5797	0.90	| Q	|	|	|	V |
17+40	3.5859	0.90	| Q	|	|	|	V |
17+45	3.5921	0.90	| Q	|	|	|	V |
17+50	3.5977	0.81	| Q	|	|	|	V |
17+55	3.6028	0.74	| Q	|	|	|	V |
18+ 0	3.6077	0.72	| Q	|	|	|	V |
18+ 5	3.6127	0.72	| Q	|	|	|	V |
18+10	3.6176	0.72	| Q	|	|	|	V |
18+15	3.6226	0.72	| Q	|	|	|	V |
18+20	3.6275	0.72	| Q	|	|	|	V |
18+25	3.6325	0.72	| Q	|	|	|	V |
18+30	3.6374	0.72	| Q	|	|	|	V |
18+35	3.6418	0.63	| Q	|	|	|	V |
18+40	3.6456	0.56	| Q	|	|	|	V |
18+45	3.6494	0.54	| Q	|	|	|	V |
18+50	3.6525	0.45	|Q	|	|	|	V |
18+55	3.6551	0.38	|Q	|	|	|	V |
19+ 0	3.6576	0.36	|Q	|	|	|	V |
19+ 5	3.6607	0.44	|Q	|	|	|	V |
19+10	3.6642	0.52	| Q	|	|	|	V |
19+15	3.6679	0.53	| Q	|	|	|	V |
19+20	3.6722	0.62	| Q	|	|	|	V |
19+25	3.6770	0.70	| Q	|	|	|	V |
19+30	3.6819	0.71	| Q	|	|	|	V |
19+35	3.6862	0.63	| Q	|	|	|	V |
19+40	3.6901	0.56	| Q	|	|	|	V |
19+45	3.6938	0.54	| Q	|	|	|	V |
19+50	3.6970	0.45	|Q	|	|	|	V |
19+55	3.6996	0.38	|Q	|	|	|	V |
20+ 0	3.7021	0.36	|Q	|	|	|	V |
20+ 5	3.7051	0.44	|Q	|	|	|	V |
20+10	3.7087	0.52	| Q	|	|	|	V |
20+15	3.7124	0.53	| Q	|	|	|	V |
20+20	3.7161	0.54	| Q	|	|	|	V |
20+25	3.7198	0.54	| Q	|	|	|	V |
20+30	3.7235	0.54	| Q	|	|	|	V |
20+35	3.7272	0.54	| Q	|	|	|	V |
20+40	3.7309	0.54	| Q	|	|	|	V |
20+45	3.7346	0.54	| Q	|	|	|	V |
20+50	3.7377	0.45	|Q	|	|	|	V |
20+55	3.7404	0.38	|Q	|	|	|	V |
21+ 0	3.7429	0.36	|Q	|	|	|	V |
21+ 5	3.7459	0.44	|Q	|	|	|	V |
21+10	3.7495	0.52	| Q	|	|	|	V|
21+15	3.7532	0.53	| Q	|	|	|	V|
21+20	3.7563	0.45	|Q	|	|	|	V|
21+25	3.7589	0.38	|Q	|	|	|	V|
21+30	3.7614	0.36	|Q	|	|	|	V|
21+35	3.7645	0.44	|Q	|	|	|	V|
21+40	3.7680	0.52	| Q	|	|	|	V|
21+45	3.7717	0.53	| Q	|	|	|	V|
21+50	3.7748	0.45	|Q	|	|	|	V|
21+55	3.7774	0.38	|Q	|	|	|	V|
22+ 0	3.7799	0.36	|Q	|	|	|	V|
22+ 5	3.7830	0.44	|Q	|	|	|	V|
22+10	3.7866	0.52	| Q	|	|	|	V|

22+15	3.7902	0.53	| Q	|	|	|	V|
22+20	3.7934	0.45	|Q	|	|	|	V|
22+25	3.7960	0.38	|Q	|	|	|	V|
22+30	3.7985	0.36	|Q	|	|	|	V|
22+35	3.8009	0.36	|Q	|	|	|	V|
22+40	3.8034	0.36	|Q	|	|	|	V|
22+45	3.8059	0.36	|Q	|	|	|	V|
22+50	3.8084	0.36	|Q	|	|	|	V|
22+55	3.8108	0.36	|Q	|	|	|	V|
23+ 0	3.8133	0.36	|Q	|	|	|	V|
23+ 5	3.8158	0.36	|Q	|	|	|	V|
23+10	3.8182	0.36	|Q	|	|	|	V|
23+15	3.8207	0.36	|Q	|	|	|	V|
23+20	3.8232	0.36	|Q	|	|	|	V|
23+25	3.8257	0.36	|Q	|	|	|	V|
23+30	3.8281	0.36	|Q	|	|	|	V|
23+35	3.8306	0.36	|Q	|	|	|	V|
23+40	3.8331	0.36	|Q	|	|	|	V|
23+45	3.8355	0.36	|Q	|	|	|	V|
23+50	3.8380	0.36	|Q	|	|	|	V|
23+55	3.8405	0.36	|Q	|	|	|	V|
24+ 0	3.8430	0.36	|Q	|	|	|	V|
24+ 5	3.8443	0.19	Q	|	|	|	V|
24+10	3.8446	0.04	Q	|	|	|	V|
24+15	3.8446	0.01	Q	|	|	|	V

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

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Study date 10/02/24 File: qp100uhb24100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED B
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 12.68(Ac.) = 0.020 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 12.68(Ac.) = 0.020 Sq. Mi.
Length along longest watercourse = 818.00(Ft.)
Length along longest watercourse measured to centroid = 475.00(Ft.)
Length along longest watercourse = 0.155 Mi.
Length along longest watercourse measured to centroid = 0.090 Mi.
Difference in elevation = 25.60(Ft.)
Slope along watercourse = 165.2421 Ft./Mi.
Average Manning's 'N' = 0.016
Lag time = 0.028 Hr.
Lag time = 1.68 Min.
25% of lag time = 0.42 Min.
40% of lag time = 0.67 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
12.68	1.80	22.82

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
12.68	5.00	63.40

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.800(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
12.680	57.60	0.819

Total Area Entered = 12.68(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
57.6	57.6	0.494	0.819	0.130	1.000	0.130
					Sum (F) =	0.130

Area averaged mean soil loss (F) (In/Hr) = 0.130
Minimum soil loss rate ((In/Hr)) = 0.065
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.245

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	297.946	56.468	7.216
2	0.167	595.892	37.242	4.759
3	0.250	893.838	6.290	0.804
			Sum = 100.000	Sum= 12.779

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.040	(0.230)	0.010	0.030
2	0.17	0.07	0.040	(0.230)	0.010	0.030
3	0.25	0.07	0.040	(0.229)	0.010	0.030
4	0.33	0.10	0.060	(0.228)	0.015	0.045
5	0.42	0.10	0.060	(0.227)	0.015	0.045
6	0.50	0.10	0.060	(0.226)	0.015	0.045

7	0.58	0.10	0.060	(0.225)	0.015	0.045
8	0.67	0.10	0.060	(0.224)	0.015	0.045
9	0.75	0.10	0.060	(0.223)	0.015	0.045
10	0.83	0.13	0.080	(0.222)	0.020	0.060
11	0.92	0.13	0.080	(0.222)	0.020	0.060
12	1.00	0.13	0.080	(0.221)	0.020	0.060
13	1.08	0.10	0.060	(0.220)	0.015	0.045
14	1.17	0.10	0.060	(0.219)	0.015	0.045
15	1.25	0.10	0.060	(0.218)	0.015	0.045
16	1.33	0.10	0.060	(0.217)	0.015	0.045
17	1.42	0.10	0.060	(0.216)	0.015	0.045
18	1.50	0.10	0.060	(0.216)	0.015	0.045
19	1.58	0.10	0.060	(0.215)	0.015	0.045
20	1.67	0.10	0.060	(0.214)	0.015	0.045
21	1.75	0.10	0.060	(0.213)	0.015	0.045
22	1.83	0.13	0.080	(0.212)	0.020	0.060
23	1.92	0.13	0.080	(0.211)	0.020	0.060
24	2.00	0.13	0.080	(0.210)	0.020	0.060
25	2.08	0.13	0.080	(0.210)	0.020	0.060
26	2.17	0.13	0.080	(0.209)	0.020	0.060
27	2.25	0.13	0.080	(0.208)	0.020	0.060
28	2.33	0.13	0.080	(0.207)	0.020	0.060
29	2.42	0.13	0.080	(0.206)	0.020	0.060
30	2.50	0.13	0.080	(0.205)	0.020	0.060
31	2.58	0.17	0.100	(0.204)	0.024	0.076
32	2.67	0.17	0.100	(0.204)	0.024	0.076
33	2.75	0.17	0.100	(0.203)	0.024	0.076
34	2.83	0.17	0.100	(0.202)	0.024	0.076
35	2.92	0.17	0.100	(0.201)	0.024	0.076
36	3.00	0.17	0.100	(0.200)	0.024	0.076
37	3.08	0.17	0.100	(0.199)	0.024	0.076
38	3.17	0.17	0.100	(0.199)	0.024	0.076
39	3.25	0.17	0.100	(0.198)	0.024	0.076
40	3.33	0.17	0.100	(0.197)	0.024	0.076
41	3.42	0.17	0.100	(0.196)	0.024	0.076
42	3.50	0.17	0.100	(0.195)	0.024	0.076
43	3.58	0.17	0.100	(0.195)	0.024	0.076
44	3.67	0.17	0.100	(0.194)	0.024	0.076
45	3.75	0.17	0.100	(0.193)	0.024	0.076
46	3.83	0.20	0.120	(0.192)	0.029	0.091
47	3.92	0.20	0.120	(0.191)	0.029	0.091
48	4.00	0.20	0.120	(0.190)	0.029	0.091
49	4.08	0.20	0.120	(0.190)	0.029	0.091
50	4.17	0.20	0.120	(0.189)	0.029	0.091
51	4.25	0.20	0.120	(0.188)	0.029	0.091
52	4.33	0.23	0.140	(0.187)	0.034	0.106
53	4.42	0.23	0.140	(0.186)	0.034	0.106
54	4.50	0.23	0.140	(0.186)	0.034	0.106
55	4.58	0.23	0.140	(0.185)	0.034	0.106
56	4.67	0.23	0.140	(0.184)	0.034	0.106
57	4.75	0.23	0.140	(0.183)	0.034	0.106
58	4.83	0.27	0.160	(0.182)	0.039	0.121
59	4.92	0.27	0.160	(0.182)	0.039	0.121
60	5.00	0.27	0.160	(0.181)	0.039	0.121
61	5.08	0.20	0.120	(0.180)	0.029	0.091
62	5.17	0.20	0.120	(0.179)	0.029	0.091
63	5.25	0.20	0.120	(0.179)	0.029	0.091

64	5.33	0.23	0.140	(0.178)	0.034	0.106
65	5.42	0.23	0.140	(0.177)	0.034	0.106
66	5.50	0.23	0.140	(0.176)	0.034	0.106
67	5.58	0.27	0.160	(0.175)	0.039	0.121
68	5.67	0.27	0.160	(0.175)	0.039	0.121
69	5.75	0.27	0.160	(0.174)	0.039	0.121
70	5.83	0.27	0.160	(0.173)	0.039	0.121
71	5.92	0.27	0.160	(0.172)	0.039	0.121
72	6.00	0.27	0.160	(0.172)	0.039	0.121
73	6.08	0.30	0.180	(0.171)	0.044	0.136
74	6.17	0.30	0.180	(0.170)	0.044	0.136
75	6.25	0.30	0.180	(0.169)	0.044	0.136
76	6.33	0.30	0.180	(0.169)	0.044	0.136
77	6.42	0.30	0.180	(0.168)	0.044	0.136
78	6.50	0.30	0.180	(0.167)	0.044	0.136
79	6.58	0.33	0.200	(0.166)	0.049	0.151
80	6.67	0.33	0.200	(0.166)	0.049	0.151
81	6.75	0.33	0.200	(0.165)	0.049	0.151
82	6.83	0.33	0.200	(0.164)	0.049	0.151
83	6.92	0.33	0.200	(0.163)	0.049	0.151
84	7.00	0.33	0.200	(0.163)	0.049	0.151
85	7.08	0.33	0.200	(0.162)	0.049	0.151
86	7.17	0.33	0.200	(0.161)	0.049	0.151
87	7.25	0.33	0.200	(0.160)	0.049	0.151
88	7.33	0.37	0.220	(0.160)	0.054	0.166
89	7.42	0.37	0.220	(0.159)	0.054	0.166
90	7.50	0.37	0.220	(0.158)	0.054	0.166
91	7.58	0.40	0.240	(0.157)	0.059	0.181
92	7.67	0.40	0.240	(0.157)	0.059	0.181
93	7.75	0.40	0.240	(0.156)	0.059	0.181
94	7.83	0.43	0.260	(0.155)	0.064	0.196
95	7.92	0.43	0.260	(0.155)	0.064	0.196
96	8.00	0.43	0.260	(0.154)	0.064	0.196
97	8.08	0.50	0.300	(0.153)	0.073	0.227
98	8.17	0.50	0.300	(0.152)	0.073	0.227
99	8.25	0.50	0.300	(0.152)	0.073	0.227
100	8.33	0.50	0.300	(0.151)	0.073	0.227
101	8.42	0.50	0.300	(0.150)	0.073	0.227
102	8.50	0.50	0.300	(0.150)	0.073	0.227
103	8.58	0.53	0.320	(0.149)	0.078	0.242
104	8.67	0.53	0.320	(0.148)	0.078	0.242
105	8.75	0.53	0.320	(0.147)	0.078	0.242
106	8.83	0.57	0.340	(0.147)	0.083	0.257
107	8.92	0.57	0.340	(0.146)	0.083	0.257
108	9.00	0.57	0.340	(0.145)	0.083	0.257
109	9.08	0.63	0.380	(0.145)	0.093	0.287
110	9.17	0.63	0.380	(0.144)	0.093	0.287
111	9.25	0.63	0.380	(0.143)	0.093	0.287
112	9.33	0.67	0.400	(0.143)	0.098	0.302
113	9.42	0.67	0.400	(0.142)	0.098	0.302
114	9.50	0.67	0.400	(0.141)	0.098	0.302
115	9.58	0.70	0.420	(0.141)	0.103	0.317
116	9.67	0.70	0.420	(0.140)	0.103	0.317
117	9.75	0.70	0.420	(0.139)	0.103	0.317
118	9.83	0.73	0.440	(0.139)	0.108	0.332
119	9.92	0.73	0.440	(0.138)	0.108	0.332
120	10.00	0.73	0.440	(0.137)	0.108	0.332

121	10.08	0.50	0.300	(0.137)	0.073	0.227
122	10.17	0.50	0.300	(0.136)	0.073	0.227
123	10.25	0.50	0.300	(0.135)	0.073	0.227
124	10.33	0.50	0.300	(0.135)	0.073	0.227
125	10.42	0.50	0.300	(0.134)	0.073	0.227
126	10.50	0.50	0.300	(0.133)	0.073	0.227
127	10.58	0.67	0.400	(0.133)	0.098	0.302
128	10.67	0.67	0.400	(0.132)	0.098	0.302
129	10.75	0.67	0.400	(0.131)	0.098	0.302
130	10.83	0.67	0.400	(0.131)	0.098	0.302
131	10.92	0.67	0.400	(0.130)	0.098	0.302
132	11.00	0.67	0.400	(0.129)	0.098	0.302
133	11.08	0.63	0.380	(0.129)	0.093	0.287
134	11.17	0.63	0.380	(0.128)	0.093	0.287
135	11.25	0.63	0.380	(0.128)	0.093	0.287
136	11.33	0.63	0.380	(0.127)	0.093	0.287
137	11.42	0.63	0.380	(0.126)	0.093	0.287
138	11.50	0.63	0.380	(0.126)	0.093	0.287
139	11.58	0.57	0.340	(0.125)	0.083	0.257
140	11.67	0.57	0.340	(0.124)	0.083	0.257
141	11.75	0.57	0.340	(0.124)	0.083	0.257
142	11.83	0.60	0.360	(0.123)	0.088	0.272
143	11.92	0.60	0.360	(0.123)	0.088	0.272
144	12.00	0.60	0.360	(0.122)	0.088	0.272
145	12.08	0.83	0.500	0.121	(0.122)	0.379
146	12.17	0.83	0.500	0.121	(0.122)	0.379
147	12.25	0.83	0.500	0.120	(0.122)	0.380
148	12.33	0.87	0.520	0.120	(0.127)	0.400
149	12.42	0.87	0.520	0.119	(0.127)	0.401
150	12.50	0.87	0.520	0.118	(0.127)	0.402
151	12.58	0.93	0.560	0.118	(0.137)	0.442
152	12.67	0.93	0.560	0.117	(0.137)	0.443
153	12.75	0.93	0.560	0.117	(0.137)	0.443
154	12.83	0.97	0.580	0.116	(0.142)	0.464
155	12.92	0.97	0.580	0.115	(0.142)	0.465
156	13.00	0.97	0.580	0.115	(0.142)	0.465
157	13.08	1.13	0.680	0.114	(0.166)	0.566
158	13.17	1.13	0.680	0.114	(0.166)	0.566
159	13.25	1.13	0.680	0.113	(0.166)	0.567
160	13.33	1.13	0.680	0.112	(0.166)	0.567
161	13.42	1.13	0.680	0.112	(0.166)	0.568
162	13.50	1.13	0.680	0.111	(0.166)	0.569
163	13.58	0.77	0.460	0.111	(0.113)	0.349
164	13.67	0.77	0.460	0.110	(0.113)	0.350
165	13.75	0.77	0.460	0.110	(0.113)	0.350
166	13.83	0.77	0.460	0.109	(0.113)	0.351
167	13.92	0.77	0.460	0.109	(0.113)	0.351
168	14.00	0.77	0.460	0.108	(0.113)	0.352
169	14.08	0.90	0.540	0.107	(0.132)	0.433
170	14.17	0.90	0.540	0.107	(0.132)	0.433
171	14.25	0.90	0.540	0.106	(0.132)	0.434
172	14.33	0.87	0.520	0.106	(0.127)	0.414
173	14.42	0.87	0.520	0.105	(0.127)	0.415
174	14.50	0.87	0.520	0.105	(0.127)	0.415
175	14.58	0.87	0.520	0.104	(0.127)	0.416
176	14.67	0.87	0.520	0.104	(0.127)	0.416
177	14.75	0.87	0.520	0.103	(0.127)	0.417

178	14.83	0.83	0.500	0.103	(0.122)	0.397
179	14.92	0.83	0.500	0.102	(0.122)	0.398
180	15.00	0.83	0.500	0.102	(0.122)	0.398
181	15.08	0.80	0.480	0.101	(0.118)	0.379
182	15.17	0.80	0.480	0.100	(0.118)	0.379
183	15.25	0.80	0.480	0.100	(0.118)	0.380
184	15.33	0.77	0.460	0.099	(0.113)	0.361
185	15.42	0.77	0.460	0.099	(0.113)	0.361
186	15.50	0.77	0.460	0.098	(0.113)	0.362
187	15.58	0.63	0.380	(0.098)	0.093	0.287
188	15.67	0.63	0.380	(0.097)	0.093	0.287
189	15.75	0.63	0.380	(0.097)	0.093	0.287
190	15.83	0.63	0.380	(0.096)	0.093	0.287
191	15.92	0.63	0.380	(0.096)	0.093	0.287
192	16.00	0.63	0.380	(0.095)	0.093	0.287
193	16.08	0.13	0.080	(0.095)	0.020	0.060
194	16.17	0.13	0.080	(0.094)	0.020	0.060
195	16.25	0.13	0.080	(0.094)	0.020	0.060
196	16.33	0.13	0.080	(0.094)	0.020	0.060
197	16.42	0.13	0.080	(0.093)	0.020	0.060
198	16.50	0.13	0.080	(0.093)	0.020	0.060
199	16.58	0.10	0.060	(0.092)	0.015	0.045
200	16.67	0.10	0.060	(0.092)	0.015	0.045
201	16.75	0.10	0.060	(0.091)	0.015	0.045
202	16.83	0.10	0.060	(0.091)	0.015	0.045
203	16.92	0.10	0.060	(0.090)	0.015	0.045
204	17.00	0.10	0.060	(0.090)	0.015	0.045
205	17.08	0.17	0.100	(0.089)	0.024	0.076
206	17.17	0.17	0.100	(0.089)	0.024	0.076
207	17.25	0.17	0.100	(0.088)	0.024	0.076
208	17.33	0.17	0.100	(0.088)	0.024	0.076
209	17.42	0.17	0.100	(0.088)	0.024	0.076
210	17.50	0.17	0.100	(0.087)	0.024	0.076
211	17.58	0.17	0.100	(0.087)	0.024	0.076
212	17.67	0.17	0.100	(0.086)	0.024	0.076
213	17.75	0.17	0.100	(0.086)	0.024	0.076
214	17.83	0.13	0.080	(0.085)	0.020	0.060
215	17.92	0.13	0.080	(0.085)	0.020	0.060
216	18.00	0.13	0.080	(0.085)	0.020	0.060
217	18.08	0.13	0.080	(0.084)	0.020	0.060
218	18.17	0.13	0.080	(0.084)	0.020	0.060
219	18.25	0.13	0.080	(0.083)	0.020	0.060
220	18.33	0.13	0.080	(0.083)	0.020	0.060
221	18.42	0.13	0.080	(0.083)	0.020	0.060
222	18.50	0.13	0.080	(0.082)	0.020	0.060
223	18.58	0.10	0.060	(0.082)	0.015	0.045
224	18.67	0.10	0.060	(0.081)	0.015	0.045
225	18.75	0.10	0.060	(0.081)	0.015	0.045
226	18.83	0.07	0.040	(0.081)	0.010	0.030
227	18.92	0.07	0.040	(0.080)	0.010	0.030
228	19.00	0.07	0.040	(0.080)	0.010	0.030
229	19.08	0.10	0.060	(0.079)	0.015	0.045
230	19.17	0.10	0.060	(0.079)	0.015	0.045
231	19.25	0.10	0.060	(0.079)	0.015	0.045
232	19.33	0.13	0.080	(0.078)	0.020	0.060
233	19.42	0.13	0.080	(0.078)	0.020	0.060
234	19.50	0.13	0.080	(0.078)	0.020	0.060

235	19.58	0.10	0.060	(0.077)	0.015	0.045
236	19.67	0.10	0.060	(0.077)	0.015	0.045
237	19.75	0.10	0.060	(0.077)	0.015	0.045
238	19.83	0.07	0.040	(0.076)	0.010	0.030
239	19.92	0.07	0.040	(0.076)	0.010	0.030
240	20.00	0.07	0.040	(0.075)	0.010	0.030
241	20.08	0.10	0.060	(0.075)	0.015	0.045
242	20.17	0.10	0.060	(0.075)	0.015	0.045
243	20.25	0.10	0.060	(0.074)	0.015	0.045
244	20.33	0.10	0.060	(0.074)	0.015	0.045
245	20.42	0.10	0.060	(0.074)	0.015	0.045
246	20.50	0.10	0.060	(0.074)	0.015	0.045
247	20.58	0.10	0.060	(0.073)	0.015	0.045
248	20.67	0.10	0.060	(0.073)	0.015	0.045
249	20.75	0.10	0.060	(0.073)	0.015	0.045
250	20.83	0.07	0.040	(0.072)	0.010	0.030
251	20.92	0.07	0.040	(0.072)	0.010	0.030
252	21.00	0.07	0.040	(0.072)	0.010	0.030
253	21.08	0.10	0.060	(0.071)	0.015	0.045
254	21.17	0.10	0.060	(0.071)	0.015	0.045
255	21.25	0.10	0.060	(0.071)	0.015	0.045
256	21.33	0.07	0.040	(0.071)	0.010	0.030
257	21.42	0.07	0.040	(0.070)	0.010	0.030
258	21.50	0.07	0.040	(0.070)	0.010	0.030
259	21.58	0.10	0.060	(0.070)	0.015	0.045
260	21.67	0.10	0.060	(0.070)	0.015	0.045
261	21.75	0.10	0.060	(0.069)	0.015	0.045
262	21.83	0.07	0.040	(0.069)	0.010	0.030
263	21.92	0.07	0.040	(0.069)	0.010	0.030
264	22.00	0.07	0.040	(0.069)	0.010	0.030
265	22.08	0.10	0.060	(0.068)	0.015	0.045
266	22.17	0.10	0.060	(0.068)	0.015	0.045
267	22.25	0.10	0.060	(0.068)	0.015	0.045
268	22.33	0.07	0.040	(0.068)	0.010	0.030
269	22.42	0.07	0.040	(0.068)	0.010	0.030
270	22.50	0.07	0.040	(0.067)	0.010	0.030
271	22.58	0.07	0.040	(0.067)	0.010	0.030
272	22.67	0.07	0.040	(0.067)	0.010	0.030
273	22.75	0.07	0.040	(0.067)	0.010	0.030
274	22.83	0.07	0.040	(0.067)	0.010	0.030
275	22.92	0.07	0.040	(0.066)	0.010	0.030
276	23.00	0.07	0.040	(0.066)	0.010	0.030
277	23.08	0.07	0.040	(0.066)	0.010	0.030
278	23.17	0.07	0.040	(0.066)	0.010	0.030
279	23.25	0.07	0.040	(0.066)	0.010	0.030
280	23.33	0.07	0.040	(0.066)	0.010	0.030
281	23.42	0.07	0.040	(0.066)	0.010	0.030
282	23.50	0.07	0.040	(0.065)	0.010	0.030
283	23.58	0.07	0.040	(0.065)	0.010	0.030
284	23.67	0.07	0.040	(0.065)	0.010	0.030
285	23.75	0.07	0.040	(0.065)	0.010	0.030
286	23.83	0.07	0.040	(0.065)	0.010	0.030
287	23.92	0.07	0.040	(0.065)	0.010	0.030
288	24.00	0.07	0.040	(0.065)	0.010	0.030

(Loss Rate Not Used)

Sum = 100.0 Sum = 46.2

Flood volume = Effective rainfall 3.85(In)

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 times area      12.7(Ac.)/[(In)/(Ft.)] =       4.1(Ac.Ft)
Total soil loss =      1.15(In)
Total soil loss =     1.216(Ac.Ft)
Total rainfall =      5.00(In)
Flood volume =      177163.0 Cubic Feet
Total soil loss =       52973.3 Cubic Feet
---------------------------------------------------------------------
 Peak flow rate of this hydrograph =      7.267(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))

---------------------------------------------------------------------
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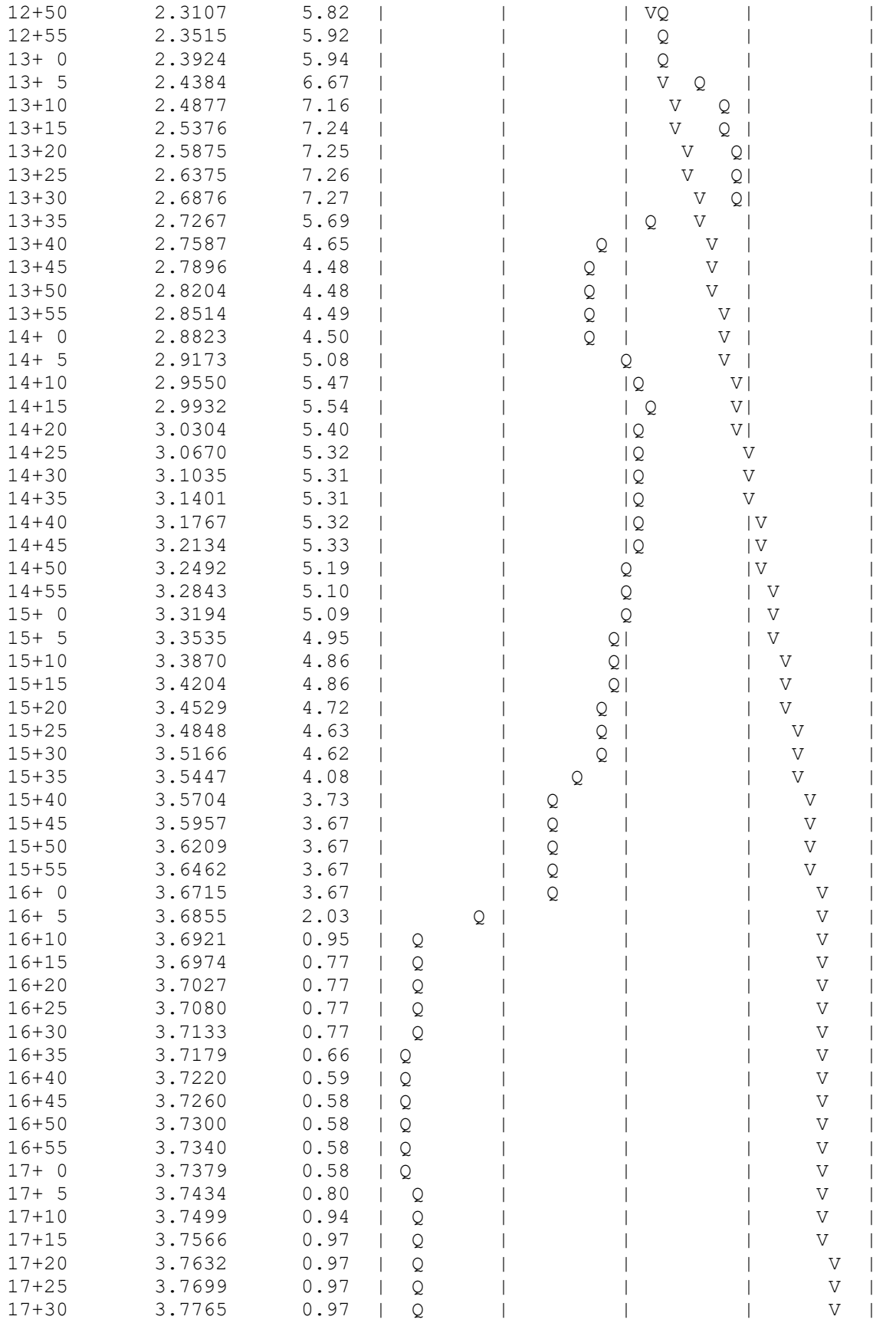
Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0015	0.22	Q				
0+10	0.0040	0.36	VQ				
0+15	0.0067	0.39	VQ				
0+20	0.0101	0.50	VQ				
0+25	0.0140	0.57	V Q				
0+30	0.0180	0.58	V Q				
0+35	0.0220	0.58	V Q				
0+40	0.0259	0.58	V Q				
0+45	0.0299	0.58	V Q				
0+50	0.0347	0.69	V Q				
0+55	0.0399	0.76	V Q				
1+ 0	0.0452	0.77	V Q				
1+ 5	0.0498	0.66	V Q				
1+10	0.0539	0.59	V Q				
1+15	0.0579	0.58	V Q				
1+20	0.0619	0.58	V Q				
1+25	0.0658	0.58	V Q				
1+30	0.0698	0.58	V Q				
1+35	0.0738	0.58	V Q				
1+40	0.0778	0.58	V Q				
1+45	0.0818	0.58	V Q				
1+50	0.0865	0.69	V Q				
1+55	0.0918	0.76	V Q				
2+ 0	0.0971	0.77	V Q				
2+ 5	0.1024	0.77	|V Q				
2+10	0.1077	0.77	|V Q				
2+15	0.1131	0.77	|V Q				
2+20	0.1184	0.77	|V Q				
2+25	0.1237	0.77	|V Q				
2+30	0.1290	0.77	|V Q				
2+35	0.1351	0.88	|V Q				
2+40	0.1417	0.95	|V Q				
2+45	0.1483	0.97	|V Q				
2+50	0.1550	0.97	|V Q				
2+55	0.1616	0.97	|V Q				
3+ 0	0.1683	0.97	|V Q				
3+ 5	0.1749	0.97	|V Q				
3+10	0.1816	0.97	|V Q				
3+15	0.1882	0.97	|V Q				

3+20	0.1949	0.97	V Q			
3+25	0.2015	0.97	V Q			
3+30	0.2082	0.97	VQ			
3+35	0.2148	0.97	VQ			
3+40	0.2214	0.97	VQ			
3+45	0.2281	0.97	VQ			
3+50	0.2355	1.07	V Q			
3+55	0.2434	1.15	V Q			
4+ 0	0.2514	1.16	V Q			
4+ 5	0.2594	1.16	V Q			
4+10	0.2673	1.16	V Q			
4+15	0.2753	1.16	V Q			
4+20	0.2840	1.27	V Q			
4+25	0.2933	1.34	V Q			
4+30	0.3026	1.35	V Q			
4+35	0.3119	1.35	V Q			
4+40	0.3212	1.35	V Q			
4+45	0.3305	1.35	V Q			
4+50	0.3406	1.46	V Q			
4+55	0.3511	1.53	V Q			
5+ 0	0.3618	1.54	V Q			
5+ 5	0.3709	1.33	V Q			
5+10	0.3791	1.18	VQ			
5+15	0.3870	1.16	VQ			
5+20	0.3958	1.27	V Q			
5+25	0.4050	1.34	V Q			
5+30	0.4143	1.35	VQ			
5+35	0.4244	1.46	VQ			
5+40	0.4349	1.53	V Q			
5+45	0.4456	1.54	V Q			
5+50	0.4562	1.54	V Q			
5+55	0.4668	1.54	V Q			
6+ 0	0.4775	1.54	V Q			
6+ 5	0.4889	1.65	V Q			
6+10	0.5008	1.73	V Q			
6+15	0.5127	1.74	VQ			
6+20	0.5247	1.74	VQ			
6+25	0.5367	1.74	VQ			
6+30	0.5486	1.74	VQ			
6+35	0.5613	1.85	V Q			
6+40	0.5746	1.92	V Q			
6+45	0.5879	1.93	V Q			
6+50	0.6012	1.93	V Q			
6+55	0.6145	1.93	VQ			
7+ 0	0.6278	1.93	VQ			
7+ 5	0.6411	1.93	VQ			
7+10	0.6544	1.93	VQ			
7+15	0.6677	1.93	VQ			
7+20	0.6817	2.04	V Q			
7+25	0.6963	2.11	V Q			
7+30	0.7109	2.12	V Q			
7+35	0.7263	2.23	VQ			
7+40	0.7421	2.31	V Q			
7+45	0.7581	2.32	V Q			
7+50	0.7748	2.43	V Q			
7+55	0.7920	2.50	V Q			
8+ 0	0.8093	2.51	V Q			

8+ 5	0.8281	2.73	V Q			
8+10	0.8479	2.87	V |Q			
8+15	0.8678	2.90	V |Q			
8+20	0.8878	2.90	V |Q			
8+25	0.9077	2.90	V |Q			
8+30	0.9277	2.90	V|Q			
8+35	0.9484	3.01	V| Q			
8+40	0.9696	3.08	V| Q			
8+45	0.9909	3.09	V| Q			
8+50	1.0129	3.20	V| Q			
8+55	1.0354	3.27	V Q			
9+ 0	1.0580	3.28	V Q			
9+ 5	1.0821	3.50	V Q			
9+10	1.1072	3.64	V Q			
9+15	1.1325	3.67	|V Q			
9+20	1.1585	3.78	|V Q			
9+25	1.1850	3.85	|V Q			
9+30	1.2116	3.86	|V Q			
9+35	1.2390	3.97	| V Q			
9+40	1.2668	4.04	| V Q			
9+45	1.2948	4.06	| V Q			
9+50	1.3234	4.16	| V Q			
9+55	1.3526	4.24	| V Q			
10+ 0	1.3819	4.25	| V Q			
10+ 5	1.4059	3.49	| Q			
10+10	1.4264	2.98	|Q V			
10+15	1.4464	2.90	|Q V			
10+20	1.4663	2.90	|Q V			
10+25	1.4863	2.90	|Q V			
10+30	1.5062	2.90	|Q V			
10+35	1.5299	3.44	| Q V			
10+40	1.5561	3.80	| Q			
10+45	1.5827	3.86	| Q			
10+50	1.6093	3.86	| Q			
10+55	1.6359	3.86	| QV			
11+ 0	1.6625	3.86	| QV			
11+ 5	1.6883	3.75	| QV			
11+10	1.7137	3.68	| Q V			
11+15	1.7390	3.67	| Q V			
11+20	1.7642	3.67	| Q V			
11+25	1.7895	3.67	| Q V			
11+30	1.8148	3.67	| Q V			
11+35	1.8385	3.45	| Q V			
11+40	1.8613	3.31	| Q V			
11+45	1.8839	3.28	| Q V			
11+50	1.9073	3.39	| Q V			
11+55	1.9311	3.46	| Q V			
12+ 0	1.9551	3.48	| Q V|			
12+ 5	1.9843	4.25	| Q V|			
12+10	2.0171	4.76	| Q|			
12+15	2.0505	4.85	| QV			
12+20	2.0850	5.00	| Q			
12+25	2.1202	5.11	| Q			
12+30	2.1555	5.13	| QV			
12+35	2.1929	5.43	| |Q			
12+40	2.2316	5.63	| |VQ			
12+45	2.2707	5.67	| | Q			



17+35	3.7832	0.97	| Q	|	|	| V	|
17+40	3.7898	0.97	| Q	|	|	| V	|
17+45	3.7965	0.97	| Q	|	|	| V	|
17+50	3.8024	0.86	| Q	|	|	| V	|
17+55	3.8078	0.78	| Q	|	|	| V	|
18+ 0	3.8131	0.77	| Q	|	|	| V	|
18+ 5	3.8184	0.77	| Q	|	|	| V	|
18+10	3.8237	0.77	| Q	|	|	| V	|
18+15	3.8291	0.77	| Q	|	|	| V	|
18+20	3.8344	0.77	| Q	|	|	| V	|
18+25	3.8397	0.77	| Q	|	|	| V	|
18+30	3.8450	0.77	| Q	|	|	| V	|
18+35	3.8496	0.66	| Q	|	|	| V	|
18+40	3.8537	0.59	| Q	|	|	| V	|
18+45	3.8576	0.58	| Q	|	|	| V	|
18+50	3.8609	0.47	|Q	|	|	| V	|
18+55	3.8636	0.40	|Q	|	|	| V	|
19+ 0	3.8663	0.39	|Q	|	|	| V	|
19+ 5	3.8697	0.50	|Q	|	|	| V	|
19+10	3.8736	0.57	| Q	|	|	| V	|
19+15	3.8776	0.58	| Q	|	|	| V	|
19+20	3.8823	0.69	| Q	|	|	| V	|
19+25	3.8876	0.76	| Q	|	|	| V	|
19+30	3.8929	0.77	| Q	|	|	| V	|
19+35	3.8975	0.66	| Q	|	|	| V	|
19+40	3.9015	0.59	| Q	|	|	| V	|
19+45	3.9055	0.58	| Q	|	|	| V	|
19+50	3.9088	0.47	|Q	|	|	| V	|
19+55	3.9115	0.40	|Q	|	|	| V	|
20+ 0	3.9142	0.39	|Q	|	|	| V	|
20+ 5	3.9176	0.50	|Q	|	|	| V	|
20+10	3.9215	0.57	| Q	|	|	| V	|
20+15	3.9255	0.58	| Q	|	|	| V	|
20+20	3.9295	0.58	| Q	|	|	| V	|
20+25	3.9334	0.58	| Q	|	|	| V	|
20+30	3.9374	0.58	| Q	|	|	| V	|
20+35	3.9414	0.58	| Q	|	|	| V	|
20+40	3.9454	0.58	| Q	|	|	| V	|
20+45	3.9494	0.58	| Q	|	|	| V	|
20+50	3.9526	0.47	|Q	|	|	| V	|
20+55	3.9554	0.40	|Q	|	|	| V	|
21+ 0	3.9581	0.39	|Q	|	|	| V	|
21+ 5	3.9615	0.50	|Q	|	|	| V	|
21+10	3.9654	0.57	| Q	|	|	| V	|
21+15	3.9694	0.58	| Q	|	|	| V	|
21+20	3.9726	0.47	|Q	|	|	| V	|
21+25	3.9753	0.40	|Q	|	|	| V	|
21+30	3.9780	0.39	|Q	|	|	| V	|
21+35	3.9814	0.50	|Q	|	|	| V	|
21+40	3.9853	0.57	| Q	|	|	| V	|
21+45	3.9893	0.58	| Q	|	|	| V	|
21+50	3.9925	0.47	|Q	|	|	| V	|
21+55	3.9953	0.40	|Q	|	|	| V	|
22+ 0	3.9980	0.39	|Q	|	|	| V	|
22+ 5	4.0014	0.50	|Q	|	|	| V	|
22+10	4.0053	0.57	| Q	|	|	| V	|
22+15	4.0093	0.58	| Q	|	|	| V	|

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   22+20       4.0125      0.47  |Q        |         |         |        V|
   22+25       4.0152      0.40  |Q        |         |         |        V|
   22+30       4.0179      0.39  |Q        |         |         |        V|
   22+35       4.0206      0.39  |Q        |         |         |        V|
   22+40       4.0232      0.39  |Q        |         |         |        V|
   22+45       4.0259      0.39  |Q        |         |         |        V|
   22+50       4.0285      0.39  |Q        |         |         |        V|
   22+55       4.0312      0.39  |Q        |         |         |        V|
   23+ 0       4.0339      0.39  |Q        |         |         |        V|
   23+ 5       4.0365      0.39  |Q        |         |         |        V|
   23+10       4.0392      0.39  |Q        |         |         |        V|
   23+15       4.0418      0.39  |Q        |         |         |        V|
   23+20       4.0445      0.39  |Q        |         |         |        V|
   23+25       4.0472      0.39  |Q        |         |         |        V|
   23+30       4.0498      0.39  |Q        |         |         |        V|
   23+35       4.0525      0.39  |Q        |         |         |        V|
   23+40       4.0551      0.39  |Q        |         |         |        V|
   23+45       4.0578      0.39  |Q        |         |         |        V|
   23+50       4.0605      0.39  |Q        |         |         |        V|
   23+55       4.0631      0.39  |Q        |         |         |        V|
   24+ 0       4.0658      0.39  |Q        |         |         |        V|
   24+ 5       4.0669      0.17  Q         |         |         |        V|
   24+10       4.0671      0.02  Q         |         |         |         V
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U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/01/24 File: pq100uha6100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION - WATERSHED A
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 13.22(Ac.) = 0.021 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 13.22(Ac.) = 0.021 Sq. Mi.
Length along longest watercourse = 1359.00(Ft.)
Length along longest watercourse measured to centroid = 693.00(Ft.)
Length along longest watercourse = 0.257 Mi.
Length along longest watercourse measured to centroid = 0.131 Mi.
Difference in elevation = 18.70(Ft.)
Slope along watercourse = 72.6534 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.088 Hr.
Lag time = 5.28 Min.
25% of lag time = 1.32 Min.
40% of lag time = 2.11 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
13.22	1.20	15.86

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
13.22	2.50	33.05

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
13.220	61.30	0.500

Total Area Entered = 13.22(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
61.3	61.3	0.456	0.500	0.251	1.000	0.251
					Sum (F) =	0.251

Area averaged mean soil loss (F) (In/Hr) = 0.251
Minimum soil loss rate ((In/Hr)) = 0.125
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	94.673	17.575	2.342
2	0.167	189.345	47.848	6.375
3	0.250	284.018	16.514	2.200
4	0.333	378.691	7.359	0.980
5	0.417	473.363	4.203	0.560
6	0.500	568.036	2.720	0.362
7	0.583	662.709	1.772	0.236
8	0.667	757.381	1.110	0.148
9	0.750	852.054	0.900	0.120
			Sum = 100.000	Sum= 13.323

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)

1	0.08	0.50	0.150	(0.251)	0.075	0.075
2	0.17	0.60	0.180	(0.251)	0.090	0.090
3	0.25	0.60	0.180	(0.251)	0.090	0.090
4	0.33	0.60	0.180	(0.251)	0.090	0.090
5	0.42	0.60	0.180	(0.251)	0.090	0.090
6	0.50	0.70	0.210	(0.251)	0.105	0.105
7	0.58	0.70	0.210	(0.251)	0.105	0.105
8	0.67	0.70	0.210	(0.251)	0.105	0.105
9	0.75	0.70	0.210	(0.251)	0.105	0.105
10	0.83	0.70	0.210	(0.251)	0.105	0.105
11	0.92	0.70	0.210	(0.251)	0.105	0.105
12	1.00	0.80	0.240	(0.251)	0.120	0.120
13	1.08	0.80	0.240	(0.251)	0.120	0.120
14	1.17	0.80	0.240	(0.251)	0.120	0.120
15	1.25	0.80	0.240	(0.251)	0.120	0.120
16	1.33	0.80	0.240	(0.251)	0.120	0.120
17	1.42	0.80	0.240	(0.251)	0.120	0.120
18	1.50	0.80	0.240	(0.251)	0.120	0.120
19	1.58	0.80	0.240	(0.251)	0.120	0.120
20	1.67	0.80	0.240	(0.251)	0.120	0.120
21	1.75	0.80	0.240	(0.251)	0.120	0.120
22	1.83	0.80	0.240	(0.251)	0.120	0.120
23	1.92	0.80	0.240	(0.251)	0.120	0.120
24	2.00	0.90	0.270	(0.251)	0.135	0.135
25	2.08	0.80	0.240	(0.251)	0.120	0.120
26	2.17	0.90	0.270	(0.251)	0.135	0.135
27	2.25	0.90	0.270	(0.251)	0.135	0.135
28	2.33	0.90	0.270	(0.251)	0.135	0.135
29	2.42	0.90	0.270	(0.251)	0.135	0.135
30	2.50	0.90	0.270	(0.251)	0.135	0.135
31	2.58	0.90	0.270	(0.251)	0.135	0.135
32	2.67	0.90	0.270	(0.251)	0.135	0.135
33	2.75	1.00	0.300	(0.251)	0.150	0.150
34	2.83	1.00	0.300	(0.251)	0.150	0.150
35	2.92	1.00	0.300	(0.251)	0.150	0.150
36	3.00	1.00	0.300	(0.251)	0.150	0.150
37	3.08	1.00	0.300	(0.251)	0.150	0.150
38	3.17	1.10	0.330	(0.251)	0.165	0.165
39	3.25	1.10	0.330	(0.251)	0.165	0.165
40	3.33	1.10	0.330	(0.251)	0.165	0.165
41	3.42	1.20	0.360	(0.251)	0.180	0.180
42	3.50	1.30	0.390	(0.251)	0.195	0.195
43	3.58	1.40	0.420	(0.251)	0.210	0.210
44	3.67	1.40	0.420	(0.251)	0.210	0.210
45	3.75	1.50	0.450	(0.251)	0.225	0.225
46	3.83	1.50	0.450	(0.251)	0.225	0.225
47	3.92	1.60	0.480	(0.251)	0.240	0.240
48	4.00	1.60	0.480	(0.251)	0.240	0.240
49	4.08	1.70	0.510	0.251	(0.255)	0.259
50	4.17	1.80	0.540	0.251	(0.270)	0.289
51	4.25	1.90	0.570	0.251	(0.285)	0.319
52	4.33	2.00	0.600	0.251	(0.300)	0.349
53	4.42	2.10	0.630	0.251	(0.315)	0.379
54	4.50	2.10	0.630	0.251	(0.315)	0.379
55	4.58	2.20	0.660	0.251	(0.330)	0.409
56	4.67	2.30	0.690	0.251	(0.345)	0.439
57	4.75	2.40	0.720	0.251	(0.360)	0.469

58	4.83	2.40	0.720	0.251	(0.360)		0.469
59	4.92	2.50	0.750	0.251	(0.375)		0.499
60	5.00	2.60	0.780	0.251	(0.390)		0.529
61	5.08	3.10	0.930	0.251	(0.465)		0.679
62	5.17	3.60	1.080	0.251	(0.540)		0.829
63	5.25	3.90	1.170	0.251	(0.585)		0.919
64	5.33	4.20	1.260	0.251	(0.630)		1.009
65	5.42	4.70	1.410	0.251	(0.705)		1.159
66	5.50	5.60	1.680	0.251	(0.840)		1.429
67	5.58	1.90	0.570	0.251	(0.285)		0.319
68	5.67	0.90	0.270	(0.251)	0.135		0.135
69	5.75	0.60	0.180	(0.251)	0.090		0.090
70	5.83	0.50	0.150	(0.251)	0.075		0.075
71	5.92	0.30	0.090	(0.251)	0.045		0.045
72	6.00	0.20	0.060	(0.251)	0.030		0.030

(Loss Rate Not Used)

Sum = 100.0 Sum = 18.2

Flood volume = Effective rainfall 1.52(In)
times area 13.2(Ac.)/[(In)/(Ft.)] = 1.7(Ac.Ft)
Total soil loss = 0.98(In)
Total soil loss = 1.085(Ac.Ft)
Total rainfall = 2.50(In)
Flood volume = 72719.4 Cubic Feet
Total soil loss = 47246.6 Cubic Feet

Peak flow rate of this hydrograph = 14.831(CFS)

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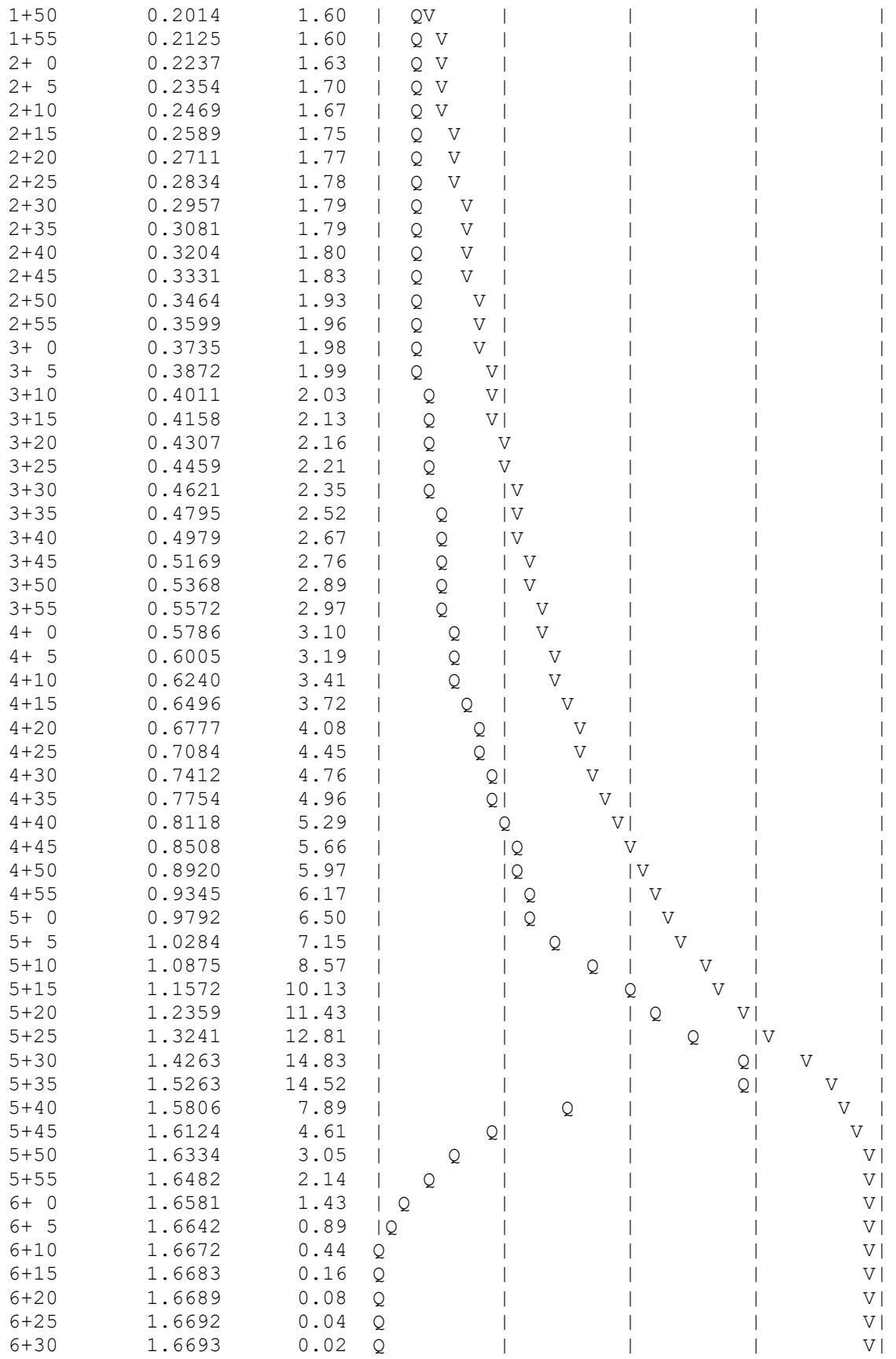
6 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0012	0.18	Q				
0+10	0.0060	0.69	VQ				
0+15	0.0125	0.95	VQ				
0+20	0.0198	1.06	V Q				
0+25	0.0274	1.11	V Q				
0+30	0.0356	1.18	V Q				
0+35	0.0446	1.30	|VQ				
0+40	0.0539	1.35	|VQ				
0+45	0.0633	1.38	|VQ				
0+50	0.0729	1.39	|VQ				
0+55	0.0825	1.39	|VQ				
1+ 0	0.0923	1.43	| Q				
1+ 5	0.1029	1.53	| VQ				
1+10	0.1136	1.56	| VQ				
1+15	0.1245	1.58	| VQ				
1+20	0.1354	1.59	| Q				
1+25	0.1464	1.59	| Q				
1+30	0.1574	1.60	| Q				
1+35	0.1684	1.60	| QV				
1+40	0.1794	1.60	| QV				
1+45	0.1904	1.60	| QV				



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    6+35       1.6694      0.01  Q          |          |          |         V|
    6+40       1.6694      0.00  Q          |          |          |         V|
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U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/02/24 File: pquh100b66100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION - WATERSHED B
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 12.58(Ac.) = 0.020 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 12.58(Ac.) = 0.020 Sq. Mi.
Length along longest watercourse = 1170.00(Ft.)
Length along longest watercourse measured to centroid = 550.00(Ft.)
Length along longest watercourse = 0.222 Mi.
Length along longest watercourse measured to centroid = 0.104 Mi.
Difference in elevation = 16.50(Ft.)
Slope along watercourse = 74.4615 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.076 Hr.
Lag time = 4.55 Min.
25% of lag time = 1.14 Min.
40% of lag time = 1.82 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
12.58	1.20	15.10

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
12.58	2.50	31.45

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
12.580	57.80	0.500

Total Area Entered = 12.58(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
57.8	57.8	0.492	0.500	0.271	1.000	0.271
					Sum (F) =	0.271

Area averaged mean soil loss (F) (In/Hr) = 0.271
Minimum soil loss rate ((In/Hr)) = 0.135
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	109.928	22.218	2.817
2	0.167	219.855	48.832	6.191
3	0.250	329.783	14.316	1.815
4	0.333	439.710	6.548	0.830
5	0.417	549.638	3.637	0.461
6	0.500	659.565	2.267	0.287
7	0.583	769.493	1.329	0.168
8	0.667	879.421	0.855	0.108
		Sum =	100.000 Sum=	12.678

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.50	0.150	(0.271)	0.075	0.075

2	0.17	0.60	0.180	(0.271)	0.090	0.090
3	0.25	0.60	0.180	(0.271)	0.090	0.090
4	0.33	0.60	0.180	(0.271)	0.090	0.090
5	0.42	0.60	0.180	(0.271)	0.090	0.090
6	0.50	0.70	0.210	(0.271)	0.105	0.105
7	0.58	0.70	0.210	(0.271)	0.105	0.105
8	0.67	0.70	0.210	(0.271)	0.105	0.105
9	0.75	0.70	0.210	(0.271)	0.105	0.105
10	0.83	0.70	0.210	(0.271)	0.105	0.105
11	0.92	0.70	0.210	(0.271)	0.105	0.105
12	1.00	0.80	0.240	(0.271)	0.120	0.120
13	1.08	0.80	0.240	(0.271)	0.120	0.120
14	1.17	0.80	0.240	(0.271)	0.120	0.120
15	1.25	0.80	0.240	(0.271)	0.120	0.120
16	1.33	0.80	0.240	(0.271)	0.120	0.120
17	1.42	0.80	0.240	(0.271)	0.120	0.120
18	1.50	0.80	0.240	(0.271)	0.120	0.120
19	1.58	0.80	0.240	(0.271)	0.120	0.120
20	1.67	0.80	0.240	(0.271)	0.120	0.120
21	1.75	0.80	0.240	(0.271)	0.120	0.120
22	1.83	0.80	0.240	(0.271)	0.120	0.120
23	1.92	0.80	0.240	(0.271)	0.120	0.120
24	2.00	0.90	0.270	(0.271)	0.135	0.135
25	2.08	0.80	0.240	(0.271)	0.120	0.120
26	2.17	0.90	0.270	(0.271)	0.135	0.135
27	2.25	0.90	0.270	(0.271)	0.135	0.135
28	2.33	0.90	0.270	(0.271)	0.135	0.135
29	2.42	0.90	0.270	(0.271)	0.135	0.135
30	2.50	0.90	0.270	(0.271)	0.135	0.135
31	2.58	0.90	0.270	(0.271)	0.135	0.135
32	2.67	0.90	0.270	(0.271)	0.135	0.135
33	2.75	1.00	0.300	(0.271)	0.150	0.150
34	2.83	1.00	0.300	(0.271)	0.150	0.150
35	2.92	1.00	0.300	(0.271)	0.150	0.150
36	3.00	1.00	0.300	(0.271)	0.150	0.150
37	3.08	1.00	0.300	(0.271)	0.150	0.150
38	3.17	1.10	0.330	(0.271)	0.165	0.165
39	3.25	1.10	0.330	(0.271)	0.165	0.165
40	3.33	1.10	0.330	(0.271)	0.165	0.165
41	3.42	1.20	0.360	(0.271)	0.180	0.180
42	3.50	1.30	0.390	(0.271)	0.195	0.195
43	3.58	1.40	0.420	(0.271)	0.210	0.210
44	3.67	1.40	0.420	(0.271)	0.210	0.210
45	3.75	1.50	0.450	(0.271)	0.225	0.225
46	3.83	1.50	0.450	(0.271)	0.225	0.225
47	3.92	1.60	0.480	(0.271)	0.240	0.240
48	4.00	1.60	0.480	(0.271)	0.240	0.240
49	4.08	1.70	0.510	(0.271)	0.255	0.255
50	4.17	1.80	0.540	(0.271)	0.270	0.270
51	4.25	1.90	0.570	0.271	(0.285)	0.299
52	4.33	2.00	0.600	0.271	(0.300)	0.329
53	4.42	2.10	0.630	0.271	(0.315)	0.359
54	4.50	2.10	0.630	0.271	(0.315)	0.359
55	4.58	2.20	0.660	0.271	(0.330)	0.389
56	4.67	2.30	0.690	0.271	(0.345)	0.419
57	4.75	2.40	0.720	0.271	(0.360)	0.449
58	4.83	2.40	0.720	0.271	(0.360)	0.449

59	4.92	2.50	0.750	0.271	(0.375)		0.479
60	5.00	2.60	0.780	0.271	(0.390)		0.509
61	5.08	3.10	0.930	0.271	(0.465)		0.659
62	5.17	3.60	1.080	0.271	(0.540)		0.809
63	5.25	3.90	1.170	0.271	(0.585)		0.899
64	5.33	4.20	1.260	0.271	(0.630)		0.989
65	5.42	4.70	1.410	0.271	(0.705)		1.139
66	5.50	5.60	1.680	0.271	(0.840)		1.409
67	5.58	1.90	0.570	0.271	(0.285)		0.299
68	5.67	0.90	0.270	(0.271)	0.135		0.135
69	5.75	0.60	0.180	(0.271)	0.090		0.090
70	5.83	0.50	0.150	(0.271)	0.075		0.075
71	5.92	0.30	0.090	(0.271)	0.045		0.045
72	6.00	0.20	0.060	(0.271)	0.030		0.030

(Loss Rate Not Used)

Sum = 100.0 Sum = 17.8

Flood volume = Effective rainfall 1.48(In)
times area 12.6(Ac.)/[(In)/(Ft.)] = 1.6(Ac.Ft)
Total soil loss = 1.01(In)
Total soil loss = 1.064(Ac.Ft)
Total rainfall = 2.50(In)
Flood volume = 67812.0 Cubic Feet
Total soil loss = 46346.5 Cubic Feet

Peak flow rate of this hydrograph = 14.270(CFS)

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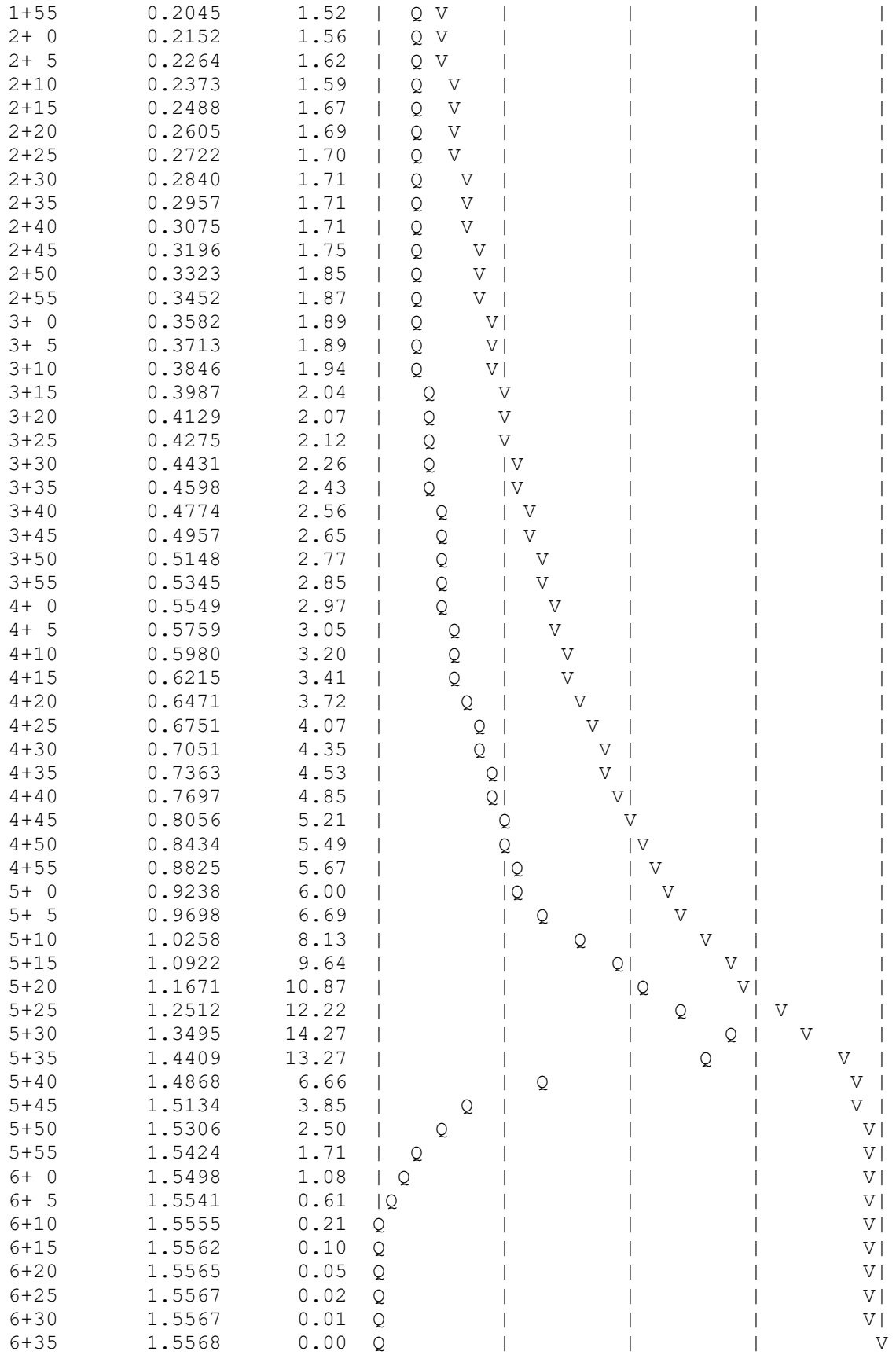
6 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0015	0.21	Q				
0+10	0.0064	0.72	VQ				
0+15	0.0129	0.95	VQ				
0+20	0.0201	1.04	V Q				
0+25	0.0275	1.08	V Q				
0+30	0.0355	1.15	V Q				
0+35	0.0442	1.26	|VQ				
0+40	0.0532	1.30	|VQ				
0+45	0.0622	1.32	|VQ				
0+50	0.0713	1.32	|VQ				
0+55	0.0805	1.33	| Q				
1+ 0	0.0899	1.37	| Q				
1+ 5	0.1000	1.47	| Q				
1+10	0.1103	1.49	| Q				
1+15	0.1207	1.51	| Q				
1+20	0.1311	1.51	| Q				
1+25	0.1416	1.52	| Q				
1+30	0.1521	1.52	| Q				
1+35	0.1625	1.52	| QV				
1+40	0.1730	1.52	| QV				
1+45	0.1835	1.52	| QV				
1+50	0.1940	1.52	| QV				



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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED A
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 13.13(Ac.) = 0.021 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 13.13(Ac.) = 0.021 Sq. Mi.
Length along longest watercourse = 1103.00(Ft.)
Length along longest watercourse measured to centroid = 759.00(Ft.)
Length along longest watercourse = 0.209 Mi.
Length along longest watercourse measured to centroid = 0.144 Mi.
Difference in elevation = 26.26(Ft.)
Slope along watercourse = 125.7052 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.038 Hr.
Lag time = 2.28 Min.
25% of lag time = 0.57 Min.
40% of lag time = 0.91 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
13.13	1.20	15.76

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
13.13	2.50	32.83

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
13.130	60.80	0.722

Total Area Entered = 13.13(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
60.8	60.8	0.461	0.722	0.162	1.000	0.162
					Sum (F) =	0.162

Area averaged mean soil loss (F) (In/Hr) = 0.162
Minimum soil loss rate ((In/Hr)) = 0.081
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.322

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	219.748	46.617	6.169
2	0.167	439.496	42.013	5.559
3	0.250	659.243	8.048	1.065
4	0.333	878.991	3.322	0.440
		Sum =	100.000 Sum=	13.233

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.50	0.150	(0.162)	0.048	0.102
2	0.17	0.60	0.180	(0.162)	0.058	0.122
3	0.25	0.60	0.180	(0.162)	0.058	0.122
4	0.33	0.60	0.180	(0.162)	0.058	0.122
5	0.42	0.60	0.180	(0.162)	0.058	0.122

6	0.50	0.70	0.210	(0.162)	0.068	0.142
7	0.58	0.70	0.210	(0.162)	0.068	0.142
8	0.67	0.70	0.210	(0.162)	0.068	0.142
9	0.75	0.70	0.210	(0.162)	0.068	0.142
10	0.83	0.70	0.210	(0.162)	0.068	0.142
11	0.92	0.70	0.210	(0.162)	0.068	0.142
12	1.00	0.80	0.240	(0.162)	0.077	0.163
13	1.08	0.80	0.240	(0.162)	0.077	0.163
14	1.17	0.80	0.240	(0.162)	0.077	0.163
15	1.25	0.80	0.240	(0.162)	0.077	0.163
16	1.33	0.80	0.240	(0.162)	0.077	0.163
17	1.42	0.80	0.240	(0.162)	0.077	0.163
18	1.50	0.80	0.240	(0.162)	0.077	0.163
19	1.58	0.80	0.240	(0.162)	0.077	0.163
20	1.67	0.80	0.240	(0.162)	0.077	0.163
21	1.75	0.80	0.240	(0.162)	0.077	0.163
22	1.83	0.80	0.240	(0.162)	0.077	0.163
23	1.92	0.80	0.240	(0.162)	0.077	0.163
24	2.00	0.90	0.270	(0.162)	0.087	0.183
25	2.08	0.80	0.240	(0.162)	0.077	0.163
26	2.17	0.90	0.270	(0.162)	0.087	0.183
27	2.25	0.90	0.270	(0.162)	0.087	0.183
28	2.33	0.90	0.270	(0.162)	0.087	0.183
29	2.42	0.90	0.270	(0.162)	0.087	0.183
30	2.50	0.90	0.270	(0.162)	0.087	0.183
31	2.58	0.90	0.270	(0.162)	0.087	0.183
32	2.67	0.90	0.270	(0.162)	0.087	0.183
33	2.75	1.00	0.300	(0.162)	0.097	0.203
34	2.83	1.00	0.300	(0.162)	0.097	0.203
35	2.92	1.00	0.300	(0.162)	0.097	0.203
36	3.00	1.00	0.300	(0.162)	0.097	0.203
37	3.08	1.00	0.300	(0.162)	0.097	0.203
38	3.17	1.10	0.330	(0.162)	0.106	0.224
39	3.25	1.10	0.330	(0.162)	0.106	0.224
40	3.33	1.10	0.330	(0.162)	0.106	0.224
41	3.42	1.20	0.360	(0.162)	0.116	0.244
42	3.50	1.30	0.390	(0.162)	0.126	0.264
43	3.58	1.40	0.420	(0.162)	0.135	0.285
44	3.67	1.40	0.420	(0.162)	0.135	0.285
45	3.75	1.50	0.450	(0.162)	0.145	0.305
46	3.83	1.50	0.450	(0.162)	0.145	0.305
47	3.92	1.60	0.480	(0.162)	0.155	0.325
48	4.00	1.60	0.480	(0.162)	0.155	0.325
49	4.08	1.70	0.510	0.162	(0.164)	0.348
50	4.17	1.80	0.540	0.162	(0.174)	0.378
51	4.25	1.90	0.570	0.162	(0.184)	0.408
52	4.33	2.00	0.600	0.162	(0.193)	0.438
53	4.42	2.10	0.630	0.162	(0.203)	0.468
54	4.50	2.10	0.630	0.162	(0.203)	0.468
55	4.58	2.20	0.660	0.162	(0.213)	0.498
56	4.67	2.30	0.690	0.162	(0.222)	0.528
57	4.75	2.40	0.720	0.162	(0.232)	0.558
58	4.83	2.40	0.720	0.162	(0.232)	0.558
59	4.92	2.50	0.750	0.162	(0.242)	0.588
60	5.00	2.60	0.780	0.162	(0.251)	0.618
61	5.08	3.10	0.930	0.162	(0.300)	0.768
62	5.17	3.60	1.080	0.162	(0.348)	0.918

63	5.25	3.90	1.170	0.162	(0.377)		1.008
64	5.33	4.20	1.260	0.162	(0.406)		1.098
65	5.42	4.70	1.410	0.162	(0.455)		1.248
66	5.50	5.60	1.680	0.162	(0.542)		1.518
67	5.58	1.90	0.570	0.162	(0.184)		0.408
68	5.67	0.90	0.270	(0.162)	0.087		0.183
69	5.75	0.60	0.180	(0.162)	0.058		0.122
70	5.83	0.50	0.150	(0.162)	0.048		0.102
71	5.92	0.30	0.090	(0.162)	0.029		0.061
72	6.00	0.20	0.060	(0.162)	0.019		0.041

(Loss Rate Not Used)

Sum = 100.0 Sum = 22.4

Flood volume = Effective rainfall 1.87(In)
times area 13.1(Ac.)/[(In)/(Ft.)] = 2.0(Ac.Ft)
Total soil loss = 0.63(In)
Total soil loss = 0.694(Ac.Ft)
Total rainfall = 2.50(In)
Flood volume = 88902.2 Cubic Feet
Total soil loss = 30247.2 Cubic Feet

Peak flow rate of this hydrograph = 17.929(CFS)

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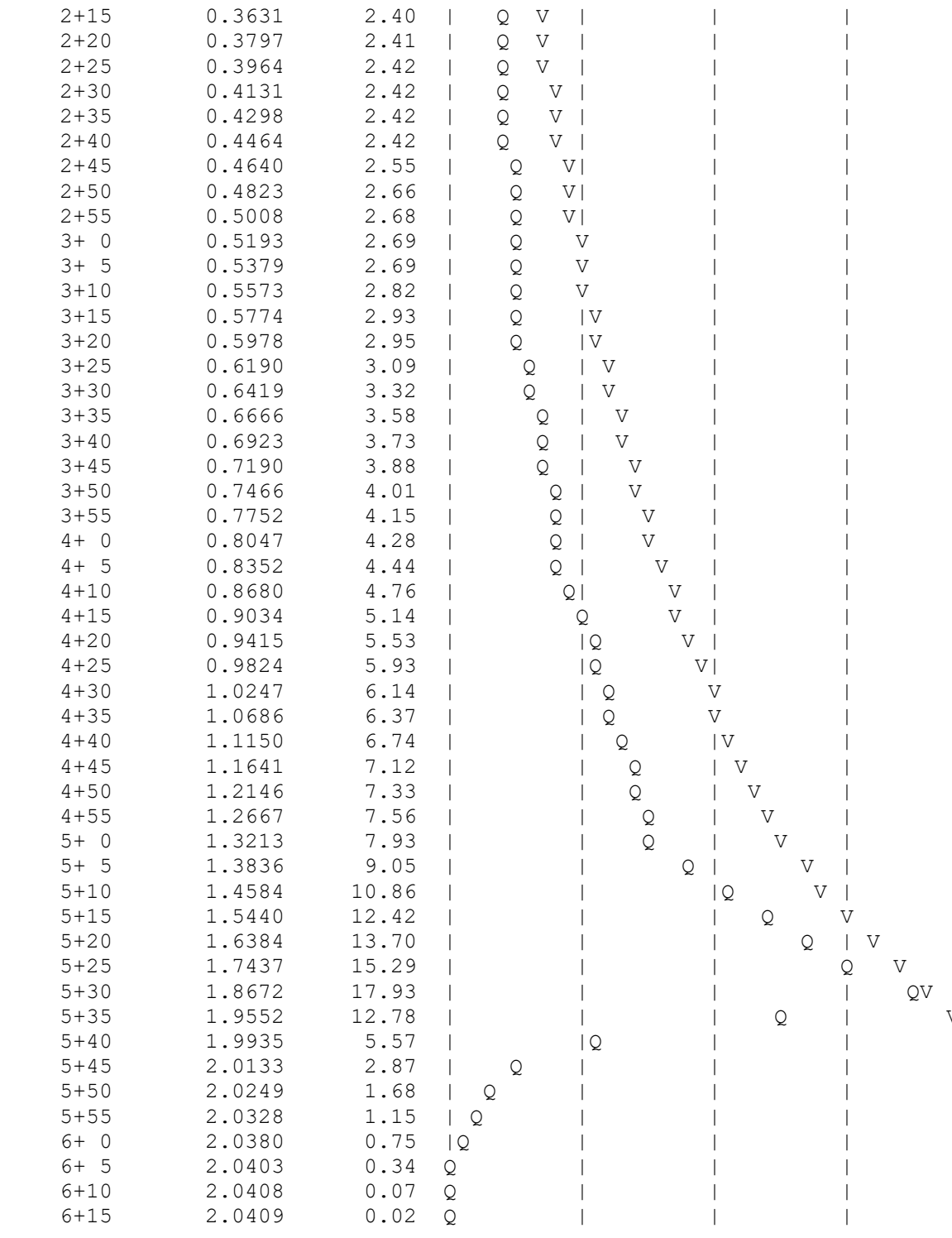
6 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0043	0.63	VQ				
0+10	0.0134	1.32	V Q				
0+15	0.0240	1.54	V Q				
0+20	0.0351	1.61	V Q				
0+25	0.0462	1.61	V Q				
0+30	0.0582	1.74	|V Q				
0+35	0.0709	1.85	|V Q				
0+40	0.0838	1.87	|V Q				
0+45	0.0968	1.88	|V Q				
0+50	0.1098	1.88	| VQ				
0+55	0.1228	1.88	| VQ				
1+ 0	0.1366	2.01	| V Q				
1+ 5	0.1512	2.12	| V Q				
1+10	0.1660	2.14	| VQ				
1+15	0.1808	2.15	| VQ				
1+20	0.1956	2.15	| VQ				
1+25	0.2105	2.15	| Q				
1+30	0.2253	2.15	| Q				
1+35	0.2401	2.15	| Q				
1+40	0.2549	2.15	| Q				
1+45	0.2698	2.15	| QV				
1+50	0.2846	2.15	| QV				
1+55	0.2994	2.15	| QV				
2+ 0	0.3151	2.28	| Q V				
2+ 5	0.3307	2.27	| Q V				
2+10	0.3466	2.30	| Q V				



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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION - WATERSHED B
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 12.68(Ac.) = 0.020 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 12.68(Ac.) = 0.020 Sq. Mi.
Length along longest watercourse = 818.00(Ft.)
Length along longest watercourse measured to centroid = 475.00(Ft.)
Length along longest watercourse = 0.155 Mi.
Length along longest watercourse measured to centroid = 0.090 Mi.
Difference in elevation = 25.60(Ft.)
Slope along watercourse = 165.2421 Ft./Mi.
Average Manning's 'N' = 0.016
Lag time = 0.028 Hr.
Lag time = 1.68 Min.
25% of lag time = 0.42 Min.
40% of lag time = 0.67 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
12.68	1.20	15.22

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
12.68	2.50	31.70

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
12.680	57.60	0.819

Total Area Entered = 12.68(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
57.6	57.6	0.494	0.819	0.130	1.000	0.130
					Sum (F) =	0.130

Area averaged mean soil loss (F) (In/Hr) = 0.130
Minimum soil loss rate ((In/Hr)) = 0.065
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.245

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	297.946	56.468	7.216
2	0.167	595.892	37.242	4.759
3	0.250	893.838	6.290	0.804
		Sum = 100.000	Sum=	12.779

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.50	0.150	(0.130)	0.037	0.113
2	0.17	0.60	0.180	(0.130)	0.044	0.136
3	0.25	0.60	0.180	(0.130)	0.044	0.136
4	0.33	0.60	0.180	(0.130)	0.044	0.136
5	0.42	0.60	0.180	(0.130)	0.044	0.136
6	0.50	0.70	0.210	(0.130)	0.051	0.159

7	0.58	0.70	0.210	(0.130)	0.051	0.159
8	0.67	0.70	0.210	(0.130)	0.051	0.159
9	0.75	0.70	0.210	(0.130)	0.051	0.159
10	0.83	0.70	0.210	(0.130)	0.051	0.159
11	0.92	0.70	0.210	(0.130)	0.051	0.159
12	1.00	0.80	0.240	(0.130)	0.059	0.181
13	1.08	0.80	0.240	(0.130)	0.059	0.181
14	1.17	0.80	0.240	(0.130)	0.059	0.181
15	1.25	0.80	0.240	(0.130)	0.059	0.181
16	1.33	0.80	0.240	(0.130)	0.059	0.181
17	1.42	0.80	0.240	(0.130)	0.059	0.181
18	1.50	0.80	0.240	(0.130)	0.059	0.181
19	1.58	0.80	0.240	(0.130)	0.059	0.181
20	1.67	0.80	0.240	(0.130)	0.059	0.181
21	1.75	0.80	0.240	(0.130)	0.059	0.181
22	1.83	0.80	0.240	(0.130)	0.059	0.181
23	1.92	0.80	0.240	(0.130)	0.059	0.181
24	2.00	0.90	0.270	(0.130)	0.066	0.204
25	2.08	0.80	0.240	(0.130)	0.059	0.181
26	2.17	0.90	0.270	(0.130)	0.066	0.204
27	2.25	0.90	0.270	(0.130)	0.066	0.204
28	2.33	0.90	0.270	(0.130)	0.066	0.204
29	2.42	0.90	0.270	(0.130)	0.066	0.204
30	2.50	0.90	0.270	(0.130)	0.066	0.204
31	2.58	0.90	0.270	(0.130)	0.066	0.204
32	2.67	0.90	0.270	(0.130)	0.066	0.204
33	2.75	1.00	0.300	(0.130)	0.073	0.227
34	2.83	1.00	0.300	(0.130)	0.073	0.227
35	2.92	1.00	0.300	(0.130)	0.073	0.227
36	3.00	1.00	0.300	(0.130)	0.073	0.227
37	3.08	1.00	0.300	(0.130)	0.073	0.227
38	3.17	1.10	0.330	(0.130)	0.081	0.249
39	3.25	1.10	0.330	(0.130)	0.081	0.249
40	3.33	1.10	0.330	(0.130)	0.081	0.249
41	3.42	1.20	0.360	(0.130)	0.088	0.272
42	3.50	1.30	0.390	(0.130)	0.095	0.295
43	3.58	1.40	0.420	(0.130)	0.103	0.317
44	3.67	1.40	0.420	(0.130)	0.103	0.317
45	3.75	1.50	0.450	(0.130)	0.110	0.340
46	3.83	1.50	0.450	(0.130)	0.110	0.340
47	3.92	1.60	0.480	(0.130)	0.117	0.362
48	4.00	1.60	0.480	(0.130)	0.117	0.362
49	4.08	1.70	0.510	(0.130)	0.125	0.385
50	4.17	1.80	0.540	0.130	(0.132)	0.410
51	4.25	1.90	0.570	0.130	(0.140)	0.440
52	4.33	2.00	0.600	0.130	(0.147)	0.470
53	4.42	2.10	0.630	0.130	(0.154)	0.500
54	4.50	2.10	0.630	0.130	(0.154)	0.500
55	4.58	2.20	0.660	0.130	(0.162)	0.530
56	4.67	2.30	0.690	0.130	(0.169)	0.560
57	4.75	2.40	0.720	0.130	(0.176)	0.590
58	4.83	2.40	0.720	0.130	(0.176)	0.590
59	4.92	2.50	0.750	0.130	(0.184)	0.620
60	5.00	2.60	0.780	0.130	(0.191)	0.650
61	5.08	3.10	0.930	0.130	(0.228)	0.800
62	5.17	3.60	1.080	0.130	(0.264)	0.950
63	5.25	3.90	1.170	0.130	(0.286)	1.040

64	5.33	4.20	1.260		0.130	(0.308)		1.130
65	5.42	4.70	1.410		0.130	(0.345)		1.280
66	5.50	5.60	1.680		0.130	(0.411)		1.550
67	5.58	1.90	0.570		0.130	(0.140)		0.440
68	5.67	0.90	0.270	(	0.130)	0.066		0.204
69	5.75	0.60	0.180	(	0.130)	0.044		0.136
70	5.83	0.50	0.150	(	0.130)	0.037		0.113
71	5.92	0.30	0.090	(	0.130)	0.022		0.068
72	6.00	0.20	0.060	(	0.130)	0.015		0.045

(Loss Rate Not Used)

Sum = 100.0 Sum = 24.1

Flood volume = Effective rainfall 2.01(In)
times area 12.7(Ac.)/[(In)/(Ft.)] = 2.1(Ac.Ft)
Total soil loss = 0.49(In)
Total soil loss = 0.521(Ac.Ft)
Total rainfall = 2.50(In)
Flood volume = 92372.6 Cubic Feet
Total soil loss = 22693.3 Cubic Feet

Peak flow rate of this hydrograph = 18.194(CFS)

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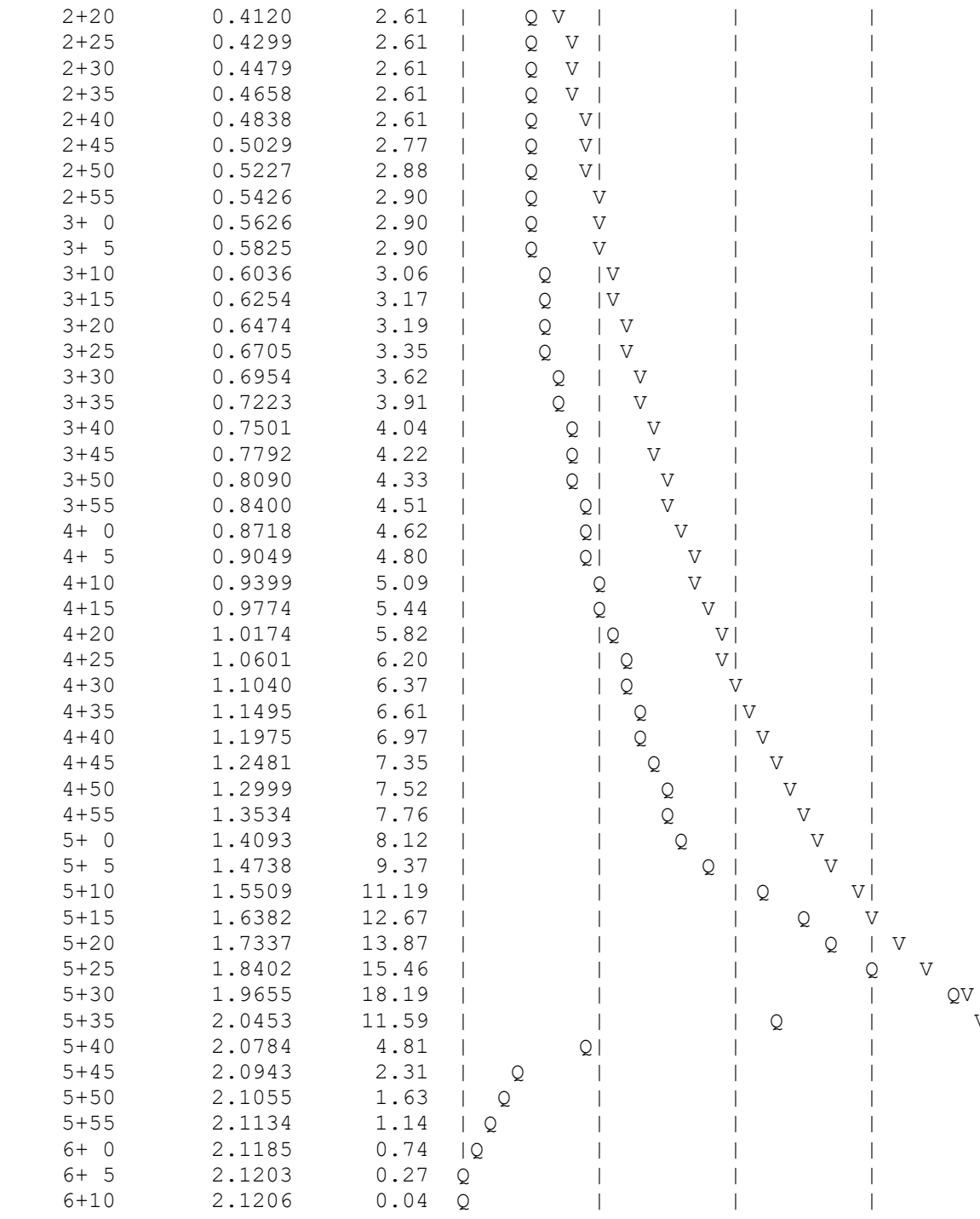
6 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0056	0.82	VQ				
0+10	0.0161	1.52	V Q				
0+15	0.0279	1.72	V Q				
0+20	0.0399	1.74	V Q				
0+25	0.0519	1.74	V Q				
0+30	0.0650	1.90	|V Q				
0+35	0.0788	2.01	|V Q				
0+40	0.0928	2.03	|V Q				
0+45	0.1068	2.03	| V Q				
0+50	0.1207	2.03	| V Q				
0+55	0.1347	2.03	| V Q				
1+ 0	0.1498	2.19	| V Q				
1+ 5	0.1656	2.30	| VQ				
1+10	0.1816	2.32	| VQ				
1+15	0.1975	2.32	| VQ				
1+20	0.2135	2.32	| Q				
1+25	0.2294	2.32	| Q				
1+30	0.2454	2.32	| Q				
1+35	0.2614	2.32	| Q				
1+40	0.2773	2.32	| QV				
1+45	0.2933	2.32	| QV				
1+50	0.3092	2.32	| QV				
1+55	0.3252	2.32	| Q V				
2+ 0	0.3423	2.48	| Q V				
2+ 5	0.3590	2.43	| Q V				
2+10	0.3762	2.50	| Q V				
2+15	0.3940	2.59	| Q V				



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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION - WATERSHED A
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 13.22(Ac.) = 0.021 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 13.22(Ac.) = 0.021 Sq. Mi.
Length along longest watercourse = 1359.00(Ft.)
Length along longest watercourse measured to centroid = 693.00(Ft.)
Length along longest watercourse = 0.257 Mi.
Length along longest watercourse measured to centroid = 0.131 Mi.
Difference in elevation = 18.70(Ft.)
Slope along watercourse = 72.6534 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.088 Hr.
Lag time = 5.28 Min.
25% of lag time = 1.32 Min.
40% of lag time = 2.11 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
13.22	0.80	10.58

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
13.22	1.90	25.12

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 1.900(In)

Point rain (area averaged) = 1.900(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.900(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
13.220	61.30	0.500

Total Area Entered = 13.22(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
61.3	61.3	0.456	0.500	0.251	1.000	0.251
					Sum (F) =	0.251

Area averaged mean soil loss (F) (In/Hr) = 0.251
Minimum soil loss rate ((In/Hr)) = 0.125
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	94.673	17.575	2.342
2	0.167	189.345	47.848	6.375
3	0.250	284.018	16.514	2.200
4	0.333	378.691	7.359	0.980
5	0.417	473.363	4.203	0.560
6	0.500	568.036	2.720	0.362
7	0.583	662.709	1.772	0.236
8	0.667	757.381	1.110	0.148
9	0.750	852.054	0.900	0.120
			Sum = 100.000	Sum= 13.323

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)

1	0.08	1.30	0.296	(0.251)	0.148	0.148	
2	0.17	1.30	0.296	(0.251)	0.148	0.148	
3	0.25	1.10	0.251	(0.251)	0.125	0.125	
4	0.33	1.50	0.342	(0.251)	0.171	0.171	
5	0.42	1.50	0.342	(0.251)	0.171	0.171	
6	0.50	1.80	0.410	(0.251)	0.205	0.205	
7	0.58	1.50	0.342	(0.251)	0.171	0.171	
8	0.67	1.80	0.410	(0.251)	0.205	0.205	
9	0.75	1.80	0.410	(0.251)	0.205	0.205	
10	0.83	1.50	0.342	(0.251)	0.171	0.171	
11	0.92	1.60	0.365	(0.251)	0.182	0.182	
12	1.00	1.80	0.410	(0.251)	0.205	0.205	
13	1.08	2.20	0.502	0.251	(0.251)	0.251	
14	1.17	2.20	0.502	0.251	(0.251)	0.251	
15	1.25	2.20	0.502	0.251	(0.251)	0.251	
16	1.33	2.00	0.456	(0.251)	0.228	0.228	
17	1.42	2.60	0.593	0.251	(0.296)	0.342	
18	1.50	2.70	0.616	0.251	(0.308)	0.365	
19	1.58	2.40	0.547	0.251	(0.274)	0.296	
20	1.67	2.70	0.616	0.251	(0.308)	0.365	
21	1.75	3.30	0.752	0.251	(0.376)	0.502	
22	1.83	3.10	0.707	0.251	(0.353)	0.456	
23	1.92	2.90	0.661	0.251	(0.331)	0.410	
24	2.00	3.00	0.684	0.251	(0.342)	0.433	
25	2.08	3.10	0.707	0.251	(0.353)	0.456	
26	2.17	4.20	0.958	0.251	(0.479)	0.707	
27	2.25	5.00	1.140	0.251	(0.570)	0.889	
28	2.33	3.50	0.798	0.251	(0.399)	0.547	
29	2.42	6.80	1.550	0.251	(0.775)	1.300	
30	2.50	7.30	1.664	0.251	(0.832)	1.414	
31	2.58	8.20	1.869	0.251	(0.935)	1.619	
32	2.67	5.90	1.345	0.251	(0.673)	1.094	
33	2.75	2.00	0.456	(0.251)	0.228	0.228	
34	2.83	1.80	0.410	(0.251)	0.205	0.205	
35	2.92	1.80	0.410	(0.251)	0.205	0.205	
36	3.00	0.60	0.137	(0.251)	0.068	0.068	

(Loss Rate Not Used)

Sum = 100.0 Sum = 15.0

Flood volume = Effective rainfall 1.25(In)
times area 13.2(Ac.)/[(In)/(Ft.)] = 1.4(Ac.Ft)
Total soil loss = 0.65(In)
Total soil loss = 0.717(Ac.Ft)
Total rainfall = 1.90(In)
Flood volume = 59946.9 Cubic Feet
Total soil loss = 31226.2 Cubic Feet

Peak flow rate of this hydrograph = 18.190(CFS)

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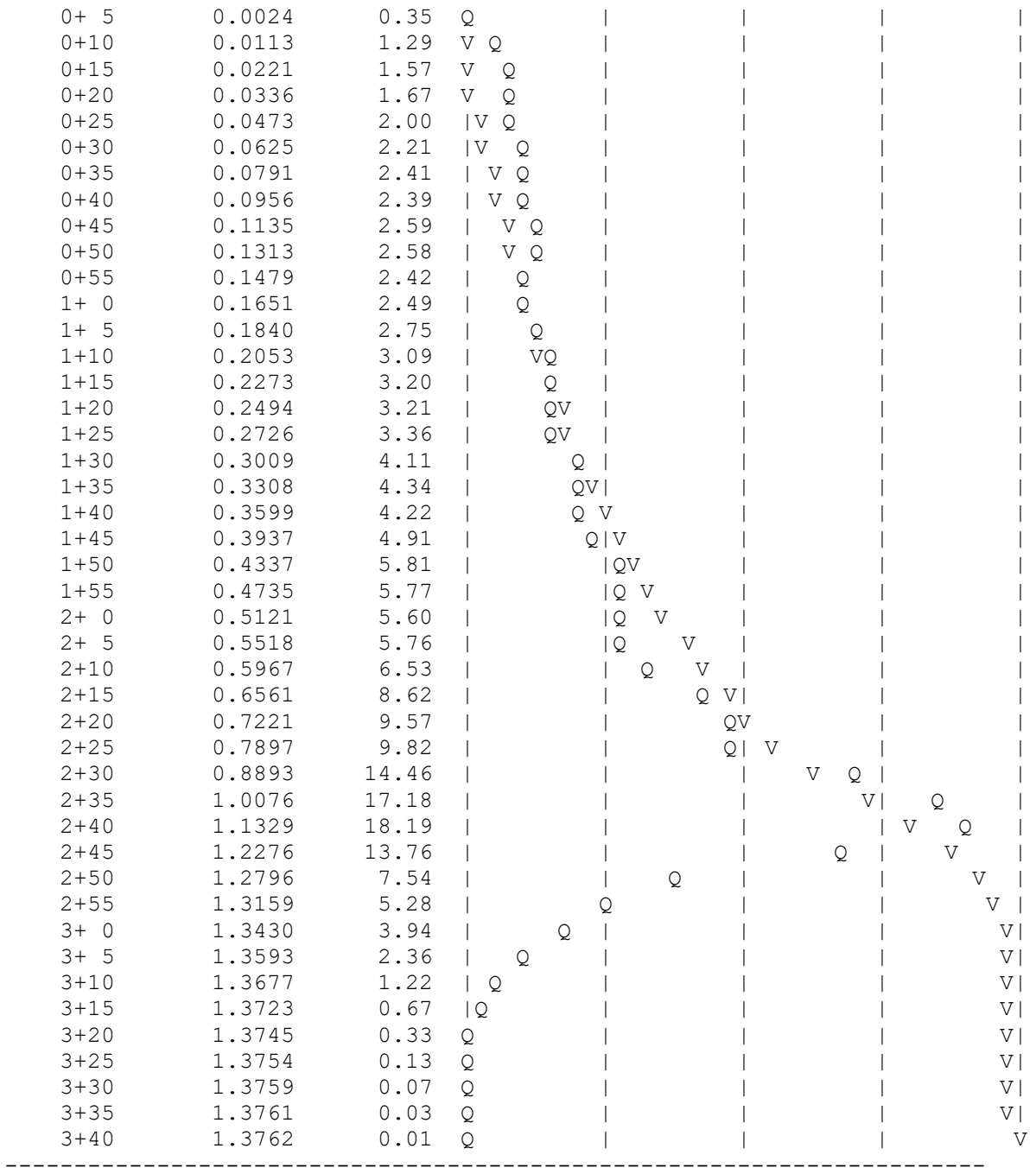
3 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m) Volume Ac.Ft Q(CFS) 0 5.0 10.0 15.0 20.0



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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION - WATERSHED B
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 12.58(Ac.) = 0.020 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 12.58(Ac.) = 0.020 Sq. Mi.
Length along longest watercourse = 1170.00(Ft.)
Length along longest watercourse measured to centroid = 550.00(Ft.)
Length along longest watercourse = 0.222 Mi.
Length along longest watercourse measured to centroid = 0.104 Mi.
Difference in elevation = 16.50(Ft.)
Slope along watercourse = 74.4615 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.076 Hr.
Lag time = 4.55 Min.
25% of lag time = 1.14 Min.
40% of lag time = 1.82 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
12.58	0.80	10.06

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
12.58	1.90	23.90

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 1.900(In)

Point rain (area averaged) = 1.900(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.900(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
12.580	57.80	0.500

Total Area Entered = 12.58(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
57.8	57.8	0.492	0.500	0.271	1.000	0.271
					Sum (F) =	0.271

Area averaged mean soil loss (F) (In/Hr) = 0.271
Minimum soil loss rate ((In/Hr)) = 0.135
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	109.928	22.218	2.817
2	0.167	219.855	48.832	6.191
3	0.250	329.783	14.316	1.815
4	0.333	439.710	6.548	0.830
5	0.417	549.638	3.637	0.461
6	0.500	659.565	2.267	0.287
7	0.583	769.493	1.329	0.168
8	0.667	879.421	0.855	0.108
		Sum =	100.000 Sum=	12.678

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.296	(0.271)	0.148	0.148

2	0.17	1.30	0.296	(0.271)	0.148	0.148
3	0.25	1.10	0.251	(0.271)	0.125	0.125
4	0.33	1.50	0.342	(0.271)	0.171	0.171
5	0.42	1.50	0.342	(0.271)	0.171	0.171
6	0.50	1.80	0.410	(0.271)	0.205	0.205
7	0.58	1.50	0.342	(0.271)	0.171	0.171
8	0.67	1.80	0.410	(0.271)	0.205	0.205
9	0.75	1.80	0.410	(0.271)	0.205	0.205
10	0.83	1.50	0.342	(0.271)	0.171	0.171
11	0.92	1.60	0.365	(0.271)	0.182	0.182
12	1.00	1.80	0.410	(0.271)	0.205	0.205
13	1.08	2.20	0.502	(0.271)	0.251	0.251
14	1.17	2.20	0.502	(0.271)	0.251	0.251
15	1.25	2.20	0.502	(0.271)	0.251	0.251
16	1.33	2.00	0.456	(0.271)	0.228	0.228
17	1.42	2.60	0.593	0.271	(0.296)	0.322
18	1.50	2.70	0.616	0.271	(0.308)	0.345
19	1.58	2.40	0.547	0.271	(0.274)	0.276
20	1.67	2.70	0.616	0.271	(0.308)	0.345
21	1.75	3.30	0.752	0.271	(0.376)	0.482
22	1.83	3.10	0.707	0.271	(0.353)	0.436
23	1.92	2.90	0.661	0.271	(0.331)	0.390
24	2.00	3.00	0.684	0.271	(0.342)	0.413
25	2.08	3.10	0.707	0.271	(0.353)	0.436
26	2.17	4.20	0.958	0.271	(0.479)	0.687
27	2.25	5.00	1.140	0.271	(0.570)	0.869
28	2.33	3.50	0.798	0.271	(0.399)	0.527
29	2.42	6.80	1.550	0.271	(0.775)	1.279
30	2.50	7.30	1.664	0.271	(0.832)	1.393
31	2.58	8.20	1.869	0.271	(0.935)	1.599
32	2.67	5.90	1.345	0.271	(0.673)	1.074
33	2.75	2.00	0.456	(0.271)	0.228	0.228
34	2.83	1.80	0.410	(0.271)	0.205	0.205
35	2.92	1.80	0.410	(0.271)	0.205	0.205
36	3.00	0.60	0.137	(0.271)	0.068	0.068

(Loss Rate Not Used)

Sum = 100.0 Sum = 14.7

Flood volume = Effective rainfall 1.22(In)
times area 12.6(Ac.)/[(In)/(Ft.)] = 1.3(Ac.Ft)
Total soil loss = 0.68(In)
Total soil loss = 0.710(Ac.Ft)
Total rainfall = 1.90(In)
Flood volume = 55823.2 Cubic Feet
Total soil loss = 30936.3 Cubic Feet

Peak flow rate of this hydrograph = 17.179(CFS)

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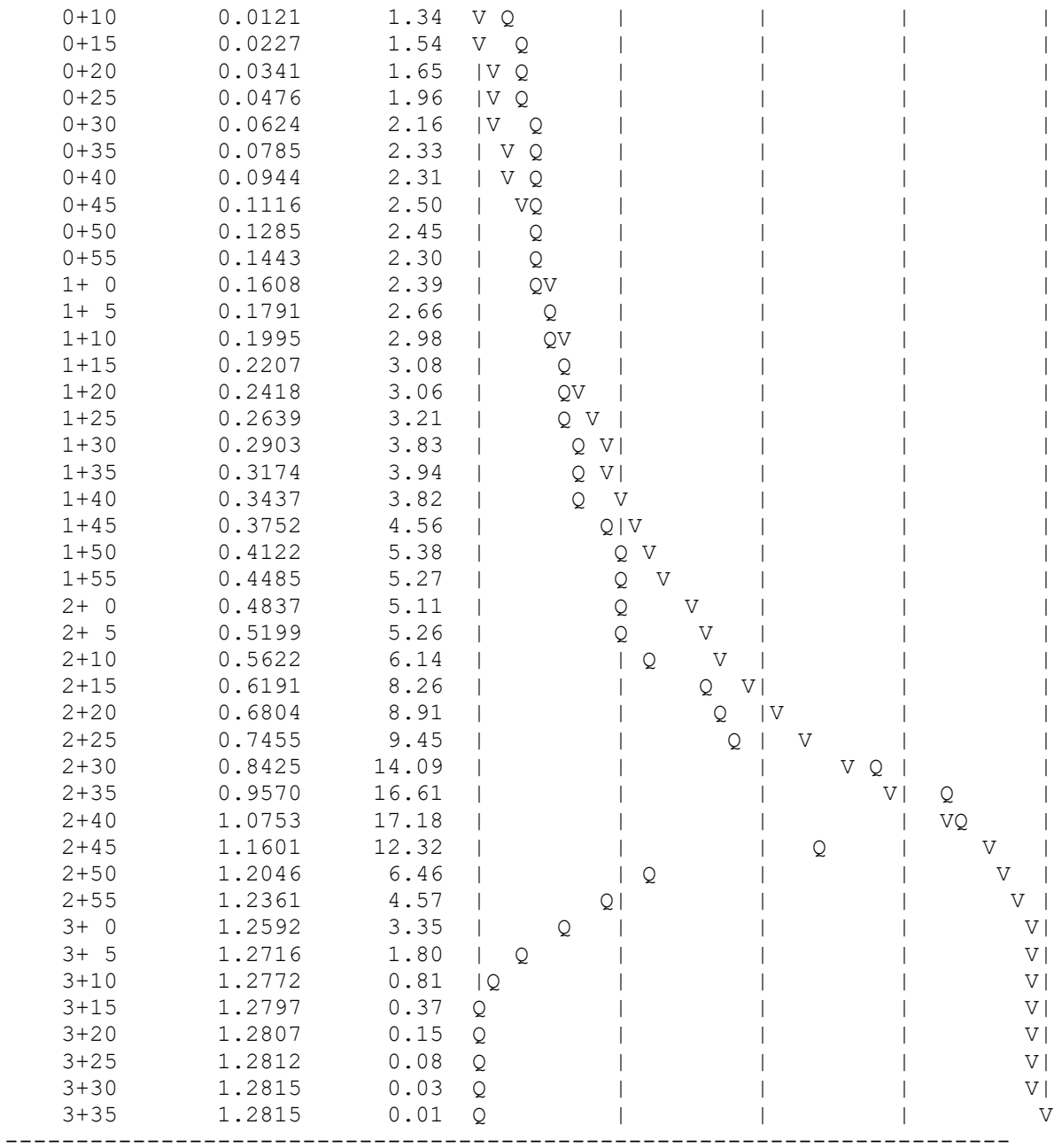
3 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0029	0.42	Q	|	|	|	|



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 10/02/24 File: pq6100uh3100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED A
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 13.13(Ac.) = 0.021 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 13.13(Ac.) = 0.021 Sq. Mi.
Length along longest watercourse = 1103.00(Ft.)
Length along longest watercourse measured to centroid = 759.00(Ft.)
Length along longest watercourse = 0.209 Mi.
Length along longest watercourse measured to centroid = 0.144 Mi.
Difference in elevation = 26.26(Ft.)
Slope along watercourse = 125.7052 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.038 Hr.
Lag time = 2.28 Min.
25% of lag time = 0.57 Min.
40% of lag time = 0.91 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
13.13	0.80	10.50

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
13.13	1.90	24.95

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 1.900(In)

Point rain (area averaged) = 1.900(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.900(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
13.130	60.80	0.722

Total Area Entered = 13.13(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
60.8	60.8	0.461	0.722	0.162	1.000	0.162
					Sum (F) =	0.162

Area averaged mean soil loss (F) (In/Hr) = 0.162
Minimum soil loss rate ((In/Hr)) = 0.081
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.322

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	219.748	46.617	6.169
2	0.167	439.496	42.013	5.559
3	0.250	659.243	8.048	1.065
4	0.333	878.991	3.322	0.440
		Sum =	100.000 Sum=	13.233

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.296	(0.162)	0.096	0.201
2	0.17	1.30	0.296	(0.162)	0.096	0.201
3	0.25	1.10	0.251	(0.162)	0.081	0.170
4	0.33	1.50	0.342	(0.162)	0.110	0.232
5	0.42	1.50	0.342	(0.162)	0.110	0.232

6	0.50	1.80	0.410	(0.162)	0.132	0.278
7	0.58	1.50	0.342	(0.162)	0.110	0.232
8	0.67	1.80	0.410	(0.162)	0.132	0.278
9	0.75	1.80	0.410	(0.162)	0.132	0.278
10	0.83	1.50	0.342	(0.162)	0.110	0.232
11	0.92	1.60	0.365	(0.162)	0.118	0.247
12	1.00	1.80	0.410	(0.162)	0.132	0.278
13	1.08	2.20	0.502	0.162	(0.162)	0.340
14	1.17	2.20	0.502	0.162	(0.162)	0.340
15	1.25	2.20	0.502	0.162	(0.162)	0.340
16	1.33	2.00	0.456	(0.162)	0.147	0.309
17	1.42	2.60	0.593	0.162	(0.191)	0.431
18	1.50	2.70	0.616	0.162	(0.198)	0.454
19	1.58	2.40	0.547	0.162	(0.176)	0.386
20	1.67	2.70	0.616	0.162	(0.198)	0.454
21	1.75	3.30	0.752	0.162	(0.243)	0.591
22	1.83	3.10	0.707	0.162	(0.228)	0.545
23	1.92	2.90	0.661	0.162	(0.213)	0.500
24	2.00	3.00	0.684	0.162	(0.221)	0.522
25	2.08	3.10	0.707	0.162	(0.228)	0.545
26	2.17	4.20	0.958	0.162	(0.309)	0.796
27	2.25	5.00	1.140	0.162	(0.368)	0.978
28	2.33	3.50	0.798	0.162	(0.257)	0.636
29	2.42	6.80	1.550	0.162	(0.500)	1.389
30	2.50	7.30	1.664	0.162	(0.537)	1.503
31	2.58	8.20	1.869	0.162	(0.603)	1.708
32	2.67	5.90	1.345	0.162	(0.434)	1.184
33	2.75	2.00	0.456	(0.162)	0.147	0.309
34	2.83	1.80	0.410	(0.162)	0.132	0.278
35	2.92	1.80	0.410	(0.162)	0.132	0.278
36	3.00	0.60	0.137	(0.162)	0.044	0.093

(Loss Rate Not Used)

Sum = 100.0 Sum = 17.8

Flood volume = Effective rainfall 1.48(In)
times area 13.1(Ac.)/[(In)/(Ft.)] = 1.6(Ac.Ft)
Total soil loss = 0.42(In)
Total soil loss = 0.459(Ac.Ft)
Total rainfall = 1.90(In)
Flood volume = 70564.9 Cubic Feet
Total soil loss = 19987.5 Cubic Feet

Peak flow rate of this hydrograph = 20.659(CFS)

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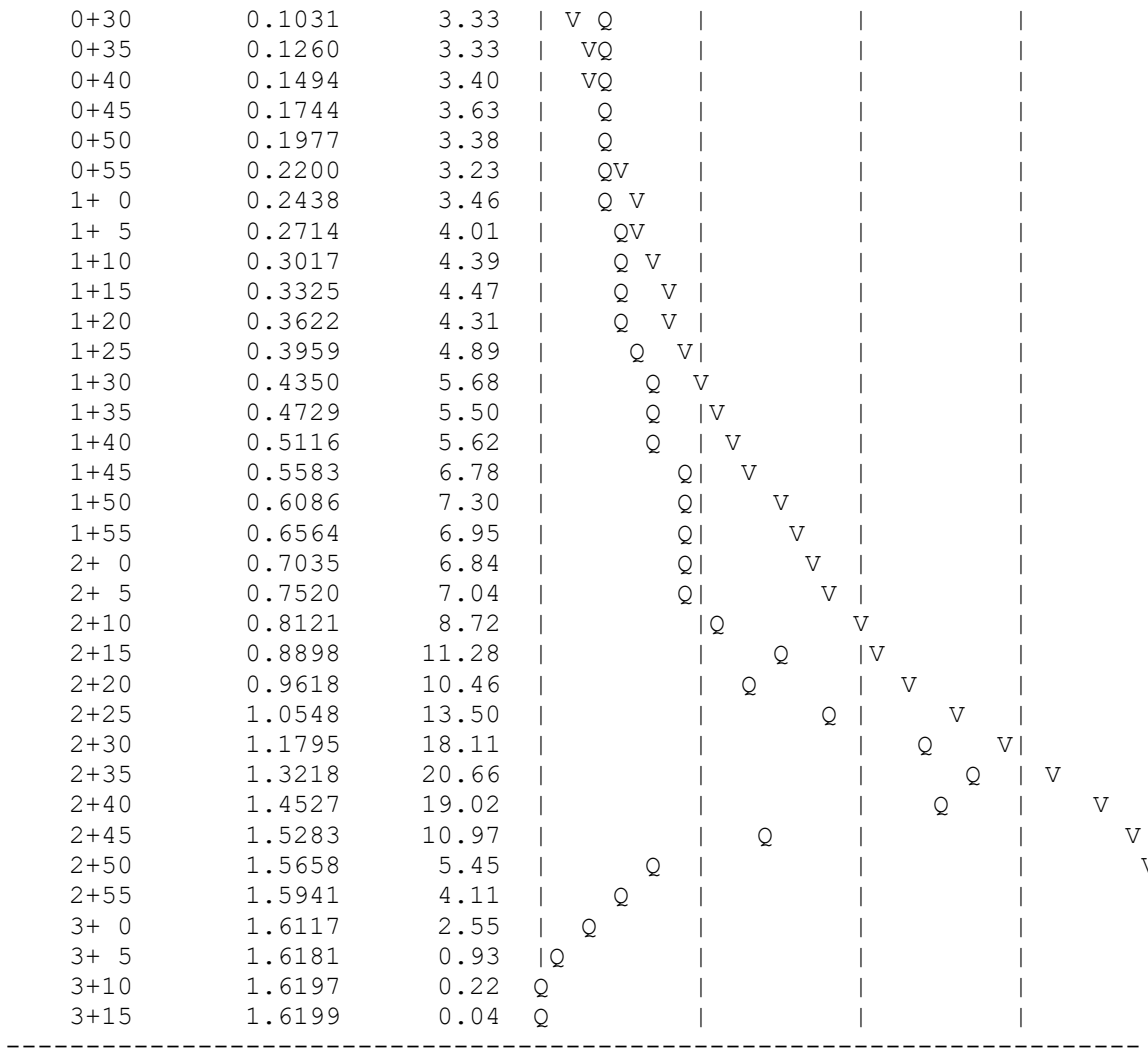
3 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	7.5	15.0	22.5	30.0
0+ 5	0.0085	1.24	VQ				
0+10	0.0248	2.36	V Q				
0+15	0.0412	2.38	|V Q				
0+20	0.0596	2.68	|V Q				
0+25	0.0802	2.99	|V Q				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0+35 0.1260 3.33
0+40 0.1494 3.40
0+45 0.1744 3.63
0+50 0.1977 3.38
0+55 0.2200 3.23
1+ 0 0.2438 3.46
1+ 5 0.2714 4.01
1+10 0.3017 4.39
1+15 0.3325 4.47
1+20 0.3622 4.31
1+25 0.3959 4.89
1+30 0.4350 5.68
1+35 0.4729 5.50
1+40 0.5116 5.62
1+45 0.5583 6.78
1+50 0.6086 7.30
1+55 0.6564 6.95
2+ 0 0.7035 6.84
2+ 5 0.7520 7.04
2+10 0.8121 8.72
2+15 0.8898 11.28
2+20 0.9618 10.46
2+25 1.0548 13.50
2+30 1.1795 18.11
2+35 1.3218 20.66
2+40 1.4527 19.02
2+45 1.5283 10.97
2+50 1.5658 5.45
2+55 1.5941 4.11
3+ 0 1.6117 2.55
3+ 5 1.6181 0.93
3+10 1.6197 0.22
3+15 1.6199 0.04

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED B
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 12.68(Ac.) = 0.020 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 12.68(Ac.) = 0.020 Sq. Mi.
Length along longest watercourse = 818.00(Ft.)
Length along longest watercourse measured to centroid = 475.00(Ft.)
Length along longest watercourse = 0.155 Mi.
Length along longest watercourse measured to centroid = 0.090 Mi.
Difference in elevation = 25.60(Ft.)
Slope along watercourse = 165.2421 Ft./Mi.
Average Manning's 'N' = 0.016
Lag time = 0.028 Hr.
Lag time = 1.68 Min.
25% of lag time = 0.42 Min.
40% of lag time = 0.67 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
12.68	0.80	10.14

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
12.68	1.90	24.09

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 1.900(In)

Point rain (area averaged) = 1.900(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.900(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
12.680	57.60	0.819

Total Area Entered = 12.68(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
57.6	57.6	0.494	0.819	0.130	1.000	0.130
					Sum (F) =	0.130

Area averaged mean soil loss (F) (In/Hr) = 0.130
Minimum soil loss rate ((In/Hr)) = 0.065
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.245

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	297.946	56.468	7.216
2	0.167	595.892	37.242	4.759
3	0.250	893.838	6.290	0.804
			Sum = 100.000	Sum= 12.779

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.296	(0.130)	0.073	0.224
2	0.17	1.30	0.296	(0.130)	0.073	0.224
3	0.25	1.10	0.251	(0.130)	0.061	0.189
4	0.33	1.50	0.342	(0.130)	0.084	0.258
5	0.42	1.50	0.342	(0.130)	0.084	0.258
6	0.50	1.80	0.410	(0.130)	0.100	0.310

7	0.58	1.50	0.342	(0.130)	0.084	0.258
8	0.67	1.80	0.410	(0.130)	0.100	0.310
9	0.75	1.80	0.410	(0.130)	0.100	0.310
10	0.83	1.50	0.342	(0.130)	0.084	0.258
11	0.92	1.60	0.365	(0.130)	0.089	0.275
12	1.00	1.80	0.410	(0.130)	0.100	0.310
13	1.08	2.20	0.502	(0.130)	0.123	0.379
14	1.17	2.20	0.502	(0.130)	0.123	0.379
15	1.25	2.20	0.502	(0.130)	0.123	0.379
16	1.33	2.00	0.456	(0.130)	0.112	0.344
17	1.42	2.60	0.593	0.130 (0.145)		0.463
18	1.50	2.70	0.616	0.130 (0.151)		0.486
19	1.58	2.40	0.547	0.130 (0.134)		0.417
20	1.67	2.70	0.616	0.130 (0.151)		0.486
21	1.75	3.30	0.752	0.130 (0.184)		0.622
22	1.83	3.10	0.707	0.130 (0.173)		0.577
23	1.92	2.90	0.661	0.130 (0.162)		0.531
24	2.00	3.00	0.684	0.130 (0.167)		0.554
25	2.08	3.10	0.707	0.130 (0.173)		0.577
26	2.17	4.20	0.958	0.130 (0.234)		0.828
27	2.25	5.00	1.140	0.130 (0.279)		1.010
28	2.33	3.50	0.798	0.130 (0.195)		0.668
29	2.42	6.80	1.550	0.130 (0.380)		1.420
30	2.50	7.30	1.664	0.130 (0.407)		1.534
31	2.58	8.20	1.869	0.130 (0.458)		1.739
32	2.67	5.90	1.345	0.130 (0.329)		1.215
33	2.75	2.00	0.456	(0.130)	0.112	0.344
34	2.83	1.80	0.410	(0.130)	0.100	0.310
35	2.92	1.80	0.410	(0.130)	0.100	0.310
36	3.00	0.60	0.137	(0.130)	0.033	0.103

(Loss Rate Not Used)

Sum = 100.0 Sum = 18.9

Flood volume = Effective rainfall 1.57(In)
times area 12.7(Ac.)/[(In)/(Ft.)] = 1.7(Ac.Ft)
Total soil loss = 0.33(In)
Total soil loss = 0.347(Ac.Ft)
Total rainfall = 1.90(In)
Flood volume = 72342.2 Cubic Feet
Total soil loss = 15106.9 Cubic Feet

Peak flow rate of this hydrograph = 21.007(CFS)

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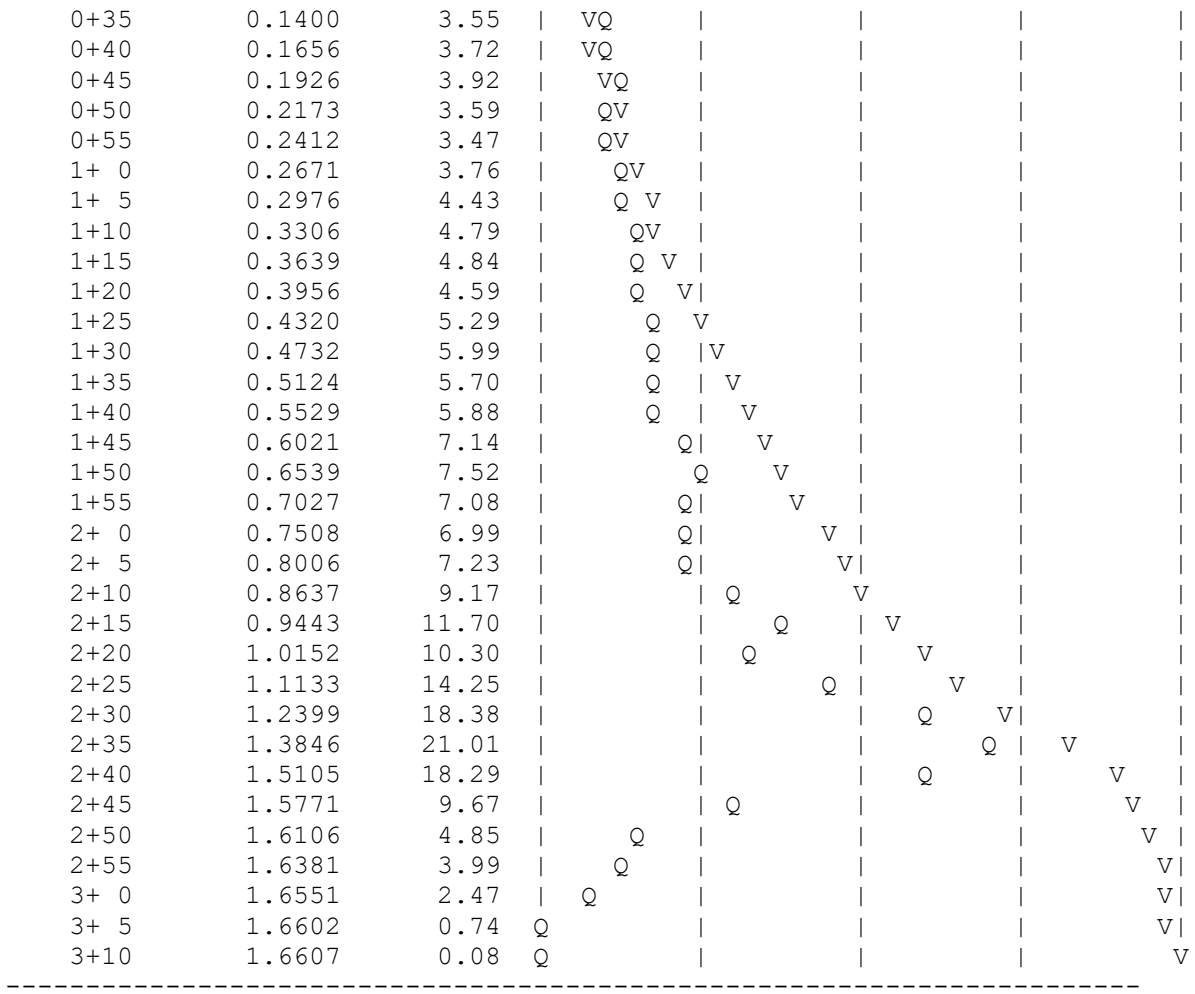
3 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	7.5	15.0	22.5	30.0
0+ 5	0.0111	1.62	V Q	|	|	|	|
0+10	0.0296	2.68	V Q	|	|	|	|
0+15	0.0476	2.61	|V Q	|	|	|	|
0+20	0.0679	2.95	|V Q	|	|	|	|
0+25	0.0902	3.25	| V Q	|	|	|	|
0+30	0.1156	3.68	| V Q	|	|	|	|



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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION - WATERSHED A
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 13.22(Ac.) = 0.021 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 13.22(Ac.) = 0.021 Sq. Mi.
Length along longest watercourse = 1359.00(Ft.)
Length along longest watercourse measured to centroid = 693.00(Ft.)
Length along longest watercourse = 0.257 Mi.
Length along longest watercourse measured to centroid = 0.131 Mi.
Difference in elevation = 18.70(Ft.)
Slope along watercourse = 72.6534 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.088 Hr.
Lag time = 5.28 Min.
25% of lag time = 1.32 Min.
40% of lag time = 2.11 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
13.22	0.50	6.61

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
13.22	1.12	14.81

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.120(In)

Point rain (area averaged) = 1.120(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.120(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
13.220	61.30	0.500

Total Area Entered = 13.22(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
61.3	61.3	0.456	0.500	0.251	1.000	0.251
					Sum (F) =	0.251

Area averaged mean soil loss (F) (In/Hr) = 0.251
Minimum soil loss rate ((In/Hr)) = 0.125
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	94.673	17.575	2.342
2	0.167	189.345	47.848	6.375
3	0.250	284.018	16.514	2.200
4	0.333	378.691	7.359	0.980
5	0.417	473.363	4.203	0.560
6	0.500	568.036	2.720	0.362
7	0.583	662.709	1.772	0.236
8	0.667	757.381	1.110	0.148
9	0.750	852.054	0.900	0.120
			Sum = 100.000	Sum= 13.323

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	4.20	0.564	0.251	(0.282)	0.314
2	0.17	4.30	0.578	0.251	(0.289)	0.327
3	0.25	5.00	0.672	0.251	(0.336)	0.421
4	0.33	5.00	0.672	0.251	(0.336)	0.421
5	0.42	5.80	0.779	0.251	(0.390)	0.529
6	0.50	6.50	0.873	0.251	(0.437)	0.623
7	0.58	7.40	0.994	0.251	(0.497)	0.744
8	0.67	8.60	1.156	0.251	(0.578)	0.905
9	0.75	12.30	1.653	0.251	(0.826)	1.402
10	0.83	29.10	3.911	0.251	(1.955)	3.660
11	0.92	6.80	0.914	0.251	(0.457)	0.663
12	1.00	5.00	0.672	0.251	(0.336)	0.421

(Loss Rate Not Used)

Sum = 100.0 Sum = 10.4

Flood volume = Effective rainfall 0.87(In)
times area 13.2(Ac.)/[(In)/(Ft.)] = 1.0(Ac.Ft)
Total soil loss = 0.25(In)
Total soil loss = 0.276(Ac.Ft)
Total rainfall = 1.12(In)
Flood volume = 41706.3 Cubic Feet
Total soil loss = 12034.5 Cubic Feet

Peak flow rate of this hydrograph = 29.751(CFS)

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

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	7.5	15.0	22.5	30.0
0+ 5	0.0051	0.73	Q				
0+10	0.0241	2.77	V Q				
0+15	0.0500	3.76	V Q				
0+20	0.0824	4.70	V Q				
0+25	0.1192	5.35	V Q				
0+30	0.1638	6.47	V Q				
0+35	0.2169	7.72	VQ				
0+40	0.2808	9.26	VQ				
0+45	0.3630	11.94	Q				
0+50	0.5075	20.98	V Q				
0+55	0.7124	29.75	V Q				
1+ 0	0.8205	15.70	Q V				
1+ 5	0.8837	9.18	Q V				
1+10	0.9149	4.53	Q V				
1+15	0.9333	2.67	Q V				
1+20	0.9447	1.66	Q V				
1+25	0.9517	1.02	Q V				
1+30	0.9561	0.64	Q V				
1+35	0.9571	0.14	Q V				
1+40	0.9574	0.05	Q V				

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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION - WATERSHED B
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 12.58(Ac.) = 0.020 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 12.58(Ac.) = 0.020 Sq. Mi.
Length along longest watercourse = 1170.00(Ft.)
Length along longest watercourse measured to centroid = 550.00(Ft.)
Length along longest watercourse = 0.222 Mi.
Length along longest watercourse measured to centroid = 0.104 Mi.
Difference in elevation = 16.50(Ft.)
Slope along watercourse = 74.4615 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.076 Hr.
Lag time = 4.55 Min.
25% of lag time = 1.14 Min.
40% of lag time = 1.82 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
12.58	0.50	6.29

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
12.58	1.12	14.09

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.120(In)

Point rain (area averaged) = 1.120(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.120(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
12.580	57.80	0.500

Total Area Entered = 12.58(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
57.8	57.8	0.492	0.500	0.271	1.000	0.271
					Sum (F) =	0.271

Area averaged mean soil loss (F) (In/Hr) = 0.271
Minimum soil loss rate ((In/Hr)) = 0.135
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	109.928	22.218	2.817
2	0.167	219.855	48.832	6.191
3	0.250	329.783	14.316	1.815
4	0.333	439.710	6.548	0.830
5	0.417	549.638	3.637	0.461
6	0.500	659.565	2.267	0.287
7	0.583	769.493	1.329	0.168
8	0.667	879.421	0.855	0.108
		Sum =	100.000 Sum=	12.678

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

Unit Time	Pattern	Storm Rain	Loss rate(In./Hr)	Effective

	(Hr.)	Percent	(In/Hr)	Max	Low	(In/Hr)	
1	0.08	4.20	0.564	0.271	(0.282)		0.294
2	0.17	4.30	0.578	0.271	(0.289)		0.307
3	0.25	5.00	0.672	0.271	(0.336)		0.401
4	0.33	5.00	0.672	0.271	(0.336)		0.401
5	0.42	5.80	0.779	0.271	(0.390)		0.509
6	0.50	6.50	0.874	0.271	(0.437)		0.603
7	0.58	7.40	0.994	0.271	(0.497)		0.724
8	0.67	8.60	1.156	0.271	(0.578)		0.885
9	0.75	12.30	1.653	0.271	(0.826)		1.382
10	0.83	29.10	3.911	0.271	(1.955)		3.640
11	0.92	6.80	0.914	0.271	(0.457)		0.643
12	1.00	5.00	0.672	0.271	(0.336)		0.401

(Loss Rate Not Used)

Sum = 100.0 Sum = 10.2

Flood volume = Effective rainfall 0.85(In)
times area 12.6(Ac.)/[(In)/(Ft.)] = 0.9(Ac.Ft)
Total soil loss = 0.27(In)
Total soil loss = 0.284(Ac.Ft)
Total rainfall = 1.12(In)
Flood volume = 38771.3 Cubic Feet
Total soil loss = 12368.1 Cubic Feet

Peak flow rate of this hydrograph = 28.239(CFS)

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

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	7.5	15.0	22.5	30.0
0+ 5	0.0057	0.83	VQ				
0+10	0.0242	2.68	V Q				
0+15	0.0487	3.57	V Q				
0+20	0.0791	4.42	V Q				
0+25	0.1138	5.04	VQ				
0+30	0.1561	6.14	VQ				
0+35	0.2067	7.35	Q				
0+40	0.2679	8.88	QV				
0+45	0.3480	11.64	Q				
0+50	0.4965	21.56	V Q				
0+55	0.6910	28.24	V Q				
1+ 0	0.7850	13.64	Q V				
1+ 5	0.8384	7.75	Q V				
1+10	0.8629	3.57	Q V				
1+15	0.8768	2.01	Q V				
1+20	0.8846	1.13	Q V				
1+25	0.8888	0.62	Q V				
1+30	0.8898	0.14	Q V				
1+35	0.8901	0.04	Q V				

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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED A
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 13.13(Ac.) = 0.021 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 13.13(Ac.) = 0.021 Sq. Mi.
Length along longest watercourse = 1103.00(Ft.)
Length along longest watercourse measured to centroid = 759.00(Ft.)
Length along longest watercourse = 0.209 Mi.
Length along longest watercourse measured to centroid = 0.144 Mi.
Difference in elevation = 26.26(Ft.)
Slope along watercourse = 125.7052 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.038 Hr.
Lag time = 2.28 Min.
25% of lag time = 0.57 Min.
40% of lag time = 0.91 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
13.13	0.50	6.57

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
13.13	1.12	14.71

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.120(In)

Point rain (area averaged) = 1.120(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.120(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
13.130	60.80	0.722

Total Area Entered = 13.13(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
60.8	60.8	0.461	0.722	0.162	1.000	0.162
					Sum (F) =	0.162

Area averaged mean soil loss (F) (In/Hr) = 0.162
Minimum soil loss rate ((In/Hr)) = 0.081
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.322

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	219.748	46.617	6.169
2	0.167	439.496	42.013	5.559
3	0.250	659.243	8.048	1.065
4	0.333	878.991	3.322	0.440
		Sum = 100.000	Sum=	13.233

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	4.20	0.564	0.162	(0.182)	0.403
2	0.17	4.30	0.578	0.162	(0.186)	0.416
3	0.25	5.00	0.672	0.162	(0.217)	0.510

```
 4   0.33     5.00      0.672          0.162    (  0.217)        0.510
 5   0.42     5.80      0.779          0.162    (  0.251)        0.618
 6   0.50     6.50      0.873          0.162    (  0.282)        0.712
 7   0.58     7.40      0.994          0.162    (  0.321)        0.833
 8   0.67     8.60      1.156          0.162    (  0.373)        0.994
 9   0.75    12.30      1.653          0.162    (  0.533)        1.491
10   0.83    29.10      3.911          0.162    (  1.261)        3.749
11   0.92     6.80      0.914          0.162    (  0.295)        0.752
12   1.00     5.00      0.672          0.162    (  0.217)        0.510
           (Loss Rate Not Used)
   Sum =     100.0                                    Sum =    11.5
    Flood volume = Effective rainfall      0.96(In)
     times area      13.1(Ac.)/[(In)/(Ft.)] =       1.0(Ac.Ft)
    Total soil loss =      0.16(In)
    Total soil loss =     0.177(Ac.Ft)
    Total rainfall =      1.12(In)
    Flood volume =       45674.3 Cubic Feet
    Total soil loss =        7700.7 Cubic Feet
    ---------------------------------------------------------------------
     Peak flow rate of this hydrograph =     32.859(CFS)
    ---------------------------------------------------------------------
    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                      1 - H O U R    S T O R M
                  R u n o f f      H y d r o g r a p h
    ---------------------------------------------------------------------
                Hydrograph in   5   Minute intervals ((CFS))

    ---------------------------------------------------------------------
 Time(h+m) Volume Ac.Ft   Q(CFS)  0       10.0      20.0      30.0      40.0
 ---------------------------------------------------------------------------
   0+ 5       0.0171      2.49  V Q       |         |         |         |
   0+10       0.0502      4.81  |V  Q     |         |         |         |
   0+15       0.0908      5.89  |  V Q    |         |         |         |
   0+20       0.1364      6.61  |    VQ   |         |         |         |
   0+25       0.1872      7.38  |      Q  |         |         |         |
   0+30       0.2464      8.60  |       QV|         |         |         |
   0+35       0.3152      9.98  |        Q| V       |         |         |
   0+40       0.3964     11.80  |         |Q   V    |         |         |
   0+45       0.5062     15.93  |         |    Q   V|         |         |
   0+50       0.7325     32.86  |         |         |      V  | Q       |
   0+55       0.9220     27.52  |         |         |      Q  |    V    |
   1+ 0       1.0045     11.98  |         |Q        |         |       V |
   1+ 5       1.0410      5.29  |    Q    |         |         |        V|
   1+10       1.0470      0.87  Q         |         |         |        V|
   1+15       1.0485      0.22  Q         |         |         |         V
---------------------------------------------------------------------------
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U n i t H y d r o g r a p h A n a l y s i s

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED B
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 12.68(Ac.) = 0.020 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 12.68(Ac.) = 0.020 Sq. Mi.
Length along longest watercourse = 818.00(Ft.)
Length along longest watercourse measured to centroid = 475.00(Ft.)
Length along longest watercourse = 0.155 Mi.
Length along longest watercourse measured to centroid = 0.090 Mi.
Difference in elevation = 25.60(Ft.)
Slope along watercourse = 165.2421 Ft./Mi.
Average Manning's 'N' = 0.016
Lag time = 0.028 Hr.
Lag time = 1.68 Min.
25% of lag time = 0.42 Min.
40% of lag time = 0.67 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
12.68	0.50	6.34

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
12.68	1.12	14.20

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.120(In)

Point rain (area averaged) = 1.120(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.120(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
12.680	57.60	0.819

Total Area Entered = 12.68(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
57.6	57.6	0.494	0.819	0.130	1.000	0.130
					Sum (F) =	0.130

Area averaged mean soil loss (F) (In/Hr) = 0.130
Minimum soil loss rate ((In/Hr)) = 0.065
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.245

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	297.946	56.468	7.216
2	0.167	595.892	37.242	4.759
3	0.250	893.838	6.290	0.804
			Sum = 100.000	Sum= 12.779

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	4.20	0.564	0.130	(0.138)	0.434
2	0.17	4.30	0.578	0.130	(0.141)	0.448
3	0.25	5.00	0.672	0.130	(0.164)	0.542
4	0.33	5.00	0.672	0.130	(0.164)	0.542

```
 5   0.42     5.80      0.779          0.130    (  0.191)        0.649
 6   0.50     6.50      0.873          0.130    (  0.214)        0.744
 7   0.58     7.40      0.994          0.130    (  0.243)        0.864
 8   0.67     8.60      1.156          0.130    (  0.283)        1.026
 9   0.75    12.30      1.653          0.130    (  0.405)        1.523
10   0.83    29.10      3.911          0.130    (  0.957)        3.781
11   0.92     6.80      0.914          0.130    (  0.224)        0.784
12   1.00     5.00      0.672          0.130    (  0.164)        0.542
           (Loss Rate Not Used)
   Sum =     100.0                                    Sum =    11.9
    Flood volume = Effective rainfall      0.99(In)
     times area      12.7(Ac.)/[(In)/(Ft.)] =       1.0(Ac.Ft)
    Total soil loss =      0.13(In)
    Total soil loss =     0.137(Ac.Ft)
    Total rainfall =      1.12(In)
    Flood volume =       45562.2 Cubic Feet
    Total soil loss =        5983.6 Cubic Feet
    ---------------------------------------------------------------------
     Peak flow rate of this hydrograph =     35.372(CFS)
    ---------------------------------------------------------------------
    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                      1 - H O U R    S T O R M
                  R u n o f f      H y d r o g r a p h
    ---------------------------------------------------------------------
                Hydrograph in   5   Minute intervals ((CFS))

    ---------------------------------------------------------------------
 Time(h+m) Volume Ac.Ft   Q(CFS)  0       10.0      20.0      30.0      40.0
 ---------------------------------------------------------------------------
   0+ 5       0.0216      3.14  V  Q      |         |         |         |
   0+10       0.0581      5.30  | V  Q    |         |         |         |
   0+15       0.1022      6.39  |  V  Q   |         |         |         |
   0+20       0.1494      6.85  |    VQ   |         |         |         |
   0+25       0.2024      7.71  |      Q  |         |         |         |
   0+30       0.2637      8.90  |       Q V         |         |         |
   0+35       0.3346     10.30  |         Q V       |         |         |
   0+40       0.4181     12.12  |         | Q  V    |         |         |
   0+45       0.5323     16.57  |         |     Q   V         |         |
   0+50       0.7759     35.37  |         |         |         V|    Q    |
   0+55       0.9473     24.89  |         |         |   Q     |     V   |
   1+ 0       1.0209     10.69  |         Q         |         |        V|
   1+ 5       1.0430      3.21  |  Q      |         |         |        V|
   1+10       1.0460      0.44  Q         |         |         |         V
---------------------------------------------------------------------------
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SECTION 3 - REFERENCE DATA

USGS SOILS REPORT

PLATE D-4.1

INFILTRATION REPORT (EXCERPT)

CONTECH UNDERGROUND CHAMBER SYSTEM

DCV CALCULATIONS (WQMP)

PP190005 – HARVILL DISTRIBUTION CENTER OFFSITE DRAINAGE IMPROVEMENTS (HYDROLOGY MAPS)

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Western Riverside Area, California

October 1, 2024

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:2,390 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 17, Aug 30, 2024

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

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
EpA	Exeter sandy loam, deep, 0 to 2 percent slopes	7.2	27.8%
GyC2	Greenfield sandy loam, 2 to 8 percent slopes, eroded	0.3	1.3%
PaA	Pachappa fine sandy loam, 0 to 2 percent slopes	18.3	70.9%
Totals for Area of Interest		**25.8**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Western Riverside Area, California

EpA—Exeter sandy loam, deep, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hctk
Elevation: 300 to 700 feet
Mean annual precipitation: 7 to 15 inches
Mean annual air temperature: 64 degrees F
Frost-free period: 250 to 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Exeter

Setting

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

Typical profile

H1 - 0 to 16 inches: sandy loam
H2 - 16 to 37 inches: sandy clay loam
H3 - 37 to 50 inches: indurated
H4 - 50 to 60 inches: stratified sandy loam to silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 35 to 60 inches to duripan
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Greenfield
Percent of map unit: 5 percent
Hydric soil rating: No

Ramona
Percent of map unit: 5 percent
Hydric soil rating: No

Monserate
Percent of map unit: 5 percent
Hydric soil rating: No

GyC2—Greenfield sandy loam, 2 to 8 percent slopes, eroded

Map Unit Setting
National map unit symbol: hcvw
Elevation: 100 to 3,500 feet
Mean annual precipitation: 9 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Prime farmland if irrigated

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

Description of Greenfield

Setting
Landform: Terraces, alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile
H1 - 0 to 26 inches: sandy loam
H2 - 26 to 43 inches: fine sandy loam
H3 - 43 to 60 inches: loam
H4 - 60 to 72 inches: stratified loamy sand to sandy loam

Properties and qualities
Slope: 2 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: A
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 3 percent
Hydric soil rating: No

Pachappa

Percent of map unit: 3 percent
Hydric soil rating: No

Arlington

Percent of map unit: 3 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 3 percent
Hydric soil rating: No

Ramona

Percent of map unit: 3 percent
Hydric soil rating: No

PaA—Pachappa fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hcxn
Elevation: 1,000 feet
Mean annual precipitation: 14 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 270 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Pachappa

Setting

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

Typical profile

H1 - 0 to 20 inches: fine sandy loam
H2 - 20 to 63 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

San emigdio

Percent of map unit: 5 percent
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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.

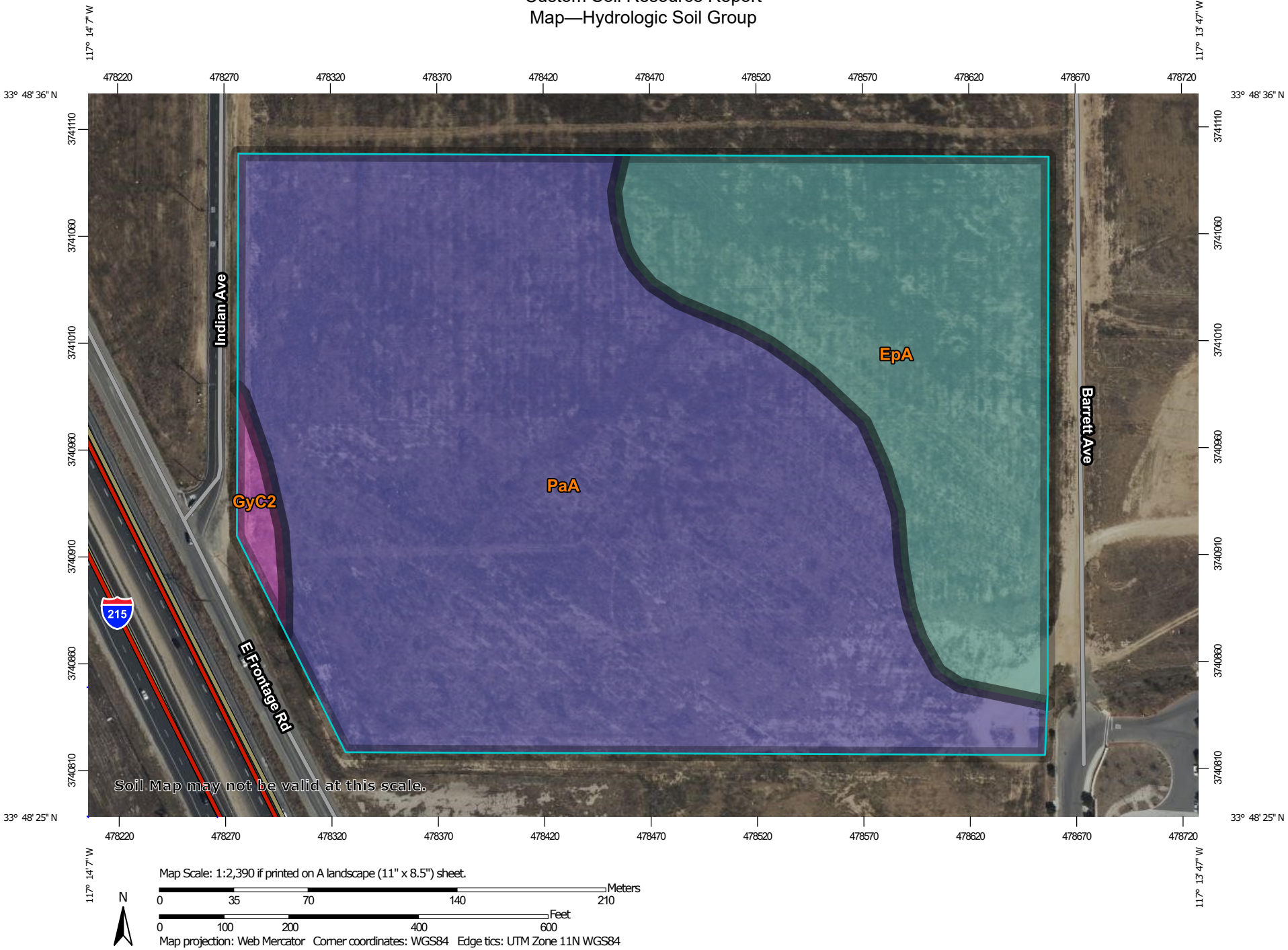
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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.

Custom Soil Resource Report
Map—Hydrologic Soil Group



Map Scale: 1:2,390 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

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 1:15,800.

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

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

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

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

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

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 17, Aug 30, 2024

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

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

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.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
EpA	Exeter sandy loam, deep, 0 to 2 percent slopes	C	7.2	27.8%
GyC2	Greenfield sandy loam, 2 to 8 percent slopes, eroded	A	0.3	1.3%
PaA	Pachappa fine sandy loam, 0 to 2 percent slopes	B	18.3	70.9%
Totals for Area of Interest			**25.8**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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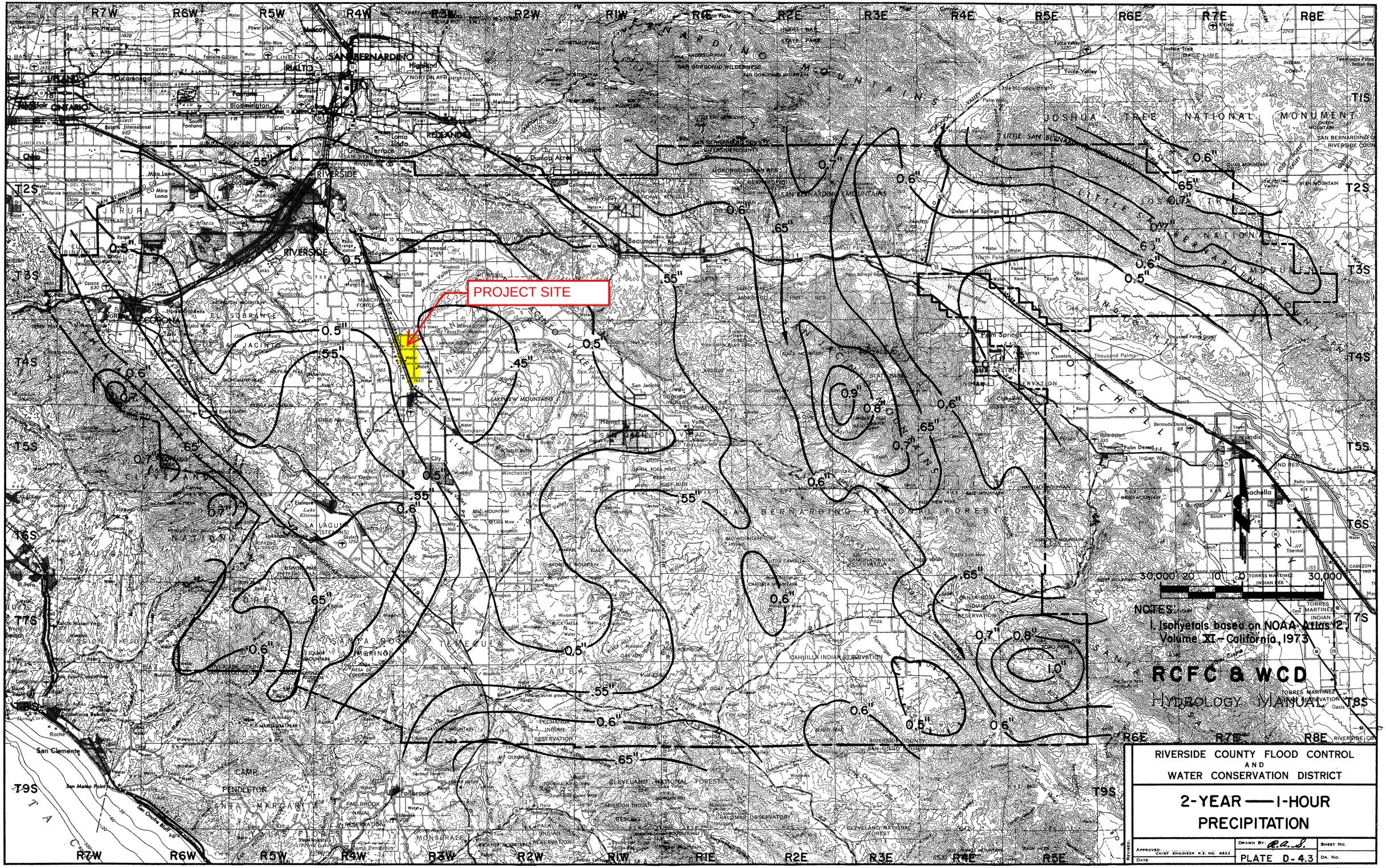
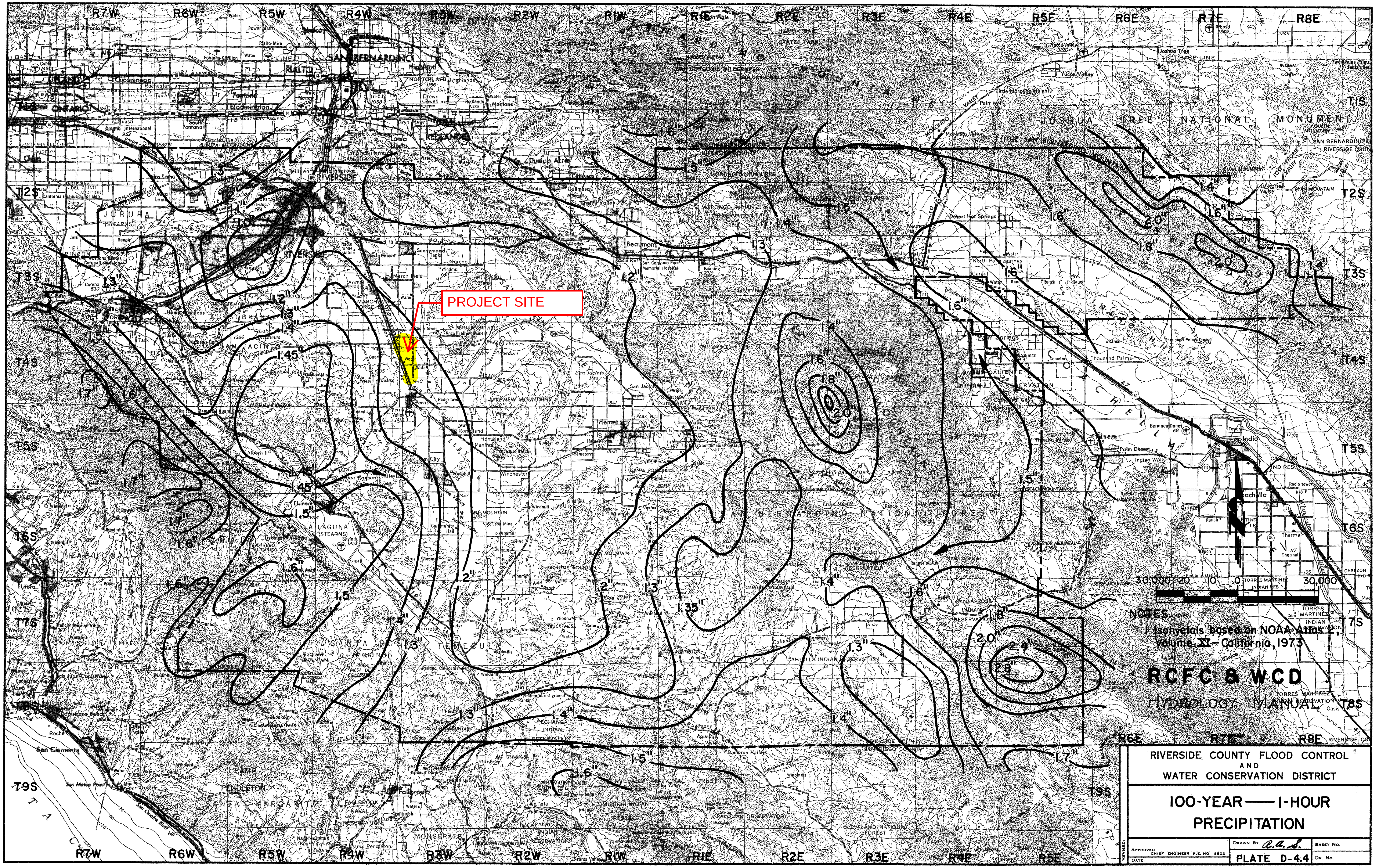
RAINFALL INTENSITY–INCHES PER HOUR

MIRA LOMA			MURRIETA - TEMECULA & RANCHO CALIFORNIA			NORCO			PALM SPRINGS			PERRIS VALLEY		
DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY	
	10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR
5	2.84	4.48	5	3.45	5.10	5	2.77	4.16	5	4.23	6.76	5	2.64	3.78
6	2.58	4.07	6	3.12	4.61	6	2.53	3.79	6	3.80	6.08	6	2.41	3.46
7	2.37	3.75	7	2.87	4.24	7	2.34	3.51	7	3.48	5.56	7	2.24	3.21
8	2.21	3.49	8	2.67	3.94	8	2.19	3.29	8	3.22	5.15	8	2.09	3.01
9	2.08	3.28	9	2.50	3.69	9	2.07	3.10	9	3.01	4.81	9	1.98	2.84
10	1.96	3.10	10	2.36	3.48	10	1.96	2.94	10	2.83	4.52	10	1.88	2.69
11	1.87	2.95	11	2.24	3.30	11	1.87	2.80	11	2.67	4.28	11	1.79	2.57
12	1.78	2.82	12	2.13	3.15	12	1.79	2.68	12	2.54	4.07	12	1.72	2.46
13	1.71	2.70	13	2.04	3.01	13	1.72	2.58	13	2.43	3.88	13	1.65	2.37
14	1.64	2.60	14	1.96	2.89	14	1.66	2.48	14	2.33	3.72	14	1.59	2.29
15	1.58	2.50	15	1.89	2.79	15	1.60	2.40	15	2.23	3.58	15	1.54	2.21
16	1.53	2.42	16	1.82	2.69	16	1.55	2.32	16	2.15	3.44	16	1.49	2.14
17	1.48	2.34	17	1.76	2.60	17	1.50	2.25	17	2.08	3.32	17	1.45	2.08
18	1.44	2.27	18	1.71	2.52	18	1.46	2.19	18	2.01	3.22	18	1.41	2.02
19	1.40	2.21	19	1.66	2.45	19	1.42	2.13	19	1.95	3.12	19	1.37	1.97
20	1.36	2.15	20	1.61	2.38	20	1.39	2.08	20	1.89	3.03	20	1.34	1.92
22	1.29	2.04	22	1.53	2.26	22	1.32	1.98	22	1.79	2.86	22	1.28	1.83
24	1.24	1.95	24	1.46	2.15	24	1.26	1.90	24	1.70	2.72	24	1.22	1.75
26	1.18	1.87	26	1.39	2.06	26	1.22	1.82	26	1.62	2.60	26	1.18	1.69
28	1.14	1.80	28	1.34	1.98	28	1.17	1.76	28	1.56	2.49	28	1.13	1.63
30	1.10	1.73	30	1.29	1.90	30	1.13	1.70	30	1.49	2.39	30	1.10	1.57
32	1.06	1.67	32	1.24	1.84	32	1.10	1.64	32	1.44	2.30	32	1.06	1.52
34	1.03	1.62	34	1.20	1.78	34	1.06	1.59	34	1.39	2.22	34	1.03	1.48
36	1.00	1.57	36	1.17	1.72	36	1.03	1.55	36	1.34	2.15	36	1.00	1.44
38	.97	1.53	38	1.13	1.67	38	1.01	1.51	38	1.30	2.09	38	.98	1.40
40	.94	1.49	40	1.10	1.62	40	.98	1.47	40	1.27	2.02	40	.95	1.37
45	.89	1.40	45	1.03	1.52	45	.92	1.39	45	1.18	1.89	45	.90	1.29
50	.84	1.32	50	.97	1.44	50	.88	1.31	50	1.11	1.78	50	.85	1.22
55	.80	1.26	55	.92	1.36	55	.84	1.25	55	1.05	1.68	55	.81	1.17
60	.76	1.20	60	.88	1.30	60	.80	1.20	60	1.00	1.60	60	.78	1.12
65	.73	1.15	65	.84	1.24	65	.77	1.15	65	.95	1.53	65	.75	1.08
70	.70	1.11	70	.81	1.19	70	.74	1.11	70	.91	1.46	70	.72	1.04
75	.68	1.07	75	.78	1.15	75	.72	1.07	75	.88	1.41	75	.70	1.00
80	.65	1.03	80	.75	1.11	80	.69	1.04	80	.85	1.35	80	.68	.97
85	.63	1.00	85	.73	1.07	85	.67	1.01	85	.82	1.31	85	.66	.94
SLOPE = .530			SLOPE = .550			SLOPE = .500			SLOPE = .580			SLOPE = .490		

STANDARD
INTENSITY–DURATION
CURVES DATA


PROJECT SITE
NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
2-YEAR — 1-HOUR PRECIPITATION
PLATE D-4.3
DRAWN BY: R.A.S.
APPROVED CHIEF ENGINEER R.E. NO. 8822
DATE
SHEET No.
DR. No.
REVISED:


PROJECT SITE
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
100-YEAR —— 1-HOUR
PRECIPITATION
PLATE D-4.4
NOTES
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
30,000 20 10 0 30,000
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T7S
T8S
T9S
SAN BERNARDINO
RIVERSIDE
REDLANDS
ONTARIO
UPLAND
RIALTO
Beaumont
Perris
Hemet
San Jacinto
Elsinore
Indio
Palm Springs
Palm Desert
Coachella
Fallbrook
San Clemente
JOSHUA TREE NATIONAL MONUMENT
SAN BERNARDINO MOUNTAINS
LAKEVIEW MOUNTAINS
SAN BERNARDINO NATIONAL FOREST
CLEVELAND NATIONAL FOREST
CAMP PENDLETON
1.0"
1.1"
1.2"
1.3"
1.35"
1.4"
1.45"
1.5"
1.6"
1.7"
1.8"
2.0"
2.4"
2.8"

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

September 20, 2023

Howard Industrial Partners
1944 North Tustin Street, Suite 122
Orange, California 92865

Attention: Mr. Mike Tunney
Vice President

Project No.: **22G183-4**

Subject: **Results of Additional Infiltration Testing**
Harvest Landing Industrial Development
Indian Avenue and Orange Avenue
Perris, California

Reference: 1) Geotechnical Investigation, Proposed Harvest Landing Industrial Development, Indian Avenue and Orange Avenue, Perris, California, prepared for Howard Industrial Partners, by Southern California Geotechnical, Inc. (SCG), SCG Project No. 22G183-1, dated June 13, 2022.

2) Results of Infiltration Testing, Proposed Harvest Landing Industrial Development, Indian Avenue and Orange Avenue, Perris, California, prepared by Southern California Geotechnical, Inc. (SCG), SCG Project No. 22G183-2, dated July 1, 2022.

3) Geotechnical Investigation, Harvest Landing Industrial Development, Indian Avenue and Orange Avenue, Perris, California, prepared for Howard Industrial Partners, by Southern California Geotechnical, Inc. (SCG), SCG Project No. 22G183-3, dated September 21, 2023.

Mr. Tunney:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

Scope of Services

The scope of services performed for this project was in general accordance with our Proposal No. 23P306R, dated August 9, 2023. The scope of services included site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the on-site soils. The infiltration testing was performed in general accordance with the guidelines published in Riverside County – Low Impact Development BMP Design Handbook – Section 2.3 of Appendix A, prepared for the Riverside County Department of Environmental Health (RCDEH), dated December, 2013.

Site and Project Description

The site is located at the southwest corner of North Perris Boulevard and Orange Avenue in Perris, California. The site is bounded to the north by Orange Avenue, West Water Avenue, and vacant land, to the west by Interstate 215 Frontage Road and Freeway I-215, to the south by an existing commercial development and a vacant land, and to the east by an existing commercial development, North Perris Boulevard and Barrett Avenue. The western portion of the site is partially transected by Indian Avenue (trending north-south). Orange Avenue (trending east-west) separates the northern portion of the overall site (designated as Phase 2 on the site plans) from Phase 1 in the central to southern portions of the western portion of the overall site. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 in Appendix A of this report.

The site consists of several parcels, which total 214.82± acres in size. The west-central area of the site, is developed with four (4) single-family residences (SFRs) which range from approximately 1,200 to 6,160 ft² in size. The residences are of wood-frame and stucco construction and are assumed to be supported on conventional shallow foundations, with slab-on-grade floors. Ground surface cover surrounding the SFRs includes asphaltic concrete with Portland cement concrete driveways, exposed soil, and trees. The remaining areas of the site are vacant and undeveloped. Ground surface cover consists of exposed soil with sparse to moderate native grass and weed growth and occasional trees. A water pump is present approximately 200 feet south of the intersection of Perris Boulevard and Orange Avenue, within the site's boundary. A 3- to 4-foot deep drainage rut is present in the central-eastern area of the site, trending east-west between a dirt road located and the east boundary of the site. Many small stockpiles of plant material and woodchips are located along the eastern side of Indian Avenue, approximately 2 to 4-feet in height. Based on historic aerial photographs obtained from Google Earth, the site was previously used for farming activities. Due to previous tilling activities, the ground surface throughout the site is generally hummocky.

Detailed topographic information was obtained from the Exhibit A-Infiltration Testing Locations plan, prepared by FM Civil Engineers, Inc. Based on this plan, the overall site topography slopes downward to the east at a gradient of 1.5± percent.

Proposed Development

Based on a site plan prepared by RGA, the site will be developed with the following industrial/commercial buildings, located throughout the site.

Building Type	Building Name	Location	Size (ft²)
Industrial	1	Northwest	380,000
Industrial	2	West-Central	88,400
Industrial	3	West-Central	50,000
Industrial	4	Southwest	18,800

Distribution	5	Central	440,000
Commercial	Big Box Retail	Southeast	165,000
Commercial	Shopping Center	Northeast	150,000
Retail	Pad 1	Northeast	6,500
Retail	Pad 2	Northeast	6,500
Restaurant	Pad 3	East	2,305
Retail	Pad 4	East	9,000
Restaurant	Pad 5	Southeast	3,172

Building Nos. 1 through 4 - Industrial Buildings

Dock-high doors will be constructed along a portion of at least one building wall for each of the industrial buildings. The buildings will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete pavements in the loading dock areas, and limited areas of concrete flatwork and landscape planters throughout.

Detailed structural information has not been provided. We assume the new industrial buildings will be single-story structures of tilt-up concrete construction, typically supported on conventional shallow foundation systems with concrete slab-on-grade floors. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 100 kips and 4 to 7 kips per linear foot, respectively.

Building No. 5 - Distribution Building

Dock-high doors will be constructed along portions of the east and west building walls. The building will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete pavements in the loading dock areas, and limited areas of concrete flatwork and landscape planters throughout. Two ancillary buildings, 15,300± ft² and 3,300± ft² in size are located to the south of the main distribution building.

Detailed structural information has not been provided. We assume the new main distribution building will be a two-story structure of tilt-up concrete construction, typically supported on conventional shallow foundation system with a concrete slab-on-grade floor. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 700 to 900 kips and 4 to 7 kips per linear foot, respectively.

Commercial – Big Box Retail

Dock-high doors will be constructed along a portion of the east building wall. The building will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete in the loading dock areas, and limited areas of concrete flatwork and landscape planters

throughout. This commercial development will include an automobile service station located east of the building. The service station will include a canopy, five (5) fuel pump islands, and underground storage tanks (USTs).

Detailed structural information has not been provided. We assume that the commercial building will be a single-story structure of tilt-up concrete construction, typically supported on conventional shallow foundation system with concrete slab-on-grade floors. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 100 kips and 4 to 7 kips per linear foot, respectively. The new pump island canopy is expected to be a steel frame structure, typically supported on deepened shallow foundations. Maximum column loads for the canopy are expected to be in the range of 20 kips, with significant overturning and/or uplift loads.

Commercial – Shopping Center

The shopping center building will consist of eight (8) suites ranging from 2,400± ft² to 54,000± ft² in size. Dock-high doors will be constructed along a portion of the west building walls for four (4) of the suites of the shopping center building. The building will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete in the loading dock areas, and limited areas of concrete flatwork and landscape planters throughout.

Detailed structural information has not been provided. We assume that the new shopping center building will be a single-story structure of wood frame or masonry block construction, typically supported on conventional shallow foundation systems with a concrete slab-on-grade floor. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 50 kips and 2 to 3 kips per linear foot, respectively.

Retail and Restaurant Buildings

The two fast-food restaurant buildings will include drive-thru lanes. Pad 4 will contain four (4) suites. The buildings will be surrounded by asphaltic concrete pavements in the parking and drive lanes, concrete flatwork, and limited areas of landscape planters throughout.

Detailed structural information has not been provided. We assume that the new retail and restaurant buildings will be single-story structures of wood frame construction, typically supported on conventional shallow foundation systems with concrete slab-on-grade floors. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 20 kips and 1 to 3 kips per linear foot, respectively.

Streets

Barrett Avenue and two access streets will be constructed at the site. It is assumed that the new streets will consist of asphaltic concrete pavements.

General

No significant amounts of below-grade construction, such as basements or crawl spaces, are expected to be included in the proposed development. Based on the assumed topography, cuts and fills of up to 8 to 10± feet are expected to be necessary to achieve the proposed site grades

throughout the site.

Streets

Barrett Avenue and two access streets will be constructed at the site. It is assumed that the new streets will consist of asphaltic concrete pavements.

Previous Studies

Southern California Geotechnical (SCG) previously conducted a geotechnical investigation at the subject site (Reference No. 1). As a part of this study, twenty-three (23) borings (Identified as Boring Nos. B-1 through B-23) were advanced to depths of 15 to 25± feet below the existing site grades. Native alluvium was encountered at each boring locations, extending to at least the maximum depth explored of 25± feet below existing site grades. The alluvium generally consists of medium dense to very dense silty sands to sandy silts, with trace to little clay content. Free water was not encountered during the drilling of the borings. Based on the lack of water within the borings and the moisture contents of the recovered soil samples, the static groundwater is considered to have existed at a depth in excess of 25± feet at the time of the subsurface exploration.

SCG also previously conducted infiltration testing at the subject site (Reference No. 2). The subsurface exploration performed for the infiltration testing consisted of six (6) shallow infiltration trenches (identified as Infiltration Trench Nos. I-1 through I-6) and four (4) deep infiltration borings (identified as Infiltration Boring Nos. I-7 through I-10). The infiltration trenches were excavated to a depth of 7± feet below existing site grades. The infiltration borings were extended to a depth of 50± feet below existing site grades. In addition, one (1) exploratory boring was extended to a depth of 60± feet below site grades. Artificial fill soils were encountered at the ground surface at Infiltration Test No. I-3, extending to a depth of 1± foot below existing site grades. The fill soils consisted of medium dense fine to medium sandy silts with trace quantities of clay and fine gravel. Native alluvium was encountered at the ground surface at all of the remaining boring and trench locations, extending to at least the maximum explored depth of 60± feet below existing site grades. The near-surface alluvium encountered at depths less than 25± feet below existing site grades consisted of medium dense to very dense fine to medium sandy silts, silty fine to medium sands, clayey fine to coarse sands, and hard fine to coarse sandy clays. At depths greater than 25± feet, the alluvium consisted of medium dense to very dense fine sandy silts, fine to medium sandy silts, silty fine to medium sands, and hard fine to medium sandy clays. Based on the results of the testing, SCG recommended infiltration rates of 0.9 to 3.6 inches per hour for the proposed chamber systems. Additionally, SCG did not recommend dry well infiltration at the subject site.

Concurrent Study

SCG concurrently conducted a geotechnical investigation at the subject site (Reference No. 3). As a part of this study, forty-three (43) borings (identified as Boring Nos. B-25 through B-67) were advanced to depths of 10 to 50± feet below the existing site grades.

Younger native alluvium was encountered at the ground surface at Boring Nos. B-25, B-28, B-29, B-31, B-32, B-50, B-55 through B-58, B-60, B-64, and B-67, extending to depths of 2½ to 5½± feet below existing site grades. The alluvium generally consists of loose to medium dense silty

fine sands, silty fine to medium sands, fine sandy silts, clayey fine sands. Occasional layers of very stiff fine sandy clays and silty clays. The younger native alluvial soils are classified as "alluvium" on the boring logs. Native older alluvium was encountered beneath the younger native alluvial soils (at the boring locations listed above) and at the ground surface at the remaining boring locations. All of the borings were terminated within the older alluvium, and the older alluvial soils extend to at least the maximum depth explored of 50± feet below ground surface. The older alluvial soils generally consist of medium dense to very dense well- to poorly-graded silty sands with varying clay content, well-graded to poorly-graded sandy silts with varying clay content, well-graded to poorly-graded clayey sands with varying silt content, and clayey silts. Additionally, layers of very stiff to hard fine sandy clays and silty clays were encountered. The older alluvium generally possesses weak to moderate cementation, and occasionally possesses trace to extensive calcareous nodules and veining.

Groundwater

Free water was not encountered during the drilling of any of the borings. Based on the moisture content of the recovered soil samples and the lack of free water in the borings, the static groundwater table is at a depth greater than the maximum explored depth of 50± feet below existing site grades for this project.

Recent water level data was obtained from the California Department of Water Resources website, http://www.water.ca.gov/waterdatalibrary/. The nearest monitoring well is located on the northeast corner of the site. Water level readings within this monitoring well indicates a groundwater level of 40± feet (March 2023) below the ground surface.

Subsurface Exploration

Scope of Exploration

The subsurface exploration conducted for the infiltration testing consisted of thirty-seven (37) infiltration test borings, advanced to depths of 3 to 10½± feet below the existing site grades. The infiltration borings were advanced using a truck-mounted drilling rig, equipped with 8-inch-diameter hollow stem augers and were logged during drilling by a member of our staff. The approximate locations of the infiltration test borings (identified as Infiltration Test Nos. I-11 through I-37) are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Upon the completion of the infiltration borings, the bottom of each test boring was covered with 2± inches of clean ¾-inch gravel. A sufficient length of 3-inch-diameter perforated PVC casing was then placed into each test hole so that the PVC casing extended from the bottom of the test hole to the ground surface. Clean ¾-inch gravel was then installed in the annulus surrounding the PVC casing.

Geotechnical Conditions

Native younger alluvium was encountered at the ground surface at Infiltration Test Nos. I-11, I-23, I-26 and I-39, extending to depths of 3 to 6± feet below the existing site grades. The younger alluvium generally consists of medium dense silty sands and sandy silts. Native older alluvium was encountered beneath the native younger alluvium and at the ground surface at the remaining

infiltration test locations, extending to at least the maximum depth explored of 10½± feet. The older alluvium generally consists of medium dense to very dense silty sands and sandy silts with trace to little clay content. The older alluvium occasionally possesses weak cementation. The Infiltration Boring Logs, which illustrate the conditions encountered at each of the borings, are included with this report.

Infiltration Testing

As previously mentioned, the infiltration testing was performed in general accordance with the Riverside County guidelines: Riverside County – Low Impact Development BMP Design Handbook – Section 2.3 of Appendix A.

Pre-soaking

In accordance with the county infiltration standards all of the infiltration test borings were pre-soaked prior to the infiltration testing. The pre-soaking process consisted of filling the test borings by inverting a full 5-gallon bottle of clear water supported over each hole so that the water level reaches a level of at least 5 times the hole's radius above the gravel at the bottom of each hole. The pre-soaking was completed after all of the water had percolated through each test hole or after 15 hours since initiating the pre-soak. Based on the results of the pre-soaking process, 30-minute readings were utilized during all of the infiltration tests, except for Infiltration Test Nos. I-24 and I-45. For Infiltration Test Nos. I-24 and I-45, 10-minute readings were utilized during the infiltration tests.

Infiltration Testing

Following the pre-soaking process of the infiltration test borings, SCG performed the infiltration testing. Each test hole was filled with water to a depth of at least 5 times the hole's radius above the gravel at the bottom of each test hole. In accordance with the Riverside County guidelines, in areas where "non-sandy soils" were encountered at the bottom of each infiltration test boring, (where 6 inches of water did not infiltrate into the surrounding soils in less than 25 minutes for two (2) consecutive readings), readings were taken at 30-minute intervals for a total of 6 hours at the test locations. At Infiltration Test Nos. I-24 and I-45, "sandy-soils" were encountered at the bottom of the test borings, (where 6 inches of water did infiltrate into the surrounding soils in less than 25 minutes for two (2) consecutive readings), therefore, readings were taken at 10-minute intervals for 1 hour at the test locations. The water level readings are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on the spreadsheets.

The infiltration rates from the test are tabulated in inches per hour. In accordance with the typically accepted practice, it is recommended that the most conservative reading from the latter part of the infiltration tests be used as the design infiltration rate. The rates are summarized below:

Infiltration Test No.	Depth (feet)	Soil Description	Measured Infiltration Rate (inches/hour)
I-11	4½	YOUNGER ALLUVIUM: Brown Silty fine to coarse Sand, trace Clay	0.2

I-12	4½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.2
I-13	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.2
I-14	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.2
I-15	10½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-16	9½	OLDER ALLUVIUM: Dark Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.2
I-17	10	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace to little Clay, trace coarse Sand	0.0
I-18	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace to little Clay, trace coarse Sand	0.0
I-19	3	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-20	3	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-21	3½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, little coarse Sand	0.4
I-22	4½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, little coarse Sand	0.3
I-23	9	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-24	9	OLDER ALLUVIUM: Brown Silty fine to coarse Sand	1.7
I-25	9	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-26	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-27	7	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace coarse Sand	0.1
I-28	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.0
I-29	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-30	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace Clay	0.1
I-31	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-32	6½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-33	6½	OLDER ALLUVIUM: Brown fine to medium Sandy Silt to Silty fine to medium Sand, trace Clay	0.1
I-34	5	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-35	4½	OLDER ALLUVIUM: Light Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-36	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.0
I-37	6½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1

I-38	6½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-39	7½	OLDER ALLUVIUM: Dark Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-40	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-41	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace Clay, trace coarse Sand	0.0
I-42	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace Clay, trace coarse Sand	0.0
I-43	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-44	4½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-45	5	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.8
I-46	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-47	7	OLDER ALLUVIUM: Brown fine to medium Sandy Silt, little Clay	0.1

Laboratory Testing

Moisture Content

The moisture contents for the recovered soil samples within the borings were determined in accordance with ASTM D-2216 and are expressed as a percentage of the dry weight. These test results are presented on the Boring Logs.

Grain Size Analysis

The grain size distribution of selected soils collected from the bottom of each infiltration test boring have been determined using a range of wire mesh screens. These tests were performed in general accordance with ASTM D-422 and/or ASTM D-1140. The weight of the portion of the sample retained on each screen is recorded and the percentage finer or coarser of the total weight is calculated. The results of these tests are presented on Plates C-1 through C-37 of this report.

Design Recommendations

Thirty-seven (37) infiltration tests were performed at the subject site. As noted above, the calculated infiltration rates at the infiltration test locations range between 0.0 and 1.7 inches per hour. The major factors affecting the lack of infiltration at these locations are the presence of very dense older alluvium with high contents of fine-grained soil. **Based on these conditions and the results of infiltration testing we recommend the following design infiltration rates to be utilized for the proposed infiltration systems:**

Infiltration System(s)	Infiltration Test Nos.	Infiltration Test Depth (ft)	Infiltration System Type	Infiltration System Location	Design Infiltration Rate (inches/hour)
"A"	I-11	4½	Bio-Retention Basin	West	Not Recommended
"B"	I-12	4½	Bio-Retention Basin	West	Not Recommended
"C"	I-13	5½	Below-Grade Chamber	West	Not Recommended
"D"	I-14	7½	Below-Grade Chamber	Northwest	Not Recommended
"E"	I-15 through I-17	9½ to 10½	Bio-Retention Basin	North	Not Recommended
"F"	I-18	7½	Below-Grade Chamber	North	Not Recommended
"G"	I-19 through I-22	3 to 4½	Bio-Retention Basin	South	Not Recommended
"H"	I-23, I-24	9	Bio-Retention Basin	South	Not Recommended
"I" & "J"	I-25 through I-33	5½ to 9	Bio-Retention Basin	Northeast	Not Recommended
"K"	I-34 through I-36	4½ to 5½	Below-Grade Chamber	Southeast	Not Recommended
"L"	I-37	6½	Below-Grade Chamber	Southeast	Not Recommended
"M"	I-38, I-39	6½ to 7½	Below-Grade Chamber	Southeast	Not Recommended
"N"	I-40	7½	Below-Grade Chamber	Northeast	Not Recommended
"O"	I-41	6	Below-Grade Chamber	Northeast	Not Recommended
"P"	I-42	6	Below-Grade Chamber	Northeast	Not Recommended
"Q"	I-43	6	Below-Grade Chamber	Northeast	Not Recommended
"R"	I-44	4½	Below-Grade Chamber	Northeast	Not Recommended*
"S"	I-45	5	Below-Grade Chamber	Northeast	Not Recommended
"T"	I-46	5½	Below-Grade Chamber	Northeast	Not Recommended
"U"	I-47	7	Below-Grade Chamber	Northeast	Not Recommended

*Although the test results indicate an infiltration rate of 0.8 in/hr at this location, the subsurface soil profile at this site includes many soil layers with low permeability. Soil layers with some capacity for infiltration, such as the silty sand layer encountered at Infiltration test-location I-44, are generally interbedded between low permeability soil layers, based on our review of the boring logs for the overall site. Therefore, long-term infiltration is not considered to feasible.

Although infiltration is not considered feasible, the client may desire to use storm water disposal systems that do not rely on infiltration at this site. The design of the proposed storm water

disposal systems should be performed by the project civil engineer, in accordance with the City of Perris, and/or County of Riverside guidelines. However, it is recommended that the system be constructed so as to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the system.

Infiltration Rate Considerations

The infiltration rates presented herein were determined in accordance with the Riverside County guidelines and are considered valid only for the time and place of the actual test. Varying subsurface conditions will exist in other areas of the site, which could alter the recommended infiltration rates presented above. The infiltration rates will decline over time between maintenance cycles as silt or clay particles accumulate on the BMP surface. The infiltration rate is highly dependent upon a number of factors, including density, silt and clay content, grainsize distribution throughout the range of particle sizes, and particle shape. Small changes in these factors can cause large changes in the infiltration rates.

Infiltration rates are based on unsaturated flow. As water is introduced into soils by infiltration, the soils become saturated and the wetting front advances from the unsaturated zone to the saturated zone. Once the soils become saturated, infiltration rates become zero, and water can only move through soils by hydraulic conductivity at a rate determined by pressure head and soil permeability. Changes in soil moisture content will affect the infiltration rate. Infiltration rates should be expected to decrease until the soils become saturated. Soil permeability values will then govern groundwater movement. Permeability values may be on the order of 10 to 20 times less than infiltration rates. The system designer should incorporate adequate factors of safety and allow for overflow design into appropriate traditional storm drain systems, which would transport storm water off-site.

Location of Infiltration Systems

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration area could potentially be damaged due to saturation of the subgrade soils. **Any proposed infiltration systems for this site should be located at least 25 feet away from any structures, including retaining walls.** Even with this provision of locating the infiltration system at least 25 feet from the building(s), it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration system.

The infiltration system designer should also give special consideration to the effect that the proposed infiltration systems may have on nearby subterranean structures, open excavations, or descending slopes. In particular, infiltration systems should not be located near the crest of descending slopes, particularly where the slopes are comprised of granular soils. Such systems will require specialized design and analysis to evaluate the potential for slope instability, piping failures and other phenomena that typically

apply to earthen dam design. This type of analysis is beyond the scope of this infiltration test report, but these factors should be considered by the infiltration system designer when locating the infiltration systems.

General Comments

This report has been prepared as an instrument of service for use by the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, structural engineer, and/or civil engineer. The design of the proposed storm water infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rate contained herein, the civil engineer agrees to indemnify, defend, and hold harmless the geotechnical engineer for all aspects of the design and performance of the proposed storm water infiltration system. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur.

The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between boring locations and testing depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted. The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

Closure

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

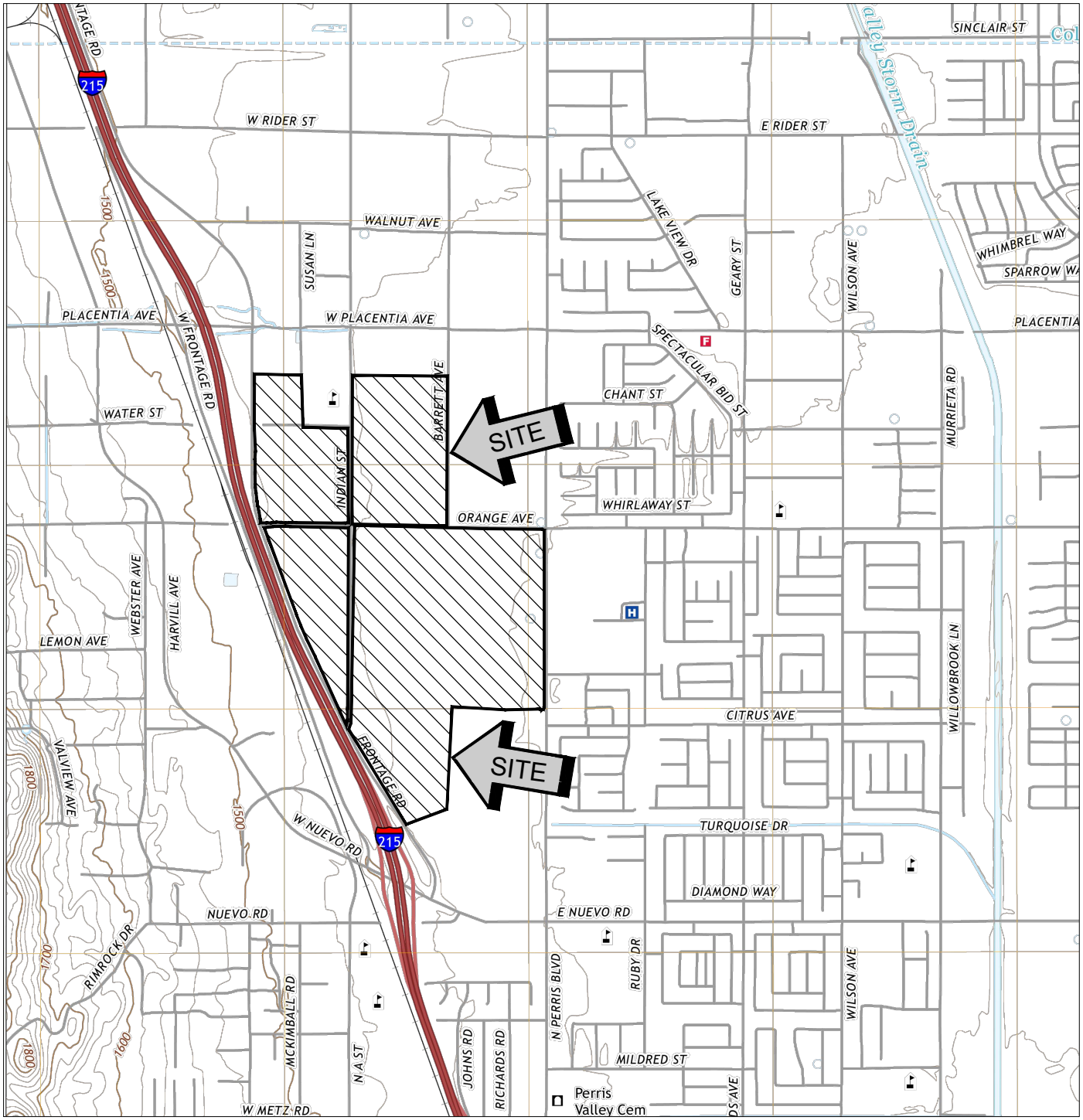
SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

Ryan Bremer
Staff Geologist

Daniel W. Nielsen, GE 3166
Senior Engineer

Distribution: (1) Addressee

Enclosures: Plate 1 - Site Location Map
Plate 2 - Infiltration Test Location Plan
Boring Log Legend and Logs (39 pages)
Infiltration Test Results Spreadsheets (37 pages)
Grain Size Distribution Graphs (37 pages)



SOURCE: USGS TOPOGRAPHIC MAP OF THE PERRIS QUADRANGLE, RIVERSIDE COUNTY, CALIFORNIA, 2021

SITE LOCATION MAP

HARVEST LANDING INDUSTRIAL DEVELOPMENT

PERRIS, CALIFORNIA

SCALE: 1" = 2000'	
DRAWN: RB CHKD: RGT	
SCG PROJECT 22G183-4	
PLATE 1	

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL

GEOTECHNICAL LEGEND

- APPROXIMATE INFILTRATION TEST LOCATION
- CONCURRENT BORING LOCATION (SCG PROJECT NO. 22G183-3)
- PREVIOUS BORING LOCATION (SCG PROJECT NO. 22G183-1)
- PREVIOUS INFILTRATION LOCATION (SCG PROJECT NO. 22G183-2)
- PREVIOUS INFILTRATION LOCATION (SCG PROJECT NO. 22G183-2)
- PREVIOUS BORING LOCATION (SCG PROJECT NO. 22G183-2)
- PROPOSED BUILDING
- PROPOSED INFILTRATION SYSTEM LOCATION
- EXISTING STRUCTURE

NOTE: CONCEPTUAL GRADING PLAN PREPARED BY FMCIVIL ENGINEERING.

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SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

NORTH
SoCalGeo

SCALE: 1" = 200'
DRAWN: RB
CHKD: RGT
SCG PROJECT 22G183-4

INFILTRATION TEST LOCATION PLAN

HARVEST LANDING INDUSTRIAL DEVELOPMENT
PERRIS, CALIFORNIA

PLATE 2

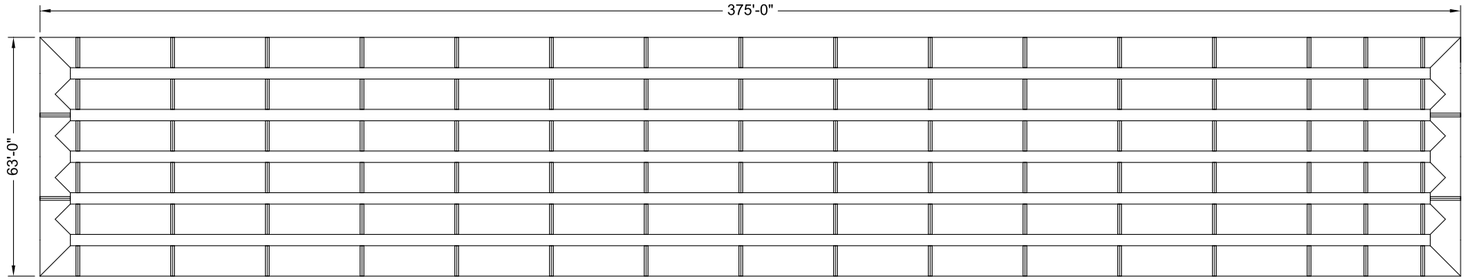
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 2,280 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 114,605 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 114,605 CF

PIPE DETAILS
- DIAMETER = 96"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 36"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"



NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE $2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

ASSEMBLY
SCALE: 1" = 40'

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CONTECH® CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

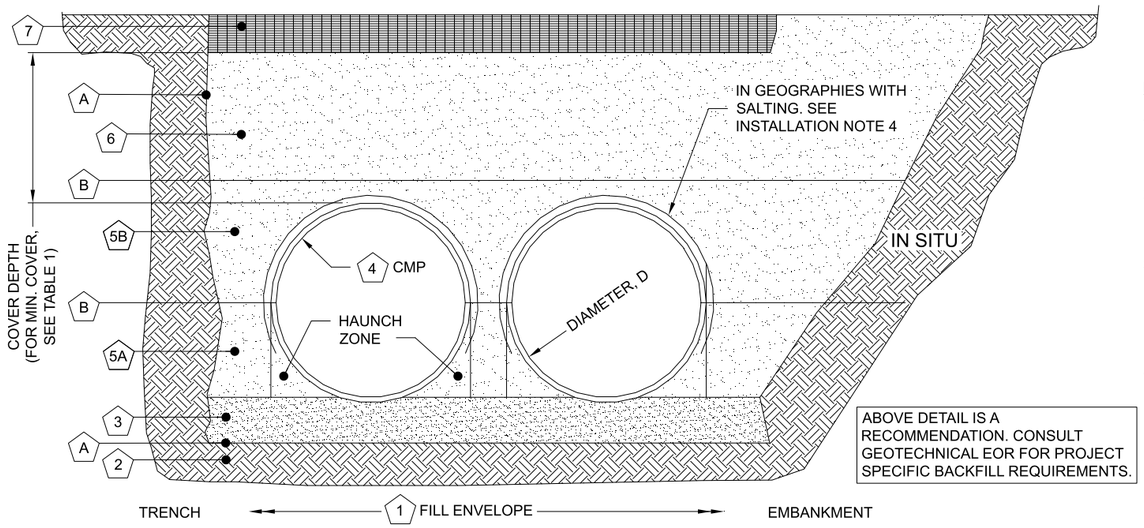
DYO60538 20-001 Harvest Landing Site 6
Northerly Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
42824	60538	10/2/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

TABLE 1:

DIAMETER, D	MIN. COVER	CORR. PROFILE
6"-10"	12"	1 1/2" x 1/4"
12"-48"	12"	2 2/3" x 1/2"
>48"-96"	12"	3" x 1", 5" x 1"
>96"	D/8	3" x 1", 5" x 1"

- STRUCTURAL BACKFILL MUST EXTEND TO LIMITS OF THE TABLE
- TOTAL HEIGHT OF COMPACTED COVER FOR CONVENTIONAL HIGHWAY LOADS IS MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TOP OF RIGID PAVEMENT
- ULTRAFLO ALSO AVAILABLE FOR SIZES 18" - 120" WITH 3/4"x 3/4"x 7 1/2" CORRUGATION



MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT

INSTALLATION NOTES

1. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES.
2. OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.
3. BACKFILL USING CONTROLLED LOW-STRENGTH MATERIAL (CLSM, "FLASH FILL" OR "FLOWABLE FILL") MAY BE USED WHEN THE SPACING BETWEEN THE PIPES WILL NOT ALLOW FOR PLACEMENT AND ADEQUATE COMPACTION OF THE BACKFILL. CONTACT CONTECH FOR FURTHER EVALUATION.
4. IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, A GEOMEMBRANE BARRIER IS RECOMMENDED OVER THE UPPER HALF OF THE PIPE. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

TABLE 2: SOLID STANDARD

CMP DETENTION AND CMP DRAINAGE STANDARD BACKFILL SPECIFICATIONS

	MATERIAL LOCATION	MATERIAL SPECIFICATION	DESCRIPTION	
1	FILL ENVELOPE WIDTH	PER ENGINEER OF RECORD	MINIMUM TRENCH WIDTH MUST ALLOW ROOM FOR PROPER COMPACTION OF HAUNCH MATERIALS UNDER THE PIPE. THE SUGGESTED MINIMUM TRENCH WIDTH, OR EOR RECOMMENDATION: PIPE ≤ 12": D + 16" PIPE > 12": 1.5D + 12"	MINIMUM EMBANKMENT WIDTH (IN FEET) FOR INITIAL FILL ENVELOPE: PIPE < 24": 3.0D PIPE 24" - 144": D + 4'0" PIPE > 144": D + 10'0"
2	FOUNDATION	**AASHTO 26.5.2** OR PER ENGINEER OF RECORD	PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND FOUNDATION BROUGHT BACK TO GRADE WITH A FILL MATERIAL APPROVED BY THE ENGINEER OF RECORD.	
3	BEDDING	**AASHTO M 43: 3, 357, 4, 467, 5, 56, 57** (APPROVED REGIONAL EQUIVALENTS INCLUDE CA-7)	ENGINEER OF RECORD TO DETERMINE IF BEDDING IS REQUIRED. PIPE MAY BE PLACED ON THE TRENCH BOTTOM OF A RELATIVELY LOOSE, NATIVE SUITABLE WELL GRADED GRANULAR MATERIAL THAT IS ROUGHLY SHAPED TO FIT THE BOTTOM OF THE PIPE, 2" MIN DEPTH. THE BEDDING MATERIAL MAY BE SUITABLE FOUNDATION SOILS CONFORMING TO AASHTO SOIL CLASSIFICATIONS A1, A2, OR A3 WITH MAXIMUM PARTICLE SIZE OF 3" PER AASHTO 26.3.8.1	
4	CORRUGATED METAL PIPE			
5A	CRITICAL BACKFILL	**AASHTO M 145: A-1, A-2, A-3** *	HAUNCH ZONE MATERIAL SHALL BE HAND SHOVELED OR SHOVEL SLICED INTO PLACE TO ALLOW FOR PROPER COMPACTION WITHOUT SOFT SPOTS. BACKFILL SHALL BE PLACED IN 8" +/- LOOSE LIFTS AND COMPACTED TO 90% STANDARD PROCTOR PER AASHTO T 99. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A THREE LIFT (24") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHOULD BE ADVANCED ALONG THE LENGTH OF THE SYSTEM TO AVOID DIFFERENTIAL LOADING. WELL GRADED GRANULAR MATERIAL WHICH MAY CONTAIN SMALL AMOUNTS OF SILT OR CLAY AND MAXIMUM PARTICLE SIZE OF 3" (PER AASHTO 26.3.8.1 AND 12.4-1.3).	
5B	BACKFILL	**AASHTO M 145: A-1, A-2, A-3**		
6	COVER MATERIAL	UP TO MIN. COVER - SEE 5A AND 5B ABOVE ABOVE MIN. COVER - PER ENGINEER OF RECORD	COVER MATERIAL MAY INCLUDE NON-BITUMINOUS, GRANULAR ROAD BASE MATERIAL WITHIN MIN COVER LIMITS	
7	RIGID OR FLEXIBLE PAVEMENT (IF APPLICABLE)	PER ENGINEER OF RECORD	FLEXIBLE PAVEMENT SHOULD NOT BE COUNTED AS PART OF THE FILL HEIGHT OVER THE CMP. FINAL BACKFILL MATERIAL SELECTION AND COMPACTION REQUIREMENTS SHALL FOLLOW THE PROJECT PLANS AND SPECIFICATIONS PER THE ENGINEER OF RECORD.	
A	OPTIONAL SIDE GEOTEXTILE	NONE	GEOTEXTILE LAYER IS RECOMMENDED ON SIDES OF EXCAVATION TO PREVENT SOIL MIGRATION.	
B	OPTIONAL GEOTEXTILE BETWEEN LAYERS	NONE	IF SOIL TYPES DIFFER AT ANY POINT ABOVE PIPE INVERT, A GEOTEXTILE LAYER IS RECOMMENDED TO BE PLACED BETWEEN THE LAYERS TO PREVENT SOIL MIGRATION.	

NOTES:
- FOR MULTIPLE BARREL INSTALLATIONS, THE RECOMMENDED STANDARD SPACING BETWEEN PARALLEL PIPE RUNS SHALL BE THE PIPE DIAMETER /2 BUT NO LESS THAN 12" FOR DIAMETERS <72". FOR 72" AND LARGER DIAMETERS, THE MINIMUM SPACING IS 36". CONTACT YOUR CONTECH REPRESENTATIVE FOR NONSTANDARD SPACING.

* APPROVED REGIONAL EQUIVALENTS FOR SECTION 5A INCLUDE CA-7, CODOT #67, MIDOT 2G, 34G, OR 21AA STONE OR GRAVEL; #8; #57; MIDOT 6A, 2G, 3G, 34G.

MANUFACTURER RECOMMENDED BACKFILL

NOT TO SCALE

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CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO60538 20-001 Harvest Landing Site 6
Northerly Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
42824	60538	10/2/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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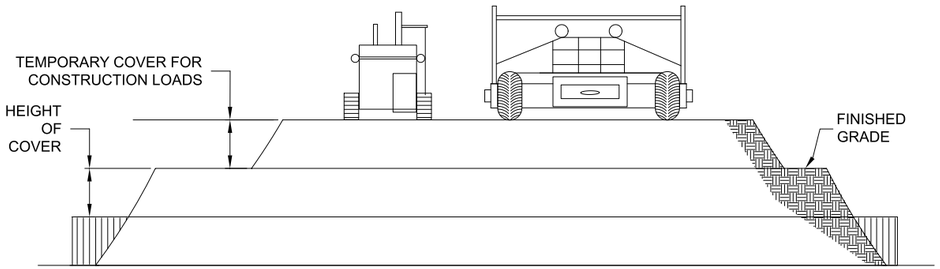

CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

APPLICABLE POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

APPLICABLE
HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.
REQUIREMENTS
INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

NOTE:
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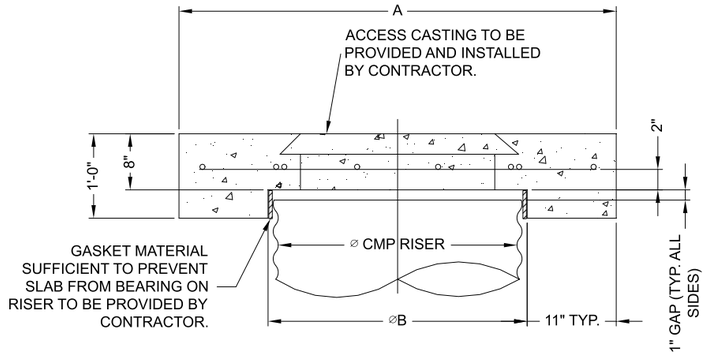
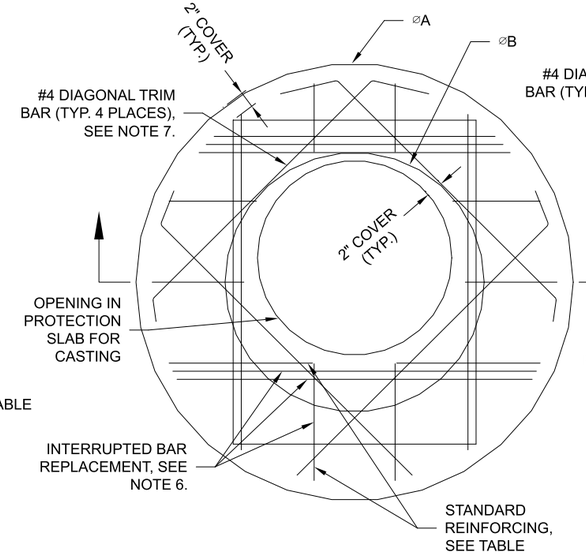


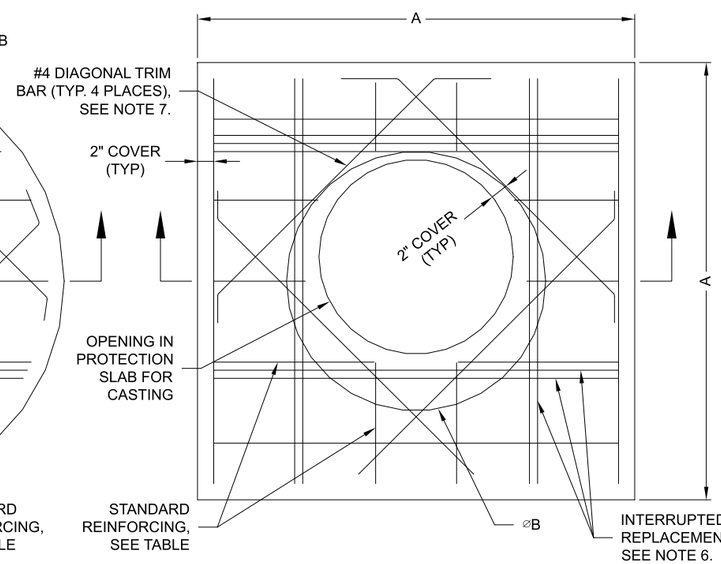
SECTION VIEW

REINFORCING TABLE				
⌀ CMP RISER	A	⌀ B	REINFORCING	**BEARING PRESSURE (PSF)
24"	⌀ 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	⌀ 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	⌀ 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	⌀ 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	⌀ 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

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CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO60538 20-001 Harvest Landing Site 6
Northerly Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
42824	60538	10/2/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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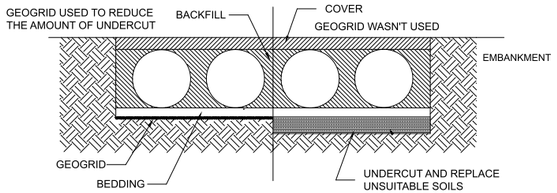
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

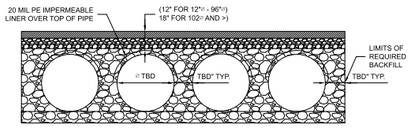
IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.



GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

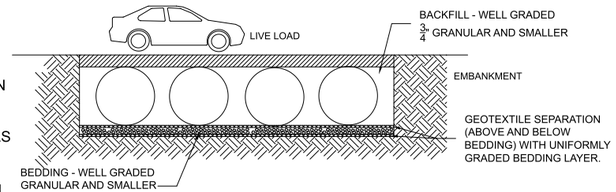
THE RESISTIVITY OF A PROJECT SITE MAY CHANGE OVER TIME DUE TO THE USE OF VARIOUS SALTING, DE-ICING, AND AGRICULTURAL AGENTS APPLIED ON OR NEAR THE AREA. TO MITIGATE THE POTENTIAL IMPACT OF THESE AGENTS, AN HDPE MEMBRANE LINER WILL BE INSTALLED ON THE CROWN OF EACH PIPE, CREATING AN IMPERMEABLE BARRIER. THIS MEASURE IS DESIGNED TO PROTECT THE SYSTEM FROM ENVIRONMENTAL CHANGES THAT COULD LEAD TO PREMATURE CORROSION AND REDUCE THE OVERALL SERVICE LIFE.



IN-SITU TRENCH WALL

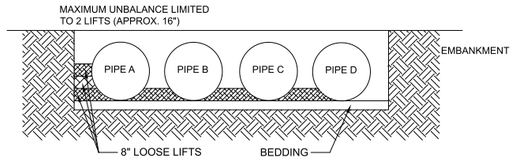
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



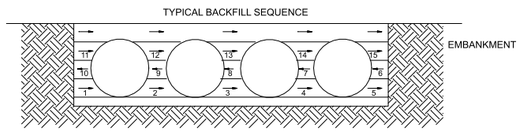
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

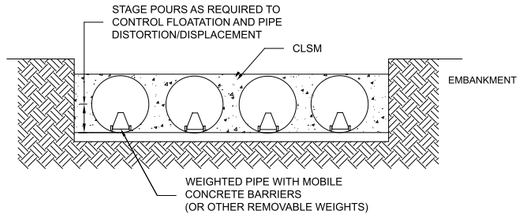


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

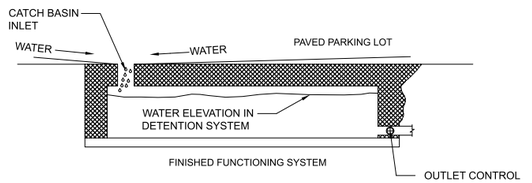


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

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CONTECH CMP DETENTION SYSTEMS

CONTECH **DYODS** DRAWING

DYO60538 20-001 Harvest Landing Site 6
Northerly Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
42824	60538	10/2/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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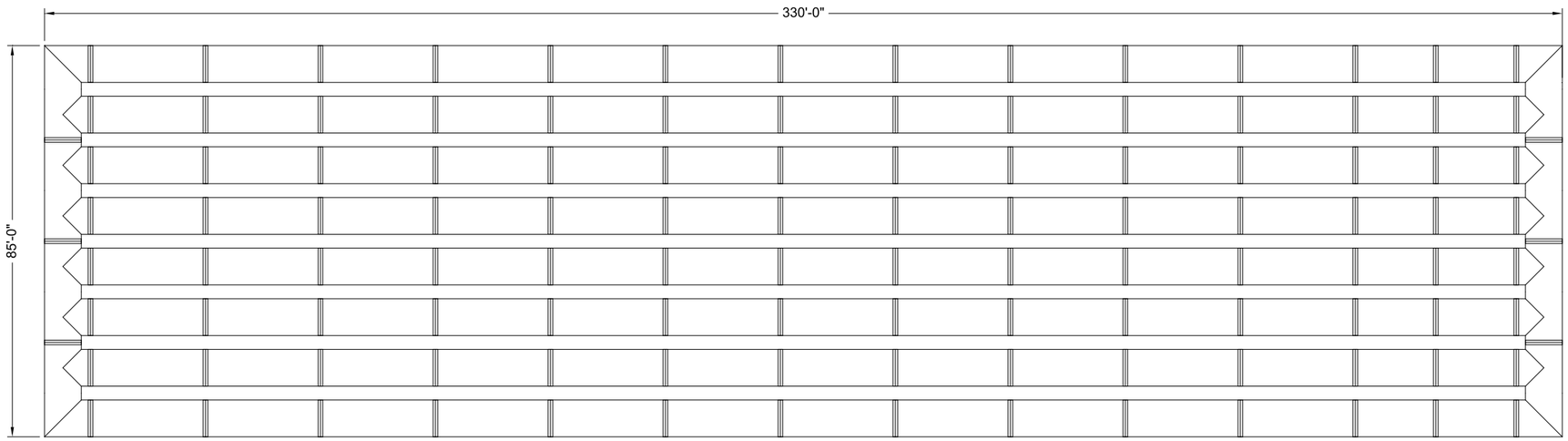
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 2,682 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 134,812 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 134,812 CF

PIPE DETAILS
- DIAMETER = 96"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 36"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"



NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE $2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

ASSEMBLY
SCALE: 1" = 30'

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CONTECH® CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO60540 20-001 Harvest Landing Site 6
Southerly Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
42826	60540	10/2/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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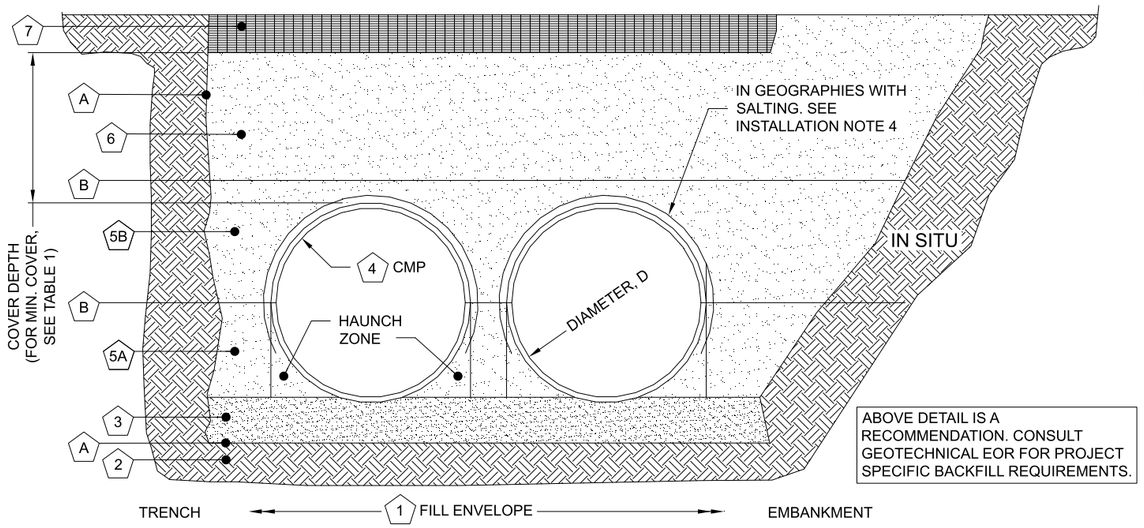
TABLE 1:

DIAMETER, D	MIN. COVER	CORR. PROFILE
6"-10"	12"	1 1/2" x 1/4"
12"-48"	12"	2 2/3" x 1/2"
>48"-96"	12"	3" x 1", 5" x 1"
>96"	D/8	3" x 1", 5" x 1"

- STRUCTURAL BACKFILL MUST EXTEND TO LIMITS OF THE TABLE
- TOTAL HEIGHT OF COMPACTED COVER FOR CONVENTIONAL HIGHWAY LOADS IS MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TOP OF RIGID PAVEMENT
- ULTRAFLO ALSO AVAILABLE FOR SIZES 18" - 120" WITH 3/4"x 3/4"x 7 1/2" CORRUGATION



MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT

INSTALLATION NOTES

1. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES.
2. OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.
3. BACKFILL USING CONTROLLED LOW-STRENGTH MATERIAL (CLSM, "FLASH FILL" OR "FLOWABLE FILL") MAY BE USED WHEN THE SPACING BETWEEN THE PIPES WILL NOT ALLOW FOR PLACEMENT AND ADEQUATE COMPACTION OF THE BACKFILL. CONTACT CONTECH FOR FURTHER EVALUATION.
4. IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, A GEOMEMBRANE BARRIER IS RECOMMENDED OVER THE UPPER HALF OF THE PIPE. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

TABLE 2: SOLID STANDARD

CMP DETENTION AND CMP DRAINAGE STANDARD BACKFILL SPECIFICATIONS

	MATERIAL LOCATION	MATERIAL SPECIFICATION	DESCRIPTION	
1	FILL ENVELOPE WIDTH	PER ENGINEER OF RECORD	MINIMUM TRENCH WIDTH MUST ALLOW ROOM FOR PROPER COMPACTION OF HAUNCH MATERIALS UNDER THE PIPE. THE SUGGESTED MINIMUM TRENCH WIDTH, OR EOR RECOMMENDATION: PIPE ≤ 12": D + 16" PIPE > 12": 1.5D + 12"	MINIMUM EMBANKMENT WIDTH (IN FEET) FOR INITIAL FILL ENVELOPE: PIPE < 24": 3.0D PIPE 24" - 144": D + 4'0" PIPE > 144": D + 10'0"
2	FOUNDATION	**AASHTO 26.5.2** OR PER ENGINEER OF RECORD	PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND FOUNDATION BROUGHT BACK TO GRADE WITH A FILL MATERIAL APPROVED BY THE ENGINEER OF RECORD.	
3	BEDDING	**AASHTO M 43: 3, 357, 4, 467, 5, 56, 57** (APPROVED REGIONAL EQUIVALENTS INCLUDE CA-7)	ENGINEER OF RECORD TO DETERMINE IF BEDDING IS REQUIRED. PIPE MAY BE PLACED ON THE TRENCH BOTTOM OF A RELATIVELY LOOSE, NATIVE SUITABLE WELL GRADED GRANULAR MATERIAL THAT IS ROUGHLY SHAPED TO FIT THE BOTTOM OF THE PIPE, 2" MIN DEPTH. THE BEDDING MATERIAL MAY BE SUITABLE FOUNDATION SOILS CONFORMING TO AASHTO SOIL CLASSIFICATIONS A1, A2, OR A3 WITH MAXIMUM PARTICLE SIZE OF 3" PER AASHTO 26.3.8.1	
4	CORRUGATED METAL PIPE			
5A	CRITICAL BACKFILL	**AASHTO M 145: A-1, A-2, A-3** *	HAUNCH ZONE MATERIAL SHALL BE HAND SHOVELED OR SHOVEL SLICED INTO PLACE TO ALLOW FOR PROPER COMPACTION WITHOUT SOFT SPOTS. BACKFILL SHALL BE PLACED IN 8" +/- LOOSE LIFTS AND COMPACTED TO 90% STANDARD PROCTOR PER AASHTO T 99. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A THREE LIFT (24") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHOULD BE ADVANCED ALONG THE LENGTH OF THE SYSTEM TO AVOID DIFFERENTIAL LOADING. WELL GRADED GRANULAR MATERIAL WHICH MAY CONTAIN SMALL AMOUNTS OF SILT OR CLAY AND MAXIMUM PARTICLE SIZE OF 3" (PER AASHTO 26.3.8.1 AND 12.4-1.3).	
5B	BACKFILL	**AASHTO M 145: A-1, A-2, A-3**		
6	COVER MATERIAL	UP TO MIN. COVER - SEE 5A AND 5B ABOVE ABOVE MIN. COVER - PER ENGINEER OF RECORD	COVER MATERIAL MAY INCLUDE NON-BITUMINOUS, GRANULAR ROAD BASE MATERIAL WITHIN MIN COVER LIMITS	
7	RIGID OR FLEXIBLE PAVEMENT (IF APPLICABLE)	PER ENGINEER OF RECORD	FLEXIBLE PAVEMENT SHOULD NOT BE COUNTED AS PART OF THE FILL HEIGHT OVER THE CMP. FINAL BACKFILL MATERIAL SELECTION AND COMPACTION REQUIREMENTS SHALL FOLLOW THE PROJECT PLANS AND SPECIFICATIONS PER THE ENGINEER OF RECORD.	
A	OPTIONAL SIDE GEOTEXTILE	NONE	GEOTEXTILE LAYER IS RECOMMENDED ON SIDES OF EXCAVATION TO PREVENT SOIL MIGRATION.	
B	OPTIONAL GEOTEXTILE BETWEEN LAYERS	NONE	IF SOIL TYPES DIFFER AT ANY POINT ABOVE PIPE INVERT, A GEOTEXTILE LAYER IS RECOMMENDED TO BE PLACED BETWEEN THE LAYERS TO PREVENT SOIL MIGRATION.	

NOTES:
- FOR MULTIPLE BARREL INSTALLATIONS, THE RECOMMENDED STANDARD SPACING BETWEEN PARALLEL PIPE RUNS SHALL BE THE PIPE DIAMETER /2 BUT NO LESS THAN 12" FOR DIAMETERS <72". FOR 72" AND LARGER DIAMETERS, THE MINIMUM SPACING IS 36". CONTACT YOUR CONTECH REPRESENTATIVE FOR NONSTANDARD SPACING.

* APPROVED REGIONAL EQUIVALENTS FOR SECTION 5A INCLUDE CA-7, CODOT #67, MIDOT 2G, 34G, OR 21AA STONE OR GRAVEL; #8; #57; MIDOT 6A, 2G, 3G, 34G.

MANUFACTURER RECOMMENDED BACKFILL

NOT TO SCALE

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CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO60540 20-001 Harvest Landing Site 6
Southerly Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
42826	60540	10/2/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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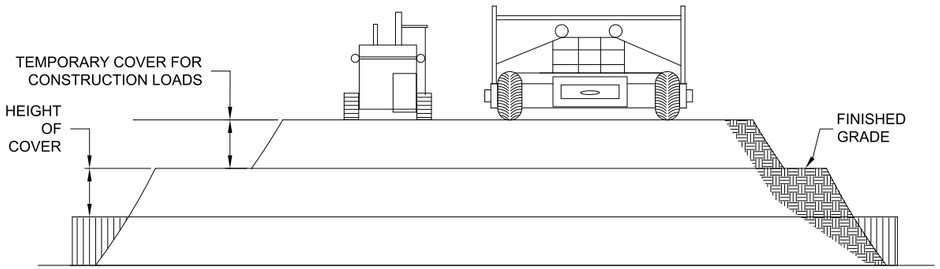


CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

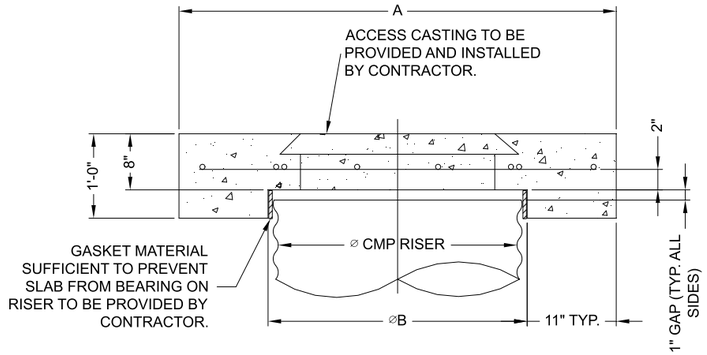
APPLICABLE POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

APPLICABLE
HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.
REQUIREMENTS
INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

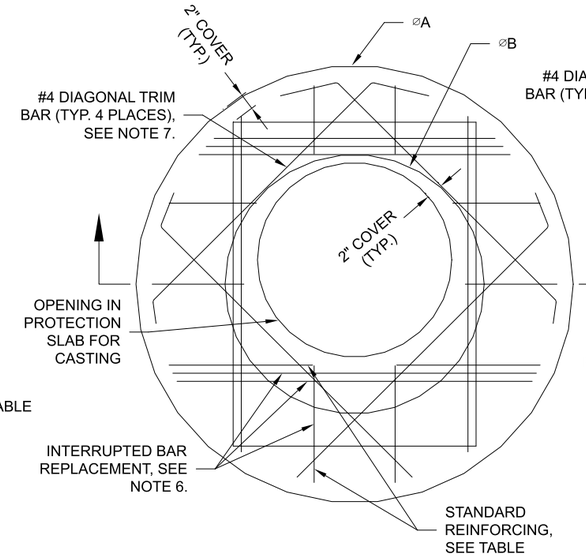
NOTE:
THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.



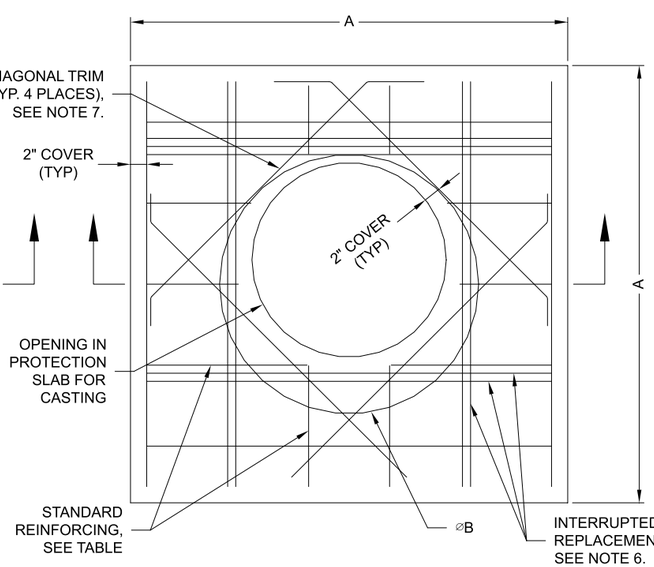
SECTION VIEW

REINFORCING TABLE				
⌀ CMP RISER	A	⌀ B	REINFORCING	**BEARING PRESSURE (PSF)
24"	⌀ 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	⌀ 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	⌀ 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	⌀ 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	⌀ 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

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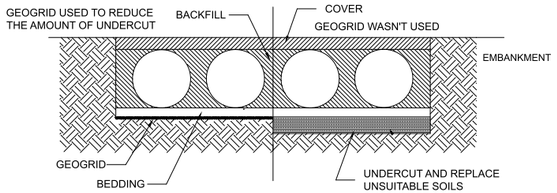
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

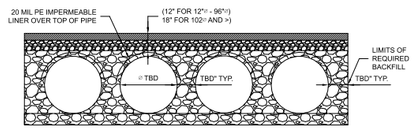
IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.



GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

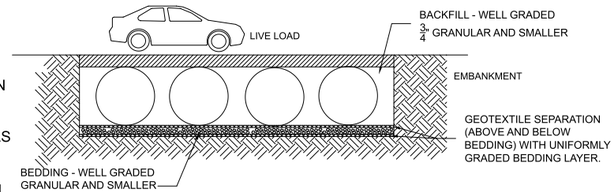
THE RESISTIVITY OF A PROJECT SITE MAY CHANGE OVER TIME DUE TO THE USE OF VARIOUS SALTING, DE-ICING, AND AGRICULTURAL AGENTS APPLIED ON OR NEAR THE AREA. TO MITIGATE THE POTENTIAL IMPACT OF THESE AGENTS, AN HDPE MEMBRANE LINER WILL BE INSTALLED ON THE CROWN OF EACH PIPE, CREATING AN IMPERMEABLE BARRIER. THIS MEASURE IS DESIGNED TO PROTECT THE SYSTEM FROM ENVIRONMENTAL CHANGES THAT COULD LEAD TO PREMATURE CORROSION AND REDUCE THE OVERALL SERVICE LIFE.



IN-SITU TRENCH WALL

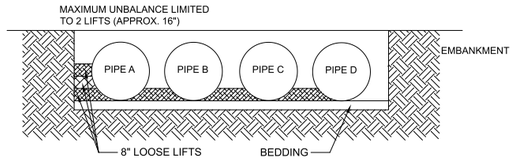
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



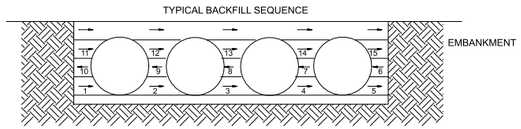
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

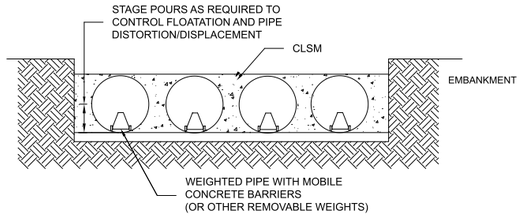


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

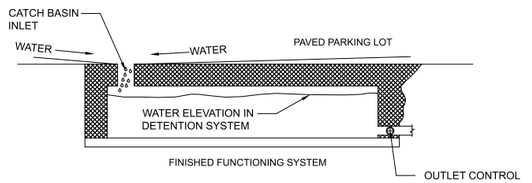


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

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CONTECH CMP DETENTION SYSTEMS

CONTECH **DYODS** DRAWING

DYO60540 20-001 Harvest Landing Site 6
Southerly Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
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DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	FMCivil Engineers Inc	Date	10/4/2024
Designed by	Hector Paez	Case No	
Company Project Number/Name	20-001 - Site 6		

BMP Identification

BMP NAME / ID: S6-1 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S6-1A	*142737.57*	*Roofs*	*1*	*0.89*	*127321.9*			
S6-1C	*114415.59*	*Concrete or Asphalt*	*1*	*0.892*	*102058.7*			
	257153.16	***Total***			**229380.6**	**0.20**	***1.05***	***1.154***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	FMCivil Engineers Inc	Date	10/4/2024
Designed by	Hector Paez	Case No	
Company Project Number/Name	20-001 - Site 6		

BMP Identification

BMP NAME / ID: S6-2 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S6-2A	*143823.86*	*Roofs*	*1*	*0.89*	*128290.9*			
S6-2C	*127078.39*	*Concrete or Asphalt*	*1*	*0.892*	*113353.9*			
	270902.25	***Total***			**241644.8**	**0.20**	***1.11***	***1.154***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries | Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc — Date: 10/4/2024

Designed by: Hector Paez — Case No:

Company Project Number/Name: 20-001 - Site 6

BMP Identification

BMP NAME / ID: S6-3 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity — I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S6-3A	*88575.34*	*Roofs*	*1*	*0.89*	*79009.2*			
S6-3C	*60762.75*	*Concrete or Asphalt*	*1*	*0.892*	*54200.4*			
	149338.09	***Total***			133209.6	0.20	*0.61*	*0.693*

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	FMCivil Engineers Inc	Date	10/4/2024
Designed by	Hector Paez	Case No	
Company Project Number/Name	20-001 - Site 6		

BMP Identification

BMP NAME / ID: S6-4 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S6-4A	*87541.33*	*Roofs*	*1*	*0.89*	*78086.9*			
S6-4C	*60000.62*	*Concrete or Asphalt*	*1*	*0.892*	*53520.6*			
	147541.95		***Total***		**131607.5**	**0.20**	***0.6***	***0.693***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	FMCivil Engineers Inc	Date	10/4/2024
Designed by	Hector Paez	Case No	
Company Project Number/Name	20-001 - Site 6		

BMP Identification

BMP NAME / ID: S6-5 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S6-5A	*20936.36*	*Roofs*	*1*	*0.89*	*18675.2*			
S6-5C	*47001.96*	*Concrete or Asphalt*	*1*	*0.892*	*41925.7*			
	67938.32		***Total***		**60600.9**	**0.20**	***0.28***	***0.346***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc — Date: 10/4/2024
Designed by: Hector Paez — Case No:
Company Project Number/Name: 20-001 - Site 6

BMP Identification

BMP NAME / ID: S6-6 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity: I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S6-6A	*20934.5*	*Roofs*	*1*	*0.89*	*18673.6*			
S6-6C	*52272.3*	*Concrete or Asphalt*	*1*	*0.892*	*46626.9*			
	73206.8	***Total***			**65300.5**	**0.20**	***0.30***	***0.346***

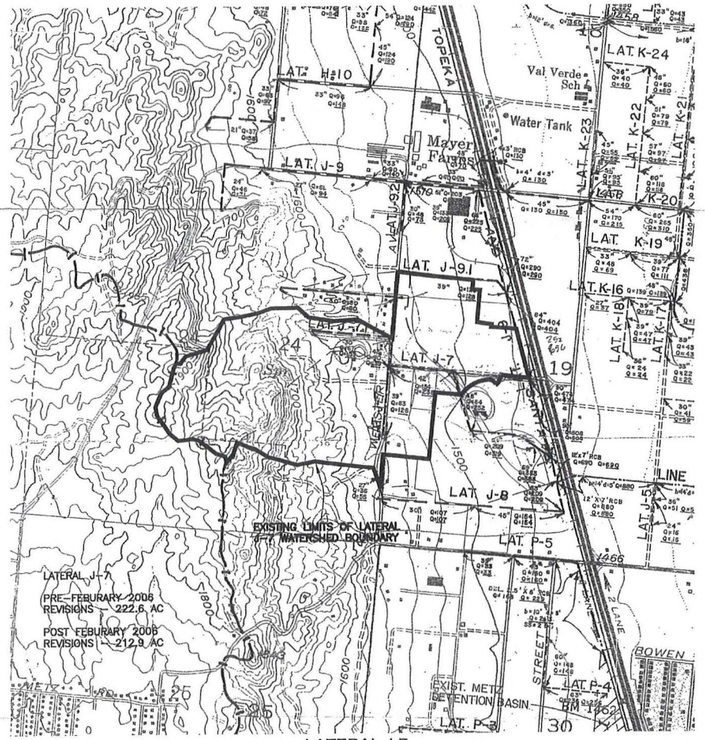
DMAs

Notes:

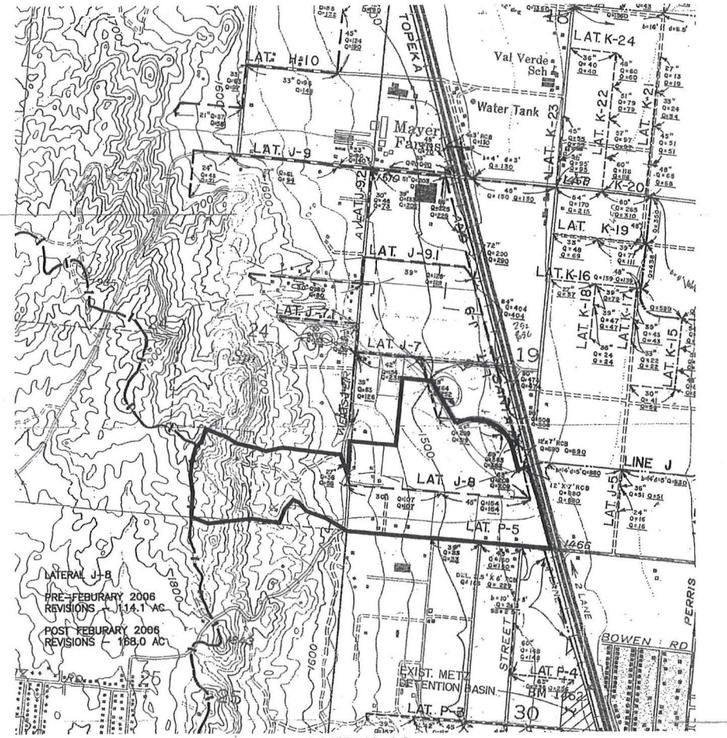
PORTION OF
8K3
1" = 1000'

REVISED HYDROLOGY MAP
PERRIS MASTER DRAINAGE PLAN

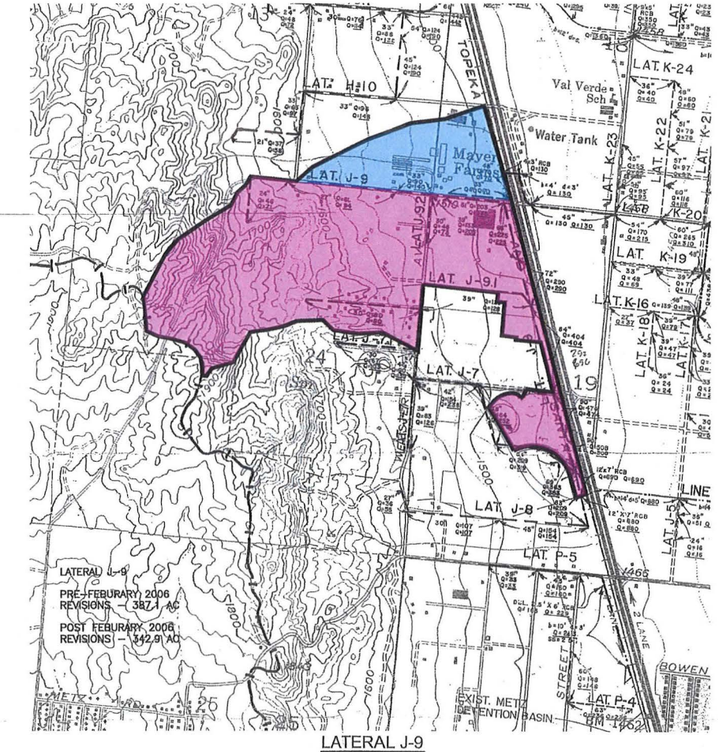
LATERALS J–7, J–8, & J–9



LATERAL J-7



LATERAL J-8



LATERAL J-9

LATERAL No.	PRE–FEBURARY 2006 REVISIONS	POST FEBURARY 2006 REVISIONS	INCREASE/DECREASE (ACRES)
LAT J–8	114.1	168.0	+53.9
LAT J–9	609.8	555.9	–53.9

LEGEND

PROPOSED LATERAL WATERSHED BOUNDARIES AFTER FEBRUARY 2006 REVISION

N

SCALE: 1"=1000'

B:\CAD\Nuevo Industrial Park - NV\PE\Exhibits\NV\P Perris MDP Hydrology map lat 7 and lat 9.dwg, 2/2/2007 1:10:00 PM, Donal Pearce

WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR GRADING PERMIT HAS BEEN ISSUED.

THE PRIVATE ENGINEER SIGNING THESE PLANS IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF THE DESIGN HEREON. IN THE EVENT OF DISCREPANCIES ARISING AFTER COUNTY APPROVAL OR DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISING THE PLANS FOR APPROVAL BY THE COUNTY.

DATE	BY	MARK	REVISIONS	APPR	DATE

ENGINEER — COUNTY

SEAL–COUNTY

REGISTERED PROFESSIONAL ENGINEER ALAN D. FRENCH No. 45702 Exp. 12–31–08 CIVIL STATE OF CALIFORNIA

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY:

ALAN D. FRENCH, P.E.
CIVIL ENGINEER, R.C.E. NO. 45702 — DATE

RECOMMENDED — DATE

SEAL–ENGINEER

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RECOMMENDED FOR APPROVAL — APPROVED BY:

PLANNING ENGINEER — CHIEF ENGINEER

DATE: — DATE:

ENGINEERING SOLUTIONS
ENGINEERING-LAND PLANNING-SURVEYING-MAPPING
2155 CHICAGO AVENUE, STE. 201
RIVERSIDE, CA. 92507
PHONE – (951) 784–0288
FAX – (951) 784–0287
PREPARED BY:

DATE EXP. 06–30–07

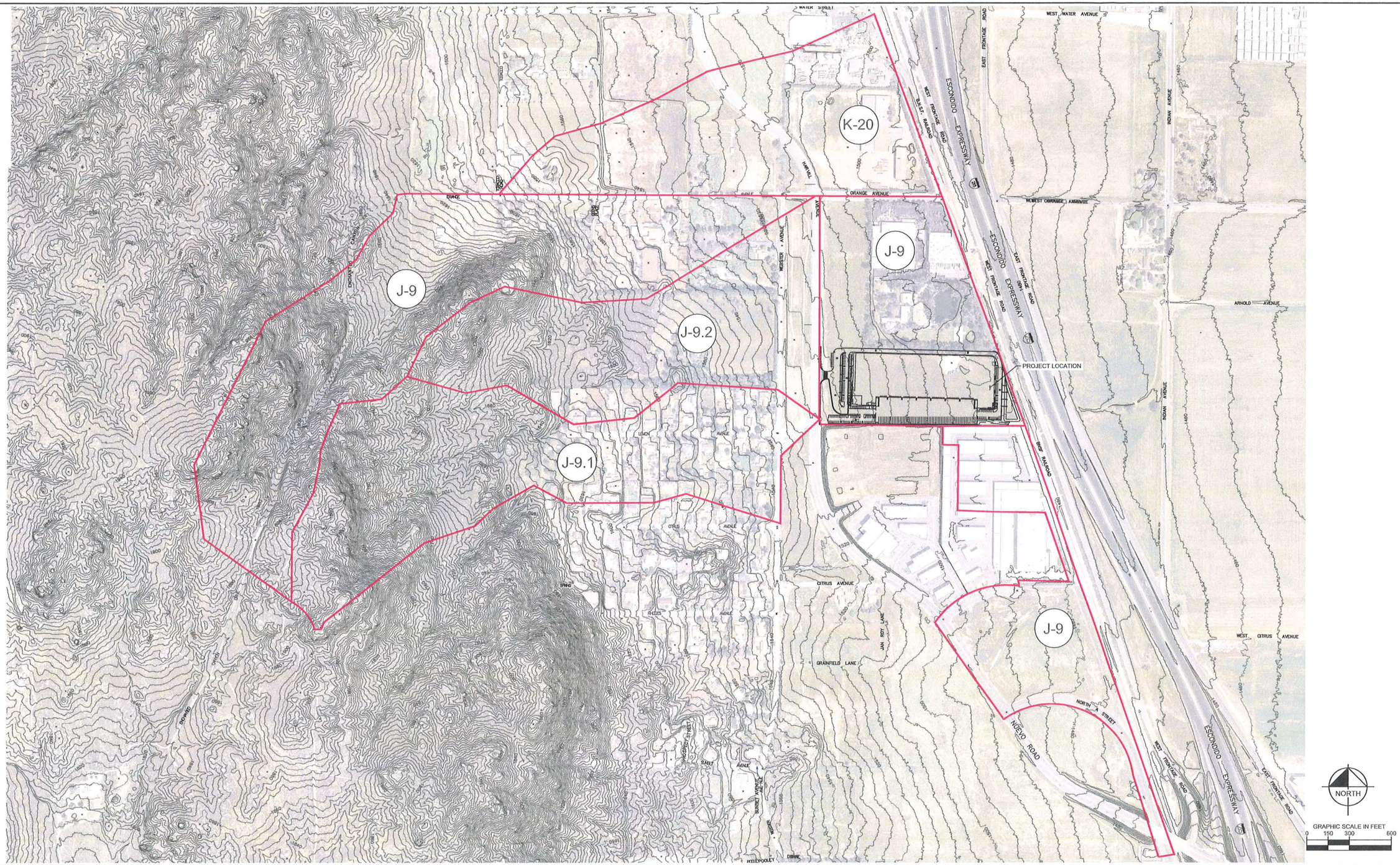
BENCHMARK:

SCALE:

I.P. No. XXXXX
COUNTY OF RIVERSIDE
REVISED HYDROLOGY MAP
PERRIS MASTER DRAINAGE PLAN
LATERALS J–7, J–8, & J–9

SHEET NO. 1 OF 1 SHTS.

FOR: | W.O. | COUNTY FILE NO.:



Kimley»Horn
401 B STREET, SUITE 600, SAN DIEGO, CA 92101
PHONE: 619-234-9411
WWW.KIMLEY-HORN.COM

RCFC MDP DRAINAGE AREA MAP LINE J-9
ROCKEFELLER HARVILL INDUSTRIAL PARK
October 9, 2020

k:\snd_ldev\rockefeller - riverside_harvill\to\rcfc\2020.10.08 - mdp letter\2020.10.09 - mdp drainage area.dwg 10/9/2020

EXHIBITS

EXHIBIT A: VICINITY MAP

EXHIBIT B: EXISTING HYDROLOGY MAP

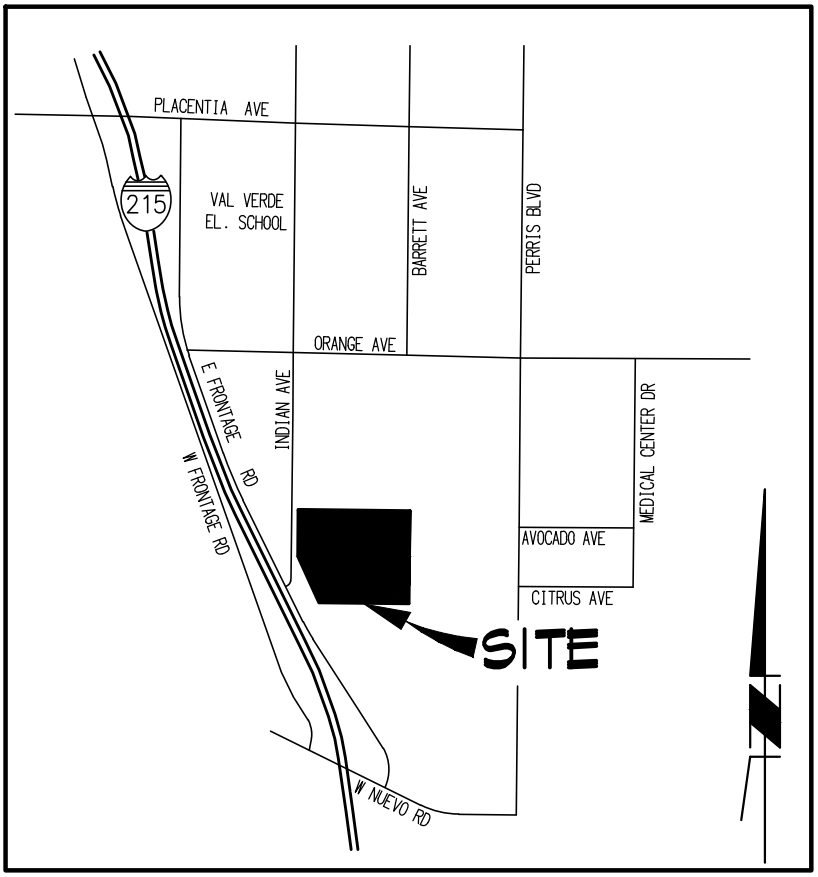
EXHIBIT C: PROPOSED HYDROLOGY MAP

EXHIBIT D: HYDROLOGIC SOILS GROUP MAP

EXHIBIT E: RCFCD MDP FACILITIES OVERLAY

EXHIBIT F: PHASE 1 OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM

EXHIBIT G: CONCEPTUAL GRADING



VICINITY MAP

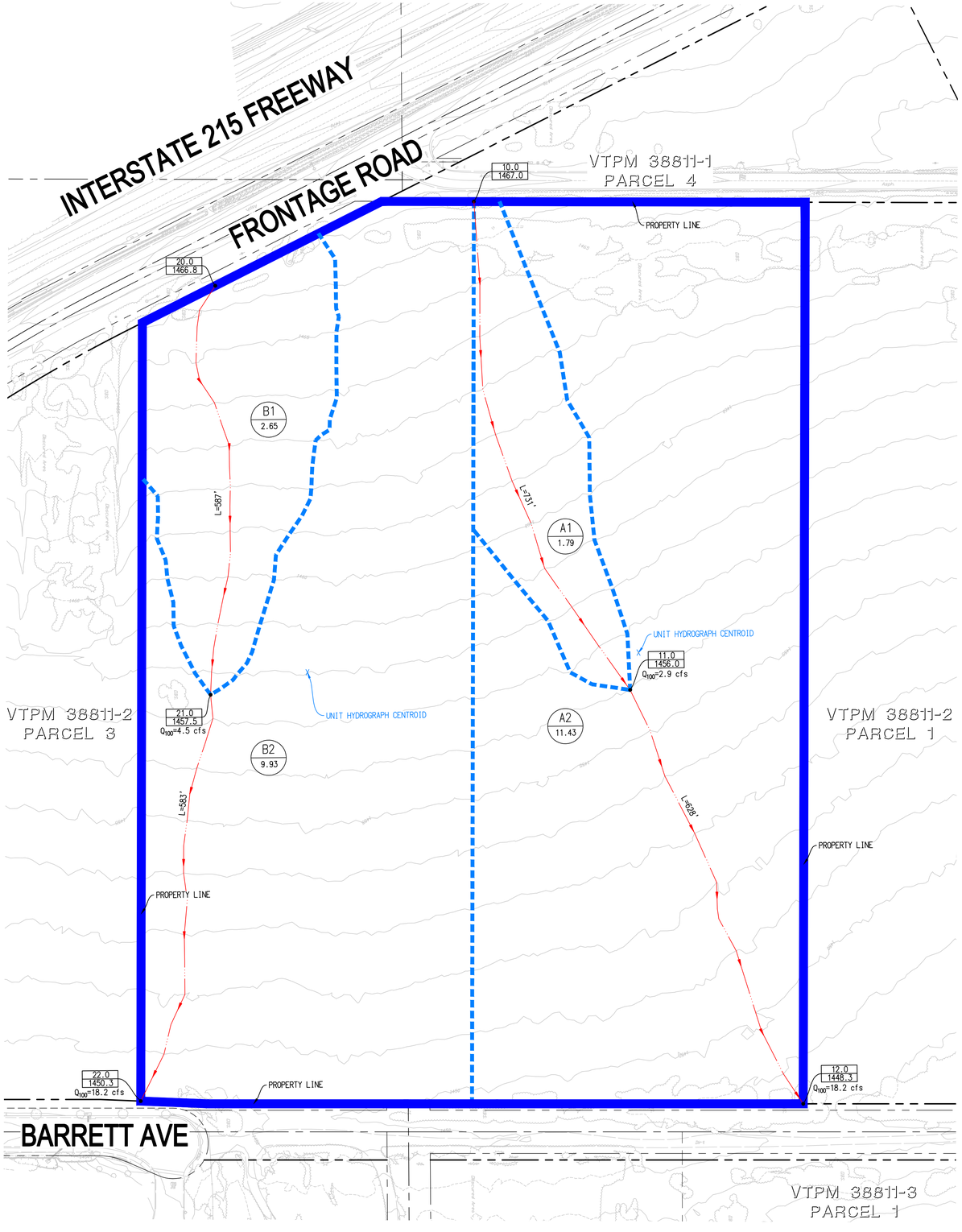
T4S, R3W, SEC 19
NOT TO SCALE

FMCIVIL ENGINEERS INC.
29995 TECHNOLOGY DRIVE, SUITE 306 | MURRIETA | CA 92563
951.331.9873 - FMCIVIL.COM

SITE 6 AT HARVEST LANDING

FIGURE 1
VICINITY MAP

H:\PDATA\20-001 HARVEST LANDING\DWGS\EXHIBITS\20-001-FEDEX-VICINITY-MAP .DWG DANNY 10/2/2024 4:34 PM



LEGEND

- D2 / 2.16 — DRAINAGE BASIN NAME / DRAINAGE BASIN AREA(AC.)
- 11 / 1027.0 — NODE I.D. / ELEVATION
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- FLOW DIRECTION

UNIT HYDROGRAPH PARAMETERS - AREA A			
L_{HC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
1,359	693	18.70	0.03

UNIT HYDROGRAPH PARAMETERS - AREA B			
L_{HC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
1,170	550	16.50	0.03

SCALE 1"=80'

80 40 0 80 160 240

SCALE: 1"=80'

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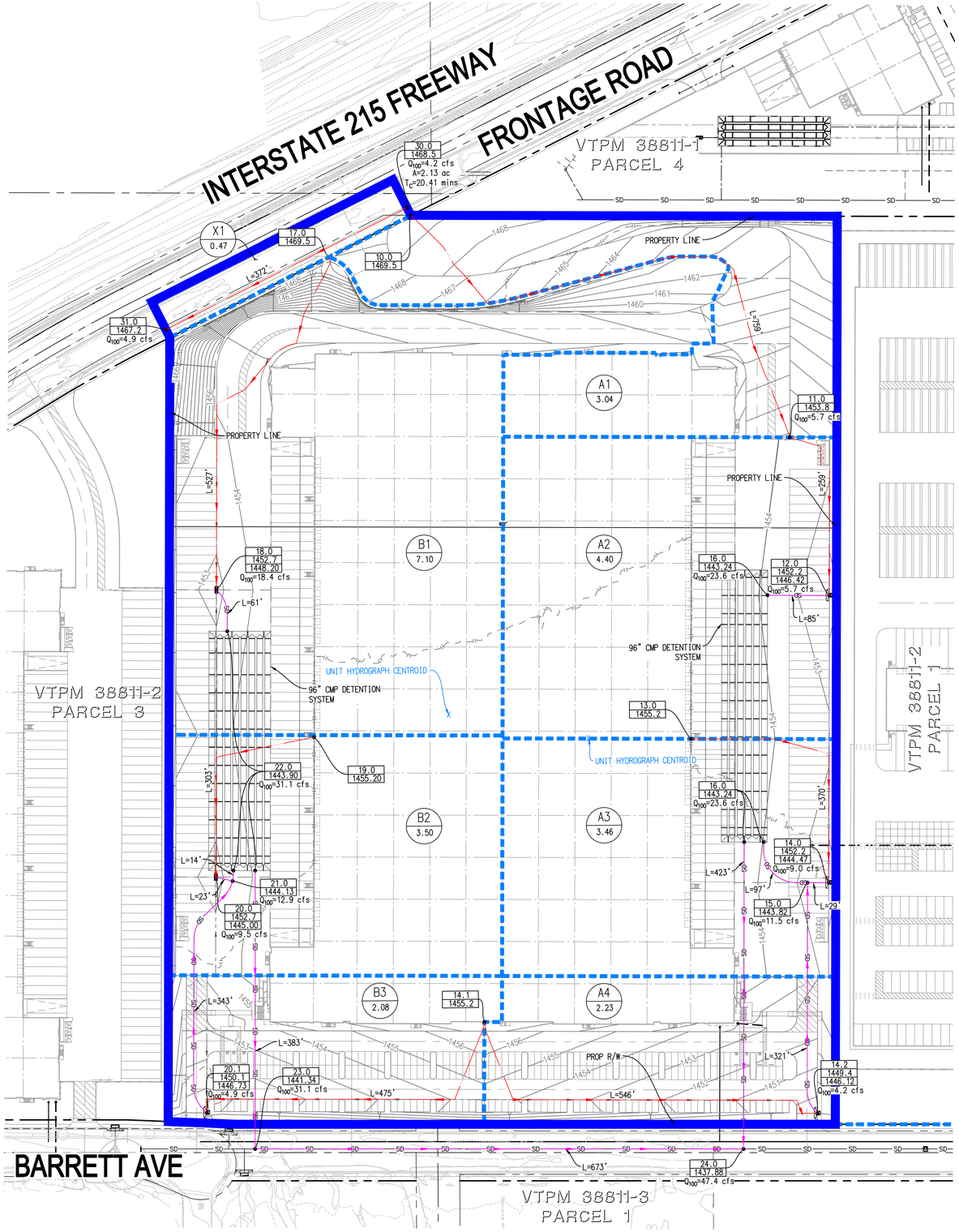
HARVEST LANDING

SITE 6 - EXISTING DRAINAGE



LEGEND

- D2 / 2.16 — DRAINAGE BASIN NAME / DRAINAGE BASIN AREA(AC.)
- 11 / 1027.0 — NODE I.D. / ELEVATION
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- FLOW DIRECTION
- PIPE FLOW DIRECTION

UNIT HYDROGRAPH PARAMETERS - AREA A			
L_{MC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
1,103	759	26.26	0.015

UNIT HYDROGRAPH PARAMETERS - AREA B			
L_{MC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
818	475	25.60	0.015

SCALE 1"=80'

80 40 0 80 160 240

SCALE: 1"=80'

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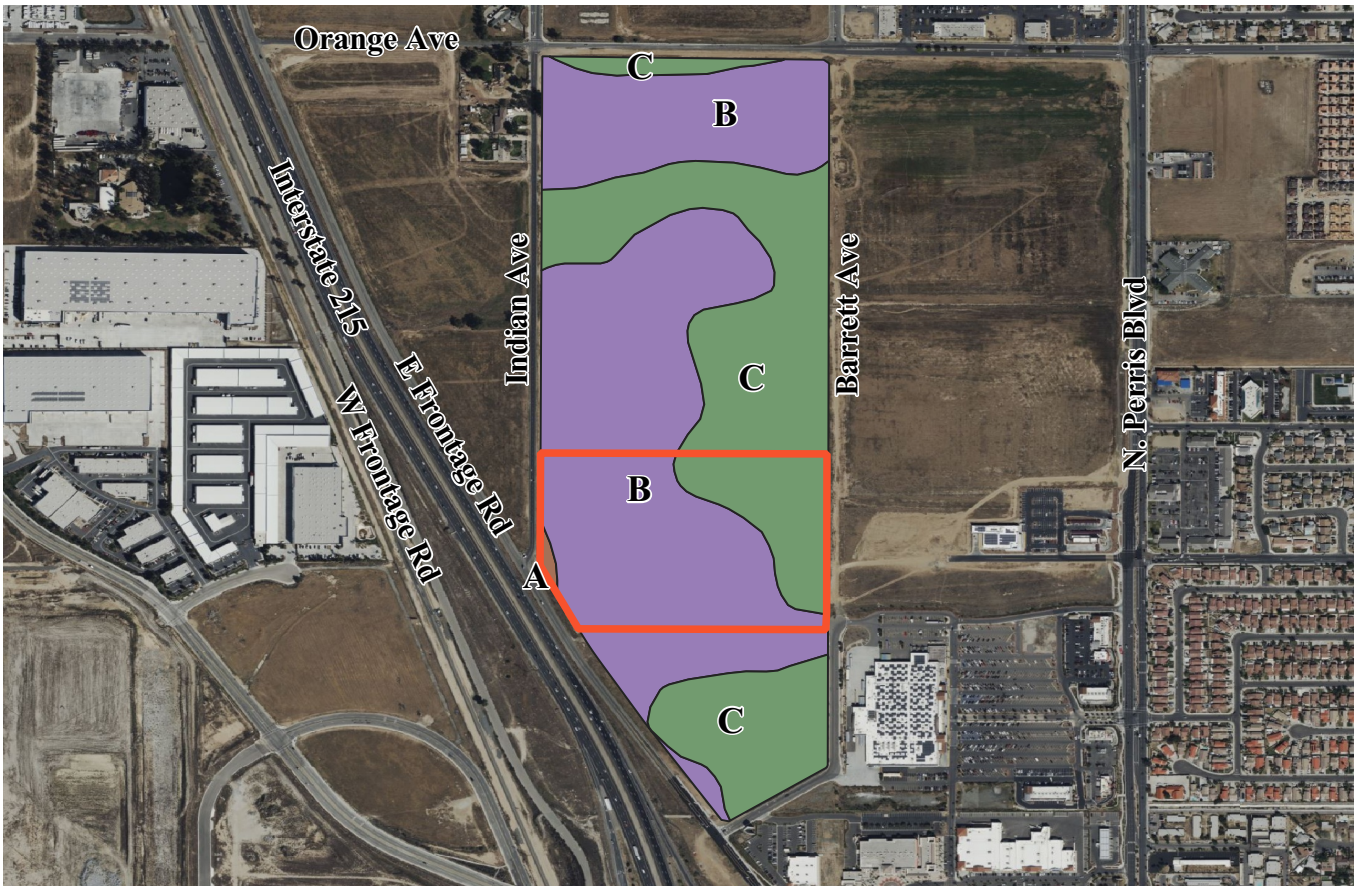
MURRIETA | CA 92563
951.331.9873 - FMCIVIL.COM

HARVEST LANDING

SITE 6 - PROPOSED DRAINAGE



LEGEND

- SITE 6 BOUNDARY
- HYDROLOGIC SOIL A
- HYDROLOGIC SOIL B
- HYDROLOGIC SOIL C

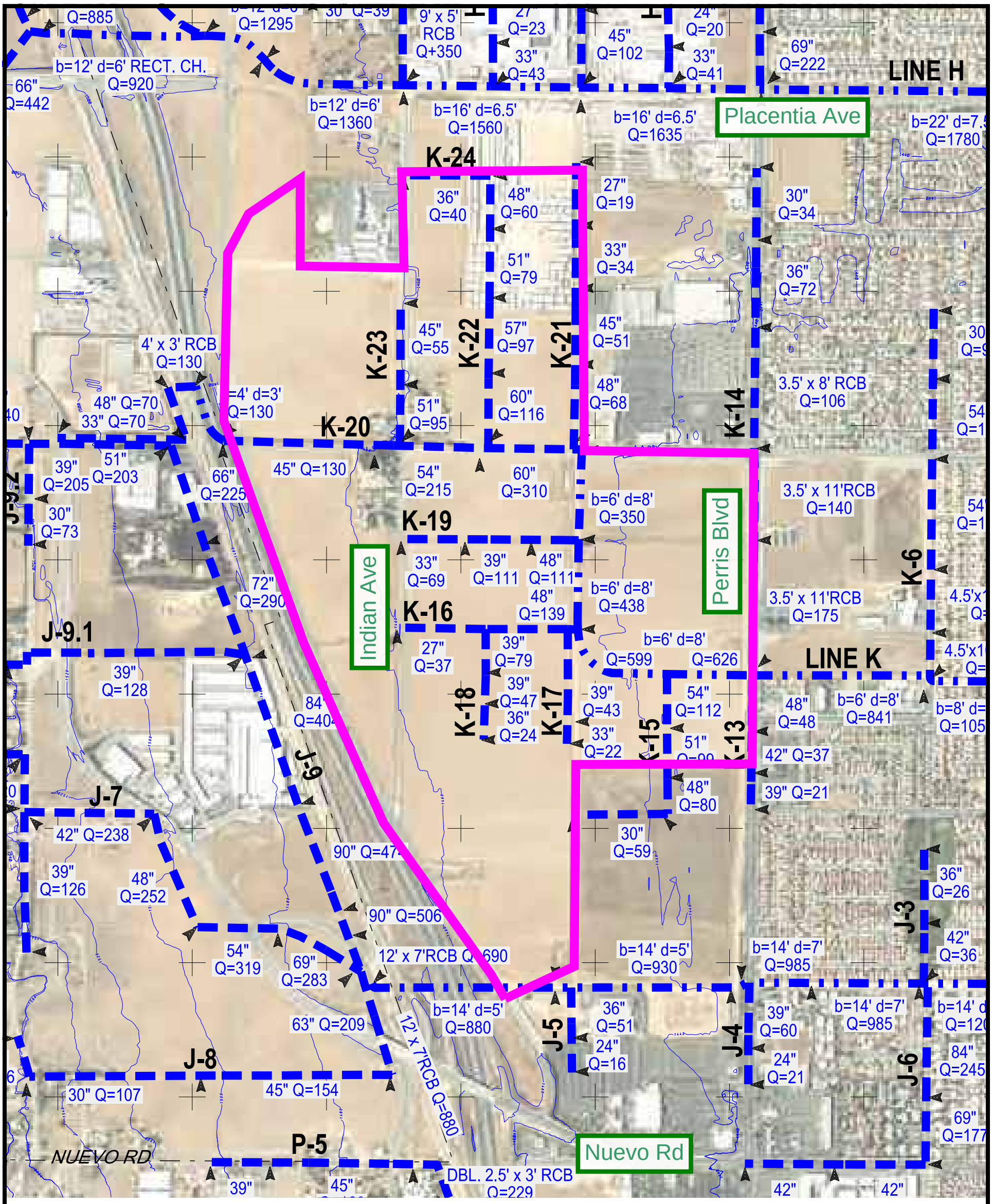
0 500 1,000 ft

FM CIVIL ENGINEERS INC.

Source: USDA Web Soil Survey

HARVEST LANDING

SITE 6 - HYDROLOGICAL SOIL GROUPS



N.T.S.

Site Boundary

MDP Facilities

Perris Harvest Landing MDP Exhibit

FMCIVIL ENGINEERS INC.

IN THE CITY OF PERRIS,
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM

VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

HOWARD INDUSTRIAL PARTNERS
1944 NORTH TUSTIN STREET, SUITE 122
ORANGE, CA 92865
CONTACT: TIM HOWARD
(TEL)714-769-9155

ENGINEER

FMCIVIL ENGINEERS INC.
29995 TECHNOLOGY DRIVE, SUITE 306
MURRIETA, CA 92563
CONTACT: FRANCISCO MARTINEZ
(TEL)951-331-9813

ARCHITECT

AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: STEPHEN PRZYBYLOWSKI
(TEL)714-639-9860

LEGEND

- RIGHT OF WAY
- (1025) EXISTING CONTOUR
- EASEMENT
- SD PROP. ONSITE STORM DRAIN SYSTEM
- SD PROP. OFFSITE STORM DRAIN SYSTEM
- PROP. STORM DRAIN LOW FLOW SYSTEM
- PROP. STORM DRAIN UNDER DRAIN SYSTEM
- W EXISTING WATER LINE
- W PROP. WATER LINE
- SS EXISTING SWR LINE
- SS PROP. SEWER LINE
- SD EXISTING STORM DRAIN PIPE
- E EXISTING OVERHEAD LINES

SCALE 1"=200'

200 100 0 200 400 600

SCALE: 1"=200'

CITY OF PERRIS

HARVEST LANDING INDUSTRIAL - PHASE I OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM EXHIBIT

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF.:	

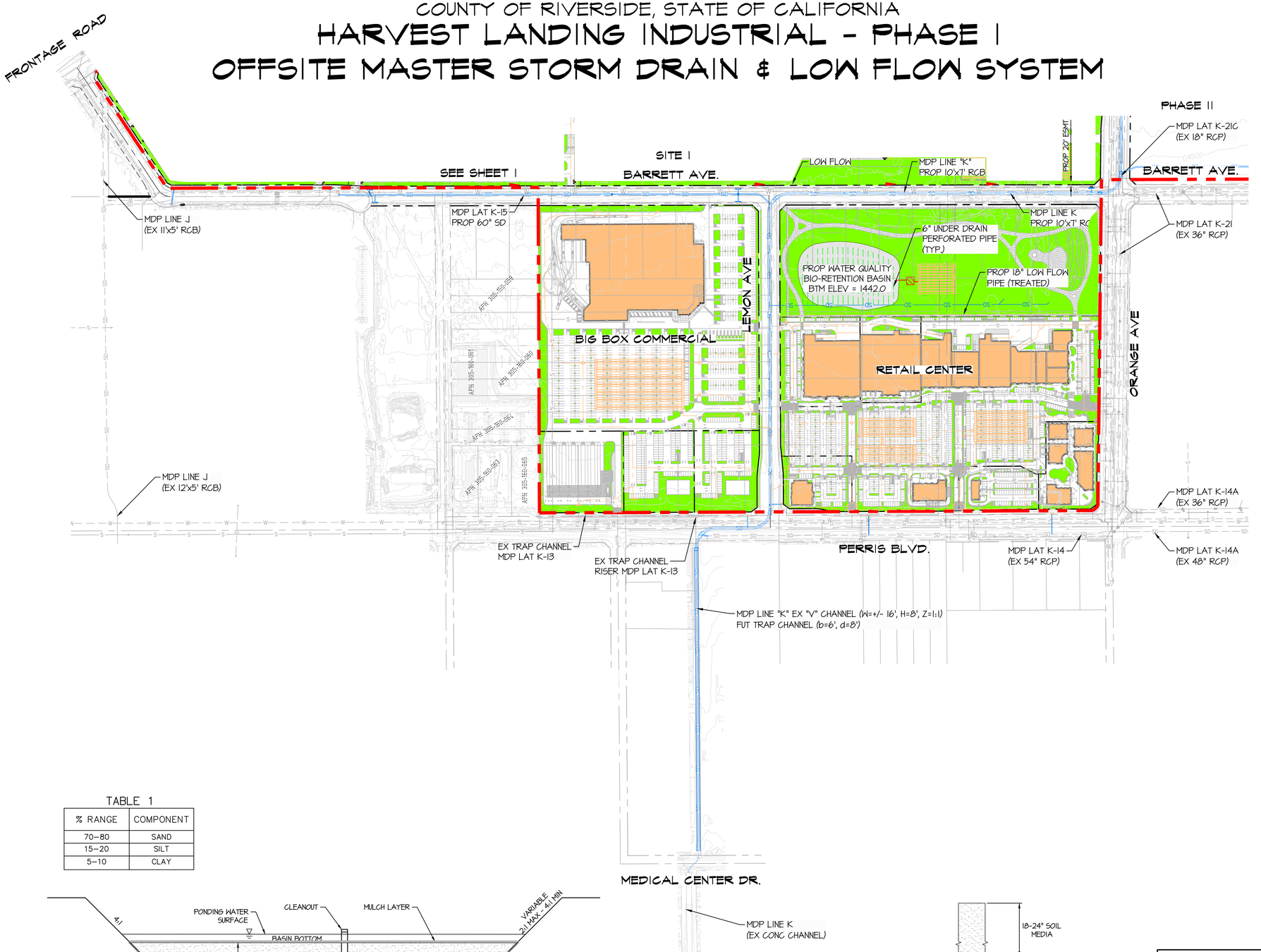
FMCIVIL ENGINEERS INC.
41870 KALMIA STREET, SUITE 120
MURRIETA, CA 92562
951.473.0202 - FMCIVIL.COM

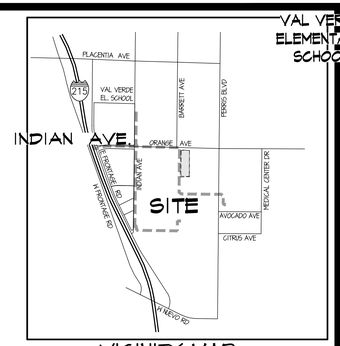
SHEET 1 OF 2 SHEETS

H:\PDATA\20-001 HARVEST LANDING\DWGS\PLDG\ENTITLEMENT\CUP\ALT-3\20-001-CUP_MSD3-01.DWG DANNY 10/7/2024 4:55 PM

COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM





VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

HOWARD INDUSTRIAL PARTNERS
1944 NORTH TUSTIN STREET, SUITE 122
ORANGE, CA 92865
CONTACT: TIM HOWARD
(TEL)714-769-9155

ENGINEER

FMCIVIL ENGINEERS INC.
29995 TECHNOLOGY DRIVE, SUITE 306
MURRIETA, CA 92563
CONTACT: FRANCISCO MARTINEZ
(TEL)951-331-9873

ARCHITECT

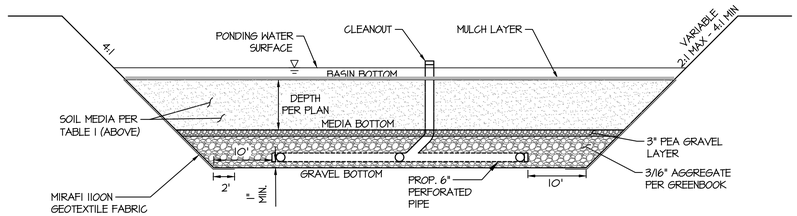
AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: STEPHEN PRZYBYLOWSKI
(TEL)714-639-9860

TABLE 1

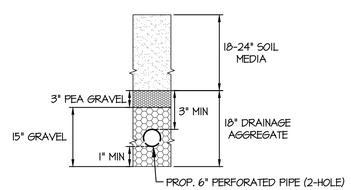
% RANGE	COMPONENT
70-80	SAND
15-20	SILT
5-10	CLAY

LEGEND

- RIGHT OF WAY
- (1025) EXISTING CONTOUR
- EASEMENT
- SD PROP. ONSITE STORM DRAIN SYSTEM
- SD PROP. OFFSITE STORM DRAIN SYSTEM
- PROP. STORM DRAIN LOW FLOW SYSTEM
- PROP. STORM DRAIN UNDER DRAIN SYSTEM
- W EXISTING WATER LINE
- W PROP. WATER LINE
- SS EXISTING SWR LINE
- SS PROP. SEWER LINE
- SD EXISTING STORM DRAIN PIPE
- E EXISTING OVERHEAD LINES



BASIN CROSS SECTION
N.T.S.



AGGREGATE CROSS SECTION
N.T.S.

SCALE 1"=200'

200 100 0 200 400 600
SCALE: 1"=200'

CITY OF PERRIS

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN
& LOW FLOW SYSTEM EXHIBIT

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF.:	

FMCIVIL ENGINEERS INC.
41870 KALMIA STREET, SUITE 120
MURRIETA | CA 92562
951.973.0202 - FMCIVIL.COM

SHEET 2 OF 2 SHEETS

H:\PDATA\20-001 HARVEST LANDING\DWGS\PLNCK\ENTITLEMENT\CUP\ALT-3\20-001-CUP_MSD3-01.DWG DANNY 10/8/2024 7:35 AM

IN THE CITY OF PERRIS,
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
SITE #6 CONCEPTUAL GRADING & DRAINAGE PLAN

VESTING TENTATIVE TRACT MAP 38811-2 - PARCEL 2

LEGEND

- (1025) EXISTING CONTOUR
- 1025 PROPOSED CONTOUR
- A RETAINING WALL
- FENCE
- E SIGN
- MH MANHOLE
- RIGHT OF WAY
- EASEMENT
- PARCEL LINE
- PARCEL MAP BOUNDARY
- STREET CENTER LINE
- SCREEN WALL
- COMBINATION SCREEN/RETAINING WALL
- EXISTING LOT LINE
- RIDGE LINE
- RIBBON GUTTER
- FLOW ARROW
- PROPOSED EDGE OF PAVEMENT
- W EXISTING WATER LINE
- W PROPOSED WATER LINE
- SS PROPOSED SEWER LINE
- SD EXISTING STORM DRAIN PIPE
- SD PROPOSED STORM DRAIN PIPE
- E EXISTING OVERHEAD LINES
- CUT/FILL LINE
- SLOPE SYMBOL

ZONING ORDINANCE

EXISTING ZONING:
HARVEST LANDING SPECIFIC PLANS - MULTIPLE BUSINESS USE (MBU)

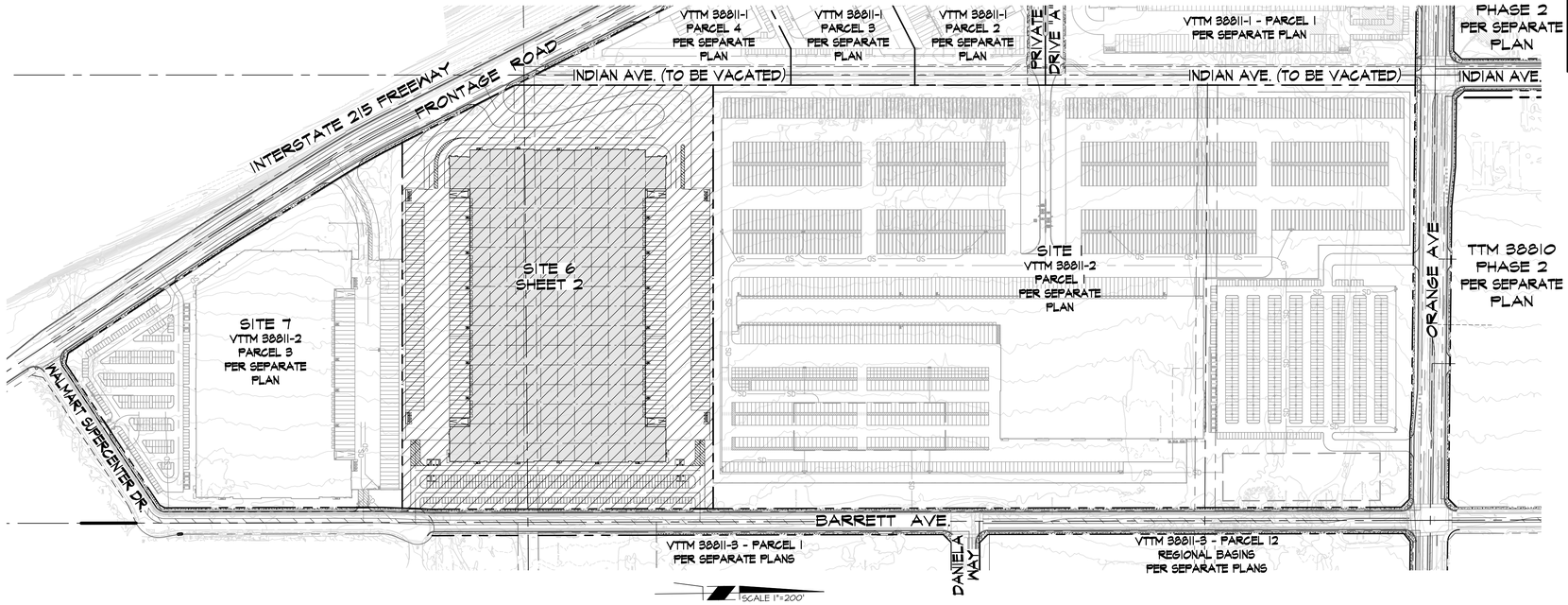
PROPOSED ZONING:
HARVEST LANDING SPECIFIC PLANS - MULTIPLE BUSINESS USE (MBU)

ASSESSOR'S PARCEL NUMBERS:

305-120-004 thru 008, 020 thru 026, &
305-130-001 thru 006, 009, &
305-160-001 thru 003, 025 thru 030, &
305-190-014, 019, 020, 028 thru 031, &
305-220-011, 054 thru 062

LEGAL DESCRIPTION

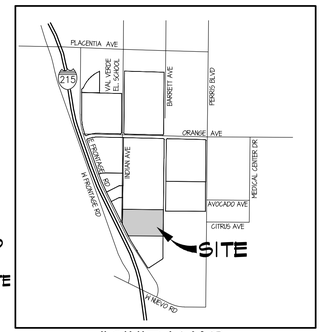
BLOCKS 1-4 OF FIGADOTA FARMS NO. 1A AS SHOWN BY MAP ON FILE IN THE OFFICE OF THE COUNTY RECORDER OF THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, IN BOOK 16 OF MAPS, PAGE 68 TOGETHER WITH LOTS 1-8, AND 13-20 OF FIGADOTA FARMS AS SHOWN BY MAP ON FILE IN THE OFFICE OF THE COUNTY RECORDER OF THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, IN BOOK 16 OF MAPS, PAGE 53 EXCEPTING THAT PORTION LYING WEST OF THE EASTERLY LINE OF THE FRONTAGE ROAD.



SCALE 1"=200'

INDEX MAP

200 100 0 200 400 600
SCALE: 1"=200'



VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

HOWARD INDUSTRIAL PARTNERS
2244 NORTH PACIFIC STREET
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CONTACT: TIM HOWARD
(TEL)714-637-3333

ENGINEER

FMCIVIL ENGINEERS INC.
41870 KALMIA ST., SUITE 120
MURRIETA, CA 92562
CONTACT: FRANCISCO MARTINEZ
(TEL)951-973-0202

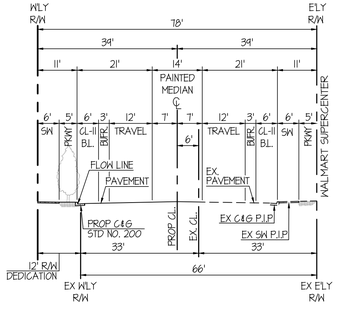
ARCHITECT

AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: DAN MACDAVID
(TEL)714-634-9860

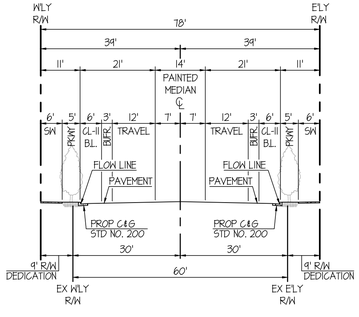
EARTHWORK ESTIMATE:

RAW CUT:	81,530 CY
RAW FILL:	61,100 CY
NET:	20,430 CY EXPORT

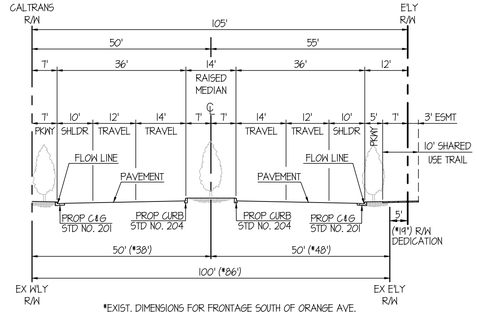
HAUL TRIPS:
ASSUMED (13 CY PER TRIP) = 1,572



BARRETT AVE
(FRONTAGE RD. - N'LY WALMART DWY)
MAJOR COLLECTOR
(78'/56')



BARRETT AVE
(N'LY WALMART DWY - ORANGE AVE)
MAJOR COLLECTOR
(78'/56')



*EXIST. DIMENSIONS FOR FRONTAGE SOUTH OF ORANGE AVE.

FRONTAGE ROAD
SECONDARY ARTERIAL
(105'/84')

CITY OF PERRIS

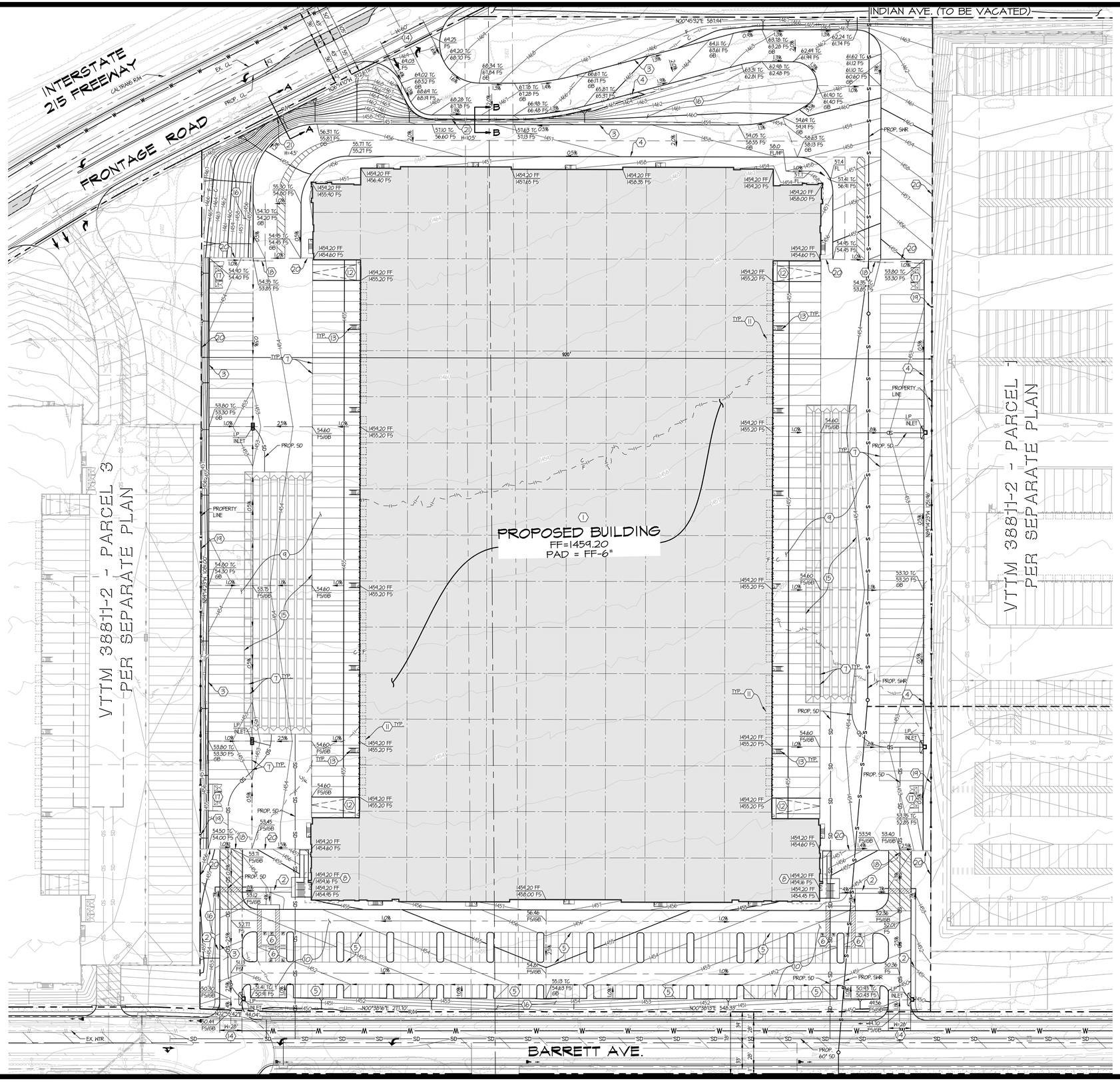
HARVEST LANDING RETAIL CENTER & BUSINESS PARK
SITE #6 CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-2 - PARCEL 2

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF:	

FMCIVIL ENGINEERS INC.
41870 KALMIA STREET, SUITE 120
MURRIETA | CA 92562
951.973.0202 - FMCIVIL.COM

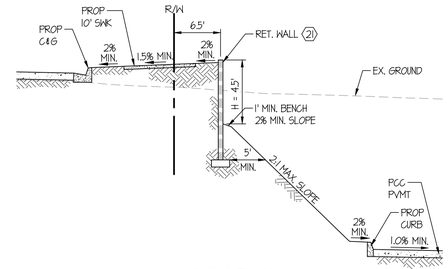
SHEET 1 OF 2 SHEETS

H:\PDATA\20-001 HARVEST LANDING\DWGS\PLNG\ENTITLEMENT\CUP\ALT-3\BLDG-6\20-001-CUP_BLDG6-CG-01.DWG JASON STOUFFER 10/2/2024 4:51 PM

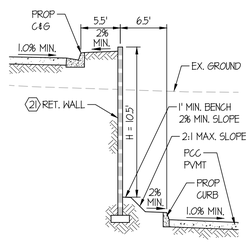


SITE PLAN KEYNOTES

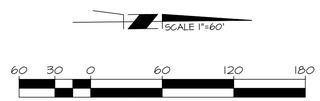
1. PAINTED CONCRETE TILT-UP WAREHOUSE / OFFICE / MANUFACTURING FACILITY. BUILDING TO BE DESIGNED PER ARCHITECT'S PLANS
2. ON SITE ACCESSIBLE SIDEWALK AND CURB RAMPS.
3. CONCRETE CURB
4. CONCRETE CURB & GUTTER
5. STANDARD PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
6. HANDICAP PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
7. TRAILER / TRACTOR PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
8. ACCESSIBLE BUILDING ENTRY WITH ADJACENT BICYCLE RACKS PER ARCHITECT'S PLANS
9. PORTLAND CONC. CEMENT (PCC) PAVED TRUCK YARD ARCHITECT'S PLANS
10. PORTLAND CONC. CEMENT (PCC) PAVED AUTO PARKING ARCHITECT'S PLANS
11. DOCK HIGH TRUCK DOOR PER ARCHITECT'S PLANS
12. GRADE LEVEL RAMP DOOR PER ARCHITECT'S PLANS
13. EXTERIOR MAN DOOR AND STAIRS W/GUARD POST PER ARCHITECT'S PLANS
14. COMMERCIAL DRIVEWAY APPROACH PER RIVERSIDE COUNTY STD.207A, WITH DECORATIVE CONCRETE PAVING PER ARCHITECT'S PLANS
15. UNDERGROUND STORM WATER CHAMBER SYSTEM
16. LANDSCAPE AREA PER LANDSCAPE ARCHITECT'S PLANS
17. APPROXIMATE LOCATION OF TRASH ENCLOSURE
18. ENTRY GATE PER ARCHITECT'S PLANS
19. CHAIN LINK FENCE PER ARCHITECT'S PLANS
20. SCREEN WALL PER ARCHITECT'S PLANS (COMBO RETAINING)
21. RETAINING WALL (H=APPROXIMATE MAXIMUM EXPOSED WALL FACE)



SECTION A-A
HOR. SCALE: 1"=10'



SECTION B-B
HOR. SCALE: 1"=10'



CITY OF PERRIS

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
SITE #6 CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-2 - PARCEL 2

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF:	

FMCIVIL ENGINEERS INC.
41810 KALMIA STREET, SUITE 120
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SHEET 2 OF 2 SHEETS

H:\PDATA\20-001 HARVEST LANDING\DWGS\PLNG\ENTITLEMENT\CUP\ALT-3\BLDG-6\20-001-CUP_BLDG6-CG-01.DWG JASON STOUFFER 10/7/2024 4:00 PM

DEVELOPMENT PLAN REVIEW – VTPM 38811-2
PARCEL 3 – SITE 7
CITY OF PERRIS
RIVERSIDE COUNTY, CALIFORNIA

Drainage Study Report

Prepared for:
Howard Industrial Partners LLC
1944 North Tustin Street, Suite 122
Orange, CA 92865

Prepared By:

FM CIVIL ENGINEERS INC.

29995 Technology Drive, Suite 306
Murrieta, CA 92563

Engineer of Work/Contacts:

Francisco Martinez, Jr.

October 4, 2024

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SECTION 1 - GENERAL OVERVIEW

INTRODUCTION

The purpose of this study is to support the entitlement phase and determine minimum drainage improvements required for the proposed industrial development of approximately 16.4 acres and 309,000 square feet warehouse building with 30 truck docks, and parking lot that lays within the Harvest Landing Specific Plan, located in the City of Perris, County of Riverside CA. More specifically, the project site is bounded to the north by Orange Avenue, the vacated Indian Avenue to the west, vacant land to the south and Barrett Avenue to the east.

The primary objectives of this report are as follows:

1. Delineate the drainage areas tributary to the onsite above/underground basin

2. Based on drainage patterns, ground slope, land use and soil type and using the Riverside County Rational Method, perform hydrologic and hydraulics of onsite drainage facilities.

3. Determine the 100-year peak storm flows based upon the pre-project, proposed land use per the MDP and post-project condition for the 24-hour storm duration utilizing the Unit Hydrograph Method as outlined in the Riverside County Flood Control & Water Conservation District Hydrology Manual.

4. Determine the required underground detention facilities to mitigate the 100-year peak storm flows for the 24-hour storm duration in the post-project condition to flows less than or equal to the proposed land use condition flow rates.

5. Determine the required the minimum storm drain infrastructure to flood protect the project site for the 100-year storm event.

6. Preparation of a hydrology report, which consist of hydrological and analytical results and exhibits.

BACKGROUND

EXISTING CONDITIONS

The project site is located within Riverside County Flood Control's Perris Valley Master Drainage Plan, and tributary to a low point in Perris Boulevard and the existing MDP Line "K" (earthen V-Channel) located about 2600 lineal feet east of Indian Avenue.

The site is in a relatively mild to flat sloping undeveloped terrain on a drainage area which drains easterly towards Barrett Avenue with no offsite flows. All the developed storm flows continue to travel easterly through the property, to Barrett Avenue and the vacant parcels to the east where it ultimately reaches a low point at Perris Boulevard; storm drain flows are intercepted by existing street inlets and the existing MDP Line "K". MDP Line "K" is an earthen "V" channel (w= 16', H=8' & z=1:1) and planned as a future Trapezoidal Channel (b=6', d=8'). In the existing condition a portion of the site labeled watershed B is tributary to an existing inlet just west of the knuckle on Walmart Supercenter Drive and conveyed to the existing MDP Line "J". MDP Line "J" is an existing 12' x 5' box.

DEVELOPED CONDITIONS

The preliminary offsite design is shown on Exhibit F "Harvest Landing Industrial Phase 1 Offsite Master Storm Drain & Low Flow System". The offsite master storm drain system (backbone) will be part of a separate report and therefore excluded. The onsite storm water runoff will be collected and treated using proprietary devices to accommodate the water quality component of mitigation. The onsite storm water runoff will be conveyed to an underground chamber system to mitigate the increased storm runoff to be at or below the current MDP land use condition flow. See the table below for the rational method results:

Description	**Q100 Peak Flow Rates**	
Watershed Area	**A**	B
Proposed	24.3	25.7
Existing	14.1	15.3
Onsite MDP	16.3	17.7

For purposes of this preliminary drainage report, the 100-year 24-hour peak flow rates for the post developed condition, predeveloped condition and proposed developed condition per the land use on the MDP were the only storm events analyzed for mitigation. The project storm mitigation is provided by utilizing the underground storm drain detention system and the outlet control structures. The total mitigation volume required was determined by selecting the flow rates from the recess limb of the proposed unit hydrograph runs for the 100-year 24-hour storm event that are equal or less than the flow rates from the proposed land use conditions. Smaller storm events were analyzed in this, however, since the storm volume demand to mitigate the storm flows from the 100-year 24hour event are considerably larger than volumes produced by the smaller storm events, thus a conservative approach.

MDP Condition Watershed A Volume: 1.39 ac-ft; $Q_{100\text{-}24hr}$: 4.45 cfs
Proposed Condition Watershed A Volume: 1.90 ac-ft; $Q_{100\text{-}24hr}$: 5.21 cfs
Underground Chamber Watershed A Volume: *2.04 ac-ft

MDP Watershed B Volume: 1.13 ac-ft; $Q_{100\text{-}24hr}$: 3.85 cfs
Proposed Condition Watershed B Volume: 1.86 ac-ft; $Q_{100\text{-}24hr}$: 5.18 cfs
Underground Chamber Watershed B Volume: *1.91 ac-ft

*For watershed "A" since this volume is greater than 1.92 ac-ft the underground chambers have enough storage to mitigate peak storm flows to the proposed land use levels. Similarly for watershed "B" since the volume provided by the underground chambers exceeds 1.91 ac-ft, there is enough storage to mitigate peak storm flows to the proposed land use levels. See the table on the following page for the unit hydrograph results:

Watershed A

Storm Duration	SP Q_{peak}	SP V_{TOTAL}	MDP Q_{PEAK}	MDP V_{TOTAL}
1	25.45	0.7488	21.92	0.6975
3	15.04	0.9868	13.36	0.8356
6	13.04	1.5032	11.01	1.2173
24	5.21	2.875	4.45	2.1619
Acreage	9.05		9.71	

Watershed B

Storm Duration	SP Q_{peak}	SP V_{TOTAL}	MDP Q_{PEAK}	MDP V_{TOTAL}
1	26.92	0.7387	17.34	0.5778
3	14.97	1.1666	10.85	0.8394
6	13.10	1.4806	9.27	1.01
24	5.18	2.8309	3.85	1.7993
Acreage	8.80		7.54	

METHODOLOGY

HYDROLOGY

Hydrologic calculations were performed using the Riverside County Rational Method from RCFCD & WCD Hydrology Manual, dated April 1978. The 100-year design discharge was computed by generating a hydrologic "link-node" model in which divides the area into drainage sub-areas, each tributary to a concentration point or hydrologic "node" point determined by the proposed layout. The computer results are included in section 2. The following assumptions/guidelines were applied for use of the Rational Method:

1. The map from the Riverside County Hydrology Manual indicates that the study area is primarily Group "B" and "C" soils, with a small area as "A". A USGS soils map for the project site is included as Exhibit D, under the Exhibit section.
2. Initial sub-areas were drawn to be less than 10-acres in size and less than 1,000 feet in length, per County guidelines. Time of concentration for the initial sub-area is based on Time of Concentration Nomograph for Initial Sub-area from the Hydrology Manual.
3. Antecedent Moisture Condition 2 was used for 100-year storm events.
4. Standard intensity-duration curve data for the project area was used for the Perris Valley area; Plate D-4.1.

HYDRAULICS

Civil Design hydrology module was used for preliminarily sizing the storm drainpipe system. The onsite storm drain infrastructure will consist of pipe sizes ranging from 12"-30" in diameter. A more detailed analysis will be provided in subsequent submittals and a WSPG analysis for onsite storm drainpipe system will be performed during final engineering.

CONCLUSIONS & RECOMMENDATIONS

The hydrology analyses evaluated the proposed development to determine the necessary onsite drainage improvements required to mitigate flows for increased runoff and it has been concluded that:

1. The proposed drainage facilities will adequately convey the 100-year flows and provide flood protection to the project site.
2. The proposed underground pipe chamber system will have sufficient storage to adequately mitigate for increased runoff.

SECTION 2 - HYDROLOGY ANALYSIS

100-YEAR EXISTING ON-SITE HYDROLOGY WATERSHED A (RATIONAL METHOD)

100-YEAR EXISTING ON-SITE HYDROLOGY WATERSHED B (RATIONAL METHOD)

100-YEAR EXISTING ON-SITE HYDROLOGY WATERSHED O – E FRONTAGE RD (RATIONAL METHOD)

100-YEAR EXISTING ON-SITE HYDROLOGY WATERSHED X – BARRETT AVE (RATIONAL METHOD)

100-YEAR PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED A (RATIONAL METHOD)

100-YEAR PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED B (RATIONAL METHOD)

100-YEAR PROPOSED ON-SITE HYDROLOGY WATERSHED A (RATIONAL METHOD)

100-YEAR PROPOSED ON-SITE HYDROLOGY WATERSHED B (RATIONAL METHOD)

100-YEAR PROPOSED OFF-SITE HYDROLOGY WATERSHED O – BARRETT AVE (RATIONAL METHOD)

100-YEAR PROPOSED OFF-SITE HYDROLOGY WATERSHED X – E FRONTAGE RD(RATIONAL METHOD)

100-YEAR-24 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

100-YEAR-24 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

100-YEAR-24 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

100-YEAR-24 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

100-YEAR-6 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

100-YEAR-6 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

100-YEAR-6 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

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100-YEAR-3 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

100-YEAR-3 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

100-YEAR-3 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

100-YEAR-3 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/02/24 File:q100a7.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
EXISTING CONDITION - WATERSHED A
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1464.800(Ft.)
Bottom (of initial area) elevation = 1450.200(Ft.)
Difference in elevation = 14.600(Ft.)
Slope = 0.01460 s(percent)= 1.46
TC = k(0.530)*[(length^3)/(elevation change)]^0.2

```
Initial area time of concentration =   19.562 min.
Rainfall intensity =      1.940(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.783
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.480
Decimal fraction soil group C = 0.520
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  82.16
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      8.916(CFS)
Total initial stream area =        5.870(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       11.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      5.870(Ac.)
Runoff from this stream =      8.916(CFS)
Time of concentration =   19.56 min.
Rainfall intensity =     1.940(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.100 to Point/Station       10.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   962.000(Ft.)
Top (of initial area) elevation =  1466.400(Ft.)
Bottom (of initial area) elevation =  1452.000(Ft.)
Difference in elevation =    14.400(Ft.)
Slope =    0.01497  s(percent)=       1.50
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   19.165 min.
Rainfall intensity =      1.959(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.755
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      4.719(CFS)
Total initial stream area =        3.190(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.200 to Point/Station       11.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
______________________________________________________________________________
```

```
Estimated mean flow rate at midpoint of channel =      5.200(CFS)
Depth of flow =   0.219(Ft.), Average velocity =   1.534(Ft/s)
!!Warning: Water is above left or right bank elevations
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              0.10
      2             10.00              0.00
      3             20.00              0.10
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      5.200(CFS)
  '     '    flow top width =     20.000(Ft.)
  '     '    velocity=    1.534(Ft/s)
  '     '    area =      3.390(Sq.Ft)
  '     '    Froude number =     0.657

Upstream point elevation =  1452.000(Ft.)
Downstream point elevation =  1450.200(Ft.)
Flow length =   176.000(Ft.)
Travel time  =    1.91 min.
Time of concentration =   21.08 min.
Depth of flow =   0.219(Ft.)
Average velocity =   1.534(Ft/s)
Total irregular channel flow =     5.200(CFS)
Irregular channel normal depth above invert elev. =   0.219(Ft.)
Average velocity of channel(s) =   1.534(Ft/s)
!!Warning: Water is above left or right bank elevations
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.750
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.990
Decimal fraction soil group C = 0.010
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  78.08
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.870(In/Hr) for a   100.0 year storm
Subarea runoff =      0.912(CFS) for      0.650(Ac.)
Total runoff =      5.631(CFS)      Total area =       3.840(Ac.)
Depth of flow =   0.228(Ft.), Average velocity =   1.584(Ft/s)
!!Warning: Water is above left or right bank elevations


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.200 to Point/Station       11.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.840(Ac.)
Runoff from this stream =      5.631(CFS)
Time of concentration =   21.08 min.
Rainfall intensity =     1.870(In/Hr)
Summary of stream data:
```

```
Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        8.916     19.56               1.940
2        5.631     21.08               1.870
Largest stream flow has longer or shorter time of concentration
Qp =      8.916 + sum of
        Qa          Tb/Ta
         5.631 *    0.928 =      5.226
Qp =     14.142

Total of 2 main streams to confluence:
Flow rates before confluence point:
       8.916       5.631
Area of streams before confluence:
        5.870        3.840


Results of confluence:
Total flow rate =     14.142(CFS)
Time of concentration =    19.562 min.
Effective stream area after confluence  =      9.710(Ac.)
End of computations, total study area =            9.71 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number =  80.5
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/02/24 File:q100b6x.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
EXISTING CONDITION - WATERSHED B
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 20.000 to Point/Station 21.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 864.000(Ft.)
Top (of initial area) elevation = 1462.500(Ft.)
Bottom (of initial area) elevation = 1448.600(Ft.)
Difference in elevation = 13.900(Ft.)
Slope = 0.01609 s(percent)= 1.61

```
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   18.096 min.
Rainfall intensity =      2.015(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.815
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.870
Decimal fraction soil group D = 0.130
RI index for soil(AMC 2)  =  86.39
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     12.384(CFS)
Total initial stream area =        7.540(Ac.)
Pervious area fraction = 1.000


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Process from Point/Station       21.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1444.840(Ft.)
Downstream point/station elevation =  1444.790(Ft.)
Pipe length  =    26.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.384(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    12.384(CFS)
Normal flow depth in pipe =   20.25(In.)
Flow top width inside pipe =   23.38(In.)
Critical Depth =   14.64(In.)
Pipe flow velocity =      3.87(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    18.21 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      7.540(Ac.)
Runoff from this stream =     12.384(CFS)
Time of concentration =   18.21 min.
Rainfall intensity =     2.009(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.100 to Point/Station       22.000

**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   597.000(Ft.)
Top (of initial area) elevation =  1460.000(Ft.)
Bottom (of initial area) elevation =  1449.000(Ft.)
Difference in elevation =    11.000(Ft.)
Slope =    0.01843  s(percent)=       1.84
```

```
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.599 min.
Rainfall intensity =      2.902(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.885
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.232(CFS)
Total initial stream area =        0.480(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       21.100 to Point/Station       22.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.480(Ac.)
Runoff from this stream =      1.232(CFS)
Time of concentration =    8.60 min.
Rainfall intensity =     2.902(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.200 to Point/Station       22.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   400.000(Ft.)
Top (of initial area) elevation =  1450.300(Ft.)
Bottom (of initial area) elevation =  1449.000(Ft.)
Difference in elevation =     1.300(Ft.)
Slope =    0.00325  s(percent)=       0.32
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.365 min.
Rainfall intensity =      2.648(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.748(CFS)
Total initial stream area =        0.320(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.200 to Point/Station       22.000
**** CONFLUENCE OF MAIN STREAMS ****
```

```
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      0.320(Ac.)
Runoff from this stream =      0.748(CFS)
Time of concentration =   10.36 min.
Rainfall intensity =     2.648(In/Hr)
Summary of stream data:

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


1       12.384     18.21               2.009
2        1.232      8.60               2.902
3        0.748     10.36               2.648
Largest stream flow has longer time of concentration
Qp =     12.384 + sum of
        Qb         Ia/Ib
         1.232 *    0.692 =      0.853
        Qb         Ia/Ib
         0.748 *    0.759 =      0.568
Qp =     13.805

Total of 3 main streams to confluence:
Flow rates before confluence point:
      12.384       1.232       0.748
Area of streams before confluence:
        7.540        0.480        0.320


Results of confluence:
Total flow rate =     13.805(CFS)
Time of concentration =    18.208 min.
Effective stream area after confluence  =      8.340(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1444.790(Ft.)
Downstream point/station elevation =  1444.710(Ft.)
Pipe length  =    35.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.805(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    13.805(CFS)
Normal flow depth in pipe =   20.65(In.)
Flow top width inside pipe =   22.90(In.)
Critical Depth =   15.50(In.)
Pipe flow velocity =      4.23(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =    18.35 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
```

```
**** CONFLUENCE OF MAIN STREAMS ****
_____________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      8.340(Ac.)
Runoff from this stream =     13.805(CFS)
Time of concentration =   18.35 min.
Rainfall intensity =     2.002(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.100 to Point/Station       22.300
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________
Initial area flow distance =   662.000(Ft.)
Top (of initial area) elevation =  1460.800(Ft.)
Bottom (of initial area) elevation =  1449.000(Ft.)
Difference in elevation =    11.800(Ft.)
Slope =    0.01782  s(percent)=       1.78
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.021 min.
Rainfall intensity =      2.834(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.328(CFS)
Total initial stream area =        0.530(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.100 to Point/Station       22.300
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      0.530(Ac.)
Runoff from this stream =      1.328(CFS)
Time of concentration =    9.02 min.
Rainfall intensity =     2.834(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.200 to Point/Station       22.300
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________
Initial area flow distance =   392.000(Ft.)
Top (of initial area) elevation =  1450.700(Ft.)
Bottom (of initial area) elevation =  1449.000(Ft.)
Difference in elevation =     1.700(Ft.)
Slope =    0.00434  s(percent)=       0.43
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
```

```
Initial area time of concentration =    9.705 min.
Rainfall intensity =      2.735(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.725(CFS)
Total initial stream area =        0.300(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.200 to Point/Station       22.300
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.300(Ac.)
Runoff from this stream =      0.725(CFS)
Time of concentration =    9.71 min.
Rainfall intensity =     2.735(In/Hr)
Summary of stream data:

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


1        1.328      9.02                2.834
2        0.725      9.71                2.735
Largest stream flow has longer or shorter time of concentration
Qp =      1.328 + sum of
        Qa          Tb/Ta
         0.725 *    0.930 =      0.674
Qp =      2.002

Total of 2 streams to confluence:
Flow rates before confluence point:
       1.328       0.725
Area of streams before confluence:
        0.530        0.300
Results of confluence:
Total flow rate =      2.002(CFS)
Time of concentration =     9.021 min.
Effective stream area after confluence =      0.830(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.300 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1444.840(Ft.)
Downstream point/station elevation =  1444.710(Ft.)
Pipe length  =    16.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.002(CFS)
```

```
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.002(CFS)
Normal flow depth in pipe =    6.86(In.)
Flow top width inside pipe =   11.88(In.)
Critical Depth =    7.25(In.)
Pipe flow velocity =      4.31(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     9.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.300 to Point/Station       23.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.830(Ac.)
Runoff from this stream =      2.002(CFS)
Time of concentration =    9.08 min.
Rainfall intensity =     2.825(In/Hr)
Summary of stream data:

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


1       13.805     18.35               2.002
2        2.002      9.08               2.825
Largest stream flow has longer time of concentration
Qp =     13.805 + sum of
        Qb         Ia/Ib
         2.002 *    0.709 =      1.419
Qp =     15.223

Total of 2 main streams to confluence:
Flow rates before confluence point:
      13.805       2.002
Area of streams before confluence:
        8.340        0.830


Results of confluence:
Total flow rate =     15.223(CFS)
Time of concentration =    18.346 min.
Effective stream area after confluence  =      9.170(Ac.)
End of computations, total study area =            9.17 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.840
Area averaged RI index number =  83.3
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/02/24 File:100xo7.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
EXISTING CONDITION - WATERSHED O - E FRONTAGE RD
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 30.000 to Point/Station 31.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 715.000(Ft.)
Top (of initial area) elevation = 1468.000(Ft.)
Bottom (of initial area) elevation = 1461.200(Ft.)
Difference in elevation = 6.800(Ft.)
Slope = 0.00951 s(percent)= 0.95

```
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.549 min.
Rainfall intensity =      2.625(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.874
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.249(CFS)
Total initial stream area =        0.980(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.000 to Point/Station       32.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1461.200(Ft.)
End of street segment elevation =  1460.500(Ft.)
Length of street segment  =   447.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  43.000(Ft.)
Distance from crown to crossfall grade break  =  41.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  12.000(Ft.)
Slope from curb to property line (v/hz) =   0.015
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 =      2.957(CFS)
Depth of flow =   0.362(Ft.), Average velocity =   0.978(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  11.772(Ft.)
Flow velocity =   0.98(Ft/s)
Travel time =    7.62 min.     TC =   18.17  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.869
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.011(In/Hr) for a   100.0 year storm
Subarea runoff =      1.224(CFS) for      0.700(Ac.)
Total runoff =      3.473(CFS)      Total area =       1.680(Ac.)
Street flow at end of street =      3.473(CFS)
Half street flow at end of street =      1.736(CFS)
Depth of flow =   0.378(Ft.), Average velocity =   1.015(Ft/s)
```

Flow width (from curb towards crown)= 12.583(Ft.)
End of computations, total study area = 1.68 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 56.0

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/03/24 File:q100px7.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
EXISTING CONDITION - BARRETT AVE WATERSHED - X
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 21.200 to Point/Station 12.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 103.000(Ft.)
Top (of initial area) elevation = 1450.300(Ft.)
Bottom (of initial area) elevation = 1450.200(Ft.)
Difference in elevation = 0.100(Ft.)

```
Slope =    0.00097  s(percent)=       0.10
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.670 min.
Rainfall intensity =      3.069(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.885
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.038(CFS)
Total initial stream area =        0.750(Ac.)
Pervious area fraction = 0.100
End of computations, total study area =            0.75 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  69.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/02/24 File:q100a7.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION - WATERSHED A
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1464.800(Ft.)
Bottom (of initial area) elevation = 1450.200(Ft.)
Difference in elevation = 14.600(Ft.)
Slope = 0.01460 s(percent)= 1.46

```
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.394 min.
Rainfall intensity =      2.254(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.783
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.480
Decimal fraction soil group C = 0.520
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  62.76
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =     10.362(CFS)
Total initial stream area =        5.870(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       11.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      5.870(Ac.)
Runoff from this stream =     10.362(CFS)
Time of concentration =   14.39 min.
Rainfall intensity =     2.254(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.100 to Point/Station       10.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   962.000(Ft.)
Top (of initial area) elevation =  1466.400(Ft.)
Bottom (of initial area) elevation =  1452.000(Ft.)
Difference in elevation =    14.400(Ft.)
Slope =    0.01497  s(percent)=       1.50
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.103 min.
Rainfall intensity =      2.277(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.758
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      5.507(CFS)
Total initial stream area =        3.190(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.200 to Point/Station       11.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
```

```
Estimated mean flow rate at midpoint of channel =      6.068(CFS)
Depth of flow =   0.236(Ft.), Average velocity =   1.632(Ft/s)
!!Warning: Water is above left or right bank elevations
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              0.10
      2             10.00              0.00
      3             20.00              0.10
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      6.068(CFS)
  '     '    flow top width =     20.000(Ft.)
  '     '    velocity=    1.632(Ft/s)
  '     '    area =      3.719(Sq.Ft)
  '     '    Froude number =     0.667

Upstream point elevation =  1452.000(Ft.)
Downstream point elevation =  1450.200(Ft.)
Flow length =   176.000(Ft.)
Travel time  =    1.80 min.
Time of concentration =   15.90 min.
Depth of flow =   0.236(Ft.)
Average velocity =   1.632(Ft/s)
Total irregular channel flow =     6.068(CFS)
Irregular channel normal depth above invert elev. =   0.236(Ft.)
Average velocity of channel(s) =   1.632(Ft/s)
!!Warning: Water is above left or right bank elevations
 Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.753
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.990
Decimal fraction soil group C = 0.010
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.13
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      2.147(In/Hr) for a   100.0 year storm
Subarea runoff =      1.051(CFS) for      0.650(Ac.)
Total runoff =      6.558(CFS)      Total area =       3.840(Ac.)
Depth of flow =   0.245(Ft.), Average velocity =   1.683(Ft/s)
!!Warning: Water is above left or right bank elevations


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.200 to Point/Station       11.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.840(Ac.)
Runoff from this stream =      6.558(CFS)
Time of concentration =   15.90 min.
Rainfall intensity =     2.147(In/Hr)
Summary of stream data:
```

```
Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       10.362     14.39               2.254
2        6.558     15.90               2.147
Largest stream flow has longer or shorter time of concentration
Qp =     10.362 + sum of
        Qa          Tb/Ta
         6.558 *    0.905 =      5.937
Qp =     16.299

Total of 2 main streams to confluence:
Flow rates before confluence point:
      10.362       6.558
Area of streams before confluence:
        5.870        3.840


Results of confluence:
Total flow rate =     16.299(CFS)
Time of concentration =    14.394 min.
Effective stream area after confluence  =      9.710(Ac.)
End of computations, total study area =            9.71 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged RI index number =  60.1
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/02/24 File:q100b6x.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION - WATERSHED B
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 20.000 to Point/Station 21.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 864.000(Ft.)
Top (of initial area) elevation = 1462.500(Ft.)
Bottom (of initial area) elevation = 1448.600(Ft.)
Difference in elevation = 13.900(Ft.)
Slope = 0.01609 s(percent)= 1.61

```
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.316 min.
Rainfall intensity =      2.342(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.811
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.870
Decimal fraction soil group D = 0.130
RI index for soil(AMC 2)  =  69.78
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =     14.321(CFS)
Total initial stream area =        7.540(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1444.840(Ft.)
Downstream point/station elevation =  1444.790(Ft.)
Pipe length  =    26.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.321(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    14.321(CFS)
Normal flow depth in pipe =   23.77(In.)
Flow top width inside pipe =   17.53(In.)
Critical Depth =   15.80(In.)
Pipe flow velocity =      3.86(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    13.43 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      7.540(Ac.)
Runoff from this stream =     14.321(CFS)
Time of concentration =   13.43 min.
Rainfall intensity =     2.332(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.100 to Point/Station       22.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   597.000(Ft.)
Top (of initial area) elevation =  1460.000(Ft.)
Bottom (of initial area) elevation =  1449.000(Ft.)
Difference in elevation =    11.000(Ft.)
Slope =    0.01843  s(percent)=       1.84
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
```

```
Initial area time of concentration =    8.599 min.
Rainfall intensity =      2.902(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.885
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.232(CFS)
Total initial stream area =        0.480(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.100 to Point/Station       22.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.480(Ac.)
Runoff from this stream =      1.232(CFS)
Time of concentration =    8.60 min.
Rainfall intensity =     2.902(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.200 to Point/Station       22.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   400.000(Ft.)
Top (of initial area) elevation =  1450.300(Ft.)
Bottom (of initial area) elevation =  1449.000(Ft.)
Difference in elevation =     1.300(Ft.)
Slope =    0.00325  s(percent)=       0.32
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.365 min.
Rainfall intensity =      2.648(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.748(CFS)
Total initial stream area =        0.320(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       21.200 to Point/Station       22.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
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The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      0.320(Ac.)
Runoff from this stream =      0.748(CFS)
Time of concentration =   10.36 min.
Rainfall intensity =     2.648(In/Hr)
Summary of stream data:

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


1       14.321     13.43               2.332
2        1.232      8.60               2.902
3        0.748     10.36               2.648
Largest stream flow has longer time of concentration
Qp =     14.321 + sum of
        Qb         Ia/Ib
         1.232 *    0.804 =      0.990
        Qb         Ia/Ib
         0.748 *    0.881 =      0.659
Qp =     15.970

Total of 3 main streams to confluence:
Flow rates before confluence point:
      14.321       1.232       0.748
Area of streams before confluence:
        7.540        0.480        0.320


Results of confluence:
Total flow rate =     15.970(CFS)
Time of concentration =    13.428 min.
Effective stream area after confluence  =      8.340(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1444.790(Ft.)
Downstream point/station elevation =  1444.710(Ft.)
Pipe length  =    35.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    15.970(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    15.970(CFS)
Normal flow depth in pipe =   20.58(In.)
Flow top width inside pipe =   27.85(In.)
Critical Depth =   16.20(In.)
Pipe flow velocity =      4.45(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    13.56 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       23.000
**** CONFLUENCE OF MAIN STREAMS ****
```

```
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      8.340(Ac.)
Runoff from this stream =     15.970(CFS)
Time of concentration =   13.56 min.
Rainfall intensity =     2.321(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.100 to Point/Station       22.300
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   662.000(Ft.)
Top (of initial area) elevation =  1460.800(Ft.)
Bottom (of initial area) elevation =  1449.000(Ft.)
Difference in elevation =    11.800(Ft.)
Slope =    0.01782  s(percent)=       1.78
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.021 min.
Rainfall intensity =      2.834(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.328(CFS)
Total initial stream area =        0.530(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.100 to Point/Station       22.300
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      0.530(Ac.)
Runoff from this stream =      1.328(CFS)
Time of concentration =    9.02 min.
Rainfall intensity =     2.834(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.200 to Point/Station       22.300
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   392.000(Ft.)
Top (of initial area) elevation =  1450.700(Ft.)
Bottom (of initial area) elevation =  1449.000(Ft.)
Difference in elevation =     1.700(Ft.)
Slope =    0.00434  s(percent)=       0.43
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.705 min.
```

```
Rainfall intensity =      2.735(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.725(CFS)
Total initial stream area =        0.300(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.200 to Point/Station       22.300
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.300(Ac.)
Runoff from this stream =      0.725(CFS)
Time of concentration =    9.71 min.
Rainfall intensity =     2.735(In/Hr)
Summary of stream data:

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


1        1.328      9.02                2.834
2        0.725      9.71                2.735
Largest stream flow has longer or shorter time of concentration
Qp =      1.328 + sum of
        Qa          Tb/Ta
         0.725 *    0.930 =      0.674
Qp =      2.002

Total of 2 streams to confluence:
Flow rates before confluence point:
       1.328       0.725
Area of streams before confluence:
        0.530        0.300
Results of confluence:
Total flow rate =      2.002(CFS)
Time of concentration =     9.021 min.
Effective stream area after confluence =      0.830(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.300 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1444.840(Ft.)
Downstream point/station elevation =  1444.710(Ft.)
Pipe length  =    16.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.002(CFS)
Nearest computed pipe diameter  =     12.00(In.)
```

```
Calculated individual pipe flow  =     2.002(CFS)
Normal flow depth in pipe =    6.86(In.)
Flow top width inside pipe =   11.88(In.)
Critical Depth =    7.25(In.)
Pipe flow velocity =      4.31(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     9.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.300 to Point/Station       23.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.830(Ac.)
Runoff from this stream =      2.002(CFS)
Time of concentration =    9.08 min.
Rainfall intensity =     2.825(In/Hr)
Summary of stream data:

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


1       15.970     13.56               2.321
2        2.002      9.08               2.825
Largest stream flow has longer time of concentration
Qp =     15.970 + sum of
        Qb         Ia/Ib
         2.002 *    0.822 =      1.645
Qp =     17.616

Total of 2 main streams to confluence:
Flow rates before confluence point:
      15.970       2.002
Area of streams before confluence:
        8.340        0.830


Results of confluence:
Total flow rate =     17.616(CFS)
Time of concentration =    13.559 min.
Effective stream area after confluence  =      9.170(Ac.)
End of computations, total study area =            9.17 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.429
Area averaged RI index number =  69.6
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/02/24 File:q100p7a.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED A
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 637.000(Ft.)
Top (of initial area) elevation = 1468.100(Ft.)
Bottom (of initial area) elevation = 1455.300(Ft.)
Difference in elevation = 12.800(Ft.)
Slope = 0.02009 s(percent)= 2.01

```
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.673 min.
Rainfall intensity =      2.889(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.879
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.710
Decimal fraction soil group C = 0.290
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  59.77
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     13.253(CFS)
Total initial stream area =        5.220(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       11.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.696
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.990
Decimal fraction soil group C = 0.010
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  61.13
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =     8.67 min.
Rainfall intensity =      2.889(In/Hr) for a   100.0 year storm
Subarea runoff =      1.990(CFS) for      0.990(Ac.)
Total runoff =     15.243(CFS)      Total area =       6.210(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1448.200(Ft.)
Downstream point/station elevation =  1445.230(Ft.)
Pipe length  =    28.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    15.243(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    15.243(CFS)
Normal flow depth in pipe =    9.47(In.)
Flow top width inside pipe =   14.47(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.69(Ft/s)
Travel time through pipe =    0.02 min.
Time of concentration (TC) =     8.70 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
```

```
In Main Stream number: 1
Stream flow area =      6.210(Ac.)
Runoff from this stream =     15.243(CFS)
Time of concentration =    8.70 min.
Rainfall intensity =     2.885(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   369.000(Ft.)
Top (of initial area) elevation =  1457.600(Ft.)
Bottom (of initial area) elevation =  1454.600(Ft.)
Difference in elevation =     3.000(Ft.)
Slope =    0.00813  s(percent)=       0.81
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.354 min.
Rainfall intensity =      2.943(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.881
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.490
Decimal fraction soil group C = 0.510
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  62.63
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      6.066(CFS)
Total initial stream area =        2.340(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       14.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
SINGLE FAMILY (1/2 Acre Lot)
Runoff Coefficient = 0.792
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.360
Decimal fraction soil group C = 0.640
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  64.32
Pervious area fraction =  0.600; Impervious fraction =  0.400
Time of concentration =     8.35 min.
Rainfall intensity =      2.943(In/Hr) for a   100.0 year storm
Subarea runoff =      1.165(CFS) for      0.500(Ac.)
Total runoff =      7.231(CFS)      Total area =       2.840(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1449.300(Ft.)
Downstream point/station elevation =  1445.230(Ft.)
```

```
Pipe length  =   182.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.231(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     7.231(CFS)
Normal flow depth in pipe =    9.68(In.)
Flow top width inside pipe =   14.35(In.)
Critical Depth =   12.88(In.)
Pipe flow velocity =      8.64(Ft/s)
Travel time through pipe =    0.35 min.
Time of concentration (TC) =     8.71 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       16.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.840(Ac.)
Runoff from this stream =      7.231(CFS)
Time of concentration =    8.71 min.
Rainfall intensity =     2.884(In/Hr)
Summary of stream data:

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


1       15.243      8.70               2.885
2        7.231      8.71               2.884
Largest stream flow has longer or shorter time of concentration
Qp =     15.243 + sum of
        Qa          Tb/Ta
         7.231 *    0.999 =      7.224
Qp =     22.467

Total of 2 main streams to confluence:
Flow rates before confluence point:
      15.243       7.231
Area of streams before confluence:
        6.210        2.840


Results of confluence:
Total flow rate =     22.467(CFS)
Time of concentration =     8.698 min.
Effective stream area after confluence  =      9.050(Ac.)


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Process from Point/Station       16.000 to Point/Station       17.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1445.230(Ft.)
Downstream point/station elevation =  1442.090(Ft.)
Pipe length  =   441.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    22.467(CFS)
```

```
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    22.467(CFS)
Normal flow depth in pipe =   19.29(In.)
Flow top width inside pipe =   24.39(In.)
Critical Depth =   19.91(In.)
Pipe flow velocity =      7.39(Ft/s)
Travel time through pipe =    0.99 min.
Time of concentration (TC) =     9.69 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       16.000 to Point/Station       17.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      9.050(Ac.)
Runoff from this stream =     22.467(CFS)
Time of concentration =    9.69 min.
Rainfall intensity =     2.736(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       16.100 to Point/Station       16.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   416.000(Ft.)
Top (of initial area) elevation =  1451.300(Ft.)
Bottom (of initial area) elevation =  1449.100(Ft.)
Difference in elevation =     2.200(Ft.)
Slope =    0.00529  s(percent)=       0.53
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.552 min.
Rainfall intensity =      2.756(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.926(CFS)
Total initial stream area =        0.380(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       16.200 to Point/Station       17.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1445.000(Ft.)
Downstream point/station elevation =  1442.090(Ft.)
Pipe length  =    23.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.926(CFS)
Nearest computed pipe diameter  =      6.00(In.)
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```
Calculated individual pipe flow  =     0.926(CFS)
Normal flow depth in pipe =    2.87(In.)
Flow top width inside pipe =    5.99(In.)
Critical Depth =    5.57(In.)
Pipe flow velocity =      9.97(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     9.59 min.


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Process from Point/Station       16.200 to Point/Station       17.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.380(Ac.)
Runoff from this stream =      0.926(CFS)
Time of concentration =    9.59 min.
Rainfall intensity =     2.751(In/Hr)
Summary of stream data:

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


1       22.467      9.69               2.736
2        0.926      9.59               2.751
Largest stream flow has longer time of concentration
Qp =     22.467 + sum of
        Qb         Ia/Ib
         0.926 *    0.995 =      0.921
Qp =     23.388

Total of 2 main streams to confluence:
Flow rates before confluence point:
      22.467       0.926
Area of streams before confluence:
        9.050        0.380


Results of confluence:
Total flow rate =     23.388(CFS)
Time of concentration =     9.692 min.
Effective stream area after confluence  =      9.430(Ac.)


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Process from Point/Station       17.000 to Point/Station       18.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1442.090(Ft.)
Downstream point/station elevation =  1441.980(Ft.)
Pipe length  =    21.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    23.388(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    23.388(CFS)
Normal flow depth in pipe =   23.34(In.)
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Flow top width inside pipe =   18.48(In.)
Critical Depth =   20.31(In.)
Pipe flow velocity =      6.40(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     9.75 min.


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Process from Point/Station       17.000 to Point/Station       18.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      9.430(Ac.)
Runoff from this stream =     23.388(CFS)
Time of concentration =    9.75 min.
Rainfall intensity =     2.729(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       17.100 to Point/Station       17.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   395.000(Ft.)
Top (of initial area) elevation =  1451.600(Ft.)
Bottom (of initial area) elevation =  1450.000(Ft.)
Difference in elevation =     1.600(Ft.)
Slope =    0.00405  s(percent)=       0.41
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.869 min.
Rainfall intensity =      2.712(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.863(CFS)
Total initial stream area =        0.360(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       17.200 to Point/Station       18.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1445.000(Ft.)
Downstream point/station elevation =  1441.980(Ft.)
Pipe length  =    33.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.863(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.863(CFS)
Normal flow depth in pipe =    3.03(In.)
Flow top width inside pipe =    6.00(In.)
```

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Critical Depth =    5.46(In.)
Pipe flow velocity =      8.68(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =     9.93 min.


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Process from Point/Station       17.200 to Point/Station       18.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.360(Ac.)
Runoff from this stream =      0.863(CFS)
Time of concentration =    9.93 min.
Rainfall intensity =     2.704(In/Hr)
Summary of stream data:

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


1       23.388      9.75               2.729
2        0.863      9.93               2.704
Largest stream flow has longer or shorter time of concentration
Qp =     23.388 + sum of
        Qa          Tb/Ta
         0.863 *    0.981 =      0.847
Qp =     24.235

Total of 2 main streams to confluence:
Flow rates before confluence point:
      23.388       0.863
Area of streams before confluence:
        9.430        0.360


Results of confluence:
Total flow rate =     24.235(CFS)
Time of concentration =     9.747 min.
Effective stream area after confluence  =      9.790(Ac.)
End of computations, total study area =            9.79 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.217
Area averaged RI index number =  61.5
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/02/24 File:q100bp7.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED B
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 20.000 to Point/Station 21.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 495.000(Ft.)
Top (of initial area) elevation = 1461.900(Ft.)
Bottom (of initial area) elevation = 1455.100(Ft.)
Difference in elevation = 6.800(Ft.)
Slope = 0.01374 s(percent)= 1.37

```
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.109 min.
Rainfall intensity =      2.821(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.861
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.430
Decimal fraction soil group C = 0.570
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  63.41
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =     12.271(CFS)
Total initial stream area =        5.050(Ac.)
Pervious area fraction = 0.200


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Process from Point/Station       20.000 to Point/Station       21.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
CONDOMINIUM subarea type
Runoff Coefficient = 0.845
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.010
Decimal fraction soil group C = 0.990
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  68.87
Pervious area fraction =  0.350; Impervious fraction =  0.650
Time of concentration =     9.11 min.
Rainfall intensity =      2.821(In/Hr) for a   100.0 year storm
Subarea runoff =      1.167(CFS) for      0.490(Ac.)
Total runoff =     13.438(CFS)      Total area =       5.540(Ac.)


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Process from Point/Station       21.000 to Point/Station       25.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1451.350(Ft.)
Downstream point/station elevation =  1448.020(Ft.)
Pipe length  =   120.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.438(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    13.438(CFS)
Normal flow depth in pipe =   11.82(In.)
Flow top width inside pipe =   17.09(In.)
Critical Depth =   16.38(In.)
Pipe flow velocity =     10.92(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =     9.29 min.


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Process from Point/Station       21.000 to Point/Station       25.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
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```
In Main Stream number: 1
Stream flow area =      5.540(Ac.)
Runoff from this stream =     13.438(CFS)
Time of concentration =    9.29 min.
Rainfall intensity =     2.793(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       22.000 to Point/Station       23.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   236.000(Ft.)
Top (of initial area) elevation =  1458.800(Ft.)
Bottom (of initial area) elevation =  1455.100(Ft.)
Difference in elevation =     3.700(Ft.)
Slope =    0.01568  s(percent)=       1.57
TC = k(0.323)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.596 min.
Rainfall intensity =      3.304(In/Hr) for a   100.0 year storm
APARTMENT subarea type
Runoff Coefficient = 0.872
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.200; Impervious fraction =  0.800
Initial subarea runoff =      7.206(CFS)
Total initial stream area =        2.500(Ac.)
Pervious area fraction = 0.200


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1451.600(Ft.)
Downstream point/station elevation =  1451.070(Ft.)
Pipe length  =   110.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.206(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     7.206(CFS)
Normal flow depth in pipe =   14.58(In.)
Flow top width inside pipe =   14.13(In.)
Critical Depth =   12.47(In.)
Pipe flow velocity =      4.70(Ft/s)
Travel time through pipe =    0.39 min.
Time of concentration (TC) =     6.99 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       24.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      2.500(Ac.)
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```
Runoff from this stream =      7.206(CFS)
Time of concentration =    6.99 min.
Rainfall intensity =     3.212(In/Hr)


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Process from Point/Station       23.100 to Point/Station       23.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   291.000(Ft.)
Top (of initial area) elevation =  1459.200(Ft.)
Bottom (of initial area) elevation =  1455.100(Ft.)
Difference in elevation =     4.100(Ft.)
Slope =    0.01409  s(percent)=       1.41
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.806 min.
Rainfall intensity =      3.254(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.886
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.191(CFS)
Total initial stream area =        0.760(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       23.200 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1451.580(Ft.)
Downstream point/station elevation =  1451.070(Ft.)
Pipe length  =   101.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.191(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.191(CFS)
Normal flow depth in pipe =    8.63(In.)
Flow top width inside pipe =   10.79(In.)
Critical Depth =    7.59(In.)
Pipe flow velocity =      3.63(Ft/s)
Travel time through pipe =    0.46 min.
Time of concentration (TC) =     7.27 min.


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Process from Point/Station       23.200 to Point/Station       24.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.760(Ac.)
Runoff from this stream =      2.191(CFS)
Time of concentration =    7.27 min.
Rainfall intensity =     3.150(In/Hr)
```

```
Summary of stream data:

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


1        7.206      6.99                3.212
2        2.191      7.27                3.150
Largest stream flow has longer or shorter time of concentration
Qp =      7.206 + sum of
        Qa          Tb/Ta
         2.191 *    0.961 =      2.105
Qp =      9.311

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.206       2.191
Area of streams before confluence:
        2.500        0.760
Results of confluence:
Total flow rate =      9.311(CFS)
Time of concentration =     6.986 min.
Effective stream area after confluence =      3.260(Ac.)


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Process from Point/Station       24.000 to Point/Station       25.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1451.070(Ft.)
Downstream point/station elevation =  1448.020(Ft.)
Pipe length  =     9.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.311(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     9.311(CFS)
Normal flow depth in pipe =    7.13(In.)
Flow top width inside pipe =    7.31(In.)
Critical depth could not be calculated.
Pipe flow velocity =     24.83(Ft/s)
Travel time through pipe =    0.01 min.
Time of concentration (TC) =     6.99 min.


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Process from Point/Station       24.000 to Point/Station       25.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.260(Ac.)
Runoff from this stream =      9.311(CFS)
Time of concentration =    6.99 min.
Rainfall intensity =     3.211(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)
```

```
1       13.438      9.29               2.793
2        9.311      6.99               3.211
Largest stream flow has longer time of concentration
Qp =     13.438 + sum of
        Qb         Ia/Ib
         9.311 *    0.870 =      8.100
Qp =     21.539

Total of 2 main streams to confluence:
Flow rates before confluence point:
      13.438       9.311
Area of streams before confluence:
        5.540        3.260


Results of confluence:
Total flow rate =     21.539(CFS)
Time of concentration =     9.292 min.
Effective stream area after confluence  =      8.800(Ac.)


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Process from Point/Station       25.000 to Point/Station       26.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1448.020(Ft.)
Downstream point/station elevation =  1444.910(Ft.)
Pipe length  =   290.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    21.539(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    21.539(CFS)
Normal flow depth in pipe =   18.14(In.)
Flow top width inside pipe =   20.62(In.)
Critical Depth =   19.93(In.)
Pipe flow velocity =      8.46(Ft/s)
Travel time through pipe =    0.57 min.
Time of concentration (TC) =     9.86 min.


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Process from Point/Station       25.000 to Point/Station       26.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      8.800(Ac.)
Runoff from this stream =     21.539(CFS)
Time of concentration =    9.86 min.
Rainfall intensity =     2.713(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       25.100 to Point/Station       26.000
**** INITIAL AREA EVALUATION ****
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```
Initial area flow distance =   592.000(Ft.)
Top (of initial area) elevation =  1460.200(Ft.)
Bottom (of initial area) elevation =  1449.300(Ft.)
Difference in elevation =    10.900(Ft.)
Slope =    0.01841  s(percent)=       1.84
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.571 min.
Rainfall intensity =      2.906(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.885
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.388(CFS)
Total initial stream area =        0.540(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       25.100 to Point/Station       26.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.540(Ac.)
Runoff from this stream =      1.388(CFS)
Time of concentration =    8.57 min.
Rainfall intensity =     2.906(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.200 to Point/Station       26.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   391.000(Ft.)
Top (of initial area) elevation =  1451.600(Ft.)
Bottom (of initial area) elevation =  1449.300(Ft.)
Difference in elevation =     2.300(Ft.)
Slope =    0.00588  s(percent)=       0.59
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.122 min.
Rainfall intensity =      2.819(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.847(CFS)
Total initial stream area =        0.340(Ac.)
```

```
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.200 to Point/Station       26.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      0.340(Ac.)
Runoff from this stream =      0.847(CFS)
Time of concentration =    9.12 min.
Rainfall intensity =     2.819(In/Hr)
Summary of stream data:

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


1       21.539      9.86               2.713
2        1.388      8.57               2.906
3        0.847      9.12               2.819
Largest stream flow has longer time of concentration
Qp =     21.539 + sum of
        Qb          Ia/Ib
         1.388 *    0.933 =      1.296
        Qb          Ia/Ib
         0.847 *    0.962 =      0.816
Qp =     23.650

Total of 3 main streams to confluence:
Flow rates before confluence point:
      21.539       1.388       0.847
Area of streams before confluence:
        8.800        0.540        0.340


Results of confluence:
Total flow rate =     23.650(CFS)
Time of concentration =     9.863 min.
Effective stream area after confluence  =      9.680(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.000 to Point/Station       27.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1444.910(Ft.)
Downstream point/station elevation =  1444.590(Ft.)
Pipe length  =    65.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    23.650(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    23.650(CFS)
Normal flow depth in pipe =   20.72(In.)
Flow top width inside pipe =   27.73(In.)
Critical Depth =   19.85(In.)
Pipe flow velocity =      6.55(Ft/s)
```

```
Travel time through pipe =    0.17 min.
Time of concentration (TC) =    10.03 min.


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Process from Point/Station       26.000 to Point/Station       27.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      9.680(Ac.)
Runoff from this stream =     23.650(CFS)
Time of concentration =   10.03 min.
Rainfall intensity =     2.691(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.100 to Point/Station       27.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   667.000(Ft.)
Top (of initial area) elevation =  1460.200(Ft.)
Bottom (of initial area) elevation =  1449.000(Ft.)
Difference in elevation =    11.200(Ft.)
Slope =    0.01679  s(percent)=       1.68
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.157 min.
Rainfall intensity =      2.814(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.368(CFS)
Total initial stream area =        0.550(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.100 to Point/Station       27.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.550(Ac.)
Runoff from this stream =      1.368(CFS)
Time of concentration =    9.16 min.
Rainfall intensity =     2.814(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.200 to Point/Station       27.000
```

```
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________
Initial area flow distance =   390.000(Ft.)
Top (of initial area) elevation =  1451.800(Ft.)
Bottom (of initial area) elevation =  1449.000(Ft.)
Difference in elevation =     2.800(Ft.)
Slope =    0.00718  s(percent)=       0.72
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.756 min.
Rainfall intensity =      2.876(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.763(CFS)
Total initial stream area =        0.300(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.200 to Point/Station       27.000
**** CONFLUENCE OF MAIN STREAMS ****
_____________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      0.300(Ac.)
Runoff from this stream =      0.763(CFS)
Time of concentration =    8.76 min.
Rainfall intensity =     2.876(In/Hr)
Summary of stream data:

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


1       23.650     10.03               2.691
2        1.368      9.16               2.814
3        0.763      8.76               2.876
Largest stream flow has longer time of concentration
Qp =     23.650 + sum of
        Qb         Ia/Ib
         1.368 *    0.956 =      1.309
        Qb         Ia/Ib
         0.763 *    0.936 =      0.714
Qp =     25.673

Total of 3 main streams to confluence:
Flow rates before confluence point:
      23.650       1.368       0.763
Area of streams before confluence:
        9.680        0.550        0.300
```

Results of confluence:
Total flow rate = 25.673(CFS)
Time of concentration = 10.029 min.
Effective stream area after confluence = 10.530(Ac.)
End of computations, total study area = 10.53 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.183
Area averaged RI index number = 66.3

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/02/24 File:q100o7p.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED O - BARRETT AVE
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 25.200 to Point/Station 30.100
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 245.000(Ft.)
Top (of initial area) elevation = 1451.600(Ft.)
Bottom (of initial area) elevation = 1450.600(Ft.)
Difference in elevation = 1.000(Ft.)
Slope = 0.00408 s(percent)= 0.41

```
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.140 min.
Rainfall intensity =      2.981(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.885
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.923(CFS)
Total initial stream area =        0.350(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.100 to Point/Station       31.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1444.920(Ft.)
Downstream point/station elevation =  1444.720(Ft.)
Pipe length  =    28.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.923(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.923(CFS)
Normal flow depth in pipe =    5.34(In.)
Flow top width inside pipe =    8.84(In.)
Critical Depth =    5.28(In.)
Pipe flow velocity =      3.38(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     8.28 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.100 to Point/Station       31.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      0.350(Ac.)
Runoff from this stream =      0.923(CFS)
Time of concentration =    8.28 min.
Rainfall intensity =     2.956(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       26.200 to Point/Station       30.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   243.000(Ft.)
Top (of initial area) elevation =  1451.800(Ft.)
Bottom (of initial area) elevation =  1449.600(Ft.)
Difference in elevation =     2.200(Ft.)
Slope =    0.00905  s(percent)=       0.91
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
```

```
Initial area time of concentration =    6.918 min.
Rainfall intensity =      3.228(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.886
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.087(CFS)
Total initial stream area =        0.380(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       31.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1444.860(Ft.)
Downstream point/station elevation =  1444.720(Ft.)
Pipe length  =    28.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.087(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.087(CFS)
Normal flow depth in pipe =    6.86(In.)
Flow top width inside pipe =    7.67(In.)
Critical Depth =    5.74(In.)
Pipe flow velocity =      3.01(Ft/s)
Travel time through pipe =    0.16 min.
Time of concentration (TC) =     7.07 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       31.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.380(Ac.)
Runoff from this stream =      1.087(CFS)
Time of concentration =    7.07 min.
Rainfall intensity =     3.193(In/Hr)
Summary of stream data:

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


1        0.923      8.28               2.956
2        1.087      7.07               3.193
Largest stream flow has longer or shorter time of concentration
Qp =      1.087 + sum of
        Qa          Tb/Ta
         0.923 *    0.854 =      0.789
Qp =      1.876
```

```
Total of 2 main streams to confluence:
Flow rates before confluence point:
       0.923       1.087
Area of streams before confluence:
        0.350        0.380


Results of confluence:
Total flow rate =      1.876(CFS)
Time of concentration =     7.074 min.
Effective stream area after confluence  =      0.730(Ac.)
End of computations, total study area =            0.73 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  69.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/11/24 File:frontage7p.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED O - E FRONTAGE ROAD
100-YEAR ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 40.000 to Point/Station 40.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 1.769(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.865
Decimal fraction soil group A = 0.090

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Decimal fraction soil group B = 0.910
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  53.84
Pervious area fraction =  0.100; Impervious fraction =  0.900
User specified values are as follows:
TC =  23.61 min.  Rain intensity =       1.77(In/Hr)
Total area =         2.60(Ac.)  Total runoff =      4.90(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       41.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1467.200(Ft.)
End of street segment elevation =  1461.700(Ft.)
Length of street segment  =   621.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  43.000(Ft.)
Distance from crown to crossfall grade break  =  41.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  12.000(Ft.)
Slope from curb to property line (v/hz) =   0.015
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0130
 Manning's N from gutter to grade break =  0.0130
 Manning's N from grade break to crown =  0.0130
Estimated mean flow rate at midpoint of street =      5.501(CFS)
Depth of flow =   0.394(Ft.), Average velocity =   2.883(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  13.347(Ft.)
Flow velocity =   2.88(Ft/s)
Travel time =    3.59 min.     TC =   27.20  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.865
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      1.650(In/Hr) for a   100.0 year storm

Subarea runoff =      1.114(CFS) for      0.780(Ac.)
Total runoff =      6.014(CFS)      Total area =       3.380(Ac.)
Street flow at end of street =      6.014(CFS)
Half street flow at end of street =      6.014(CFS)
Depth of flow =   0.403(Ft.), Average velocity =   2.945(Ft/s)
Flow width (from curb towards crown)=  13.839(Ft.)


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Process from Point/Station       41.000 to Point/Station       42.000
```

**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****

Top of street segment elevation = 1461.700(Ft.)
End of street segment elevation = 1459.800(Ft.)
Length of street segment = 498.000(Ft.)
Height of curb above gutter flowline = 8.0(In.)
Width of half street (curb to crown) = 43.000(Ft.)
Distance from crown to crossfall grade break = 41.000(Ft.)
Slope from gutter to grade break (v/hz) = 0.083
Slope from grade break to crown (v/hz) = 0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line = 12.000(Ft.)
Slope from curb to property line (v/hz) = 0.015
Gutter width = 2.000(Ft.)
Gutter hike from flowline = 2.000(In.)
Manning's N in gutter = 0.0130
Manning's N from gutter to grade break = 0.0130
Manning's N from grade break to crown = 0.0130
Estimated mean flow rate at midpoint of street = 6.564(CFS)
Depth of flow = 0.466(Ft.), Average velocity = 2.186(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width = 16.960(Ft.)
Flow velocity = 2.19(Ft/s)
Travel time = 3.80 min. TC = 31.00 min.
Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.864
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 56.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Rainfall intensity = 1.548(In/Hr) for a 100.0 year storm
Subarea runoff = 1.016(CFS) for 0.760(Ac.)
Total runoff = 7.030(CFS) Total area = 4.140(Ac.)
Street flow at end of street = 7.030(CFS)
Half street flow at end of street = 7.030(CFS)
Depth of flow = 0.475(Ft.), Average velocity = 2.222(Ft/s)
Flow width (from curb towards crown)= 17.425(Ft.)
End of computations, total study area = 4.14 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 54.6

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 10/02/24 File: q100uh7ax24100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION - WATERSHED A
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 9.71(Ac.) = 0.015 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 9.71(Ac.) = 0.015 Sq. Mi.
Length along longest watercourse = 1138.00(Ft.)
Length along longest watercourse measured to centroid = 638.00(Ft.)
Length along longest watercourse = 0.216 Mi.
Length along longest watercourse measured to centroid = 0.121 Mi.
Difference in elevation = 14.60(Ft.)
Slope along watercourse = 67.7399 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.081 Hr.
Lag time = 4.85 Min.
25% of lag time = 1.21 Min.
40% of lag time = 1.94 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.71	1.80	17.48

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.71	5.00	48.55

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.800(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.710	60.10	0.500

Total Area Entered = 9.71(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
60.1	60.1	0.469	0.500	0.258	1.000	0.258
					Sum (F) =	0.258

Area averaged mean soil loss (F) (In/Hr) = 0.258
Minimum soil loss rate ((In/Hr)) = 0.129
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	103.129	20.160	1.973
2	0.167	206.259	48.606	4.756
3	0.250	309.388	15.181	1.486
4	0.333	412.518	6.899	0.675
5	0.417	515.647	3.854	0.377
6	0.500	618.777	2.481	0.243
7	0.583	721.906	1.504	0.147
8	0.667	825.035	1.315	0.129
		Sum = 100.000	Sum=	9.786

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

Unit Time	Pattern	Storm Rain	Loss rate(In./Hr)	Effective

	(Hr.)	Percent	(In/Hr)	Max		Low	(In/Hr)
1	0.08	0.07	0.040	(	0.457)	0.020	0.020
2	0.17	0.07	0.040	(	0.455)	0.020	0.020
3	0.25	0.07	0.040	(	0.454)	0.020	0.020
4	0.33	0.10	0.060	(	0.452)	0.030	0.030
5	0.42	0.10	0.060	(	0.450)	0.030	0.030
6	0.50	0.10	0.060	(	0.448)	0.030	0.030
7	0.58	0.10	0.060	(	0.447)	0.030	0.030
8	0.67	0.10	0.060	(	0.445)	0.030	0.030
9	0.75	0.10	0.060	(	0.443)	0.030	0.030
10	0.83	0.13	0.080	(	0.441)	0.040	0.040
11	0.92	0.13	0.080	(	0.440)	0.040	0.040
12	1.00	0.13	0.080	(	0.438)	0.040	0.040
13	1.08	0.10	0.060	(	0.436)	0.030	0.030
14	1.17	0.10	0.060	(	0.434)	0.030	0.030
15	1.25	0.10	0.060	(	0.433)	0.030	0.030
16	1.33	0.10	0.060	(	0.431)	0.030	0.030
17	1.42	0.10	0.060	(	0.429)	0.030	0.030
18	1.50	0.10	0.060	(	0.428)	0.030	0.030
19	1.58	0.10	0.060	(	0.426)	0.030	0.030
20	1.67	0.10	0.060	(	0.424)	0.030	0.030
21	1.75	0.10	0.060	(	0.422)	0.030	0.030
22	1.83	0.13	0.080	(	0.421)	0.040	0.040
23	1.92	0.13	0.080	(	0.419)	0.040	0.040
24	2.00	0.13	0.080	(	0.417)	0.040	0.040
25	2.08	0.13	0.080	(	0.416)	0.040	0.040
26	2.17	0.13	0.080	(	0.414)	0.040	0.040
27	2.25	0.13	0.080	(	0.412)	0.040	0.040
28	2.33	0.13	0.080	(	0.411)	0.040	0.040
29	2.42	0.13	0.080	(	0.409)	0.040	0.040
30	2.50	0.13	0.080	(	0.407)	0.040	0.040
31	2.58	0.17	0.100	(	0.406)	0.050	0.050
32	2.67	0.17	0.100	(	0.404)	0.050	0.050
33	2.75	0.17	0.100	(	0.402)	0.050	0.050
34	2.83	0.17	0.100	(	0.401)	0.050	0.050
35	2.92	0.17	0.100	(	0.399)	0.050	0.050
36	3.00	0.17	0.100	(	0.397)	0.050	0.050
37	3.08	0.17	0.100	(	0.396)	0.050	0.050
38	3.17	0.17	0.100	(	0.394)	0.050	0.050
39	3.25	0.17	0.100	(	0.392)	0.050	0.050
40	3.33	0.17	0.100	(	0.391)	0.050	0.050
41	3.42	0.17	0.100	(	0.389)	0.050	0.050
42	3.50	0.17	0.100	(	0.388)	0.050	0.050
43	3.58	0.17	0.100	(	0.386)	0.050	0.050
44	3.67	0.17	0.100	(	0.384)	0.050	0.050
45	3.75	0.17	0.100	(	0.383)	0.050	0.050
46	3.83	0.20	0.120	(	0.381)	0.060	0.060
47	3.92	0.20	0.120	(	0.379)	0.060	0.060
48	4.00	0.20	0.120	(	0.378)	0.060	0.060
49	4.08	0.20	0.120	(	0.376)	0.060	0.060
50	4.17	0.20	0.120	(	0.375)	0.060	0.060
51	4.25	0.20	0.120	(	0.373)	0.060	0.060
52	4.33	0.23	0.140	(	0.371)	0.070	0.070
53	4.42	0.23	0.140	(	0.370)	0.070	0.070
54	4.50	0.23	0.140	(	0.368)	0.070	0.070
55	4.58	0.23	0.140	(	0.367)	0.070	0.070
56	4.67	0.23	0.140	(	0.365)	0.070	0.070

57	4.75	0.23	0.140	(0.364)	0.070	0.070
58	4.83	0.27	0.160	(0.362)	0.080	0.080
59	4.92	0.27	0.160	(0.360)	0.080	0.080
60	5.00	0.27	0.160	(0.359)	0.080	0.080
61	5.08	0.20	0.120	(0.357)	0.060	0.060
62	5.17	0.20	0.120	(0.356)	0.060	0.060
63	5.25	0.20	0.120	(0.354)	0.060	0.060
64	5.33	0.23	0.140	(0.353)	0.070	0.070
65	5.42	0.23	0.140	(0.351)	0.070	0.070
66	5.50	0.23	0.140	(0.350)	0.070	0.070
67	5.58	0.27	0.160	(0.348)	0.080	0.080
68	5.67	0.27	0.160	(0.347)	0.080	0.080
69	5.75	0.27	0.160	(0.345)	0.080	0.080
70	5.83	0.27	0.160	(0.343)	0.080	0.080
71	5.92	0.27	0.160	(0.342)	0.080	0.080
72	6.00	0.27	0.160	(0.340)	0.080	0.080
73	6.08	0.30	0.180	(0.339)	0.090	0.090
74	6.17	0.30	0.180	(0.337)	0.090	0.090
75	6.25	0.30	0.180	(0.336)	0.090	0.090
76	6.33	0.30	0.180	(0.334)	0.090	0.090
77	6.42	0.30	0.180	(0.333)	0.090	0.090
78	6.50	0.30	0.180	(0.331)	0.090	0.090
79	6.58	0.33	0.200	(0.330)	0.100	0.100
80	6.67	0.33	0.200	(0.328)	0.100	0.100
81	6.75	0.33	0.200	(0.327)	0.100	0.100
82	6.83	0.33	0.200	(0.325)	0.100	0.100
83	6.92	0.33	0.200	(0.324)	0.100	0.100
84	7.00	0.33	0.200	(0.323)	0.100	0.100
85	7.08	0.33	0.200	(0.321)	0.100	0.100
86	7.17	0.33	0.200	(0.320)	0.100	0.100
87	7.25	0.33	0.200	(0.318)	0.100	0.100
88	7.33	0.37	0.220	(0.317)	0.110	0.110
89	7.42	0.37	0.220	(0.315)	0.110	0.110
90	7.50	0.37	0.220	(0.314)	0.110	0.110
91	7.58	0.40	0.240	(0.312)	0.120	0.120
92	7.67	0.40	0.240	(0.311)	0.120	0.120
93	7.75	0.40	0.240	(0.309)	0.120	0.120
94	7.83	0.43	0.260	(0.308)	0.130	0.130
95	7.92	0.43	0.260	(0.307)	0.130	0.130
96	8.00	0.43	0.260	(0.305)	0.130	0.130
97	8.08	0.50	0.300	(0.304)	0.150	0.150
98	8.17	0.50	0.300	(0.302)	0.150	0.150
99	8.25	0.50	0.300	(0.301)	0.150	0.150
100	8.33	0.50	0.300	(0.300)	0.150	0.150
101	8.42	0.50	0.300	(0.298)	0.150	0.150
102	8.50	0.50	0.300	(0.297)	0.150	0.150
103	8.58	0.53	0.320	(0.295)	0.160	0.160
104	8.67	0.53	0.320	(0.294)	0.160	0.160
105	8.75	0.53	0.320	(0.293)	0.160	0.160
106	8.83	0.57	0.340	(0.291)	0.170	0.170
107	8.92	0.57	0.340	(0.290)	0.170	0.170
108	9.00	0.57	0.340	(0.288)	0.170	0.170
109	9.08	0.63	0.380	(0.287)	0.190	0.190
110	9.17	0.63	0.380	(0.286)	0.190	0.190
111	9.25	0.63	0.380	(0.284)	0.190	0.190
112	9.33	0.67	0.400	(0.283)	0.200	0.200
113	9.42	0.67	0.400	(0.282)	0.200	0.200

114	9.50	0.67	0.400	(0.280)	0.200	0.200
115	9.58	0.70	0.420	(0.279)	0.210	0.210
116	9.67	0.70	0.420	(0.278)	0.210	0.210
117	9.75	0.70	0.420	(0.276)	0.210	0.210
118	9.83	0.73	0.440	(0.275)	0.220	0.220
119	9.92	0.73	0.440	(0.274)	0.220	0.220
120	10.00	0.73	0.440	(0.272)	0.220	0.220
121	10.08	0.50	0.300	(0.271)	0.150	0.150
122	10.17	0.50	0.300	(0.270)	0.150	0.150
123	10.25	0.50	0.300	(0.268)	0.150	0.150
124	10.33	0.50	0.300	(0.267)	0.150	0.150
125	10.42	0.50	0.300	(0.266)	0.150	0.150
126	10.50	0.50	0.300	(0.265)	0.150	0.150
127	10.58	0.67	0.400	(0.263)	0.200	0.200
128	10.67	0.67	0.400	(0.262)	0.200	0.200
129	10.75	0.67	0.400	(0.261)	0.200	0.200
130	10.83	0.67	0.400	(0.259)	0.200	0.200
131	10.92	0.67	0.400	(0.258)	0.200	0.200
132	11.00	0.67	0.400	(0.257)	0.200	0.200
133	11.08	0.63	0.380	(0.256)	0.190	0.190
134	11.17	0.63	0.380	(0.254)	0.190	0.190
135	11.25	0.63	0.380	(0.253)	0.190	0.190
136	11.33	0.63	0.380	(0.252)	0.190	0.190
137	11.42	0.63	0.380	(0.251)	0.190	0.190
138	11.50	0.63	0.380	(0.249)	0.190	0.190
139	11.58	0.57	0.340	(0.248)	0.170	0.170
140	11.67	0.57	0.340	(0.247)	0.170	0.170
141	11.75	0.57	0.340	(0.246)	0.170	0.170
142	11.83	0.60	0.360	(0.244)	0.180	0.180
143	11.92	0.60	0.360	(0.243)	0.180	0.180
144	12.00	0.60	0.360	(0.242)	0.180	0.180
145	12.08	0.83	0.500	0.241	(0.250)	0.259
146	12.17	0.83	0.500	0.240	(0.250)	0.260
147	12.25	0.83	0.500	0.238	(0.250)	0.262
148	12.33	0.87	0.520	0.237	(0.260)	0.283
149	12.42	0.87	0.520	0.236	(0.260)	0.284
150	12.50	0.87	0.520	0.235	(0.260)	0.285
151	12.58	0.93	0.560	0.234	(0.280)	0.326
152	12.67	0.93	0.560	0.232	(0.280)	0.328
153	12.75	0.93	0.560	0.231	(0.280)	0.329
154	12.83	0.97	0.580	0.230	(0.290)	0.350
155	12.92	0.97	0.580	0.229	(0.290)	0.351
156	13.00	0.97	0.580	0.228	(0.290)	0.352
157	13.08	1.13	0.680	0.227	(0.340)	0.453
158	13.17	1.13	0.680	0.225	(0.340)	0.455
159	13.25	1.13	0.680	0.224	(0.340)	0.456
160	13.33	1.13	0.680	0.223	(0.340)	0.457
161	13.42	1.13	0.680	0.222	(0.340)	0.458
162	13.50	1.13	0.680	0.221	(0.340)	0.459
163	13.58	0.77	0.460	0.220	(0.230)	0.240
164	13.67	0.77	0.460	0.219	(0.230)	0.241
165	13.75	0.77	0.460	0.218	(0.230)	0.242
166	13.83	0.77	0.460	0.216	(0.230)	0.244
167	13.92	0.77	0.460	0.215	(0.230)	0.245
168	14.00	0.77	0.460	0.214	(0.230)	0.246
169	14.08	0.90	0.540	0.213	(0.270)	0.327
170	14.17	0.90	0.540	0.212	(0.270)	0.328

171	14.25	0.90	0.540	0.211	(0.270)	0.329
172	14.33	0.87	0.520	0.210	(0.260)	0.310
173	14.42	0.87	0.520	0.209	(0.260)	0.311
174	14.50	0.87	0.520	0.208	(0.260)	0.312
175	14.58	0.87	0.520	0.207	(0.260)	0.313
176	14.67	0.87	0.520	0.206	(0.260)	0.314
177	14.75	0.87	0.520	0.205	(0.260)	0.315
178	14.83	0.83	0.500	0.204	(0.250)	0.296
179	14.92	0.83	0.500	0.202	(0.250)	0.298
180	15.00	0.83	0.500	0.201	(0.250)	0.299
181	15.08	0.80	0.480	0.200	(0.240)	0.280
182	15.17	0.80	0.480	0.199	(0.240)	0.281
183	15.25	0.80	0.480	0.198	(0.240)	0.282
184	15.33	0.77	0.460	0.197	(0.230)	0.263
185	15.42	0.77	0.460	0.196	(0.230)	0.264
186	15.50	0.77	0.460	0.195	(0.230)	0.265
187	15.58	0.63	0.380	(0.194)	0.190	0.190
188	15.67	0.63	0.380	(0.193)	0.190	0.190
189	15.75	0.63	0.380	(0.192)	0.190	0.190
190	15.83	0.63	0.380	(0.191)	0.190	0.190
191	15.92	0.63	0.380	(0.190)	0.190	0.190
192	16.00	0.63	0.380	0.189	(0.190)	0.191
193	16.08	0.13	0.080	(0.188)	0.040	0.040
194	16.17	0.13	0.080	(0.187)	0.040	0.040
195	16.25	0.13	0.080	(0.187)	0.040	0.040
196	16.33	0.13	0.080	(0.186)	0.040	0.040
197	16.42	0.13	0.080	(0.185)	0.040	0.040
198	16.50	0.13	0.080	(0.184)	0.040	0.040
199	16.58	0.10	0.060	(0.183)	0.030	0.030
200	16.67	0.10	0.060	(0.182)	0.030	0.030
201	16.75	0.10	0.060	(0.181)	0.030	0.030
202	16.83	0.10	0.060	(0.180)	0.030	0.030
203	16.92	0.10	0.060	(0.179)	0.030	0.030
204	17.00	0.10	0.060	(0.178)	0.030	0.030
205	17.08	0.17	0.100	(0.177)	0.050	0.050
206	17.17	0.17	0.100	(0.176)	0.050	0.050
207	17.25	0.17	0.100	(0.175)	0.050	0.050
208	17.33	0.17	0.100	(0.175)	0.050	0.050
209	17.42	0.17	0.100	(0.174)	0.050	0.050
210	17.50	0.17	0.100	(0.173)	0.050	0.050
211	17.58	0.17	0.100	(0.172)	0.050	0.050
212	17.67	0.17	0.100	(0.171)	0.050	0.050
213	17.75	0.17	0.100	(0.170)	0.050	0.050
214	17.83	0.13	0.080	(0.169)	0.040	0.040
215	17.92	0.13	0.080	(0.169)	0.040	0.040
216	18.00	0.13	0.080	(0.168)	0.040	0.040
217	18.08	0.13	0.080	(0.167)	0.040	0.040
218	18.17	0.13	0.080	(0.166)	0.040	0.040
219	18.25	0.13	0.080	(0.165)	0.040	0.040
220	18.33	0.13	0.080	(0.164)	0.040	0.040
221	18.42	0.13	0.080	(0.164)	0.040	0.040
222	18.50	0.13	0.080	(0.163)	0.040	0.040
223	18.58	0.10	0.060	(0.162)	0.030	0.030
224	18.67	0.10	0.060	(0.161)	0.030	0.030
225	18.75	0.10	0.060	(0.161)	0.030	0.030
226	18.83	0.07	0.040	(0.160)	0.020	0.020
227	18.92	0.07	0.040	(0.159)	0.020	0.020

228	19.00	0.07	0.040	(0.158)	0.020	0.020
229	19.08	0.10	0.060	(0.158)	0.030	0.030
230	19.17	0.10	0.060	(0.157)	0.030	0.030
231	19.25	0.10	0.060	(0.156)	0.030	0.030
232	19.33	0.13	0.080	(0.155)	0.040	0.040
233	19.42	0.13	0.080	(0.155)	0.040	0.040
234	19.50	0.13	0.080	(0.154)	0.040	0.040
235	19.58	0.10	0.060	(0.153)	0.030	0.030
236	19.67	0.10	0.060	(0.152)	0.030	0.030
237	19.75	0.10	0.060	(0.152)	0.030	0.030
238	19.83	0.07	0.040	(0.151)	0.020	0.020
239	19.92	0.07	0.040	(0.150)	0.020	0.020
240	20.00	0.07	0.040	(0.150)	0.020	0.020
241	20.08	0.10	0.060	(0.149)	0.030	0.030
242	20.17	0.10	0.060	(0.148)	0.030	0.030
243	20.25	0.10	0.060	(0.148)	0.030	0.030
244	20.33	0.10	0.060	(0.147)	0.030	0.030
245	20.42	0.10	0.060	(0.147)	0.030	0.030
246	20.50	0.10	0.060	(0.146)	0.030	0.030
247	20.58	0.10	0.060	(0.145)	0.030	0.030
248	20.67	0.10	0.060	(0.145)	0.030	0.030
249	20.75	0.10	0.060	(0.144)	0.030	0.030
250	20.83	0.07	0.040	(0.143)	0.020	0.020
251	20.92	0.07	0.040	(0.143)	0.020	0.020
252	21.00	0.07	0.040	(0.142)	0.020	0.020
253	21.08	0.10	0.060	(0.142)	0.030	0.030
254	21.17	0.10	0.060	(0.141)	0.030	0.030
255	21.25	0.10	0.060	(0.141)	0.030	0.030
256	21.33	0.07	0.040	(0.140)	0.020	0.020
257	21.42	0.07	0.040	(0.140)	0.020	0.020
258	21.50	0.07	0.040	(0.139)	0.020	0.020
259	21.58	0.10	0.060	(0.139)	0.030	0.030
260	21.67	0.10	0.060	(0.138)	0.030	0.030
261	21.75	0.10	0.060	(0.138)	0.030	0.030
262	21.83	0.07	0.040	(0.137)	0.020	0.020
263	21.92	0.07	0.040	(0.137)	0.020	0.020
264	22.00	0.07	0.040	(0.136)	0.020	0.020
265	22.08	0.10	0.060	(0.136)	0.030	0.030
266	22.17	0.10	0.060	(0.135)	0.030	0.030
267	22.25	0.10	0.060	(0.135)	0.030	0.030
268	22.33	0.07	0.040	(0.134)	0.020	0.020
269	22.42	0.07	0.040	(0.134)	0.020	0.020
270	22.50	0.07	0.040	(0.134)	0.020	0.020
271	22.58	0.07	0.040	(0.133)	0.020	0.020
272	22.67	0.07	0.040	(0.133)	0.020	0.020
273	22.75	0.07	0.040	(0.133)	0.020	0.020
274	22.83	0.07	0.040	(0.132)	0.020	0.020
275	22.92	0.07	0.040	(0.132)	0.020	0.020
276	23.00	0.07	0.040	(0.131)	0.020	0.020
277	23.08	0.07	0.040	(0.131)	0.020	0.020
278	23.17	0.07	0.040	(0.131)	0.020	0.020
279	23.25	0.07	0.040	(0.131)	0.020	0.020
280	23.33	0.07	0.040	(0.130)	0.020	0.020
281	23.42	0.07	0.040	(0.130)	0.020	0.020
282	23.50	0.07	0.040	(0.130)	0.020	0.020
283	23.58	0.07	0.040	(0.130)	0.020	0.020

284	23.67	0.07	0.040	(0.129)	0.020	0.020
285	23.75	0.07	0.040	(0.129)	0.020	0.020
286	23.83	0.07	0.040	(0.129)	0.020	0.020
287	23.92	0.07	0.040	(0.129)	0.020	0.020
288	24.00	0.07	0.040	(0.129)	0.020	0.020

(Loss Rate Not Used)

Sum = 100.0 Sum = 32.1

Flood volume = Effective rainfall 2.67(In)
times area 9.7(Ac.)/[(In)/(Ft.)] = 2.2(Ac.Ft)
Total soil loss = 2.33(In)
Total soil loss = 1.884(Ac.Ft)
Total rainfall = 5.00(In)
Flood volume = 94171.9 Cubic Feet
Total soil loss = 82061.3 Cubic Feet

Peak flow rate of this hydrograph = 4.451(CFS)

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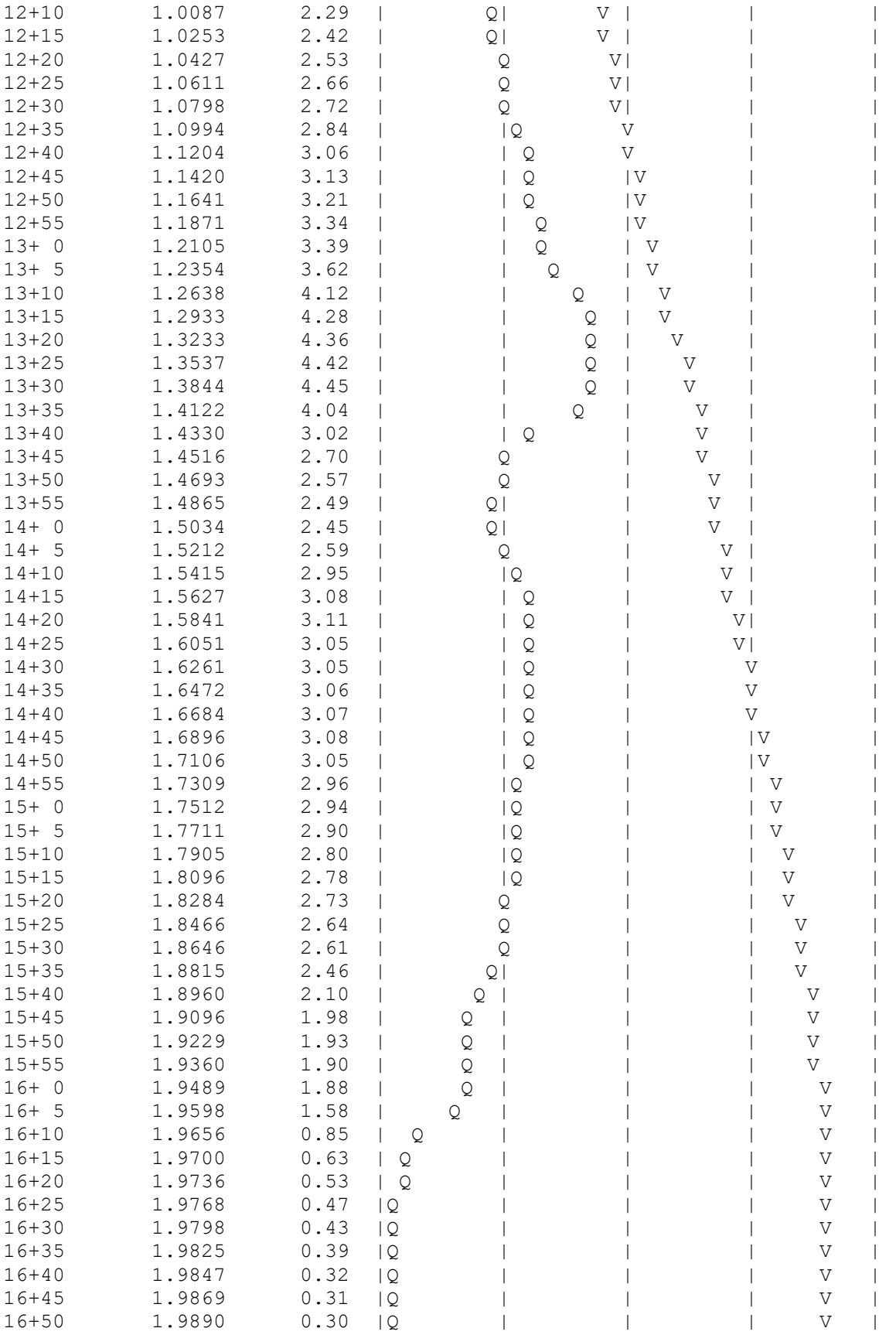
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0003	0.04	Q				
0+10	0.0012	0.13	Q				
0+15	0.0023	0.16	Q				
0+20	0.0037	0.20	Q				
0+25	0.0054	0.25	VQ				
0+30	0.0073	0.27	VQ				
0+35	0.0093	0.28	VQ				
0+40	0.0112	0.29	VQ				
0+45	0.0132	0.29	VQ				
0+50	0.0154	0.31	VQ				
0+55	0.0179	0.36	VQ				
1+ 0	0.0205	0.38	VQ				
1+ 5	0.0230	0.36	VQ				
1+10	0.0252	0.32	VQ				
1+15	0.0273	0.31	VQ				
1+20	0.0294	0.30	VQ				
1+25	0.0314	0.30	VQ				
1+30	0.0335	0.30	VQ				
1+35	0.0355	0.30	VQ				
1+40	0.0375	0.29	VQ				
1+45	0.0395	0.29	VQ				
1+50	0.0417	0.31	VQ				
1+55	0.0442	0.36	VQ				
2+ 0	0.0468	0.38	VQ				
2+ 5	0.0494	0.38	VQ				
2+10	0.0521	0.39	VQ				
2+15	0.0547	0.39	|Q				
2+20	0.0574	0.39	|Q				
2+25	0.0601	0.39	|Q				
2+30	0.0628	0.39	|Q				
2+35	0.0657	0.41	|Q				

2+40	0.0688	0.46	|Q	|	|	|	|
2+45	0.0721	0.47	|Q	|	|	|	|
2+50	0.0754	0.48	|Q	|	|	|	|
2+55	0.0787	0.48	|Q	|	|	|	|
3+ 0	0.0821	0.49	|Q	|	|	|	|
3+ 5	0.0854	0.49	|Q	|	|	|	|
3+10	0.0888	0.49	|Q	|	|	|	|
3+15	0.0922	0.49	|Q	|	|	|	|
3+20	0.0956	0.49	|Q	|	|	|	|
3+25	0.0989	0.49	|Q	|	|	|	|
3+30	0.1023	0.49	|Q	|	|	|	|
3+35	0.1057	0.49	|Q	|	|	|	|
3+40	0.1090	0.49	|QV	|	|	|	|
3+45	0.1124	0.49	|QV	|	|	|	|
3+50	0.1159	0.51	| Q	|	|	|	|
3+55	0.1198	0.56	| Q	|	|	|	|
4+ 0	0.1237	0.57	| Q	|	|	|	|
4+ 5	0.1277	0.58	| Q	|	|	|	|
4+10	0.1317	0.58	| Q	|	|	|	|
4+15	0.1357	0.58	| Q	|	|	|	|
4+20	0.1399	0.61	| Q	|	|	|	|
4+25	0.1444	0.65	| Q	|	|	|	|
4+30	0.1490	0.67	| Q	|	|	|	|
4+35	0.1537	0.68	| Q	|	|	|	|
4+40	0.1584	0.68	| Q	|	|	|	|
4+45	0.1631	0.68	| QV	|	|	|	|
4+50	0.1679	0.70	| QV	|	|	|	|
4+55	0.1731	0.75	| Q	|	|	|	|
5+ 0	0.1784	0.77	| Q	|	|	|	|
5+ 5	0.1834	0.73	| QV	|	|	|	|
5+10	0.1879	0.64	| QV	|	|	|	|
5+15	0.1921	0.62	| QV	|	|	|	|
5+20	0.1964	0.62	| QV	|	|	|	|
5+25	0.2010	0.67	| QV	|	|	|	|
5+30	0.2056	0.68	| QV	|	|	|	|
5+35	0.2104	0.70	| QV	|	|	|	|
5+40	0.2156	0.75	| QV	|	|	|	|
5+45	0.2209	0.76	| QV	|	|	|	|
5+50	0.2262	0.77	| QV	|	|	|	|
5+55	0.2315	0.78	| QV	|	|	|	|
6+ 0	0.2369	0.78	| QV	|	|	|	|
6+ 5	0.2424	0.80	| QV	|	|	|	|
6+10	0.2483	0.85	| QV	|	|	|	|
6+15	0.2543	0.87	| QV	|	|	|	|
6+20	0.2603	0.87	| QV	|	|	|	|
6+25	0.2663	0.88	| QV	|	|	|	|
6+30	0.2723	0.88	| Q V	|	|	|	|
6+35	0.2785	0.90	| Q V	|	|	|	|
6+40	0.2851	0.95	| Q V	|	|	|	|
6+45	0.2917	0.96	| Q V	|	|	|	|
6+50	0.2984	0.97	| Q V	|	|	|	|
6+55	0.3051	0.97	| Q V	|	|	|	|
7+ 0	0.3118	0.98	| Q V	|	|	|	|
7+ 5	0.3186	0.98	| Q V	|	|	|	|
7+10	0.3253	0.98	| Q V	|	|	|	|
7+15	0.3320	0.98	| Q V	|	|	|	|
7+20	0.3389	1.00	| Q V	|	|	|	|

7+25	0.3461	1.05	Q V				
7+30	0.3534	1.06	Q V				
7+35	0.3609	1.09	Q V				
7+40	0.3688	1.14	Q V				
7+45	0.3767	1.16	Q V				
7+50	0.3849	1.18	Q V				
7+55	0.3934	1.24	Q V				
8+ 0	0.4021	1.25	Q V				
8+ 5	0.4110	1.30	Q V				
8+10	0.4207	1.40	Q V				
8+15	0.4306	1.43	Q V				
8+20	0.4405	1.45	Q V				
8+25	0.4506	1.46	Q V				
8+30	0.4607	1.46	Q V				
8+35	0.4709	1.49	Q V				
8+40	0.4815	1.54	Q V				
8+45	0.4921	1.55	Q V				
8+50	0.5030	1.58	Q V				
8+55	0.5142	1.63	Q V				
9+ 0	0.5256	1.65	Q V				
9+ 5	0.5372	1.69	Q V				
9+10	0.5496	1.79	Q V				
9+15	0.5622	1.83	Q V				
9+20	0.5750	1.86	Q V				
9+25	0.5882	1.92	Q V				
9+30	0.6015	1.94	Q V				
9+35	0.6151	1.97	Q V				
9+40	0.6290	2.02	Q V				
9+45	0.6430	2.04	Q V				
9+50	0.6572	2.07	Q V				
9+55	0.6718	2.12	Q V				
10+ 0	0.6865	2.14	Q V				
10+ 5	0.7003	2.01	Q V				
10+10	0.7119	1.68	Q V				
10+15	0.7227	1.58	Q V				
10+20	0.7333	1.53	Q V				
10+25	0.7436	1.50	Q V				
10+30	0.7539	1.49	Q V				
10+35	0.7647	1.58	Q V				
10+40	0.7772	1.81	Q V				
10+45	0.7901	1.88	Q V				
10+50	0.8033	1.91	Q V				
10+55	0.8166	1.93	Q V				
11+ 0	0.8300	1.94	Q V				
11+ 5	0.8433	1.93	Q V				
11+10	0.8563	1.89	Q V				
11+15	0.8692	1.88	Q V				
11+20	0.8821	1.87	Q V				
11+25	0.8950	1.87	Q V				
11+30	0.9078	1.86	Q V				
11+35	0.9203	1.82	Q V				
11+40	0.9322	1.73	Q V				
11+45	0.9439	1.70	Q V				
11+50	0.9556	1.70	Q V				
11+55	0.9676	1.74	Q V				
12+ 0	0.9797	1.75	Q V				
12+ 5	0.9929	1.91	Q V				



16+55	1.9910	0.30	|Q	|	|	|	V |
17+ 0	1.9931	0.30	|Q	|	|	|	V |
17+ 5	1.9954	0.33	|Q	|	|	|	V |
17+10	1.9983	0.43	|Q	|	|	|	V |
17+15	2.0015	0.46	|Q	|	|	|	V |
17+20	2.0047	0.47	|Q	|	|	|	V |
17+25	2.0080	0.48	|Q	|	|	|	V |
17+30	2.0113	0.48	|Q	|	|	|	V |
17+35	2.0147	0.49	|Q	|	|	|	V |
17+40	2.0181	0.49	|Q	|	|	|	V |
17+45	2.0214	0.49	|Q	|	|	|	V |
17+50	2.0247	0.47	|Q	|	|	|	V |
17+55	2.0276	0.42	|Q	|	|	|	V |
18+ 0	2.0304	0.41	|Q	|	|	|	V |
18+ 5	2.0332	0.40	|Q	|	|	|	V |
18+10	2.0359	0.40	|Q	|	|	|	V |
18+15	2.0386	0.39	|Q	|	|	|	V |
18+20	2.0413	0.39	|Q	|	|	|	V |
18+25	2.0440	0.39	|Q	|	|	|	V |
18+30	2.0467	0.39	|Q	|	|	|	V |
18+35	2.0493	0.37	|Q	|	|	|	V |
18+40	2.0515	0.32	|Q	|	|	|	V |
18+45	2.0536	0.31	|Q	|	|	|	V |
18+50	2.0556	0.28	|Q	|	|	|	V |
18+55	2.0572	0.23	Q	|	|	|	V |
19+ 0	2.0586	0.21	Q	|	|	|	V |
19+ 5	2.0602	0.23	Q	|	|	|	V |
19+10	2.0620	0.27	|Q	|	|	|	V |
19+15	2.0640	0.28	|Q	|	|	|	V |
19+20	2.0661	0.31	|Q	|	|	|	V |
19+25	2.0685	0.36	|Q	|	|	|	V |
19+30	2.0711	0.37	|Q	|	|	|	V |
19+35	2.0736	0.36	|Q	|	|	|	V |
19+40	2.0758	0.32	|Q	|	|	|	V |
19+45	2.0779	0.31	|Q	|	|	|	V |
19+50	2.0798	0.28	|Q	|	|	|	V |
19+55	2.0814	0.23	Q	|	|	|	V |
20+ 0	2.0829	0.21	Q	|	|	|	V |
20+ 5	2.0845	0.23	Q	|	|	|	V |
20+10	2.0863	0.27	|Q	|	|	|	V |
20+15	2.0883	0.28	|Q	|	|	|	V |
20+20	2.0902	0.29	|Q	|	|	|	V |
20+25	2.0922	0.29	|Q	|	|	|	V |
20+30	2.0942	0.29	|Q	|	|	|	V |
20+35	2.0962	0.29	|Q	|	|	|	V |
20+40	2.0983	0.29	|Q	|	|	|	V |
20+45	2.1003	0.29	|Q	|	|	|	V |
20+50	2.1022	0.27	|Q	|	|	|	V |
20+55	2.1037	0.23	Q	|	|	|	V |
21+ 0	2.1052	0.21	Q	|	|	|	V |
21+ 5	2.1067	0.22	Q	|	|	|	V |
21+10	2.1086	0.27	|Q	|	|	|	V|
21+15	2.1105	0.28	|Q	|	|	|	V|
21+20	2.1123	0.27	|Q	|	|	|	V|
21+25	2.1139	0.22	Q	|	|	|	V|
21+30	2.1153	0.21	Q	|	|	|	V|
21+35	2.1168	0.22	Q	|	|	|	V|

21+40	2.1187	0.27	|Q	|	|	|	V|
21+45	2.1206	0.28	|Q	|	|	|	V|
21+50	2.1225	0.27	|Q	|	|	|	V|
21+55	2.1240	0.22	Q	|	|	|	V|
22+ 0	2.1254	0.21	Q	|	|	|	V|
22+ 5	2.1270	0.22	Q	|	|	|	V|
22+10	2.1288	0.27	|Q	|	|	|	V|
22+15	2.1307	0.28	|Q	|	|	|	V|
22+20	2.1326	0.27	|Q	|	|	|	V|
22+25	2.1341	0.22	Q	|	|	|	V|
22+30	2.1355	0.21	Q	|	|	|	V|
22+35	2.1369	0.20	Q	|	|	|	V|
22+40	2.1383	0.20	Q	|	|	|	V|
22+45	2.1397	0.20	Q	|	|	|	V|
22+50	2.1410	0.20	Q	|	|	|	V|
22+55	2.1424	0.20	Q	|	|	|	V|
23+ 0	2.1437	0.20	Q	|	|	|	V|
23+ 5	2.1451	0.20	Q	|	|	|	V|
23+10	2.1464	0.20	Q	|	|	|	V|
23+15	2.1478	0.20	Q	|	|	|	V|
23+20	2.1491	0.20	Q	|	|	|	V|
23+25	2.1505	0.20	Q	|	|	|	V|
23+30	2.1518	0.20	Q	|	|	|	V|
23+35	2.1532	0.20	Q	|	|	|	V|
23+40	2.1545	0.20	Q	|	|	|	V|
23+45	2.1559	0.20	Q	|	|	|	V|
23+50	2.1572	0.20	Q	|	|	|	V|
23+55	2.1586	0.20	Q	|	|	|	V|
24+ 0	2.1599	0.20	Q	|	|	|	V|
24+ 5	2.1610	0.16	Q	|	|	|	V|
24+10	2.1614	0.06	Q	|	|	|	V|
24+15	2.1616	0.03	Q	|	|	|	V|
24+20	2.1618	0.02	Q	|	|	|	V|
24+25	2.1618	0.01	Q	|	|	|	V|
24+30	2.1619	0.01	Q	|	|	|	V|
24+35	2.1619	0.00	Q	|	|	|	V

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

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Study date 10/02/24 File: q100uhbx724100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION - WATERSHED B
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 7.54(Ac.) = 0.012 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 7.54(Ac.) = 0.012 Sq. Mi.
Length along longest watercourse = 864.00(Ft.)
Length along longest watercourse measured to centroid = 584.00(Ft.)
Length along longest watercourse = 0.164 Mi.
Length along longest watercourse measured to centroid = 0.111 Mi.
Difference in elevation = 13.90(Ft.)
Slope along watercourse = 84.9444 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.067 Hr.
Lag time = 4.04 Min.
25% of lag time = 1.01 Min.
40% of lag time = 1.62 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
7.54	1.80	13.57

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
7.54	5.00	37.70

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.800(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
7.540	69.78	0.500

Total Area Entered = 7.54(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
69.8	69.8	0.364	0.500	0.200	1.000	0.200
					Sum (F) =	0.200

Area averaged mean soil loss (F) (In/Hr) = 0.200
Minimum soil loss rate ((In/Hr)) = 0.100
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	123.627	26.240	1.994
2	0.167	247.253	48.590	3.692
3	0.250	370.880	13.000	0.988
4	0.333	494.506	5.858	0.445
5	0.417	618.133	3.269	0.248
6	0.500	741.759	1.825	0.139
7	0.583	865.386	1.217	0.092
			Sum = 100.000	Sum= 7.599

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max		Low	Effective (In/Hr)
1	0.08	0.07	0.040	(0.355)		0.020	0.020
2	0.17	0.07	0.040	(0.354)		0.020	0.020

3	0.25	0.07	0.040	(0.353)	0.020	0.020
4	0.33	0.10	0.060	(0.351)	0.030	0.030
5	0.42	0.10	0.060	(0.350)	0.030	0.030
6	0.50	0.10	0.060	(0.348)	0.030	0.030
7	0.58	0.10	0.060	(0.347)	0.030	0.030
8	0.67	0.10	0.060	(0.346)	0.030	0.030
9	0.75	0.10	0.060	(0.344)	0.030	0.030
10	0.83	0.13	0.080	(0.343)	0.040	0.040
11	0.92	0.13	0.080	(0.342)	0.040	0.040
12	1.00	0.13	0.080	(0.340)	0.040	0.040
13	1.08	0.10	0.060	(0.339)	0.030	0.030
14	1.17	0.10	0.060	(0.338)	0.030	0.030
15	1.25	0.10	0.060	(0.336)	0.030	0.030
16	1.33	0.10	0.060	(0.335)	0.030	0.030
17	1.42	0.10	0.060	(0.334)	0.030	0.030
18	1.50	0.10	0.060	(0.332)	0.030	0.030
19	1.58	0.10	0.060	(0.331)	0.030	0.030
20	1.67	0.10	0.060	(0.330)	0.030	0.030
21	1.75	0.10	0.060	(0.328)	0.030	0.030
22	1.83	0.13	0.080	(0.327)	0.040	0.040
23	1.92	0.13	0.080	(0.326)	0.040	0.040
24	2.00	0.13	0.080	(0.324)	0.040	0.040
25	2.08	0.13	0.080	(0.323)	0.040	0.040
26	2.17	0.13	0.080	(0.322)	0.040	0.040
27	2.25	0.13	0.080	(0.320)	0.040	0.040
28	2.33	0.13	0.080	(0.319)	0.040	0.040
29	2.42	0.13	0.080	(0.318)	0.040	0.040
30	2.50	0.13	0.080	(0.317)	0.040	0.040
31	2.58	0.17	0.100	(0.315)	0.050	0.050
32	2.67	0.17	0.100	(0.314)	0.050	0.050
33	2.75	0.17	0.100	(0.313)	0.050	0.050
34	2.83	0.17	0.100	(0.311)	0.050	0.050
35	2.92	0.17	0.100	(0.310)	0.050	0.050
36	3.00	0.17	0.100	(0.309)	0.050	0.050
37	3.08	0.17	0.100	(0.307)	0.050	0.050
38	3.17	0.17	0.100	(0.306)	0.050	0.050
39	3.25	0.17	0.100	(0.305)	0.050	0.050
40	3.33	0.17	0.100	(0.304)	0.050	0.050
41	3.42	0.17	0.100	(0.302)	0.050	0.050
42	3.50	0.17	0.100	(0.301)	0.050	0.050
43	3.58	0.17	0.100	(0.300)	0.050	0.050
44	3.67	0.17	0.100	(0.299)	0.050	0.050
45	3.75	0.17	0.100	(0.297)	0.050	0.050
46	3.83	0.20	0.120	(0.296)	0.060	0.060
47	3.92	0.20	0.120	(0.295)	0.060	0.060
48	4.00	0.20	0.120	(0.294)	0.060	0.060
49	4.08	0.20	0.120	(0.292)	0.060	0.060
50	4.17	0.20	0.120	(0.291)	0.060	0.060
51	4.25	0.20	0.120	(0.290)	0.060	0.060
52	4.33	0.23	0.140	(0.289)	0.070	0.070
53	4.42	0.23	0.140	(0.287)	0.070	0.070
54	4.50	0.23	0.140	(0.286)	0.070	0.070
55	4.58	0.23	0.140	(0.285)	0.070	0.070
56	4.67	0.23	0.140	(0.284)	0.070	0.070
57	4.75	0.23	0.140	(0.283)	0.070	0.070
58	4.83	0.27	0.160	(0.281)	0.080	0.080
59	4.92	0.27	0.160	(0.280)	0.080	0.080

60	5.00	0.27	0.160	(0.279)	0.080	0.080
61	5.08	0.20	0.120	(0.278)	0.060	0.060
62	5.17	0.20	0.120	(0.276)	0.060	0.060
63	5.25	0.20	0.120	(0.275)	0.060	0.060
64	5.33	0.23	0.140	(0.274)	0.070	0.070
65	5.42	0.23	0.140	(0.273)	0.070	0.070
66	5.50	0.23	0.140	(0.272)	0.070	0.070
67	5.58	0.27	0.160	(0.270)	0.080	0.080
68	5.67	0.27	0.160	(0.269)	0.080	0.080
69	5.75	0.27	0.160	(0.268)	0.080	0.080
70	5.83	0.27	0.160	(0.267)	0.080	0.080
71	5.92	0.27	0.160	(0.266)	0.080	0.080
72	6.00	0.27	0.160	(0.265)	0.080	0.080
73	6.08	0.30	0.180	(0.263)	0.090	0.090
74	6.17	0.30	0.180	(0.262)	0.090	0.090
75	6.25	0.30	0.180	(0.261)	0.090	0.090
76	6.33	0.30	0.180	(0.260)	0.090	0.090
77	6.42	0.30	0.180	(0.259)	0.090	0.090
78	6.50	0.30	0.180	(0.258)	0.090	0.090
79	6.58	0.33	0.200	(0.256)	0.100	0.100
80	6.67	0.33	0.200	(0.255)	0.100	0.100
81	6.75	0.33	0.200	(0.254)	0.100	0.100
82	6.83	0.33	0.200	(0.253)	0.100	0.100
83	6.92	0.33	0.200	(0.252)	0.100	0.100
84	7.00	0.33	0.200	(0.251)	0.100	0.100
85	7.08	0.33	0.200	(0.249)	0.100	0.100
86	7.17	0.33	0.200	(0.248)	0.100	0.100
87	7.25	0.33	0.200	(0.247)	0.100	0.100
88	7.33	0.37	0.220	(0.246)	0.110	0.110
89	7.42	0.37	0.220	(0.245)	0.110	0.110
90	7.50	0.37	0.220	(0.244)	0.110	0.110
91	7.58	0.40	0.240	(0.243)	0.120	0.120
92	7.67	0.40	0.240	(0.242)	0.120	0.120
93	7.75	0.40	0.240	(0.240)	0.120	0.120
94	7.83	0.43	0.260	(0.239)	0.130	0.130
95	7.92	0.43	0.260	(0.238)	0.130	0.130
96	8.00	0.43	0.260	(0.237)	0.130	0.130
97	8.08	0.50	0.300	(0.236)	0.150	0.150
98	8.17	0.50	0.300	(0.235)	0.150	0.150
99	8.25	0.50	0.300	(0.234)	0.150	0.150
100	8.33	0.50	0.300	(0.233)	0.150	0.150
101	8.42	0.50	0.300	(0.232)	0.150	0.150
102	8.50	0.50	0.300	(0.231)	0.150	0.150
103	8.58	0.53	0.320	(0.230)	0.160	0.160
104	8.67	0.53	0.320	(0.228)	0.160	0.160
105	8.75	0.53	0.320	(0.227)	0.160	0.160
106	8.83	0.57	0.340	(0.226)	0.170	0.170
107	8.92	0.57	0.340	(0.225)	0.170	0.170
108	9.00	0.57	0.340	(0.224)	0.170	0.170
109	9.08	0.63	0.380	(0.223)	0.190	0.190
110	9.17	0.63	0.380	(0.222)	0.190	0.190
111	9.25	0.63	0.380	(0.221)	0.190	0.190
112	9.33	0.67	0.400	(0.220)	0.200	0.200
113	9.42	0.67	0.400	(0.219)	0.200	0.200
114	9.50	0.67	0.400	(0.218)	0.200	0.200
115	9.58	0.70	0.420	(0.217)	0.210	0.210
116	9.67	0.70	0.420	(0.216)	0.210	0.210

117	9.75	0.70	0.420	(0.215)	0.210	0.210
118	9.83	0.73	0.440	0.214	(0.220)	0.226
119	9.92	0.73	0.440	0.213	(0.220)	0.227
120	10.00	0.73	0.440	0.212	(0.220)	0.228
121	10.08	0.50	0.300	(0.211)	0.150	0.150
122	10.17	0.50	0.300	(0.210)	0.150	0.150
123	10.25	0.50	0.300	(0.209)	0.150	0.150
124	10.33	0.50	0.300	(0.208)	0.150	0.150
125	10.42	0.50	0.300	(0.207)	0.150	0.150
126	10.50	0.50	0.300	(0.206)	0.150	0.150
127	10.58	0.67	0.400	(0.205)	0.200	0.200
128	10.67	0.67	0.400	(0.204)	0.200	0.200
129	10.75	0.67	0.400	(0.203)	0.200	0.200
130	10.83	0.67	0.400	(0.202)	0.200	0.200
131	10.92	0.67	0.400	(0.201)	0.200	0.200
132	11.00	0.67	0.400	0.200	(0.200)	0.200
133	11.08	0.63	0.380	(0.199)	0.190	0.190
134	11.17	0.63	0.380	(0.198)	0.190	0.190
135	11.25	0.63	0.380	(0.197)	0.190	0.190
136	11.33	0.63	0.380	(0.196)	0.190	0.190
137	11.42	0.63	0.380	(0.195)	0.190	0.190
138	11.50	0.63	0.380	(0.194)	0.190	0.190
139	11.58	0.57	0.340	(0.193)	0.170	0.170
140	11.67	0.57	0.340	(0.192)	0.170	0.170
141	11.75	0.57	0.340	(0.191)	0.170	0.170
142	11.83	0.60	0.360	(0.190)	0.180	0.180
143	11.92	0.60	0.360	(0.189)	0.180	0.180
144	12.00	0.60	0.360	(0.188)	0.180	0.180
145	12.08	0.83	0.500	0.187	(0.250)	0.313
146	12.17	0.83	0.500	0.186	(0.250)	0.314
147	12.25	0.83	0.500	0.185	(0.250)	0.315
148	12.33	0.87	0.520	0.184	(0.260)	0.336
149	12.42	0.87	0.520	0.183	(0.260)	0.337
150	12.50	0.87	0.520	0.182	(0.260)	0.338
151	12.58	0.93	0.560	0.182	(0.280)	0.378
152	12.67	0.93	0.560	0.181	(0.280)	0.379
153	12.75	0.93	0.560	0.180	(0.280)	0.380
154	12.83	0.97	0.580	0.179	(0.290)	0.401
155	12.92	0.97	0.580	0.178	(0.290)	0.402
156	13.00	0.97	0.580	0.177	(0.290)	0.403
157	13.08	1.13	0.680	0.176	(0.340)	0.504
158	13.17	1.13	0.680	0.175	(0.340)	0.505
159	13.25	1.13	0.680	0.174	(0.340)	0.506
160	13.33	1.13	0.680	0.173	(0.340)	0.507
161	13.42	1.13	0.680	0.173	(0.340)	0.507
162	13.50	1.13	0.680	0.172	(0.340)	0.508
163	13.58	0.77	0.460	0.171	(0.230)	0.289
164	13.67	0.77	0.460	0.170	(0.230)	0.290
165	13.75	0.77	0.460	0.169	(0.230)	0.291
166	13.83	0.77	0.460	0.168	(0.230)	0.292
167	13.92	0.77	0.460	0.167	(0.230)	0.293
168	14.00	0.77	0.460	0.166	(0.230)	0.294
169	14.08	0.90	0.540	0.166	(0.270)	0.374
170	14.17	0.90	0.540	0.165	(0.270)	0.375
171	14.25	0.90	0.540	0.164	(0.270)	0.376
172	14.33	0.87	0.520	0.163	(0.260)	0.357
173	14.42	0.87	0.520	0.162	(0.260)	0.358

174	14.50	0.87	0.520	0.161	(0.260)	0.359
175	14.58	0.87	0.520	0.161	(0.260)	0.359
176	14.67	0.87	0.520	0.160	(0.260)	0.360
177	14.75	0.87	0.520	0.159	(0.260)	0.361
178	14.83	0.83	0.500	0.158	(0.250)	0.342
179	14.92	0.83	0.500	0.157	(0.250)	0.343
180	15.00	0.83	0.500	0.157	(0.250)	0.343
181	15.08	0.80	0.480	0.156	(0.240)	0.324
182	15.17	0.80	0.480	0.155	(0.240)	0.325
183	15.25	0.80	0.480	0.154	(0.240)	0.326
184	15.33	0.77	0.460	0.153	(0.230)	0.307
185	15.42	0.77	0.460	0.153	(0.230)	0.307
186	15.50	0.77	0.460	0.152	(0.230)	0.308
187	15.58	0.63	0.380	0.151	(0.190)	0.229
188	15.67	0.63	0.380	0.150	(0.190)	0.230
189	15.75	0.63	0.380	0.149	(0.190)	0.231
190	15.83	0.63	0.380	0.149	(0.190)	0.231
191	15.92	0.63	0.380	0.148	(0.190)	0.232
192	16.00	0.63	0.380	0.147	(0.190)	0.233
193	16.08	0.13	0.080	(0.146)	0.040	0.040
194	16.17	0.13	0.080	(0.146)	0.040	0.040
195	16.25	0.13	0.080	(0.145)	0.040	0.040
196	16.33	0.13	0.080	(0.144)	0.040	0.040
197	16.42	0.13	0.080	(0.143)	0.040	0.040
198	16.50	0.13	0.080	(0.143)	0.040	0.040
199	16.58	0.10	0.060	(0.142)	0.030	0.030
200	16.67	0.10	0.060	(0.141)	0.030	0.030
201	16.75	0.10	0.060	(0.141)	0.030	0.030
202	16.83	0.10	0.060	(0.140)	0.030	0.030
203	16.92	0.10	0.060	(0.139)	0.030	0.030
204	17.00	0.10	0.060	(0.138)	0.030	0.030
205	17.08	0.17	0.100	(0.138)	0.050	0.050
206	17.17	0.17	0.100	(0.137)	0.050	0.050
207	17.25	0.17	0.100	(0.136)	0.050	0.050
208	17.33	0.17	0.100	(0.136)	0.050	0.050
209	17.42	0.17	0.100	(0.135)	0.050	0.050
210	17.50	0.17	0.100	(0.134)	0.050	0.050
211	17.58	0.17	0.100	(0.134)	0.050	0.050
212	17.67	0.17	0.100	(0.133)	0.050	0.050
213	17.75	0.17	0.100	(0.132)	0.050	0.050
214	17.83	0.13	0.080	(0.132)	0.040	0.040
215	17.92	0.13	0.080	(0.131)	0.040	0.040
216	18.00	0.13	0.080	(0.130)	0.040	0.040
217	18.08	0.13	0.080	(0.130)	0.040	0.040
218	18.17	0.13	0.080	(0.129)	0.040	0.040
219	18.25	0.13	0.080	(0.128)	0.040	0.040
220	18.33	0.13	0.080	(0.128)	0.040	0.040
221	18.42	0.13	0.080	(0.127)	0.040	0.040
222	18.50	0.13	0.080	(0.127)	0.040	0.040
223	18.58	0.10	0.060	(0.126)	0.030	0.030
224	18.67	0.10	0.060	(0.125)	0.030	0.030
225	18.75	0.10	0.060	(0.125)	0.030	0.030
226	18.83	0.07	0.040	(0.124)	0.020	0.020
227	18.92	0.07	0.040	(0.124)	0.020	0.020
228	19.00	0.07	0.040	(0.123)	0.020	0.020
229	19.08	0.10	0.060	(0.122)	0.030	0.030
230	19.17	0.10	0.060	(0.122)	0.030	0.030

231	19.25	0.10	0.060	(0.121)	0.030	0.030
232	19.33	0.13	0.080	(0.121)	0.040	0.040
233	19.42	0.13	0.080	(0.120)	0.040	0.040
234	19.50	0.13	0.080	(0.120)	0.040	0.040
235	19.58	0.10	0.060	(0.119)	0.030	0.030
236	19.67	0.10	0.060	(0.118)	0.030	0.030
237	19.75	0.10	0.060	(0.118)	0.030	0.030
238	19.83	0.07	0.040	(0.117)	0.020	0.020
239	19.92	0.07	0.040	(0.117)	0.020	0.020
240	20.00	0.07	0.040	(0.116)	0.020	0.020
241	20.08	0.10	0.060	(0.116)	0.030	0.030
242	20.17	0.10	0.060	(0.115)	0.030	0.030
243	20.25	0.10	0.060	(0.115)	0.030	0.030
244	20.33	0.10	0.060	(0.114)	0.030	0.030
245	20.42	0.10	0.060	(0.114)	0.030	0.030
246	20.50	0.10	0.060	(0.113)	0.030	0.030
247	20.58	0.10	0.060	(0.113)	0.030	0.030
248	20.67	0.10	0.060	(0.112)	0.030	0.030
249	20.75	0.10	0.060	(0.112)	0.030	0.030
250	20.83	0.07	0.040	(0.112)	0.020	0.020
251	20.92	0.07	0.040	(0.111)	0.020	0.020
252	21.00	0.07	0.040	(0.111)	0.020	0.020
253	21.08	0.10	0.060	(0.110)	0.030	0.030
254	21.17	0.10	0.060	(0.110)	0.030	0.030
255	21.25	0.10	0.060	(0.109)	0.030	0.030
256	21.33	0.07	0.040	(0.109)	0.020	0.020
257	21.42	0.07	0.040	(0.108)	0.020	0.020
258	21.50	0.07	0.040	(0.108)	0.020	0.020
259	21.58	0.10	0.060	(0.108)	0.030	0.030
260	21.67	0.10	0.060	(0.107)	0.030	0.030
261	21.75	0.10	0.060	(0.107)	0.030	0.030
262	21.83	0.07	0.040	(0.107)	0.020	0.020
263	21.92	0.07	0.040	(0.106)	0.020	0.020
264	22.00	0.07	0.040	(0.106)	0.020	0.020
265	22.08	0.10	0.060	(0.105)	0.030	0.030
266	22.17	0.10	0.060	(0.105)	0.030	0.030
267	22.25	0.10	0.060	(0.105)	0.030	0.030
268	22.33	0.07	0.040	(0.104)	0.020	0.020
269	22.42	0.07	0.040	(0.104)	0.020	0.020
270	22.50	0.07	0.040	(0.104)	0.020	0.020
271	22.58	0.07	0.040	(0.104)	0.020	0.020
272	22.67	0.07	0.040	(0.103)	0.020	0.020
273	22.75	0.07	0.040	(0.103)	0.020	0.020
274	22.83	0.07	0.040	(0.103)	0.020	0.020
275	22.92	0.07	0.040	(0.102)	0.020	0.020
276	23.00	0.07	0.040	(0.102)	0.020	0.020
277	23.08	0.07	0.040	(0.102)	0.020	0.020
278	23.17	0.07	0.040	(0.102)	0.020	0.020
279	23.25	0.07	0.040	(0.101)	0.020	0.020
280	23.33	0.07	0.040	(0.101)	0.020	0.020
281	23.42	0.07	0.040	(0.101)	0.020	0.020
282	23.50	0.07	0.040	(0.101)	0.020	0.020
283	23.58	0.07	0.040	(0.101)	0.020	0.020
284	23.67	0.07	0.040	(0.101)	0.020	0.020
285	23.75	0.07	0.040	(0.100)	0.020	0.020
286	23.83	0.07	0.040	(0.100)	0.020	0.020
287	23.92	0.07	0.040	(0.100)	0.020	0.020

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288  24.00     0.07      0.040       (  0.100)       0.020        0.020
            (Loss Rate Not Used)
    Sum =     100.0                                    Sum =    34.4
     Flood volume = Effective rainfall      2.86(In)
      times area       7.5(Ac.)/[(In)/(Ft.)] =       1.8(Ac.Ft)
     Total soil loss =      2.14(In)
     Total soil loss =     1.342(Ac.Ft)
     Total rainfall =      5.00(In)
     Flood volume =       78378.6 Cubic Feet
     Total soil loss =       58470.4 Cubic Feet
     ---------------------------------------------------------------------
      Peak flow rate of this hydrograph =      3.847(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        2.5       5.0       7.5      10.0
 ----------------------------------------------------------------------------
   0+ 5       0.0003      0.04  Q          |         |         |         |
   0+10       0.0011      0.11  Q          |         |         |         |
   0+15       0.0020      0.13  Q          |         |         |         |
   0+20       0.0031      0.16  Q          |         |         |         |
   0+25       0.0045      0.20  Q          |         |         |         |
   0+30       0.0060      0.22  Q          |         |         |         |
   0+35       0.0075      0.22  Q          |         |         |         |
   0+40       0.0091      0.23  Q          |         |         |         |
   0+45       0.0107      0.23  Q          |         |         |         |
   0+50       0.0124      0.25  Q          |         |         |         |
   0+55       0.0143      0.28  VQ         |         |         |         |
   1+ 0       0.0164      0.29  VQ         |         |         |         |
   1+ 5       0.0183      0.28  VQ         |         |         |         |
   1+10       0.0200      0.24  Q          |         |         |         |
   1+15       0.0216      0.24  Q          |         |         |         |
   1+20       0.0232      0.23  Q          |         |         |         |
   1+25       0.0248      0.23  Q          |         |         |         |
   1+30       0.0264      0.23  Q          |         |         |         |
   1+35       0.0279      0.23  Q          |         |         |         |
   1+40       0.0295      0.23  Q          |         |         |         |
   1+45       0.0311      0.23  Q          |         |         |         |
   1+50       0.0328      0.25  Q          |         |         |         |
   1+55       0.0347      0.28  VQ         |         |         |         |
   2+ 0       0.0368      0.29  VQ         |         |         |         |
   2+ 5       0.0388      0.30  VQ         |         |         |         |
   2+10       0.0409      0.30  VQ         |         |         |         |
   2+15       0.0430      0.30  VQ         |         |         |         |
   2+20       0.0451      0.30  |Q         |         |         |         |
   2+25       0.0472      0.30  |Q         |         |         |         |
   2+30       0.0493      0.30  |Q         |         |         |         |
   2+35       0.0515      0.32  |Q         |         |         |         |
   2+40       0.0540      0.36  |Q         |         |         |         |
   2+45       0.0566      0.37  |Q         |         |         |         |
   2+50       0.0591      0.38  |Q         |         |         |         |
   2+55       0.0617      0.38  |Q         |         |         |         |
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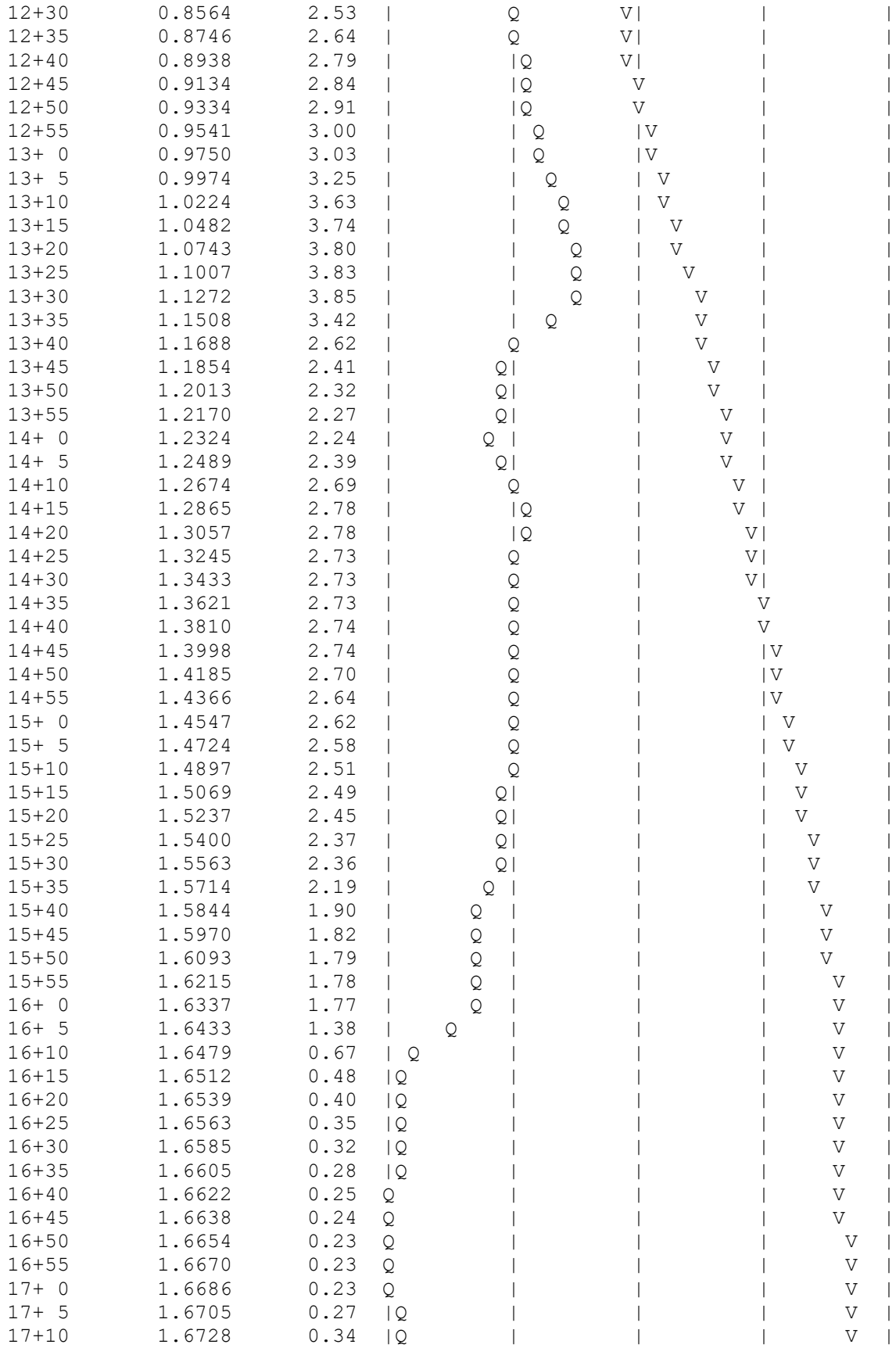
3+ 0	0.0644	0.38	|Q	|	|	|	|
3+ 5	0.0670	0.38	|Q	|	|	|	|
3+10	0.0696	0.38	|Q	|	|	|	|
3+15	0.0722	0.38	|Q	|	|	|	|
3+20	0.0748	0.38	|Q	|	|	|	|
3+25	0.0774	0.38	|Q	|	|	|	|
3+30	0.0801	0.38	|Q	|	|	|	|
3+35	0.0827	0.38	|Q	|	|	|	|
3+40	0.0853	0.38	|Q	|	|	|	|
3+45	0.0879	0.38	|Q	|	|	|	|
3+50	0.0907	0.40	|QV	|	|	|	|
3+55	0.0937	0.44	|QV	|	|	|	|
4+ 0	0.0968	0.45	|QV	|	|	|	|
4+ 5	0.0999	0.45	|QV	|	|	|	|
4+10	0.1030	0.45	|QV	|	|	|	|
4+15	0.1061	0.46	|QV	|	|	|	|
4+20	0.1094	0.48	|QV	|	|	|	|
4+25	0.1129	0.51	| Q	|	|	|	|
4+30	0.1165	0.52	| Q	|	|	|	|
4+35	0.1202	0.53	| Q	|	|	|	|
4+40	0.1238	0.53	| Q	|	|	|	|
4+45	0.1275	0.53	| Q	|	|	|	|
4+50	0.1313	0.55	| Q	|	|	|	|
4+55	0.1353	0.59	| QV	|	|	|	|
5+ 0	0.1395	0.60	| QV	|	|	|	|
5+ 5	0.1434	0.56	| QV	|	|	|	|
5+10	0.1467	0.49	|Q V	|	|	|	|
5+15	0.1500	0.47	|Q V	|	|	|	|
5+20	0.1534	0.49	|Q V	|	|	|	|
5+25	0.1569	0.52	| QV	|	|	|	|
5+30	0.1605	0.52	| QV	|	|	|	|
5+35	0.1643	0.55	| QV	|	|	|	|
5+40	0.1683	0.59	| QV	|	|	|	|
5+45	0.1725	0.60	| QV	|	|	|	|
5+50	0.1766	0.60	| QV	|	|	|	|
5+55	0.1808	0.61	| Q V	|	|	|	|
6+ 0	0.1850	0.61	| Q V	|	|	|	|
6+ 5	0.1893	0.63	| Q V	|	|	|	|
6+10	0.1939	0.67	| Q V	|	|	|	|
6+15	0.1985	0.67	| Q V	|	|	|	|
6+20	0.2032	0.68	| Q V	|	|	|	|
6+25	0.2079	0.68	| Q V	|	|	|	|
6+30	0.2126	0.68	| Q V	|	|	|	|
6+35	0.2175	0.70	| Q V	|	|	|	|
6+40	0.2226	0.74	| Q V	|	|	|	|
6+45	0.2277	0.75	| Q V	|	|	|	|
6+50	0.2329	0.76	| Q V	|	|	|	|
6+55	0.2382	0.76	| Q V	|	|	|	|
7+ 0	0.2434	0.76	| Q V	|	|	|	|
7+ 5	0.2486	0.76	| Q V	|	|	|	|
7+10	0.2539	0.76	| Q V	|	|	|	|
7+15	0.2591	0.76	| Q V	|	|	|	|
7+20	0.2645	0.78	| Q V	|	|	|	|
7+25	0.2701	0.82	| Q V	|	|	|	|
7+30	0.2758	0.83	| Q V	|	|	|	|
7+35	0.2817	0.85	| Q V	|	|	|	|
7+40	0.2878	0.89	| Q V	|	|	|	|

7+45	0.2940	0.90	Q V				
7+50	0.3004	0.93	Q V				
7+55	0.3071	0.97	Q V				
8+ 0	0.3138	0.98	Q V				
8+ 5	0.3208	1.02	Q V				
8+10	0.3284	1.10	Q V				
8+15	0.3361	1.12	Q V				
8+20	0.3439	1.13	Q V				
8+25	0.3517	1.14	Q V				
8+30	0.3596	1.14	Q V				
8+35	0.3676	1.16	Q V				
8+40	0.3758	1.20	Q V				
8+45	0.3841	1.21	Q V				
8+50	0.3926	1.23	Q V				
8+55	0.4014	1.27	Q V				
9+ 0	0.4102	1.28	Q V				
9+ 5	0.4193	1.33	Q V				
9+10	0.4290	1.40	Q V				
9+15	0.4388	1.43	Q V				
9+20	0.4488	1.45	Q V				
9+25	0.4592	1.50	Q V				
9+30	0.4696	1.51	Q V				
9+35	0.4801	1.54	Q V				
9+40	0.4910	1.58	Q V				
9+45	0.5019	1.59	Q V				
9+50	0.5131	1.62	Q V				
9+55	0.5247	1.69	Q V				
10+ 0	0.5365	1.71	Q V				
10+ 5	0.5473	1.57	Q V				
10+10	0.5562	1.29	Q V				
10+15	0.5645	1.21	Q V				
10+20	0.5726	1.18	Q V				
10+25	0.5806	1.16	Q V				
10+30	0.5885	1.15	Q V				
10+35	0.5970	1.24	Q V				
10+40	0.6069	1.42	Q V				
10+45	0.6170	1.47	Q V				
10+50	0.6273	1.50	Q V				
10+55	0.6377	1.51	Q V				
11+ 0	0.6482	1.52	Q V				
11+ 5	0.6585	1.50	Q V				
11+10	0.6686	1.46	Q V				
11+15	0.6786	1.45	Q V				
11+20	0.6886	1.45	Q V				
11+25	0.6985	1.45	Q V				
11+30	0.7085	1.45	Q V				
11+35	0.7182	1.40	Q V				
11+40	0.7273	1.33	Q V				
11+45	0.7364	1.31	Q V				
11+50	0.7455	1.32	Q V				
11+55	0.7548	1.35	Q V				
12+ 0	0.7642	1.36	Q V				
12+ 5	0.7754	1.63	Q V				
12+10	0.7900	2.12	Q V				
12+15	0.8056	2.26	Q V				
12+20	0.8219	2.37	Q V				
12+25	0.8390	2.48	Q V				



17+15	1.6753	0.36	|Q	|	|	|	V |
17+20	1.6778	0.37	|Q	|	|	|	V |
17+25	1.6804	0.38	|Q	|	|	|	V |
17+30	1.6830	0.38	|Q	|	|	|	V |
17+35	1.6857	0.38	|Q	|	|	|	V |
17+40	1.6883	0.38	|Q	|	|	|	V |
17+45	1.6909	0.38	|Q	|	|	|	V |
17+50	1.6934	0.36	|Q	|	|	|	V |
17+55	1.6956	0.32	|Q	|	|	|	V |
18+ 0	1.6978	0.31	|Q	|	|	|	V |
18+ 5	1.6999	0.31	|Q	|	|	|	V |
18+10	1.7020	0.31	|Q	|	|	|	V |
18+15	1.7041	0.31	|Q	|	|	|	V |
18+20	1.7062	0.30	|Q	|	|	|	V |
18+25	1.7083	0.30	|Q	|	|	|	V |
18+30	1.7104	0.30	|Q	|	|	|	V |
18+35	1.7123	0.28	|Q	|	|	|	V |
18+40	1.7140	0.25	Q	|	|	|	V |
18+45	1.7157	0.24	Q	|	|	|	V |
18+50	1.7171	0.21	Q	|	|	|	V |
18+55	1.7183	0.17	Q	|	|	|	V |
19+ 0	1.7195	0.16	Q	|	|	|	V |
19+ 5	1.7207	0.18	Q	|	|	|	V |
19+10	1.7221	0.21	Q	|	|	|	V |
19+15	1.7236	0.22	Q	|	|	|	V |
19+20	1.7253	0.24	Q	|	|	|	V |
19+25	1.7273	0.28	|Q	|	|	|	V |
19+30	1.7293	0.29	|Q	|	|	|	V |
19+35	1.7312	0.28	|Q	|	|	|	V |
19+40	1.7329	0.24	Q	|	|	|	V |
19+45	1.7345	0.24	Q	|	|	|	V |
19+50	1.7360	0.21	Q	|	|	|	V |
19+55	1.7372	0.17	Q	|	|	|	V |
20+ 0	1.7383	0.16	Q	|	|	|	V |
20+ 5	1.7395	0.18	Q	|	|	|	V |
20+10	1.7410	0.21	Q	|	|	|	V |
20+15	1.7425	0.22	Q	|	|	|	V |
20+20	1.7440	0.22	Q	|	|	|	V |
20+25	1.7456	0.23	Q	|	|	|	V |
20+30	1.7471	0.23	Q	|	|	|	V |
20+35	1.7487	0.23	Q	|	|	|	V |
20+40	1.7503	0.23	Q	|	|	|	V |
20+45	1.7519	0.23	Q	|	|	|	V |
20+50	1.7533	0.21	Q	|	|	|	V |
20+55	1.7545	0.17	Q	|	|	|	V|
21+ 0	1.7556	0.16	Q	|	|	|	V|
21+ 5	1.7568	0.18	Q	|	|	|	V|
21+10	1.7583	0.21	Q	|	|	|	V|
21+15	1.7598	0.22	Q	|	|	|	V|
21+20	1.7612	0.20	Q	|	|	|	V|
21+25	1.7623	0.17	Q	|	|	|	V|
21+30	1.7634	0.16	Q	|	|	|	V|
21+35	1.7647	0.18	Q	|	|	|	V|
21+40	1.7661	0.21	Q	|	|	|	V|
21+45	1.7676	0.22	Q	|	|	|	V|
21+50	1.7690	0.20	Q	|	|	|	V|
21+55	1.7702	0.17	Q	|	|	|	V|

22+ 0	1.7713	0.16	Q	|	|	|	V|
22+ 5	1.7725	0.18	Q	|	|	|	V|
22+10	1.7740	0.21	Q	|	|	|	V|
22+15	1.7755	0.22	Q	|	|	|	V|
22+20	1.7769	0.20	Q	|	|	|	V|
22+25	1.7780	0.17	Q	|	|	|	V|
22+30	1.7791	0.16	Q	|	|	|	V|
22+35	1.7802	0.16	Q	|	|	|	V|
22+40	1.7813	0.15	Q	|	|	|	V|
22+45	1.7823	0.15	Q	|	|	|	V|
22+50	1.7834	0.15	Q	|	|	|	V|
22+55	1.7844	0.15	Q	|	|	|	V|
23+ 0	1.7855	0.15	Q	|	|	|	V|
23+ 5	1.7865	0.15	Q	|	|	|	V|
23+10	1.7876	0.15	Q	|	|	|	V|
23+15	1.7886	0.15	Q	|	|	|	V|
23+20	1.7897	0.15	Q	|	|	|	V|
23+25	1.7907	0.15	Q	|	|	|	V|
23+30	1.7918	0.15	Q	|	|	|	V|
23+35	1.7928	0.15	Q	|	|	|	V|
23+40	1.7939	0.15	Q	|	|	|	V|
23+45	1.7949	0.15	Q	|	|	|	V|
23+50	1.7960	0.15	Q	|	|	|	V|
23+55	1.7970	0.15	Q	|	|	|	V|
24+ 0	1.7981	0.15	Q	|	|	|	V|
24+ 5	1.7988	0.11	Q	|	|	|	V|
24+10	1.7991	0.04	Q	|	|	|	V|
24+15	1.7992	0.02	Q	|	|	|	V|
24+20	1.7993	0.01	Q	|	|	|	V|
24+25	1.7993	0.00	Q	|	|	|	V|
24+30	1.7993	0.00	Q	|	|	|	V

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

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Study date 10/02/24 File: qp7100uh24100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPSOED CONDITION - WATERSHED A
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 9.05(Ac.) = 0.014 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 9.05(Ac.) = 0.014 Sq. Mi.
Length along longest watercourse = 665.00(Ft.)
Length along longest watercourse measured to centroid = 635.00(Ft.)
Length along longest watercourse = 0.126 Mi.
Length along longest watercourse measured to centroid = 0.120 Mi.
Difference in elevation = 22.87(Ft.)
Slope along watercourse = 181.5844 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.027 Hr.
Lag time = 1.64 Min.
25% of lag time = 0.41 Min.
40% of lag time = 0.65 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.05	1.80	16.29

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.05	5.00	45.25

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.800(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.050	61.50	0.800

Total Area Entered = 9.05(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
61.5	61.5	0.454	0.800	0.127	1.000	0.127
					Sum (F) =	0.127

Area averaged mean soil loss (F) (In/Hr) = 0.127
Minimum soil loss rate ((In/Hr)) = 0.064
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.260

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	305.645	57.252	5.222
2	0.167	611.289	36.820	3.358
3	0.250	916.934	5.928	0.541
			Sum = 100.000	Sum= 9.121

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.040	(0.225)	0.010	0.030
2	0.17	0.07	0.040	(0.224)	0.010	0.030
3	0.25	0.07	0.040	(0.224)	0.010	0.030
4	0.33	0.10	0.060	(0.223)	0.016	0.044
5	0.42	0.10	0.060	(0.222)	0.016	0.044
6	0.50	0.10	0.060	(0.221)	0.016	0.044

7	0.58	0.10	0.060	(0.220)	0.016	0.044
8	0.67	0.10	0.060	(0.219)	0.016	0.044
9	0.75	0.10	0.060	(0.218)	0.016	0.044
10	0.83	0.13	0.080	(0.217)	0.021	0.059
11	0.92	0.13	0.080	(0.217)	0.021	0.059
12	1.00	0.13	0.080	(0.216)	0.021	0.059
13	1.08	0.10	0.060	(0.215)	0.016	0.044
14	1.17	0.10	0.060	(0.214)	0.016	0.044
15	1.25	0.10	0.060	(0.213)	0.016	0.044
16	1.33	0.10	0.060	(0.212)	0.016	0.044
17	1.42	0.10	0.060	(0.212)	0.016	0.044
18	1.50	0.10	0.060	(0.211)	0.016	0.044
19	1.58	0.10	0.060	(0.210)	0.016	0.044
20	1.67	0.10	0.060	(0.209)	0.016	0.044
21	1.75	0.10	0.060	(0.208)	0.016	0.044
22	1.83	0.13	0.080	(0.207)	0.021	0.059
23	1.92	0.13	0.080	(0.206)	0.021	0.059
24	2.00	0.13	0.080	(0.206)	0.021	0.059
25	2.08	0.13	0.080	(0.205)	0.021	0.059
26	2.17	0.13	0.080	(0.204)	0.021	0.059
27	2.25	0.13	0.080	(0.203)	0.021	0.059
28	2.33	0.13	0.080	(0.202)	0.021	0.059
29	2.42	0.13	0.080	(0.202)	0.021	0.059
30	2.50	0.13	0.080	(0.201)	0.021	0.059
31	2.58	0.17	0.100	(0.200)	0.026	0.074
32	2.67	0.17	0.100	(0.199)	0.026	0.074
33	2.75	0.17	0.100	(0.198)	0.026	0.074
34	2.83	0.17	0.100	(0.197)	0.026	0.074
35	2.92	0.17	0.100	(0.197)	0.026	0.074
36	3.00	0.17	0.100	(0.196)	0.026	0.074
37	3.08	0.17	0.100	(0.195)	0.026	0.074
38	3.17	0.17	0.100	(0.194)	0.026	0.074
39	3.25	0.17	0.100	(0.193)	0.026	0.074
40	3.33	0.17	0.100	(0.193)	0.026	0.074
41	3.42	0.17	0.100	(0.192)	0.026	0.074
42	3.50	0.17	0.100	(0.191)	0.026	0.074
43	3.58	0.17	0.100	(0.190)	0.026	0.074
44	3.67	0.17	0.100	(0.189)	0.026	0.074
45	3.75	0.17	0.100	(0.189)	0.026	0.074
46	3.83	0.20	0.120	(0.188)	0.031	0.089
47	3.92	0.20	0.120	(0.187)	0.031	0.089
48	4.00	0.20	0.120	(0.186)	0.031	0.089
49	4.08	0.20	0.120	(0.185)	0.031	0.089
50	4.17	0.20	0.120	(0.185)	0.031	0.089
51	4.25	0.20	0.120	(0.184)	0.031	0.089
52	4.33	0.23	0.140	(0.183)	0.036	0.104
53	4.42	0.23	0.140	(0.182)	0.036	0.104
54	4.50	0.23	0.140	(0.181)	0.036	0.104
55	4.58	0.23	0.140	(0.181)	0.036	0.104
56	4.67	0.23	0.140	(0.180)	0.036	0.104
57	4.75	0.23	0.140	(0.179)	0.036	0.104
58	4.83	0.27	0.160	(0.178)	0.042	0.118
59	4.92	0.27	0.160	(0.178)	0.042	0.118
60	5.00	0.27	0.160	(0.177)	0.042	0.118
61	5.08	0.20	0.120	(0.176)	0.031	0.089
62	5.17	0.20	0.120	(0.175)	0.031	0.089
63	5.25	0.20	0.120	(0.175)	0.031	0.089

64	5.33	0.23	0.140	(0.174)	0.036	0.104
65	5.42	0.23	0.140	(0.173)	0.036	0.104
66	5.50	0.23	0.140	(0.172)	0.036	0.104
67	5.58	0.27	0.160	(0.171)	0.042	0.118
68	5.67	0.27	0.160	(0.171)	0.042	0.118
69	5.75	0.27	0.160	(0.170)	0.042	0.118
70	5.83	0.27	0.160	(0.169)	0.042	0.118
71	5.92	0.27	0.160	(0.168)	0.042	0.118
72	6.00	0.27	0.160	(0.168)	0.042	0.118
73	6.08	0.30	0.180	(0.167)	0.047	0.133
74	6.17	0.30	0.180	(0.166)	0.047	0.133
75	6.25	0.30	0.180	(0.165)	0.047	0.133
76	6.33	0.30	0.180	(0.165)	0.047	0.133
77	6.42	0.30	0.180	(0.164)	0.047	0.133
78	6.50	0.30	0.180	(0.163)	0.047	0.133
79	6.58	0.33	0.200	(0.163)	0.052	0.148
80	6.67	0.33	0.200	(0.162)	0.052	0.148
81	6.75	0.33	0.200	(0.161)	0.052	0.148
82	6.83	0.33	0.200	(0.160)	0.052	0.148
83	6.92	0.33	0.200	(0.160)	0.052	0.148
84	7.00	0.33	0.200	(0.159)	0.052	0.148
85	7.08	0.33	0.200	(0.158)	0.052	0.148
86	7.17	0.33	0.200	(0.157)	0.052	0.148
87	7.25	0.33	0.200	(0.157)	0.052	0.148
88	7.33	0.37	0.220	(0.156)	0.057	0.163
89	7.42	0.37	0.220	(0.155)	0.057	0.163
90	7.50	0.37	0.220	(0.155)	0.057	0.163
91	7.58	0.40	0.240	(0.154)	0.062	0.178
92	7.67	0.40	0.240	(0.153)	0.062	0.178
93	7.75	0.40	0.240	(0.152)	0.062	0.178
94	7.83	0.43	0.260	(0.152)	0.068	0.192
95	7.92	0.43	0.260	(0.151)	0.068	0.192
96	8.00	0.43	0.260	(0.150)	0.068	0.192
97	8.08	0.50	0.300	(0.150)	0.078	0.222
98	8.17	0.50	0.300	(0.149)	0.078	0.222
99	8.25	0.50	0.300	(0.148)	0.078	0.222
100	8.33	0.50	0.300	(0.148)	0.078	0.222
101	8.42	0.50	0.300	(0.147)	0.078	0.222
102	8.50	0.50	0.300	(0.146)	0.078	0.222
103	8.58	0.53	0.320	(0.146)	0.083	0.237
104	8.67	0.53	0.320	(0.145)	0.083	0.237
105	8.75	0.53	0.320	(0.144)	0.083	0.237
106	8.83	0.57	0.340	(0.143)	0.088	0.252
107	8.92	0.57	0.340	(0.143)	0.088	0.252
108	9.00	0.57	0.340	(0.142)	0.088	0.252
109	9.08	0.63	0.380	(0.141)	0.099	0.281
110	9.17	0.63	0.380	(0.141)	0.099	0.281
111	9.25	0.63	0.380	(0.140)	0.099	0.281
112	9.33	0.67	0.400	(0.139)	0.104	0.296
113	9.42	0.67	0.400	(0.139)	0.104	0.296
114	9.50	0.67	0.400	(0.138)	0.104	0.296
115	9.58	0.70	0.420	(0.137)	0.109	0.311
116	9.67	0.70	0.420	(0.137)	0.109	0.311
117	9.75	0.70	0.420	(0.136)	0.109	0.311
118	9.83	0.73	0.440	(0.135)	0.114	0.326
119	9.92	0.73	0.440	(0.135)	0.114	0.326
120	10.00	0.73	0.440	(0.134)	0.114	0.326

121	10.08	0.50	0.300	(0.134)	0.078	0.222
122	10.17	0.50	0.300	(0.133)	0.078	0.222
123	10.25	0.50	0.300	(0.132)	0.078	0.222
124	10.33	0.50	0.300	(0.132)	0.078	0.222
125	10.42	0.50	0.300	(0.131)	0.078	0.222
126	10.50	0.50	0.300	(0.130)	0.078	0.222
127	10.58	0.67	0.400	(0.130)	0.104	0.296
128	10.67	0.67	0.400	(0.129)	0.104	0.296
129	10.75	0.67	0.400	(0.128)	0.104	0.296
130	10.83	0.67	0.400	(0.128)	0.104	0.296
131	10.92	0.67	0.400	(0.127)	0.104	0.296
132	11.00	0.67	0.400	(0.127)	0.104	0.296
133	11.08	0.63	0.380	(0.126)	0.099	0.281
134	11.17	0.63	0.380	(0.125)	0.099	0.281
135	11.25	0.63	0.380	(0.125)	0.099	0.281
136	11.33	0.63	0.380	(0.124)	0.099	0.281
137	11.42	0.63	0.380	(0.123)	0.099	0.281
138	11.50	0.63	0.380	(0.123)	0.099	0.281
139	11.58	0.57	0.340	(0.122)	0.088	0.252
140	11.67	0.57	0.340	(0.122)	0.088	0.252
141	11.75	0.57	0.340	(0.121)	0.088	0.252
142	11.83	0.60	0.360	(0.120)	0.094	0.266
143	11.92	0.60	0.360	(0.120)	0.094	0.266
144	12.00	0.60	0.360	(0.119)	0.094	0.266
145	12.08	0.83	0.500	0.119	(0.130)	0.381
146	12.17	0.83	0.500	0.118	(0.130)	0.382
147	12.25	0.83	0.500	0.117	(0.130)	0.383
148	12.33	0.87	0.520	0.117	(0.135)	0.403
149	12.42	0.87	0.520	0.116	(0.135)	0.404
150	12.50	0.87	0.520	0.116	(0.135)	0.404
151	12.58	0.93	0.560	0.115	(0.146)	0.445
152	12.67	0.93	0.560	0.115	(0.146)	0.445
153	12.75	0.93	0.560	0.114	(0.146)	0.446
154	12.83	0.97	0.580	0.113	(0.151)	0.467
155	12.92	0.97	0.580	0.113	(0.151)	0.467
156	13.00	0.97	0.580	0.112	(0.151)	0.468
157	13.08	1.13	0.680	0.112	(0.177)	0.568
158	13.17	1.13	0.680	0.111	(0.177)	0.569
159	13.25	1.13	0.680	0.111	(0.177)	0.569
160	13.33	1.13	0.680	0.110	(0.177)	0.570
161	13.42	1.13	0.680	0.109	(0.177)	0.571
162	13.50	1.13	0.680	0.109	(0.177)	0.571
163	13.58	0.77	0.460	0.108	(0.120)	0.352
164	13.67	0.77	0.460	0.108	(0.120)	0.352
165	13.75	0.77	0.460	0.107	(0.120)	0.353
166	13.83	0.77	0.460	0.107	(0.120)	0.353
167	13.92	0.77	0.460	0.106	(0.120)	0.354
168	14.00	0.77	0.460	0.106	(0.120)	0.354
169	14.08	0.90	0.540	0.105	(0.140)	0.435
170	14.17	0.90	0.540	0.104	(0.140)	0.436
171	14.25	0.90	0.540	0.104	(0.140)	0.436
172	14.33	0.87	0.520	0.103	(0.135)	0.417
173	14.42	0.87	0.520	0.103	(0.135)	0.417
174	14.50	0.87	0.520	0.102	(0.135)	0.418
175	14.58	0.87	0.520	0.102	(0.135)	0.418
176	14.67	0.87	0.520	0.101	(0.135)	0.419
177	14.75	0.87	0.520	0.101	(0.135)	0.419

178	14.83	0.83	0.500	0.100	(0.130)	0.400
179	14.92	0.83	0.500	0.100	(0.130)	0.400
180	15.00	0.83	0.500	0.099	(0.130)	0.401
181	15.08	0.80	0.480	0.099	(0.125)	0.381
182	15.17	0.80	0.480	0.098	(0.125)	0.382
183	15.25	0.80	0.480	0.098	(0.125)	0.382
184	15.33	0.77	0.460	0.097	(0.120)	0.363
185	15.42	0.77	0.460	0.097	(0.120)	0.363
186	15.50	0.77	0.460	0.096	(0.120)	0.364
187	15.58	0.63	0.380	0.096	(0.099)	0.284
188	15.67	0.63	0.380	0.095	(0.099)	0.285
189	15.75	0.63	0.380	0.095	(0.099)	0.285
190	15.83	0.63	0.380	0.094	(0.099)	0.286
191	15.92	0.63	0.380	0.094	(0.099)	0.286
192	16.00	0.63	0.380	0.093	(0.099)	0.287
193	16.08	0.13	0.080	(0.093)	0.021	0.059
194	16.17	0.13	0.080	(0.092)	0.021	0.059
195	16.25	0.13	0.080	(0.092)	0.021	0.059
196	16.33	0.13	0.080	(0.091)	0.021	0.059
197	16.42	0.13	0.080	(0.091)	0.021	0.059
198	16.50	0.13	0.080	(0.090)	0.021	0.059
199	16.58	0.10	0.060	(0.090)	0.016	0.044
200	16.67	0.10	0.060	(0.090)	0.016	0.044
201	16.75	0.10	0.060	(0.089)	0.016	0.044
202	16.83	0.10	0.060	(0.089)	0.016	0.044
203	16.92	0.10	0.060	(0.088)	0.016	0.044
204	17.00	0.10	0.060	(0.088)	0.016	0.044
205	17.08	0.17	0.100	(0.087)	0.026	0.074
206	17.17	0.17	0.100	(0.087)	0.026	0.074
207	17.25	0.17	0.100	(0.086)	0.026	0.074
208	17.33	0.17	0.100	(0.086)	0.026	0.074
209	17.42	0.17	0.100	(0.086)	0.026	0.074
210	17.50	0.17	0.100	(0.085)	0.026	0.074
211	17.58	0.17	0.100	(0.085)	0.026	0.074
212	17.67	0.17	0.100	(0.084)	0.026	0.074
213	17.75	0.17	0.100	(0.084)	0.026	0.074
214	17.83	0.13	0.080	(0.083)	0.021	0.059
215	17.92	0.13	0.080	(0.083)	0.021	0.059
216	18.00	0.13	0.080	(0.083)	0.021	0.059
217	18.08	0.13	0.080	(0.082)	0.021	0.059
218	18.17	0.13	0.080	(0.082)	0.021	0.059
219	18.25	0.13	0.080	(0.081)	0.021	0.059
220	18.33	0.13	0.080	(0.081)	0.021	0.059
221	18.42	0.13	0.080	(0.081)	0.021	0.059
222	18.50	0.13	0.080	(0.080)	0.021	0.059
223	18.58	0.10	0.060	(0.080)	0.016	0.044
224	18.67	0.10	0.060	(0.079)	0.016	0.044
225	18.75	0.10	0.060	(0.079)	0.016	0.044
226	18.83	0.07	0.040	(0.079)	0.010	0.030
227	18.92	0.07	0.040	(0.078)	0.010	0.030
228	19.00	0.07	0.040	(0.078)	0.010	0.030
229	19.08	0.10	0.060	(0.078)	0.016	0.044
230	19.17	0.10	0.060	(0.077)	0.016	0.044
231	19.25	0.10	0.060	(0.077)	0.016	0.044
232	19.33	0.13	0.080	(0.077)	0.021	0.059
233	19.42	0.13	0.080	(0.076)	0.021	0.059
234	19.50	0.13	0.080	(0.076)	0.021	0.059

235	19.58	0.10	0.060	(0.075)	0.016	0.044
236	19.67	0.10	0.060	(0.075)	0.016	0.044
237	19.75	0.10	0.060	(0.075)	0.016	0.044
238	19.83	0.07	0.040	(0.074)	0.010	0.030
239	19.92	0.07	0.040	(0.074)	0.010	0.030
240	20.00	0.07	0.040	(0.074)	0.010	0.030
241	20.08	0.10	0.060	(0.073)	0.016	0.044
242	20.17	0.10	0.060	(0.073)	0.016	0.044
243	20.25	0.10	0.060	(0.073)	0.016	0.044
244	20.33	0.10	0.060	(0.073)	0.016	0.044
245	20.42	0.10	0.060	(0.072)	0.016	0.044
246	20.50	0.10	0.060	(0.072)	0.016	0.044
247	20.58	0.10	0.060	(0.072)	0.016	0.044
248	20.67	0.10	0.060	(0.071)	0.016	0.044
249	20.75	0.10	0.060	(0.071)	0.016	0.044
250	20.83	0.07	0.040	(0.071)	0.010	0.030
251	20.92	0.07	0.040	(0.070)	0.010	0.030
252	21.00	0.07	0.040	(0.070)	0.010	0.030
253	21.08	0.10	0.060	(0.070)	0.016	0.044
254	21.17	0.10	0.060	(0.070)	0.016	0.044
255	21.25	0.10	0.060	(0.069)	0.016	0.044
256	21.33	0.07	0.040	(0.069)	0.010	0.030
257	21.42	0.07	0.040	(0.069)	0.010	0.030
258	21.50	0.07	0.040	(0.069)	0.010	0.030
259	21.58	0.10	0.060	(0.068)	0.016	0.044
260	21.67	0.10	0.060	(0.068)	0.016	0.044
261	21.75	0.10	0.060	(0.068)	0.016	0.044
262	21.83	0.07	0.040	(0.068)	0.010	0.030
263	21.92	0.07	0.040	(0.067)	0.010	0.030
264	22.00	0.07	0.040	(0.067)	0.010	0.030
265	22.08	0.10	0.060	(0.067)	0.016	0.044
266	22.17	0.10	0.060	(0.067)	0.016	0.044
267	22.25	0.10	0.060	(0.066)	0.016	0.044
268	22.33	0.07	0.040	(0.066)	0.010	0.030
269	22.42	0.07	0.040	(0.066)	0.010	0.030
270	22.50	0.07	0.040	(0.066)	0.010	0.030
271	22.58	0.07	0.040	(0.066)	0.010	0.030
272	22.67	0.07	0.040	(0.065)	0.010	0.030
273	22.75	0.07	0.040	(0.065)	0.010	0.030
274	22.83	0.07	0.040	(0.065)	0.010	0.030
275	22.92	0.07	0.040	(0.065)	0.010	0.030
276	23.00	0.07	0.040	(0.065)	0.010	0.030
277	23.08	0.07	0.040	(0.065)	0.010	0.030
278	23.17	0.07	0.040	(0.064)	0.010	0.030
279	23.25	0.07	0.040	(0.064)	0.010	0.030
280	23.33	0.07	0.040	(0.064)	0.010	0.030
281	23.42	0.07	0.040	(0.064)	0.010	0.030
282	23.50	0.07	0.040	(0.064)	0.010	0.030
283	23.58	0.07	0.040	(0.064)	0.010	0.030
284	23.67	0.07	0.040	(0.064)	0.010	0.030
285	23.75	0.07	0.040	(0.064)	0.010	0.030
286	23.83	0.07	0.040	(0.064)	0.010	0.030
287	23.92	0.07	0.040	(0.064)	0.010	0.030
288	24.00	0.07	0.040	(0.064)	0.010	0.030

(Loss Rate Not Used)

Sum = 100.0 Sum = 45.7

Flood volume = Effective rainfall 3.81(In)

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 times area       9.1(Ac.)/[(In)/(Ft.)] =       2.9(Ac.Ft)
Total soil loss =      1.19(In)
Total soil loss =     0.896(Ac.Ft)
Total rainfall =      5.00(In)
Flood volume =      125235.5 Cubic Feet
Total soil loss =       39019.1 Cubic Feet
---------------------------------------------------------------------
 Peak flow rate of this hydrograph =      5.210(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))

---------------------------------------------------------------------
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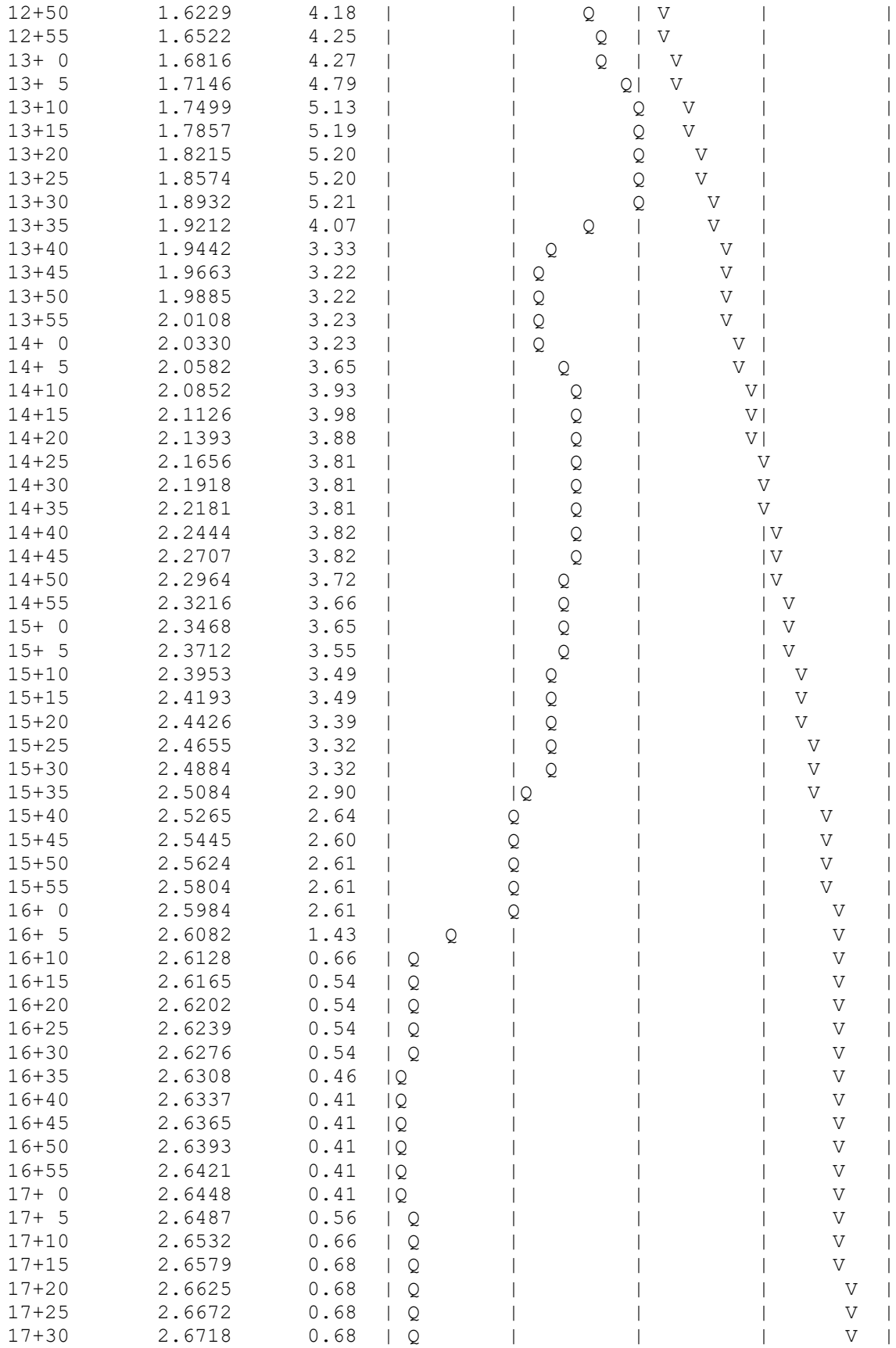
Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0011	0.15	Q				
0+10	0.0028	0.25	VQ				
0+15	0.0047	0.27	VQ				
0+20	0.0071	0.35	VQ				
0+25	0.0098	0.40	VQ				
0+30	0.0126	0.41	VQ				
0+35	0.0154	0.41	VQ				
0+40	0.0182	0.41	VQ				
0+45	0.0210	0.41	VQ				
0+50	0.0243	0.48	VQ				
0+55	0.0280	0.53	V Q				
1+ 0	0.0317	0.54	V Q				
1+ 5	0.0349	0.46	VQ				
1+10	0.0377	0.41	VQ				
1+15	0.0405	0.41	VQ				
1+20	0.0433	0.41	VQ				
1+25	0.0461	0.41	VQ				
1+30	0.0489	0.41	VQ				
1+35	0.0517	0.41	VQ				
1+40	0.0544	0.41	VQ				
1+45	0.0572	0.41	VQ				
1+50	0.0606	0.48	VQ				
1+55	0.0642	0.53	V Q				
2+ 0	0.0679	0.54	V Q				
2+ 5	0.0717	0.54	V Q				
2+10	0.0754	0.54	|VQ				
2+15	0.0791	0.54	|VQ				
2+20	0.0828	0.54	|VQ				
2+25	0.0866	0.54	|VQ				
2+30	0.0903	0.54	|VQ				
2+35	0.0945	0.62	|VQ				
2+40	0.0991	0.67	|VQ				
2+45	0.1038	0.68	|VQ				
2+50	0.1084	0.68	|VQ				
2+55	0.1131	0.68	|VQ				
3+ 0	0.1177	0.68	|VQ				
3+ 5	0.1224	0.68	|VQ				
3+10	0.1270	0.68	|VQ				
3+15	0.1317	0.68	|VQ				

3+20	0.1363	0.68	VQ				
3+25	0.1410	0.68	VQ				
3+30	0.1456	0.68	Q				
3+35	0.1503	0.68	Q				
3+40	0.1549	0.68	Q				
3+45	0.1596	0.68	Q				
3+50	0.1648	0.75	VQ				
3+55	0.1703	0.80	VQ				
4+ 0	0.1759	0.81	VQ				
4+ 5	0.1814	0.81	VQ				
4+10	0.1870	0.81	VQ				
4+15	0.1926	0.81	VQ				
4+20	0.1987	0.89	VQ				
4+25	0.2052	0.94	VQ				
4+30	0.2117	0.95	VQ				
4+35	0.2182	0.95	Q				
4+40	0.2247	0.95	Q				
4+45	0.2312	0.95	Q				
4+50	0.2383	1.02	VQ				
4+55	0.2457	1.07	VQ				
5+ 0	0.2531	1.08	VQ				
5+ 5	0.2595	0.93	Q				
5+10	0.2652	0.83	Q				
5+15	0.2707	0.81	Q				
5+20	0.2769	0.89	Q				
5+25	0.2833	0.94	Q				
5+30	0.2898	0.95	QV				
5+35	0.2969	1.02	Q				
5+40	0.3042	1.07	Q				
5+45	0.3117	1.08	Q				
5+50	0.3191	1.08	Q				
5+55	0.3266	1.08	Q				
6+ 0	0.3340	1.08	Q				
6+ 5	0.3420	1.16	Q				
6+10	0.3503	1.21	Q				
6+15	0.3587	1.22	Q				
6+20	0.3670	1.22	QV				
6+25	0.3754	1.22	QV				
6+30	0.3838	1.22	QV				
6+35	0.3927	1.29	Q				
6+40	0.4019	1.34	Q				
6+45	0.4112	1.35	Q				
6+50	0.4205	1.35	Q				
6+55	0.4298	1.35	Q				
7+ 0	0.4391	1.35	QV				
7+ 5	0.4484	1.35	QV				
7+10	0.4577	1.35	QV				
7+15	0.4670	1.35	QV				
7+20	0.4769	1.43	QV				
7+25	0.4871	1.48	QV				
7+30	0.4973	1.49	QV				
7+35	0.5080	1.56	QV				
7+40	0.5192	1.61	QV				
7+45	0.5303	1.62	QV				
7+50	0.5420	1.70	QV				
7+55	0.5540	1.75	QV				
8+ 0	0.5661	1.76	Q				

8+ 5	0.5793	1.91	QV				
8+10	0.5931	2.01	Q				
8+15	0.6071	2.03	Q				
8+20	0.6210	2.03	Q				
8+25	0.6350	2.03	Q				
8+30	0.6489	2.03	QV				
8+35	0.6634	2.10	QV				
8+40	0.6783	2.15	QV				
8+45	0.6931	2.16	QV				
8+50	0.7086	2.24	QV				
8+55	0.7243	2.29	QV				
9+ 0	0.7401	2.30	QV				
9+ 5	0.7570	2.45	QV				
9+10	0.7746	2.55	Q				
9+15	0.7922	2.57	QV				
9+20	0.8104	2.64	QV				
9+25	0.8290	2.69	QV				
9+30	0.8476	2.70	QV				
9+35	0.8667	2.78	QV				
9+40	0.8862	2.83	QV				
9+45	0.9057	2.84	QV				
9+50	0.9258	2.91	QV				
9+55	0.9462	2.96	Q V				
10+ 0	0.9667	2.97	Q V				
10+ 5	0.9834	2.43	Q V				
10+10	0.9977	2.08	Q V				
10+15	1.0117	2.03	Q V				
10+20	1.0256	2.03	Q V				
10+25	1.0396	2.03	Q V				
10+30	1.0535	2.03	Q V				
10+35	1.0702	2.41	Q V				
10+40	1.0885	2.66	Q V				
10+45	1.1071	2.70	Q V				
10+50	1.1257	2.70	Q V				
10+55	1.1443	2.70	Q V				
11+ 0	1.1629	2.70	Q V				
11+ 5	1.1810	2.62	Q V				
11+10	1.1987	2.57	Q V				
11+15	1.2164	2.57	Q V				
11+20	1.2340	2.57	Q V				
11+25	1.2517	2.57	Q V				
11+30	1.2694	2.57	Q V				
11+35	1.2860	2.41	Q V				
11+40	1.3019	2.31	Q V				
11+45	1.3177	2.30	Q V				
11+50	1.3341	2.37	Q V				
11+55	1.3508	2.42	Q V				
12+ 0	1.3675	2.43	Q V				
12+ 5	1.3884	3.03	Q V				
12+10	1.4119	3.42	Q V				
12+15	1.4360	3.49	Q V				
12+20	1.4607	3.60	Q V				
12+25	1.4860	3.67	Q V				
12+30	1.5114	3.69	Q V				
12+35	1.5383	3.90	Q V				
12+40	1.5661	4.04	Q V				
12+45	1.5941	4.07	Q V				



17+35	2.6765	0.68	| Q	|	|	|	V |
17+40	2.6811	0.68	| Q	|	|	|	V |
17+45	2.6858	0.68	| Q	|	|	|	V |
17+50	2.6899	0.60	| Q	|	|	|	V |
17+55	2.6937	0.55	| Q	|	|	|	V |
18+ 0	2.6974	0.54	| Q	|	|	|	V |
18+ 5	2.7011	0.54	| Q	|	|	|	V |
18+10	2.7048	0.54	| Q	|	|	|	V |
18+15	2.7086	0.54	| Q	|	|	|	V |
18+20	2.7123	0.54	| Q	|	|	|	V |
18+25	2.7160	0.54	| Q	|	|	|	V |
18+30	2.7197	0.54	| Q	|	|	|	V |
18+35	2.7229	0.46	|Q	|	|	|	V |
18+40	2.7258	0.41	|Q	|	|	|	V |
18+45	2.7286	0.41	|Q	|	|	|	V |
18+50	2.7308	0.33	|Q	|	|	|	V |
18+55	2.7327	0.28	|Q	|	|	|	V |
19+ 0	2.7346	0.27	|Q	|	|	|	V |
19+ 5	2.7370	0.35	|Q	|	|	|	V |
19+10	2.7397	0.40	|Q	|	|	|	V |
19+15	2.7425	0.41	|Q	|	|	|	V |
19+20	2.7458	0.48	|Q	|	|	|	V |
19+25	2.7495	0.53	| Q	|	|	|	V |
19+30	2.7532	0.54	| Q	|	|	|	V |
19+35	2.7564	0.46	|Q	|	|	|	V |
19+40	2.7592	0.41	|Q	|	|	|	V |
19+45	2.7620	0.41	|Q	|	|	|	V |
19+50	2.7643	0.33	|Q	|	|	|	V |
19+55	2.7662	0.28	|Q	|	|	|	V |
20+ 0	2.7681	0.27	|Q	|	|	|	V |
20+ 5	2.7705	0.35	|Q	|	|	|	V |
20+10	2.7732	0.40	|Q	|	|	|	V |
20+15	2.7760	0.41	|Q	|	|	|	V |
20+20	2.7788	0.41	|Q	|	|	|	V |
20+25	2.7816	0.41	|Q	|	|	|	V |
20+30	2.7844	0.41	|Q	|	|	|	V |
20+35	2.7872	0.41	|Q	|	|	|	V |
20+40	2.7899	0.41	|Q	|	|	|	V |
20+45	2.7927	0.41	|Q	|	|	|	V |
20+50	2.7950	0.33	|Q	|	|	|	V |
20+55	2.7969	0.28	|Q	|	|	|	V |
21+ 0	2.7988	0.27	|Q	|	|	|	V |
21+ 5	2.8012	0.35	|Q	|	|	|	V |
21+10	2.8039	0.40	|Q	|	|	|	V|
21+15	2.8067	0.41	|Q	|	|	|	V|
21+20	2.8089	0.33	|Q	|	|	|	V|
21+25	2.8109	0.28	|Q	|	|	|	V|
21+30	2.8127	0.27	|Q	|	|	|	V|
21+35	2.8151	0.35	|Q	|	|	|	V|
21+40	2.8178	0.40	|Q	|	|	|	V|
21+45	2.8206	0.41	|Q	|	|	|	V|
21+50	2.8229	0.33	|Q	|	|	|	V|
21+55	2.8248	0.28	|Q	|	|	|	V|
22+ 0	2.8267	0.27	|Q	|	|	|	V|
22+ 5	2.8291	0.35	|Q	|	|	|	V|
22+10	2.8318	0.40	|Q	|	|	|	V|
22+15	2.8346	0.41	|Q	|	|	|	V|

22+20	2.8368	0.33	|Q	|	|	|	V|
22+25	2.8388	0.28	|Q	|	|	|	V|
22+30	2.8406	0.27	|Q	|	|	|	V|
22+35	2.8425	0.27	|Q	|	|	|	V|
22+40	2.8443	0.27	|Q	|	|	|	V|
22+45	2.8462	0.27	|Q	|	|	|	V|
22+50	2.8481	0.27	|Q	|	|	|	V|
22+55	2.8499	0.27	|Q	|	|	|	V|
23+ 0	2.8518	0.27	|Q	|	|	|	V|
23+ 5	2.8536	0.27	|Q	|	|	|	V|
23+10	2.8555	0.27	|Q	|	|	|	V|
23+15	2.8574	0.27	|Q	|	|	|	V|
23+20	2.8592	0.27	|Q	|	|	|	V|
23+25	2.8611	0.27	|Q	|	|	|	V|
23+30	2.8629	0.27	|Q	|	|	|	V|
23+35	2.8648	0.27	|Q	|	|	|	V|
23+40	2.8667	0.27	|Q	|	|	|	V|
23+45	2.8685	0.27	|Q	|	|	|	V|
23+50	2.8704	0.27	|Q	|	|	|	V|
23+55	2.8722	0.27	|Q	|	|	|	V|
24+ 0	2.8741	0.27	|Q	|	|	|	V|
24+ 5	2.8749	0.12	Q	|	|	|	V|
24+10	2.8750	0.02	Q	|	|	|	V

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

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Study date 10/02/24 File: qo100b724100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED B
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 8.80(Ac.) = 0.014 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 8.80(Ac.) = 0.014 Sq. Mi.
Length along longest watercourse = 615.00(Ft.)
Length along longest watercourse measured to centroid = 247.00(Ft.)
Length along longest watercourse = 0.116 Mi.
Length along longest watercourse measured to centroid = 0.047 Mi.
Difference in elevation = 13.88(Ft.)
Slope along watercourse = 119.1649 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.020 Hr.
Lag time = 1.20 Min.
25% of lag time = 0.30 Min.
40% of lag time = 0.48 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
8.80	1.80	15.84

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
8.80	5.00	44.00

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.800(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
8.800	66.30	0.800

Total Area Entered = 8.80(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
66.3	66.3	0.402	0.800	0.113	1.000	0.113
					Sum (F) =	0.113

Area averaged mean soil loss (F) (In/Hr) = 0.113
Minimum soil loss rate ((In/Hr)) = 0.056
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.260

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	416.091	66.163	5.868
2	0.167	832.183	33.837	3.001
		Sum = 100.000	Sum=	8.869

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.040	(0.200)	0.010	0.030
2	0.17	0.07	0.040	(0.199)	0.010	0.030
3	0.25	0.07	0.040	(0.198)	0.010	0.030
4	0.33	0.10	0.060	(0.197)	0.016	0.044
5	0.42	0.10	0.060	(0.196)	0.016	0.044
6	0.50	0.10	0.060	(0.196)	0.016	0.044
7	0.58	0.10	0.060	(0.195)	0.016	0.044

8	0.67	0.10	0.060	(0.194)	0.016	0.044
9	0.75	0.10	0.060	(0.193)	0.016	0.044
10	0.83	0.13	0.080	(0.193)	0.021	0.059
11	0.92	0.13	0.080	(0.192)	0.021	0.059
12	1.00	0.13	0.080	(0.191)	0.021	0.059
13	1.08	0.10	0.060	(0.190)	0.016	0.044
14	1.17	0.10	0.060	(0.190)	0.016	0.044
15	1.25	0.10	0.060	(0.189)	0.016	0.044
16	1.33	0.10	0.060	(0.188)	0.016	0.044
17	1.42	0.10	0.060	(0.187)	0.016	0.044
18	1.50	0.10	0.060	(0.187)	0.016	0.044
19	1.58	0.10	0.060	(0.186)	0.016	0.044
20	1.67	0.10	0.060	(0.185)	0.016	0.044
21	1.75	0.10	0.060	(0.184)	0.016	0.044
22	1.83	0.13	0.080	(0.184)	0.021	0.059
23	1.92	0.13	0.080	(0.183)	0.021	0.059
24	2.00	0.13	0.080	(0.182)	0.021	0.059
25	2.08	0.13	0.080	(0.181)	0.021	0.059
26	2.17	0.13	0.080	(0.181)	0.021	0.059
27	2.25	0.13	0.080	(0.180)	0.021	0.059
28	2.33	0.13	0.080	(0.179)	0.021	0.059
29	2.42	0.13	0.080	(0.178)	0.021	0.059
30	2.50	0.13	0.080	(0.178)	0.021	0.059
31	2.58	0.17	0.100	(0.177)	0.026	0.074
32	2.67	0.17	0.100	(0.176)	0.026	0.074
33	2.75	0.17	0.100	(0.176)	0.026	0.074
34	2.83	0.17	0.100	(0.175)	0.026	0.074
35	2.92	0.17	0.100	(0.174)	0.026	0.074
36	3.00	0.17	0.100	(0.173)	0.026	0.074
37	3.08	0.17	0.100	(0.173)	0.026	0.074
38	3.17	0.17	0.100	(0.172)	0.026	0.074
39	3.25	0.17	0.100	(0.171)	0.026	0.074
40	3.33	0.17	0.100	(0.171)	0.026	0.074
41	3.42	0.17	0.100	(0.170)	0.026	0.074
42	3.50	0.17	0.100	(0.169)	0.026	0.074
43	3.58	0.17	0.100	(0.168)	0.026	0.074
44	3.67	0.17	0.100	(0.168)	0.026	0.074
45	3.75	0.17	0.100	(0.167)	0.026	0.074
46	3.83	0.20	0.120	(0.166)	0.031	0.089
47	3.92	0.20	0.120	(0.166)	0.031	0.089
48	4.00	0.20	0.120	(0.165)	0.031	0.089
49	4.08	0.20	0.120	(0.164)	0.031	0.089
50	4.17	0.20	0.120	(0.163)	0.031	0.089
51	4.25	0.20	0.120	(0.163)	0.031	0.089
52	4.33	0.23	0.140	(0.162)	0.036	0.104
53	4.42	0.23	0.140	(0.161)	0.036	0.104
54	4.50	0.23	0.140	(0.161)	0.036	0.104
55	4.58	0.23	0.140	(0.160)	0.036	0.104
56	4.67	0.23	0.140	(0.159)	0.036	0.104
57	4.75	0.23	0.140	(0.159)	0.036	0.104
58	4.83	0.27	0.160	(0.158)	0.042	0.118
59	4.92	0.27	0.160	(0.157)	0.042	0.118
60	5.00	0.27	0.160	(0.157)	0.042	0.118
61	5.08	0.20	0.120	(0.156)	0.031	0.089
62	5.17	0.20	0.120	(0.155)	0.031	0.089
63	5.25	0.20	0.120	(0.155)	0.031	0.089

64	5.33	0.23	0.140	(0.154)	0.036	0.104
65	5.42	0.23	0.140	(0.153)	0.036	0.104
66	5.50	0.23	0.140	(0.153)	0.036	0.104
67	5.58	0.27	0.160	(0.152)	0.042	0.118
68	5.67	0.27	0.160	(0.151)	0.042	0.118
69	5.75	0.27	0.160	(0.151)	0.042	0.118
70	5.83	0.27	0.160	(0.150)	0.042	0.118
71	5.92	0.27	0.160	(0.149)	0.042	0.118
72	6.00	0.27	0.160	(0.149)	0.042	0.118
73	6.08	0.30	0.180	(0.148)	0.047	0.133
74	6.17	0.30	0.180	(0.147)	0.047	0.133
75	6.25	0.30	0.180	(0.147)	0.047	0.133
76	6.33	0.30	0.180	(0.146)	0.047	0.133
77	6.42	0.30	0.180	(0.145)	0.047	0.133
78	6.50	0.30	0.180	(0.145)	0.047	0.133
79	6.58	0.33	0.200	(0.144)	0.052	0.148
80	6.67	0.33	0.200	(0.143)	0.052	0.148
81	6.75	0.33	0.200	(0.143)	0.052	0.148
82	6.83	0.33	0.200	(0.142)	0.052	0.148
83	6.92	0.33	0.200	(0.141)	0.052	0.148
84	7.00	0.33	0.200	(0.141)	0.052	0.148
85	7.08	0.33	0.200	(0.140)	0.052	0.148
86	7.17	0.33	0.200	(0.139)	0.052	0.148
87	7.25	0.33	0.200	(0.139)	0.052	0.148
88	7.33	0.37	0.220	(0.138)	0.057	0.163
89	7.42	0.37	0.220	(0.138)	0.057	0.163
90	7.50	0.37	0.220	(0.137)	0.057	0.163
91	7.58	0.40	0.240	(0.136)	0.062	0.178
92	7.67	0.40	0.240	(0.136)	0.062	0.178
93	7.75	0.40	0.240	(0.135)	0.062	0.178
94	7.83	0.43	0.260	(0.134)	0.068	0.192
95	7.92	0.43	0.260	(0.134)	0.068	0.192
96	8.00	0.43	0.260	(0.133)	0.068	0.192
97	8.08	0.50	0.300	(0.133)	0.078	0.222
98	8.17	0.50	0.300	(0.132)	0.078	0.222
99	8.25	0.50	0.300	(0.131)	0.078	0.222
100	8.33	0.50	0.300	(0.131)	0.078	0.222
101	8.42	0.50	0.300	(0.130)	0.078	0.222
102	8.50	0.50	0.300	(0.130)	0.078	0.222
103	8.58	0.53	0.320	(0.129)	0.083	0.237
104	8.67	0.53	0.320	(0.128)	0.083	0.237
105	8.75	0.53	0.320	(0.128)	0.083	0.237
106	8.83	0.57	0.340	(0.127)	0.088	0.252
107	8.92	0.57	0.340	(0.126)	0.088	0.252
108	9.00	0.57	0.340	(0.126)	0.088	0.252
109	9.08	0.63	0.380	(0.125)	0.099	0.281
110	9.17	0.63	0.380	(0.125)	0.099	0.281
111	9.25	0.63	0.380	(0.124)	0.099	0.281
112	9.33	0.67	0.400	(0.124)	0.104	0.296
113	9.42	0.67	0.400	(0.123)	0.104	0.296
114	9.50	0.67	0.400	(0.122)	0.104	0.296
115	9.58	0.70	0.420	(0.122)	0.109	0.311
116	9.67	0.70	0.420	(0.121)	0.109	0.311
117	9.75	0.70	0.420	(0.121)	0.109	0.311
118	9.83	0.73	0.440	(0.120)	0.114	0.326
119	9.92	0.73	0.440	(0.119)	0.114	0.326
120	10.00	0.73	0.440	(0.119)	0.114	0.326

121	10.08	0.50	0.300	(0.118)	0.078	0.222
122	10.17	0.50	0.300	(0.118)	0.078	0.222
123	10.25	0.50	0.300	(0.117)	0.078	0.222
124	10.33	0.50	0.300	(0.117)	0.078	0.222
125	10.42	0.50	0.300	(0.116)	0.078	0.222
126	10.50	0.50	0.300	(0.115)	0.078	0.222
127	10.58	0.67	0.400	(0.115)	0.104	0.296
128	10.67	0.67	0.400	(0.114)	0.104	0.296
129	10.75	0.67	0.400	(0.114)	0.104	0.296
130	10.83	0.67	0.400	(0.113)	0.104	0.296
131	10.92	0.67	0.400	(0.113)	0.104	0.296
132	11.00	0.67	0.400	(0.112)	0.104	0.296
133	11.08	0.63	0.380	(0.112)	0.099	0.281
134	11.17	0.63	0.380	(0.111)	0.099	0.281
135	11.25	0.63	0.380	(0.110)	0.099	0.281
136	11.33	0.63	0.380	(0.110)	0.099	0.281
137	11.42	0.63	0.380	(0.109)	0.099	0.281
138	11.50	0.63	0.380	(0.109)	0.099	0.281
139	11.58	0.57	0.340	(0.108)	0.088	0.252
140	11.67	0.57	0.340	(0.108)	0.088	0.252
141	11.75	0.57	0.340	(0.107)	0.088	0.252
142	11.83	0.60	0.360	(0.107)	0.094	0.266
143	11.92	0.60	0.360	(0.106)	0.094	0.266
144	12.00	0.60	0.360	(0.106)	0.094	0.266
145	12.08	0.83	0.500	0.105	(0.130)	0.395
146	12.17	0.83	0.500	0.105	(0.130)	0.395
147	12.25	0.83	0.500	0.104	(0.130)	0.396
148	12.33	0.87	0.520	0.103	(0.135)	0.417
149	12.42	0.87	0.520	0.103	(0.135)	0.417
150	12.50	0.87	0.520	0.102	(0.135)	0.418
151	12.58	0.93	0.560	0.102	(0.146)	0.458
152	12.67	0.93	0.560	0.101	(0.146)	0.459
153	12.75	0.93	0.560	0.101	(0.146)	0.459
154	12.83	0.97	0.580	0.100	(0.151)	0.480
155	12.92	0.97	0.580	0.100	(0.151)	0.480
156	13.00	0.97	0.580	0.099	(0.151)	0.481
157	13.08	1.13	0.680	0.099	(0.177)	0.581
158	13.17	1.13	0.680	0.098	(0.177)	0.582
159	13.25	1.13	0.680	0.098	(0.177)	0.582
160	13.33	1.13	0.680	0.097	(0.177)	0.583
161	13.42	1.13	0.680	0.097	(0.177)	0.583
162	13.50	1.13	0.680	0.096	(0.177)	0.584
163	13.58	0.77	0.460	0.096	(0.120)	0.364
164	13.67	0.77	0.460	0.095	(0.120)	0.365
165	13.75	0.77	0.460	0.095	(0.120)	0.365
166	13.83	0.77	0.460	0.094	(0.120)	0.366
167	13.92	0.77	0.460	0.094	(0.120)	0.366
168	14.00	0.77	0.460	0.093	(0.120)	0.367
169	14.08	0.90	0.540	0.093	(0.140)	0.447
170	14.17	0.90	0.540	0.093	(0.140)	0.447
171	14.25	0.90	0.540	0.092	(0.140)	0.448
172	14.33	0.87	0.520	0.092	(0.135)	0.428
173	14.42	0.87	0.520	0.091	(0.135)	0.429
174	14.50	0.87	0.520	0.091	(0.135)	0.429
175	14.58	0.87	0.520	0.090	(0.135)	0.430
176	14.67	0.87	0.520	0.090	(0.135)	0.430
177	14.75	0.87	0.520	0.089	(0.135)	0.431

178	14.83	0.83	0.500		0.089	(	0.130)	0.411
179	14.92	0.83	0.500		0.088	(	0.130)	0.412
180	15.00	0.83	0.500		0.088	(	0.130)	0.412
181	15.08	0.80	0.480		0.087	(	0.125)	0.393
182	15.17	0.80	0.480		0.087	(	0.125)	0.393
183	15.25	0.80	0.480		0.087	(	0.125)	0.393
184	15.33	0.77	0.460		0.086	(	0.120)	0.374
185	15.42	0.77	0.460		0.086	(	0.120)	0.374
186	15.50	0.77	0.460		0.085	(	0.120)	0.375
187	15.58	0.63	0.380		0.085	(	0.099)	0.295
188	15.67	0.63	0.380		0.084	(	0.099)	0.296
189	15.75	0.63	0.380		0.084	(	0.099)	0.296
190	15.83	0.63	0.380		0.084	(	0.099)	0.296
191	15.92	0.63	0.380		0.083	(	0.099)	0.297
192	16.00	0.63	0.380		0.083	(	0.099)	0.297
193	16.08	0.13	0.080	(	0.082)		0.021	0.059
194	16.17	0.13	0.080	(	0.082)		0.021	0.059
195	16.25	0.13	0.080	(	0.081)		0.021	0.059
196	16.33	0.13	0.080	(	0.081)		0.021	0.059
197	16.42	0.13	0.080	(	0.081)		0.021	0.059
198	16.50	0.13	0.080	(	0.080)		0.021	0.059
199	16.58	0.10	0.060	(	0.080)		0.016	0.044
200	16.67	0.10	0.060	(	0.079)		0.016	0.044
201	16.75	0.10	0.060	(	0.079)		0.016	0.044
202	16.83	0.10	0.060	(	0.079)		0.016	0.044
203	16.92	0.10	0.060	(	0.078)		0.016	0.044
204	17.00	0.10	0.060	(	0.078)		0.016	0.044
205	17.08	0.17	0.100	(	0.077)		0.026	0.074
206	17.17	0.17	0.100	(	0.077)		0.026	0.074
207	17.25	0.17	0.100	(	0.077)		0.026	0.074
208	17.33	0.17	0.100	(	0.076)		0.026	0.074
209	17.42	0.17	0.100	(	0.076)		0.026	0.074
210	17.50	0.17	0.100	(	0.075)		0.026	0.074
211	17.58	0.17	0.100	(	0.075)		0.026	0.074
212	17.67	0.17	0.100	(	0.075)		0.026	0.074
213	17.75	0.17	0.100	(	0.074)		0.026	0.074
214	17.83	0.13	0.080	(	0.074)		0.021	0.059
215	17.92	0.13	0.080	(	0.074)		0.021	0.059
216	18.00	0.13	0.080	(	0.073)		0.021	0.059
217	18.08	0.13	0.080	(	0.073)		0.021	0.059
218	18.17	0.13	0.080	(	0.072)		0.021	0.059
219	18.25	0.13	0.080	(	0.072)		0.021	0.059
220	18.33	0.13	0.080	(	0.072)		0.021	0.059
221	18.42	0.13	0.080	(	0.071)		0.021	0.059
222	18.50	0.13	0.080	(	0.071)		0.021	0.059
223	18.58	0.10	0.060	(	0.071)		0.016	0.044
224	18.67	0.10	0.060	(	0.070)		0.016	0.044
225	18.75	0.10	0.060	(	0.070)		0.016	0.044
226	18.83	0.07	0.040	(	0.070)		0.010	0.030
227	18.92	0.07	0.040	(	0.069)		0.010	0.030
228	19.00	0.07	0.040	(	0.069)		0.010	0.030
229	19.08	0.10	0.060	(	0.069)		0.016	0.044
230	19.17	0.10	0.060	(	0.068)		0.016	0.044
231	19.25	0.10	0.060	(	0.068)		0.016	0.044
232	19.33	0.13	0.080	(	0.068)		0.021	0.059
233	19.42	0.13	0.080	(	0.067)		0.021	0.059
234	19.50	0.13	0.080	(	0.067)		0.021	0.059

235	19.58	0.10	0.060	(0.067)	0.016	0.044
236	19.67	0.10	0.060	(0.067)	0.016	0.044
237	19.75	0.10	0.060	(0.066)	0.016	0.044
238	19.83	0.07	0.040	(0.066)	0.010	0.030
239	19.92	0.07	0.040	(0.066)	0.010	0.030
240	20.00	0.07	0.040	(0.065)	0.010	0.030
241	20.08	0.10	0.060	(0.065)	0.016	0.044
242	20.17	0.10	0.060	(0.065)	0.016	0.044
243	20.25	0.10	0.060	(0.064)	0.016	0.044
244	20.33	0.10	0.060	(0.064)	0.016	0.044
245	20.42	0.10	0.060	(0.064)	0.016	0.044
246	20.50	0.10	0.060	(0.064)	0.016	0.044
247	20.58	0.10	0.060	(0.063)	0.016	0.044
248	20.67	0.10	0.060	(0.063)	0.016	0.044
249	20.75	0.10	0.060	(0.063)	0.016	0.044
250	20.83	0.07	0.040	(0.063)	0.010	0.030
251	20.92	0.07	0.040	(0.062)	0.010	0.030
252	21.00	0.07	0.040	(0.062)	0.010	0.030
253	21.08	0.10	0.060	(0.062)	0.016	0.044
254	21.17	0.10	0.060	(0.062)	0.016	0.044
255	21.25	0.10	0.060	(0.061)	0.016	0.044
256	21.33	0.07	0.040	(0.061)	0.010	0.030
257	21.42	0.07	0.040	(0.061)	0.010	0.030
258	21.50	0.07	0.040	(0.061)	0.010	0.030
259	21.58	0.10	0.060	(0.060)	0.016	0.044
260	21.67	0.10	0.060	(0.060)	0.016	0.044
261	21.75	0.10	0.060	(0.060)	0.016	0.044
262	21.83	0.07	0.040	(0.060)	0.010	0.030
263	21.92	0.07	0.040	(0.060)	0.010	0.030
264	22.00	0.07	0.040	(0.059)	0.010	0.030
265	22.08	0.10	0.060	(0.059)	0.016	0.044
266	22.17	0.10	0.060	(0.059)	0.016	0.044
267	22.25	0.10	0.060	(0.059)	0.016	0.044
268	22.33	0.07	0.040	(0.059)	0.010	0.030
269	22.42	0.07	0.040	(0.058)	0.010	0.030
270	22.50	0.07	0.040	(0.058)	0.010	0.030
271	22.58	0.07	0.040	(0.058)	0.010	0.030
272	22.67	0.07	0.040	(0.058)	0.010	0.030
273	22.75	0.07	0.040	(0.058)	0.010	0.030
274	22.83	0.07	0.040	(0.058)	0.010	0.030
275	22.92	0.07	0.040	(0.058)	0.010	0.030
276	23.00	0.07	0.040	(0.057)	0.010	0.030
277	23.08	0.07	0.040	(0.057)	0.010	0.030
278	23.17	0.07	0.040	(0.057)	0.010	0.030
279	23.25	0.07	0.040	(0.057)	0.010	0.030
280	23.33	0.07	0.040	(0.057)	0.010	0.030
281	23.42	0.07	0.040	(0.057)	0.010	0.030
282	23.50	0.07	0.040	(0.057)	0.010	0.030
283	23.58	0.07	0.040	(0.057)	0.010	0.030
284	23.67	0.07	0.040	(0.057)	0.010	0.030
285	23.75	0.07	0.040	(0.056)	0.010	0.030
286	23.83	0.07	0.040	(0.056)	0.010	0.030
287	23.92	0.07	0.040	(0.056)	0.010	0.030
288	24.00	0.07	0.040	(0.056)	0.010	0.030

(Loss Rate Not Used)

Sum = 100.0 Sum = 46.3

Flood volume = Effective rainfall 3.86(In)

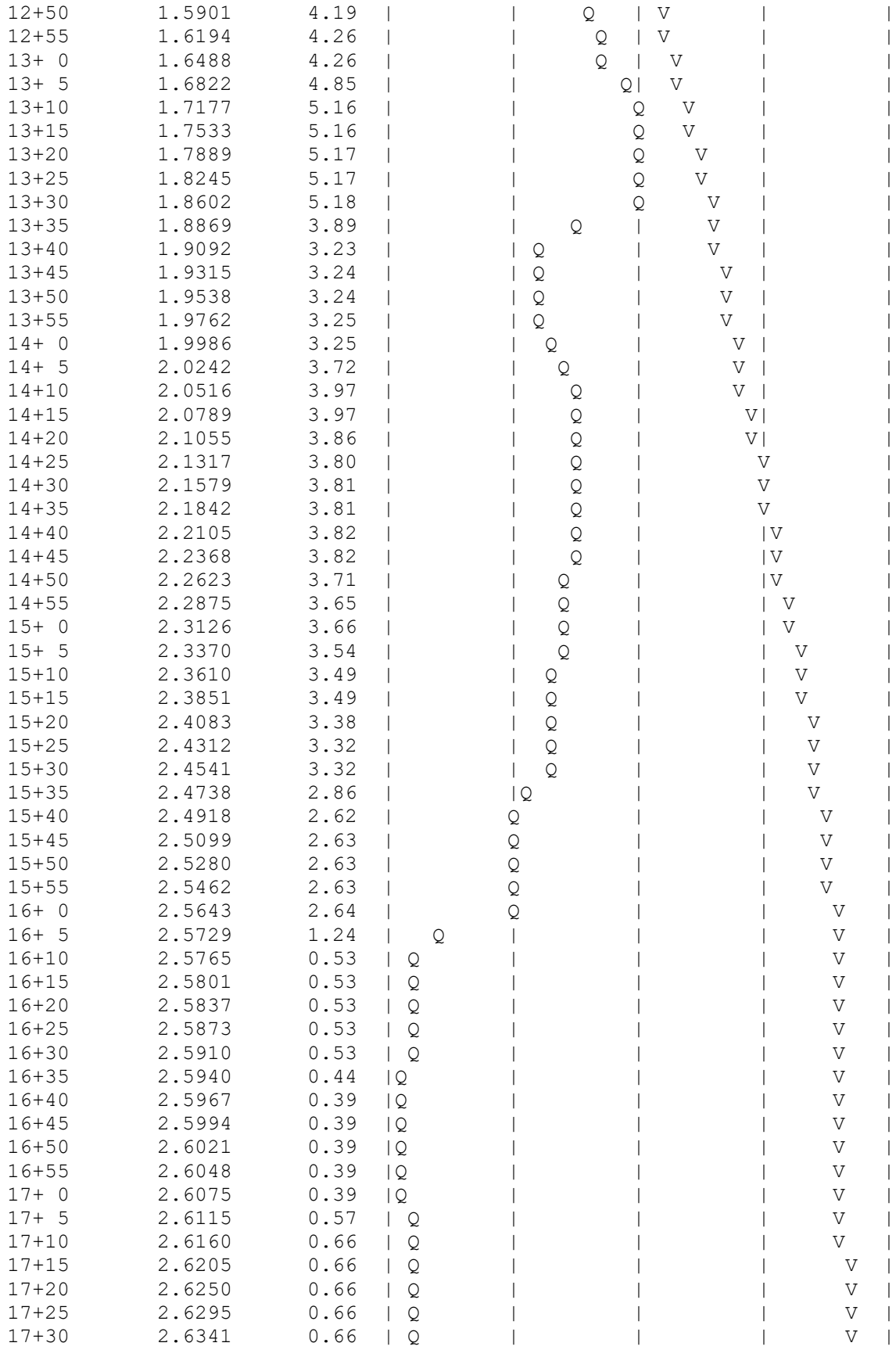
```
 times area       8.8(Ac.)/[(In)/(Ft.)] =       2.8(Ac.Ft)
Total soil loss =      1.14(In)
Total soil loss =     0.836(Ac.Ft)
Total rainfall =      5.00(In)
Flood volume =      123316.1 Cubic Feet
Total soil loss =       36401.1 Cubic Feet
--------------------------------------------------------------------
 Peak flow rate of this hydrograph =      5.177(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	2.5	5.0	7.5	10.0
0+ 5	0.0012	0.17	Q				
0+10	0.0030	0.26	VQ				
0+15	0.0048	0.26	VQ				
0+20	0.0072	0.35	VQ				
0+25	0.0099	0.39	VQ				
0+30	0.0126	0.39	VQ				
0+35	0.0154	0.39	VQ				
0+40	0.0181	0.39	VQ				
0+45	0.0208	0.39	VQ				
0+50	0.0241	0.48	VQ				
0+55	0.0277	0.53	V Q				
1+ 0	0.0313	0.53	V Q				
1+ 5	0.0344	0.44	VQ				
1+10	0.0371	0.39	VQ				
1+15	0.0398	0.39	VQ				
1+20	0.0425	0.39	VQ				
1+25	0.0452	0.39	VQ				
1+30	0.0479	0.39	VQ				
1+35	0.0506	0.39	VQ				
1+40	0.0533	0.39	VQ				
1+45	0.0561	0.39	VQ				
1+50	0.0594	0.48	VQ				
1+55	0.0630	0.53	V Q				
2+ 0	0.0666	0.53	V Q				
2+ 5	0.0702	0.53	V Q				
2+10	0.0738	0.53	|VQ				
2+15	0.0775	0.53	|VQ				
2+20	0.0811	0.53	|VQ				
2+25	0.0847	0.53	|VQ				
2+30	0.0883	0.53	|VQ				
2+35	0.0925	0.61	|VQ				
2+40	0.0971	0.66	|VQ				
2+45	0.1016	0.66	|VQ				
2+50	0.1061	0.66	|VQ				
2+55	0.1106	0.66	|VQ				
3+ 0	0.1151	0.66	|VQ				
3+ 5	0.1197	0.66	|VQ				
3+10	0.1242	0.66	|VQ				
3+15	0.1287	0.66	|VQ				

3+20	0.1332	0.66	VQ				
3+25	0.1378	0.66	VQ				
3+30	0.1423	0.66	Q				
3+35	0.1468	0.66	Q				
3+40	0.1513	0.66	Q				
3+45	0.1558	0.66	Q				
3+50	0.1610	0.74	Q				
3+55	0.1664	0.79	VQ				
4+ 0	0.1718	0.79	VQ				
4+ 5	0.1772	0.79	VQ				
4+10	0.1827	0.79	VQ				
4+15	0.1881	0.79	VQ				
4+20	0.1941	0.87	VQ				
4+25	0.2004	0.92	VQ				
4+30	0.2068	0.92	VQ				
4+35	0.2131	0.92	Q				
4+40	0.2194	0.92	Q				
4+45	0.2258	0.92	Q				
4+50	0.2327	1.01	VQ				
4+55	0.2399	1.05	VQ				
5+ 0	0.2472	1.05	VQ				
5+ 5	0.2532	0.88	Q				
5+10	0.2586	0.79	Q				
5+15	0.2641	0.79	Q				
5+20	0.2701	0.87	Q				
5+25	0.2764	0.92	Q				
5+30	0.2828	0.92	Q				
5+35	0.2897	1.01	Q				
5+40	0.2969	1.05	Q				
5+45	0.3042	1.05	Q				
5+50	0.3114	1.05	Q				
5+55	0.3186	1.05	Q				
6+ 0	0.3259	1.05	Q				
6+ 5	0.3337	1.14	Q				
6+10	0.3418	1.18	Q				
6+15	0.3500	1.18	Q				
6+20	0.3581	1.18	QV				
6+25	0.3663	1.18	QV				
6+30	0.3744	1.18	QV				
6+35	0.3831	1.27	Q				
6+40	0.3922	1.31	Q				
6+45	0.4012	1.31	Q				
6+50	0.4103	1.31	Q				
6+55	0.4193	1.31	Q				
7+ 0	0.4284	1.31	QV				
7+ 5	0.4374	1.31	QV				
7+10	0.4464	1.31	QV				
7+15	0.4555	1.31	QV				
7+20	0.4651	1.40	QV				
7+25	0.4751	1.44	QV				
7+30	0.4850	1.44	QV				
7+35	0.4956	1.53	QV				
7+40	0.5064	1.58	QV				
7+45	0.5173	1.58	QV				
7+50	0.5287	1.66	QV				
7+55	0.5405	1.71	QV				
8+ 0	0.5522	1.71	QV				

8+ 5	0.5652	1.88	Q			
8+10	0.5788	1.97	QV			
8+15	0.5923	1.97	QV			
8+20	0.6059	1.97	QV			
8+25	0.6195	1.97	QV			
8+30	0.6330	1.97	QV			
8+35	0.6472	2.06	QV			
8+40	0.6617	2.10	QV			
8+45	0.6761	2.10	QV			
8+50	0.6912	2.19	QV			
8+55	0.7066	2.23	QV			
9+ 0	0.7220	2.23	Q V			
9+ 5	0.7385	2.41	QV			
9+10	0.7557	2.50	QV			
9+15	0.7729	2.50	QV			
9+20	0.7907	2.58	QV			
9+25	0.8088	2.63	QV			
9+30	0.8269	2.63	QV			
9+35	0.8455	2.71	QV			
9+40	0.8645	2.76	QV			
9+45	0.8835	2.76	QV			
9+50	0.9031	2.84	QV			
9+55	0.9230	2.89	Q V			
10+ 0	0.9429	2.89	Q V			
10+ 5	0.9586	2.28	Q V			
10+10	0.9722	1.97	Q V			
10+15	0.9858	1.97	Q V			
10+20	0.9993	1.97	Q V			
10+25	1.0129	1.97	Q V			
10+30	1.0265	1.97	Q V			
10+35	1.0430	2.40	Q V			
10+40	1.0611	2.63	Q V			
10+45	1.0792	2.63	Q V			
10+50	1.0973	2.63	Q V			
10+55	1.1154	2.63	Q V			
11+ 0	1.1335	2.63	Q V			
11+ 5	1.1509	2.54	Q V			
11+10	1.1681	2.50	Q V			
11+15	1.1853	2.50	Q V			
11+20	1.2025	2.50	Q V			
11+25	1.2197	2.50	Q V			
11+30	1.2369	2.50	Q V			
11+35	1.2529	2.32	Q V			
11+40	1.2682	2.23	Q V			
11+45	1.2836	2.23	Q V			
11+50	1.2996	2.32	Q V			
11+55	1.3159	2.36	Q V			
12+ 0	1.3321	2.36	Q V			
12+ 5	1.3536	3.12	Q V			
12+10	1.3778	3.51	Q V			
12+15	1.4020	3.51	Q V			
12+20	1.4270	3.63	Q V			
12+25	1.4525	3.70	Q V			
12+30	1.4780	3.70	Q V			
12+35	1.5051	3.94	Q V			
12+40	1.5331	4.07	Q V			
12+45	1.5612	4.07	Q V			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12+55 1.6194 4.26
13+ 0 1.6488 4.26
13+ 5 1.6822 4.85
13+10 1.7177 5.16
13+15 1.7533 5.16
13+20 1.7889 5.17
13+25 1.8245 5.17
13+30 1.8602 5.18
13+35 1.8869 3.89
13+40 1.9092 3.23
13+45 1.9315 3.24
13+50 1.9538 3.24
13+55 1.9762 3.25
14+ 0 1.9986 3.25
14+ 5 2.0242 3.72
14+10 2.0516 3.97
14+15 2.0789 3.97
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16+55 2.6048 0.39
17+ 0 2.6075 0.39
17+ 5 2.6115 0.57
17+10 2.6160 0.66
17+15 2.6205 0.66
17+20 2.6250 0.66
17+25 2.6295 0.66
17+30 2.6341 0.66

17+35	2.6386	0.66	| Q	|	|	|	V |
17+40	2.6431	0.66	| Q	|	|	|	V |
17+45	2.6476	0.66	| Q	|	|	|	V |
17+50	2.6516	0.57	| Q	|	|	|	V |
17+55	2.6552	0.53	| Q	|	|	|	V |
18+ 0	2.6588	0.53	| Q	|	|	|	V |
18+ 5	2.6624	0.53	| Q	|	|	|	V |
18+10	2.6660	0.53	| Q	|	|	|	V |
18+15	2.6696	0.53	| Q	|	|	|	V |
18+20	2.6733	0.53	| Q	|	|	|	V |
18+25	2.6769	0.53	| Q	|	|	|	V |
18+30	2.6805	0.53	| Q	|	|	|	V |
18+35	2.6835	0.44	|Q	|	|	|	V |
18+40	2.6862	0.39	|Q	|	|	|	V |
18+45	2.6889	0.39	|Q	|	|	|	V |
18+50	2.6911	0.31	|Q	|	|	|	V |
18+55	2.6929	0.26	|Q	|	|	|	V |
19+ 0	2.6947	0.26	|Q	|	|	|	V |
19+ 5	2.6971	0.35	|Q	|	|	|	V |
19+10	2.6998	0.39	|Q	|	|	|	V |
19+15	2.7025	0.39	|Q	|	|	|	V |
19+20	2.7058	0.48	|Q	|	|	|	V |
19+25	2.7094	0.53	| Q	|	|	|	V |
19+30	2.7131	0.53	| Q	|	|	|	V |
19+35	2.7161	0.44	|Q	|	|	|	V |
19+40	2.7188	0.39	|Q	|	|	|	V |
19+45	2.7215	0.39	|Q	|	|	|	V |
19+50	2.7236	0.31	|Q	|	|	|	V |
19+55	2.7254	0.26	|Q	|	|	|	V |
20+ 0	2.7272	0.26	|Q	|	|	|	V |
20+ 5	2.7296	0.35	|Q	|	|	|	V |
20+10	2.7324	0.39	|Q	|	|	|	V |
20+15	2.7351	0.39	|Q	|	|	|	V |
20+20	2.7378	0.39	|Q	|	|	|	V |
20+25	2.7405	0.39	|Q	|	|	|	V |
20+30	2.7432	0.39	|Q	|	|	|	V |
20+35	2.7459	0.39	|Q	|	|	|	V |
20+40	2.7486	0.39	|Q	|	|	|	V |
20+45	2.7513	0.39	|Q	|	|	|	V |
20+50	2.7535	0.31	|Q	|	|	|	V |
20+55	2.7553	0.26	|Q	|	|	|	V |
21+ 0	2.7571	0.26	|Q	|	|	|	V |
21+ 5	2.7595	0.35	|Q	|	|	|	V |
21+10	2.7622	0.39	|Q	|	|	|	V|
21+15	2.7649	0.39	|Q	|	|	|	V|
21+20	2.7670	0.31	|Q	|	|	|	V|
21+25	2.7688	0.26	|Q	|	|	|	V|
21+30	2.7706	0.26	|Q	|	|	|	V|
21+35	2.7731	0.35	|Q	|	|	|	V|
21+40	2.7758	0.39	|Q	|	|	|	V|
21+45	2.7785	0.39	|Q	|	|	|	V|
21+50	2.7806	0.31	|Q	|	|	|	V|
21+55	2.7824	0.26	|Q	|	|	|	V|
22+ 0	2.7842	0.26	|Q	|	|	|	V|
22+ 5	2.7866	0.35	|Q	|	|	|	V|
22+10	2.7893	0.39	|Q	|	|	|	V|
22+15	2.7920	0.39	|Q	|	|	|	V|

22+20	2.7942	0.31	|Q	|	|	|	V|
22+25	2.7960	0.26	|Q	|	|	|	V|
22+30	2.7978	0.26	|Q	|	|	|	V|
22+35	2.7996	0.26	|Q	|	|	|	V|
22+40	2.8014	0.26	|Q	|	|	|	V|
22+45	2.8032	0.26	|Q	|	|	|	V|
22+50	2.8050	0.26	|Q	|	|	|	V|
22+55	2.8068	0.26	|Q	|	|	|	V|
23+ 0	2.8086	0.26	|Q	|	|	|	V|
23+ 5	2.8104	0.26	|Q	|	|	|	V|
23+10	2.8122	0.26	|Q	|	|	|	V|
23+15	2.8141	0.26	|Q	|	|	|	V|
23+20	2.8159	0.26	|Q	|	|	|	V|
23+25	2.8177	0.26	|Q	|	|	|	V|
23+30	2.8195	0.26	|Q	|	|	|	V|
23+35	2.8213	0.26	|Q	|	|	|	V|
23+40	2.8231	0.26	|Q	|	|	|	V|
23+45	2.8249	0.26	|Q	|	|	|	V|
23+50	2.8267	0.26	|Q	|	|	|	V|
23+55	2.8285	0.26	|Q	|	|	|	V|
24+ 0	2.8303	0.26	|Q	|	|	|	V|
24+ 5	2.8309	0.09	Q	|	|	|	V|

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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION - WATERSHED A
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 9.71(Ac.) = 0.015 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 9.71(Ac.) = 0.015 Sq. Mi.
Length along longest watercourse = 1138.00(Ft.)
Length along longest watercourse measured to centroid = 638.00(Ft.)
Length along longest watercourse = 0.216 Mi.
Length along longest watercourse measured to centroid = 0.121 Mi.
Difference in elevation = 14.60(Ft.)
Slope along watercourse = 67.7399 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.081 Hr.
Lag time = 4.85 Min.
25% of lag time = 1.21 Min.
40% of lag time = 1.94 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.71	1.20	11.65

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.71	2.50	24.28

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.710	60.10	0.500

Total Area Entered = 9.71(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
60.1	60.1	0.469	0.500	0.258	1.000	0.258
					Sum (F) =	0.258

Area averaged mean soil loss (F) (In/Hr) = 0.258
Minimum soil loss rate ((In/Hr)) = 0.129
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	103.129	20.160	1.973
2	0.167	206.259	48.606	4.756
3	0.250	309.388	15.181	1.486
4	0.333	412.518	6.899	0.675
5	0.417	515.647	3.854	0.377
6	0.500	618.777	2.481	0.243
7	0.583	721.906	1.504	0.147
8	0.667	825.035	1.315	0.129
		Sum = 100.000	Sum=	9.786

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.50	0.150	(0.258)	0.075	0.075

2	0.17	0.60	0.180	(0.258)	0.090	0.090
3	0.25	0.60	0.180	(0.258)	0.090	0.090
4	0.33	0.60	0.180	(0.258)	0.090	0.090
5	0.42	0.60	0.180	(0.258)	0.090	0.090
6	0.50	0.70	0.210	(0.258)	0.105	0.105
7	0.58	0.70	0.210	(0.258)	0.105	0.105
8	0.67	0.70	0.210	(0.258)	0.105	0.105
9	0.75	0.70	0.210	(0.258)	0.105	0.105
10	0.83	0.70	0.210	(0.258)	0.105	0.105
11	0.92	0.70	0.210	(0.258)	0.105	0.105
12	1.00	0.80	0.240	(0.258)	0.120	0.120
13	1.08	0.80	0.240	(0.258)	0.120	0.120
14	1.17	0.80	0.240	(0.258)	0.120	0.120
15	1.25	0.80	0.240	(0.258)	0.120	0.120
16	1.33	0.80	0.240	(0.258)	0.120	0.120
17	1.42	0.80	0.240	(0.258)	0.120	0.120
18	1.50	0.80	0.240	(0.258)	0.120	0.120
19	1.58	0.80	0.240	(0.258)	0.120	0.120
20	1.67	0.80	0.240	(0.258)	0.120	0.120
21	1.75	0.80	0.240	(0.258)	0.120	0.120
22	1.83	0.80	0.240	(0.258)	0.120	0.120
23	1.92	0.80	0.240	(0.258)	0.120	0.120
24	2.00	0.90	0.270	(0.258)	0.135	0.135
25	2.08	0.80	0.240	(0.258)	0.120	0.120
26	2.17	0.90	0.270	(0.258)	0.135	0.135
27	2.25	0.90	0.270	(0.258)	0.135	0.135
28	2.33	0.90	0.270	(0.258)	0.135	0.135
29	2.42	0.90	0.270	(0.258)	0.135	0.135
30	2.50	0.90	0.270	(0.258)	0.135	0.135
31	2.58	0.90	0.270	(0.258)	0.135	0.135
32	2.67	0.90	0.270	(0.258)	0.135	0.135
33	2.75	1.00	0.300	(0.258)	0.150	0.150
34	2.83	1.00	0.300	(0.258)	0.150	0.150
35	2.92	1.00	0.300	(0.258)	0.150	0.150
36	3.00	1.00	0.300	(0.258)	0.150	0.150
37	3.08	1.00	0.300	(0.258)	0.150	0.150
38	3.17	1.10	0.330	(0.258)	0.165	0.165
39	3.25	1.10	0.330	(0.258)	0.165	0.165
40	3.33	1.10	0.330	(0.258)	0.165	0.165
41	3.42	1.20	0.360	(0.258)	0.180	0.180
42	3.50	1.30	0.390	(0.258)	0.195	0.195
43	3.58	1.40	0.420	(0.258)	0.210	0.210
44	3.67	1.40	0.420	(0.258)	0.210	0.210
45	3.75	1.50	0.450	(0.258)	0.225	0.225
46	3.83	1.50	0.450	(0.258)	0.225	0.225
47	3.92	1.60	0.480	(0.258)	0.240	0.240
48	4.00	1.60	0.480	(0.258)	0.240	0.240
49	4.08	1.70	0.510	(0.258)	0.255	0.255
50	4.17	1.80	0.540	0.258	(0.270)	0.282
51	4.25	1.90	0.570	0.258	(0.285)	0.312
52	4.33	2.00	0.600	0.258	(0.300)	0.342
53	4.42	2.10	0.630	0.258	(0.315)	0.372
54	4.50	2.10	0.630	0.258	(0.315)	0.372
55	4.58	2.20	0.660	0.258	(0.330)	0.402
56	4.67	2.30	0.690	0.258	(0.345)	0.432
57	4.75	2.40	0.720	0.258	(0.360)	0.462
58	4.83	2.40	0.720	0.258	(0.360)	0.462

59	4.92	2.50	0.750	0.258	(0.375)		0.492
60	5.00	2.60	0.780	0.258	(0.390)		0.522
61	5.08	3.10	0.930	0.258	(0.465)		0.672
62	5.17	3.60	1.080	0.258	(0.540)		0.822
63	5.25	3.90	1.170	0.258	(0.585)		0.912
64	5.33	4.20	1.260	0.258	(0.630)		1.002
65	5.42	4.70	1.410	0.258	(0.705)		1.152
66	5.50	5.60	1.680	0.258	(0.840)		1.422
67	5.58	1.90	0.570	0.258	(0.285)		0.312
68	5.67	0.90	0.270	(0.258)	0.135		0.135
69	5.75	0.60	0.180	(0.258)	0.090		0.090
70	5.83	0.50	0.150	(0.258)	0.075		0.075
71	5.92	0.30	0.090	(0.258)	0.045		0.045
72	6.00	0.20	0.060	(0.258)	0.030		0.030

(Loss Rate Not Used)

Sum = 100.0 Sum = 18.1

Flood volume = Effective rainfall 1.50(In)
times area 9.7(Ac.)/[(In)/(Ft.)] = 1.2(Ac.Ft)
Total soil loss = 1.00(In)
Total soil loss = 0.806(Ac.Ft)
Total rainfall = 2.50(In)
Flood volume = 53023.5 Cubic Feet
Total soil loss = 35091.8 Cubic Feet

Peak flow rate of this hydrograph = 11.009(CFS)

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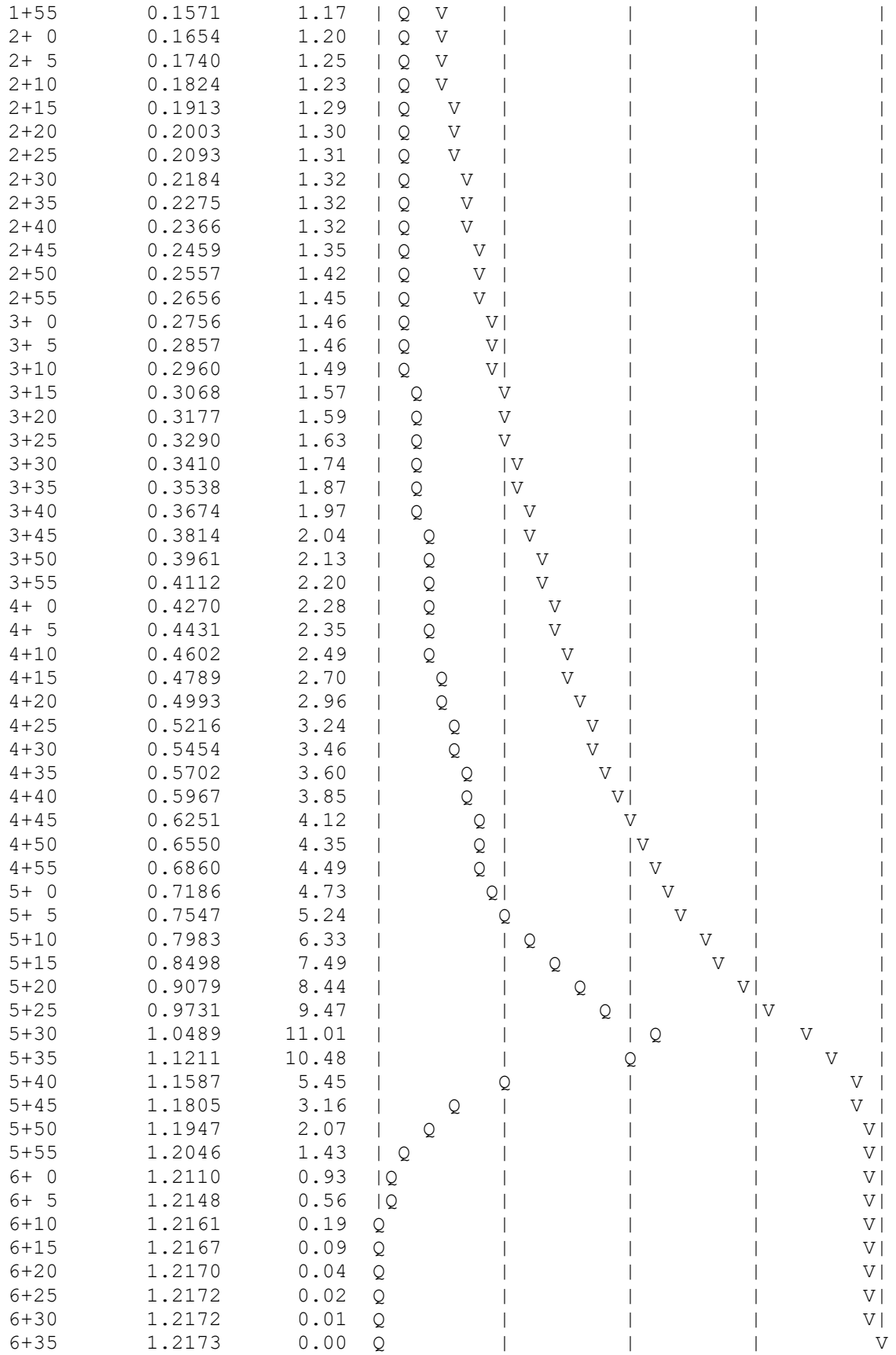
6 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0010	0.15	Q				
0+10	0.0047	0.53	VQ				
0+15	0.0096	0.72	VQ				
0+20	0.0151	0.79	VQ				
0+25	0.0208	0.83	VQ				
0+30	0.0269	0.88	VQ				
0+35	0.0335	0.97	|Q				
0+40	0.0404	1.00	|VQ				
0+45	0.0474	1.01	|VQ				
0+50	0.0545	1.02	|VQ				
0+55	0.0615	1.02	| Q				
1+ 0	0.0688	1.06	| Q				
1+ 5	0.0766	1.13	| Q				
1+10	0.0845	1.15	| Q				
1+15	0.0925	1.16	| QV				
1+20	0.1005	1.17	| QV				
1+25	0.1086	1.17	| QV				
1+30	0.1167	1.17	| QV				
1+35	0.1248	1.17	| Q V				
1+40	0.1328	1.17	| Q V				
1+45	0.1409	1.17	| Q V				
1+50	0.1490	1.17	| Q V				



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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION - WATERSHED B
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 7.54(Ac.) = 0.012 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 7.54(Ac.) = 0.012 Sq. Mi.
Length along longest watercourse = 864.00(Ft.)
Length along longest watercourse measured to centroid = 584.00(Ft.)
Length along longest watercourse = 0.164 Mi.
Length along longest watercourse measured to centroid = 0.111 Mi.
Difference in elevation = 13.90(Ft.)
Slope along watercourse = 84.9444 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.067 Hr.
Lag time = 4.04 Min.
25% of lag time = 1.01 Min.
40% of lag time = 1.62 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
7.54	1.20	9.05

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
7.54	2.50	18.85

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
7.540	69.78	0.500

Total Area Entered = 7.54(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
69.8	69.8	0.364	0.500	0.200	1.000	0.200
					Sum (F) =	0.200

Area averaged mean soil loss (F) (In/Hr) = 0.200
Minimum soil loss rate ((In/Hr)) = 0.100
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	123.627	26.240	1.994
2	0.167	247.253	48.590	3.692
3	0.250	370.880	13.000	0.988
4	0.333	494.506	5.858	0.445
5	0.417	618.133	3.269	0.248
6	0.500	741.759	1.825	0.139
7	0.583	865.386	1.217	0.092
		Sum =	100.000 Sum=	7.599

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

Unit Time	Pattern	Storm Rain	Loss rate(In./Hr)			Effective
(Hr.)	Percent	(In/Hr)	Max		Low	(In/Hr)
1 0.08	0.50	0.150	(0.200)		0.075	0.075
2 0.17	0.60	0.180	(0.200)		0.090	0.090

3	0.25	0.60	0.180	(0.200)	0.090	0.090
4	0.33	0.60	0.180	(0.200)	0.090	0.090
5	0.42	0.60	0.180	(0.200)	0.090	0.090
6	0.50	0.70	0.210	(0.200)	0.105	0.105
7	0.58	0.70	0.210	(0.200)	0.105	0.105
8	0.67	0.70	0.210	(0.200)	0.105	0.105
9	0.75	0.70	0.210	(0.200)	0.105	0.105
10	0.83	0.70	0.210	(0.200)	0.105	0.105
11	0.92	0.70	0.210	(0.200)	0.105	0.105
12	1.00	0.80	0.240	(0.200)	0.120	0.120
13	1.08	0.80	0.240	(0.200)	0.120	0.120
14	1.17	0.80	0.240	(0.200)	0.120	0.120
15	1.25	0.80	0.240	(0.200)	0.120	0.120
16	1.33	0.80	0.240	(0.200)	0.120	0.120
17	1.42	0.80	0.240	(0.200)	0.120	0.120
18	1.50	0.80	0.240	(0.200)	0.120	0.120
19	1.58	0.80	0.240	(0.200)	0.120	0.120
20	1.67	0.80	0.240	(0.200)	0.120	0.120
21	1.75	0.80	0.240	(0.200)	0.120	0.120
22	1.83	0.80	0.240	(0.200)	0.120	0.120
23	1.92	0.80	0.240	(0.200)	0.120	0.120
24	2.00	0.90	0.270	(0.200)	0.135	0.135
25	2.08	0.80	0.240	(0.200)	0.120	0.120
26	2.17	0.90	0.270	(0.200)	0.135	0.135
27	2.25	0.90	0.270	(0.200)	0.135	0.135
28	2.33	0.90	0.270	(0.200)	0.135	0.135
29	2.42	0.90	0.270	(0.200)	0.135	0.135
30	2.50	0.90	0.270	(0.200)	0.135	0.135
31	2.58	0.90	0.270	(0.200)	0.135	0.135
32	2.67	0.90	0.270	(0.200)	0.135	0.135
33	2.75	1.00	0.300	(0.200)	0.150	0.150
34	2.83	1.00	0.300	(0.200)	0.150	0.150
35	2.92	1.00	0.300	(0.200)	0.150	0.150
36	3.00	1.00	0.300	(0.200)	0.150	0.150
37	3.08	1.00	0.300	(0.200)	0.150	0.150
38	3.17	1.10	0.330	(0.200)	0.165	0.165
39	3.25	1.10	0.330	(0.200)	0.165	0.165
40	3.33	1.10	0.330	(0.200)	0.165	0.165
41	3.42	1.20	0.360	(0.200)	0.180	0.180
42	3.50	1.30	0.390	(0.200)	0.195	0.195
43	3.58	1.40	0.420	0.200	(0.210)	0.220
44	3.67	1.40	0.420	0.200	(0.210)	0.220
45	3.75	1.50	0.450	0.200	(0.225)	0.250
46	3.83	1.50	0.450	0.200	(0.225)	0.250
47	3.92	1.60	0.480	0.200	(0.240)	0.280
48	4.00	1.60	0.480	0.200	(0.240)	0.280
49	4.08	1.70	0.510	0.200	(0.255)	0.310
50	4.17	1.80	0.540	0.200	(0.270)	0.340
51	4.25	1.90	0.570	0.200	(0.285)	0.370
52	4.33	2.00	0.600	0.200	(0.300)	0.400
53	4.42	2.10	0.630	0.200	(0.315)	0.430
54	4.50	2.10	0.630	0.200	(0.315)	0.430
55	4.58	2.20	0.660	0.200	(0.330)	0.460
56	4.67	2.30	0.690	0.200	(0.345)	0.490
57	4.75	2.40	0.720	0.200	(0.360)	0.520
58	4.83	2.40	0.720	0.200	(0.360)	0.520
59	4.92	2.50	0.750	0.200	(0.375)	0.550

60	5.00	2.60	0.780	0.200	(0.390)		0.580
61	5.08	3.10	0.930	0.200	(0.465)		0.730
62	5.17	3.60	1.080	0.200	(0.540)		0.880
63	5.25	3.90	1.170	0.200	(0.585)		0.970
64	5.33	4.20	1.260	0.200	(0.630)		1.060
65	5.42	4.70	1.410	0.200	(0.705)		1.210
66	5.50	5.60	1.680	0.200	(0.840)		1.480
67	5.58	1.90	0.570	0.200	(0.285)		0.370
68	5.67	0.90	0.270	(0.200)	0.135		0.135
69	5.75	0.60	0.180	(0.200)	0.090		0.090
70	5.83	0.50	0.150	(0.200)	0.075		0.075
71	5.92	0.30	0.090	(0.200)	0.045		0.045
72	6.00	0.20	0.060	(0.200)	0.030		0.030

(Loss Rate Not Used)

Sum = 100.0 Sum = 19.3

Flood volume = Effective rainfall 1.61(In)
times area 7.5(Ac.)/[(In)/(Ft.)] = 1.0(Ac.Ft)
Total soil loss = 0.89(In)
Total soil loss = 0.561(Ac.Ft)
Total rainfall = 2.50(In)
Flood volume = 43995.8 Cubic Feet
Total soil loss = 24428.0 Cubic Feet

Peak flow rate of this hydrograph = 9.273(CFS)

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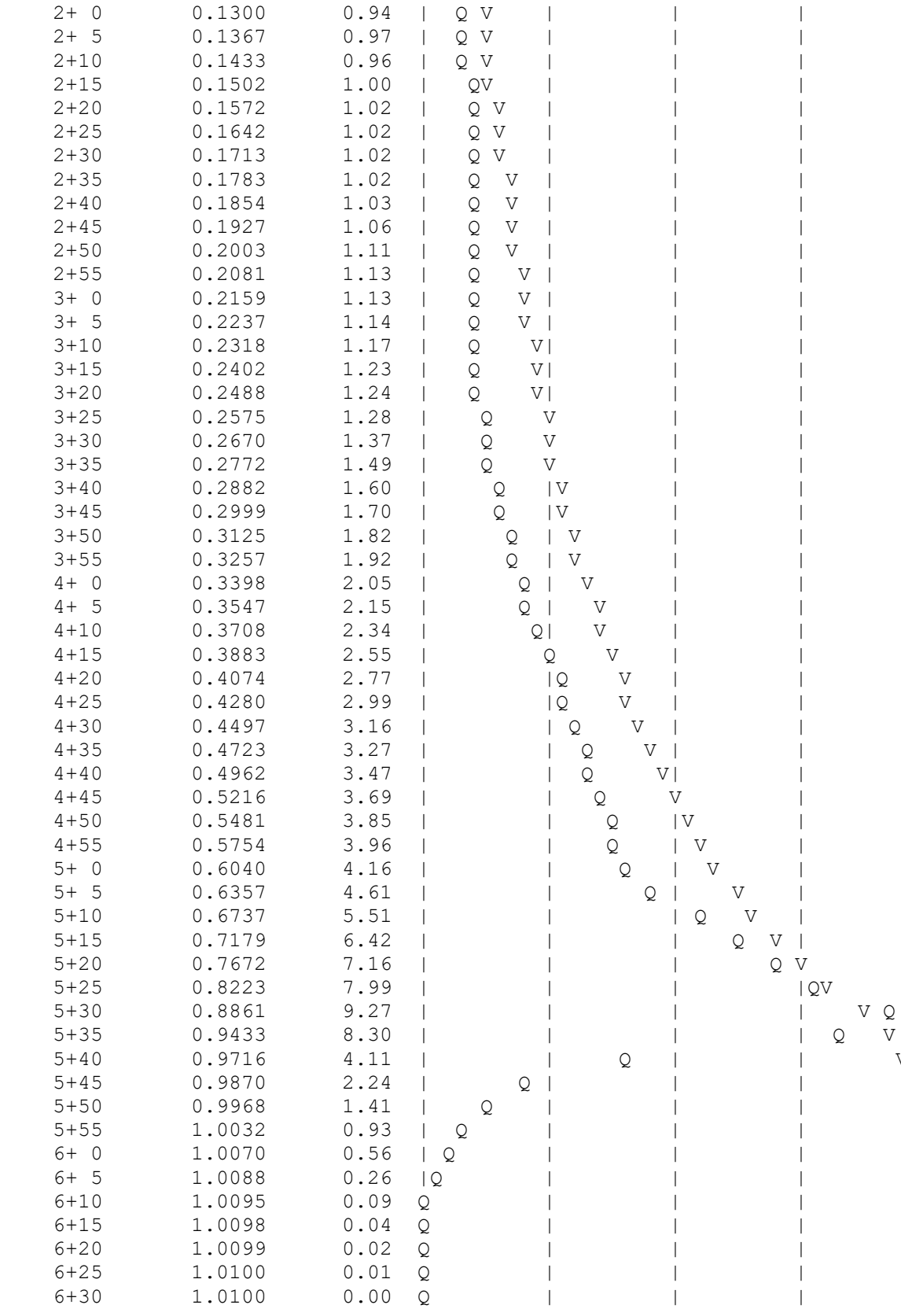
6 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0010	0.15	Q				
0+10	0.0042	0.46	VQ				
0+15	0.0082	0.59	V Q				
0+20	0.0126	0.63	V Q				
0+25	0.0171	0.66	V Q				
0+30	0.0220	0.70	V Q				
0+35	0.0273	0.77	|V Q				
0+40	0.0327	0.78	|V Q				
0+45	0.0381	0.79	|V Q				
0+50	0.0436	0.79	|V Q				
0+55	0.0491	0.80	|V Q				
1+ 0	0.0548	0.83	| VQ				
1+ 5	0.0609	0.88	| VQ				
1+10	0.0671	0.90	| VQ				
1+15	0.0733	0.91	| VQ				
1+20	0.0795	0.91	| Q				
1+25	0.0858	0.91	| Q				
1+30	0.0921	0.91	| Q				
1+35	0.0984	0.91	| Q				
1+40	0.1047	0.91	| QV				
1+45	0.1110	0.91	| QV				
1+50	0.1172	0.91	| QV				
1+55	0.1235	0.91	| QV				



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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED A
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 9.05(Ac.) = 0.014 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 9.05(Ac.) = 0.014 Sq. Mi.
Length along longest watercourse = 665.00(Ft.)
Length along longest watercourse measured to centroid = 635.00(Ft.)
Length along longest watercourse = 0.126 Mi.
Length along longest watercourse measured to centroid = 0.120 Mi.
Difference in elevation = 22.87(Ft.)
Slope along watercourse = 181.5844 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.027 Hr.
Lag time = 1.64 Min.
25% of lag time = 0.41 Min.
40% of lag time = 0.65 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.05	1.20	10.86

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.05	2.50	22.63

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.050	61.50	0.800

Total Area Entered = 9.05(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
61.5	61.5	0.454	0.800	0.127	1.000	0.127
					Sum (F) =	0.127

Area averaged mean soil loss (F) (In/Hr) = 0.127
Minimum soil loss rate ((In/Hr)) = 0.064
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.260

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	305.645	57.252	5.222
2	0.167	611.289	36.820	3.358
3	0.250	916.934	5.928	0.541
			Sum = 100.000	Sum= 9.121

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.50	0.150	(0.127)	0.039	0.111
2	0.17	0.60	0.180	(0.127)	0.047	0.133
3	0.25	0.60	0.180	(0.127)	0.047	0.133
4	0.33	0.60	0.180	(0.127)	0.047	0.133
5	0.42	0.60	0.180	(0.127)	0.047	0.133
6	0.50	0.70	0.210	(0.127)	0.055	0.155

7	0.58	0.70	0.210	(0.127)	0.055	0.155
8	0.67	0.70	0.210	(0.127)	0.055	0.155
9	0.75	0.70	0.210	(0.127)	0.055	0.155
10	0.83	0.70	0.210	(0.127)	0.055	0.155
11	0.92	0.70	0.210	(0.127)	0.055	0.155
12	1.00	0.80	0.240	(0.127)	0.062	0.178
13	1.08	0.80	0.240	(0.127)	0.062	0.178
14	1.17	0.80	0.240	(0.127)	0.062	0.178
15	1.25	0.80	0.240	(0.127)	0.062	0.178
16	1.33	0.80	0.240	(0.127)	0.062	0.178
17	1.42	0.80	0.240	(0.127)	0.062	0.178
18	1.50	0.80	0.240	(0.127)	0.062	0.178
19	1.58	0.80	0.240	(0.127)	0.062	0.178
20	1.67	0.80	0.240	(0.127)	0.062	0.178
21	1.75	0.80	0.240	(0.127)	0.062	0.178
22	1.83	0.80	0.240	(0.127)	0.062	0.178
23	1.92	0.80	0.240	(0.127)	0.062	0.178
24	2.00	0.90	0.270	(0.127)	0.070	0.200
25	2.08	0.80	0.240	(0.127)	0.062	0.178
26	2.17	0.90	0.270	(0.127)	0.070	0.200
27	2.25	0.90	0.270	(0.127)	0.070	0.200
28	2.33	0.90	0.270	(0.127)	0.070	0.200
29	2.42	0.90	0.270	(0.127)	0.070	0.200
30	2.50	0.90	0.270	(0.127)	0.070	0.200
31	2.58	0.90	0.270	(0.127)	0.070	0.200
32	2.67	0.90	0.270	(0.127)	0.070	0.200
33	2.75	1.00	0.300	(0.127)	0.078	0.222
34	2.83	1.00	0.300	(0.127)	0.078	0.222
35	2.92	1.00	0.300	(0.127)	0.078	0.222
36	3.00	1.00	0.300	(0.127)	0.078	0.222
37	3.08	1.00	0.300	(0.127)	0.078	0.222
38	3.17	1.10	0.330	(0.127)	0.086	0.244
39	3.25	1.10	0.330	(0.127)	0.086	0.244
40	3.33	1.10	0.330	(0.127)	0.086	0.244
41	3.42	1.20	0.360	(0.127)	0.094	0.266
42	3.50	1.30	0.390	(0.127)	0.101	0.289
43	3.58	1.40	0.420	(0.127)	0.109	0.311
44	3.67	1.40	0.420	(0.127)	0.109	0.311
45	3.75	1.50	0.450	(0.127)	0.117	0.333
46	3.83	1.50	0.450	(0.127)	0.117	0.333
47	3.92	1.60	0.480	(0.127)	0.125	0.355
48	4.00	1.60	0.480	(0.127)	0.125	0.355
49	4.08	1.70	0.510	0.127	(0.133)	0.383
50	4.17	1.80	0.540	0.127	(0.140)	0.413
51	4.25	1.90	0.570	0.127	(0.148)	0.443
52	4.33	2.00	0.600	0.127	(0.156)	0.473
53	4.42	2.10	0.630	0.127	(0.164)	0.503
54	4.50	2.10	0.630	0.127	(0.164)	0.503
55	4.58	2.20	0.660	0.127	(0.172)	0.533
56	4.67	2.30	0.690	0.127	(0.179)	0.563
57	4.75	2.40	0.720	0.127	(0.187)	0.593
58	4.83	2.40	0.720	0.127	(0.187)	0.593
59	4.92	2.50	0.750	0.127	(0.195)	0.623
60	5.00	2.60	0.780	0.127	(0.203)	0.653
61	5.08	3.10	0.930	0.127	(0.242)	0.803
62	5.17	3.60	1.080	0.127	(0.281)	0.953
63	5.25	3.90	1.170	0.127	(0.304)	1.043

64	5.33	4.20	1.260	0.127	(0.328)		1.133
65	5.42	4.70	1.410	0.127	(0.367)		1.283
66	5.50	5.60	1.680	0.127	(0.437)		1.553
67	5.58	1.90	0.570	0.127	(0.148)		0.443
68	5.67	0.90	0.270	(0.127)	0.070		0.200
69	5.75	0.60	0.180	(0.127)	0.047		0.133
70	5.83	0.50	0.150	(0.127)	0.039		0.111
71	5.92	0.30	0.090	(0.127)	0.023		0.067
72	6.00	0.20	0.060	(0.127)	0.016		0.044

(Loss Rate Not Used)

Sum = 100.0 Sum = 23.9

Flood volume = Effective rainfall 1.99(In)
times area 9.1(Ac.)/[(In)/(Ft.)] = 1.5(Ac.Ft)
Total soil loss = 0.51(In)
Total soil loss = 0.382(Ac.Ft)
Total rainfall = 2.50(In)
Flood volume = 65481.2 Cubic Feet
Total soil loss = 16645.0 Cubic Feet

Peak flow rate of this hydrograph = 13.036(CFS)

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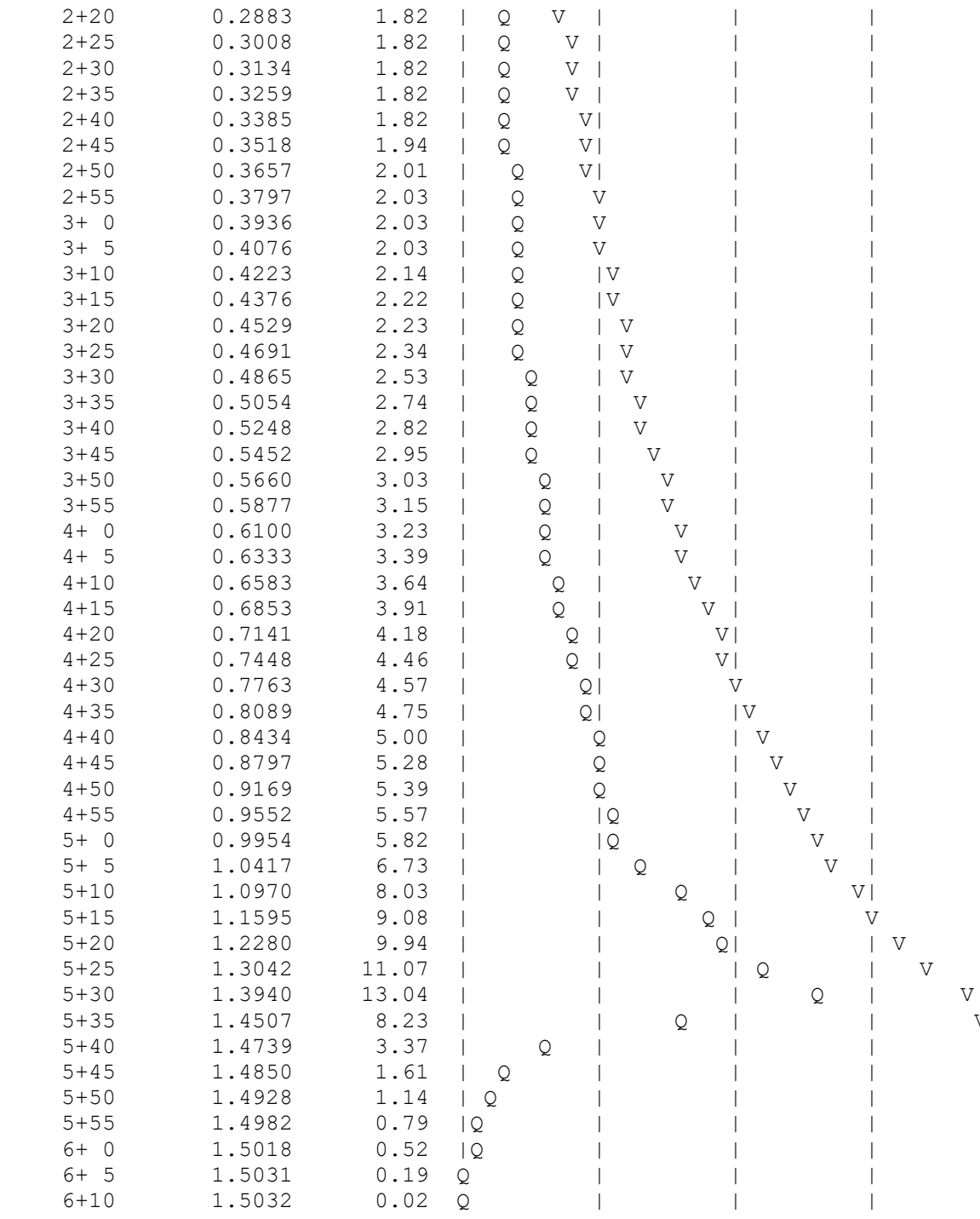
6 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0040	0.58	VQ				
0+10	0.0114	1.07	V Q				
0+15	0.0196	1.20	V Q				
0+20	0.0280	1.22	V Q				
0+25	0.0364	1.22	V Q				
0+30	0.0456	1.33	|VQ				
0+35	0.0552	1.41	|VQ				
0+40	0.0650	1.42	|VQ				
0+45	0.0748	1.42	|VQ				
0+50	0.0845	1.42	| Q				
0+55	0.0943	1.42	| Q				
1+ 0	0.1049	1.53	| VQ				
1+ 5	0.1159	1.61	| Q				
1+10	0.1271	1.62	| Q				
1+15	0.1383	1.62	| Q				
1+20	0.1494	1.62	| Q				
1+25	0.1606	1.62	| QV				
1+30	0.1718	1.62	| QV				
1+35	0.1829	1.62	| QV				
1+40	0.1941	1.62	| Q V				
1+45	0.2052	1.62	| Q V				
1+50	0.2164	1.62	| Q V				
1+55	0.2276	1.62	| Q V				
2+ 0	0.2395	1.74	| Q V				
2+ 5	0.2512	1.70	| Q V				
2+10	0.2632	1.75	| Q V				
2+15	0.2757	1.81	| Q V				



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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED B
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 8.80(Ac.) = 0.014 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 8.80(Ac.) = 0.014 Sq. Mi.
Length along longest watercourse = 615.00(Ft.)
Length along longest watercourse measured to centroid = 247.00(Ft.)
Length along longest watercourse = 0.116 Mi.
Length along longest watercourse measured to centroid = 0.047 Mi.
Difference in elevation = 13.88(Ft.)
Slope along watercourse = 119.1649 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.020 Hr.
Lag time = 1.20 Min.
25% of lag time = 0.30 Min.
40% of lag time = 0.48 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
8.80	1.20	10.56

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
8.80	2.50	22.00

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
8.800	66.30	0.800

Total Area Entered = 8.80(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
66.3	66.3	0.402	0.800	0.113	1.000	0.113
					Sum (F) =	0.113

Area averaged mean soil loss (F) (In/Hr) = 0.113
Minimum soil loss rate ((In/Hr)) = 0.056
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.260

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	416.091	66.163	5.868
2	0.167	832.183	33.837	3.001
		Sum = 100.000	Sum=	8.869

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.50	0.150	(0.113)	0.039	0.111
2	0.17	0.60	0.180	(0.113)	0.047	0.133
3	0.25	0.60	0.180	(0.113)	0.047	0.133
4	0.33	0.60	0.180	(0.113)	0.047	0.133
5	0.42	0.60	0.180	(0.113)	0.047	0.133
6	0.50	0.70	0.210	(0.113)	0.055	0.155
7	0.58	0.70	0.210	(0.113)	0.055	0.155

8	0.67	0.70	0.210	(0.113)	0.055	0.155
9	0.75	0.70	0.210	(0.113)	0.055	0.155
10	0.83	0.70	0.210	(0.113)	0.055	0.155
11	0.92	0.70	0.210	(0.113)	0.055	0.155
12	1.00	0.80	0.240	(0.113)	0.062	0.178
13	1.08	0.80	0.240	(0.113)	0.062	0.178
14	1.17	0.80	0.240	(0.113)	0.062	0.178
15	1.25	0.80	0.240	(0.113)	0.062	0.178
16	1.33	0.80	0.240	(0.113)	0.062	0.178
17	1.42	0.80	0.240	(0.113)	0.062	0.178
18	1.50	0.80	0.240	(0.113)	0.062	0.178
19	1.58	0.80	0.240	(0.113)	0.062	0.178
20	1.67	0.80	0.240	(0.113)	0.062	0.178
21	1.75	0.80	0.240	(0.113)	0.062	0.178
22	1.83	0.80	0.240	(0.113)	0.062	0.178
23	1.92	0.80	0.240	(0.113)	0.062	0.178
24	2.00	0.90	0.270	(0.113)	0.070	0.200
25	2.08	0.80	0.240	(0.113)	0.062	0.178
26	2.17	0.90	0.270	(0.113)	0.070	0.200
27	2.25	0.90	0.270	(0.113)	0.070	0.200
28	2.33	0.90	0.270	(0.113)	0.070	0.200
29	2.42	0.90	0.270	(0.113)	0.070	0.200
30	2.50	0.90	0.270	(0.113)	0.070	0.200
31	2.58	0.90	0.270	(0.113)	0.070	0.200
32	2.67	0.90	0.270	(0.113)	0.070	0.200
33	2.75	1.00	0.300	(0.113)	0.078	0.222
34	2.83	1.00	0.300	(0.113)	0.078	0.222
35	2.92	1.00	0.300	(0.113)	0.078	0.222
36	3.00	1.00	0.300	(0.113)	0.078	0.222
37	3.08	1.00	0.300	(0.113)	0.078	0.222
38	3.17	1.10	0.330	(0.113)	0.086	0.244
39	3.25	1.10	0.330	(0.113)	0.086	0.244
40	3.33	1.10	0.330	(0.113)	0.086	0.244
41	3.42	1.20	0.360	(0.113)	0.094	0.266
42	3.50	1.30	0.390	(0.113)	0.101	0.289
43	3.58	1.40	0.420	(0.113)	0.109	0.311
44	3.67	1.40	0.420	(0.113)	0.109	0.311
45	3.75	1.50	0.450	0.113	(0.117)	0.337
46	3.83	1.50	0.450	0.113	(0.117)	0.337
47	3.92	1.60	0.480	0.113	(0.125)	0.367
48	4.00	1.60	0.480	0.113	(0.125)	0.367
49	4.08	1.70	0.510	0.113	(0.133)	0.397
50	4.17	1.80	0.540	0.113	(0.140)	0.427
51	4.25	1.90	0.570	0.113	(0.148)	0.457
52	4.33	2.00	0.600	0.113	(0.156)	0.487
53	4.42	2.10	0.630	0.113	(0.164)	0.517
54	4.50	2.10	0.630	0.113	(0.164)	0.517
55	4.58	2.20	0.660	0.113	(0.172)	0.547
56	4.67	2.30	0.690	0.113	(0.179)	0.577
57	4.75	2.40	0.720	0.113	(0.187)	0.607
58	4.83	2.40	0.720	0.113	(0.187)	0.607
59	4.92	2.50	0.750	0.113	(0.195)	0.637
60	5.00	2.60	0.780	0.113	(0.203)	0.667
61	5.08	3.10	0.930	0.113	(0.242)	0.817
62	5.17	3.60	1.080	0.113	(0.281)	0.967
63	5.25	3.90	1.170	0.113	(0.304)	1.057
64	5.33	4.20	1.260	0.113	(0.328)	1.147

65	5.42	4.70	1.410	0.113	(0.367)		1.297
66	5.50	5.60	1.680	0.113	(0.437)		1.567
67	5.58	1.90	0.570	0.113	(0.148)		0.457
68	5.67	0.90	0.270	(0.113)	0.070		0.200
69	5.75	0.60	0.180	(0.113)	0.047		0.133
70	5.83	0.50	0.150	(0.113)	0.039		0.111
71	5.92	0.30	0.090	(0.113)	0.023		0.067
72	6.00	0.20	0.060	(0.113)	0.016		0.044

(Loss Rate Not Used)

Sum = 100.0 Sum = 24.2

Flood volume = Effective rainfall 2.02(In)
times area 8.8(Ac.)/[(In)/(Ft.)] = 1.5(Ac.Ft)
Total soil loss = 0.48(In)
Total soil loss = 0.353(Ac.Ft)
Total rainfall = 2.50(In)
Flood volume = 64495.4 Cubic Feet
Total soil loss = 15362.2 Cubic Feet

Peak flow rate of this hydrograph = 13.097(CFS)

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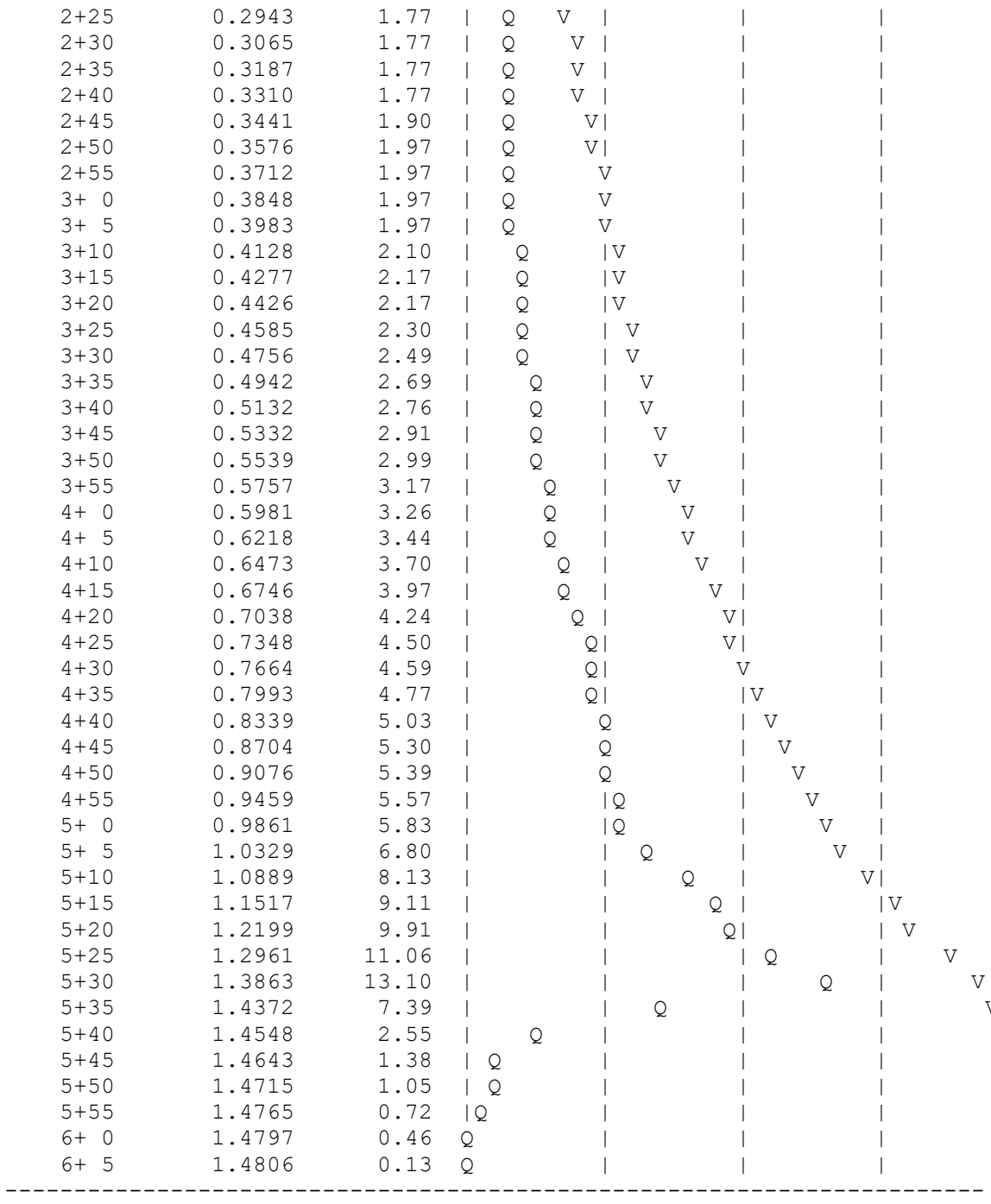
6 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0045	0.65	VQ				
0+10	0.0122	1.12	V Q				
0+15	0.0203	1.18	V Q				
0+20	0.0284	1.18	V Q				
0+25	0.0366	1.18	V Q				
0+30	0.0456	1.31	|VQ				
0+35	0.0551	1.38	|VQ				
0+40	0.0646	1.38	|VQ				
0+45	0.0741	1.38	| Q				
0+50	0.0836	1.38	| Q				
0+55	0.0931	1.38	| Q				
1+ 0	0.1035	1.51	| VQ				
1+ 5	0.1144	1.58	| Q				
1+10	0.1252	1.58	| Q				
1+15	0.1361	1.58	| Q				
1+20	0.1469	1.58	| Q				
1+25	0.1578	1.58	| QV				
1+30	0.1686	1.58	| QV				
1+35	0.1795	1.58	| QV				
1+40	0.1903	1.58	| Q V				
1+45	0.2012	1.58	| Q V				
1+50	0.2120	1.58	| Q V				
1+55	0.2229	1.58	| Q V				
2+ 0	0.2346	1.71	| Q V				
2+ 5	0.2459	1.64	| Q V				
2+10	0.2577	1.71	| Q V				
2+15	0.2699	1.77	| Q V				
2+20	0.2821	1.77	| Q V				


2+25 0.2943 1.77
2+30 0.3065 1.77
2+35 0.3187 1.77
2+40 0.3310 1.77
2+45 0.3441 1.90
2+50 0.3576 1.97
2+55 0.3712 1.97
3+ 0 0.3848 1.97
3+ 5 0.3983 1.97
3+10 0.4128 2.10
3+15 0.4277 2.17
3+20 0.4426 2.17
3+25 0.4585 2.30
3+30 0.4756 2.49
3+35 0.4942 2.69
3+40 0.5132 2.76
3+45 0.5332 2.91
3+50 0.5539 2.99
3+55 0.5757 3.17
4+ 0 0.5981 3.26
4+ 5 0.6218 3.44
4+10 0.6473 3.70
4+15 0.6746 3.97
4+20 0.7038 4.24
4+25 0.7348 4.50
4+30 0.7664 4.59
4+35 0.7993 4.77
4+40 0.8339 5.03
4+45 0.8704 5.30
4+50 0.9076 5.39
4+55 0.9459 5.57
5+ 0 0.9861 5.83
5+ 5 1.0329 6.80
5+10 1.0889 8.13
5+15 1.1517 9.11
5+20 1.2199 9.91
5+25 1.2961 11.06
5+30 1.3863 13.10
5+35 1.4372 7.39
5+40 1.4548 2.55
5+45 1.4643 1.38
5+50 1.4715 1.05
5+55 1.4765 0.72
6+ 0 1.4797 0.46
6+ 5 1.4806 0.13

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION - WATERSHED A
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 9.71(Ac.) = 0.015 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 9.71(Ac.) = 0.015 Sq. Mi.
Length along longest watercourse = 1138.00(Ft.)
Length along longest watercourse measured to centroid = 638.00(Ft.)
Length along longest watercourse = 0.216 Mi.
Length along longest watercourse measured to centroid = 0.121 Mi.
Difference in elevation = 14.60(Ft.)
Slope along watercourse = 67.7399 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.081 Hr.
Lag time = 4.85 Min.
25% of lag time = 1.21 Min.
40% of lag time = 1.94 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.71	0.80	7.77

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.71	1.90	18.45

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 1.900(In)

Point rain (area averaged) = 1.900(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 1.900(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.710	60.10	0.500

Total Area Entered = 9.71(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
60.1	60.1	0.469	0.500	0.258	1.000	0.258
					Sum (F) =	0.258

Area averaged mean soil loss (F) (In/Hr) = 0.258
Minimum soil loss rate ((In/Hr)) = 0.129
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	103.129	20.160	1.973
2	0.167	206.259	48.606	4.756
3	0.250	309.388	15.181	1.486
4	0.333	412.518	6.899	0.675
5	0.417	515.647	3.854	0.377
6	0.500	618.777	2.481	0.243
7	0.583	721.906	1.504	0.147
8	0.667	825.035	1.315	0.129
		Sum = 100.000	Sum=	9.786

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1 0.08	1.30	0.296	(0.258)	0.148	0.148

2	0.17	1.30	0.296	(0.258)	0.148		0.148
3	0.25	1.10	0.251	(0.258)	0.125		0.125
4	0.33	1.50	0.342	(0.258)	0.171		0.171
5	0.42	1.50	0.342	(0.258)	0.171		0.171
6	0.50	1.80	0.410	(0.258)	0.205		0.205
7	0.58	1.50	0.342	(0.258)	0.171		0.171
8	0.67	1.80	0.410	(0.258)	0.205		0.205
9	0.75	1.80	0.410	(0.258)	0.205		0.205
10	0.83	1.50	0.342	(0.258)	0.171		0.171
11	0.92	1.60	0.365	(0.258)	0.182		0.182
12	1.00	1.80	0.410	(0.258)	0.205		0.205
13	1.08	2.20	0.502	(0.258)	0.251		0.251
14	1.17	2.20	0.502	(0.258)	0.251		0.251
15	1.25	2.20	0.502	(0.258)	0.251		0.251
16	1.33	2.00	0.456	(0.258)	0.228		0.228
17	1.42	2.60	0.593	0.258	(0.296)		0.335
18	1.50	2.70	0.616	0.258	(0.308)		0.358
19	1.58	2.40	0.547	0.258	(0.274)		0.289
20	1.67	2.70	0.616	0.258	(0.308)		0.358
21	1.75	3.30	0.752	0.258	(0.376)		0.494
22	1.83	3.10	0.707	0.258	(0.353)		0.449
23	1.92	2.90	0.661	0.258	(0.331)		0.403
24	2.00	3.00	0.684	0.258	(0.342)		0.426
25	2.08	3.10	0.707	0.258	(0.353)		0.449
26	2.17	4.20	0.958	0.258	(0.479)		0.700
27	2.25	5.00	1.140	0.258	(0.570)		0.882
28	2.33	3.50	0.798	0.258	(0.399)		0.540
29	2.42	6.80	1.550	0.258	(0.775)		1.292
30	2.50	7.30	1.664	0.258	(0.832)		1.406
31	2.58	8.20	1.870	0.258	(0.935)		1.612
32	2.67	5.90	1.345	0.258	(0.673)		1.087
33	2.75	2.00	0.456	(0.258)	0.228		0.228
34	2.83	1.80	0.410	(0.258)	0.205		0.205
35	2.92	1.80	0.410	(0.258)	0.205		0.205
36	3.00	0.60	0.137	(0.258)	0.068		0.068

(Loss Rate Not Used)

Sum = 100.0 Sum = 14.9

Flood volume = Effective rainfall 1.24(In)
times area 9.7(Ac.)/[(In)/(Ft.)] = 1.0(Ac.Ft)
Total soil loss = 0.66(In)
Total soil loss = 0.534(Ac.Ft)
Total rainfall = 1.90(In)
Flood volume = 43696.4 Cubic Feet
Total soil loss = 23270.7 Cubic Feet

Peak flow rate of this hydrograph = 13.358(CFS)

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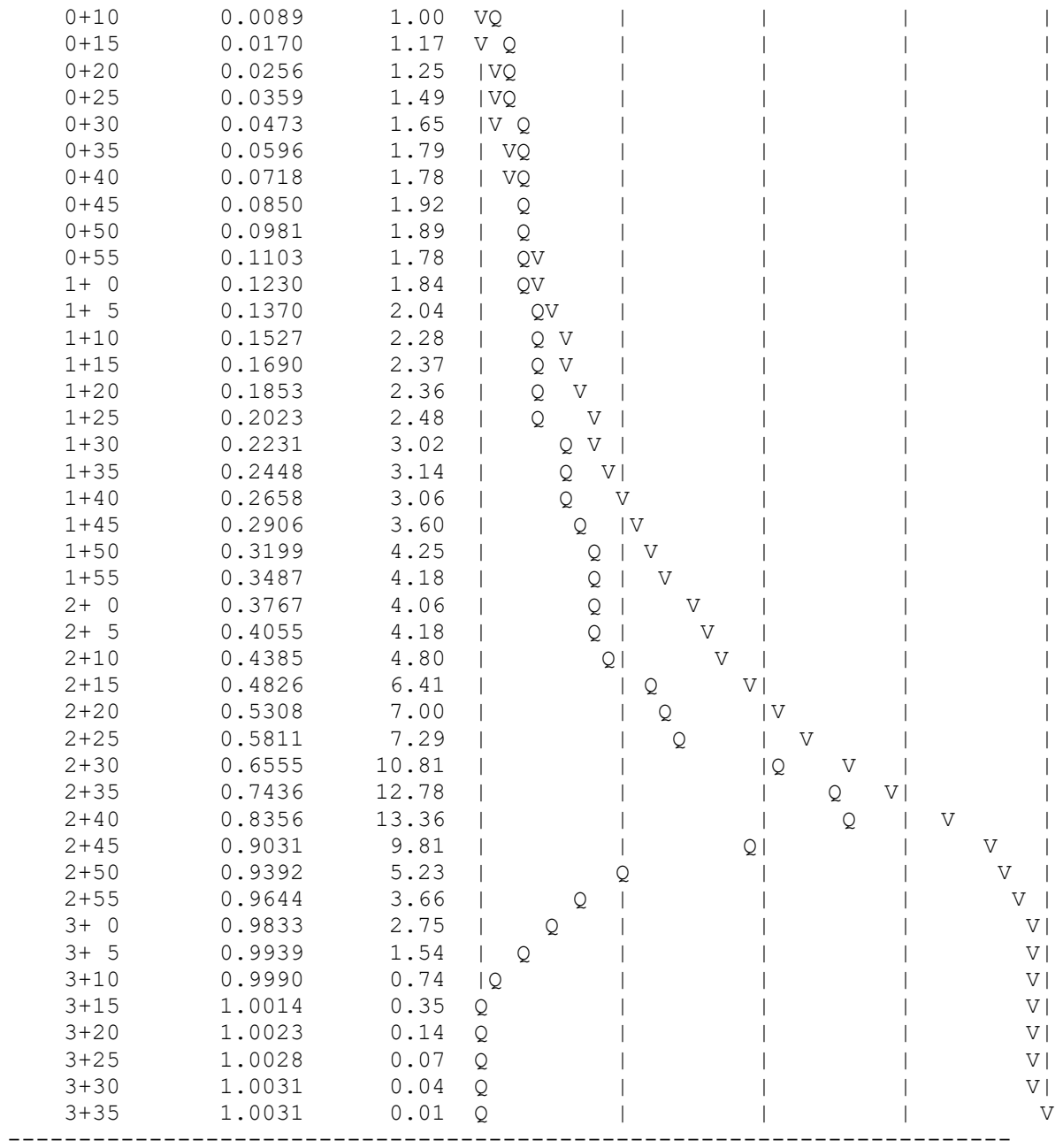
3 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0020	0.29	Q	|	|	|	|


0+10 0.0089 1.00
0+15 0.0170 1.17
0+20 0.0256 1.25
0+25 0.0359 1.49
0+30 0.0473 1.65
0+35 0.0596 1.79
0+40 0.0718 1.78
0+45 0.0850 1.92
0+50 0.0981 1.89
0+55 0.1103 1.78
1+ 0 0.1230 1.84
1+ 5 0.1370 2.04
1+10 0.1527 2.28
1+15 0.1690 2.37
1+20 0.1853 2.36
1+25 0.2023 2.48
1+30 0.2231 3.02
1+35 0.2448 3.14
1+40 0.2658 3.06
1+45 0.2906 3.60
1+50 0.3199 4.25
1+55 0.3487 4.18
2+ 0 0.3767 4.06
2+ 5 0.4055 4.18
2+10 0.4385 4.80
2+15 0.4826 6.41
2+20 0.5308 7.00
2+25 0.5811 7.29
2+30 0.6555 10.81
2+35 0.7436 12.78
2+40 0.8356 13.36
2+45 0.9031 9.81
2+50 0.9392 5.23
2+55 0.9644 3.66
3+ 0 0.9833 2.75
3+ 5 0.9939 1.54
3+10 0.9990 0.74
3+15 1.0014 0.35
3+20 1.0023 0.14
3+25 1.0028 0.07
3+30 1.0031 0.04
3+35 1.0031 0.01

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION - WATERSHED B
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 7.54(Ac.) = 0.012 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 7.54(Ac.) = 0.012 Sq. Mi.
Length along longest watercourse = 864.00(Ft.)
Length along longest watercourse measured to centroid = 584.00(Ft.)
Length along longest watercourse = 0.164 Mi.
Length along longest watercourse measured to centroid = 0.111 Mi.
Difference in elevation = 13.90(Ft.)
Slope along watercourse = 84.9444 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.067 Hr.
Lag time = 4.04 Min.
25% of lag time = 1.01 Min.
40% of lag time = 1.62 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
7.54	0.80	6.03

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
7.54	1.90	14.33

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 1.900(In)

Point rain (area averaged) = 1.900(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 1.900(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
7.540	69.78	0.500

Total Area Entered = 7.54(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
69.8	69.8	0.364	0.500	0.200	1.000	0.200
					Sum (F) =	0.200

Area averaged mean soil loss (F) (In/Hr) = 0.200
Minimum soil loss rate ((In/Hr)) = 0.100
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	123.627	26.240	1.994
2	0.167	247.253	48.590	3.692
3	0.250	370.880	13.000	0.988
4	0.333	494.506	5.858	0.445
5	0.417	618.133	3.269	0.248
6	0.500	741.759	1.825	0.139
7	0.583	865.386	1.217	0.092
		Sum =	100.000 Sum=	7.599

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.296	(0.200)	0.148	0.148
2	0.17	1.30	0.296	(0.200)	0.148	0.148

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 3   0.25     1.10      0.251       (  0.200)       0.125        0.125
 4   0.33     1.50      0.342       (  0.200)       0.171        0.171
 5   0.42     1.50      0.342       (  0.200)       0.171        0.171
 6   0.50     1.80      0.410          0.200    (  0.205)        0.210
 7   0.58     1.50      0.342       (  0.200)       0.171        0.171
 8   0.67     1.80      0.410          0.200    (  0.205)        0.210
 9   0.75     1.80      0.410          0.200    (  0.205)        0.210
10   0.83     1.50      0.342       (  0.200)       0.171        0.171
11   0.92     1.60      0.365       (  0.200)       0.182        0.182
12   1.00     1.80      0.410          0.200    (  0.205)        0.210
13   1.08     2.20      0.502          0.200    (  0.251)        0.301
14   1.17     2.20      0.502          0.200    (  0.251)        0.301
15   1.25     2.20      0.502          0.200    (  0.251)        0.301
16   1.33     2.00      0.456          0.200    (  0.228)        0.256
17   1.42     2.60      0.593          0.200    (  0.296)        0.392
18   1.50     2.70      0.616          0.200    (  0.308)        0.415
19   1.58     2.40      0.547          0.200    (  0.274)        0.347
20   1.67     2.70      0.616          0.200    (  0.308)        0.415
21   1.75     3.30      0.752          0.200    (  0.376)        0.552
22   1.83     3.10      0.707          0.200    (  0.353)        0.506
23   1.92     2.90      0.661          0.200    (  0.331)        0.461
24   2.00     3.00      0.684          0.200    (  0.342)        0.484
25   2.08     3.10      0.707          0.200    (  0.353)        0.506
26   2.17     4.20      0.958          0.200    (  0.479)        0.757
27   2.25     5.00      1.140          0.200    (  0.570)        0.940
28   2.33     3.50      0.798          0.200    (  0.399)        0.598
29   2.42     6.80      1.550          0.200    (  0.775)        1.350
30   2.50     7.30      1.664          0.200    (  0.832)        1.464
31   2.58     8.20      1.870          0.200    (  0.935)        1.669
32   2.67     5.90      1.345          0.200    (  0.673)        1.145
33   2.75     2.00      0.456          0.200    (  0.228)        0.256
34   2.83     1.80      0.410          0.200    (  0.205)        0.210
35   2.92     1.80      0.410          0.200    (  0.205)        0.210
36   3.00     0.60      0.137       (  0.200)       0.068        0.068
          (Loss Rate Not Used)
   Sum =     100.0                                    Sum =    16.0
    Flood volume = Effective rainfall      1.34(In)
     times area       7.5(Ac.)/[(In)/(Ft.)] =       0.8(Ac.Ft)
    Total soil loss =      0.56(In)
    Total soil loss =     0.354(Ac.Ft)
    Total rainfall =      1.90(In)
    Flood volume =       36565.9 Cubic Feet
    Total soil loss =       15435.7 Cubic Feet
    ---------------------------------------------------------------------
     Peak flow rate of this hydrograph =     10.847(CFS)
    ---------------------------------------------------------------------
    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                        3 - 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        5.0      10.0      15.0      20.0
-------------------------------------------------------------------------
  0+ 5       0.0020      0.30  Q         |         |         |         |
  0+10       0.0078      0.84  VQ        |         |         |         |
```

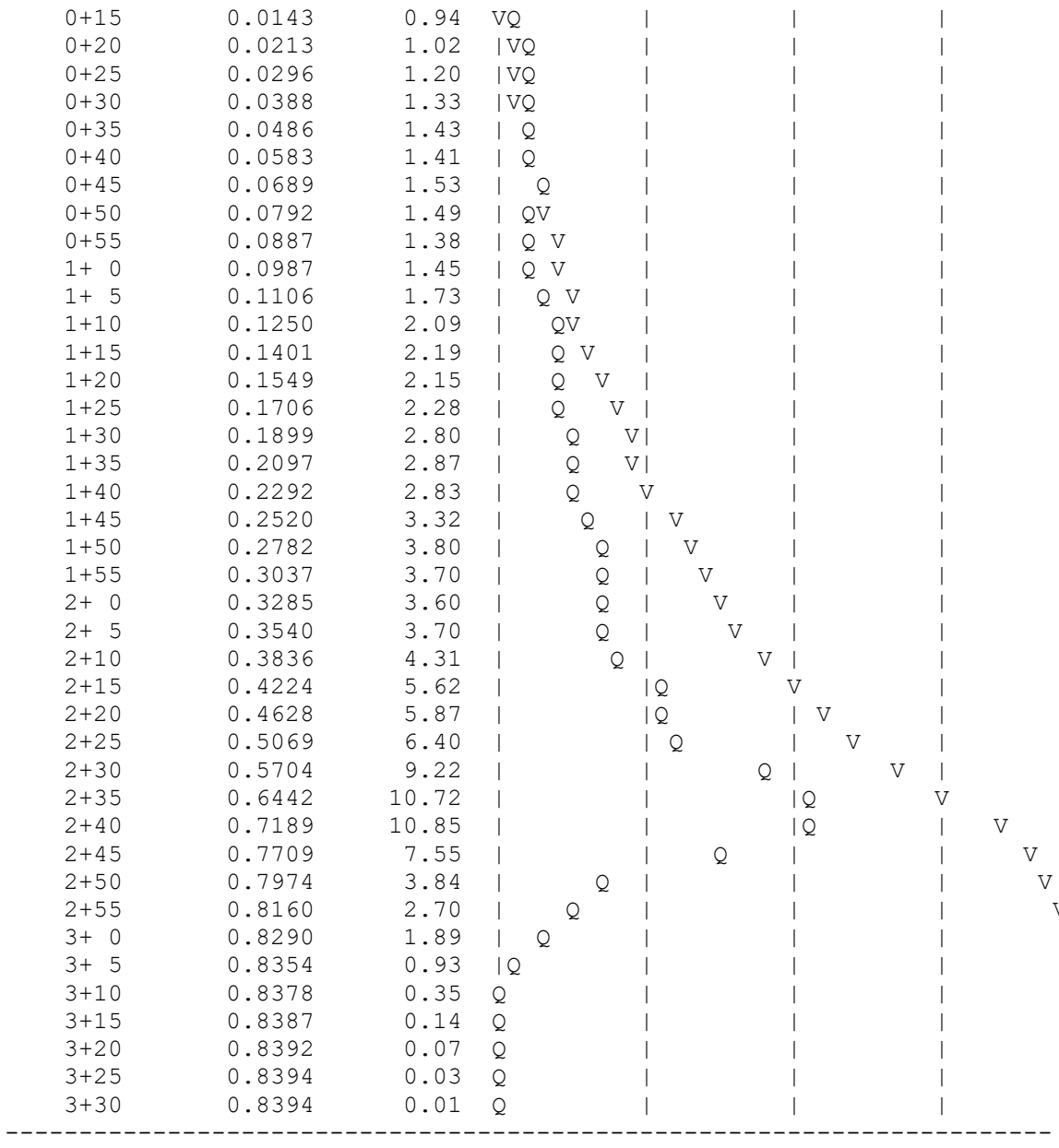

U n i t H y d r o g r a p h A n a l y s i s

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED A
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 9.05(Ac.) = 0.014 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 9.05(Ac.) = 0.014 Sq. Mi.
Length along longest watercourse = 665.00(Ft.)
Length along longest watercourse measured to centroid = 635.00(Ft.)
Length along longest watercourse = 0.126 Mi.
Length along longest watercourse measured to centroid = 0.120 Mi.
Difference in elevation = 22.87(Ft.)
Slope along watercourse = 181.5844 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.027 Hr.
Lag time = 1.64 Min.
25% of lag time = 0.41 Min.
40% of lag time = 0.65 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.05	0.80	7.24

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.05	1.90	17.20

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 1.900(In)

Point rain (area averaged) = 1.900(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 1.900(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.050	61.50	0.800

Total Area Entered = 9.05(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
61.5	61.5	0.454	0.800	0.127	1.000	0.127
					Sum (F) =	0.127

Area averaged mean soil loss (F) (In/Hr) = 0.127
Minimum soil loss rate ((In/Hr)) = 0.064
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.260

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	305.645	57.252	5.222
2	0.167	611.289	36.820	3.358
3	0.250	916.934	5.928	0.541
		Sum = 100.000	Sum=	9.121

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.296	(0.127)	0.077	0.219
2	0.17	1.30	0.296	(0.127)	0.077	0.219
3	0.25	1.10	0.251	(0.127)	0.065	0.186
4	0.33	1.50	0.342	(0.127)	0.089	0.253
5	0.42	1.50	0.342	(0.127)	0.089	0.253
6	0.50	1.80	0.410	(0.127)	0.107	0.304

```
 7   0.58     1.50      0.342       (  0.127)       0.089        0.253
 8   0.67     1.80      0.410       (  0.127)       0.107        0.304
 9   0.75     1.80      0.410       (  0.127)       0.107        0.304
10   0.83     1.50      0.342       (  0.127)       0.089        0.253
11   0.92     1.60      0.365       (  0.127)       0.095        0.270
12   1.00     1.80      0.410       (  0.127)       0.107        0.304
13   1.08     2.20      0.502          0.127    (  0.130)        0.375
14   1.17     2.20      0.502          0.127    (  0.130)        0.375
15   1.25     2.20      0.502          0.127    (  0.130)        0.375
16   1.33     2.00      0.456       (  0.127)       0.119        0.337
17   1.42     2.60      0.593          0.127    (  0.154)        0.466
18   1.50     2.70      0.616          0.127    (  0.160)        0.489
19   1.58     2.40      0.547          0.127    (  0.142)        0.420
20   1.67     2.70      0.616          0.127    (  0.160)        0.489
21   1.75     3.30      0.752          0.127    (  0.196)        0.625
22   1.83     3.10      0.707          0.127    (  0.184)        0.580
23   1.92     2.90      0.661          0.127    (  0.172)        0.534
24   2.00     3.00      0.684          0.127    (  0.178)        0.557
25   2.08     3.10      0.707          0.127    (  0.184)        0.580
26   2.17     4.20      0.958          0.127    (  0.249)        0.830
27   2.25     5.00      1.140          0.127    (  0.296)        1.013
28   2.33     3.50      0.798          0.127    (  0.207)        0.671
29   2.42     6.80      1.550          0.127    (  0.403)        1.423
30   2.50     7.30      1.664          0.127    (  0.433)        1.537
31   2.58     8.20      1.870          0.127    (  0.486)        1.742
32   2.67     5.90      1.345          0.127    (  0.350)        1.218
33   2.75     2.00      0.456       (  0.127)       0.119        0.337
34   2.83     1.80      0.410       (  0.127)       0.107        0.304
35   2.92     1.80      0.410       (  0.127)       0.107        0.304
36   3.00     0.60      0.137       (  0.127)       0.036        0.101
          (Loss Rate Not Used)
   Sum =     100.0                                    Sum =    18.8
    Flood volume = Effective rainfall      1.57(In)
     times area       9.1(Ac.)/[(In)/(Ft.)] =       1.2(Ac.Ft)
    Total soil loss =      0.33(In)
    Total soil loss =     0.251(Ac.Ft)
    Total rainfall =      1.90(In)
    Flood volume =       51473.3 Cubic Feet
    Total soil loss =       10942.1 Cubic Feet
    ---------------------------------------------------------------------
     Peak flow rate of this hydrograph =     15.039(CFS)
    ---------------------------------------------------------------------
    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                        3 - 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        5.0      10.0      15.0      20.0
-------------------------------------------------------------------------
  0+ 5       0.0079      1.15  V Q       |         |         |         |
  0+10       0.0209      1.88  V  Q      |         |         |         |
  0+15       0.0334      1.83  |V Q      |         |         |         |
  0+20       0.0476      2.06  |V  Q     |         |         |         |
  0+25       0.0633      2.27  | V Q     |         |         |         |
  0+30       0.0810      2.57  | V  Q    |         |         |         |
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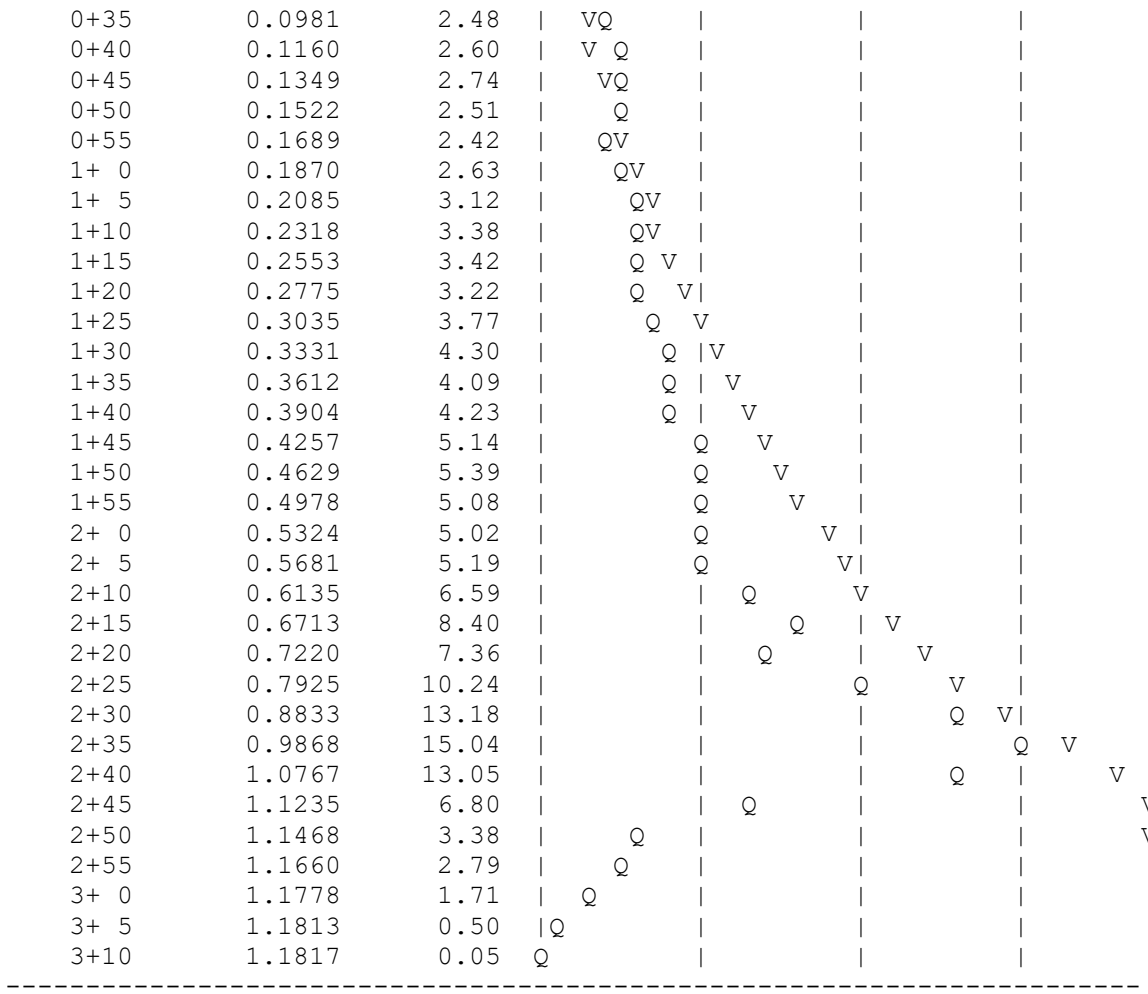
0+35 0.0981 2.48
0+40 0.1160 2.60
0+45 0.1349 2.74
0+50 0.1522 2.51
0+55 0.1689 2.42
1+ 0 0.1870 2.63
1+ 5 0.2085 3.12
1+10 0.2318 3.38
1+15 0.2553 3.42
1+20 0.2775 3.22
1+25 0.3035 3.77
1+30 0.3331 4.30
1+35 0.3612 4.09
1+40 0.3904 4.23
1+45 0.4257 5.14
1+50 0.4629 5.39
1+55 0.4978 5.08
2+ 0 0.5324 5.02
2+ 5 0.5681 5.19
2+10 0.6135 6.59
2+15 0.6713 8.40
2+20 0.7220 7.36
2+25 0.7925 10.24
2+30 0.8833 13.18
2+35 0.9868 15.04
2+40 1.0767 13.05
2+45 1.1235 6.80
2+50 1.1468 3.38
2+55 1.1660 2.79
3+ 0 1.1778 1.71
3+ 5 1.1813 0.50
3+10 1.1817 0.05

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED B
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 8.80(Ac.) = 0.014 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 8.80(Ac.) = 0.014 Sq. Mi.
Length along longest watercourse = 615.00(Ft.)
Length along longest watercourse measured to centroid = 247.00(Ft.)
Length along longest watercourse = 0.116 Mi.
Length along longest watercourse measured to centroid = 0.047 Mi.
Difference in elevation = 13.88(Ft.)
Slope along watercourse = 119.1649 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.020 Hr.
Lag time = 1.20 Min.
25% of lag time = 0.30 Min.
40% of lag time = 0.48 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
8.80	0.80	7.04

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
8.80	1.90	16.72

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 1.900(In)

Point rain (area averaged) = 1.900(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 1.900(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
8.800	66.30	0.800

Total Area Entered = 8.80(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
66.3	66.3	0.402	0.800	0.113	1.000	0.113
					Sum (F) =	0.113

Area averaged mean soil loss (F) (In/Hr) = 0.113
Minimum soil loss rate ((In/Hr)) = 0.056
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.260

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	416.091	66.163	5.868
2	0.167	832.183	33.837	3.001
		Sum = 100.000	Sum=	8.869

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.296	(0.113)	0.077	0.219
2	0.17	1.30	0.296	(0.113)	0.077	0.219
3	0.25	1.10	0.251	(0.113)	0.065	0.186
4	0.33	1.50	0.342	(0.113)	0.089	0.253
5	0.42	1.50	0.342	(0.113)	0.089	0.253
6	0.50	1.80	0.410	(0.113)	0.107	0.304
7	0.58	1.50	0.342	(0.113)	0.089	0.253

8	0.67	1.80	0.410	(	0.113)	0.107		0.304
9	0.75	1.80	0.410	(	0.113)	0.107		0.304
10	0.83	1.50	0.342	(	0.113)	0.089		0.253
11	0.92	1.60	0.365	(	0.113)	0.095		0.270
12	1.00	1.80	0.410	(	0.113)	0.107		0.304
13	1.08	2.20	0.502		0.113	(0.130)		0.389
14	1.17	2.20	0.502		0.113	(0.130)		0.389
15	1.25	2.20	0.502		0.113	(0.130)		0.389
16	1.33	2.00	0.456		0.113	(0.119)		0.343
17	1.42	2.60	0.593		0.113	(0.154)		0.480
18	1.50	2.70	0.616		0.113	(0.160)		0.503
19	1.58	2.40	0.547		0.113	(0.142)		0.435
20	1.67	2.70	0.616		0.113	(0.160)		0.503
21	1.75	3.30	0.752		0.113	(0.196)		0.640
22	1.83	3.10	0.707		0.113	(0.184)		0.594
23	1.92	2.90	0.661		0.113	(0.172)		0.549
24	2.00	3.00	0.684		0.113	(0.178)		0.571
25	2.08	3.10	0.707		0.113	(0.184)		0.594
26	2.17	4.20	0.958		0.113	(0.249)		0.845
27	2.25	5.00	1.140		0.113	(0.296)		1.027
28	2.33	3.50	0.798		0.113	(0.207)		0.685
29	2.42	6.80	1.550		0.113	(0.403)		1.438
30	2.50	7.30	1.664		0.113	(0.433)		1.552
31	2.58	8.20	1.870		0.113	(0.486)		1.757
32	2.67	5.90	1.345		0.113	(0.350)		1.233
33	2.75	2.00	0.456		0.113	(0.119)		0.343
34	2.83	1.80	0.410	(	0.113)	0.107		0.304
35	2.92	1.80	0.410	(	0.113)	0.107		0.304
36	3.00	0.60	0.137	(	0.113)	0.036		0.101

(Loss Rate Not Used)

Sum = 100.0 Sum = 19.1

Flood volume = Effective rainfall 1.59(In)
times area 8.8(Ac.)/[(In)/(Ft.)] = 1.2(Ac.Ft)
Total soil loss = 0.31(In)
Total soil loss = 0.227(Ac.Ft)
Total rainfall = 1.90(In)
Flood volume = 50817.6 Cubic Feet
Total soil loss = 9873.7 Cubic Feet

Peak flow rate of this hydrograph = 14.974(CFS)

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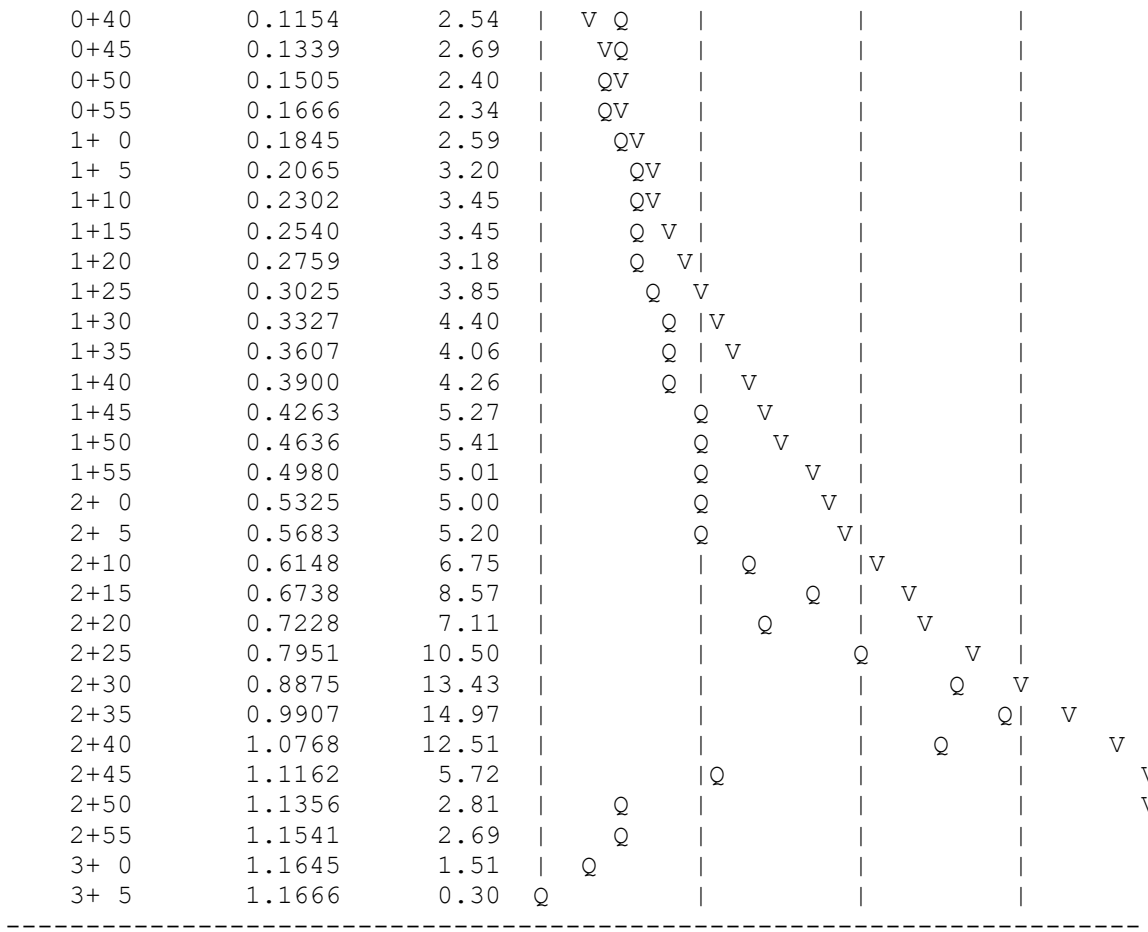
3 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	5.0	10.0	15.0	20.0
0+ 5	0.0089	1.29	V Q				
0+10	0.0223	1.95	V Q				
0+15	0.0343	1.75	V Q				
0+20	0.0484	2.04	V Q				
0+25	0.0638	2.25	V Q				
0+30	0.0814	2.54	V Q				
0+35	0.0979	2.40	VQ				


0+40 0.1154 2.54
0+45 0.1339 2.69
0+50 0.1505 2.40
0+55 0.1666 2.34
1+ 0 0.1845 2.59
1+ 5 0.2065 3.20
1+10 0.2302 3.45
1+15 0.2540 3.45
1+20 0.2759 3.18
1+25 0.3025 3.85
1+30 0.3327 4.40
1+35 0.3607 4.06
1+40 0.3900 4.26
1+45 0.4263 5.27
1+50 0.4636 5.41
1+55 0.4980 5.01
2+ 0 0.5325 5.00
2+ 5 0.5683 5.20
2+10 0.6148 6.75
2+15 0.6738 8.57
2+20 0.7228 7.11
2+25 0.7951 10.50
2+30 0.8875 13.43
2+35 0.9907 14.97
2+40 1.0768 12.51
2+45 1.1162 5.72
2+50 1.1356 2.81
2+55 1.1541 2.69
3+ 0 1.1645 1.51
3+ 5 1.1666 0.30

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION - WATERSHED A
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 9.71(Ac.) = 0.015 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 9.71(Ac.) = 0.015 Sq. Mi.
Length along longest watercourse = 1138.00(Ft.)
Length along longest watercourse measured to centroid = 638.00(Ft.)
Length along longest watercourse = 0.216 Mi.
Length along longest watercourse measured to centroid = 0.121 Mi.
Difference in elevation = 14.60(Ft.)
Slope along watercourse = 67.7399 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.081 Hr.
Lag time = 4.85 Min.
25% of lag time = 1.21 Min.
40% of lag time = 1.94 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.71	0.50	4.86

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.71	1.12	10.88

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.120(In)

Point rain (area averaged) = 1.120(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.120(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.710	60.10	0.500

Total Area Entered = 9.71(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
60.1	60.1	0.469	0.500	0.258	1.000	0.258
					Sum (F) =	0.258

Area averaged mean soil loss (F) (In/Hr) = 0.258
Minimum soil loss rate ((In/Hr)) = 0.129
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	103.129	20.160	1.973
2	0.167	206.259	48.606	4.756
3	0.250	309.388	15.181	1.486
4	0.333	412.518	6.899	0.675
5	0.417	515.647	3.854	0.377
6	0.500	618.777	2.481	0.243
7	0.583	721.906	1.504	0.147
8	0.667	825.035	1.315	0.129
		Sum =	100.000 Sum=	9.786

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

Unit Time	Pattern	Storm Rain	Loss rate(In./Hr)	Effective

```
      (Hr.)  Percent   (In/Hr)         Max   |   Low        (In/Hr)
 1    0.08     4.20      0.564          0.258    (  0.282)        0.307
 2    0.17     4.30      0.578          0.258    (  0.289)        0.320
 3    0.25     5.00      0.672          0.258    (  0.336)        0.414
 4    0.33     5.00      0.672          0.258    (  0.336)        0.414
 5    0.42     5.80      0.779          0.258    (  0.390)        0.522
 6    0.50     6.50      0.874          0.258    (  0.437)        0.616
 7    0.58     7.40      0.994          0.258    (  0.497)        0.737
 8    0.67     8.60      1.156          0.258    (  0.578)        0.898
 9    0.75    12.30      1.653          0.258    (  0.826)        1.395
10    0.83    29.10      3.911          0.258    (  1.955)        3.653
11    0.92     6.80      0.914          0.258    (  0.457)        0.656
12    1.00     5.00      0.672          0.258    (  0.336)        0.414
            (Loss Rate Not Used)
   Sum =     100.0                                      Sum =    10.3
    Flood volume = Effective rainfall      0.86(In)
     times area       9.7(Ac.)/[(In)/(Ft.)] =       0.7(Ac.Ft)
    Total soil loss =      0.26(In)
    Total soil loss =     0.209(Ac.Ft)
    Total rainfall =      1.12(In)
    Flood volume =       30383.0 Cubic Feet
    Total soil loss =        9090.5 Cubic Feet
    ---------------------------------------------------------------------
     Peak flow rate of this hydrograph =     21.916(CFS)
    ---------------------------------------------------------------------
    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                       1 - H O U R    S T O R M
                  R u n o f f      H y d r o g r a p h
    ---------------------------------------------------------------------
               Hydrograph in   5   Minute intervals ((CFS))

    ---------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0        7.5      15.0      22.5      30.0
---------------------------------------------------------------------------
  0+ 5       0.0042      0.61  Q         |         |         |         |
  0+10       0.0186      2.09  |VQ       |         |         |         |
  0+15       0.0378      2.80  | VQ      |         |         |         |
  0+20       0.0617      3.47  |  VQ     |         |         |         |
  0+25       0.0889      3.95  |    Q    |         |         |         |
  0+30       0.1219      4.79  |     Q   |         |         |         |
  0+35       0.1612      5.72  |      Q V|         |         |         |
  0+40       0.2087      6.89  |        Q|V        |         |         |
  0+45       0.2702      8.94  |         |Q   V    |         |         |
  0+50       0.3815     16.15  |         |         |Q        |         |
  0+55       0.5324     21.92  |         |         |        QV         |
  1+ 0       0.6081     10.99  |         |   Q     |         |   V     |
  1+ 5       0.6518      6.34  |       Q |         |         |      V  |
  1+10       0.6725      3.00  |   Q     |         |         |       V |
  1+15       0.6844      1.74  | Q       |         |         |        V|
  1+20       0.6915      1.03  |Q        |         |         |        V|
  1+25       0.6961      0.67  Q         |         |         |        V|
  1+30       0.6971      0.15  Q         |         |         |        V|
  1+35       0.6975      0.05  Q         |         |         |         V
---------------------------------------------------------------------------
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U n i t H y d r o g r a p h A n a l y s i s

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
MDP LANDUSE CONDITION - WATERSHED B
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 7.54(Ac.) = 0.012 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 7.54(Ac.) = 0.012 Sq. Mi.
Length along longest watercourse = 864.00(Ft.)
Length along longest watercourse measured to centroid = 584.00(Ft.)
Length along longest watercourse = 0.164 Mi.
Length along longest watercourse measured to centroid = 0.111 Mi.
Difference in elevation = 13.90(Ft.)
Slope along watercourse = 84.9444 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time = 0.067 Hr.
Lag time = 4.04 Min.
25% of lag time = 1.01 Min.
40% of lag time = 1.62 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
7.54	0.50	3.77

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
7.54	1.12	8.44

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.120(In)

Point rain (area averaged) = 1.120(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.120(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
7.540	69.78	0.500

Total Area Entered = 7.54(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
69.8	69.8	0.364	0.500	0.200	1.000	0.200
					Sum (F) =	0.200

Area averaged mean soil loss (F) (In/Hr) = 0.200
Minimum soil loss rate ((In/Hr)) = 0.100
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	123.627	26.240	1.994
2	0.167	247.253	48.590	3.692
3	0.250	370.880	13.000	0.988
4	0.333	494.506	5.858	0.445
5	0.417	618.133	3.269	0.248
6	0.500	741.759	1.825	0.139
7	0.583	865.386	1.217	0.092
		Sum = 100.000	Sum=	7.599

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)

1	0.08	4.20	0.564	0.200	(	0.282)	0.364
2	0.17	4.30	0.578	0.200	(	0.289)	0.377
3	0.25	5.00	0.672	0.200	(	0.336)	0.472
4	0.33	5.00	0.672	0.200	(	0.336)	0.472
5	0.42	5.80	0.779	0.200	(	0.390)	0.579
6	0.50	6.50	0.874	0.200	(	0.437)	0.673
7	0.58	7.40	0.994	0.200	(	0.497)	0.794
8	0.67	8.60	1.156	0.200	(	0.578)	0.955
9	0.75	12.30	1.653	0.200	(	0.827)	1.453
10	0.83	29.10	3.911	0.200	(	1.955)	3.710
11	0.92	6.80	0.914	0.200	(	0.457)	0.713
12	1.00	5.00	0.672	0.200	(	0.336)	0.472

(Loss Rate Not Used)

Sum = 100.0 Sum = 11.0

Flood volume = Effective rainfall 0.92(In)
times area 7.5(Ac.)/[(In)/(Ft.)] = 0.6(Ac.Ft)
Total soil loss = 0.20(In)
Total soil loss = 0.126(Ac.Ft)
Total rainfall = 1.12(In)
Flood volume = 25167.4 Cubic Feet
Total soil loss = 5485.2 Cubic Feet

Peak flow rate of this hydrograph = 17.336(CFS)

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1 - 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	5.0	10.0	15.0	20.0
0+ 5	0.0050	0.73	VQ				
0+10	0.0194	2.10	V Q				
0+15	0.0380	2.70	V Q				
0+20	0.0602	3.22	V Q				
0+25	0.0851	3.62	V Q				
0+30	0.1147	4.30	VQ				
0+35	0.1496	5.06	Q				
0+40	0.1908	5.98	Q V				
0+45	0.2442	7.76	QV				
0+50	0.3431	14.36			V Q		
0+55	0.4625	17.34				V Q	
1+ 0	0.5197	8.30		Q		V	
1+ 5	0.5518	4.67	Q			V	
1+10	0.5656	2.00	Q			V	
1+15	0.5727	1.04	Q			V	
1+20	0.5766	0.56	Q			V	
1+25	0.5775	0.13	Q			V	
1+30	0.5778	0.04	Q			V	

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

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RCFC & WCD Manual date - April 1978

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED A
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 9.05(Ac.) = 0.014 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 9.05(Ac.) = 0.014 Sq. Mi.
Length along longest watercourse = 665.00(Ft.)
Length along longest watercourse measured to centroid = 635.00(Ft.)
Length along longest watercourse = 0.126 Mi.
Length along longest watercourse measured to centroid = 0.120 Mi.
Difference in elevation = 22.87(Ft.)
Slope along watercourse = 181.5844 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.027 Hr.
Lag time = 1.64 Min.
25% of lag time = 0.41 Min.
40% of lag time = 0.65 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.05	0.50	4.53

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
9.05	1.12	10.14

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.120(In)

Point rain (area averaged) = 1.120(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.120(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
9.050	61.50	0.800

Total Area Entered = 9.05(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
61.5	61.5	0.454	0.800	0.127	1.000	0.127
					Sum (F) =	0.127

Area averaged mean soil loss (F) (In/Hr) = 0.127
Minimum soil loss rate ((In/Hr)) = 0.064
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.260

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	305.645	57.252	5.222
2	0.167	611.289	36.820	3.358
3	0.250	916.934	5.928	0.541
		Sum = 100.000	Sum=	9.121

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	4.20	0.564	0.127	(0.147)	0.437
2	0.17	4.30	0.578	0.127	(0.150)	0.451
3	0.25	5.00	0.672	0.127	(0.175)	0.545
4	0.33	5.00	0.672	0.127	(0.175)	0.545

```
 5   0.42     5.80      0.779          0.127    (  0.203)        0.652
 6   0.50     6.50      0.874          0.127    (  0.227)        0.746
 7   0.58     7.40      0.994          0.127    (  0.259)        0.867
 8   0.67     8.60      1.156          0.127    (  0.300)        1.029
 9   0.75    12.30      1.653          0.127    (  0.430)        1.526
10   0.83    29.10      3.911          0.127    (  1.017)        3.784
11   0.92     6.80      0.914          0.127    (  0.238)        0.787
12   1.00     5.00      0.672          0.127    (  0.175)        0.545
           (Loss Rate Not Used)
   Sum =     100.0                                  Sum =    11.9
    Flood volume = Effective rainfall      0.99(In)
     times area       9.1(Ac.)/[(In)/(Ft.)] =       0.7(Ac.Ft)
    Total soil loss =      0.13(In)
    Total soil loss =     0.096(Ac.Ft)
    Total rainfall =      1.12(In)
    Flood volume =       32616.4 Cubic Feet
    Total soil loss =        4174.2 Cubic Feet
    ---------------------------------------------------------------------
     Peak flow rate of this hydrograph =     25.451(CFS)
    ---------------------------------------------------------------------
    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                      1 - H O U R    S T O R M
                  R u n o f f      H y d r o g r a p h
    ---------------------------------------------------------------------
                Hydrograph in   5   Minute intervals ((CFS))

    ---------------------------------------------------------------------
 Time(h+m) Volume Ac.Ft   Q(CFS)  0        7.5      15.0      22.5      30.0
 ---------------------------------------------------------------------------
   0+ 5       0.0157      2.29  V  Q      |         |         |         |
   0+10       0.0421      3.82  | V  Q    |         |         |         |
   0+15       0.0737      4.60  |  V  Q   |         |         |         |
   0+20       0.1076      4.92  |    VQ   |         |         |         |
   0+25       0.1458      5.53  |      Q  |         |         |         |
   0+30       0.1897      6.39  |       Q V         |         |         |
   0+35       0.2407      7.39  |        Q| V       |         |         |
   0+40       0.3005      8.69  |         |Q    V   |         |         |
   0+45       0.3825     11.90  |         |    Q    V         |         |
   0+50       0.5577     25.45  |         |         |        V|  Q      |
   0+55       0.6793     17.65  |         |         |  Q      |     V   |
   1+ 0       0.7312      7.54  |         Q         |         |        V|
   1+ 5       0.7467      2.26  |  Q      |         |         |        V|
   1+10       0.7488      0.29  Q         |         |         |         V
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U n i t H y d r o g r a p h A n a l y s i s

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED B
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 8.80(Ac.) = 0.014 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 8.80(Ac.) = 0.014 Sq. Mi.
Length along longest watercourse = 615.00(Ft.)
Length along longest watercourse measured to centroid = 247.00(Ft.)
Length along longest watercourse = 0.116 Mi.
Length along longest watercourse measured to centroid = 0.047 Mi.
Difference in elevation = 13.88(Ft.)
Slope along watercourse = 119.1649 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.020 Hr.
Lag time = 1.20 Min.
25% of lag time = 0.30 Min.
40% of lag time = 0.48 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
8.80	0.50	4.40

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
8.80	1.12	9.86

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.120(In)

Point rain (area averaged) = 1.120(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.120(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
8.800	66.30	0.800

Total Area Entered = 8.80(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
66.3	66.3	0.402	0.800	0.113	1.000	0.113
					Sum (F) =	0.113

Area averaged mean soil loss (F) (In/Hr) = 0.113
Minimum soil loss rate ((In/Hr)) = 0.056
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.260

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	416.091	66.163	5.868
2	0.167	832.183	33.837	3.001
		Sum = 100.000	Sum=	8.869

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	4.20	0.564	0.113	(0.147)	0.452
2	0.17	4.30	0.578	0.113	(0.150)	0.465
3	0.25	5.00	0.672	0.113	(0.175)	0.559
4	0.33	5.00	0.672	0.113	(0.175)	0.559
5	0.42	5.80	0.779	0.113	(0.203)	0.667

```
 6   0.50     6.50      0.874          0.113    (  0.227)        0.761
 7   0.58     7.40      0.994          0.113    (  0.259)        0.882
 8   0.67     8.60      1.156          0.113    (  0.300)        1.043
 9   0.75    12.30      1.653          0.113    (  0.430)        1.540
10   0.83    29.10      3.911          0.113    (  1.017)        3.798
11   0.92     6.80      0.914          0.113    (  0.238)        0.801
12   1.00     5.00      0.672          0.113    (  0.175)        0.559
           (Loss Rate Not Used)
   Sum =     100.0                                    Sum =    12.1
    Flood volume = Effective rainfall      1.01(In)
     times area       8.8(Ac.)/[(In)/(Ft.)] =       0.7(Ac.Ft)
    Total soil loss =      0.11(In)
    Total soil loss =     0.083(Ac.Ft)
    Total rainfall =      1.12(In)
    Flood volume =       32179.2 Cubic Feet
    Total soil loss =        3595.3 Cubic Feet
    ---------------------------------------------------------------------
     Peak flow rate of this hydrograph =     26.924(CFS)
    ---------------------------------------------------------------------
    +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                        1 - H O U R    S T O R M
                   R u n o f f      H y d r o g r a p h
    ---------------------------------------------------------------------
                Hydrograph in   5   Minute intervals ((CFS))

    ---------------------------------------------------------------------
 Time(h+m) Volume Ac.Ft   Q(CFS)  0        7.5      15.0      22.5      30.0
 ---------------------------------------------------------------------------
   0+ 5       0.0183      2.65  V  Q      |         |         |         |
   0+10       0.0464      4.09  | V  Q    |         |         |         |
   0+15       0.0787      4.68  |   V Q   |         |         |         |
   0+20       0.1129      4.96  |     Q   |         |         |         |
   0+25       0.1514      5.59  |      QV |         |         |         |
   0+30       0.1959      6.47  |       Q V         |         |         |
   0+35       0.2473      7.46  |        Q|  V      |         |         |
   0+40       0.3078      8.77  |         |Q    V   |         |         |
   0+45       0.3916     12.18  |         |     Q   |V        |         |
   0+50       0.5770     26.92  |         |         |         |V   Q    |
   0+55       0.6880     16.11  |         |         |Q        |      V  |
   1+ 0       0.7272      5.69  |      Q  |         |         |        V|
   1+ 5       0.7387      1.68  | Q       |         |         |         V
---------------------------------------------------------------------------
```

SECTION 3 - REFERENCE DATA

USGS SOILS REPORT

PLATE D-4.1

INFILTRATION REPORT (EXCERPT)

CONTECH UNDERGROUND CHAMBER SYSTEM

DCV CALCULATIONS (WQMP)

PP190005 – HARVILL DISTRIBUTION CENTER OFFSITE DRAINAGE IMPROVEMENTS (HYDROLOGY MAPS)

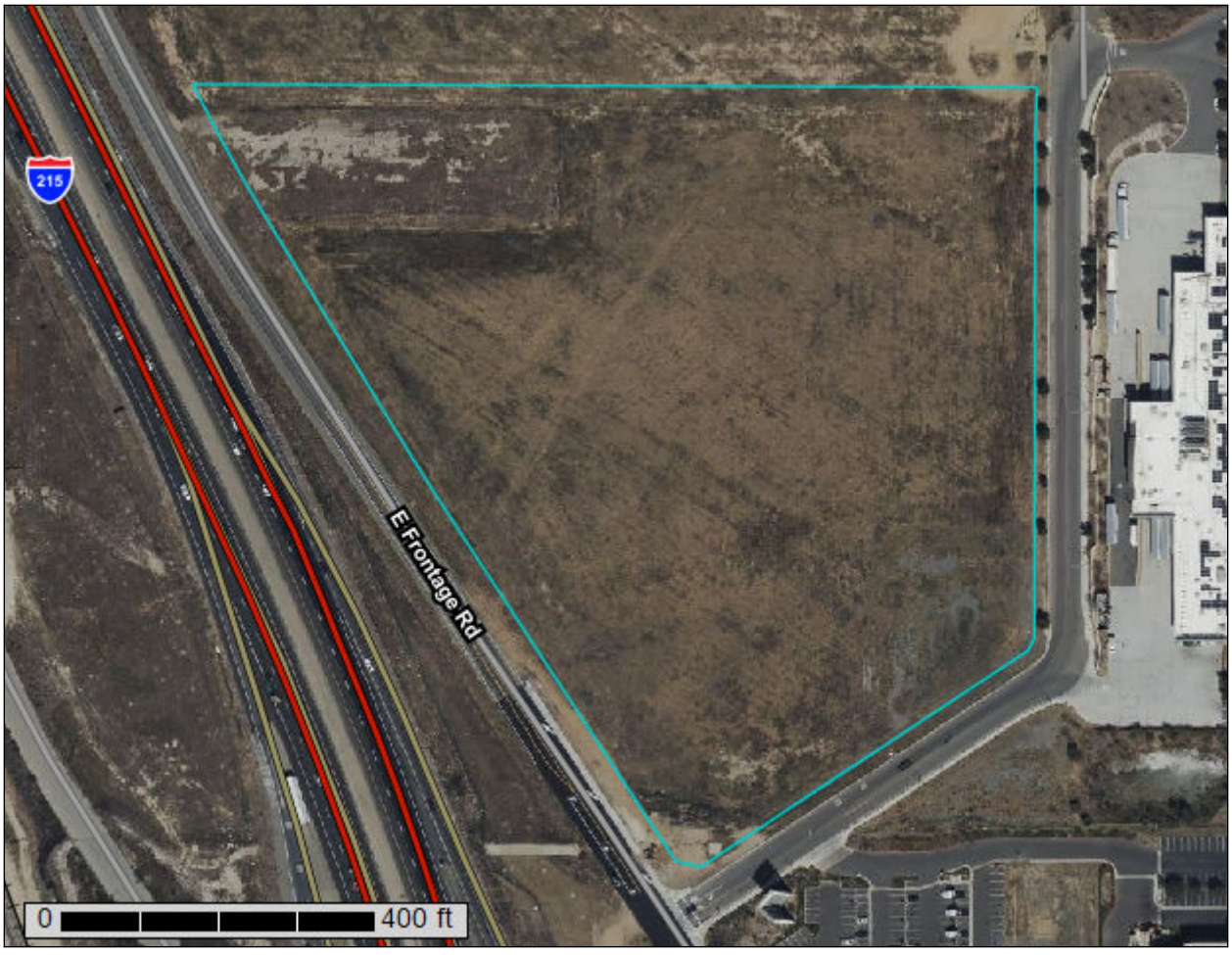
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Western Riverside Area, California



October 1, 2024

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:2,580 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 17, Aug 30, 2024

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

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
EpA	Exeter sandy loam, deep, 0 to 2 percent slopes	9.6	58.8%
PaA	Pachappa fine sandy loam, 0 to 2 percent slopes	6.7	41.2%
Totals for Area of Interest		**16.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Western Riverside Area, California

EpA—Exeter sandy loam, deep, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hctk
Elevation: 300 to 700 feet
Mean annual precipitation: 7 to 15 inches
Mean annual air temperature: 64 degrees F
Frost-free period: 250 to 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Exeter

Setting

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

Typical profile

H1 - 0 to 16 inches: sandy loam
H2 - 16 to 37 inches: sandy clay loam
H3 - 37 to 50 inches: indurated
H4 - 50 to 60 inches: stratified sandy loam to silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 35 to 60 inches to duripan
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Greenfield
Percent of map unit: 5 percent
Hydric soil rating: No

Ramona
Percent of map unit: 5 percent
Hydric soil rating: No

Monserate
Percent of map unit: 5 percent
Hydric soil rating: No

PaA—Pachappa fine sandy loam, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: hcxn
Elevation: 1,000 feet
Mean annual precipitation: 14 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 270 days
Farmland classification: Prime farmland if irrigated

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

Description of Pachappa

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

Typical profile
H1 - 0 to 20 inches: fine sandy loam
H2 - 20 to 63 inches: loam

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare

Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

San emigdio

Percent of map unit: 5 percent
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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:

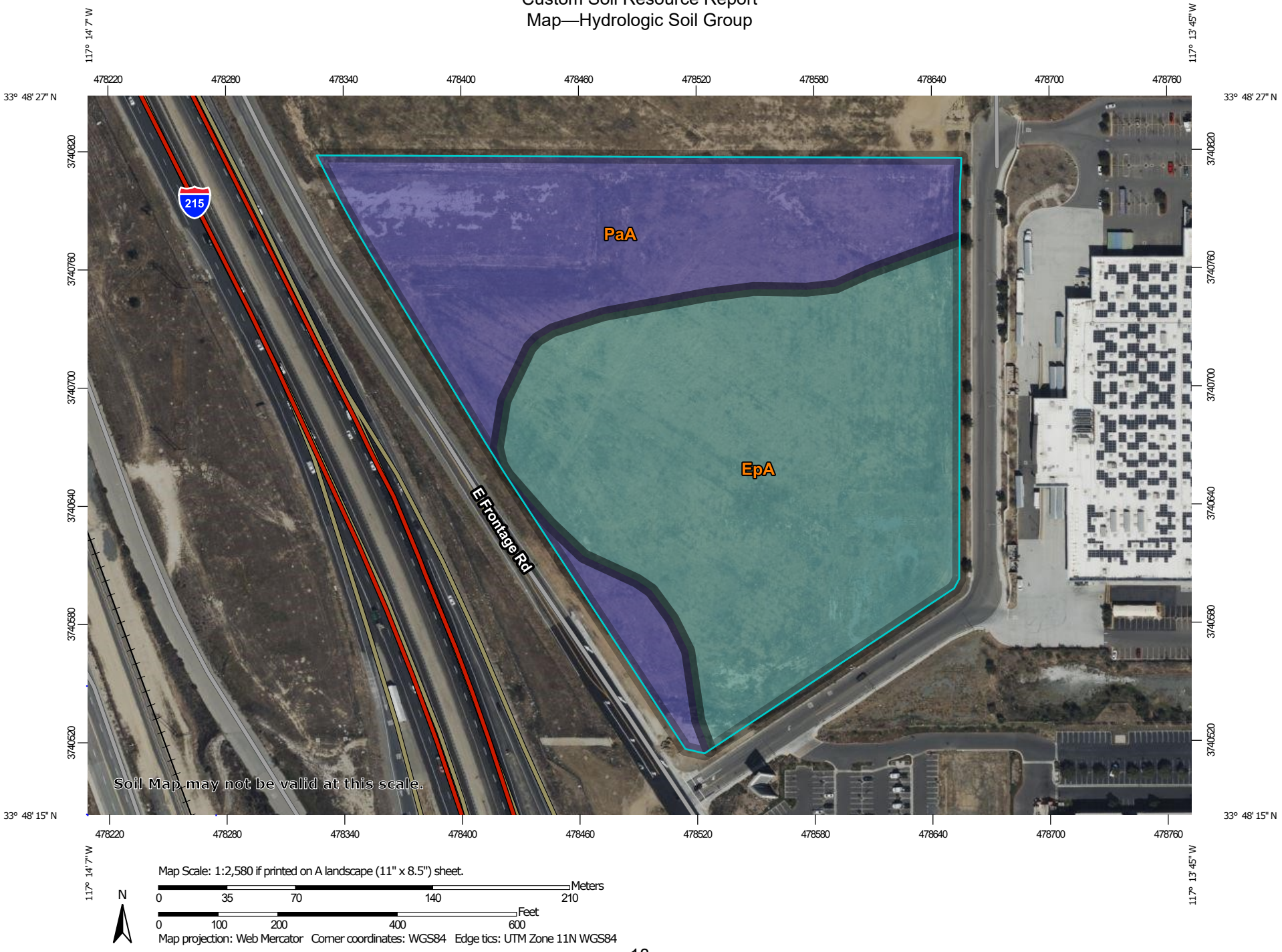
Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

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.


117° 14' 7" W
117° 13' 45" W
33° 48' 27" N
33° 48' 15" N
478220
478280
478340
478400
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478520
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215
PaA
EpA
E Frontage Rd
Soil Map may not be valid at this scale.
Map Scale: 1:2,580 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0
35
70
140
210
Feet
0
100
200
400
600
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 1:15,800.

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

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

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

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

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Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 17, Aug 30, 2024

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

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

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.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
EpA	Exeter sandy loam, deep, 0 to 2 percent slopes	C	9.6	58.8%
PaA	Pachappa fine sandy loam, 0 to 2 percent slopes	B	6.7	41.2%
Totals for Area of Interest			**16.4**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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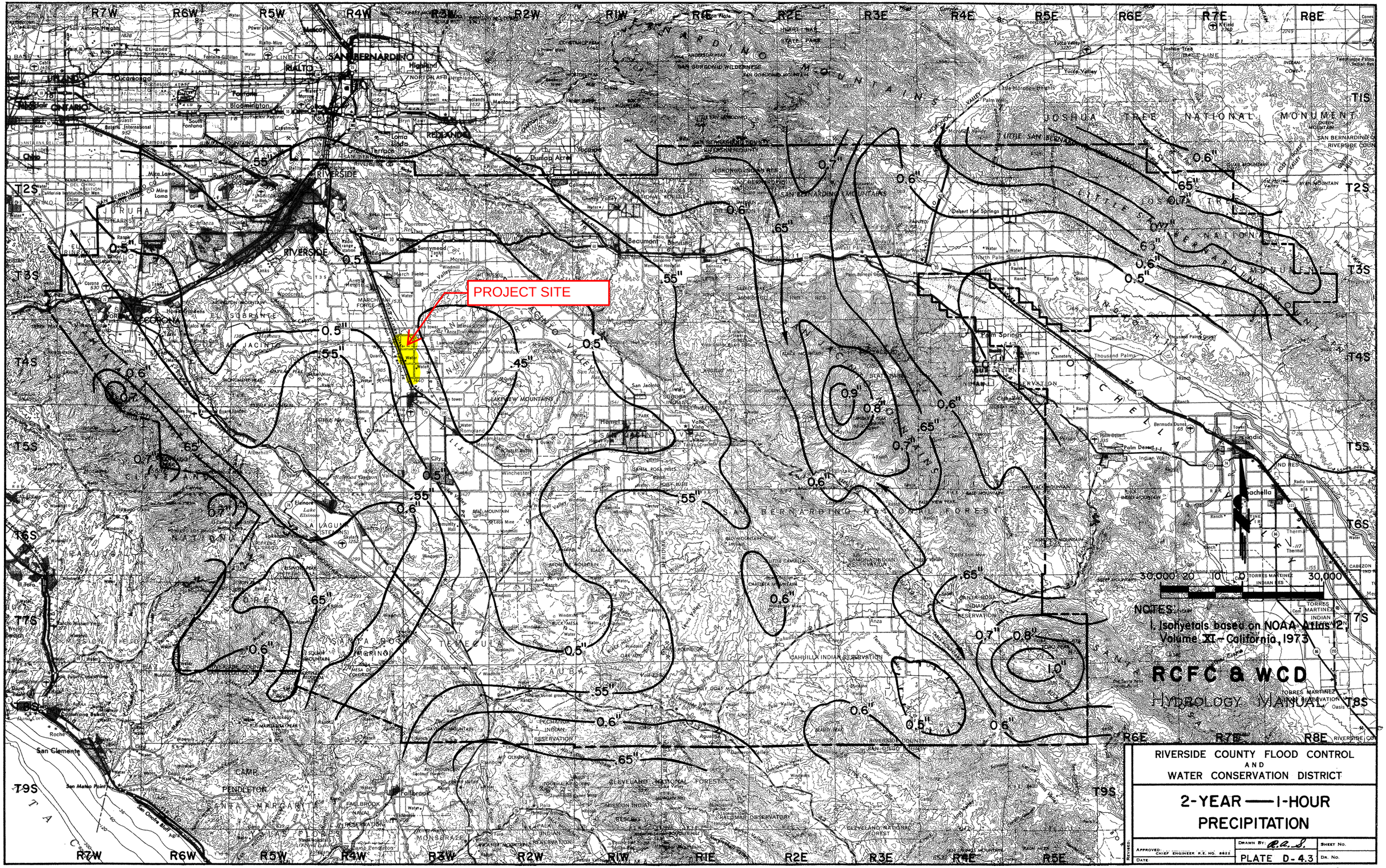
RAINFALL INTENSITY–INCHES PER HOUR

MIRA LOMA			MURRIETA - TEMECULA & RANCHO CALIFORNIA			NORCO			PALM SPRINGS			PERRIS VALLEY		
DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY	
	10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR
5	2.84	4.48	5	3.45	5.10	5	2.77	4.16	5	4.23	6.76	5	2.64	3.78
6	2.58	4.07	6	3.12	4.61	6	2.53	3.79	6	3.80	6.08	6	2.41	3.46
7	2.37	3.75	7	2.87	4.24	7	2.34	3.51	7	3.48	5.56	7	2.24	3.21
8	2.21	3.49	8	2.67	3.94	8	2.19	3.29	8	3.22	5.15	8	2.09	3.01
9	2.08	3.28	9	2.50	3.69	9	2.07	3.10	9	3.01	4.81	9	1.98	2.84
10	1.96	3.10	10	2.36	3.48	10	1.96	2.94	10	2.83	4.52	10	1.88	2.69
11	1.87	2.95	11	2.24	3.30	11	1.87	2.80	11	2.67	4.28	11	1.79	2.57
12	1.78	2.82	12	2.13	3.15	12	1.79	2.68	12	2.54	4.07	12	1.72	2.46
13	1.71	2.70	13	2.04	3.01	13	1.72	2.58	13	2.43	3.88	13	1.65	2.37
14	1.64	2.60	14	1.96	2.89	14	1.66	2.48	14	2.33	3.72	14	1.59	2.29
15	1.58	2.50	15	1.89	2.79	15	1.60	2.40	15	2.23	3.58	15	1.54	2.21
16	1.53	2.42	16	1.82	2.69	16	1.55	2.32	16	2.15	3.44	16	1.49	2.14
17	1.48	2.34	17	1.76	2.60	17	1.50	2.25	17	2.08	3.32	17	1.45	2.08
18	1.44	2.27	18	1.71	2.52	18	1.46	2.19	18	2.01	3.22	18	1.41	2.02
19	1.40	2.21	19	1.66	2.45	19	1.42	2.13	19	1.95	3.12	19	1.37	1.97
20	1.36	2.15	20	1.61	2.38	20	1.39	2.08	20	1.89	3.03	20	1.34	1.92
22	1.29	2.04	22	1.53	2.26	22	1.32	1.98	22	1.79	2.86	22	1.28	1.83
24	1.24	1.95	24	1.46	2.15	24	1.26	1.90	24	1.70	2.72	24	1.22	1.75
26	1.18	1.87	26	1.39	2.06	26	1.22	1.82	26	1.62	2.60	26	1.18	1.69
28	1.14	1.80	28	1.34	1.98	28	1.17	1.76	28	1.56	2.49	28	1.13	1.63
30	1.10	1.73	30	1.29	1.90	30	1.13	1.70	30	1.49	2.39	30	1.10	1.57
32	1.06	1.67	32	1.24	1.84	32	1.10	1.64	32	1.44	2.30	32	1.06	1.52
34	1.03	1.62	34	1.20	1.78	34	1.06	1.59	34	1.39	2.22	34	1.03	1.48
36	1.00	1.57	36	1.17	1.72	36	1.03	1.55	36	1.34	2.15	36	1.00	1.44
38	.97	1.53	38	1.13	1.67	38	1.01	1.51	38	1.30	2.09	38	.98	1.40
40	.94	1.49	40	1.10	1.62	40	.98	1.47	40	1.27	2.02	40	.95	1.37
45	.89	1.40	45	1.03	1.52	45	.92	1.39	45	1.18	1.89	45	.90	1.29
50	.84	1.32	50	.97	1.44	50	.88	1.31	50	1.11	1.78	50	.85	1.22
55	.80	1.26	55	.92	1.36	55	.84	1.25	55	1.05	1.68	55	.81	1.17
60	.76	1.20	60	.88	1.30	60	.80	1.20	60	1.00	1.60	60	.78	1.12
65	.73	1.15	65	.84	1.24	65	.77	1.15	65	.95	1.53	65	.75	1.08
70	.70	1.11	70	.81	1.19	70	.74	1.11	70	.91	1.46	70	.72	1.04
75	.68	1.07	75	.78	1.15	75	.72	1.07	75	.88	1.41	75	.70	1.00
80	.65	1.03	80	.75	1.11	80	.69	1.04	80	.85	1.35	80	.68	.97
85	.63	1.00	85	.73	1.07	85	.67	1.01	85	.82	1.31	85	.66	.94
SLOPE = .530			SLOPE = .550			SLOPE = .500			SLOPE = .580			SLOPE = .490		

STANDARD
INTENSITY–DURATION
CURVES DATA


PROJECT SITE
NOTES:
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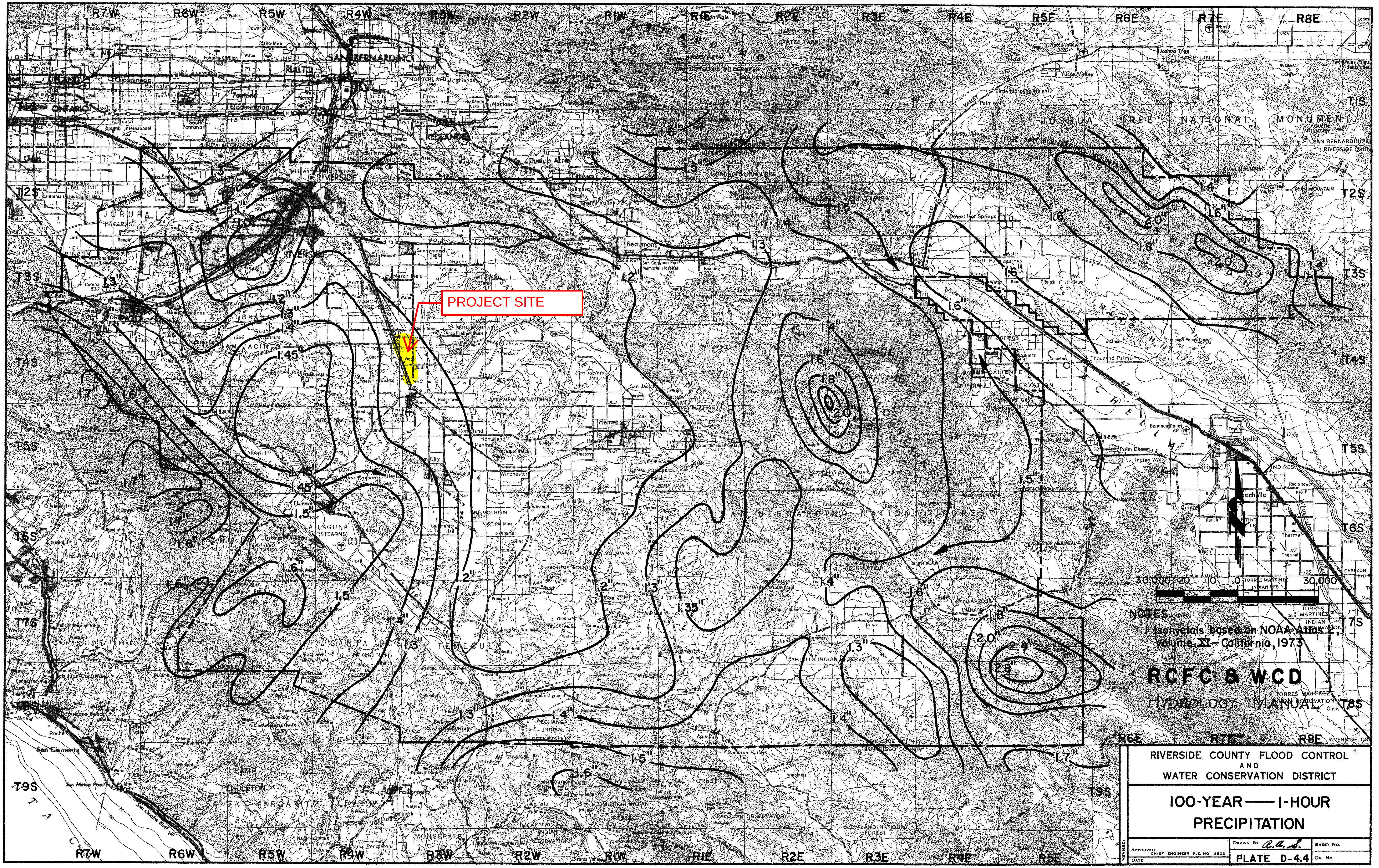
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
2-YEAR — 1-HOUR PRECIPITATION
PLATE D-4.3
DRAWN BY: R.A.S.
APPROVED CHIEF ENGINEER R.E. NO. 8822
DATE
SHEET No.
DR. No.
REVISED:


PROJECT SITE
NOTES
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RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
100-YEAR —— 1-HOUR
PRECIPITATION
DRAWN BY: R.A.S.
SHEET NO.
APPROVED: CHIEF ENGINEER R.E. NO. 8822
DATE
REVISED
PLATE D-4.4
DR. NO.
30,000 20 10 0 30,000
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E
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R4E
R5E
R6E
R7E
R8E
T1S
T2S
T3S
T4S
T5S
T6S
T7S
T8S
T9S
SAN BERNARDINO
RIVERSIDE
REDLANDS
ONTARIO
UPLAND
RIALTO
CORONA
Perris
Beaumont
Banning
Hemet
San Jacinto
Palm Springs
Indio
Coachella
Elsinore
Fallbrook
San Clemente
Temecula
JOSHUA TREE NATIONAL MONUMENT
SAN BERNARDINO MOUNTAINS
SAN JACINTO MOUNTAINS
CLEVELAND NATIONAL FOREST
SAN BERNARDINO NATIONAL FOREST
1.0"
1.1"
1.2"
1.3"
1.35"
1.4"
1.45"
1.5"
1.6"
1.7"
1.8"
2.0"
2.4"
2.8"

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

September 20, 2023

Howard Industrial Partners
1944 North Tustin Street, Suite 122
Orange, California 92865

Attention: Mr. Mike Tunney
Vice President

Project No.: **22G183-4**

Subject: **Results of Additional Infiltration Testing**
Harvest Landing Industrial Development
Indian Avenue and Orange Avenue
Perris, California

Reference: 1) Geotechnical Investigation, Proposed Harvest Landing Industrial Development, Indian Avenue and Orange Avenue, Perris, California, prepared for Howard Industrial Partners, by Southern California Geotechnical, Inc. (SCG), SCG Project No. 22G183-1, dated June 13, 2022.

2) Results of Infiltration Testing, Proposed Harvest Landing Industrial Development, Indian Avenue and Orange Avenue, Perris, California, prepared by Southern California Geotechnical, Inc. (SCG), SCG Project No. 22G183-2, dated July 1, 2022.

3) Geotechnical Investigation, Harvest Landing Industrial Development, Indian Avenue and Orange Avenue, Perris, California, prepared for Howard Industrial Partners, by Southern California Geotechnical, Inc. (SCG), SCG Project No. 22G183-3, dated September 21, 2023.

Mr. Tunney:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

Scope of Services

The scope of services performed for this project was in general accordance with our Proposal No. 23P306R, dated August 9, 2023. The scope of services included site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the on-site soils. The infiltration testing was performed in general accordance with the guidelines published in Riverside County – Low Impact Development BMP Design Handbook – Section 2.3 of Appendix A, prepared for the Riverside County Department of Environmental Health (RCDEH), dated December, 2013.

Site and Project Description

The site is located at the southwest corner of North Perris Boulevard and Orange Avenue in Perris, California. The site is bounded to the north by Orange Avenue, West Water Avenue, and vacant land, to the west by Interstate 215 Frontage Road and Freeway I-215, to the south by an existing commercial development and a vacant land, and to the east by an existing commercial development, North Perris Boulevard and Barrett Avenue. The western portion of the site is partially transected by Indian Avenue (trending north-south). Orange Avenue (trending east-west) separates the northern portion of the overall site (designated as Phase 2 on the site plans) from Phase 1 in the central to southern portions of the western portion of the overall site. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 in Appendix A of this report.

The site consists of several parcels, which total 214.82± acres in size. The west-central area of the site, is developed with four (4) single-family residences (SFRs) which range from approximately 1,200 to 6,160 ft² in size. The residences are of wood-frame and stucco construction and are assumed to be supported on conventional shallow foundations, with slab-on-grade floors. Ground surface cover surrounding the SFRs includes asphaltic concrete with Portland cement concrete driveways, exposed soil, and trees. The remaining areas of the site are vacant and undeveloped. Ground surface cover consists of exposed soil with sparse to moderate native grass and weed growth and occasional trees. A water pump is present approximately 200 feet south of the intersection of Perris Boulevard and Orange Avenue, within the site's boundary. A 3- to 4-foot deep drainage rut is present in the central-eastern area of the site, trending east-west between a dirt road located and the east boundary of the site. Many small stockpiles of plant material and woodchips are located along the eastern side of Indian Avenue, approximately 2 to 4-feet in height. Based on historic aerial photographs obtained from Google Earth, the site was previously used for farming activities. Due to previous tilling activities, the ground surface throughout the site is generally hummocky.

Detailed topographic information was obtained from the Exhibit A-Infiltration Testing Locations plan, prepared by FM Civil Engineers, Inc. Based on this plan, the overall site topography slopes downward to the east at a gradient of 1.5± percent.

Proposed Development

Based on a site plan prepared by RGA, the site will be developed with the following industrial/commercial buildings, located throughout the site.

Building Type	Building Name	Location	Size (ft²)
Industrial	1	Northwest	380,000
Industrial	2	West-Central	88,400
Industrial	3	West-Central	50,000
Industrial	4	Southwest	18,800

Distribution	5	Central	440,000
Commercial	Big Box Retail	Southeast	165,000
Commercial	Shopping Center	Northeast	150,000
Retail	Pad 1	Northeast	6,500
Retail	Pad 2	Northeast	6,500
Restaurant	Pad 3	East	2,305
Retail	Pad 4	East	9,000
Restaurant	Pad 5	Southeast	3,172

Building Nos. 1 through 4 - Industrial Buildings

Dock-high doors will be constructed along a portion of at least one building wall for each of the industrial buildings. The buildings will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete pavements in the loading dock areas, and limited areas of concrete flatwork and landscape planters throughout.

Detailed structural information has not been provided. We assume the new industrial buildings will be single-story structures of tilt-up concrete construction, typically supported on conventional shallow foundation systems with concrete slab-on-grade floors. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 100 kips and 4 to 7 kips per linear foot, respectively.

Building No. 5 - Distribution Building

Dock-high doors will be constructed along portions of the east and west building walls. The building will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete pavements in the loading dock areas, and limited areas of concrete flatwork and landscape planters throughout. Two ancillary buildings, 15,300± ft² and 3,300± ft² in size are located to the south of the main distribution building.

Detailed structural information has not been provided. We assume the new main distribution building will be a two-story structure of tilt-up concrete construction, typically supported on conventional shallow foundation system with a concrete slab-on-grade floor. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 700 to 900 kips and 4 to 7 kips per linear foot, respectively.

Commercial – Big Box Retail

Dock-high doors will be constructed along a portion of the east building wall. The building will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete in the loading dock areas, and limited areas of concrete flatwork and landscape planters

throughout. This commercial development will include an automobile service station located east of the building. The service station will include a canopy, five (5) fuel pump islands, and underground storage tanks (USTs).

Detailed structural information has not been provided. We assume that the commercial building will be a single-story structure of tilt-up concrete construction, typically supported on conventional shallow foundation system with concrete slab-on-grade floors. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 100 kips and 4 to 7 kips per linear foot, respectively. The new pump island canopy is expected to be a steel frame structure, typically supported on deepened shallow foundations. Maximum column loads for the canopy are expected to be in the range of 20 kips, with significant overturning and/or uplift loads.

Commercial – Shopping Center

The shopping center building will consist of eight (8) suites ranging from 2,400± ft² to 54,000± ft² in size. Dock-high doors will be constructed along a portion of the west building walls for four (4) of the suites of the shopping center building. The building will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete in the loading dock areas, and limited areas of concrete flatwork and landscape planters throughout.

Detailed structural information has not been provided. We assume that the new shopping center building will be a single-story structure of wood frame or masonry block construction, typically supported on conventional shallow foundation systems with a concrete slab-on-grade floor. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 50 kips and 2 to 3 kips per linear foot, respectively.

Retail and Restaurant Buildings

The two fast-food restaurant buildings will include drive-thru lanes. Pad 4 will contain four (4) suites. The buildings will be surrounded by asphaltic concrete pavements in the parking and drive lanes, concrete flatwork, and limited areas of landscape planters throughout.

Detailed structural information has not been provided. We assume that the new retail and restaurant buildings will be single-story structures of wood frame construction, typically supported on conventional shallow foundation systems with concrete slab-on-grade floors. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 20 kips and 1 to 3 kips per linear foot, respectively.

Streets

Barrett Avenue and two access streets will be constructed at the site. It is assumed that the new streets will consist of asphaltic concrete pavements.

General

No significant amounts of below-grade construction, such as basements or crawl spaces, are expected to be included in the proposed development. Based on the assumed topography, cuts and fills of up to 8 to 10± feet are expected to be necessary to achieve the proposed site grades

throughout the site.

Streets

Barrett Avenue and two access streets will be constructed at the site. It is assumed that the new streets will consist of asphaltic concrete pavements.

Previous Studies

Southern California Geotechnical (SCG) previously conducted a geotechnical investigation at the subject site (Reference No. 1). As a part of this study, twenty-three (23) borings (Identified as Boring Nos. B-1 through B-23) were advanced to depths of 15 to 25± feet below the existing site grades. Native alluvium was encountered at each boring locations, extending to at least the maximum depth explored of 25± feet below existing site grades. The alluvium generally consists of medium dense to very dense silty sands to sandy silts, with trace to little clay content. Free water was not encountered during the drilling of the borings. Based on the lack of water within the borings and the moisture contents of the recovered soil samples, the static groundwater is considered to have existed at a depth in excess of 25± feet at the time of the subsurface exploration.

SCG also previously conducted infiltration testing at the subject site (Reference No. 2). The subsurface exploration performed for the infiltration testing consisted of six (6) shallow infiltration trenches (identified as Infiltration Trench Nos. I-1 through I-6) and four (4) deep infiltration borings (identified as Infiltration Boring Nos. I-7 through I-10). The infiltration trenches were excavated to a depth of 7± feet below existing site grades. The infiltration borings were extended to a depth of 50± feet below existing site grades. In addition, one (1) exploratory boring was extended to a depth of 60± feet below site grades. Artificial fill soils were encountered at the ground surface at Infiltration Test No. I-3, extending to a depth of 1± foot below existing site grades. The fill soils consisted of medium dense fine to medium sandy silts with trace quantities of clay and fine gravel. Native alluvium was encountered at the ground surface at all of the remaining boring and trench locations, extending to at least the maximum explored depth of 60± feet below existing site grades. The near-surface alluvium encountered at depths less than 25± feet below existing site grades consisted of medium dense to very dense fine to medium sandy silts, silty fine to medium sands, clayey fine to coarse sands, and hard fine to coarse sandy clays. At depths greater than 25± feet, the alluvium consisted of medium dense to very dense fine sandy silts, fine to medium sandy silts, silty fine to medium sands, and hard fine to medium sandy clays. Based on the results of the testing, SCG recommended infiltration rates of 0.9 to 3.6 inches per hour for the proposed chamber systems. Additionally, SCG did not recommend dry well infiltration at the subject site.

Concurrent Study

SCG concurrently conducted a geotechnical investigation at the subject site (Reference No. 3). As a part of this study, forty-three (43) borings (identified as Boring Nos. B-25 through B-67) were advanced to depths of 10 to 50± feet below the existing site grades.

Younger native alluvium was encountered at the ground surface at Boring Nos. B-25, B-28, B-29, B-31, B-32, B-50, B-55 through B-58, B-60, B-64, and B-67, extending to depths of 2½ to 5½± feet below existing site grades. The alluvium generally consists of loose to medium dense silty

fine sands, silty fine to medium sands, fine sandy silts, clayey fine sands. Occasional layers of very stiff fine sandy clays and silty clays. The younger native alluvial soils are classified as "alluvium" on the boring logs. Native older alluvium was encountered beneath the younger native alluvial soils (at the boring locations listed above) and at the ground surface at the remaining boring locations. All of the borings were terminated within the older alluvium, and the older alluvial soils extend to at least the maximum depth explored of 50± feet below ground surface. The older alluvial soils generally consist of medium dense to very dense well- to poorly-graded silty sands with varying clay content, well-graded to poorly-graded sandy silts with varying clay content, well-graded to poorly-graded clayey sands with varying silt content, and clayey silts. Additionally, layers of very stiff to hard fine sandy clays and silty clays were encountered. The older alluvium generally possesses weak to moderate cementation, and occasionally possesses trace to extensive calcareous nodules and veining.

Groundwater

Free water was not encountered during the drilling of any of the borings. Based on the moisture content of the recovered soil samples and the lack of free water in the borings, the static groundwater table is at a depth greater than the maximum explored depth of 50± feet below existing site grades for this project.

Recent water level data was obtained from the California Department of Water Resources website, http://www.water.ca.gov/waterdatalibrary/. The nearest monitoring well is located on the northeast corner of the site. Water level readings within this monitoring well indicates a groundwater level of 40± feet (March 2023) below the ground surface.

Subsurface Exploration

Scope of Exploration

The subsurface exploration conducted for the infiltration testing consisted of thirty-seven (37) infiltration test borings, advanced to depths of 3 to 10½± feet below the existing site grades. The infiltration borings were advanced using a truck-mounted drilling rig, equipped with 8-inch-diameter hollow stem augers and were logged during drilling by a member of our staff. The approximate locations of the infiltration test borings (identified as Infiltration Test Nos. I-11 through I-37) are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Upon the completion of the infiltration borings, the bottom of each test boring was covered with 2± inches of clean ¾-inch gravel. A sufficient length of 3-inch-diameter perforated PVC casing was then placed into each test hole so that the PVC casing extended from the bottom of the test hole to the ground surface. Clean ¾-inch gravel was then installed in the annulus surrounding the PVC casing.

Geotechnical Conditions

Native younger alluvium was encountered at the ground surface at Infiltration Test Nos. I-11, I-23, I-26 and I-39, extending to depths of 3 to 6± feet below the existing site grades. The younger alluvium generally consists of medium dense silty sands and sandy silts. Native older alluvium was encountered beneath the native younger alluvium and at the ground surface at the remaining

infiltration test locations, extending to at least the maximum depth explored of 10½± feet. The older alluvium generally consists of medium dense to very dense silty sands and sandy silts with trace to little clay content. The older alluvium occasionally possesses weak cementation. The Infiltration Boring Logs, which illustrate the conditions encountered at each of the borings, are included with this report.

Infiltration Testing

As previously mentioned, the infiltration testing was performed in general accordance with the Riverside County guidelines: Riverside County – Low Impact Development BMP Design Handbook – Section 2.3 of Appendix A.

Pre-soaking

In accordance with the county infiltration standards all of the infiltration test borings were pre-soaked prior to the infiltration testing. The pre-soaking process consisted of filling the test borings by inverting a full 5-gallon bottle of clear water supported over each hole so that the water level reaches a level of at least 5 times the hole's radius above the gravel at the bottom of each hole. The pre-soaking was completed after all of the water had percolated through each test hole or after 15 hours since initiating the pre-soak. Based on the results of the pre-soaking process, 30-minute readings were utilized during all of the infiltration tests, except for Infiltration Test Nos. I-24 and I-45. For Infiltration Test Nos. I-24 and I-45, 10-minute readings were utilized during the infiltration tests.

Infiltration Testing

Following the pre-soaking process of the infiltration test borings, SCG performed the infiltration testing. Each test hole was filled with water to a depth of at least 5 times the hole's radius above the gravel at the bottom of each test hole. In accordance with the Riverside County guidelines, in areas where "non-sandy soils" were encountered at the bottom of each infiltration test boring, (where 6 inches of water did not infiltrate into the surrounding soils in less than 25 minutes for two (2) consecutive readings), readings were taken at 30-minute intervals for a total of 6 hours at the test locations. At Infiltration Test Nos. I-24 and I-45, "sandy-soils" were encountered at the bottom of the test borings, (where 6 inches of water did infiltrate into the surrounding soils in less than 25 minutes for two (2) consecutive readings), therefore, readings were taken at 10-minute intervals for 1 hour at the test locations. The water level readings are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on the spreadsheets.

The infiltration rates from the test are tabulated in inches per hour. In accordance with the typically accepted practice, it is recommended that the most conservative reading from the latter part of the infiltration tests be used as the design infiltration rate. The rates are summarized below:

Infiltration Test No.	Depth (feet)	Soil Description	Measured Infiltration Rate (inches/hour)
I-11	4½	YOUNGER ALLUVIUM: Brown Silty fine to coarse Sand, trace Clay	0.2

I-12	4½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.2
I-13	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.2
I-14	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.2
I-15	10½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-16	9½	OLDER ALLUVIUM: Dark Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.2
I-17	10	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace to little Clay, trace coarse Sand	0.0
I-18	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace to little Clay, trace coarse Sand	0.0
I-19	3	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-20	3	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-21	3½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, little coarse Sand	0.4
I-22	4½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, little coarse Sand	0.3
I-23	9	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-24	9	OLDER ALLUVIUM: Brown Silty fine to coarse Sand	1.7
I-25	9	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-26	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-27	7	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace coarse Sand	0.1
I-28	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.0
I-29	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-30	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace Clay	0.1
I-31	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-32	6½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-33	6½	OLDER ALLUVIUM: Brown fine to medium Sandy Silt to Silty fine to medium Sand, trace Clay	0.1
I-34	5	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-35	4½	OLDER ALLUVIUM: Light Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-36	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.0
I-37	6½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1

I-38	6½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-39	7½	OLDER ALLUVIUM: Dark Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-40	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-41	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace Clay, trace coarse Sand	0.0
I-42	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace Clay, trace coarse Sand	0.0
I-43	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-44	4½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-45	5	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.8
I-46	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-47	7	OLDER ALLUVIUM: Brown fine to medium Sandy Silt, little Clay	0.1

Laboratory Testing

Moisture Content

The moisture contents for the recovered soil samples within the borings were determined in accordance with ASTM D-2216 and are expressed as a percentage of the dry weight. These test results are presented on the Boring Logs.

Grain Size Analysis

The grain size distribution of selected soils collected from the bottom of each infiltration test boring have been determined using a range of wire mesh screens. These tests were performed in general accordance with ASTM D-422 and/or ASTM D-1140. The weight of the portion of the sample retained on each screen is recorded and the percentage finer or coarser of the total weight is calculated. The results of these tests are presented on Plates C-1 through C-37 of this report.

Design Recommendations

Thirty-seven (37) infiltration tests were performed at the subject site. As noted above, the calculated infiltration rates at the infiltration test locations range between 0.0 and 1.7 inches per hour. The major factors affecting the lack of infiltration at these locations are the presence of very dense older alluvium with high contents of fine-grained soil. **Based on these conditions and the results of infiltration testing we recommend the following design infiltration rates to be utilized for the proposed infiltration systems:**

Infiltration System(s)	Infiltration Test Nos.	Infiltration Test Depth (ft)	Infiltration System Type	Infiltration System Location	Design Infiltration Rate (inches/hour)
"A"	I-11	4½	Bio-Retention Basin	West	Not Recommended
"B"	I-12	4½	Bio-Retention Basin	West	Not Recommended
"C"	I-13	5½	Below-Grade Chamber	West	Not Recommended
"D"	I-14	7½	Below-Grade Chamber	Northwest	Not Recommended
"E"	I-15 through I-17	9½ to 10½	Bio-Retention Basin	North	Not Recommended
"F"	I-18	7½	Below-Grade Chamber	North	Not Recommended
"G"	I-19 through I-22	3 to 4½	Bio-Retention Basin	South	Not Recommended
"H"	I-23, I-24	9	Bio-Retention Basin	South	Not Recommended
"I" & "J"	I-25 through I-33	5½ to 9	Bio-Retention Basin	Northeast	Not Recommended
"K"	I-34 through I-36	4½ to 5½	Below-Grade Chamber	Southeast	Not Recommended
"L"	I-37	6½	Below-Grade Chamber	Southeast	Not Recommended
"M"	I-38, I-39	6½ to 7½	Below-Grade Chamber	Southeast	Not Recommended
"N"	I-40	7½	Below-Grade Chamber	Northeast	Not Recommended
"O"	I-41	6	Below-Grade Chamber	Northeast	Not Recommended
"P"	I-42	6	Below-Grade Chamber	Northeast	Not Recommended
"Q"	I-43	6	Below-Grade Chamber	Northeast	Not Recommended
"R"	I-44	4½	Below-Grade Chamber	Northeast	Not Recommended*
"S"	I-45	5	Below-Grade Chamber	Northeast	Not Recommended
"T"	I-46	5½	Below-Grade Chamber	Northeast	Not Recommended
"U"	I-47	7	Below-Grade Chamber	Northeast	Not Recommended

*Although the test results indicate an infiltration rate of 0.8 in/hr at this location, the subsurface soil profile at this site includes many soil layers with low permeability. Soil layers with some capacity for infiltration, such as the silty sand layer encountered at Infiltration test-location I-44, are generally interbedded between low permeability soil layers, based on our review of the boring logs for the overall site. Therefore, long-term infiltration is not considered to feasible.

Although infiltration is not considered feasible, the client may desire to use storm water disposal systems that do not rely on infiltration at this site. The design of the proposed storm water

disposal systems should be performed by the project civil engineer, in accordance with the City of Perris, and/or County of Riverside guidelines. However, it is recommended that the system be constructed so as to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the system.

Infiltration Rate Considerations

The infiltration rates presented herein were determined in accordance with the Riverside County guidelines and are considered valid only for the time and place of the actual test. Varying subsurface conditions will exist in other areas of the site, which could alter the recommended infiltration rates presented above. The infiltration rates will decline over time between maintenance cycles as silt or clay particles accumulate on the BMP surface. The infiltration rate is highly dependent upon a number of factors, including density, silt and clay content, grainsize distribution throughout the range of particle sizes, and particle shape. Small changes in these factors can cause large changes in the infiltration rates.

Infiltration rates are based on unsaturated flow. As water is introduced into soils by infiltration, the soils become saturated and the wetting front advances from the unsaturated zone to the saturated zone. Once the soils become saturated, infiltration rates become zero, and water can only move through soils by hydraulic conductivity at a rate determined by pressure head and soil permeability. Changes in soil moisture content will affect the infiltration rate. Infiltration rates should be expected to decrease until the soils become saturated. Soil permeability values will then govern groundwater movement. Permeability values may be on the order of 10 to 20 times less than infiltration rates. The system designer should incorporate adequate factors of safety and allow for overflow design into appropriate traditional storm drain systems, which would transport storm water off-site.

Location of Infiltration Systems

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration area could potentially be damaged due to saturation of the subgrade soils. **Any proposed infiltration systems for this site should be located at least 25 feet away from any structures, including retaining walls.** Even with this provision of locating the infiltration system at least 25 feet from the building(s), it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration system.

The infiltration system designer should also give special consideration to the effect that the proposed infiltration systems may have on nearby subterranean structures, open excavations, or descending slopes. In particular, infiltration systems should not be located near the crest of descending slopes, particularly where the slopes are comprised of granular soils. Such systems will require specialized design and analysis to evaluate the potential for slope instability, piping failures and other phenomena that typically

apply to earthen dam design. This type of analysis is beyond the scope of this infiltration test report, but these factors should be considered by the infiltration system designer when locating the infiltration systems.

General Comments

This report has been prepared as an instrument of service for use by the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, structural engineer, and/or civil engineer. The design of the proposed storm water infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rate contained herein, the civil engineer agrees to indemnify, defend, and hold harmless the geotechnical engineer for all aspects of the design and performance of the proposed storm water infiltration system. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur.

The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between boring locations and testing depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted. The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

Closure

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

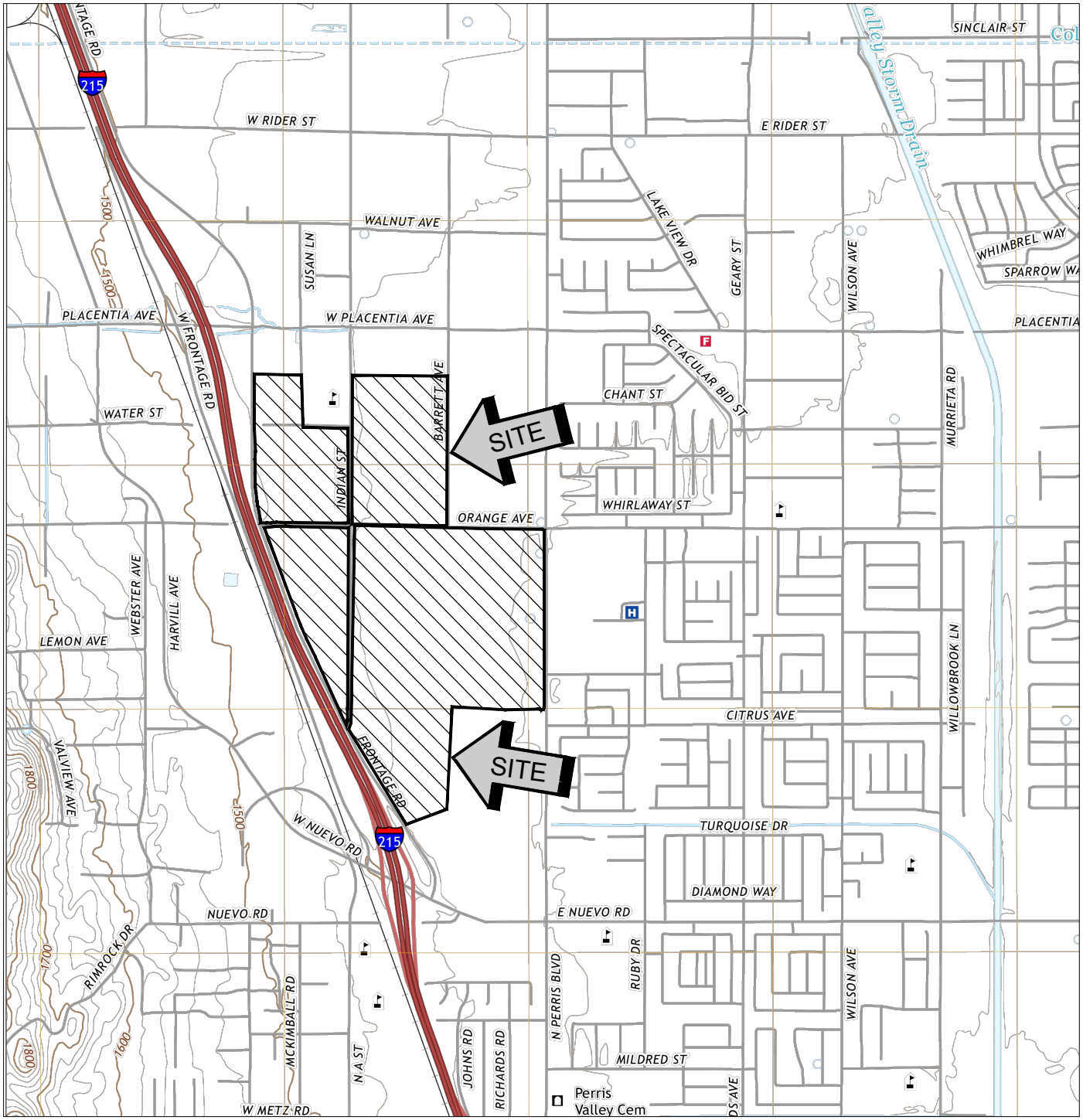
SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

Ryan Bremer
Staff Geologist

Daniel W. Nielsen, GE 3166
Senior Engineer

Distribution: (1) Addressee

Enclosures: Plate 1 - Site Location Map
Plate 2 - Infiltration Test Location Plan
Boring Log Legend and Logs (39 pages)
Infiltration Test Results Spreadsheets (37 pages)
Grain Size Distribution Graphs (37 pages)



SOURCE: USGS TOPOGRAPHIC MAP OF THE PERRIS QUADRANGLE, RIVERSIDE COUNTY, CALIFORNIA, 2021

SITE LOCATION MAP

HARVEST LANDING INDUSTRIAL DEVELOPMENT

PERRIS, CALIFORNIA

SCALE: 1" = 2000'	
DRAWN: RB CHKD: RGT	
SCG PROJECT 22G183-4	
PLATE 1	

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL

GEOTECHNICAL LEGEND

- APPROXIMATE INFILTRATION TEST LOCATION
- CONCURRENT BORING LOCATION (SCG PROJECT NO. 22G183-3)
- PREVIOUS BORING LOCATION (SCG PROJECT NO. 22G183-1)
- PREVIOUS INFILTRATION LOCATION (SCG PROJECT NO. 22G183-2)
- PREVIOUS INFILTRATION LOCATION (SCG PROJECT NO. 22G183-2)
- PREVIOUS BORING LOCATION (SCG PROJECT NO. 22G183-2)
- PROPOSED BUILDING
- PROPOSED INFILTRATION SYSTEM LOCATION
- EXISTING STRUCTURE

NOTE: CONCEPTUAL GRADING PLAN PREPARED BY FMCIVIL ENGINEERING.

22885 Savi Ranch Parkway
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Yorba Linda, CA 92887
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SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

NORTH
SoCalGeo

SCALE: 1" = 200'
DRAWN: RB
CHKD: RGT
SCG PROJECT 22G183-4

INFILTRATION TEST LOCATION PLAN

HARVEST LANDING INDUSTRIAL DEVELOPMENT
PERRIS, CALIFORNIA

PLATE 2

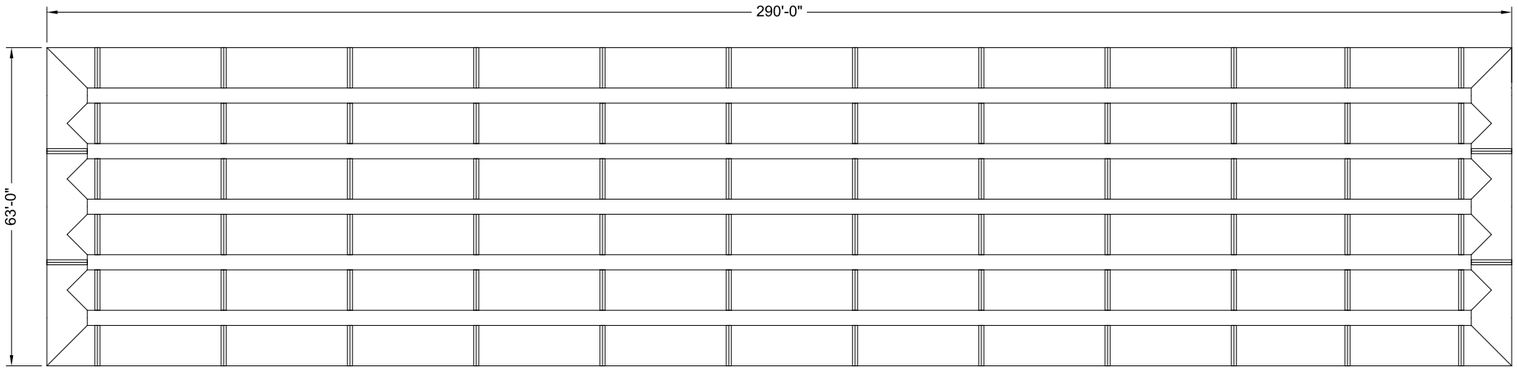
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 1,770 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 88,970 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 88,970 CF

PIPE DETAILS
- DIAMETER = 96"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 36"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"



ASSEMBLY
SCALE: 1" = 30'

NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE $2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

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CONTECH® CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO60569 20-001 Harvest Landing Retail Center and Business Park
Northerly Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
42851	60569	10/3/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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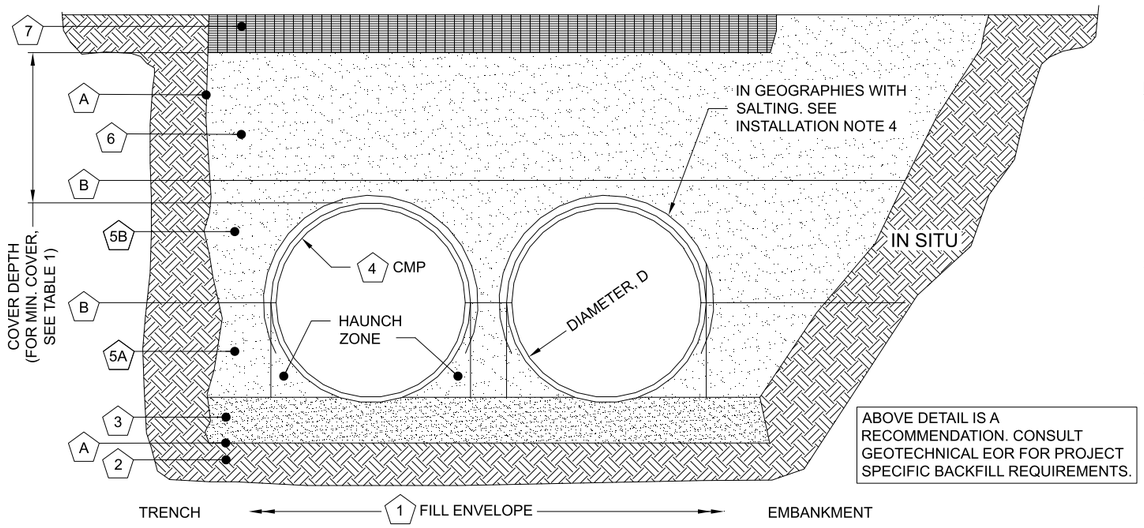
TABLE 1:

DIAMETER, D	MIN. COVER	CORR. PROFILE
6"-10"	12"	1 1/2" x 1/4"
12"-48"	12"	2 2/3" x 1/2"
>48"-96"	12"	3" x 1", 5" x 1"
>96"	D/8	3" x 1", 5" x 1"

- STRUCTURAL BACKFILL MUST EXTEND TO LIMITS OF THE TABLE
- TOTAL HEIGHT OF COMPACTED COVER FOR CONVENTIONAL HIGHWAY LOADS IS MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TOP OF RIGID PAVEMENT
- ULTRAFLO ALSO AVAILABLE FOR SIZES 18" - 120" WITH 3/4"x 3/4"x 7 1/2" CORRUGATION



ABOVE DETAIL IS A RECOMMENDATION. CONSULT GEOTECHNICAL EOR FOR PROJECT SPECIFIC BACKFILL REQUIREMENTS.

MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT

INSTALLATION NOTES

1. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES.
2. OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.
3. BACKFILL USING CONTROLLED LOW-STRENGTH MATERIAL (CLSM, "FLASH FILL" OR "FLOWABLE FILL") MAY BE USED WHEN THE SPACING BETWEEN THE PIPES WILL NOT ALLOW FOR PLACEMENT AND ADEQUATE COMPACTION OF THE BACKFILL. CONTACT CONTECH FOR FURTHER EVALUATION.
4. IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, A GEOMEMBRANE BARRIER IS RECOMMENDED OVER THE UPPER HALF OF THE PIPE. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

TABLE 2: SOLID STANDARD

CMP DETENTION AND CMP DRAINAGE STANDARD BACKFILL SPECIFICATIONS

	MATERIAL LOCATION	MATERIAL SPECIFICATION	DESCRIPTION	
1	FILL ENVELOPE WIDTH	PER ENGINEER OF RECORD	MINIMUM TRENCH WIDTH MUST ALLOW ROOM FOR PROPER COMPACTION OF HAUNCH MATERIALS UNDER THE PIPE. THE SUGGESTED MINIMUM TRENCH WIDTH, OR EOR RECOMMENDATION: PIPE ≤ 12": D + 16" PIPE > 12": 1.5D + 12"	MINIMUM EMBANKMENT WIDTH (IN FEET) FOR INITIAL FILL ENVELOPE: PIPE < 24": 3.0D PIPE 24" - 144": D + 4'0" PIPE > 144": D + 10'0"
2	FOUNDATION	**AASHTO 26.5.2** OR PER ENGINEER OF RECORD	PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND FOUNDATION BROUGHT BACK TO GRADE WITH A FILL MATERIAL APPROVED BY THE ENGINEER OF RECORD.	
3	BEDDING	**AASHTO M 43: 3, 357, 4, 467, 5, 56, 57** (APPROVED REGIONAL EQUIVALENTS INCLUDE CA-7)	ENGINEER OF RECORD TO DETERMINE IF BEDDING IS REQUIRED. PIPE MAY BE PLACED ON THE TRENCH BOTTOM OF A RELATIVELY LOOSE, NATIVE SUITABLE WELL GRADED GRANULAR MATERIAL THAT IS ROUGHLY SHAPED TO FIT THE BOTTOM OF THE PIPE, 2" MIN DEPTH. THE BEDDING MATERIAL MAY BE SUITABLE FOUNDATION SOILS CONFORMING TO AASHTO SOIL CLASSIFICATIONS A1, A2, OR A3 WITH MAXIMUM PARTICLE SIZE OF 3" PER AASHTO 26.3.8.1	
4	CORRUGATED METAL PIPE			
5A	CRITICAL BACKFILL	**AASHTO M 145: A-1, A-2, A-3** *	HAUNCH ZONE MATERIAL SHALL BE HAND SHOVELED OR SHOVEL SLICED INTO PLACE TO ALLOW FOR PROPER COMPACTION WITHOUT SOFT SPOTS. BACKFILL SHALL BE PLACED IN 8" +/- LOOSE LIFTS AND COMPACTED TO 90% STANDARD PROCTOR PER AASHTO T 99. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A THREE LIFT (24") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHOULD BE ADVANCED ALONG THE LENGTH OF THE SYSTEM TO AVOID DIFFERENTIAL LOADING. WELL GRADED GRANULAR MATERIAL WHICH MAY CONTAIN SMALL AMOUNTS OF SILT OR CLAY AND MAXIMUM PARTICLE SIZE OF 3" (PER AASHTO 26.3.8.1 AND 12.4-1.3).	
5B	BACKFILL	**AASHTO M 145: A-1, A-2, A-3**		
6	COVER MATERIAL	UP TO MIN. COVER - SEE 5A AND 5B ABOVE ABOVE MIN. COVER - PER ENGINEER OF RECORD	COVER MATERIAL MAY INCLUDE NON-BITUMINOUS, GRANULAR ROAD BASE MATERIAL WITHIN MIN COVER LIMITS	
7	RIGID OR FLEXIBLE PAVEMENT (IF APPLICABLE)	PER ENGINEER OF RECORD	FLEXIBLE PAVEMENT SHOULD NOT BE COUNTED AS PART OF THE FILL HEIGHT OVER THE CMP. FINAL BACKFILL MATERIAL SELECTION AND COMPACTION REQUIREMENTS SHALL FOLLOW THE PROJECT PLANS AND SPECIFICATIONS PER THE ENGINEER OF RECORD.	
A	OPTIONAL SIDE GEOTEXTILE	NONE	GEOTEXTILE LAYER IS RECOMMENDED ON SIDES OF EXCAVATION TO PREVENT SOIL MIGRATION.	
B	OPTIONAL GEOTEXTILE BETWEEN LAYERS	NONE	IF SOIL TYPES DIFFER AT ANY POINT ABOVE PIPE INVERT, A GEOTEXTILE LAYER IS RECOMMENDED TO BE PLACED BETWEEN THE LAYERS TO PREVENT SOIL MIGRATION.	

NOTES:
- FOR MULTIPLE BARREL INSTALLATIONS, THE RECOMMENDED STANDARD SPACING BETWEEN PARALLEL PIPE RUNS SHALL BE THE PIPE DIAMETER /2 BUT NO LESS THAN 12" FOR DIAMETERS <72". FOR 72" AND LARGER DIAMETERS, THE MINIMUM SPACING IS 36". CONTACT YOUR CONTECH REPRESENTATIVE FOR NONSTANDARD SPACING.

* APPROVED REGIONAL EQUIVALENTS FOR SECTION 5A INCLUDE CA-7, CODOT #67, MIDOT 2G, 34G, OR 21AA STONE OR GRAVEL; #8; #57; MIDOT 6A, 2G, 3G, 34G.

MANUFACTURER RECOMMENDED BACKFILL

NOT TO SCALE

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CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO60569 20-001 Harvest Landing Retail Center and Business Park
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DETENTION SYSTEM

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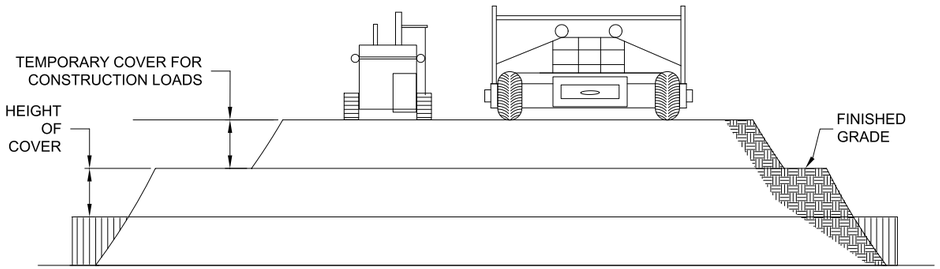

CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

APPLICABLE POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

APPLICABLE
HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.
REQUIREMENTS
INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

NOTE:
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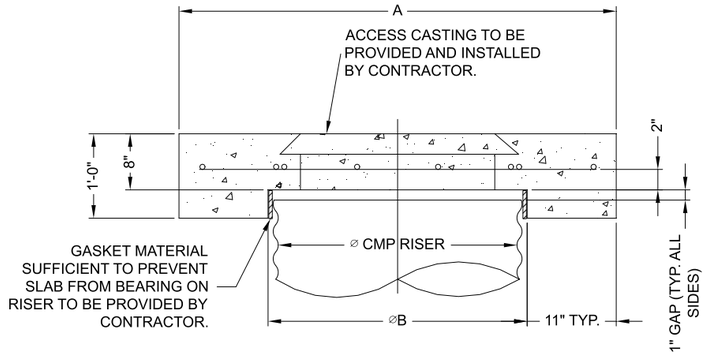
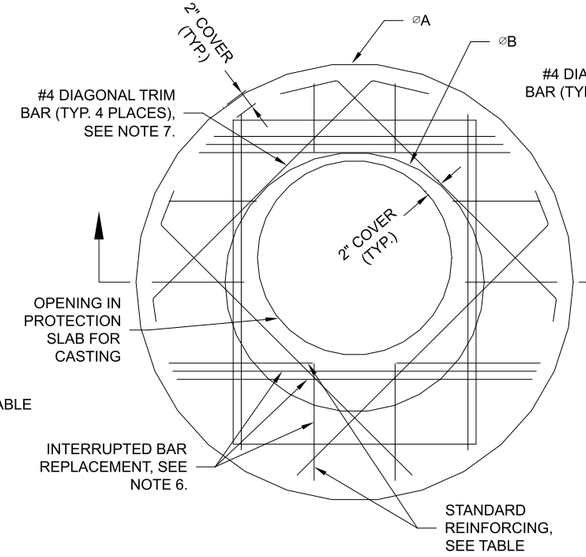


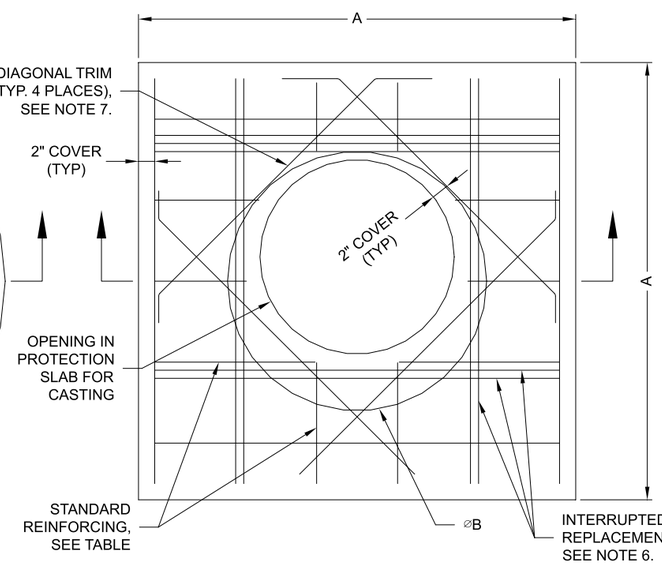
SECTION VIEW

REINFORCING TABLE				
⌀ CMP RISER	A	⌀ B	REINFORCING	**BEARING PRESSURE (PSF)
24"	⌀ 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	⌀ 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	⌀ 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	⌀ 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	⌀ 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

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CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO60569 20-001 Harvest Landing Retail Center and Business Park
Northerly Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
42851	60569	10/3/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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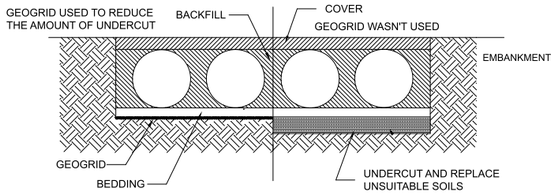
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

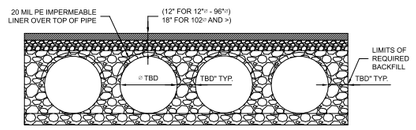
IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.



GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

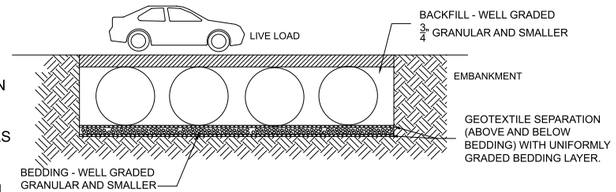
THE RESISTIVITY OF A PROJECT SITE MAY CHANGE OVER TIME DUE TO THE USE OF VARIOUS SALTING, DE-ICING, AND AGRICULTURAL AGENTS APPLIED ON OR NEAR THE AREA. TO MITIGATE THE POTENTIAL IMPACT OF THESE AGENTS, AN HDPE MEMBRANE LINER WILL BE INSTALLED ON THE CROWN OF EACH PIPE, CREATING AN IMPERMEABLE BARRIER. THIS MEASURE IS DESIGNED TO PROTECT THE SYSTEM FROM ENVIRONMENTAL CHANGES THAT COULD LEAD TO PREMATURE CORROSION AND REDUCE THE OVERALL SERVICE LIFE.



IN-SITU TRENCH WALL

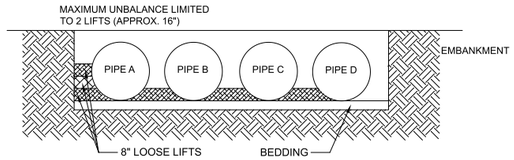
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



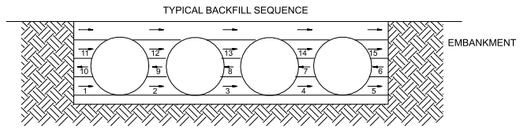
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

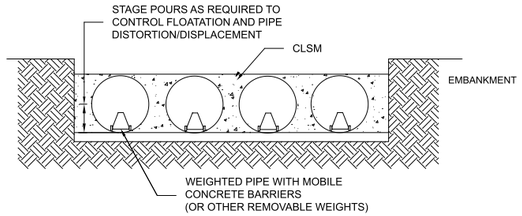


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

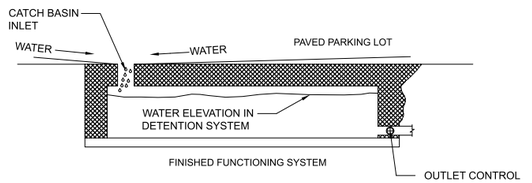


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

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CONTECH CMP DETENTION SYSTEMS

CONTECH **DYODS** DRAWING

DYO60569 20-001 Harvest Landing Retail Center and Business Park
Northerly Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
42851	60569	10/3/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 1,656 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 83,240 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 83,240 CF

PIPE DETAILS
- DIAMETER = 96"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 36"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"

NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE $2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

ASSEMBLY
SCALE: 1" = 20'

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CONTECH CMP DETENTION SYSTEMS
CONTECH **DYODS** DRAWING

DYO60570 20-001 Harvest Landing Retail Center and Business Park - Site 7
Southerly Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
42852	60570	10/3/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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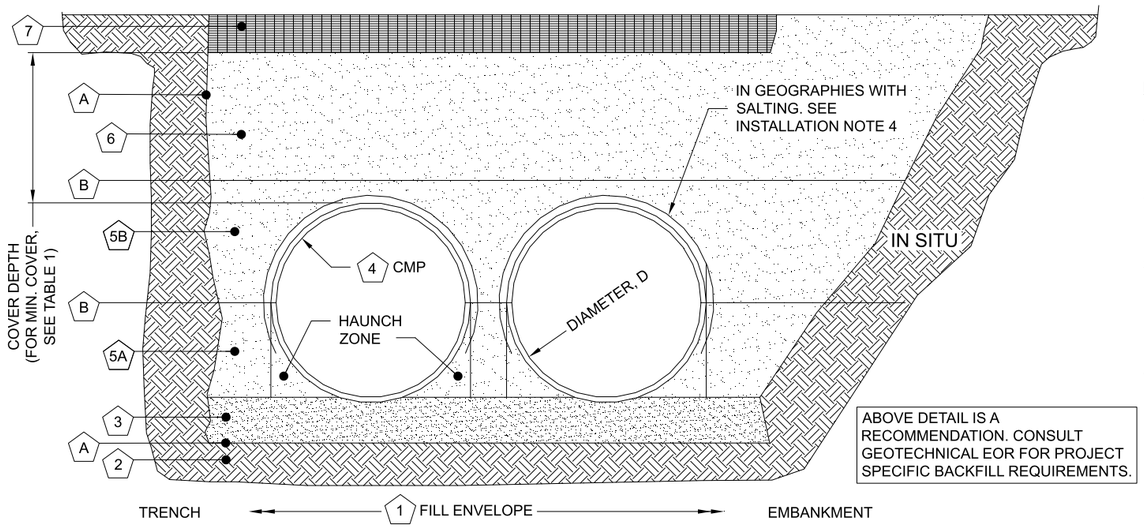
TABLE 1:

DIAMETER, D	MIN. COVER	CORR. PROFILE
6"-10"	12"	1 1/2" x 1/4"
12"-48"	12"	2 2/3" x 1/2"
>48"-96"	12"	3" x 1", 5" x 1"
>96"	D/8	3" x 1", 5" x 1"

- STRUCTURAL BACKFILL MUST EXTEND TO LIMITS OF THE TABLE
- TOTAL HEIGHT OF COMPACTED COVER FOR CONVENTIONAL HIGHWAY LOADS IS MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TOP OF RIGID PAVEMENT
- ULTRAFLO ALSO AVAILABLE FOR SIZES 18" - 120" WITH 3/4"x 3/4"x 7 1/2" CORRUGATION



MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT

INSTALLATION NOTES

1. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES.
2. OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.
3. BACKFILL USING CONTROLLED LOW-STRENGTH MATERIAL (CLSM, "FLASH FILL" OR "FLOWABLE FILL") MAY BE USED WHEN THE SPACING BETWEEN THE PIPES WILL NOT ALLOW FOR PLACEMENT AND ADEQUATE COMPACTION OF THE BACKFILL. CONTACT CONTECH FOR FURTHER EVALUATION.
4. IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, A GEOMEMBRANE BARRIER IS RECOMMENDED OVER THE UPPER HALF OF THE PIPE. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

TABLE 2: SOLID STANDARD

CMP DETENTION AND CMP DRAINAGE STANDARD BACKFILL SPECIFICATIONS

	MATERIAL LOCATION	MATERIAL SPECIFICATION	DESCRIPTION	
1	FILL ENVELOPE WIDTH	PER ENGINEER OF RECORD	MINIMUM TRENCH WIDTH MUST ALLOW ROOM FOR PROPER COMPACTION OF HAUNCH MATERIALS UNDER THE PIPE. THE SUGGESTED MINIMUM TRENCH WIDTH, OR EOR RECOMMENDATION: PIPE ≤ 12": D + 16" PIPE > 12": 1.5D + 12"	MINIMUM EMBANKMENT WIDTH (IN FEET) FOR INITIAL FILL ENVELOPE: PIPE < 24": 3.0D PIPE 24" - 144": D + 4'0" PIPE > 144": D + 10'0"
2	FOUNDATION	**AASHTO 26.5.2** OR PER ENGINEER OF RECORD	PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND FOUNDATION BROUGHT BACK TO GRADE WITH A FILL MATERIAL APPROVED BY THE ENGINEER OF RECORD.	
3	BEDDING	**AASHTO M 43: 3, 357, 4, 467, 5, 56, 57** (APPROVED REGIONAL EQUIVALENTS INCLUDE CA-7)	ENGINEER OF RECORD TO DETERMINE IF BEDDING IS REQUIRED. PIPE MAY BE PLACED ON THE TRENCH BOTTOM OF A RELATIVELY LOOSE, NATIVE SUITABLE WELL GRADED GRANULAR MATERIAL THAT IS ROUGHLY SHAPED TO FIT THE BOTTOM OF THE PIPE, 2" MIN DEPTH. THE BEDDING MATERIAL MAY BE SUITABLE FOUNDATION SOILS CONFORMING TO AASHTO SOIL CLASSIFICATIONS A1, A2, OR A3 WITH MAXIMUM PARTICLE SIZE OF 3" PER AASHTO 26.3.8.1	
4	CORRUGATED METAL PIPE			
5A	CRITICAL BACKFILL	**AASHTO M 145: A-1, A-2, A-3** *	HAUNCH ZONE MATERIAL SHALL BE HAND SHOVELED OR SHOVEL SLICED INTO PLACE TO ALLOW FOR PROPER COMPACTION WITHOUT SOFT SPOTS. BACKFILL SHALL BE PLACED IN 8" +/- LOOSE LIFTS AND COMPACTED TO 90% STANDARD PROCTOR PER AASHTO T 99. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A THREE LIFT (24") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHOULD BE ADVANCED ALONG THE LENGTH OF THE SYSTEM TO AVOID DIFFERENTIAL LOADING. WELL GRADED GRANULAR MATERIAL WHICH MAY CONTAIN SMALL AMOUNTS OF SILT OR CLAY AND MAXIMUM PARTICLE SIZE OF 3" (PER AASHTO 26.3.8.1 AND 12.4-1.3).	
5B	BACKFILL	**AASHTO M 145: A-1, A-2, A-3**		
6	COVER MATERIAL	UP TO MIN. COVER - SEE 5A AND 5B ABOVE ABOVE MIN. COVER - PER ENGINEER OF RECORD	COVER MATERIAL MAY INCLUDE NON-BITUMINOUS, GRANULAR ROAD BASE MATERIAL WITHIN MIN COVER LIMITS	
7	RIGID OR FLEXIBLE PAVEMENT (IF APPLICABLE)	PER ENGINEER OF RECORD	FLEXIBLE PAVEMENT SHOULD NOT BE COUNTED AS PART OF THE FILL HEIGHT OVER THE CMP. FINAL BACKFILL MATERIAL SELECTION AND COMPACTION REQUIREMENTS SHALL FOLLOW THE PROJECT PLANS AND SPECIFICATIONS PER THE ENGINEER OF RECORD.	
A	OPTIONAL SIDE GEOTEXTILE	NONE	GEOTEXTILE LAYER IS RECOMMENDED ON SIDES OF EXCAVATION TO PREVENT SOIL MIGRATION.	
B	OPTIONAL GEOTEXTILE BETWEEN LAYERS	NONE	IF SOIL TYPES DIFFER AT ANY POINT ABOVE PIPE INVERT, A GEOTEXTILE LAYER IS RECOMMENDED TO BE PLACED BETWEEN THE LAYERS TO PREVENT SOIL MIGRATION.	

NOTES:
- FOR MULTIPLE BARREL INSTALLATIONS, THE RECOMMENDED STANDARD SPACING BETWEEN PARALLEL PIPE RUNS SHALL BE THE PIPE DIAMETER /2 BUT NO LESS THAN 12" FOR DIAMETERS <72". FOR 72" AND LARGER DIAMETERS, THE MINIMUM SPACING IS 36". CONTACT YOUR CONTECH REPRESENTATIVE FOR NONSTANDARD SPACING.

* APPROVED REGIONAL EQUIVALENTS FOR SECTION 5A INCLUDE CA-7, CODOT #67, MIDOT 2G, 34G, OR 21AA STONE OR GRAVEL; #8; #57; MIDOT 6A, 2G, 3G, 34G.

MANUFACTURER RECOMMENDED BACKFILL

NOT TO SCALE

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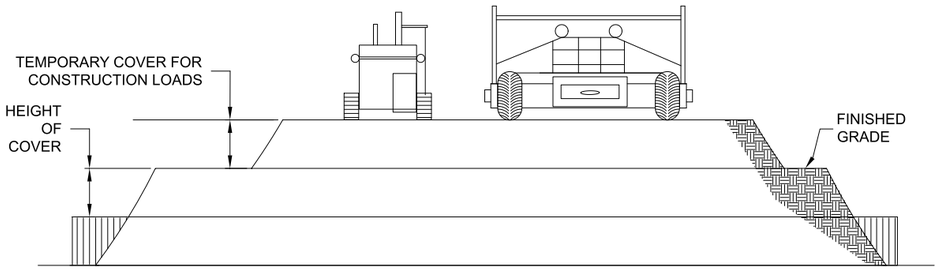


CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

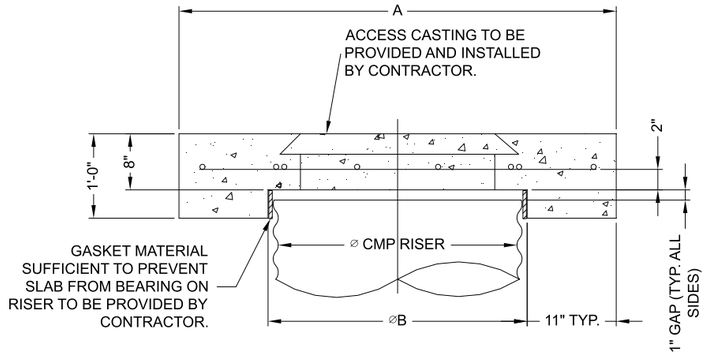
APPLICABLE POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

APPLICABLE
HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.
REQUIREMENTS
INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

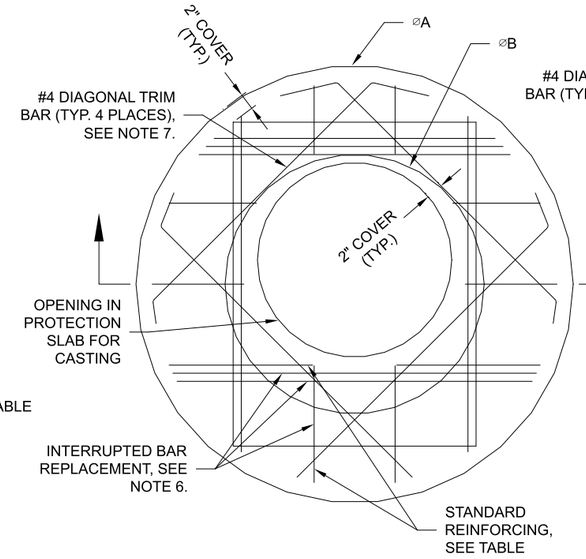
NOTE:
THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.



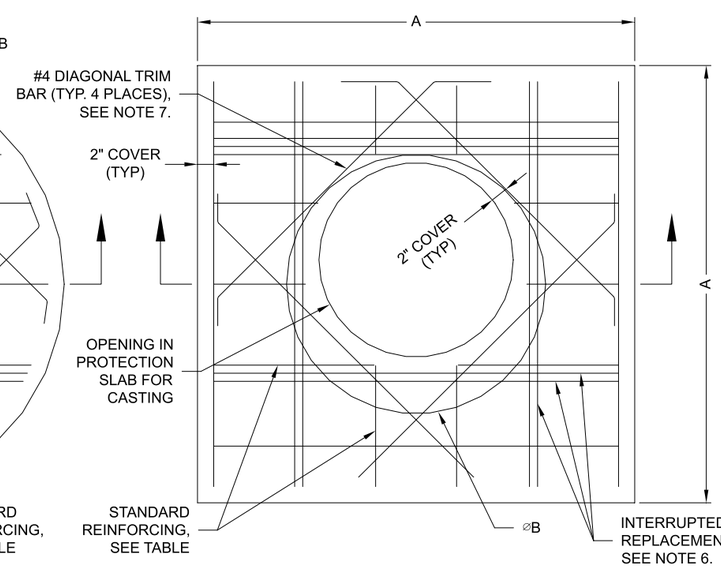
SECTION VIEW

REINFORCING TABLE				
⌀ CMP RISER	A	⌀ B	REINFORCING	**BEARING PRESSURE (PSF)
24"	⌀ 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	⌀ 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	⌀ 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	⌀ 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	⌀ 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

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CONTECH® CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO60570 20-001 Harvest Landing Retail Center and Business Park - Site 7
Southerly Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.: 42852	SEQ. No.: 60570	DATE: 10/3/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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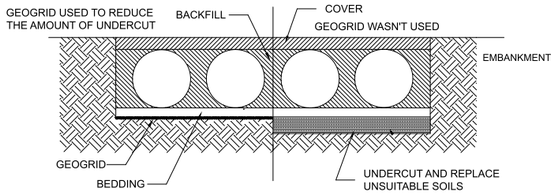
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

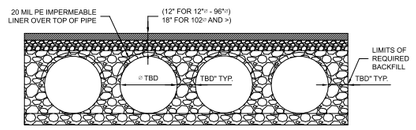
IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.



GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

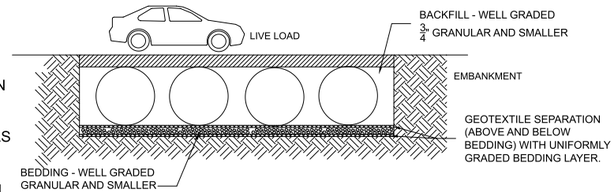
THE RESISTIVITY OF A PROJECT SITE MAY CHANGE OVER TIME DUE TO THE USE OF VARIOUS SALTING, DE-ICING, AND AGRICULTURAL AGENTS APPLIED ON OR NEAR THE AREA. TO MITIGATE THE POTENTIAL IMPACT OF THESE AGENTS, AN HDPE MEMBRANE LINER WILL BE INSTALLED ON THE CROWN OF EACH PIPE, CREATING AN IMPERMEABLE BARRIER. THIS MEASURE IS DESIGNED TO PROTECT THE SYSTEM FROM ENVIRONMENTAL CHANGES THAT COULD LEAD TO PREMATURE CORROSION AND REDUCE THE OVERALL SERVICE LIFE.



IN-SITU TRENCH WALL

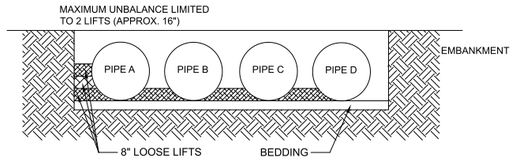
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



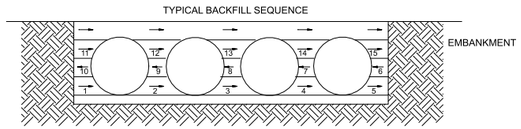
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

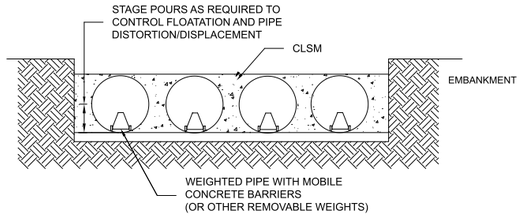


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

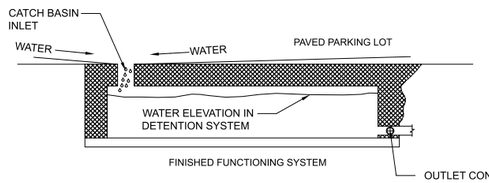


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

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CONTECH **DYODS** DRAWING

DYO60570 20-001 Harvest Landing Retail Center and Business Park - Site 7
Southerly Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
42852	60570	10/3/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	FMCivil Engineers Inc	Date	10/4/2024
Designed by	Hector Paez	Case No	
Company Project Number/Name	20-001 - Site 7		

BMP Identification

BMP NAME / ID: S7-1 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S7-1A	*57309.9*	*Roofs*	*1*	*0.89*	*51120.4*			
S7-1C	*67852.19*	*Concrete or Asphalt*	*1*	*0.892*	*60524.2*			
	125162.09		***Total***		**111644.6**	**0.20**	***0.51***	***0.577***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc | Date: 10/4/2024

Designed by: Hector Paez | Case No:

Company Project Number/Name: 20-001 - Site 7

BMP Identification

BMP NAME / ID: S7-2 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S7-2A	*17606*	*Roofs*	*1*	*0.89*	*15704.6*			
S7-2C	*11967.73*	*Concrete or Asphalt*	*1*	*0.892*	*10675.2*			
	29573.73	***Total***			**26379.8**	**0.20**	**0.12**	**0.144**

DMAs

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc — Date: 10/4/2024

Designed by: Hector Paez — Case No:

Company Project Number/Name: 20-001 - Site 7

BMP Identification

BMP NAME / ID: S7-3 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity — I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S7-3A	*54098.5*	*Roofs*	*1*	*0.89*	*48255.9*			
S7-3C	*32139.36*	*Concrete or Asphalt*	*1*	*0.892*	*28668.3*			
	86237.86	***Total***			**76924.2**	**0.20**	***0.35***	***0.346***

DMAs

Proposed Volume must be greater than the Design Capture Volume

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc — Date: 10/4/2024
Designed by: Hector Paez — Case No:
Company Project Number/Name: 20-001 - Site 7

BMP Identification

BMP NAME / ID: S7-4 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity — I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S7-4A	*98582.75*	*Roofs*	*1*	*0.89*	*87935.8*			
S7-4C	*93880.34*	*Concrete or Asphalt*	*1*	*0.892*	*83741.3*			
	192463.09	***Total***			**171677.1**	**0.20**	***0.79***	***0.808***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	FMCivil Engineers Inc	Date	10/4/2024
Designed by	Hector Paez	Case No	
Company Project Number/Name	20-001 - Site 7		

BMP Identification

BMP NAME / ID: S7-5 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Rainfall Intensity (in/hr)	Design Flow Rate (cfs)	Proposed Flow Rate (cfs)
S7-5A	56184.36	Roofs	1	0.89	50116.4			
S7-5C	43500.29	Concrete or Asphalt	1	0.892	38802.3			
	99684.65	Total			88918.7	0.20	0.41	0.462

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc
Date: 10/4/2024
Designed by: Hector Paez
Case No:
Company Project Number/Name: 20-001 - Site 7

BMP Identification

BMP NAME / ID: S7-6 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

	DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
DMAs	*S7-6A*	*6528.45*	*Roofs*	*1*	*0.89*	*5823.4*			
	S7-6C	*1757.82*	*Concrete or Asphalt*	*1*	*0.892*	*1568*			
		8286.27	***Total***			**7391.4**	**0.20**	***0.03***	***0.052***

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc — Date: 10/4/2024

Designed by: Hector Paez — Case No:

Company Project Number/Name: 20-001 - Site 7

BMP Identification

BMP NAME / ID: S7-7 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity — I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	Design Rainfall Intensity (in/hr)	Design Flow Rate (cfs)	Proposed Flow Rate (cfs)
S7-7A	13853.76	Roofs	1	0.89	12357.6			
S7-7C	126.23	Concrete or Asphalt	1	0.892	112.6			
	13979.99	Total			12470.2	0.20	0.06	0.073

DMAs

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries | Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name: FMCivil Engineers Inc

Date: 10/4/2024

Designed by: Hector Paez

Case No:

Company Project Number/Name: 20-001 - Site 7

BMP Identification

BMP NAME / ID: S7-8 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

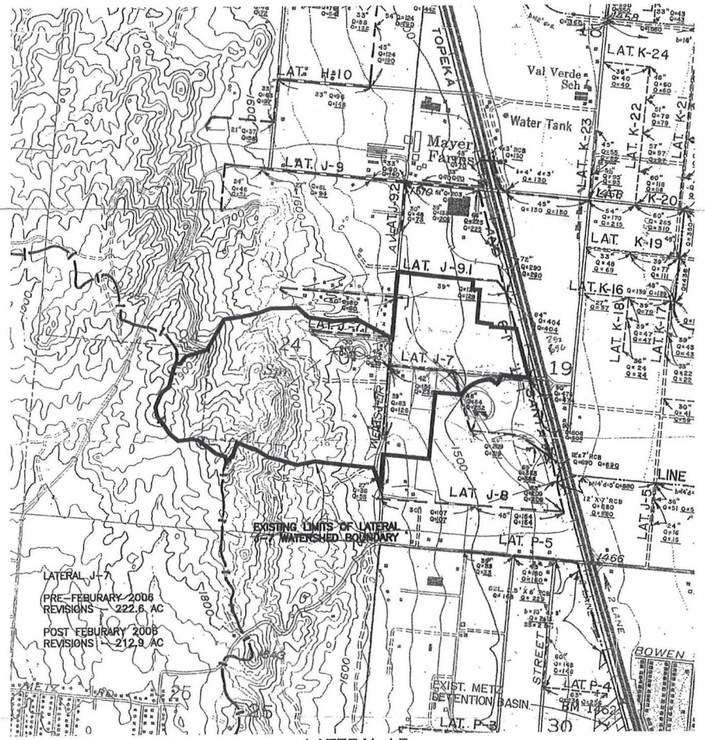
	DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Impervious Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
DMAs	*S7-8A*	*0*	*Roofs*	*1*	*0.89*	*0*			
	S7-8C	*87.08*	*Concrete or Asphalt*	*1*	*0.892*	*77.7*			
		87.08		**Total**		**77.7**	**0.20**	**0**	**0**

Notes:

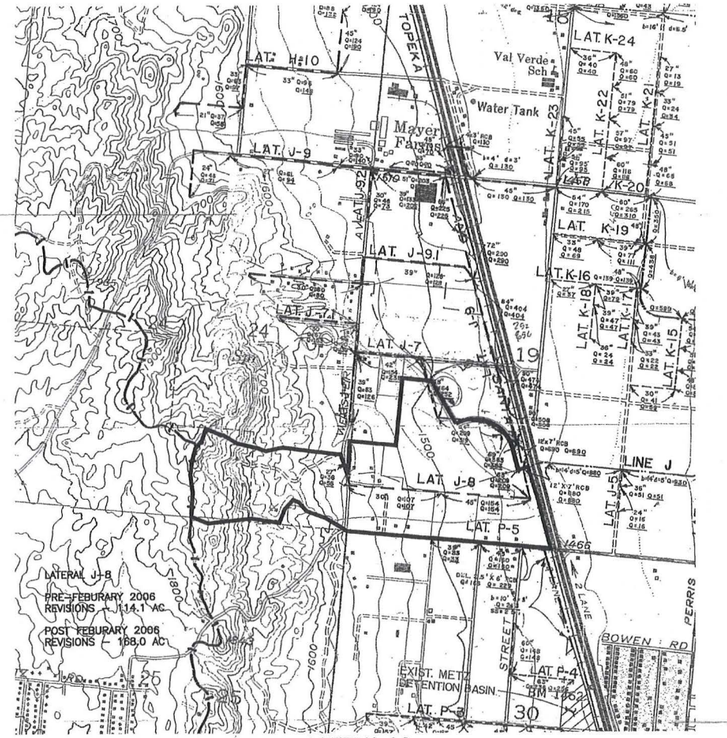
PORTION OF
8K3
1" = 1000'

REVISED HYDROLOGY MAP
PERRIS MASTER DRAINAGE PLAN

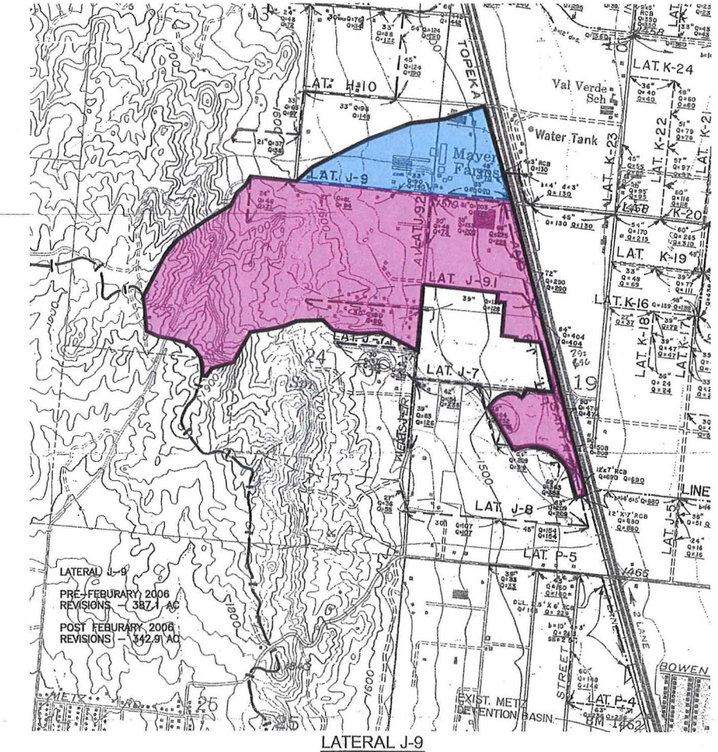
LATERALS J–7, J–8, & J–9



LATERAL J-7



LATERAL J-8



LATERAL J-9

LATERAL No.	PRE–FEBURARY 2006 REVISIONS	POST FEBURARY 2006 REVISIONS	INCREASE/DECREASE (ACRES)
LAT J–8	114.1	168.0	+53.9
LAT J–9	609.8	555.9	–53.9

LEGEND

PROPOSED LATERAL WATERSHED BOUNDARIES AFTER FEBRUARY 2006 REVISION

N

SCALE: 1"=1000'

B:\CAD\Nuevo Industrial Park - NV\PE\Exhibits\NV\P Perris MDP Hydrology map lat 7 and lat 9.dwg, 2/2/2007 1:10:00 PM, Donal Pearce

WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR GRADING PERMIT HAS BEEN ISSUED.

THE PRIVATE ENGINEER SIGNING THESE PLANS IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF THE DESIGN HEREON. IN THE EVENT OF DISCREPANCIES ARISING AFTER COUNTY APPROVAL OR DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISING THE PLANS FOR APPROVAL BY THE COUNTY.

DATE	BY	MARK	REVISIONS	APPR	DATE

ENGINEER — COUNTY

SEAL–COUNTY

REGISTERED PROFESSIONAL ENGINEER ALAN D. FRENCH No. 45702 Exp. 12–31–08 CIVIL STATE OF CALIFORNIA

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY:

ALAN D. FRENCH, P.E.
CIVIL ENGINEER, R.C.E. NO. 45702 — DATE

RECOMMENDED — DATE

SEAL–ENGINEER

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RECOMMENDED FOR APPROVAL — APPROVED BY:

PLANNING ENGINEER — CHIEF ENGINEER

DATE: — DATE:

ENGINEERING SOLUTIONS
ENGINEERING-LAND PLANNING-SURVEYING-MAPPING
2155 CHICAGO AVENUE, STE. 201
RIVERSIDE, CA. 92507
PHONE – (951) 784–0288
FAX – (951) 784–0287
PREPARED BY:

DATE EXP. 06–30–07

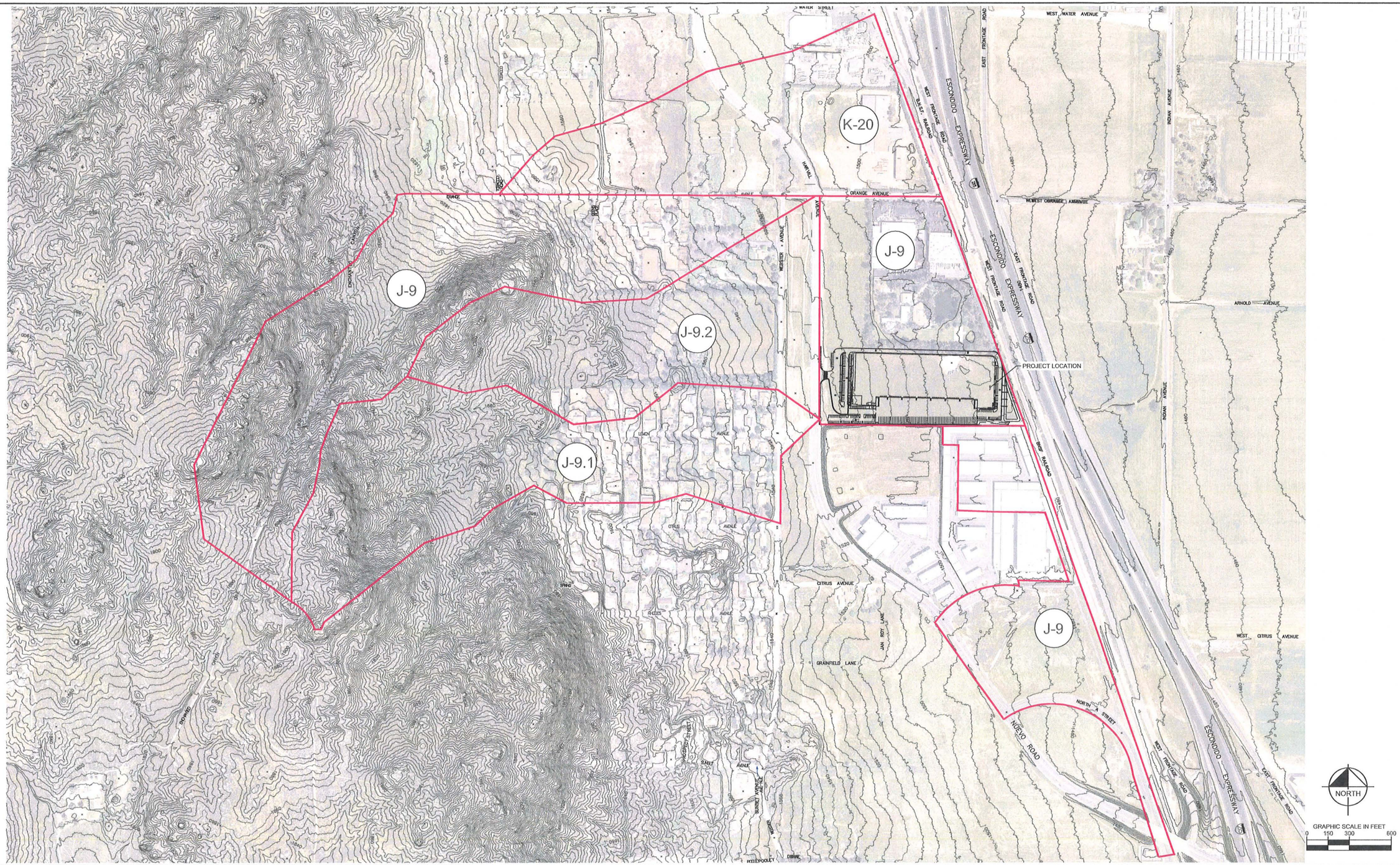
BENCHMARK:

SCALE:

I.P. No. XXXXX
COUNTY OF RIVERSIDE
REVISED HYDROLOGY MAP
PERRIS MASTER DRAINAGE PLAN
LATERALS J–7, J–8, & J–9

SHEET NO. 1 OF 1 SHTS.

FOR: | W.O. | COUNTY FILE NO.:



Kimley»Horn
401 B STREET, SUITE 600, SAN DIEGO, CA 92101
PHONE: 619-234-9411
WWW.KIMLEY-HORN.COM

RCFC MDP DRAINAGE AREA MAP LINE J-9
ROCKEFELLER HARVILL INDUSTRIAL PARK
October 9, 2020

k:\snd_ldev\rockefeller - riverside_harvill\to\rcfc\2020.10.08 - mdp letter\2020.10.09 - mdp drainage area.dwg 10/9/2020

EXHIBITS

EXHIBIT A: VICINITY MAP

EXHIBIT B: EXISTING HYDROLOGY MAP

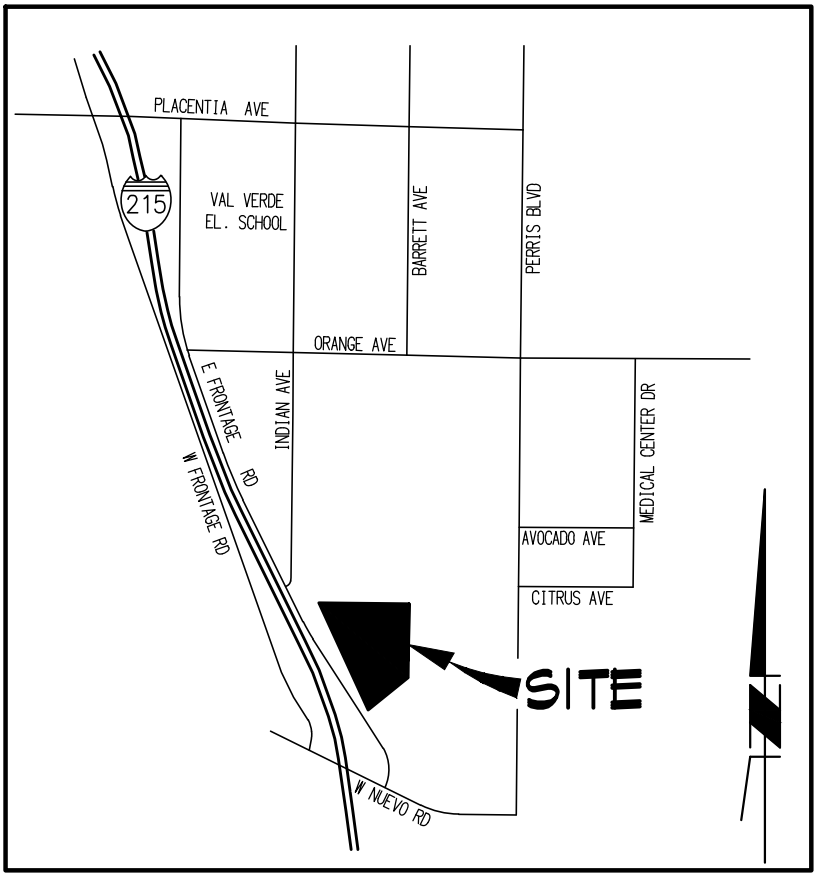
EXHIBIT C: PROPOSED HYDROLOGY MAP

EXHIBIT D: HYDROLOGIC SOILS GROUP MAP

EXHIBIT E: RCFCD MDP FACILITIES OVERLAY

EXHIBIT F: PHASE 1 OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM

EXHIBIT G: CONCEPTUAL GRADING



VICINITY MAP

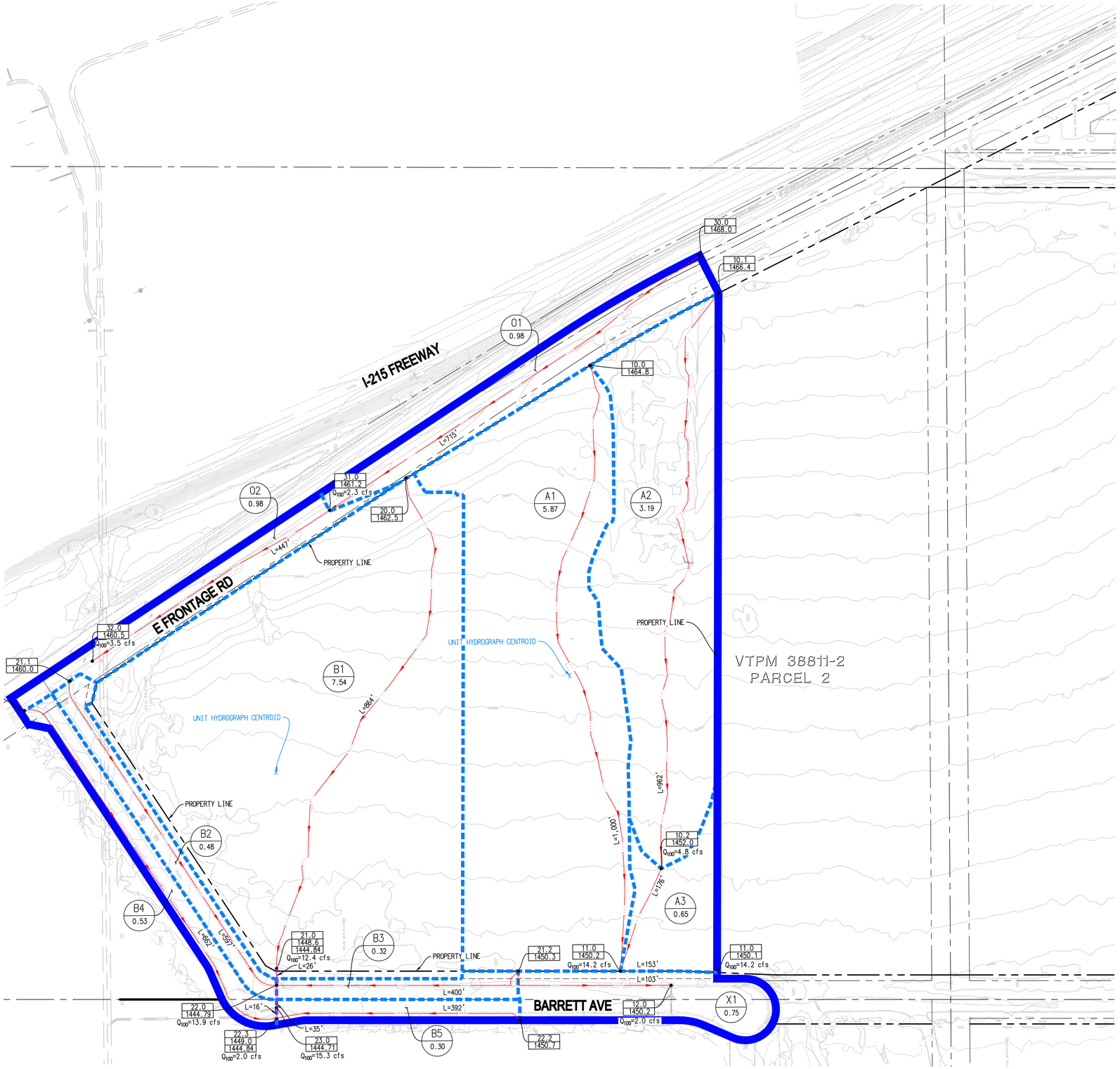
T4S, R3W, SEC 19
NOT TO SCALE

FMCIVIL ENGINEERS INC.
29995 TECHNOLOGY DRIVE, SUITE 306 | MURRIETA | CA 92563
951.331.9873 - FMCIVIL.COM

SITE 7 AT HARVEST LANDING

FIGURE 1
VICINITY MAP

H:\PDATA\20-001 HARVEST LANDING\DWGS\EXHIBITS\20-001-FEDEX-VICINITY-MAP .DWG DANNY 10/3/2024 7:55 AM



LEGEND

- D2 / 2.16 — DRAINAGE BASIN NAME / DRAINAGE BASIN AREA(AC.)
- 11 / 1027.0 — NODE I.D. / ELEVATION
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- FLOW DIRECTION

UNIT HYDROGRAPH PARAMETERS - AREA A			
L_{WC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
1,138	638	14.60	0.03

UNIT HYDROGRAPH PARAMETERS - AREA B			
L_{WC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
864	584	13.90	0.03

SCALE 1"=80'

80 40 0 80 160 240

SCALE: 1"=80'

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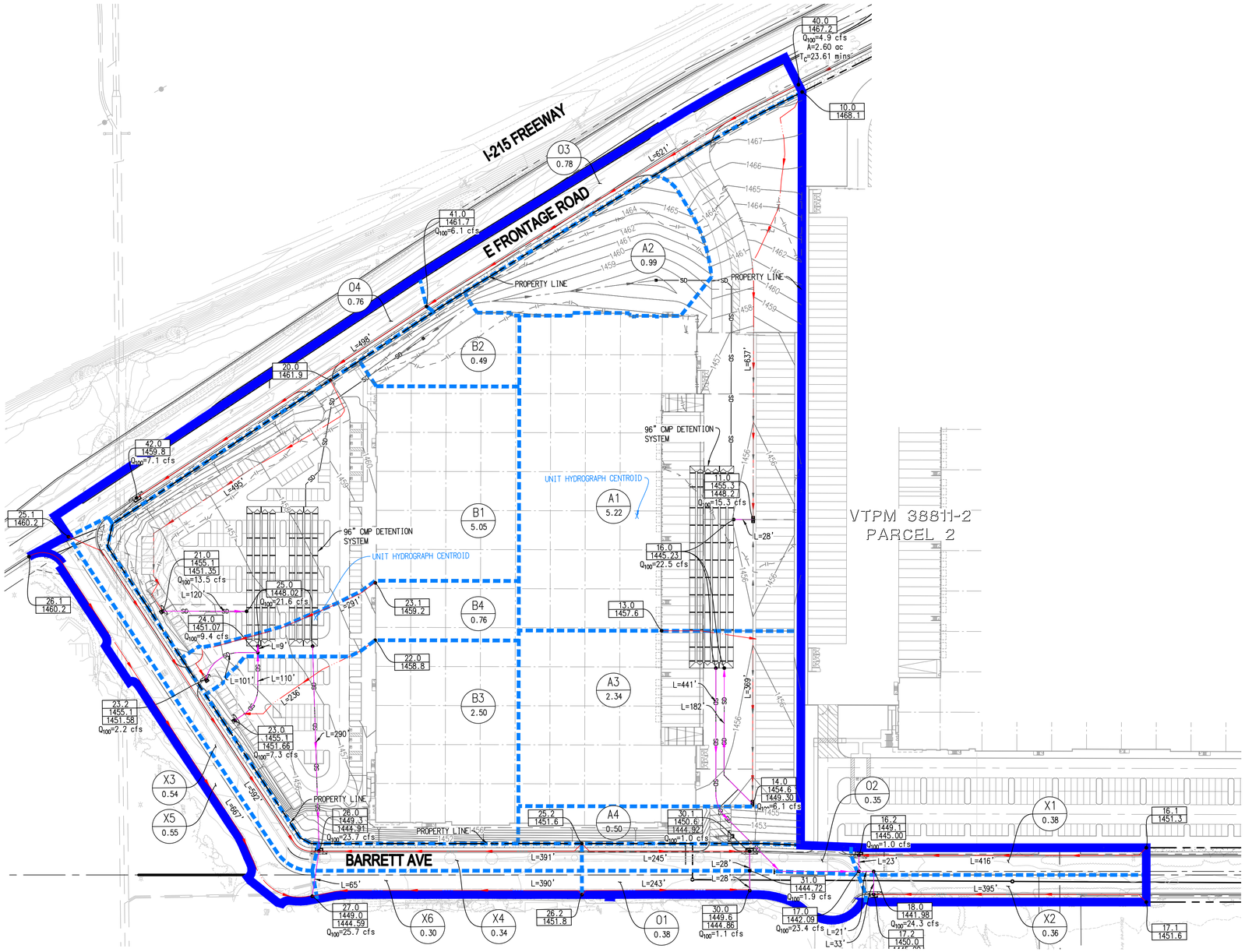
HARVEST LANDING

SITE 7 - EXISTING DRAINAGE



LEGEND

D2 / 2.16 — DRAINAGE BASIN NAME; DRAINAGE BASIN AREA(AC.)

11 / 1027.0 — NODE I.D.; ELEVATION

WATERSHED BOUNDARY
SUB-WATERSHED BOUNDARY
FLOW DIRECTION
PIPE FLOW DIRECTION

UNIT HYDROGRAPH PARAMETERS - AREA A			
L_{MC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
665	635	22.87	0.015

UNIT HYDROGRAPH PARAMETERS - AREA B			
L_{MC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
615	247	13.88	0.015

SCALE 1"=80'

80 40 0 80 160 240
SCALE: 1"=80'

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MURRIETA | CA 92563
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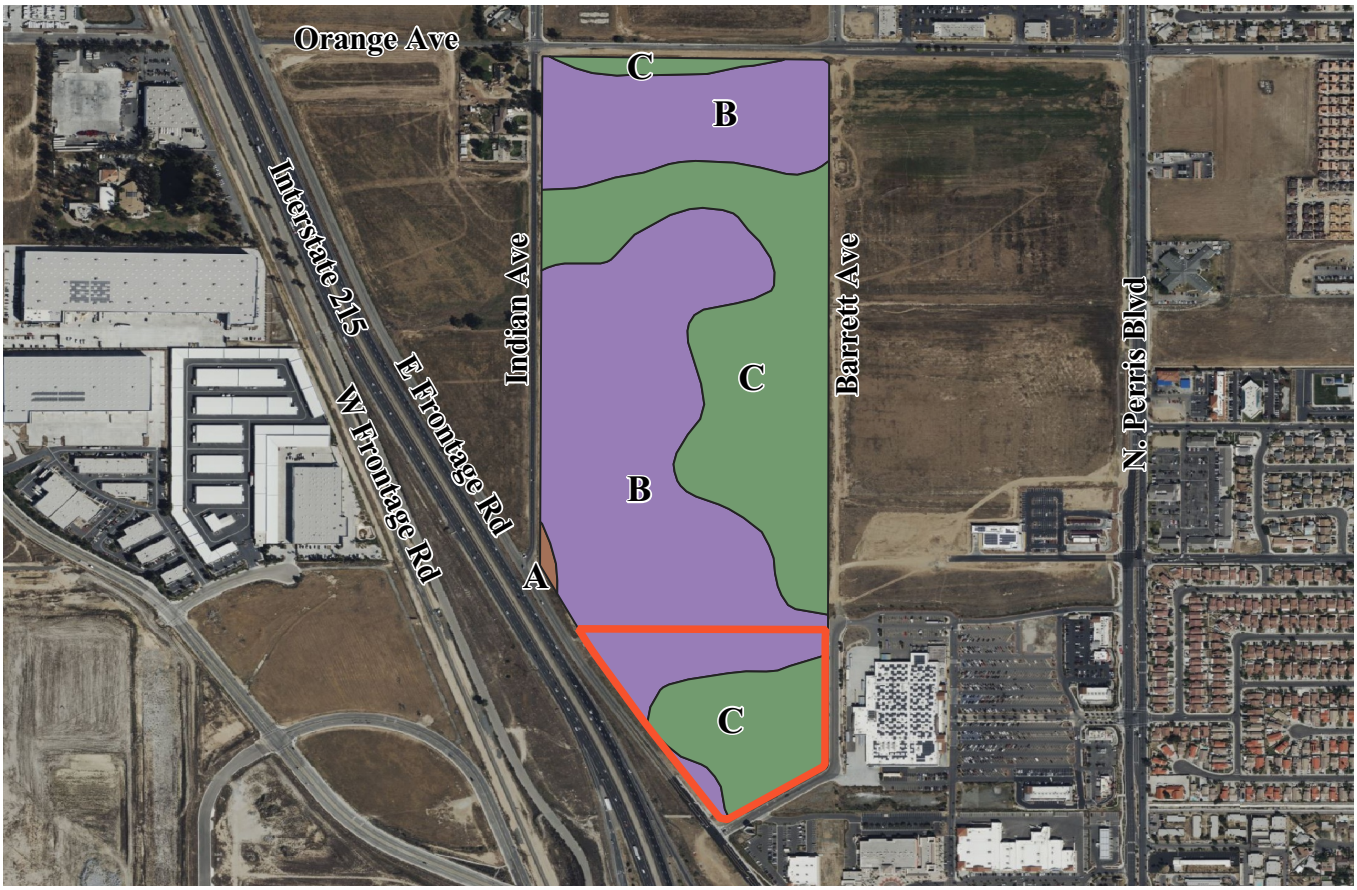
HARVEST LANDING

SITE 7 - PROPOSED DRAINAGE



LEGEND

- SITE 7 BOUNDARY
- HYDROLOGIC SOIL A
- HYDROLOGIC SOIL B
- HYDROLOGIC SOIL C

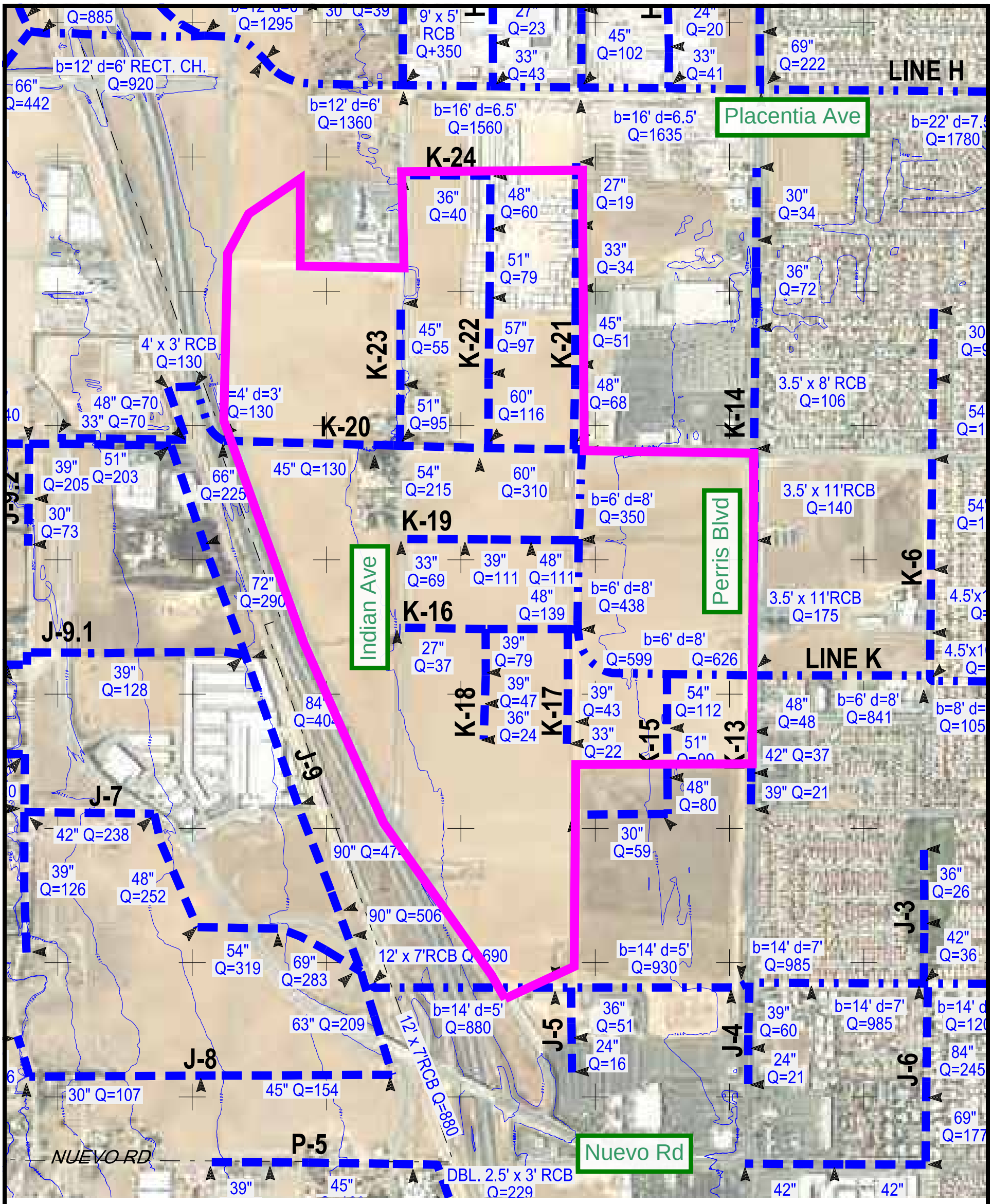
0 500 1,000 ft

FM CIVIL ENGINEERS INC.

Source: USDA Web Soil Survey

HARVEST LANDING

SITE 7 - HYDROLOGICAL SOIL GROUPS



N.T.S.

Site Boundary

MDP Facilities

Perris Harvest Landing MDP Exhibit

FMCIVIL ENGINEERS INC.

IN THE CITY OF PERRIS,
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM

VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

HOWARD INDUSTRIAL PARTNERS
1944 NORTH TUSTIN STREET, SUITE 122
ORANGE, CA 92865
CONTACT: TIM HOWARD
(TEL)714-769-9155

ENGINEER

FMCIVIL ENGINEERS INC.
29995 TECHNOLOGY DRIVE, SUITE 306
MURRIETA, CA 92563
CONTACT: FRANCISCO MARTINEZ
(TEL)951-331-9813

ARCHITECT

AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: STEPHEN PRZYBYLOWSKI
(TEL)714-639-9860

LEGEND

- RIGHT OF WAY
- (1025) EXISTING CONTOUR
- EASEMENT
- SD PROP. ONSITE STORM DRAIN SYSTEM
- SD PROP. OFFSITE STORM DRAIN SYSTEM
- PROP. STORM DRAIN LOW FLOW SYSTEM
- PROP. STORM DRAIN UNDER DRAIN SYSTEM
- W EXISTING WATER LINE
- W PROP. WATER LINE
- SS EXISTING SWR LINE
- SS PROP. SEWER LINE
- SD EXISTING STORM DRAIN PIPE
- E EXISTING OVERHEAD LINES

SCALE 1"=200'

200 100 0 200 400 600

SCALE: 1"=200'

CITY OF PERRIS

HARVEST LANDING INDUSTRIAL - PHASE I OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM EXHIBIT

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF.:	

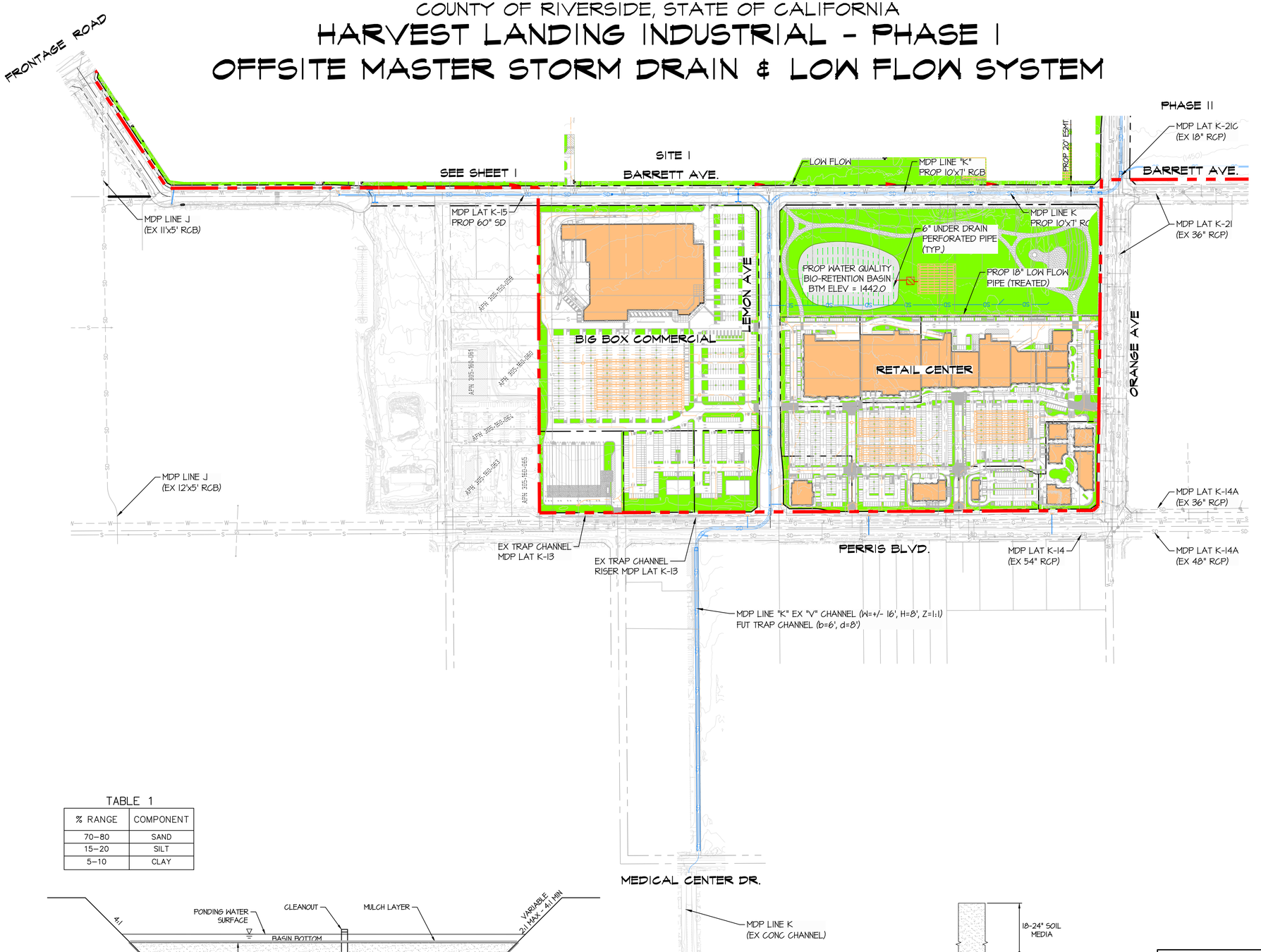
FMCIVIL ENGINEERS INC.
41870 KALMIA STREET, SUITE 120
MURRIETA, CA 92562
951.473.0202 - FMCIVIL.COM

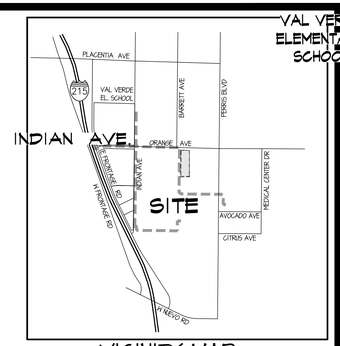
SHEET 1 OF 2 SHEETS

H:\PDATA\20-001 HARVEST LANDING\DWGS\PLDG\ENTITLEMENT\CUP\ALT-3\20-001-CUP_MSD3-01.DWG DANNY 10/7/2024 4:55 PM

COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM





VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

HOWARD INDUSTRIAL PARTNERS
1944 NORTH TUSTIN STREET, SUITE 122
ORANGE, CA 92865
CONTACT: TIM HOWARD
(TEL)714-769-9155

ENGINEER

FMCIVIL ENGINEERS INC.
29995 TECHNOLOGY DRIVE, SUITE 306
MURRIETA, CA 92563
CONTACT: FRANCISCO MARTINEZ
(TEL)951-331-9873

ARCHITECT

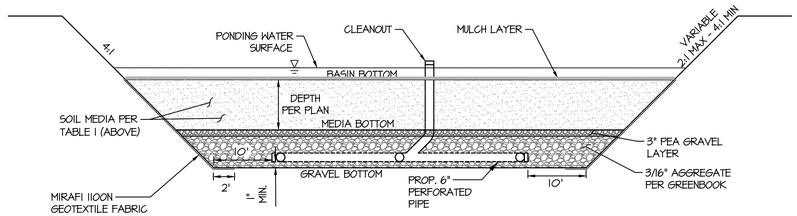
AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: STEPHEN PRZYBYLOWSKI
(TEL)714-639-9860

TABLE 1

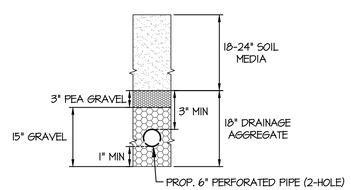
% RANGE	COMPONENT
70-80	SAND
15-20	SILT
5-10	CLAY

LEGEND

- RIGHT OF WAY
- (1025) EXISTING CONTOUR
- EASEMENT
- SD PROP. ONSITE STORM DRAIN SYSTEM
- SD PROP. OFFSITE STORM DRAIN SYSTEM
- PROP. STORM DRAIN LOW FLOW SYSTEM
- PROP. STORM DRAIN UNDER DRAIN SYSTEM
- W EXISTING WATER LINE
- W PROP. WATER LINE
- SS EXISTING SWR LINE
- SS PROP. SEWER LINE
- SD EXISTING STORM DRAIN PIPE
- E EXISTING OVERHEAD LINES



BASIN CROSS SECTION
N.T.S.



AGGREGATE CROSS SECTION
N.T.S.

SCALE 1"=200'

200 100 0 200 400 600
SCALE: 1"=200'

CITY OF PERRIS

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN
& LOW FLOW SYSTEM EXHIBIT

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF.:	

FMCIVIL ENGINEERS INC.
41870 KALMIA STREET, SUITE 120
MURRIETA | CA 92562
951.973.0202 - FMCIVIL.COM

SHEET 2 OF 2 SHEETS

H:\PDATA\20-001 HARVEST LANDING\DWGS\PLNCK\ENTITLEMENT\CUP\ALT-3\20-001-CUP_MSD3-01.DWG DANNY 10/8/2024 7:35 AM

IN THE CITY OF PERRIS,
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
SITE #7 CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-2 - PARCEL 3

LEGEND

- (1025) EXISTING CONTOUR
- 1025 PROPOSED CONTOUR
- A RETAINING WALL
- FENCE
- E SIGN
- MH MANHOLE
- RIGHT OF WAY
- EASEMENT
- PARCEL LINE
- PARCEL MAP BOUNDARY
- STREET CENTER LINE
- SCREEN WALL
- COMBINATION SCREEN/RETAINING WALL
- EXISTING LOT LINE
- RIDGE LINE
- RIBBON GUTTER
- FLOW ARROW
- PROPOSED EDGE OF PAVEMENT
- W EXISTING WATER LINE
- W PROPOSED WATER LINE
- SS EXISTING SWR LINE
- SS PROPOSED SEWER LINE
- SD EXISTING STORM DRAIN PIPE
- SD PROPOSED STORM DRAIN PIPE
- E EXISTING OVERHEAD LINES
- CUT/FILL LINE
- SLOPE SYMBOL

ZONING ORDINANCE

EXISTING ZONING:
HARVEST LANDING SPECIFIC PLANS - MULTIPLE BUSINESS USE (MBU)

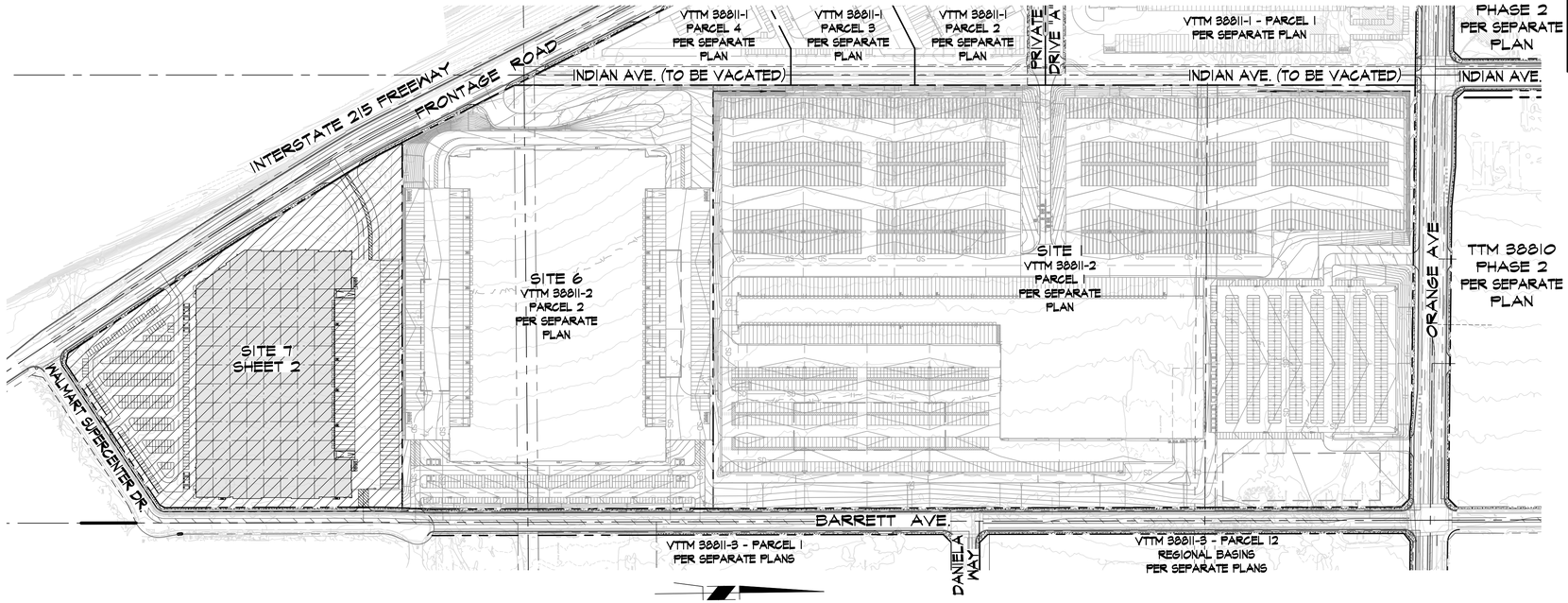
PROPOSED ZONING:
HARVEST LANDING SPECIFIC PLANS - MULTIPLE BUSINESS USE (MBU)

ASSESSOR'S PARCEL NUMBERS:

305-120-004 thru 008, 020 thru 026, &
305-130-001 thru 006, 009, &
305-160-001 thru 003, 025 thru 030, &
305-190-014, 019, 020, 028 thru 031, &
305-220-011, 054 thru 062

LEGAL DESCRIPTION

BLOCKS 1-4 OF FIGADOTA FARMS NO. 1A AS SHOWN BY MAP ON FILE IN THE OFFICE OF THE COUNTY RECORDER OF THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, IN BOOK 16 OF MAPS, PAGE 68 TOGETHER WITH LOTS 1-8, AND 13-20 OF FIGADOTA FARMS AS SHOWN BY MAP ON FILE IN THE OFFICE OF THE COUNTY RECORDER OF THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, IN BOOK 16 OF MAPS, PAGE 53 EXCEPTING THAT PORTION LYING WEST OF THE EASTERLY LINE OF THE FRONTAGE ROAD.



INDEX MAP

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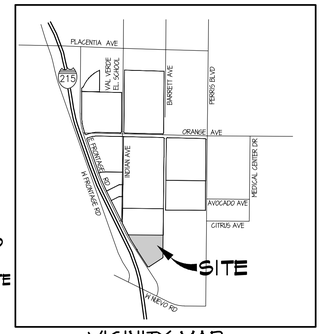
SCALE: 1"=200'



VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

HOWARD INDUSTRIAL PARTNERS
2244 NORTH PACIFIC STREET
ORANGE, CA 92865
CONTACT: TIM HOWARD
(TEL)714-637-3333

ENGINEER

FMCIVIL ENGINEERS INC.
41870 KALMIA ST., SUITE 120
MURRIETA, CA 92562
CONTACT: FRANCISCO MARTINEZ
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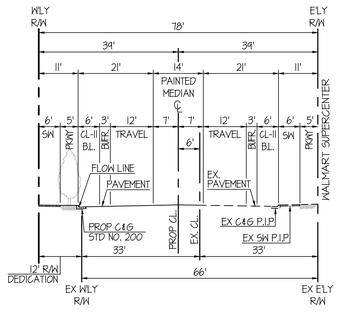
ARCHITECT

AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: DAN MACDAVID
(TEL)714-639-9860

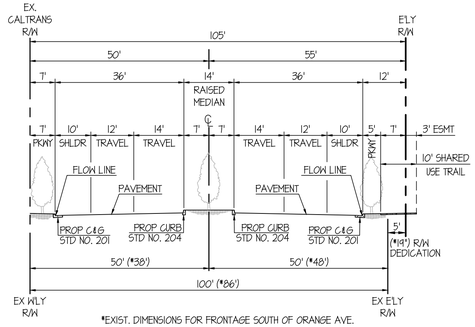
EARTHWORK ESTIMATE:

RAW CUT:	7,630 CY
RAW FILL:	94,590 CY
NET:	86,960 CY IMPORT

HAUL TRIPS:
ASSUMED (13 CY PER TRIP) = 6,690



BARRETT AVE
(FRONTAGE RD. - N'LY WALMART DWY)
MAJOR COLLECTOR
(78'/56')



*EXIST. DIMENSIONS FOR FRONTAGE SOUTH OF ORANGE AVE.

FRONTAGE ROAD
SECONDARY ARTERIAL
(105'/84')

CITY OF PERRIS

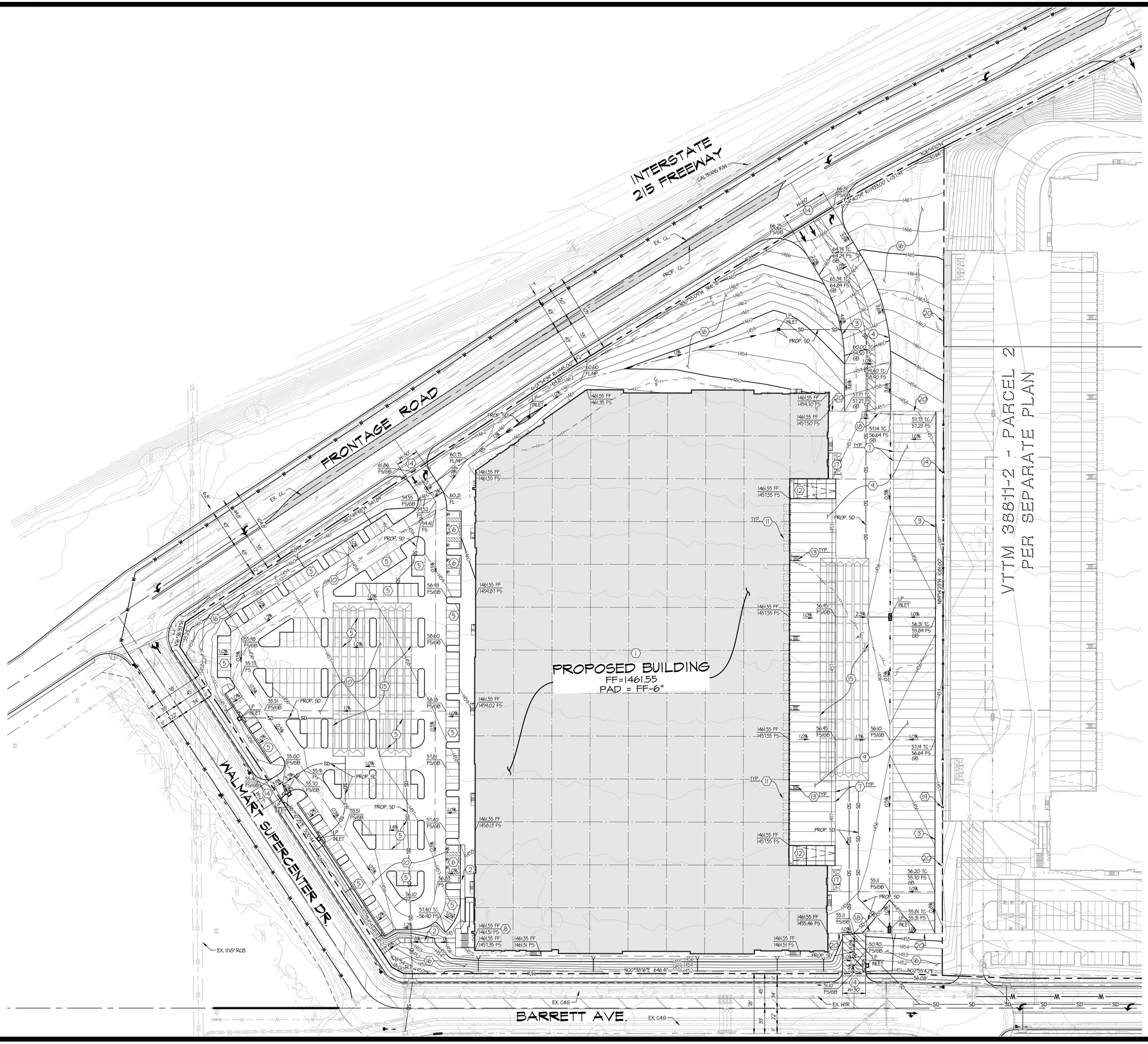
HARVEST LANDING RETAIL CENTER & BUSINESS PARK
SITE #7 CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-2 - PARCEL 3

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF:	

FMCIVIL ENGINEERS INC.
41870 KALMIA STREET, SUITE 120
MURRIETA | CA 92562
951.973.0202 - FMCIVIL.COM

SHEET 1 OF 2 SHEETS

H:\PDATA\20-001 HARVEST LANDING\DWGS\PLNG\ENTITLEMENT\CUP\ALT-3\BLDG-7\20-001-CUP_BLDG7-CG-01.DWG JASON STOUFFER 10/2/2024 4:53 PM



SITE PLAN KEYNOTES

1. PAINTED CONCRETE TILT-UP WAREHOUSE / OFFICE / MANUFACTURING FACILITY. BUILDING TO BE DESIGNED PER ARCHITECT'S PLANS
2. ON SITE ACCESSIBLE SIDEWALK AND CURB RAMPS.
3. CONCRETE CURB
4. CONCRETE CURB & GUTTER
5. STANDARD PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
6. HANDICAP PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
7. TRAILER / TRACTOR PARKING STALLS - STRIPE PER STANDARDS SHOWN ON ARCHITECT'S PLANS
8. ACCESSIBLE BUILDING ENTRY WITH ADJACENT BICYCLE RACKS PER ARCHITECT'S PLANS
9. PORTLAND CONC. CEMENT (PCC) PAVED TRUCK YARD ARCHITECT'S PLANS
10. PORTLAND CONC. CEMENT (PCC) PAVED AUTO PARKING ARCHITECT'S PLANS
11. DOCK HIGH TRUCK DOOR PER ARCHITECT'S PLANS
12. GRADE LEVEL RAMP DOOR PER ARCHITECT'S PLANS
13. EXTERIOR MAN DOOR AND STAIRS W/GUARD POST PER ARCHITECT'S PLANS
14. COMMERCIAL DRIVEWAY APPROACH PER RIVERSIDE COUNTY STD.207A, WITH DECORATIVE CONCRETE PAVING PER ARCHITECT'S PLANS
15. UNDERGROUND STORM WATER CHAMBER SYSTEM
16. LANDSCAPE AREA PER LANDSCAPE ARCHITECT'S PLANS
17. APPROXIMATE LOCATION OF TRASH ENCLOSURE
18. ENTRY GATE PER ARCHITECT'S PLANS
19. CHAIN LINK FENCE PER ARCHITECT'S PLANS
20. SCREEN WALL PER ARCHITECT'S PLANS (COMBO RETAINING)

CITY OF PERRIS

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
SITE #7 CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-2 - PARCEL 3

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF:	

FMCIVIL ENGINEERS INC.
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SHEET 2 OF 2 SHEETS

H:\PDATA\20-001 HARVEST LANDING\DWGS\PLNG\ENTITLEMENT\CUP\ALT-3\BLDG-71\20-001-CUP_BLD07-CG-01.DWG JASON STOUFFER 10/7/2024 3:47 PM

DEVELOPMENT PLAN REVIEW – VTTM 38811-3, PARCELS 5-11
CITY OF PERRIS
RIVERSIDE COUNTY, CALIFORNIA

Drainage Study Report

Prepared for:
Howard Industrial Partners LLC
1944 North Tustin Street, Suite 122
Orange, CA 92865

Prepared By:

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Murrieta, CA 92563

Engineer of Work/Contacts:

Francisco Martinez, Jr.

April 12, 2024
Revised: October 8, 2024

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SECTION 1 - GENERAL OVERVIEW

INTRODUCTION

The purpose of this study is to support the entitlement phase and determine minimum drainage improvements required for the proposed commercial retail and restaurant development of approximately 35.1 acres and 10 major retail buildings (totaling 203,363 square feet) with 5 truck docks, 8 food/retail buildings (totaling 47,249 square feet), and a parking lot that lays within the Harvest Landing Specific Plan, located in the City of Perris, County of Riverside CA. More specifically, the project site is bounded to the north by Orange Ave, proposed regional water quality facilities to the west, Daniela Way to the south and Perris Boulevard to the east.

The primary objectives of this report are as follows:

1. Delineate the drainage areas tributary to the onsite underground basin

2. Based on drainage patterns, ground slope, land use and soil type and using the Riverside County Rational Method, perform hydrologic and hydraulics of onsite drainage facilities.

3. Determine the 100-year peak storm flows based upon the pre-project, proposed land use per the MDP and post-project condition for the 24-hour storm duration utilizing the Unit Hydrograph Method as outlined in the Riverside County Flood Control & Water Conservation District Hydrology Manual.

4. Determine the required underground detention facilities to mitigate the 100-year peak storm flows for the 24-hour storm duration in the post-project condition to flows less than or equal to the proposed land use condition flow rates.

5. Determine the required the minimum storm drain infrastructure to flood protect the project site for the 100-year storm event.

6. Preparation of a hydrology report, which consist of hydrological and analytical results and exhibits.

BACKGROUND

EXISTING CONDITIONS

The project site is located within Riverside County Flood Control's Perris Valley Master Drainage Plan, and tributary to a low point in Perris Boulevard and the existing MDP Line "K" (earthen V-Channel) located about 2600 lineal feet east of Indian Avenue.

The site is in a relatively mild to flat sloping undeveloped terrain on a drainage area which drains easterly towards Perris Boulevard with no offsite flows. All the developed storm flows continue to travel easterly through the property, and to two different low points. The southerly half of the existing site condition is being picked up by an existing headwall. The northerly half of the existing site is being picked up by an existing inlet that lies to the west of Perris Boulevard. Once the flows are intercepted, they are conveyed via their respective laterals into a 54" main line on Perris Blvd. This 54" pipe ties into the existing MDP Line "K". MDP Line "K" is an earthen "V" channel (w= 16', H=8' & z=1:1) and planned as a future Trapezoidal Channel (b=6', d=8').

DEVELOPED CONDITIONS

The preliminary offsite design is shown on Exhibit F "Harvest Landing Industrial Phase 1 Offsite Master Storm Drain & Low Flow System". The offsite master storm drain system (backbone) will be part of a separate report and therefore excluded. The onsite storm water runoff will be collected via onsite storm drain system and conveyed to a CDS unit for pretreatment and directed to an offsite water quality retention system for water quality mitigation. However, the higher flow rates will be directed to an on-site underground pipe chamber which will mitigate the 100-year frequency storm event and release flows to be at or below the proposed land use condition flow rates. See the table below for the rational method results:

Description	**Q100 Peak Flow Rates**		
Watershed Area	**A**	B	C
Proposed	27.1	22.4	14.2
Existing	16.3	14.7	21.8
Onsite MDP	18.1	16.2	25.3

For purposes of this preliminary drainage report, the 100-year 24-hour peak flow rates for the post developed condition, predeveloped condition and proposed developed condition per the land use on the MDP were the only storm events analyzed for mitigation for watersheds A and B. Since watershed C generated less flow in the proposed condition compared to the proposed developed condition per the land use on the MDP no increased runoff mitigation is required for this watershed. Therefore, no unit hydrographs for the watershed C were provided. The project storm mitigation is provided by utilizing the underground storm drain detention system and the outlet control structures. The total mitigation volume required was determined by selecting the flow rates from the recess limb of the proposed unit hydrograph runs for the 100-year 24-hour storm event that are equal or less than the flow rates from the proposed land use conditions. Smaller storm events were not analyzed in this preliminary phase however, since the storm volume demand to mitigate the storm flows from the 100-year 24hour event is expected to be considerably larger than volumes produced by the smaller storm events, thus a conservative approach.

MDP Land Use Condition Watershed A Volume: 1.65 ac-ft; $Q_{100\text{-}24hr}$: 5.43 cfs
Proposed Condition Watershed A Volume: 2.78 ac-ft; $Q_{100\text{-}24hr}$: 7.50 cfs
Underground Chamber Watershed A Volume: *2.87 ac-ft

MDP Land Use Condition Watershed B Volume: 1.59 ac-ft; $Q_{100\text{-}24hr}$: 5.01 cfs
Proposed Condition Watershed B Volume: 2.31 ac-ft; $Q_{100\text{-}24hr}$: 6.14 cfs
Underground Chamber Watershed B Volume: *2.46 ac-ft

*For watershed "A" since this volume is greater than 2.86 ac-ft the underground chambers have enough storage to mitigate peak storm flows to the proposed land use levels. Similarly for watershed "B" since the volume provided by the underground chambers exceeds 2.37 ac-ft, there is enough storage to mitigate peak storm flows to the proposed land use levels. See the table on the following page for the unit hydrograph results:

Watershed A:

Storm Duration	SP Q_{peak}	SP V_{TOTAL}	MDP Q_{PEAK}	MDP V_{TOTAL}
1	30.43	1.1349	26.57	0.9038
3	20.53	1.8024	17.12	1.2763
6	17.00	2.1921	13.88	1.444
24	7.50	4.2598	5.43	2.5742
Acreage	12.14		11.21	

Watershed B:

Storm Duration	SP Q_{peak}	SP V_{TOTAL}	MDP Q_{PEAK}	MDP V_{TOTAL}
1	23.54	0.8679	26.09	0.8709
3	17.11	1.4844	16.76	1.2084
6	14.15	1.8091	13.51	1.3741
24	6.14	3.5159	5.01	2.4376
Acreage	10.13		11.08	

METHODOLOGY

HYDROLOGY

Hydrologic calculations were performed using the Riverside County Rational Method from RCFCD & WCD Hydrology Manual, dated April 1978. The 100-year design discharge was computed by generating a hydrologic "link-node" model in which divides the area into drainage sub-areas, each tributary to a concentration point or hydrologic "node" point determined by the proposed layout. The computer results are included in section 2. The following assumptions/guidelines were applied for use of the Rational Method:

1. The map from the Riverside County Hydrology Manual indicates that the study area consists Group "B", "C" AND "D" soils. A USGS soils map for the project site is included as Exhibit D, under the Exhibit section.
2. Initial sub-areas were drawn to be less than 10-acres in size and less than 1,000 feet in length, per County guidelines. Time of concentration for the initial sub-area is based on Time of Concentration Nomograph for Initial Sub-area from the Hydrology Manual.
3. Antecedent Moisture Condition 2 was used for 100-year storm events.
4. Standard intensity-duration curve data for the project area was used for the Perris Valley area; Plate D-4.1.

HYDRAULICS

Civil Design hydrology module was used for preliminarily sizing the storm drainpipe system. The onsite storm drain infrastructure will consist of pipe sizes ranging from 12"-48" in diameter. A more detail

analysis will be provided in subsequent submittals and a WSPG analysis for onsite storm drainpipe system will be performed during final engineering.

CONCLUSIONS & RECOMMENDATIONS

The hydrology analyses evaluated the proposed development to determine the necessary onsite drainage improvements required to mitigate flows for increased runoff and it has been concluded that:

1. The proposed drainage facilities will adequately convey the 100-year flows and provide flood protection to the project site.
2. The proposed underground pipe chamber system will have sufficient storage to adequately mitigate for increased runoff.

SECTION 2 - HYDROLOGY ANALYSIS

100-YEAR EXISTING ON-SITE HYDROLOGY WATERSHED A (RATIONAL METHOD)

100-YEAR EXISTING ON-SITE HYDROLOGY WATERSHED B (RATIONAL METHOD)

100-YEAR EXISTING OFF-SITE HYDROLOGY WATERSHED C (RATIONAL METHOD)

100-YEAR PROPOSED MPD LAND USE ON-SITE HYDROLOGY WATERSHED A (RATIONAL METHOD)

100-YEAR PROPOSED MPD LAND USE ON-SITE HYDROLOGY WATERSHED B (RATIONAL METHOD)

100-YEAR PROPOSED MPD LAND USE OFF-SITE HYDROLOGY WATERSHED C (RATIONAL METHOD)

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100-YEAR PROPOSED ON-SITE HYDROLOGY WITH OFFSITES WATERSHED A-B-X (RATIONAL METHOD)

100-YEAR-24 HOUR STORM PROPOSED MDP LAND USE ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

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100-YEAR-6 HOUR STORM PROPOSED MDP LAND USE ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

100-YEAR-6 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

100-YEAR-6 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

100-YEAR-3 HOUR STORM PROPOSED MDP LAND USE ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

100-YEAR-3 HOUR STORM PROPOSED MDP LAND USE ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

100-YEAR-3 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

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100-YEAR-1 HOUR STORM PROPOSED MDP LAND USE ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED MDP LAND USE ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED A (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED ON-SITE HYDROLOGY WATERSHED B (UNIT HYDROGRAPH METHOD)

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 09/19/23 File:qa100x.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
EXISTING CONDITION - WATERSHED A
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 455.000(Ft.)
Top (of initial area) elevation = 1443.800(Ft.)
Bottom (of initial area) elevation = 1440.000(Ft.)
Difference in elevation = 3.800(Ft.)

```
Slope =    0.00835  s(percent)=       0.84
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.963 min.
Rainfall intensity =      2.143(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.766
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      2.904(CFS)
Total initial stream area =        1.770(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      9.628(CFS)
Depth of flow =   0.312(Ft.), Average velocity =   0.992(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.00
      2            100.00              0.00
      3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      9.628(CFS)
  '     '    flow top width =     62.313(Ft.)
  '     '    velocity=    0.992(Ft/s)
  '     '    area =      9.707(Sq.Ft)
  '     '    Froude number =     0.443

Upstream point elevation =  1440.000(Ft.)
Downstream point elevation =  1437.900(Ft.)
Flow length =   439.000(Ft.)
Travel time  =    7.38 min.
Time of concentration =   23.34 min.
Depth of flow =   0.312(Ft.)
Average velocity =   0.992(Ft/s)
Total irregular channel flow =     9.628(CFS)
Irregular channel normal depth above invert elev. =   0.312(Ft.)
Average velocity of channel(s) =   0.992(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.796
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.150
Decimal fraction soil group C = 0.710
Decimal fraction soil group D = 0.140
RI index for soil(AMC 2)  =  85.22
Pervious area fraction =  1.000; Impervious fraction =  0.000
```

```
Rainfall intensity =      1.779(In/Hr) for a   100.0 year storm
Subarea runoff =     13.374(CFS) for      9.440(Ac.)
Total runoff =     16.278(CFS)      Total area =      11.210(Ac.)
Depth of flow =   0.379(Ft.), Average velocity =   1.131(Ft/s)
End of computations, total study area =           11.21 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number =  84.1
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 09/19/23 File:qb100x.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
EXISTING CONDITION - WATERSHED B
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 20.000 to Point/Station 21.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 328.000(Ft.)
Top (of initial area) elevation = 1442.900(Ft.)
Bottom (of initial area) elevation = 1440.900(Ft.)
Difference in elevation = 2.000(Ft.)

```
Slope =    0.00610  s(percent)=       0.61
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.914 min.
Rainfall intensity =      2.215(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.769
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      2.335(CFS)
Total initial stream area =        1.370(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      8.543(CFS)
Depth of flow =   0.317(Ft.), Average velocity =   0.850(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.00
      2            100.00              0.00
      3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      8.543(CFS)
  '     '    flow top width =     63.395(Ft.)
  '     '    velocity=    0.850(Ft/s)
  '     '    area =     10.047(Sq.Ft)
  '     '    Froude number =     0.376

Upstream point elevation =  1440.900(Ft.)
Downstream point elevation =  1439.000(Ft.)
Flow length =   553.000(Ft.)
Travel time  =   10.84 min.
Time of concentration =   25.75 min.
Depth of flow =   0.317(Ft.)
Average velocity =   0.850(Ft/s)
Total irregular channel flow =     8.543(CFS)
Irregular channel normal depth above invert elev. =   0.317(Ft.)
Average velocity of channel(s) =   0.850(Ft/s)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.749
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.850
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.150
RI index for soil(AMC 2)  =  79.65
Pervious area fraction =  1.000; Impervious fraction =  0.000
```

Rainfall intensity = 1.695(In/Hr) for a 100.0 year storm
Subarea runoff = 12.335(CFS) for 9.710(Ac.)
Total runoff = 14.670(CFS) Total area = 11.080(Ac.)
Depth of flow = 0.388(Ft.), Average velocity = 0.973(Ft/s)
End of computations, total study area = 11.08 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 79.4

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/07/24
File:c100pretail.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
EXISTING CONDITION - WATERSHED C
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 40.000 to Point/Station 41.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 519.000(Ft.)
Top (of initial area) elevation = 1449.300(Ft.)
Bottom (of initial area) elevation = 1443.200(Ft.)

```
Difference in elevation =     6.100(Ft.)
Slope =    0.01175  s(percent)=       1.18
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.715 min.
Rainfall intensity =      2.159(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.801
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.330
Decimal fraction soil group C = 0.670
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  83.36
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     11.004(CFS)
Total initial stream area =        6.360(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       42.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      6.360(Ac.)
Runoff from this stream =     11.004(CFS)
Time of concentration =   15.71 min.
Rainfall intensity =     2.159(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       42.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   496.000(Ft.)
Top (of initial area) elevation =  1449.300(Ft.)
Bottom (of initial area) elevation =  1443.000(Ft.)
Difference in elevation =     6.300(Ft.)
Slope =    0.01270  s(percent)=       1.27
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   15.195 min.
Rainfall intensity =      2.195(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.773
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.920
Decimal fraction soil group C = 0.080
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  78.64
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     11.108(CFS)
Total initial stream area =        6.550(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

```
Process from Point/Station       40.000 to Point/Station       41.000
**** CONFLUENCE OF MAIN STREAMS ****
____________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      6.550(Ac.)
Runoff from this stream =     11.108(CFS)
Time of concentration =   15.19 min.
Rainfall intensity =     2.195(In/Hr)
Summary of stream data:

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


1       11.004     15.71               2.159
2       11.108     15.19               2.195
Largest stream flow has longer or shorter time of concentration
Qp =     11.108 + sum of
        Qa          Tb/Ta
        11.004 *    0.967 =     10.640
Qp =     21.748

Total of 2 main streams to confluence:
Flow rates before confluence point:
      11.004      11.108
Area of streams before confluence:
        6.360        6.550


Results of confluence:
Total flow rate =     21.748(CFS)
Time of concentration =    15.195 min.
Effective stream area after confluence  =     12.910(Ac.)
End of computations, total study area =           12.91 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number =  81.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 09/15/23 File:qa100x.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LANDUSE CONDITION - WATERSHED A
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 455.000(Ft.)
Top (of initial area) elevation = 1443.800(Ft.)
Bottom (of initial area) elevation = 1440.000(Ft.)
Difference in elevation = 3.800(Ft.)

```
Slope =    0.00835  s(percent)=       0.84
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.747 min.
Rainfall intensity =      2.490(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.767
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      3.380(CFS)
Total initial stream area =        1.770(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     10.771(CFS)
Depth of flow =   0.325(Ft.), Average velocity =   1.020(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.00
      2            100.00              0.00
      3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     10.771(CFS)
  '     '    flow top width =     64.990(Ft.)
  '     '    velocity=    1.020(Ft/s)
  '     '    area =     10.559(Sq.Ft)
  '     '    Froude number =     0.446

Upstream point elevation =  1440.000(Ft.)
Downstream point elevation =  1437.900(Ft.)
Flow length =   439.000(Ft.)
Travel time  =    7.17 min.
Time of concentration =   18.92 min.
Depth of flow =   0.325(Ft.)
Average velocity =   1.020(Ft/s)
Total irregular channel flow =    10.771(CFS)
Irregular channel normal depth above invert elev. =   0.325(Ft.)
Average velocity of channel(s) =   1.020(Ft/s)
 Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.791
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.150
Decimal fraction soil group C = 0.710
Decimal fraction soil group D = 0.140
RI index for soil(AMC 2)  =  67.89
Pervious area fraction =  0.500; Impervious fraction =  0.500
```

Rainfall intensity = 1.972(In/Hr) for a 100.0 year storm
Subarea runoff = 14.721(CFS) for 9.440(Ac.)
Total runoff = 18.101(CFS) Total area = 11.210(Ac.)
Depth of flow = 0.395(Ft.), Average velocity = 1.161(Ft/s)
End of computations, total study area = 11.21 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged RI index number = 66.0

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 09/15/23 File:qb100x.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PRK
PROPOSED LANDUSE CONDITION - WATERHSED B
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 20.000 to Point/Station 21.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 328.000(Ft.)
Top (of initial area) elevation = 1442.900(Ft.)
Bottom (of initial area) elevation = 1440.900(Ft.)
Difference in elevation = 2.000(Ft.)

```
Slope =    0.00610  s(percent)=       0.61
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.974 min.
Rainfall intensity =      2.575(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.770
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      2.716(CFS)
Total initial stream area =        1.370(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      9.476(CFS)
Depth of flow =   0.330(Ft.), Average velocity =   0.873(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.00
      2            100.00              0.00
      3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =      9.476(CFS)
  '     '    flow top width =     65.907(Ft.)
  '     '    velocity=    0.873(Ft/s)
  '     '    area =     10.859(Sq.Ft)
  '     '    Froude number =     0.379

Upstream point elevation =  1440.900(Ft.)
Downstream point elevation =  1439.000(Ft.)
Flow length =   553.000(Ft.)
Travel time  =   10.56 min.
Time of concentration =   21.54 min.
Depth of flow =   0.330(Ft.)
Average velocity =   0.873(Ft/s)
Total irregular channel flow =     9.476(CFS)
Irregular channel normal depth above invert elev. =   0.330(Ft.)
Average velocity of channel(s) =   0.873(Ft/s)
 Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.749
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.850
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.150
RI index for soil(AMC 2)  =  58.85
Pervious area fraction =  0.500; Impervious fraction =  0.500
```

Rainfall intensity = 1.850(In/Hr) for a 100.0 year storm
Subarea runoff = 13.461(CFS) for 9.710(Ac.)
Total runoff = 16.177(CFS) Total area = 11.080(Ac.)
Depth of flow = 0.403(Ft.), Average velocity = 0.997(Ft/s)
End of computations, total study area = 11.08 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged RI index number = 58.5

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/07/24
File:c100pretail.out

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

English (in-lb) Units used in input data file

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 40.000 to Point/Station 41.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 519.000(Ft.)
Top (of initial area) elevation = 1449.300(Ft.)
Bottom (of initial area) elevation = 1443.200(Ft.)
Difference in elevation = 6.100(Ft.)
Slope = 0.01175 s(percent)= 1.18
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.564 min.
Rainfall intensity = 2.510(In/Hr) for a 100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.799
Decimal fraction soil group A = 0.000

```
Decimal fraction soil group B = 0.330
Decimal fraction soil group C = 0.670
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  64.71
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =     12.751(CFS)
Total initial stream area =        6.360(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       42.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      6.360(Ac.)
Runoff from this stream =     12.751(CFS)
Time of concentration =   11.56 min.
Rainfall intensity =     2.510(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       42.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   496.000(Ft.)
Top (of initial area) elevation =  1449.300(Ft.)
Bottom (of initial area) elevation =  1443.000(Ft.)
Difference in elevation =     6.300(Ft.)
Slope =    0.01270  s(percent)=       1.27
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.181 min.
Rainfall intensity =      2.551(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.773
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.920
Decimal fraction soil group C = 0.080
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  57.04
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =     12.916(CFS)
Total initial stream area =        6.550(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       40.000 to Point/Station       41.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      6.550(Ac.)
Runoff from this stream =     12.916(CFS)
Time of concentration =   11.18 min.
```

Rainfall intensity = 2.551(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	12.751	11.56	2.510
2	12.916	11.18	2.551

Largest stream flow has longer or shorter time of concentration
Qp = 12.916 + sum of

Qa	Tb/Ta	
12.751 *	0.967 =	12.329

Qp = 25.245

Total of 2 main streams to confluence:
Flow rates before confluence point:
12.751 12.916
Area of streams before confluence:
6.360 6.550

Results of confluence:
Total flow rate = 25.245(CFS)
Time of concentration = 11.181 min.
Effective stream area after confluence = 12.910(Ac.)
End of computations, total study area = 12.91 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged RI index number = 60.8

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 09/26/23 File:aretail.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED A
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 11.100 to Point/Station 20.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 637.000(Ft.)
Top (of initial area) elevation = 1447.200(Ft.)
Bottom (of initial area) elevation = 1443.100(Ft.)
Difference in elevation = 4.100(Ft.)
Slope = 0.00644 s(percent)= 0.64

```
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.891 min.
Rainfall intensity =      2.584(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.878
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.540
Decimal fraction soil group C = 0.460
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  61.98
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      9.875(CFS)
Total initial stream area =        4.350(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       21.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1436.170(Ft.)
Downstream point/station elevation =  1434.060(Ft.)
Pipe length  =   421.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.875(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     9.875(CFS)
Normal flow depth in pipe =   15.28(In.)
Flow top width inside pipe =   18.70(In.)
Critical Depth =   14.03(In.)
Pipe flow velocity =      5.26(Ft/s)
Travel time through pipe =    1.33 min.
Time of concentration (TC) =    12.22 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       21.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      4.350(Ac.)
Runoff from this stream =      9.875(CFS)
Time of concentration =   12.22 min.
Rainfall intensity =     2.442(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.100 to Point/Station       20.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   467.000(Ft.)
Top (of initial area) elevation =  1445.460(Ft.)
Bottom (of initial area) elevation =  1439.100(Ft.)
Difference in elevation =     6.360(Ft.)
Slope =    0.01362  s(percent)=       1.36
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
```

```
Initial area time of concentration =    8.280 min.
Rainfall intensity =      2.956(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.885
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.940
Decimal fraction soil group D = 0.060
RI index for soil(AMC 2)  =  69.36
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      8.214(CFS)
Total initial stream area =        3.140(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.200 to Point/Station       21.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1434.980(Ft.)
Downstream point/station elevation =  1434.060(Ft.)
Pipe length  =   184.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.214(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     8.214(CFS)
Normal flow depth in pipe =   13.36(In.)
Flow top width inside pipe =   20.21(In.)
Critical Depth =   12.76(In.)
Pipe flow velocity =      5.09(Ft/s)
Travel time through pipe =    0.60 min.
Time of concentration (TC) =     8.88 min.


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Process from Point/Station       20.200 to Point/Station       21.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.140(Ac.)
Runoff from this stream =      8.214(CFS)
Time of concentration =    8.88 min.
Rainfall intensity =     2.856(In/Hr)
Summary of stream data:

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


1        9.875     12.22               2.442
2        8.214      8.88               2.856
Largest stream flow has longer time of concentration
Qp =      9.875 + sum of
        Qb         Ia/Ib
         8.214 *    0.855 =      7.025
Qp =     16.899
```

```
Total of 2 main streams to confluence:
Flow rates before confluence point:
       9.875       8.214
Area of streams before confluence:
        4.350        3.140


Results of confluence:
Total flow rate =     16.899(CFS)
Time of concentration =    12.224 min.
Effective stream area after confluence  =      7.490(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1434.060(Ft.)
Downstream point/station elevation =  1432.920(Ft.)
Pipe length  =   228.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.899(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    16.899(CFS)
Normal flow depth in pipe =   17.79(In.)
Flow top width inside pipe =   25.60(In.)
Critical Depth =   17.23(In.)
Pipe flow velocity =      6.08(Ft/s)
Travel time through pipe =    0.63 min.
Time of concentration (TC) =    12.85 min.


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Process from Point/Station       21.000 to Point/Station       23.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      7.490(Ac.)
Runoff from this stream =     16.899(CFS)
Time of concentration =   12.85 min.
Rainfall intensity =     2.383(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       21.100 to Point/Station       21.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   373.000(Ft.)
Top (of initial area) elevation =  1446.300(Ft.)
Bottom (of initial area) elevation =  1440.300(Ft.)
Difference in elevation =     6.000(Ft.)
Slope =    0.01609  s(percent)=       1.61
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.320 min.
Rainfall intensity =      3.140(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
```

```
Runoff Coefficient = 0.887
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.670
Decimal fraction soil group D = 0.330
RI index for soil(AMC 2)  =  70.98
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      7.266(CFS)
Total initial stream area =        2.610(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       21.200 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1433.930(Ft.)
Downstream point/station elevation =  1433.000(Ft.)
Pipe length  =   191.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.266(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     7.266(CFS)
Normal flow depth in pipe =   14.63(In.)
Flow top width inside pipe =   14.05(In.)
Critical Depth =   12.53(In.)
Pipe flow velocity =      4.73(Ft/s)
Travel time through pipe =    0.67 min.
Time of concentration (TC) =     7.99 min.


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Process from Point/Station       21.200 to Point/Station       22.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      2.610(Ac.)
Runoff from this stream =      7.266(CFS)
Time of concentration =    7.99 min.
Rainfall intensity =     3.007(In/Hr)


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Process from Point/Station       10.000 to Point/Station       21.300
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   390.000(Ft.)
Top (of initial area) elevation =  1447.600(Ft.)
Bottom (of initial area) elevation =  1440.900(Ft.)
Difference in elevation =     6.700(Ft.)
Slope =    0.01718  s(percent)=       1.72
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.354 min.
Rainfall intensity =      3.133(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.879
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.790
```

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Decimal fraction soil group C = 0.160
Decimal fraction soil group D = 0.050
RI index for soil(AMC 2)  =  59.03
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      5.235(CFS)
Total initial stream area =        1.900(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       21.300 to Point/Station       22.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1433.450(Ft.)
Downstream point/station elevation =  1433.000(Ft.)
Pipe length  =    88.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.235(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     5.235(CFS)
Normal flow depth in pipe =   11.06(In.)
Flow top width inside pipe =   17.52(In.)
Critical Depth =   10.57(In.)
Pipe flow velocity =      4.59(Ft/s)
Travel time through pipe =    0.32 min.
Time of concentration (TC) =     7.67 min.


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Process from Point/Station       21.300 to Point/Station       22.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.900(Ac.)
Runoff from this stream =      5.235(CFS)
Time of concentration =    7.67 min.
Rainfall intensity =     3.068(In/Hr)
Summary of stream data:

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


1        7.266      7.99                3.007
2        5.235      7.67                3.068
Largest stream flow has longer time of concentration
Qp =      7.266 + sum of
        Qb         Ia/Ib
         5.235 *    0.980 =      5.131
Qp =     12.397

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.266       5.235
Area of streams before confluence:
        2.610        1.900
Results of confluence:
Total flow rate =     12.397(CFS)
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Time of concentration =     7.993 min.
Effective stream area after confluence =      4.510(Ac.)


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Process from Point/Station       22.000 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1433.000(Ft.)
Downstream point/station elevation =  1432.920(Ft.)
Pipe length  =    16.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.397(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    12.397(CFS)
Normal flow depth in pipe =   15.87(In.)
Flow top width inside pipe =   22.72(In.)
Critical Depth =   15.19(In.)
Pipe flow velocity =      5.62(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =     8.04 min.


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Process from Point/Station       22.000 to Point/Station       23.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.510(Ac.)
Runoff from this stream =     12.397(CFS)
Time of concentration =    8.04 min.
Rainfall intensity =     2.999(In/Hr)
Program is now starting with Main Stream No. 3


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Process from Point/Station       22.100 to Point/Station       22.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =    97.000(Ft.)
Top (of initial area) elevation =  1442.600(Ft.)
Bottom (of initial area) elevation =  1438.000(Ft.)
Difference in elevation =     4.600(Ft.)
Slope =    0.04742  s(percent)=       4.74
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Warning: TC computed to be less than 5 min.; program is assuming the
time of concentration is 5 minutes.
Initial area time of concentration =    5.000 min.
Rainfall intensity =      3.785(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.891
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  75.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
```

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Initial subarea runoff =      0.472(CFS)
Total initial stream area =        0.140(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       22.200 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1434.000(Ft.)
Downstream point/station elevation =  1432.920(Ft.)
Pipe length  =   215.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.472(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     0.472(CFS)
Normal flow depth in pipe =    3.97(In.)
Flow top width inside pipe =    8.94(In.)
Critical Depth =    3.72(In.)
Pipe flow velocity =      2.51(Ft/s)
Travel time through pipe =    1.43 min.
Time of concentration (TC) =     6.43 min.


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Process from Point/Station       22.200 to Point/Station       23.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      0.140(Ac.)
Runoff from this stream =      0.472(CFS)
Time of concentration =    6.43 min.
Rainfall intensity =     3.346(In/Hr)
Summary of stream data:

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


1       16.899     12.85               2.383
2       12.397      8.04               2.999
3        0.472      6.43               3.346
Largest stream flow has longer time of concentration
Qp =     16.899 + sum of
        Qb         Ia/Ib
        12.397 *    0.795 =      9.853
        Qb         Ia/Ib
         0.472 *    0.712 =      0.336
Qp =     27.088

Total of 3 main streams to confluence:
Flow rates before confluence point:
      16.899      12.397       0.472
Area of streams before confluence:
        7.490        4.510        0.140
```

Results of confluence:
Total flow rate = 27.088(CFS)
Time of concentration = 12.849 min.
Effective stream area after confluence = 12.140(Ac.)
End of computations, total study area = 12.14 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number = 65.5

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 09/26/23
File:Q100PRETAIL.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED B
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 571.000(Ft.)
Top (of initial area) elevation = 1447.600(Ft.)
Bottom (of initial area) elevation = 1440.500(Ft.)

```
Difference in elevation =     7.100(Ft.)
Slope =    0.01243  s(percent)=       1.24
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.138 min.
Rainfall intensity =      2.816(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.878
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.830
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.170
RI index for soil(AMC 2)  =  59.23
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      9.296(CFS)
Total initial stream area =        3.760(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       11.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.880
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.640
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.360
RI index for soil(AMC 2)  =  62.84
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =     9.14 min.
Rainfall intensity =      2.816(In/Hr) for a   100.0 year storm
Subarea runoff =      5.008(CFS) for      2.020(Ac.)
Total runoff =     14.305(CFS)      Total area =       5.780(Ac.)


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Process from Point/Station       11.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1434.290(Ft.)
Downstream point/station elevation =  1433.300(Ft.)
Pipe length  =   203.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.305(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    14.305(CFS)
Normal flow depth in pipe =   17.91(In.)
Flow top width inside pipe =   20.89(In.)
Critical Depth =   16.35(In.)
Pipe flow velocity =      5.70(Ft/s)
Travel time through pipe =    0.59 min.
Time of concentration (TC) =     9.73 min.


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Process from Point/Station       11.000 to Point/Station       13.000
**** CONFLUENCE OF MAIN STREAMS ****
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```
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      5.780(Ac.)
Runoff from this stream =     14.305(CFS)
Time of concentration =    9.73 min.
Rainfall intensity =     2.731(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       11.100 to Point/Station       11.200
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   614.000(Ft.)
Top (of initial area) elevation =  1447.200(Ft.)
Bottom (of initial area) elevation =  1442.900(Ft.)
Difference in elevation =     4.300(Ft.)
Slope =    0.00700  s(percent)=       0.70
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.552 min.
Rainfall intensity =      2.625(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.874
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      7.894(CFS)
Total initial stream area =        3.440(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       11.200 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1437.410(Ft.)
Downstream point/station elevation =  1434.780(Ft.)
Pipe length  =   359.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.894(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     7.894(CFS)
Normal flow depth in pipe =   13.08(In.)
Flow top width inside pipe =   16.05(In.)
Critical Depth =   13.06(In.)
Pipe flow velocity =      5.74(Ft/s)
Travel time through pipe =    1.04 min.
Time of concentration (TC) =    11.59 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.200 to Point/Station       12.000
**** CONFLUENCE OF MINOR STREAMS ****
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```
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      3.440(Ac.)
Runoff from this stream =      7.894(CFS)
Time of concentration =   11.59 min.
Rainfall intensity =     2.506(In/Hr)


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Process from Point/Station       11.300 to Point/Station       11.400
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   224.000(Ft.)
Top (of initial area) elevation =  1445.000(Ft.)
Bottom (of initial area) elevation =  1441.600(Ft.)
Difference in elevation =     3.400(Ft.)
Slope =    0.01518  s(percent)=       1.52
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.039 min.
Rainfall intensity =      3.450(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.879
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.426(CFS)
Total initial stream area =        0.800(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       11.400 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1434.970(Ft.)
Downstream point/station elevation =  1434.780(Ft.)
Pipe length  =    38.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.426(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.426(CFS)
Normal flow depth in pipe =    9.46(In.)
Flow top width inside pipe =    9.81(In.)
Critical Depth =    8.00(In.)
Pipe flow velocity =      3.65(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =     6.21 min.


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Process from Point/Station       11.400 to Point/Station       12.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.800(Ac.)
Runoff from this stream =      2.426(CFS)
```

```
Time of concentration =    6.21 min.
Rainfall intensity =     3.403(In/Hr)
Summary of stream data:

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


1        7.894     11.59                2.506
2        2.426      6.21                3.403
Largest stream flow has longer time of concentration
Qp =      7.894 + sum of
        Qb         Ia/Ib
         2.426 *    0.737 =      1.787
Qp =      9.681

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.894       2.426
Area of streams before confluence:
        3.440        0.800
Results of confluence:
Total flow rate =      9.681(CFS)
Time of concentration =    11.594 min.
Effective stream area after confluence =      4.240(Ac.)


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Process from Point/Station       12.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1434.780(Ft.)
Downstream point/station elevation =  1433.300(Ft.)
Pipe length  =   203.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.681(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     9.681(CFS)
Normal flow depth in pipe =   13.14(In.)
Flow top width inside pipe =   20.33(In.)
Critical Depth =   13.90(In.)
Pipe flow velocity =      6.11(Ft/s)
Travel time through pipe =    0.55 min.
Time of concentration (TC) =    12.15 min.


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Process from Point/Station       12.000 to Point/Station       13.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.240(Ac.)
Runoff from this stream =      9.681(CFS)
Time of concentration =   12.15 min.
Rainfall intensity =     2.450(In/Hr)
Summary of stream data:
```

```
Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1       14.305      9.73               2.731
2        9.681     12.15               2.450
Largest stream flow has longer or shorter time of concentration
Qp =     14.305 + sum of
        Qa          Tb/Ta
         9.681 *    0.801 =      7.756
Qp =     22.061

Total of 2 main streams to confluence:
Flow rates before confluence point:
      14.305       9.681
Area of streams before confluence:
        5.780        4.240


Results of confluence:
Total flow rate =     22.061(CFS)
Time of concentration =     9.732 min.
Effective stream area after confluence  =     10.020(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1433.300(Ft.)
Downstream point/station elevation =  1433.150(Ft.)
Pipe length  =    20.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    22.061(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    22.061(CFS)
Normal flow depth in pipe =   18.66(In.)
Flow top width inside pipe =   24.95(In.)
Critical Depth =   19.72(In.)
Pipe flow velocity =      7.53(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     9.78 min.


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Process from Point/Station       13.000 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     10.020(Ac.)
Runoff from this stream =     22.061(CFS)
Time of concentration =    9.78 min.
Rainfall intensity =     2.725(In/Hr)
Program is now starting with Main Stream No. 2


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```
Process from Point/Station       13.100 to Point/Station       13.200
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________
Initial area flow distance =    95.000(Ft.)
Top (of initial area) elevation =  1443.500(Ft.)
Bottom (of initial area) elevation =  1438.400(Ft.)
Difference in elevation =     5.100(Ft.)
Slope =    0.05368  s(percent)=       5.37
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Warning: TC computed to be less than 5 min.; program is assuming the
time of concentration is 5 minutes.
Initial area time of concentration =    5.000 min.
Rainfall intensity =      3.785(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.888
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.310
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.690
RI index for soil(AMC 2)  =  69.11
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.370(CFS)
Total initial stream area =        0.110(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.200 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  1434.590(Ft.)
Downstream point/station elevation =  1433.150(Ft.)
Pipe length  =   288.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     0.370(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     0.370(CFS)
Normal flow depth in pipe =    4.59(In.)
Flow top width inside pipe =    5.08(In.)
Critical Depth =    3.71(In.)
Pipe flow velocity =      2.30(Ft/s)
Travel time through pipe =    2.09 min.
Time of concentration (TC) =     7.09 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.200 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
_____________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.110(Ac.)
Runoff from this stream =      0.370(CFS)
Time of concentration =    7.09 min.
Rainfall intensity =     3.189(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
```

```
 No.       (CFS)       (min)                  (In/Hr)


1       22.061      9.78               2.725
2        0.370      7.09               3.189
Largest stream flow has longer time of concentration
Qp =     22.061 + sum of
        Qb         Ia/Ib
         0.370 *    0.854 =      0.316
Qp =     22.376

Total of 2 main streams to confluence:
Flow rates before confluence point:
      22.061       0.370
Area of streams before confluence:
       10.020        0.110


Results of confluence:
Total flow rate =     22.376(CFS)
Time of concentration =     9.776 min.
Effective stream area after confluence  =     10.130(Ac.)
End of computations, total study area =           10.13 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  58.7
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 09/26/23 File:q100abo.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED AREAS A+B+X
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 14.000 to Point/Station 14.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****

Rainfall intensity = 2.725(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.877
Decimal fraction soil group A = 0.000

```
Decimal fraction soil group B = 0.860
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.140
RI index for soil(AMC 2)  =  58.66
Pervious area fraction =  0.100; Impervious fraction =  0.900
User specified values are as follows:
TC =   9.78 min.  Rain intensity =       2.72(In/Hr)
Total area =        10.13(Ac.)  Total runoff =     22.38(CFS)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1435.480(Ft.)
Downstream point/station elevation =  1433.560(Ft.)
Pipe length  =   383.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    22.376(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    22.376(CFS)
Normal flow depth in pipe =   22.69(In.)
Flow top width inside pipe =   19.78(In.)
Critical Depth =   19.87(In.)
Pipe flow velocity =      6.28(Ft/s)
Travel time through pipe =    1.02 min.
Time of concentration (TC) =    10.79 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       24.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     10.130(Ac.)
Runoff from this stream =     22.376(CFS)
Time of concentration =   10.79 min.
Rainfall intensity =     2.596(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       23.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
______________________________________________________________________________
Rainfall intensity =      2.383(In/Hr) for a   100.0 year storm
USER INPUT of soil data for subarea
Runoff Coefficient = 0.880
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.320
Decimal fraction soil group C = 0.580
Decimal fraction soil group D = 0.100
RI index for soil(AMC 2)  =  65.50
Pervious area fraction =  0.100; Impervious fraction =  0.900
User specified values are as follows:
TC =  12.85 min.  Rain intensity =       2.38(In/Hr)
Total area =        12.14(Ac.)  Total runoff =     27.09(CFS)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1433.640(Ft.)
Downstream point/station elevation =  1433.560(Ft.)
Pipe length  =    15.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    27.088(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    27.088(CFS)
Normal flow depth in pipe =   22.34(In.)
Flow top width inside pipe =   26.17(In.)
Critical Depth =   21.30(In.)
Pipe flow velocity =      6.91(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    12.89 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       24.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     12.140(Ac.)
Runoff from this stream =     27.088(CFS)
Time of concentration =   12.89 min.
Rainfall intensity =     2.380(In/Hr)
Summary of stream data:

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


1       22.376     10.79               2.596
2       27.088     12.89               2.380
Largest stream flow has longer time of concentration
Qp =     27.088 + sum of
        Qb         Ia/Ib
        22.376 *    0.917 =     20.515
Qp =     47.603

Total of 2 main streams to confluence:
Flow rates before confluence point:
      22.376      27.088
Area of streams before confluence:
       10.130       12.140


Results of confluence:
Total flow rate =     47.603(CFS)
Time of concentration =    12.885 min.
Effective stream area after confluence  =     22.270(Ac.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.000 to Point/Station       25.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1433.560(Ft.)
Downstream point/station elevation =  1429.970(Ft.)
Pipe length  =   518.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    47.603(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    47.603(CFS)
Normal flow depth in pipe =   25.66(In.)
Flow top width inside pipe =   32.57(In.)
Critical Depth =   26.97(In.)
Pipe flow velocity =      8.83(Ft/s)
Travel time through pipe =    0.98 min.
Time of concentration (TC) =    13.86 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       31.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1429.970(Ft.)
Downstream point/station elevation =  1429.800(Ft.)
Pipe length  =    54.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    47.603(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    47.603(CFS)
Normal flow depth in pipe =   33.00(In.)
Flow top width inside pipe =   28.14(In.)
Critical Depth =   26.42(In.)
Pipe flow velocity =      6.35(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =    14.00 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       25.000 to Point/Station       31.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     22.270(Ac.)
Runoff from this stream =     47.603(CFS)
Time of concentration =   14.00 min.
Rainfall intensity =     2.285(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.000 to Point/Station       30.100
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   742.000(Ft.)
Top (of initial area) elevation =  1443.300(Ft.)
Bottom (of initial area) elevation =  1438.000(Ft.)
Difference in elevation =     5.300(Ft.)
```

```
Slope =    0.00714  s(percent)=       0.71
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.337 min.
Rainfall intensity =      2.534(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.924(CFS)
Total initial stream area =        0.860(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.100 to Point/Station       31.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1433.000(Ft.)
Downstream point/station elevation =  1429.800(Ft.)
Pipe length  =    45.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.924(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.924(CFS)
Normal flow depth in pipe =    4.16(In.)
Flow top width inside pipe =    8.97(In.)
Critical Depth =    7.59(In.)
Pipe flow velocity =      9.64(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    11.42 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       30.100 to Point/Station       31.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.860(Ac.)
Runoff from this stream =      1.924(CFS)
Time of concentration =   11.42 min.
Rainfall intensity =     2.526(In/Hr)
Summary of stream data:

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


1       47.603     14.00               2.285
2        1.924     11.42               2.526
Largest stream flow has longer time of concentration
Qp =     47.603 + sum of
        Qb         Ia/Ib
         1.924 *    0.905 =      1.740
```

```
Qp =     49.343

Total of 2 main streams to confluence:
Flow rates before confluence point:
      47.603       1.924
Area of streams before confluence:
       22.270        0.860


Results of confluence:
Total flow rate =     49.343(CFS)
Time of concentration =    14.005 min.
Effective stream area after confluence  =     23.130(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.000 to Point/Station       34.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1429.800(Ft.)
Downstream point/station elevation =  1428.770(Ft.)
Pipe length  =   344.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    49.343(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =    49.343(CFS)
Normal flow depth in pipe =   31.03(In.)
Flow top width inside pipe =   36.90(In.)
Critical Depth =   26.35(In.)
Pipe flow velocity =      6.47(Ft/s)
Travel time through pipe =    0.89 min.
Time of concentration (TC) =    14.89 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.000 to Point/Station       34.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     23.130(Ac.)
Runoff from this stream =     49.343(CFS)
Time of concentration =   14.89 min.
Rainfall intensity =     2.217(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.100 to Point/Station       31.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   736.000(Ft.)
Top (of initial area) elevation =  1443.030(Ft.)
Bottom (of initial area) elevation =  1439.500(Ft.)
Difference in elevation =     3.530(Ft.)
Slope =    0.00480  s(percent)=       0.48
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.238 min.
```

```
Rainfall intensity =      2.441(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.877
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.680
Decimal fraction soil group C = 0.220
Decimal fraction soil group D = 0.100
RI index for soil(AMC 2)  =  60.76
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.439(CFS)
Total initial stream area =        1.140(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.200 to Point/Station       31.300
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1435.000(Ft.)
Downstream point/station elevation =  1433.600(Ft.)
Pipe length  =    64.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.439(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.439(CFS)
Normal flow depth in pipe =    7.35(In.)
Flow top width inside pipe =    6.97(In.)
Critical Depth =    8.25(In.)
Pipe flow velocity =      6.31(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =    12.41 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.300 to Point/Station       32.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1433.600(Ft.)
Downstream point/station elevation =  1432.370(Ft.)
Pipe length  =   350.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.439(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     2.439(CFS)
Normal flow depth in pipe =    8.70(In.)
Flow top width inside pipe =   14.81(In.)
Critical Depth =    7.50(In.)
Pipe flow velocity =      3.31(Ft/s)
Travel time through pipe =    1.76 min.
Time of concentration (TC) =    14.17 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.300 to Point/Station       32.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.140(Ac.)
Runoff from this stream =      2.439(CFS)
```

```
Time of concentration =   14.17 min.
Rainfall intensity =     2.272(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.400 to Point/Station       31.500
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   385.000(Ft.)
Top (of initial area) elevation =  1439.400(Ft.)
Bottom (of initial area) elevation =  1439.080(Ft.)
Difference in elevation =     0.320(Ft.)
Slope =    0.00083  s(percent)=       0.08
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.408 min.
Rainfall intensity =      2.334(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.886
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  75.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.178(CFS)
Total initial stream area =        0.570(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.500 to Point/Station       31.500
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.886
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  75.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    13.41 min.
Rainfall intensity =      2.334(In/Hr) for a   100.0 year storm
Subarea runoff =      0.682(CFS) for      0.330(Ac.)
Total runoff =      1.860(CFS)      Total area =       0.900(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.500 to Point/Station       32.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1434.640(Ft.)
Downstream point/station elevation =  1432.370(Ft.)
Pipe length  =    77.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.860(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     1.860(CFS)
```

```
Normal flow depth in pipe =    5.31(In.)
Flow top width inside pipe =    8.85(In.)
Critical Depth =    7.47(In.)
Pipe flow velocity =      6.86(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =    13.60 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.500 to Point/Station       32.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.900(Ac.)
Runoff from this stream =      1.860(CFS)
Time of concentration =   13.60 min.
Rainfall intensity =     2.318(In/Hr)
Summary of stream data:

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


1        2.439     14.17                2.272
2        1.860     13.60                2.318
Largest stream flow has longer time of concentration
Qp =      2.439 + sum of
        Qb          Ia/Ib
         1.860 *    0.980 =      1.823
Qp =      4.262

Total of 2 streams to confluence:
Flow rates before confluence point:
       2.439       1.860
Area of streams before confluence:
        1.140        0.900
Results of confluence:
Total flow rate =      4.262(CFS)
Time of concentration =    14.170 min.
Effective stream area after confluence =      2.040(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.000 to Point/Station       33.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1432.370(Ft.)
Downstream point/station elevation =  1431.010(Ft.)
Pipe length  =   725.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.262(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     4.262(CFS)
Normal flow depth in pipe =   13.83(In.)
Flow top width inside pipe =   15.19(In.)
Critical Depth =    9.49(In.)
Pipe flow velocity =      2.93(Ft/s)
Travel time through pipe =    4.13 min.
```

```
Time of concentration (TC) =    18.30 min.


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Process from Point/Station       32.000 to Point/Station       33.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      2.040(Ac.)
Runoff from this stream =      4.262(CFS)
Time of concentration =   18.30 min.
Rainfall intensity =     2.004(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       31.400 to Point/Station       32.100
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   374.000(Ft.)
Top (of initial area) elevation =  1439.400(Ft.)
Bottom (of initial area) elevation =  1437.700(Ft.)
Difference in elevation =     1.700(Ft.)
Slope =    0.00455  s(percent)=       0.45
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.435 min.
Rainfall intensity =      2.773(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.888
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 1.000
RI index for soil(AMC 2)  =  75.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.353(CFS)
Total initial stream area =        0.550(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.100 to Point/Station       32.100
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.887
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.270
Decimal fraction soil group D = 0.730
RI index for soil(AMC 2)  =  73.38
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =     9.44 min.
Rainfall intensity =      2.773(In/Hr) for a   100.0 year storm
Subarea runoff =      1.377(CFS) for      0.560(Ac.)
Total runoff =      2.730(CFS)      Total area =       1.110(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.100 to Point/Station       33.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1433.280(Ft.)
Downstream point/station elevation =  1431.010(Ft.)
Pipe length  =    77.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.730(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.730(CFS)
Normal flow depth in pipe =    7.08(In.)
Flow top width inside pipe =    7.38(In.)
Critical Depth =    8.49(In.)
Pipe flow velocity =      7.32(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =     9.61 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       32.100 to Point/Station       33.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.110(Ac.)
Runoff from this stream =      2.730(CFS)
Time of concentration =    9.61 min.
Rainfall intensity =     2.748(In/Hr)
Summary of stream data:

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


1        4.262     18.30                2.004
2        2.730      9.61                2.748
Largest stream flow has longer time of concentration
Qp =      4.262 + sum of
        Qb         Ia/Ib
         2.730 *    0.729 =      1.991
Qp =      6.253

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.262       2.730
Area of streams before confluence:
        2.040       1.110
Results of confluence:
Total flow rate =      6.253(CFS)
Time of concentration =    18.300 min.
Effective stream area after confluence =      3.150(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       33.000 to Point/Station       34.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1431.010(Ft.)
```

```
Downstream point/station elevation =  1428.770(Ft.)
Pipe length  =   665.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.253(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     6.253(CFS)
Normal flow depth in pipe =   12.70(In.)
Flow top width inside pipe =   20.53(In.)
Critical Depth =   11.07(In.)
Pipe flow velocity =      4.11(Ft/s)
Travel time through pipe =    2.70 min.
Time of concentration (TC) =    21.00 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       33.000 to Point/Station       34.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.150(Ac.)
Runoff from this stream =      6.253(CFS)
Time of concentration =   21.00 min.
Rainfall intensity =     1.874(In/Hr)
Summary of stream data:

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


1       49.343     14.89               2.217
2        6.253     21.00               1.874
Largest stream flow has longer or shorter time of concentration
Qp =     49.343 + sum of
        Qa          Tb/Ta
         6.253 *    0.709 =      4.435
Qp =     53.778

Total of 2 main streams to confluence:
Flow rates before confluence point:
      49.343       6.253
Area of streams before confluence:
       23.130        3.150


Results of confluence:
Total flow rate =     53.778(CFS)
Time of concentration =    14.891 min.
Effective stream area after confluence  =     26.280(Ac.)
End of computations, total study area =           26.28 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  63.5
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/07/24
File:100pcretail.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED C
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 40.000 to Point/Station 41.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 445.000(Ft.)
Top (of initial area) elevation = 1451.200(Ft.)
Bottom (of initial area) elevation = 1443.000(Ft.)

```
Difference in elevation =     8.200(Ft.)
Slope =    0.01843  s(percent)=       1.84
TC = k(0.940)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   23.954 min.
Rainfall intensity =      1.756(In/Hr) for a   100.0 year storm
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.606
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  61.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      3.267(CFS)
Total initial stream area =        3.070(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       41.000 to Point/Station       42.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1438.120(Ft.)
Downstream point/station elevation =  1437.110(Ft.)
Pipe length  =   202.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.267(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     3.267(CFS)
Normal flow depth in pipe =    9.39(In.)
Flow top width inside pipe =   14.52(In.)
Critical Depth =    8.73(In.)
Pipe flow velocity =      4.05(Ft/s)
Travel time through pipe =    0.83 min.
Time of concentration (TC) =    24.79 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       41.000 to Point/Station       42.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      3.070(Ac.)
Runoff from this stream =      3.267(CFS)
Time of concentration =   24.79 min.
Rainfall intensity =     1.727(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       41.100 to Point/Station       41.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   391.000(Ft.)
Top (of initial area) elevation =  1451.400(Ft.)
Bottom (of initial area) elevation =  1442.900(Ft.)
Difference in elevation =     8.500(Ft.)
```

```
Slope =    0.02174  s(percent)=       2.17
TC = k(0.940)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   22.006 min.
Rainfall intensity =      1.831(In/Hr) for a   100.0 year storm
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.628
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.870
Decimal fraction soil group C = 0.130
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  62.69
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      3.759(CFS)
Total initial stream area =        3.270(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       41.200 to Point/Station       42.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1437.660(Ft.)
Downstream point/station elevation =  1437.110(Ft.)
Pipe length  =    30.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.759(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     3.759(CFS)
Normal flow depth in pipe =    7.97(In.)
Flow top width inside pipe =   11.34(In.)
Critical Depth =    9.91(In.)
Pipe flow velocity =      6.79(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    22.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       41.200 to Point/Station       42.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      3.270(Ac.)
Runoff from this stream =      3.759(CFS)
Time of concentration =   22.08 min.
Rainfall intensity =     1.828(In/Hr)
Summary of stream data:

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


1        3.267     24.79               1.727
2        3.759     22.08               1.828
Largest stream flow has longer or shorter time of concentration
Qp =      3.759 + sum of
        Qa          Tb/Ta
         3.267 *    0.891 =      2.910
```

```
Qp =      6.670

Total of 2 main streams to confluence:
Flow rates before confluence point:
       3.267       3.759
Area of streams before confluence:
        3.070        3.270


Results of confluence:
Total flow rate =      6.670(CFS)
Time of concentration =    22.080 min.
Effective stream area after confluence  =      6.340(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       42.000 to Point/Station       43.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1437.110(Ft.)
Downstream point/station elevation =  1433.230(Ft.)
Pipe length  =   776.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.670(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     6.670(CFS)
Normal flow depth in pipe =   13.32(In.)
Flow top width inside pipe =   15.79(In.)
Critical Depth =   12.00(In.)
Pipe flow velocity =      4.76(Ft/s)
Travel time through pipe =    2.72 min.
Time of concentration (TC) =    24.80 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       42.000 to Point/Station       43.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      6.340(Ac.)
Runoff from this stream =      6.670(CFS)
Time of concentration =   24.80 min.
Rainfall intensity =     1.727(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       42.100 to Point/Station       42.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   363.000(Ft.)
Top (of initial area) elevation =  1450.500(Ft.)
Bottom (of initial area) elevation =  1442.000(Ft.)
Difference in elevation =     8.500(Ft.)
Slope =    0.02342  s(percent)=       2.34
TC = k(0.940)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   21.047 min.
```

```
Rainfall intensity =      1.871(In/Hr) for a   100.0 year storm
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.686
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.340
Decimal fraction soil group C = 0.660
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.58
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      5.766(CFS)
Total initial stream area =        4.490(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       42.200 to Point/Station       42.200
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.688
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.320
Decimal fraction soil group C = 0.680
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.84
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    21.05 min.
Rainfall intensity =      1.871(In/Hr) for a   100.0 year storm
Subarea runoff =      2.679(CFS) for      2.080(Ac.)
Total runoff =      8.445(CFS)      Total area =       6.570(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       42.200 to Point/Station       43.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1434.280(Ft.)
Downstream point/station elevation =  1433.230(Ft.)
Pipe length  =   110.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.445(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     8.445(CFS)
Normal flow depth in pipe =   12.43(In.)
Flow top width inside pipe =   16.64(In.)
Critical Depth =   13.51(In.)
Pipe flow velocity =      6.48(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =    21.33 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       42.200 to Point/Station       43.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      6.570(Ac.)
```

Runoff from this stream = 8.445(CFS)
Time of concentration = 21.33 min.
Rainfall intensity = 1.859(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	6.670	24.80	1.727
2	8.445	21.33	1.859

Largest stream flow has longer or shorter time of concentration
Qp = 8.445 + sum of

Qa		Tb/Ta	
6.670	*	0.860	= 5.736

Qp = 14.181

Total of 2 main streams to confluence:
Flow rates before confluence point:
6.670 8.445
Area of streams before confluence:
6.340 6.570

Results of confluence:
Total flow rate = 14.181(CFS)
Time of concentration = 21.330 min.
Effective stream area after confluence = 12.910(Ac.)
End of computations, total study area = 12.91 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number = 65.8

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 10/11/23 File: QA100XUH24100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION - WATERSHED A
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 11.21(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 11.21(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 894.00(Ft.)
Length along longest watercourse measured to centroid = 600.00(Ft.)
Length along longest watercourse = 0.169 Mi.
Length along longest watercourse measured to centroid = 0.114 Mi.
Difference in elevation = 5.90(Ft.)
Slope along watercourse = 34.8456 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.054 Hr.
Lag time = 3.27 Min.
25% of lag time = 0.82 Min.
40% of lag time = 1.31 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.21	2.00	22.42

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.21	5.00	56.05

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 2.000(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.210	64.40	0.500

Total Area Entered = 11.21(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
64.4	64.4	0.422	0.500	0.232	1.000	0.232
					Sum (F) =	0.232

Area averaged mean soil loss (F) (In/Hr) = 0.232
Minimum soil loss rate ((In/Hr)) = 0.116
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	152.961	33.884	3.828
2	0.167	305.923	46.792	5.286
3	0.250	458.884	11.012	1.244
4	0.333	611.845	4.794	0.542
5	0.417	764.807	2.382	0.269
6	0.500	917.768	1.136	0.128

Sum = 100.000 Sum= 11.298

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.040	(0.412)	0.020	0.020
2	0.17	0.07	0.040	(0.410)	0.020	0.020
3	0.25	0.07	0.040	(0.409)	0.020	0.020
4	0.33	0.10	0.060	(0.407)	0.030	0.030
5	0.42	0.10	0.060	(0.406)	0.030	0.030
6	0.50	0.10	0.060	(0.404)	0.030	0.030
7	0.58	0.10	0.060	(0.402)	0.030	0.030
8	0.67	0.10	0.060	(0.401)	0.030	0.030
9	0.75	0.10	0.060	(0.399)	0.030	0.030
10	0.83	0.13	0.080	(0.398)	0.040	0.040
11	0.92	0.13	0.080	(0.396)	0.040	0.040
12	1.00	0.13	0.080	(0.395)	0.040	0.040
13	1.08	0.10	0.060	(0.393)	0.030	0.030
14	1.17	0.10	0.060	(0.391)	0.030	0.030
15	1.25	0.10	0.060	(0.390)	0.030	0.030
16	1.33	0.10	0.060	(0.388)	0.030	0.030
17	1.42	0.10	0.060	(0.387)	0.030	0.030
18	1.50	0.10	0.060	(0.385)	0.030	0.030
19	1.58	0.10	0.060	(0.384)	0.030	0.030
20	1.67	0.10	0.060	(0.382)	0.030	0.030
21	1.75	0.10	0.060	(0.381)	0.030	0.030
22	1.83	0.13	0.080	(0.379)	0.040	0.040
23	1.92	0.13	0.080	(0.378)	0.040	0.040
24	2.00	0.13	0.080	(0.376)	0.040	0.040
25	2.08	0.13	0.080	(0.375)	0.040	0.040
26	2.17	0.13	0.080	(0.373)	0.040	0.040
27	2.25	0.13	0.080	(0.372)	0.040	0.040
28	2.33	0.13	0.080	(0.370)	0.040	0.040
29	2.42	0.13	0.080	(0.368)	0.040	0.040
30	2.50	0.13	0.080	(0.367)	0.040	0.040
31	2.58	0.17	0.100	(0.365)	0.050	0.050
32	2.67	0.17	0.100	(0.364)	0.050	0.050
33	2.75	0.17	0.100	(0.362)	0.050	0.050
34	2.83	0.17	0.100	(0.361)	0.050	0.050
35	2.92	0.17	0.100	(0.360)	0.050	0.050
36	3.00	0.17	0.100	(0.358)	0.050	0.050
37	3.08	0.17	0.100	(0.357)	0.050	0.050
38	3.17	0.17	0.100	(0.355)	0.050	0.050
39	3.25	0.17	0.100	(0.354)	0.050	0.050
40	3.33	0.17	0.100	(0.352)	0.050	0.050
41	3.42	0.17	0.100	(0.351)	0.050	0.050

42	3.50	0.17	0.100	(0.349)	0.050	0.050
43	3.58	0.17	0.100	(0.348)	0.050	0.050
44	3.67	0.17	0.100	(0.346)	0.050	0.050
45	3.75	0.17	0.100	(0.345)	0.050	0.050
46	3.83	0.20	0.120	(0.343)	0.060	0.060
47	3.92	0.20	0.120	(0.342)	0.060	0.060
48	4.00	0.20	0.120	(0.340)	0.060	0.060
49	4.08	0.20	0.120	(0.339)	0.060	0.060
50	4.17	0.20	0.120	(0.338)	0.060	0.060
51	4.25	0.20	0.120	(0.336)	0.060	0.060
52	4.33	0.23	0.140	(0.335)	0.070	0.070
53	4.42	0.23	0.140	(0.333)	0.070	0.070
54	4.50	0.23	0.140	(0.332)	0.070	0.070
55	4.58	0.23	0.140	(0.330)	0.070	0.070
56	4.67	0.23	0.140	(0.329)	0.070	0.070
57	4.75	0.23	0.140	(0.328)	0.070	0.070
58	4.83	0.27	0.160	(0.326)	0.080	0.080
59	4.92	0.27	0.160	(0.325)	0.080	0.080
60	5.00	0.27	0.160	(0.323)	0.080	0.080
61	5.08	0.20	0.120	(0.322)	0.060	0.060
62	5.17	0.20	0.120	(0.321)	0.060	0.060
63	5.25	0.20	0.120	(0.319)	0.060	0.060
64	5.33	0.23	0.140	(0.318)	0.070	0.070
65	5.42	0.23	0.140	(0.316)	0.070	0.070
66	5.50	0.23	0.140	(0.315)	0.070	0.070
67	5.58	0.27	0.160	(0.314)	0.080	0.080
68	5.67	0.27	0.160	(0.312)	0.080	0.080
69	5.75	0.27	0.160	(0.311)	0.080	0.080
70	5.83	0.27	0.160	(0.309)	0.080	0.080
71	5.92	0.27	0.160	(0.308)	0.080	0.080
72	6.00	0.27	0.160	(0.307)	0.080	0.080
73	6.08	0.30	0.180	(0.305)	0.090	0.090
74	6.17	0.30	0.180	(0.304)	0.090	0.090
75	6.25	0.30	0.180	(0.303)	0.090	0.090
76	6.33	0.30	0.180	(0.301)	0.090	0.090
77	6.42	0.30	0.180	(0.300)	0.090	0.090
78	6.50	0.30	0.180	(0.299)	0.090	0.090
79	6.58	0.33	0.200	(0.297)	0.100	0.100
80	6.67	0.33	0.200	(0.296)	0.100	0.100
81	6.75	0.33	0.200	(0.295)	0.100	0.100
82	6.83	0.33	0.200	(0.293)	0.100	0.100
83	6.92	0.33	0.200	(0.292)	0.100	0.100
84	7.00	0.33	0.200	(0.291)	0.100	0.100
85	7.08	0.33	0.200	(0.289)	0.100	0.100
86	7.17	0.33	0.200	(0.288)	0.100	0.100
87	7.25	0.33	0.200	(0.287)	0.100	0.100
88	7.33	0.37	0.220	(0.285)	0.110	0.110
89	7.42	0.37	0.220	(0.284)	0.110	0.110
90	7.50	0.37	0.220	(0.283)	0.110	0.110
91	7.58	0.40	0.240	(0.281)	0.120	0.120

92	7.67	0.40	0.240	(0.280)	0.120	0.120
93	7.75	0.40	0.240	(0.279)	0.120	0.120
94	7.83	0.43	0.260	(0.278)	0.130	0.130
95	7.92	0.43	0.260	(0.276)	0.130	0.130
96	8.00	0.43	0.260	(0.275)	0.130	0.130
97	8.08	0.50	0.300	(0.274)	0.150	0.150
98	8.17	0.50	0.300	(0.272)	0.150	0.150
99	8.25	0.50	0.300	(0.271)	0.150	0.150
100	8.33	0.50	0.300	(0.270)	0.150	0.150
101	8.42	0.50	0.300	(0.269)	0.150	0.150
102	8.50	0.50	0.300	(0.267)	0.150	0.150
103	8.58	0.53	0.320	(0.266)	0.160	0.160
104	8.67	0.53	0.320	(0.265)	0.160	0.160
105	8.75	0.53	0.320	(0.264)	0.160	0.160
106	8.83	0.57	0.340	(0.262)	0.170	0.170
107	8.92	0.57	0.340	(0.261)	0.170	0.170
108	9.00	0.57	0.340	(0.260)	0.170	0.170
109	9.08	0.63	0.380	(0.259)	0.190	0.190
110	9.17	0.63	0.380	(0.257)	0.190	0.190
111	9.25	0.63	0.380	(0.256)	0.190	0.190
112	9.33	0.67	0.400	(0.255)	0.200	0.200
113	9.42	0.67	0.400	(0.254)	0.200	0.200
114	9.50	0.67	0.400	(0.253)	0.200	0.200
115	9.58	0.70	0.420	(0.251)	0.210	0.210
116	9.67	0.70	0.420	(0.250)	0.210	0.210
117	9.75	0.70	0.420	(0.249)	0.210	0.210
118	9.83	0.73	0.440	(0.248)	0.220	0.220
119	9.92	0.73	0.440	(0.247)	0.220	0.220
120	10.00	0.73	0.440	(0.245)	0.220	0.220
121	10.08	0.50	0.300	(0.244)	0.150	0.150
122	10.17	0.50	0.300	(0.243)	0.150	0.150
123	10.25	0.50	0.300	(0.242)	0.150	0.150
124	10.33	0.50	0.300	(0.241)	0.150	0.150
125	10.42	0.50	0.300	(0.239)	0.150	0.150
126	10.50	0.50	0.300	(0.238)	0.150	0.150
127	10.58	0.67	0.400	(0.237)	0.200	0.200
128	10.67	0.67	0.400	(0.236)	0.200	0.200
129	10.75	0.67	0.400	(0.235)	0.200	0.200
130	10.83	0.67	0.400	(0.234)	0.200	0.200
131	10.92	0.67	0.400	(0.233)	0.200	0.200
132	11.00	0.67	0.400	(0.231)	0.200	0.200
133	11.08	0.63	0.380	(0.230)	0.190	0.190
134	11.17	0.63	0.380	(0.229)	0.190	0.190
135	11.25	0.63	0.380	(0.228)	0.190	0.190
136	11.33	0.63	0.380	(0.227)	0.190	0.190
137	11.42	0.63	0.380	(0.226)	0.190	0.190
138	11.50	0.63	0.380	(0.225)	0.190	0.190
139	11.58	0.57	0.340	(0.224)	0.170	0.170
140	11.67	0.57	0.340	(0.222)	0.170	0.170
141	11.75	0.57	0.340	(0.221)	0.170	0.170

142	11.83	0.60	0.360	(	0.220)		0.180	0.180
143	11.92	0.60	0.360	(	0.219)		0.180	0.180
144	12.00	0.60	0.360	(	0.218)		0.180	0.180
145	12.08	0.83	0.500		0.217	(	0.250)	0.283
146	12.17	0.83	0.500		0.216	(	0.250)	0.284
147	12.25	0.83	0.500		0.215	(	0.250)	0.285
148	12.33	0.87	0.520		0.214	(	0.260)	0.306
149	12.42	0.87	0.520		0.213	(	0.260)	0.307
150	12.50	0.87	0.520		0.212	(	0.260)	0.308
151	12.58	0.93	0.560		0.210	(	0.280)	0.350
152	12.67	0.93	0.560		0.209	(	0.280)	0.351
153	12.75	0.93	0.560		0.208	(	0.280)	0.352
154	12.83	0.97	0.580		0.207	(	0.290)	0.373
155	12.92	0.97	0.580		0.206	(	0.290)	0.374
156	13.00	0.97	0.580		0.205	(	0.290)	0.375
157	13.08	1.13	0.680		0.204	(	0.340)	0.476
158	13.17	1.13	0.680		0.203	(	0.340)	0.477
159	13.25	1.13	0.680		0.202	(	0.340)	0.478
160	13.33	1.13	0.680		0.201	(	0.340)	0.479
161	13.42	1.13	0.680		0.200	(	0.340)	0.480
162	13.50	1.13	0.680		0.199	(	0.340)	0.481
163	13.58	0.77	0.460		0.198	(	0.230)	0.262
164	13.67	0.77	0.460		0.197	(	0.230)	0.263
165	13.75	0.77	0.460		0.196	(	0.230)	0.264
166	13.83	0.77	0.460		0.195	(	0.230)	0.265
167	13.92	0.77	0.460		0.194	(	0.230)	0.266
168	14.00	0.77	0.460		0.193	(	0.230)	0.267
169	14.08	0.90	0.540		0.192	(	0.270)	0.348
170	14.17	0.90	0.540		0.191	(	0.270)	0.349
171	14.25	0.90	0.540		0.190	(	0.270)	0.350
172	14.33	0.87	0.520		0.189	(	0.260)	0.331
173	14.42	0.87	0.520		0.188	(	0.260)	0.332
174	14.50	0.87	0.520		0.187	(	0.260)	0.333
175	14.58	0.87	0.520		0.186	(	0.260)	0.334
176	14.67	0.87	0.520		0.185	(	0.260)	0.335
177	14.75	0.87	0.520		0.184	(	0.260)	0.336
178	14.83	0.83	0.500		0.183	(	0.250)	0.317
179	14.92	0.83	0.500		0.182	(	0.250)	0.318
180	15.00	0.83	0.500		0.181	(	0.250)	0.319
181	15.08	0.80	0.480		0.181	(	0.240)	0.299
182	15.17	0.80	0.480		0.180	(	0.240)	0.300
183	15.25	0.80	0.480		0.179	(	0.240)	0.301
184	15.33	0.77	0.460		0.178	(	0.230)	0.282
185	15.42	0.77	0.460		0.177	(	0.230)	0.283
186	15.50	0.77	0.460		0.176	(	0.230)	0.284
187	15.58	0.63	0.380		0.175	(	0.190)	0.205
188	15.67	0.63	0.380		0.174	(	0.190)	0.206
189	15.75	0.63	0.380		0.173	(	0.190)	0.207
190	15.83	0.63	0.380		0.172	(	0.190)	0.208
191	15.92	0.63	0.380		0.172	(	0.190)	0.208

192	16.00	0.63	0.380	0.171	(0.190)	0.209
193	16.08	0.13	0.080	(0.170)	0.040	0.040
194	16.17	0.13	0.080	(0.169)	0.040	0.040
195	16.25	0.13	0.080	(0.168)	0.040	0.040
196	16.33	0.13	0.080	(0.167)	0.040	0.040
197	16.42	0.13	0.080	(0.166)	0.040	0.040
198	16.50	0.13	0.080	(0.165)	0.040	0.040
199	16.58	0.10	0.060	(0.165)	0.030	0.030
200	16.67	0.10	0.060	(0.164)	0.030	0.030
201	16.75	0.10	0.060	(0.163)	0.030	0.030
202	16.83	0.10	0.060	(0.162)	0.030	0.030
203	16.92	0.10	0.060	(0.161)	0.030	0.030
204	17.00	0.10	0.060	(0.161)	0.030	0.030
205	17.08	0.17	0.100	(0.160)	0.050	0.050
206	17.17	0.17	0.100	(0.159)	0.050	0.050
207	17.25	0.17	0.100	(0.158)	0.050	0.050
208	17.33	0.17	0.100	(0.157)	0.050	0.050
209	17.42	0.17	0.100	(0.157)	0.050	0.050
210	17.50	0.17	0.100	(0.156)	0.050	0.050
211	17.58	0.17	0.100	(0.155)	0.050	0.050
212	17.67	0.17	0.100	(0.154)	0.050	0.050
213	17.75	0.17	0.100	(0.153)	0.050	0.050
214	17.83	0.13	0.080	(0.153)	0.040	0.040
215	17.92	0.13	0.080	(0.152)	0.040	0.040
216	18.00	0.13	0.080	(0.151)	0.040	0.040
217	18.08	0.13	0.080	(0.150)	0.040	0.040
218	18.17	0.13	0.080	(0.150)	0.040	0.040
219	18.25	0.13	0.080	(0.149)	0.040	0.040
220	18.33	0.13	0.080	(0.148)	0.040	0.040
221	18.42	0.13	0.080	(0.147)	0.040	0.040
222	18.50	0.13	0.080	(0.147)	0.040	0.040
223	18.58	0.10	0.060	(0.146)	0.030	0.030
224	18.67	0.10	0.060	(0.145)	0.030	0.030
225	18.75	0.10	0.060	(0.145)	0.030	0.030
226	18.83	0.07	0.040	(0.144)	0.020	0.020
227	18.92	0.07	0.040	(0.143)	0.020	0.020
228	19.00	0.07	0.040	(0.143)	0.020	0.020
229	19.08	0.10	0.060	(0.142)	0.030	0.030
230	19.17	0.10	0.060	(0.141)	0.030	0.030
231	19.25	0.10	0.060	(0.141)	0.030	0.030
232	19.33	0.13	0.080	(0.140)	0.040	0.040
233	19.42	0.13	0.080	(0.139)	0.040	0.040
234	19.50	0.13	0.080	(0.139)	0.040	0.040
235	19.58	0.10	0.060	(0.138)	0.030	0.030
236	19.67	0.10	0.060	(0.137)	0.030	0.030
237	19.75	0.10	0.060	(0.137)	0.030	0.030
238	19.83	0.07	0.040	(0.136)	0.020	0.020
239	19.92	0.07	0.040	(0.136)	0.020	0.020
240	20.00	0.07	0.040	(0.135)	0.020	0.020
241	20.08	0.10	0.060	(0.134)	0.030	0.030

242	20.17	0.10	0.060	(0.134)	0.030	0.030
243	20.25	0.10	0.060	(0.133)	0.030	0.030
244	20.33	0.10	0.060	(0.133)	0.030	0.030
245	20.42	0.10	0.060	(0.132)	0.030	0.030
246	20.50	0.10	0.060	(0.131)	0.030	0.030
247	20.58	0.10	0.060	(0.131)	0.030	0.030
248	20.67	0.10	0.060	(0.130)	0.030	0.030
249	20.75	0.10	0.060	(0.130)	0.030	0.030
250	20.83	0.07	0.040	(0.129)	0.020	0.020
251	20.92	0.07	0.040	(0.129)	0.020	0.020
252	21.00	0.07	0.040	(0.128)	0.020	0.020
253	21.08	0.10	0.060	(0.128)	0.030	0.030
254	21.17	0.10	0.060	(0.127)	0.030	0.030
255	21.25	0.10	0.060	(0.127)	0.030	0.030
256	21.33	0.07	0.040	(0.126)	0.020	0.020
257	21.42	0.07	0.040	(0.126)	0.020	0.020
258	21.50	0.07	0.040	(0.125)	0.020	0.020
259	21.58	0.10	0.060	(0.125)	0.030	0.030
260	21.67	0.10	0.060	(0.124)	0.030	0.030
261	21.75	0.10	0.060	(0.124)	0.030	0.030
262	21.83	0.07	0.040	(0.124)	0.020	0.020
263	21.92	0.07	0.040	(0.123)	0.020	0.020
264	22.00	0.07	0.040	(0.123)	0.020	0.020
265	22.08	0.10	0.060	(0.122)	0.030	0.030
266	22.17	0.10	0.060	(0.122)	0.030	0.030
267	22.25	0.10	0.060	(0.121)	0.030	0.030
268	22.33	0.07	0.040	(0.121)	0.020	0.020
269	22.42	0.07	0.040	(0.121)	0.020	0.020
270	22.50	0.07	0.040	(0.120)	0.020	0.020
271	22.58	0.07	0.040	(0.120)	0.020	0.020
272	22.67	0.07	0.040	(0.120)	0.020	0.020
273	22.75	0.07	0.040	(0.119)	0.020	0.020
274	22.83	0.07	0.040	(0.119)	0.020	0.020
275	22.92	0.07	0.040	(0.119)	0.020	0.020
276	23.00	0.07	0.040	(0.118)	0.020	0.020
277	23.08	0.07	0.040	(0.118)	0.020	0.020
278	23.17	0.07	0.040	(0.118)	0.020	0.020
279	23.25	0.07	0.040	(0.118)	0.020	0.020
280	23.33	0.07	0.040	(0.117)	0.020	0.020
281	23.42	0.07	0.040	(0.117)	0.020	0.020
282	23.50	0.07	0.040	(0.117)	0.020	0.020
283	23.58	0.07	0.040	(0.117)	0.020	0.020
284	23.67	0.07	0.040	(0.117)	0.020	0.020
285	23.75	0.07	0.040	(0.117)	0.020	0.020
286	23.83	0.07	0.040	(0.116)	0.020	0.020
287	23.92	0.07	0.040	(0.116)	0.020	0.020
288	24.00	0.07	0.040	(0.116)	0.020	0.020

(Loss Rate Not Used)

Sum = 100.0 Sum = 33.1

Flood volume = Effective rainfall 2.76(In)

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 times area      11.2(Ac.)/[(In)/(Ft.)] =       2.6(Ac.Ft)
Total soil loss =      2.24(In)
Total soil loss =     2.097(Ac.Ft)
Total rainfall =      5.00(In)
Flood volume =      112131.8 Cubic Feet
Total soil loss =       91325.2 Cubic Feet
------------------------------------------------------------------------
 Peak flow rate of this hydrograph =      5.425(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        2.5       5.0       7.5      10.0
------------------------------------------------------------------------
  0+ 5       0.0005      0.08  Q         |         |         |         |
  0+10       0.0018      0.18  Q         |         |         |         |
  0+15       0.0032      0.21  Q         |         |         |         |
  0+20       0.0050      0.26  VQ        |         |         |         |
  0+25       0.0071      0.31  VQ        |         |         |         |
  0+30       0.0094      0.33  VQ        |         |         |         |
  0+35       0.0117      0.34  VQ        |         |         |         |
  0+40       0.0140      0.34  VQ        |         |         |         |
  0+45       0.0164      0.34  VQ        |         |         |         |
  0+50       0.0190      0.38  VQ        |         |         |         |
  0+55       0.0219      0.43  VQ        |         |         |         |
  1+ 0       0.0250      0.44  VQ        |         |         |         |
  1+ 5       0.0278      0.41  VQ        |         |         |         |
  1+10       0.0303      0.36  VQ        |         |         |         |
  1+15       0.0327      0.35  VQ        |         |         |         |
  1+20       0.0351      0.34  VQ        |         |         |         |
  1+25       0.0374      0.34  VQ        |         |         |         |
  1+30       0.0397      0.34  VQ        |         |         |         |
  1+35       0.0421      0.34  VQ        |         |         |         |
  1+40       0.0444      0.34  VQ        |         |         |         |
  1+45       0.0467      0.34  VQ        |         |         |         |
  1+50       0.0493      0.38  VQ        |         |         |         |
  1+55       0.0523      0.43  VQ        |         |         |         |
  2+ 0       0.0554      0.44  VQ        |         |         |         |
  2+ 5       0.0584      0.45  VQ        |         |         |         |
  2+10       0.0615      0.45  VQ        |         |         |         |
  2+15       0.0647      0.45  |Q        |         |         |         |
  2+20       0.0678      0.45  |Q        |         |         |         |
  2+25       0.0709      0.45  |Q        |         |         |         |
  2+30       0.0740      0.45  |Q        |         |         |         |
  2+35       0.0774      0.49  |Q        |         |         |         |
  2+40       0.0811      0.54  |VQ       |         |         |         |
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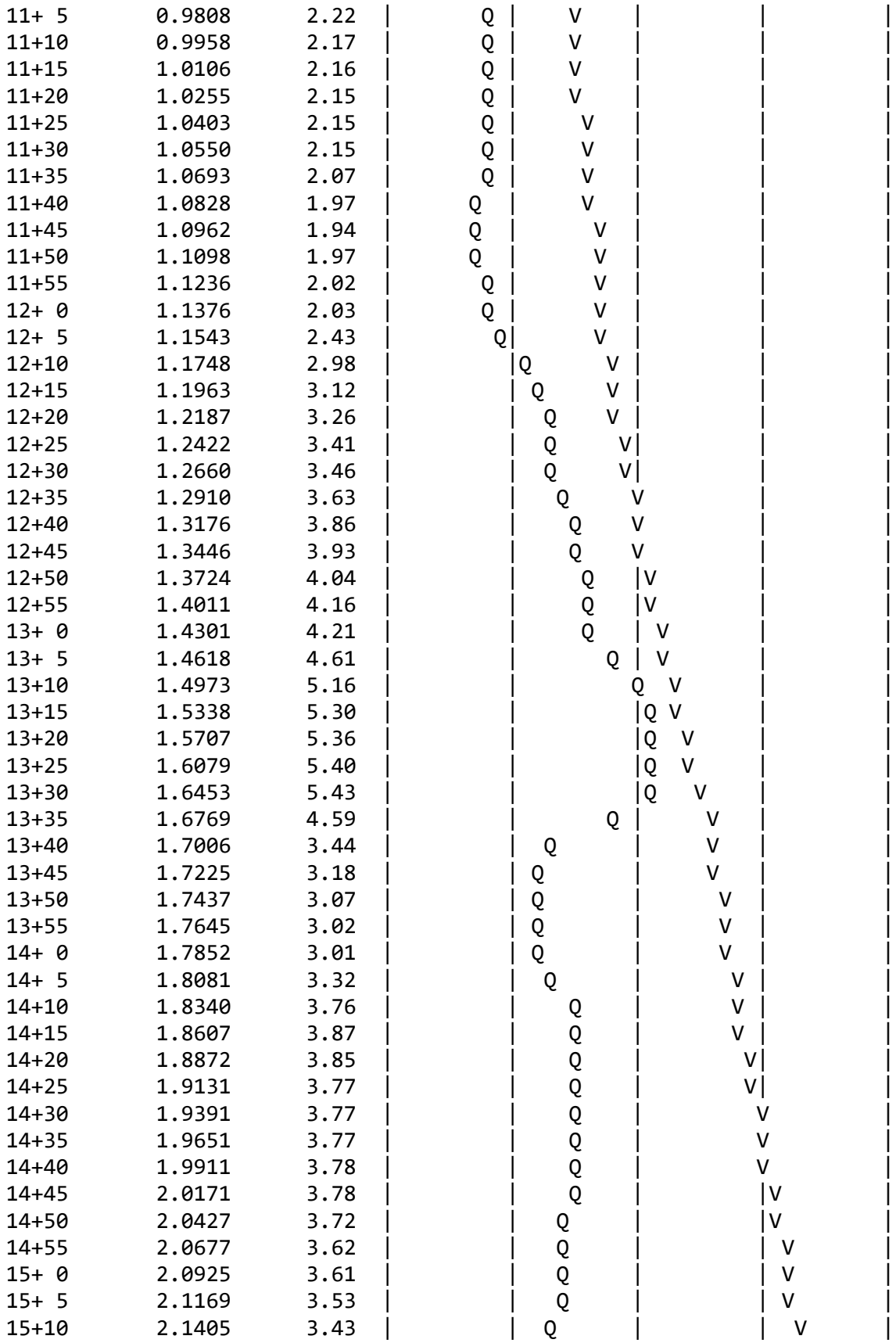
2+45	0.0849	0.56	VQ				
2+50	0.0888	0.56	VQ				
2+55	0.0927	0.56	VQ				
3+ 0	0.0966	0.57	VQ				
3+ 5	0.1005	0.57	VQ				
3+10	0.1044	0.57	VQ				
3+15	0.1083	0.57	VQ				
3+20	0.1122	0.57	VQ				
3+25	0.1161	0.57	VQ				
3+30	0.1199	0.57	VQ				
3+35	0.1238	0.57	VQ				
3+40	0.1277	0.57	VQ				
3+45	0.1316	0.57	Q				
3+50	0.1358	0.60	Q				
3+55	0.1403	0.66	Q				
4+ 0	0.1449	0.67	Q				
4+ 5	0.1495	0.67	Q				
4+10	0.1542	0.68	Q				
4+15	0.1589	0.68	Q				
4+20	0.1638	0.72	Q				
4+25	0.1691	0.77	VQ				
4+30	0.1745	0.78	VQ				
4+35	0.1799	0.79	VQ				
4+40	0.1854	0.79	VQ				
4+45	0.1908	0.79	VQ				
4+50	0.1965	0.83	Q				
4+55	0.2026	0.88	Q				
5+ 0	0.2088	0.89	Q				
5+ 5	0.2144	0.82	Q				
5+10	0.2194	0.72	QV				
5+15	0.2242	0.70	QV				
5+20	0.2292	0.72	QV				
5+25	0.2345	0.77	Q				
5+30	0.2399	0.78	Q				
5+35	0.2456	0.83	Q				
5+40	0.2516	0.88	Q				
5+45	0.2578	0.89	QV				
5+50	0.2640	0.90	QV				
5+55	0.2702	0.90	QV				
6+ 0	0.2765	0.90	QV				
6+ 5	0.2829	0.94	QV				
6+10	0.2898	1.00	QV				
6+15	0.2967	1.01	Q				
6+20	0.3037	1.01	Q				
6+25	0.3107	1.02	Q				
6+30	0.3177	1.02	Q				
6+35	0.3250	1.06	QV				
6+40	0.3326	1.11	QV				
6+45	0.3403	1.12	QV				
6+50	0.3481	1.13	QV				

6+55	0.3559	1.13	QV			
7+ 0	0.3637	1.13	QV			
7+ 5	0.3714	1.13	QV			
7+10	0.3792	1.13	QV			
7+15	0.3870	1.13	Q V			
7+20	0.3951	1.17	Q V			
7+25	0.4035	1.22	Q V			
7+30	0.4120	1.23	Q V			
7+35	0.4208	1.28	QV			
7+40	0.4300	1.33	QV			
7+45	0.4392	1.35	QV			
7+50	0.4488	1.39	QV			
7+55	0.4588	1.45	Q V			
8+ 0	0.4688	1.46	Q V			
8+ 5	0.4794	1.54	QV			
8+10	0.4908	1.65	QV			
8+15	0.5024	1.68	QV			
8+20	0.5140	1.69	QV			
8+25	0.5256	1.69	Q V			
8+30	0.5373	1.70	Q V			
8+35	0.5493	1.73	Q V			
8+40	0.5616	1.79	QV			
8+45	0.5740	1.80	QV			
8+50	0.5866	1.84	Q V			
8+55	0.5997	1.90	Q V			
9+ 0	0.6129	1.91	Q V			
9+ 5	0.6266	1.99	Q V			
9+10	0.6411	2.10	QV			
9+15	0.6558	2.13	Q V			
9+20	0.6708	2.18	Q V			
9+25	0.6862	2.24	Q V			
9+30	0.7017	2.25	QV			
9+35	0.7175	2.29	Q V			
9+40	0.7337	2.35	Q V			
9+45	0.7499	2.36	Q V			
9+50	0.7665	2.41	Q V			
9+55	0.7835	2.46	Q V			
10+ 0	0.8006	2.48	Q V			
10+ 5	0.8158	2.21	Q V			
10+10	0.8285	1.85	Q V			
10+15	0.8407	1.76	Q V			
10+20	0.8525	1.72	Q V			
10+25	0.8643	1.70	Q V			
10+30	0.8759	1.70	Q V			
10+35	0.8889	1.89	Q V			
10+40	0.9038	2.15	Q V			
10+45	0.9190	2.21	Q V			
10+50	0.9344	2.24	Q V			
10+55	0.9500	2.25	Q V			
11+ 0	0.9655	2.26	Q V			



15+15	2.1640	3.41	|	Q	|	V	|
15+20	2.1870	3.34	|	Q	|	V	|
15+25	2.2093	3.24	|	Q	|	V	|
15+30	2.2314	3.22	|	Q	|	V	|
15+35	2.2515	2.91	|	Q	|	V	|
15+40	2.2687	2.49	|	Q	|	V	|
15+45	2.2852	2.40	|	Q	|	V	|
15+50	2.3015	2.37	|	Q	|	V	|
15+55	2.3178	2.36	|	Q	|	V	|
16+ 0	2.3340	2.36	|	Q	|	V	|
16+ 5	2.3458	1.71	|	Q	|	V	|
16+10	2.3515	0.82	|	Q	|	V	|
16+15	2.3557	0.61	|	Q	|	V	|
16+20	2.3592	0.52	|	Q	|	V	|
16+25	2.3625	0.47	|	Q	|	V	|
16+30	2.3656	0.45	|	Q	|	V	|
16+35	2.3685	0.41	|	Q	|	V	|
16+40	2.3710	0.36	|	Q	|	V	|
16+45	2.3734	0.35	|	Q	|	V	|
16+50	2.3757	0.34	|	Q	|	V	|
16+55	2.3781	0.34	|	Q	|	V	|
17+ 0	2.3804	0.34	|	Q	|	V	|
17+ 5	2.3833	0.42	|	Q	|	V	|
17+10	2.3868	0.52	|	Q	|	V	|
17+15	2.3906	0.55	|	Q	|	V	|
17+20	2.3944	0.56	|	Q	|	V	|
17+25	2.3983	0.56	|	Q	|	V	|
17+30	2.4022	0.57	|	Q	|	V	|
17+35	2.4061	0.57	|	Q	|	V	|
17+40	2.4100	0.57	|	Q	|	V	|
17+45	2.4139	0.57	|	Q	|	V	|
17+50	2.4175	0.53	|	Q	|	V	|
17+55	2.4208	0.47	|	Q	|	V	|
18+ 0	2.4240	0.46	|	Q	|	V	|
18+ 5	2.4271	0.46	|	Q	|	V	|
18+10	2.4302	0.45	|	Q	|	V	|
18+15	2.4333	0.45	|	Q	|	V	|
18+20	2.4365	0.45	|	Q	|	V	|
18+25	2.4396	0.45	|	Q	|	V	|
18+30	2.4427	0.45	|	Q	|	V	|
18+35	2.4455	0.41	|	Q	|	V	|
18+40	2.4480	0.36	|	Q	|	V	|
18+45	2.4504	0.35	|	Q	|	V	|
18+50	2.4525	0.30	|	Q	|	V	|
18+55	2.4542	0.25	|	Q	|	V	|
19+ 0	2.4559	0.24	|	Q	|	V	|
19+ 5	2.4577	0.27	|	Q	|	V	|
19+10	2.4599	0.32	|	Q	|	V	|
19+15	2.4622	0.33	|	Q	|	V	|
19+20	2.4647	0.37	|	Q	|	V	|

19+25	2.4677	0.43	|Q	|	|	|	V |
19+30	2.4707	0.44	|Q	|	|	|	V |
19+35	2.4736	0.41	|Q	|	|	|	V |
19+40	2.4760	0.36	|Q	|	|	|	V |
19+45	2.4784	0.35	|Q	|	|	|	V |
19+50	2.4805	0.30	|Q	|	|	|	V |
19+55	2.4823	0.25	Q	|	|	|	V |
20+ 0	2.4839	0.24	Q	|	|	|	V |
20+ 5	2.4857	0.27	|Q	|	|	|	V |
20+10	2.4879	0.32	|Q	|	|	|	V |
20+15	2.4902	0.33	|Q	|	|	|	V |
20+20	2.4925	0.34	|Q	|	|	|	V |
20+25	2.4948	0.34	|Q	|	|	|	V |
20+30	2.4972	0.34	|Q	|	|	|	V |
20+35	2.4995	0.34	|Q	|	|	|	V |
20+40	2.5018	0.34	|Q	|	|	|	V |
20+45	2.5042	0.34	|Q	|	|	|	V |
20+50	2.5062	0.30	|Q	|	|	|	V |
20+55	2.5079	0.25	Q	|	|	|	V |
21+ 0	2.5096	0.24	Q	|	|	|	V |
21+ 5	2.5114	0.27	|Q	|	|	|	V|
21+10	2.5136	0.32	|Q	|	|	|	V|
21+15	2.5159	0.33	|Q	|	|	|	V|
21+20	2.5179	0.30	|Q	|	|	|	V|
21+25	2.5196	0.25	Q	|	|	|	V|
21+30	2.5212	0.24	Q	|	|	|	V|
21+35	2.5231	0.27	|Q	|	|	|	V|
21+40	2.5253	0.32	|Q	|	|	|	V|
21+45	2.5276	0.33	|Q	|	|	|	V|
21+50	2.5296	0.30	|Q	|	|	|	V|
21+55	2.5313	0.25	Q	|	|	|	V|
22+ 0	2.5329	0.24	Q	|	|	|	V|
22+ 5	2.5348	0.27	|Q	|	|	|	V|
22+10	2.5370	0.32	|Q	|	|	|	V|
22+15	2.5392	0.33	|Q	|	|	|	V|
22+20	2.5413	0.30	|Q	|	|	|	V|
22+25	2.5430	0.25	Q	|	|	|	V|
22+30	2.5446	0.24	Q	|	|	|	V|
22+35	2.5462	0.23	Q	|	|	|	V|
22+40	2.5477	0.23	Q	|	|	|	V|
22+45	2.5493	0.23	Q	|	|	|	V|
22+50	2.5509	0.23	Q	|	|	|	V|
22+55	2.5524	0.23	Q	|	|	|	V|
23+ 0	2.5540	0.23	Q	|	|	|	V|
23+ 5	2.5555	0.23	Q	|	|	|	V|
23+10	2.5571	0.23	Q	|	|	|	V|
23+15	2.5586	0.23	Q	|	|	|	V|
23+20	2.5602	0.23	Q	|	|	|	V|
23+25	2.5618	0.23	Q	|	|	|	V|
23+30	2.5633	0.23	Q	|	|	|	V|

23+35	2.5649	0.23	Q	|	|	|	V|
23+40	2.5664	0.23	Q	|	|	|	V|
23+45	2.5680	0.23	Q	|	|	|	V|
23+50	2.5695	0.23	Q	|	|	|	V|
23+55	2.5711	0.23	Q	|	|	|	V|
24+ 0	2.5727	0.23	Q	|	|	|	V|
24+ 5	2.5737	0.15	Q	|	|	|	V|
24+10	2.5740	0.04	Q	|	|	|	V|
24+15	2.5741	0.02	Q	|	|	|	V|
24+20	2.5742	0.01	Q	|	|	|	V|
24+25	2.5742	0.00	Q	|	|	|	V|

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

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Study date 10/11/23 File: QB100XUH24100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION - WATERSHED B
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 11.08(Ac.) = 0.017 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 11.08(Ac.) = 0.017 Sq. Mi.
Length along longest watercourse = 881.00(Ft.)
Length along longest watercourse measured to centroid = 378.00(Ft.)
Length along longest watercourse = 0.167 Mi.
Length along longest watercourse measured to centroid = 0.072 Mi.
Difference in elevation = 3.90(Ft.)
Slope along watercourse = 23.3734 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.049 Hr.
Lag time = 2.94 Min.
25% of lag time = 0.74 Min.
40% of lag time = 1.18 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.08	2.00	22.16

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.08	5.00	55.40

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 2.000(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.080	58.19	0.500

Total Area Entered = 11.08(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
58.2	58.2	0.488	0.500	0.269	1.000	0.269
					Sum (F) =	0.269

Area averaged mean soil loss (F) (In/Hr) = 0.269
Minimum soil loss rate ((In/Hr)) = 0.134
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	169.941	37.677	4.207
2	0.167	339.883	45.521	5.083
3	0.250	509.824	10.142	1.133
4	0.333	679.765	4.262	0.476
5	0.417	849.706	2.398	0.268
			Sum = 100.000	Sum= 11.167

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.040	(0.476)	0.020	0.020
2	0.17	0.07	0.040	(0.474)	0.020	0.020
3	0.25	0.07	0.040	(0.473)	0.020	0.020
4	0.33	0.10	0.060	(0.471)	0.030	0.030
5	0.42	0.10	0.060	(0.469)	0.030	0.030
6	0.50	0.10	0.060	(0.467)	0.030	0.030
7	0.58	0.10	0.060	(0.465)	0.030	0.030
8	0.67	0.10	0.060	(0.463)	0.030	0.030
9	0.75	0.10	0.060	(0.462)	0.030	0.030
10	0.83	0.13	0.080	(0.460)	0.040	0.040
11	0.92	0.13	0.080	(0.458)	0.040	0.040
12	1.00	0.13	0.080	(0.456)	0.040	0.040
13	1.08	0.10	0.060	(0.454)	0.030	0.030
14	1.17	0.10	0.060	(0.453)	0.030	0.030
15	1.25	0.10	0.060	(0.451)	0.030	0.030
16	1.33	0.10	0.060	(0.449)	0.030	0.030
17	1.42	0.10	0.060	(0.447)	0.030	0.030
18	1.50	0.10	0.060	(0.445)	0.030	0.030
19	1.58	0.10	0.060	(0.444)	0.030	0.030
20	1.67	0.10	0.060	(0.442)	0.030	0.030
21	1.75	0.10	0.060	(0.440)	0.030	0.030
22	1.83	0.13	0.080	(0.438)	0.040	0.040
23	1.92	0.13	0.080	(0.437)	0.040	0.040
24	2.00	0.13	0.080	(0.435)	0.040	0.040
25	2.08	0.13	0.080	(0.433)	0.040	0.040
26	2.17	0.13	0.080	(0.431)	0.040	0.040
27	2.25	0.13	0.080	(0.430)	0.040	0.040
28	2.33	0.13	0.080	(0.428)	0.040	0.040
29	2.42	0.13	0.080	(0.426)	0.040	0.040
30	2.50	0.13	0.080	(0.424)	0.040	0.040
31	2.58	0.17	0.100	(0.423)	0.050	0.050
32	2.67	0.17	0.100	(0.421)	0.050	0.050
33	2.75	0.17	0.100	(0.419)	0.050	0.050
34	2.83	0.17	0.100	(0.417)	0.050	0.050
35	2.92	0.17	0.100	(0.416)	0.050	0.050
36	3.00	0.17	0.100	(0.414)	0.050	0.050
37	3.08	0.17	0.100	(0.412)	0.050	0.050
38	3.17	0.17	0.100	(0.411)	0.050	0.050
39	3.25	0.17	0.100	(0.409)	0.050	0.050
40	3.33	0.17	0.100	(0.407)	0.050	0.050
41	3.42	0.17	0.100	(0.405)	0.050	0.050
42	3.50	0.17	0.100	(0.404)	0.050	0.050

43	3.58	0.17	0.100	(0.402)	0.050	0.050
44	3.67	0.17	0.100	(0.400)	0.050	0.050
45	3.75	0.17	0.100	(0.399)	0.050	0.050
46	3.83	0.20	0.120	(0.397)	0.060	0.060
47	3.92	0.20	0.120	(0.395)	0.060	0.060
48	4.00	0.20	0.120	(0.394)	0.060	0.060
49	4.08	0.20	0.120	(0.392)	0.060	0.060
50	4.17	0.20	0.120	(0.390)	0.060	0.060
51	4.25	0.20	0.120	(0.389)	0.060	0.060
52	4.33	0.23	0.140	(0.387)	0.070	0.070
53	4.42	0.23	0.140	(0.385)	0.070	0.070
54	4.50	0.23	0.140	(0.384)	0.070	0.070
55	4.58	0.23	0.140	(0.382)	0.070	0.070
56	4.67	0.23	0.140	(0.380)	0.070	0.070
57	4.75	0.23	0.140	(0.379)	0.070	0.070
58	4.83	0.27	0.160	(0.377)	0.080	0.080
59	4.92	0.27	0.160	(0.375)	0.080	0.080
60	5.00	0.27	0.160	(0.374)	0.080	0.080
61	5.08	0.20	0.120	(0.372)	0.060	0.060
62	5.17	0.20	0.120	(0.371)	0.060	0.060
63	5.25	0.20	0.120	(0.369)	0.060	0.060
64	5.33	0.23	0.140	(0.367)	0.070	0.070
65	5.42	0.23	0.140	(0.366)	0.070	0.070
66	5.50	0.23	0.140	(0.364)	0.070	0.070
67	5.58	0.27	0.160	(0.363)	0.080	0.080
68	5.67	0.27	0.160	(0.361)	0.080	0.080
69	5.75	0.27	0.160	(0.359)	0.080	0.080
70	5.83	0.27	0.160	(0.358)	0.080	0.080
71	5.92	0.27	0.160	(0.356)	0.080	0.080
72	6.00	0.27	0.160	(0.355)	0.080	0.080
73	6.08	0.30	0.180	(0.353)	0.090	0.090
74	6.17	0.30	0.180	(0.351)	0.090	0.090
75	6.25	0.30	0.180	(0.350)	0.090	0.090
76	6.33	0.30	0.180	(0.348)	0.090	0.090
77	6.42	0.30	0.180	(0.347)	0.090	0.090
78	6.50	0.30	0.180	(0.345)	0.090	0.090
79	6.58	0.33	0.200	(0.344)	0.100	0.100
80	6.67	0.33	0.200	(0.342)	0.100	0.100
81	6.75	0.33	0.200	(0.341)	0.100	0.100
82	6.83	0.33	0.200	(0.339)	0.100	0.100
83	6.92	0.33	0.200	(0.338)	0.100	0.100
84	7.00	0.33	0.200	(0.336)	0.100	0.100
85	7.08	0.33	0.200	(0.334)	0.100	0.100
86	7.17	0.33	0.200	(0.333)	0.100	0.100
87	7.25	0.33	0.200	(0.331)	0.100	0.100
88	7.33	0.37	0.220	(0.330)	0.110	0.110
89	7.42	0.37	0.220	(0.328)	0.110	0.110
90	7.50	0.37	0.220	(0.327)	0.110	0.110
91	7.58	0.40	0.240	(0.325)	0.120	0.120
92	7.67	0.40	0.240	(0.324)	0.120	0.120

93	7.75	0.40	0.240	(0.322)	0.120	0.120
94	7.83	0.43	0.260	(0.321)	0.130	0.130
95	7.92	0.43	0.260	(0.319)	0.130	0.130
96	8.00	0.43	0.260	(0.318)	0.130	0.130
97	8.08	0.50	0.300	(0.316)	0.150	0.150
98	8.17	0.50	0.300	(0.315)	0.150	0.150
99	8.25	0.50	0.300	(0.314)	0.150	0.150
100	8.33	0.50	0.300	(0.312)	0.150	0.150
101	8.42	0.50	0.300	(0.311)	0.150	0.150
102	8.50	0.50	0.300	(0.309)	0.150	0.150
103	8.58	0.53	0.320	(0.308)	0.160	0.160
104	8.67	0.53	0.320	(0.306)	0.160	0.160
105	8.75	0.53	0.320	(0.305)	0.160	0.160
106	8.83	0.57	0.340	(0.303)	0.170	0.170
107	8.92	0.57	0.340	(0.302)	0.170	0.170
108	9.00	0.57	0.340	(0.301)	0.170	0.170
109	9.08	0.63	0.380	(0.299)	0.190	0.190
110	9.17	0.63	0.380	(0.298)	0.190	0.190
111	9.25	0.63	0.380	(0.296)	0.190	0.190
112	9.33	0.67	0.400	(0.295)	0.200	0.200
113	9.42	0.67	0.400	(0.293)	0.200	0.200
114	9.50	0.67	0.400	(0.292)	0.200	0.200
115	9.58	0.70	0.420	(0.291)	0.210	0.210
116	9.67	0.70	0.420	(0.289)	0.210	0.210
117	9.75	0.70	0.420	(0.288)	0.210	0.210
118	9.83	0.73	0.440	(0.286)	0.220	0.220
119	9.92	0.73	0.440	(0.285)	0.220	0.220
120	10.00	0.73	0.440	(0.284)	0.220	0.220
121	10.08	0.50	0.300	(0.282)	0.150	0.150
122	10.17	0.50	0.300	(0.281)	0.150	0.150
123	10.25	0.50	0.300	(0.280)	0.150	0.150
124	10.33	0.50	0.300	(0.278)	0.150	0.150
125	10.42	0.50	0.300	(0.277)	0.150	0.150
126	10.50	0.50	0.300	(0.276)	0.150	0.150
127	10.58	0.67	0.400	(0.274)	0.200	0.200
128	10.67	0.67	0.400	(0.273)	0.200	0.200
129	10.75	0.67	0.400	(0.272)	0.200	0.200
130	10.83	0.67	0.400	(0.270)	0.200	0.200
131	10.92	0.67	0.400	(0.269)	0.200	0.200
132	11.00	0.67	0.400	(0.268)	0.200	0.200
133	11.08	0.63	0.380	(0.266)	0.190	0.190
134	11.17	0.63	0.380	(0.265)	0.190	0.190
135	11.25	0.63	0.380	(0.264)	0.190	0.190
136	11.33	0.63	0.380	(0.262)	0.190	0.190
137	11.42	0.63	0.380	(0.261)	0.190	0.190
138	11.50	0.63	0.380	(0.260)	0.190	0.190
139	11.58	0.57	0.340	(0.258)	0.170	0.170
140	11.67	0.57	0.340	(0.257)	0.170	0.170
141	11.75	0.57	0.340	(0.256)	0.170	0.170
142	11.83	0.60	0.360	(0.255)	0.180	0.180

143	11.92	0.60	0.360	(0.253)	0.180	0.180
144	12.00	0.60	0.360	(0.252)	0.180	0.180
145	12.08	0.83	0.500	(0.251)	0.250	0.250
146	12.17	0.83	0.500	0.250	(0.250)	0.250
147	12.25	0.83	0.500	0.248	(0.250)	0.252
148	12.33	0.87	0.520	0.247	(0.260)	0.273
149	12.42	0.87	0.520	0.246	(0.260)	0.274
150	12.50	0.87	0.520	0.245	(0.260)	0.275
151	12.58	0.93	0.560	0.243	(0.280)	0.317
152	12.67	0.93	0.560	0.242	(0.280)	0.318
153	12.75	0.93	0.560	0.241	(0.280)	0.319
154	12.83	0.97	0.580	0.240	(0.290)	0.340
155	12.92	0.97	0.580	0.238	(0.290)	0.342
156	13.00	0.97	0.580	0.237	(0.290)	0.343
157	13.08	1.13	0.680	0.236	(0.340)	0.444
158	13.17	1.13	0.680	0.235	(0.340)	0.445
159	13.25	1.13	0.680	0.234	(0.340)	0.446
160	13.33	1.13	0.680	0.232	(0.340)	0.448
161	13.42	1.13	0.680	0.231	(0.340)	0.449
162	13.50	1.13	0.680	0.230	(0.340)	0.450
163	13.58	0.77	0.460	0.229	(0.230)	0.231
164	13.67	0.77	0.460	0.228	(0.230)	0.232
165	13.75	0.77	0.460	0.227	(0.230)	0.233
166	13.83	0.77	0.460	0.225	(0.230)	0.235
167	13.92	0.77	0.460	0.224	(0.230)	0.236
168	14.00	0.77	0.460	0.223	(0.230)	0.237
169	14.08	0.90	0.540	0.222	(0.270)	0.318
170	14.17	0.90	0.540	0.221	(0.270)	0.319
171	14.25	0.90	0.540	0.220	(0.270)	0.320
172	14.33	0.87	0.520	0.219	(0.260)	0.301
173	14.42	0.87	0.520	0.218	(0.260)	0.302
174	14.50	0.87	0.520	0.216	(0.260)	0.304
175	14.58	0.87	0.520	0.215	(0.260)	0.305
176	14.67	0.87	0.520	0.214	(0.260)	0.306
177	14.75	0.87	0.520	0.213	(0.260)	0.307
178	14.83	0.83	0.500	0.212	(0.250)	0.288
179	14.92	0.83	0.500	0.211	(0.250)	0.289
180	15.00	0.83	0.500	0.210	(0.250)	0.290
181	15.08	0.80	0.480	0.209	(0.240)	0.271
182	15.17	0.80	0.480	0.208	(0.240)	0.272
183	15.25	0.80	0.480	0.207	(0.240)	0.273
184	15.33	0.77	0.460	0.206	(0.230)	0.254
185	15.42	0.77	0.460	0.205	(0.230)	0.255
186	15.50	0.77	0.460	0.203	(0.230)	0.257
187	15.58	0.63	0.380	(0.202)	0.190	0.190
188	15.67	0.63	0.380	(0.201)	0.190	0.190
189	15.75	0.63	0.380	(0.200)	0.190	0.190
190	15.83	0.63	0.380	(0.199)	0.190	0.190
191	15.92	0.63	0.380	(0.198)	0.190	0.190
192	16.00	0.63	0.380	(0.197)	0.190	0.190

193	16.08	0.13	0.080	(0.196)	0.040	0.040
194	16.17	0.13	0.080	(0.195)	0.040	0.040
195	16.25	0.13	0.080	(0.194)	0.040	0.040
196	16.33	0.13	0.080	(0.193)	0.040	0.040
197	16.42	0.13	0.080	(0.192)	0.040	0.040
198	16.50	0.13	0.080	(0.191)	0.040	0.040
199	16.58	0.10	0.060	(0.190)	0.030	0.030
200	16.67	0.10	0.060	(0.189)	0.030	0.030
201	16.75	0.10	0.060	(0.188)	0.030	0.030
202	16.83	0.10	0.060	(0.187)	0.030	0.030
203	16.92	0.10	0.060	(0.187)	0.030	0.030
204	17.00	0.10	0.060	(0.186)	0.030	0.030
205	17.08	0.17	0.100	(0.185)	0.050	0.050
206	17.17	0.17	0.100	(0.184)	0.050	0.050
207	17.25	0.17	0.100	(0.183)	0.050	0.050
208	17.33	0.17	0.100	(0.182)	0.050	0.050
209	17.42	0.17	0.100	(0.181)	0.050	0.050
210	17.50	0.17	0.100	(0.180)	0.050	0.050
211	17.58	0.17	0.100	(0.179)	0.050	0.050
212	17.67	0.17	0.100	(0.178)	0.050	0.050
213	17.75	0.17	0.100	(0.177)	0.050	0.050
214	17.83	0.13	0.080	(0.176)	0.040	0.040
215	17.92	0.13	0.080	(0.176)	0.040	0.040
216	18.00	0.13	0.080	(0.175)	0.040	0.040
217	18.08	0.13	0.080	(0.174)	0.040	0.040
218	18.17	0.13	0.080	(0.173)	0.040	0.040
219	18.25	0.13	0.080	(0.172)	0.040	0.040
220	18.33	0.13	0.080	(0.171)	0.040	0.040
221	18.42	0.13	0.080	(0.171)	0.040	0.040
222	18.50	0.13	0.080	(0.170)	0.040	0.040
223	18.58	0.10	0.060	(0.169)	0.030	0.030
224	18.67	0.10	0.060	(0.168)	0.030	0.030
225	18.75	0.10	0.060	(0.167)	0.030	0.030
226	18.83	0.07	0.040	(0.166)	0.020	0.020
227	18.92	0.07	0.040	(0.166)	0.020	0.020
228	19.00	0.07	0.040	(0.165)	0.020	0.020
229	19.08	0.10	0.060	(0.164)	0.030	0.030
230	19.17	0.10	0.060	(0.163)	0.030	0.030
231	19.25	0.10	0.060	(0.163)	0.030	0.030
232	19.33	0.13	0.080	(0.162)	0.040	0.040
233	19.42	0.13	0.080	(0.161)	0.040	0.040
234	19.50	0.13	0.080	(0.160)	0.040	0.040
235	19.58	0.10	0.060	(0.160)	0.030	0.030
236	19.67	0.10	0.060	(0.159)	0.030	0.030
237	19.75	0.10	0.060	(0.158)	0.030	0.030
238	19.83	0.07	0.040	(0.157)	0.020	0.020
239	19.92	0.07	0.040	(0.157)	0.020	0.020
240	20.00	0.07	0.040	(0.156)	0.020	0.020
241	20.08	0.10	0.060	(0.155)	0.030	0.030
242	20.17	0.10	0.060	(0.155)	0.030	0.030

243	20.25	0.10	0.060	(0.154)	0.030	0.030
244	20.33	0.10	0.060	(0.153)	0.030	0.030
245	20.42	0.10	0.060	(0.153)	0.030	0.030
246	20.50	0.10	0.060	(0.152)	0.030	0.030
247	20.58	0.10	0.060	(0.151)	0.030	0.030
248	20.67	0.10	0.060	(0.151)	0.030	0.030
249	20.75	0.10	0.060	(0.150)	0.030	0.030
250	20.83	0.07	0.040	(0.149)	0.020	0.020
251	20.92	0.07	0.040	(0.149)	0.020	0.020
252	21.00	0.07	0.040	(0.148)	0.020	0.020
253	21.08	0.10	0.060	(0.148)	0.030	0.030
254	21.17	0.10	0.060	(0.147)	0.030	0.030
255	21.25	0.10	0.060	(0.147)	0.030	0.030
256	21.33	0.07	0.040	(0.146)	0.020	0.020
257	21.42	0.07	0.040	(0.145)	0.020	0.020
258	21.50	0.07	0.040	(0.145)	0.020	0.020
259	21.58	0.10	0.060	(0.144)	0.030	0.030
260	21.67	0.10	0.060	(0.144)	0.030	0.030
261	21.75	0.10	0.060	(0.143)	0.030	0.030
262	21.83	0.07	0.040	(0.143)	0.020	0.020
263	21.92	0.07	0.040	(0.142)	0.020	0.020
264	22.00	0.07	0.040	(0.142)	0.020	0.020
265	22.08	0.10	0.060	(0.141)	0.030	0.030
266	22.17	0.10	0.060	(0.141)	0.030	0.030
267	22.25	0.10	0.060	(0.140)	0.030	0.030
268	22.33	0.07	0.040	(0.140)	0.020	0.020
269	22.42	0.07	0.040	(0.140)	0.020	0.020
270	22.50	0.07	0.040	(0.139)	0.020	0.020
271	22.58	0.07	0.040	(0.139)	0.020	0.020
272	22.67	0.07	0.040	(0.138)	0.020	0.020
273	22.75	0.07	0.040	(0.138)	0.020	0.020
274	22.83	0.07	0.040	(0.138)	0.020	0.020
275	22.92	0.07	0.040	(0.137)	0.020	0.020
276	23.00	0.07	0.040	(0.137)	0.020	0.020
277	23.08	0.07	0.040	(0.137)	0.020	0.020
278	23.17	0.07	0.040	(0.136)	0.020	0.020
279	23.25	0.07	0.040	(0.136)	0.020	0.020
280	23.33	0.07	0.040	(0.136)	0.020	0.020
281	23.42	0.07	0.040	(0.136)	0.020	0.020
282	23.50	0.07	0.040	(0.135)	0.020	0.020
283	23.58	0.07	0.040	(0.135)	0.020	0.020
284	23.67	0.07	0.040	(0.135)	0.020	0.020
285	23.75	0.07	0.040	(0.135)	0.020	0.020
286	23.83	0.07	0.040	(0.135)	0.020	0.020
287	23.92	0.07	0.040	(0.134)	0.020	0.020
288	24.00	0.07	0.040	(0.134)	0.020	0.020

(Loss Rate Not Used)

Sum = 100.0 Sum = 31.7

Flood volume = Effective rainfall 2.64(In)

times area 11.1(Ac.)/[(In)/(Ft.)] = 2.4(Ac.Ft)

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      Total soil loss =      2.36(In)
      Total soil loss =     2.179(Ac.Ft)
      Total rainfall =      5.00(In)
      Flood volume =      106183.9 Cubic Feet
      Total soil loss =       94913.8 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =      5.015(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        2.5       5.0       7.5      10.0
-------------------------------------------------------------------------
  0+ 5       0.0006      0.08  Q         |         |         |         |
  0+10       0.0019      0.19  Q         |         |         |         |
  0+15       0.0033      0.21  Q         |         |         |         |
  0+20       0.0051      0.26  VQ        |         |         |         |
  0+25       0.0073      0.32  VQ        |         |         |         |
  0+30       0.0095      0.33  VQ        |         |         |         |
  0+35       0.0118      0.33  VQ        |         |         |         |
  0+40       0.0141      0.34  VQ        |         |         |         |
  0+45       0.0164      0.34  VQ        |         |         |         |
  0+50       0.0190      0.38  VQ        |         |         |         |
  0+55       0.0220      0.43  VQ        |         |         |         |
  1+ 0       0.0250      0.44  VQ        |         |         |         |
  1+ 5       0.0278      0.40  VQ        |         |         |         |
  1+10       0.0302      0.35  VQ        |         |         |         |
  1+15       0.0326      0.34  VQ        |         |         |         |
  1+20       0.0349      0.34  VQ        |         |         |         |
  1+25       0.0372      0.34  VQ        |         |         |         |
  1+30       0.0395      0.34  VQ        |         |         |         |
  1+35       0.0418      0.34  VQ        |         |         |         |
  1+40       0.0441      0.34  VQ        |         |         |         |
  1+45       0.0464      0.34  VQ        |         |         |         |
  1+50       0.0490      0.38  VQ        |         |         |         |
  1+55       0.0520      0.43  VQ        |         |         |         |
  2+ 0       0.0550      0.44  VQ        |         |         |         |
  2+ 5       0.0581      0.44  VQ        |         |         |         |
  2+10       0.0611      0.45  |Q        |         |         |         |
  2+15       0.0642      0.45  |Q        |         |         |         |
  2+20       0.0673      0.45  |Q        |         |         |         |
  2+25       0.0704      0.45  |Q        |         |         |         |
  2+30       0.0735      0.45  |Q        |         |         |         |
  2+35       0.0768      0.49  |Q        |         |         |         |
  2+40       0.0805      0.54  |VQ       |         |         |         |
  2+45       0.0843      0.55  |VQ       |         |         |         |
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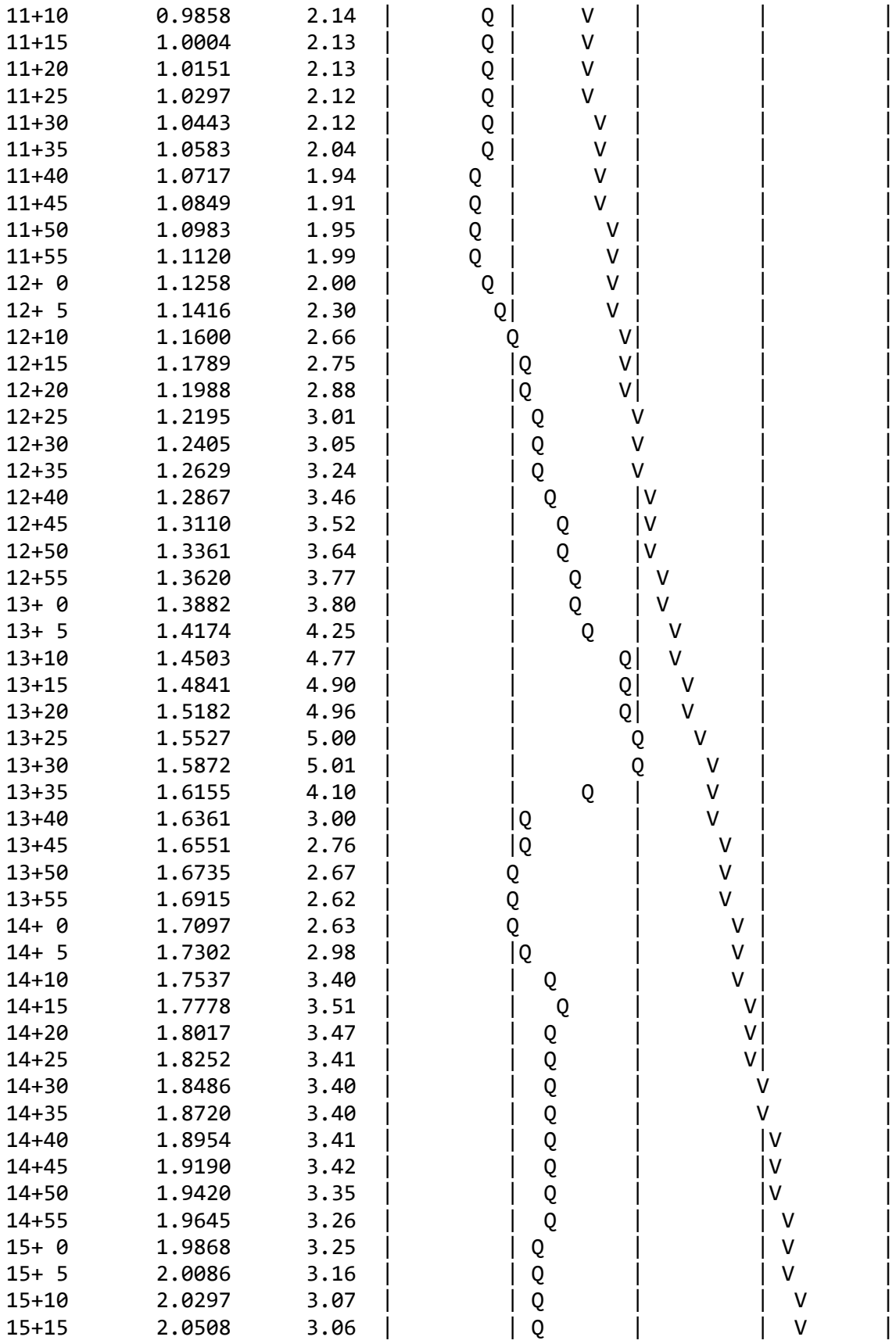
2+50	0.0882	0.56	VQ				
2+55	0.0920	0.56	VQ				
3+ 0	0.0959	0.56	VQ				
3+ 5	0.0997	0.56	VQ				
3+10	0.1036	0.56	VQ				
3+15	0.1074	0.56	VQ				
3+20	0.1113	0.56	VQ				
3+25	0.1151	0.56	VQ				
3+30	0.1189	0.56	VQ				
3+35	0.1228	0.56	Q				
3+40	0.1266	0.56	Q				
3+45	0.1305	0.56	Q				
3+50	0.1346	0.60	Q				
3+55	0.1391	0.65	Q				
4+ 0	0.1437	0.66	Q				
4+ 5	0.1483	0.67	Q				
4+10	0.1529	0.67	Q				
4+15	0.1575	0.67	Q				
4+20	0.1624	0.71	Q				
4+25	0.1677	0.76	VQ				
4+30	0.1730	0.77	VQ				
4+35	0.1784	0.78	VQ				
4+40	0.1838	0.78	Q				
4+45	0.1891	0.78	Q				
4+50	0.1948	0.82	Q				
4+55	0.2008	0.87	Q				
5+ 0	0.2070	0.89	Q				
5+ 5	0.2125	0.81	Q				
5+10	0.2174	0.71	QV				
5+15	0.2221	0.69	QV				
5+20	0.2270	0.72	QV				
5+25	0.2323	0.76	Q				
5+30	0.2376	0.77	Q				
5+35	0.2433	0.82	Q				
5+40	0.2493	0.87	QV				
5+45	0.2554	0.89	QV				
5+50	0.2616	0.89	QV				
5+55	0.2677	0.89	QV				
6+ 0	0.2739	0.89	QV				
6+ 5	0.2803	0.94	QV				
6+10	0.2871	0.99	QV				
6+15	0.2940	1.00	QV				
6+20	0.3009	1.00	Q				
6+25	0.3078	1.01	QV				
6+30	0.3147	1.01	QV				
6+35	0.3220	1.05	QV				
6+40	0.3295	1.10	QV				
6+45	0.3372	1.11	QV				
6+50	0.3448	1.11	QV				
6+55	0.3525	1.12	QV				

7+ 0	0.3602	1.12	QV			
7+ 5	0.3679	1.12	Q V			
7+10	0.3756	1.12	Q V			
7+15	0.3833	1.12	Q V			
7+20	0.3913	1.16	Q V			
7+25	0.3996	1.21	Q V			
7+30	0.4080	1.22	Q V			
7+35	0.4168	1.27	QV			
7+40	0.4259	1.32	QV			
7+45	0.4351	1.33	Q V			
7+50	0.4446	1.38	Q V			
7+55	0.4544	1.43	Q V			
8+ 0	0.4644	1.44	Q V			
8+ 5	0.4750	1.53	QV			
8+10	0.4862	1.64	QV			
8+15	0.4977	1.66	Q V			
8+20	0.5092	1.67	Q V			
8+25	0.5207	1.68	Q V			
8+30	0.5323	1.68	Q V			
8+35	0.5441	1.72	Q V			
8+40	0.5563	1.77	Q V			
8+45	0.5685	1.78	Q V			
8+50	0.5811	1.83	Q V			
8+55	0.5941	1.88	Q V			
9+ 0	0.6071	1.89	Q V			
9+ 5	0.6207	1.98	Q V			
9+10	0.6351	2.09	Q V			
9+15	0.6496	2.11	Q V			
9+20	0.6645	2.16	Q V			
9+25	0.6798	2.22	Q V			
9+30	0.6951	2.23	Q V			
9+35	0.7108	2.27	Q V			
9+40	0.7268	2.33	Q V			
9+45	0.7429	2.34	Q V			
9+50	0.7593	2.39	Q V			
9+55	0.7761	2.44	Q V			
10+ 0	0.7930	2.45	Q V			
10+ 5	0.8079	2.16	Q V			
10+10	0.8203	1.81	Q V			
10+15	0.8322	1.73	Q V			
10+20	0.8439	1.69	Q V			
10+25	0.8554	1.68	Q V			
10+30	0.8670	1.68	Q V			
10+35	0.8800	1.89	Q V			
10+40	0.8947	2.14	Q V			
10+45	0.9098	2.20	Q V			
10+50	0.9251	2.22	Q V			
10+55	0.9405	2.23	Q V			
11+ 0	0.9559	2.23	Q V			
11+ 5	0.9710	2.19	Q V			



15+20	2.0713	2.98	|	|Q	|	|	V |
15+25	2.0912	2.88	|	|Q	|	|	V |
15+30	2.1109	2.87	|	|Q	|	|	V |
15+35	2.1287	2.59	|	Q	|	|	V |
15+40	2.1442	2.25	|	Q |	|	|	V |
15+45	2.1592	2.17	|	Q |	|	|	V |
15+50	2.1739	2.14	|	Q |	|	|	V |
15+55	2.1885	2.12	|	Q |	|	|	V |
16+ 0	2.2032	2.12	|	Q |	|	|	V |
16+ 5	2.2134	1.49	| Q	|	|	|	V |
16+10	2.2184	0.73	| Q	|	|	|	V |
16+15	2.2223	0.56	| Q	|	|	|	V |
16+20	2.2256	0.49	|Q	|	|	|	V |
16+25	2.2287	0.45	|Q	|	|	|	V |
16+30	2.2318	0.45	|Q	|	|	|	V |
16+35	2.2346	0.40	|Q	|	|	|	V |
16+40	2.2370	0.35	|Q	|	|	|	V |
16+45	2.2394	0.34	|Q	|	|	|	V |
16+50	2.2417	0.34	|Q	|	|	|	V |
16+55	2.2440	0.34	|Q	|	|	|	V |
17+ 0	2.2463	0.34	|Q	|	|	|	V |
17+ 5	2.2492	0.42	|Q	|	|	|	V |
17+10	2.2528	0.52	| Q	|	|	|	V |
17+15	2.2566	0.54	| Q	|	|	|	V |
17+20	2.2604	0.55	| Q	|	|	|	V |
17+25	2.2642	0.56	| Q	|	|	|	V |
17+30	2.2681	0.56	| Q	|	|	|	V |
17+35	2.2719	0.56	| Q	|	|	|	V |
17+40	2.2758	0.56	| Q	|	|	|	V |
17+45	2.2796	0.56	| Q	|	|	|	V |
17+50	2.2832	0.52	| Q	|	|	|	V |
17+55	2.2864	0.47	|Q	|	|	|	V |
18+ 0	2.2895	0.45	|Q	|	|	|	V |
18+ 5	2.2926	0.45	|Q	|	|	|	V |
18+10	2.2957	0.45	|Q	|	|	|	V |
18+15	2.2987	0.45	|Q	|	|	|	V |
18+20	2.3018	0.45	|Q	|	|	|	V |
18+25	2.3049	0.45	|Q	|	|	|	V |
18+30	2.3080	0.45	|Q	|	|	|	V |
18+35	2.3108	0.40	|Q	|	|	|	V |
18+40	2.3132	0.35	|Q	|	|	|	V |
18+45	2.3156	0.34	|Q	|	|	|	V |
18+50	2.3176	0.30	|Q	|	|	|	V |
18+55	2.3193	0.24	Q	|	|	|	V |
19+ 0	2.3209	0.23	Q	|	|	|	V |
19+ 5	2.3227	0.27	|Q	|	|	|	V |
19+10	2.3249	0.32	|Q	|	|	|	V |
19+15	2.3271	0.33	|Q	|	|	|	V |
19+20	2.3297	0.37	|Q	|	|	|	V |
19+25	2.3327	0.43	|Q	|	|	|	V |

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19+30       2.3357      0.44  |Q        |         |         |        V |
19+35       2.3385      0.40  |Q        |         |         |        V |
19+40       2.3409      0.35  |Q        |         |         |        V |
19+45       2.3433      0.34  |Q        |         |         |        V |
19+50       2.3453      0.30  |Q        |         |         |        V |
19+55       2.3470      0.24  Q         |         |         |        V |
20+ 0       2.3486      0.23  Q         |         |         |        V |
20+ 5       2.3504      0.27  |Q        |         |         |        V |
20+10       2.3526      0.32  |Q        |         |         |        V |
20+15       2.3548      0.33  |Q        |         |         |        V |
20+20       2.3571      0.33  |Q        |         |         |        V |
20+25       2.3594      0.34  |Q        |         |         |        V |
20+30       2.3617      0.34  |Q        |         |         |        V |
20+35       2.3641      0.34  |Q        |         |         |        V |
20+40       2.3664      0.34  |Q        |         |         |        V |
20+45       2.3687      0.34  |Q        |         |         |        V |
20+50       2.3707      0.29  |Q        |         |         |        V |
20+55       2.3724      0.24  Q         |         |         |        V |
21+ 0       2.3739      0.23  Q         |         |         |        V |
21+ 5       2.3758      0.27  |Q        |         |         |        V |
21+10       2.3780      0.32  |Q        |         |         |         V|
21+15       2.3802      0.33  |Q        |         |         |         V|
21+20       2.3822      0.29  |Q        |         |         |         V|
21+25       2.3839      0.24  Q         |         |         |         V|
21+30       2.3855      0.23  Q         |         |         |         V|
21+35       2.3873      0.27  |Q        |         |         |         V|
21+40       2.3895      0.32  |Q        |         |         |         V|
21+45       2.3918      0.33  |Q        |         |         |         V|
21+50       2.3938      0.29  |Q        |         |         |         V|
21+55       2.3954      0.24  Q         |         |         |         V|
22+ 0       2.3970      0.23  Q         |         |         |         V|
22+ 5       2.3989      0.27  |Q        |         |         |         V|
22+10       2.4011      0.32  |Q        |         |         |         V|
22+15       2.4033      0.33  |Q        |         |         |         V|
22+20       2.4053      0.29  |Q        |         |         |         V|
22+25       2.4070      0.24  Q         |         |         |         V|
22+30       2.4086      0.23  Q         |         |         |         V|
22+35       2.4101      0.23  Q         |         |         |         V|
22+40       2.4117      0.22  Q         |         |         |         V|
22+45       2.4132      0.22  Q         |         |         |         V|
22+50       2.4147      0.22  Q         |         |         |         V|
22+55       2.4163      0.22  Q         |         |         |         V|
23+ 0       2.4178      0.22  Q         |         |         |         V|
23+ 5       2.4194      0.22  Q         |         |         |         V|
23+10       2.4209      0.22  Q         |         |         |         V|
23+15       2.4224      0.22  Q         |         |         |         V|
23+20       2.4240      0.22  Q         |         |         |         V|
23+25       2.4255      0.22  Q         |         |         |         V|
23+30       2.4271      0.22  Q         |         |         |         V|
23+35       2.4286      0.22  Q         |         |         |         V|
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   23+40       2.4301      0.22  Q         |          |          |         V|
   23+45       2.4317      0.22  Q         |          |          |         V|
   23+50       2.4332      0.22  Q         |          |          |         V|
   23+55       2.4348      0.22  Q         |          |          |         V|
   24+ 0       2.4363      0.22  Q         |          |          |         V|
   24+ 5       2.4372      0.14  Q         |          |          |         V|
   24+10       2.4375      0.04  Q         |          |          |         V|
   24+15       2.4376      0.01  Q         |          |          |         V|
   24+20       2.4376      0.01  Q         |          |          |          V
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U n i t H y d r o g r a p h A n a l y s i s

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Study date 09/26/23 File: qauh24100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED A
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 12.14(Ac.) = 0.019 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 12.14(Ac.) = 0.019 Sq. Mi.
Length along longest watercourse = 1286.00(Ft.)
Length along longest watercourse measured to centroid = 1036.00(Ft.)
Length along longest watercourse = 0.244 Mi.
Length along longest watercourse measured to centroid = 0.196 Mi.
Difference in elevation = 14.28(Ft.)
Slope along watercourse = 58.6302 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.052 Hr.
Lag time = 3.14 Min.
25% of lag time = 0.78 Min.
40% of lag time = 1.26 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

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

12.14	2.00	24.28

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
12.14	5.00	60.70

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 2.000(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
12.140	65.50	0.900

Total Area Entered = 12.14(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
65.5	65.5	0.411	0.900	0.078	1.000	0.078
					Sum (F) =	0.078

Area averaged mean soil loss (F) (In/Hr) = 0.078
Minimum soil loss rate ((In/Hr)) = 0.039
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	159.336	35.360	4.326
2	0.167	318.671	46.318	5.667
3	0.250	478.007	10.666	1.305
4	0.333	637.342	4.600	0.563
5	0.417	796.678	2.225	0.272
6	0.500	956.014	0.832	0.102
		Sum =	100.000 Sum=	12.235

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max		Low	Effective (In/Hr)
1	0.08	0.07	0.040	(0.138)		0.007	0.033
2	0.17	0.07	0.040	(0.138)		0.007	0.033

3	0.25	0.07	0.040	(0.137)	0.007	0.033
4	0.33	0.10	0.060	(0.137)	0.011	0.049
5	0.42	0.10	0.060	(0.136)	0.011	0.049
6	0.50	0.10	0.060	(0.136)	0.011	0.049
7	0.58	0.10	0.060	(0.135)	0.011	0.049
8	0.67	0.10	0.060	(0.135)	0.011	0.049
9	0.75	0.10	0.060	(0.134)	0.011	0.049
10	0.83	0.13	0.080	(0.134)	0.014	0.066
11	0.92	0.13	0.080	(0.133)	0.014	0.066
12	1.00	0.13	0.080	(0.132)	0.014	0.066
13	1.08	0.10	0.060	(0.132)	0.011	0.049
14	1.17	0.10	0.060	(0.131)	0.011	0.049
15	1.25	0.10	0.060	(0.131)	0.011	0.049
16	1.33	0.10	0.060	(0.130)	0.011	0.049
17	1.42	0.10	0.060	(0.130)	0.011	0.049
18	1.50	0.10	0.060	(0.129)	0.011	0.049
19	1.58	0.10	0.060	(0.129)	0.011	0.049
20	1.67	0.10	0.060	(0.128)	0.011	0.049
21	1.75	0.10	0.060	(0.128)	0.011	0.049
22	1.83	0.13	0.080	(0.127)	0.014	0.066
23	1.92	0.13	0.080	(0.127)	0.014	0.066
24	2.00	0.13	0.080	(0.126)	0.014	0.066
25	2.08	0.13	0.080	(0.126)	0.014	0.066
26	2.17	0.13	0.080	(0.125)	0.014	0.066
27	2.25	0.13	0.080	(0.125)	0.014	0.066
28	2.33	0.13	0.080	(0.124)	0.014	0.066
29	2.42	0.13	0.080	(0.124)	0.014	0.066
30	2.50	0.13	0.080	(0.123)	0.014	0.066
31	2.58	0.17	0.100	(0.123)	0.018	0.082
32	2.67	0.17	0.100	(0.122)	0.018	0.082
33	2.75	0.17	0.100	(0.122)	0.018	0.082
34	2.83	0.17	0.100	(0.121)	0.018	0.082
35	2.92	0.17	0.100	(0.121)	0.018	0.082
36	3.00	0.17	0.100	(0.120)	0.018	0.082
37	3.08	0.17	0.100	(0.120)	0.018	0.082
38	3.17	0.17	0.100	(0.119)	0.018	0.082
39	3.25	0.17	0.100	(0.119)	0.018	0.082
40	3.33	0.17	0.100	(0.118)	0.018	0.082
41	3.42	0.17	0.100	(0.118)	0.018	0.082
42	3.50	0.17	0.100	(0.117)	0.018	0.082
43	3.58	0.17	0.100	(0.117)	0.018	0.082
44	3.67	0.17	0.100	(0.116)	0.018	0.082
45	3.75	0.17	0.100	(0.116)	0.018	0.082
46	3.83	0.20	0.120	(0.115)	0.022	0.098
47	3.92	0.20	0.120	(0.115)	0.022	0.098
48	4.00	0.20	0.120	(0.114)	0.022	0.098
49	4.08	0.20	0.120	(0.114)	0.022	0.098
50	4.17	0.20	0.120	(0.113)	0.022	0.098
51	4.25	0.20	0.120	(0.113)	0.022	0.098
52	4.33	0.23	0.140	(0.112)	0.025	0.115
53	4.42	0.23	0.140	(0.112)	0.025	0.115
54	4.50	0.23	0.140	(0.111)	0.025	0.115
55	4.58	0.23	0.140	(0.111)	0.025	0.115
56	4.67	0.23	0.140	(0.110)	0.025	0.115
57	4.75	0.23	0.140	(0.110)	0.025	0.115
58	4.83	0.27	0.160	(0.110)	0.029	0.131
59	4.92	0.27	0.160	(0.109)	0.029	0.131

60	5.00	0.27	0.160	(0.109)	0.029	0.131
61	5.08	0.20	0.120	(0.108)	0.022	0.098
62	5.17	0.20	0.120	(0.108)	0.022	0.098
63	5.25	0.20	0.120	(0.107)	0.022	0.098
64	5.33	0.23	0.140	(0.107)	0.025	0.115
65	5.42	0.23	0.140	(0.106)	0.025	0.115
66	5.50	0.23	0.140	(0.106)	0.025	0.115
67	5.58	0.27	0.160	(0.105)	0.029	0.131
68	5.67	0.27	0.160	(0.105)	0.029	0.131
69	5.75	0.27	0.160	(0.104)	0.029	0.131
70	5.83	0.27	0.160	(0.104)	0.029	0.131
71	5.92	0.27	0.160	(0.103)	0.029	0.131
72	6.00	0.27	0.160	(0.103)	0.029	0.131
73	6.08	0.30	0.180	(0.103)	0.032	0.148
74	6.17	0.30	0.180	(0.102)	0.032	0.148
75	6.25	0.30	0.180	(0.102)	0.032	0.148
76	6.33	0.30	0.180	(0.101)	0.032	0.148
77	6.42	0.30	0.180	(0.101)	0.032	0.148
78	6.50	0.30	0.180	(0.100)	0.032	0.148
79	6.58	0.33	0.200	(0.100)	0.036	0.164
80	6.67	0.33	0.200	(0.099)	0.036	0.164
81	6.75	0.33	0.200	(0.099)	0.036	0.164
82	6.83	0.33	0.200	(0.098)	0.036	0.164
83	6.92	0.33	0.200	(0.098)	0.036	0.164
84	7.00	0.33	0.200	(0.098)	0.036	0.164
85	7.08	0.33	0.200	(0.097)	0.036	0.164
86	7.17	0.33	0.200	(0.097)	0.036	0.164
87	7.25	0.33	0.200	(0.096)	0.036	0.164
88	7.33	0.37	0.220	(0.096)	0.040	0.180
89	7.42	0.37	0.220	(0.095)	0.040	0.180
90	7.50	0.37	0.220	(0.095)	0.040	0.180
91	7.58	0.40	0.240	(0.094)	0.043	0.197
92	7.67	0.40	0.240	(0.094)	0.043	0.197
93	7.75	0.40	0.240	(0.094)	0.043	0.197
94	7.83	0.43	0.260	(0.093)	0.047	0.213
95	7.92	0.43	0.260	(0.093)	0.047	0.213
96	8.00	0.43	0.260	(0.092)	0.047	0.213
97	8.08	0.50	0.300	(0.092)	0.054	0.246
98	8.17	0.50	0.300	(0.091)	0.054	0.246
99	8.25	0.50	0.300	(0.091)	0.054	0.246
100	8.33	0.50	0.300	(0.091)	0.054	0.246
101	8.42	0.50	0.300	(0.090)	0.054	0.246
102	8.50	0.50	0.300	(0.090)	0.054	0.246
103	8.58	0.53	0.320	(0.089)	0.058	0.262
104	8.67	0.53	0.320	(0.089)	0.058	0.262
105	8.75	0.53	0.320	(0.089)	0.058	0.262
106	8.83	0.57	0.340	(0.088)	0.061	0.279
107	8.92	0.57	0.340	(0.088)	0.061	0.279
108	9.00	0.57	0.340	(0.087)	0.061	0.279
109	9.08	0.63	0.380	(0.087)	0.068	0.312
110	9.17	0.63	0.380	(0.086)	0.068	0.312
111	9.25	0.63	0.380	(0.086)	0.068	0.312
112	9.33	0.67	0.400	(0.086)	0.072	0.328
113	9.42	0.67	0.400	(0.085)	0.072	0.328
114	9.50	0.67	0.400	(0.085)	0.072	0.328
115	9.58	0.70	0.420	(0.084)	0.076	0.344
116	9.67	0.70	0.420	(0.084)	0.076	0.344

117	9.75	0.70	0.420	(0.084)	0.076	0.344
118	9.83	0.73	0.440	(0.083)	0.079	0.361
119	9.92	0.73	0.440	(0.083)	0.079	0.361
120	10.00	0.73	0.440	(0.082)	0.079	0.361
121	10.08	0.50	0.300	(0.082)	0.054	0.246
122	10.17	0.50	0.300	(0.082)	0.054	0.246
123	10.25	0.50	0.300	(0.081)	0.054	0.246
124	10.33	0.50	0.300	(0.081)	0.054	0.246
125	10.42	0.50	0.300	(0.080)	0.054	0.246
126	10.50	0.50	0.300	(0.080)	0.054	0.246
127	10.58	0.67	0.400	(0.080)	0.072	0.328
128	10.67	0.67	0.400	(0.079)	0.072	0.328
129	10.75	0.67	0.400	(0.079)	0.072	0.328
130	10.83	0.67	0.400	(0.078)	0.072	0.328
131	10.92	0.67	0.400	(0.078)	0.072	0.328
132	11.00	0.67	0.400	(0.078)	0.072	0.328
133	11.08	0.63	0.380	(0.077)	0.068	0.312
134	11.17	0.63	0.380	(0.077)	0.068	0.312
135	11.25	0.63	0.380	(0.077)	0.068	0.312
136	11.33	0.63	0.380	(0.076)	0.068	0.312
137	11.42	0.63	0.380	(0.076)	0.068	0.312
138	11.50	0.63	0.380	(0.075)	0.068	0.312
139	11.58	0.57	0.340	(0.075)	0.061	0.279
140	11.67	0.57	0.340	(0.075)	0.061	0.279
141	11.75	0.57	0.340	(0.074)	0.061	0.279
142	11.83	0.60	0.360	(0.074)	0.065	0.295
143	11.92	0.60	0.360	(0.074)	0.065	0.295
144	12.00	0.60	0.360	(0.073)	0.065	0.295
145	12.08	0.83	0.500	0.073	(0.090)	0.427
146	12.17	0.83	0.500	0.072	(0.090)	0.428
147	12.25	0.83	0.500	0.072	(0.090)	0.428
148	12.33	0.87	0.520	0.072	(0.094)	0.448
149	12.42	0.87	0.520	0.071	(0.094)	0.449
150	12.50	0.87	0.520	0.071	(0.094)	0.449
151	12.58	0.93	0.560	0.071	(0.101)	0.489
152	12.67	0.93	0.560	0.070	(0.101)	0.490
153	12.75	0.93	0.560	0.070	(0.101)	0.490
154	12.83	0.97	0.580	0.070	(0.104)	0.510
155	12.92	0.97	0.580	0.069	(0.104)	0.511
156	13.00	0.97	0.580	0.069	(0.104)	0.511
157	13.08	1.13	0.680	0.069	(0.122)	0.611
158	13.17	1.13	0.680	0.068	(0.122)	0.612
159	13.25	1.13	0.680	0.068	(0.122)	0.612
160	13.33	1.13	0.680	0.068	(0.122)	0.612
161	13.42	1.13	0.680	0.067	(0.122)	0.613
162	13.50	1.13	0.680	0.067	(0.122)	0.613
163	13.58	0.77	0.460	0.066	(0.083)	0.394
164	13.67	0.77	0.460	0.066	(0.083)	0.394
165	13.75	0.77	0.460	0.066	(0.083)	0.394
166	13.83	0.77	0.460	0.065	(0.083)	0.395
167	13.92	0.77	0.460	0.065	(0.083)	0.395
168	14.00	0.77	0.460	0.065	(0.083)	0.395
169	14.08	0.90	0.540	0.064	(0.097)	0.476
170	14.17	0.90	0.540	0.064	(0.097)	0.476
171	14.25	0.90	0.540	0.064	(0.097)	0.476
172	14.33	0.87	0.520	0.063	(0.094)	0.457
173	14.42	0.87	0.520	0.063	(0.094)	0.457

174	14.50	0.87	0.520	0.063	(0.094)	0.457
175	14.58	0.87	0.520	0.063	(0.094)	0.457
176	14.67	0.87	0.520	0.062	(0.094)	0.458
177	14.75	0.87	0.520	0.062	(0.094)	0.458
178	14.83	0.83	0.500	0.062	(0.090)	0.438
179	14.92	0.83	0.500	0.061	(0.090)	0.439
180	15.00	0.83	0.500	0.061	(0.090)	0.439
181	15.08	0.80	0.480	0.061	(0.086)	0.419
182	15.17	0.80	0.480	0.060	(0.086)	0.420
183	15.25	0.80	0.480	0.060	(0.086)	0.420
184	15.33	0.77	0.460	0.060	(0.083)	0.400
185	15.42	0.77	0.460	0.059	(0.083)	0.401
186	15.50	0.77	0.460	0.059	(0.083)	0.401
187	15.58	0.63	0.380	0.059	(0.068)	0.321
188	15.67	0.63	0.380	0.058	(0.068)	0.322
189	15.75	0.63	0.380	0.058	(0.068)	0.322
190	15.83	0.63	0.380	0.058	(0.068)	0.322
191	15.92	0.63	0.380	0.058	(0.068)	0.322
192	16.00	0.63	0.380	0.057	(0.068)	0.323
193	16.08	0.13	0.080	(0.057)	0.014	0.066
194	16.17	0.13	0.080	(0.057)	0.014	0.066
195	16.25	0.13	0.080	(0.056)	0.014	0.066
196	16.33	0.13	0.080	(0.056)	0.014	0.066
197	16.42	0.13	0.080	(0.056)	0.014	0.066
198	16.50	0.13	0.080	(0.056)	0.014	0.066
199	16.58	0.10	0.060	(0.055)	0.011	0.049
200	16.67	0.10	0.060	(0.055)	0.011	0.049
201	16.75	0.10	0.060	(0.055)	0.011	0.049
202	16.83	0.10	0.060	(0.054)	0.011	0.049
203	16.92	0.10	0.060	(0.054)	0.011	0.049
204	17.00	0.10	0.060	(0.054)	0.011	0.049
205	17.08	0.17	0.100	(0.054)	0.018	0.082
206	17.17	0.17	0.100	(0.053)	0.018	0.082
207	17.25	0.17	0.100	(0.053)	0.018	0.082
208	17.33	0.17	0.100	(0.053)	0.018	0.082
209	17.42	0.17	0.100	(0.053)	0.018	0.082
210	17.50	0.17	0.100	(0.052)	0.018	0.082
211	17.58	0.17	0.100	(0.052)	0.018	0.082
212	17.67	0.17	0.100	(0.052)	0.018	0.082
213	17.75	0.17	0.100	(0.052)	0.018	0.082
214	17.83	0.13	0.080	(0.051)	0.014	0.066
215	17.92	0.13	0.080	(0.051)	0.014	0.066
216	18.00	0.13	0.080	(0.051)	0.014	0.066
217	18.08	0.13	0.080	(0.050)	0.014	0.066
218	18.17	0.13	0.080	(0.050)	0.014	0.066
219	18.25	0.13	0.080	(0.050)	0.014	0.066
220	18.33	0.13	0.080	(0.050)	0.014	0.066
221	18.42	0.13	0.080	(0.050)	0.014	0.066
222	18.50	0.13	0.080	(0.049)	0.014	0.066
223	18.58	0.10	0.060	(0.049)	0.011	0.049
224	18.67	0.10	0.060	(0.049)	0.011	0.049
225	18.75	0.10	0.060	(0.049)	0.011	0.049
226	18.83	0.07	0.040	(0.048)	0.007	0.033
227	18.92	0.07	0.040	(0.048)	0.007	0.033
228	19.00	0.07	0.040	(0.048)	0.007	0.033
229	19.08	0.10	0.060	(0.048)	0.011	0.049
230	19.17	0.10	0.060	(0.047)	0.011	0.049

231	19.25	0.10	0.060	(0.047)	0.011	0.049
232	19.33	0.13	0.080	(0.047)	0.014	0.066
233	19.42	0.13	0.080	(0.047)	0.014	0.066
234	19.50	0.13	0.080	(0.047)	0.014	0.066
235	19.58	0.10	0.060	(0.046)	0.011	0.049
236	19.67	0.10	0.060	(0.046)	0.011	0.049
237	19.75	0.10	0.060	(0.046)	0.011	0.049
238	19.83	0.07	0.040	(0.046)	0.007	0.033
239	19.92	0.07	0.040	(0.046)	0.007	0.033
240	20.00	0.07	0.040	(0.045)	0.007	0.033
241	20.08	0.10	0.060	(0.045)	0.011	0.049
242	20.17	0.10	0.060	(0.045)	0.011	0.049
243	20.25	0.10	0.060	(0.045)	0.011	0.049
244	20.33	0.10	0.060	(0.045)	0.011	0.049
245	20.42	0.10	0.060	(0.044)	0.011	0.049
246	20.50	0.10	0.060	(0.044)	0.011	0.049
247	20.58	0.10	0.060	(0.044)	0.011	0.049
248	20.67	0.10	0.060	(0.044)	0.011	0.049
249	20.75	0.10	0.060	(0.044)	0.011	0.049
250	20.83	0.07	0.040	(0.043)	0.007	0.033
251	20.92	0.07	0.040	(0.043)	0.007	0.033
252	21.00	0.07	0.040	(0.043)	0.007	0.033
253	21.08	0.10	0.060	(0.043)	0.011	0.049
254	21.17	0.10	0.060	(0.043)	0.011	0.049
255	21.25	0.10	0.060	(0.043)	0.011	0.049
256	21.33	0.07	0.040	(0.042)	0.007	0.033
257	21.42	0.07	0.040	(0.042)	0.007	0.033
258	21.50	0.07	0.040	(0.042)	0.007	0.033
259	21.58	0.10	0.060	(0.042)	0.011	0.049
260	21.67	0.10	0.060	(0.042)	0.011	0.049
261	21.75	0.10	0.060	(0.042)	0.011	0.049
262	21.83	0.07	0.040	(0.041)	0.007	0.033
263	21.92	0.07	0.040	(0.041)	0.007	0.033
264	22.00	0.07	0.040	(0.041)	0.007	0.033
265	22.08	0.10	0.060	(0.041)	0.011	0.049
266	22.17	0.10	0.060	(0.041)	0.011	0.049
267	22.25	0.10	0.060	(0.041)	0.011	0.049
268	22.33	0.07	0.040	(0.041)	0.007	0.033
269	22.42	0.07	0.040	(0.041)	0.007	0.033
270	22.50	0.07	0.040	(0.040)	0.007	0.033
271	22.58	0.07	0.040	(0.040)	0.007	0.033
272	22.67	0.07	0.040	(0.040)	0.007	0.033
273	22.75	0.07	0.040	(0.040)	0.007	0.033
274	22.83	0.07	0.040	(0.040)	0.007	0.033
275	22.92	0.07	0.040	(0.040)	0.007	0.033
276	23.00	0.07	0.040	(0.040)	0.007	0.033
277	23.08	0.07	0.040	(0.040)	0.007	0.033
278	23.17	0.07	0.040	(0.040)	0.007	0.033
279	23.25	0.07	0.040	(0.040)	0.007	0.033
280	23.33	0.07	0.040	(0.039)	0.007	0.033
281	23.42	0.07	0.040	(0.039)	0.007	0.033
282	23.50	0.07	0.040	(0.039)	0.007	0.033
283	23.58	0.07	0.040	(0.039)	0.007	0.033
284	23.67	0.07	0.040	(0.039)	0.007	0.033
285	23.75	0.07	0.040	(0.039)	0.007	0.033
286	23.83	0.07	0.040	(0.039)	0.007	0.033
287	23.92	0.07	0.040	(0.039)	0.007	0.033

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288  24.00     0.07      0.040       (  0.039)       0.007        0.033
           (Loss Rate Not Used)
    Sum =     100.0                                    Sum =    50.5
     Flood volume = Effective rainfall      4.21(In)
      times area      12.1(Ac.)/[(In)/(Ft.)] =       4.3(Ac.Ft)
     Total soil loss =      0.79(In)
     Total soil loss =     0.798(Ac.Ft)
     Total rainfall =      5.00(In)
     Flood volume =      185556.3 Cubic Feet
     Total soil loss =       34779.4 Cubic Feet
     ---------------------------------------------------------------------
      Peak flow rate of this hydrograph =      7.502(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        2.5       5.0       7.5      10.0
 ----------------------------------------------------------------------------
   0+ 5       0.0010      0.14  Q          |         |         |         |
   0+10       0.0032      0.33  VQ         |         |         |         |
   0+15       0.0058      0.37  VQ         |         |         |         |
   0+20       0.0090      0.46  VQ         |         |         |         |
   0+25       0.0128      0.56  V Q        |         |         |         |
   0+30       0.0169      0.59  V Q        |         |         |         |
   0+35       0.0210      0.60  V Q        |         |         |         |
   0+40       0.0251      0.60  V Q        |         |         |         |
   0+45       0.0293      0.60  V Q        |         |         |         |
   0+50       0.0339      0.67  V Q        |         |         |         |
   0+55       0.0392      0.77  V  Q       |         |         |         |
   1+ 0       0.0446      0.79  V  Q       |         |         |         |
   1+ 5       0.0496      0.73  V Q        |         |         |         |
   1+10       0.0540      0.64  V Q        |         |         |         |
   1+15       0.0582      0.62  V Q        |         |         |         |
   1+20       0.0624      0.61  V Q        |         |         |         |
   1+25       0.0666      0.60  V Q        |         |         |         |
   1+30       0.0707      0.60  V Q        |         |         |         |
   1+35       0.0749      0.60  V Q        |         |         |         |
   1+40       0.0790      0.60  V Q        |         |         |         |
   1+45       0.0832      0.60  V Q        |         |         |         |
   1+50       0.0878      0.67  V Q        |         |         |         |
   1+55       0.0931      0.77  V  Q       |         |         |         |
   2+ 0       0.0985      0.79  V  Q       |         |         |         |
   2+ 5       0.1040      0.80  V  Q       |         |         |         |
   2+10       0.1095      0.80  |V Q        |         |         |         |
   2+15       0.1151      0.80  |V Q        |         |         |         |
   2+20       0.1206      0.80  |V Q        |         |         |         |
   2+25       0.1261      0.80  |V Q        |         |         |         |
   2+30       0.1316      0.80  |V Q        |         |         |         |
   2+35       0.1377      0.87  |V Q        |         |         |         |
   2+40       0.1443      0.97  |V Q        |         |         |         |
   2+45       0.1511      0.99  |V Q        |         |         |         |
   2+50       0.1580      1.00  |V Q        |         |         |         |
   2+55       0.1649      1.00  |V  Q       |         |         |         |
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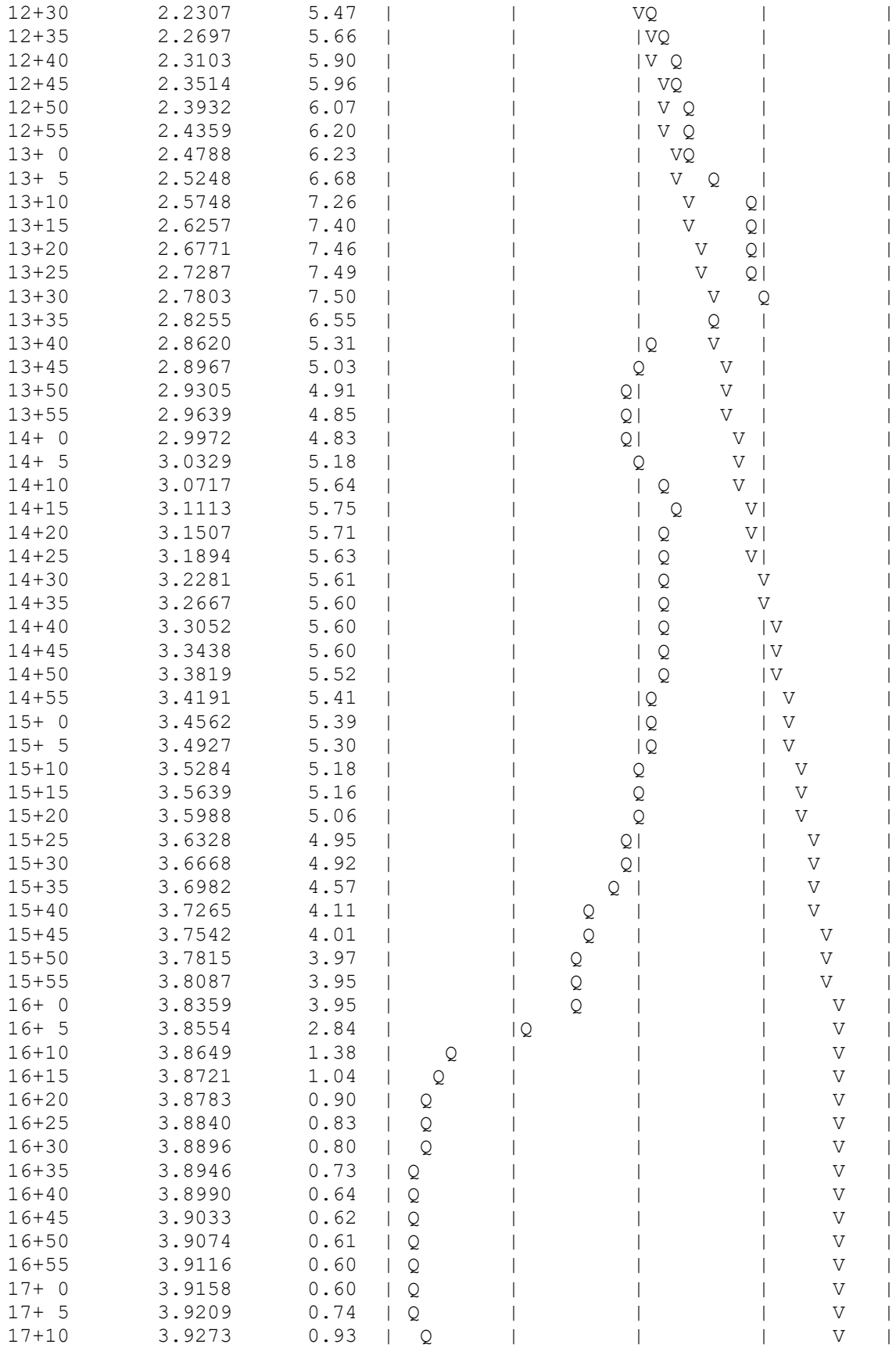
3+ 0	0.1718	1.00	V Q			
3+ 5	0.1787	1.00	V Q			
3+10	0.1856	1.00	V Q			
3+15	0.1926	1.00	V Q			
3+20	0.1995	1.00	V Q			
3+25	0.2064	1.00	V Q			
3+30	0.2133	1.00	V Q			
3+35	0.2202	1.00	V Q			
3+40	0.2271	1.00	V Q			
3+45	0.2340	1.00	V Q			
3+50	0.2414	1.07	V Q			
3+55	0.2495	1.17	V Q			
4+ 0	0.2577	1.19	V Q			
4+ 5	0.2659	1.20	V Q			
4+10	0.2742	1.20	V Q			
4+15	0.2825	1.20	V Q			
4+20	0.2913	1.28	V Q			
4+25	0.3007	1.37	V Q			
4+30	0.3103	1.39	V Q			
4+35	0.3199	1.40	V Q			
4+40	0.3296	1.40	V Q			
4+45	0.3393	1.41	V Q			
4+50	0.3494	1.48	V Q			
4+55	0.3602	1.57	V Q			
5+ 0	0.3712	1.59	V Q			
5+ 5	0.3812	1.46	V Q			
5+10	0.3900	1.28	V Q			
5+15	0.3985	1.24	VQ			
5+20	0.4074	1.29	V Q			
5+25	0.4168	1.37	V Q			
5+30	0.4264	1.39	VQ			
5+35	0.4365	1.47	VQ			
5+40	0.4473	1.57	V Q			
5+45	0.4583	1.59	V Q			
5+50	0.4693	1.60	V Q			
5+55	0.4804	1.60	V Q			
6+ 0	0.4914	1.61	V Q			
6+ 5	0.5030	1.68	V Q			
6+10	0.5152	1.77	V Q			
6+15	0.5275	1.79	V Q			
6+20	0.5399	1.80	V Q			
6+25	0.5523	1.81	V Q			
6+30	0.5648	1.81	V Q			
6+35	0.5777	1.88	V Q			
6+40	0.5913	1.97	V Q			
6+45	0.6050	1.99	V Q			
6+50	0.6188	2.00	V Q			
6+55	0.6326	2.01	V Q			
7+ 0	0.6464	2.01	V Q			
7+ 5	0.6602	2.01	V Q			
7+10	0.6741	2.01	V Q			
7+15	0.6879	2.01	V Q			
7+20	0.7022	2.08	V Q			
7+25	0.7172	2.17	V Q			
7+30	0.7323	2.19	V Q			
7+35	0.7479	2.27	V Q			
7+40	0.7643	2.37	V Q			

7+45	0.7807	2.39	V Q|			
7+50	0.7978	2.47	V Q|			
7+55	0.8155	2.57	V Q			
8+ 0	0.8334	2.59	V Q			
8+ 5	0.8523	2.75	V Q			
8+10	0.8725	2.94	V |Q			
8+15	0.8930	2.98	V |Q			
8+20	0.9137	3.00	V |Q			
8+25	0.9344	3.01	V | Q			
8+30	0.9551	3.01	V | Q			
8+35	0.9763	3.08	V| Q			
8+40	0.9982	3.18	V| Q			
8+45	1.0202	3.20	V| Q			
8+50	1.0428	3.28	V| Q			
8+55	1.0660	3.37	V Q			
9+ 0	1.0894	3.40	V Q			
9+ 5	1.1139	3.55	V Q			
9+10	1.1396	3.74	V Q			
9+15	1.1657	3.78	V Q			
9+20	1.1924	3.87	|V Q			
9+25	1.2197	3.97	|V Q			
9+30	1.2473	4.00	|V Q			
9+35	1.2754	4.08	|V Q			
9+40	1.3041	4.18	| V Q			
9+45	1.3331	4.20	| V Q			
9+50	1.3626	4.28	| V Q			
9+55	1.3927	4.38	| V Q			
10+ 0	1.4230	4.40	| V Q			
10+ 5	1.4500	3.91	| V Q			
10+10	1.4725	3.27	| Q			
10+15	1.4939	3.12	| Q V			
10+20	1.5150	3.05	| Q V			
10+25	1.5358	3.02	| Q V			
10+30	1.5565	3.01	| Q V			
10+35	1.5797	3.37	| QV			
10+40	1.6061	3.83	| Q			
10+45	1.6332	3.94	| Q			
10+50	1.6607	3.98	| Q			
10+55	1.6883	4.01	| VQ			
11+ 0	1.7159	4.02	| Q			
11+ 5	1.7431	3.94	| QV			
11+10	1.7696	3.85	| QV			
11+15	1.7960	3.83	| QV			
11+20	1.8223	3.82	| Q V			
11+25	1.8486	3.82	| Q V			
11+30	1.8748	3.81	| Q V			
11+35	1.9001	3.67	| Q V			
11+40	1.9241	3.49	| Q V			
11+45	1.9479	3.44	| Q V			
11+50	1.9719	3.50	| Q V			
11+55	1.9966	3.58	| Q V			
12+ 0	2.0214	3.60	| Q V			
12+ 5	2.0501	4.18	| Q V|			
12+10	2.0841	4.93	| Q|			
12+15	2.1193	5.11	| VQ			
12+20	2.1556	5.28	| VQ			
12+25	2.1930	5.43	| VQ			



17+15	3.9340	0.97	| Q	|	|	| V	|
17+20	3.9408	0.99	| Q	|	|	| V	|
17+25	3.9477	1.00	| Q	|	|	| V	|
17+30	3.9546	1.00	| Q	|	|	| V	|
17+35	3.9615	1.00	| Q	|	|	| V	|
17+40	3.9684	1.00	| Q	|	|	| V	|
17+45	3.9754	1.00	| Q	|	|	| V	|
17+50	3.9818	0.93	| Q	|	|	| V	|
17+55	3.9876	0.84	| Q	|	|	| V	|
18+ 0	3.9932	0.82	| Q	|	|	| V	|
18+ 5	3.9988	0.81	| Q	|	|	| V	|
18+10	4.0043	0.80	| Q	|	|	| V	|
18+15	4.0098	0.80	| Q	|	|	| V	|
18+20	4.0154	0.80	| Q	|	|	| V	|
18+25	4.0209	0.80	| Q	|	|	| V	|
18+30	4.0264	0.80	| Q	|	|	| V	|
18+35	4.0315	0.73	| Q	|	|	| V	|
18+40	4.0359	0.64	| Q	|	|	| V	|
18+45	4.0401	0.62	| Q	|	|	| V	|
18+50	4.0438	0.54	| Q	|	|	| V	|
18+55	4.0469	0.44	|Q	|	|	| V	|
19+ 0	4.0497	0.42	|Q	|	|	| V	|
19+ 5	4.0530	0.48	|Q	|	|	| V	|
19+10	4.0569	0.57	| Q	|	|	| V	|
19+15	4.0610	0.59	| Q	|	|	| V	|
19+20	4.0656	0.67	| Q	|	|	| V	|
19+25	4.0708	0.76	| Q	|	|	| V	|
19+30	4.0763	0.79	| Q	|	|	| V	|
19+35	4.0813	0.73	| Q	|	|	| V	|
19+40	4.0857	0.64	| Q	|	|	| V	|
19+45	4.0899	0.62	| Q	|	|	| V	|
19+50	4.0936	0.54	| Q	|	|	| V	|
19+55	4.0966	0.44	|Q	|	|	| V	|
20+ 0	4.0995	0.42	|Q	|	|	| V	|
20+ 5	4.1028	0.48	|Q	|	|	| V	|
20+10	4.1067	0.57	| Q	|	|	| V	|
20+15	4.1108	0.59	| Q	|	|	| V	|
20+20	4.1149	0.60	| Q	|	|	| V	|
20+25	4.1190	0.60	| Q	|	|	| V	|
20+30	4.1231	0.60	| Q	|	|	| V	|
20+35	4.1273	0.60	| Q	|	|	| V	|
20+40	4.1314	0.60	| Q	|	|	| V	|
20+45	4.1356	0.60	| Q	|	|	| V	|
20+50	4.1392	0.53	| Q	|	|	| V	|
20+55	4.1423	0.44	|Q	|	|	| V	|
21+ 0	4.1451	0.42	|Q	|	|	| V	|
21+ 5	4.1484	0.48	|Q	|	|	| V	|
21+10	4.1523	0.57	| Q	|	|	| V	|
21+15	4.1564	0.59	| Q	|	|	| V	|
21+20	4.1600	0.53	| Q	|	|	| V	|
21+25	4.1630	0.44	|Q	|	|	| V	|
21+30	4.1659	0.42	|Q	|	|	| V	|
21+35	4.1692	0.48	|Q	|	|	| V	|
21+40	4.1731	0.57	| Q	|	|	| V	|
21+45	4.1771	0.59	| Q	|	|	| V	|
21+50	4.1807	0.53	| Q	|	|	| V	|
21+55	4.1837	0.44	|Q	|	|	| V	|

22+ 0	4.1866	0.42	|Q	|	|	|	V|
22+ 5	4.1899	0.48	|Q	|	|	|	V|
22+10	4.1938	0.57	| Q	|	|	|	V|
22+15	4.1979	0.59	| Q	|	|	|	V|
22+20	4.2015	0.53	| Q	|	|	|	V|
22+25	4.2045	0.44	|Q	|	|	|	V|
22+30	4.2073	0.42	|Q	|	|	|	V|
22+35	4.2102	0.41	|Q	|	|	|	V|
22+40	4.2129	0.40	|Q	|	|	|	V|
22+45	4.2157	0.40	|Q	|	|	|	V|
22+50	4.2185	0.40	|Q	|	|	|	V|
22+55	4.2212	0.40	|Q	|	|	|	V|
23+ 0	4.2240	0.40	|Q	|	|	|	V|
23+ 5	4.2268	0.40	|Q	|	|	|	V|
23+10	4.2295	0.40	|Q	|	|	|	V|
23+15	4.2323	0.40	|Q	|	|	|	V|
23+20	4.2351	0.40	|Q	|	|	|	V|
23+25	4.2378	0.40	|Q	|	|	|	V|
23+30	4.2406	0.40	|Q	|	|	|	V|
23+35	4.2433	0.40	|Q	|	|	|	V|
23+40	4.2461	0.40	|Q	|	|	|	V|
23+45	4.2489	0.40	|Q	|	|	|	V|
23+50	4.2516	0.40	|Q	|	|	|	V|
23+55	4.2544	0.40	|Q	|	|	|	V|
24+ 0	4.2572	0.40	|Q	|	|	|	V|
24+ 5	4.2590	0.26	|Q	|	|	|	V|
24+10	4.2595	0.07	Q	|	|	|	V|
24+15	4.2597	0.03	Q	|	|	|	V|
24+20	4.2598	0.01	Q	|	|	|	V|
24+25	4.2598	0.00	Q	|	|	|	V|

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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WATERSHED B
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 10.13(Ac.) = 0.016 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 10.13(Ac.) = 0.016 Sq. Mi.
Length along longest watercourse = 1196.00(Ft.)
Length along longest watercourse measured to centroid = 993.00(Ft.)
Length along longest watercourse = 0.227 Mi.
Length along longest watercourse measured to centroid = 0.188 Mi.
Difference in elevation = 14.05(Ft.)
Slope along watercourse = 62.0268 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.050 Hr.
Lag time = 2.97 Min.
25% of lag time = 0.74 Min.
40% of lag time = 1.19 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

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

10.13 2.00 20.26

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
10.13	5.00	50.65

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 2.000(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
10.130	58.70	0.900

Total Area Entered = 10.13(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
58.7	58.7	0.483	0.900	0.092	1.000	0.092
					Sum (F) =	0.092

Area averaged mean soil loss (F) (In/Hr) = 0.092
Minimum soil loss rate ((In/Hr)) = 0.046
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	168.240	37.316	3.810
2	0.167	336.480	45.647	4.660
3	0.250	504.720	10.225	1.044
4	0.333	672.960	4.317	0.441
5	0.417	841.200	2.495	0.255
			Sum = 100.000	Sum= 10.209

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max		Low	Effective (In/Hr)
1	0.08	0.07	0.040	(0.163)		0.007	0.033
2	0.17	0.07	0.040	(0.162)		0.007	0.033
3	0.25	0.07	0.040	(0.162)		0.007	0.033

4	0.33	0.10	0.060	(0.161)	0.011	0.049
5	0.42	0.10	0.060	(0.160)	0.011	0.049
6	0.50	0.10	0.060	(0.160)	0.011	0.049
7	0.58	0.10	0.060	(0.159)	0.011	0.049
8	0.67	0.10	0.060	(0.158)	0.011	0.049
9	0.75	0.10	0.060	(0.158)	0.011	0.049
10	0.83	0.13	0.080	(0.157)	0.014	0.066
11	0.92	0.13	0.080	(0.157)	0.014	0.066
12	1.00	0.13	0.080	(0.156)	0.014	0.066
13	1.08	0.10	0.060	(0.155)	0.011	0.049
14	1.17	0.10	0.060	(0.155)	0.011	0.049
15	1.25	0.10	0.060	(0.154)	0.011	0.049
16	1.33	0.10	0.060	(0.153)	0.011	0.049
17	1.42	0.10	0.060	(0.153)	0.011	0.049
18	1.50	0.10	0.060	(0.152)	0.011	0.049
19	1.58	0.10	0.060	(0.152)	0.011	0.049
20	1.67	0.10	0.060	(0.151)	0.011	0.049
21	1.75	0.10	0.060	(0.150)	0.011	0.049
22	1.83	0.13	0.080	(0.150)	0.014	0.066
23	1.92	0.13	0.080	(0.149)	0.014	0.066
24	2.00	0.13	0.080	(0.149)	0.014	0.066
25	2.08	0.13	0.080	(0.148)	0.014	0.066
26	2.17	0.13	0.080	(0.147)	0.014	0.066
27	2.25	0.13	0.080	(0.147)	0.014	0.066
28	2.33	0.13	0.080	(0.146)	0.014	0.066
29	2.42	0.13	0.080	(0.146)	0.014	0.066
30	2.50	0.13	0.080	(0.145)	0.014	0.066
31	2.58	0.17	0.100	(0.144)	0.018	0.082
32	2.67	0.17	0.100	(0.144)	0.018	0.082
33	2.75	0.17	0.100	(0.143)	0.018	0.082
34	2.83	0.17	0.100	(0.143)	0.018	0.082
35	2.92	0.17	0.100	(0.142)	0.018	0.082
36	3.00	0.17	0.100	(0.141)	0.018	0.082
37	3.08	0.17	0.100	(0.141)	0.018	0.082
38	3.17	0.17	0.100	(0.140)	0.018	0.082
39	3.25	0.17	0.100	(0.140)	0.018	0.082
40	3.33	0.17	0.100	(0.139)	0.018	0.082
41	3.42	0.17	0.100	(0.139)	0.018	0.082
42	3.50	0.17	0.100	(0.138)	0.018	0.082
43	3.58	0.17	0.100	(0.137)	0.018	0.082
44	3.67	0.17	0.100	(0.137)	0.018	0.082
45	3.75	0.17	0.100	(0.136)	0.018	0.082
46	3.83	0.20	0.120	(0.136)	0.022	0.098
47	3.92	0.20	0.120	(0.135)	0.022	0.098
48	4.00	0.20	0.120	(0.135)	0.022	0.098
49	4.08	0.20	0.120	(0.134)	0.022	0.098
50	4.17	0.20	0.120	(0.133)	0.022	0.098
51	4.25	0.20	0.120	(0.133)	0.022	0.098
52	4.33	0.23	0.140	(0.132)	0.025	0.115
53	4.42	0.23	0.140	(0.132)	0.025	0.115
54	4.50	0.23	0.140	(0.131)	0.025	0.115
55	4.58	0.23	0.140	(0.131)	0.025	0.115
56	4.67	0.23	0.140	(0.130)	0.025	0.115
57	4.75	0.23	0.140	(0.129)	0.025	0.115
58	4.83	0.27	0.160	(0.129)	0.029	0.131
59	4.92	0.27	0.160	(0.128)	0.029	0.131
60	5.00	0.27	0.160	(0.128)	0.029	0.131

61	5.08	0.20	0.120	(0.127)	0.022	0.098
62	5.17	0.20	0.120	(0.127)	0.022	0.098
63	5.25	0.20	0.120	(0.126)	0.022	0.098
64	5.33	0.23	0.140	(0.126)	0.025	0.115
65	5.42	0.23	0.140	(0.125)	0.025	0.115
66	5.50	0.23	0.140	(0.124)	0.025	0.115
67	5.58	0.27	0.160	(0.124)	0.029	0.131
68	5.67	0.27	0.160	(0.123)	0.029	0.131
69	5.75	0.27	0.160	(0.123)	0.029	0.131
70	5.83	0.27	0.160	(0.122)	0.029	0.131
71	5.92	0.27	0.160	(0.122)	0.029	0.131
72	6.00	0.27	0.160	(0.121)	0.029	0.131
73	6.08	0.30	0.180	(0.121)	0.032	0.148
74	6.17	0.30	0.180	(0.120)	0.032	0.148
75	6.25	0.30	0.180	(0.120)	0.032	0.148
76	6.33	0.30	0.180	(0.119)	0.032	0.148
77	6.42	0.30	0.180	(0.119)	0.032	0.148
78	6.50	0.30	0.180	(0.118)	0.032	0.148
79	6.58	0.33	0.200	(0.117)	0.036	0.164
80	6.67	0.33	0.200	(0.117)	0.036	0.164
81	6.75	0.33	0.200	(0.116)	0.036	0.164
82	6.83	0.33	0.200	(0.116)	0.036	0.164
83	6.92	0.33	0.200	(0.115)	0.036	0.164
84	7.00	0.33	0.200	(0.115)	0.036	0.164
85	7.08	0.33	0.200	(0.114)	0.036	0.164
86	7.17	0.33	0.200	(0.114)	0.036	0.164
87	7.25	0.33	0.200	(0.113)	0.036	0.164
88	7.33	0.37	0.220	(0.113)	0.040	0.180
89	7.42	0.37	0.220	(0.112)	0.040	0.180
90	7.50	0.37	0.220	(0.112)	0.040	0.180
91	7.58	0.40	0.240	(0.111)	0.043	0.197
92	7.67	0.40	0.240	(0.111)	0.043	0.197
93	7.75	0.40	0.240	(0.110)	0.043	0.197
94	7.83	0.43	0.260	(0.110)	0.047	0.213
95	7.92	0.43	0.260	(0.109)	0.047	0.213
96	8.00	0.43	0.260	(0.109)	0.047	0.213
97	8.08	0.50	0.300	(0.108)	0.054	0.246
98	8.17	0.50	0.300	(0.108)	0.054	0.246
99	8.25	0.50	0.300	(0.107)	0.054	0.246
100	8.33	0.50	0.300	(0.107)	0.054	0.246
101	8.42	0.50	0.300	(0.106)	0.054	0.246
102	8.50	0.50	0.300	(0.106)	0.054	0.246
103	8.58	0.53	0.320	(0.105)	0.058	0.262
104	8.67	0.53	0.320	(0.105)	0.058	0.262
105	8.75	0.53	0.320	(0.104)	0.058	0.262
106	8.83	0.57	0.340	(0.104)	0.061	0.279
107	8.92	0.57	0.340	(0.103)	0.061	0.279
108	9.00	0.57	0.340	(0.103)	0.061	0.279
109	9.08	0.63	0.380	(0.102)	0.068	0.312
110	9.17	0.63	0.380	(0.102)	0.068	0.312
111	9.25	0.63	0.380	(0.101)	0.068	0.312
112	9.33	0.67	0.400	(0.101)	0.072	0.328
113	9.42	0.67	0.400	(0.100)	0.072	0.328
114	9.50	0.67	0.400	(0.100)	0.072	0.328
115	9.58	0.70	0.420	(0.099)	0.076	0.344
116	9.67	0.70	0.420	(0.099)	0.076	0.344
117	9.75	0.70	0.420	(0.098)	0.076	0.344

118	9.83	0.73	0.440	(0.098)	0.079	0.361
119	9.92	0.73	0.440	(0.097)	0.079	0.361
120	10.00	0.73	0.440	(0.097)	0.079	0.361
121	10.08	0.50	0.300	(0.096)	0.054	0.246
122	10.17	0.50	0.300	(0.096)	0.054	0.246
123	10.25	0.50	0.300	(0.096)	0.054	0.246
124	10.33	0.50	0.300	(0.095)	0.054	0.246
125	10.42	0.50	0.300	(0.095)	0.054	0.246
126	10.50	0.50	0.300	(0.094)	0.054	0.246
127	10.58	0.67	0.400	(0.094)	0.072	0.328
128	10.67	0.67	0.400	(0.093)	0.072	0.328
129	10.75	0.67	0.400	(0.093)	0.072	0.328
130	10.83	0.67	0.400	(0.092)	0.072	0.328
131	10.92	0.67	0.400	(0.092)	0.072	0.328
132	11.00	0.67	0.400	(0.091)	0.072	0.328
133	11.08	0.63	0.380	(0.091)	0.068	0.312
134	11.17	0.63	0.380	(0.091)	0.068	0.312
135	11.25	0.63	0.380	(0.090)	0.068	0.312
136	11.33	0.63	0.380	(0.090)	0.068	0.312
137	11.42	0.63	0.380	(0.089)	0.068	0.312
138	11.50	0.63	0.380	(0.089)	0.068	0.312
139	11.58	0.57	0.340	(0.088)	0.061	0.279
140	11.67	0.57	0.340	(0.088)	0.061	0.279
141	11.75	0.57	0.340	(0.087)	0.061	0.279
142	11.83	0.60	0.360	(0.087)	0.065	0.295
143	11.92	0.60	0.360	(0.087)	0.065	0.295
144	12.00	0.60	0.360	(0.086)	0.065	0.295
145	12.08	0.83	0.500	0.086	(0.090)	0.414
146	12.17	0.83	0.500	0.085	(0.090)	0.415
147	12.25	0.83	0.500	0.085	(0.090)	0.415
148	12.33	0.87	0.520	0.084	(0.094)	0.436
149	12.42	0.87	0.520	0.084	(0.094)	0.436
150	12.50	0.87	0.520	0.084	(0.094)	0.436
151	12.58	0.93	0.560	0.083	(0.101)	0.477
152	12.67	0.93	0.560	0.083	(0.101)	0.477
153	12.75	0.93	0.560	0.082	(0.101)	0.478
154	12.83	0.97	0.580	0.082	(0.104)	0.498
155	12.92	0.97	0.580	0.081	(0.104)	0.498
156	13.00	0.97	0.580	0.081	(0.104)	0.499
157	13.08	1.13	0.680	0.081	(0.122)	0.599
158	13.17	1.13	0.680	0.080	(0.122)	0.600
159	13.25	1.13	0.680	0.080	(0.122)	0.600
160	13.33	1.13	0.680	0.079	(0.122)	0.601
161	13.42	1.13	0.680	0.079	(0.122)	0.601
162	13.50	1.13	0.680	0.079	(0.122)	0.601
163	13.58	0.77	0.460	0.078	(0.083)	0.382
164	13.67	0.77	0.460	0.078	(0.083)	0.382
165	13.75	0.77	0.460	0.077	(0.083)	0.383
166	13.83	0.77	0.460	0.077	(0.083)	0.383
167	13.92	0.77	0.460	0.077	(0.083)	0.383
168	14.00	0.77	0.460	0.076	(0.083)	0.384
169	14.08	0.90	0.540	0.076	(0.097)	0.464
170	14.17	0.90	0.540	0.075	(0.097)	0.464
171	14.25	0.90	0.540	0.075	(0.097)	0.465
172	14.33	0.87	0.520	0.075	(0.094)	0.445
173	14.42	0.87	0.520	0.074	(0.094)	0.446
174	14.50	0.87	0.520	0.074	(0.094)	0.446

175	14.58	0.87	0.520	0.074	(0.094)	0.446
176	14.67	0.87	0.520	0.073	(0.094)	0.447
177	14.75	0.87	0.520	0.073	(0.094)	0.447
178	14.83	0.83	0.500	0.072	(0.090)	0.428
179	14.92	0.83	0.500	0.072	(0.090)	0.428
180	15.00	0.83	0.500	0.072	(0.090)	0.428
181	15.08	0.80	0.480	0.071	(0.086)	0.409
182	15.17	0.80	0.480	0.071	(0.086)	0.409
183	15.25	0.80	0.480	0.071	(0.086)	0.409
184	15.33	0.77	0.460	0.070	(0.083)	0.390
185	15.42	0.77	0.460	0.070	(0.083)	0.390
186	15.50	0.77	0.460	0.070	(0.083)	0.390
187	15.58	0.63	0.380	(0.069)	0.068	0.312
188	15.67	0.63	0.380	(0.069)	0.068	0.312
189	15.75	0.63	0.380	(0.068)	0.068	0.312
190	15.83	0.63	0.380	0.068	(0.068)	0.312
191	15.92	0.63	0.380	0.068	(0.068)	0.312
192	16.00	0.63	0.380	0.067	(0.068)	0.313
193	16.08	0.13	0.080	(0.067)	0.014	0.066
194	16.17	0.13	0.080	(0.067)	0.014	0.066
195	16.25	0.13	0.080	(0.066)	0.014	0.066
196	16.33	0.13	0.080	(0.066)	0.014	0.066
197	16.42	0.13	0.080	(0.066)	0.014	0.066
198	16.50	0.13	0.080	(0.065)	0.014	0.066
199	16.58	0.10	0.060	(0.065)	0.011	0.049
200	16.67	0.10	0.060	(0.065)	0.011	0.049
201	16.75	0.10	0.060	(0.064)	0.011	0.049
202	16.83	0.10	0.060	(0.064)	0.011	0.049
203	16.92	0.10	0.060	(0.064)	0.011	0.049
204	17.00	0.10	0.060	(0.063)	0.011	0.049
205	17.08	0.17	0.100	(0.063)	0.018	0.082
206	17.17	0.17	0.100	(0.063)	0.018	0.082
207	17.25	0.17	0.100	(0.062)	0.018	0.082
208	17.33	0.17	0.100	(0.062)	0.018	0.082
209	17.42	0.17	0.100	(0.062)	0.018	0.082
210	17.50	0.17	0.100	(0.062)	0.018	0.082
211	17.58	0.17	0.100	(0.061)	0.018	0.082
212	17.67	0.17	0.100	(0.061)	0.018	0.082
213	17.75	0.17	0.100	(0.061)	0.018	0.082
214	17.83	0.13	0.080	(0.060)	0.014	0.066
215	17.92	0.13	0.080	(0.060)	0.014	0.066
216	18.00	0.13	0.080	(0.060)	0.014	0.066
217	18.08	0.13	0.080	(0.059)	0.014	0.066
218	18.17	0.13	0.080	(0.059)	0.014	0.066
219	18.25	0.13	0.080	(0.059)	0.014	0.066
220	18.33	0.13	0.080	(0.059)	0.014	0.066
221	18.42	0.13	0.080	(0.058)	0.014	0.066
222	18.50	0.13	0.080	(0.058)	0.014	0.066
223	18.58	0.10	0.060	(0.058)	0.011	0.049
224	18.67	0.10	0.060	(0.057)	0.011	0.049
225	18.75	0.10	0.060	(0.057)	0.011	0.049
226	18.83	0.07	0.040	(0.057)	0.007	0.033
227	18.92	0.07	0.040	(0.057)	0.007	0.033
228	19.00	0.07	0.040	(0.056)	0.007	0.033
229	19.08	0.10	0.060	(0.056)	0.011	0.049
230	19.17	0.10	0.060	(0.056)	0.011	0.049
231	19.25	0.10	0.060	(0.056)	0.011	0.049

232	19.33	0.13	0.080	(0.055)	0.014	0.066
233	19.42	0.13	0.080	(0.055)	0.014	0.066
234	19.50	0.13	0.080	(0.055)	0.014	0.066
235	19.58	0.10	0.060	(0.055)	0.011	0.049
236	19.67	0.10	0.060	(0.054)	0.011	0.049
237	19.75	0.10	0.060	(0.054)	0.011	0.049
238	19.83	0.07	0.040	(0.054)	0.007	0.033
239	19.92	0.07	0.040	(0.054)	0.007	0.033
240	20.00	0.07	0.040	(0.053)	0.007	0.033
241	20.08	0.10	0.060	(0.053)	0.011	0.049
242	20.17	0.10	0.060	(0.053)	0.011	0.049
243	20.25	0.10	0.060	(0.053)	0.011	0.049
244	20.33	0.10	0.060	(0.052)	0.011	0.049
245	20.42	0.10	0.060	(0.052)	0.011	0.049
246	20.50	0.10	0.060	(0.052)	0.011	0.049
247	20.58	0.10	0.060	(0.052)	0.011	0.049
248	20.67	0.10	0.060	(0.052)	0.011	0.049
249	20.75	0.10	0.060	(0.051)	0.011	0.049
250	20.83	0.07	0.040	(0.051)	0.007	0.033
251	20.92	0.07	0.040	(0.051)	0.007	0.033
252	21.00	0.07	0.040	(0.051)	0.007	0.033
253	21.08	0.10	0.060	(0.050)	0.011	0.049
254	21.17	0.10	0.060	(0.050)	0.011	0.049
255	21.25	0.10	0.060	(0.050)	0.011	0.049
256	21.33	0.07	0.040	(0.050)	0.007	0.033
257	21.42	0.07	0.040	(0.050)	0.007	0.033
258	21.50	0.07	0.040	(0.050)	0.007	0.033
259	21.58	0.10	0.060	(0.049)	0.011	0.049
260	21.67	0.10	0.060	(0.049)	0.011	0.049
261	21.75	0.10	0.060	(0.049)	0.011	0.049
262	21.83	0.07	0.040	(0.049)	0.007	0.033
263	21.92	0.07	0.040	(0.049)	0.007	0.033
264	22.00	0.07	0.040	(0.048)	0.007	0.033
265	22.08	0.10	0.060	(0.048)	0.011	0.049
266	22.17	0.10	0.060	(0.048)	0.011	0.049
267	22.25	0.10	0.060	(0.048)	0.011	0.049
268	22.33	0.07	0.040	(0.048)	0.007	0.033
269	22.42	0.07	0.040	(0.048)	0.007	0.033
270	22.50	0.07	0.040	(0.048)	0.007	0.033
271	22.58	0.07	0.040	(0.047)	0.007	0.033
272	22.67	0.07	0.040	(0.047)	0.007	0.033
273	22.75	0.07	0.040	(0.047)	0.007	0.033
274	22.83	0.07	0.040	(0.047)	0.007	0.033
275	22.92	0.07	0.040	(0.047)	0.007	0.033
276	23.00	0.07	0.040	(0.047)	0.007	0.033
277	23.08	0.07	0.040	(0.047)	0.007	0.033
278	23.17	0.07	0.040	(0.047)	0.007	0.033
279	23.25	0.07	0.040	(0.047)	0.007	0.033
280	23.33	0.07	0.040	(0.046)	0.007	0.033
281	23.42	0.07	0.040	(0.046)	0.007	0.033
282	23.50	0.07	0.040	(0.046)	0.007	0.033
283	23.58	0.07	0.040	(0.046)	0.007	0.033
284	23.67	0.07	0.040	(0.046)	0.007	0.033
285	23.75	0.07	0.040	(0.046)	0.007	0.033
286	23.83	0.07	0.040	(0.046)	0.007	0.033
287	23.92	0.07	0.040	(0.046)	0.007	0.033
288	24.00	0.07	0.040	(0.046)	0.007	0.033

(Loss Rate Not Used)

Sum = 100.0 Sum = 50.0

Flood volume = Effective rainfall 4.16(In)
times area 10.1(Ac.)/[(In)/(Ft.)] = 3.5(Ac.Ft)
Total soil loss = 0.83(In)
Total soil loss = 0.705(Ac.Ft)
Total rainfall = 5.00(In)
Flood volume = 153152.4 Cubic Feet
Total soil loss = 30703.4 Cubic Feet

Peak flow rate of this hydrograph = 6.139(CFS)

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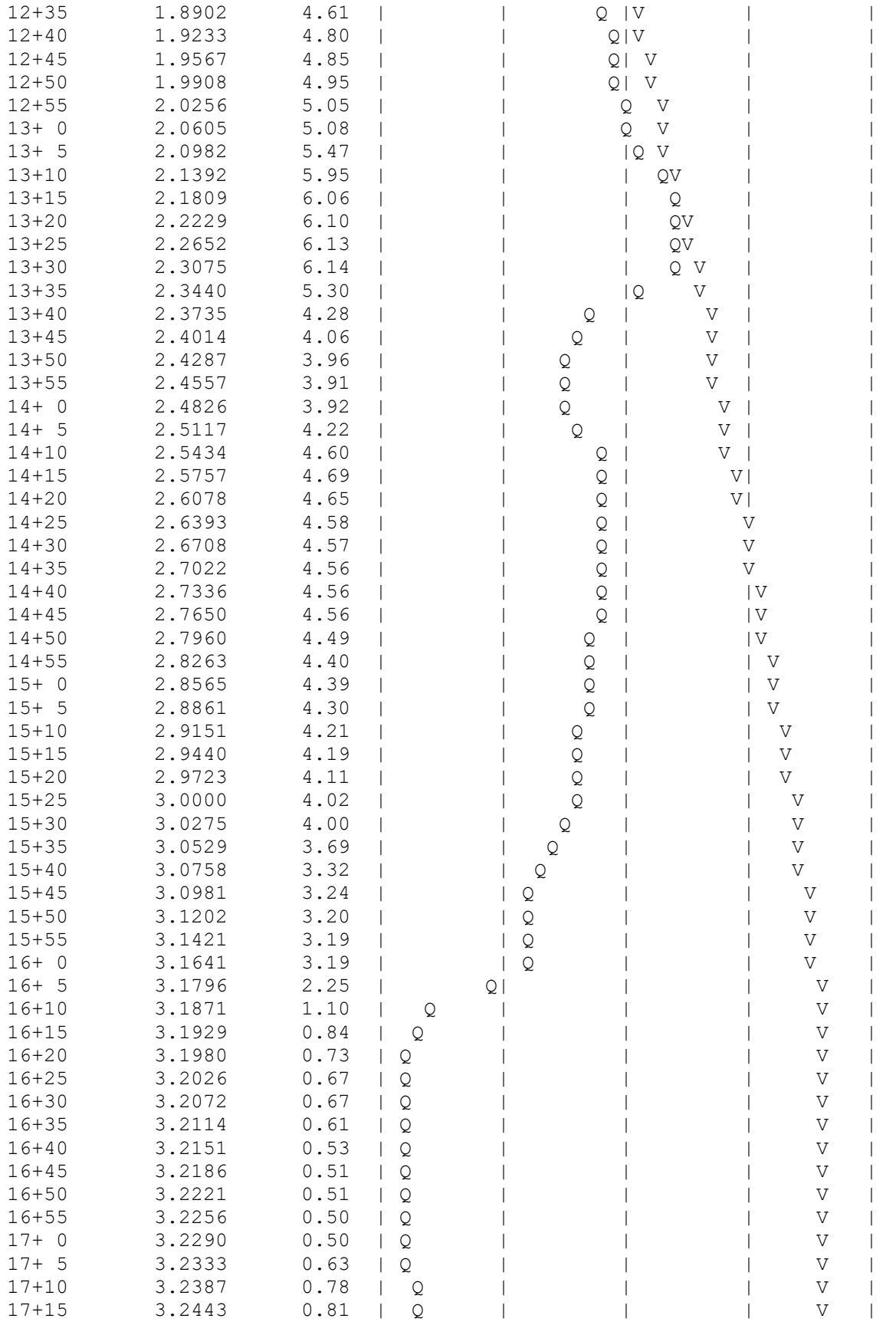
24 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	2.5	5.0	7.5	10.0
0+ 5	0.0009	0.13	Q				
0+10	0.0028	0.28	VQ				
0+15	0.0049	0.31	VQ				
0+20	0.0076	0.39	VQ				
0+25	0.0109	0.47	VQ				
0+30	0.0143	0.49	VQ				
0+35	0.0177	0.50	VQ				
0+40	0.0211	0.50	V Q				
0+45	0.0246	0.50	V Q				
0+50	0.0285	0.57	V Q				
0+55	0.0329	0.64	V Q				
1+ 0	0.0375	0.66	V Q				
1+ 5	0.0416	0.60	V Q				
1+10	0.0453	0.53	V Q				
1+15	0.0488	0.51	V Q				
1+20	0.0523	0.51	V Q				
1+25	0.0558	0.50	V Q				
1+30	0.0592	0.50	V Q				
1+35	0.0627	0.50	V Q				
1+40	0.0661	0.50	V Q				
1+45	0.0696	0.50	V Q				
1+50	0.0735	0.57	V Q				
1+55	0.0779	0.64	V Q				
2+ 0	0.0824	0.66	V Q				
2+ 5	0.0870	0.67	V Q				
2+10	0.0916	0.67	|VQ				
2+15	0.0963	0.67	|VQ				
2+20	0.1009	0.67	|VQ				
2+25	0.1055	0.67	|VQ				
2+30	0.1101	0.67	|VQ				
2+35	0.1152	0.73	|VQ				
2+40	0.1207	0.81	|V Q				
2+45	0.1264	0.83	|V Q				
2+50	0.1322	0.83	|V Q				
2+55	0.1379	0.84	|V Q				
3+ 0	0.1437	0.84	|V Q				

3+ 5	0.1495	0.84	V Q			
3+10	0.1552	0.84	V Q			
3+15	0.1610	0.84	V Q			
3+20	0.1668	0.84	V Q			
3+25	0.1725	0.84	V Q			
3+30	0.1783	0.84	VQ			
3+35	0.1841	0.84	VQ			
3+40	0.1898	0.84	VQ			
3+45	0.1956	0.84	VQ			
3+50	0.2018	0.90	VQ			
3+55	0.2085	0.98	VQ			
4+ 0	0.2154	0.99	VQ			
4+ 5	0.2223	1.00	V Q			
4+10	0.2292	1.01	V Q			
4+15	0.2361	1.01	V Q			
4+20	0.2435	1.07	V Q			
4+25	0.2513	1.14	V Q			
4+30	0.2593	1.16	V Q			
4+35	0.2674	1.17	VQ			
4+40	0.2755	1.17	VQ			
4+45	0.2835	1.17	VQ			
4+50	0.2920	1.24	VQ			
4+55	0.3011	1.31	V Q			
5+ 0	0.3102	1.33	V Q			
5+ 5	0.3186	1.21	VQ			
5+10	0.3259	1.06	VQ			
5+15	0.3330	1.03	VQ			
5+20	0.3404	1.08	VQ			
5+25	0.3482	1.14	VQ			
5+30	0.3562	1.16	Q			
5+35	0.3647	1.23	Q			
5+40	0.3738	1.31	VQ			
5+45	0.3829	1.33	VQ			
5+50	0.3921	1.34	VQ			
5+55	0.4013	1.34	VQ			
6+ 0	0.4106	1.34	VQ			
6+ 5	0.4202	1.40	VQ			
6+10	0.4304	1.48	VQ			
6+15	0.4407	1.50	Q			
6+20	0.4511	1.50	VQ			
6+25	0.4615	1.51	VQ			
6+30	0.4718	1.51	VQ			
6+35	0.4827	1.57	VQ			
6+40	0.4940	1.65	VQ			
6+45	0.5054	1.66	VQ			
6+50	0.5170	1.67	VQ			
6+55	0.5285	1.68	Q			
7+ 0	0.5400	1.68	Q			
7+ 5	0.5516	1.68	Q			
7+10	0.5631	1.68	Q			
7+15	0.5746	1.68	Q			
7+20	0.5866	1.74	Q			
7+25	0.5991	1.81	VQ			
7+30	0.6117	1.83	VQ			
7+35	0.6248	1.90	Q			
7+40	0.6385	1.98	Q			
7+45	0.6522	2.00	Q			

7+50	0.6665	2.07	VQ				
7+55	0.6813	2.15	VQ				
8+ 0	0.6962	2.17	VQ				
8+ 5	0.7120	2.30	VQ				
8+10	0.7289	2.46	VQ				
8+15	0.7461	2.49	VQ				
8+20	0.7633	2.50	V Q				
8+25	0.7806	2.51	V Q				
8+30	0.7979	2.51	VQ				
8+35	0.8157	2.58	VQ				
8+40	0.8339	2.65	VQ				
8+45	0.8523	2.67	VQ				
8+50	0.8712	2.74	VQ				
8+55	0.8906	2.82	VQ				
9+ 0	0.9101	2.84	VQ				
9+ 5	0.9306	2.97	VQ				
9+10	0.9521	3.13	V Q				
9+15	0.9739	3.16	VQ				
9+20	0.9961	3.24	VQ				
9+25	1.0190	3.32	V Q				
9+30	1.0420	3.34	V Q				
9+35	1.0655	3.41	VQ				
9+40	1.0895	3.49	VQ				
9+45	1.1137	3.51	V Q				
9+50	1.1383	3.58	V Q				
9+55	1.1635	3.66	VQ				
10+ 0	1.1888	3.67	VQ				
10+ 5	1.2111	3.24	QV				
10+10	1.2298	2.71	Q V				
10+15	1.2477	2.59	Q V				
10+20	1.2652	2.54	Q V				
10+25	1.2825	2.51	Q V				
10+30	1.2998	2.51	Q V				
10+35	1.3192	2.83	Q V				
10+40	1.3413	3.21	Q V				
10+45	1.3640	3.29	Q V				
10+50	1.3869	3.33	Q V				
10+55	1.4100	3.35	Q V				
11+ 0	1.4331	3.35	Q V				
11+ 5	1.4557	3.29	Q V				
11+10	1.4778	3.21	Q V				
11+15	1.4998	3.19	Q V				
11+20	1.5218	3.19	Q V				
11+25	1.5437	3.18	Q V				
11+30	1.5656	3.18	Q V				
11+35	1.5867	3.06	Q V				
11+40	1.6067	2.90	Q V				
11+45	1.6265	2.87	Q V				
11+50	1.6466	2.92	Q V				
11+55	1.6671	2.99	Q V				
12+ 0	1.6878	3.00	Q V				
12+ 5	1.7117	3.46	Q V				
12+10	1.7394	4.03	Q V				
12+15	1.7680	4.15	Q V				
12+20	1.7975	4.29	Q V				
12+25	1.8279	4.41	Q V				
12+30	1.8585	4.44	Q V				



17+20	3.2500	0.83	| Q	|	|	| V	|
17+25	3.2558	0.84	| Q	|	|	| V	|
17+30	3.2616	0.84	| Q	|	|	| V	|
17+35	3.2673	0.84	| Q	|	|	| V	|
17+40	3.2731	0.84	| Q	|	|	| V	|
17+45	3.2789	0.84	| Q	|	|	| V	|
17+50	3.2842	0.78	| Q	|	|	| V	|
17+55	3.2890	0.70	| Q	|	|	| V	|
18+ 0	3.2937	0.68	| Q	|	|	| V	|
18+ 5	3.2984	0.67	| Q	|	|	| V	|
18+10	3.3030	0.67	| Q	|	|	| V	|
18+15	3.3076	0.67	| Q	|	|	| V	|
18+20	3.3122	0.67	| Q	|	|	| V	|
18+25	3.3168	0.67	| Q	|	|	| V	|
18+30	3.3214	0.67	| Q	|	|	| V	|
18+35	3.3256	0.61	| Q	|	|	| V	|
18+40	3.3293	0.53	| Q	|	|	| V	|
18+45	3.3328	0.51	| Q	|	|	| V	|
18+50	3.3359	0.44	|Q	|	|	| V	|
18+55	3.3384	0.36	|Q	|	|	| V	|
19+ 0	3.3408	0.35	|Q	|	|	| V	|
19+ 5	3.3435	0.40	|Q	|	|	| V	|
19+10	3.3468	0.47	|Q	|	|	| V	|
19+15	3.3502	0.49	|Q	|	|	| V	|
19+20	3.3540	0.56	| Q	|	|	| V	|
19+25	3.3585	0.64	| Q	|	|	| V	|
19+30	3.3630	0.66	| Q	|	|	| V	|
19+35	3.3671	0.60	| Q	|	|	| V	|
19+40	3.3708	0.53	| Q	|	|	| V	|
19+45	3.3743	0.51	| Q	|	|	| V	|
19+50	3.3774	0.44	|Q	|	|	| V	|
19+55	3.3799	0.36	|Q	|	|	| V	|
20+ 0	3.3823	0.35	|Q	|	|	| V	|
20+ 5	3.3851	0.40	|Q	|	|	| V	|
20+10	3.3883	0.47	|Q	|	|	| V	|
20+15	3.3917	0.49	|Q	|	|	| V	|
20+20	3.3951	0.50	|Q	|	|	| V	|
20+25	3.3986	0.50	| Q	|	|	| V	|
20+30	3.4021	0.50	| Q	|	|	| V	|
20+35	3.4055	0.50	| Q	|	|	| V	|
20+40	3.4090	0.50	| Q	|	|	| V	|
20+45	3.4124	0.50	| Q	|	|	| V	|
20+50	3.4155	0.44	|Q	|	|	| V	|
20+55	3.4180	0.36	|Q	|	|	| V	|
21+ 0	3.4204	0.35	|Q	|	|	| V	|
21+ 5	3.4231	0.40	|Q	|	|	| V	|
21+10	3.4264	0.47	|Q	|	|	| V	|
21+15	3.4298	0.49	|Q	|	|	| V	|
21+20	3.4328	0.44	|Q	|	|	| V	|
21+25	3.4353	0.36	|Q	|	|	| V	|
21+30	3.4377	0.35	|Q	|	|	| V	|
21+35	3.4404	0.40	|Q	|	|	| V	|
21+40	3.4437	0.47	|Q	|	|	| V	|
21+45	3.4471	0.49	|Q	|	|	| V	|
21+50	3.4501	0.44	|Q	|	|	| V	|
21+55	3.4526	0.36	|Q	|	|	| V	|
22+ 0	3.4550	0.35	|Q	|	|	| V	|

22+ 5	3.4577	0.40	|Q	|	|	|	V|
22+10	3.4610	0.47	|Q	|	|	|	V|
22+15	3.4644	0.49	|Q	|	|	|	V|
22+20	3.4674	0.44	|Q	|	|	|	V|
22+25	3.4699	0.36	|Q	|	|	|	V|
22+30	3.4723	0.35	|Q	|	|	|	V|
22+35	3.4746	0.34	|Q	|	|	|	V|
22+40	3.4769	0.34	|Q	|	|	|	V|
22+45	3.4792	0.34	|Q	|	|	|	V|
22+50	3.4815	0.34	|Q	|	|	|	V|
22+55	3.4838	0.34	|Q	|	|	|	V|
23+ 0	3.4862	0.34	|Q	|	|	|	V|
23+ 5	3.4885	0.34	|Q	|	|	|	V|
23+10	3.4908	0.34	|Q	|	|	|	V|
23+15	3.4931	0.34	|Q	|	|	|	V|
23+20	3.4954	0.34	|Q	|	|	|	V|
23+25	3.4977	0.34	|Q	|	|	|	V|
23+30	3.5000	0.34	|Q	|	|	|	V|
23+35	3.5023	0.34	|Q	|	|	|	V|
23+40	3.5046	0.34	|Q	|	|	|	V|
23+45	3.5069	0.34	|Q	|	|	|	V|
23+50	3.5092	0.34	|Q	|	|	|	V|
23+55	3.5115	0.34	|Q	|	|	|	V|
24+ 0	3.5138	0.34	|Q	|	|	|	V|
24+ 5	3.5153	0.21	Q	|	|	|	V|
24+10	3.5157	0.06	Q	|	|	|	V|
24+15	3.5158	0.02	Q	|	|	|	V|
24+20	3.5159	0.01	Q	|	|	|	V|

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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION - WATERSHED A
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 11.21(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 11.21(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 894.00(Ft.)
Length along longest watercourse measured to centroid = 600.00(Ft.)
Length along longest watercourse = 0.169 Mi.
Length along longest watercourse measured to centroid = 0.114 Mi.
Difference in elevation = 5.90(Ft.)
Slope along watercourse = 34.8456 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.054 Hr.
Lag time = 3.27 Min.
25% of lag time = 0.82 Min.
40% of lag time = 1.31 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.21	1.20	13.45

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.21	2.50	28.03

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.210	64.40	0.500

Total Area Entered = 11.21(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
64.4	64.4	0.422	0.500	0.232	1.000	0.232
					Sum (F) =	0.232

Area averaged mean soil loss (F) (In/Hr) = 0.232
Minimum soil loss rate ((In/Hr)) = 0.116
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	152.961	33.884	3.828
2	0.167	305.923	46.792	5.286
3	0.250	458.884	11.012	1.244
4	0.333	611.845	4.794	0.542
5	0.417	764.807	2.382	0.269
6	0.500	917.768	1.136	0.128

Sum = 100.000 Sum= 11.298

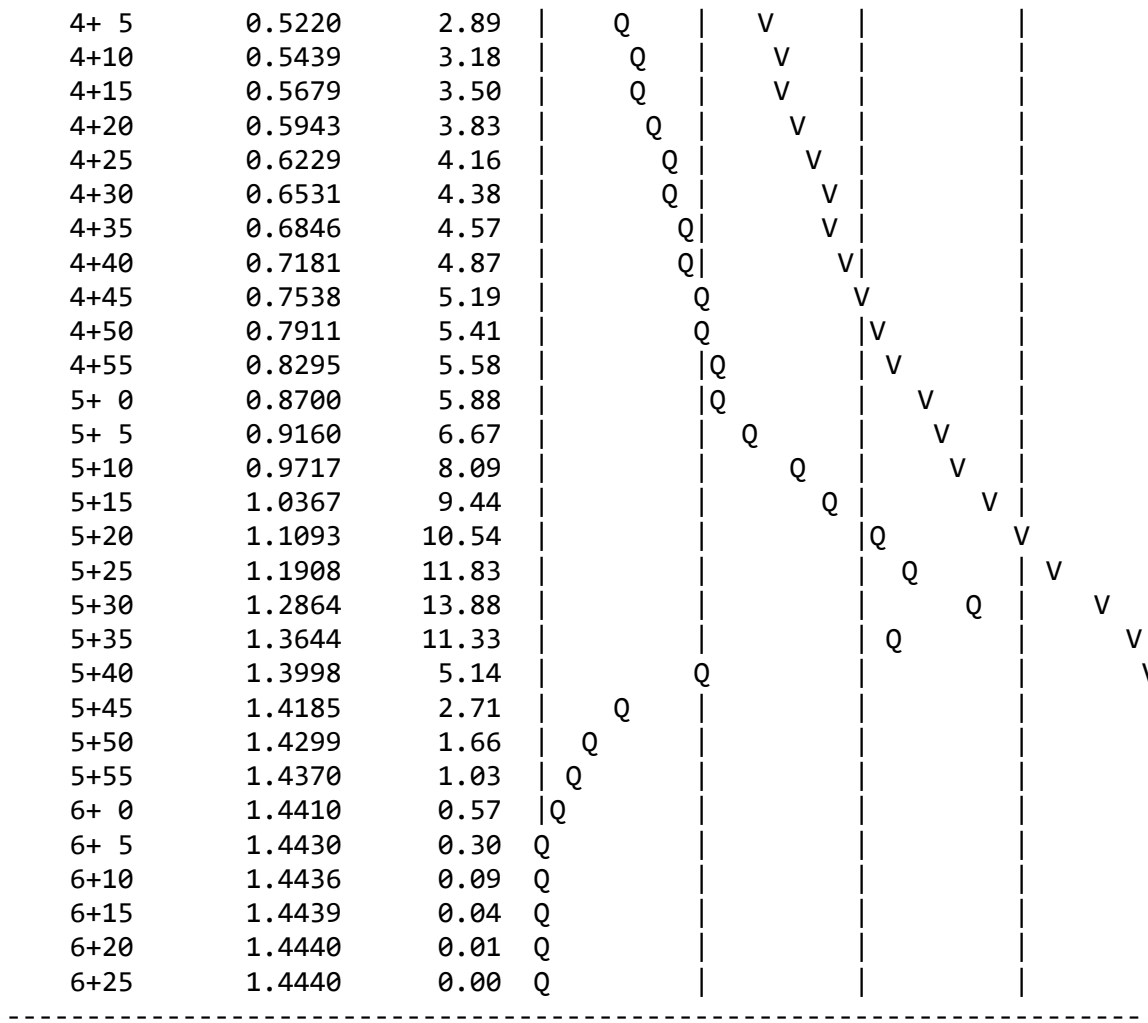
The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.50	0.150	(0.232)	0.075	0.075
2	0.17	0.60	0.180	(0.232)	0.090	0.090
3	0.25	0.60	0.180	(0.232)	0.090	0.090
4	0.33	0.60	0.180	(0.232)	0.090	0.090
5	0.42	0.60	0.180	(0.232)	0.090	0.090
6	0.50	0.70	0.210	(0.232)	0.105	0.105
7	0.58	0.70	0.210	(0.232)	0.105	0.105
8	0.67	0.70	0.210	(0.232)	0.105	0.105
9	0.75	0.70	0.210	(0.232)	0.105	0.105
10	0.83	0.70	0.210	(0.232)	0.105	0.105
11	0.92	0.70	0.210	(0.232)	0.105	0.105
12	1.00	0.80	0.240	(0.232)	0.120	0.120
13	1.08	0.80	0.240	(0.232)	0.120	0.120
14	1.17	0.80	0.240	(0.232)	0.120	0.120
15	1.25	0.80	0.240	(0.232)	0.120	0.120
16	1.33	0.80	0.240	(0.232)	0.120	0.120
17	1.42	0.80	0.240	(0.232)	0.120	0.120
18	1.50	0.80	0.240	(0.232)	0.120	0.120
19	1.58	0.80	0.240	(0.232)	0.120	0.120
20	1.67	0.80	0.240	(0.232)	0.120	0.120
21	1.75	0.80	0.240	(0.232)	0.120	0.120
22	1.83	0.80	0.240	(0.232)	0.120	0.120
23	1.92	0.80	0.240	(0.232)	0.120	0.120
24	2.00	0.90	0.270	(0.232)	0.135	0.135
25	2.08	0.80	0.240	(0.232)	0.120	0.120
26	2.17	0.90	0.270	(0.232)	0.135	0.135
27	2.25	0.90	0.270	(0.232)	0.135	0.135
28	2.33	0.90	0.270	(0.232)	0.135	0.135
29	2.42	0.90	0.270	(0.232)	0.135	0.135
30	2.50	0.90	0.270	(0.232)	0.135	0.135
31	2.58	0.90	0.270	(0.232)	0.135	0.135
32	2.67	0.90	0.270	(0.232)	0.135	0.135
33	2.75	1.00	0.300	(0.232)	0.150	0.150
34	2.83	1.00	0.300	(0.232)	0.150	0.150
35	2.92	1.00	0.300	(0.232)	0.150	0.150
36	3.00	1.00	0.300	(0.232)	0.150	0.150
37	3.08	1.00	0.300	(0.232)	0.150	0.150
38	3.17	1.10	0.330	(0.232)	0.165	0.165
39	3.25	1.10	0.330	(0.232)	0.165	0.165
40	3.33	1.10	0.330	(0.232)	0.165	0.165
41	3.42	1.20	0.360	(0.232)	0.180	0.180

```
42   3.50     1.30      0.390       (  0.232)       0.195        0.195
43   3.58     1.40      0.420       (  0.232)       0.210        0.210
44   3.67     1.40      0.420       (  0.232)       0.210        0.210
45   3.75     1.50      0.450       (  0.232)       0.225        0.225
46   3.83     1.50      0.450       (  0.232)       0.225        0.225
47   3.92     1.60      0.480          0.232    (  0.240)        0.248
48   4.00     1.60      0.480          0.232    (  0.240)        0.248
49   4.08     1.70      0.510          0.232    (  0.255)        0.278
50   4.17     1.80      0.540          0.232    (  0.270)        0.308
51   4.25     1.90      0.570          0.232    (  0.285)        0.338
52   4.33     2.00      0.600          0.232    (  0.300)        0.368
53   4.42     2.10      0.630          0.232    (  0.315)        0.398
54   4.50     2.10      0.630          0.232    (  0.315)        0.398
55   4.58     2.20      0.660          0.232    (  0.330)        0.428
56   4.67     2.30      0.690          0.232    (  0.345)        0.458
57   4.75     2.40      0.720          0.232    (  0.360)        0.488
58   4.83     2.40      0.720          0.232    (  0.360)        0.488
59   4.92     2.50      0.750          0.232    (  0.375)        0.518
60   5.00     2.60      0.780          0.232    (  0.390)        0.548
61   5.08     3.10      0.930          0.232    (  0.465)        0.698
62   5.17     3.60      1.080          0.232    (  0.540)        0.848
63   5.25     3.90      1.170          0.232    (  0.585)        0.938
64   5.33     4.20      1.260          0.232    (  0.630)        1.028
65   5.42     4.70      1.410          0.232    (  0.705)        1.178
66   5.50     5.60      1.680          0.232    (  0.840)        1.448
67   5.58     1.90      0.570          0.232    (  0.285)        0.338
68   5.67     0.90      0.270       (  0.232)       0.135        0.135
69   5.75     0.60      0.180       (  0.232)       0.090        0.090
70   5.83     0.50      0.150       (  0.232)       0.075        0.075
71   5.92     0.30      0.090       (  0.232)       0.045        0.045
72   6.00     0.20      0.060       (  0.232)       0.030        0.030
              (Loss Rate Not Used)
   Sum =     100.0                                    Sum =    18.5
      Flood volume = Effective rainfall      1.55(In)
       times area      11.2(Ac.)/[(In)/(Ft.)] =       1.4(Ac.Ft)
      Total soil loss =      0.95(In)
      Total soil loss =     0.891(Ac.Ft)
      Total rainfall =      2.50(In)
      Flood volume =       62901.7 Cubic Feet
      Total soil loss =       38825.2 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     13.878(CFS)
      ---------------------------------------------------------------------
      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          6 - 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	5.0	10.0	15.0	20.0
0+ 5	0.0020	0.29	Q				
0+10	0.0071	0.74	VQ				
0+15	0.0134	0.91	VQ				
0+20	0.0201	0.97	VQ				
0+25	0.0270	1.00	V Q				
0+30	0.0344	1.07	V Q				
0+35	0.0423	1.15	|VQ				
0+40	0.0504	1.17	|VQ				
0+45	0.0585	1.18	|VQ				
0+50	0.0667	1.18	|VQ				
0+55	0.0749	1.19	| Q				
1+ 0	0.0834	1.24	| Q				
1+ 5	0.0925	1.32	| Q				
1+10	0.1018	1.34	| Q				
1+15	0.1111	1.35	| QV				
1+20	0.1204	1.35	| QV				
1+25	0.1298	1.36	| QV				
1+30	0.1391	1.36	| QV				
1+35	0.1484	1.36	| Q V				
1+40	0.1578	1.36	| Q V				
1+45	0.1671	1.36	| Q V				
1+50	0.1765	1.36	| Q V				
1+55	0.1858	1.36	| Q V				
2+ 0	0.1955	1.41	| Q V				
2+ 5	0.2054	1.44	| Q V				
2+10	0.2153	1.43	| Q V				
2+15	0.2256	1.50	| Q V				
2+20	0.2361	1.52	| Q V				
2+25	0.2466	1.52	| Q V				
2+30	0.2571	1.52	| Q V				
2+35	0.2676	1.53	| Q V				
2+40	0.2781	1.53	| Q V				
2+45	0.2890	1.58	| Q V				
2+50	0.3004	1.66	| Q V				
2+55	0.3120	1.68	| Q V				
3+ 0	0.3236	1.69	| Q V				
3+ 5	0.3353	1.69	| Q V|			
3+10	0.3474	1.75	| Q V|			
3+15	0.3600	1.83	| Q V|			
3+20	0.3727	1.85	| Q V				
3+25	0.3859	1.92	| Q V				
3+30	0.4001	2.06	| Q |V				
3+35	0.4154	2.21	| Q |V				
3+40	0.4313	2.32	| Q |V				
3+45	0.4479	2.41	| Q | V				
3+50	0.4652	2.50	| Q | V				
3+55	0.4832	2.61	| Q | V				
4+ 0	0.5021	2.74	| Q | V				


4+ 5 0.5220 2.89
4+10 0.5439 3.18
4+15 0.5679 3.50
4+20 0.5943 3.83
4+25 0.6229 4.16
4+30 0.6531 4.38
4+35 0.6846 4.57
4+40 0.7181 4.87
4+45 0.7538 5.19
4+50 0.7911 5.41
4+55 0.8295 5.58
5+ 0 0.8700 5.88
5+ 5 0.9160 6.67
5+10 0.9717 8.09
5+15 1.0367 9.44
5+20 1.1093 10.54
5+25 1.1908 11.83
5+30 1.2864 13.88
5+35 1.3644 11.33
5+40 1.3998 5.14
5+45 1.4185 2.71
5+50 1.4299 1.66
5+55 1.4370 1.03
6+ 0 1.4410 0.57
6+ 5 1.4430 0.30
6+10 1.4436 0.09
6+15 1.4439 0.04
6+20 1.4440 0.01
6+25 1.4440 0.00

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION - WATERSHED B
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 11.08(Ac.) = 0.017 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 11.08(Ac.) = 0.017 Sq. Mi.
Length along longest watercourse = 881.00(Ft.)
Length along longest watercourse measured to centroid = 378.00(Ft.)
Length along longest watercourse = 0.167 Mi.
Length along longest watercourse measured to centroid = 0.072 Mi.
Difference in elevation = 3.90(Ft.)
Slope along watercourse = 23.3734 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.049 Hr.
Lag time = 2.94 Min.
25% of lag time = 0.74 Min.
40% of lag time = 1.18 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.08	1.20	13.30

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.08	2.50	27.70

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.080	58.19	0.500

Total Area Entered = 11.08(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
58.2	58.2	0.488	0.500	0.269	1.000	0.269
					Sum (F) =	0.269

Area averaged mean soil loss (F) (In/Hr) = 0.269
Minimum soil loss rate ((In/Hr)) = 0.134
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	169.941	37.677	4.207
2	0.167	339.883	45.521	5.083
3	0.250	509.824	10.142	1.133
4	0.333	679.765	4.262	0.476
5	0.417	849.706	2.398	0.268
			Sum = 100.000	Sum= 11.167

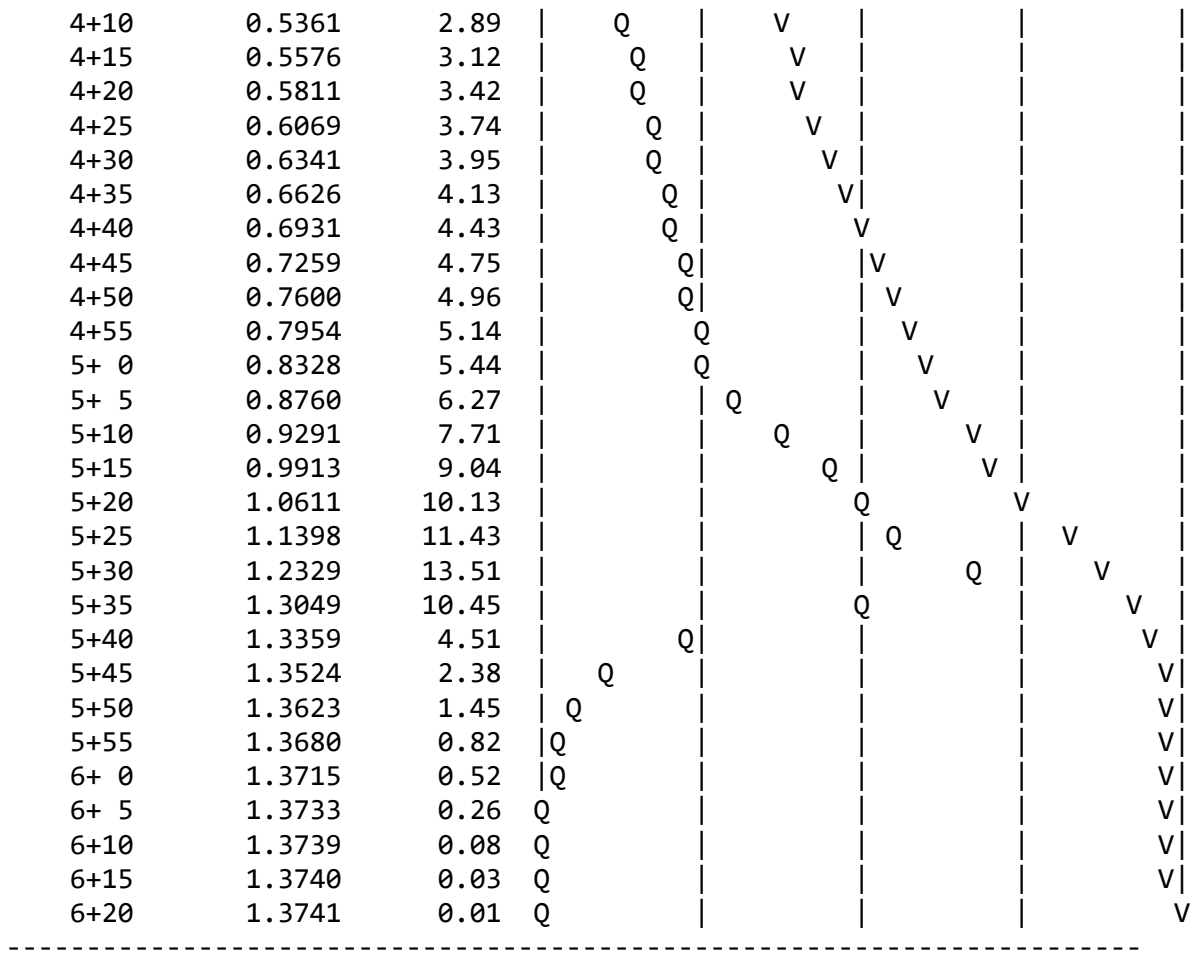
The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.50	0.150	(0.269)	0.075	0.075
2	0.17	0.60	0.180	(0.269)	0.090	0.090
3	0.25	0.60	0.180	(0.269)	0.090	0.090
4	0.33	0.60	0.180	(0.269)	0.090	0.090
5	0.42	0.60	0.180	(0.269)	0.090	0.090
6	0.50	0.70	0.210	(0.269)	0.105	0.105
7	0.58	0.70	0.210	(0.269)	0.105	0.105
8	0.67	0.70	0.210	(0.269)	0.105	0.105
9	0.75	0.70	0.210	(0.269)	0.105	0.105
10	0.83	0.70	0.210	(0.269)	0.105	0.105
11	0.92	0.70	0.210	(0.269)	0.105	0.105
12	1.00	0.80	0.240	(0.269)	0.120	0.120
13	1.08	0.80	0.240	(0.269)	0.120	0.120
14	1.17	0.80	0.240	(0.269)	0.120	0.120
15	1.25	0.80	0.240	(0.269)	0.120	0.120
16	1.33	0.80	0.240	(0.269)	0.120	0.120
17	1.42	0.80	0.240	(0.269)	0.120	0.120
18	1.50	0.80	0.240	(0.269)	0.120	0.120
19	1.58	0.80	0.240	(0.269)	0.120	0.120
20	1.67	0.80	0.240	(0.269)	0.120	0.120
21	1.75	0.80	0.240	(0.269)	0.120	0.120
22	1.83	0.80	0.240	(0.269)	0.120	0.120
23	1.92	0.80	0.240	(0.269)	0.120	0.120
24	2.00	0.90	0.270	(0.269)	0.135	0.135
25	2.08	0.80	0.240	(0.269)	0.120	0.120
26	2.17	0.90	0.270	(0.269)	0.135	0.135
27	2.25	0.90	0.270	(0.269)	0.135	0.135
28	2.33	0.90	0.270	(0.269)	0.135	0.135
29	2.42	0.90	0.270	(0.269)	0.135	0.135
30	2.50	0.90	0.270	(0.269)	0.135	0.135
31	2.58	0.90	0.270	(0.269)	0.135	0.135
32	2.67	0.90	0.270	(0.269)	0.135	0.135
33	2.75	1.00	0.300	(0.269)	0.150	0.150
34	2.83	1.00	0.300	(0.269)	0.150	0.150
35	2.92	1.00	0.300	(0.269)	0.150	0.150
36	3.00	1.00	0.300	(0.269)	0.150	0.150
37	3.08	1.00	0.300	(0.269)	0.150	0.150
38	3.17	1.10	0.330	(0.269)	0.165	0.165
39	3.25	1.10	0.330	(0.269)	0.165	0.165
40	3.33	1.10	0.330	(0.269)	0.165	0.165
41	3.42	1.20	0.360	(0.269)	0.180	0.180
42	3.50	1.30	0.390	(0.269)	0.195	0.195

```
43   3.58     1.40      0.420       (  0.269)       0.210        0.210
44   3.67     1.40      0.420       (  0.269)       0.210        0.210
45   3.75     1.50      0.450       (  0.269)       0.225        0.225
46   3.83     1.50      0.450       (  0.269)       0.225        0.225
47   3.92     1.60      0.480       (  0.269)       0.240        0.240
48   4.00     1.60      0.480       (  0.269)       0.240        0.240
49   4.08     1.70      0.510       (  0.269)       0.255        0.255
50   4.17     1.80      0.540          0.269    (  0.270)       0.271
51   4.25     1.90      0.570          0.269    (  0.285)       0.301
52   4.33     2.00      0.600          0.269    (  0.300)       0.331
53   4.42     2.10      0.630          0.269    (  0.315)       0.361
54   4.50     2.10      0.630          0.269    (  0.315)       0.361
55   4.58     2.20      0.660          0.269    (  0.330)       0.391
56   4.67     2.30      0.690          0.269    (  0.345)       0.421
57   4.75     2.40      0.720          0.269    (  0.360)       0.451
58   4.83     2.40      0.720          0.269    (  0.360)       0.451
59   4.92     2.50      0.750          0.269    (  0.375)       0.481
60   5.00     2.60      0.780          0.269    (  0.390)       0.511
61   5.08     3.10      0.930          0.269    (  0.465)       0.661
62   5.17     3.60      1.080          0.269    (  0.540)       0.811
63   5.25     3.90      1.170          0.269    (  0.585)       0.901
64   5.33     4.20      1.260          0.269    (  0.630)       0.991
65   5.42     4.70      1.410          0.269    (  0.705)       1.141
66   5.50     5.60      1.680          0.269    (  0.840)       1.411
67   5.58     1.90      0.570          0.269    (  0.285)       0.301
68   5.67     0.90      0.270       (  0.269)       0.135        0.135
69   5.75     0.60      0.180       (  0.269)       0.090        0.090
70   5.83     0.50      0.150       (  0.269)       0.075        0.075
71   5.92     0.30      0.090       (  0.269)       0.045        0.045
72   6.00     0.20      0.060       (  0.269)       0.030        0.030
               (Loss Rate Not Used)
   Sum =     100.0                                    Sum =    17.9
      Flood volume = Effective rainfall      1.49(In)
       times area      11.1(Ac.)/[(In)/(Ft.)] =       1.4(Ac.Ft)
      Total soil loss =      1.01(In)
      Total soil loss =     0.934(Ac.Ft)
      Total rainfall =      2.50(In)
      Flood volume =       59855.9 Cubic Feet
      Total soil loss =       40691.3 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     13.515(CFS)
      ---------------------------------------------------------------------
      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          6 - 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        5.0      10.0      15.0      20.0
```

```
-------------------------------------------------------------------------
 0+ 5       0.0022      0.32  Q         |          |          |          |
 0+10       0.0074      0.76  VQ        |          |          |          |
 0+15       0.0138      0.92  VQ        |          |          |          |
 0+20       0.0205      0.97  VQ        |          |          |          |
 0+25       0.0274      1.00  V Q       |          |          |          |
 0+30       0.0347      1.07  |VQ       |          |          |          |
 0+35       0.0426      1.14  |VQ       |          |          |          |
 0+40       0.0506      1.16  |VQ       |          |          |          |
 0+45       0.0587      1.17  |VQ       |          |          |          |
 0+50       0.0667      1.17  |VQ       |          |          |          |
 0+55       0.0748      1.17  | Q       |          |          |          |
 1+ 0       0.0833      1.24  | Q       |          |          |          |
 1+ 5       0.0924      1.31  | Q       |          |          |          |
 1+10       0.1015      1.33  | Q       |          |          |          |
 1+15       0.1107      1.34  | QV      |          |          |          |
 1+20       0.1200      1.34  | QV      |          |          |          |
 1+25       0.1292      1.34  | QV      |          |          |          |
 1+30       0.1384      1.34  | Q V     |          |          |          |
 1+35       0.1477      1.34  | Q V     |          |          |          |
 1+40       0.1569      1.34  | Q V     |          |          |          |
 1+45       0.1661      1.34  | Q V     |          |          |          |
 1+50       0.1754      1.34  | Q  V    |          |          |          |
 1+55       0.1846      1.34  | Q  V    |          |          |          |
 2+ 0       0.1943      1.40  | Q  V    |          |          |          |
 2+ 5       0.2040      1.42  | Q  V    |          |          |          |
 2+10       0.2138      1.42  | Q   V   |          |          |          |
 2+15       0.2240      1.49  | Q   V   |          |          |          |
 2+20       0.2344      1.50  |  Q  V   |          |          |          |
 2+25       0.2447      1.50  |  Q   V  |          |          |          |
 2+30       0.2551      1.51  |  Q   V  |          |          |          |
 2+35       0.2655      1.51  |  Q   V  |          |          |          |
 2+40       0.2759      1.51  |  Q    V |          |          |          |
 2+45       0.2867      1.57  |  Q    V |          |          |          |
 2+50       0.2981      1.65  |  Q    V |          |          |          |
 2+55       0.3095      1.66  |  Q     V|          |          |          |
 3+ 0       0.3211      1.67  |  Q     V|          |          |          |
 3+ 5       0.3326      1.68  |  Q     V|          |          |          |
 3+10       0.3446      1.74  |  Q      V          |          |          |
 3+15       0.3571      1.82  |  Q      V          |          |          |
 3+20       0.3697      1.83  |  Q      V          |          |          |
 3+25       0.3828      1.90  |  Q      |V         |          |          |
 3+30       0.3969      2.05  |   Q     |V         |          |          |
 3+35       0.4121      2.20  |   Q     |V         |          |          |
 3+40       0.4279      2.30  |   Q     | V        |          |          |
 3+45       0.4444      2.39  |   Q     | V        |          |          |
 3+50       0.4615      2.48  |   Q     |  V       |          |          |
 3+55       0.4792      2.57  |    Q    |  V       |          |          |
 4+ 0       0.4974      2.65  |    Q    |   V      |          |          |
 4+ 5       0.5162      2.73  |    Q    |    V     |          |          |
```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4+15 0.5576 3.12
4+20 0.5811 3.42
4+25 0.6069 3.74
4+30 0.6341 3.95
4+35 0.6626 4.13
4+40 0.6931 4.43
4+45 0.7259 4.75
4+50 0.7600 4.96
4+55 0.7954 5.14
5+ 0 0.8328 5.44
5+ 5 0.8760 6.27
5+10 0.9291 7.71
5+15 0.9913 9.04
5+20 1.0611 10.13
5+25 1.1398 11.43
5+30 1.2329 13.51
5+35 1.3049 10.45
5+40 1.3359 4.51
5+45 1.3524 2.38
5+50 1.3623 1.45
5+55 1.3680 0.82
6+ 0 1.3715 0.52
6+ 5 1.3733 0.26
6+10 1.3739 0.08
6+15 1.3740 0.03
6+20 1.3741 0.01

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100-YEAR, 6 HOUR STORM EVENT ANALYSIS - WATERSHED A

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

English Units used in output format

Drainage Area = 12.14(Ac.) = 0.019 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 12.14(Ac.) = 0.019 Sq. Mi.
Length along longest watercourse = 1286.00(Ft.)
Length along longest watercourse measured to centroid = 1036.00(Ft.)
Length along longest watercourse = 0.244 Mi.
Length along longest watercourse measured to centroid = 0.196 Mi.
Difference in elevation = 14.28(Ft.)
Slope along watercourse = 58.6302 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.052 Hr.
Lag time = 3.14 Min.
25% of lag time = 0.78 Min.
40% of lag time = 1.26 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
12.14	1.20	14.57

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
12.14	2.50	30.35

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
12.140	65.50	0.900

Total Area Entered = 12.14(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
65.5	65.5	0.411	0.900	0.078	1.000	0.078
					Sum (F) =	0.078

Area averaged mean soil loss (F) (In/Hr) = 0.078
Minimum soil loss rate ((In/Hr)) = 0.039
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	159.336	35.360	4.326
2	0.167	318.671	46.318	5.667
3	0.250	478.007	10.666	1.305
4	0.333	637.342	4.600	0.563
5	0.417	796.678	2.225	0.272
6	0.500	956.014	0.832	0.102

Sum = 100.000 Sum= 12.235

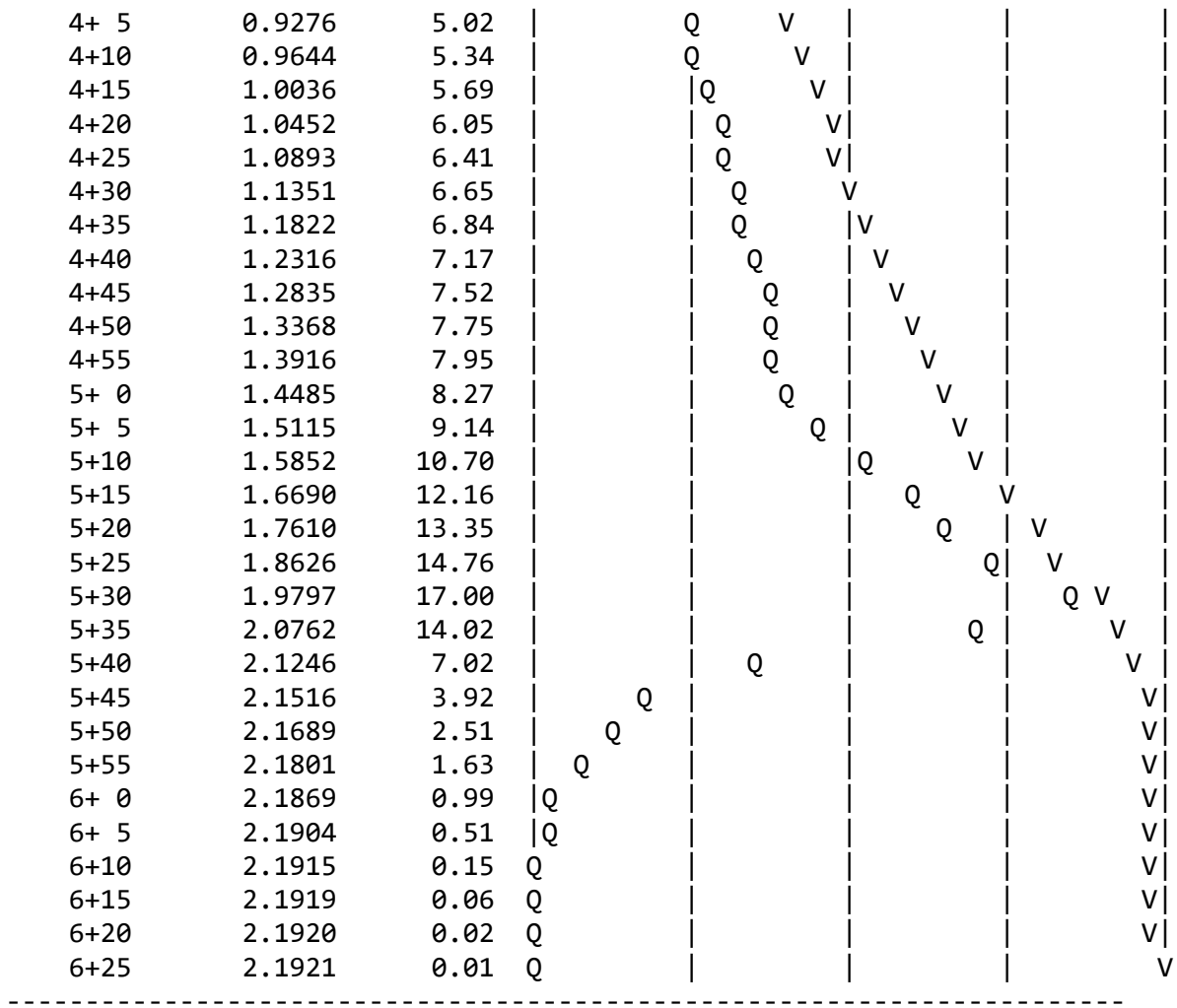
The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.50	0.150	(0.078)	0.027	0.123
2	0.17	0.60	0.180	(0.078)	0.032	0.148
3	0.25	0.60	0.180	(0.078)	0.032	0.148
4	0.33	0.60	0.180	(0.078)	0.032	0.148
5	0.42	0.60	0.180	(0.078)	0.032	0.148
6	0.50	0.70	0.210	(0.078)	0.038	0.172
7	0.58	0.70	0.210	(0.078)	0.038	0.172
8	0.67	0.70	0.210	(0.078)	0.038	0.172
9	0.75	0.70	0.210	(0.078)	0.038	0.172
10	0.83	0.70	0.210	(0.078)	0.038	0.172
11	0.92	0.70	0.210	(0.078)	0.038	0.172
12	1.00	0.80	0.240	(0.078)	0.043	0.197
13	1.08	0.80	0.240	(0.078)	0.043	0.197
14	1.17	0.80	0.240	(0.078)	0.043	0.197
15	1.25	0.80	0.240	(0.078)	0.043	0.197
16	1.33	0.80	0.240	(0.078)	0.043	0.197
17	1.42	0.80	0.240	(0.078)	0.043	0.197
18	1.50	0.80	0.240	(0.078)	0.043	0.197
19	1.58	0.80	0.240	(0.078)	0.043	0.197
20	1.67	0.80	0.240	(0.078)	0.043	0.197
21	1.75	0.80	0.240	(0.078)	0.043	0.197
22	1.83	0.80	0.240	(0.078)	0.043	0.197
23	1.92	0.80	0.240	(0.078)	0.043	0.197
24	2.00	0.90	0.270	(0.078)	0.049	0.221
25	2.08	0.80	0.240	(0.078)	0.043	0.197
26	2.17	0.90	0.270	(0.078)	0.049	0.221
27	2.25	0.90	0.270	(0.078)	0.049	0.221
28	2.33	0.90	0.270	(0.078)	0.049	0.221
29	2.42	0.90	0.270	(0.078)	0.049	0.221
30	2.50	0.90	0.270	(0.078)	0.049	0.221
31	2.58	0.90	0.270	(0.078)	0.049	0.221
32	2.67	0.90	0.270	(0.078)	0.049	0.221
33	2.75	1.00	0.300	(0.078)	0.054	0.246
34	2.83	1.00	0.300	(0.078)	0.054	0.246
35	2.92	1.00	0.300	(0.078)	0.054	0.246
36	3.00	1.00	0.300	(0.078)	0.054	0.246
37	3.08	1.00	0.300	(0.078)	0.054	0.246
38	3.17	1.10	0.330	(0.078)	0.059	0.271
39	3.25	1.10	0.330	(0.078)	0.059	0.271
40	3.33	1.10	0.330	(0.078)	0.059	0.271
41	3.42	1.20	0.360	(0.078)	0.065	0.295

```
42   3.50     1.30      0.390       (  0.078)       0.070        0.320
43   3.58     1.40      0.420       (  0.078)       0.076        0.344
44   3.67     1.40      0.420       (  0.078)       0.076        0.344
45   3.75     1.50      0.450          0.078    (  0.081)        0.372
46   3.83     1.50      0.450          0.078    (  0.081)        0.372
47   3.92     1.60      0.480          0.078    (  0.086)        0.402
48   4.00     1.60      0.480          0.078    (  0.086)        0.402
49   4.08     1.70      0.510          0.078    (  0.092)        0.432
50   4.17     1.80      0.540          0.078    (  0.097)        0.462
51   4.25     1.90      0.570          0.078    (  0.103)        0.492
52   4.33     2.00      0.600          0.078    (  0.108)        0.522
53   4.42     2.10      0.630          0.078    (  0.113)        0.552
54   4.50     2.10      0.630          0.078    (  0.113)        0.552
55   4.58     2.20      0.660          0.078    (  0.119)        0.582
56   4.67     2.30      0.690          0.078    (  0.124)        0.612
57   4.75     2.40      0.720          0.078    (  0.130)        0.642
58   4.83     2.40      0.720          0.078    (  0.130)        0.642
59   4.92     2.50      0.750          0.078    (  0.135)        0.672
60   5.00     2.60      0.780          0.078    (  0.140)        0.702
61   5.08     3.10      0.930          0.078    (  0.167)        0.852
62   5.17     3.60      1.080          0.078    (  0.194)        1.002
63   5.25     3.90      1.170          0.078    (  0.211)        1.092
64   5.33     4.20      1.260          0.078    (  0.227)        1.182
65   5.42     4.70      1.410          0.078    (  0.254)        1.332
66   5.50     5.60      1.680          0.078    (  0.302)        1.602
67   5.58     1.90      0.570          0.078    (  0.103)        0.492
68   5.67     0.90      0.270       (  0.078)       0.049        0.221
69   5.75     0.60      0.180       (  0.078)       0.032        0.148
70   5.83     0.50      0.150       (  0.078)       0.027        0.123
71   5.92     0.30      0.090       (  0.078)       0.016        0.074
72   6.00     0.20      0.060       (  0.078)       0.011        0.049
              (Loss Rate Not Used)
   Sum =     100.0                                    Sum =    26.0
      Flood volume = Effective rainfall      2.17(In)
       times area      12.1(Ac.)/[(In)/(Ft.)] =       2.2(Ac.Ft)
      Total soil loss =      0.33(In)
      Total soil loss =     0.337(Ac.Ft)
      Total rainfall =      2.50(In)
      Flood volume =       95485.9 Cubic Feet
      Total soil loss =       14680.0 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     17.003(CFS)
      ---------------------------------------------------------------------
      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          6 - 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	5.0	10.0	15.0	20.0
0+ 5	0.0037	0.53	VQ				
0+10	0.0129	1.34	V Q				
0+15	0.0241	1.64	V Q				
0+20	0.0361	1.74	V Q				
0+25	0.0484	1.78	V Q				
0+30	0.0616	1.91	V Q				
0+35	0.0757	2.05	V Q				
0+40	0.0901	2.08	V Q				
0+45	0.1045	2.10	V Q				
0+50	0.1190	2.11	V Q				
0+55	0.1335	2.11	V Q				
1+ 0	0.1488	2.21	V Q				
1+ 5	0.1650	2.35	VQ				
1+10	0.1814	2.39	VQ				
1+15	0.1979	2.40	VQ				
1+20	0.2145	2.41	VQ				
1+25	0.2311	2.41	Q				
1+30	0.2477	2.41	Q				
1+35	0.2643	2.41	Q				
1+40	0.2809	2.41	QV				
1+45	0.2975	2.41	QV				
1+50	0.3141	2.41	QV				
1+55	0.3307	2.41	Q V				
2+ 0	0.3480	2.52	QV				
2+ 5	0.3655	2.55	QV				
2+10	0.3831	2.55	QV				
2+15	0.4015	2.67	Q V				
2+20	0.4200	2.69	Q V				
2+25	0.4386	2.70	Q V				
2+30	0.4573	2.71	Q V				
2+35	0.4759	2.71	Q V				
2+40	0.4946	2.71	Q V				
2+45	0.5140	2.82	Q V				
2+50	0.5344	2.96	Q V				
2+55	0.5549	2.99	Q V				
3+ 0	0.5756	3.00	Q V				
3+ 5	0.5963	3.01	Q V				
3+10	0.6178	3.12	Q V				
3+15	0.6402	3.26	Q V				
3+20	0.6629	3.29	Q V				
3+25	0.6864	3.41	Q V				
3+30	0.7116	3.66	Q V				
3+35	0.7387	3.94	Q V				
3+40	0.7672	4.13	Q V				
3+45	0.7968	4.30	Q V				
3+50	0.8276	4.48	Q V				
3+55	0.8597	4.65	Q V				
4+ 0	0.8931	4.84	Q V				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4+10 0.9644 5.34
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4+20 1.0452 6.05
4+25 1.0893 6.41
4+30 1.1351 6.65
4+35 1.1822 6.84
4+40 1.2316 7.17
4+45 1.2835 7.52
4+50 1.3368 7.75
4+55 1.3916 7.95
5+ 0 1.4485 8.27
5+ 5 1.5115 9.14
5+10 1.5852 10.70
5+15 1.6690 12.16
5+20 1.7610 13.35
5+25 1.8626 14.76
5+30 1.9797 17.00
5+35 2.0762 14.02
5+40 2.1246 7.02
5+45 2.1516 3.92
5+50 2.1689 2.51
5+55 2.1801 1.63
6+ 0 2.1869 0.99
6+ 5 2.1904 0.51
6+10 2.1915 0.15
6+15 2.1919 0.06
6+20 2.1920 0.02
6+25 2.1921 0.01

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 10/06/23 File: Q100BUH6100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100-YEAR, 6 HOUR STORM EVENT ANALYSIS - WATERSHED B

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

English Units used in output format

Drainage Area = 10.13(Ac.) = 0.016 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 10.13(Ac.) = 0.016 Sq. Mi.
Length along longest watercourse = 1196.00(Ft.)
Length along longest watercourse measured to centroid = 993.00(Ft.)
Length along longest watercourse = 0.227 Mi.
Length along longest watercourse measured to centroid = 0.188 Mi.
Difference in elevation = 14.05(Ft.)
Slope along watercourse = 62.0268 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.050 Hr.
Lag time = 2.97 Min.
25% of lag time = 0.74 Min.
40% of lag time = 1.19 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
10.13	1.20	12.16

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
10.13	2.50	25.33

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
10.130	58.70	0.900

Total Area Entered = 10.13(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
58.7	58.7	0.483	0.900	0.092	1.000	0.092
					Sum (F) =	0.092

Area averaged mean soil loss (F) (In/Hr) = 0.092
Minimum soil loss rate ((In/Hr)) = 0.046
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	168.240	37.316	3.810
2	0.167	336.480	45.647	4.660
3	0.250	504.720	10.225	1.044
4	0.333	672.960	4.317	0.441
5	0.417	841.200	2.495	0.255
			Sum = 100.000	Sum= 10.209

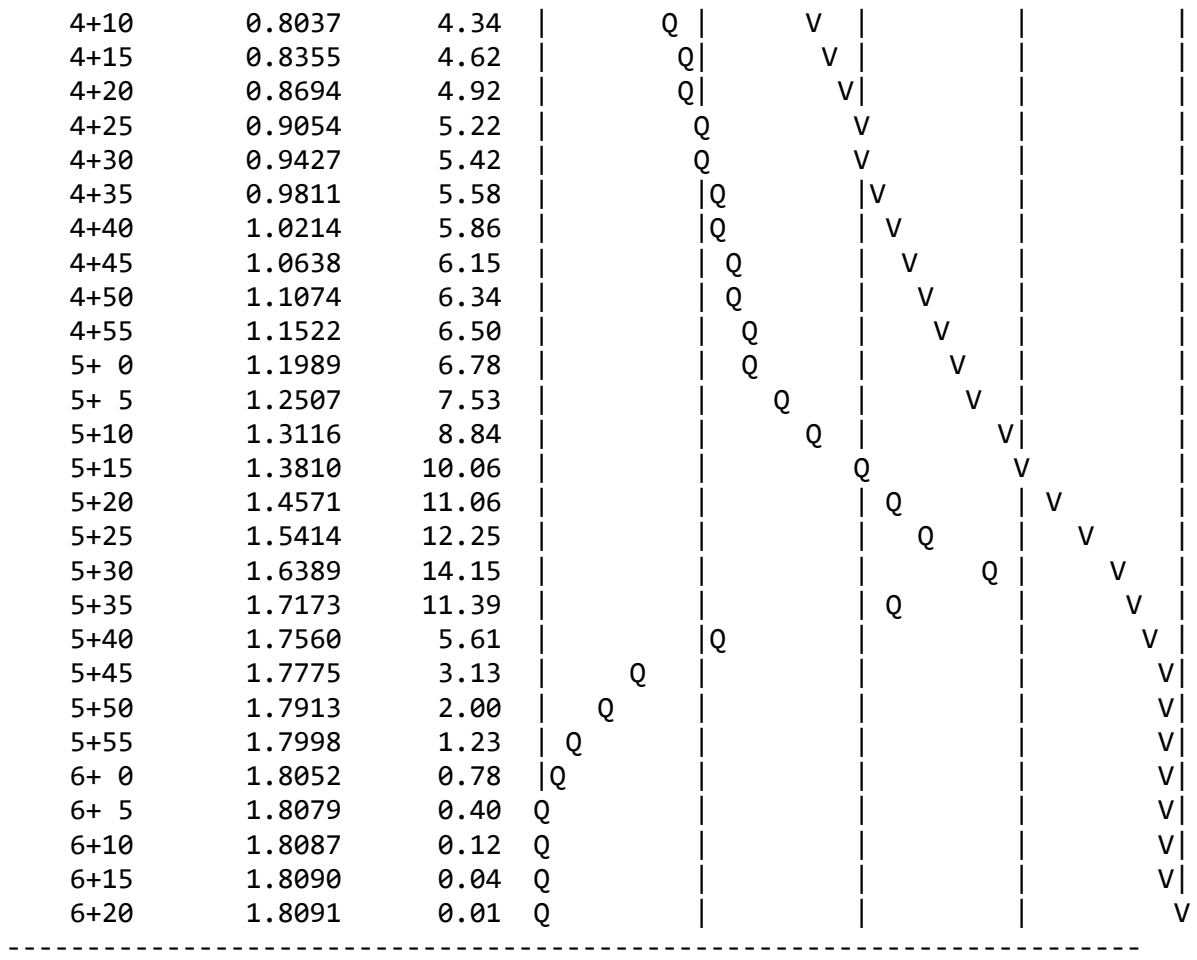
The following loss rate calculations reflect use of the minimum calculated loss rate subtracted from the Storm Rain to produce the maximum Effective Rain value

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.50	0.150	(0.092)	0.027	0.123
2	0.17	0.60	0.180	(0.092)	0.032	0.148
3	0.25	0.60	0.180	(0.092)	0.032	0.148
4	0.33	0.60	0.180	(0.092)	0.032	0.148
5	0.42	0.60	0.180	(0.092)	0.032	0.148
6	0.50	0.70	0.210	(0.092)	0.038	0.172
7	0.58	0.70	0.210	(0.092)	0.038	0.172
8	0.67	0.70	0.210	(0.092)	0.038	0.172
9	0.75	0.70	0.210	(0.092)	0.038	0.172
10	0.83	0.70	0.210	(0.092)	0.038	0.172
11	0.92	0.70	0.210	(0.092)	0.038	0.172
12	1.00	0.80	0.240	(0.092)	0.043	0.197
13	1.08	0.80	0.240	(0.092)	0.043	0.197
14	1.17	0.80	0.240	(0.092)	0.043	0.197
15	1.25	0.80	0.240	(0.092)	0.043	0.197
16	1.33	0.80	0.240	(0.092)	0.043	0.197
17	1.42	0.80	0.240	(0.092)	0.043	0.197
18	1.50	0.80	0.240	(0.092)	0.043	0.197
19	1.58	0.80	0.240	(0.092)	0.043	0.197
20	1.67	0.80	0.240	(0.092)	0.043	0.197
21	1.75	0.80	0.240	(0.092)	0.043	0.197
22	1.83	0.80	0.240	(0.092)	0.043	0.197
23	1.92	0.80	0.240	(0.092)	0.043	0.197
24	2.00	0.90	0.270	(0.092)	0.049	0.221
25	2.08	0.80	0.240	(0.092)	0.043	0.197
26	2.17	0.90	0.270	(0.092)	0.049	0.221
27	2.25	0.90	0.270	(0.092)	0.049	0.221
28	2.33	0.90	0.270	(0.092)	0.049	0.221
29	2.42	0.90	0.270	(0.092)	0.049	0.221
30	2.50	0.90	0.270	(0.092)	0.049	0.221
31	2.58	0.90	0.270	(0.092)	0.049	0.221
32	2.67	0.90	0.270	(0.092)	0.049	0.221
33	2.75	1.00	0.300	(0.092)	0.054	0.246
34	2.83	1.00	0.300	(0.092)	0.054	0.246
35	2.92	1.00	0.300	(0.092)	0.054	0.246
36	3.00	1.00	0.300	(0.092)	0.054	0.246
37	3.08	1.00	0.300	(0.092)	0.054	0.246
38	3.17	1.10	0.330	(0.092)	0.059	0.271
39	3.25	1.10	0.330	(0.092)	0.059	0.271
40	3.33	1.10	0.330	(0.092)	0.059	0.271
41	3.42	1.20	0.360	(0.092)	0.065	0.295
42	3.50	1.30	0.390	(0.092)	0.070	0.320

```
43   3.58     1.40      0.420       (  0.092)       0.076        0.344
44   3.67     1.40      0.420       (  0.092)       0.076        0.344
45   3.75     1.50      0.450       (  0.092)       0.081        0.369
46   3.83     1.50      0.450       (  0.092)       0.081        0.369
47   3.92     1.60      0.480       (  0.092)       0.086        0.394
48   4.00     1.60      0.480       (  0.092)       0.086        0.394
49   4.08     1.70      0.510       (  0.092)       0.092        0.418
50   4.17     1.80      0.540          0.092    (  0.097)        0.448
51   4.25     1.90      0.570          0.092    (  0.103)        0.478
52   4.33     2.00      0.600          0.092    (  0.108)        0.508
53   4.42     2.10      0.630          0.092    (  0.113)        0.538
54   4.50     2.10      0.630          0.092    (  0.113)        0.538
55   4.58     2.20      0.660          0.092    (  0.119)        0.568
56   4.67     2.30      0.690          0.092    (  0.124)        0.598
57   4.75     2.40      0.720          0.092    (  0.130)        0.628
58   4.83     2.40      0.720          0.092    (  0.130)        0.628
59   4.92     2.50      0.750          0.092    (  0.135)        0.658
60   5.00     2.60      0.780          0.092    (  0.140)        0.688
61   5.08     3.10      0.930          0.092    (  0.167)        0.838
62   5.17     3.60      1.080          0.092    (  0.194)        0.988
63   5.25     3.90      1.170          0.092    (  0.211)        1.078
64   5.33     4.20      1.260          0.092    (  0.227)        1.168
65   5.42     4.70      1.410          0.092    (  0.254)        1.318
66   5.50     5.60      1.680          0.092    (  0.302)        1.588
67   5.58     1.90      0.570          0.092    (  0.103)        0.478
68   5.67     0.90      0.270       (  0.092)       0.049        0.221
69   5.75     0.60      0.180       (  0.092)       0.032        0.148
70   5.83     0.50      0.150       (  0.092)       0.027        0.123
71   5.92     0.30      0.090       (  0.092)       0.016        0.074
72   6.00     0.20      0.060       (  0.092)       0.011        0.049
               (Loss Rate Not Used)
   Sum =     100.0                                    Sum =    25.7
      Flood volume = Effective rainfall      2.14(In)
       times area      10.1(Ac.)/[(In)/(Ft.)] =       1.8(Ac.Ft)
      Total soil loss =      0.36(In)
      Total soil loss =     0.301(Ac.Ft)
      Total rainfall =      2.50(In)
      Flood volume =       78803.7 Cubic Feet
      Total soil loss =       13122.8 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     14.146(CFS)
      ---------------------------------------------------------------------
      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          6 - 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        5.0      10.0      15.0      20.0
```

```
---------------------------------------------------------------------
 0+ 5       0.0032      0.47  Q          |          |          |          |
 0+10       0.0111      1.14  V Q        |          |          |          |
 0+15       0.0206      1.38  V Q        |          |          |          |
 0+20       0.0306      1.46  V Q        |          |          |          |
 0+25       0.0409      1.50  V  Q       |          |          |          |
 0+30       0.0520      1.60  |V Q       |          |          |          |
 0+35       0.0638      1.72  |V Q       |          |          |          |
 0+40       0.0758      1.74  |V Q       |          |          |          |
 0+45       0.0879      1.75  |V Q       |          |          |          |
 0+50       0.1000      1.76  | VQ       |          |          |          |
 0+55       0.1121      1.76  | VQ       |          |          |          |
 1+ 0       0.1248      1.85  | VQ       |          |          |          |
 1+ 5       0.1384      1.97  |  Q       |          |          |          |
 1+10       0.1521      1.99  |  Q       |          |          |          |
 1+15       0.1659      2.00  |  VQ      |          |          |          |
 1+20       0.1798      2.01  |  VQ      |          |          |          |
 1+25       0.1936      2.01  |   Q      |          |          |          |
 1+30       0.2074      2.01  |   Q      |          |          |          |
 1+35       0.2213      2.01  |   Q      |          |          |          |
 1+40       0.2351      2.01  |   QV     |          |          |          |
 1+45       0.2490      2.01  |   QV     |          |          |          |
 1+50       0.2628      2.01  |   QV     |          |          |          |
 1+55       0.2767      2.01  |   Q V    |          |          |          |
 2+ 0       0.2912      2.10  |   Q V    |          |          |          |
 2+ 5       0.3058      2.12  |   Q V    |          |          |          |
 2+10       0.3205      2.13  |   Q  V   |          |          |          |
 2+15       0.3358      2.23  |   Q  V   |          |          |          |
 2+20       0.3513      2.25  |   Q  V   |          |          |          |
 2+25       0.3668      2.26  |   Q   V  |          |          |          |
 2+30       0.3824      2.26  |   Q   V  |          |          |          |
 2+35       0.3980      2.26  |   Q   V  |          |          |          |
 2+40       0.4136      2.26  |   Q    V|          |          |          |
 2+45       0.4298      2.36  |   Q    V|          |          |          |
 2+50       0.4468      2.47  |   Q    V|          |          |          |
 2+55       0.4640      2.50  |   Q     V          |          |          |
 3+ 0       0.4812      2.51  |    Q    V          |          |          |
 3+ 5       0.4985      2.51  |    Q    |V         |          |          |
 3+10       0.5165      2.61  |    Q    |V         |          |          |
 3+15       0.5352      2.72  |    Q    |V         |          |          |
 3+20       0.5542      2.75  |    Q    | V        |          |          |
 3+25       0.5738      2.85  |    Q    | V        |          |          |
 3+30       0.5949      3.07  |     Q   |  V       |          |          |
 3+35       0.6176      3.30  |     Q   |  V       |          |          |
 3+40       0.6414      3.45  |     Q   |   V      |          |          |
 3+45       0.6661      3.59  |      Q  |   V      |          |          |
 3+50       0.6917      3.72  |      Q  |    V     |          |          |
 3+55       0.7182      3.85  |      Q  |    V     |          |          |
 4+ 0       0.7456      3.97  |      Q  |     V    |          |          |
 4+ 5       0.7738      4.10  |       Q |      V   |          |          |
```


4+10 0.8037 4.34
4+15 0.8355 4.62
4+20 0.8694 4.92
4+25 0.9054 5.22
4+30 0.9427 5.42
4+35 0.9811 5.58
4+40 1.0214 5.86
4+45 1.0638 6.15
4+50 1.1074 6.34
4+55 1.1522 6.50
5+ 0 1.1989 6.78
5+ 5 1.2507 7.53
5+10 1.3116 8.84
5+15 1.3810 10.06
5+20 1.4571 11.06
5+25 1.5414 12.25
5+30 1.6389 14.15
5+35 1.7173 11.39
5+40 1.7560 5.61
5+45 1.7775 3.13
5+50 1.7913 2.00
5+55 1.7998 1.23
6+ 0 1.8052 0.78
6+ 5 1.8079 0.40
6+10 1.8087 0.12
6+15 1.8090 0.04
6+20 1.8091 0.01

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION - WATERSHED A
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 11.21(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 11.21(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 894.00(Ft.)
Length along longest watercourse measured to centroid = 600.00(Ft.)
Length along longest watercourse = 0.169 Mi.
Length along longest watercourse measured to centroid = 0.114 Mi.
Difference in elevation = 5.90(Ft.)
Slope along watercourse = 34.8456 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.054 Hr.
Lag time = 3.27 Min.
25% of lag time = 0.82 Min.
40% of lag time = 1.31 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.21	0.80	8.97

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.21	2.00	22.42

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 2.000(In)

Point rain (area averaged) = 2.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.210	64.40	0.500

Total Area Entered = 11.21(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
64.4	64.4	0.422	0.500	0.232	1.000	0.232
					Sum (F) =	0.232

Area averaged mean soil loss (F) (In/Hr) = 0.232
Minimum soil loss rate ((In/Hr)) = 0.116
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	152.961	33.884	3.828
2	0.167	305.923	46.792	5.286
3	0.250	458.884	11.012	1.244
4	0.333	611.845	4.794	0.542
5	0.417	764.807	2.382	0.269
6	0.500	917.768	1.136	0.128

Sum = 100.000 Sum= 11.298

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.312	(0.232)	0.156	0.156
2	0.17	1.30	0.312	(0.232)	0.156	0.156
3	0.25	1.10	0.264	(0.232)	0.132	0.132
4	0.33	1.50	0.360	(0.232)	0.180	0.180
5	0.42	1.50	0.360	(0.232)	0.180	0.180
6	0.50	1.80	0.432	(0.232)	0.216	0.216
7	0.58	1.50	0.360	(0.232)	0.180	0.180
8	0.67	1.80	0.432	(0.232)	0.216	0.216
9	0.75	1.80	0.432	(0.232)	0.216	0.216
10	0.83	1.50	0.360	(0.232)	0.180	0.180
11	0.92	1.60	0.384	(0.232)	0.192	0.192
12	1.00	1.80	0.432	(0.232)	0.216	0.216
13	1.08	2.20	0.528	0.232	(0.264)	0.296
14	1.17	2.20	0.528	0.232	(0.264)	0.296
15	1.25	2.20	0.528	0.232	(0.264)	0.296
16	1.33	2.00	0.480	0.232	(0.240)	0.248
17	1.42	2.60	0.624	0.232	(0.312)	0.392
18	1.50	2.70	0.648	0.232	(0.324)	0.416
19	1.58	2.40	0.576	0.232	(0.288)	0.344
20	1.67	2.70	0.648	0.232	(0.324)	0.416
21	1.75	3.30	0.792	0.232	(0.396)	0.560
22	1.83	3.10	0.744	0.232	(0.372)	0.512
23	1.92	2.90	0.696	0.232	(0.348)	0.464
24	2.00	3.00	0.720	0.232	(0.360)	0.488
25	2.08	3.10	0.744	0.232	(0.372)	0.512
26	2.17	4.20	1.008	0.232	(0.504)	0.776
27	2.25	5.00	1.200	0.232	(0.600)	0.968
28	2.33	3.50	0.840	0.232	(0.420)	0.608
29	2.42	6.80	1.632	0.232	(0.816)	1.400
30	2.50	7.30	1.752	0.232	(0.876)	1.520
31	2.58	8.20	1.968	0.232	(0.984)	1.736
32	2.67	5.90	1.416	0.232	(0.708)	1.184
33	2.75	2.00	0.480	0.232	(0.240)	0.248
34	2.83	1.80	0.432	(0.232)	0.216	0.216
35	2.92	1.80	0.432	(0.232)	0.216	0.216
36	3.00	0.60	0.144	(0.232)	0.072	0.072
		(Loss Rate Not Used)				
Sum =		100.0			Sum =	16.4

Flood volume = Effective rainfall 1.37(In)
times area 11.2(Ac.)/[(In)/(Ft.)] = 1.3(Ac.Ft)
Total soil loss = 0.63(In)

```
      Total soil loss =     0.592(Ac.Ft)
      Total rainfall =      2.00(In)
      Flood volume =       55596.9 Cubic Feet
      Total soil loss =       25783.7 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     17.116(CFS)
      ---------------------------------------------------------------------
      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          3 - 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        5.0      10.0      15.0      20.0
-------------------------------------------------------------------------
  0+ 5       0.0041      0.60  VQ        |         |         |         |
  0+10       0.0139      1.42  V Q       |         |         |         |
  0+15       0.0244      1.52  V  Q      |         |         |         |
  0+20       0.0359      1.67  |V Q      |         |         |         |
  0+25       0.0492      1.93  |V Q      |         |         |         |
  0+30       0.0639      2.14  | V Q     |         |         |         |
  0+35       0.0791      2.21  | V Q     |         |         |         |
  0+40       0.0944      2.21  | V Q     |         |         |         |
  0+45       0.1108      2.38  |  VQ     |         |         |         |
  0+50       0.1265      2.28  |  VQ     |         |         |         |
  0+55       0.1413      2.15  |   Q     |         |         |         |
  1+ 0       0.1569      2.27  |   Q     |         |         |         |
  1+ 5       0.1754      2.70  |    Q    |         |         |         |
  1+10       0.1971      3.14  |     Q   |         |         |         |
  1+15       0.2195      3.26  |     Q   |         |         |         |
  1+20       0.2410      3.12  |     QV  |         |         |         |
  1+25       0.2647      3.44  |     Q V |         |         |         |
  1+30       0.2940      4.25  |       QV|         |         |         |
  1+35       0.3233      4.25  |       Q V         |         |         |
  1+40       0.3525      4.24  |       Q |V        |         |         |
  1+45       0.3879      5.13  |         Q V       |         |         |
  1+50       0.4277      5.78  |         |Q V      |         |         |
  1+55       0.4659      5.55  |         |Q  V     |         |         |
  2+ 0       0.5032      5.42  |         Q    V    |         |         |
  2+ 5       0.5418      5.60  |         |Q    V   |         |         |
  2+10       0.5882      6.74  |         |  Q    V |         |         |
  2+15       0.6495      8.90  |         |      Q  V         |         |
  2+20       0.7107      8.88  |         |      Q  | V       |         |
  2+25       0.7823     10.40  |         |         Q   V     |         |
  2+30       0.8840     14.78  |         |         |      V Q|         |
  2+35       1.0019     17.12  |         |         |         |V  Q     |
  2+40       1.1166     16.65  |         |         |         |  QV     |
  2+45       1.1899     10.65  |         |         |Q        |      V  |
  2+50       1.2253      5.14  |         Q         |         |       V |
```

```
    2+55       1.2500      3.58  |      Q  |         |         |        V|
    3+ 0       1.2663      2.36  |   Q     |         |         |        V|
    3+ 5       1.2730      0.99  |Q        |         |         |        V|
    3+10       1.2751      0.30  Q         |         |         |        V|
    3+15       1.2759      0.12  Q         |         |         |        V|
    3+20       1.2763      0.05  Q         |         |         |        V|
    3+25       1.2763      0.01  Q         |         |         |         V
-------------------------------------------------------------------------
```

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

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Study date 10/11/23 File: QB100XUH3100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION - WATERSHED B
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 11.08(Ac.) = 0.017 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 11.08(Ac.) = 0.017 Sq. Mi.
Length along longest watercourse = 881.00(Ft.)
Length along longest watercourse measured to centroid = 378.00(Ft.)
Length along longest watercourse = 0.167 Mi.
Length along longest watercourse measured to centroid = 0.072 Mi.
Difference in elevation = 3.90(Ft.)
Slope along watercourse = 23.3734 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.049 Hr.
Lag time = 2.94 Min.
25% of lag time = 0.74 Min.
40% of lag time = 1.18 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.08	0.80	8.86

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.08	2.00	22.16

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 2.000(In)

Point rain (area averaged) = 2.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.080	58.19	0.500

Total Area Entered = 11.08(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
58.2	58.2	0.488	0.500	0.269	1.000	0.269
					Sum (F) =	0.269

Area averaged mean soil loss (F) (In/Hr) = 0.269
Minimum soil loss rate ((In/Hr)) = 0.134
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	169.941	37.677	4.207
2	0.167	339.883	45.521	5.083
3	0.250	509.824	10.142	1.133
4	0.333	679.765	4.262	0.476
5	0.417	849.706	2.398	0.268
			Sum = 100.000	Sum= 11.167

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.312	(0.269)	0.156	0.156
2	0.17	1.30	0.312	(0.269)	0.156	0.156
3	0.25	1.10	0.264	(0.269)	0.132	0.132
4	0.33	1.50	0.360	(0.269)	0.180	0.180
5	0.42	1.50	0.360	(0.269)	0.180	0.180
6	0.50	1.80	0.432	(0.269)	0.216	0.216
7	0.58	1.50	0.360	(0.269)	0.180	0.180
8	0.67	1.80	0.432	(0.269)	0.216	0.216
9	0.75	1.80	0.432	(0.269)	0.216	0.216
10	0.83	1.50	0.360	(0.269)	0.180	0.180
11	0.92	1.60	0.384	(0.269)	0.192	0.192
12	1.00	1.80	0.432	(0.269)	0.216	0.216
13	1.08	2.20	0.528	(0.269)	0.264	0.264
14	1.17	2.20	0.528	(0.269)	0.264	0.264
15	1.25	2.20	0.528	(0.269)	0.264	0.264
16	1.33	2.00	0.480	(0.269)	0.240	0.240
17	1.42	2.60	0.624	0.269	(0.312)	0.355
18	1.50	2.70	0.648	0.269	(0.324)	0.379
19	1.58	2.40	0.576	0.269	(0.288)	0.307
20	1.67	2.70	0.648	0.269	(0.324)	0.379
21	1.75	3.30	0.792	0.269	(0.396)	0.523
22	1.83	3.10	0.744	0.269	(0.372)	0.475
23	1.92	2.90	0.696	0.269	(0.348)	0.427
24	2.00	3.00	0.720	0.269	(0.360)	0.451
25	2.08	3.10	0.744	0.269	(0.372)	0.475
26	2.17	4.20	1.008	0.269	(0.504)	0.739
27	2.25	5.00	1.200	0.269	(0.600)	0.931
28	2.33	3.50	0.840	0.269	(0.420)	0.571
29	2.42	6.80	1.632	0.269	(0.816)	1.363
30	2.50	7.30	1.752	0.269	(0.876)	1.483
31	2.58	8.20	1.968	0.269	(0.984)	1.699
32	2.67	5.90	1.416	0.269	(0.708)	1.147
33	2.75	2.00	0.480	(0.269)	0.240	0.240
34	2.83	1.80	0.432	(0.269)	0.216	0.216
35	2.92	1.80	0.432	(0.269)	0.216	0.216
36	3.00	0.60	0.144	(0.269)	0.072	0.072
		(Loss Rate Not Used)				
Sum =		100.0			Sum =	15.7

Flood volume = Effective rainfall 1.31(In)
times area 11.1(Ac.)/[(In)/(Ft.)] = 1.2(Ac.Ft)
Total soil loss = 0.69(In)
Total soil loss = 0.638(Ac.Ft)

```
      Total rainfall =      2.00(In)
      Flood volume =       52637.0 Cubic Feet
      Total soil loss =       27799.9 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     16.763(CFS)
      ---------------------------------------------------------------------
      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          3 - 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        5.0      10.0      15.0      20.0
-------------------------------------------------------------------------
  0+ 5       0.0045      0.66  VQ        |         |         |         |
  0+10       0.0145      1.45  V Q       |         |         |         |
  0+15       0.0250      1.53  V  Q      |         |         |         |
  0+20       0.0366      1.68  |V Q      |         |         |         |
  0+25       0.0499      1.94  |V Q      |         |         |         |
  0+30       0.0646      2.13  | V Q     |         |         |         |
  0+35       0.0797      2.18  | V Q     |         |         |         |
  0+40       0.0948      2.20  |  VQ     |         |         |         |
  0+45       0.1111      2.36  |  VQ     |         |         |         |
  0+50       0.1266      2.24  |   Q     |         |         |         |
  0+55       0.1411      2.12  |   Q     |         |         |         |
  1+ 0       0.1566      2.25  |   QV    |         |         |         |
  1+ 5       0.1744      2.57  |    Q    |         |         |         |
  1+10       0.1939      2.84  |    QV   |         |         |         |
  1+15       0.2139      2.91  |    Q V  |         |         |         |
  1+20       0.2334      2.84  |    Q V  |         |         |         |
  1+25       0.2556      3.21  |     Q V |         |         |         |
  1+30       0.2822      3.87  |      Q V|         |         |         |
  1+35       0.3085      3.81  |      Q  V         |         |         |
  1+40       0.3348      3.82  |      Q  |V        |         |         |
  1+45       0.3676      4.76  |        Q| V       |         |         |
  1+50       0.4043      5.34  |         Q  V      |         |         |
  1+55       0.4393      5.07  |         Q   V     |         |         |
  2+ 0       0.4734      4.96  |        Q|    V    |         |         |
  2+ 5       0.5089      5.15  |         Q     V   |         |         |
  2+10       0.5528      6.37  |         | Q     V |         |         |
  2+15       0.6116      8.55  |         |      Q  V         |         |
  2+20       0.6690      8.33  |         |     Q   | V       |         |
  2+25       0.7391     10.18  |         |         Q   V     |         |
  2+30       0.8387     14.47  |         |           |      VQ |         |
  2+35       0.9542     16.76  |         |           |         |V Q      |
  2+40       1.0640     15.95  |         |           |         |Q   V    |
  2+45       1.1318      9.84  |         |         Q |         |      V  |
  2+50       1.1637      4.64  |        Q|           |         |       V |
  2+55       1.1863      3.28  |     Q   |           |         |        V|
```

```
    3+ 0       1.2006      2.07  |   Q     |         |         |        V|
    3+ 5       1.2059      0.78  |Q        |         |         |        V|
    3+10       1.2076      0.24  Q         |         |         |        V|
    3+15       1.2082      0.09  Q         |         |         |        V|
    3+20       1.2084      0.02  Q         |         |         |         V
---------------------------------------------------------------------------
```

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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100-YEAR, 3 HOUR STORM EVENT ANALYSIS - WATERSHED A

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

English Units used in output format

Drainage Area = 12.14(Ac.) = 0.019 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 12.14(Ac.) = 0.019 Sq. Mi.
Length along longest watercourse = 1286.00(Ft.)
Length along longest watercourse measured to centroid = 1036.00(Ft.)
Length along longest watercourse = 0.244 Mi.
Length along longest watercourse measured to centroid = 0.196 Mi.
Difference in elevation = 14.28(Ft.)
Slope along watercourse = 58.6302 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.052 Hr.
Lag time = 3.14 Min.
25% of lag time = 0.78 Min.
40% of lag time = 1.26 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
12.14	0.80	9.71

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
12.14	2.00	24.28

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 2.000(In)

Point rain (area averaged) = 2.000(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 2.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
12.140	65.50	0.900

Total Area Entered = 12.14(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
65.5	65.5	0.411	0.900	0.078	1.000	0.078
					Sum (F) =	0.078

Area averaged mean soil loss (F) (In/Hr) = 0.078
Minimum soil loss rate ((In/Hr)) = 0.039
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	159.336	35.360	4.326
2	0.167	318.671	46.318	5.667
3	0.250	478.007	10.666	1.305
4	0.333	637.342	4.600	0.563
5	0.417	796.678	2.225	0.272
6	0.500	956.014	0.832	0.102

Sum = 100.000 Sum= 12.235

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.312	(0.078)	0.056	0.256
2	0.17	1.30	0.312	(0.078)	0.056	0.256
3	0.25	1.10	0.264	(0.078)	0.048	0.216
4	0.33	1.50	0.360	(0.078)	0.065	0.295
5	0.42	1.50	0.360	(0.078)	0.065	0.295
6	0.50	1.80	0.432	(0.078)	0.078	0.354
7	0.58	1.50	0.360	(0.078)	0.065	0.295
8	0.67	1.80	0.432	(0.078)	0.078	0.354
9	0.75	1.80	0.432	(0.078)	0.078	0.354
10	0.83	1.50	0.360	(0.078)	0.065	0.295
11	0.92	1.60	0.384	(0.078)	0.069	0.315
12	1.00	1.80	0.432	(0.078)	0.078	0.354
13	1.08	2.20	0.528	0.078	(0.095)	0.450
14	1.17	2.20	0.528	0.078	(0.095)	0.450
15	1.25	2.20	0.528	0.078	(0.095)	0.450
16	1.33	2.00	0.480	0.078	(0.086)	0.402
17	1.42	2.60	0.624	0.078	(0.112)	0.546
18	1.50	2.70	0.648	0.078	(0.117)	0.570
19	1.58	2.40	0.576	0.078	(0.104)	0.498
20	1.67	2.70	0.648	0.078	(0.117)	0.570
21	1.75	3.30	0.792	0.078	(0.143)	0.714
22	1.83	3.10	0.744	0.078	(0.134)	0.666
23	1.92	2.90	0.696	0.078	(0.125)	0.618
24	2.00	3.00	0.720	0.078	(0.130)	0.642
25	2.08	3.10	0.744	0.078	(0.134)	0.666
26	2.17	4.20	1.008	0.078	(0.181)	0.930
27	2.25	5.00	1.200	0.078	(0.216)	1.122
28	2.33	3.50	0.840	0.078	(0.151)	0.762
29	2.42	6.80	1.632	0.078	(0.294)	1.554
30	2.50	7.30	1.752	0.078	(0.315)	1.674
31	2.58	8.20	1.968	0.078	(0.354)	1.890
32	2.67	5.90	1.416	0.078	(0.255)	1.338
33	2.75	2.00	0.480	0.078	(0.086)	0.402
34	2.83	1.80	0.432	(0.078)	0.078	0.354
35	2.92	1.80	0.432	(0.078)	0.078	0.354
36	3.00	0.60	0.144	(0.078)	0.026	0.118
		(Loss Rate Not Used)				
Sum =		100.0			Sum =	21.4

Flood volume = Effective rainfall 1.78(In)
times area 12.1(Ac.)/[(In)/(Ft.)] = 1.8(Ac.Ft)
Total soil loss = 0.22(In)

```
      Total soil loss =     0.221(Ac.Ft)
      Total rainfall =      2.00(In)
      Flood volume =       78514.3 Cubic Feet
      Total soil loss =        9617.5 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     20.529(CFS)
      ---------------------------------------------------------------------
      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          3 - H O U R    S T O R M
                     R u n o f f      H y d r o g r a p h
      ---------------------------------------------------------------------
                   Hydrograph in   5   Minute intervals ((CFS))

      ---------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0        7.5      15.0      22.5      30.0
-------------------------------------------------------------------------
  0+ 5       0.0076      1.11  VQ        |         |         |         |
  0+10       0.0252      2.56  V  Q      |         |         |         |
  0+15       0.0440      2.72  V  Q      |         |         |         |
  0+20       0.0645      2.98  |V Q      |         |         |         |
  0+25       0.0883      3.45  |V  Q     |         |         |         |
  0+30       0.1145      3.81  | V  Q    |         |         |         |
  0+35       0.1415      3.92  |  V Q    |         |         |         |
  0+40       0.1687      3.94  |  V Q    |         |         |         |
  0+45       0.1978      4.24  |   VQ    |         |         |         |
  0+50       0.2257      4.04  |    Q    |         |         |         |
  0+55       0.2519      3.81  |    Q    |         |         |         |
  1+ 0       0.2797      4.03  |    QV   |         |         |         |
  1+ 5       0.3118      4.67  |     Q   |         |         |         |
  1+10       0.3480      5.26  |      Q  |         |         |         |
  1+15       0.3852      5.40  |      QV |         |         |         |
  1+20       0.4214      5.26  |      Q V|         |         |         |
  1+25       0.4603      5.64  |      Q  V         |         |         |
  1+30       0.5051      6.51  |       Q |V        |         |         |
  1+35       0.5499      6.49  |       Q | V       |         |         |
  1+40       0.5946      6.50  |       Q |  V      |         |         |
  1+45       0.6461      7.48  |        Q|   V     |         |         |
  1+50       0.7024      8.17  |         Q    V    |         |         |
  1+55       0.7568      7.90  |         Q     V   |         |         |
  2+ 0       0.8102      7.76  |         Q      V  |         |         |
  2+ 5       0.8650      7.96  |         Q        V|         |         |
  2+10       0.9286      9.24  |         | Q       V         |         |
  2+15       1.0085     11.60  |         |    Q    | V       |         |
  2+20       1.0876     11.49  |         |    Q    |   V     |         |
  2+25       1.1791     13.28  |         |      Q  |     V   |         |
  2+30       1.3031     18.00  |         |         |   Q   V |         |
  2+35       1.4445     20.53  |         |         |      Q  | V       |
  2+40       1.5814     19.89  |         |         |     Q   |    V    |
  2+45       1.6726     13.24  |         |      Q  |         |      V  |
  2+50       1.7224      7.24  |        Q|         |         |       V |
```

```
    2+55       1.7603      5.50  |      Q  |         |         |        V|
    3+ 0       1.7863      3.77  |    Q    |         |         |        V|
    3+ 5       1.7971      1.58  | Q       |         |         |        V|
    3+10       1.8005      0.49  Q         |         |         |        V|
    3+15       1.8019      0.20  Q         |         |         |        V|
    3+20       1.8024      0.07  Q         |         |         |        V|
    3+25       1.8024      0.01  Q         |         |         |        V|
-------------------------------------------------------------------------
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U n i t H y d r o g r a p h A n a l y s i s

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100-YEAR, 3 HOUR STORM EVENT ANALYSIS - WATERSHED B

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

English Units used in output format

Drainage Area = 10.13(Ac.) = 0.016 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 10.13(Ac.) = 0.016 Sq. Mi.
Length along longest watercourse = 1196.00(Ft.)
Length along longest watercourse measured to centroid = 993.00(Ft.)
Length along longest watercourse = 0.227 Mi.
Length along longest watercourse measured to centroid = 0.188 Mi.
Difference in elevation = 14.05(Ft.)
Slope along watercourse = 62.0268 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.050 Hr.
Lag time = 2.97 Min.
25% of lag time = 0.74 Min.
40% of lag time = 1.19 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
10.13	0.80	8.10

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
10.13	2.00	20.26

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 2.000(In)

Point rain (area averaged) = 2.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 2.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
10.130	58.70	0.900

Total Area Entered = 10.13(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
58.7	58.7	0.483	0.900	0.092	1.000	0.092
					Sum (F) =	0.092

Area averaged mean soil loss (F) (In/Hr) = 0.092
Minimum soil loss rate ((In/Hr)) = 0.046
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	168.240	37.316	3.810
2	0.167	336.480	45.647	4.660
3	0.250	504.720	10.225	1.044
4	0.333	672.960	4.317	0.441
5	0.417	841.200	2.495	0.255
			Sum = 100.000	Sum= 10.209

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.312	(0.092)	0.056	0.256
2	0.17	1.30	0.312	(0.092)	0.056	0.256
3	0.25	1.10	0.264	(0.092)	0.048	0.216
4	0.33	1.50	0.360	(0.092)	0.065	0.295
5	0.42	1.50	0.360	(0.092)	0.065	0.295
6	0.50	1.80	0.432	(0.092)	0.078	0.354
7	0.58	1.50	0.360	(0.092)	0.065	0.295
8	0.67	1.80	0.432	(0.092)	0.078	0.354
9	0.75	1.80	0.432	(0.092)	0.078	0.354
10	0.83	1.50	0.360	(0.092)	0.065	0.295
11	0.92	1.60	0.384	(0.092)	0.069	0.315
12	1.00	1.80	0.432	(0.092)	0.078	0.354
13	1.08	2.20	0.528	0.092	(0.095)	0.436
14	1.17	2.20	0.528	0.092	(0.095)	0.436
15	1.25	2.20	0.528	0.092	(0.095)	0.436
16	1.33	2.00	0.480	(0.092)	0.086	0.394
17	1.42	2.60	0.624	0.092	(0.112)	0.532
18	1.50	2.70	0.648	0.092	(0.117)	0.556
19	1.58	2.40	0.576	0.092	(0.104)	0.484
20	1.67	2.70	0.648	0.092	(0.117)	0.556
21	1.75	3.30	0.792	0.092	(0.143)	0.700
22	1.83	3.10	0.744	0.092	(0.134)	0.652
23	1.92	2.90	0.696	0.092	(0.125)	0.604
24	2.00	3.00	0.720	0.092	(0.130)	0.628
25	2.08	3.10	0.744	0.092	(0.134)	0.652
26	2.17	4.20	1.008	0.092	(0.181)	0.916
27	2.25	5.00	1.200	0.092	(0.216)	1.108
28	2.33	3.50	0.840	0.092	(0.151)	0.748
29	2.42	6.80	1.632	0.092	(0.294)	1.540
30	2.50	7.30	1.752	0.092	(0.315)	1.660
31	2.58	8.20	1.968	0.092	(0.354)	1.876
32	2.67	5.90	1.416	0.092	(0.255)	1.324
33	2.75	2.00	0.480	(0.092)	0.086	0.394
34	2.83	1.80	0.432	(0.092)	0.078	0.354
35	2.92	1.80	0.432	(0.092)	0.078	0.354
36	3.00	0.60	0.144	(0.092)	0.026	0.118
		(Loss Rate Not Used)				
Sum =		100.0			Sum =	21.1

Flood volume = Effective rainfall 1.76(In)
times area 10.1(Ac.)/[(In)/(Ft.)] = 1.5(Ac.Ft)
Total soil loss = 0.24(In)
Total soil loss = 0.204(Ac.Ft)

Total rainfall = 2.00(In)
Flood volume = 64660.3 Cubic Feet
Total soil loss = 8880.3 Cubic Feet

Peak flow rate of this hydrograph = 17.112(CFS)

++

3 - 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 5.0 10.0 15.0 20.0
0+ 5	0.0067	0.98	VQ
0+10	0.0216	2.17	V Q
0+15	0.0374	2.29	V Q
0+20	0.0547	2.51	V Q
0+25	0.0747	2.91	V Q
0+30	0.0967	3.20	V Q
0+35	0.1192	3.27	V Q
0+40	0.1420	3.30	V Q
0+45	0.1664	3.54	V Q
0+50	0.1896	3.37	VQ
0+55	0.2114	3.18	VQ
1+ 0	0.2347	3.37	Q
1+ 5	0.2613	3.86	Q
1+10	0.2908	4.28	VQ
1+15	0.3210	4.39	Q
1+20	0.3504	4.27	QV
1+25	0.3822	4.62	QV
1+30	0.4188	5.32	QV
1+35	0.4552	5.28	Q V
1+40	0.4917	5.29	Q V
1+45	0.5340	6.15	Q V
1+50	0.5801	6.69	Q V
1+55	0.6244	6.44	Q V
2+ 0	0.6681	6.34	Q V
2+ 5	0.7130	6.51	Q V
2+10	0.7654	7.62	Q V
2+15	0.8316	9.61	Q V
2+20	0.8965	9.42	Q V
2+25	0.9729	11.09	Q V
2+30	1.0762	15.01	VQ
2+35	1.1941	17.11	V Q
2+40	1.3070	16.40	Q V
2+45	1.3811	10.76	Q V
2+50	1.4212	5.82	Q V
2+55	1.4520	4.47	Q V

```
    3+ 0       1.4726      2.98  |    Q    |         |         |        V|
    3+ 5       1.4807      1.18  | Q       |         |         |        V|
    3+10       1.4832      0.37  Q         |         |         |        V|
    3+15       1.4842      0.14  Q         |         |         |        V|
    3+20       1.4844      0.03  Q         |         |         |        V|
-------------------------------------------------------------------------
```

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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION - WATERSHED A
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 11.21(Ac.) = 0.018 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 11.21(Ac.) = 0.018 Sq. Mi.
Length along longest watercourse = 894.00(Ft.)
Length along longest watercourse measured to centroid = 600.00(Ft.)
Length along longest watercourse = 0.169 Mi.
Length along longest watercourse measured to centroid = 0.114 Mi.
Difference in elevation = 5.90(Ft.)
Slope along watercourse = 34.8456 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.054 Hr.
Lag time = 3.27 Min.
25% of lag time = 0.82 Min.
40% of lag time = 1.31 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.21	0.50	5.61

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.21	1.20	13.45

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.200(In)

Point rain (area averaged) = 1.200(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.200(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.210	64.40	0.500

Total Area Entered = 11.21(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
64.4	64.4	0.422	0.500	0.232	1.000	0.232
					Sum (F) =	0.232

Area averaged mean soil loss (F) (In/Hr) = 0.232
Minimum soil loss rate ((In/Hr)) = 0.116
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	152.961	33.884	3.828
2	0.167	305.923	46.792	5.286
3	0.250	458.884	11.012	1.244
4	0.333	611.845	4.794	0.542

5	0.417	764.807	2.382	0.269
6	0.500	917.768	1.136	0.128
			Sum = 100.000 Sum=	11.298

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	4.20	0.605	0.232	(0.302)	0.372
2	0.17	4.30	0.619	0.232	(0.310)	0.387
3	0.25	5.00	0.720	0.232	(0.360)	0.488
4	0.33	5.00	0.720	0.232	(0.360)	0.488
5	0.42	5.80	0.835	0.232	(0.418)	0.603
6	0.50	6.50	0.936	0.232	(0.468)	0.704
7	0.58	7.40	1.065	0.232	(0.533)	0.833
8	0.67	8.60	1.238	0.232	(0.619)	1.006
9	0.75	12.30	1.771	0.232	(0.886)	1.539
10	0.83	29.10	4.190	0.232	(2.095)	3.958
11	0.92	6.80	0.979	0.232	(0.490)	0.747
12	1.00	5.00	0.720	0.232	(0.360)	0.488
		(Loss Rate Not Used)				
Sum =		100.0			Sum =	11.6

Flood volume = Effective rainfall 0.97(In)
times area 11.2(Ac.)/[(In)/(Ft.)] = 0.9(Ac.Ft)
Total soil loss = 0.23(In)
Total soil loss = 0.217(Ac.Ft)
Total rainfall = 1.20(In)
Flood volume = 39370.4 Cubic Feet
Total soil loss = 9455.4 Cubic Feet

Peak flow rate of this hydrograph = 26.567(CFS)

++

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

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	7.5	15.0	22.5	30.0
0+ 5	0.0098	1.43	VQ				
0+10	0.0336	3.45	V Q				
0+15	0.0637	4.38	V Q				
0+20	0.0991	5.13	V Q				
0+25	0.1390	5.80	VQ				
0+30	0.1866	6.91	VQ				

```
    0+35       0.2424      8.11  |         Q         |         |         |
    0+40       0.3089      9.66  |         | QV      |         |         |
    0+45       0.3975     12.86  |         |      Q  |         |         |
    0+50       0.5715     25.27  |         |         |    V    |  Q      |
    0+55       0.7544     26.57  |         |         |         |  V Q    |
    1+ 0       0.8368     11.95  |         |    Q    |         |      V  |
    1+ 5       0.8795      6.20  |       Q |         |         |       V |
    1+10       0.8951      2.27  |  Q      |         |         |        V|
    1+15       0.9018      0.97  |Q        |         |         |        V|
    1+20       0.9034      0.23  Q         |         |         |        V|
    1+25       0.9038      0.06  Q         |         |         |        V|
-------------------------------------------------------------------------
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U n i t H y d r o g r a p h A n a l y s i s

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION - WATERSHED B
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 11.08(Ac.) = 0.017 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 11.08(Ac.) = 0.017 Sq. Mi.
Length along longest watercourse = 881.00(Ft.)
Length along longest watercourse measured to centroid = 378.00(Ft.)
Length along longest watercourse = 0.167 Mi.
Length along longest watercourse measured to centroid = 0.072 Mi.
Difference in elevation = 3.90(Ft.)
Slope along watercourse = 23.3734 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.049 Hr.
Lag time = 2.94 Min.
25% of lag time = 0.74 Min.
40% of lag time = 1.18 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.08	0.50	5.54

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
11.08	1.21	13.43

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.212(In)

Point rain (area averaged) = 1.212(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.212(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
11.080	58.19	0.500

Total Area Entered = 11.08(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
58.2	58.2	0.488	0.500	0.269	1.000	0.269
					Sum (F) =	0.269

Area averaged mean soil loss (F) (In/Hr) = 0.269
Minimum soil loss rate ((In/Hr)) = 0.134
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	169.941	37.677	4.207
2	0.167	339.883	45.521	5.083
3	0.250	509.824	10.142	1.133
4	0.333	679.765	4.262	0.476

```
          5   0.417        849.706          2.398              0.268
                                      Sum = 100.000   Sum=      11.167
-----------------------------------------------------------------------
```

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	4.20	0.611	0.269	(0.305)	0.342
2	0.17	4.30	0.625	0.269	(0.313)	0.357
3	0.25	5.00	0.727	0.269	(0.364)	0.458
4	0.33	5.00	0.727	0.269	(0.364)	0.458
5	0.42	5.80	0.843	0.269	(0.422)	0.575
6	0.50	6.50	0.945	0.269	(0.473)	0.677
7	0.58	7.40	1.076	0.269	(0.538)	0.807
8	0.67	8.60	1.251	0.269	(0.625)	0.982
9	0.75	12.30	1.789	0.269	(0.894)	1.520
10	0.83	29.10	4.232	0.269	(2.116)	3.963
11	0.92	6.80	0.989	0.269	(0.494)	0.720
12	1.00	5.00	0.727	0.269	(0.364)	0.458
		(Loss Rate Not Used)				
Sum =		100.0			Sum =	11.3

```
   Flood volume = Effective rainfall      0.94(In)
    times area      11.1(Ac.)/[(In)/(Ft.)] =       0.9(Ac.Ft)
   Total soil loss =      0.27(In)
   Total soil loss =     0.248(Ac.Ft)
   Total rainfall =      1.21(In)
   Flood volume =       37936.9 Cubic Feet
   Total soil loss =       10805.4 Cubic Feet
   ---------------------------------------------------------------------
    Peak flow rate of this hydrograph =     26.092(CFS)
   ---------------------------------------------------------------------
   +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                       1 - H O U R    S T O R M
                  R u n o f f      H y d r o g r a p h
   ---------------------------------------------------------------------
               Hydrograph in   5   Minute intervals ((CFS))

   ---------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0        7.5      15.0      22.5      30.0
---------------------------------------------------------------------------
  0+ 5       0.0099      1.44  VQ        |         |         |         |
  0+10       0.0322      3.24  |V  Q     |         |         |         |
  0+15       0.0607      4.13  | V  Q    |         |         |         |
  0+20       0.0940      4.83  |   V Q   |         |         |         |
  0+25       0.1321      5.53  |     VQ  |         |         |         |
  0+30       0.1775      6.60  |       Q |         |         |         |
  0+35       0.2315      7.83  |         Q         |         |         |
```

```
    0+40       0.2962      9.40  |          | QV       |          |          |
    0+45       0.3843     12.78  |          |      Q   |          |          |
    0+50       0.5640     26.09  |          |          |    V     |   Q      |
    0+55       0.7403     25.59  |          |          |          |  VQ      |
    1+ 0       0.8165     11.07  |          |   Q      |          |       V  |
    1+ 5       0.8540      5.44  |       Q  |          |          |         V|
    1+10       0.8672      1.92  | Q        |          |          |         V|
    1+15       0.8701      0.41  Q          |          |          |         V|
    1+20       0.8709      0.12  Q          |          |          |          V
---------------------------------------------------------------------------
```

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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100-YEAR, 1 HOUR STORM EVENT ANALYSIS - WATERSHED A

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

English Units used in output format

Drainage Area = 12.14(Ac.) = 0.019 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 12.14(Ac.) = 0.019 Sq. Mi.
Length along longest watercourse = 1286.00(Ft.)
Length along longest watercourse measured to centroid = 1036.00(Ft.)
Length along longest watercourse = 0.244 Mi.
Length along longest watercourse measured to centroid = 0.196 Mi.
Difference in elevation = 14.28(Ft.)
Slope along watercourse = 58.6302 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.052 Hr.
Lag time = 3.14 Min.
25% of lag time = 0.78 Min.
40% of lag time = 1.26 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
12.14	0.50	6.07

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
12.14	1.20	14.57

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.200(In)

Point rain (area averaged) = 1.200(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.200(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
12.140	65.50	0.900

Total Area Entered = 12.14(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
65.5	65.5	0.411	0.900	0.078	1.000	0.078
					Sum (F) =	0.078

Area averaged mean soil loss (F) (In/Hr) = 0.078
Minimum soil loss rate ((In/Hr)) = 0.039
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	159.336	35.360	4.326
2	0.167	318.671	46.318	5.667
3	0.250	478.007	10.666	1.305
4	0.333	637.342	4.600	0.563

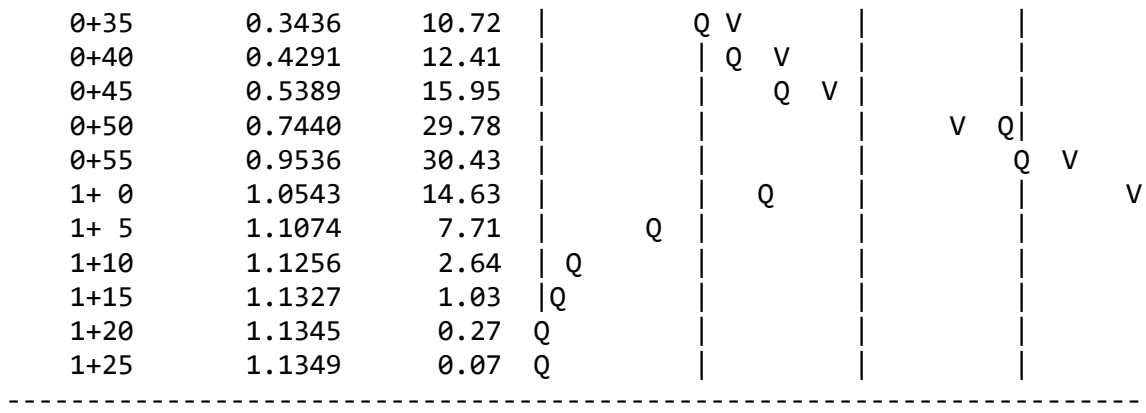
```
           5   0.417        796.678          2.225              0.272
           6   0.500        956.014          0.832              0.102
                                    Sum = 100.000   Sum=      12.235
-----------------------------------------------------------------------
```

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	4.20	0.605	0.078	(0.109)	0.527
2	0.17	4.30	0.619	0.078	(0.111)	0.541
3	0.25	5.00	0.720	0.078	(0.130)	0.642
4	0.33	5.00	0.720	0.078	(0.130)	0.642
5	0.42	5.80	0.835	0.078	(0.150)	0.757
6	0.50	6.50	0.936	0.078	(0.168)	0.858
7	0.58	7.40	1.065	0.078	(0.192)	0.987
8	0.67	8.60	1.238	0.078	(0.223)	1.160
9	0.75	12.30	1.771	0.078	(0.319)	1.693
10	0.83	29.10	4.190	0.078	(0.754)	4.112
11	0.92	6.80	0.979	0.078	(0.176)	0.901
12	1.00	5.00	0.720	0.078	(0.130)	0.642
		(Loss Rate Not Used)				
Sum =		100.0			Sum =	13.5

```
   Flood volume = Effective rainfall      1.12(In)
    times area      12.1(Ac.)/[(In)/(Ft.)] =       1.1(Ac.Ft)
   Total soil loss =      0.08(In)
   Total soil loss =     0.079(Ac.Ft)
   Total rainfall =      1.20(In)
   Flood volume =       49438.1 Cubic Feet
   Total soil loss =        3437.9 Cubic Feet
   ---------------------------------------------------------------------
    Peak flow rate of this hydrograph =     30.434(CFS)
   ---------------------------------------------------------------------
   +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                        1 - H O U R    S T O R M
                    R u n o f f      H y d r o g r a p h
   ---------------------------------------------------------------------
                Hydrograph in   5   Minute intervals ((CFS))

   ---------------------------------------------------------------------
 Time(h+m) Volume Ac.Ft   Q(CFS)  0       10.0      20.0      30.0      40.0
 ----------------------------------------------------------------------
   0+ 5       0.0157      2.28  V Q       |         |         |         |
   0+10       0.0524      5.33  |V   Q    |         |         |         |
   0+15       0.0974      6.53  |  V  Q   |         |         |         |
   0+20       0.1485      7.42  |    V Q  |         |         |         |
   0+25       0.2050      8.20  |      VQ |         |         |         |
   0+30       0.2698      9.41  |        Q|         |         |         |
```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0+40 0.4291 12.41
0+45 0.5389 15.95
0+50 0.7440 29.78
0+55 0.9536 30.43
1+ 0 1.0543 14.63
1+ 5 1.1074 7.71
1+10 1.1256 2.64
1+15 1.1327 1.03
1+20 1.1345 0.27
1+25 1.1349 0.07

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 10/06/23 File: Q100BUH1100.out

++

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100-YEAR, 1 HOUR STORM EVENT ANALYSIS - WATERSHED B

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

English Units used in output format

Drainage Area = 10.13(Ac.) = 0.016 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 10.13(Ac.) = 0.016 Sq. Mi.
Length along longest watercourse = 1196.00(Ft.)
Length along longest watercourse measured to centroid = 993.00(Ft.)
Length along longest watercourse = 0.227 Mi.
Length along longest watercourse measured to centroid = 0.188 Mi.
Difference in elevation = 14.05(Ft.)
Slope along watercourse = 62.0268 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.050 Hr.
Lag time = 2.97 Min.
25% of lag time = 0.74 Min.
40% of lag time = 1.19 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
10.13	0.50	5.07

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
10.13	1.12	11.35

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.120(In)

Point rain (area averaged) = 1.120(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 1.120(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
10.130	58.70	0.900

Total Area Entered = 10.13(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
58.7	58.7	0.483	0.900	0.092	1.000	0.092
					Sum (F) =	0.092

Area averaged mean soil loss (F) (In/Hr) = 0.092
Minimum soil loss rate ((In/Hr)) = 0.046
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	168.240	37.316	3.810
2	0.167	336.480	45.647	4.660
3	0.250	504.720	10.225	1.044
4	0.333	672.960	4.317	0.441

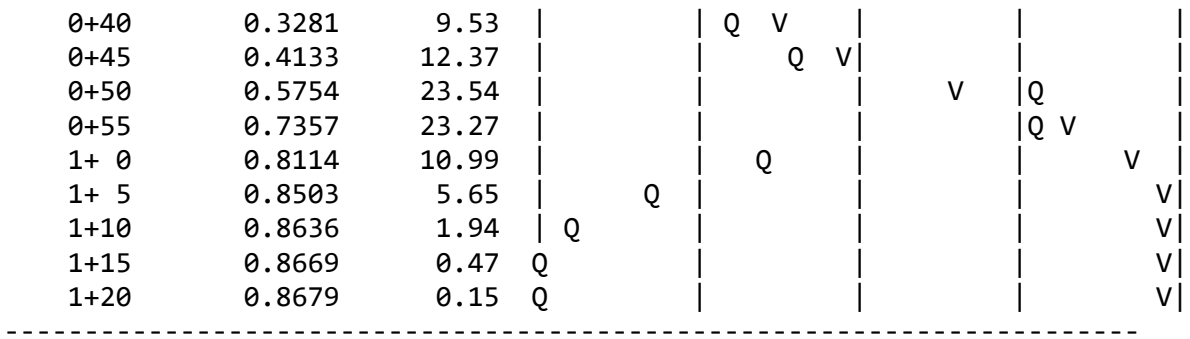
```
          5   0.417        841.200          2.495              0.255
                                      Sum = 100.000   Sum=      10.209
-----------------------------------------------------------------------
```

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	4.20	0.564	0.092	(0.102)	0.473
2	0.17	4.30	0.578	0.092	(0.104)	0.486
3	0.25	5.00	0.672	0.092	(0.121)	0.580
4	0.33	5.00	0.672	0.092	(0.121)	0.580
5	0.42	5.80	0.779	0.092	(0.140)	0.688
6	0.50	6.50	0.874	0.092	(0.157)	0.782
7	0.58	7.40	0.994	0.092	(0.179)	0.903
8	0.67	8.60	1.156	0.092	(0.208)	1.064
9	0.75	12.30	1.653	0.092	(0.298)	1.561
10	0.83	29.10	3.911	0.092	(0.704)	3.819
11	0.92	6.80	0.914	0.092	(0.164)	0.822
12	1.00	5.00	0.672	0.092	(0.121)	0.580
		(Loss Rate Not Used)				
Sum =		100.0			Sum =	12.3

```
   Flood volume = Effective rainfall      1.03(In)
    times area      10.1(Ac.)/[(In)/(Ft.)] =       0.9(Ac.Ft)
   Total soil loss =      0.09(In)
   Total soil loss =     0.078(Ac.Ft)
   Total rainfall =      1.12(In)
   Flood volume =       37804.4 Cubic Feet
   Total soil loss =        3376.4 Cubic Feet
   ---------------------------------------------------------------------
    Peak flow rate of this hydrograph =     23.544(CFS)
   ---------------------------------------------------------------------
   +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                       1 - H O U R    S T O R M
                   R u n o f f      H y d r o g r a p h
   ---------------------------------------------------------------------
               Hydrograph in   5   Minute intervals ((CFS))

   ---------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0        7.5      15.0      22.5      30.0
---------------------------------------------------------------------------
  0+ 5       0.0124      1.80  V Q       |         |         |         |
  0+10       0.0403      4.06  |V   Q    |         |         |         |
  0+15       0.0746      4.97  |  V  Q   |         |         |         |
  0+20       0.1134      5.63  |    V Q  |         |         |         |
  0+25       0.1565      6.27  |      VQ |         |         |         |
  0+30       0.2059      7.17  |        Q|         |         |         |
  0+35       0.2624      8.21  |         Q V       |         |         |
```


0+40 0.3281 9.53
0+45 0.4133 12.37
0+50 0.5754 23.54
0+55 0.7357 23.27
1+ 0 0.8114 10.99
1+ 5 0.8503 5.65
1+10 0.8636 1.94
1+15 0.8669 0.47
1+20 0.8679 0.15

SECTION 3 - REFERENCE DATA

USGS SOILS REPORT

PLATE D-4.1

INFILTRATION REPORT (EXCERPT)

CONTECH UNDERGROUND CHAMBER SYSTEM

DCV CALCULATIONS (WQMP)

PP190005 – HARVILL DISTRIBUTION CENTER OFFSITE DRAINAGE IMPROVEMENTS (HYDROLOGY MAPS)

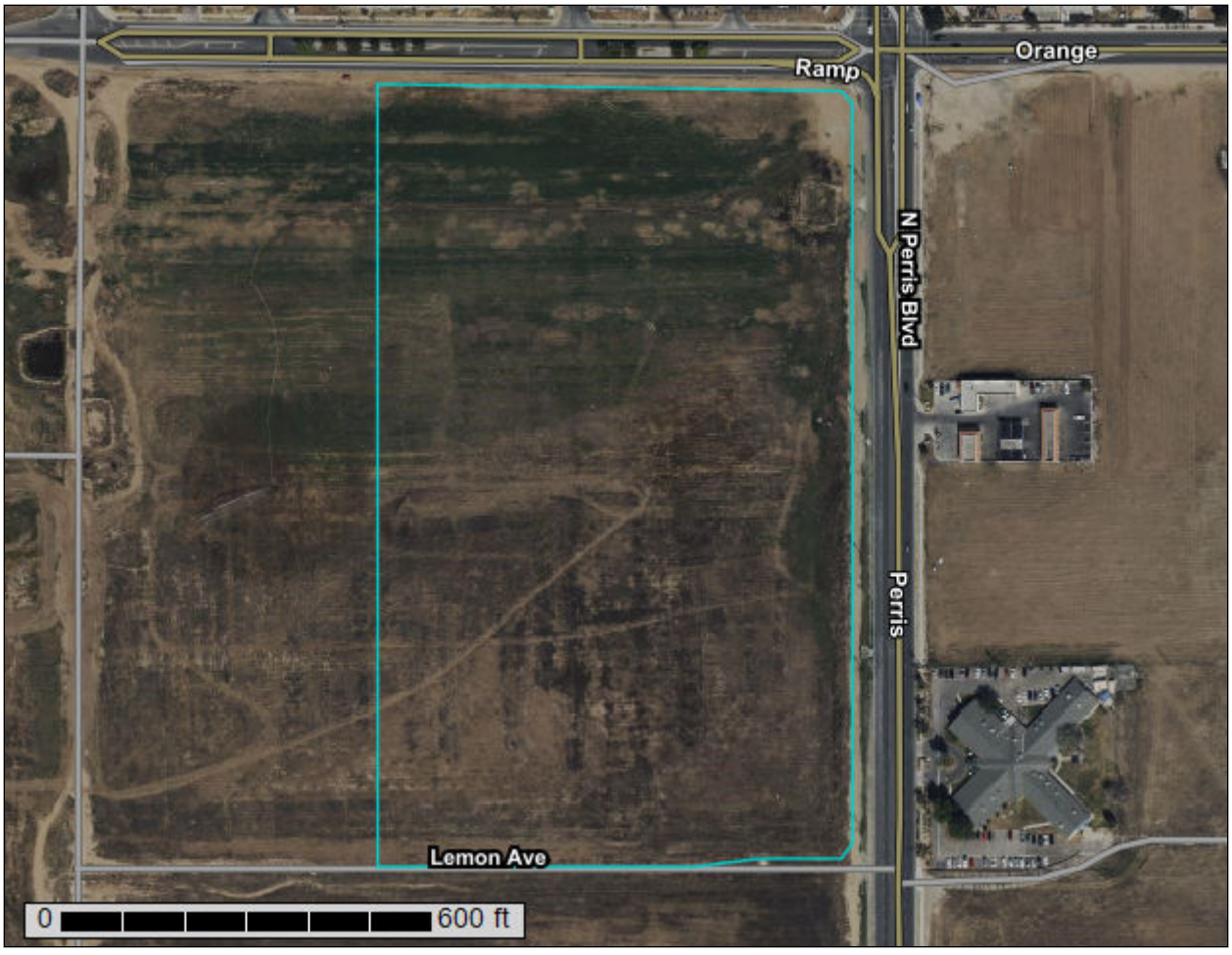
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Western Riverside Area, California



September 22, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

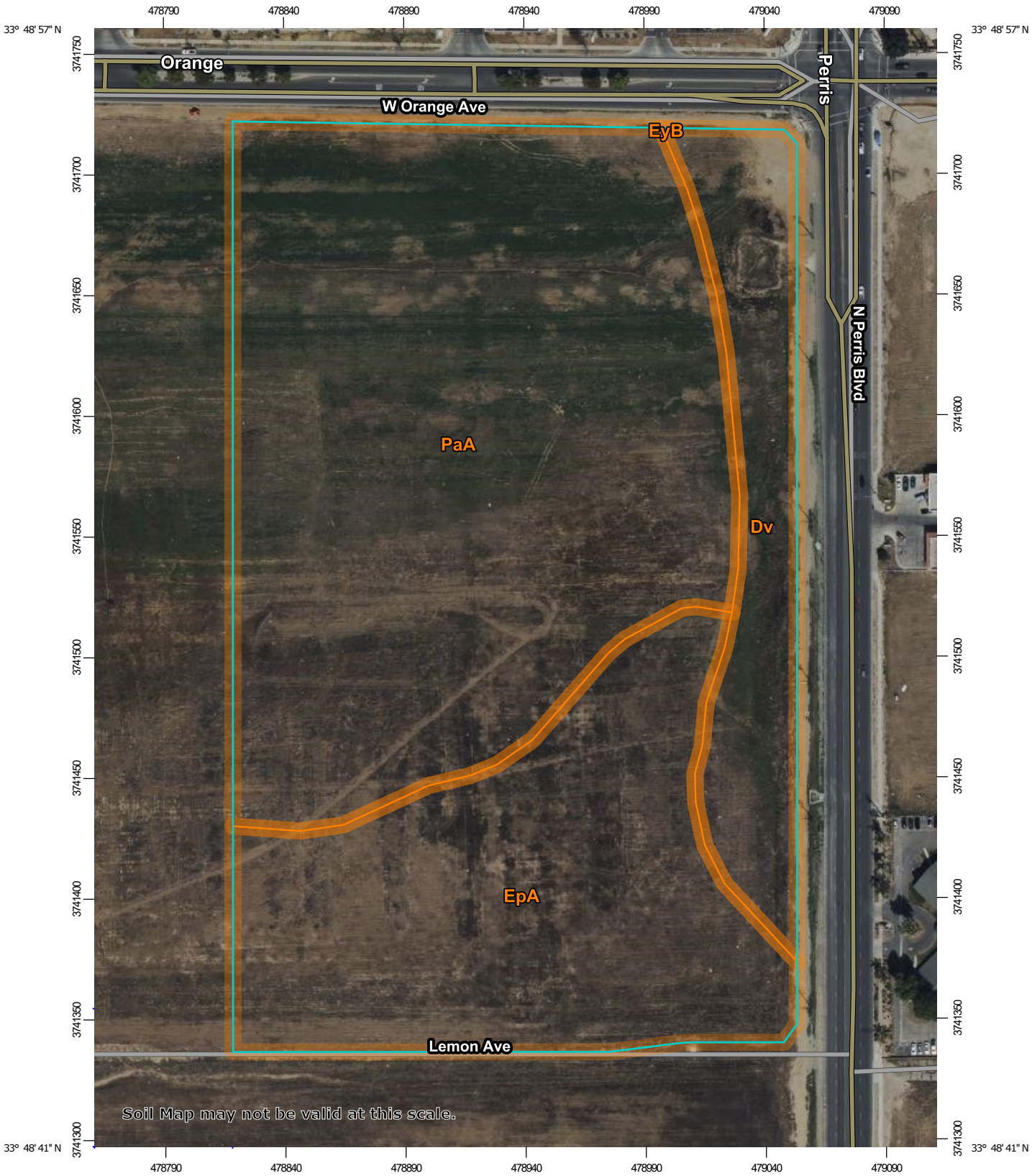
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:2,260 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 15, Sep 6, 2022

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

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Dv	Domino silt loam, saline-alkali	2.8	12.4%
EpA	Exeter sandy loam, deep, 0 to 2 percent slopes	6.7	29.9%
EyB	Exeter very fine sandy loam, deep, 0 to 5 percent slopes	0.0	0.0%
PaA	Pachappa fine sandy loam, 0 to 2 percent slopes	12.9	57.7%
Totals for Area of Interest		**22.3**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate

pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Western Riverside Area, California

Dv—Domino silt loam, saline-alkali

Map Unit Setting

National map unit symbol: hct8
Elevation: 1,000 to 1,800 feet
Mean annual precipitation: 12 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 230 to 280 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Domino

Setting

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

Typical profile

H1 - 0 to 14 inches: silt loam
H2 - 14 to 27 inches: silt loam
H3 - 27 to 36 inches: cemented
H4 - 36 to 63 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 20 to 40 inches to duripan
Drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Maximum salinity: Moderately saline to strongly saline (8.0 to 16.0 mmhos/cm)
Available water supply, 0 to 60 inches: Very low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): 3s
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: D
Ecological site: R019XD068CA - SILTY BASIN
Hydric soil rating: No

Minor Components

Chino
Percent of map unit: 10 percent
Hydric soil rating: No

Willows
Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed
Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

EpA—Exeter sandy loam, deep, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: hctk
Elevation: 300 to 700 feet
Mean annual precipitation: 7 to 15 inches
Mean annual air temperature: 64 degrees F
Frost-free period: 250 to 300 days
Farmland classification: Prime farmland if irrigated

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

Description of Exeter

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

Typical profile
H1 - 0 to 16 inches: sandy loam
H2 - 16 to 37 inches: sandy clay loam
H3 - 37 to 50 inches: indurated
H4 - 50 to 60 inches: stratified sandy loam to silt loam

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: 35 to 60 inches to duripan
Drainage class: Well drained
Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Ramona

Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

Monserate

Percent of map unit: 5 percent
Hydric soil rating: No

EyB—Exeter very fine sandy loam, deep, 0 to 5 percent slopes

Map Unit Setting

National map unit symbol: hctn
Elevation: 300 to 700 feet
Mean annual precipitation: 7 to 15 inches
Mean annual air temperature: 64 degrees F
Frost-free period: 250 to 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Exeter

Setting

Landform: Alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear

Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile

H1 - 0 to 16 inches: fine sandy loam
H2 - 16 to 37 inches: sandy clay loam
H3 - 37 to 50 inches: indurated
H4 - 50 to 60 inches: stratified sandy loam to silt loam

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: 35 to 60 inches to duripan
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Ramona

Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

Monserate

Percent of map unit: 5 percent
Hydric soil rating: No

PaA—Pachappa fine sandy loam, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hcxn
Elevation: 1,000 feet
Mean annual precipitation: 14 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 270 days

Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Pachappa

Setting

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

Typical profile

H1 - 0 to 20 inches: fine sandy loam
H2 - 20 to 63 inches: loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 5 percent
Maximum salinity: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: B
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield

Percent of map unit: 5 percent
Hydric soil rating: No

San emigdio

Percent of map unit: 5 percent
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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.

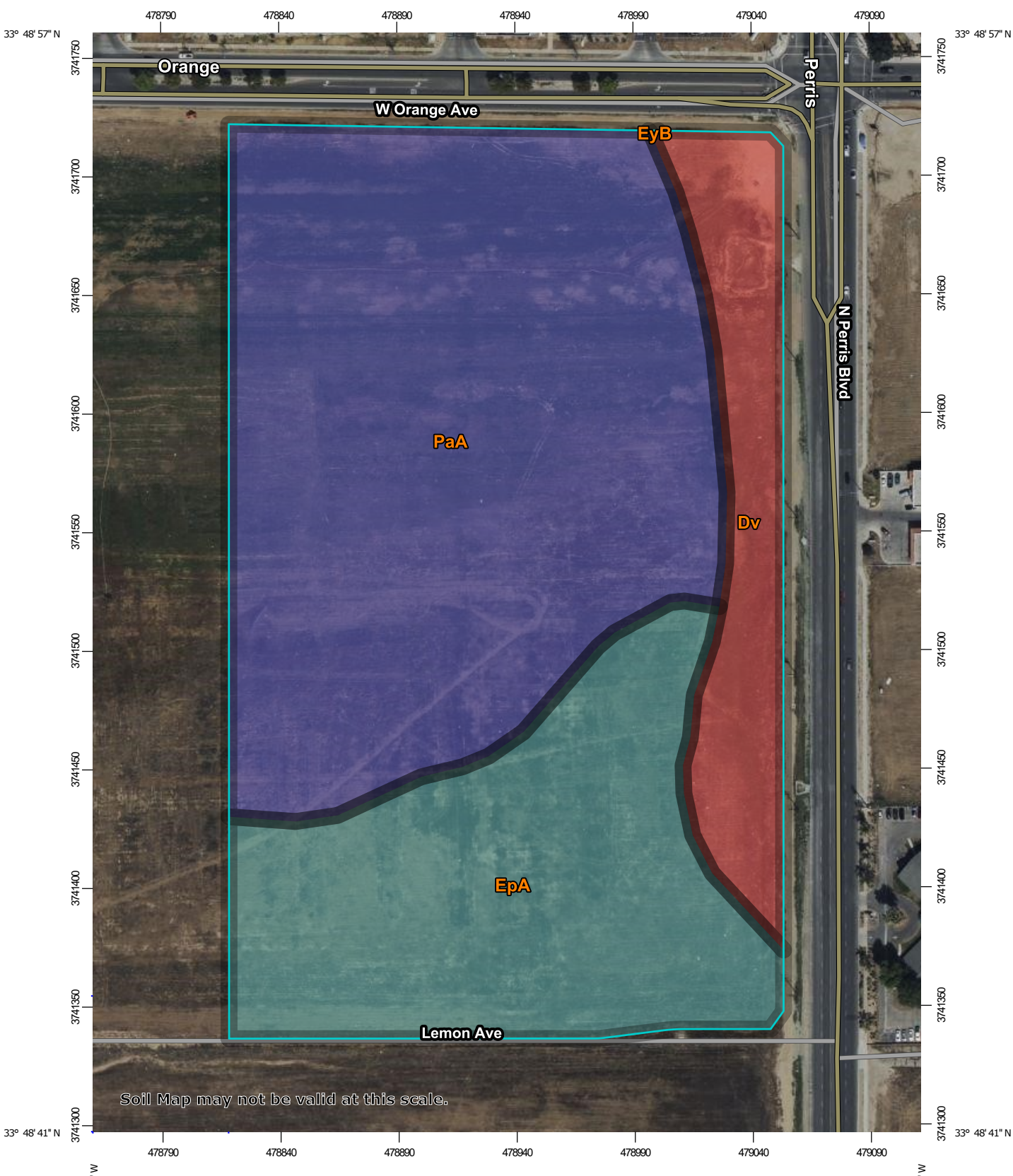
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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.

Custom Soil Resource Report
Map—Hydrologic Soil Group



Map Scale: 1:2,260 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

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 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 15, Sep 6, 2022

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

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

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.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
Dv	Domino silt loam, saline-alkali	D	2.8	12.4%
EpA	Exeter sandy loam, deep, 0 to 2 percent slopes	C	6.7	29.9%
EyB	Exeter very fine sandy loam, deep, 0 to 5 percent slopes	C	0.0	0.0%
PaA	Pachappa fine sandy loam, 0 to 2 percent slopes	B	12.9	57.7%
Totals for Area of Interest			**22.3**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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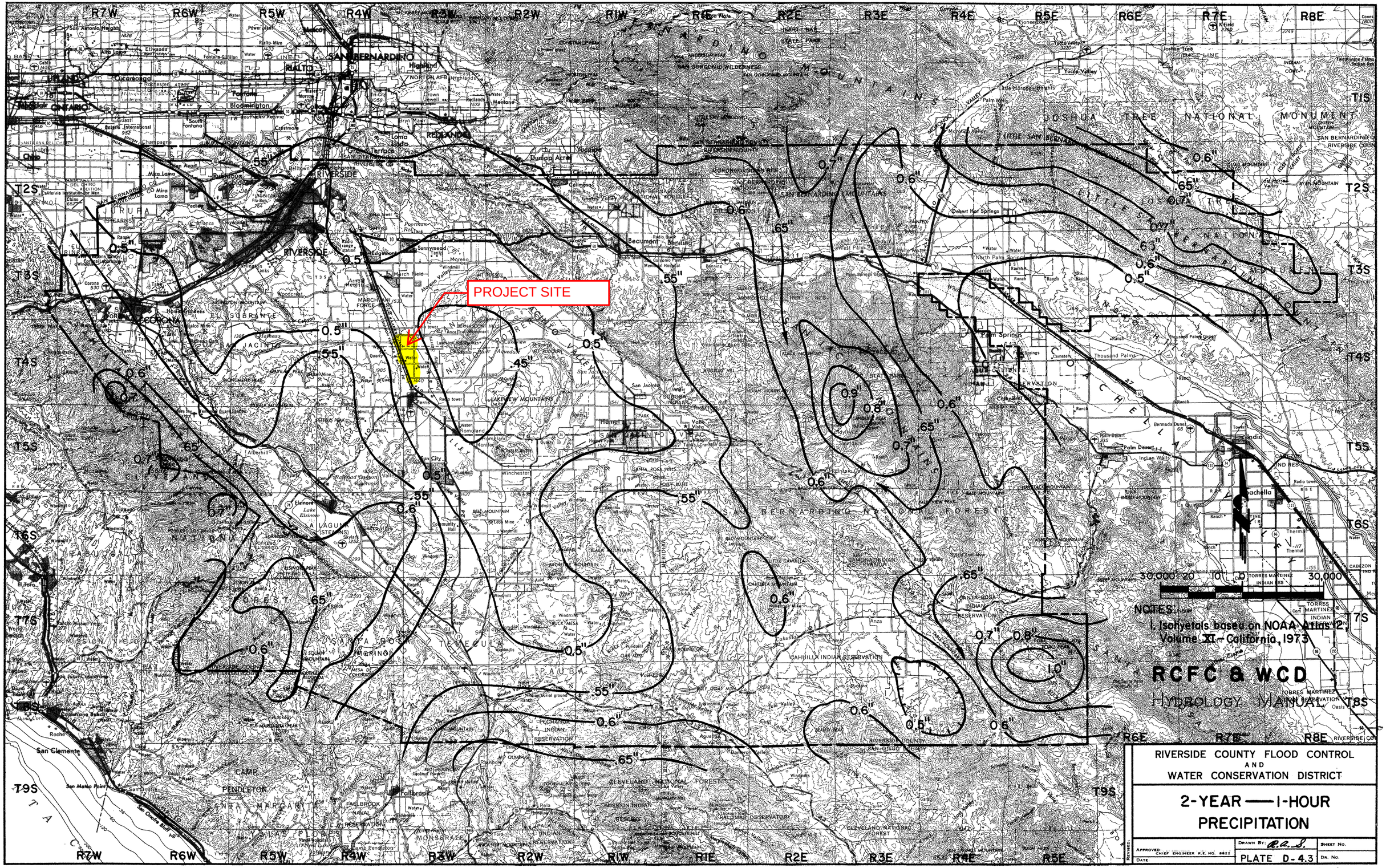
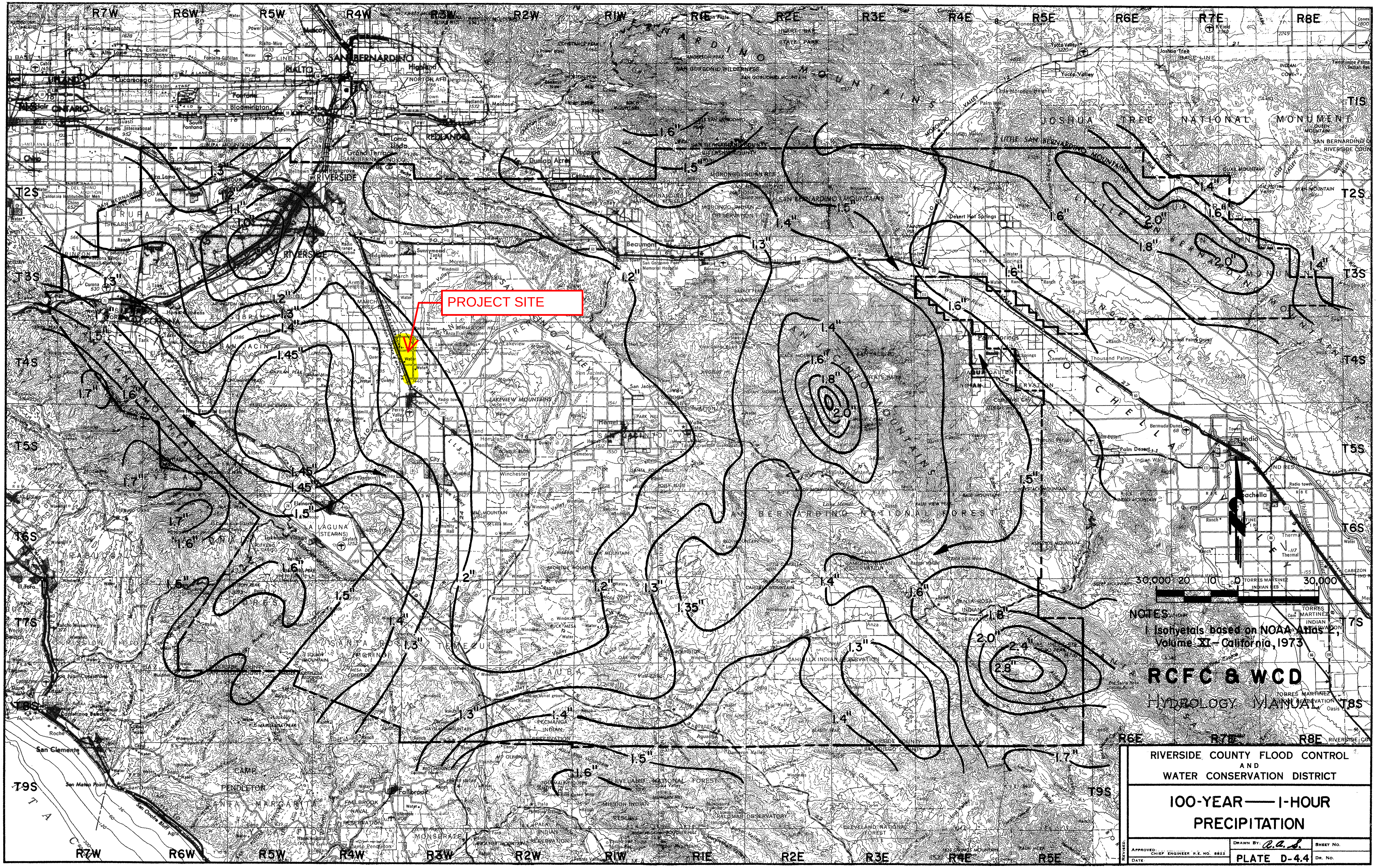
RAINFALL INTENSITY–INCHES PER HOUR

MIRA LOMA			MURRIETA - TEMECULA & RANCHO CALIFORNIA			NORCO			PALM SPRINGS			PERRIS VALLEY		
DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY	
	10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR
5	2.84	4.48	5	3.45	5.10	5	2.77	4.16	5	4.23	6.76	5	2.64	3.78
6	2.58	4.07	6	3.12	4.61	6	2.53	3.79	6	3.80	6.08	6	2.41	3.46
7	2.37	3.75	7	2.87	4.24	7	2.34	3.51	7	3.48	5.56	7	2.24	3.21
8	2.21	3.49	8	2.67	3.94	8	2.19	3.29	8	3.22	5.15	8	2.09	3.01
9	2.08	3.28	9	2.50	3.69	9	2.07	3.10	9	3.01	4.81	9	1.98	2.84
10	1.96	3.10	10	2.36	3.48	10	1.96	2.94	10	2.83	4.52	10	1.88	2.69
11	1.87	2.95	11	2.24	3.30	11	1.87	2.80	11	2.67	4.28	11	1.79	2.57
12	1.78	2.82	12	2.13	3.15	12	1.79	2.68	12	2.54	4.07	12	1.72	2.46
13	1.71	2.70	13	2.04	3.01	13	1.72	2.58	13	2.43	3.88	13	1.65	2.37
14	1.64	2.60	14	1.96	2.89	14	1.66	2.48	14	2.33	3.72	14	1.59	2.29
15	1.58	2.50	15	1.89	2.79	15	1.60	2.40	15	2.23	3.58	15	1.54	2.21
16	1.53	2.42	16	1.82	2.69	16	1.55	2.32	16	2.15	3.44	16	1.49	2.14
17	1.48	2.34	17	1.76	2.60	17	1.50	2.25	17	2.08	3.32	17	1.45	2.08
18	1.44	2.27	18	1.71	2.52	18	1.46	2.19	18	2.01	3.22	18	1.41	2.02
19	1.40	2.21	19	1.66	2.45	19	1.42	2.13	19	1.95	3.12	19	1.37	1.97
20	1.36	2.15	20	1.61	2.38	20	1.39	2.08	20	1.89	3.03	20	1.34	1.92
22	1.29	2.04	22	1.53	2.26	22	1.32	1.98	22	1.79	2.86	22	1.28	1.83
24	1.24	1.95	24	1.46	2.15	24	1.26	1.90	24	1.70	2.72	24	1.22	1.75
26	1.18	1.87	26	1.39	2.06	26	1.22	1.82	26	1.62	2.60	26	1.18	1.69
28	1.14	1.80	28	1.34	1.98	28	1.17	1.76	28	1.56	2.49	28	1.13	1.63
30	1.10	1.73	30	1.29	1.90	30	1.13	1.70	30	1.49	2.39	30	1.10	1.57
32	1.06	1.67	32	1.24	1.84	32	1.10	1.64	32	1.44	2.30	32	1.06	1.52
34	1.03	1.62	34	1.20	1.78	34	1.06	1.59	34	1.39	2.22	34	1.03	1.48
36	1.00	1.57	36	1.17	1.72	36	1.03	1.55	36	1.34	2.15	36	1.00	1.44
38	.97	1.53	38	1.13	1.67	38	1.01	1.51	38	1.30	2.09	38	.98	1.40
40	.94	1.49	40	1.10	1.62	40	.98	1.47	40	1.27	2.02	40	.95	1.37
45	.89	1.40	45	1.03	1.52	45	.92	1.39	45	1.18	1.89	45	.90	1.29
50	.84	1.32	50	.97	1.44	50	.88	1.31	50	1.11	1.78	50	.85	1.22
55	.80	1.26	55	.92	1.36	55	.84	1.25	55	1.05	1.68	55	.81	1.17
60	.76	1.20	60	.88	1.30	60	.80	1.20	60	1.00	1.60	60	.78	1.12
65	.73	1.15	65	.84	1.24	65	.77	1.15	65	.95	1.53	65	.75	1.08
70	.70	1.11	70	.81	1.19	70	.74	1.11	70	.91	1.46	70	.72	1.04
75	.68	1.07	75	.78	1.15	75	.72	1.07	75	.88	1.41	75	.70	1.00
80	.65	1.03	80	.75	1.11	80	.69	1.04	80	.85	1.35	80	.68	.97
85	.63	1.00	85	.73	1.07	85	.67	1.01	85	.82	1.31	85	.66	.94
SLOPE = .530			SLOPE = .550			SLOPE = .500			SLOPE = .580			SLOPE = .490		

STANDARD
INTENSITY–DURATION
CURVES DATA


PROJECT SITE
NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
2-YEAR — 1-HOUR PRECIPITATION
PLATE D-4.3
DRAWN BY: R.A.S.
APPROVED CHIEF ENGINEER R.E. NO. 8822
DATE
SHEET No.
DR. No.
REVISED:


PROJECT SITE
R7W R6W R5W R4W R3W R2W R1W R1E R2E R3E R4E R5E R6E R7E R8E
T1S T2S T3S T4S T5S T6S T7S T8S T9S
SAN BERNARDINO
RIVERSIDE
JOSHUA TREE NATIONAL MONUMENT
SAN BERNARDINO NATIONAL FOREST
CLEVELAND NATIONAL FOREST
1.0" 1.1" 1.2" 1.3" 1.35" 1.4" 1.45" 1.5" 1.6" 1.7" 1.8" 2.0" 2.4" 2.8"
30,000 20 10 0 30,000
NOTES
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
100-YEAR —— 1-HOUR
PRECIPITATION
APPROVED: CHIEF ENGINEER R.E. NO. 8822
DATE
REVISED
DRAWN BY: R.A.S.
SHEET NO.
PLATE D-4.4
DR. NO.

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

September 20, 2023

Howard Industrial Partners
1944 North Tustin Street, Suite 122
Orange, California 92865

Attention: Mr. Mike Tunney
Vice President

Project No.: **22G183-4**

Subject: **Results of Additional Infiltration Testing**
Harvest Landing Industrial Development
Indian Avenue and Orange Avenue
Perris, California

Reference: 1) Geotechnical Investigation, Proposed Harvest Landing Industrial Development, Indian Avenue and Orange Avenue, Perris, California, prepared for Howard Industrial Partners, by Southern California Geotechnical, Inc. (SCG), SCG Project No. 22G183-1, dated June 13, 2022.

2) Results of Infiltration Testing, Proposed Harvest Landing Industrial Development, Indian Avenue and Orange Avenue, Perris, California, prepared by Southern California Geotechnical, Inc. (SCG), SCG Project No. 22G183-2, dated July 1, 2022.

3) Geotechnical Investigation, Harvest Landing Industrial Development, Indian Avenue and Orange Avenue, Perris, California, prepared for Howard Industrial Partners, by Southern California Geotechnical, Inc. (SCG), SCG Project No. 22G183-3, dated September 21, 2023.

Mr. Tunney:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

Scope of Services

The scope of services performed for this project was in general accordance with our Proposal No. 23P306R, dated August 9, 2023. The scope of services included site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the on-site soils. The infiltration testing was performed in general accordance with the guidelines published in Riverside County – Low Impact Development BMP Design Handbook – Section 2.3 of Appendix A, prepared for the Riverside County Department of Environmental Health (RCDEH), dated December, 2013.

Site and Project Description

The site is located at the southwest corner of North Perris Boulevard and Orange Avenue in Perris, California. The site is bounded to the north by Orange Avenue, West Water Avenue, and vacant land, to the west by Interstate 215 Frontage Road and Freeway I-215, to the south by an existing commercial development and a vacant land, and to the east by an existing commercial development, North Perris Boulevard and Barrett Avenue. The western portion of the site is partially transected by Indian Avenue (trending north-south). Orange Avenue (trending east-west) separates the northern portion of the overall site (designated as Phase 2 on the site plans) from Phase 1 in the central to southern portions of the western portion of the overall site. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 in Appendix A of this report.

The site consists of several parcels, which total 214.82± acres in size. The west-central area of the site, is developed with four (4) single-family residences (SFRs) which range from approximately 1,200 to 6,160 ft² in size. The residences are of wood-frame and stucco construction and are assumed to be supported on conventional shallow foundations, with slab-on-grade floors. Ground surface cover surrounding the SFRs includes asphaltic concrete with Portland cement concrete driveways, exposed soil, and trees. The remaining areas of the site are vacant and undeveloped. Ground surface cover consists of exposed soil with sparse to moderate native grass and weed growth and occasional trees. A water pump is present approximately 200 feet south of the intersection of Perris Boulevard and Orange Avenue, within the site's boundary. A 3- to 4-foot deep drainage rut is present in the central-eastern area of the site, trending east-west between a dirt road located and the east boundary of the site. Many small stockpiles of plant material and woodchips are located along the eastern side of Indian Avenue, approximately 2 to 4-feet in height. Based on historic aerial photographs obtained from Google Earth, the site was previously used for farming activities. Due to previous tilling activities, the ground surface throughout the site is generally hummocky.

Detailed topographic information was obtained from the Exhibit A-Infiltration Testing Locations plan, prepared by FM Civil Engineers, Inc. Based on this plan, the overall site topography slopes downward to the east at a gradient of 1.5± percent.

Proposed Development

Based on a site plan prepared by RGA, the site will be developed with the following industrial/commercial buildings, located throughout the site.

Building Type	Building Name	Location	Size (ft²)
Industrial	1	Northwest	380,000
Industrial	2	West-Central	88,400
Industrial	3	West-Central	50,000
Industrial	4	Southwest	18,800

Distribution	5	Central	440,000
Commercial	Big Box Retail	Southeast	165,000
Commercial	Shopping Center	Northeast	150,000
Retail	Pad 1	Northeast	6,500
Retail	Pad 2	Northeast	6,500
Restaurant	Pad 3	East	2,305
Retail	Pad 4	East	9,000
Restaurant	Pad 5	Southeast	3,172

Building Nos. 1 through 4 - Industrial Buildings

Dock-high doors will be constructed along a portion of at least one building wall for each of the industrial buildings. The buildings will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete pavements in the loading dock areas, and limited areas of concrete flatwork and landscape planters throughout.

Detailed structural information has not been provided. We assume the new industrial buildings will be single-story structures of tilt-up concrete construction, typically supported on conventional shallow foundation systems with concrete slab-on-grade floors. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 100 kips and 4 to 7 kips per linear foot, respectively.

Building No. 5 - Distribution Building

Dock-high doors will be constructed along portions of the east and west building walls. The building will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete pavements in the loading dock areas, and limited areas of concrete flatwork and landscape planters throughout. Two ancillary buildings, 15,300± ft² and 3,300± ft² in size are located to the south of the main distribution building.

Detailed structural information has not been provided. We assume the new main distribution building will be a two-story structure of tilt-up concrete construction, typically supported on conventional shallow foundation system with a concrete slab-on-grade floor. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 700 to 900 kips and 4 to 7 kips per linear foot, respectively.

Commercial – Big Box Retail

Dock-high doors will be constructed along a portion of the east building wall. The building will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete in the loading dock areas, and limited areas of concrete flatwork and landscape planters

throughout. This commercial development will include an automobile service station located east of the building. The service station will include a canopy, five (5) fuel pump islands, and underground storage tanks (USTs).

Detailed structural information has not been provided. We assume that the commercial building will be a single-story structure of tilt-up concrete construction, typically supported on conventional shallow foundation system with concrete slab-on-grade floors. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 100 kips and 4 to 7 kips per linear foot, respectively. The new pump island canopy is expected to be a steel frame structure, typically supported on deepened shallow foundations. Maximum column loads for the canopy are expected to be in the range of 20 kips, with significant overturning and/or uplift loads.

Commercial – Shopping Center

The shopping center building will consist of eight (8) suites ranging from 2,400± ft² to 54,000± ft² in size. Dock-high doors will be constructed along a portion of the west building walls for four (4) of the suites of the shopping center building. The building will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete in the loading dock areas, and limited areas of concrete flatwork and landscape planters throughout.

Detailed structural information has not been provided. We assume that the new shopping center building will be a single-story structure of wood frame or masonry block construction, typically supported on conventional shallow foundation systems with a concrete slab-on-grade floor. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 50 kips and 2 to 3 kips per linear foot, respectively.

Retail and Restaurant Buildings

The two fast-food restaurant buildings will include drive-thru lanes. Pad 4 will contain four (4) suites. The buildings will be surrounded by asphaltic concrete pavements in the parking and drive lanes, concrete flatwork, and limited areas of landscape planters throughout.

Detailed structural information has not been provided. We assume that the new retail and restaurant buildings will be single-story structures of wood frame construction, typically supported on conventional shallow foundation systems with concrete slab-on-grade floors. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 20 kips and 1 to 3 kips per linear foot, respectively.

Streets

Barrett Avenue and two access streets will be constructed at the site. It is assumed that the new streets will consist of asphaltic concrete pavements.

General

No significant amounts of below-grade construction, such as basements or crawl spaces, are expected to be included in the proposed development. Based on the assumed topography, cuts and fills of up to 8 to 10± feet are expected to be necessary to achieve the proposed site grades

throughout the site.

Streets

Barrett Avenue and two access streets will be constructed at the site. It is assumed that the new streets will consist of asphaltic concrete pavements.

Previous Studies

Southern California Geotechnical (SCG) previously conducted a geotechnical investigation at the subject site (Reference No. 1). As a part of this study, twenty-three (23) borings (Identified as Boring Nos. B-1 through B-23) were advanced to depths of 15 to 25± feet below the existing site grades. Native alluvium was encountered at each boring locations, extending to at least the maximum depth explored of 25± feet below existing site grades. The alluvium generally consists of medium dense to very dense silty sands to sandy silts, with trace to little clay content. Free water was not encountered during the drilling of the borings. Based on the lack of water within the borings and the moisture contents of the recovered soil samples, the static groundwater is considered to have existed at a depth in excess of 25± feet at the time of the subsurface exploration.

SCG also previously conducted infiltration testing at the subject site (Reference No. 2). The subsurface exploration performed for the infiltration testing consisted of six (6) shallow infiltration trenches (identified as Infiltration Trench Nos. I-1 through I-6) and four (4) deep infiltration borings (identified as Infiltration Boring Nos. I-7 through I-10). The infiltration trenches were excavated to a depth of 7± feet below existing site grades. The infiltration borings were extended to a depth of 50± feet below existing site grades. In addition, one (1) exploratory boring was extended to a depth of 60± feet below site grades. Artificial fill soils were encountered at the ground surface at Infiltration Test No. I-3, extending to a depth of 1± foot below existing site grades. The fill soils consisted of medium dense fine to medium sandy silts with trace quantities of clay and fine gravel. Native alluvium was encountered at the ground surface at all of the remaining boring and trench locations, extending to at least the maximum explored depth of 60± feet below existing site grades. The near-surface alluvium encountered at depths less than 25± feet below existing site grades consisted of medium dense to very dense fine to medium sandy silts, silty fine to medium sands, clayey fine to coarse sands, and hard fine to coarse sandy clays. At depths greater than 25± feet, the alluvium consisted of medium dense to very dense fine sandy silts, fine to medium sandy silts, silty fine to medium sands, and hard fine to medium sandy clays. Based on the results of the testing, SCG recommended infiltration rates of 0.9 to 3.6 inches per hour for the proposed chamber systems. Additionally, SCG did not recommend dry well infiltration at the subject site.

Concurrent Study

SCG concurrently conducted a geotechnical investigation at the subject site (Reference No. 3). As a part of this study, forty-three (43) borings (identified as Boring Nos. B-25 through B-67) were advanced to depths of 10 to 50± feet below the existing site grades.

Younger native alluvium was encountered at the ground surface at Boring Nos. B-25, B-28, B-29, B-31, B-32, B-50, B-55 through B-58, B-60, B-64, and B-67, extending to depths of 2½ to 5½± feet below existing site grades. The alluvium generally consists of loose to medium dense silty

fine sands, silty fine to medium sands, fine sandy silts, clayey fine sands. Occasional layers of very stiff fine sandy clays and silty clays. The younger native alluvial soils are classified as "alluvium" on the boring logs. Native older alluvium was encountered beneath the younger native alluvial soils (at the boring locations listed above) and at the ground surface at the remaining boring locations. All of the borings were terminated within the older alluvium, and the older alluvial soils extend to at least the maximum depth explored of 50± feet below ground surface. The older alluvial soils generally consist of medium dense to very dense well- to poorly-graded silty sands with varying clay content, well-graded to poorly-graded sandy silts with varying clay content, well-graded to poorly-graded clayey sands with varying silt content, and clayey silts. Additionally, layers of very stiff to hard fine sandy clays and silty clays were encountered. The older alluvium generally possesses weak to moderate cementation, and occasionally possesses trace to extensive calcareous nodules and veining.

Groundwater

Free water was not encountered during the drilling of any of the borings. Based on the moisture content of the recovered soil samples and the lack of free water in the borings, the static groundwater table is at a depth greater than the maximum explored depth of 50± feet below existing site grades for this project.

Recent water level data was obtained from the California Department of Water Resources website, http://www.water.ca.gov/waterdatalibrary/. The nearest monitoring well is located on the northeast corner of the site. Water level readings within this monitoring well indicates a groundwater level of 40± feet (March 2023) below the ground surface.

Subsurface Exploration

Scope of Exploration

The subsurface exploration conducted for the infiltration testing consisted of thirty-seven (37) infiltration test borings, advanced to depths of 3 to 10½± feet below the existing site grades. The infiltration borings were advanced using a truck-mounted drilling rig, equipped with 8-inch-diameter hollow stem augers and were logged during drilling by a member of our staff. The approximate locations of the infiltration test borings (identified as Infiltration Test Nos. I-11 through I-37) are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Upon the completion of the infiltration borings, the bottom of each test boring was covered with 2± inches of clean ¾-inch gravel. A sufficient length of 3-inch-diameter perforated PVC casing was then placed into each test hole so that the PVC casing extended from the bottom of the test hole to the ground surface. Clean ¾-inch gravel was then installed in the annulus surrounding the PVC casing.

Geotechnical Conditions

Native younger alluvium was encountered at the ground surface at Infiltration Test Nos. I-11, I-23, I-26 and I-39, extending to depths of 3 to 6± feet below the existing site grades. The younger alluvium generally consists of medium dense silty sands and sandy silts. Native older alluvium was encountered beneath the native younger alluvium and at the ground surface at the remaining

infiltration test locations, extending to at least the maximum depth explored of 10½± feet. The older alluvium generally consists of medium dense to very dense silty sands and sandy silts with trace to little clay content. The older alluvium occasionally possesses weak cementation. The Infiltration Boring Logs, which illustrate the conditions encountered at each of the borings, are included with this report.

Infiltration Testing

As previously mentioned, the infiltration testing was performed in general accordance with the Riverside County guidelines: Riverside County – Low Impact Development BMP Design Handbook – Section 2.3 of Appendix A.

Pre-soaking

In accordance with the county infiltration standards all of the infiltration test borings were pre-soaked prior to the infiltration testing. The pre-soaking process consisted of filling the test borings by inverting a full 5-gallon bottle of clear water supported over each hole so that the water level reaches a level of at least 5 times the hole's radius above the gravel at the bottom of each hole. The pre-soaking was completed after all of the water had percolated through each test hole or after 15 hours since initiating the pre-soak. Based on the results of the pre-soaking process, 30-minute readings were utilized during all of the infiltration tests, except for Infiltration Test Nos. I-24 and I-45. For Infiltration Test Nos. I-24 and I-45, 10-minute readings were utilized during the infiltration tests.

Infiltration Testing

Following the pre-soaking process of the infiltration test borings, SCG performed the infiltration testing. Each test hole was filled with water to a depth of at least 5 times the hole's radius above the gravel at the bottom of each test hole. In accordance with the Riverside County guidelines, in areas where "non-sandy soils" were encountered at the bottom of each infiltration test boring, (where 6 inches of water did not infiltrate into the surrounding soils in less than 25 minutes for two (2) consecutive readings), readings were taken at 30-minute intervals for a total of 6 hours at the test locations. At Infiltration Test Nos. I-24 and I-45, "sandy-soils" were encountered at the bottom of the test borings, (where 6 inches of water did infiltrate into the surrounding soils in less than 25 minutes for two (2) consecutive readings), therefore, readings were taken at 10-minute intervals for 1 hour at the test locations. The water level readings are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on the spreadsheets.

The infiltration rates from the test are tabulated in inches per hour. In accordance with the typically accepted practice, it is recommended that the most conservative reading from the latter part of the infiltration tests be used as the design infiltration rate. The rates are summarized below:

Infiltration Test No.	Depth (feet)	Soil Description	Measured Infiltration Rate (inches/hour)
I-11	4½	YOUNGER ALLUVIUM: Brown Silty fine to coarse Sand, trace Clay	0.2

I-12	4½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.2
I-13	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.2
I-14	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.2
I-15	10½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-16	9½	OLDER ALLUVIUM: Dark Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.2
I-17	10	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace to little Clay, trace coarse Sand	0.0
I-18	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace to little Clay, trace coarse Sand	0.0
I-19	3	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-20	3	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-21	3½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, little coarse Sand	0.4
I-22	4½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, little coarse Sand	0.3
I-23	9	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-24	9	OLDER ALLUVIUM: Brown Silty fine to coarse Sand	1.7
I-25	9	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-26	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-27	7	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace coarse Sand	0.1
I-28	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.0
I-29	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-30	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace Clay	0.1
I-31	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-32	6½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-33	6½	OLDER ALLUVIUM: Brown fine to medium Sandy Silt to Silty fine to medium Sand, trace Clay	0.1
I-34	5	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-35	4½	OLDER ALLUVIUM: Light Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-36	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.0
I-37	6½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1

I-38	6½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-39	7½	OLDER ALLUVIUM: Dark Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-40	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-41	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace Clay, trace coarse Sand	0.0
I-42	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace Clay, trace coarse Sand	0.0
I-43	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-44	4½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-45	5	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.8
I-46	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-47	7	OLDER ALLUVIUM: Brown fine to medium Sandy Silt, little Clay	0.1

Laboratory Testing

Moisture Content

The moisture contents for the recovered soil samples within the borings were determined in accordance with ASTM D-2216 and are expressed as a percentage of the dry weight. These test results are presented on the Boring Logs.

Grain Size Analysis

The grain size distribution of selected soils collected from the bottom of each infiltration test boring have been determined using a range of wire mesh screens. These tests were performed in general accordance with ASTM D-422 and/or ASTM D-1140. The weight of the portion of the sample retained on each screen is recorded and the percentage finer or coarser of the total weight is calculated. The results of these tests are presented on Plates C-1 through C-37 of this report.

Design Recommendations

Thirty-seven (37) infiltration tests were performed at the subject site. As noted above, the calculated infiltration rates at the infiltration test locations range between 0.0 and 1.7 inches per hour. The major factors affecting the lack of infiltration at these locations are the presence of very dense older alluvium with high contents of fine-grained soil. **Based on these conditions and the results of infiltration testing we recommend the following design infiltration rates to be utilized for the proposed infiltration systems:**

Infiltration System(s)	Infiltration Test Nos.	Infiltration Test Depth (ft)	Infiltration System Type	Infiltration System Location	Design Infiltration Rate (inches/hour)
"A"	I-11	4½	Bio-Retention Basin	West	Not Recommended
"B"	I-12	4½	Bio-Retention Basin	West	Not Recommended
"C"	I-13	5½	Below-Grade Chamber	West	Not Recommended
"D"	I-14	7½	Below-Grade Chamber	Northwest	Not Recommended
"E"	I-15 through I-17	9½ to 10½	Bio-Retention Basin	North	Not Recommended
"F"	I-18	7½	Below-Grade Chamber	North	Not Recommended
"G"	I-19 through I-22	3 to 4½	Bio-Retention Basin	South	Not Recommended
"H"	I-23, I-24	9	Bio-Retention Basin	South	Not Recommended
"I" & "J"	I-25 through I-33	5½ to 9	Bio-Retention Basin	Northeast	Not Recommended
"K"	I-34 through I-36	4½ to 5½	Below-Grade Chamber	Southeast	Not Recommended
"L"	I-37	6½	Below-Grade Chamber	Southeast	Not Recommended
"M"	I-38, I-39	6½ to 7½	Below-Grade Chamber	Southeast	Not Recommended
"N"	I-40	7½	Below-Grade Chamber	Northeast	Not Recommended
"O"	I-41	6	Below-Grade Chamber	Northeast	Not Recommended
"P"	I-42	6	Below-Grade Chamber	Northeast	Not Recommended
"Q"	I-43	6	Below-Grade Chamber	Northeast	Not Recommended
"R"	I-44	4½	Below-Grade Chamber	Northeast	Not Recommended*
"S"	I-45	5	Below-Grade Chamber	Northeast	Not Recommended
"T"	I-46	5½	Below-Grade Chamber	Northeast	Not Recommended
"U"	I-47	7	Below-Grade Chamber	Northeast	Not Recommended

*Although the test results indicate an infiltration rate of 0.8 in/hr at this location, the subsurface soil profile at this site includes many soil layers with low permeability. Soil layers with some capacity for infiltration, such as the silty sand layer encountered at Infiltration test-location I-44, are generally interbedded between low permeability soil layers, based on our review of the boring logs for the overall site. Therefore, long-term infiltration is not considered to feasible.

Although infiltration is not considered feasible, the client may desire to use storm water disposal systems that do not rely on infiltration at this site. The design of the proposed storm water

disposal systems should be performed by the project civil engineer, in accordance with the City of Perris, and/or County of Riverside guidelines. However, it is recommended that the system be constructed so as to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the system.

Infiltration Rate Considerations

The infiltration rates presented herein were determined in accordance with the Riverside County guidelines and are considered valid only for the time and place of the actual test. Varying subsurface conditions will exist in other areas of the site, which could alter the recommended infiltration rates presented above. The infiltration rates will decline over time between maintenance cycles as silt or clay particles accumulate on the BMP surface. The infiltration rate is highly dependent upon a number of factors, including density, silt and clay content, grainsize distribution throughout the range of particle sizes, and particle shape. Small changes in these factors can cause large changes in the infiltration rates.

Infiltration rates are based on unsaturated flow. As water is introduced into soils by infiltration, the soils become saturated and the wetting front advances from the unsaturated zone to the saturated zone. Once the soils become saturated, infiltration rates become zero, and water can only move through soils by hydraulic conductivity at a rate determined by pressure head and soil permeability. Changes in soil moisture content will affect the infiltration rate. Infiltration rates should be expected to decrease until the soils become saturated. Soil permeability values will then govern groundwater movement. Permeability values may be on the order of 10 to 20 times less than infiltration rates. The system designer should incorporate adequate factors of safety and allow for overflow design into appropriate traditional storm drain systems, which would transport storm water off-site.

Location of Infiltration Systems

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration area could potentially be damaged due to saturation of the subgrade soils. **Any proposed infiltration systems for this site should be located at least 25 feet away from any structures, including retaining walls.** Even with this provision of locating the infiltration system at least 25 feet from the building(s), it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration system.

The infiltration system designer should also give special consideration to the effect that the proposed infiltration systems may have on nearby subterranean structures, open excavations, or descending slopes. In particular, infiltration systems should not be located near the crest of descending slopes, particularly where the slopes are comprised of granular soils. Such systems will require specialized design and analysis to evaluate the potential for slope instability, piping failures and other phenomena that typically

apply to earthen dam design. This type of analysis is beyond the scope of this infiltration test report, but these factors should be considered by the infiltration system designer when locating the infiltration systems.

General Comments

This report has been prepared as an instrument of service for use by the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, structural engineer, and/or civil engineer. The design of the proposed storm water infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rate contained herein, the civil engineer agrees to indemnify, defend, and hold harmless the geotechnical engineer for all aspects of the design and performance of the proposed storm water infiltration system. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur.

The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between boring locations and testing depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted. The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

Closure

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

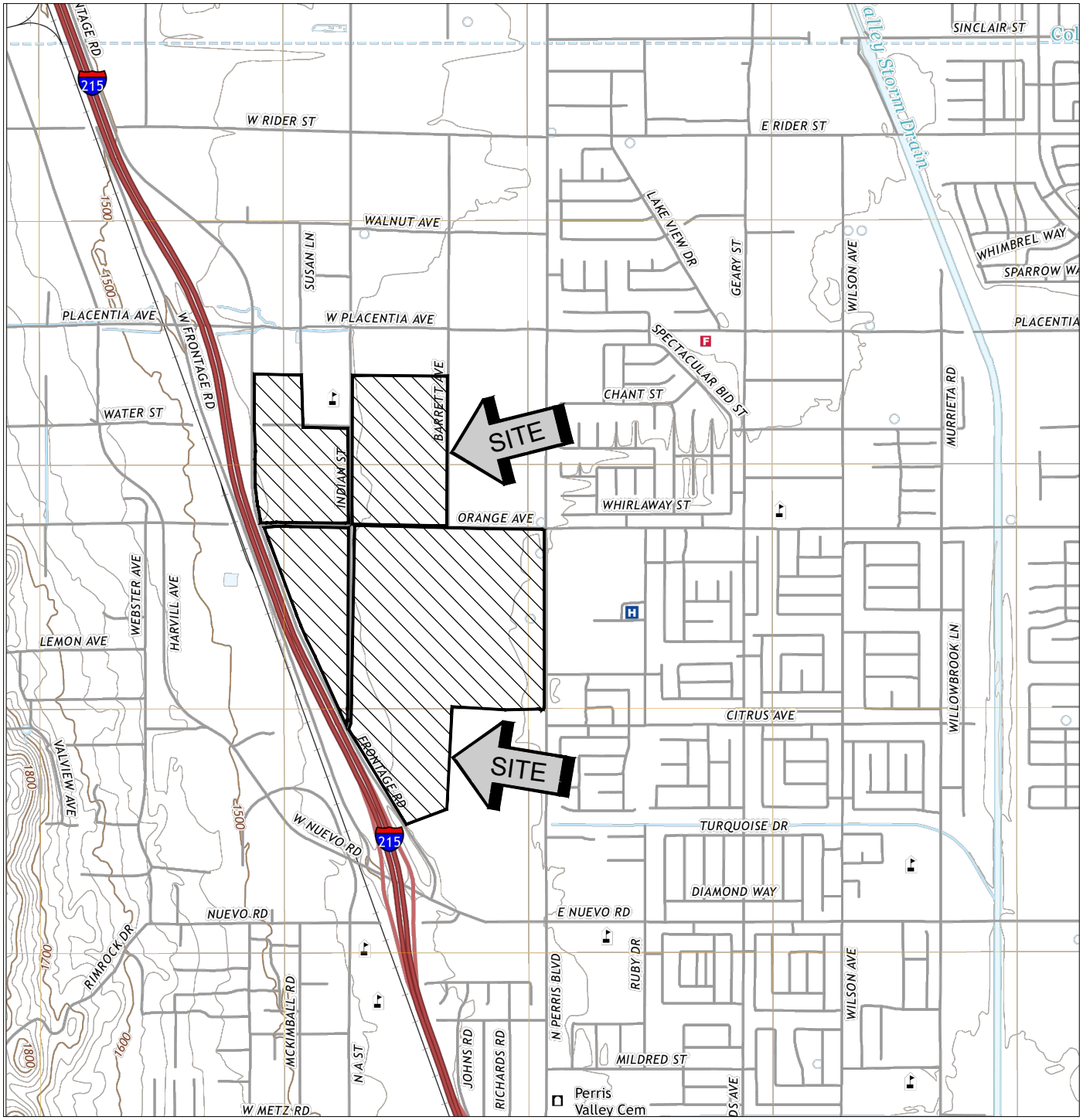
SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

Ryan Bremer
Staff Geologist

Daniel W. Nielsen, GE 3166
Senior Engineer

Distribution: (1) Addressee

Enclosures: Plate 1 - Site Location Map
Plate 2 - Infiltration Test Location Plan
Boring Log Legend and Logs (39 pages)
Infiltration Test Results Spreadsheets (37 pages)
Grain Size Distribution Graphs (37 pages)



SOURCE: USGS TOPOGRAPHIC MAP OF THE PERRIS QUADRANGLE, RIVERSIDE COUNTY, CALIFORNIA, 2021

SITE LOCATION MAP

HARVEST LANDING INDUSTRIAL DEVELOPMENT

PERRIS, CALIFORNIA

SCALE: 1" = 2000'	
DRAWN: RB CHKD: RGT	
SCG PROJECT 22G183-4	
PLATE 1	

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL

GEOTECHNICAL LEGEND

- APPROXIMATE INFILTRATION TEST LOCATION
- CONCURRENT BORING LOCATION (SCG PROJECT NO. 22G183-3)
- PREVIOUS BORING LOCATION (SCG PROJECT NO. 22G183-1)
- PREVIOUS INFILTRATION LOCATION (SCG PROJECT NO. 22G183-2)
- PREVIOUS INFILTRATION LOCATION (SCG PROJECT NO. 22G183-2)
- PREVIOUS BORING LOCATION (SCG PROJECT NO. 22G183-2)
- PROPOSED BUILDING
- PROPOSED INFILTRATION SYSTEM LOCATION
- EXISTING STRUCTURE

NOTE: CONCEPTUAL GRADING PLAN PREPARED BY FMCIVIL ENGINEERING.

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SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

NORTH
SoCalGeo

SCALE: 1" = 200'
DRAWN: RB
CHKD: RGT
SCG PROJECT 22G183-4

INFILTRATION TEST LOCATION PLAN

HARVEST LANDING INDUSTRIAL DEVELOPMENT
PERRIS, CALIFORNIA

PLATE 2

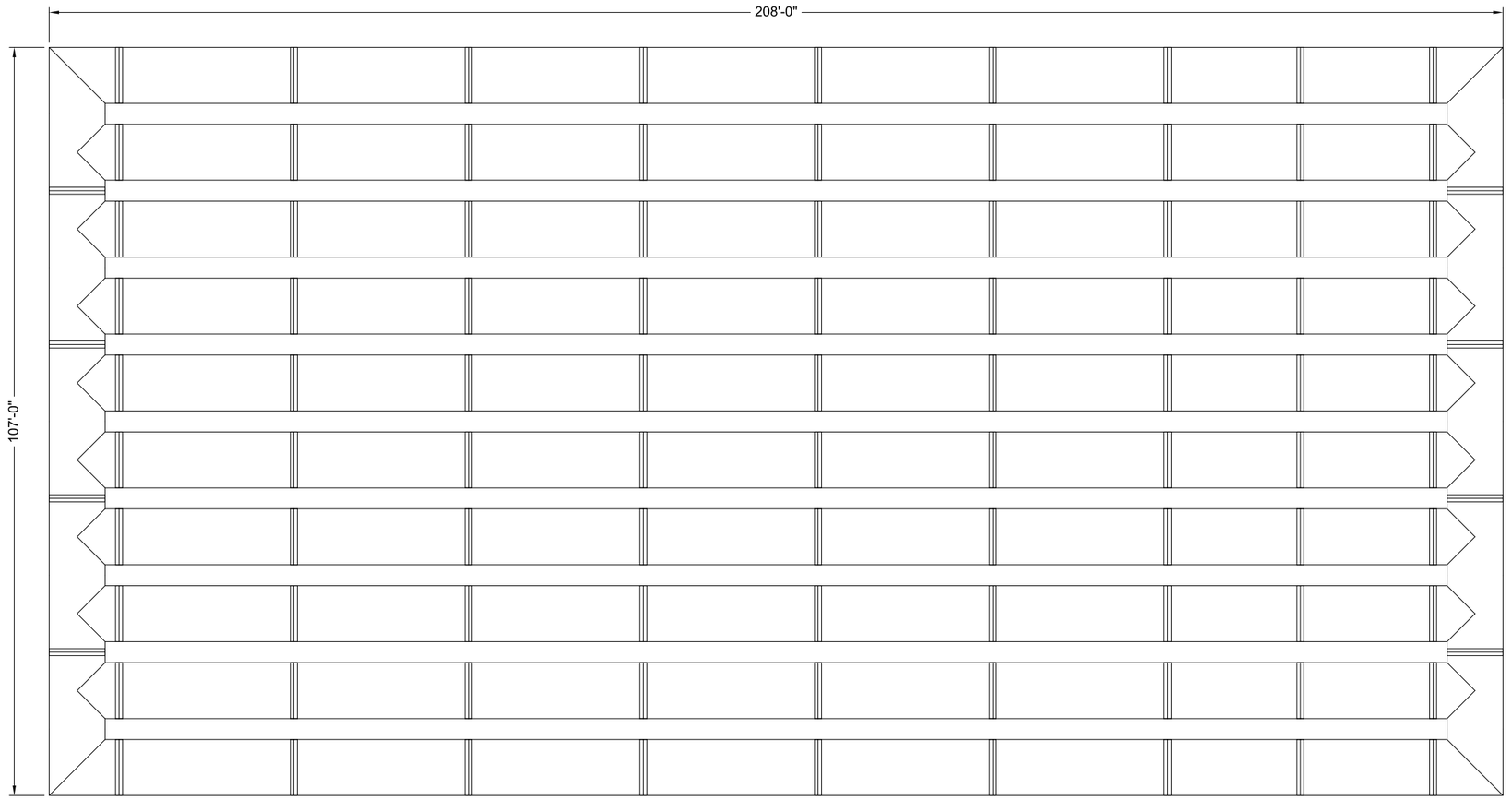
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 2,134 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 107,267 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 107,267 CF

PIPE DETAILS
- DIAMETER = 96"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 36"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"



NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE $2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

ASSEMBLY
SCALE: 1" = 20'

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DATE	REVISION DESCRIPTION	BY

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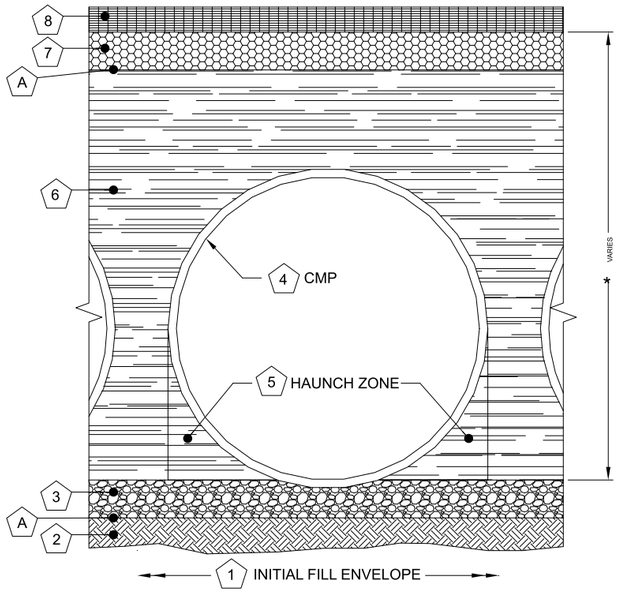
CONTECH® CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO36317 20-001 Harvest Landing Retail Center and Business Park
Retail System - Northerly Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
24648	36317	9/26/2023
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		



	DETENTION SYSTEMS - CMP DETENTION / CMP DRAINAGE			
	Material Location	Description	Material Designation	Designation
8	Rigid or Flexible Pavement (if applicable)			
7	Road Base (if applicable)			
A	Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types
6	Backfill	Well graded granular material which may contain small amounts of silt or clay.	AASHTO M 145- A-1, A-2, A-3	Placed in 8" +/- loose lifts and compacted to 90% Standard Proctor Per AASHTO T 99
3	Bedding Stone	Well graded granular bedding material w/maximum particle size of 3"	AASHTO M43 - 3,357,4,467, 5, 56, 57	Engineer to determine if bedding is required. Pipe may be placed on the trench bottom of a relatively loose, native suitable well graded & granular material. For Arch pipes it is recommended to be shaped to a relatively flat bottom or fine-grade the foundation to a slight v-shape. Unsuitable material should be over-excavated and re-placed with a 4"-6" layer of well graded & granular stone per the material designation. See AASHTO 26.3.8.1 / 26.5.3 Bedding info.
A	Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types
*	*Note: Backfill using controlled low-strength material (CLSM, "flash fill" or "flowable fill") when the spacing between the pipes will not allow for placement and adequate compaction of the backfill.*			

1 MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT

FOUNDATION/BEDDING PREPARATION

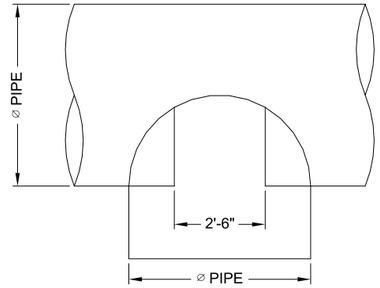
2 PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE ENGINEER.

5 HAUNCH ZONE MATERIAL SHALL BE PLACED AND UNIFORMALLY COMPACTED WITHOUT SOFT SPOTS.

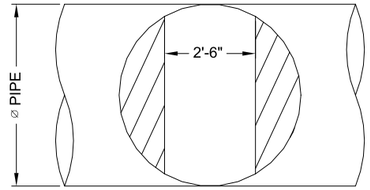
BACKFILL

WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO LIFT (16") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE DETENTION SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON THE PIPE.

OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.



PLAN

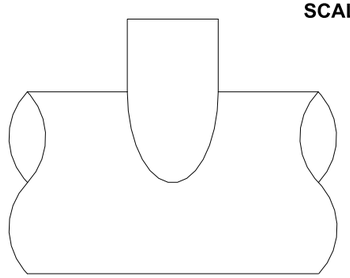


FRONT

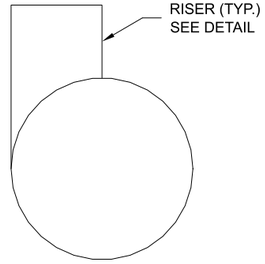
NOTE:
MANWAY DETAIL APPLICABLE FOR CMP SYSTEMS WITH DIAMETERS 48" AND LARGER. MANWAYS MAY BE REQUIRED ON SMALLER SYSTEMS DEPENDING ON ACTUAL SITE SPECIFIC CONDITIONS.

TYPICAL MANWAY DETAIL

SCALE: N.T.S.



ELEVATION

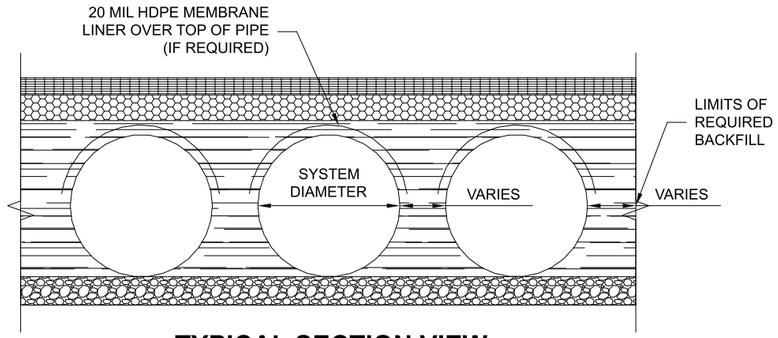


END

NOTE:
LADDERS ARE OPTIONAL AND ARE NOT REQUIRED FOR ALL SYSTEMS.

TYPICAL RISER DETAIL

SCALE: N.T.S.



TYPICAL SECTION VIEW

LINER OVER ROWS
SCALE: N.T.S.

NOTE: IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, AN HDPE MEMBRANE LINER IS RECOMMENDED WITH THE SYSTEM. THE IMPERMEABLE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

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CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO36317 20-001 Harvest Landing Retail Center and Business Park
Retail System - Northerly Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
24648	36317	9/26/2023
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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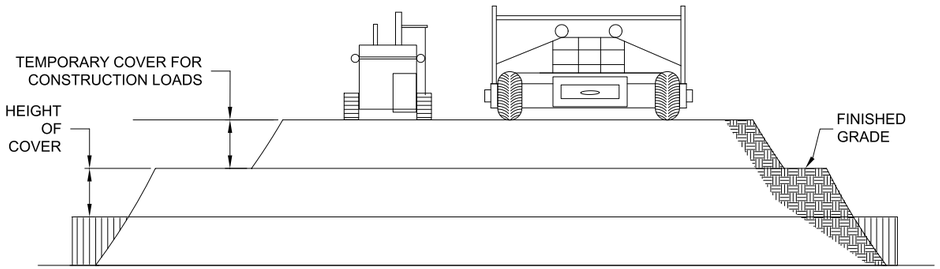


CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

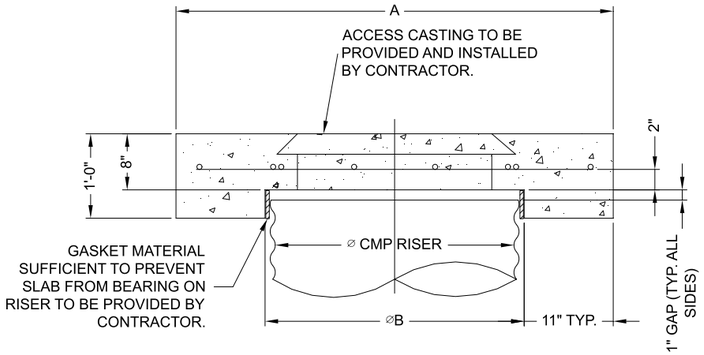
APPLICABLE POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

APPLICABLE
HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.
REQUIREMENTS
INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

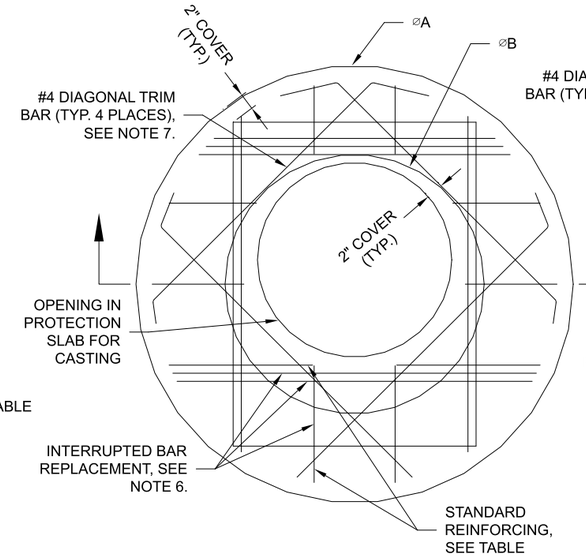
NOTE:
THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.



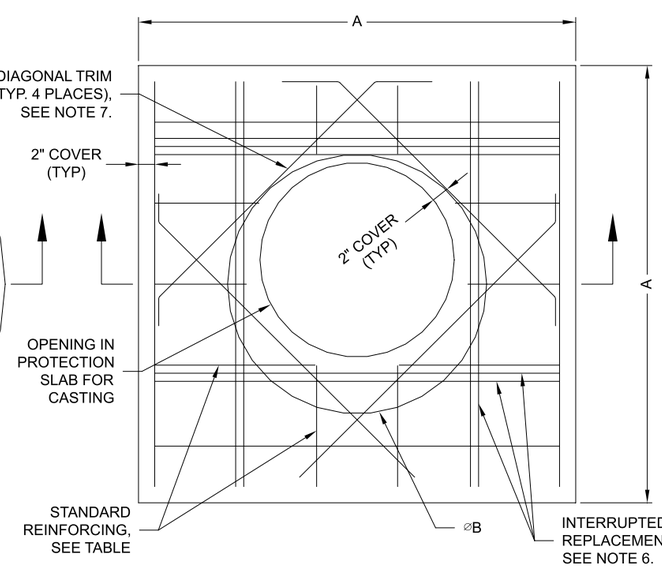
SECTION VIEW

REINFORCING TABLE				
⌀ CMP RISER	A	⌀ B	REINFORCING	**BEARING PRESSURE (PSF)
24"	⌀ 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	⌀ 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	⌀ 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	⌀ 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	⌀ 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

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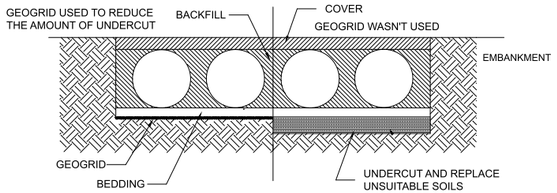
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.

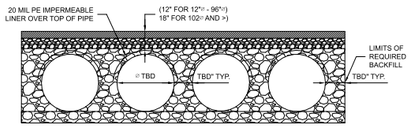


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

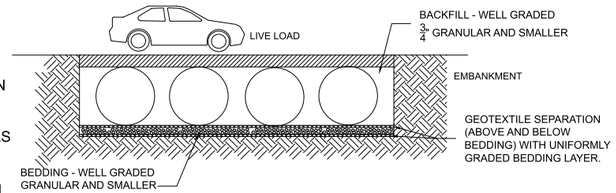
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

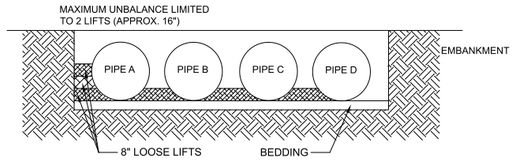
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



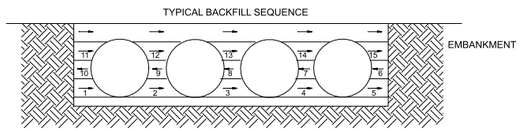
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

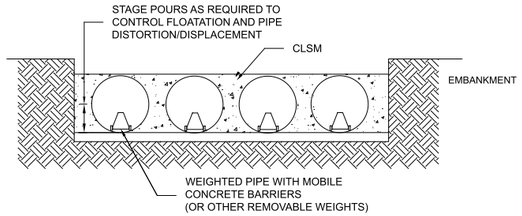


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

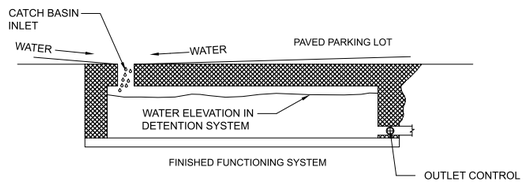


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

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www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS

CONTECH **DYODS** DRAWING

DYO36317 20-001 Harvest Landing Retail Center and Business Park
Retail System - Northerly Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
24648	36317	9/26/2023
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

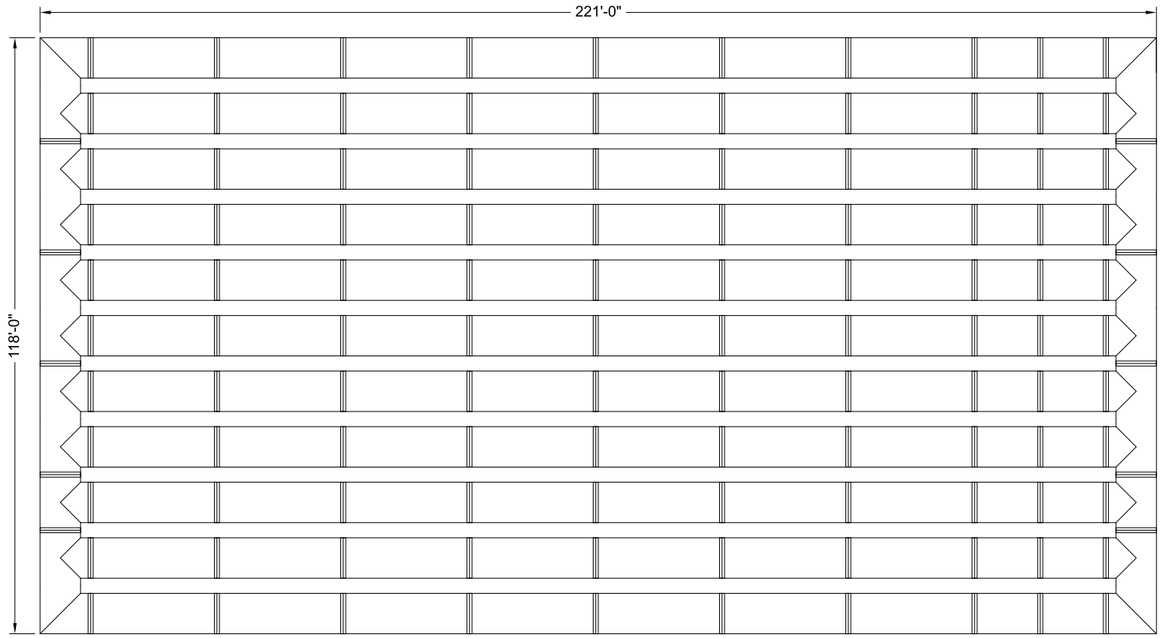
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 2,491 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 125,211 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 125,211 CF

PIPE DETAILS
- DIAMETER = 96"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 36"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"



NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE 2⅔" x ½" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

ASSEMBLY

SCALE: 1" = 30'

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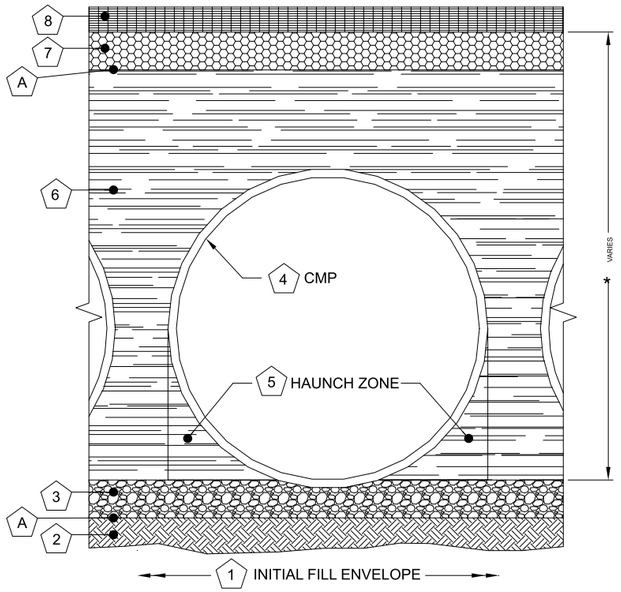
CONTECH® CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO36322 20-001 Harvest Landing Retail Center and Business Park
Retail System - Southerly Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
24651	36322	9/26/2023
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		



	DETENTION SYSTEMS - CMP DETENTION / CMP DRAINAGE			
	Material Location	Description	Material Designation	Designation
8	Rigid or Flexible Pavement (if applicable)			
7	Road Base (if applicable)			
A	Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types
6	Backfill	Well graded granular material which may contain small amounts of silt or clay.	AASHTO M 145- A-1, A-2, A-3	Placed in 8" +/- loose lifts and compacted to 90% Standard Proctor Per AASHTO T 99
3	Bedding Stone	Well graded granular bedding material w/maximum particle size of 3"	AASHTO M43 - 3,357,4,467, 5, 56, 57	Engineer to determine if bedding is required. Pipe may be placed on the trench bottom of a relatively loose, native suitable well graded & granular material. For Arch pipes it is recommended to be shaped to a relatively flat bottom or fine-grade the foundation to a slight v-shape. Unsuitable material should be over-excavated and re-placed with a 4"-6" layer of well graded & granular stone per the material designation. See AASHTO 26.3.8.1 / 26.5.3 Bedding info.
A	Geotextile Layer	Non-Woven Geotextile	CONTECH C-40 or C-45	Engineer Decision for consideration to prevent soil migration into varying soil types
*	*Note: Backfill using controlled low-strength material (CLSM, "flash fill" or "flowable fill") when the spacing between the pipes will not allow for placement and adequate compaction of the backfill.*			

1 MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT

FOUNDATION/BEDDING PREPARATION

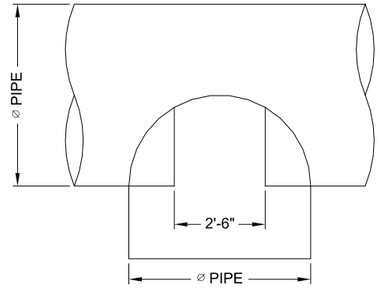
2 PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND BROUGHT BACK TO THE GRADE WITH A FILL MATERIAL AS APPROVED BY THE ENGINEER.

5 HAUNCH ZONE MATERIAL SHALL BE PLACED AND UNIFORMALLY COMPACTED WITHOUT SOFT SPOTS.

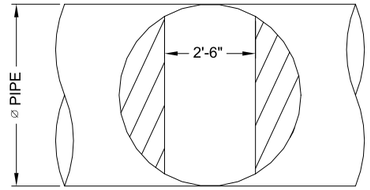
BACKFILL

WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A TWO LIFT (16") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHALL BE ADVANCED ALONG THE LENGTH OF THE DETENTION SYSTEM AT THE SAME RATE TO AVOID DIFFERENTIAL LOADING ON THE PIPE.

OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.



PLAN

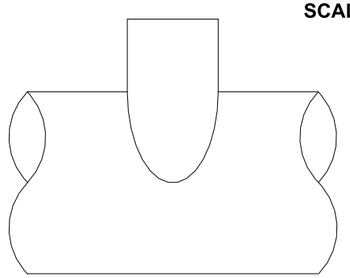


FRONT

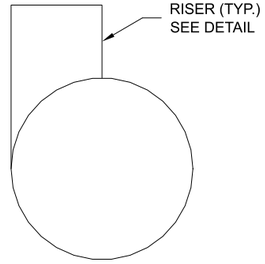
NOTE:
MANWAY DETAIL APPLICABLE FOR CMP SYSTEMS WITH DIAMETERS 48" AND LARGER. MANWAYS MAY BE REQUIRED ON SMALLER SYSTEMS DEPENDING ON ACTUAL SITE SPECIFIC CONDITIONS.

TYPICAL MANWAY DETAIL

SCALE: N.T.S.



ELEVATION

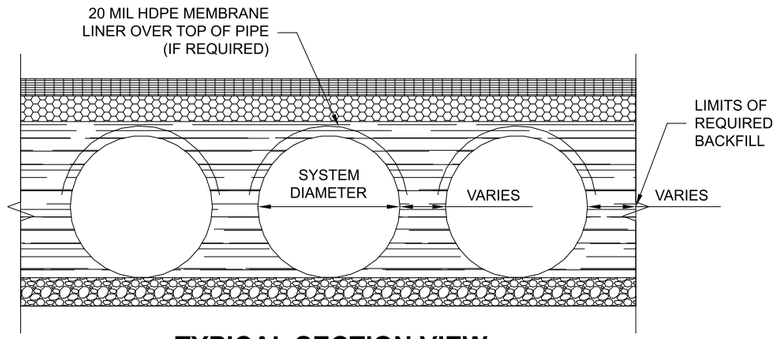


END

NOTE:
LADDERS ARE OPTIONAL AND ARE NOT REQUIRED FOR ALL SYSTEMS.

TYPICAL RISER DETAIL

SCALE: N.T.S.



TYPICAL SECTION VIEW

LINER OVER ROWS
SCALE: N.T.S.

NOTE: IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, AN HDPE MEMBRANE LINER IS RECOMMENDED WITH THE SYSTEM. THE IMPERMEABLE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

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SHEET NO.: 1		

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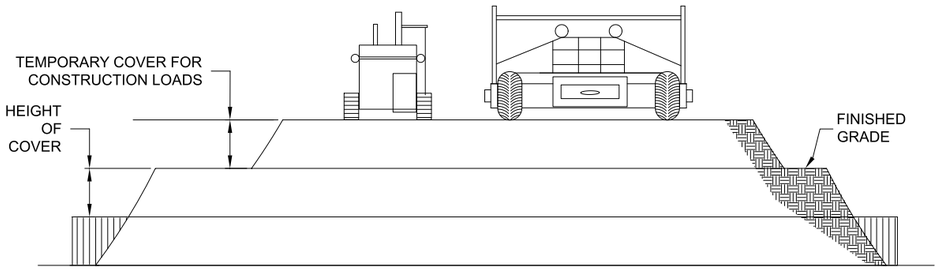

CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

APPLICABLE POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

APPLICABLE
HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.
REQUIREMENTS
INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

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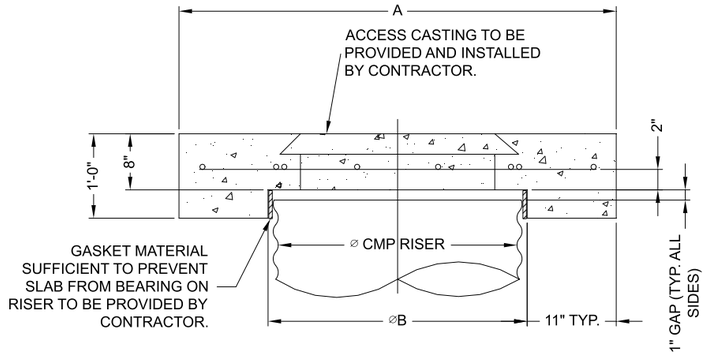
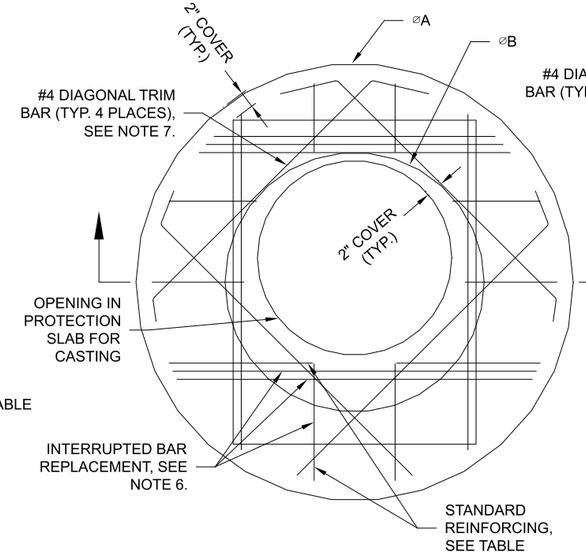


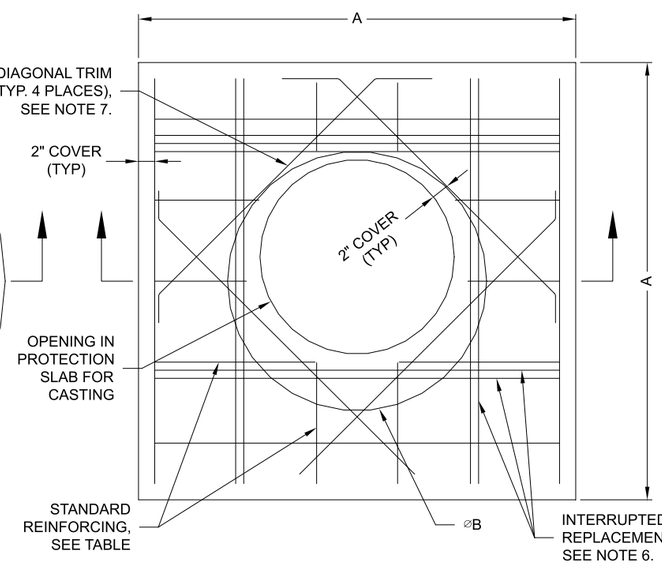
SECTION VIEW

REINFORCING TABLE				
⌀ CMP RISER	A	⌀ B	REINFORCING	**BEARING PRESSURE (PSF)
24"	⌀ 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	⌀ 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	⌀ 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	⌀ 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	⌀ 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

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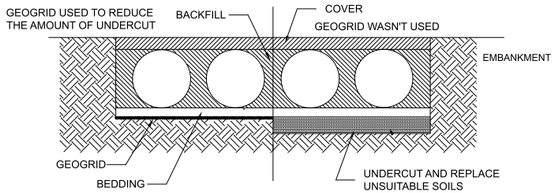
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.

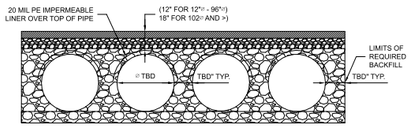


GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

A SITE'S RESISTIVITY MAY CHANGE OVER TIME WHEN VARIOUS TYPES OF SALTING AGENTS ARE USED, SUCH AS ROAD SALTS FOR DEICING AGENTS. IF SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE, A GEOMEMBRANE BARRIER IS RECOMMENDED WITH THE SYSTEM. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM THE USE OF SUCH AGENTS INCLUDING PREMATURE CORROSION AND REDUCED ACTUAL SERVICE LIFE.

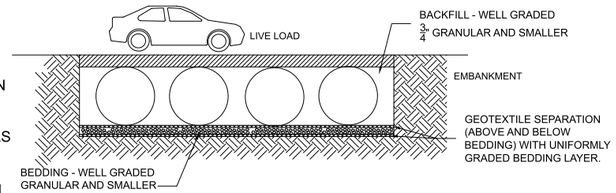
THE PROJECT'S ENGINEER OF RECORD IS TO EVALUATE WHETHER SALTING AGENTS WILL BE USED ON OR NEAR THE PROJECT SITE, AND USE HIS/HER BEST JUDGEMENT TO DETERMINE IF ANY ADDITIONAL PROTECTIVE MEASURES ARE REQUIRED. BELOW IS A TYPICAL DETAIL SHOWING THE PLACEMENT OF A GEOMEMBRANE BARRIER FOR PROJECTS WHERE SALTING AGENTS ARE USED ON OR NEAR THE PROJECT SITE.



IN-SITU TRENCH WALL

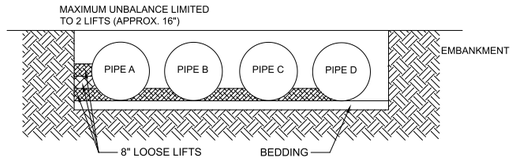
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



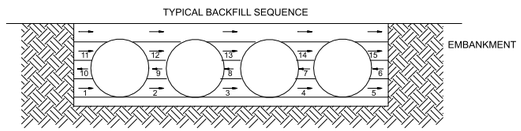
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

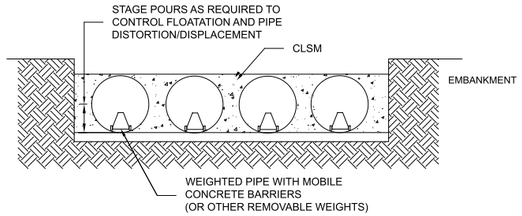


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

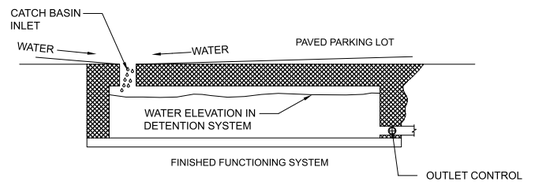


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

C:\EXPORTS\TEMPLATES\CMP_V8.DWG 10/18/2019 10:02 AM

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DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS
CONTECH DYODS DRAWING

DYO36322 20-001 Harvest Landing Retail Center and Business Park
Retail System - Southerly Chambers
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
24651	36322	9/26/2023
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries | Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name FMCivil Engineers Inc | Date 10/5/2023

Designed by Hector Paez | Case No

Company Project Number/Name 20-001 - Site 6

BMP Identification

BMP NAME / ID Offsite Sub-Regional Basin

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.60 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
6-1A	249651.8	Roofs	1	0.89	222689.4			
6-1B	96768.42	Ornamental Landscaping	0.1	0.11	10688.8			
6-1C	624387.67	Concrete or Asphalt	1	0.89	556953.8			
	970807.89	**Total**			790332	0.60	39516.6	

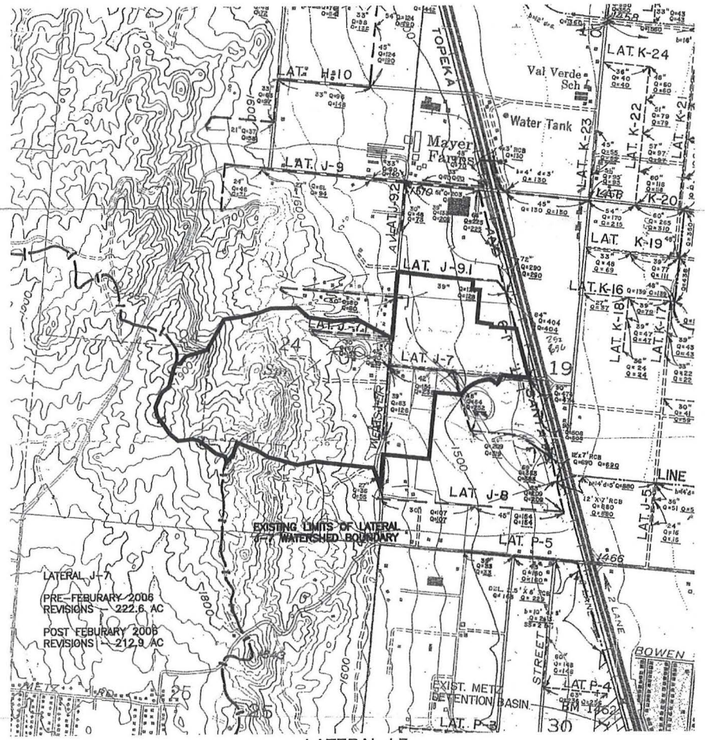
Proposed Volume must be greater than the Design Capture Volume

Notes:

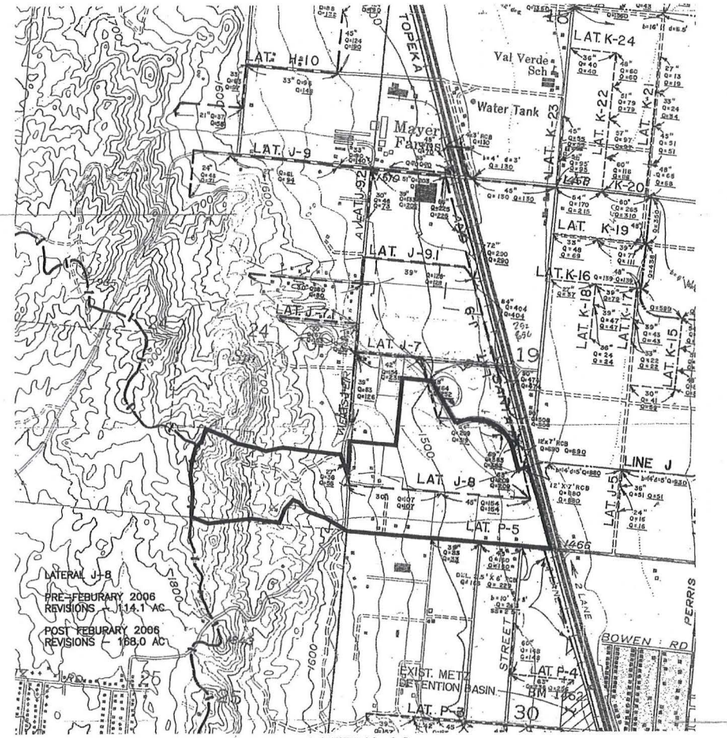
PORTION OF
8K3
1" = 1000'

REVISED HYDROLOGY MAP
PERRIS MASTER DRAINAGE PLAN

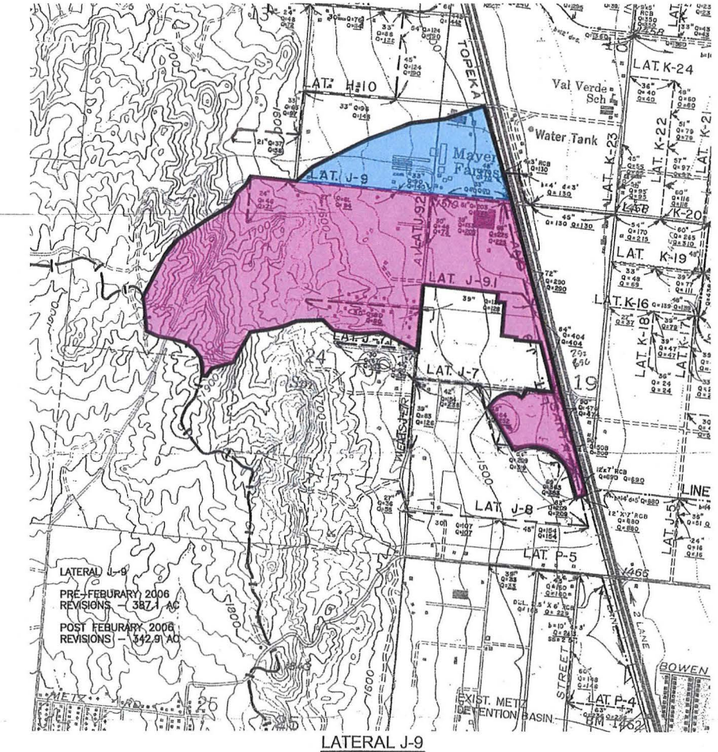
LATERALS J–7, J–8, & J–9



LATERAL J-7



LATERAL J-8



LATERAL J-9

LATERAL No.	PRE–FEBURARY 2006 REVISIONS	POST FEBURARY 2006 REVISIONS	INCREASE/DECREASE (ACRES)
LAT J–8	114.1	168.0	+53.9
LAT J–9	609.8	555.9	–53.9

LEGEND

PROPOSED LATERAL WATERSHED BOUNDARIES AFTER FEBRUARY 2006 REVISION

N

SCALE: 1"=1000'

B:\CAD\Nuevo Industrial Park - NV\PE\Exhibits\NV\P Perris MDP Hydrology map lat 7 and lat 9.dwg, 2/2/2007 1:10:00 PM, Donal Pearce

WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR GRADING PERMIT HAS BEEN ISSUED.

THE PRIVATE ENGINEER SIGNING THESE PLANS IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF THE DESIGN HEREON. IN THE EVENT OF DISCREPANCIES ARISING AFTER COUNTY APPROVAL OR DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISING THE PLANS FOR APPROVAL BY THE COUNTY.

DATE	BY	MARK	REVISIONS	APPR	DATE

ENGINEER — COUNTY

SEAL–COUNTY

REGISTERED PROFESSIONAL ENGINEER ALAN D. FRENCH No. 45702 Exp. 12–31–08 CIVIL STATE OF CALIFORNIA

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY:

ALAN D. FRENCH, P.E.
CIVIL ENGINEER, R.C.E. NO. 45702 — DATE

RECOMMENDED — DATE

SEAL–ENGINEER

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RECOMMENDED FOR APPROVAL — APPROVED BY:

PLANNING ENGINEER — CHIEF ENGINEER

DATE: — DATE:

ENGINEERING SOLUTIONS
ENGINEERING-LAND PLANNING-SURVEYING-MAPPING
2155 CHICAGO AVENUE, STE. 201
RIVERSIDE, CA. 92507
PHONE – (951) 784–0288
FAX – (951) 784–0287
PREPARED BY:

DATE EXP. 06–30–07

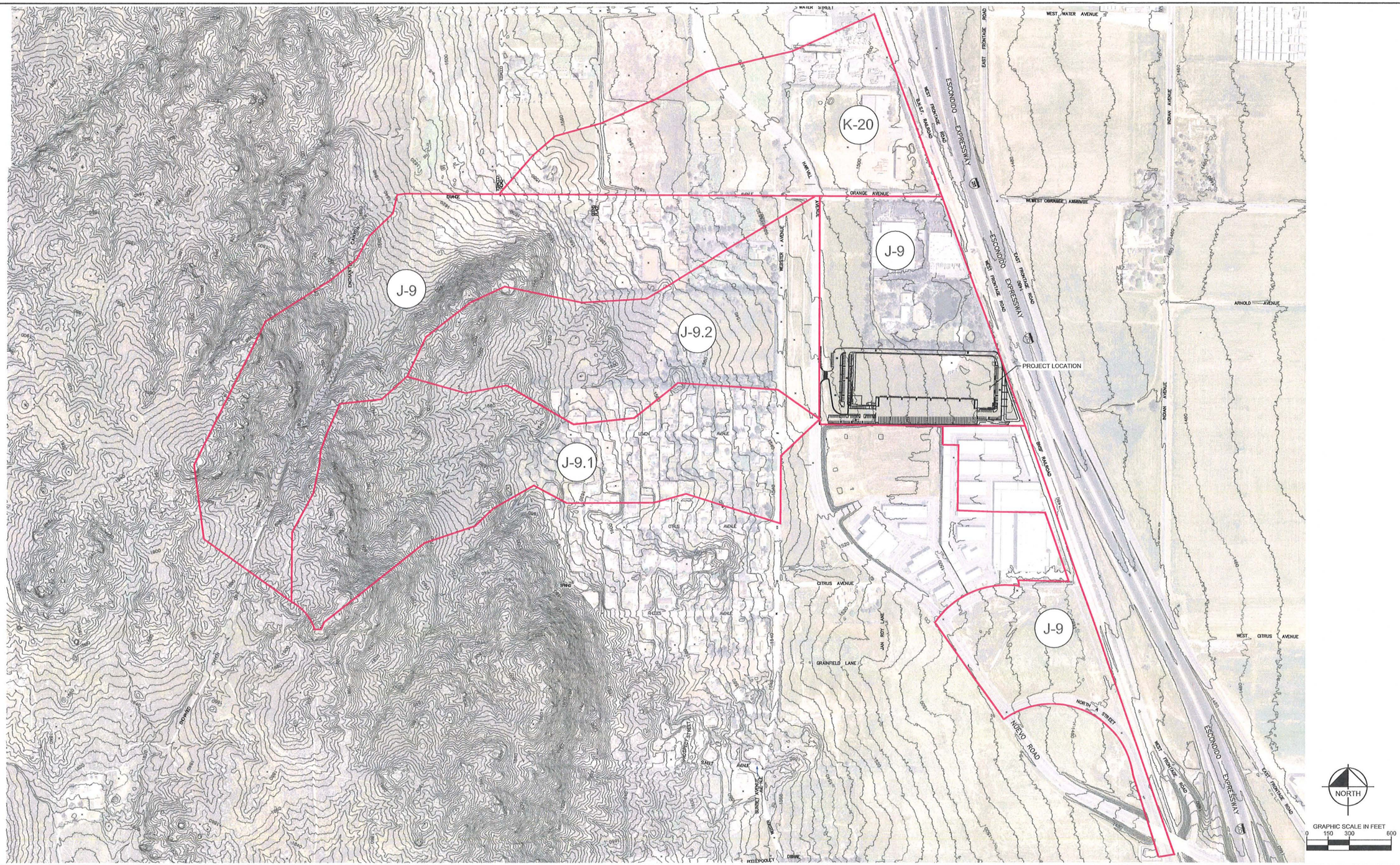
BENCHMARK:

SCALE:

I.P. No. XXXXX
COUNTY OF RIVERSIDE
REVISED HYDROLOGY MAP
PERRIS MASTER DRAINAGE PLAN
LATERALS J–7, J–8, & J–9

SHEET NO. 1 OF 1 SHTS.

FOR: | W.O. | COUNTY FILE NO.:



Kimley»Horn
401 B STREET, SUITE 600, SAN DIEGO, CA 92101
PHONE: 619-234-9411
WWW.KIMLEY-HORN.COM

RCFC MDP DRAINAGE AREA MAP LINE J-9
ROCKEFELLER HARVILL INDUSTRIAL PARK
October 9, 2020

k:\snd_ldev\rockefeller - riverside_harvill\to\rcfc\2020.10.08 - mdp letter\2020.10.09 - mdp drainage area.dwg 10/9/2020

EXHIBITS

EXHIBIT A: VICINITY MAP

EXHIBIT B: EXISTING HYDROLOGY MAP

EXHIBIT C: EXISTING HYDROLOGY MAP - OFFSITE

EXHIBIT D: PROPOSED HYDROLOGY MAP

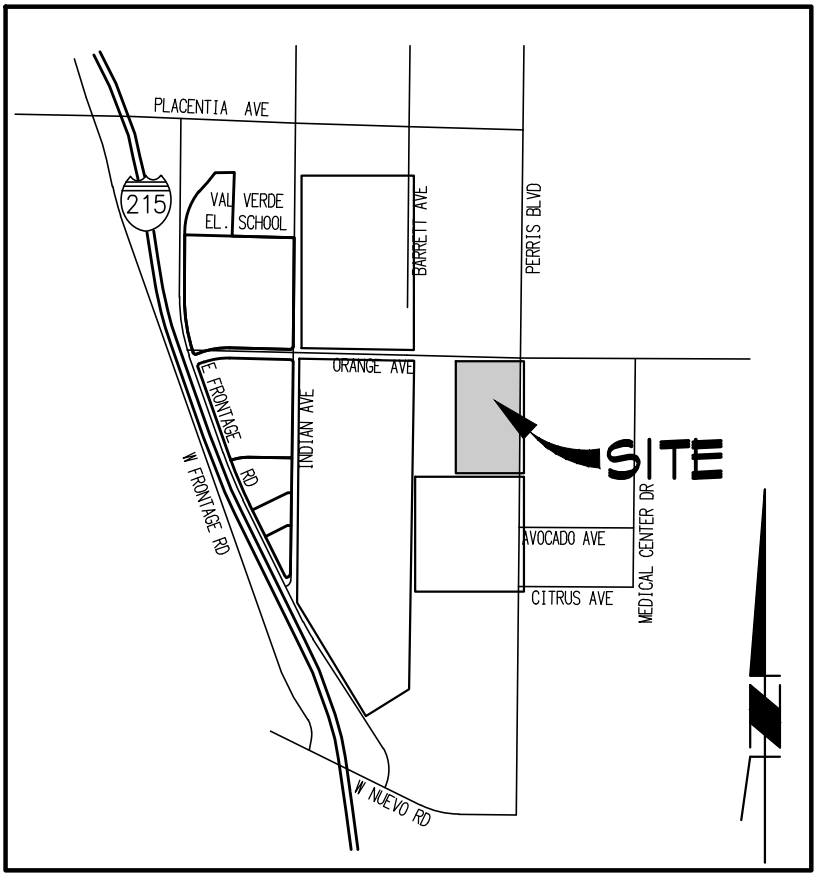
EXHIBIT E: PROPOSED HYDROLOGY MAP - OFFSITE

EXHIBIT F: HYDROLOGIC SOILS GROUP MAP

EXHIBIT G: RCFCD MDP FACILITIES OVERLAY

EXHIBIT H: PHASE 1 OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM

EXHIBIT I: CONCEPTUAL GRADING



VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

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29995 TECHNOLOGY DRIVE, SUITE 306 | MURRIETA | CA 92563
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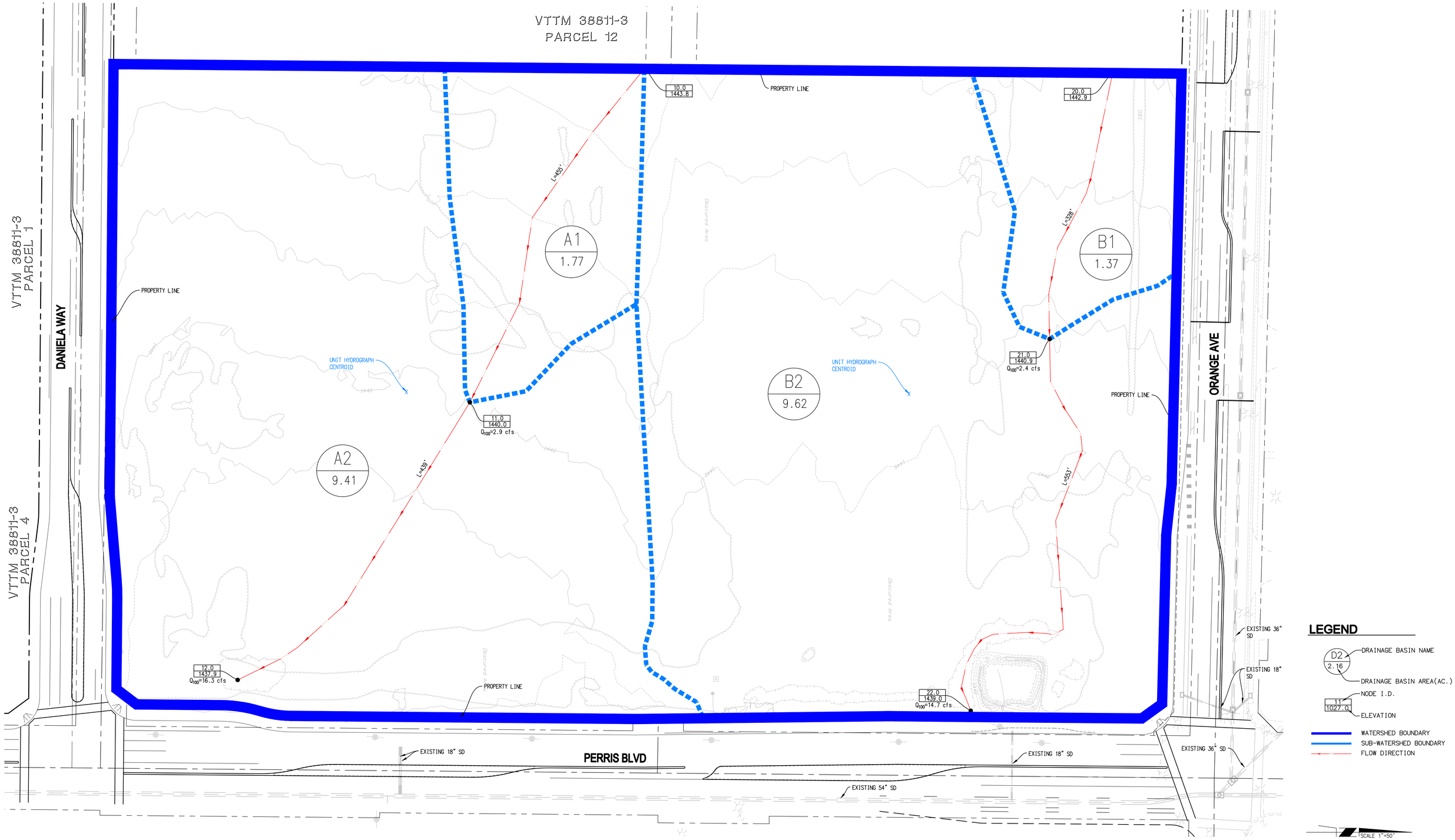
HARVEST LANDING SITE 1

FIGURE 1
VICINITY MAP

H:\PDATA\20-001 HARVEST LANDING\DWGS\EXHIBITS\20-001-VICINITY-MAP.DWG DANNY 10/11/2023 11:28 AM



UNIT HYDROGRAPH PARAMETERS - AREA A			
L_{MC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
894	600	5.90	0.02

UNIT HYDROGRAPH PARAMETERS - AREA B			
L_{MC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
881	483	3.90	0.02

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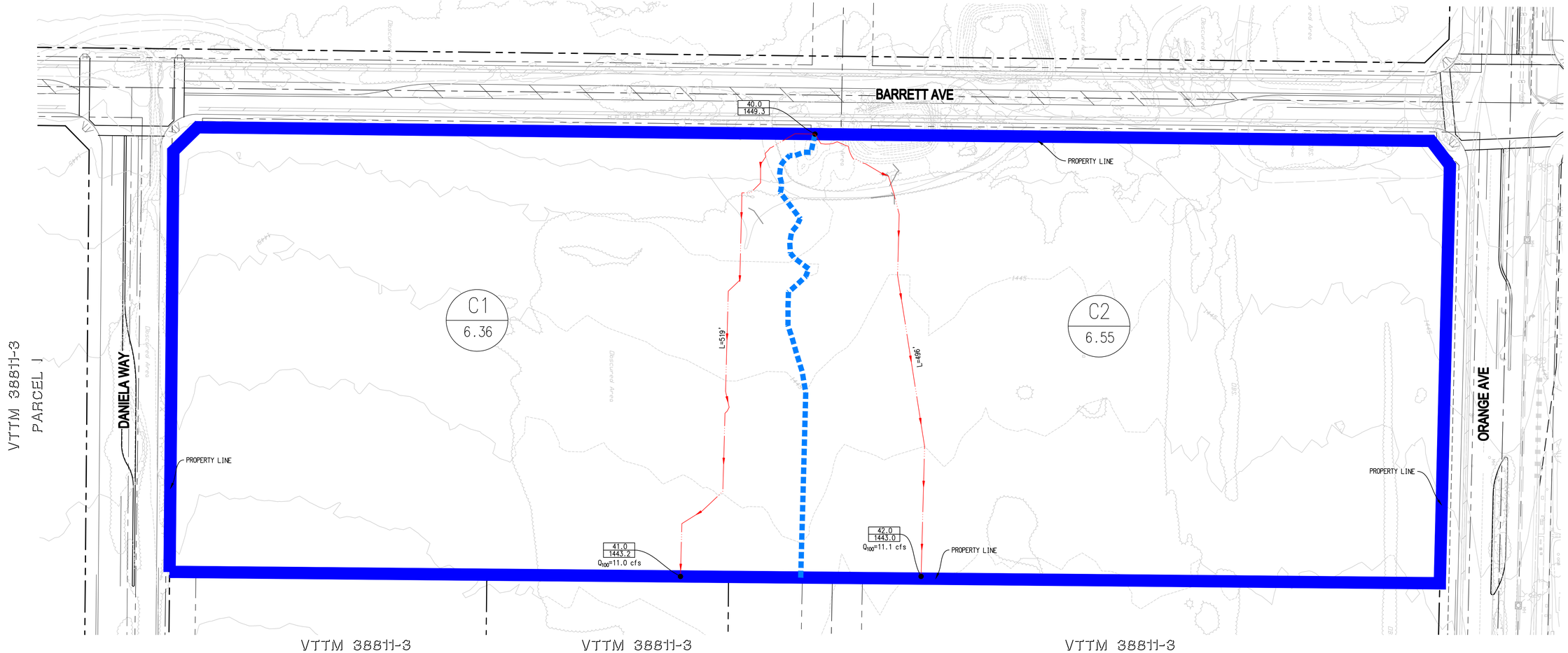
HARVEST LANDING

VTTM 38811-3, PARCELS 5-11 - EXISTING DRAINAGE

VTTM 38811-2
PARCEL 1



VTTM 38811-3
PARCEL 1

VTTM 38811-3
PARCEL 5

VTTM 38811-3
PARCEL 6

VTTM 38811-3
PARCEL 5

LEGEND

- D2 / 2.16 — DRAINAGE BASIN NAME / DRAINAGE BASIN AREA(AC.)
- 11 / 1027.0 — NODE I.D. / ELEVATION
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- FLOW DIRECTION

SCALE 1"=50'

50 25 0 50 100 150

SCALE: 1"=50'

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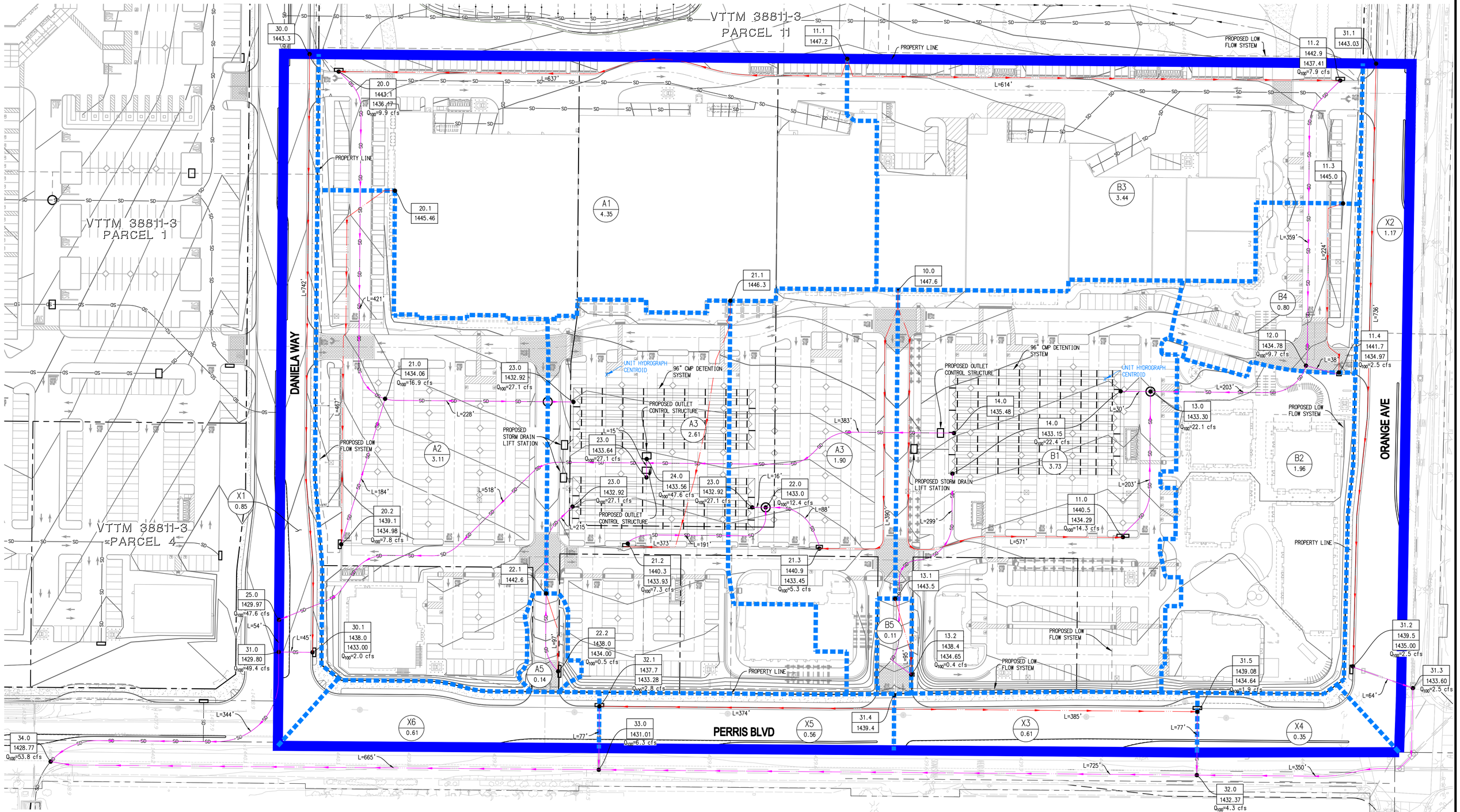
HARVEST LANDING

VTTM 38811-3, PARCEL 12 - EXISTING DRAINAGE



UNIT HYDROGRAPH PARAMETERS - AREA A			
L_{WC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
1,286	1,036	14.28	0.015

UNIT HYDROGRAPH PARAMETERS - AREA B			
L_{WC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
1,196	993	14.05	0.015

LEGEND

- D2 / 2.16 — DRAINAGE BASIN NAME / DRAINAGE BASIN AREA(AC.)
- 11 / 1027.0 — NODE I.D. / ELEVATION
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- FLOW DIRECTION
- PIPE FLOW DIRECTION

SCALE 1"=50'

50 25 0 50 100 150

SCALE: 1"=50'

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HARVEST LANDING

VTTM 38811-3, PARCELS 5-10 - PROPOSED DRAINAGE

VTTM 38811-2
PARCEL 1

VTTM 38811-3
PARCEL 1

VTTM 38811-2
PARCEL 5

VTTM 38811-2
PARCEL 6

VTTM 38811-2
PARCEL 5

BARRETT AVE

DANIELA WAY

ORANGE AVE

PROPERTY LINE

C1 3.07

C2 3.27

C3 4.49

C4 2.08

42.1 | 1450.5

41.1 | 1451.4

40.0 | 1451.2

42.2 | 1442.0 | 1434.28
Q_{100}=8.5 cfs

43.0 | 1433.23
Q_{100}=14.2 cfs

42.0 | 1437.11
Q_{100}=6.7 cfs

41.2 | 1442.9 | 1437.66
Q_{100}=3.8 cfs

41.0 | 1443.0 | 1438.12
Q_{100}=3.3 cfs

96" CMP DETENTION SYSTEM

STORM DRAIN LIFT STATION

PROP LOW FLOW SYSTEM

PROPERTY LINE

PROP LOW FLOW SYSTEM

L=110'

L=776'

L=30'

L=202'

L=393'

L=391'

L=445'

LEGEND

- D2 / 2.16 — DRAINAGE BASIN NAME / DRAINAGE BASIN AREA(AC.)
- 11 / 1027.0 — NODE I.D. / ELEVATION
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- FLOW DIRECTION
- PIPE FLOW DIRECTION

SCALE 1"=50'

50 25 0 50 100 150

SCALE: 1"=50'

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HARVEST LANDING

VTTM 38811-3, PARCELS 12 - PROPOSED DRAINAGE

LEGEND

- VTTM 3881-3, PARCELS 5-11 SITE BOUNDARY
- HYDROLOGIC SOIL B
- HYDROLOGIC SOIL C
- HYDROLOGIC SOIL D

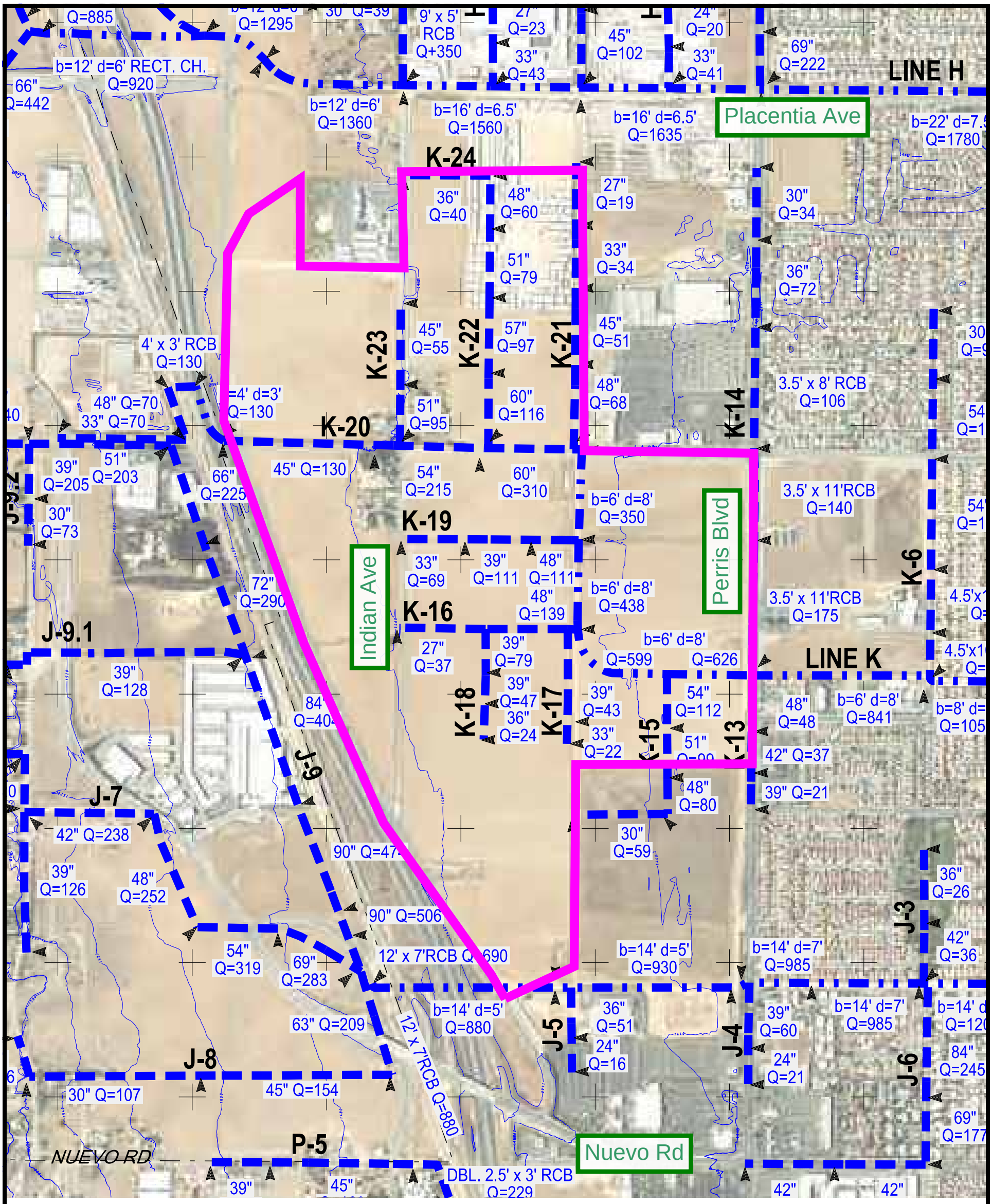
0 250 500 ft

FMCIVIL ENGINEERS INC.

Source: USDA Web Soil Survey

HARVEST LANDING

VTTM 38811-3, PARCELS 5-11 - HYDROLOGICAL SOIL GROUPS



N.T.S.

Site Boundary

MDP Facilities

Perris Harvest Landing MDP Exhibit

FMCIVIL ENGINEERS INC.

IN THE CITY OF PERRIS,
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM

VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

HOWARD INDUSTRIAL PARTNERS
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ENGINEER

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CONTACT: FRANCISCO MARTINEZ
(TEL)951-331-9813

ARCHITECT

AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: STEPHEN PRZYBYLOWSKI
(TEL)714-639-9860

LEGEND

- RIGHT OF WAY
- (1025) EXISTING CONTOUR
- EASEMENT
- SD PROP. ONSITE STORM DRAIN SYSTEM
- SD PROP. OFFSITE STORM DRAIN SYSTEM
- PROP. STORM DRAIN LOW FLOW SYSTEM
- PROP. STORM DRAIN UNDER DRAIN SYSTEM
- W EXISTING WATER LINE
- W PROP. WATER LINE
- SS EXISTING SWR LINE
- SS PROP. SEWER LINE
- SD EXISTING STORM DRAIN PIPE
- E EXISTING OVERHEAD LINES

SCALE 1"=200'

200 100 0 200 400 600

SCALE: 1"=200'

CITY OF PERRIS

HARVEST LANDING INDUSTRIAL - PHASE I OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM EXHIBIT

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF.:	

FMCIVIL ENGINEERS INC.
41870 KALMIA STREET, SUITE 120
MURRIETA, CA 92562
951.473.0202 - FMCIVIL.COM

SHEET 1 OF 2 SHEETS

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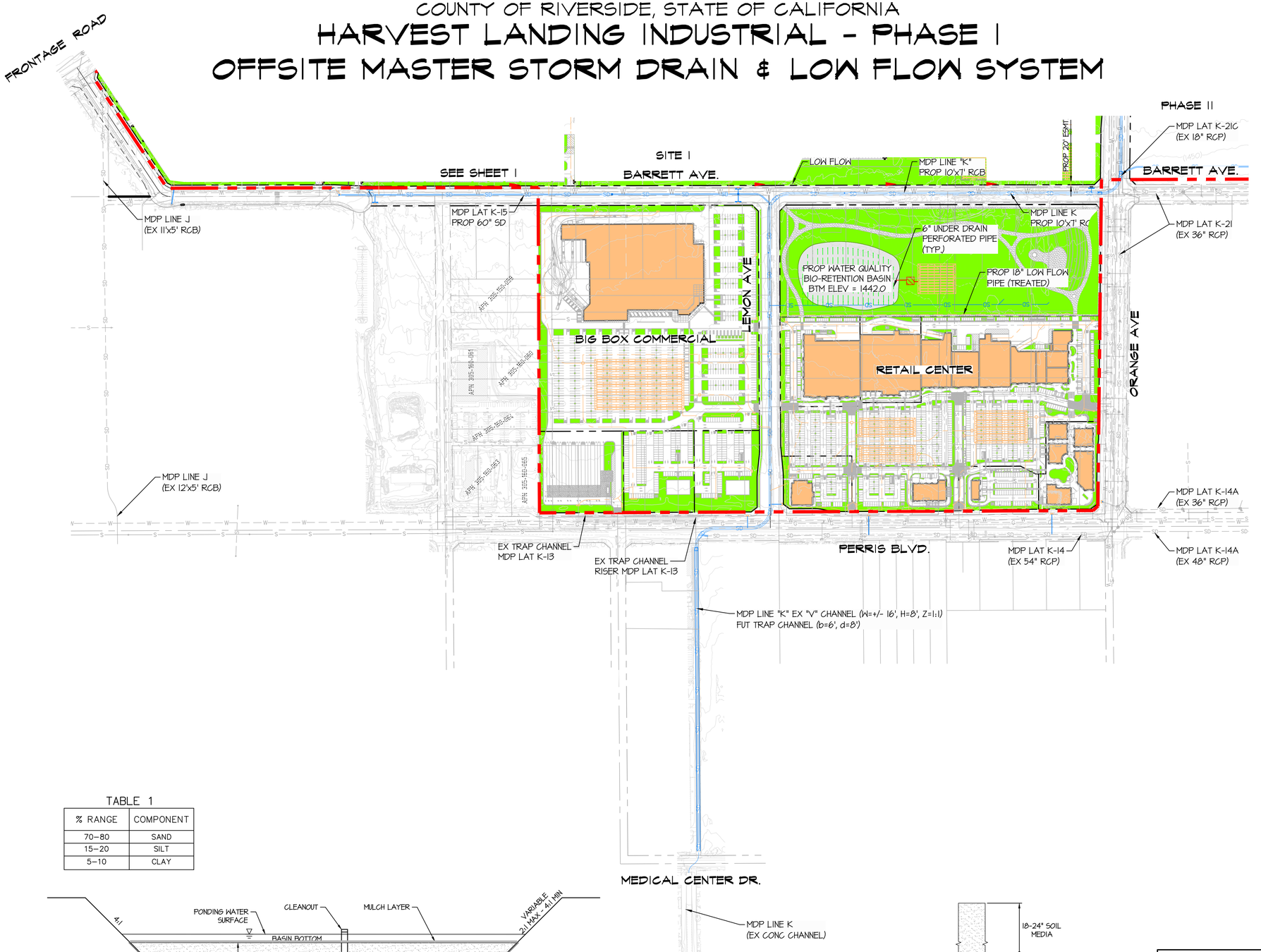
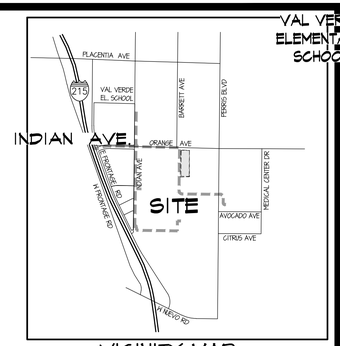
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM





VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

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ARCHITECT

AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: STEPHEN PRZYBYLOWSKI
(TEL)714-639-9860

TABLE 1

% RANGE	COMPONENT
70-80	SAND
15-20	SILT
5-10	CLAY

LEGEND

- RIGHT OF WAY
- (1025) EXISTING CONTOUR
- EASEMENT
- SD PROP. ONSITE STORM DRAIN SYSTEM
- SD PROP. OFFSITE STORM DRAIN SYSTEM
- PROP. STORM DRAIN LOW FLOW SYSTEM
- PROP. STORM DRAIN UNDER DRAIN SYSTEM
- W EXISTING WATER LINE
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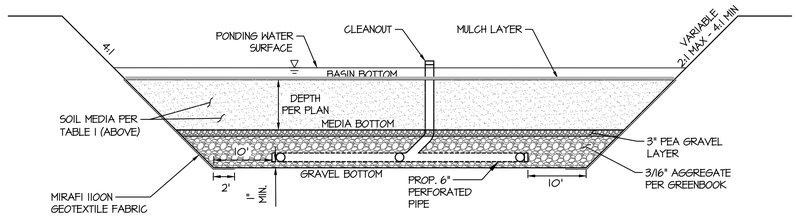
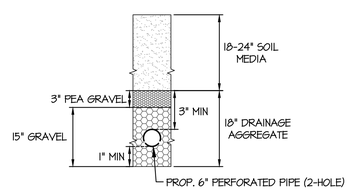
- SS EXISTING SWR LINE
- SS PROP. SEWER LINE
- SD EXISTING STORM DRAIN PIPE
- E EXISTING OVERHEAD LINES



BASIN CROSS SECTION
N.T.S.



AGGREGATE CROSS SECTION
N.T.S.

SCALE 1"=200'

200 100 0 200 400 600
SCALE: 1"=200'

CITY OF PERRIS

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN
& LOW FLOW SYSTEM EXHIBIT

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LEGEND

- (1025) EXISTING CONTOUR
- 1025 PROPOSED CONTOUR
- RETAINING WALL
- FENCE
- EDGE OF PAVEMENT
- SIGN
- MH MANHOLE
- RIGHT OF WAY
- EASEMENT
- PARCEL LINE
- PARCEL MAP BOUNDARY
- STREET CENTER LINE
- SCREEN WALL
- COMBINATION SCREEN/RETAINING WALL
- EXISTING LOT LINE
- RIDGE LINE
- RIBBON GUTTER
- FLOW ARROW
- PROPOSED EDGE OF PAVEMENT
- EXISTING WATER LINE
- PROPOSED WATER LINE
- EXISTING SWR LINE
- PROPOSED SEWER LINE
- EXISTING STORM DRAIN PIPE
- PROPOSED STORM DRAIN PIPE
- EXISTING OVERHEAD LINES
- CUT/FILL LINE
- SLOPE SYMBOL

ZONING ORDINANCE

EXISTING ZONING:
HARVEST LANDING SPECIFIC PLANS - MULTIPLE BUSINESS USE (MBU)

PROPOSED ZONING:
HARVEST LANDING SPECIFIC PLANS - MULTIPLE BUSINESS USE (MBU)

ASSESSOR'S PARCEL NUMBERS:

305-110-015, 016, 022 thru 027, 032 thru 035, &
305-140-012, 024 thru 027, 031, 032, 034, 040, 041, 049 thru 050, 052 thru 061

LEGAL DESCRIPTION

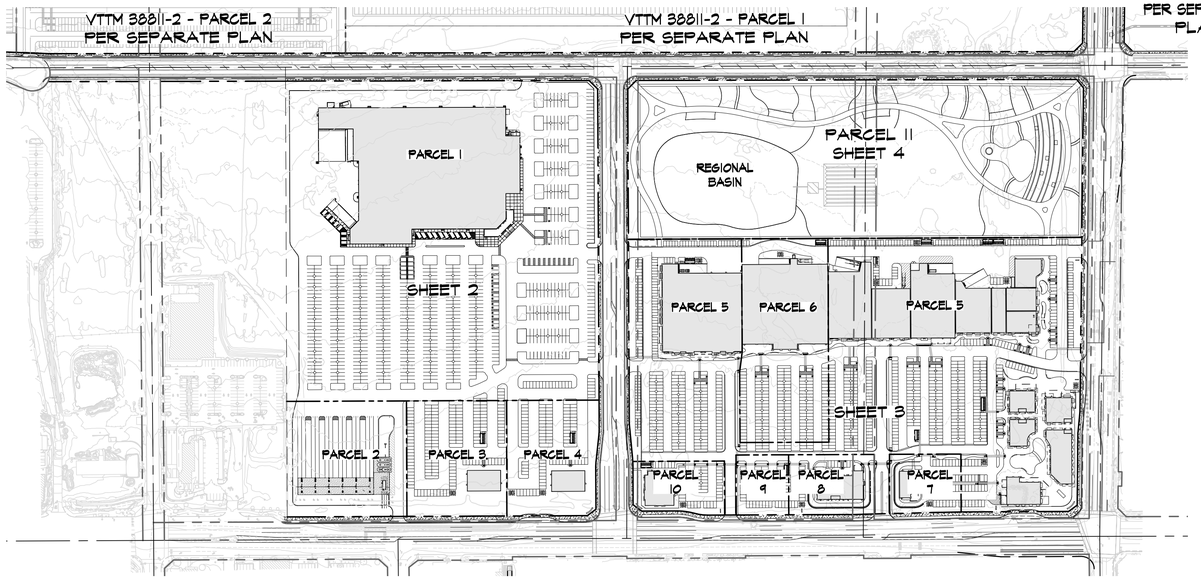
BLOCKS 1-3, 8-14, AND 19-20 OF FIGADOTA FARMS NO. 6 AS SHOWN BY MAP ON FILE IN THE OFFICE OF THE COUNTY RECORDER OF THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, IN BOOK 16 OF MAPS, PAGE 77.

IN THE CITY OF PERRIS,
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING RETAIL CENTER & BUSINESS PARK

CONCEPTUAL GRADING & DRAINAGE PLAN

VESTING TENTATIVE TRACT MAP 38811-3 - PARCELS 1-11

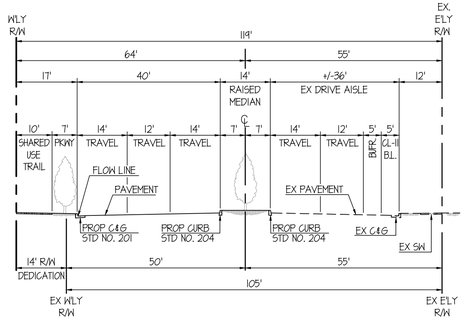


SCALE 1"=200'

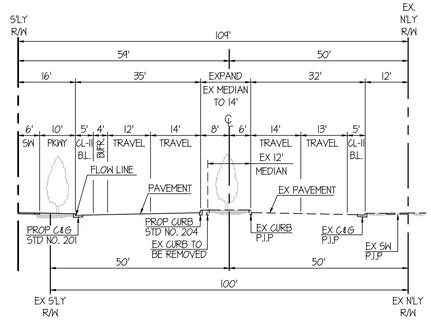
INDEX MAP

200 100 0 200 400 600

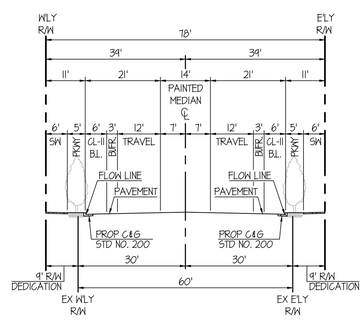
SCALE: 1"=200'



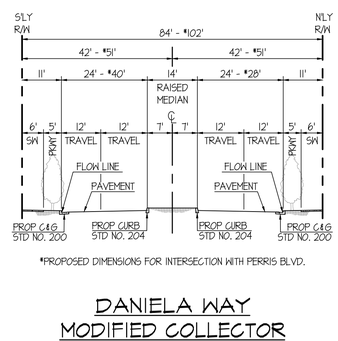
PERRIS BOULEVARD
PRIMARY ARTERIAL
(119'/90')



ORANGE AVENUE
(WEST OF PERRIS BLVD)
SECONDARY ARTERIAL
(109'/81')

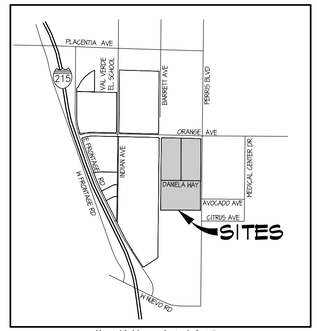


BARRETT AVE
(N'LY WALMART DWY - ORANGE AVE)
MAJOR COLLECTOR
(78'/56')



*PROPOSED DIMENSIONS FOR INTERSECTION WITH PERRIS BLVD.

DANIELA WAY
MODIFIED COLLECTOR
(84'/62')



VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

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ARCHITECT

MMA ARCHITECTURE
120 WEST LIME AVE.
MONROVIA, CA 91016
CONTACT: DANIEL KIM
(TEL)626-583-8348

EARTHWORK ESTIMATE:

RAW CUT:	6,665 CY
RAW FILL:	261,405 CY
NET:	254,740 CY IMPORT

HAUL TRIPS:
ASSUMED (13 CY PER TRIP) = 19,595

CITY OF PERRIS

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-3 - PARCELS 1-12

SCALE:	AS SHOWN
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SHEET 1 OF 4 SHEETS

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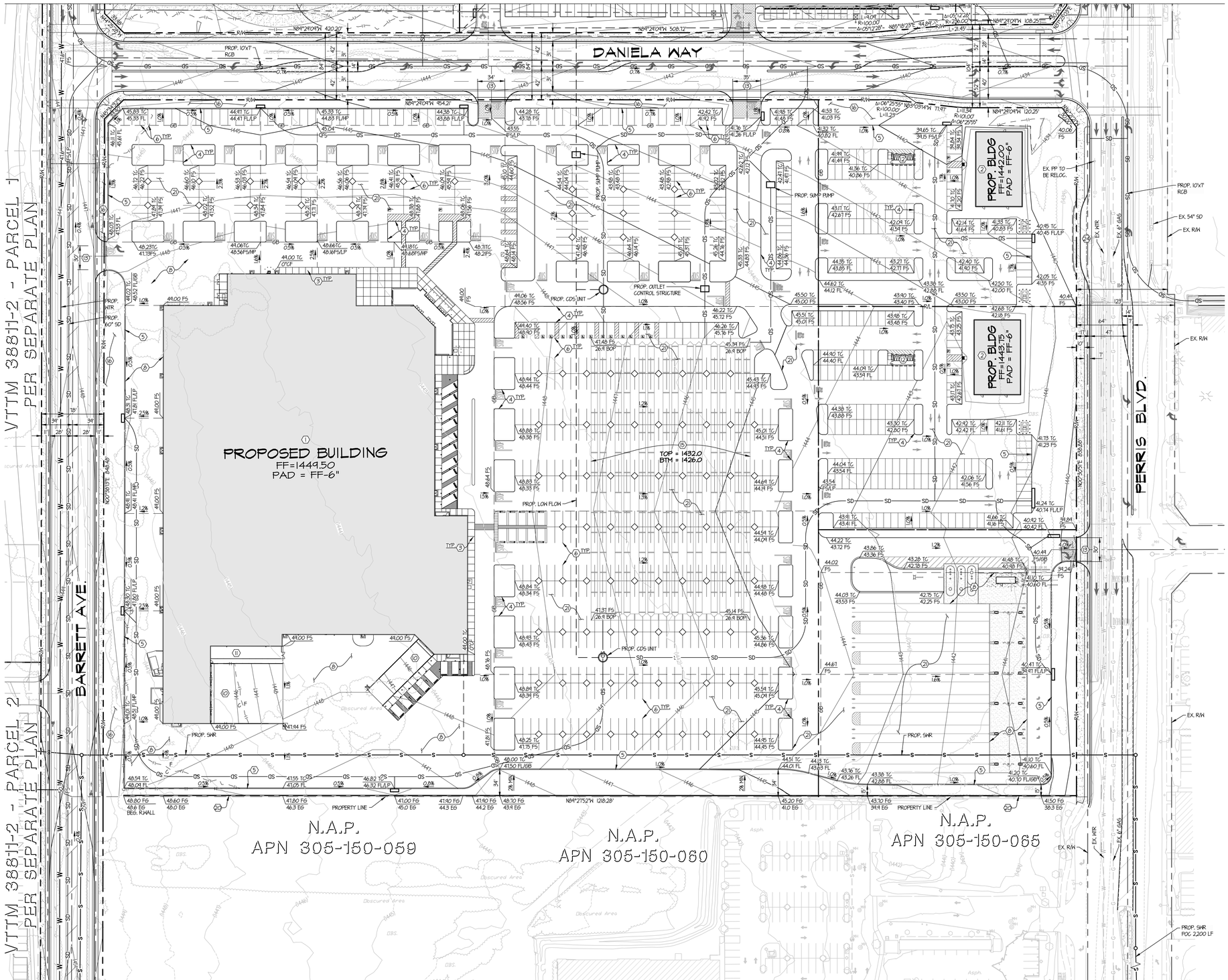
SEE SHEET 3



SITE PLAN KEYNOTES

1. PAINTED CONCRETE TILT-UP RETAIL / RESTAURANT FACILITY. BUILDING TO BE DESIGNED PER ARCHITECT'S PLANS
2. PAINTED STUCCO FRAMING RETAIL / RESTAURANT FACILITY. BUILDING TO BE DESIGNED PER ARCHITECT'S PLANS
3. ON SITE ACCESSIBLE SIDEWALK AND CURB RAMPS.
4. CONCRETE CURB
5. CONCRETE CURB & GUTTER
6. STANDARD PARKING STALL STRIPING PER STANDARDS SHOWN ON ARCHITECT'S PLANS
7. HANDICAP PARKING STALL STRIPING PER STANDARDS SHOWN ON ARCHITECT'S PLANS
8. PORTLAND CONC. CEMENT (PCC) PAVED TRUCK ACCESS PER ARCHITECT'S PLANS
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10. DEPRESSED LOADING DOCK PER ARCHITECT'S PLANS
11. TRASH COMPACTOR PER ARCHITECT'S PLANS
12. TRASH ENCLOSURES WITH ROOF PER ARCHITECT'S PLANS
13. COMMERCIAL DRIVEWAY APPROACH PER RIVERSIDE COUNTY STD. 207A
14. DETENTION BASIN
15. UNDERGROUND DETENTION CHAMBER SYSTEM - 96" CMP - TOP AND BOTTOM OF PIPE (BOP) ELEVATION PER PLAN
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17. CHAIN LINK FENCE PER ARCHITECT'S PLANS
18. APPROXIMATE LOCATION OF MONUMENT PROJECT SIGNS PER ARCHITECT'S PLANS
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22. PROPOSED CONCRETE RIBBON GUTTER
23. COMPACT PARKING STALL STRIPING PER STANDARDS SHOWN ON ARCHITECT'S PLANS
24. BUS TURNOUT PER RIVERSIDE COUNTY STD. 814

CITY OF PERRIS

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-3 - PARCELS 1-4

SCALE:	AS SHOWN
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SHEET 2 OF 4 SHEETS

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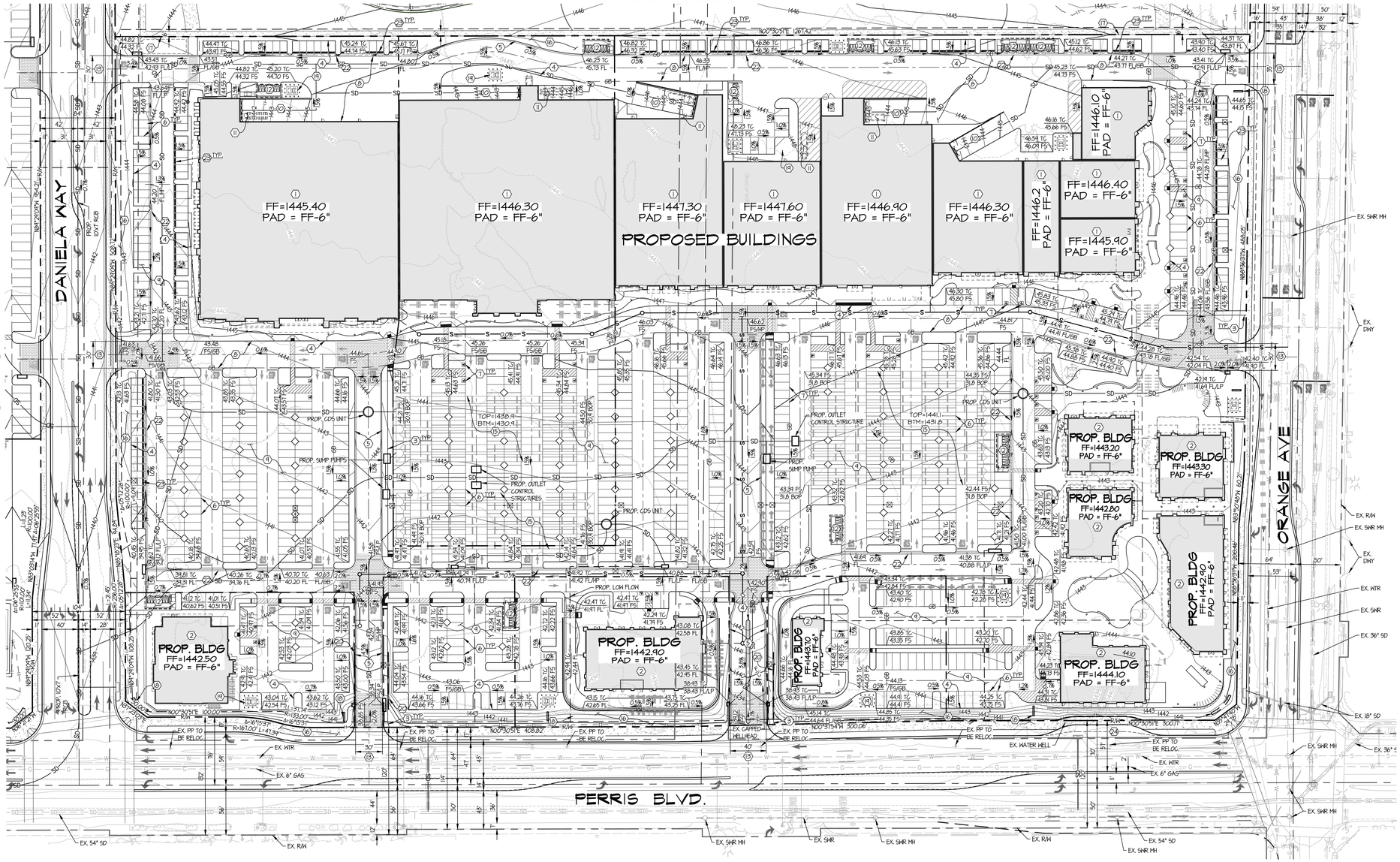
SEE SHEET 2



SITE PLAN KEYNOTES

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24. BUS TURNOUT PER RIVERSIDE COUNTY STD. 814

SCALE 1"=60'

60 30 0 60 120 180

SCALE: 1"=60'

CITY OF PERRIS

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-3 - PARCELS 5-10

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SHEET 3 OF 4 SHEETS

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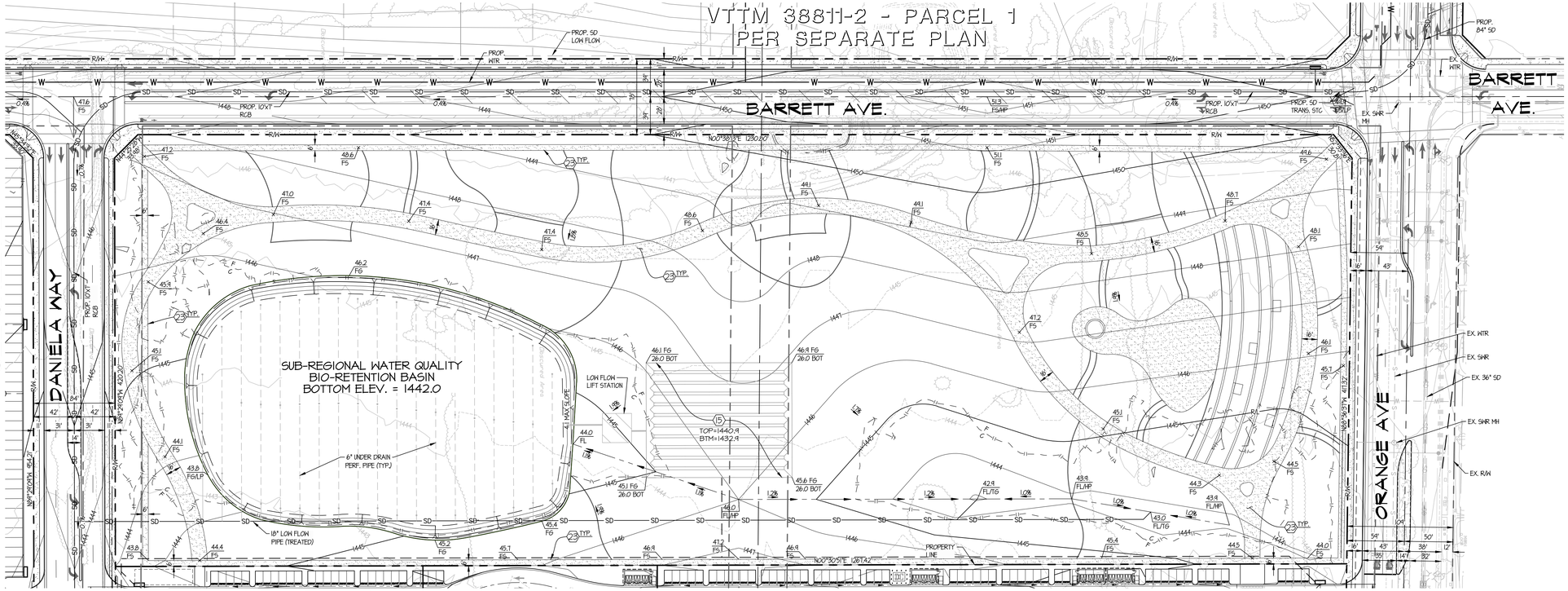

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SCALE 1"=60'

60 30 0 60 120 180

SCALE: 1"=60'

CITY OF PERRIS

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-3 - PARCEL 11

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DEVELOPMENT PLAN REVIEW – VTTM 38811-3, PARCELS 1-4
CITY OF PERRIS
RIVERSIDE COUNTY, CALIFORNIA

Drainage Study Report

Prepared for:
Howard Industrial Partners LLC
1944 North Tustin Street, Suite 122
Orange, CA 92865

Prepared By:

FM CIVIL ENGINEERS INC.

29995 Technology Drive, Suite 306
Murrieta, CA 92563

Engineer of Work/Contacts:

Francisco Martinez, Jr.

April 12, 2024
Revised: October 4, 2024

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CONCLUSIONS & RECOMMENDATIONS 4

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100-YEAR-6 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD) 2-1
100-YEAR-3 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD) 2-1
100-YEAR-3 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD) 2-1
100-YEAR-1 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD) 2-1
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SECTION 1 - GENERAL OVERVIEW

INTRODUCTION

The purpose of this study is to support the entitlement phase and determine minimum drainage improvements required for the proposed commercial retail development of approximately 24.5 acres and 168,000 square feet commercial building with 8 truck docks, and parking lot that lays within the Harvest Landing Specific Plan, located in the City of Perris, County of Riverside CA. More specifically, the project site is bounded to the north by Daniela Way, Barrett Avenue to the west, Aldi shopping center to the south and Perris Boulevard to the east.

The primary objectives of this report are as follows:

1. Delineate the drainage areas tributary to the onsite above/underground basin

2. Based on drainage patterns, ground slope, land use and soil type and using the Riverside County Rational Method, perform hydrologic and hydraulics of onsite drainage facilities.

3. Determine the 100-year peak storm flows based upon the pre-project, proposed land use per the MDP and post-project condition for the 24-hour storm duration utilizing the Unit Hydrograph Method as outlined in the Riverside County Flood Control & Water Conservation District Hydrology Manual.

4. Determine the required underground detention facilities to mitigate the 100-year peak storm flows for the 24-hour storm duration in the post-project condition to flows less than or equal to the proposed land use condition flow rates.

5. Determine the required the minimum storm drain infrastructure to flood protect the project site for the 100-year storm event.

6. Preparation of a hydrology report, which consist of hydrological and analytical results and exhibits.

BACKGROUND

EXISTING CONDITIONS

The project site is located within Riverside County Flood Control's Perris Valley Master Drainage Plan, and tributary to a low point in Perris Boulevard and the existing MDP Line "K" (earthen V-Channel) located about 2600 lineal feet east of Indian Avenue.

The site is in a relatively mild to flat sloping undeveloped terrain on a drainage area which drains easterly towards Perris Boulevard with no offsite flows. All the developed storm flows continue to travel easterly through the property, to an existing trapezoidal channel (b=6', d=2') that lies to the west of Perris Boulevard. This trapezoidal channel flows are intercepted by a grated inlet and conveyed into a lateral that connects to the existing MDP Line "K".MDP Line "K" is an earthen "V" channel (w= 16', H=8' & z=1:1) and planned as a future Trapezoidal Channel (b=6', d=8').

DEVELOPED CONDITIONS

The preliminary offsite design is shown on Exhibit G "Harvest Landing Industrial Phase 1 Offsite Master Storm Drain & Low Flow System". The offsite master storm drain system (backbone) will be part of a separate report and therefore excluded. The onsite storm water runoff will be collected via onsite storm drain system and conveyed to a CDS unit for pretreatment and directed to an offsite water quality retention system for water quality mitigation. However, the higher flow rates will be directed to an on-site underground pipe chamber which will mitigate the 100-year frequency storm event and release flows to be at or below the proposed land use condition flow rates. See the table below for the rational method results:

Description	Q_{100} Peak Flow Rates
Proposed	54.8
Existing	27.7
Onsite MDP	31.9

For purposes of this preliminary drainage report, the 100-year 24-hour peak flow rates for the post developed condition, predeveloped condition and proposed developed condition per the land use on the MDP were the only storm events analyzed for mitigation. The project storm mitigation is provided by utilizing the underground storm drain detention system and the outlet control structures. The total mitigation volume required was determined by selecting the flow rates from the recess limb of the proposed unit hydrograph runs for the 100-year 24-hour storm event that are equal or less than the flow rates from the proposed land use conditions. Smaller storm events analyzed, however, since the storm volume demand to mitigate the storm flows from the 100-year 24hour event are considerably larger than volumes produced by the smaller storm events, thus a conservative approach.

MDP Condition Watershed A Volume: 3.38 ac-ft; $Q_{100\text{-}24hr}$: 9.74 cfs
Proposed Condition Watershed A Volume: 5.54 ac-ft; $Q_{100\text{-}24hr}$: 14.35 cfs
Underground Chamber Watershed A Volume: *5.79 ac-ft

*Since this volume is greater than 5.69 ac-ft the underground chambers have enough storage to mitigate peak storm flows to the MDP land use levels. See the table below for the unit hydrograph results:

Storm Duration	SP Q_{peak}	SP V_{TOTAL}	MDP Q_{PEAK}	MDP V_{TOTAL}
1	72.79	2.2085	57.73	1.7826
3	43.01	3.5139	34.14	2.5147
6	35.3	4.2937	26.59	2.883
24	14.35	8.3545	9.74	5.1496
Acreage	24.44		24.45	

METHODOLOGY

HYDROLOGY

Hydrologic calculations were performed using the Riverside County Rational Method from RCFCD & WCD Hydrology Manual, dated April 1978. The 100-year design discharge was computed by generating a hydrologic "link-node" model in which divides the area into drainage sub-areas, each tributary to a concentration point or hydrologic "node" point determined by the proposed layout. The computer results are included in section 2. The following assumptions/guidelines were applied for use of the Rational Method:

1. The map from the Riverside County Hydrology Manual indicates that the study area consists Group "A" and "C" soils. A USGS soils map for the project site is included as Exhibit D, under the Exhibit section.
2. Initial sub-areas were drawn to be less than 10-acres in size and less than 1,000 feet in length, per County guidelines. Time of concentration for the initial sub-area is based on Time of Concentration Nomograph for Initial Sub-area from the Hydrology Manual.
3. Antecedent Moisture Condition 2 was used for 100-year storm events.
4. Standard intensity-duration curve data for the project area was used for the Perris Valley area; Plate D-4.1.

HYDRAULICS

Civil Design hydrology module was used for preliminarily sizing the storm drainpipe system. The onsite storm drain infrastructure will consist of pipe sizes ranging from 12"-48" in diameter. A more detailed analysis will be provided in subsequent submittals and a WSPG analysis for onsite storm drainpipe system will be performed during final engineering.

CONCLUSIONS & RECOMMENDATIONS

The hydrology analyses evaluated the proposed development to determine the necessary onsite drainage improvements required to mitigate flows for increased runoff and it has been concluded that:

1. The proposed drainage facilities will adequately convey the 100-year flows and provide flood protection to the project site.

2. The proposed underground pipe chamber system will have sufficient storage to adequately mitigate for increased runoff.

SECTION 2 - HYDROLOGY ANALYSIS

100-YEAR EXISTING ON-SITE HYDROLOGY (RATIONAL METHOD)

100-YEAR PROPOSED LAND USE MDP ON-SITE HYDROLOGY (RATIONAL METHOD)

100-YEAR PROPOSED ON-SITE HYDROLOGY WITH OFFSITES (RATIONAL METHOD)

100-YEAR PROPOSED ON-SITE HYDROLOGY (RATIONAL METHOD)

100-YEAR-24 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-24 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-6 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-6 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-3 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-3 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED LAND USE MDP ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

100-YEAR-1 HOUR STORM PROPOSED ON-SITE HYDROLOGY (UNIT HYDROGRAPH METHOD)

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 09/19/23 File:qa100x.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
EXISTING CONDITION
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 754.000(Ft.)
Top (of initial area) elevation = 1449.600(Ft.)
Bottom (of initial area) elevation = 1442.000(Ft.)
Difference in elevation = 7.600(Ft.)
Slope = 0.01008 s(percent)= 1.01

```
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   18.816 min.
Rainfall intensity =      1.977(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.678
Decimal fraction soil group A = 0.980
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.020
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  67.38
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      6.465(CFS)
Total initial stream area =        4.820(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     12.535(CFS)
Depth of flow =   0.354(Ft.), Average velocity =   1.003(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.00
      2            100.00              0.00
      3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     12.535(CFS)
  '     '    flow top width =     70.702(Ft.)
  '     '    velocity=    1.003(Ft/s)
  '     '    area =     12.497(Sq.Ft)
  '     '    Froude number =     0.420

Upstream point elevation =  1442.000(Ft.)
Downstream point elevation =  1438.800(Ft.)
Flow length =   774.000(Ft.)
Travel time  =   12.86 min.
Time of concentration =   31.68 min.
Depth of flow =   0.354(Ft.)
Average velocity =   1.003(Ft/s)
Total irregular channel flow =    12.535(CFS)
Irregular channel normal depth above invert elev. =   0.354(Ft.)
Average velocity of channel(s) =   1.003(Ft/s)
 Adding area flow to channel
USER INPUT of soil data for subarea
Runoff Coefficient = 0.655
Decimal fraction soil group A = 0.580
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.420
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  70.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.532(In/Hr) for a   100.0 year storm
```

```
Subarea runoff =     12.067(CFS) for     12.020(Ac.)
Total runoff =     18.532(CFS)      Total area =      16.840(Ac.)
Depth of flow =   0.409(Ft.), Average velocity =   1.106(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     16.840(Ac.)
Runoff from this stream =     18.532(CFS)
Time of concentration =   31.68 min.
Rainfall intensity =     1.532(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.100 to Point/Station       10.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   711.000(Ft.)
Top (of initial area) elevation =  1445.000(Ft.)
Bottom (of initial area) elevation =  1440.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00703  s(percent)=       0.70
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   19.752 min.
Rainfall intensity =      1.930(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.788
Decimal fraction soil group A = 0.160
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.840
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  82.96
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      4.519(CFS)
Total initial stream area =        2.970(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.200 to Point/Station       12.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      6.887(CFS)
Depth of flow =   0.313(Ft.), Average velocity =   0.702(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.00
      2            100.00              0.00
      3            200.00              1.00
Manning's 'N' friction factor =   0.030
```

```
----------------------------------------------------------------------
Sub-Channel flow  =      6.887(CFS)
  '     '    flow top width =     62.637(Ft.)
  '     '    velocity=    0.702(Ft/s)
  '     '    area =      9.808(Sq.Ft)
  '     '    Froude number =     0.313

Upstream point elevation =  1440.000(Ft.)
Downstream point elevation =  1438.800(Ft.)
Flow length =   504.000(Ft.)
Travel time  =   11.96 min.
Time of concentration =   31.71 min.
Depth of flow =   0.313(Ft.)
Average velocity =   0.702(Ft/s)
Total irregular channel flow =     6.887(CFS)
Irregular channel normal depth above invert elev. =   0.313(Ft.)
Average velocity of channel(s) =   0.702(Ft/s)
 Adding area flow to channel
USER INPUT of soil data for subarea
Runoff Coefficient = 0.655
Decimal fraction soil group A = 0.460
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.540
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  70.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.531(In/Hr) for a   100.0 year storm
Subarea runoff =      4.655(CFS) for      4.640(Ac.)
Total runoff =      9.174(CFS)      Total area =       7.610(Ac.)
Depth of flow =   0.349(Ft.), Average velocity =   0.754(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.200 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      7.610(Ac.)
Runoff from this stream =      9.174(CFS)
Time of concentration =   31.71 min.
Rainfall intensity =     1.531(In/Hr)
Summary of stream data:

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


1       18.532     31.68               1.532
2        9.174     31.71               1.531
Largest stream flow has longer or shorter time of concentration
Qp =     18.532 + sum of
        Qa          Tb/Ta
         9.174 *    0.999 =      9.163
Qp =     27.695

Total of 2 main streams to confluence:
```

```
Flow rates before confluence point:
      18.532       9.174
Area of streams before confluence:
       16.840        7.610


Results of confluence:
Total flow rate =     27.695(CFS)
Time of concentration =    31.677 min.
Effective stream area after confluence  =     24.450(Ac.)
End of computations, total study area =           24.45 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number =  71.1
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 09/15/23 File:qa100x.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LANDUSE CONDITION
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 754.000(Ft.)
Top (of initial area) elevation = 1449.600(Ft.)
Bottom (of initial area) elevation = 1442.000(Ft.)
Difference in elevation = 7.600(Ft.)

```
Slope =    0.01008  s(percent)=       1.01
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   13.846 min.
Rainfall intensity =      2.298(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.655
Decimal fraction soil group A = 0.980
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.020
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  32.74
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      7.257(CFS)
Total initial stream area =        4.820(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =     14.250(CFS)
Depth of flow =   0.371(Ft.), Average velocity =   1.036(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.00
      2            100.00              0.00
      3            200.00              1.00
Manning's 'N' friction factor =   0.030
------------------------------------------------------------------
Sub-Channel flow  =     14.250(CFS)
  '     '    flow top width =     74.184(Ft.)
  '     '    velocity=    1.036(Ft/s)
  '     '    area =     13.758(Sq.Ft)
  '     '    Froude number =     0.424

Upstream point elevation =  1442.000(Ft.)
Downstream point elevation =  1438.800(Ft.)
Flow length =   774.000(Ft.)
Travel time  =   12.45 min.
Time of concentration =   26.30 min.
Depth of flow =   0.371(Ft.)
Average velocity =   1.036(Ft/s)
Total irregular channel flow =    14.250(CFS)
Irregular channel normal depth above invert elev. =   0.371(Ft.)
Average velocity of channel(s) =   1.036(Ft/s)
 Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.690
Decimal fraction soil group A = 0.580
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.420
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  47.54
Pervious area fraction =  0.500; Impervious fraction =  0.500
```

```
Rainfall intensity =      1.678(In/Hr) for a   100.0 year storm
Subarea runoff =     13.910(CFS) for     12.020(Ac.)
Total runoff =     21.166(CFS)      Total area =      16.840(Ac.)
Depth of flow =   0.430(Ft.), Average velocity =   1.143(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     16.840(Ac.)
Runoff from this stream =     21.166(CFS)
Time of concentration =   26.30 min.
Rainfall intensity =     1.678(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.100 to Point/Station       10.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   711.000(Ft.)
Top (of initial area) elevation =  1445.000(Ft.)
Bottom (of initial area) elevation =  1440.000(Ft.)
Difference in elevation =     5.000(Ft.)
Slope =    0.00703  s(percent)=       0.70
TC = k(0.390)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   14.534 min.
Rainfall intensity =      2.244(In/Hr) for a   100.0 year storm
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.784
Decimal fraction soil group A = 0.160
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.840
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  63.08
Pervious area fraction =  0.500; Impervious fraction =  0.500
Initial subarea runoff =      5.223(CFS)
Total initial stream area =        2.970(Ac.)
Pervious area fraction = 0.500


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.200 to Point/Station       12.000
**** IRREGULAR CHANNEL FLOW TRAVEL TIME ****
________________________________________________________________________
Estimated mean flow rate at midpoint of channel =      8.045(CFS)
Depth of flow =   0.332(Ft.), Average velocity =   0.730(Ft/s)
      ******* Irregular Channel Data ***********
------------------------------------------------------------------
Information entered for subchannel number 1 :
Point number      'X' coordinate     'Y' coordinate
      1              0.00              1.00
      2            100.00              0.00
      3            200.00              1.00
```

```
Manning's 'N' friction factor =   0.030
-----------------------------------------------------------------
Sub-Channel flow  =      8.045(CFS)
  '     '    flow top width =     66.394(Ft.)
  '     '    velocity=    0.730(Ft/s)
  '     '    area =     11.021(Sq.Ft)
  '     '    Froude number =     0.316

Upstream point elevation =  1440.000(Ft.)
Downstream point elevation =  1438.800(Ft.)
Flow length =   504.000(Ft.)
Travel time  =   11.51 min.
Time of concentration =   26.04 min.
Depth of flow =   0.332(Ft.)
Average velocity =   0.730(Ft/s)
Total irregular channel flow =     8.045(CFS)
Irregular channel normal depth above invert elev. =   0.332(Ft.)
Average velocity of channel(s) =   0.730(Ft/s)
 Adding area flow to channel
SINGLE FAMILY (1/4 Acre Lot)
Runoff Coefficient = 0.710
Decimal fraction soil group A = 0.460
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.540
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  51.98
Pervious area fraction =  0.500; Impervious fraction =  0.500
Rainfall intensity =      1.686(In/Hr) for a   100.0 year storm
Subarea runoff =      5.554(CFS) for      4.640(Ac.)
Total runoff =     10.777(CFS)      Total area =       7.610(Ac.)
Depth of flow =   0.370(Ft.), Average velocity =   0.785(Ft/s)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.200 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
_________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      7.610(Ac.)
Runoff from this stream =     10.777(CFS)
Time of concentration =   26.04 min.
Rainfall intensity =     1.686(In/Hr)
Summary of stream data:

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


1       21.166     26.30               1.678
2       10.777     26.04               1.686
Largest stream flow has longer time of concentration
Qp =     21.166 + sum of
        Qb         Ia/Ib
        10.777 *    0.995 =     10.725
Qp =     31.892
```

```
Total of 2 main streams to confluence:
Flow rates before confluence point:
      21.166      10.777
Area of streams before confluence:
       16.840        7.610


Results of confluence:
Total flow rate =     31.892(CFS)
Time of concentration =    26.301 min.
Effective stream area after confluence  =     24.450(Ac.)
End of computations, total study area =           24.45 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.500
Area averaged RI index number =  47.4
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/03/24 File:q100psams.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WITH OFFSITE FLOWS
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 745.000(Ft.)
Top (of initial area) elevation = 1449.000(Ft.)
Bottom (of initial area) elevation = 1440.700(Ft.)
Difference in elevation = 8.300(Ft.)

```
Slope =    0.01114  s(percent)=       1.11
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.390 min.
Rainfall intensity =      2.645(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.861
Decimal fraction soil group A = 0.800
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.200
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  39.40
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     16.776(CFS)
Total initial stream area =        7.370(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       11.000 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1434.000(Ft.)
Downstream point/station elevation =  1433.330(Ft.)
Pipe length  =    44.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.776(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    16.776(CFS)
Normal flow depth in pipe =   14.98(In.)
Flow top width inside pipe =   19.00(In.)
Critical Depth =   18.05(In.)
Pipe flow velocity =      9.14(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    10.47 min.


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Process from Point/Station       11.000 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      7.370(Ac.)
Runoff from this stream =     16.776(CFS)
Time of concentration =   10.47 min.
Rainfall intensity =     2.635(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       11.100 to Point/Station       11.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   859.000(Ft.)
Top (of initial area) elevation =  1449.000(Ft.)
Bottom (of initial area) elevation =  1440.000(Ft.)
Difference in elevation =     9.000(Ft.)
Slope =    0.01048  s(percent)=       1.05
```

```
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.134 min.
Rainfall intensity =      2.556(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.870
Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  50.50
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      7.981(CFS)
Total initial stream area =        3.590(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       11.200 to Point/Station       11.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1434.510(Ft.)
Downstream point/station elevation =  1433.680(Ft.)
Pipe length  =   165.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.981(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     7.981(CFS)
Normal flow depth in pipe =   13.08(In.)
Flow top width inside pipe =   20.36(In.)
Critical Depth =   12.58(In.)
Pipe flow velocity =      5.07(Ft/s)
Travel time through pipe =    0.54 min.
Time of concentration (TC) =    11.68 min.


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Process from Point/Station       11.200 to Point/Station       11.500
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      3.590(Ac.)
Runoff from this stream =      7.981(CFS)
Time of concentration =   11.68 min.
Rainfall intensity =     2.498(In/Hr)


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Process from Point/Station       11.300 to Point/Station       11.400
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   757.000(Ft.)
Top (of initial area) elevation =  1449.000(Ft.)
Bottom (of initial area) elevation =  1440.200(Ft.)
Difference in elevation =     8.800(Ft.)
Slope =    0.01162  s(percent)=       1.16
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.368 min.
Rainfall intensity =      2.647(In/Hr) for a   100.0 year storm
```

```
COMMERCIAL subarea type
Runoff Coefficient = 0.870
Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  50.50
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.880(CFS)
Total initial stream area =        1.250(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       11.400 to Point/Station       11.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1436.050(Ft.)
Downstream point/station elevation =  1433.680(Ft.)
Pipe length  =    28.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.880(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.880(CFS)
Normal flow depth in pipe =    5.02(In.)
Flow top width inside pipe =    8.94(In.)
Critical depth could not be calculated.
Pipe flow velocity =     11.38(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    10.41 min.


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Process from Point/Station       11.400 to Point/Station       11.500
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.250(Ac.)
Runoff from this stream =      2.880(CFS)
Time of concentration =   10.41 min.
Rainfall intensity =     2.642(In/Hr)
Summary of stream data:

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


1        7.981     11.68                2.498
2        2.880     10.41                2.642
Largest stream flow has longer time of concentration
Qp =      7.981 + sum of
        Qb         Ia/Ib
         2.880 *    0.945 =      2.722
Qp =     10.703

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.981       2.880
```

```
Area of streams before confluence:
        3.590        1.250
Results of confluence:
Total flow rate =     10.703(CFS)
Time of concentration =    11.677 min.
Effective stream area after confluence =      4.840(Ac.)


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Process from Point/Station       11.500 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1433.680(Ft.)
Downstream point/station elevation =  1433.330(Ft.)
Pipe length  =    70.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.703(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    10.703(CFS)
Normal flow depth in pipe =   16.43(In.)
Flow top width inside pipe =   17.33(In.)
Critical Depth =   14.62(In.)
Pipe flow velocity =      5.30(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =    11.90 min.


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Process from Point/Station       11.500 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.840(Ac.)
Runoff from this stream =     10.703(CFS)
Time of concentration =   11.90 min.
Rainfall intensity =     2.475(In/Hr)
Summary of stream data:

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


1       16.776     10.47               2.635
2       10.703     11.90               2.475
Largest stream flow has longer or shorter time of concentration
Qp =     16.776 + sum of
        Qa          Tb/Ta
        10.703 *    0.880 =      9.419
Qp =     26.195

Total of 2 main streams to confluence:
Flow rates before confluence point:
      16.776      10.703
Area of streams before confluence:
        7.370        4.840
```

```
Results of confluence:
Total flow rate =     26.195(CFS)
Time of concentration =    10.470 min.
Effective stream area after confluence  =     12.210(Ac.)


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Process from Point/Station       12.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1433.330(Ft.)
Downstream point/station elevation =  1432.180(Ft.)
Pipe length  =    76.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    26.195(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    26.195(CFS)
Normal flow depth in pipe =   18.52(In.)
Flow top width inside pipe =   20.15(In.)
Critical Depth =   21.49(In.)
Pipe flow velocity =     10.07(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    10.60 min.


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Process from Point/Station       12.000 to Point/Station       13.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     12.210(Ac.)
Runoff from this stream =     26.195(CFS)
Time of concentration =   10.60 min.
Rainfall intensity =     2.619(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       12.100 to Point/Station       12.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   538.000(Ft.)
Top (of initial area) elevation =  1447.600(Ft.)
Bottom (of initial area) elevation =  1439.150(Ft.)
Difference in elevation =     8.450(Ft.)
Slope =    0.01571  s(percent)=       1.57
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.516 min.
Rainfall intensity =      2.915(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.010
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.990
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  68.63
Pervious area fraction =  0.100; Impervious fraction =  0.900
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Initial subarea runoff =      4.693(CFS)
Total initial stream area =        1.820(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       12.200 to Point/Station       12.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1434.590(Ft.)
Downstream point/station elevation =  1433.860(Ft.)
Pipe length  =   146.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.693(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     4.693(CFS)
Normal flow depth in pipe =   10.38(In.)
Flow top width inside pipe =   17.79(In.)
Critical Depth =    9.98(In.)
Pipe flow velocity =      4.45(Ft/s)
Travel time through pipe =    0.55 min.
Time of concentration (TC) =     9.06 min.


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Process from Point/Station       12.200 to Point/Station       12.500
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.820(Ac.)
Runoff from this stream =      4.693(CFS)
Time of concentration =    9.06 min.
Rainfall intensity =     2.828(In/Hr)


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Process from Point/Station       12.300 to Point/Station       12.400
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   211.000(Ft.)
Top (of initial area) elevation =  1443.600(Ft.)
Bottom (of initial area) elevation =  1440.400(Ft.)
Difference in elevation =     3.200(Ft.)
Slope =    0.01517  s(percent)=       1.52
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.897 min.
Rainfall intensity =      3.491(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.887
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.414(CFS)
Total initial stream area =        0.780(Ac.)
Pervious area fraction = 0.100
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Process from Point/Station       12.400 to Point/Station       12.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1434.470(Ft.)
Downstream point/station elevation =  1433.860(Ft.)
Pipe length  =   121.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.414(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.414(CFS)
Normal flow depth in pipe =    9.38(In.)
Flow top width inside pipe =    9.92(In.)
Critical Depth =    7.98(In.)
Pipe flow velocity =      3.67(Ft/s)
Travel time through pipe =    0.55 min.
Time of concentration (TC) =     6.45 min.


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Process from Point/Station       12.400 to Point/Station       12.500
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.780(Ac.)
Runoff from this stream =      2.414(CFS)
Time of concentration =    6.45 min.
Rainfall intensity =     3.341(In/Hr)
Summary of stream data:

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


1        4.693      9.06                2.828
2        2.414      6.45                3.341
Largest stream flow has longer time of concentration
Qp =      4.693 + sum of
        Qb         Ia/Ib
         2.414 *    0.846 =      2.043
Qp =      6.736

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.693       2.414
Area of streams before confluence:
        1.820        0.780
Results of confluence:
Total flow rate =      6.736(CFS)
Time of concentration =     9.063 min.
Effective stream area after confluence =      2.600(Ac.)


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Process from Point/Station       12.500 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
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Upstream point/station elevation =  1433.860(Ft.)
Downstream point/station elevation =  1432.180(Ft.)
Pipe length  =   335.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.736(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     6.736(CFS)
Normal flow depth in pipe =   13.43(In.)
Flow top width inside pipe =   15.67(In.)
Critical Depth =   12.05(In.)
Pipe flow velocity =      4.77(Ft/s)
Travel time through pipe =    1.17 min.
Time of concentration (TC) =    10.23 min.


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Process from Point/Station       12.500 to Point/Station       13.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.600(Ac.)
Runoff from this stream =      6.736(CFS)
Time of concentration =   10.23 min.
Rainfall intensity =     2.664(In/Hr)
Summary of stream data:

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


1       26.195     10.60               2.619
2        6.736     10.23               2.664
Largest stream flow has longer time of concentration
Qp =     26.195 + sum of
        Qb         Ia/Ib
         6.736 *    0.983 =      6.623
Qp =     32.818

Total of 2 main streams to confluence:
Flow rates before confluence point:
      26.195       6.736
Area of streams before confluence:
       12.210        2.600


Results of confluence:
Total flow rate =     32.818(CFS)
Time of concentration =    10.596 min.
Effective stream area after confluence  =     14.810(Ac.)


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Process from Point/Station       13.000 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1432.180(Ft.)
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Downstream point/station elevation =  1428.170(Ft.)
Pipe length  =   286.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    32.818(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    32.818(CFS)
Normal flow depth in pipe =   19.92(In.)
Flow top width inside pipe =   23.75(In.)
Critical Depth =   23.58(In.)
Pipe flow velocity =     10.43(Ft/s)
Travel time through pipe =    0.46 min.
Time of concentration (TC) =    11.05 min.


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Process from Point/Station       13.000 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     14.810(Ac.)
Runoff from this stream =     32.818(CFS)
Time of concentration =   11.05 min.
Rainfall intensity =     2.566(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       13.100 to Point/Station       13.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   173.000(Ft.)
Top (of initial area) elevation =  1449.000(Ft.)
Bottom (of initial area) elevation =  1447.800(Ft.)
Difference in elevation =     1.200(Ft.)
Slope =    0.00694  s(percent)=       0.69
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.370 min.
Rainfall intensity =      3.361(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.859
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  32.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      4.619(CFS)
Total initial stream area =        1.600(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       13.200 to Point/Station       13.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1443.810(Ft.)
Downstream point/station elevation =  1440.720(Ft.)
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Pipe length  =   260.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.619(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     4.619(CFS)
Normal flow depth in pipe =    8.86(In.)
Flow top width inside pipe =   14.75(In.)
Critical Depth =   10.45(In.)
Pipe flow velocity =      6.12(Ft/s)
Travel time through pipe =    0.71 min.
Time of concentration (TC) =     7.08 min.


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Process from Point/Station       13.200 to Point/Station       13.500
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.600(Ac.)
Runoff from this stream =      4.619(CFS)
Time of concentration =    7.08 min.
Rainfall intensity =     3.192(In/Hr)


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Process from Point/Station       13.300 to Point/Station       13.400
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   174.000(Ft.)
Top (of initial area) elevation =  1450.000(Ft.)
Bottom (of initial area) elevation =  1447.800(Ft.)
Difference in elevation =     2.200(Ft.)
Slope =    0.01264  s(percent)=       1.26
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.662 min.
Rainfall intensity =      3.561(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.860
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  32.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      4.135(CFS)
Total initial stream area =        1.350(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       13.400 to Point/Station       13.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1442.930(Ft.)
Downstream point/station elevation =  1440.720(Ft.)
Pipe length  =    21.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.135(CFS)
Nearest computed pipe diameter  =      9.00(In.)
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Calculated individual pipe flow  =     4.135(CFS)
Normal flow depth in pipe =    5.93(In.)
Flow top width inside pipe =    8.53(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.40(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     5.69 min.


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Process from Point/Station       13.400 to Point/Station       13.500
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.350(Ac.)
Runoff from this stream =      4.135(CFS)
Time of concentration =    5.69 min.
Rainfall intensity =     3.553(In/Hr)
Summary of stream data:

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


1        4.619      7.08                3.192
2        4.135      5.69                3.553
Largest stream flow has longer time of concentration
Qp =      4.619 + sum of
        Qb         Ia/Ib
         4.135 *    0.898 =      3.715
Qp =      8.334

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.619       4.135
Area of streams before confluence:
        1.600        1.350
Results of confluence:
Total flow rate =      8.334(CFS)
Time of concentration =     7.078 min.
Effective stream area after confluence =      2.950(Ac.)


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Process from Point/Station       13.500 to Point/Station       13.800
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1440.720(Ft.)
Downstream point/station elevation =  1434.830(Ft.)
Pipe length  =   496.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.334(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     8.334(CFS)
Normal flow depth in pipe =   11.39(In.)
Flow top width inside pipe =   17.35(In.)
Critical Depth =   13.42(In.)
Pipe flow velocity =      7.07(Ft/s)
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Travel time through pipe =    1.17 min.
Time of concentration (TC) =     8.25 min.


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Process from Point/Station       13.500 to Point/Station       13.800
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      2.950(Ac.)
Runoff from this stream =      8.334(CFS)
Time of concentration =    8.25 min.
Rainfall intensity =     2.962(In/Hr)


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Process from Point/Station       13.300 to Point/Station       13.700
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   452.000(Ft.)
Top (of initial area) elevation =  1450.000(Ft.)
Bottom (of initial area) elevation =  1446.300(Ft.)
Difference in elevation =     3.700(Ft.)
Slope =    0.00819  s(percent)=       0.82
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.048 min.
Rainfall intensity =      2.830(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.855
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  32.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      4.307(CFS)
Total initial stream area =        1.780(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       13.700 to Point/Station       13.800
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1435.110(Ft.)
Downstream point/station elevation =  1434.830(Ft.)
Pipe length  =    15.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.307(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.307(CFS)
Normal flow depth in pipe =    8.78(In.)
Flow top width inside pipe =   10.64(In.)
Critical Depth =   10.47(In.)
Pipe flow velocity =      7.00(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     9.08 min.
```

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Process from Point/Station       13.700 to Point/Station       13.800
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.780(Ac.)
Runoff from this stream =      4.307(CFS)
Time of concentration =    9.08 min.
Rainfall intensity =     2.825(In/Hr)
Summary of stream data:

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


1        8.334      8.25                2.962
2        4.307      9.08                2.825
Largest stream flow has longer or shorter time of concentration
Qp =      8.334 + sum of
        Qa          Tb/Ta
         4.307 *    0.908 =      3.910
Qp =     12.244

Total of 2 streams to confluence:
Flow rates before confluence point:
       8.334       4.307
Area of streams before confluence:
        2.950        1.780
Results of confluence:
Total flow rate =     12.244(CFS)
Time of concentration =     8.248 min.
Effective stream area after confluence =      4.730(Ac.)


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Process from Point/Station       13.800 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1434.830(Ft.)
Downstream point/station elevation =  1428.170(Ft.)
Pipe length  =   562.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.244(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    12.244(CFS)
Normal flow depth in pipe =   13.07(In.)
Flow top width inside pipe =   20.36(In.)
Critical Depth =   15.65(In.)
Pipe flow velocity =      7.78(Ft/s)
Travel time through pipe =    1.20 min.
Time of concentration (TC) =     9.45 min.


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Process from Point/Station       13.800 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
```

```
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.730(Ac.)
Runoff from this stream =     12.244(CFS)
Time of concentration =    9.45 min.
Rainfall intensity =     2.770(In/Hr)
Summary of stream data:

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


1       32.818     11.05               2.566
2       12.244      9.45               2.770
Largest stream flow has longer time of concentration
Qp =     32.818 + sum of
        Qb         Ia/Ib
        12.244 *    0.926 =     11.340
Qp =     44.158

Total of 2 main streams to confluence:
Flow rates before confluence point:
      32.818      12.244
Area of streams before confluence:
       14.810        4.730


Results of confluence:
Total flow rate =     44.158(CFS)
Time of concentration =    11.053 min.
Effective stream area after confluence  =     19.540(Ac.)


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Process from Point/Station       14.000 to Point/Station       15.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1428.170(Ft.)
Downstream point/station elevation =  1428.080(Ft.)
Pipe length  =    17.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    44.158(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    44.158(CFS)
Normal flow depth in pipe =   26.95(In.)
Flow top width inside pipe =   31.23(In.)
Critical Depth =   25.96(In.)
Pipe flow velocity =      7.78(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    11.09 min.


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Process from Point/Station       14.000 to Point/Station       15.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
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In Main Stream number: 1
Stream flow area =     19.540(Ac.)
Runoff from this stream =     44.158(CFS)
Time of concentration =   11.09 min.
Rainfall intensity =     2.562(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       13.100 to Point/Station       14.100
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   444.000(Ft.)
Top (of initial area) elevation =  1449.000(Ft.)
Bottom (of initial area) elevation =  1444.400(Ft.)
Difference in elevation =     4.600(Ft.)
Slope =    0.01036  s(percent)=       1.04
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.570 min.
Rainfall intensity =      2.906(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.882
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  65.30
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      4.026(CFS)
Total initial stream area =        1.570(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       14.100 to Point/Station       14.400
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1440.000(Ft.)
Downstream point/station elevation =  1434.520(Ft.)
Pipe length  =   266.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.026(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.026(CFS)
Normal flow depth in pipe =    8.03(In.)
Flow top width inside pipe =   11.29(In.)
Critical Depth =   10.19(In.)
Pipe flow velocity =      7.21(Ft/s)
Travel time through pipe =    0.61 min.
Time of concentration (TC) =     9.18 min.


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Process from Point/Station       14.100 to Point/Station       14.400
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.570(Ac.)
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Runoff from this stream =      4.026(CFS)
Time of concentration =    9.18 min.
Rainfall intensity =     2.809(In/Hr)


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Process from Point/Station       14.200 to Point/Station       14.300
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   370.000(Ft.)
Top (of initial area) elevation =  1449.000(Ft.)
Bottom (of initial area) elevation =  1443.800(Ft.)
Difference in elevation =     5.200(Ft.)
Slope =    0.01405  s(percent)=       1.41
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.496 min.
Rainfall intensity =      3.103(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  65.30
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      3.098(CFS)
Total initial stream area =        1.130(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       14.300 to Point/Station       14.400
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1434.690(Ft.)
Downstream point/station elevation =  1434.520(Ft.)
Pipe length  =    34.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.098(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     3.098(CFS)
Normal flow depth in pipe =    9.06(In.)
Flow top width inside pipe =   14.67(In.)
Critical Depth =    8.50(In.)
Pipe flow velocity =      4.00(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     7.64 min.


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Process from Point/Station       14.300 to Point/Station       14.400
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.130(Ac.)
Runoff from this stream =      3.098(CFS)
Time of concentration =    7.64 min.
Rainfall intensity =     3.075(In/Hr)
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Summary of stream data:

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


1        4.026      9.18                2.809
2        3.098      7.64                3.075
Largest stream flow has longer time of concentration
Qp =      4.026 + sum of
        Qb         Ia/Ib
         3.098 *    0.914 =      2.830
Qp =      6.856

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.026       3.098
Area of streams before confluence:
        1.570        1.130
Results of confluence:
Total flow rate =      6.856(CFS)
Time of concentration =     9.185 min.
Effective stream area after confluence =      2.700(Ac.)


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Process from Point/Station       14.400 to Point/Station       14.700
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1434.520(Ft.)
Downstream point/station elevation =  1429.750(Ft.)
Pipe length  =   231.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.856(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     6.856(CFS)
Normal flow depth in pipe =    9.59(In.)
Flow top width inside pipe =   14.41(In.)
Critical Depth =   12.61(In.)
Pipe flow velocity =      8.27(Ft/s)
Travel time through pipe =    0.47 min.
Time of concentration (TC) =     9.65 min.


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Process from Point/Station       14.400 to Point/Station       14.700
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      2.700(Ac.)
Runoff from this stream =      6.856(CFS)
Time of concentration =    9.65 min.
Rainfall intensity =     2.742(In/Hr)


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Process from Point/Station       14.500 to Point/Station       14.600
**** INITIAL AREA EVALUATION ****
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```
Initial area flow distance =   536.000(Ft.)
Top (of initial area) elevation =  1449.000(Ft.)
Bottom (of initial area) elevation =  1440.900(Ft.)
Difference in elevation =     8.100(Ft.)
Slope =    0.01511  s(percent)=       1.51
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.569 min.
Rainfall intensity =      2.907(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.010
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.990
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  68.63
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      5.398(CFS)
Total initial stream area =        2.100(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       14.600 to Point/Station       14.700
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1430.790(Ft.)
Downstream point/station elevation =  1429.750(Ft.)
Pipe length  =   208.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.398(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     5.398(CFS)
Normal flow depth in pipe =   11.38(In.)
Flow top width inside pipe =   17.36(In.)
Critical Depth =   10.74(In.)
Pipe flow velocity =      4.58(Ft/s)
Travel time through pipe =    0.76 min.
Time of concentration (TC) =     9.33 min.


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Process from Point/Station       14.600 to Point/Station       14.700
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.100(Ac.)
Runoff from this stream =      5.398(CFS)
Time of concentration =    9.33 min.
Rainfall intensity =     2.789(In/Hr)
Summary of stream data:

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


1        6.856      9.65                2.742
2        5.398      9.33                2.789
```

```
Largest stream flow has longer time of concentration
Qp =      6.856 + sum of
        Qb         Ia/Ib
         5.398 *    0.983 =      5.308
Qp =     12.164

Total of 2 streams to confluence:
Flow rates before confluence point:
       6.856       5.398
Area of streams before confluence:
        2.700        2.100
Results of confluence:
Total flow rate =     12.164(CFS)
Time of concentration =     9.650 min.
Effective stream area after confluence =      4.800(Ac.)


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Process from Point/Station       14.700 to Point/Station       15.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1429.750(Ft.)
Downstream point/station elevation =  1428.080(Ft.)
Pipe length  =    81.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.164(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    12.164(CFS)
Normal flow depth in pipe =   12.26(In.)
Flow top width inside pipe =   16.78(In.)
Critical Depth =   15.85(In.)
Pipe flow velocity =      9.50(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     9.79 min.


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Process from Point/Station       14.700 to Point/Station       15.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.800(Ac.)
Runoff from this stream =     12.164(CFS)
Time of concentration =    9.79 min.
Rainfall intensity =     2.723(In/Hr)
Summary of stream data:

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


1       44.158     11.09               2.562
2       12.164      9.79               2.723
Largest stream flow has longer time of concentration
Qp =     44.158 + sum of
        Qb         Ia/Ib
        12.164 *    0.941 =     11.445
```

```
Qp =     55.603

Total of 2 main streams to confluence:
Flow rates before confluence point:
      44.158      12.164
Area of streams before confluence:
       19.540        4.800


Results of confluence:
Total flow rate =     55.603(CFS)
Time of concentration =    11.089 min.
Effective stream area after confluence  =     24.340(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1433.060(Ft.)
Downstream point/station elevation =  1430.720(Ft.)
Pipe length  =   269.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    55.603(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    55.603(CFS)
Normal flow depth in pipe =   26.53(In.)
Flow top width inside pipe =   31.70(In.)
Critical Depth =   29.02(In.)
Pipe flow velocity =      9.95(Ft/s)
Travel time through pipe =    0.45 min.
Time of concentration (TC) =    11.54 min.


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Process from Point/Station       15.000 to Point/Station       24.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     24.340(Ac.)
Runoff from this stream =     55.603(CFS)
Time of concentration =   11.54 min.
Rainfall intensity =     2.512(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       20.000 to Point/Station       21.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   266.000(Ft.)
Top (of initial area) elevation =  1451.300(Ft.)
Bottom (of initial area) elevation =  1449.700(Ft.)
Difference in elevation =     1.600(Ft.)
Slope =    0.00602  s(percent)=       0.60
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.784 min.
```

```
Rainfall intensity =      3.047(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.857
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  32.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.496(CFS)
Total initial stream area =        0.190(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       21.000 to Point/Station       22.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1449.700(Ft.)
End of street segment elevation =  1446.500(Ft.)
Length of street segment  =   792.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  28.000(Ft.)
Distance from crown to crossfall grade break  =  26.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
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  =  11.000(Ft.)
Slope from curb to property line (v/hz) =   0.015
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 =      1.119(CFS)
Depth of flow =   0.247(Ft.), Average velocity =   1.148(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   6.006(Ft.)
Flow velocity =   1.15(Ft/s)
Travel time =   11.50 min.     TC =   19.28  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.879
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      1.953(In/Hr) for a   100.0 year storm
Subarea runoff =      1.099(CFS) for      0.640(Ac.)
Total runoff =      1.595(CFS)      Total area =       0.830(Ac.)
Street flow at end of street =      1.595(CFS)
Half street flow at end of street =      0.797(CFS)
Depth of flow =   0.271(Ft.), Average velocity =   1.231(Ft/s)
Flow width (from curb towards crown)=   7.219(Ft.)
```

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

Upstream point/station elevation = 1439.500(Ft.)
Downstream point/station elevation = 1435.530(Ft.)
Pipe length = 26.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.595(CFS)
Nearest computed pipe diameter = 6.00(In.)
Calculated individual pipe flow = 1.595(CFS)
Normal flow depth in pipe = 3.80(In.)
Flow top width inside pipe = 5.78(In.)
Critical depth could not be calculated.
Pipe flow velocity = 12.18(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 19.32 min.

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

Upstream point/station elevation = 1435.530(Ft.)
Downstream point/station elevation = 1430.720(Ft.)
Pipe length = 1027.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.595(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 1.595(CFS)
Normal flow depth in pipe = 7.08(In.)
Flow top width inside pipe = 11.80(In.)
Critical Depth = 6.43(In.)
Pipe flow velocity = 3.31(Ft/s)
Travel time through pipe = 5.17 min.
Time of concentration (TC) = 24.49 min.

++
Process from Point/Station 23.000 to Point/Station 24.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area = 0.830(Ac.)
Runoff from this stream = 1.595(CFS)
Time of concentration = 24.49 min.
Rainfall intensity = 1.737(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	55.603	11.54	2.512
2	1.595	24.49	1.737

Largest stream flow has longer or shorter time of concentration
Qp = 55.603 + sum of

```
        Qa          Tb/Ta
         1.595 *    0.471 =      0.751
Qp =     56.355

Total of 2 main streams to confluence:
Flow rates before confluence point:
      55.603       1.595
Area of streams before confluence:
       24.340        0.830


Results of confluence:
Total flow rate =     56.355(CFS)
Time of concentration =    11.540 min.
Effective stream area after confluence  =     25.170(Ac.)


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Process from Point/Station       24.000 to Point/Station       25.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1430.720(Ft.)
Downstream point/station elevation =  1429.350(Ft.)
Pipe length  =   459.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    56.355(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =    56.355(CFS)
Normal flow depth in pipe =   35.44(In.)
Flow top width inside pipe =   30.50(In.)
Critical Depth =   28.19(In.)
Pipe flow velocity =      6.50(Ft/s)
Travel time through pipe =    1.18 min.
Time of concentration (TC) =    12.72 min.


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Process from Point/Station       24.000 to Point/Station       25.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     25.170(Ac.)
Runoff from this stream =     56.355(CFS)
Time of concentration =   12.72 min.
Rainfall intensity =     2.395(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       24.100 to Point/Station       24.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   690.000(Ft.)
Top (of initial area) elevation =  1447.300(Ft.)
Bottom (of initial area) elevation =  1442.000(Ft.)
Difference in elevation =     5.300(Ft.)
Slope =    0.00768  s(percent)=       0.77
```

```
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.854 min.
Rainfall intensity =      2.589(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.532(CFS)
Total initial stream area =        0.670(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.200 to Point/Station       24.400
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1442.000(Ft.)
End of street segment elevation =  1438.600(Ft.)
Length of street segment  =   634.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  31.000(Ft.)
Distance from crown to crossfall grade break  =  29.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
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  =  11.000(Ft.)
Slope from curb to property line (v/hz) =   0.015
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 =      2.294(CFS)
Depth of flow =   0.287(Ft.), Average velocity =   1.486(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.033(Ft.)
Flow velocity =   1.49(Ft/s)
Travel time =    7.11 min.     TC =   17.97  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.879
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.022(In/Hr) for a   100.0 year storm
Subarea runoff =      1.334(CFS) for      0.750(Ac.)
Total runoff =      2.865(CFS)      Total area =       1.420(Ac.)
Street flow at end of street =      2.865(CFS)
Half street flow at end of street =      1.433(CFS)
Depth of flow =   0.305(Ft.), Average velocity =   1.560(Ft/s)
```

Flow width (from curb towards crown)= 8.898(Ft.)

++
Process from Point/Station 24.200 to Point/Station 24.400
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.420(Ac.)
Runoff from this stream = 2.865(CFS)
Time of concentration = 17.97 min.
Rainfall intensity = 2.022(In/Hr)

++
Process from Point/Station 24.300 to Point/Station 24.400
**** INITIAL AREA EVALUATION ****
_____
Initial area flow distance = 850.000(Ft.)
Top (of initial area) elevation = 1439.600(Ft.)
Bottom (of initial area) elevation = 1438.600(Ft.)
Difference in elevation = 1.000(Ft.)
Slope = 0.00118 s(percent)= 0.12
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 17.170 min.
Rainfall intensity = 2.068(In/Hr) for a 100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.880
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2) = 69.00
Pervious area fraction = 0.100; Impervious fraction = 0.900
Initial subarea runoff = 2.201(CFS)
Total initial stream area = 1.210(Ac.)
Pervious area fraction = 0.100

++
Process from Point/Station 24.300 to Point/Station 24.400
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 2 in normal stream number 2
Stream flow area = 1.210(Ac.)
Runoff from this stream = 2.201(CFS)
Time of concentration = 17.17 min.
Rainfall intensity = 2.068(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	2.865	17.97	2.022
2	2.201	17.17	2.068

Largest stream flow has longer time of concentration

```
Qp =      2.865 + sum of
        Qb         Ia/Ib
         2.201 *    0.978 =      2.153
Qp =      5.018

Total of 2 streams to confluence:
Flow rates before confluence point:
       2.865       2.201
Area of streams before confluence:
       1.420        1.210
Results of confluence:
Total flow rate =      5.018(CFS)
Time of concentration =    17.965 min.
Effective stream area after confluence =      2.630(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.400 to Point/Station       25.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1434.100(Ft.)
Downstream point/station elevation =  1429.350(Ft.)
Pipe length  =    47.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.018(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     5.018(CFS)
Normal flow depth in pipe =    7.03(In.)
Flow top width inside pipe =    7.44(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.55(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    18.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.400 to Point/Station       25.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.630(Ac.)
Runoff from this stream =      5.018(CFS)
Time of concentration =   18.02 min.
Rainfall intensity =     2.019(In/Hr)
Summary of stream data:

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


1       56.355     12.72               2.395
2        5.018     18.02               2.019
Largest stream flow has longer or shorter time of concentration
Qp =     56.355 + sum of
        Qa          Tb/Ta
         5.018 *    0.706 =      3.541
Qp =     59.895
```

```
Total of 2 main streams to confluence:
Flow rates before confluence point:
      56.355       5.018
Area of streams before confluence:
       25.170        2.630


Results of confluence:
Total flow rate =     59.895(CFS)
Time of concentration =    12.716 min.
Effective stream area after confluence  =     27.800(Ac.)
End of computations, total study area =           27.80 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  51.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/03/24 File:Q100PSAMS.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - WITH OFFSITE FLOWS
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 745.000(Ft.)
Top (of initial area) elevation = 1449.000(Ft.)
Bottom (of initial area) elevation = 1440.700(Ft.)
Difference in elevation = 8.300(Ft.)

```
Slope =    0.01114  s(percent)=       1.11
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.390 min.
Rainfall intensity =      2.645(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.861
Decimal fraction soil group A = 0.800
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.200
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  39.40
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     16.776(CFS)
Total initial stream area =        7.370(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1434.000(Ft.)
Downstream point/station elevation =  1433.330(Ft.)
Pipe length  =    44.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.776(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    16.776(CFS)
Normal flow depth in pipe =   14.98(In.)
Flow top width inside pipe =   19.00(In.)
Critical Depth =   18.05(In.)
Pipe flow velocity =      9.14(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    10.47 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      7.370(Ac.)
Runoff from this stream =     16.776(CFS)
Time of concentration =   10.47 min.
Rainfall intensity =     2.635(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.100 to Point/Station       11.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   859.000(Ft.)
Top (of initial area) elevation =  1449.000(Ft.)
Bottom (of initial area) elevation =  1440.000(Ft.)
Difference in elevation =     9.000(Ft.)
Slope =    0.01048  s(percent)=       1.05
```

```
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.134 min.
Rainfall intensity =      2.556(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.870
Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  50.50
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      7.981(CFS)
Total initial stream area =        3.590(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.200 to Point/Station       11.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1434.540(Ft.)
Downstream point/station elevation =  1433.710(Ft.)
Pipe length  =   165.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.981(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     7.981(CFS)
Normal flow depth in pipe =   13.08(In.)
Flow top width inside pipe =   20.36(In.)
Critical Depth =   12.58(In.)
Pipe flow velocity =      5.07(Ft/s)
Travel time through pipe =    0.54 min.
Time of concentration (TC) =    11.68 min.


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Process from Point/Station       11.200 to Point/Station       11.500
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      3.590(Ac.)
Runoff from this stream =      7.981(CFS)
Time of concentration =   11.68 min.
Rainfall intensity =     2.498(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.300 to Point/Station       11.400
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   757.000(Ft.)
Top (of initial area) elevation =  1449.000(Ft.)
Bottom (of initial area) elevation =  1440.200(Ft.)
Difference in elevation =     8.800(Ft.)
Slope =    0.01162  s(percent)=       1.16
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.368 min.
Rainfall intensity =      2.647(In/Hr) for a   100.0 year storm
```

```
COMMERCIAL subarea type
Runoff Coefficient = 0.870
Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  50.50
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.880(CFS)
Total initial stream area =        1.250(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.400 to Point/Station       11.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1436.050(Ft.)
Downstream point/station elevation =  1433.680(Ft.)
Pipe length  =    28.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.880(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.880(CFS)
Normal flow depth in pipe =    5.02(In.)
Flow top width inside pipe =    8.94(In.)
Critical depth could not be calculated.
Pipe flow velocity =     11.38(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    10.41 min.


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Process from Point/Station       11.400 to Point/Station       11.500
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.250(Ac.)
Runoff from this stream =      2.880(CFS)
Time of concentration =   10.41 min.
Rainfall intensity =     2.642(In/Hr)
Summary of stream data:

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


1        7.981     11.68                2.498
2        2.880     10.41                2.642
Largest stream flow has longer time of concentration
Qp =      7.981 + sum of
        Qb         Ia/Ib
         2.880 *    0.945 =      2.722
Qp =     10.703

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.981       2.880
```

```
Area of streams before confluence:
        3.590        1.250
Results of confluence:
Total flow rate =     10.703(CFS)
Time of concentration =    11.677 min.
Effective stream area after confluence =      4.840(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.500 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1433.710(Ft.)
Downstream point/station elevation =  1433.330(Ft.)
Pipe length  =    76.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.703(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    10.703(CFS)
Normal flow depth in pipe =   16.43(In.)
Flow top width inside pipe =   17.33(In.)
Critical Depth =   14.62(In.)
Pipe flow velocity =      5.30(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =    11.92 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.500 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.840(Ac.)
Runoff from this stream =     10.703(CFS)
Time of concentration =   11.92 min.
Rainfall intensity =     2.473(In/Hr)
Summary of stream data:

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


1       16.776     10.47               2.635
2       10.703     11.92               2.473
Largest stream flow has longer or shorter time of concentration
Qp =     16.776 + sum of
        Qa          Tb/Ta
        10.703 *    0.879 =      9.404
Qp =     26.180

Total of 2 main streams to confluence:
Flow rates before confluence point:
      16.776      10.703
Area of streams before confluence:
        7.370        4.840
```

```
Results of confluence:
Total flow rate =     26.180(CFS)
Time of concentration =    10.470 min.
Effective stream area after confluence  =     12.210(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1433.330(Ft.)
Downstream point/station elevation =  1432.180(Ft.)
Pipe length  =    76.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    26.180(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    26.180(CFS)
Normal flow depth in pipe =   18.52(In.)
Flow top width inside pipe =   20.15(In.)
Critical Depth =   21.47(In.)
Pipe flow velocity =     10.07(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    10.60 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     12.210(Ac.)
Runoff from this stream =     26.180(CFS)
Time of concentration =   10.60 min.
Rainfall intensity =     2.619(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.100 to Point/Station       12.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   538.000(Ft.)
Top (of initial area) elevation =  1447.600(Ft.)
Bottom (of initial area) elevation =  1439.150(Ft.)
Difference in elevation =     8.450(Ft.)
Slope =    0.01571  s(percent)=       1.57
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.516 min.
Rainfall intensity =      2.915(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.010
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.990
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  68.63
Pervious area fraction =  0.100; Impervious fraction =  0.900
```

```
Initial subarea runoff =      4.693(CFS)
Total initial stream area =        1.820(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       12.200 to Point/Station       12.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1434.590(Ft.)
Downstream point/station elevation =  1433.860(Ft.)
Pipe length  =   146.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.693(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     4.693(CFS)
Normal flow depth in pipe =   10.38(In.)
Flow top width inside pipe =   17.79(In.)
Critical Depth =    9.98(In.)
Pipe flow velocity =      4.45(Ft/s)
Travel time through pipe =    0.55 min.
Time of concentration (TC) =     9.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.200 to Point/Station       12.500
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.820(Ac.)
Runoff from this stream =      4.693(CFS)
Time of concentration =    9.06 min.
Rainfall intensity =     2.828(In/Hr)


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Process from Point/Station       12.300 to Point/Station       12.400
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   211.000(Ft.)
Top (of initial area) elevation =  1443.600(Ft.)
Bottom (of initial area) elevation =  1440.400(Ft.)
Difference in elevation =     3.200(Ft.)
Slope =    0.01517  s(percent)=       1.52
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.897 min.
Rainfall intensity =      3.491(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.887
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.414(CFS)
Total initial stream area =        0.780(Ac.)
Pervious area fraction = 0.100
```

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Process from Point/Station       12.400 to Point/Station       12.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1434.470(Ft.)
Downstream point/station elevation =  1433.860(Ft.)
Pipe length  =   121.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.414(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.414(CFS)
Normal flow depth in pipe =    9.38(In.)
Flow top width inside pipe =    9.92(In.)
Critical Depth =    7.98(In.)
Pipe flow velocity =      3.67(Ft/s)
Travel time through pipe =    0.55 min.
Time of concentration (TC) =     6.45 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.400 to Point/Station       12.500
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.780(Ac.)
Runoff from this stream =      2.414(CFS)
Time of concentration =    6.45 min.
Rainfall intensity =     3.341(In/Hr)
Summary of stream data:

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


1        4.693      9.06                2.828
2        2.414      6.45                3.341
Largest stream flow has longer time of concentration
Qp =      4.693 + sum of
        Qb         Ia/Ib
         2.414 *    0.846 =      2.043
Qp =      6.736

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.693       2.414
Area of streams before confluence:
        1.820        0.780
Results of confluence:
Total flow rate =      6.736(CFS)
Time of concentration =     9.063 min.
Effective stream area after confluence =      2.600(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.500 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
```

```
Upstream point/station elevation =  1433.860(Ft.)
Downstream point/station elevation =  1432.180(Ft.)
Pipe length  =   329.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.736(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     6.736(CFS)
Normal flow depth in pipe =   13.31(In.)
Flow top width inside pipe =   15.80(In.)
Critical Depth =   12.05(In.)
Pipe flow velocity =      4.81(Ft/s)
Travel time through pipe =    1.14 min.
Time of concentration (TC) =    10.20 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.500 to Point/Station       13.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.600(Ac.)
Runoff from this stream =      6.736(CFS)
Time of concentration =   10.20 min.
Rainfall intensity =     2.668(In/Hr)
Summary of stream data:

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


1       26.180     10.60               2.619
2        6.736     10.20               2.668
Largest stream flow has longer time of concentration
Qp =     26.180 + sum of
        Qb         Ia/Ib
         6.736 *    0.982 =      6.613
Qp =     32.794

Total of 2 main streams to confluence:
Flow rates before confluence point:
      26.180       6.736
Area of streams before confluence:
       12.210        2.600


Results of confluence:
Total flow rate =     32.794(CFS)
Time of concentration =    10.596 min.
Effective stream area after confluence  =     14.810(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1432.180(Ft.)
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Downstream point/station elevation =  1428.170(Ft.)
Pipe length  =   572.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    32.794(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    32.794(CFS)
Normal flow depth in pipe =   23.44(In.)
Flow top width inside pipe =   24.80(In.)
Critical Depth =   23.39(In.)
Pipe flow velocity =      7.96(Ft/s)
Travel time through pipe =    1.20 min.
Time of concentration (TC) =    11.79 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     14.810(Ac.)
Runoff from this stream =     32.794(CFS)
Time of concentration =   11.79 min.
Rainfall intensity =     2.486(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.100 to Point/Station       13.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   173.000(Ft.)
Top (of initial area) elevation =  1449.000(Ft.)
Bottom (of initial area) elevation =  1447.800(Ft.)
Difference in elevation =     1.200(Ft.)
Slope =    0.00694  s(percent)=       0.69
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.370 min.
Rainfall intensity =      3.361(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.859
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  32.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      4.619(CFS)
Total initial stream area =        1.600(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.200 to Point/Station       13.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1443.810(Ft.)
Downstream point/station elevation =  1440.720(Ft.)
```

```
Pipe length  =   260.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.619(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     4.619(CFS)
Normal flow depth in pipe =    8.86(In.)
Flow top width inside pipe =   14.75(In.)
Critical Depth =   10.45(In.)
Pipe flow velocity =      6.12(Ft/s)
Travel time through pipe =    0.71 min.
Time of concentration (TC) =     7.08 min.


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Process from Point/Station       13.200 to Point/Station       13.500
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.600(Ac.)
Runoff from this stream =      4.619(CFS)
Time of concentration =    7.08 min.
Rainfall intensity =     3.192(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.300 to Point/Station       13.400
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   174.000(Ft.)
Top (of initial area) elevation =  1450.000(Ft.)
Bottom (of initial area) elevation =  1447.800(Ft.)
Difference in elevation =     2.200(Ft.)
Slope =    0.01264  s(percent)=       1.26
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.662 min.
Rainfall intensity =      3.561(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.860
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  32.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      4.135(CFS)
Total initial stream area =        1.350(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       13.400 to Point/Station       13.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1442.930(Ft.)
Downstream point/station elevation =  1440.720(Ft.)
Pipe length  =    21.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.135(CFS)
Nearest computed pipe diameter  =      9.00(In.)
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Calculated individual pipe flow  =     4.135(CFS)
Normal flow depth in pipe =    5.93(In.)
Flow top width inside pipe =    8.53(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.40(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     5.69 min.


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Process from Point/Station       13.400 to Point/Station       13.500
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.350(Ac.)
Runoff from this stream =      4.135(CFS)
Time of concentration =    5.69 min.
Rainfall intensity =     3.553(In/Hr)
Summary of stream data:

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


1        4.619      7.08                3.192
2        4.135      5.69                3.553
Largest stream flow has longer time of concentration
Qp =      4.619 + sum of
        Qb         Ia/Ib
         4.135 *    0.898 =      3.715
Qp =      8.334

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.619       4.135
Area of streams before confluence:
        1.600        1.350
Results of confluence:
Total flow rate =      8.334(CFS)
Time of concentration =     7.078 min.
Effective stream area after confluence =      2.950(Ac.)


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Process from Point/Station       13.500 to Point/Station       13.800
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1440.720(Ft.)
Downstream point/station elevation =  1434.830(Ft.)
Pipe length  =   496.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.334(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     8.334(CFS)
Normal flow depth in pipe =   11.39(In.)
Flow top width inside pipe =   17.35(In.)
Critical Depth =   13.42(In.)
Pipe flow velocity =      7.07(Ft/s)
```

```
Travel time through pipe =    1.17 min.
Time of concentration (TC) =     8.25 min.


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Process from Point/Station       13.500 to Point/Station       13.800
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      2.950(Ac.)
Runoff from this stream =      8.334(CFS)
Time of concentration =    8.25 min.
Rainfall intensity =     2.962(In/Hr)


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Process from Point/Station       13.300 to Point/Station       13.700
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   452.000(Ft.)
Top (of initial area) elevation =  1450.000(Ft.)
Bottom (of initial area) elevation =  1446.300(Ft.)
Difference in elevation =     3.700(Ft.)
Slope =    0.00819  s(percent)=       0.82
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.048 min.
Rainfall intensity =      2.830(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.855
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  32.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      4.307(CFS)
Total initial stream area =        1.780(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       13.700 to Point/Station       13.800
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1435.110(Ft.)
Downstream point/station elevation =  1434.830(Ft.)
Pipe length  =    15.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.307(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.307(CFS)
Normal flow depth in pipe =    8.78(In.)
Flow top width inside pipe =   10.64(In.)
Critical Depth =   10.47(In.)
Pipe flow velocity =      7.00(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     9.08 min.
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Process from Point/Station       13.700 to Point/Station       13.800
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.780(Ac.)
Runoff from this stream =      4.307(CFS)
Time of concentration =    9.08 min.
Rainfall intensity =     2.825(In/Hr)
Summary of stream data:

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


1        8.334      8.25                2.962
2        4.307      9.08                2.825
Largest stream flow has longer or shorter time of concentration
Qp =      8.334 + sum of
        Qa          Tb/Ta
         4.307 *    0.908 =      3.910
Qp =     12.244

Total of 2 streams to confluence:
Flow rates before confluence point:
       8.334       4.307
Area of streams before confluence:
        2.950        1.780
Results of confluence:
Total flow rate =     12.244(CFS)
Time of concentration =     8.248 min.
Effective stream area after confluence =      4.730(Ac.)


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Process from Point/Station       13.800 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1434.830(Ft.)
Downstream point/station elevation =  1428.170(Ft.)
Pipe length  =   356.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.244(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    12.244(CFS)
Normal flow depth in pipe =   12.77(In.)
Flow top width inside pipe =   16.34(In.)
Critical Depth =   15.88(In.)
Pipe flow velocity =      9.13(Ft/s)
Travel time through pipe =    0.65 min.
Time of concentration (TC) =     8.90 min.


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Process from Point/Station       13.800 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
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The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.730(Ac.)
Runoff from this stream =     12.244(CFS)
Time of concentration =    8.90 min.
Rainfall intensity =     2.853(In/Hr)
Summary of stream data:

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


1       32.794     11.79               2.486
2       12.244      8.90               2.853
Largest stream flow has longer time of concentration
Qp =     32.794 + sum of
        Qb         Ia/Ib
        12.244 *    0.871 =     10.665
Qp =     43.459

Total of 2 main streams to confluence:
Flow rates before confluence point:
      32.794      12.244
Area of streams before confluence:
       14.810        4.730


Results of confluence:
Total flow rate =     43.459(CFS)
Time of concentration =    11.793 min.
Effective stream area after confluence  =     19.540(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       15.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1428.170(Ft.)
Downstream point/station elevation =  1427.940(Ft.)
Pipe length  =    46.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    43.459(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    43.459(CFS)
Normal flow depth in pipe =   27.23(In.)
Flow top width inside pipe =   30.90(In.)
Critical Depth =   25.79(In.)
Pipe flow velocity =      7.57(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    11.89 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.000 to Point/Station       15.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
```

```
Stream flow area =     19.540(Ac.)
Runoff from this stream =     43.459(CFS)
Time of concentration =   11.89 min.
Rainfall intensity =     2.475(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.100 to Point/Station       14.100
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   444.000(Ft.)
Top (of initial area) elevation =  1449.000(Ft.)
Bottom (of initial area) elevation =  1444.400(Ft.)
Difference in elevation =     4.600(Ft.)
Slope =    0.01036  s(percent)=       1.04
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.570 min.
Rainfall intensity =      2.906(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.882
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  65.30
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      4.026(CFS)
Total initial stream area =        1.570(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       14.100 to Point/Station       14.400
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1440.000(Ft.)
Downstream point/station elevation =  1434.520(Ft.)
Pipe length  =   266.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.026(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.026(CFS)
Normal flow depth in pipe =    8.03(In.)
Flow top width inside pipe =   11.29(In.)
Critical Depth =   10.19(In.)
Pipe flow velocity =      7.21(Ft/s)
Travel time through pipe =    0.61 min.
Time of concentration (TC) =     9.18 min.


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Process from Point/Station       14.100 to Point/Station       14.400
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.570(Ac.)
Runoff from this stream =      4.026(CFS)
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```
Time of concentration =    9.18 min.
Rainfall intensity =     2.809(In/Hr)


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Process from Point/Station       14.200 to Point/Station       14.300
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   370.000(Ft.)
Top (of initial area) elevation =  1449.000(Ft.)
Bottom (of initial area) elevation =  1443.800(Ft.)
Difference in elevation =     5.200(Ft.)
Slope =    0.01405  s(percent)=       1.41
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.496 min.
Rainfall intensity =      3.103(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  65.30
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      3.098(CFS)
Total initial stream area =        1.130(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       14.300 to Point/Station       14.400
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1434.690(Ft.)
Downstream point/station elevation =  1434.520(Ft.)
Pipe length  =    34.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.098(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     3.098(CFS)
Normal flow depth in pipe =    9.06(In.)
Flow top width inside pipe =   14.67(In.)
Critical Depth =    8.50(In.)
Pipe flow velocity =      4.00(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     7.64 min.


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Process from Point/Station       14.300 to Point/Station       14.400
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.130(Ac.)
Runoff from this stream =      3.098(CFS)
Time of concentration =    7.64 min.
Rainfall intensity =     3.075(In/Hr)
Summary of stream data:
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```
Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        4.026      9.18                2.809
2        3.098      7.64                3.075
Largest stream flow has longer time of concentration
Qp =      4.026 + sum of
        Qb         Ia/Ib
         3.098 *    0.914 =      2.830
Qp =      6.856

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.026       3.098
Area of streams before confluence:
        1.570        1.130
Results of confluence:
Total flow rate =      6.856(CFS)
Time of concentration =     9.185 min.
Effective stream area after confluence =      2.700(Ac.)


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Process from Point/Station       14.400 to Point/Station       14.700
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1434.520(Ft.)
Downstream point/station elevation =  1429.750(Ft.)
Pipe length  =   170.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.856(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     6.856(CFS)
Normal flow depth in pipe =    8.67(In.)
Flow top width inside pipe =   14.82(In.)
Critical Depth =   12.61(In.)
Pipe flow velocity =      9.34(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =     9.49 min.


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Process from Point/Station       14.400 to Point/Station       14.700
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      2.700(Ac.)
Runoff from this stream =      6.856(CFS)
Time of concentration =    9.49 min.
Rainfall intensity =     2.765(In/Hr)


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Process from Point/Station       14.500 to Point/Station       14.600
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
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Initial area flow distance =   536.000(Ft.)
Top (of initial area) elevation =  1449.000(Ft.)
Bottom (of initial area) elevation =  1440.900(Ft.)
Difference in elevation =     8.100(Ft.)
Slope =    0.01511  s(percent)=       1.51
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.569 min.
Rainfall intensity =      2.907(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.010
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.990
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  68.63
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      5.398(CFS)
Total initial stream area =        2.100(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       14.600 to Point/Station       14.700
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1430.850(Ft.)
Downstream point/station elevation =  1429.750(Ft.)
Pipe length  =   219.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.398(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     5.398(CFS)
Normal flow depth in pipe =   11.37(In.)
Flow top width inside pipe =   17.37(In.)
Critical Depth =   10.74(In.)
Pipe flow velocity =      4.59(Ft/s)
Travel time through pipe =    0.79 min.
Time of concentration (TC) =     9.36 min.


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Process from Point/Station       14.600 to Point/Station       14.700
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.100(Ac.)
Runoff from this stream =      5.398(CFS)
Time of concentration =    9.36 min.
Rainfall intensity =     2.783(In/Hr)
Summary of stream data:

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


1        6.856      9.49                2.765
2        5.398      9.36                2.783
Largest stream flow has longer time of concentration
```

```
Qp =      6.856 + sum of
        Qb         Ia/Ib
         5.398 *    0.994 =      5.363
Qp =     12.219

Total of 2 streams to confluence:
Flow rates before confluence point:
       6.856       5.398
Area of streams before confluence:
        2.700        2.100
Results of confluence:
Total flow rate =     12.219(CFS)
Time of concentration =     9.489 min.
Effective stream area after confluence =      4.800(Ac.)


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Process from Point/Station       14.700 to Point/Station       15.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1429.750(Ft.)
Downstream point/station elevation =  1427.940(Ft.)
Pipe length  =   239.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.219(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    12.219(CFS)
Normal flow depth in pipe =   15.38(In.)
Flow top width inside pipe =   18.60(In.)
Critical Depth =   15.64(In.)
Pipe flow velocity =      6.47(Ft/s)
Travel time through pipe =    0.62 min.
Time of concentration (TC) =    10.10 min.


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Process from Point/Station       14.700 to Point/Station       15.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.800(Ac.)
Runoff from this stream =     12.219(CFS)
Time of concentration =   10.10 min.
Rainfall intensity =     2.681(In/Hr)
Summary of stream data:

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


1       43.459     11.89               2.475
2       12.219     10.10               2.681
Largest stream flow has longer time of concentration
Qp =     43.459 + sum of
        Qb         Ia/Ib
        12.219 *    0.923 =     11.281
Qp =     54.739
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```
Total of 2 main streams to confluence:
Flow rates before confluence point:
      43.459      12.219
Area of streams before confluence:
       19.540        4.800


Results of confluence:
Total flow rate =     54.739(CFS)
Time of concentration =    11.894 min.
Effective stream area after confluence  =     24.340(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1433.060(Ft.)
Downstream point/station elevation =  1430.720(Ft.)
Pipe length  =   389.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    54.739(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    54.739(CFS)
Normal flow depth in pipe =   31.88(In.)
Flow top width inside pipe =   22.93(In.)
Critical Depth =   28.83(In.)
Pipe flow velocity =      8.27(Ft/s)
Travel time through pipe =    0.78 min.
Time of concentration (TC) =    12.68 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       24.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     24.340(Ac.)
Runoff from this stream =     54.739(CFS)
Time of concentration =   12.68 min.
Rainfall intensity =     2.399(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       21.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   266.000(Ft.)
Top (of initial area) elevation =  1451.300(Ft.)
Bottom (of initial area) elevation =  1449.700(Ft.)
Difference in elevation =     1.600(Ft.)
Slope =    0.00602  s(percent)=       0.60
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.784 min.
Rainfall intensity =      3.047(In/Hr) for a   100.0 year storm
```

```
COMMERCIAL subarea type
Runoff Coefficient = 0.857
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  32.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      0.496(CFS)
Total initial stream area =        0.190(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       21.000 to Point/Station       22.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------------
Top of street segment elevation =  1449.700(Ft.)
End of street segment elevation =  1446.500(Ft.)
Length of street segment  =   792.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  28.000(Ft.)
Distance from crown to crossfall grade break  =  26.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
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  =  11.000(Ft.)
Slope from curb to property line (v/hz) =   0.015
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 =      1.119(CFS)
Depth of flow =   0.247(Ft.), Average velocity =   1.148(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   6.006(Ft.)
Flow velocity =   1.15(Ft/s)
Travel time =   11.50 min.     TC =   19.28  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.879
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      1.953(In/Hr) for a   100.0 year storm
Subarea runoff =      1.099(CFS) for      0.640(Ac.)
Total runoff =      1.595(CFS)      Total area =       0.830(Ac.)
Street flow at end of street =      1.595(CFS)
Half street flow at end of street =      0.797(CFS)
Depth of flow =   0.271(Ft.), Average velocity =   1.231(Ft/s)
Flow width (from curb towards crown)=   7.219(Ft.)
```

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Process from Point/Station       22.000 to Point/Station       23.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1439.500(Ft.)
Downstream point/station elevation =  1435.530(Ft.)
Pipe length  =    26.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.595(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     1.595(CFS)
Normal flow depth in pipe =    3.80(In.)
Flow top width inside pipe =    5.78(In.)
Critical depth could not be calculated.
Pipe flow velocity =     12.18(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    19.32 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       24.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1435.530(Ft.)
Downstream point/station elevation =  1430.720(Ft.)
Pipe length  =  1027.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     1.595(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     1.595(CFS)
Normal flow depth in pipe =    7.08(In.)
Flow top width inside pipe =   11.80(In.)
Critical Depth =    6.43(In.)
Pipe flow velocity =      3.31(Ft/s)
Travel time through pipe =    5.17 min.
Time of concentration (TC) =    24.49 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       23.000 to Point/Station       24.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      0.830(Ac.)
Runoff from this stream =      1.595(CFS)
Time of concentration =   24.49 min.
Rainfall intensity =     1.737(In/Hr)
Summary of stream data:

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


1       54.739     12.68               2.399
2        1.595     24.49               1.737
Largest stream flow has longer or shorter time of concentration
Qp =     54.739 + sum of
        Qa          Tb/Ta
```

```
         1.595 *    0.518 =      0.826
Qp =     55.565

Total of 2 main streams to confluence:
Flow rates before confluence point:
      54.739       1.595
Area of streams before confluence:
       24.340        0.830


Results of confluence:
Total flow rate =     55.565(CFS)
Time of concentration =    12.678 min.
Effective stream area after confluence  =     25.170(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.000 to Point/Station       25.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1430.720(Ft.)
Downstream point/station elevation =  1429.350(Ft.)
Pipe length  =   459.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    55.565(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =    55.565(CFS)
Normal flow depth in pipe =   34.88(In.)
Flow top width inside pipe =   31.53(In.)
Critical Depth =   27.99(In.)
Pipe flow velocity =      6.51(Ft/s)
Travel time through pipe =    1.18 min.
Time of concentration (TC) =    13.85 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.000 to Point/Station       25.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     25.170(Ac.)
Runoff from this stream =     55.565(CFS)
Time of concentration =   13.85 min.
Rainfall intensity =     2.297(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.100 to Point/Station       24.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   690.000(Ft.)
Top (of initial area) elevation =  1447.300(Ft.)
Bottom (of initial area) elevation =  1442.000(Ft.)
Difference in elevation =     5.300(Ft.)
Slope =    0.00768  s(percent)=       0.77
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
```

```
Initial area time of concentration =   10.854 min.
Rainfall intensity =      2.589(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      1.532(CFS)
Total initial stream area =        0.670(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       24.200 to Point/Station       24.400
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1442.000(Ft.)
End of street segment elevation =  1438.600(Ft.)
Length of street segment  =   634.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  31.000(Ft.)
Distance from crown to crossfall grade break  =  29.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.083
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  =  11.000(Ft.)
Slope from curb to property line (v/hz) =   0.015
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 =      2.294(CFS)
Depth of flow =   0.287(Ft.), Average velocity =   1.486(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.033(Ft.)
Flow velocity =   1.49(Ft/s)
Travel time =    7.11 min.     TC =   17.97  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.879
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.022(In/Hr) for a   100.0 year storm
Subarea runoff =      1.334(CFS) for      0.750(Ac.)
Total runoff =      2.865(CFS)      Total area =       1.420(Ac.)
Street flow at end of street =      2.865(CFS)
Half street flow at end of street =      1.433(CFS)
Depth of flow =   0.305(Ft.), Average velocity =   1.560(Ft/s)
Flow width (from curb towards crown)=   8.898(Ft.)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.200 to Point/Station       24.400
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.420(Ac.)
Runoff from this stream =      2.865(CFS)
Time of concentration =   17.97 min.
Rainfall intensity =     2.022(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.300 to Point/Station       24.400
**** INITIAL AREA EVALUATION ****
____________________________________________________________________________
Initial area flow distance =   850.000(Ft.)
Top (of initial area) elevation =  1439.600(Ft.)
Bottom (of initial area) elevation =  1438.600(Ft.)
Difference in elevation =     1.000(Ft.)
Slope =    0.00118  s(percent)=       0.12
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   17.170 min.
Rainfall intensity =      2.068(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.880
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.201(CFS)
Total initial stream area =        1.210(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.300 to Point/Station       24.400
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.210(Ac.)
Runoff from this stream =      2.201(CFS)
Time of concentration =   17.17 min.
Rainfall intensity =     2.068(In/Hr)
Summary of stream data:

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


1        2.865     17.97                2.022
2        2.201     17.17                2.068
Largest stream flow has longer time of concentration
Qp =      2.865 + sum of
```

```
        Qb          Ia/Ib
         2.201 *    0.978 =      2.153
Qp =      5.018

Total of 2 streams to confluence:
Flow rates before confluence point:
       2.865       2.201
Area of streams before confluence:
        1.420        1.210
Results of confluence:
Total flow rate =      5.018(CFS)
Time of concentration =    17.965 min.
Effective stream area after confluence =      2.630(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.400 to Point/Station       25.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1434.100(Ft.)
Downstream point/station elevation =  1429.350(Ft.)
Pipe length  =    47.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.018(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     5.018(CFS)
Normal flow depth in pipe =    7.03(In.)
Flow top width inside pipe =    7.44(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.55(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    18.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       24.400 to Point/Station       25.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.630(Ac.)
Runoff from this stream =      5.018(CFS)
Time of concentration =   18.02 min.
Rainfall intensity =     2.019(In/Hr)
Summary of stream data:

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


1       55.565     13.85               2.297
2        5.018     18.02               2.019
Largest stream flow has longer or shorter time of concentration
Qp =     55.565 + sum of
        Qa          Tb/Ta
         5.018 *    0.769 =      3.857
Qp =     59.422
```

```
Total of 2 main streams to confluence:
Flow rates before confluence point:
      55.565       5.018
Area of streams before confluence:
       25.170        2.630


Results of confluence:
Total flow rate =     59.422(CFS)
Time of concentration =    13.853 min.
Effective stream area after confluence  =     27.800(Ac.)
End of computations, total study area =           27.80 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  51.0
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 10/03/24 File:Q100PSAMS.out

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

English (in-lb) Units used in input data file

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION - ONSITE
100-YEAR STORM ANALYSIS

Program License Serial Number 6405

Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District
1978 hydrology manual

Storm event (year) = 100.00 Antecedent Moisture Condition = 2

Standard intensity-duration curves data (Plate D-4.1)
For the [Perris Valley] area used.
10 year storm 10 minute intensity = 1.880(In/Hr)
10 year storm 60 minute intensity = 0.780(In/Hr)
100 year storm 10 minute intensity = 2.690(In/Hr)
100 year storm 60 minute intensity = 1.120(In/Hr)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.120(In/Hr)
Slope of intensity duration curve = 0.4900

++
Process from Point/Station 10.000 to Point/Station 11.000
**** INITIAL AREA EVALUATION ****

Initial area flow distance = 745.000(Ft.)
Top (of initial area) elevation = 1449.000(Ft.)
Bottom (of initial area) elevation = 1440.700(Ft.)
Difference in elevation = 8.300(Ft.)
Slope = 0.01114 s(percent)= 1.11

```
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.390 min.
Rainfall intensity =      2.645(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.861
Decimal fraction soil group A = 0.800
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.200
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  39.40
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     16.776(CFS)
Total initial stream area =        7.370(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       11.000 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1434.000(Ft.)
Downstream point/station elevation =  1433.330(Ft.)
Pipe length  =    44.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.776(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    16.776(CFS)
Normal flow depth in pipe =   14.98(In.)
Flow top width inside pipe =   19.00(In.)
Critical Depth =   18.05(In.)
Pipe flow velocity =      9.14(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    10.47 min.


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Process from Point/Station       11.000 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      7.370(Ac.)
Runoff from this stream =     16.776(CFS)
Time of concentration =   10.47 min.
Rainfall intensity =     2.635(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       11.100 to Point/Station       11.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   859.000(Ft.)
Top (of initial area) elevation =  1449.000(Ft.)
Bottom (of initial area) elevation =  1440.000(Ft.)
Difference in elevation =     9.000(Ft.)
Slope =    0.01048  s(percent)=       1.05
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
```

```
Initial area time of concentration =   11.134 min.
Rainfall intensity =      2.556(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.870
Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  50.50
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      7.981(CFS)
Total initial stream area =        3.590(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.200 to Point/Station       11.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1434.540(Ft.)
Downstream point/station elevation =  1433.710(Ft.)
Pipe length  =   165.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.981(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     7.981(CFS)
Normal flow depth in pipe =   13.08(In.)
Flow top width inside pipe =   20.36(In.)
Critical Depth =   12.58(In.)
Pipe flow velocity =      5.07(Ft/s)
Travel time through pipe =    0.54 min.
Time of concentration (TC) =    11.68 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.200 to Point/Station       11.500
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      3.590(Ac.)
Runoff from this stream =      7.981(CFS)
Time of concentration =   11.68 min.
Rainfall intensity =     2.498(In/Hr)


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Process from Point/Station       11.300 to Point/Station       11.400
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   757.000(Ft.)
Top (of initial area) elevation =  1449.000(Ft.)
Bottom (of initial area) elevation =  1440.200(Ft.)
Difference in elevation =     8.800(Ft.)
Slope =    0.01162  s(percent)=       1.16
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.368 min.
Rainfall intensity =      2.647(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
```

```
Runoff Coefficient = 0.870
Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.500
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  50.50
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.880(CFS)
Total initial stream area =        1.250(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       11.400 to Point/Station       11.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1436.050(Ft.)
Downstream point/station elevation =  1433.680(Ft.)
Pipe length  =    28.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.880(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.880(CFS)
Normal flow depth in pipe =    5.02(In.)
Flow top width inside pipe =    8.94(In.)
Critical depth could not be calculated.
Pipe flow velocity =     11.38(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    10.41 min.


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Process from Point/Station       11.400 to Point/Station       11.500
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.250(Ac.)
Runoff from this stream =      2.880(CFS)
Time of concentration =   10.41 min.
Rainfall intensity =     2.642(In/Hr)
Summary of stream data:

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


1        7.981     11.68                2.498
2        2.880     10.41                2.642
Largest stream flow has longer time of concentration
Qp =      7.981 + sum of
        Qb         Ia/Ib
         2.880 *    0.945 =      2.722
Qp =     10.703

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.981       2.880
Area of streams before confluence:
```

```
        3.590        1.250
Results of confluence:
Total flow rate =     10.703(CFS)
Time of concentration =    11.677 min.
Effective stream area after confluence =      4.840(Ac.)


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Process from Point/Station       11.500 to Point/Station       12.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1433.710(Ft.)
Downstream point/station elevation =  1433.330(Ft.)
Pipe length  =    76.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.703(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    10.703(CFS)
Normal flow depth in pipe =   16.43(In.)
Flow top width inside pipe =   17.33(In.)
Critical Depth =   14.62(In.)
Pipe flow velocity =      5.30(Ft/s)
Travel time through pipe =    0.24 min.
Time of concentration (TC) =    11.92 min.


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Process from Point/Station       11.500 to Point/Station       12.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.840(Ac.)
Runoff from this stream =     10.703(CFS)
Time of concentration =   11.92 min.
Rainfall intensity =     2.473(In/Hr)
Summary of stream data:

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


1       16.776     10.47               2.635
2       10.703     11.92               2.473
Largest stream flow has longer or shorter time of concentration
Qp =     16.776 + sum of
        Qa          Tb/Ta
        10.703 *    0.879 =      9.404
Qp =     26.180

Total of 2 main streams to confluence:
Flow rates before confluence point:
      16.776      10.703
Area of streams before confluence:
        7.370        4.840


Results of confluence:
```

```
Total flow rate =     26.180(CFS)
Time of concentration =    10.470 min.
Effective stream area after confluence  =     12.210(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1433.330(Ft.)
Downstream point/station elevation =  1432.180(Ft.)
Pipe length  =    76.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    26.180(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    26.180(CFS)
Normal flow depth in pipe =   18.52(In.)
Flow top width inside pipe =   20.15(In.)
Critical Depth =   21.47(In.)
Pipe flow velocity =     10.07(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    10.60 min.


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Process from Point/Station       12.000 to Point/Station       13.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     12.210(Ac.)
Runoff from this stream =     26.180(CFS)
Time of concentration =   10.60 min.
Rainfall intensity =     2.619(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       12.100 to Point/Station       12.200
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   538.000(Ft.)
Top (of initial area) elevation =  1447.600(Ft.)
Bottom (of initial area) elevation =  1439.150(Ft.)
Difference in elevation =     8.450(Ft.)
Slope =    0.01571  s(percent)=       1.57
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.516 min.
Rainfall intensity =      2.915(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.010
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.990
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  68.63
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      4.693(CFS)
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Total initial stream area =        1.820(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       12.200 to Point/Station       12.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1434.590(Ft.)
Downstream point/station elevation =  1433.860(Ft.)
Pipe length  =   146.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.693(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     4.693(CFS)
Normal flow depth in pipe =   10.38(In.)
Flow top width inside pipe =   17.79(In.)
Critical Depth =    9.98(In.)
Pipe flow velocity =      4.45(Ft/s)
Travel time through pipe =    0.55 min.
Time of concentration (TC) =     9.06 min.


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Process from Point/Station       12.200 to Point/Station       12.500
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.820(Ac.)
Runoff from this stream =      4.693(CFS)
Time of concentration =    9.06 min.
Rainfall intensity =     2.828(In/Hr)


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Process from Point/Station       12.300 to Point/Station       12.400
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   211.000(Ft.)
Top (of initial area) elevation =  1443.600(Ft.)
Bottom (of initial area) elevation =  1440.400(Ft.)
Difference in elevation =     3.200(Ft.)
Slope =    0.01517  s(percent)=       1.52
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.897 min.
Rainfall intensity =      3.491(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.887
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 1.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  69.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.414(CFS)
Total initial stream area =        0.780(Ac.)
Pervious area fraction = 0.100
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Process from Point/Station       12.400 to Point/Station       12.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1434.470(Ft.)
Downstream point/station elevation =  1433.860(Ft.)
Pipe length  =   121.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.414(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     2.414(CFS)
Normal flow depth in pipe =    9.38(In.)
Flow top width inside pipe =    9.92(In.)
Critical Depth =    7.98(In.)
Pipe flow velocity =      3.67(Ft/s)
Travel time through pipe =    0.55 min.
Time of concentration (TC) =     6.45 min.


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Process from Point/Station       12.400 to Point/Station       12.500
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      0.780(Ac.)
Runoff from this stream =      2.414(CFS)
Time of concentration =    6.45 min.
Rainfall intensity =     3.341(In/Hr)
Summary of stream data:

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


1        4.693      9.06                 2.828
2        2.414      6.45                 3.341
Largest stream flow has longer time of concentration
Qp =      4.693 + sum of
        Qb         Ia/Ib
         2.414 *    0.846 =      2.043
Qp =      6.736

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.693       2.414
Area of streams before confluence:
        1.820        0.780
Results of confluence:
Total flow rate =      6.736(CFS)
Time of concentration =     9.063 min.
Effective stream area after confluence =      2.600(Ac.)


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Process from Point/Station       12.500 to Point/Station       13.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
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Upstream point/station elevation =  1433.860(Ft.)
Downstream point/station elevation =  1432.180(Ft.)
Pipe length  =   329.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.736(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     6.736(CFS)
Normal flow depth in pipe =   13.31(In.)
Flow top width inside pipe =   15.80(In.)
Critical Depth =   12.05(In.)
Pipe flow velocity =      4.81(Ft/s)
Travel time through pipe =    1.14 min.
Time of concentration (TC) =    10.20 min.


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Process from Point/Station       12.500 to Point/Station       13.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      2.600(Ac.)
Runoff from this stream =      6.736(CFS)
Time of concentration =   10.20 min.
Rainfall intensity =     2.668(In/Hr)
Summary of stream data:

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


1       26.180     10.60               2.619
2        6.736     10.20               2.668
Largest stream flow has longer time of concentration
Qp =     26.180 + sum of
        Qb         Ia/Ib
         6.736 *    0.982 =      6.613
Qp =     32.794

Total of 2 main streams to confluence:
Flow rates before confluence point:
      26.180       6.736
Area of streams before confluence:
       12.210        2.600


Results of confluence:
Total flow rate =     32.794(CFS)
Time of concentration =    10.596 min.
Effective stream area after confluence  =     14.810(Ac.)


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Process from Point/Station       13.000 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1432.180(Ft.)
Downstream point/station elevation =  1428.170(Ft.)
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Pipe length  =   572.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    32.794(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    32.794(CFS)
Normal flow depth in pipe =   23.44(In.)
Flow top width inside pipe =   24.80(In.)
Critical Depth =   23.39(In.)
Pipe flow velocity =      7.96(Ft/s)
Travel time through pipe =    1.20 min.
Time of concentration (TC) =    11.79 min.


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Process from Point/Station       13.000 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     14.810(Ac.)
Runoff from this stream =     32.794(CFS)
Time of concentration =   11.79 min.
Rainfall intensity =     2.486(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       13.100 to Point/Station       13.200
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   173.000(Ft.)
Top (of initial area) elevation =  1449.000(Ft.)
Bottom (of initial area) elevation =  1447.800(Ft.)
Difference in elevation =     1.200(Ft.)
Slope =    0.00694  s(percent)=       0.69
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.370 min.
Rainfall intensity =      3.361(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.859
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  32.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      4.619(CFS)
Total initial stream area =        1.600(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       13.200 to Point/Station       13.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1443.810(Ft.)
Downstream point/station elevation =  1440.720(Ft.)
Pipe length  =   260.00(Ft.)   Manning's N = 0.013
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No. of pipes = 1  Required pipe flow  =     4.619(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     4.619(CFS)
Normal flow depth in pipe =    8.86(In.)
Flow top width inside pipe =   14.75(In.)
Critical Depth =   10.45(In.)
Pipe flow velocity =      6.12(Ft/s)
Travel time through pipe =    0.71 min.
Time of concentration (TC) =     7.08 min.


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Process from Point/Station       13.200 to Point/Station       13.500
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.600(Ac.)
Runoff from this stream =      4.619(CFS)
Time of concentration =    7.08 min.
Rainfall intensity =     3.192(In/Hr)


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Process from Point/Station       13.300 to Point/Station       13.400
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   174.000(Ft.)
Top (of initial area) elevation =  1450.000(Ft.)
Bottom (of initial area) elevation =  1447.800(Ft.)
Difference in elevation =     2.200(Ft.)
Slope =    0.01264  s(percent)=       1.26
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.662 min.
Rainfall intensity =      3.561(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.860
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  32.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      4.135(CFS)
Total initial stream area =        1.350(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.400 to Point/Station       13.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1442.930(Ft.)
Downstream point/station elevation =  1440.720(Ft.)
Pipe length  =    21.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.135(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     4.135(CFS)
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```
Normal flow depth in pipe =    5.93(In.)
Flow top width inside pipe =    8.53(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.40(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =     5.69 min.


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Process from Point/Station       13.400 to Point/Station       13.500
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.350(Ac.)
Runoff from this stream =      4.135(CFS)
Time of concentration =    5.69 min.
Rainfall intensity =     3.553(In/Hr)
Summary of stream data:

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


1        4.619      7.08                 3.192
2        4.135      5.69                 3.553
Largest stream flow has longer time of concentration
Qp =      4.619 + sum of
        Qb          Ia/Ib
         4.135 *    0.898 =      3.715
Qp =      8.334

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.619       4.135
Area of streams before confluence:
        1.600        1.350
Results of confluence:
Total flow rate =      8.334(CFS)
Time of concentration =     7.078 min.
Effective stream area after confluence =      2.950(Ac.)


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Process from Point/Station       13.500 to Point/Station       13.800
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1440.720(Ft.)
Downstream point/station elevation =  1434.830(Ft.)
Pipe length  =   496.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.334(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     8.334(CFS)
Normal flow depth in pipe =   11.39(In.)
Flow top width inside pipe =   17.35(In.)
Critical Depth =   13.42(In.)
Pipe flow velocity =      7.07(Ft/s)
Travel time through pipe =    1.17 min.
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Time of concentration (TC) =     8.25 min.


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Process from Point/Station       13.500 to Point/Station       13.800
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      2.950(Ac.)
Runoff from this stream =      8.334(CFS)
Time of concentration =    8.25 min.
Rainfall intensity =     2.962(In/Hr)


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Process from Point/Station       13.300 to Point/Station       13.700
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   452.000(Ft.)
Top (of initial area) elevation =  1450.000(Ft.)
Bottom (of initial area) elevation =  1446.300(Ft.)
Difference in elevation =     3.700(Ft.)
Slope =    0.00819  s(percent)=       0.82
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.048 min.
Rainfall intensity =      2.830(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.855
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  32.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      4.307(CFS)
Total initial stream area =        1.780(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       13.700 to Point/Station       13.800
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1435.110(Ft.)
Downstream point/station elevation =  1434.830(Ft.)
Pipe length  =    15.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.307(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.307(CFS)
Normal flow depth in pipe =    8.78(In.)
Flow top width inside pipe =   10.64(In.)
Critical Depth =   10.47(In.)
Pipe flow velocity =      7.00(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     9.08 min.
```

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Process from Point/Station       13.700 to Point/Station       13.800
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.780(Ac.)
Runoff from this stream =      4.307(CFS)
Time of concentration =    9.08 min.
Rainfall intensity =     2.825(In/Hr)
Summary of stream data:

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


1        8.334      8.25                2.962
2        4.307      9.08                2.825
Largest stream flow has longer or shorter time of concentration
Qp =      8.334 + sum of
        Qa          Tb/Ta
         4.307 *    0.908 =      3.910
Qp =     12.244

Total of 2 streams to confluence:
Flow rates before confluence point:
       8.334       4.307
Area of streams before confluence:
        2.950        1.780
Results of confluence:
Total flow rate =     12.244(CFS)
Time of concentration =     8.248 min.
Effective stream area after confluence =      4.730(Ac.)


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Process from Point/Station       13.800 to Point/Station       14.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________________
Upstream point/station elevation =  1434.830(Ft.)
Downstream point/station elevation =  1428.170(Ft.)
Pipe length  =   356.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.244(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    12.244(CFS)
Normal flow depth in pipe =   12.77(In.)
Flow top width inside pipe =   16.34(In.)
Critical Depth =   15.88(In.)
Pipe flow velocity =      9.13(Ft/s)
Travel time through pipe =    0.65 min.
Time of concentration (TC) =     8.90 min.


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Process from Point/Station       13.800 to Point/Station       14.000
**** CONFLUENCE OF MAIN STREAMS ****
____________________________________________________________________________
The following data inside Main Stream is listed:
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In Main Stream number: 2
Stream flow area =      4.730(Ac.)
Runoff from this stream =     12.244(CFS)
Time of concentration =    8.90 min.
Rainfall intensity =     2.853(In/Hr)
Summary of stream data:

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


1       32.794     11.79               2.486
2       12.244      8.90               2.853
Largest stream flow has longer time of concentration
Qp =     32.794 + sum of
        Qb         Ia/Ib
        12.244 *    0.871 =     10.665
Qp =     43.459

Total of 2 main streams to confluence:
Flow rates before confluence point:
      32.794      12.244
Area of streams before confluence:
       14.810        4.730


Results of confluence:
Total flow rate =     43.459(CFS)
Time of concentration =    11.793 min.
Effective stream area after confluence  =     19.540(Ac.)


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Process from Point/Station       14.000 to Point/Station       15.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1428.170(Ft.)
Downstream point/station elevation =  1427.940(Ft.)
Pipe length  =    46.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    43.459(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    43.459(CFS)
Normal flow depth in pipe =   27.23(In.)
Flow top width inside pipe =   30.90(In.)
Critical Depth =   25.79(In.)
Pipe flow velocity =      7.57(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    11.89 min.


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Process from Point/Station       14.000 to Point/Station       15.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     19.540(Ac.)
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Runoff from this stream =     43.459(CFS)
Time of concentration =   11.89 min.
Rainfall intensity =     2.475(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station       13.100 to Point/Station       14.100
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   444.000(Ft.)
Top (of initial area) elevation =  1449.000(Ft.)
Bottom (of initial area) elevation =  1444.400(Ft.)
Difference in elevation =     4.600(Ft.)
Slope =    0.01036  s(percent)=       1.04
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.570 min.
Rainfall intensity =      2.906(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.882
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  65.30
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      4.026(CFS)
Total initial stream area =        1.570(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station       14.100 to Point/Station       14.400
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1440.000(Ft.)
Downstream point/station elevation =  1434.520(Ft.)
Pipe length  =   266.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.026(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.026(CFS)
Normal flow depth in pipe =    8.03(In.)
Flow top width inside pipe =   11.29(In.)
Critical Depth =   10.19(In.)
Pipe flow velocity =      7.21(Ft/s)
Travel time through pipe =    0.61 min.
Time of concentration (TC) =     9.18 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.100 to Point/Station       14.400
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      1.570(Ac.)
Runoff from this stream =      4.026(CFS)
Time of concentration =    9.18 min.
```

```
Rainfall intensity =     2.809(In/Hr)

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.200 to Point/Station       14.300
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   370.000(Ft.)
Top (of initial area) elevation =  1449.000(Ft.)
Bottom (of initial area) elevation =  1443.800(Ft.)
Difference in elevation =     5.200(Ft.)
Slope =    0.01405  s(percent)=       1.41
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.496 min.
Rainfall intensity =      3.103(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.100
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  65.30
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      3.098(CFS)
Total initial stream area =        1.130(Ac.)
Pervious area fraction = 0.100

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.300 to Point/Station       14.400
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1434.690(Ft.)
Downstream point/station elevation =  1434.520(Ft.)
Pipe length  =    34.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.098(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     3.098(CFS)
Normal flow depth in pipe =    9.06(In.)
Flow top width inside pipe =   14.67(In.)
Critical Depth =    8.50(In.)
Pipe flow velocity =      4.00(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =     7.64 min.

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Process from Point/Station       14.300 to Point/Station       14.400
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      1.130(Ac.)
Runoff from this stream =      3.098(CFS)
Time of concentration =    7.64 min.
Rainfall intensity =     3.075(In/Hr)
Summary of stream data:
```

```
Stream   Flow rate      TC            Rainfall Intensity
 No.       (CFS)       (min)                 (In/Hr)


1        4.026      9.18                 2.809
2        3.098      7.64                 3.075
Largest stream flow has longer time of concentration
Qp =      4.026 + sum of
        Qb         Ia/Ib
         3.098 *    0.914 =      2.830
Qp =      6.856

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.026       3.098
Area of streams before confluence:
        1.570        1.130
Results of confluence:
Total flow rate =      6.856(CFS)
Time of concentration =     9.185 min.
Effective stream area after confluence =      2.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.400 to Point/Station       14.700
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1434.520(Ft.)
Downstream point/station elevation =  1429.750(Ft.)
Pipe length  =   170.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.856(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     6.856(CFS)
Normal flow depth in pipe =    8.67(In.)
Flow top width inside pipe =   14.82(In.)
Critical Depth =   12.61(In.)
Pipe flow velocity =      9.34(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =     9.49 min.


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Process from Point/Station       14.400 to Point/Station       14.700
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      2.700(Ac.)
Runoff from this stream =      6.856(CFS)
Time of concentration =    9.49 min.
Rainfall intensity =     2.765(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.500 to Point/Station       14.600
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   536.000(Ft.)
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Top (of initial area) elevation =  1449.000(Ft.)
Bottom (of initial area) elevation =  1440.900(Ft.)
Difference in elevation =     8.100(Ft.)
Slope =    0.01511  s(percent)=       1.51
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.569 min.
Rainfall intensity =      2.907(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.884
Decimal fraction soil group A = 0.010
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.990
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  68.63
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      5.398(CFS)
Total initial stream area =        2.100(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       14.600 to Point/Station       14.700
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1430.850(Ft.)
Downstream point/station elevation =  1429.750(Ft.)
Pipe length  =   219.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.398(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     5.398(CFS)
Normal flow depth in pipe =   11.37(In.)
Flow top width inside pipe =   17.37(In.)
Critical Depth =   10.74(In.)
Pipe flow velocity =      4.59(Ft/s)
Travel time through pipe =    0.79 min.
Time of concentration (TC) =     9.36 min.


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Process from Point/Station       14.600 to Point/Station       14.700
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.100(Ac.)
Runoff from this stream =      5.398(CFS)
Time of concentration =    9.36 min.
Rainfall intensity =     2.783(In/Hr)
Summary of stream data:

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


1        6.856      9.49                2.765
2        5.398      9.36                2.783
Largest stream flow has longer time of concentration
Qp =      6.856 + sum of
```

```
        Qb         Ia/Ib
         5.398 *    0.994 =      5.363
Qp =     12.219

Total of 2 streams to confluence:
Flow rates before confluence point:
       6.856       5.398
Area of streams before confluence:
        2.700        2.100
Results of confluence:
Total flow rate =     12.219(CFS)
Time of concentration =     9.489 min.
Effective stream area after confluence =      4.800(Ac.)


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Process from Point/Station       14.700 to Point/Station       15.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1429.750(Ft.)
Downstream point/station elevation =  1427.940(Ft.)
Pipe length  =   239.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.219(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    12.219(CFS)
Normal flow depth in pipe =   15.38(In.)
Flow top width inside pipe =   18.60(In.)
Critical Depth =   15.64(In.)
Pipe flow velocity =      6.47(Ft/s)
Travel time through pipe =    0.62 min.
Time of concentration (TC) =    10.10 min.


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Process from Point/Station       14.700 to Point/Station       15.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      4.800(Ac.)
Runoff from this stream =     12.219(CFS)
Time of concentration =   10.10 min.
Rainfall intensity =     2.681(In/Hr)
Summary of stream data:

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


1       43.459     11.89               2.475
2       12.219     10.10               2.681
Largest stream flow has longer time of concentration
Qp =     43.459 + sum of
        Qb         Ia/Ib
        12.219 *    0.923 =     11.281
Qp =     54.739
```

```
Total of 2 main streams to confluence:
Flow rates before confluence point:
      43.459      12.219
Area of streams before confluence:
       19.540        4.800


Results of confluence:
Total flow rate =     54.739(CFS)
Time of concentration =    11.894 min.
Effective stream area after confluence  =     24.340(Ac.)
End of computations, total study area =           24.34 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  48.7
```

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 10/11/23 File: 100QAXUH24100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 24.45(Ac.) = 0.038 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 24.45(Ac.) = 0.038 Sq. Mi.
Length along longest watercourse = 1528.00(Ft.)
Length along longest watercourse measured to centroid = 754.00(Ft.)
Length along longest watercourse = 0.289 Mi.
Length along longest watercourse measured to centroid = 0.143 Mi.
Difference in elevation = 10.80(Ft.)
Slope along watercourse = 37.3194 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.072 Hr.
Lag time = 4.31 Min.
25% of lag time = 1.08 Min.
40% of lag time = 1.73 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
24.45	2.00	48.90

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
24.45	5.00	122.25

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 2.000(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
24.450	47.40	0.500

Total Area Entered = 24.45(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
47.4	47.4	0.597	0.500	0.329	1.000	0.329
					Sum (F) =	0.329

Area averaged mean soil loss (F) (In/Hr) = 0.329
Minimum soil loss rate ((In/Hr)) = 0.164
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	115.899	23.999	5.914
2	0.167	231.798	48.816	12.029
3	0.250	347.696	13.683	3.372
4	0.333	463.595	6.239	1.537
5	0.417	579.494	3.476	0.857
6	0.500	695.393	2.068	0.510

	7	0.583	811.291	1.719		0.423
				Sum = 100.000	Sum=	24.641

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.040	(0.583)	0.020	0.020
2	0.17	0.07	0.040	(0.580)	0.020	0.020
3	0.25	0.07	0.040	(0.578)	0.020	0.020
4	0.33	0.10	0.060	(0.576)	0.030	0.030
5	0.42	0.10	0.060	(0.574)	0.030	0.030
6	0.50	0.10	0.060	(0.571)	0.030	0.030
7	0.58	0.10	0.060	(0.569)	0.030	0.030
8	0.67	0.10	0.060	(0.567)	0.030	0.030
9	0.75	0.10	0.060	(0.565)	0.030	0.030
10	0.83	0.13	0.080	(0.562)	0.040	0.040
11	0.92	0.13	0.080	(0.560)	0.040	0.040
12	1.00	0.13	0.080	(0.558)	0.040	0.040
13	1.08	0.10	0.060	(0.556)	0.030	0.030
14	1.17	0.10	0.060	(0.554)	0.030	0.030
15	1.25	0.10	0.060	(0.551)	0.030	0.030
16	1.33	0.10	0.060	(0.549)	0.030	0.030
17	1.42	0.10	0.060	(0.547)	0.030	0.030
18	1.50	0.10	0.060	(0.545)	0.030	0.030
19	1.58	0.10	0.060	(0.543)	0.030	0.030
20	1.67	0.10	0.060	(0.540)	0.030	0.030
21	1.75	0.10	0.060	(0.538)	0.030	0.030
22	1.83	0.13	0.080	(0.536)	0.040	0.040
23	1.92	0.13	0.080	(0.534)	0.040	0.040
24	2.00	0.13	0.080	(0.532)	0.040	0.040
25	2.08	0.13	0.080	(0.530)	0.040	0.040
26	2.17	0.13	0.080	(0.528)	0.040	0.040
27	2.25	0.13	0.080	(0.525)	0.040	0.040
28	2.33	0.13	0.080	(0.523)	0.040	0.040
29	2.42	0.13	0.080	(0.521)	0.040	0.040
30	2.50	0.13	0.080	(0.519)	0.040	0.040
31	2.58	0.17	0.100	(0.517)	0.050	0.050
32	2.67	0.17	0.100	(0.515)	0.050	0.050
33	2.75	0.17	0.100	(0.513)	0.050	0.050
34	2.83	0.17	0.100	(0.511)	0.050	0.050
35	2.92	0.17	0.100	(0.508)	0.050	0.050
36	3.00	0.17	0.100	(0.506)	0.050	0.050
37	3.08	0.17	0.100	(0.504)	0.050	0.050
38	3.17	0.17	0.100	(0.502)	0.050	0.050
39	3.25	0.17	0.100	(0.500)	0.050	0.050
40	3.33	0.17	0.100	(0.498)	0.050	0.050

41	3.42	0.17	0.100	(0.496)	0.050	0.050
42	3.50	0.17	0.100	(0.494)	0.050	0.050
43	3.58	0.17	0.100	(0.492)	0.050	0.050
44	3.67	0.17	0.100	(0.490)	0.050	0.050
45	3.75	0.17	0.100	(0.488)	0.050	0.050
46	3.83	0.20	0.120	(0.486)	0.060	0.060
47	3.92	0.20	0.120	(0.483)	0.060	0.060
48	4.00	0.20	0.120	(0.481)	0.060	0.060
49	4.08	0.20	0.120	(0.479)	0.060	0.060
50	4.17	0.20	0.120	(0.477)	0.060	0.060
51	4.25	0.20	0.120	(0.475)	0.060	0.060
52	4.33	0.23	0.140	(0.473)	0.070	0.070
53	4.42	0.23	0.140	(0.471)	0.070	0.070
54	4.50	0.23	0.140	(0.469)	0.070	0.070
55	4.58	0.23	0.140	(0.467)	0.070	0.070
56	4.67	0.23	0.140	(0.465)	0.070	0.070
57	4.75	0.23	0.140	(0.463)	0.070	0.070
58	4.83	0.27	0.160	(0.461)	0.080	0.080
59	4.92	0.27	0.160	(0.459)	0.080	0.080
60	5.00	0.27	0.160	(0.457)	0.080	0.080
61	5.08	0.20	0.120	(0.455)	0.060	0.060
62	5.17	0.20	0.120	(0.453)	0.060	0.060
63	5.25	0.20	0.120	(0.451)	0.060	0.060
64	5.33	0.23	0.140	(0.449)	0.070	0.070
65	5.42	0.23	0.140	(0.447)	0.070	0.070
66	5.50	0.23	0.140	(0.445)	0.070	0.070
67	5.58	0.27	0.160	(0.443)	0.080	0.080
68	5.67	0.27	0.160	(0.442)	0.080	0.080
69	5.75	0.27	0.160	(0.440)	0.080	0.080
70	5.83	0.27	0.160	(0.438)	0.080	0.080
71	5.92	0.27	0.160	(0.436)	0.080	0.080
72	6.00	0.27	0.160	(0.434)	0.080	0.080
73	6.08	0.30	0.180	(0.432)	0.090	0.090
74	6.17	0.30	0.180	(0.430)	0.090	0.090
75	6.25	0.30	0.180	(0.428)	0.090	0.090
76	6.33	0.30	0.180	(0.426)	0.090	0.090
77	6.42	0.30	0.180	(0.424)	0.090	0.090
78	6.50	0.30	0.180	(0.422)	0.090	0.090
79	6.58	0.33	0.200	(0.420)	0.100	0.100
80	6.67	0.33	0.200	(0.418)	0.100	0.100
81	6.75	0.33	0.200	(0.417)	0.100	0.100
82	6.83	0.33	0.200	(0.415)	0.100	0.100
83	6.92	0.33	0.200	(0.413)	0.100	0.100
84	7.00	0.33	0.200	(0.411)	0.100	0.100
85	7.08	0.33	0.200	(0.409)	0.100	0.100
86	7.17	0.33	0.200	(0.407)	0.100	0.100
87	7.25	0.33	0.200	(0.405)	0.100	0.100
88	7.33	0.37	0.220	(0.404)	0.110	0.110
89	7.42	0.37	0.220	(0.402)	0.110	0.110
90	7.50	0.37	0.220	(0.400)	0.110	0.110

91	7.58	0.40	0.240	(0.398)	0.120	0.120
92	7.67	0.40	0.240	(0.396)	0.120	0.120
93	7.75	0.40	0.240	(0.394)	0.120	0.120
94	7.83	0.43	0.260	(0.393)	0.130	0.130
95	7.92	0.43	0.260	(0.391)	0.130	0.130
96	8.00	0.43	0.260	(0.389)	0.130	0.130
97	8.08	0.50	0.300	(0.387)	0.150	0.150
98	8.17	0.50	0.300	(0.385)	0.150	0.150
99	8.25	0.50	0.300	(0.383)	0.150	0.150
100	8.33	0.50	0.300	(0.382)	0.150	0.150
101	8.42	0.50	0.300	(0.380)	0.150	0.150
102	8.50	0.50	0.300	(0.378)	0.150	0.150
103	8.58	0.53	0.320	(0.376)	0.160	0.160
104	8.67	0.53	0.320	(0.375)	0.160	0.160
105	8.75	0.53	0.320	(0.373)	0.160	0.160
106	8.83	0.57	0.340	(0.371)	0.170	0.170
107	8.92	0.57	0.340	(0.369)	0.170	0.170
108	9.00	0.57	0.340	(0.368)	0.170	0.170
109	9.08	0.63	0.380	(0.366)	0.190	0.190
110	9.17	0.63	0.380	(0.364)	0.190	0.190
111	9.25	0.63	0.380	(0.362)	0.190	0.190
112	9.33	0.67	0.400	(0.361)	0.200	0.200
113	9.42	0.67	0.400	(0.359)	0.200	0.200
114	9.50	0.67	0.400	(0.357)	0.200	0.200
115	9.58	0.70	0.420	(0.355)	0.210	0.210
116	9.67	0.70	0.420	(0.354)	0.210	0.210
117	9.75	0.70	0.420	(0.352)	0.210	0.210
118	9.83	0.73	0.440	(0.350)	0.220	0.220
119	9.92	0.73	0.440	(0.349)	0.220	0.220
120	10.00	0.73	0.440	(0.347)	0.220	0.220
121	10.08	0.50	0.300	(0.345)	0.150	0.150
122	10.17	0.50	0.300	(0.344)	0.150	0.150
123	10.25	0.50	0.300	(0.342)	0.150	0.150
124	10.33	0.50	0.300	(0.340)	0.150	0.150
125	10.42	0.50	0.300	(0.339)	0.150	0.150
126	10.50	0.50	0.300	(0.337)	0.150	0.150
127	10.58	0.67	0.400	(0.335)	0.200	0.200
128	10.67	0.67	0.400	(0.334)	0.200	0.200
129	10.75	0.67	0.400	(0.332)	0.200	0.200
130	10.83	0.67	0.400	(0.330)	0.200	0.200
131	10.92	0.67	0.400	(0.329)	0.200	0.200
132	11.00	0.67	0.400	(0.327)	0.200	0.200
133	11.08	0.63	0.380	(0.326)	0.190	0.190
134	11.17	0.63	0.380	(0.324)	0.190	0.190
135	11.25	0.63	0.380	(0.322)	0.190	0.190
136	11.33	0.63	0.380	(0.321)	0.190	0.190
137	11.42	0.63	0.380	(0.319)	0.190	0.190
138	11.50	0.63	0.380	(0.318)	0.190	0.190
139	11.58	0.57	0.340	(0.316)	0.170	0.170
140	11.67	0.57	0.340	(0.315)	0.170	0.170

141	11.75	0.57	0.340	(	0.313)	0.170		0.170
142	11.83	0.60	0.360	(	0.311)	0.180		0.180
143	11.92	0.60	0.360	(	0.310)	0.180		0.180
144	12.00	0.60	0.360	(	0.308)	0.180		0.180
145	12.08	0.83	0.500	(	0.307)	0.250		0.250
146	12.17	0.83	0.500	(	0.305)	0.250		0.250
147	12.25	0.83	0.500	(	0.304)	0.250		0.250
148	12.33	0.87	0.520	(	0.302)	0.260		0.260
149	12.42	0.87	0.520	(	0.301)	0.260		0.260
150	12.50	0.87	0.520	(	0.299)	0.260		0.260
151	12.58	0.93	0.560	(	0.298)	0.280		0.280
152	12.67	0.93	0.560	(	0.296)	0.280		0.280
153	12.75	0.93	0.560	(	0.295)	0.280		0.280
154	12.83	0.97	0.580	(	0.293)	0.290		0.290
155	12.92	0.97	0.580	(	0.292)	0.290		0.290
156	13.00	0.97	0.580	(	0.290)	0.290		0.290
157	13.08	1.13	0.680		0.289	(	0.340)	0.391
158	13.17	1.13	0.680		0.287	(	0.340)	0.393
159	13.25	1.13	0.680		0.286	(	0.340)	0.394
160	13.33	1.13	0.680		0.284	(	0.340)	0.396
161	13.42	1.13	0.680		0.283	(	0.340)	0.397
162	13.50	1.13	0.680		0.281	(	0.340)	0.399
163	13.58	0.77	0.460	(	0.280)	0.230		0.230
164	13.67	0.77	0.460	(	0.279)	0.230		0.230
165	13.75	0.77	0.460	(	0.277)	0.230		0.230
166	13.83	0.77	0.460	(	0.276)	0.230		0.230
167	13.92	0.77	0.460	(	0.274)	0.230		0.230
168	14.00	0.77	0.460	(	0.273)	0.230		0.230
169	14.08	0.90	0.540	(	0.272)	0.270		0.270
170	14.17	0.90	0.540	(	0.270)	0.270		0.270
171	14.25	0.90	0.540		0.269	(	0.270)	0.271
172	14.33	0.87	0.520	(	0.267)	0.260		0.260
173	14.42	0.87	0.520	(	0.266)	0.260		0.260
174	14.50	0.87	0.520	(	0.265)	0.260		0.260
175	14.58	0.87	0.520	(	0.263)	0.260		0.260
176	14.67	0.87	0.520	(	0.262)	0.260		0.260
177	14.75	0.87	0.520	(	0.261)	0.260		0.260
178	14.83	0.83	0.500	(	0.259)	0.250		0.250
179	14.92	0.83	0.500	(	0.258)	0.250		0.250
180	15.00	0.83	0.500	(	0.257)	0.250		0.250
181	15.08	0.80	0.480	(	0.255)	0.240		0.240
182	15.17	0.80	0.480	(	0.254)	0.240		0.240
183	15.25	0.80	0.480	(	0.253)	0.240		0.240
184	15.33	0.77	0.460	(	0.251)	0.230		0.230
185	15.42	0.77	0.460	(	0.250)	0.230		0.230
186	15.50	0.77	0.460	(	0.249)	0.230		0.230
187	15.58	0.63	0.380	(	0.248)	0.190		0.190
188	15.67	0.63	0.380	(	0.246)	0.190		0.190
189	15.75	0.63	0.380	(	0.245)	0.190		0.190
190	15.83	0.63	0.380	(	0.244)	0.190		0.190

191	15.92	0.63	0.380	(0.243)	0.190	0.190
192	16.00	0.63	0.380	(0.241)	0.190	0.190
193	16.08	0.13	0.080	(0.240)	0.040	0.040
194	16.17	0.13	0.080	(0.239)	0.040	0.040
195	16.25	0.13	0.080	(0.238)	0.040	0.040
196	16.33	0.13	0.080	(0.236)	0.040	0.040
197	16.42	0.13	0.080	(0.235)	0.040	0.040
198	16.50	0.13	0.080	(0.234)	0.040	0.040
199	16.58	0.10	0.060	(0.233)	0.030	0.030
200	16.67	0.10	0.060	(0.232)	0.030	0.030
201	16.75	0.10	0.060	(0.230)	0.030	0.030
202	16.83	0.10	0.060	(0.229)	0.030	0.030
203	16.92	0.10	0.060	(0.228)	0.030	0.030
204	17.00	0.10	0.060	(0.227)	0.030	0.030
205	17.08	0.17	0.100	(0.226)	0.050	0.050
206	17.17	0.17	0.100	(0.225)	0.050	0.050
207	17.25	0.17	0.100	(0.224)	0.050	0.050
208	17.33	0.17	0.100	(0.222)	0.050	0.050
209	17.42	0.17	0.100	(0.221)	0.050	0.050
210	17.50	0.17	0.100	(0.220)	0.050	0.050
211	17.58	0.17	0.100	(0.219)	0.050	0.050
212	17.67	0.17	0.100	(0.218)	0.050	0.050
213	17.75	0.17	0.100	(0.217)	0.050	0.050
214	17.83	0.13	0.080	(0.216)	0.040	0.040
215	17.92	0.13	0.080	(0.215)	0.040	0.040
216	18.00	0.13	0.080	(0.214)	0.040	0.040
217	18.08	0.13	0.080	(0.213)	0.040	0.040
218	18.17	0.13	0.080	(0.212)	0.040	0.040
219	18.25	0.13	0.080	(0.211)	0.040	0.040
220	18.33	0.13	0.080	(0.210)	0.040	0.040
221	18.42	0.13	0.080	(0.209)	0.040	0.040
222	18.50	0.13	0.080	(0.208)	0.040	0.040
223	18.58	0.10	0.060	(0.207)	0.030	0.030
224	18.67	0.10	0.060	(0.206)	0.030	0.030
225	18.75	0.10	0.060	(0.205)	0.030	0.030
226	18.83	0.07	0.040	(0.204)	0.020	0.020
227	18.92	0.07	0.040	(0.203)	0.020	0.020
228	19.00	0.07	0.040	(0.202)	0.020	0.020
229	19.08	0.10	0.060	(0.201)	0.030	0.030
230	19.17	0.10	0.060	(0.200)	0.030	0.030
231	19.25	0.10	0.060	(0.199)	0.030	0.030
232	19.33	0.13	0.080	(0.198)	0.040	0.040
233	19.42	0.13	0.080	(0.197)	0.040	0.040
234	19.50	0.13	0.080	(0.196)	0.040	0.040
235	19.58	0.10	0.060	(0.195)	0.030	0.030
236	19.67	0.10	0.060	(0.194)	0.030	0.030
237	19.75	0.10	0.060	(0.193)	0.030	0.030
238	19.83	0.07	0.040	(0.193)	0.020	0.020
239	19.92	0.07	0.040	(0.192)	0.020	0.020
240	20.00	0.07	0.040	(0.191)	0.020	0.020

241	20.08	0.10	0.060	(0.190)	0.030	0.030
242	20.17	0.10	0.060	(0.189)	0.030	0.030
243	20.25	0.10	0.060	(0.188)	0.030	0.030
244	20.33	0.10	0.060	(0.188)	0.030	0.030
245	20.42	0.10	0.060	(0.187)	0.030	0.030
246	20.50	0.10	0.060	(0.186)	0.030	0.030
247	20.58	0.10	0.060	(0.185)	0.030	0.030
248	20.67	0.10	0.060	(0.184)	0.030	0.030
249	20.75	0.10	0.060	(0.184)	0.030	0.030
250	20.83	0.07	0.040	(0.183)	0.020	0.020
251	20.92	0.07	0.040	(0.182)	0.020	0.020
252	21.00	0.07	0.040	(0.181)	0.020	0.020
253	21.08	0.10	0.060	(0.181)	0.030	0.030
254	21.17	0.10	0.060	(0.180)	0.030	0.030
255	21.25	0.10	0.060	(0.179)	0.030	0.030
256	21.33	0.07	0.040	(0.179)	0.020	0.020
257	21.42	0.07	0.040	(0.178)	0.020	0.020
258	21.50	0.07	0.040	(0.177)	0.020	0.020
259	21.58	0.10	0.060	(0.177)	0.030	0.030
260	21.67	0.10	0.060	(0.176)	0.030	0.030
261	21.75	0.10	0.060	(0.175)	0.030	0.030
262	21.83	0.07	0.040	(0.175)	0.020	0.020
263	21.92	0.07	0.040	(0.174)	0.020	0.020
264	22.00	0.07	0.040	(0.174)	0.020	0.020
265	22.08	0.10	0.060	(0.173)	0.030	0.030
266	22.17	0.10	0.060	(0.172)	0.030	0.030
267	22.25	0.10	0.060	(0.172)	0.030	0.030
268	22.33	0.07	0.040	(0.171)	0.020	0.020
269	22.42	0.07	0.040	(0.171)	0.020	0.020
270	22.50	0.07	0.040	(0.170)	0.020	0.020
271	22.58	0.07	0.040	(0.170)	0.020	0.020
272	22.67	0.07	0.040	(0.169)	0.020	0.020
273	22.75	0.07	0.040	(0.169)	0.020	0.020
274	22.83	0.07	0.040	(0.168)	0.020	0.020
275	22.92	0.07	0.040	(0.168)	0.020	0.020
276	23.00	0.07	0.040	(0.168)	0.020	0.020
277	23.08	0.07	0.040	(0.167)	0.020	0.020
278	23.17	0.07	0.040	(0.167)	0.020	0.020
279	23.25	0.07	0.040	(0.166)	0.020	0.020
280	23.33	0.07	0.040	(0.166)	0.020	0.020
281	23.42	0.07	0.040	(0.166)	0.020	0.020
282	23.50	0.07	0.040	(0.165)	0.020	0.020
283	23.58	0.07	0.040	(0.165)	0.020	0.020
284	23.67	0.07	0.040	(0.165)	0.020	0.020
285	23.75	0.07	0.040	(0.165)	0.020	0.020
286	23.83	0.07	0.040	(0.165)	0.020	0.020
287	23.92	0.07	0.040	(0.164)	0.020	0.020
288	24.00	0.07	0.040	(0.164)	0.020	0.020
		(Loss Rate Not Used)				
	Sum =	100.0			Sum =	30.3

```
     Flood volume = Effective rainfall      2.53(In)
      times area      24.4(Ac.)/[(In)/(Ft.)] =       5.1(Ac.Ft)
     Total soil loss =      2.47(In)
     Total soil loss =     5.037(Ac.Ft)
     Total rainfall =      5.00(In)
     Flood volume =      224318.3 Cubic Feet
     Total soil loss =      219428.0 Cubic Feet
     ----------------------------------------------------------------------
      Peak flow rate of this hydrograph =      9.736(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        2.5       5.0       7.5      10.0
----------------------------------------------------------------------------
  0+ 5       0.0008      0.12  Q         |         |         |         |
  0+10       0.0033      0.36  VQ        |         |         |         |
  0+15       0.0062      0.43  VQ        |         |         |         |
  0+20       0.0098      0.52  V Q       |         |         |         |
  0+25       0.0143      0.65  V Q       |         |         |         |
  0+30       0.0191      0.70  V Q       |         |         |         |
  0+35       0.0241      0.72  V Q       |         |         |         |
  0+40       0.0291      0.73  V Q       |         |         |         |
  0+45       0.0342      0.74  V Q       |         |         |         |
  0+50       0.0397      0.80  V  Q      |         |         |         |
  0+55       0.0460      0.92  V  Q      |         |         |         |
  1+ 0       0.0525      0.95  V  Q      |         |         |         |
  1+ 5       0.0588      0.91  V  Q      |         |         |         |
  1+10       0.0643      0.80  V  Q      |         |         |         |
  1+15       0.0696      0.77  V  Q      |         |         |         |
  1+20       0.0748      0.76  V  Q      |         |         |         |
  1+25       0.0800      0.75  V Q       |         |         |         |
  1+30       0.0851      0.74  V Q       |         |         |         |
  1+35       0.0902      0.74  V Q       |         |         |         |
  1+40       0.0953      0.74  V Q       |         |         |         |
  1+45       0.1004      0.74  V Q       |         |         |         |
  1+50       0.1059      0.80  V  Q      |         |         |         |
  1+55       0.1122      0.92  V  Q      |         |         |         |
  2+ 0       0.1188      0.95  V  Q      |         |         |         |
  2+ 5       0.1254      0.97  V  Q      |         |         |         |
  2+10       0.1322      0.98  |V Q      |         |         |         |
  2+15       0.1389      0.98  |V Q      |         |         |         |
  2+20       0.1457      0.99  |V Q      |         |         |         |
  2+25       0.1525      0.99  |V Q      |         |         |         |
  2+30       0.1593      0.99  |V Q      |         |         |         |
  2+35       0.1665      1.05  |V  Q     |         |         |         |
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2+40       0.1745      1.17  |V  Q     |          |          |          |
2+45       0.1828      1.20  |V  Q     |          |          |          |
2+50       0.1911      1.21  |V  Q     |          |          |          |
2+55       0.1996      1.22  |V  Q     |          |          |          |
3+ 0       0.2080      1.23  |V  Q     |          |          |          |
3+ 5       0.2165      1.23  |V  Q     |          |          |          |
3+10       0.2250      1.23  |V  Q     |          |          |          |
3+15       0.2335      1.23  |V  Q     |          |          |          |
3+20       0.2420      1.23  |V  Q     |          |          |          |
3+25       0.2505      1.23  |V  Q     |          |          |          |
3+30       0.2590      1.23  | V Q     |          |          |          |
3+35       0.2675      1.23  | V Q     |          |          |          |
3+40       0.2759      1.23  | V Q     |          |          |          |
3+45       0.2844      1.23  | V Q     |          |          |          |
3+50       0.2933      1.29  | V  Q    |          |          |          |
3+55       0.3031      1.41  | V  Q    |          |          |          |
4+ 0       0.3130      1.45  | V  Q    |          |          |          |
4+ 5       0.3231      1.46  | V  Q    |          |          |          |
4+10       0.3332      1.47  | V  Q    |          |          |          |
4+15       0.3434      1.47  | V  Q    |          |          |          |
4+20       0.3540      1.54  | V   Q   |          |          |          |
4+25       0.3654      1.66  | V   Q   |          |          |          |
4+30       0.3770      1.69  | V   Q   |          |          |          |
4+35       0.3888      1.71  |  V  Q   |          |          |          |
4+40       0.4006      1.72  |  V  Q   |          |          |          |
4+45       0.4125      1.72  |  V  Q   |          |          |          |
4+50       0.4248      1.78  |  V   Q  |          |          |          |
4+55       0.4379      1.91  |  V   Q  |          |          |          |
5+ 0       0.4512      1.94  |  V   Q  |          |          |          |
5+ 5       0.4639      1.84  |  V   Q  |          |          |          |
5+10       0.4749      1.60  |  V  Q   |          |          |          |
5+15       0.4855      1.54  |  V  Q   |          |          |          |
5+20       0.4964      1.57  |  V  Q   |          |          |          |
5+25       0.5079      1.68  |  V  Q   |          |          |          |
5+30       0.5196      1.70  |   V Q   |          |          |          |
5+35       0.5318      1.77  |   V  Q  |          |          |          |
5+40       0.5449      1.90  |   V  Q  |          |          |          |
5+45       0.5582      1.93  |   V  Q  |          |          |          |
5+50       0.5717      1.95  |   V  Q  |          |          |          |
5+55       0.5852      1.96  |   V  Q  |          |          |          |
6+ 0       0.5987      1.97  |   V  Q  |          |          |          |
6+ 5       0.6127      2.03  |   V   Q |          |          |          |
6+10       0.6275      2.15  |   V   Q |          |          |          |
6+15       0.6426      2.19  |   V   Q |          |          |          |
6+20       0.6577      2.20  |    V  Q |          |          |          |
6+25       0.6730      2.21  |    V  Q |          |          |          |
6+30       0.6882      2.21  |    V  Q |          |          |          |
6+35       0.7039      2.28  |    V   Q|          |          |          |
6+40       0.7204      2.40  |    V   Q|          |          |          |
6+45       0.7372      2.43  |    V   Q|          |          |          |
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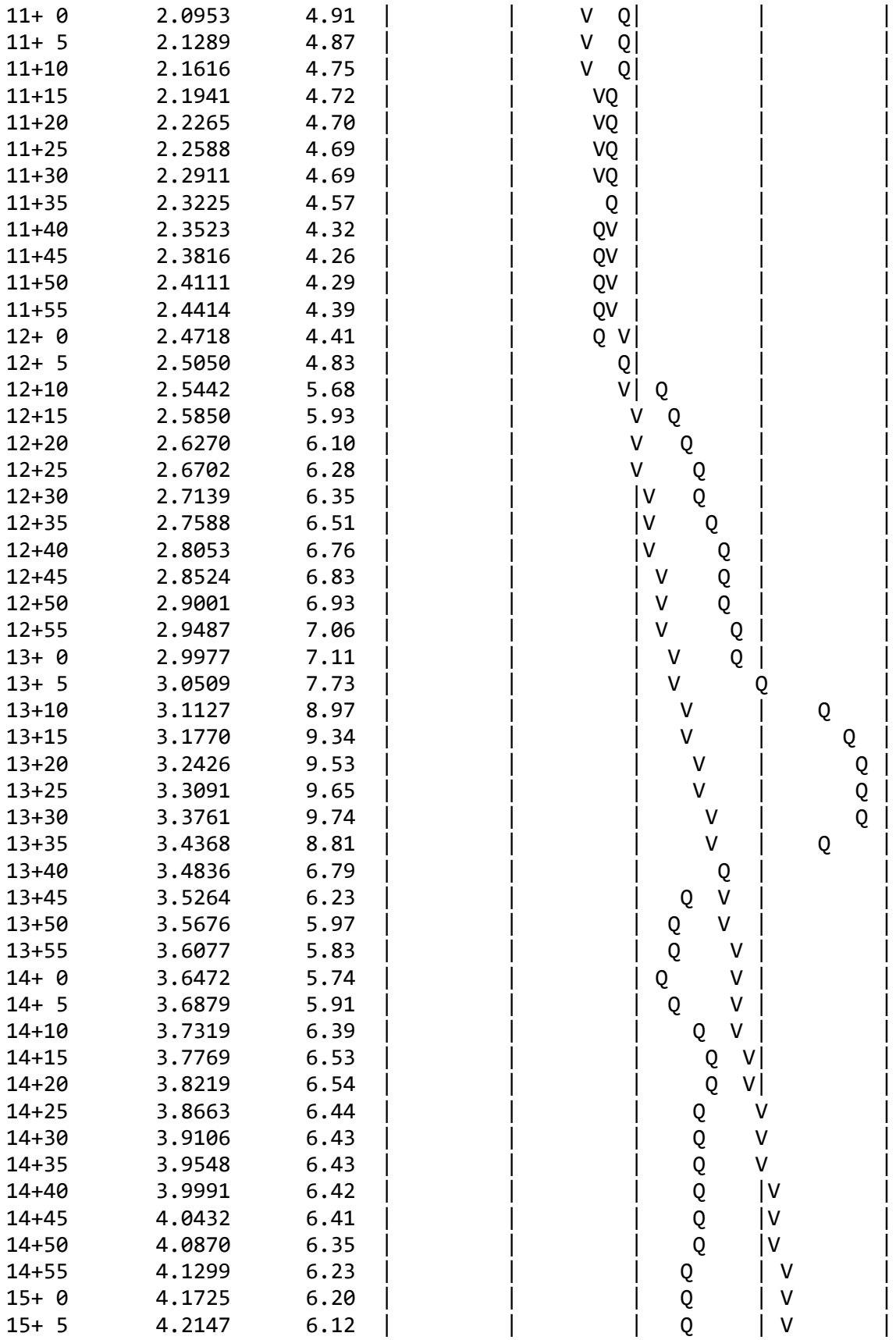
6+50	0.7540	2.45	| V Q|	|	|	|
6+55	0.7709	2.46	| V Q|	|	|	|
7+ 0	0.7879	2.46	| V Q|	|	|	|
7+ 5	0.8049	2.47	| V Q|	|	|	|
7+10	0.8218	2.47	| V Q|	|	|	|
7+15	0.8388	2.47	| V Q|	|	|	|
7+20	0.8562	2.52	| V Q	|	|	|
7+25	0.8744	2.64	| V Q	|	|	|
7+30	0.8929	2.68	| V Q	|	|	|
7+35	0.9118	2.75	| V |Q	|	|	|
7+40	0.9317	2.88	| V |Q	|	|	|
7+45	0.9518	2.92	| V |Q	|	|	|
7+50	0.9725	3.00	| V |Q	|	|	|
7+55	0.9940	3.13	| V | Q	|	|	|
8+ 0	1.0158	3.17	| V | Q	|	|	|
8+ 5	1.0386	3.31	| V | Q	|	|	|
8+10	1.0631	3.55	| V | Q	|	|	|
8+15	1.0880	3.63	| V | Q	|	|	|
8+20	1.1133	3.66	| V | Q	|	|	|
8+25	1.1386	3.68	| V | Q	|	|	|
8+30	1.1640	3.69	| V| Q	|	|	|
8+35	1.1899	3.76	| V| Q	|	|	|
8+40	1.2166	3.88	| V| Q	|	|	|
8+45	1.2435	3.91	| V| Q	|	|	|
8+50	1.2710	3.99	| V| Q	|	|	|
8+55	1.2993	4.11	| V Q	|	|	|
9+ 0	1.3279	4.15	| V Q	|	|	|
9+ 5	1.3575	4.29	| V Q	|	|	|
9+10	1.3887	4.54	| V Q	|	|	|
9+15	1.4205	4.61	| |V Q	|	|	|
9+20	1.4529	4.71	| |V Q	|	|	|
9+25	1.4863	4.84	| |V Q|	|	|	|
9+30	1.5200	4.89	| |V Q|	|	|	|
9+35	1.5542	4.97	| | V Q|	|	|	|
9+40	1.5893	5.10	| | V Q	|	|	|
9+45	1.6247	5.14	| | V Q	|	|	|
9+50	1.6607	5.22	| | V Q	|	|	|
9+55	1.6975	5.35	| | V |Q	|	|	|
10+ 0	1.7346	5.39	| | V |Q	|	|	|
10+ 5	1.7690	4.99	| | V Q|	|	|	|
10+10	1.7976	4.16	| | V Q	|	|	|
10+15	1.8246	3.93	| | VQ	|	|	|
10+20	1.8510	3.82	| | VQ	|	|	|
10+25	1.8769	3.76	| | VQ	|	|	|
10+30	1.9026	3.73	| | Q	|	|	|
10+35	1.9301	3.99	| | VQ	|	|	|
10+40	1.9617	4.60	| | V Q	|	|	|
10+45	1.9945	4.76	| | V Q|	|	|	|
10+50	2.0279	4.84	| | V Q|	|	|	|
10+55	2.0615	4.88	| | V Q|	|	|	|



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15+10       4.2560      5.99  |         |         |  Q      |  V      |
15+15       4.2970      5.95  |         |         |  Q      |  V      |
15+20       4.3375      5.88  |         |         |  Q      |  V      |
15+25       4.3770      5.75  |         |         | Q       |  V      |
15+30       4.4163      5.71  |         |         | Q       |   V     |
15+35       4.4539      5.45  |         |         |Q        |   V     |
15+40       4.4881      4.96  |         |        Q|         |   V     |
15+45       4.5213      4.82  |         |        Q|         |    V    |
15+50       4.5540      4.76  |         |        Q|         |    V    |
15+55       4.5865      4.72  |         |       Q |         |    V    |
16+ 0       4.6189      4.70  |         |       Q |         |    V    |
16+ 5       4.6450      3.80  |         |    Q    |         |     V   |
16+10       4.6588      1.99  |      Q  |         |         |     V   |
16+15       4.6690      1.49  |    Q    |         |         |     V   |
16+20       4.6776      1.25  |    Q    |         |         |     V   |
16+25       4.6854      1.13  |   Q     |         |         |     V   |
16+30       4.6926      1.05  |   Q     |         |         |     V   |
16+35       4.6990      0.93  |  Q      |         |         |     V   |
16+40       4.7046      0.81  |  Q      |         |         |     V   |
16+45       4.7099      0.77  |  Q      |         |         |     V   |
16+50       4.7151      0.76  |  Q      |         |         |     V   |
16+55       4.7203      0.75  | Q       |         |         |     V   |
17+ 0       4.7254      0.74  | Q       |         |         |     V   |
17+ 5       4.7313      0.86  |  Q      |         |         |     V   |
17+10       4.7389      1.10  |   Q     |         |         |     V   |
17+15       4.7469      1.17  |   Q     |         |         |     V   |
17+20       4.7551      1.20  |   Q     |         |         |     V   |
17+25       4.7635      1.21  |   Q     |         |         |      V  |
17+30       4.7719      1.22  |   Q     |         |         |      V  |
17+35       4.7804      1.23  |   Q     |         |         |      V  |
17+40       4.7889      1.23  |   Q     |         |         |      V  |
17+45       4.7974      1.23  |   Q     |         |         |      V  |
17+50       4.8055      1.17  |   Q     |         |         |      V  |
17+55       4.8127      1.05  |   Q     |         |         |      V  |
18+ 0       4.8197      1.02  |   Q     |         |         |      V  |
18+ 5       4.8267      1.00  |   Q     |         |         |      V  |
18+10       4.8335      1.00  |  Q      |         |         |      V  |
18+15       4.8403      0.99  |  Q      |         |         |      V  |
18+20       4.8471      0.99  |  Q      |         |         |      V  |
18+25       4.8539      0.99  |  Q      |         |         |      V  |
18+30       4.8607      0.99  |  Q      |         |         |      V  |
18+35       4.8671      0.93  |  Q      |         |         |      V  |
18+40       4.8726      0.81  |  Q      |         |         |      V  |
18+45       4.8780      0.77  |  Q      |         |         |      V  |
18+50       4.8828      0.70  | Q       |         |         |      V  |
18+55       4.8867      0.57  | Q       |         |         |      V  |
19+ 0       4.8904      0.53  | Q       |         |         |      V  |
19+ 5       4.8943      0.57  | Q       |         |         |       V |
19+10       4.8990      0.68  | Q       |         |         |       V |
19+15       4.9039      0.71  | Q       |         |         |       V |
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19+20	4.9092	0.78	| Q	|	|	|	V |
19+25	4.9155	0.91	| Q	|	|	|	V |
19+30	4.9220	0.95	| Q	|	|	|	V |
19+35	4.9283	0.91	| Q	|	|	|	V |
19+40	4.9338	0.80	| Q	|	|	|	V |
19+45	4.9391	0.77	| Q	|	|	|	V |
19+50	4.9439	0.70	| Q	|	|	|	V |
19+55	4.9478	0.57	| Q	|	|	|	V |
20+ 0	4.9515	0.53	| Q	|	|	|	V |
20+ 5	4.9554	0.57	| Q	|	|	|	V |
20+10	4.9601	0.68	| Q	|	|	|	V |
20+15	4.9650	0.71	| Q	|	|	|	V |
20+20	4.9700	0.72	| Q	|	|	|	V |
20+25	4.9750	0.73	| Q	|	|	|	V |
20+30	4.9801	0.74	| Q	|	|	|	V |
20+35	4.9851	0.74	| Q	|	|	|	V |
20+40	4.9902	0.74	| Q	|	|	|	V |
20+45	4.9953	0.74	| Q	|	|	|	V |
20+50	5.0000	0.68	| Q	|	|	|	V |
20+55	5.0039	0.56	| Q	|	|	|	V |
21+ 0	5.0075	0.53	| Q	|	|	|	V |
21+ 5	5.0114	0.57	| Q	|	|	|	V |
21+10	5.0161	0.68	| Q	|	|	|	V |
21+15	5.0210	0.71	| Q	|	|	|	V|
21+20	5.0256	0.66	| Q	|	|	|	V|
21+25	5.0294	0.55	| Q	|	|	|	V|
21+30	5.0330	0.52	| Q	|	|	|	V|
21+35	5.0369	0.57	| Q	|	|	|	V|
21+40	5.0416	0.68	| Q	|	|	|	V|
21+45	5.0465	0.71	| Q	|	|	|	V|
21+50	5.0510	0.66	| Q	|	|	|	V|
21+55	5.0548	0.55	| Q	|	|	|	V|
22+ 0	5.0584	0.52	| Q	|	|	|	V|
22+ 5	5.0624	0.57	| Q	|	|	|	V|
22+10	5.0671	0.68	| Q	|	|	|	V|
22+15	5.0720	0.71	| Q	|	|	|	V|
22+20	5.0765	0.66	| Q	|	|	|	V|
22+25	5.0803	0.55	| Q	|	|	|	V|
22+30	5.0839	0.52	| Q	|	|	|	V|
22+35	5.0874	0.51	| Q	|	|	|	V|
22+40	5.0909	0.50	| Q	|	|	|	V|
22+45	5.0943	0.50	|Q	|	|	|	V|
22+50	5.0977	0.49	|Q	|	|	|	V|
22+55	5.1011	0.49	|Q	|	|	|	V|
23+ 0	5.1045	0.49	|Q	|	|	|	V|
23+ 5	5.1079	0.49	|Q	|	|	|	V|
23+10	5.1113	0.49	|Q	|	|	|	V|
23+15	5.1147	0.49	|Q	|	|	|	V|
23+20	5.1181	0.49	|Q	|	|	|	V|
23+25	5.1215	0.49	|Q	|	|	|	V|

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   23+30       5.1249      0.49  |Q        |         |         |        V|
   23+35       5.1283      0.49  |Q        |         |         |        V|
   23+40       5.1317      0.49  |Q        |         |         |        V|
   23+45       5.1351      0.49  |Q        |         |         |        V|
   23+50       5.1385      0.49  |Q        |         |         |        V|
   23+55       5.1418      0.49  |Q        |         |         |        V|
   24+ 0       5.1452      0.49  |Q        |         |         |        V|
   24+ 5       5.1478      0.37  |Q        |         |         |        V|
   24+10       5.1487      0.13  Q         |         |         |        V|
   24+15       5.1492      0.07  Q         |         |         |        V|
   24+20       5.1495      0.04  Q         |         |         |        V|
   24+25       5.1496      0.02  Q         |         |         |        V|
   24+30       5.1496      0.01  Q         |         |         |        V|
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U n i t H y d r o g r a p h A n a l y s i s

Copyright (c) CIVILCADD/CIVILDESIGN, 1989 - 2014, Version 9.0
Study date 10/03/24 File: QP100SAMSUH24100.out

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20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100 YEAR, 24 HOUR STORM EVENT ANALYSIS

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

Program License Serial Number 6405

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

English Units used in output format

Drainage Area = 24.34(Ac.) = 0.038 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 24.34(Ac.) = 0.038 Sq. Mi.
Length along longest watercourse = 1495.00(Ft.)
Length along longest watercourse measured to centroid = 210.00(Ft.)
Length along longest watercourse = 0.283 Mi.
Length along longest watercourse measured to centroid = 0.040 Mi.
Difference in elevation = 21.06(Ft.)
Slope along watercourse = 74.3791 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.029 Hr.
Lag time = 1.73 Min.
25% of lag time = 0.43 Min.
40% of lag time = 0.69 Min.
Unit time = 5.00 Min.
Duration of storm = 24 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
24.34	2.00	48.68

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
24.34	5.00	121.70

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 2.000(In)
Area Averaged 100-Year Rainfall = 5.000(In)

Point rain (area averaged) = 5.000(In)
Areal adjustment factor = 100.00 %
Adjusted average point rain = 5.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
24.340	48.70	0.900

Total Area Entered = 24.34(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
48.7	48.7	0.585	0.900	0.111	1.000	0.111
					Sum (F) =	0.111

Area averaged mean soil loss (F) (In/Hr) = 0.111
Minimum soil loss rate ((In/Hr)) = 0.056
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	288.727	55.492	13.612
2	0.167	577.453	37.758	9.262
3	0.250	866.180	6.750	1.656
			Sum = 100.000	Sum= 24.530

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.07	0.040	(0.197)	0.007	0.033
2	0.17	0.07	0.040	(0.196)	0.007	0.033
3	0.25	0.07	0.040	(0.195)	0.007	0.033
4	0.33	0.10	0.060	(0.195)	0.011	0.049
5	0.42	0.10	0.060	(0.194)	0.011	0.049
6	0.50	0.10	0.060	(0.193)	0.011	0.049

7	0.58	0.10	0.060	(0.192)	0.011	0.049
8	0.67	0.10	0.060	(0.192)	0.011	0.049
9	0.75	0.10	0.060	(0.191)	0.011	0.049
10	0.83	0.13	0.080	(0.190)	0.014	0.066
11	0.92	0.13	0.080	(0.189)	0.014	0.066
12	1.00	0.13	0.080	(0.189)	0.014	0.066
13	1.08	0.10	0.060	(0.188)	0.011	0.049
14	1.17	0.10	0.060	(0.187)	0.011	0.049
15	1.25	0.10	0.060	(0.186)	0.011	0.049
16	1.33	0.10	0.060	(0.186)	0.011	0.049
17	1.42	0.10	0.060	(0.185)	0.011	0.049
18	1.50	0.10	0.060	(0.184)	0.011	0.049
19	1.58	0.10	0.060	(0.183)	0.011	0.049
20	1.67	0.10	0.060	(0.183)	0.011	0.049
21	1.75	0.10	0.060	(0.182)	0.011	0.049
22	1.83	0.13	0.080	(0.181)	0.014	0.066
23	1.92	0.13	0.080	(0.181)	0.014	0.066
24	2.00	0.13	0.080	(0.180)	0.014	0.066
25	2.08	0.13	0.080	(0.179)	0.014	0.066
26	2.17	0.13	0.080	(0.178)	0.014	0.066
27	2.25	0.13	0.080	(0.178)	0.014	0.066
28	2.33	0.13	0.080	(0.177)	0.014	0.066
29	2.42	0.13	0.080	(0.176)	0.014	0.066
30	2.50	0.13	0.080	(0.175)	0.014	0.066
31	2.58	0.17	0.100	(0.175)	0.018	0.082
32	2.67	0.17	0.100	(0.174)	0.018	0.082
33	2.75	0.17	0.100	(0.173)	0.018	0.082
34	2.83	0.17	0.100	(0.173)	0.018	0.082
35	2.92	0.17	0.100	(0.172)	0.018	0.082
36	3.00	0.17	0.100	(0.171)	0.018	0.082
37	3.08	0.17	0.100	(0.170)	0.018	0.082
38	3.17	0.17	0.100	(0.170)	0.018	0.082
39	3.25	0.17	0.100	(0.169)	0.018	0.082
40	3.33	0.17	0.100	(0.168)	0.018	0.082
41	3.42	0.17	0.100	(0.168)	0.018	0.082
42	3.50	0.17	0.100	(0.167)	0.018	0.082
43	3.58	0.17	0.100	(0.166)	0.018	0.082
44	3.67	0.17	0.100	(0.166)	0.018	0.082
45	3.75	0.17	0.100	(0.165)	0.018	0.082
46	3.83	0.20	0.120	(0.164)	0.022	0.098
47	3.92	0.20	0.120	(0.163)	0.022	0.098
48	4.00	0.20	0.120	(0.163)	0.022	0.098
49	4.08	0.20	0.120	(0.162)	0.022	0.098
50	4.17	0.20	0.120	(0.161)	0.022	0.098
51	4.25	0.20	0.120	(0.161)	0.022	0.098
52	4.33	0.23	0.140	(0.160)	0.025	0.115
53	4.42	0.23	0.140	(0.159)	0.025	0.115
54	4.50	0.23	0.140	(0.159)	0.025	0.115
55	4.58	0.23	0.140	(0.158)	0.025	0.115
56	4.67	0.23	0.140	(0.157)	0.025	0.115
57	4.75	0.23	0.140	(0.157)	0.025	0.115
58	4.83	0.27	0.160	(0.156)	0.029	0.131
59	4.92	0.27	0.160	(0.155)	0.029	0.131
60	5.00	0.27	0.160	(0.155)	0.029	0.131
61	5.08	0.20	0.120	(0.154)	0.022	0.098
62	5.17	0.20	0.120	(0.153)	0.022	0.098
63	5.25	0.20	0.120	(0.153)	0.022	0.098

64	5.33	0.23	0.140	(0.152)	0.025	0.115
65	5.42	0.23	0.140	(0.151)	0.025	0.115
66	5.50	0.23	0.140	(0.151)	0.025	0.115
67	5.58	0.27	0.160	(0.150)	0.029	0.131
68	5.67	0.27	0.160	(0.149)	0.029	0.131
69	5.75	0.27	0.160	(0.149)	0.029	0.131
70	5.83	0.27	0.160	(0.148)	0.029	0.131
71	5.92	0.27	0.160	(0.147)	0.029	0.131
72	6.00	0.27	0.160	(0.147)	0.029	0.131
73	6.08	0.30	0.180	(0.146)	0.032	0.148
74	6.17	0.30	0.180	(0.145)	0.032	0.148
75	6.25	0.30	0.180	(0.145)	0.032	0.148
76	6.33	0.30	0.180	(0.144)	0.032	0.148
77	6.42	0.30	0.180	(0.143)	0.032	0.148
78	6.50	0.30	0.180	(0.143)	0.032	0.148
79	6.58	0.33	0.200	(0.142)	0.036	0.164
80	6.67	0.33	0.200	(0.141)	0.036	0.164
81	6.75	0.33	0.200	(0.141)	0.036	0.164
82	6.83	0.33	0.200	(0.140)	0.036	0.164
83	6.92	0.33	0.200	(0.140)	0.036	0.164
84	7.00	0.33	0.200	(0.139)	0.036	0.164
85	7.08	0.33	0.200	(0.138)	0.036	0.164
86	7.17	0.33	0.200	(0.138)	0.036	0.164
87	7.25	0.33	0.200	(0.137)	0.036	0.164
88	7.33	0.37	0.220	(0.136)	0.040	0.180
89	7.42	0.37	0.220	(0.136)	0.040	0.180
90	7.50	0.37	0.220	(0.135)	0.040	0.180
91	7.58	0.40	0.240	(0.135)	0.043	0.197
92	7.67	0.40	0.240	(0.134)	0.043	0.197
93	7.75	0.40	0.240	(0.133)	0.043	0.197
94	7.83	0.43	0.260	(0.133)	0.047	0.213
95	7.92	0.43	0.260	(0.132)	0.047	0.213
96	8.00	0.43	0.260	(0.131)	0.047	0.213
97	8.08	0.50	0.300	(0.131)	0.054	0.246
98	8.17	0.50	0.300	(0.130)	0.054	0.246
99	8.25	0.50	0.300	(0.130)	0.054	0.246
100	8.33	0.50	0.300	(0.129)	0.054	0.246
101	8.42	0.50	0.300	(0.128)	0.054	0.246
102	8.50	0.50	0.300	(0.128)	0.054	0.246
103	8.58	0.53	0.320	(0.127)	0.058	0.262
104	8.67	0.53	0.320	(0.127)	0.058	0.262
105	8.75	0.53	0.320	(0.126)	0.058	0.262
106	8.83	0.57	0.340	(0.125)	0.061	0.279
107	8.92	0.57	0.340	(0.125)	0.061	0.279
108	9.00	0.57	0.340	(0.124)	0.061	0.279
109	9.08	0.63	0.380	(0.124)	0.068	0.312
110	9.17	0.63	0.380	(0.123)	0.068	0.312
111	9.25	0.63	0.380	(0.123)	0.068	0.312
112	9.33	0.67	0.400	(0.122)	0.072	0.328
113	9.42	0.67	0.400	(0.121)	0.072	0.328
114	9.50	0.67	0.400	(0.121)	0.072	0.328
115	9.58	0.70	0.420	(0.120)	0.076	0.344
116	9.67	0.70	0.420	(0.120)	0.076	0.344
117	9.75	0.70	0.420	(0.119)	0.076	0.344
118	9.83	0.73	0.440	(0.118)	0.079	0.361
119	9.92	0.73	0.440	(0.118)	0.079	0.361
120	10.00	0.73	0.440	(0.117)	0.079	0.361

121	10.08	0.50	0.300	(0.117)	0.054	0.246
122	10.17	0.50	0.300	(0.116)	0.054	0.246
123	10.25	0.50	0.300	(0.116)	0.054	0.246
124	10.33	0.50	0.300	(0.115)	0.054	0.246
125	10.42	0.50	0.300	(0.115)	0.054	0.246
126	10.50	0.50	0.300	(0.114)	0.054	0.246
127	10.58	0.67	0.400	(0.113)	0.072	0.328
128	10.67	0.67	0.400	(0.113)	0.072	0.328
129	10.75	0.67	0.400	(0.112)	0.072	0.328
130	10.83	0.67	0.400	(0.112)	0.072	0.328
131	10.92	0.67	0.400	(0.111)	0.072	0.328
132	11.00	0.67	0.400	(0.111)	0.072	0.328
133	11.08	0.63	0.380	(0.110)	0.068	0.312
134	11.17	0.63	0.380	(0.110)	0.068	0.312
135	11.25	0.63	0.380	(0.109)	0.068	0.312
136	11.33	0.63	0.380	(0.108)	0.068	0.312
137	11.42	0.63	0.380	(0.108)	0.068	0.312
138	11.50	0.63	0.380	(0.107)	0.068	0.312
139	11.58	0.57	0.340	(0.107)	0.061	0.279
140	11.67	0.57	0.340	(0.106)	0.061	0.279
141	11.75	0.57	0.340	(0.106)	0.061	0.279
142	11.83	0.60	0.360	(0.105)	0.065	0.295
143	11.92	0.60	0.360	(0.105)	0.065	0.295
144	12.00	0.60	0.360	(0.104)	0.065	0.295
145	12.08	0.83	0.500	(0.104)	0.090	0.410
146	12.17	0.83	0.500	(0.103)	0.090	0.410
147	12.25	0.83	0.500	(0.103)	0.090	0.410
148	12.33	0.87	0.520	(0.102)	0.094	0.426
149	12.42	0.87	0.520	(0.102)	0.094	0.426
150	12.50	0.87	0.520	(0.101)	0.094	0.426
151	12.58	0.93	0.560	0.101	(0.101)	0.459
152	12.67	0.93	0.560	0.100	(0.101)	0.460
153	12.75	0.93	0.560	0.100	(0.101)	0.460
154	12.83	0.97	0.580	0.099	(0.104)	0.481
155	12.92	0.97	0.580	0.099	(0.104)	0.481
156	13.00	0.97	0.580	0.098	(0.104)	0.482
157	13.08	1.13	0.680	0.098	(0.122)	0.582
158	13.17	1.13	0.680	0.097	(0.122)	0.583
159	13.25	1.13	0.680	0.097	(0.122)	0.583
160	13.33	1.13	0.680	0.096	(0.122)	0.584
161	13.42	1.13	0.680	0.096	(0.122)	0.584
162	13.50	1.13	0.680	0.095	(0.122)	0.585
163	13.58	0.77	0.460	(0.095)	0.083	0.377
164	13.67	0.77	0.460	(0.094)	0.083	0.377
165	13.75	0.77	0.460	(0.094)	0.083	0.377
166	13.83	0.77	0.460	(0.093)	0.083	0.377
167	13.92	0.77	0.460	(0.093)	0.083	0.377
168	14.00	0.77	0.460	(0.092)	0.083	0.377
169	14.08	0.90	0.540	0.092	(0.097)	0.448
170	14.17	0.90	0.540	0.091	(0.097)	0.449
171	14.25	0.90	0.540	0.091	(0.097)	0.449
172	14.33	0.87	0.520	0.090	(0.094)	0.430
173	14.42	0.87	0.520	0.090	(0.094)	0.430
174	14.50	0.87	0.520	0.089	(0.094)	0.430
175	14.58	0.87	0.520	0.089	(0.094)	0.431
176	14.67	0.87	0.520	0.089	(0.094)	0.431
177	14.75	0.87	0.520	0.088	(0.094)	0.432

178	14.83	0.83	0.500	0.088	(0.090)	0.412
179	14.92	0.83	0.500	0.087	(0.090)	0.413
180	15.00	0.83	0.500	0.087	(0.090)	0.413
181	15.08	0.80	0.480	0.086	(0.086)	0.394
182	15.17	0.80	0.480	0.086	(0.086)	0.394
183	15.25	0.80	0.480	0.085	(0.086)	0.395
184	15.33	0.77	0.460	(0.085)	0.083	0.377
185	15.42	0.77	0.460	(0.085)	0.083	0.377
186	15.50	0.77	0.460	(0.084)	0.083	0.377
187	15.58	0.63	0.380	(0.084)	0.068	0.312
188	15.67	0.63	0.380	(0.083)	0.068	0.312
189	15.75	0.63	0.380	(0.083)	0.068	0.312
190	15.83	0.63	0.380	(0.082)	0.068	0.312
191	15.92	0.63	0.380	(0.082)	0.068	0.312
192	16.00	0.63	0.380	(0.082)	0.068	0.312
193	16.08	0.13	0.080	(0.081)	0.014	0.066
194	16.17	0.13	0.080	(0.081)	0.014	0.066
195	16.25	0.13	0.080	(0.080)	0.014	0.066
196	16.33	0.13	0.080	(0.080)	0.014	0.066
197	16.42	0.13	0.080	(0.080)	0.014	0.066
198	16.50	0.13	0.080	(0.079)	0.014	0.066
199	16.58	0.10	0.060	(0.079)	0.011	0.049
200	16.67	0.10	0.060	(0.078)	0.011	0.049
201	16.75	0.10	0.060	(0.078)	0.011	0.049
202	16.83	0.10	0.060	(0.078)	0.011	0.049
203	16.92	0.10	0.060	(0.077)	0.011	0.049
204	17.00	0.10	0.060	(0.077)	0.011	0.049
205	17.08	0.17	0.100	(0.076)	0.018	0.082
206	17.17	0.17	0.100	(0.076)	0.018	0.082
207	17.25	0.17	0.100	(0.076)	0.018	0.082
208	17.33	0.17	0.100	(0.075)	0.018	0.082
209	17.42	0.17	0.100	(0.075)	0.018	0.082
210	17.50	0.17	0.100	(0.074)	0.018	0.082
211	17.58	0.17	0.100	(0.074)	0.018	0.082
212	17.67	0.17	0.100	(0.074)	0.018	0.082
213	17.75	0.17	0.100	(0.073)	0.018	0.082
214	17.83	0.13	0.080	(0.073)	0.014	0.066
215	17.92	0.13	0.080	(0.073)	0.014	0.066
216	18.00	0.13	0.080	(0.072)	0.014	0.066
217	18.08	0.13	0.080	(0.072)	0.014	0.066
218	18.17	0.13	0.080	(0.072)	0.014	0.066
219	18.25	0.13	0.080	(0.071)	0.014	0.066
220	18.33	0.13	0.080	(0.071)	0.014	0.066
221	18.42	0.13	0.080	(0.071)	0.014	0.066
222	18.50	0.13	0.080	(0.070)	0.014	0.066
223	18.58	0.10	0.060	(0.070)	0.011	0.049
224	18.67	0.10	0.060	(0.069)	0.011	0.049
225	18.75	0.10	0.060	(0.069)	0.011	0.049
226	18.83	0.07	0.040	(0.069)	0.007	0.033
227	18.92	0.07	0.040	(0.069)	0.007	0.033
228	19.00	0.07	0.040	(0.068)	0.007	0.033
229	19.08	0.10	0.060	(0.068)	0.011	0.049
230	19.17	0.10	0.060	(0.068)	0.011	0.049
231	19.25	0.10	0.060	(0.067)	0.011	0.049
232	19.33	0.13	0.080	(0.067)	0.014	0.066
233	19.42	0.13	0.080	(0.067)	0.014	0.066
234	19.50	0.13	0.080	(0.066)	0.014	0.066

235	19.58	0.10	0.060	(0.066)	0.011	0.049
236	19.67	0.10	0.060	(0.066)	0.011	0.049
237	19.75	0.10	0.060	(0.065)	0.011	0.049
238	19.83	0.07	0.040	(0.065)	0.007	0.033
239	19.92	0.07	0.040	(0.065)	0.007	0.033
240	20.00	0.07	0.040	(0.065)	0.007	0.033
241	20.08	0.10	0.060	(0.064)	0.011	0.049
242	20.17	0.10	0.060	(0.064)	0.011	0.049
243	20.25	0.10	0.060	(0.064)	0.011	0.049
244	20.33	0.10	0.060	(0.063)	0.011	0.049
245	20.42	0.10	0.060	(0.063)	0.011	0.049
246	20.50	0.10	0.060	(0.063)	0.011	0.049
247	20.58	0.10	0.060	(0.063)	0.011	0.049
248	20.67	0.10	0.060	(0.062)	0.011	0.049
249	20.75	0.10	0.060	(0.062)	0.011	0.049
250	20.83	0.07	0.040	(0.062)	0.007	0.033
251	20.92	0.07	0.040	(0.062)	0.007	0.033
252	21.00	0.07	0.040	(0.061)	0.007	0.033
253	21.08	0.10	0.060	(0.061)	0.011	0.049
254	21.17	0.10	0.060	(0.061)	0.011	0.049
255	21.25	0.10	0.060	(0.061)	0.011	0.049
256	21.33	0.07	0.040	(0.060)	0.007	0.033
257	21.42	0.07	0.040	(0.060)	0.007	0.033
258	21.50	0.07	0.040	(0.060)	0.007	0.033
259	21.58	0.10	0.060	(0.060)	0.011	0.049
260	21.67	0.10	0.060	(0.059)	0.011	0.049
261	21.75	0.10	0.060	(0.059)	0.011	0.049
262	21.83	0.07	0.040	(0.059)	0.007	0.033
263	21.92	0.07	0.040	(0.059)	0.007	0.033
264	22.00	0.07	0.040	(0.059)	0.007	0.033
265	22.08	0.10	0.060	(0.058)	0.011	0.049
266	22.17	0.10	0.060	(0.058)	0.011	0.049
267	22.25	0.10	0.060	(0.058)	0.011	0.049
268	22.33	0.07	0.040	(0.058)	0.007	0.033
269	22.42	0.07	0.040	(0.058)	0.007	0.033
270	22.50	0.07	0.040	(0.058)	0.007	0.033
271	22.58	0.07	0.040	(0.057)	0.007	0.033
272	22.67	0.07	0.040	(0.057)	0.007	0.033
273	22.75	0.07	0.040	(0.057)	0.007	0.033
274	22.83	0.07	0.040	(0.057)	0.007	0.033
275	22.92	0.07	0.040	(0.057)	0.007	0.033
276	23.00	0.07	0.040	(0.057)	0.007	0.033
277	23.08	0.07	0.040	(0.057)	0.007	0.033
278	23.17	0.07	0.040	(0.056)	0.007	0.033
279	23.25	0.07	0.040	(0.056)	0.007	0.033
280	23.33	0.07	0.040	(0.056)	0.007	0.033
281	23.42	0.07	0.040	(0.056)	0.007	0.033
282	23.50	0.07	0.040	(0.056)	0.007	0.033
283	23.58	0.07	0.040	(0.056)	0.007	0.033
284	23.67	0.07	0.040	(0.056)	0.007	0.033
285	23.75	0.07	0.040	(0.056)	0.007	0.033
286	23.83	0.07	0.040	(0.056)	0.007	0.033
287	23.92	0.07	0.040	(0.056)	0.007	0.033
288	24.00	0.07	0.040	(0.056)	0.007	0.033

(Loss Rate Not Used)

Sum = 100.0 Sum = 49.4

Flood volume = Effective rainfall 4.12(In)

```
 times area      24.3(Ac.)/[(In)/(Ft.)] =       8.4(Ac.Ft)
Total soil loss =      0.88(In)
Total soil loss =     1.787(Ac.Ft)
Total rainfall =      5.00(In)
Flood volume =      363919.9 Cubic Feet
Total soil loss =       77830.1 Cubic Feet
---------------------------------------------------------------------
 Peak flow rate of this hydrograph =     14.347(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))

---------------------------------------------------------------------
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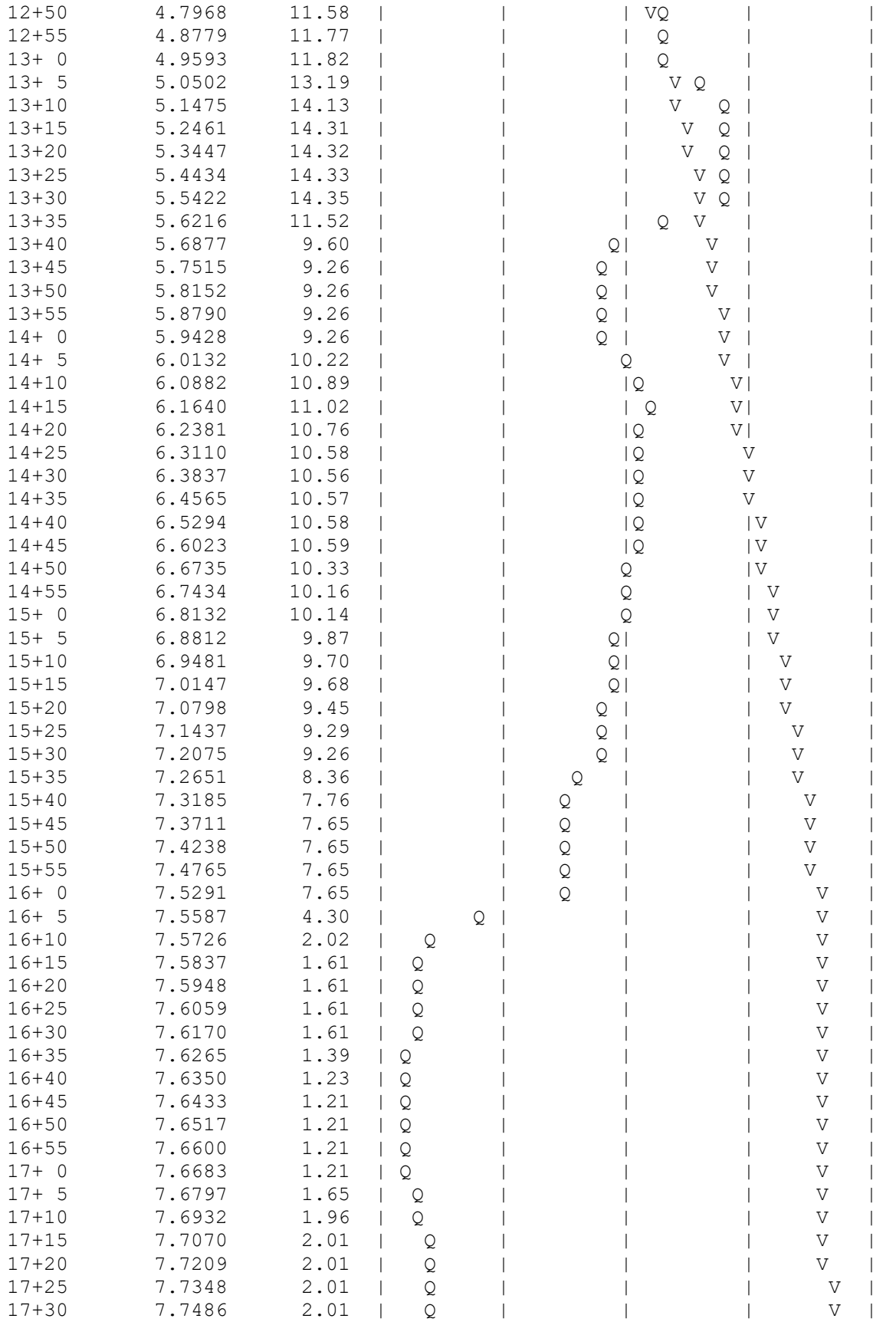
Time(h+m)	Volume Ac.Ft	Q(CFS)	0 5.0 10.0 15.0 20.0
0+ 5	0.0031	0.45	Q | | | |
0+10	0.0082	0.75	VQ | | | |
0+15	0.0138	0.80	VQ | | | |
0+20	0.0209	1.03	V Q | | | |
0+25	0.0290	1.18	V Q | | | |
0+30	0.0373	1.21	V Q | | | |
0+35	0.0456	1.21	V Q | | | |
0+40	0.0539	1.21	V Q | | | |
0+45	0.0623	1.21	V Q | | | |
0+50	0.0721	1.43	V Q | | | |
0+55	0.0830	1.58	V Q | | | |
1+ 0	0.0941	1.61	V Q | | | |
1+ 5	0.1037	1.39	V Q | | | |
1+10	0.1122	1.23	V Q | | | |
1+15	0.1205	1.21	V Q | | | |
1+20	0.1288	1.21	V Q | | | |
1+25	0.1371	1.21	V Q | | | |
1+30	0.1454	1.21	V Q | | | |
1+35	0.1537	1.21	V Q | | | |
1+40	0.1621	1.21	V Q | | | |
1+45	0.1704	1.21	V Q | | | |
1+50	0.1802	1.43	V Q | | | |
1+55	0.1911	1.58	V Q | | | |
2+ 0	0.2022	1.61	V Q | | | |
2+ 5	0.2133	1.61	|V Q | | | |
2+10	0.2244	1.61	|V Q | | | |
2+15	0.2355	1.61	|V Q | | | |
2+20	0.2466	1.61	|V Q | | | |
2+25	0.2576	1.61	|V Q | | | |
2+30	0.2687	1.61	|V Q | | | |
2+35	0.2814	1.83	|V Q | | | |
2+40	0.2950	1.99	|V Q | | | |
2+45	0.3089	2.01	|V Q | | | |
2+50	0.3228	2.01	|V Q | | | |
2+55	0.3366	2.01	|V Q | | | |
3+ 0	0.3505	2.01	|V Q | | | |
3+ 5	0.3643	2.01	|V Q | | | |
3+10	0.3782	2.01	|V Q | | | |
3+15	0.3921	2.01	|V Q | | | |

3+20	0.4059	2.01	V Q			
3+25	0.4198	2.01	V Q			
3+30	0.4336	2.01	V Q			
3+35	0.4475	2.01	V Q			
3+40	0.4614	2.01	V Q			
3+45	0.4752	2.01	V Q			
3+50	0.4906	2.24	V Q			
3+55	0.5071	2.39	V Q			
4+ 0	0.5237	2.41	V Q			
4+ 5	0.5403	2.41	V Q			
4+10	0.5569	2.41	V Q			
4+15	0.5736	2.41	V Q			
4+20	0.5917	2.64	V Q			
4+25	0.6110	2.79	V Q			
4+30	0.6304	2.82	V Q			
4+35	0.6498	2.82	V Q			
4+40	0.6692	2.82	V Q			
4+45	0.6886	2.82	V Q			
4+50	0.7095	3.04	V Q			
4+55	0.7315	3.19	V Q			
5+ 0	0.7537	3.22	V Q			
5+ 5	0.7728	2.77	V Q			
5+10	0.7898	2.47	VQ			
5+15	0.8064	2.41	VQ			
5+20	0.8246	2.64	V Q			
5+25	0.8438	2.79	VQ			
5+30	0.8632	2.82	VQ			
5+35	0.8842	3.04	V Q			
5+40	0.9061	3.19	V Q			
5+45	0.9283	3.22	V Q			
5+50	0.9505	3.22	V Q			
5+55	0.9727	3.22	V Q			
6+ 0	0.9948	3.22	V Q			
6+ 5	1.0186	3.44	V Q			
6+10	1.0433	3.60	V Q			
6+15	1.0683	3.62	V Q			
6+20	1.0932	3.62	V Q			
6+25	1.1182	3.62	V Q			
6+30	1.1431	3.62	V Q			
6+35	1.1696	3.85	V Q			
6+40	1.1971	4.00	V Q			
6+45	1.2248	4.02	V Q			
6+50	1.2526	4.02	V Q			
6+55	1.2803	4.02	V Q			
7+ 0	1.3080	4.02	V Q			
7+ 5	1.3357	4.02	V Q			
7+10	1.3634	4.02	V Q			
7+15	1.3912	4.02	V Q			
7+20	1.4204	4.25	V Q			
7+25	1.4507	4.40	V Q			
7+30	1.4812	4.43	VQ			
7+35	1.5132	4.65	V Q			
7+40	1.5463	4.80	V Q			
7+45	1.5796	4.83	V Q			
7+50	1.6144	5.05	V Q			
7+55	1.6502	5.21	V Q			
8+ 0	1.6863	5.23	V Q			

8+ 5	1.7254	5.68	V |Q	|	|	|
8+10	1.7666	5.98	V |Q	|	|	|
8+15	1.8082	6.04	V | Q	|	|	|
8+20	1.8497	6.04	V | Q	|	|	|
8+25	1.8913	6.04	V| Q	|	|	|
8+30	1.9329	6.04	V| Q	|	|	|
8+35	1.9760	6.26	V| Q	|	|	|
8+40	2.0202	6.41	V| Q	|	|	|
8+45	2.0645	6.44	V| Q	|	|	|
8+50	2.1104	6.66	V Q	|	|	|
8+55	2.1574	6.82	V Q	|	|	|
9+ 0	2.2045	6.84	V Q	|	|	|
9+ 5	2.2547	7.29	V Q	|	|	|
9+10	2.3070	7.59	|V Q	|	|	|
9+15	2.3596	7.65	|V Q	|	|	|
9+20	2.4138	7.87	|V Q	|	|	|
9+25	2.4691	8.02	|V Q	|	|	|
9+30	2.5245	8.05	| V Q	|	|	|
9+35	2.5815	8.27	| V Q	|	|	|
9+40	2.6395	8.42	| V Q	|	|	|
9+45	2.6977	8.45	| V Q	|	|	|
9+50	2.7575	8.68	| V Q	|	|	|
9+55	2.8183	8.83	| V Q	|	|	|
10+ 0	2.8793	8.85	| V Q	|	|	|
10+ 5	2.9295	7.29	| Q	|	|	|
10+10	2.9724	6.23	| Q V	|	|	|
10+15	3.0139	6.04	| Q V	|	|	|
10+20	3.0555	6.04	| Q V	|	|	|
10+25	3.0971	6.04	| Q V	|	|	|
10+30	3.1387	6.04	| Q V	|	|	|
10+35	3.1880	7.15	| QV	|	|	|
10+40	3.2425	7.91	| Q	|	|	|
10+45	3.2979	8.05	| VQ	|	|	|
10+50	3.3533	8.05	| Q	|	|	|
10+55	3.4088	8.05	| Q	|	|	|
11+ 0	3.4642	8.05	| Q	|	|	|
11+ 5	3.5181	7.83	| QV	|	|	|
11+10	3.5710	7.67	| Q V	|	|	|
11+15	3.6236	7.65	| Q V	|	|	|
11+20	3.6763	7.65	| Q V	|	|	|
11+25	3.7290	7.65	| Q V	|	|	|
11+30	3.7816	7.65	| Q V	|	|	|
11+35	3.8312	7.20	| Q V	|	|	|
11+40	3.8787	6.90	| Q V	|	|	|
11+45	3.9258	6.84	| Q V	|	|	|
11+50	3.9745	7.07	| Q V|	|	|	|
11+55	4.0242	7.22	| Q V|	|	|	|
12+ 0	4.0741	7.24	| Q V|	|	|	|
12+ 5	4.1348	8.81	| Q V|	|	|	|
12+10	4.2028	9.87	| QV	|	|	|
12+15	4.2720	10.06	| Q	|	|	|
12+20	4.3429	10.29	| Q	|	|	|
12+25	4.4148	10.44	| QV	|	|	|
12+30	4.4868	10.46	| QV	|	|	|
12+35	4.5620	10.91	| |Q	|	|	|
12+40	4.6393	11.23	| | Q	|	|	|
12+45	4.7171	11.29	| | Q	|	|	|



17+35	7.7625	2.01	| Q	|	|	V |
17+40	7.7763	2.01	| Q	|	|	V |
17+45	7.7902	2.01	| Q	|	|	V |
17+50	7.8025	1.79	| Q	|	|	V |
17+55	7.8138	1.64	| Q	|	|	V |
18+ 0	7.8249	1.61	| Q	|	|	V |
18+ 5	7.8360	1.61	| Q	|	|	V |
18+10	7.8471	1.61	| Q	|	|	V |
18+15	7.8581	1.61	| Q	|	|	V |
18+20	7.8692	1.61	| Q	|	|	V |
18+25	7.8803	1.61	| Q	|	|	V |
18+30	7.8914	1.61	| Q	|	|	V |
18+35	7.9010	1.39	| Q	|	|	V |
18+40	7.9095	1.23	| Q	|	|	V |
18+45	7.9178	1.21	| Q	|	|	V |
18+50	7.9245	0.98	|Q	|	|	V |
18+55	7.9303	0.83	|Q	|	|	V |
19+ 0	7.9358	0.80	|Q	|	|	V |
19+ 5	7.9429	1.03	| Q	|	|	V |
19+10	7.9510	1.18	| Q	|	|	V |
19+15	7.9593	1.21	| Q	|	|	V |
19+20	7.9692	1.43	| Q	|	|	V |
19+25	7.9801	1.58	| Q	|	|	V |
19+30	7.9912	1.61	| Q	|	|	V |
19+35	8.0007	1.39	| Q	|	|	V |
19+40	8.0092	1.23	| Q	|	|	V |
19+45	8.0176	1.21	| Q	|	|	V |
19+50	8.0243	0.98	|Q	|	|	V |
19+55	8.0301	0.83	|Q	|	|	V |
20+ 0	8.0356	0.80	|Q	|	|	V |
20+ 5	8.0427	1.03	| Q	|	|	V |
20+10	8.0508	1.18	| Q	|	|	V |
20+15	8.0591	1.21	| Q	|	|	V |
20+20	8.0675	1.21	| Q	|	|	V |
20+25	8.0758	1.21	| Q	|	|	V |
20+30	8.0841	1.21	| Q	|	|	V |
20+35	8.0924	1.21	| Q	|	|	V |
20+40	8.1007	1.21	| Q	|	|	V |
20+45	8.1090	1.21	| Q	|	|	V |
20+50	8.1158	0.98	|Q	|	|	V |
20+55	8.1215	0.83	|Q	|	|	V |
21+ 0	8.1271	0.80	|Q	|	|	V |
21+ 5	8.1342	1.03	| Q	|	|	V |
21+10	8.1423	1.18	| Q	|	|	V |
21+15	8.1506	1.21	| Q	|	|	V|
21+20	8.1574	0.98	|Q	|	|	V|
21+25	8.1631	0.83	|Q	|	|	V|
21+30	8.1687	0.80	|Q	|	|	V|
21+35	8.1757	1.03	| Q	|	|	V|
21+40	8.1839	1.18	| Q	|	|	V|
21+45	8.1922	1.21	| Q	|	|	V|
21+50	8.1990	0.98	|Q	|	|	V|
21+55	8.2047	0.83	|Q	|	|	V|
22+ 0	8.2102	0.80	|Q	|	|	V|
22+ 5	8.2173	1.03	| Q	|	|	V|
22+10	8.2255	1.18	| Q	|	|	V|

```
   22+15       8.2338      1.21  | Q       |         |         |         V|
   22+20       8.2405      0.98  |Q        |         |         |         V|
   22+25       8.2463      0.83  |Q        |         |         |         V|
   22+30       8.2518      0.80  |Q        |         |         |         V|
   22+35       8.2574      0.80  |Q        |         |         |         V|
   22+40       8.2629      0.80  |Q        |         |         |         V|
   22+45       8.2685      0.80  |Q        |         |         |         V|
   22+50       8.2740      0.80  |Q        |         |         |         V|
   22+55       8.2795      0.80  |Q        |         |         |         V|
   23+ 0       8.2851      0.80  |Q        |         |         |         V|
   23+ 5       8.2906      0.80  |Q        |         |         |         V|
   23+10       8.2962      0.80  |Q        |         |         |         V|
   23+15       8.3017      0.80  |Q        |         |         |         V|
   23+20       8.3073      0.80  |Q        |         |         |         V|
   23+25       8.3128      0.80  |Q        |         |         |         V|
   23+30       8.3183      0.80  |Q        |         |         |         V|
   23+35       8.3239      0.80  |Q        |         |         |         V|
   23+40       8.3294      0.80  |Q        |         |         |         V|
   23+45       8.3350      0.80  |Q        |         |         |         V|
   23+50       8.3405      0.80  |Q        |         |         |         V|
   23+55       8.3461      0.80  |Q        |         |         |         V|
   24+ 0       8.3516      0.80  |Q        |         |         |         V|
   24+ 5       8.3541      0.36  Q         |         |         |         V|
   24+10       8.3545      0.05  Q         |         |         |          V
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U n i t H y d r o g r a p h A n a l y s i s

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Study date 10/11/23 File: 100QAXUH6100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 24.45(Ac.) = 0.038 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 24.45(Ac.) = 0.038 Sq. Mi.
Length along longest watercourse = 1528.00(Ft.)
Length along longest watercourse measured to centroid = 754.00(Ft.)
Length along longest watercourse = 0.289 Mi.
Length along longest watercourse measured to centroid = 0.143 Mi.
Difference in elevation = 10.80(Ft.)
Slope along watercourse = 37.3194 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.072 Hr.
Lag time = 4.31 Min.
25% of lag time = 1.08 Min.
40% of lag time = 1.73 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
24.45	1.20	29.34

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
24.45	2.50	61.13

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
24.450	47.40	0.500

Total Area Entered = 24.45(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
47.4	47.4	0.597	0.500	0.329	1.000	0.329
					Sum (F) =	0.329

Area averaged mean soil loss (F) (In/Hr) = 0.329
Minimum soil loss rate ((In/Hr)) = 0.164
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	115.899	23.999	5.914
2	0.167	231.798	48.816	12.029
3	0.250	347.696	13.683	3.372
4	0.333	463.595	6.239	1.537
5	0.417	579.494	3.476	0.857
6	0.500	695.393	2.068	0.510

	7	0.583	811.291	1.719		0.423
				Sum = 100.000	Sum=	24.641

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.50	0.150	(0.329)	0.075	0.075
2	0.17	0.60	0.180	(0.329)	0.090	0.090
3	0.25	0.60	0.180	(0.329)	0.090	0.090
4	0.33	0.60	0.180	(0.329)	0.090	0.090
5	0.42	0.60	0.180	(0.329)	0.090	0.090
6	0.50	0.70	0.210	(0.329)	0.105	0.105
7	0.58	0.70	0.210	(0.329)	0.105	0.105
8	0.67	0.70	0.210	(0.329)	0.105	0.105
9	0.75	0.70	0.210	(0.329)	0.105	0.105
10	0.83	0.70	0.210	(0.329)	0.105	0.105
11	0.92	0.70	0.210	(0.329)	0.105	0.105
12	1.00	0.80	0.240	(0.329)	0.120	0.120
13	1.08	0.80	0.240	(0.329)	0.120	0.120
14	1.17	0.80	0.240	(0.329)	0.120	0.120
15	1.25	0.80	0.240	(0.329)	0.120	0.120
16	1.33	0.80	0.240	(0.329)	0.120	0.120
17	1.42	0.80	0.240	(0.329)	0.120	0.120
18	1.50	0.80	0.240	(0.329)	0.120	0.120
19	1.58	0.80	0.240	(0.329)	0.120	0.120
20	1.67	0.80	0.240	(0.329)	0.120	0.120
21	1.75	0.80	0.240	(0.329)	0.120	0.120
22	1.83	0.80	0.240	(0.329)	0.120	0.120
23	1.92	0.80	0.240	(0.329)	0.120	0.120
24	2.00	0.90	0.270	(0.329)	0.135	0.135
25	2.08	0.80	0.240	(0.329)	0.120	0.120
26	2.17	0.90	0.270	(0.329)	0.135	0.135
27	2.25	0.90	0.270	(0.329)	0.135	0.135
28	2.33	0.90	0.270	(0.329)	0.135	0.135
29	2.42	0.90	0.270	(0.329)	0.135	0.135
30	2.50	0.90	0.270	(0.329)	0.135	0.135
31	2.58	0.90	0.270	(0.329)	0.135	0.135
32	2.67	0.90	0.270	(0.329)	0.135	0.135
33	2.75	1.00	0.300	(0.329)	0.150	0.150
34	2.83	1.00	0.300	(0.329)	0.150	0.150
35	2.92	1.00	0.300	(0.329)	0.150	0.150
36	3.00	1.00	0.300	(0.329)	0.150	0.150
37	3.08	1.00	0.300	(0.329)	0.150	0.150
38	3.17	1.10	0.330	(0.329)	0.165	0.165
39	3.25	1.10	0.330	(0.329)	0.165	0.165
40	3.33	1.10	0.330	(0.329)	0.165	0.165

41	3.42	1.20	0.360	(0.329)	0.180	0.180
42	3.50	1.30	0.390	(0.329)	0.195	0.195
43	3.58	1.40	0.420	(0.329)	0.210	0.210
44	3.67	1.40	0.420	(0.329)	0.210	0.210
45	3.75	1.50	0.450	(0.329)	0.225	0.225
46	3.83	1.50	0.450	(0.329)	0.225	0.225
47	3.92	1.60	0.480	(0.329)	0.240	0.240
48	4.00	1.60	0.480	(0.329)	0.240	0.240
49	4.08	1.70	0.510	(0.329)	0.255	0.255
50	4.17	1.80	0.540	(0.329)	0.270	0.270
51	4.25	1.90	0.570	(0.329)	0.285	0.285
52	4.33	2.00	0.600	(0.329)	0.300	0.300
53	4.42	2.10	0.630	(0.329)	0.315	0.315
54	4.50	2.10	0.630	(0.329)	0.315	0.315
55	4.58	2.20	0.660	0.329	(0.330)	0.331
56	4.67	2.30	0.690	0.329	(0.345)	0.361
57	4.75	2.40	0.720	0.329	(0.360)	0.391
58	4.83	2.40	0.720	0.329	(0.360)	0.391
59	4.92	2.50	0.750	0.329	(0.375)	0.421
60	5.00	2.60	0.780	0.329	(0.390)	0.451
61	5.08	3.10	0.930	0.329	(0.465)	0.601
62	5.17	3.60	1.080	0.329	(0.540)	0.751
63	5.25	3.90	1.170	0.329	(0.585)	0.841
64	5.33	4.20	1.260	0.329	(0.630)	0.931
65	5.42	4.70	1.410	0.329	(0.705)	1.081
66	5.50	5.60	1.680	0.329	(0.840)	1.351
67	5.58	1.90	0.570	(0.329)	0.285	0.285
68	5.67	0.90	0.270	(0.329)	0.135	0.135
69	5.75	0.60	0.180	(0.329)	0.090	0.090
70	5.83	0.50	0.150	(0.329)	0.075	0.075
71	5.92	0.30	0.090	(0.329)	0.045	0.045
72	6.00	0.20	0.060	(0.329)	0.030	0.030

(Loss Rate Not Used)

Sum = 100.0 Sum = 17.0

Flood volume = Effective rainfall 1.41(In)
times area 24.4(Ac.)/[(In)/(Ft.)] = 2.9(Ac.Ft)
Total soil loss = 1.08(In)
Total soil loss = 2.210(Ac.Ft)
Total rainfall = 2.50(In)
Flood volume = 125585.3 Cubic Feet
Total soil loss = 96279.8 Cubic Feet

Peak flow rate of this hydrograph = 26.585(CFS)

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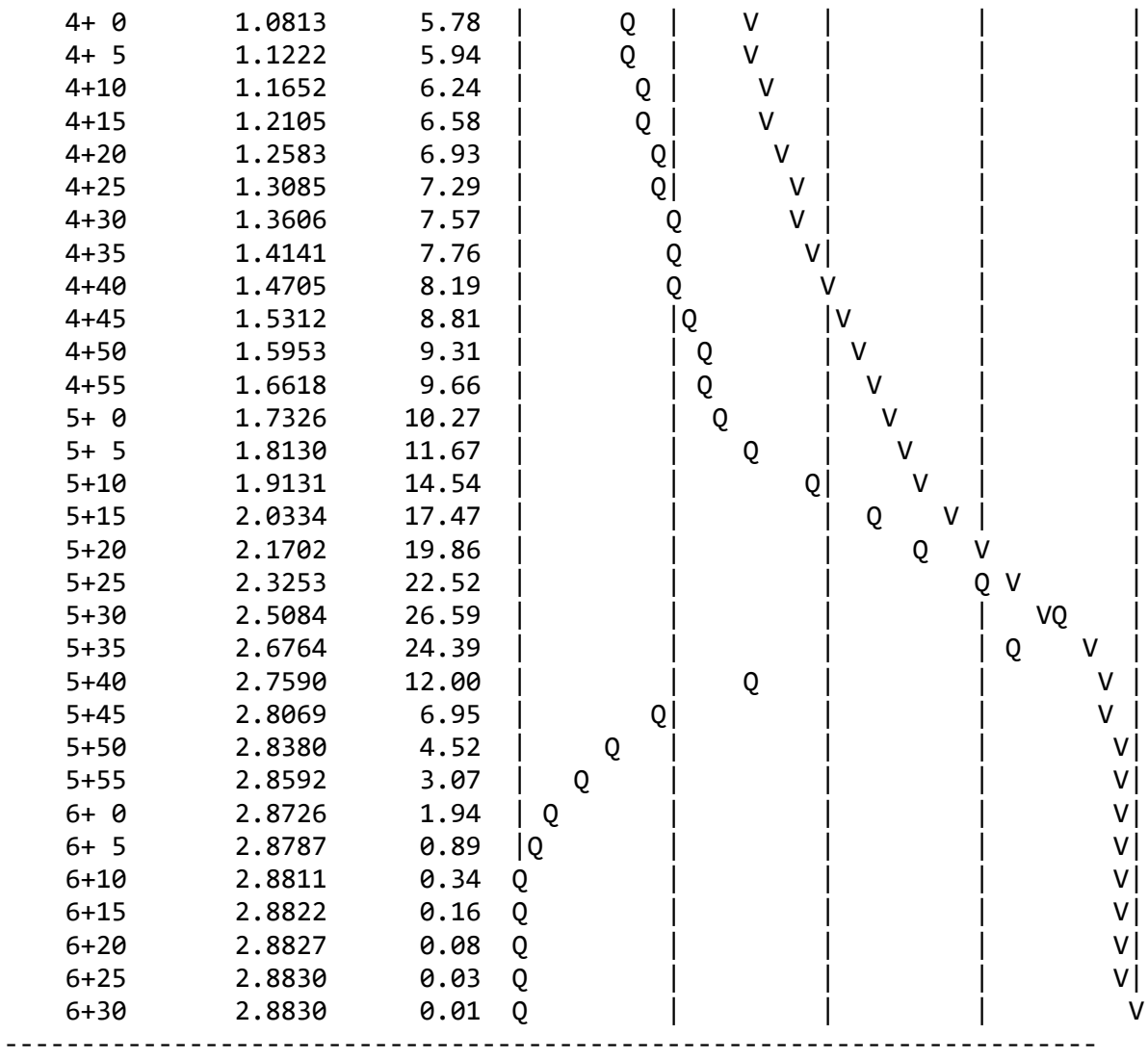
6 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	7.5	15.0	22.5	30.0
0+ 5	0.0031	0.44	Q				
0+10	0.0129	1.44	VQ				
0+15	0.0258	1.87	V Q				
0+20	0.0398	2.03	V Q				
0+25	0.0544	2.12	V Q				
0+30	0.0700	2.26	V Q				
0+35	0.0871	2.48	V Q				
0+40	0.1046	2.54	V Q				
0+45	0.1222	2.56	V Q				
0+50	0.1400	2.57	V Q				
0+55	0.1577	2.58	VQ				
1+ 0	0.1762	2.68	VQ				
1+ 5	0.1959	2.86	VQ				
1+10	0.2159	2.91	VQ				
1+15	0.2361	2.93	Q				
1+20	0.2563	2.94	Q				
1+25	0.2767	2.95	Q				
1+30	0.2971	2.96	QV				
1+35	0.3174	2.96	QV				
1+40	0.3378	2.96	QV				
1+45	0.3582	2.96	QV				
1+50	0.3785	2.96	Q V				
1+55	0.3989	2.96	Q V				
2+ 0	0.4199	3.05	QV				
2+ 5	0.4415	3.14	Q V				
2+10	0.4629	3.10	Q V				
2+15	0.4852	3.25	Q V				
2+20	0.5079	3.29	Q V				
2+25	0.5307	3.31	Q V				
2+30	0.5536	3.32	Q V				
2+35	0.5764	3.32	Q V				
2+40	0.5994	3.33	Q V				
2+45	0.6229	3.42	Q V				
2+50	0.6477	3.60	Q V				
2+55	0.6728	3.65	Q V				
3+ 0	0.6981	3.67	Q V				
3+ 5	0.7234	3.68	Q V				
3+10	0.7495	3.78	Q V				
3+15	0.7768	3.97	Q V				
3+20	0.8045	4.02	Q V				
3+25	0.8329	4.13	Q V				
3+30	0.8633	4.41	Q V				
3+35	0.8959	4.74	Q V				
3+40	0.9304	5.00	Q V				
3+45	0.9660	5.17	Q V				
3+50	1.0032	5.40	Q V				
3+55	1.0415	5.57	Q V				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4+ 5 1.1222 5.94
4+10 1.1652 6.24
4+15 1.2105 6.58
4+20 1.2583 6.93
4+25 1.3085 7.29
4+30 1.3606 7.57
4+35 1.4141 7.76
4+40 1.4705 8.19
4+45 1.5312 8.81
4+50 1.5953 9.31
4+55 1.6618 9.66
5+ 0 1.7326 10.27
5+ 5 1.8130 11.67
5+10 1.9131 14.54
5+15 2.0334 17.47
5+20 2.1702 19.86
5+25 2.3253 22.52
5+30 2.5084 26.59
5+35 2.6764 24.39
5+40 2.7590 12.00
5+45 2.8069 6.95
5+50 2.8380 4.52
5+55 2.8592 3.07
6+ 0 2.8726 1.94
6+ 5 2.8787 0.89
6+10 2.8811 0.34
6+15 2.8822 0.16
6+20 2.8827 0.08
6+25 2.8830 0.03
6+30 2.8830 0.01

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 10/03/24 File: QP100SAMSUH6100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100 YEAR, 6 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 24.34(Ac.) = 0.038 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 24.34(Ac.) = 0.038 Sq. Mi.
Length along longest watercourse = 1495.00(Ft.)
Length along longest watercourse measured to centroid = 210.00(Ft.)
Length along longest watercourse = 0.283 Mi.
Length along longest watercourse measured to centroid = 0.040 Mi.
Difference in elevation = 21.06(Ft.)
Slope along watercourse = 74.3791 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.029 Hr.
Lag time = 1.73 Min.
25% of lag time = 0.43 Min.
40% of lag time = 0.69 Min.
Unit time = 5.00 Min.
Duration of storm = 6 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
24.34	1.20	29.21

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
24.34	2.50	60.85

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 1.200(In)
Area Averaged 100-Year Rainfall = 2.500(In)

Point rain (area averaged) = 2.500(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 2.500(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
24.340	48.70	0.900

Total Area Entered = 24.34(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
48.7	48.7	0.585	0.900	0.111	1.000	0.111
					Sum (F) =	0.111

Area averaged mean soil loss (F) (In/Hr) = 0.111
Minimum soil loss rate ((In/Hr)) = 0.056
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	288.727	55.492	13.612
2	0.167	577.453	37.758	9.262
3	0.250	866.180	6.750	1.656
			Sum = 100.000	Sum= 24.530

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	0.50	0.150	(0.111)	0.027	0.123
2	0.17	0.60	0.180	(0.111)	0.032	0.148
3	0.25	0.60	0.180	(0.111)	0.032	0.148
4	0.33	0.60	0.180	(0.111)	0.032	0.148

5	0.42	0.60	0.180	(0.111)	0.032	0.148
6	0.50	0.70	0.210	(0.111)	0.038	0.172
7	0.58	0.70	0.210	(0.111)	0.038	0.172
8	0.67	0.70	0.210	(0.111)	0.038	0.172
9	0.75	0.70	0.210	(0.111)	0.038	0.172
10	0.83	0.70	0.210	(0.111)	0.038	0.172
11	0.92	0.70	0.210	(0.111)	0.038	0.172
12	1.00	0.80	0.240	(0.111)	0.043	0.197
13	1.08	0.80	0.240	(0.111)	0.043	0.197
14	1.17	0.80	0.240	(0.111)	0.043	0.197
15	1.25	0.80	0.240	(0.111)	0.043	0.197
16	1.33	0.80	0.240	(0.111)	0.043	0.197
17	1.42	0.80	0.240	(0.111)	0.043	0.197
18	1.50	0.80	0.240	(0.111)	0.043	0.197
19	1.58	0.80	0.240	(0.111)	0.043	0.197
20	1.67	0.80	0.240	(0.111)	0.043	0.197
21	1.75	0.80	0.240	(0.111)	0.043	0.197
22	1.83	0.80	0.240	(0.111)	0.043	0.197
23	1.92	0.80	0.240	(0.111)	0.043	0.197
24	2.00	0.90	0.270	(0.111)	0.049	0.221
25	2.08	0.80	0.240	(0.111)	0.043	0.197
26	2.17	0.90	0.270	(0.111)	0.049	0.221
27	2.25	0.90	0.270	(0.111)	0.049	0.221
28	2.33	0.90	0.270	(0.111)	0.049	0.221
29	2.42	0.90	0.270	(0.111)	0.049	0.221
30	2.50	0.90	0.270	(0.111)	0.049	0.221
31	2.58	0.90	0.270	(0.111)	0.049	0.221
32	2.67	0.90	0.270	(0.111)	0.049	0.221
33	2.75	1.00	0.300	(0.111)	0.054	0.246
34	2.83	1.00	0.300	(0.111)	0.054	0.246
35	2.92	1.00	0.300	(0.111)	0.054	0.246
36	3.00	1.00	0.300	(0.111)	0.054	0.246
37	3.08	1.00	0.300	(0.111)	0.054	0.246
38	3.17	1.10	0.330	(0.111)	0.059	0.271
39	3.25	1.10	0.330	(0.111)	0.059	0.271
40	3.33	1.10	0.330	(0.111)	0.059	0.271
41	3.42	1.20	0.360	(0.111)	0.065	0.295
42	3.50	1.30	0.390	(0.111)	0.070	0.320
43	3.58	1.40	0.420	(0.111)	0.076	0.344
44	3.67	1.40	0.420	(0.111)	0.076	0.344
45	3.75	1.50	0.450	(0.111)	0.081	0.369
46	3.83	1.50	0.450	(0.111)	0.081	0.369
47	3.92	1.60	0.480	(0.111)	0.086	0.394
48	4.00	1.60	0.480	(0.111)	0.086	0.394
49	4.08	1.70	0.510	(0.111)	0.092	0.418
50	4.17	1.80	0.540	(0.111)	0.097	0.443
51	4.25	1.90	0.570	(0.111)	0.103	0.467
52	4.33	2.00	0.600	(0.111)	0.108	0.492
53	4.42	2.10	0.630	0.111	(0.113)	0.519
54	4.50	2.10	0.630	0.111	(0.113)	0.519
55	4.58	2.20	0.660	0.111	(0.119)	0.549
56	4.67	2.30	0.690	0.111	(0.124)	0.579
57	4.75	2.40	0.720	0.111	(0.130)	0.609
58	4.83	2.40	0.720	0.111	(0.130)	0.609
59	4.92	2.50	0.750	0.111	(0.135)	0.639
60	5.00	2.60	0.780	0.111	(0.140)	0.669
61	5.08	3.10	0.930	0.111	(0.167)	0.819

62	5.17	3.60	1.080	0.111	(0.194)		0.969
63	5.25	3.90	1.170	0.111	(0.211)		1.059
64	5.33	4.20	1.260	0.111	(0.227)		1.149
65	5.42	4.70	1.410	0.111	(0.254)		1.299
66	5.50	5.60	1.680	0.111	(0.302)		1.569
67	5.58	1.90	0.570	(0.111)	0.103		0.467
68	5.67	0.90	0.270	(0.111)	0.049		0.221
69	5.75	0.60	0.180	(0.111)	0.032		0.148
70	5.83	0.50	0.150	(0.111)	0.027		0.123
71	5.92	0.30	0.090	(0.111)	0.016		0.074
72	6.00	0.20	0.060	(0.111)	0.011		0.049

(Loss Rate Not Used)

Sum = 100.0 Sum = 25.4

Flood volume = Effective rainfall 2.12(In)
times area 24.3(Ac.)/[(In)/(Ft.)] = 4.3(Ac.Ft)
Total soil loss = 0.38(In)
Total soil loss = 0.777(Ac.Ft)
Total rainfall = 2.50(In)
Flood volume = 187032.1 Cubic Feet
Total soil loss = 33834.9 Cubic Feet

Peak flow rate of this hydrograph = 35.304(CFS)

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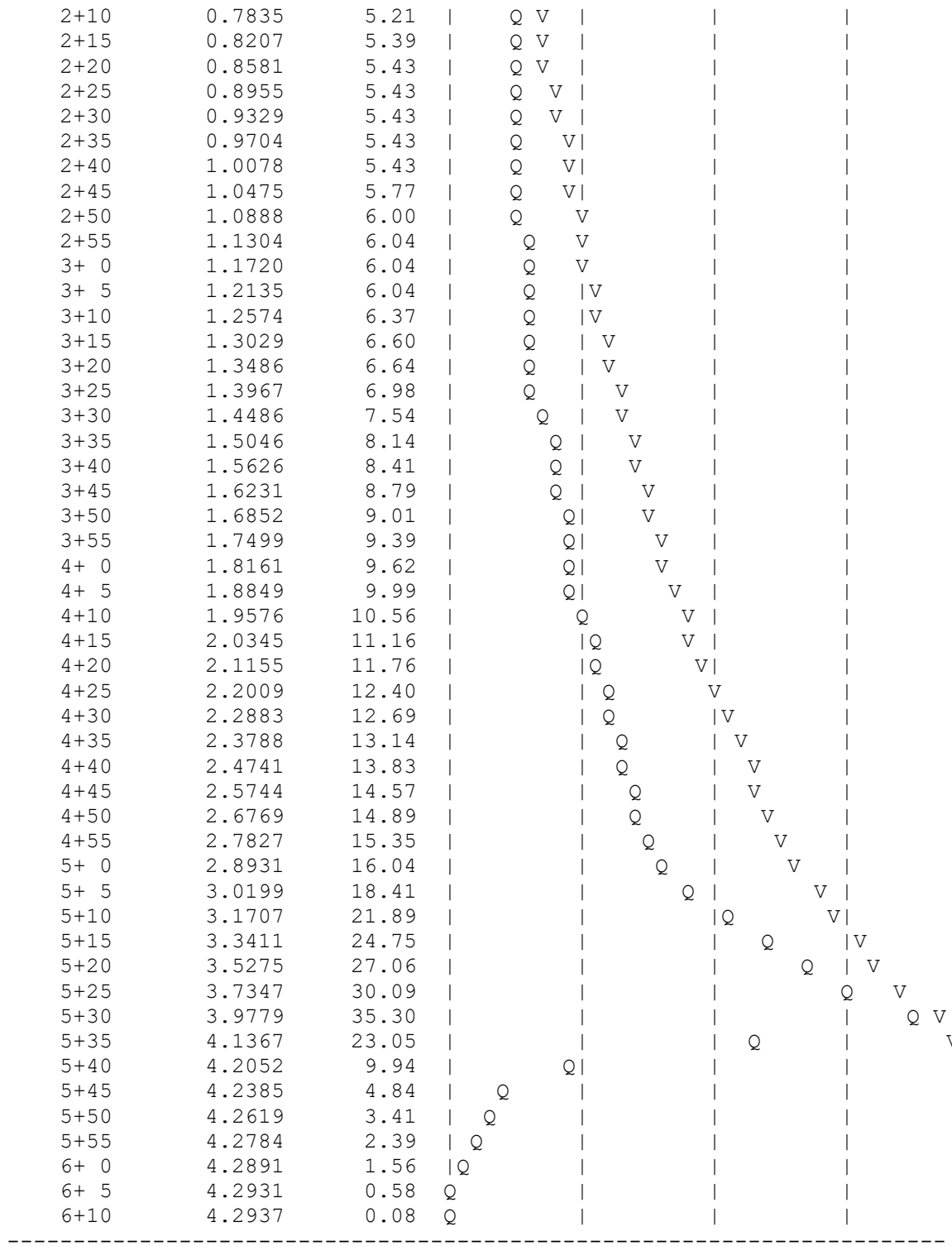
6 - H O U R S T O R M
R u n o f f H y d r o g r a p h

Hydrograph in 5 Minute intervals ((CFS))

Time(h+m)	Volume Ac.Ft	Q(CFS)	0	10.0	20.0	30.0	40.0
0+ 5	0.0115	1.68	VQ	|	|	|	|
0+10	0.0332	3.15	V Q	|	|	|	|
0+15	0.0579	3.58	V Q	|	|	|	|
0+20	0.0828	3.62	V Q	|	|	|	|
0+25	0.1078	3.62	|V Q	|	|	|	|
0+30	0.1350	3.96	|V Q	|	|	|	|
0+35	0.1639	4.19	|V Q	|	|	|	|
0+40	0.1930	4.23	|V Q	|	|	|	|
0+45	0.2221	4.23	| V Q	|	|	|	|
0+50	0.2512	4.23	| V Q	|	|	|	|
0+55	0.2803	4.23	| V Q	|	|	|	|
1+ 0	0.3117	4.56	| V Q	|	|	|	|
1+ 5	0.3447	4.79	| VQ	|	|	|	|
1+10	0.3779	4.83	| VQ	|	|	|	|
1+15	0.4112	4.83	| VQ	|	|	|	|
1+20	0.4445	4.83	| Q	|	|	|	|
1+25	0.4777	4.83	| Q	|	|	|	|
1+30	0.5110	4.83	| Q	|	|	|	|
1+35	0.5442	4.83	| QV	|	|	|	|
1+40	0.5775	4.83	| QV	|	|	|	|
1+45	0.6108	4.83	| QV	|	|	|	|
1+50	0.6440	4.83	| QV	|	|	|	|
1+55	0.6773	4.83	| Q V	|	|	|	|
2+ 0	0.7129	5.16	| QV	|	|	|	|
2+ 5	0.7477	5.06	| QV	|	|	|	|



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 10/11/23 File: 100QAXUH3100.out

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 24.45(Ac.) = 0.038 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 24.45(Ac.) = 0.038 Sq. Mi.
Length along longest watercourse = 1528.00(Ft.)
Length along longest watercourse measured to centroid = 754.00(Ft.)
Length along longest watercourse = 0.289 Mi.
Length along longest watercourse measured to centroid = 0.143 Mi.
Difference in elevation = 10.80(Ft.)
Slope along watercourse = 37.3194 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.072 Hr.
Lag time = 4.31 Min.
25% of lag time = 1.08 Min.
40% of lag time = 1.73 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
24.45	0.80	19.56

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
24.45	2.00	48.90

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 2.000(In)

Point rain (area averaged) = 2.000(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 2.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
24.450	47.40	0.500

Total Area Entered = 24.45(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
47.4	47.4	0.597	0.500	0.329	1.000	0.329
					Sum (F) =	0.329

Area averaged mean soil loss (F) (In/Hr) = 0.329
Minimum soil loss rate ((In/Hr)) = 0.164
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	115.899	23.999	5.914
2	0.167	231.798	48.816	12.029
3	0.250	347.696	13.683	3.372
4	0.333	463.595	6.239	1.537
5	0.417	579.494	3.476	0.857
6	0.500	695.393	2.068	0.510

7	0.583	811.291	1.719		0.423
			Sum = 100.000	Sum=	24.641

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.312	(0.329)	0.156	0.156
2	0.17	1.30	0.312	(0.329)	0.156	0.156
3	0.25	1.10	0.264	(0.329)	0.132	0.132
4	0.33	1.50	0.360	(0.329)	0.180	0.180
5	0.42	1.50	0.360	(0.329)	0.180	0.180
6	0.50	1.80	0.432	(0.329)	0.216	0.216
7	0.58	1.50	0.360	(0.329)	0.180	0.180
8	0.67	1.80	0.432	(0.329)	0.216	0.216
9	0.75	1.80	0.432	(0.329)	0.216	0.216
10	0.83	1.50	0.360	(0.329)	0.180	0.180
11	0.92	1.60	0.384	(0.329)	0.192	0.192
12	1.00	1.80	0.432	(0.329)	0.216	0.216
13	1.08	2.20	0.528	(0.329)	0.264	0.264
14	1.17	2.20	0.528	(0.329)	0.264	0.264
15	1.25	2.20	0.528	(0.329)	0.264	0.264
16	1.33	2.00	0.480	(0.329)	0.240	0.240
17	1.42	2.60	0.624	(0.329)	0.312	0.312
18	1.50	2.70	0.648	(0.329)	0.324	0.324
19	1.58	2.40	0.576	(0.329)	0.288	0.288
20	1.67	2.70	0.648	(0.329)	0.324	0.324
21	1.75	3.30	0.792	0.329	(0.396)	0.463
22	1.83	3.10	0.744	0.329	(0.372)	0.415
23	1.92	2.90	0.696	0.329	(0.348)	0.367
24	2.00	3.00	0.720	0.329	(0.360)	0.391
25	2.08	3.10	0.744	0.329	(0.372)	0.415
26	2.17	4.20	1.008	0.329	(0.504)	0.679
27	2.25	5.00	1.200	0.329	(0.600)	0.871
28	2.33	3.50	0.840	0.329	(0.420)	0.511
29	2.42	6.80	1.632	0.329	(0.816)	1.303
30	2.50	7.30	1.752	0.329	(0.876)	1.423
31	2.58	8.20	1.968	0.329	(0.984)	1.639
32	2.67	5.90	1.416	0.329	(0.708)	1.087
33	2.75	2.00	0.480	(0.329)	0.240	0.240
34	2.83	1.80	0.432	(0.329)	0.216	0.216
35	2.92	1.80	0.432	(0.329)	0.216	0.216
36	3.00	0.60	0.144	(0.329)	0.072	0.072
		(Loss Rate Not Used)				
Sum =		100.0			Sum =	14.8

Flood volume = Effective rainfall 1.23(In)
times area 24.4(Ac.)/[(In)/(Ft.)] = 2.5(Ac.Ft)

```
      Total soil loss =      0.77(In)
      Total soil loss =     1.560(Ac.Ft)
      Total rainfall =      2.00(In)
      Flood volume =      109541.2 Cubic Feet
      Total soil loss =       67946.8 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     34.136(CFS)
      ---------------------------------------------------------------------
      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                          3 - H O U R    S T O R M
                     R u n o f f      H y d r o g r a p h
      ---------------------------------------------------------------------
                   Hydrograph in   5   Minute intervals ((CFS))

      ---------------------------------------------------------------------
Time(h+m) Volume Ac.Ft   Q(CFS)  0       10.0      20.0      30.0      40.0
-------------------------------------------------------------------------
  0+ 5       0.0064      0.92  Q         |         |         |         |
  0+10       0.0256      2.80  V Q       |         |         |         |
  0+15       0.0476      3.18  V  Q      |         |         |         |
  0+20       0.0711      3.42  |V Q      |         |         |         |
  0+25       0.0990      4.05  |V  Q     |         |         |         |
  0+30       0.1298      4.47  | V Q     |         |         |         |
  0+35       0.1629      4.81  | V Q     |         |         |         |
  0+40       0.1955      4.74  |  VQ     |         |         |         |
  0+45       0.2308      5.12  |  V Q    |         |         |         |
  0+50       0.2654      5.02  |   VQ    |         |         |         |
  0+55       0.2977      4.70  |   Q     |         |         |         |
  1+ 0       0.3315      4.90  |   QV    |         |         |         |
  1+ 5       0.3690      5.46  |    Q    |         |         |         |
  1+10       0.4112      6.12  |     Q   |         |         |         |
  1+15       0.4546      6.31  |     QV  |         |         |         |
  1+20       0.4977      6.25  |     QV  |         |         |         |
  1+25       0.5421      6.45  |     Q V |         |         |         |
  1+30       0.5927      7.34  |      Q V|         |         |         |
  1+35       0.6443      7.50  |      Q  V         |         |         |
  1+40       0.6953      7.41  |      Q  |V        |         |         |
  1+45       0.7546      8.61  |       Q | V       |         |         |
  1+50       0.8242     10.11  |         Q  V      |         |         |
  1+55       0.8915      9.78  |        Q|   V     |         |         |
  2+ 0       0.9564      9.41  |        Q|    V    |         |         |
  2+ 5       1.0234      9.73  |        Q|     V   |         |         |
  2+10       1.1035     11.63  |         |Q     V  |         |         |
  2+15       1.2140     16.06  |         |     Q  V|         |         |
  2+20       1.3321     17.14  |         |      Q  |V        |         |
  2+25       1.4599     18.56  |         |       Q |  V      |         |
  2+30       1.6536     28.13  |         |         |     V Q |         |
  2+35       1.8828     33.28  |         |         |        V|  Q      |
  2+40       2.1179     34.14  |         |         |         |  VQ     |
  2+45       2.2830     23.97  |         |         |  Q      |     V   |
```

```
    2+50       2.3688     12.46  |          | Q       |          |       V  |
    2+55       2.4311      9.04  |         Q|         |          |        V |
    3+ 0       2.4758      6.49  |     Q    |         |          |         V|
    3+ 5       2.4991      3.38  |  Q       |         |          |         V|
    3+10       2.5083      1.34  |Q         |         |          |         V|
    3+15       2.5118      0.51  Q          |         |          |         V|
    3+20       2.5136      0.26  Q          |         |          |         V|
    3+25       2.5145      0.13  Q          |         |          |         V|
    3+30       2.5147      0.03  Q          |         |          |          V
---------------------------------------------------------------------------
```

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

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100 YEAR, 3 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 24.34(Ac.) = 0.038 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 24.34(Ac.) = 0.038 Sq. Mi.
Length along longest watercourse = 1495.00(Ft.)
Length along longest watercourse measured to centroid = 210.00(Ft.)
Length along longest watercourse = 0.283 Mi.
Length along longest watercourse measured to centroid = 0.040 Mi.
Difference in elevation = 21.06(Ft.)
Slope along watercourse = 74.3791 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.029 Hr.
Lag time = 1.73 Min.
25% of lag time = 0.43 Min.
40% of lag time = 0.69 Min.
Unit time = 5.00 Min.
Duration of storm = 3 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

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

24.34	0.80	19.47

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
24.34	2.00	48.68

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.800(In)
Area Averaged 100-Year Rainfall = 2.000(In)

Point rain (area averaged) = 2.000(In)
Areal adjustment factor = 99.99 %
Adjusted average point rain = 2.000(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
24.340	48.70	0.900

Total Area Entered = 24.34(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
48.7	48.7	0.585	0.900	0.111	1.000	0.111
					Sum (F) =	0.111

Area averaged mean soil loss (F) (In/Hr) = 0.111
Minimum soil loss rate ((In/Hr)) = 0.056
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)	Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	288.727	55.492	13.612
2	0.167	577.453	37.758	9.262
3	0.250	866.180	6.750	1.656
		Sum = 100.000	Sum=	24.530

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

Unit Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	1.30	0.312	(0.111)	0.056	0.256
2	0.17	1.30	0.312	(0.111)	0.056	0.256
3	0.25	1.10	0.264	(0.111)	0.048	0.216
4	0.33	1.50	0.360	(0.111)	0.065	0.295
5	0.42	1.50	0.360	(0.111)	0.065	0.295

6	0.50	1.80	0.432	(0.111)	0.078	0.354
7	0.58	1.50	0.360	(0.111)	0.065	0.295
8	0.67	1.80	0.432	(0.111)	0.078	0.354
9	0.75	1.80	0.432	(0.111)	0.078	0.354
10	0.83	1.50	0.360	(0.111)	0.065	0.295
11	0.92	1.60	0.384	(0.111)	0.069	0.315
12	1.00	1.80	0.432	(0.111)	0.078	0.354
13	1.08	2.20	0.528	(0.111)	0.095	0.433
14	1.17	2.20	0.528	(0.111)	0.095	0.433
15	1.25	2.20	0.528	(0.111)	0.095	0.433
16	1.33	2.00	0.480	(0.111)	0.086	0.394
17	1.42	2.60	0.624	0.111	(0.112)	0.513
18	1.50	2.70	0.648	0.111	(0.117)	0.537
19	1.58	2.40	0.576	(0.111)	0.104	0.472
20	1.67	2.70	0.648	0.111	(0.117)	0.537
21	1.75	3.30	0.792	0.111	(0.143)	0.681
22	1.83	3.10	0.744	0.111	(0.134)	0.633
23	1.92	2.90	0.696	0.111	(0.125)	0.585
24	2.00	3.00	0.720	0.111	(0.130)	0.609
25	2.08	3.10	0.744	0.111	(0.134)	0.633
26	2.17	4.20	1.008	0.111	(0.181)	0.897
27	2.25	5.00	1.200	0.111	(0.216)	1.089
28	2.33	3.50	0.840	0.111	(0.151)	0.729
29	2.42	6.80	1.632	0.111	(0.294)	1.521
30	2.50	7.30	1.752	0.111	(0.315)	1.641
31	2.58	8.20	1.968	0.111	(0.354)	1.857
32	2.67	5.90	1.416	0.111	(0.255)	1.305
33	2.75	2.00	0.480	(0.111)	0.086	0.394
34	2.83	1.80	0.432	(0.111)	0.078	0.354
35	2.92	1.80	0.432	(0.111)	0.078	0.354
36	3.00	0.60	0.144	(0.111)	0.026	0.118

(Loss Rate Not Used)

Sum = 100.0 Sum = 20.8

Flood volume = Effective rainfall 1.73(In)
times area 24.3(Ac.)/[(In)/(Ft.)] = 3.5(Ac.Ft)
Total soil loss = 0.27(In)
Total soil loss = 0.542(Ac.Ft)
Total rainfall = 2.00(In)
Flood volume = 153065.3 Cubic Feet
Total soil loss = 23624.3 Cubic Feet

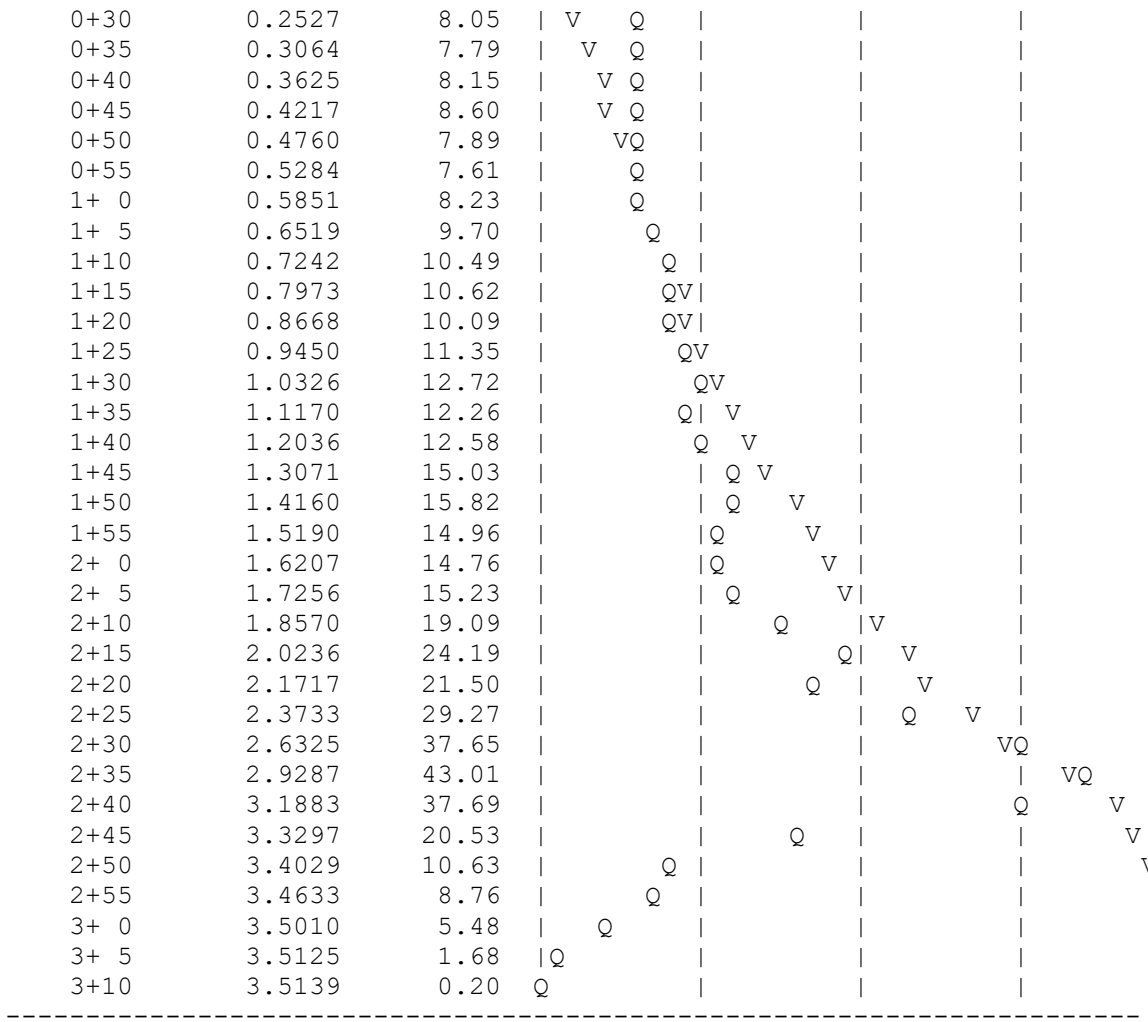
Peak flow rate of this hydrograph = 43.010(CFS)

++

3 - 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	12.5	25.0	37.5	50.0
0+ 5	0.0240	3.48	V Q	|	|	|	|
0+10	0.0643	5.85	V Q	|	|	|	|
0+15	0.1039	5.74	|V Q	|	|	|	|
0+20	0.1483	6.45	|V Q	|	|	|	|
0+25	0.1973	7.11	| V Q	|	|	|	|


0+30 0.2527 8.05
0+35 0.3064 7.79
0+40 0.3625 8.15
0+45 0.4217 8.60
0+50 0.4760 7.89
0+55 0.5284 7.61
1+ 0 0.5851 8.23
1+ 5 0.6519 9.70
1+10 0.7242 10.49
1+15 0.7973 10.62
1+20 0.8668 10.09
1+25 0.9450 11.35
1+30 1.0326 12.72
1+35 1.1170 12.26
1+40 1.2036 12.58
1+45 1.3071 15.03
1+50 1.4160 15.82
1+55 1.5190 14.96
2+ 0 1.6207 14.76
2+ 5 1.7256 15.23
2+10 1.8570 19.09
2+15 2.0236 24.19
2+20 2.1717 21.50
2+25 2.3733 29.27
2+30 2.6325 37.65
2+35 2.9287 43.01
2+40 3.1883 37.69
2+45 3.3297 20.53
2+50 3.4029 10.63
2+55 3.4633 8.76
3+ 0 3.5010 5.48
3+ 5 3.5125 1.68
3+10 3.5139 0.20

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED LAND USE CONDITION
100 YEAR, 1 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 24.45(Ac.) = 0.038 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 24.45(Ac.) = 0.038 Sq. Mi.
Length along longest watercourse = 1528.00(Ft.)
Length along longest watercourse measured to centroid = 754.00(Ft.)
Length along longest watercourse = 0.289 Mi.
Length along longest watercourse measured to centroid = 0.143 Mi.
Difference in elevation = 10.80(Ft.)
Slope along watercourse = 37.3194 Ft./Mi.
Average Manning's 'N' = 0.020
Lag time = 0.072 Hr.
Lag time = 4.31 Min.
25% of lag time = 1.08 Min.
40% of lag time = 1.73 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
24.45	0.50	12.23

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
24.45	1.20	29.34

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.200(In)

Point rain (area averaged) = 1.200(In)
Areal adjustment factor = 99.98 %
Adjusted average point rain = 1.200(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
24.450	47.40	0.500

Total Area Entered = 24.45(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
47.4	47.4	0.597	0.500	0.329	1.000	0.329
					Sum (F) =	0.329

Area averaged mean soil loss (F) (In/Hr) = 0.329
Minimum soil loss rate ((In/Hr)) = 0.164
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.500

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	115.899	23.999	5.914
2	0.167	231.798	48.816	12.029
3	0.250	347.696	13.683	3.372
4	0.333	463.595	6.239	1.537

5	0.417	579.494	3.476	0.857
6	0.500	695.393	2.068	0.510
7	0.583	811.291	1.719	0.423
			Sum = 100.000	Sum= 24.641

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	4.20	0.605	(0.329)	0.302	0.302
2	0.17	4.30	0.619	(0.329)	0.310	0.310
3	0.25	5.00	0.720	0.329	(0.360)	0.391
4	0.33	5.00	0.720	0.329	(0.360)	0.391
5	0.42	5.80	0.835	0.329	(0.418)	0.506
6	0.50	6.50	0.936	0.329	(0.468)	0.607
7	0.58	7.40	1.065	0.329	(0.533)	0.737
8	0.67	8.60	1.238	0.329	(0.619)	0.910
9	0.75	12.30	1.771	0.329	(0.885)	1.442
10	0.83	29.10	4.189	0.329	(2.095)	3.861
11	0.92	6.80	0.979	0.329	(0.489)	0.650
12	1.00	5.00	0.720	0.329	(0.360)	0.391
		(Loss Rate Not Used)				
Sum =		100.0			Sum =	10.5

Flood volume = Effective rainfall 0.87(In)
times area 24.4(Ac.)/[(In)/(Ft.)] = 1.8(Ac.Ft)
Total soil loss = 0.32(In)
Total soil loss = 0.662(Ac.Ft)
Total rainfall = 1.20(In)
Flood volume = 77650.5 Cubic Feet
Total soil loss = 28830.1 Cubic Feet

Peak flow rate of this hydrograph = 57.733(CFS)

++

1 - 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	15.0	30.0	45.0	60.0
0+ 5	0.0123	1.79	VQ	|	|	|	|
0+10	0.0500	5.47	|V Q	|	|	|	|
0+15	0.0986	7.06	| V Q	|	|	|	|
0+20	0.1574	8.53	| V Q	|	|	|	|
0+25	0.2246	9.76	| VQ	|	|	|	|

```
    0+30       0.3074     12.03  |     V Q |         |         |         |
    0+35       0.4080     14.60  |        Q|         |         |         |
    0+40       0.5301     17.74  |         |Q        |         |         |
    0+45       0.6934     23.70  |         |    Q    |         |         |
    0+50       1.0057     45.35  |         |         | V       Q         |
    0+55       1.4033     57.73  |         |         |         |V      Q |
    1+ 0       1.5878     26.80  |         |      Q  |         |    V    |
    1+ 5       1.6901     14.85  |        Q|         |         |      V  |
    1+10       1.7366      6.75  |   Q     |         |         |       V |
    1+15       1.7623      3.74  | Q       |         |         |        V|
    1+20       1.7782      2.30  |Q        |         |         |        V|
    1+25       1.7815      0.48  Q         |         |         |        V|
    1+30       1.7826      0.17  Q         |         |         |         V
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U n i t H y d r o g r a p h A n a l y s i s

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

Program License Serial Number 6405

20-001 HARVEST LANDING RETAIL CENTER AND BUSINESS PARK
PROPOSED CONDITION
100-YEAR, 1 HOUR STORM EVENT ANALYSIS

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

English Units used in output format

Drainage Area = 24.34(Ac.) = 0.038 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment = 24.34(Ac.) = 0.038 Sq. Mi.
Length along longest watercourse = 1495.00(Ft.)
Length along longest watercourse measured to centroid = 210.00(Ft.)
Length along longest watercourse = 0.283 Mi.
Length along longest watercourse measured to centroid = 0.040 Mi.
Difference in elevation = 21.06(Ft.)
Slope along watercourse = 74.3791 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time = 0.029 Hr.
Lag time = 1.73 Min.
25% of lag time = 0.43 Min.
40% of lag time = 0.69 Min.
Unit time = 5.00 Min.
Duration of storm = 1 Hour(s)
User Entered Base Flow = 0.00(CFS)

2 YEAR Area rainfall data:

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

24.34	0.50	12.17

100 YEAR Area rainfall data:

Area(Ac.)[1]	Rainfall(In)[2]	Weighting[1*2]
24.34	1.20	29.21

STORM EVENT (YEAR) = 100.00
Area Averaged 2-Year Rainfall = 0.500(In)
Area Averaged 100-Year Rainfall = 1.200(In)

Point rain (area averaged) = 1.200(In)
Areal adjustment factor = 99.98 %
Adjusted average point rain = 1.200(In)

Sub-Area Data:

Area(Ac.)	Runoff Index	Impervious %
24.340	48.70	0.900

Total Area Entered = 24.34(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
48.7	48.7	0.585	0.900	0.111	1.000	0.111
					Sum (F) =	0.111

Area averaged mean soil loss (F) (In/Hr) = 0.111
Minimum soil loss rate ((In/Hr)) = 0.056
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.180

Slope of intensity-duration curve for a 1 hour storm =0.5000

U n i t H y d r o g r a p h
VALLEY S-Curve

Unit Hydrograph Data

Unit time period (hrs)		Time % of lag	Distribution Graph %	Unit Hydrograph (CFS)
1	0.083	288.727	55.492	13.612
2	0.167	577.453	37.758	9.262
3	0.250	866.180	6.750	1.656
			Sum = 100.000	Sum= 24.530

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

Unit	Time (Hr.)	Pattern Percent	Storm Rain (In/Hr)	Loss rate(In./Hr) Max	Low	Effective (In/Hr)
1	0.08	4.20	0.605	(0.111)	0.109	0.496
2	0.17	4.30	0.619	0.111	(0.111)	0.508
3	0.25	5.00	0.720	0.111	(0.130)	0.609

4	0.33	5.00	0.720	0.111	(	0.130)	0.609
5	0.42	5.80	0.835	0.111	(	0.150)	0.724
6	0.50	6.50	0.936	0.111	(	0.168)	0.825
7	0.58	7.40	1.065	0.111	(	0.192)	0.954
8	0.67	8.60	1.238	0.111	(	0.223)	1.127
9	0.75	12.30	1.771	0.111	(	0.319)	1.660
10	0.83	29.10	4.189	0.111	(	0.754)	4.078
11	0.92	6.80	0.979	0.111	(	0.176)	0.868
12	1.00	5.00	0.720	0.111	(	0.130)	0.609

(Loss Rate Not Used)

Sum = 100.0 Sum = 13.1

Flood volume = Effective rainfall 1.09(In)
times area 24.3(Ac.)/[(In)/(Ft.)] = 2.2(Ac.Ft)
Total soil loss = 0.11(In)
Total soil loss = 0.225(Ac.Ft)
Total rainfall = 1.20(In)
Flood volume = 96202.1 Cubic Feet
Total soil loss = 9799.6 Cubic Feet

Peak flow rate of this hydrograph = 72.792(CFS)

++

1 - 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	20.0	40.0	60.0	80.0
0+ 5	0.0465	6.75	V Q	|	|	|	|
0+10	0.1258	11.51	| V Q	|	|	|	|
0+15	0.2210	13.82	| V Q	|	|	|	|
0+20	0.3227	14.77	| V Q	|	|	|	|
0+25	0.4364	16.51	| VQ	|	|	|	|
0+30	0.5669	18.95	| QV	|	|	|	|
0+35	0.7173	21.84	| Q V	|	|	|	|
0+40	0.8933	25.56	| Q V	|	|	|	|
0+45	1.1318	34.63	| Q V	|	|	|	|
0+50	1.6332	72.79	| V	|	|	| Q	|
0+55	1.9938	52.36	| Q	|	|	| V	|
1+ 0	2.1528	23.09	|Q	|	|	| V	|
1+ 5	2.2016	7.08	| Q	|	|	| V	|
1+10	2.2085	1.01	Q	|	|	|	V

SECTION 3 - REFERENCE DATA

USGS SOILS REPORT

PLATE D-4.1

INFILTRATION REPORT (EXCERPT)

CONTECH UNDERGROUND CHAMBER SYSTEM

DCV CALCULATIONS (WQMP)

PP190005 – HARVILL DISTRIBUTION CENTER OFFSITE DRAINAGE IMPROVEMENTS (HYDROLOGY MAPS)

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Western Riverside Area, California

August 3, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:2,250 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 30 60 120 180

Feet
0 100 200 400 600

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 15, Sep 6, 2022

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

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
EpA	Exeter sandy loam, deep, 0 to 2 percent slopes	10.2	41.6%
GyA	Greenfield sandy loam, 0 to 2 percent slopes	14.3	58.4%
Totals for Area of Interest		**24.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Western Riverside Area, California

EpA—Exeter sandy loam, deep, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: hctk
Elevation: 300 to 700 feet
Mean annual precipitation: 7 to 15 inches
Mean annual air temperature: 64 degrees F
Frost-free period: 250 to 300 days
Farmland classification: Prime farmland if irrigated

Map Unit Composition

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

Description of Exeter

Setting

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

Typical profile

H1 - 0 to 16 inches: sandy loam
H2 - 16 to 37 inches: sandy clay loam
H3 - 37 to 50 inches: indurated
H4 - 50 to 60 inches: stratified sandy loam to silt loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: 35 to 60 inches to duripan
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): 2s
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Ramona
Percent of map unit: 5 percent
Hydric soil rating: No

Greenfield
Percent of map unit: 5 percent
Hydric soil rating: No

Monserate
Percent of map unit: 5 percent
Hydric soil rating: No

GyA—Greenfield sandy loam, 0 to 2 percent slopes

Map Unit Setting
National map unit symbol: hcvv
Elevation: 100 to 3,500 feet
Mean annual precipitation: 9 to 20 inches
Mean annual air temperature: 63 degrees F
Frost-free period: 200 to 300 days
Farmland classification: Prime farmland if irrigated

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

Description of Greenfield

Setting
Landform: Terraces, alluvial fans
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from granite

Typical profile
H1 - 0 to 26 inches: sandy loam
H2 - 26 to 43 inches: fine sandy loam
H3 - 43 to 60 inches: loam
H4 - 60 to 72 inches: stratified loamy sand to sandy loam

Properties and qualities
Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 3c
Hydrologic Soil Group: A
Ecological site: R019XD029CA - LOAMY
Hydric soil rating: No

Minor Components

Hanford

Percent of map unit: 10 percent
Hydric soil rating: No

Pachappa

Percent of map unit: 2 percent
Hydric soil rating: No

Arlington

Percent of map unit: 2 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 1 percent
Hydric soil rating: No

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group (Sams)

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.

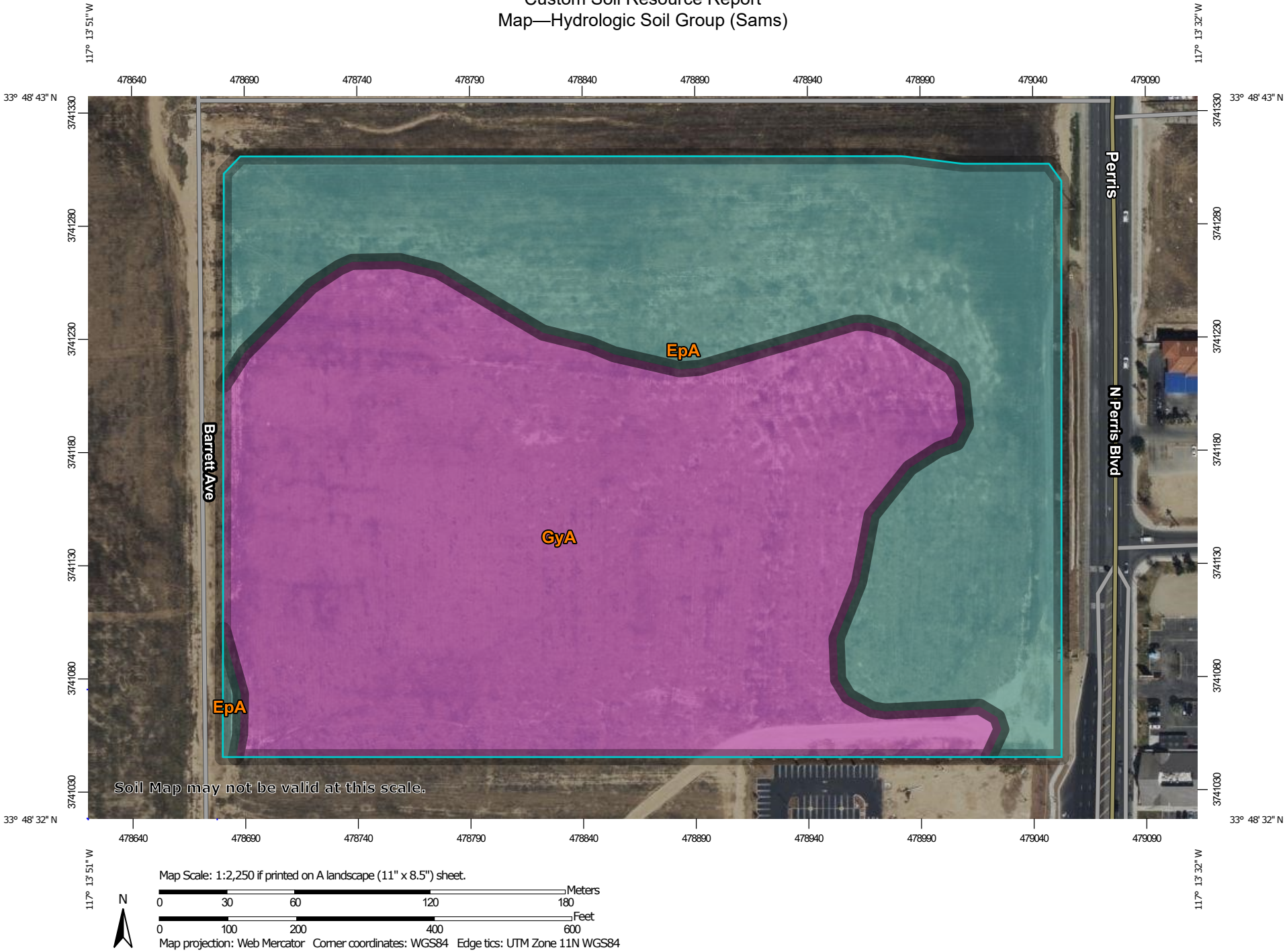
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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.

Custom Soil Resource Report
Map—Hydrologic Soil Group (Sams)



Map Scale: 1:2,250 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

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 1:15,800.

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

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Soil Survey Area: Western Riverside Area, California
Survey Area Data: Version 15, Sep 6, 2022

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

Date(s) aerial images were photographed: Mar 14, 2022—Mar 17, 2022

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Table—Hydrologic Soil Group (Sams)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
EpA	Exeter sandy loam, deep, 0 to 2 percent slopes	C	10.2	41.6%
GyA	Greenfield sandy loam, 0 to 2 percent slopes	A	14.3	58.4%
Totals for Area of Interest			**24.4**	**100.0%**

Rating Options—Hydrologic Soil Group (Sams)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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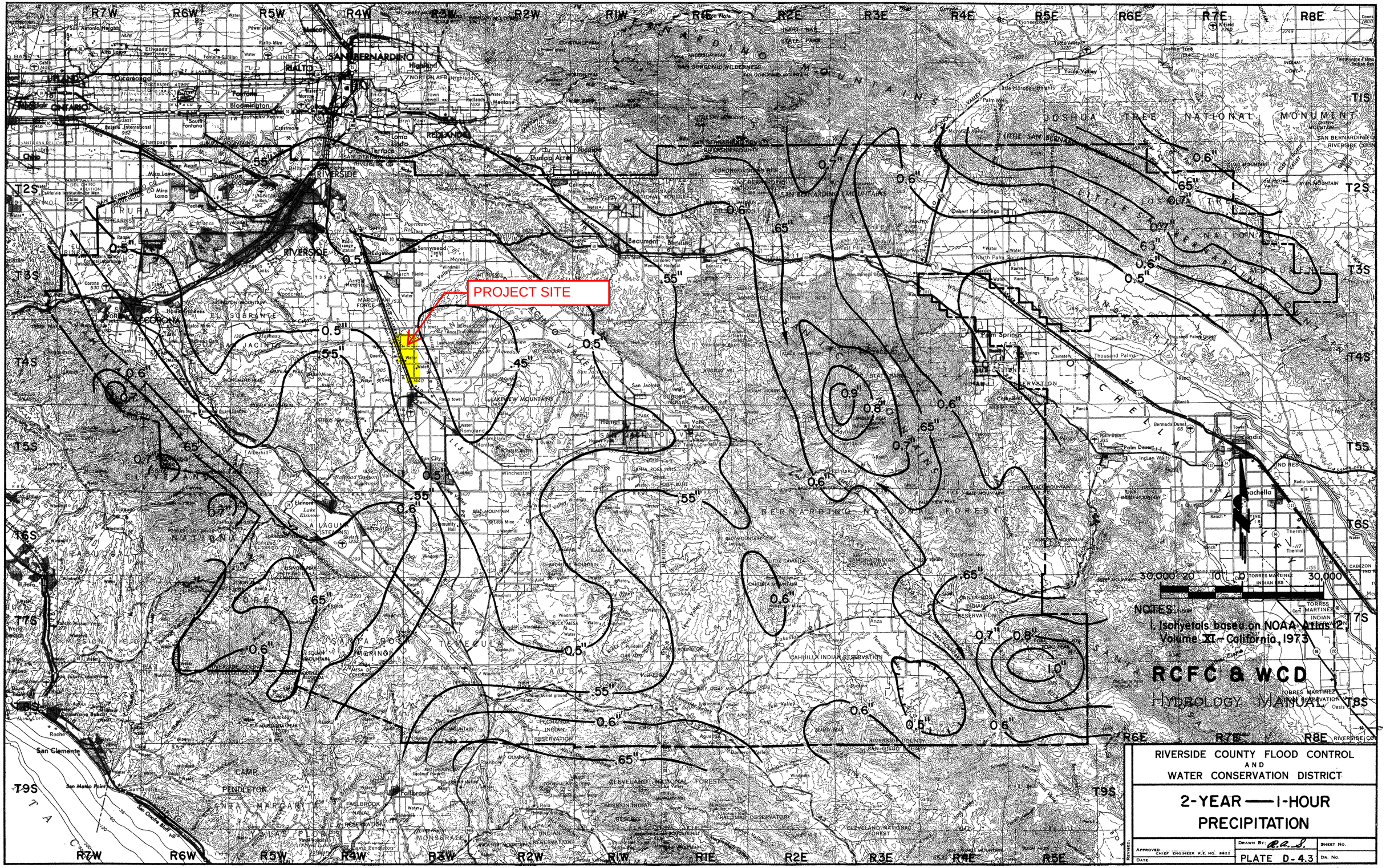
RAINFALL INTENSITY–INCHES PER HOUR

MIRA LOMA			MURRIETA - TEMECULA & RANCHO CALIFORNIA			NORCO			PALM SPRINGS			PERRIS VALLEY		
DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY		DURATION MINUTES	FREQUENCY	
	10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR		10 YEAR	100 YEAR
5	2.84	4.48	5	3.45	5.10	5	2.77	4.16	5	4.23	6.76	5	2.64	3.78
6	2.58	4.07	6	3.12	4.61	6	2.53	3.79	6	3.80	6.08	6	2.41	3.46
7	2.37	3.75	7	2.87	4.24	7	2.34	3.51	7	3.48	5.56	7	2.24	3.21
8	2.21	3.49	8	2.67	3.94	8	2.19	3.29	8	3.22	5.15	8	2.09	3.01
9	2.08	3.28	9	2.50	3.69	9	2.07	3.10	9	3.01	4.81	9	1.98	2.84
10	1.96	3.10	10	2.36	3.48	10	1.96	2.94	10	2.83	4.52	10	1.88	2.69
11	1.87	2.95	11	2.24	3.30	11	1.87	2.80	11	2.67	4.28	11	1.79	2.57
12	1.78	2.82	12	2.13	3.15	12	1.79	2.68	12	2.54	4.07	12	1.72	2.46
13	1.71	2.70	13	2.04	3.01	13	1.72	2.58	13	2.43	3.88	13	1.65	2.37
14	1.64	2.60	14	1.96	2.89	14	1.66	2.48	14	2.33	3.72	14	1.59	2.29
15	1.58	2.50	15	1.89	2.79	15	1.60	2.40	15	2.23	3.58	15	1.54	2.21
16	1.53	2.42	16	1.82	2.69	16	1.55	2.32	16	2.15	3.44	16	1.49	2.14
17	1.48	2.34	17	1.76	2.60	17	1.50	2.25	17	2.08	3.32	17	1.45	2.08
18	1.44	2.27	18	1.71	2.52	18	1.46	2.19	18	2.01	3.22	18	1.41	2.02
19	1.40	2.21	19	1.66	2.45	19	1.42	2.13	19	1.95	3.12	19	1.37	1.97
20	1.36	2.15	20	1.61	2.38	20	1.39	2.08	20	1.89	3.03	20	1.34	1.92
22	1.29	2.04	22	1.53	2.26	22	1.32	1.98	22	1.79	2.86	22	1.28	1.83
24	1.24	1.95	24	1.46	2.15	24	1.26	1.90	24	1.70	2.72	24	1.22	1.75
26	1.18	1.87	26	1.39	2.06	26	1.22	1.82	26	1.62	2.60	26	1.18	1.69
28	1.14	1.80	28	1.34	1.98	28	1.17	1.76	28	1.56	2.49	28	1.13	1.63
30	1.10	1.73	30	1.29	1.90	30	1.13	1.70	30	1.49	2.39	30	1.10	1.57
32	1.06	1.67	32	1.24	1.84	32	1.10	1.64	32	1.44	2.30	32	1.06	1.52
34	1.03	1.62	34	1.20	1.78	34	1.06	1.59	34	1.39	2.22	34	1.03	1.48
36	1.00	1.57	36	1.17	1.72	36	1.03	1.55	36	1.34	2.15	36	1.00	1.44
38	.97	1.53	38	1.13	1.67	38	1.01	1.51	38	1.30	2.09	38	.98	1.40
40	.94	1.49	40	1.10	1.62	40	.98	1.47	40	1.27	2.02	40	.95	1.37
45	.89	1.40	45	1.03	1.52	45	.92	1.39	45	1.18	1.89	45	.90	1.29
50	.84	1.32	50	.97	1.44	50	.88	1.31	50	1.11	1.78	50	.85	1.22
55	.80	1.26	55	.92	1.36	55	.84	1.25	55	1.05	1.68	55	.81	1.17
60	.76	1.20	60	.88	1.30	60	.80	1.20	60	1.00	1.60	60	.78	1.12
65	.73	1.15	65	.84	1.24	65	.77	1.15	65	.95	1.53	65	.75	1.08
70	.70	1.11	70	.81	1.19	70	.74	1.11	70	.91	1.46	70	.72	1.04
75	.68	1.07	75	.78	1.15	75	.72	1.07	75	.88	1.41	75	.70	1.00
80	.65	1.03	80	.75	1.11	80	.69	1.04	80	.85	1.35	80	.68	.97
85	.63	1.00	85	.73	1.07	85	.67	1.01	85	.82	1.31	85	.66	.94
SLOPE = .530			SLOPE = .550			SLOPE = .500			SLOPE = .580			SLOPE = .490		

STANDARD
INTENSITY–DURATION
CURVES DATA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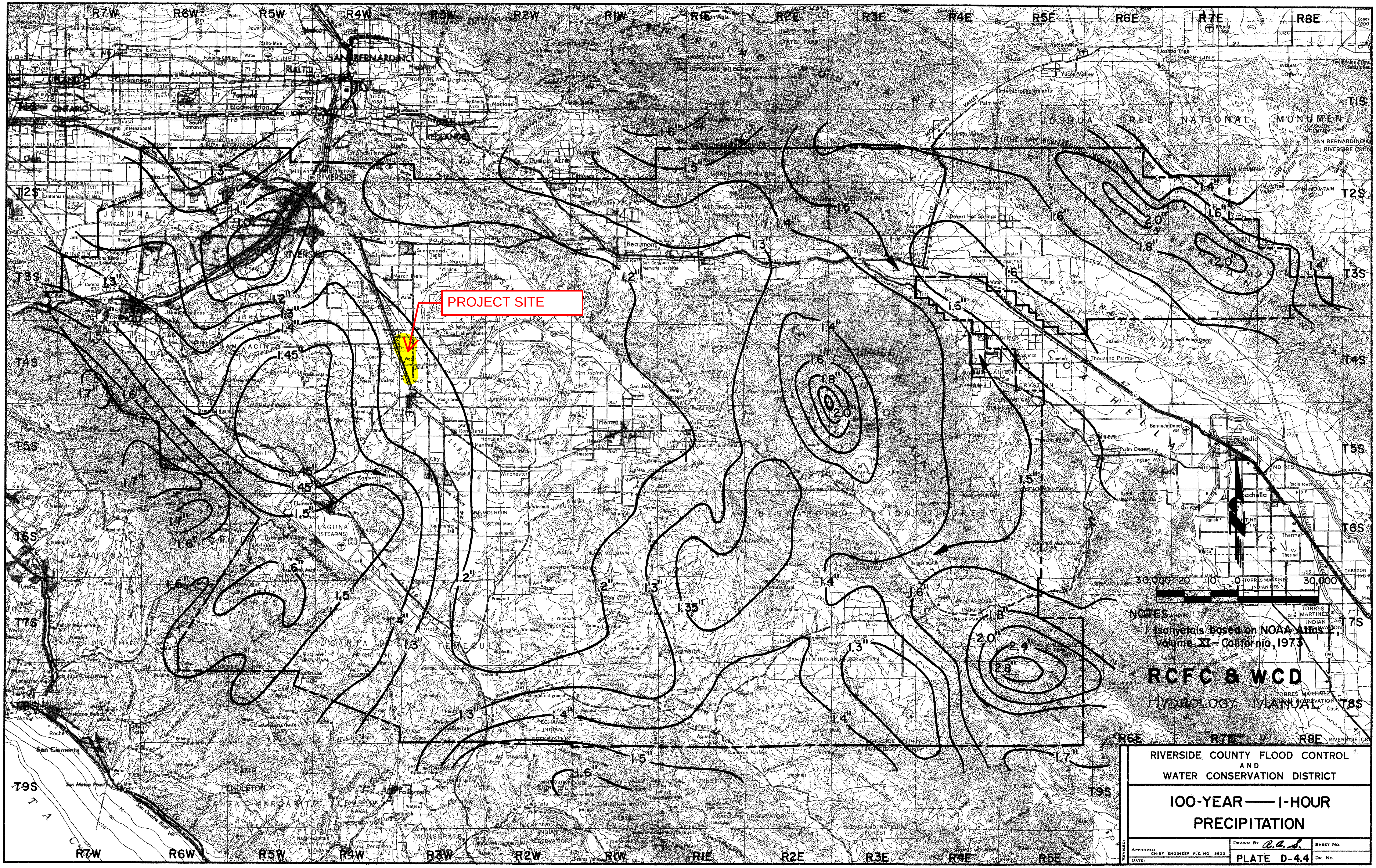
NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
2-YEAR — 1-HOUR PRECIPITATION
PLATE D-4.3
DRAWN BY: R.A.S.
APPROVED CHIEF ENGINEER R.E. NO. 8822
DATE
SHEET No.
DR. No.
REVISED:


PROJECT SITE
R7W
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R7E
R8E
T1S
T2S
T3S
T4S
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SAN BERNARDINO
RIVERSIDE
REDLANDS
ONTARIO
CORONA
Perris
Elsinore
Hemet
San Jacinto
Beaumont
Banning
Palm Springs
Indio
Coachella
Fallbrook
San Clemente
1.0"
1.1"
1.2"
1.3"
1.4"
1.45"
1.5"
1.6"
1.7"
1.8"
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30,000 20 10 0 30,000
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1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
100-YEAR —— 1-HOUR
PRECIPITATION
APPROVED: CHIEF ENGINEER R.E. NO. 8822
DATE
REVISED
DRAWN BY: R.A.S.
SHEET NO.
PLATE D-4.4
DR. NO.

SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

September 20, 2023

Howard Industrial Partners
1944 North Tustin Street, Suite 122
Orange, California 92865

Attention: Mr. Mike Tunney
Vice President

Project No.: **22G183-4**

Subject: **Results of Additional Infiltration Testing**
Harvest Landing Industrial Development
Indian Avenue and Orange Avenue
Perris, California

Reference: 1) Geotechnical Investigation, Proposed Harvest Landing Industrial Development, Indian Avenue and Orange Avenue, Perris, California, prepared for Howard Industrial Partners, by Southern California Geotechnical, Inc. (SCG), SCG Project No. 22G183-1, dated June 13, 2022.

2) Results of Infiltration Testing, Proposed Harvest Landing Industrial Development, Indian Avenue and Orange Avenue, Perris, California, prepared by Southern California Geotechnical, Inc. (SCG), SCG Project No. 22G183-2, dated July 1, 2022.

3) Geotechnical Investigation, Harvest Landing Industrial Development, Indian Avenue and Orange Avenue, Perris, California, prepared for Howard Industrial Partners, by Southern California Geotechnical, Inc. (SCG), SCG Project No. 22G183-3, dated September 21, 2023.

Mr. Tunney:

In accordance with your request, we have conducted infiltration testing at the subject site. We are pleased to present this report summarizing the results of the infiltration testing and our design recommendations.

Scope of Services

The scope of services performed for this project was in general accordance with our Proposal No. 23P306R, dated August 9, 2023. The scope of services included site reconnaissance, subsurface exploration, field testing, and engineering analysis to determine the infiltration rates of the on-site soils. The infiltration testing was performed in general accordance with the guidelines published in Riverside County – Low Impact Development BMP Design Handbook – Section 2.3 of Appendix A, prepared for the Riverside County Department of Environmental Health (RCDEH), dated December, 2013.

Site and Project Description

The site is located at the southwest corner of North Perris Boulevard and Orange Avenue in Perris, California. The site is bounded to the north by Orange Avenue, West Water Avenue, and vacant land, to the west by Interstate 215 Frontage Road and Freeway I-215, to the south by an existing commercial development and a vacant land, and to the east by an existing commercial development, North Perris Boulevard and Barrett Avenue. The western portion of the site is partially transected by Indian Avenue (trending north-south). Orange Avenue (trending east-west) separates the northern portion of the overall site (designated as Phase 2 on the site plans) from Phase 1 in the central to southern portions of the western portion of the overall site. The general location of the site is illustrated on the Site Location Map, enclosed as Plate 1 in Appendix A of this report.

The site consists of several parcels, which total 214.82± acres in size. The west-central area of the site, is developed with four (4) single-family residences (SFRs) which range from approximately 1,200 to 6,160 ft² in size. The residences are of wood-frame and stucco construction and are assumed to be supported on conventional shallow foundations, with slab-on-grade floors. Ground surface cover surrounding the SFRs includes asphaltic concrete with Portland cement concrete driveways, exposed soil, and trees. The remaining areas of the site are vacant and undeveloped. Ground surface cover consists of exposed soil with sparse to moderate native grass and weed growth and occasional trees. A water pump is present approximately 200 feet south of the intersection of Perris Boulevard and Orange Avenue, within the site's boundary. A 3- to 4-foot deep drainage rut is present in the central-eastern area of the site, trending east-west between a dirt road located and the east boundary of the site. Many small stockpiles of plant material and woodchips are located along the eastern side of Indian Avenue, approximately 2 to 4-feet in height. Based on historic aerial photographs obtained from Google Earth, the site was previously used for farming activities. Due to previous tilling activities, the ground surface throughout the site is generally hummocky.

Detailed topographic information was obtained from the Exhibit A-Infiltration Testing Locations plan, prepared by FM Civil Engineers, Inc. Based on this plan, the overall site topography slopes downward to the east at a gradient of 1.5± percent.

Proposed Development

Based on a site plan prepared by RGA, the site will be developed with the following industrial/commercial buildings, located throughout the site.

Building Type	Building Name	Location	Size (ft²)
Industrial	1	Northwest	380,000
Industrial	2	West-Central	88,400
Industrial	3	West-Central	50,000
Industrial	4	Southwest	18,800

Distribution	5	Central	440,000
Commercial	Big Box Retail	Southeast	165,000
Commercial	Shopping Center	Northeast	150,000
Retail	Pad 1	Northeast	6,500
Retail	Pad 2	Northeast	6,500
Restaurant	Pad 3	East	2,305
Retail	Pad 4	East	9,000
Restaurant	Pad 5	Southeast	3,172

Building Nos. 1 through 4 - Industrial Buildings

Dock-high doors will be constructed along a portion of at least one building wall for each of the industrial buildings. The buildings will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete pavements in the loading dock areas, and limited areas of concrete flatwork and landscape planters throughout.

Detailed structural information has not been provided. We assume the new industrial buildings will be single-story structures of tilt-up concrete construction, typically supported on conventional shallow foundation systems with concrete slab-on-grade floors. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 100 kips and 4 to 7 kips per linear foot, respectively.

Building No. 5 - Distribution Building

Dock-high doors will be constructed along portions of the east and west building walls. The building will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete pavements in the loading dock areas, and limited areas of concrete flatwork and landscape planters throughout. Two ancillary buildings, 15,300± ft² and 3,300± ft² in size are located to the south of the main distribution building.

Detailed structural information has not been provided. We assume the new main distribution building will be a two-story structure of tilt-up concrete construction, typically supported on conventional shallow foundation system with a concrete slab-on-grade floor. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 700 to 900 kips and 4 to 7 kips per linear foot, respectively.

Commercial – Big Box Retail

Dock-high doors will be constructed along a portion of the east building wall. The building will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete in the loading dock areas, and limited areas of concrete flatwork and landscape planters

throughout. This commercial development will include an automobile service station located east of the building. The service station will include a canopy, five (5) fuel pump islands, and underground storage tanks (USTs).

Detailed structural information has not been provided. We assume that the commercial building will be a single-story structure of tilt-up concrete construction, typically supported on conventional shallow foundation system with concrete slab-on-grade floors. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 100 kips and 4 to 7 kips per linear foot, respectively. The new pump island canopy is expected to be a steel frame structure, typically supported on deepened shallow foundations. Maximum column loads for the canopy are expected to be in the range of 20 kips, with significant overturning and/or uplift loads.

Commercial – Shopping Center

The shopping center building will consist of eight (8) suites ranging from 2,400± ft² to 54,000± ft² in size. Dock-high doors will be constructed along a portion of the west building walls for four (4) of the suites of the shopping center building. The building will be surrounded by asphaltic concrete pavements in the parking and drive lanes, Portland cement concrete in the loading dock areas, and limited areas of concrete flatwork and landscape planters throughout.

Detailed structural information has not been provided. We assume that the new shopping center building will be a single-story structure of wood frame or masonry block construction, typically supported on conventional shallow foundation systems with a concrete slab-on-grade floor. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 50 kips and 2 to 3 kips per linear foot, respectively.

Retail and Restaurant Buildings

The two fast-food restaurant buildings will include drive-thru lanes. Pad 4 will contain four (4) suites. The buildings will be surrounded by asphaltic concrete pavements in the parking and drive lanes, concrete flatwork, and limited areas of landscape planters throughout.

Detailed structural information has not been provided. We assume that the new retail and restaurant buildings will be single-story structures of wood frame construction, typically supported on conventional shallow foundation systems with concrete slab-on-grade floors. Based on the assumed construction, maximum column and wall loads are expected to be on the order of 20 kips and 1 to 3 kips per linear foot, respectively.

Streets

Barrett Avenue and two access streets will be constructed at the site. It is assumed that the new streets will consist of asphaltic concrete pavements.

General

No significant amounts of below-grade construction, such as basements or crawl spaces, are expected to be included in the proposed development. Based on the assumed topography, cuts and fills of up to 8 to 10± feet are expected to be necessary to achieve the proposed site grades

throughout the site.

Streets

Barrett Avenue and two access streets will be constructed at the site. It is assumed that the new streets will consist of asphaltic concrete pavements.

Previous Studies

Southern California Geotechnical (SCG) previously conducted a geotechnical investigation at the subject site (Reference No. 1). As a part of this study, twenty-three (23) borings (Identified as Boring Nos. B-1 through B-23) were advanced to depths of 15 to 25± feet below the existing site grades. Native alluvium was encountered at each boring locations, extending to at least the maximum depth explored of 25± feet below existing site grades. The alluvium generally consists of medium dense to very dense silty sands to sandy silts, with trace to little clay content. Free water was not encountered during the drilling of the borings. Based on the lack of water within the borings and the moisture contents of the recovered soil samples, the static groundwater is considered to have existed at a depth in excess of 25± feet at the time of the subsurface exploration.

SCG also previously conducted infiltration testing at the subject site (Reference No. 2). The subsurface exploration performed for the infiltration testing consisted of six (6) shallow infiltration trenches (identified as Infiltration Trench Nos. I-1 through I-6) and four (4) deep infiltration borings (identified as Infiltration Boring Nos. I-7 through I-10). The infiltration trenches were excavated to a depth of 7± feet below existing site grades. The infiltration borings were extended to a depth of 50± feet below existing site grades. In addition, one (1) exploratory boring was extended to a depth of 60± feet below site grades. Artificial fill soils were encountered at the ground surface at Infiltration Test No. I-3, extending to a depth of 1± foot below existing site grades. The fill soils consisted of medium dense fine to medium sandy silts with trace quantities of clay and fine gravel. Native alluvium was encountered at the ground surface at all of the remaining boring and trench locations, extending to at least the maximum explored depth of 60± feet below existing site grades. The near-surface alluvium encountered at depths less than 25± feet below existing site grades consisted of medium dense to very dense fine to medium sandy silts, silty fine to medium sands, clayey fine to coarse sands, and hard fine to coarse sandy clays. At depths greater than 25± feet, the alluvium consisted of medium dense to very dense fine sandy silts, fine to medium sandy silts, silty fine to medium sands, and hard fine to medium sandy clays. Based on the results of the testing, SCG recommended infiltration rates of 0.9 to 3.6 inches per hour for the proposed chamber systems. Additionally, SCG did not recommend dry well infiltration at the subject site.

Concurrent Study

SCG concurrently conducted a geotechnical investigation at the subject site (Reference No. 3). As a part of this study, forty-three (43) borings (identified as Boring Nos. B-25 through B-67) were advanced to depths of 10 to 50± feet below the existing site grades.

Younger native alluvium was encountered at the ground surface at Boring Nos. B-25, B-28, B-29, B-31, B-32, B-50, B-55 through B-58, B-60, B-64, and B-67, extending to depths of 2½ to 5½± feet below existing site grades. The alluvium generally consists of loose to medium dense silty

fine sands, silty fine to medium sands, fine sandy silts, clayey fine sands. Occasional layers of very stiff fine sandy clays and silty clays. The younger native alluvial soils are classified as "alluvium" on the boring logs. Native older alluvium was encountered beneath the younger native alluvial soils (at the boring locations listed above) and at the ground surface at the remaining boring locations. All of the borings were terminated within the older alluvium, and the older alluvial soils extend to at least the maximum depth explored of 50± feet below ground surface. The older alluvial soils generally consist of medium dense to very dense well- to poorly-graded silty sands with varying clay content, well-graded to poorly-graded sandy silts with varying clay content, well-graded to poorly-graded clayey sands with varying silt content, and clayey silts. Additionally, layers of very stiff to hard fine sandy clays and silty clays were encountered. The older alluvium generally possesses weak to moderate cementation, and occasionally possesses trace to extensive calcareous nodules and veining.

Groundwater

Free water was not encountered during the drilling of any of the borings. Based on the moisture content of the recovered soil samples and the lack of free water in the borings, the static groundwater table is at a depth greater than the maximum explored depth of 50± feet below existing site grades for this project.

Recent water level data was obtained from the California Department of Water Resources website, http://www.water.ca.gov/waterdatalibrary/. The nearest monitoring well is located on the northeast corner of the site. Water level readings within this monitoring well indicates a groundwater level of 40± feet (March 2023) below the ground surface.

Subsurface Exploration

Scope of Exploration

The subsurface exploration conducted for the infiltration testing consisted of thirty-seven (37) infiltration test borings, advanced to depths of 3 to 10½± feet below the existing site grades. The infiltration borings were advanced using a truck-mounted drilling rig, equipped with 8-inch-diameter hollow stem augers and were logged during drilling by a member of our staff. The approximate locations of the infiltration test borings (identified as Infiltration Test Nos. I-11 through I-37) are indicated on the Infiltration Test Location Plan, enclosed as Plate 2 of this report.

Upon the completion of the infiltration borings, the bottom of each test boring was covered with 2± inches of clean ¾-inch gravel. A sufficient length of 3-inch-diameter perforated PVC casing was then placed into each test hole so that the PVC casing extended from the bottom of the test hole to the ground surface. Clean ¾-inch gravel was then installed in the annulus surrounding the PVC casing.

Geotechnical Conditions

Native younger alluvium was encountered at the ground surface at Infiltration Test Nos. I-11, I-23, I-26 and I-39, extending to depths of 3 to 6± feet below the existing site grades. The younger alluvium generally consists of medium dense silty sands and sandy silts. Native older alluvium was encountered beneath the native younger alluvium and at the ground surface at the remaining

infiltration test locations, extending to at least the maximum depth explored of 10½± feet. The older alluvium generally consists of medium dense to very dense silty sands and sandy silts with trace to little clay content. The older alluvium occasionally possesses weak cementation. The Infiltration Boring Logs, which illustrate the conditions encountered at each of the borings, are included with this report.

Infiltration Testing

As previously mentioned, the infiltration testing was performed in general accordance with the Riverside County guidelines: Riverside County – Low Impact Development BMP Design Handbook – Section 2.3 of Appendix A.

Pre-soaking

In accordance with the county infiltration standards all of the infiltration test borings were pre-soaked prior to the infiltration testing. The pre-soaking process consisted of filling the test borings by inverting a full 5-gallon bottle of clear water supported over each hole so that the water level reaches a level of at least 5 times the hole's radius above the gravel at the bottom of each hole. The pre-soaking was completed after all of the water had percolated through each test hole or after 15 hours since initiating the pre-soak. Based on the results of the pre-soaking process, 30-minute readings were utilized during all of the infiltration tests, except for Infiltration Test Nos. I-24 and I-45. For Infiltration Test Nos. I-24 and I-45, 10-minute readings were utilized during the infiltration tests.

Infiltration Testing

Following the pre-soaking process of the infiltration test borings, SCG performed the infiltration testing. Each test hole was filled with water to a depth of at least 5 times the hole's radius above the gravel at the bottom of each test hole. In accordance with the Riverside County guidelines, in areas where "non-sandy soils" were encountered at the bottom of each infiltration test boring, (where 6 inches of water did not infiltrate into the surrounding soils in less than 25 minutes for two (2) consecutive readings), readings were taken at 30-minute intervals for a total of 6 hours at the test locations. At Infiltration Test Nos. I-24 and I-45, "sandy-soils" were encountered at the bottom of the test borings, (where 6 inches of water did infiltrate into the surrounding soils in less than 25 minutes for two (2) consecutive readings), therefore, readings were taken at 10-minute intervals for 1 hour at the test locations. The water level readings are presented on the spreadsheets enclosed with this report. The infiltration rates for each of the timed intervals are also tabulated on the spreadsheets.

The infiltration rates from the test are tabulated in inches per hour. In accordance with the typically accepted practice, it is recommended that the most conservative reading from the latter part of the infiltration tests be used as the design infiltration rate. The rates are summarized below:

Infiltration Test No.	Depth (feet)	Soil Description	Measured Infiltration Rate (inches/hour)
I-11	4½	YOUNGER ALLUVIUM: Brown Silty fine to coarse Sand, trace Clay	0.2

I-12	4½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.2
I-13	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.2
I-14	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.2
I-15	10½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-16	9½	OLDER ALLUVIUM: Dark Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.2
I-17	10	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace to little Clay, trace coarse Sand	0.0
I-18	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace to little Clay, trace coarse Sand	0.0
I-19	3	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-20	3	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-21	3½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, little coarse Sand	0.4
I-22	4½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, little coarse Sand	0.3
I-23	9	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-24	9	OLDER ALLUVIUM: Brown Silty fine to coarse Sand	1.7
I-25	9	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-26	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-27	7	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace coarse Sand	0.1
I-28	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.0
I-29	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-30	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace Clay	0.1
I-31	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-32	6½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-33	6½	OLDER ALLUVIUM: Brown fine to medium Sandy Silt to Silty fine to medium Sand, trace Clay	0.1
I-34	5	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-35	4½	OLDER ALLUVIUM: Light Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-36	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.0
I-37	6½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1

I-38	6½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-39	7½	OLDER ALLUVIUM: Dark Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-40	7½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, trace Clay, trace coarse Sand	0.1
I-41	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace Clay, trace coarse Sand	0.0
I-42	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand to fine to medium Sandy Silt, trace Clay, trace coarse Sand	0.0
I-43	6	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.0
I-44	4½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-45	5	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.8
I-46	5½	OLDER ALLUVIUM: Brown Silty fine to medium Sand, little Clay, trace coarse Sand	0.1
I-47	7	OLDER ALLUVIUM: Brown fine to medium Sandy Silt, little Clay	0.1

Laboratory Testing

Moisture Content

The moisture contents for the recovered soil samples within the borings were determined in accordance with ASTM D-2216 and are expressed as a percentage of the dry weight. These test results are presented on the Boring Logs.

Grain Size Analysis

The grain size distribution of selected soils collected from the bottom of each infiltration test boring have been determined using a range of wire mesh screens. These tests were performed in general accordance with ASTM D-422 and/or ASTM D-1140. The weight of the portion of the sample retained on each screen is recorded and the percentage finer or coarser of the total weight is calculated. The results of these tests are presented on Plates C-1 through C-37 of this report.

Design Recommendations

Thirty-seven (37) infiltration tests were performed at the subject site. As noted above, the calculated infiltration rates at the infiltration test locations range between 0.0 and 1.7 inches per hour. The major factors affecting the lack of infiltration at these locations are the presence of very dense older alluvium with high contents of fine-grained soil. **Based on these conditions and the results of infiltration testing we recommend the following design infiltration rates to be utilized for the proposed infiltration systems:**

Infiltration System(s)	Infiltration Test Nos.	Infiltration Test Depth (ft)	Infiltration System Type	Infiltration System Location	Design Infiltration Rate (inches/hour)
"A"	I-11	4½	Bio-Retention Basin	West	Not Recommended
"B"	I-12	4½	Bio-Retention Basin	West	Not Recommended
"C"	I-13	5½	Below-Grade Chamber	West	Not Recommended
"D"	I-14	7½	Below-Grade Chamber	Northwest	Not Recommended
"E"	I-15 through I-17	9½ to 10½	Bio-Retention Basin	North	Not Recommended
"F"	I-18	7½	Below-Grade Chamber	North	Not Recommended
"G"	I-19 through I-22	3 to 4½	Bio-Retention Basin	South	Not Recommended
"H"	I-23, I-24	9	Bio-Retention Basin	South	Not Recommended
"I" & "J"	I-25 through I-33	5½ to 9	Bio-Retention Basin	Northeast	Not Recommended
"K"	I-34 through I-36	4½ to 5½	Below-Grade Chamber	Southeast	Not Recommended
"L"	I-37	6½	Below-Grade Chamber	Southeast	Not Recommended
"M"	I-38, I-39	6½ to 7½	Below-Grade Chamber	Southeast	Not Recommended
"N"	I-40	7½	Below-Grade Chamber	Northeast	Not Recommended
"O"	I-41	6	Below-Grade Chamber	Northeast	Not Recommended
"P"	I-42	6	Below-Grade Chamber	Northeast	Not Recommended
"Q"	I-43	6	Below-Grade Chamber	Northeast	Not Recommended
"R"	I-44	4½	Below-Grade Chamber	Northeast	Not Recommended*
"S"	I-45	5	Below-Grade Chamber	Northeast	Not Recommended
"T"	I-46	5½	Below-Grade Chamber	Northeast	Not Recommended
"U"	I-47	7	Below-Grade Chamber	Northeast	Not Recommended

*Although the test results indicate an infiltration rate of 0.8 in/hr at this location, the subsurface soil profile at this site includes many soil layers with low permeability. Soil layers with some capacity for infiltration, such as the silty sand layer encountered at Infiltration test-location I-44, are generally interbedded between low permeability soil layers, based on our review of the boring logs for the overall site. Therefore, long-term infiltration is not considered to feasible.

Although infiltration is not considered feasible, the client may desire to use storm water disposal systems that do not rely on infiltration at this site. The design of the proposed storm water

disposal systems should be performed by the project civil engineer, in accordance with the City of Perris, and/or County of Riverside guidelines. However, it is recommended that the system be constructed so as to facilitate removal of silt and clay, or other deleterious materials from any water that may enter the system.

Infiltration Rate Considerations

The infiltration rates presented herein were determined in accordance with the Riverside County guidelines and are considered valid only for the time and place of the actual test. Varying subsurface conditions will exist in other areas of the site, which could alter the recommended infiltration rates presented above. The infiltration rates will decline over time between maintenance cycles as silt or clay particles accumulate on the BMP surface. The infiltration rate is highly dependent upon a number of factors, including density, silt and clay content, grainsize distribution throughout the range of particle sizes, and particle shape. Small changes in these factors can cause large changes in the infiltration rates.

Infiltration rates are based on unsaturated flow. As water is introduced into soils by infiltration, the soils become saturated and the wetting front advances from the unsaturated zone to the saturated zone. Once the soils become saturated, infiltration rates become zero, and water can only move through soils by hydraulic conductivity at a rate determined by pressure head and soil permeability. Changes in soil moisture content will affect the infiltration rate. Infiltration rates should be expected to decrease until the soils become saturated. Soil permeability values will then govern groundwater movement. Permeability values may be on the order of 10 to 20 times less than infiltration rates. The system designer should incorporate adequate factors of safety and allow for overflow design into appropriate traditional storm drain systems, which would transport storm water off-site.

Location of Infiltration Systems

The use of on-site storm water infiltration systems carries a risk of creating adverse geotechnical conditions. Increasing the moisture content of the soil can cause the soil to lose internal shear strength and increase its compressibility, resulting in a change in the designed engineering properties. Overlying structures and pavements in the infiltration area could potentially be damaged due to saturation of the subgrade soils. **Any proposed infiltration systems for this site should be located at least 25 feet away from any structures, including retaining walls.** Even with this provision of locating the infiltration system at least 25 feet from the building(s), it is possible that infiltrating water into the subsurface soils could have an adverse effect on the proposed or existing structures. It should also be noted that utility trenches which happen to collect storm water can also serve as conduits to transmit storm water toward the structure, depending on the slope of the utility trench. Therefore, consideration should also be given to the proposed locations of underground utilities which may pass near the proposed infiltration system.

The infiltration system designer should also give special consideration to the effect that the proposed infiltration systems may have on nearby subterranean structures, open excavations, or descending slopes. In particular, infiltration systems should not be located near the crest of descending slopes, particularly where the slopes are comprised of granular soils. Such systems will require specialized design and analysis to evaluate the potential for slope instability, piping failures and other phenomena that typically

apply to earthen dam design. This type of analysis is beyond the scope of this infiltration test report, but these factors should be considered by the infiltration system designer when locating the infiltration systems.

General Comments

This report has been prepared as an instrument of service for use by the client in order to aid in the evaluation of this property and to assist the architects and engineers in the design and preparation of the project plans and specifications. This report may be provided to the contractor(s) and other design consultants to disclose information relative to the project. However, this report is not intended to be utilized as a specification in and of itself, without appropriate interpretation by the project architect, structural engineer, and/or civil engineer. The design of the proposed storm water infiltration system is the responsibility of the civil engineer. The role of the geotechnical engineer is limited to determination of infiltration rate only. By using the design infiltration rate contained herein, the civil engineer agrees to indemnify, defend, and hold harmless the geotechnical engineer for all aspects of the design and performance of the proposed storm water infiltration system. The reproduction and distribution of this report must be authorized by the client and Southern California Geotechnical, Inc. Furthermore, any reliance on this report by an unauthorized third party is at such party's sole risk, and we accept no responsibility for damage or loss which may occur.

The analysis of this site was based on a subsurface profile interpolated from limited discrete soil samples. While the materials encountered in the project area are considered to be representative of the total area, some variations should be expected between boring locations and testing depths. If the conditions encountered during construction vary significantly from those detailed herein, we should be contacted immediately to determine if the conditions alter the recommendations contained herein.

This report has been based on assumed or provided characteristics of the proposed development. It is recommended that the owner, client, architect, structural engineer, and civil engineer carefully review these assumptions to ensure that they are consistent with the characteristics of the proposed development. If discrepancies exist, they should be brought to our attention to verify that they do not affect the conclusions and recommendations contained herein. We also recommend that the project plans and specifications be submitted to our office for review to verify that our recommendations have been correctly interpreted. The analysis, conclusions, and recommendations contained within this report have been promulgated in accordance with generally accepted professional geotechnical engineering practice. No other warranty is implied or expressed.

Closure

We sincerely appreciate the opportunity to be of service on this project. We look forward to providing additional consulting services during the course of the project. If we may be of further assistance in any manner, please contact our office.

Respectfully Submitted,

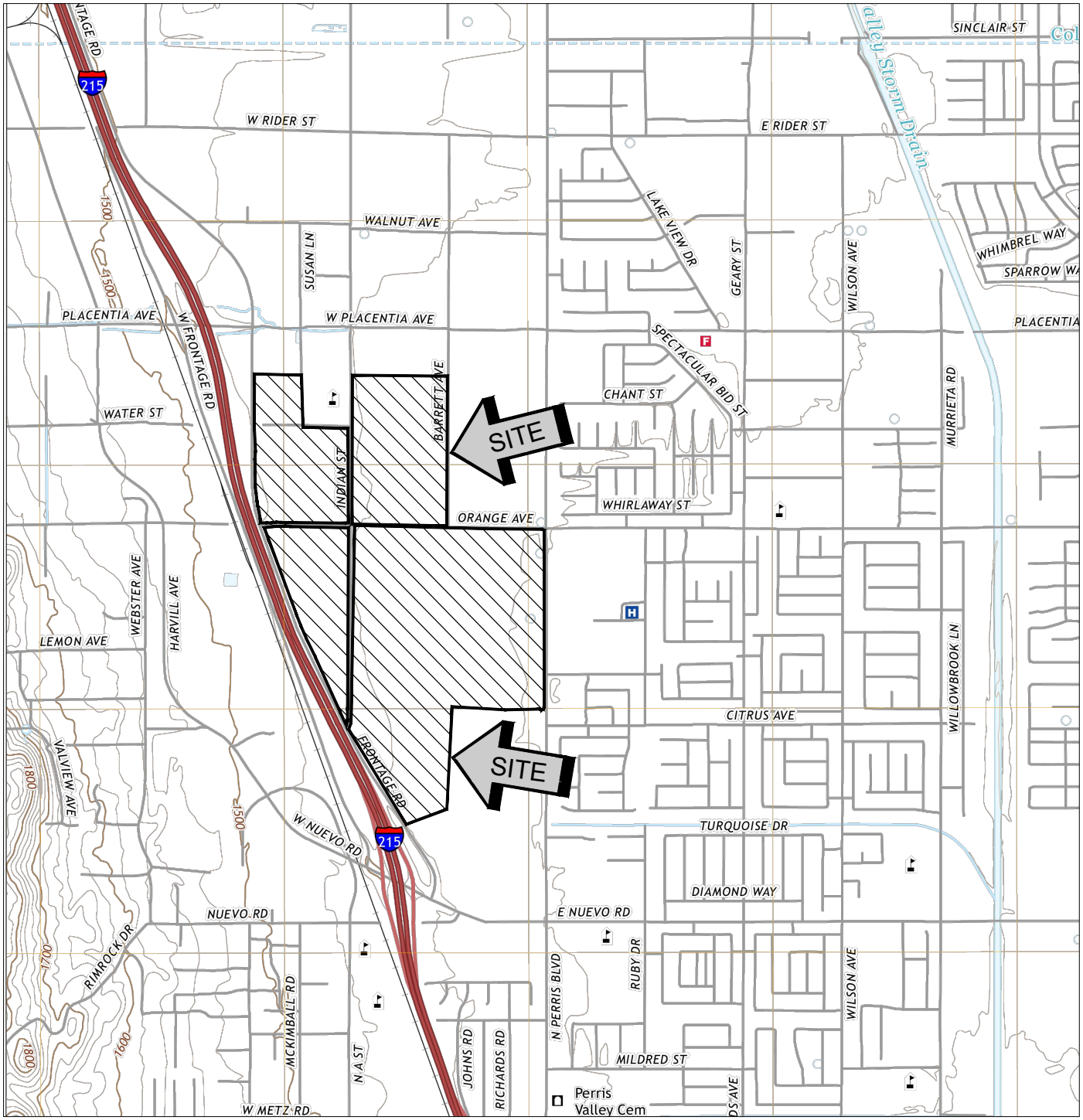
SOUTHERN CALIFORNIA GEOTECHNICAL, INC.

Ryan Bremer
Staff Geologist

Daniel W. Nielsen, GE 3166
Senior Engineer

Distribution: (1) Addressee

Enclosures: Plate 1 - Site Location Map
Plate 2 - Infiltration Test Location Plan
Boring Log Legend and Logs (39 pages)
Infiltration Test Results Spreadsheets (37 pages)
Grain Size Distribution Graphs (37 pages)



SOURCE: USGS TOPOGRAPHIC MAP OF THE PERRIS QUADRANGLE, RIVERSIDE COUNTY, CALIFORNIA, 2021

SITE LOCATION MAP

HARVEST LANDING INDUSTRIAL DEVELOPMENT

PERRIS, CALIFORNIA

SCALE: 1" = 2000'	
DRAWN: RB CHKD: RGT	
SCG PROJECT 22G183-4	
PLATE 1	

SoCalGeo

SOUTHERN CALIFORNIA GEOTECHNICAL

GEOTECHNICAL LEGEND

- APPROXIMATE INFILTRATION TEST LOCATION
- CONCURRENT BORING LOCATION (SCG PROJECT NO. 22G183-3)
- PREVIOUS BORING LOCATION (SCG PROJECT NO. 22G183-1)
- PREVIOUS INFILTRATION LOCATION (SCG PROJECT NO. 22G183-2)
- PREVIOUS INFILTRATION LOCATION (SCG PROJECT NO. 22G183-2)
- PREVIOUS BORING LOCATION (SCG PROJECT NO. 22G183-2)
- PROPOSED BUILDING
- PROPOSED INFILTRATION SYSTEM LOCATION
- EXISTING STRUCTURE

NOTE: CONCEPTUAL GRADING PLAN PREPARED BY FMCIVIL ENGINEERING.

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SOUTHERN CALIFORNIA GEOTECHNICAL
A California Corporation

NORTH
SoCalGeo

SCALE: 1" = 200'
DRAWN: RB
CHKD: RGT
SCG PROJECT 22G183-4

INFILTRATION TEST LOCATION PLAN

HARVEST LANDING INDUSTRIAL DEVELOPMENT
PERRIS, CALIFORNIA

PLATE 2

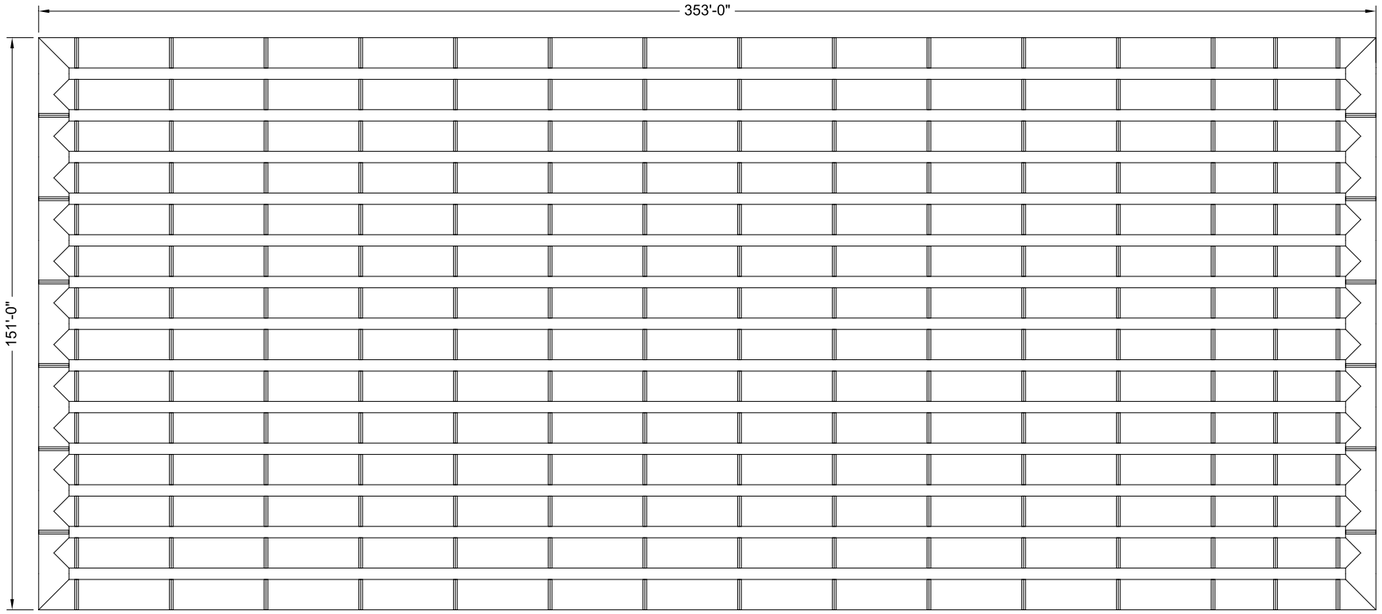
PROJECT SUMMARY

CALCULATION DETAILS
- LOADING = HS20/HS25
- APPROX. LINEAR FOOTAGE = 5,020 LF

STORAGE SUMMARY
- STORAGE VOLUME REQUIRED = N/A
- PIPE STORAGE VOLUME = 252,333 CF
- BACKFILL STORAGE VOLUME = 0 CF
- TOTAL STORAGE PROVIDED = 252,333 CF

PIPE DETAILS
- DIAMETER = 96"
- CORRUGATION = 5x1
- GAGE = 16
- COATING = ALT2
- WALL TYPE = SOLID
- BARREL SPACING = 36"

BACKFILL DETAILS
- WIDTH AT ENDS = 12"
- ABOVE PIPE = 0"
- WIDTH AT SIDES = 12"
- BELOW PIPE = 0"



ASSEMBLY
SCALE: 1" = 40'

NOTES

- ALL RISER AND STUB DIMENSIONS ARE TO CENTERLINE. ALL ELEVATIONS, DIMENSIONS, AND LOCATIONS OF RISERS AND INLETS, SHALL BE VERIFIED BY THE ENGINEER OF RECORD PRIOR TO RELEASING FOR FABRICATION.
- ALL FITTINGS AND REINFORCEMENT COMPLY WITH ASTM A998.
- ALL RISERS AND STUBS ARE $2\frac{2}{3}$" x $\frac{1}{2}$" CORRUGATION AND 16 GAGE UNLESS OTHERWISE NOTED.
- RISERS TO BE FIELD TRIMMED TO GRADE.
- QUANTITY OF PIPE SHOWN DOES NOT PROVIDE EXTRA PIPE FOR CONNECTING THE SYSTEM TO EXISTING PIPE OR DRAINAGE STRUCTURES. OUR SYSTEM AS DETAILED PROVIDES NOMINAL INLET AND/OR OUTLET PIPE STUB FOR CONNECTION TO EXISTING DRAINAGE FACILITIES. IF ADDITIONAL PIPE IS NEEDED IT IS THE RESPONSIBILITY OF THE CONTRACTOR.
- BAND TYPE TO BE DETERMINED UPON FINAL DESIGN.
- THE PROJECT SUMMARY IS REFLECTIVE OF THE DYODS DESIGN, QUANTITIES ARE APPROX. AND SHOULD BE VERIFIED UPON FINAL DESIGN AND APPROVAL. FOR EXAMPLE, TOTAL EXCAVATION DOES NOT CONSIDER ALL VARIABLES SUCH AS SHORING AND ONLY ACCOUNTS FOR MATERIAL WITHIN THE ESTIMATED EXCAVATION FOOTPRINT.
- THESE DRAWINGS ARE FOR CONCEPTUAL PURPOSES AND DO NOT REFLECT ANY LOCAL PREFERENCES OR REGULATIONS. PLEASE CONTACT YOUR LOCAL CONTECH REP FOR MODIFICATIONS.

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CONTECH DYODS DRAWING

DYO36518 20-001 Harvest Landing Retail Center and Business Park
VTTM 38811-3, PARCELS 1-4
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
24787	36518	10/3/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

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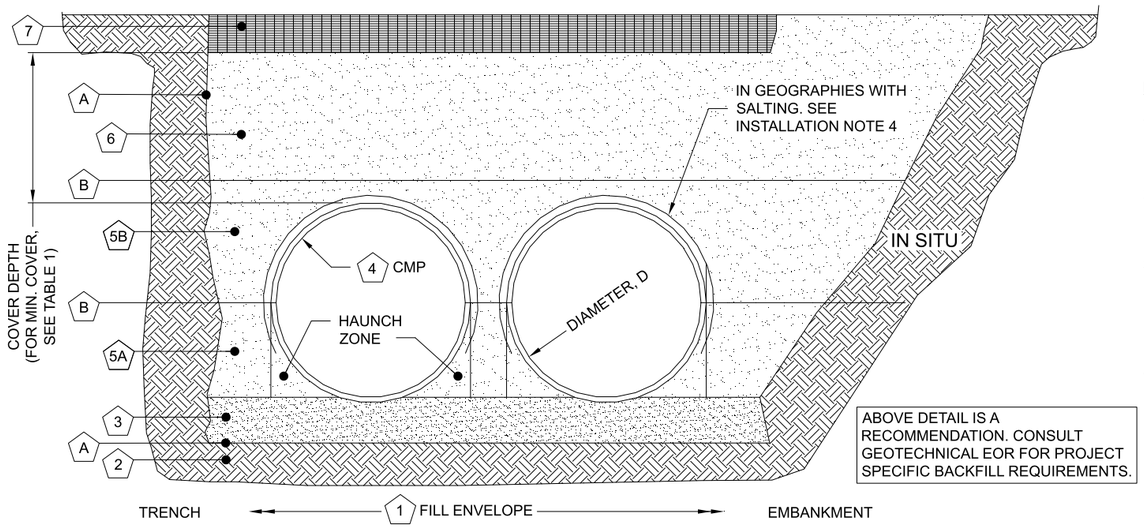
TABLE 1:

DIAMETER, D	MIN. COVER	CORR. PROFILE
6"-10"	12"	1 1/2" x 1/4"
12"-48"	12"	2 2/3" x 1/2"
>48"-96"	12"	3" x 1", 5" x 1"
>96"	D/8	3" x 1", 5" x 1"

- STRUCTURAL BACKFILL MUST EXTEND TO LIMITS OF THE TABLE
- TOTAL HEIGHT OF COMPACTED COVER FOR CONVENTIONAL HIGHWAY LOADS IS MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TOP OF RIGID PAVEMENT
- ULTRAFLO ALSO AVAILABLE FOR SIZES 18" - 120" WITH 3/4"x 3/4"x 7 1/2" CORRUGATION



MINIMUM WIDTH DEPENDS ON SITE CONDITIONS AND ENGINEERING JUDGEMENT

INSTALLATION NOTES

1. WHEN PLACING THE FIRST LIFTS OF BACKFILL IT IS IMPORTANT TO MAKE SURE THAT THE BACKFILL IS PROPERLY COMPACTED UNDER AND AROUND THE PIPE HAUNCHES.
2. OTHER ALTERNATE BACKFILL MATERIAL MAY BE ALLOWED DEPENDING ON SITE SPECIFIC CONDITIONS, AS APPROVED BY SITE ENGINEER.
3. BACKFILL USING CONTROLLED LOW-STRENGTH MATERIAL (CLSM, "FLASH FILL" OR "FLOWABLE FILL") MAY BE USED WHEN THE SPACING BETWEEN THE PIPES WILL NOT ALLOW FOR PLACEMENT AND ADEQUATE COMPACTION OF THE BACKFILL. CONTACT CONTECH FOR FURTHER EVALUATION.
4. IF SALTING AGENTS FOR SNOW AND ICE REMOVAL ARE USED ON OR NEAR THE PROJECT, A GEOMEMBRANE BARRIER IS RECOMMENDED OVER THE UPPER HALF OF THE PIPE. THE GEOMEMBRANE LINER IS INTENDED TO HELP PROTECT THE SYSTEM FROM THE POTENTIAL ADVERSE EFFECTS THAT MAY RESULT FROM A CHANGE IN THE SURROUNDING ENVIRONMENT OVER A PERIOD OF TIME. PLEASE REFER TO THE CORRUGATED METAL PIPE DETENTION DESIGN GUIDE FOR ADDITIONAL INFORMATION.

TABLE 2: SOLID STANDARD

CMP DETENTION AND CMP DRAINAGE STANDARD BACKFILL SPECIFICATIONS

	MATERIAL LOCATION	MATERIAL SPECIFICATION	DESCRIPTION	
1	FILL ENVELOPE WIDTH	PER ENGINEER OF RECORD	MINIMUM TRENCH WIDTH MUST ALLOW ROOM FOR PROPER COMPACTION OF HAUNCH MATERIALS UNDER THE PIPE. THE SUGGESTED MINIMUM TRENCH WIDTH, OR EOR RECOMMENDATION: PIPE ≤ 12": D + 16" PIPE > 12": 1.5D + 12"	MINIMUM EMBANKMENT WIDTH (IN FEET) FOR INITIAL FILL ENVELOPE: PIPE < 24": 3.0D PIPE 24" - 144": D + 4'0" PIPE > 144": D + 10'0"
2	FOUNDATION	**AASHTO 26.5.2** OR PER ENGINEER OF RECORD	PRIOR TO PLACING THE BEDDING, THE FOUNDATION MUST BE CONSTRUCTED TO A UNIFORM AND STABLE GRADE. IN THE EVENT THAT UNSUITABLE FOUNDATION MATERIALS ARE ENCOUNTERED DURING EXCAVATION, THEY SHALL BE REMOVED AND FOUNDATION BROUGHT BACK TO GRADE WITH A FILL MATERIAL APPROVED BY THE ENGINEER OF RECORD.	
3	BEDDING	**AASHTO M 43: 3, 357, 4, 467, 5, 56, 57** (APPROVED REGIONAL EQUIVALENTS INCLUDE CA-7)	ENGINEER OF RECORD TO DETERMINE IF BEDDING IS REQUIRED. PIPE MAY BE PLACED ON THE TRENCH BOTTOM OF A RELATIVELY LOOSE, NATIVE SUITABLE WELL GRADED GRANULAR MATERIAL THAT IS ROUGHLY SHAPED TO FIT THE BOTTOM OF THE PIPE, 2" MIN DEPTH. THE BEDDING MATERIAL MAY BE SUITABLE FOUNDATION SOILS CONFORMING TO AASHTO SOIL CLASSIFICATIONS A1, A2, OR A3 WITH MAXIMUM PARTICLE SIZE OF 3" PER AASHTO 26.3.8.1	
4	CORRUGATED METAL PIPE			
5A	CRITICAL BACKFILL	**AASHTO M 145: A-1, A-2, A-3** *	HAUNCH ZONE MATERIAL SHALL BE HAND SHOVELED OR SHOVEL SLICED INTO PLACE TO ALLOW FOR PROPER COMPACTION WITHOUT SOFT SPOTS. BACKFILL SHALL BE PLACED IN 8" +/- LOOSE LIFTS AND COMPACTED TO 90% STANDARD PROCTOR PER AASHTO T 99. BACKFILL SHALL BE PLACED SUCH THAT THERE IS NO MORE THAN A THREE LIFT (24") DIFFERENTIAL BETWEEN ANY OF THE PIPES AT ANY TIME DURING THE BACKFILL PROCESS. THE BACKFILL SHOULD BE ADVANCED ALONG THE LENGTH OF THE SYSTEM TO AVOID DIFFERENTIAL LOADING. WELL GRADED GRANULAR MATERIAL WHICH MAY CONTAIN SMALL AMOUNTS OF SILT OR CLAY AND MAXIMUM PARTICLE SIZE OF 3" (PER AASHTO 26.3.8.1 AND 12.4-1.3).	
5B	BACKFILL	**AASHTO M 145: A-1, A-2, A-3**		
6	COVER MATERIAL	UP TO MIN. COVER - SEE 5A AND 5B ABOVE ABOVE MIN. COVER - PER ENGINEER OF RECORD	COVER MATERIAL MAY INCLUDE NON-BITUMINOUS, GRANULAR ROAD BASE MATERIAL WITHIN MIN COVER LIMITS	
7	RIGID OR FLEXIBLE PAVEMENT (IF APPLICABLE)	PER ENGINEER OF RECORD	FLEXIBLE PAVEMENT SHOULD NOT BE COUNTED AS PART OF THE FILL HEIGHT OVER THE CMP. FINAL BACKFILL MATERIAL SELECTION AND COMPACTION REQUIREMENTS SHALL FOLLOW THE PROJECT PLANS AND SPECIFICATIONS PER THE ENGINEER OF RECORD.	
A	OPTIONAL SIDE GEOTEXTILE	NONE	GEOTEXTILE LAYER IS RECOMMENDED ON SIDES OF EXCAVATION TO PREVENT SOIL MIGRATION.	
B	OPTIONAL GEOTEXTILE BETWEEN LAYERS	NONE	IF SOIL TYPES DIFFER AT ANY POINT ABOVE PIPE INVERT, A GEOTEXTILE LAYER IS RECOMMENDED TO BE PLACED BETWEEN THE LAYERS TO PREVENT SOIL MIGRATION.	

NOTES:
- FOR MULTIPLE BARREL INSTALLATIONS, THE RECOMMENDED STANDARD SPACING BETWEEN PARALLEL PIPE RUNS SHALL BE THE PIPE DIAMETER /2 BUT NO LESS THAN 12" FOR DIAMETERS <72". FOR 72" AND LARGER DIAMETERS, THE MINIMUM SPACING IS 36". CONTACT YOUR CONTECH REPRESENTATIVE FOR NONSTANDARD SPACING.

* APPROVED REGIONAL EQUIVALENTS FOR SECTION 5A INCLUDE CA-7, CODOT #67, MIDOT 2G, 34G, OR 21AA STONE OR GRAVEL; #8; #57; MIDOT 6A, 2G, 3G, 34G.

MANUFACTURER RECOMMENDED BACKFILL

NOT TO SCALE

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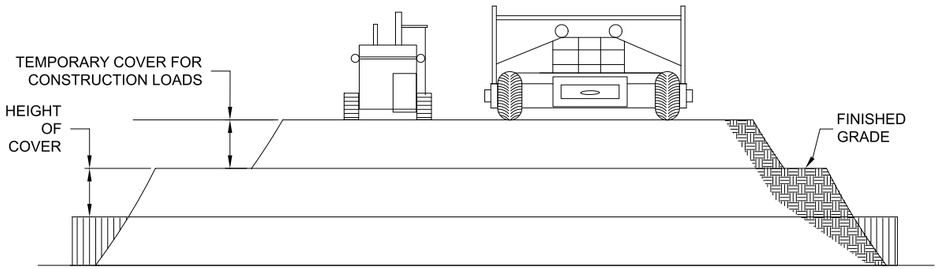

CONSTRUCTION LOADS

FOR TEMPORARY CONSTRUCTION VEHICLE LOADS, AN EXTRA AMOUNT OF COMPACTED COVER MAY BE REQUIRED OVER THE TOP OF THE PIPE. THE HEIGHT-OF-COVER SHALL MEET THE MINIMUM REQUIREMENTS SHOWN IN THE TABLE BELOW. THE USE OF HEAVY CONSTRUCTION EQUIPMENT NECESSITATES GREATER PROTECTION FOR THE PIPE THAN FINISHED GRADE COVER MINIMUMS FOR NORMAL HIGHWAY TRAFFIC.

PIPE SPAN, INCHES	AXLE LOADS (kips)			
	18-50	50-75	75-110	110-150
	MINIMUM COVER (FT)			
12-42	2.0	2.5	3.0	3.0
48-72	3.0	3.0	3.5	4.0
78-120	3.0	3.5	4.0	4.0
126-144	3.5	4.0	4.5	4.5

*MINIMUM COVER MAY VARY, DEPENDING ON LOCAL CONDITIONS. THE CONTRACTOR MUST PROVIDE THE ADDITIONAL COVER REQUIRED TO AVOID DAMAGE TO THE PIPE. MINIMUM COVER IS MEASURED FROM THE TOP OF THE PIPE TO THE TOP OF THE MAINTAINED CONSTRUCTION ROADWAY SURFACE.

CONSTRUCTION LOADING DIAGRAM

SCALE: N.T.S.

SPECIFICATION FOR DESIGNED DETENTION SYSTEM:

SCOPE
THIS SPECIFICATION COVERS THE MANUFACTURE AND INSTALLATION OF THE DESIGNED DETENTION SYSTEM DETAILED IN THE PROJECT PLANS.

MATERIAL
THE MATERIAL SHALL CONFORM TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2 STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-274 OR ASTM A-92.

THE GALVANIZED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-218 OR ASTM A-929.

THE POLYMER COATED STEEL COILS SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M-246 OR ASTM A-742.

THE ALUMINUM COILS SHALL CONFORM TO THE APPLICABLE OF AASHTO M-197 OR ASTM B-744.

CONSTRUCTION LOADS
CONSTRUCTION LOADS MAY BE HIGHER THAN FINAL LOADS. FOLLOW THE MANUFACTURER'S OR NCSPA GUIDELINES.

PIPE
THE PIPE SHALL BE MANUFACTURED IN ACCORDANCE TO THE APPLICABLE REQUIREMENTS LISTED BELOW:

ALUMINIZED TYPE 2: AASHTO M-36 OR ASTM A-760

GALVANIZED: AASHTO M-36 OR ASTM A-760

APPLICABLE POLYMER COATED: AASHTO M-245 OR ASTM A-762

ALUMINUM: AASHTO M-196 OR ASTM B-745

APPLICABLE
HANDLING AND ASSEMBLY
SHALL BE IN ACCORDANCE WITH NCSP'S (NATIONAL CORRUGATED STEEL PIPE ASSOCIATION) FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL. SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS FOR ALUMINUM PIPE.
REQUIREMENTS
INSTALLATION
SHALL BE IN ACCORDANCE WITH AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY BRIDGES, SECTION 26, DIVISION II DIVISION II OR ASTM A-798 (FOR ALUMINIZED TYPE 2, GALVANIZED OR POLYMER COATED STEEL) OR ASTM B-788 (FOR ALUMINUM PIPE) AND IN CONFORMANCE WITH THE PROJECT PLANS AND SPECIFICATIONS. IF THERE ARE ANY INCONSISTENCIES OR CONFLICTS THE CONTRACTOR SHOULD DISCUSS AND RESOLVE WITH THE SITE ENGINEER.

IT IS ALWAYS THE RESPONSIBILITY OF THE CONTRACTOR TO FOLLOW OSHA GUIDELINES FOR SAFE PRACTICES.

NOTE:
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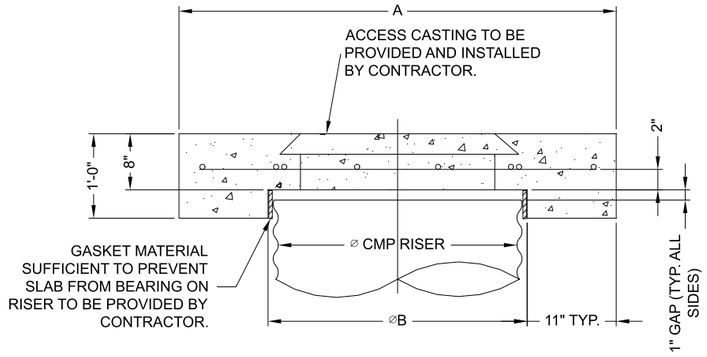
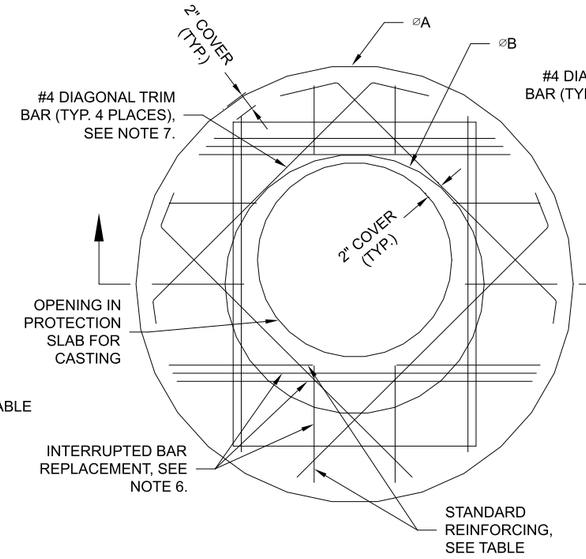


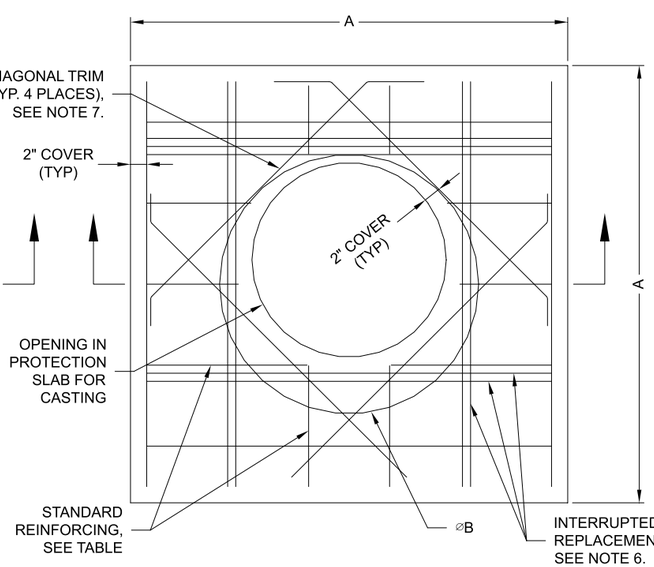
SECTION VIEW

REINFORCING TABLE				
⌀ CMP RISER	A	⌀ B	REINFORCING	**BEARING PRESSURE (PSF)
24"	⌀ 4' 4'X4'	26"	#5 @ 12" OCEW #5 @ 12" OCEW	2,410 1,780
30"	⌀ 4'-6" 4'-6" X 4'-6"	32"	#5 @ 12" OCEW #5 @ 12" OCEW	2,120 1,530
36"	⌀ 5' 5' X 5'	38"	#5 @ 10" OCEW #5 @ 10" OCEW	1,890 1,350
42"	⌀ 5'-6" 5'-6" X 5'-6"	44"	#5 @ 10" OCEW #5 @ 9" OCEW	1,720 1,210
48"	⌀ 6' 6' X 6'	50"	#5 @ 9" OCEW #5 @ 8" OCEW	1,600 1,100

** ASSUMED SOIL BEARING CAPACITY



ROUND OPTION PLAN VIEW



SQUARE OPTION PLAN VIEW

NOTES:

1. DESIGN IN ACCORDANCE WITH AASHTO, 17th EDITION.
2. DESIGN LOAD HS25.
3. EARTH COVER = 1' MAX.
4. CONCRETE STRENGTH = 3,500 psi
5. REINFORCING STEEL = ASTM A615, GRADE 60.
6. PROVIDE ADDITIONAL REINFORCING AROUND OPENINGS EQUAL TO THE BARS INTERRUPTED, HALF EACH SIDE. ADDITIONAL BARS TO BE IN THE SAME PLANE.
7. TRIM OPENING WITH DIAGONAL #4 BARS, EXTEND BARS A MINIMUM OF 12" BEYOND OPENING, BEND BARS AS REQUIRED TO MAINTAIN BAR COVER.
8. PROTECTION SLAB AND ALL MATERIALS TO BE PROVIDED AND INSTALLED BY CONTRACTOR.
9. DETAIL DESIGN BY DELTA ENGINEERING, BINGHAMTON, NY.

MANHOLE CAP DETAIL

SCALE: N.T.S.

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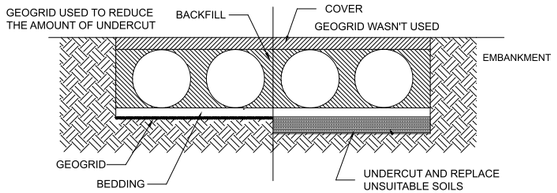
CMP DETENTION INSTALLATION GUIDE

PROPER INSTALLATION OF A FLEXIBLE UNDERGROUND DETENTION SYSTEM WILL ENSURE LONG-TERM PERFORMANCE. THE CONFIGURATION OF THESE SYSTEMS OFTEN REQUIRES SPECIAL CONSTRUCTION PRACTICES THAT DIFFER FROM CONVENTIONAL FLEXIBLE PIPE CONSTRUCTION. CONTECH ENGINEERED SOLUTIONS STRONGLY SUGGESTS SCHEDULING A PRE-CONSTRUCTION MEETING WITH YOUR LOCAL SALES ENGINEER TO DETERMINE IF ADDITIONAL MEASURES, NOT COVERED IN THIS GUIDE, ARE APPROPRIATE FOR YOUR SITE.

FOUNDATION

CONSTRUCT A FOUNDATION THAT CAN SUPPORT THE DESIGN LOADING APPLIED BY THE PIPE AND ADJACENT BACKFILL WEIGHT AS WELL AS MAINTAIN ITS INTEGRITY DURING CONSTRUCTION.

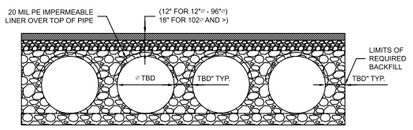
IF SOFT OR UNSUITABLE SOILS ARE ENCOUNTERED, REMOVE THE POOR SOILS DOWN TO A SUITABLE DEPTH AND THEN BUILD UP TO THE APPROPRIATE ELEVATION WITH A COMPETENT BACKFILL MATERIAL. THE STRUCTURAL FILL MATERIAL GRADATION SHOULD NOT ALLOW THE MIGRATION OF FINES, WHICH CAN CAUSE SETTLEMENT OF THE DETENTION SYSTEM OR PAVEMENT ABOVE. IF THE STRUCTURAL FILL MATERIAL IS NOT COMPATIBLE WITH THE UNDERLYING SOILS AN ENGINEERING FABRIC SHOULD BE USED AS A SEPARATOR. IN SOME CASES, USING A STIFF REINFORCING GEOGRID REDUCES OVER EXCAVATION AND REPLACEMENT FILL QUANTITIES.



GRADE THE FOUNDATION SUBGRADE TO A UNIFORM OR SLIGHTLY SLOPING GRADE. IF THE SUBGRADE IS CLAY OR RELATIVELY NON-POROUS AND THE CONSTRUCTION SEQUENCE WILL LAST FOR AN EXTENDED PERIOD OF TIME, IT IS BEST TO SLOPE THE GRADE TO ONE END OF THE SYSTEM. THIS WILL ALLOW EXCESS WATER TO DRAIN QUICKLY, PREVENTING SATURATION OF THE SUBGRADE.

GEOMEMBRANE BARRIER

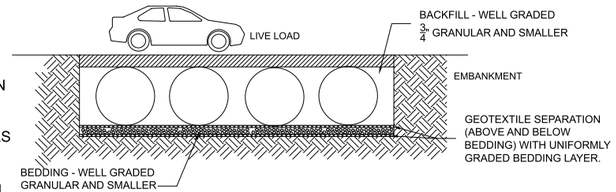
THE RESISTIVITY OF A PROJECT SITE MAY CHANGE OVER TIME DUE TO THE USE OF VARIOUS SALTING, DE-ICING, AND AGRICULTURAL AGENTS APPLIED ON OR NEAR THE AREA. TO MITIGATE THE POTENTIAL IMPACT OF THESE AGENTS, AN HDPE MEMBRANE LINER WILL BE INSTALLED ON THE CROWN OF EACH PIPE, CREATING AN IMPERMEABLE BARRIER. THIS MEASURE IS DESIGNED TO PROTECT THE SYSTEM FROM ENVIRONMENTAL CHANGES THAT COULD LEAD TO PREMATURE CORROSION AND REDUCE THE OVERALL SERVICE LIFE.



IN-SITU TRENCH WALL

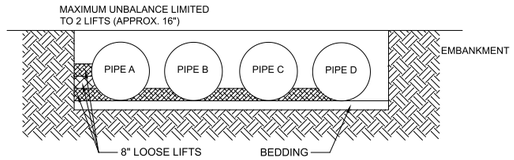
IF EXCAVATION IS REQUIRED, THE TRENCH WALL NEEDS TO BE CAPABLE OF SUPPORTING THE LOAD THAT THE PIPE SHEDS AS THE SYSTEM IS LOADED. IF SOILS ARE NOT CAPABLE OF SUPPORTING THESE LOADS, THE PIPE CAN DEFLECT. PERFORM A SIMPLE SOIL PRESSURE CHECK USING THE APPLIED LOADS TO DETERMINE THE LIMITS OF EXCAVATION BEYOND THE SPRING LINE OF THE OUTER MOST PIPES.

IN MOST CASES THE REQUIREMENTS FOR A SAFE WORK ENVIRONMENT AND PROPER BACKFILL PLACEMENT AND COMPACTION TAKE CARE OF THIS CONCERN.



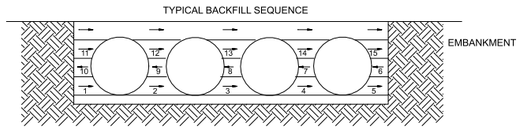
BACKFILL PLACEMENT

MATERIAL SHALL BE WORKED INTO THE PIPE HAUNCHES BY MEANS OF SHOVEL-SLICING, RODDING, AIR TAMPER, VIBRATORY ROD, OR OTHER EFFECTIVE METHODS.

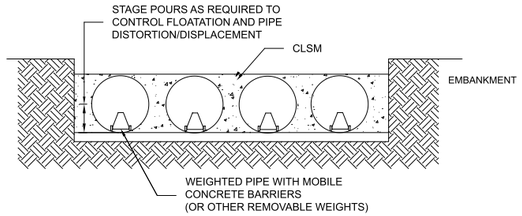


IF AASHTO T99 PROCEDURES ARE DETERMINED INFEASIBLE BY THE GEOTECHNICAL ENGINEER OF RECORD, COMPACTION IS CONSIDERED ADEQUATE WHEN NO FURTHER YIELDING OF THE MATERIAL IS OBSERVED UNDER THE COMPACTOR, OR UNDER FOOT, AND THE GEOTECHNICAL ENGINEER OF RECORD (OR REPRESENTATIVE THEREOF) IS SATISFIED WITH THE LEVEL OF COMPACTION.

FOR LARGE SYSTEMS, CONVEYOR SYSTEMS, BACKHOES WITH LONG REACHES OR DRAGLINES WITH STONE BUCKETS MAY BE USED TO PLACE BACKFILL. ONCE MINIMUM COVER FOR CONSTRUCTION LOADING ACROSS THE ENTIRE WIDTH OF THE SYSTEM IS REACHED, ADVANCE THE EQUIPMENT TO THE END OF THE RECENTLY PLACED FILL, AND BEGIN THE SEQUENCE AGAIN UNTIL THE SYSTEM IS COMPLETELY BACKFILLED. THIS TYPE OF CONSTRUCTION SEQUENCE PROVIDES ROOM FOR STOCKPILED BACKFILL DIRECTLY BEHIND THE BACKHOE, AS WELL AS THE MOVEMENT OF CONSTRUCTION TRAFFIC. MATERIAL STOCKPILES ON TOP OF THE BACKFILLED DETENTION SYSTEM SHOULD BE LIMITED TO 8- TO 10-FEET HIGH AND MUST PROVIDE BALANCED LOADING ACROSS ALL BARRELS. TO DETERMINE THE PROPER COVER OVER THE PIPES TO ALLOW THE MOVEMENT OF CONSTRUCTION EQUIPMENT SEE TABLE 1, OR CONTACT YOUR LOCAL CONTECH SALES ENGINEER.



WHEN FLOWABLE FILL IS USED, YOU MUST PREVENT PIPE FLOATATION. TYPICALLY, SMALL LIFTS ARE PLACED BETWEEN THE PIPES AND THEN ALLOWED TO SET-UP PRIOR TO THE PLACEMENT OF THE NEXT LIFT. THE ALLOWABLE THICKNESS OF THE CLSM LIFT IS A FUNCTION OF A PROPER BALANCE BETWEEN THE UPLIFT FORCE OF THE CLSM, THE OPPOSING WEIGHT OF THE PIPE, AND THE EFFECT OF OTHER RESTRAINING MEASURES. THE PIPE CAN CARRY LIMITED FLUID PRESSURE WITHOUT PIPE DISTORTION OR DISPLACEMENT, WHICH ALSO AFFECTS THE CLSM LIFT THICKNESS. YOUR LOCAL CONTECH SALES ENGINEER CAN HELP DETERMINE THE PROPER LIFT THICKNESS.

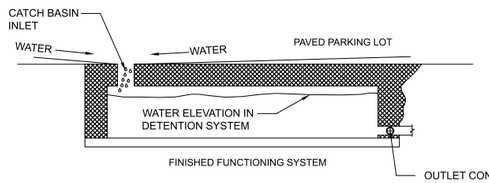


CONSTRUCTION LOADING

TYPICALLY, THE MINIMUM COVER SPECIFIED FOR A PROJECT ASSUMES H-20 LIVE LOAD. BECAUSE CONSTRUCTION LOADS OFTEN EXCEED DESIGN LIVE LOADS, INCREASED TEMPORARY MINIMUM COVER REQUIREMENTS ARE NECESSARY. SINCE CONSTRUCTION EQUIPMENT VARIES FROM JOB TO JOB, IT IS BEST TO ADDRESS EQUIPMENT SPECIFIC MINIMUM COVER REQUIREMENTS WITH YOUR LOCAL CONTECH SALES ENGINEER DURING YOUR PRE-CONSTRUCTION MEETING.

ADDITIONAL CONSIDERATIONS

BECAUSE MOST SYSTEMS ARE CONSTRUCTED BELOW-GRADE, RAINFALL CAN RAPIDLY FILL THE EXCAVATION; POTENTIALLY CAUSING FLOATATION AND MOVEMENT OF THE PREVIOUSLY PLACED PIPES. TO HELP MITIGATE POTENTIAL PROBLEMS, IT IS BEST TO START THE INSTALLATION AT THE DOWNSTREAM END WITH THE OUTLET ALREADY CONSTRUCTED TO ALLOW A ROUTE FOR THE WATER TO ESCAPE. TEMPORARY DIVERSION MEASURES MAY BE REQUIRED FOR HIGH FLOWS DUE TO THE RESTRICTED NATURE OF THE OUTLET PIPE.



CMP DETENTION SYSTEM INSPECTION AND MAINTENANCE

UNDERGROUND STORMWATER DETENTION AND INFILTRATION SYSTEMS MUST BE INSPECTED AND MAINTAINED AT REGULAR INTERVALS FOR PURPOSES OF PERFORMANCE AND LONGEVITY.

INSPECTION

INSPECTION IS THE KEY TO EFFECTIVE MAINTENANCE OF CMP DETENTION SYSTEMS AND IS EASILY PERFORMED. CONTECH RECOMMENDS ONGOING, ANNUAL INSPECTIONS. SITES WITH HIGH TRASH LOAD OR SMALL OUTLET CONTROL ORIFICES MAY NEED MORE FREQUENT INSPECTIONS. THE RATE AT WHICH THE SYSTEM COLLECTS POLLUTANTS WILL DEPEND MORE ON SITE SPECIFIC ACTIVITIES RATHER THAN THE SIZE OR CONFIGURATION OF THE SYSTEM.

INSPECTIONS SHOULD BE PERFORMED MORE OFTEN IN EQUIPMENT WASHDOWN AREAS, IN CLIMATES WHERE SANDING AND/OR SALTING OPERATIONS TAKE PLACE, AND IN OTHER VARIOUS INSTANCES IN WHICH ONE WOULD EXPECT HIGHER ACCUMULATIONS OF SEDIMENT OR ABRASIVE/ CORROSIVE CONDITIONS. A RECORD OF EACH INSPECTION IS TO BE MAINTAINED FOR THE LIFE OF THE SYSTEM

MAINTENANCE

CMP DETENTION SYSTEMS SHOULD BE CLEANED WHEN AN INSPECTION REVEALS ACCUMULATED SEDIMENT OR TRASH IS CLOGGING THE DISCHARGE ORIFICE.

ACCUMULATED SEDIMENT AND TRASH CAN TYPICALLY BE EVACUATED THROUGH THE MANHOLE OVER THE OUTLET ORIFICE. IF MAINTENANCE IS NOT PERFORMED AS RECOMMENDED, SEDIMENT AND TRASH MAY ACCUMULATE IN FRONT OF THE OUTLET ORIFICE. MANHOLE COVERS SHOULD BE SECURELY SEATED FOLLOWING CLEANING ACTIVITIES. CONTECH SUGGESTS THAT ALL SYSTEMS BE DESIGNED WITH AN ACCESS/INSPECTION MANHOLE SITUATED AT OR NEAR THE INLET AND THE OUTLET ORIFICE. SHOULD IT BE NECESSARY TO GET INSIDE THE SYSTEM TO PERFORM MAINTENANCE ACTIVITIES, ALL APPROPRIATE PRECAUTIONS REGARDING CONFINED SPACE ENTRY AND OSHA REGULATIONS SHOULD BE FOLLOWED.

ANNUAL INSPECTIONS ARE BEST PRACTICE FOR ALL UNDERGROUND SYSTEMS. DURING THIS INSPECTION, IF EVIDENCE OF SALTING/DE-ICING AGENTS IS OBSERVED WITHIN THE SYSTEM, IT IS BEST PRACTICE FOR THE SYSTEM TO BE RINSED, INCLUDING ABOVE THE SPRING LINE SOON AFTER THE SPRING THAW AS PART OF THE MAINTENANCE PROGRAM FOR THE SYSTEM.

MAINTAINING AN UNDERGROUND DETENTION OR INFILTRATION SYSTEM IS EASIEST WHEN THERE IS NO FLOW ENTERING THE SYSTEM. FOR THIS REASON, IT IS A GOOD IDEA TO SCHEDULE THE CLEANOUT DURING DRY WEATHER.

THE FOREGOING INSPECTION AND MAINTENANCE EFFORTS HELP ENSURE UNDERGROUND PIPE SYSTEMS USED FOR STORMWATER STORAGE CONTINUE TO FUNCTION AS INTENDED BY IDENTIFYING RECOMMENDED REGULAR INSPECTION AND MAINTENANCE PRACTICES. INSPECTION AND MAINTENANCE RELATED TO THE STRUCTURAL INTEGRITY OF THE PIPE OR THE SOUNDNESS OF PIPE JOINT CONNECTIONS IS BEYOND THE SCOPE OF THIS GUIDE.

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DATE	REVISION DESCRIPTION	BY

CONTECH ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CONTECH CMP DETENTION SYSTEMS

CONTECH **DYODS** DRAWING

DYO36518 20-001 Harvest Landing Retail Center and Business Park
VTTM 38811-3, PARCELS 1-4
Perris, CA
DETENTION SYSTEM

PROJECT No.:	SEQ. No.:	DATE:
24787	36518	10/3/2024
DESIGNED: DYO	DRAWN: DYO	
CHECKED: DYO	APPROVED: DYO	
SHEET NO.: 1		

C:\EXPORTS\TEMPLATES\CMP_V10.DWG 10/18/2019 10:02 AM

Santa Ana Watershed - BMP Design Volume, V_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	FMCivil Engineers Inc	Date	10/4/2024
Designed by	Hector Paez	Case No	
Company Project Number/Name	20-001 - Site 9		

BMP Identification

BMP NAME / ID: Offsite Bioretention Basin

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

85th Percentile, 24-hour Rainfall Depth, from the Isohyetal Map in Handbook Appendix E

D_{85}= 0.60 inches

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Storm Depth (in)*	*Design Capture Volume, V_{BMP} (cubic feet)*	*Proposed Volume on Plans (cubic feet)*
9-1A	*166666.11*	*Roofs*	*1*	*0.89*	*148666.2*			
9-1C	*629913.07*	*Concrete or Asphalt*	*1*	*0.89*	*561882.5*			
	796579.18	**Total**			**710548.7**	**0.60**	**35527.4**	

Proposed Volume must be greater than the Design Capture Volume

Notes:

Santa Ana Watershed - BMP Design Flow Rate, Q_{BMP}

(Rev. 10-2011)

Legend: Required Entries / Calculated Cells

*(Note this worksheet shall **only** be used in conjunction with BMP designs from the **LID BMP Design Handbook**)*

Company Name	FMCivil Engineers Inc	Date	10/4/2024
Designed by	Hector Paez	Case No	
Company Project Number/Name	20-001 - Site 9		

BMP Identification

BMP NAME / ID: S9-2 Modular Wetlands

Must match Name/ID used on BMP Design Calculation Sheet

Design Rainfall Depth

Design Rainfall Intensity I = 0.20 in/hr

Drainage Management Area Tabulation

Insert additional rows if needed to accommodate all DMAs draining to the BMP

DMAs

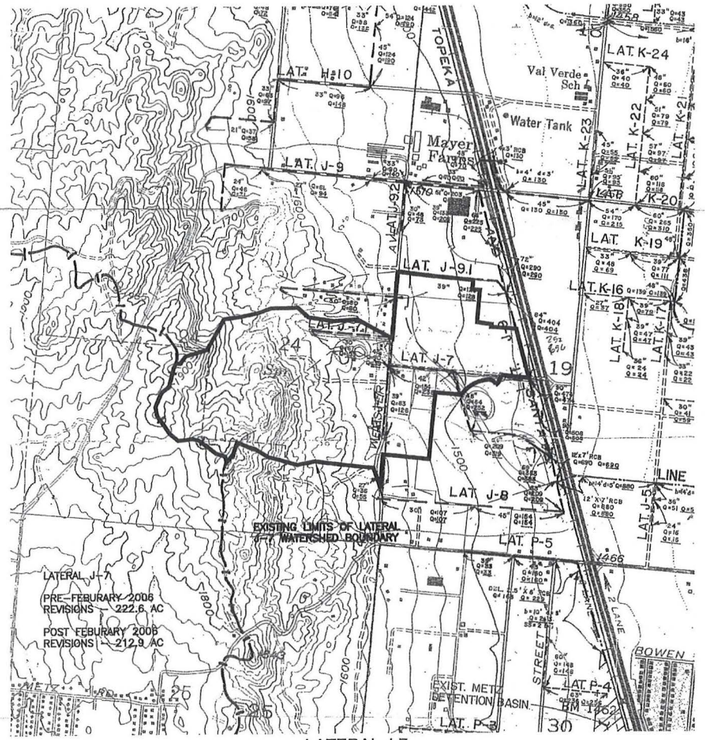
DMA Type/ID	DMA Area (square feet)	Post-Project Surface Type (use pull-down menu)	Effective Imperivous Fraction, I_f	DMA Runoff Factor	DMA Areas x Runoff Factor	*Design Rainfall Intensity (in/hr)*	*Design Flow Rate (cfs)*	*Proposed Flow Rate (cfs)*
S9-2A	*0*	*Roofs*	*1*	*0.89*	*0*			
S9-2C	*87575.2*	*Concrete or Asphalt*	*1*	*0.892*	*78117.1*			
	87575.2		***Total***		**78117.1**	**0.20**	***0.36***	***0.462***

Notes:

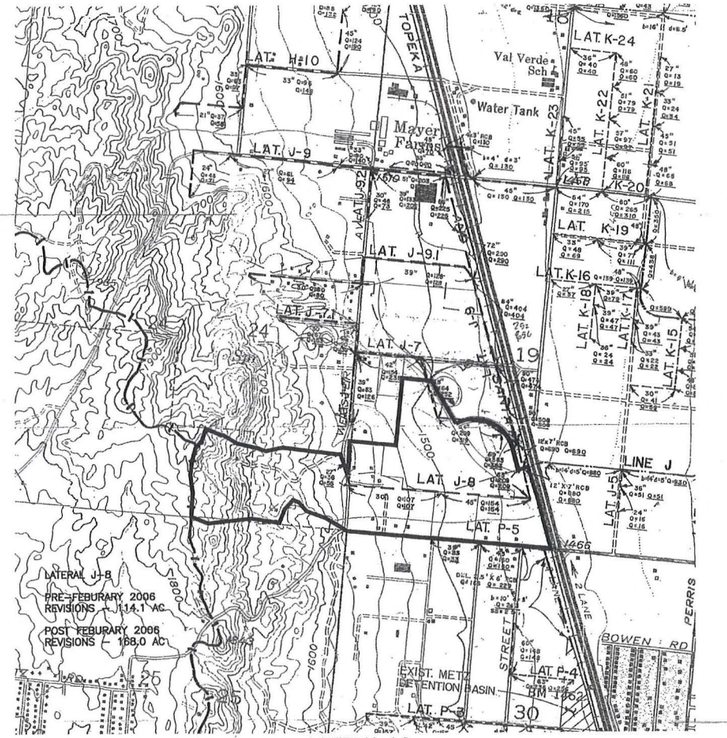
PORTION OF
8K3
1" = 1000'

REVISED HYDROLOGY MAP
PERRIS MASTER DRAINAGE PLAN

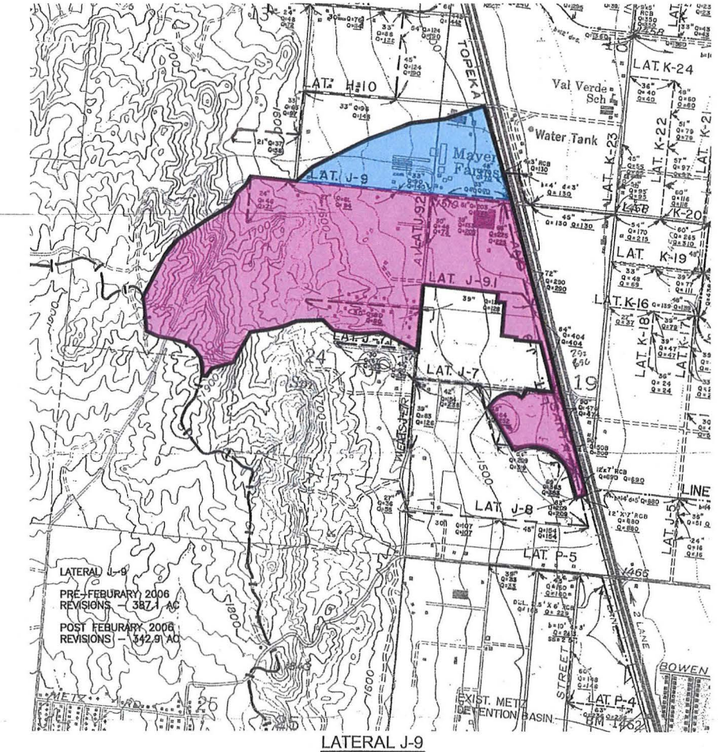
LATERALS J–7, J–8, & J–9



LATERAL J-7



LATERAL J-8



LATERAL J-9

LATERAL No.	PRE–FEBURARY 2006 REVISIONS	POST FEBURARY 2006 REVISIONS	INCREASE/DECREASE (ACRES)
LAT J–8	114.1	168.0	+53.9
LAT J–9	609.8	555.9	–53.9

LEGEND

PROPOSED LATERAL WATERSHED BOUNDARIES AFTER FEBRUARY 2006 REVISION

N

SCALE: 1"=1000'

B:\CAD\Nuevo Industrial Park - NV\PE\Exhibits\NV\P Perris MDP Hydrology map lat 7 and lat 9.dwg, 2/2/2007 1:10:00 PM, Donal Pearce

WORK CONTAINED WITHIN THESE PLANS SHALL NOT COMMENCE UNTIL AN ENCROACHMENT PERMIT AND/OR GRADING PERMIT HAS BEEN ISSUED.

THE PRIVATE ENGINEER SIGNING THESE PLANS IS RESPONSIBLE FOR ASSURING THE ACCURACY AND ACCEPTABILITY OF THE DESIGN HEREON. IN THE EVENT OF DISCREPANCIES ARISING AFTER COUNTY APPROVAL OR DURING CONSTRUCTION, THE PRIVATE ENGINEER SHALL BE RESPONSIBLE FOR DETERMINING AN ACCEPTABLE SOLUTION AND REVISING THE PLANS FOR APPROVAL BY THE COUNTY.

DATE	BY	MARK	REVISIONS	APPR	DATE

ENGINEER — COUNTY

SEAL–COUNTY

REGISTERED PROFESSIONAL ENGINEER ALAN D. FRENCH No. 45702 Exp. 12–31–08 CIVIL STATE OF CALIFORNIA

COUNTY OF RIVERSIDE
TRANSPORTATION DEPARTMENT
APPROVED BY:

ALAN D. FRENCH, P.E.
CIVIL ENGINEER, R.C.E. NO. 45702 — DATE

RECOMMENDED — DATE

SEAL–ENGINEER

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

RECOMMENDED FOR APPROVAL — APPROVED BY:

PLANNING ENGINEER — CHIEF ENGINEER

DATE: — DATE:

ENGINEERING SOLUTIONS
ENGINEERING-LAND PLANNING-SURVEYING-MAPPING
2155 CHICAGO AVENUE, STE. 201
RIVERSIDE, CA. 92507
PHONE – (951) 784–0288
FAX – (951) 784–0287
PREPARED BY:

DATE EXP. 06–30–07

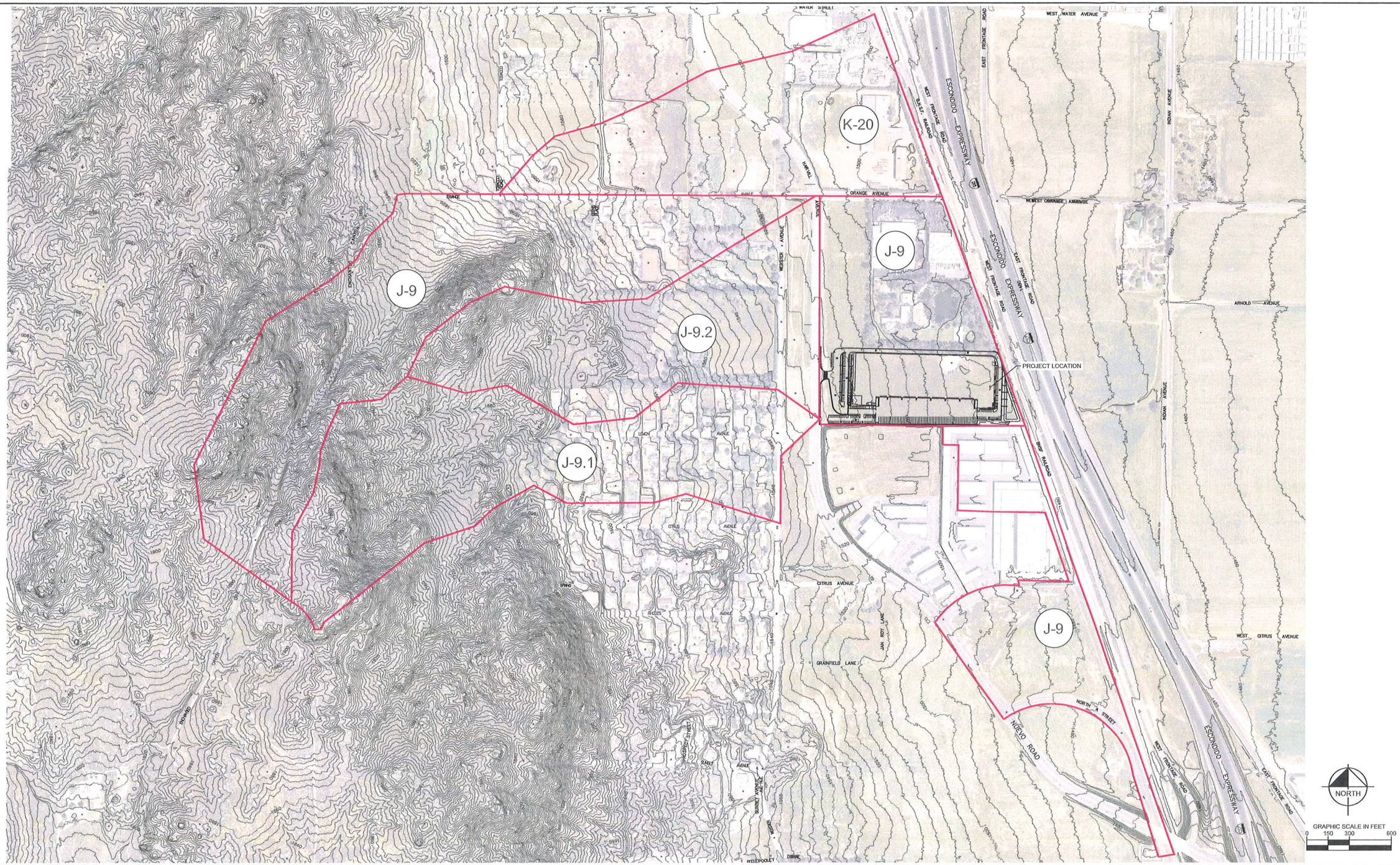
BENCHMARK:

SCALE:

I.P. No. XXXXX
COUNTY OF RIVERSIDE
REVISED HYDROLOGY MAP
PERRIS MASTER DRAINAGE PLAN
LATERALS J–7, J–8, & J–9

SHEET NO. 1 OF 1 SHTS.

FOR: | W.O. | COUNTY FILE NO.:



Kimley»Horn
401 B STREET, SUITE 600, SAN DIEGO, CA 92101
PHONE: 619-234-9411
WWW.KIMLEY-HORN.COM

RCFC MDP DRAINAGE AREA MAP LINE J-9
ROCKEFELLER HARVILL INDUSTRIAL PARK
October 9, 2020

k:\snd_ldev\rockefeller - riverside_harvill\to\rcfc\2020.10.08 - mdp letter\2020.10.09 - mdp drainage area.dwg 10/9/2020

EXHIBITS

EXHIBIT A: VICINITY MAP

EXHIBIT B: EXISTING HYDROLOGY MAP

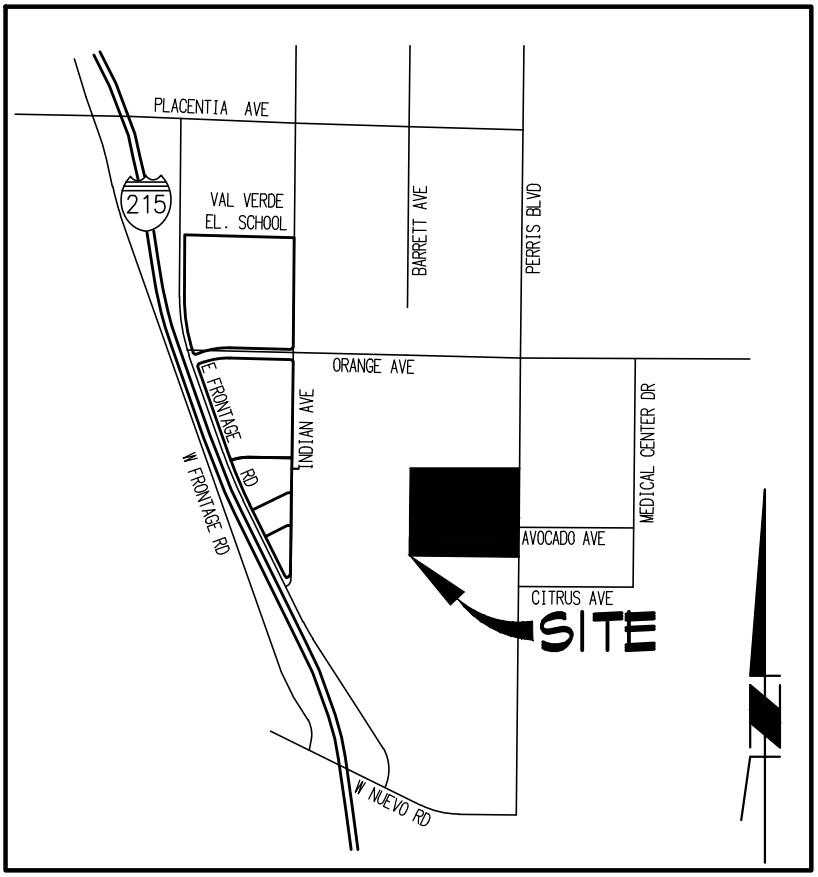
EXHIBIT C: PROPOSED HYDROLOGY MAP

EXHIBIT D: HYDROLOGIC SOILS GROUP MAP

EXHIBIT E: RCFCD MDP FACILITIES OVERLAY

EXHIBIT F: PHASE 1 OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM

EXHIBIT G: CONCEPTUAL GRADING



VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

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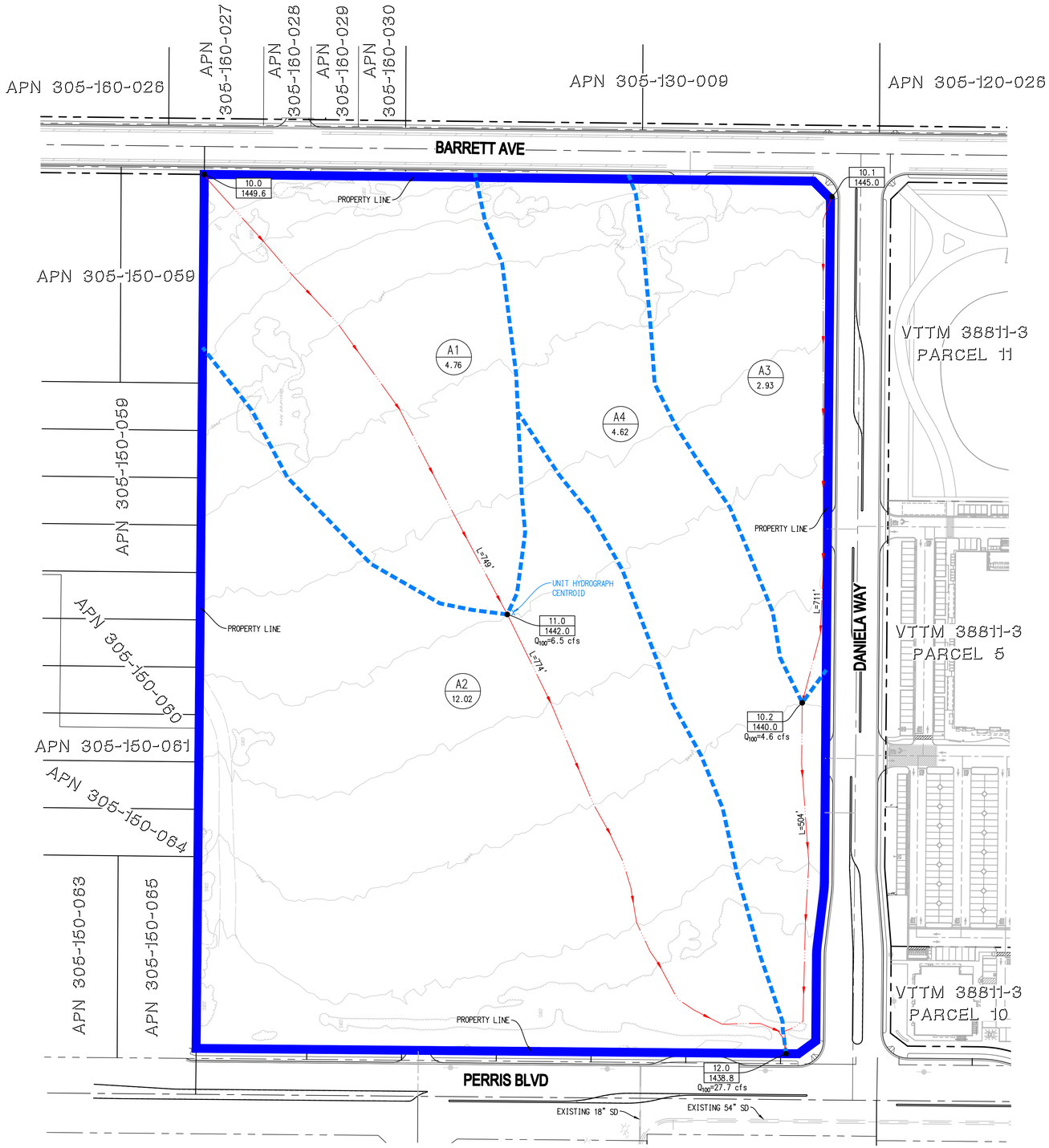
29995 TECHNOLOGY DRIVE, SUITE 306 | MURRIETA | CA 92563
951.331.9873 - FMCIVIL.COM

HARVEST LANDING
VTTM 38811-3, PARCELS 1-4

FIGURE 1
VICINITY MAP

H:\PDATA\20-001 HARVEST LANDING\DWGS\EXHIBITS\20-001-FEDEX-VICINITY-MAP .DWG DANNY 9/20/2023 4:12 PM



UNIT HYDROGRAPH PARAMETERS			
L_{WC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
1,528	754	10.80	0.02

LEGEND

D2 / 2.16 — DRAINAGE BASIN NAME / DRAINAGE BASIN AREA(AC.)

11 / 1027.0 — NODE I.D. / ELEVATION

WATERSHED BOUNDARY

SUB-WATERSHED BOUNDARY

FLOW DIRECTION

SCALE 1"=80'

80 40 0 80 160 240

SCALE: 1"=80'

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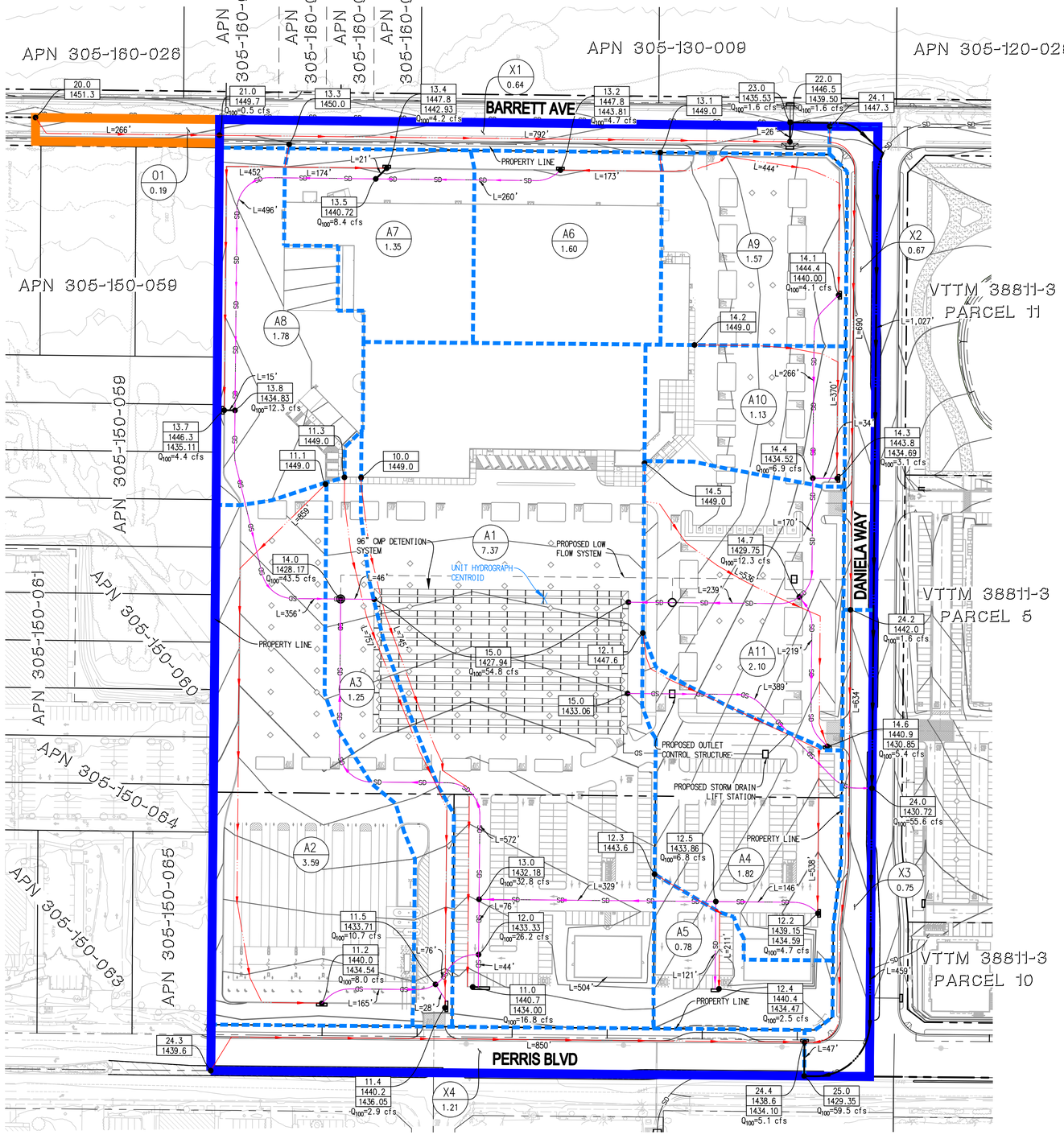
HARVEST LANDING

VTTM 38811-3, PARCELS 1-4 - EXISTING DRAINAGE



UNIT HYDROGRAPH PARAMETERS			
L_{WC} (FT)	L_C (FT)	Δ ELEV (FT)	N (-)
1,495	210	21.06	0.015

LEGEND

- D2 / 2.16 — DRAINAGE BASIN NAME / DRAINAGE BASIN AREA(AC.)
- 11 / 1027.0 — NODE I.D. / ELEVATION
- WATERSHED BOUNDARY
- SUB-WATERSHED BOUNDARY
- FLOW DIRECTION
- PIPE FLOW DIRECTION

SCALE 1"=80'

80 40 0 80 160 240

SCALE: 1"=80'

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HARVEST LANDING

VTTM 38811-3, PARCELS 1-4 - PROPOSED DRAINAGE

LEGEND

- BOUNDARY
- HYDROLOGIC SOIL A
- HYDROLOGIC SOIL C

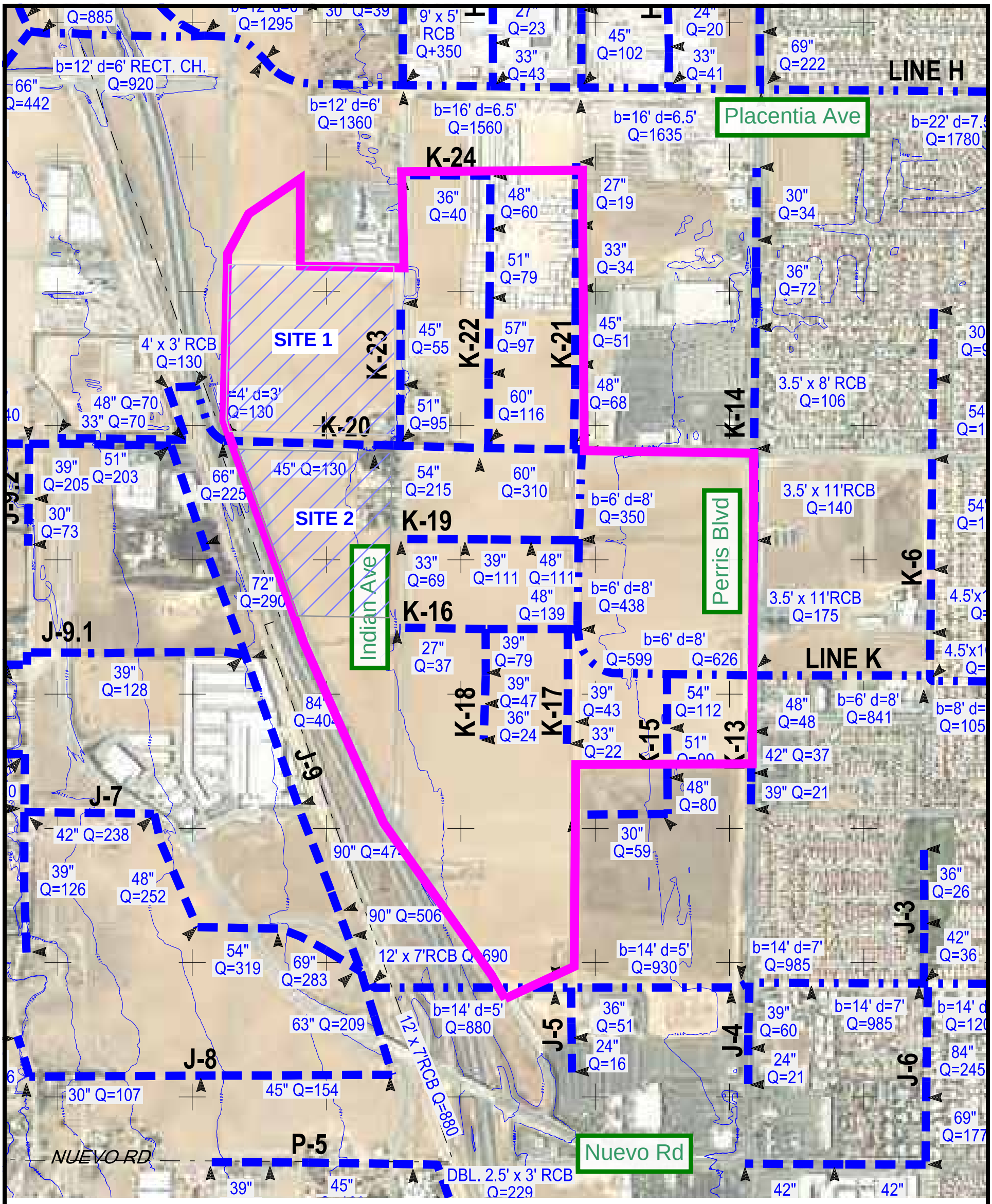
0 250 500 ft

FMCIVIL ENGINEERS INC.

Source: USDA Web Soil Survey

HARVEST LANDING

VTTM 38811-3, PARCELS 1-4 - HYDROLOGICAL SOIL GROUPS



N.T.S.

Limits of master planned development - Howard Industrial

RCFC&WCD Master Drainage Plan Facilities for the Perris Valley Area, as shown in the digital exhibit map dated July 2014.

Site 1 and Site 2

RCFCD MDP FACILITIES OVERLAY

FMCIVIL ENGINEERS INC.

IN THE CITY OF PERRIS,
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM

VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

HOWARD INDUSTRIAL PARTNERS
1944 NORTH TUSTIN STREET, SUITE 122
ORANGE, CA 92865
CONTACT: TIM HOWARD
(TEL)714-769-9155

ENGINEER

FMCIVIL ENGINEERS INC.
29995 TECHNOLOGY DRIVE, SUITE 306
MURRIETA, CA 92563
CONTACT: FRANCISCO MARTINEZ
(TEL)951-331-9813

ARCHITECT

AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: STEPHEN PRZYBYLOWSKI
(TEL)714-639-9860

LEGEND

- RIGHT OF WAY
- (1025) EXISTING CONTOUR
- EASEMENT
- SD PROP. ONSITE STORM DRAIN SYSTEM
- SD PROP. OFFSITE STORM DRAIN SYSTEM
- PROP. STORM DRAIN LOW FLOW SYSTEM
- PROP. STORM DRAIN UNDER DRAIN SYSTEM
- W EXISTING WATER LINE
- W PROP. WATER LINE
- SS EXISTING SWR LINE
- SS PROP. SEWER LINE
- SD EXISTING STORM DRAIN PIPE
- E EXISTING OVERHEAD LINES

SCALE 1"=200'

200 100 0 200 400 600

SCALE: 1"=200'

CITY OF PERRIS

HARVEST LANDING INDUSTRIAL - PHASE I OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM EXHIBIT

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF.:	

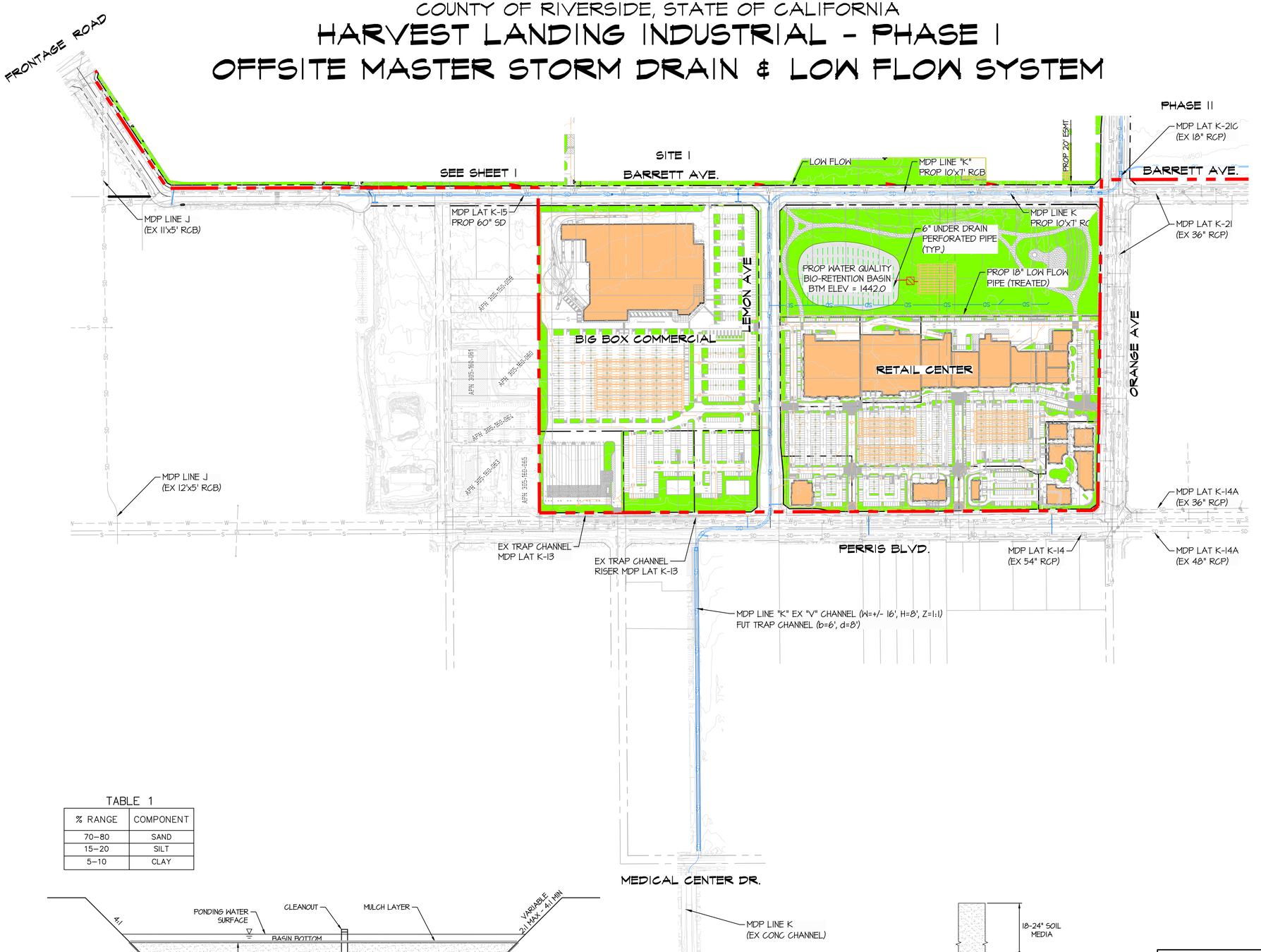
FMCIVIL ENGINEERS INC.
41870 KALMIA STREET, SUITE 120
MURRIETA, CA 92562
951.473.0202 - FMCIVIL.COM

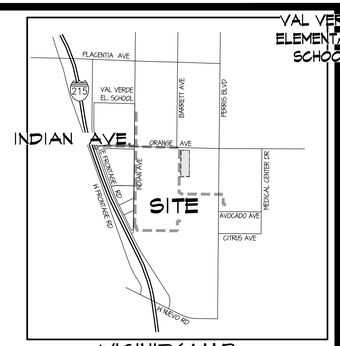
SHEET 1 OF 2 SHEETS

H:\PDATA\20-001 HARVEST LANDING\DWGS\PLDG\ENTITLEMENT\CUP\ALT-3\20-001-CUP_MSD3-01.DWG DANNY 10/7/2024 4:55 PM

COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN & LOW FLOW SYSTEM





VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

HOWARD INDUSTRIAL PARTNERS
1944 NORTH TUSTIN STREET, SUITE 122
ORANGE, CA 92865
CONTACT: TIM HOWARD
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ENGINEER

FMCIVIL ENGINEERS INC.
29995 TECHNOLOGY DRIVE, SUITE 306
MURRIETA, CA 92563
CONTACT: FRANCISCO MARTINEZ
(TEL)951-331-9873

ARCHITECT

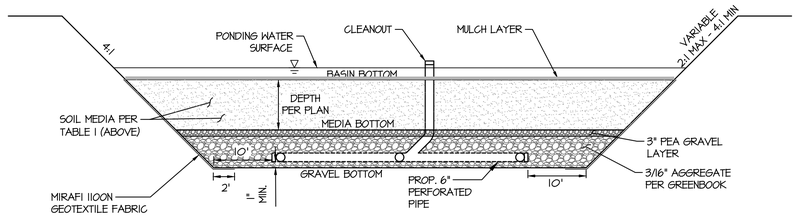
AO ARCHITECTURE
144 NORTH STREET
ORANGE, CA 92866
CONTACT: STEPHEN PRZYBYLOWSKI
(TEL)714-639-9860

TABLE 1

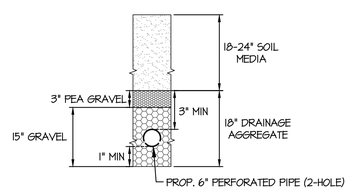
% RANGE	COMPONENT
70-80	SAND
15-20	SILT
5-10	CLAY

LEGEND

- RIGHT OF WAY
- (1025) EXISTING CONTOUR
- EASEMENT
- SD PROP. ONSITE STORM DRAIN SYSTEM
- SD PROP. OFFSITE STORM DRAIN SYSTEM
- PROP. STORM DRAIN LOW FLOW SYSTEM
- PROP. STORM DRAIN UNDER DRAIN SYSTEM
- W EXISTING WATER LINE
- W PROP. WATER LINE
- SS EXISTING SWR LINE
- SS PROP. SEWER LINE
- SD EXISTING STORM DRAIN PIPE
- E EXISTING OVERHEAD LINES



BASIN CROSS SECTION
N.T.S.



AGGREGATE CROSS SECTION
N.T.S.

SCALE 1"=200'

200 100 0 200 400 600
SCALE: 1"=200'

CITY OF PERRIS

HARVEST LANDING INDUSTRIAL - PHASE I
OFFSITE MASTER STORM DRAIN
& LOW FLOW SYSTEM EXHIBIT

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF.:	

FMCIVIL ENGINEERS INC.
41870 KALMIA STREET, SUITE 120
MURRIETA | CA 92562
951.973.0202 - FMCIVIL.COM

SHEET 2 OF 2 SHEETS

H:\PDATA\20-001 HARVEST LANDING\DWGS\PLNCK\ENTITLEMENT\CUP\ALT-3\20-001-CUP_MSD3-01.DWG DANNY 10/8/2024 7:35 AM

LEGEND

- (1025) EXISTING CONTOUR
- 1025 PROPOSED CONTOUR
- RETAINING WALL
- FENCE
- EDGE OF PAVEMENT
- SIGN
- MH MANHOLE
- RIGHT OF WAY
- EASEMENT
- PARCEL LINE
- PARCEL MAP BOUNDARY
- STREET CENTER LINE
- SCREEN WALL
- COMBINATION SCREEN/RETAINING WALL
- EXISTING LOT LINE
- RIDGE LINE
- RIBBON GUTTER
- FLOW ARROW
- PROPOSED EDGE OF PAVEMENT
- EXISTING WATER LINE
- PROPOSED WATER LINE
- EXISTING SWR LINE
- PROPOSED SEWER LINE
- EXISTING STORM DRAIN PIPE
- PROPOSED STORM DRAIN PIPE
- EXISTING OVERHEAD LINES
- CUT/FILL LINE
- SLOPE SYMBOL

ZONING ORDINANCE

EXISTING ZONING:
HARVEST LANDING SPECIFIC PLANS - MULTIPLE BUSINESS USE (MBU)

PROPOSED ZONING:
HARVEST LANDING SPECIFIC PLANS - MULTIPLE BUSINESS USE (MBU)

ASSESSOR'S PARCEL NUMBERS:

305-110-015, 016, 022 thru 027, 032 thru 035, &
305-140-012, 024 thru 027, 031, 032, 034, 040, 041, 049 thru 050, 052 thru 061

LEGAL DESCRIPTION

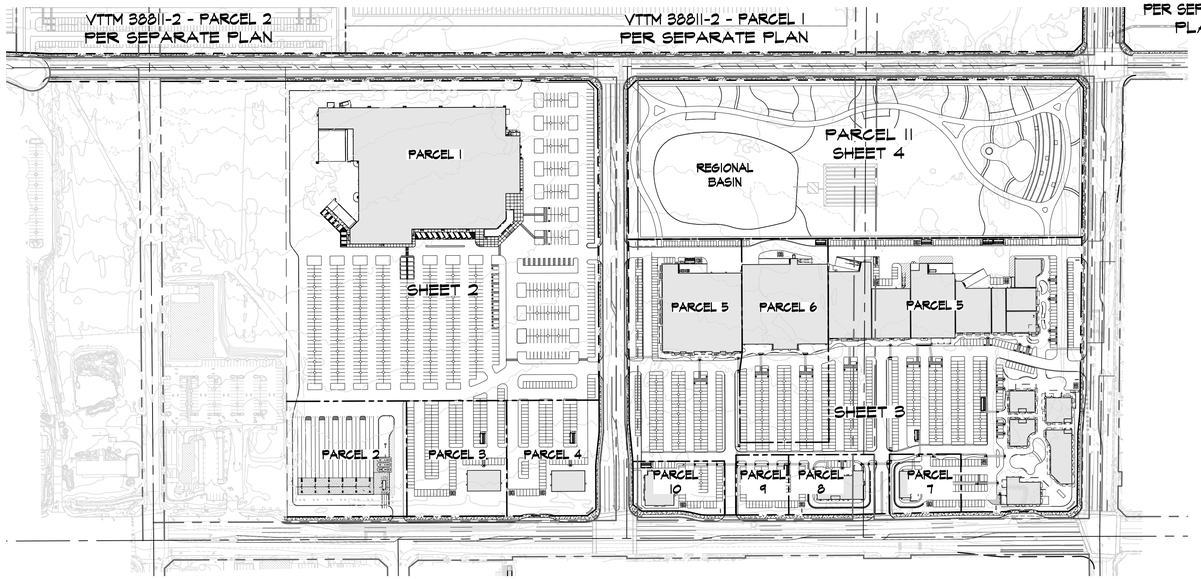
BLOCKS 1-3, 8-14, AND 19-20 OF FIGADOTA FARMS NO. 6 AS SHOWN BY MAP ON FILE IN THE OFFICE OF THE COUNTY RECORDER OF THE COUNTY OF RIVERSIDE, STATE OF CALIFORNIA, IN BOOK 16 OF MAPS, PAGE 77.

IN THE CITY OF PERRIS,
COUNTY OF RIVERSIDE, STATE OF CALIFORNIA

HARVEST LANDING RETAIL CENTER & BUSINESS PARK

CONCEPTUAL GRADING & DRAINAGE PLAN

VESTING TENTATIVE TRACT MAP 38811-3 - PARCELS 1-11

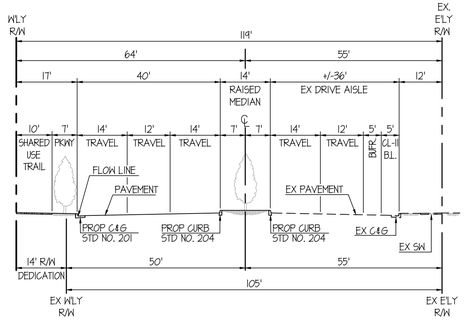


SCALE 1"=200'

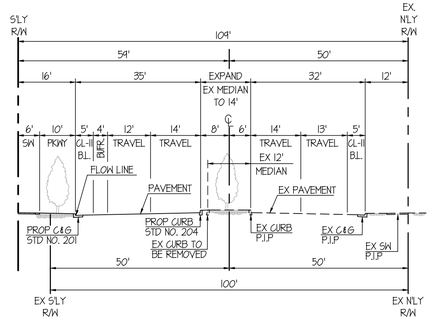
INDEX MAP

200 100 0 200 400 600

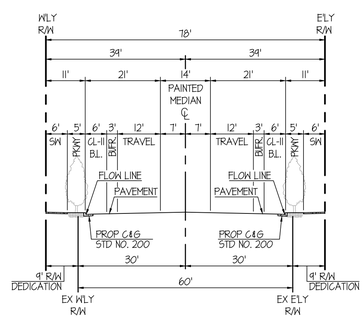
SCALE: 1"=200'



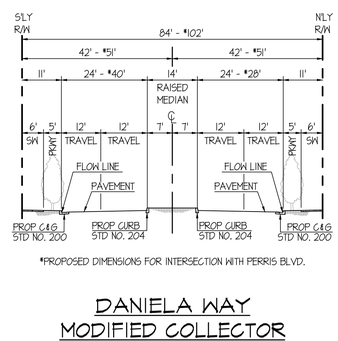
PERRIS BOULEVARD
PRIMARY ARTERIAL
(119'/90')



ORANGE AVENUE
(WEST OF PERRIS BLVD)
SECONDARY ARTERIAL
(109'/81')

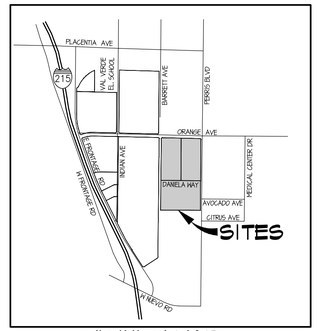


BARRETT AVE
(N'LY WALMART DWY - ORANGE AVE)
MAJOR COLLECTOR
(78'/56')



*PROPOSED DIMENSIONS FOR INTERSECTION WITH PERRIS BLVD.

DANIELA WAY
MODIFIED COLLECTOR
(84'/62')



VICINITY MAP

T4S, R3W, SEC 19
NOT TO SCALE

APPLICANT/OWNER

HOWARD INDUSTRIAL PARTNERS
2244 NORTH PACIFIC STREET
ORANGE, CA 92865
CONTACT: TIM HOWARD
(TEL)714-637-3333

ENGINEER

FMCIVIL ENGINEERS INC.
41870 KALMIA ST., SUITE 120
MURRIETA, CA 92562
CONTACT: FRANCISCO MARTINEZ
(TEL)951-973-0202

ARCHITECT

MMA ARCHITECTURE
120 WEST LIME AVE.
MONROVIA, CA 91016
CONTACT: DANIEL KIM
(TEL)626-583-8348

EARTHWORK ESTIMATE:

RAW CUT:	6,665 CY
RAW FILL:	261,405 CY
NET:	254,740 CY IMPORT

HAUL TRIPS:
ASSUMED (13 CY PER TRIP) = 19,595

CITY OF PERRIS

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-3 - PARCELS 1-12

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF:	

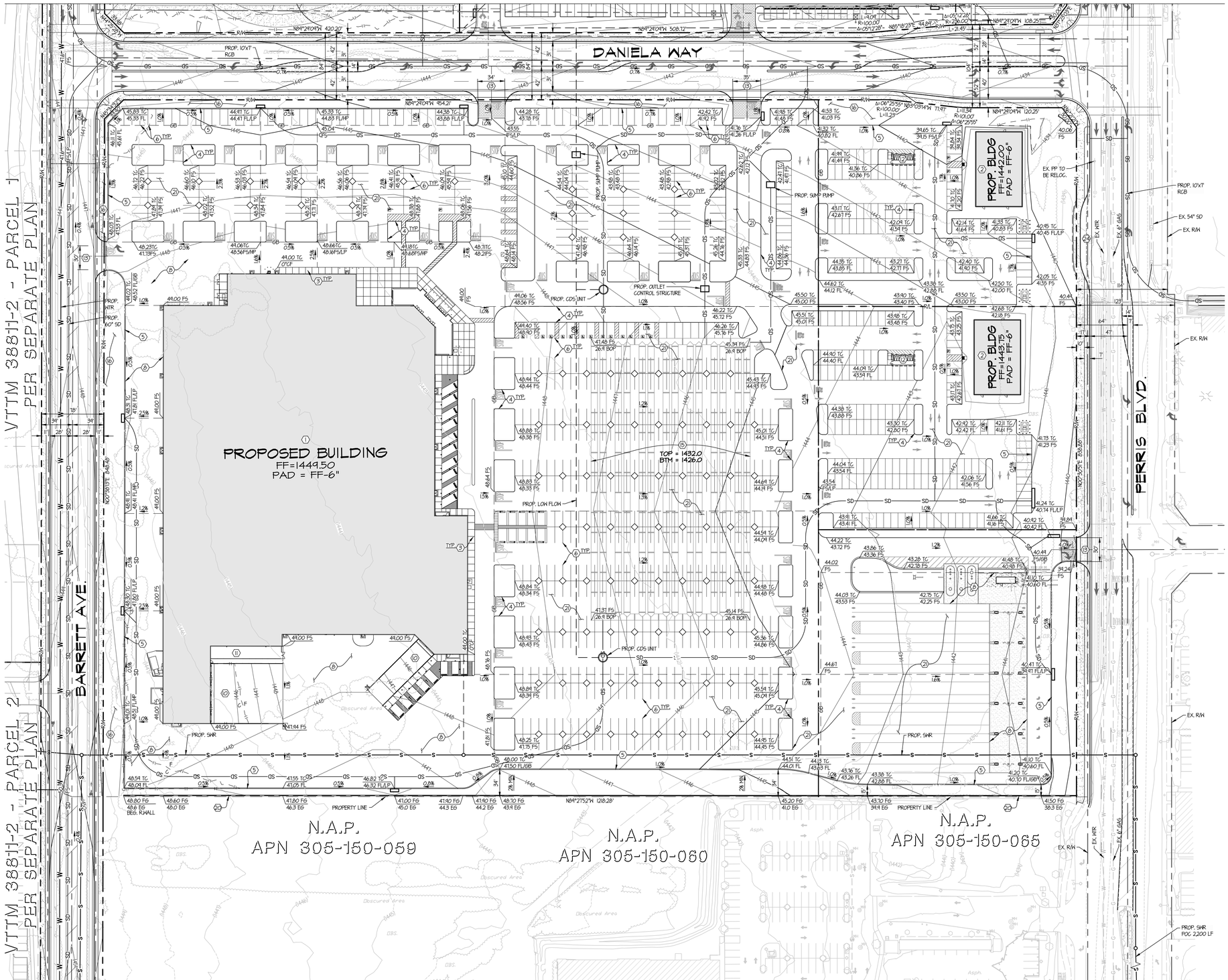
FMCIVIL ENGINEERS INC.
41870 KALMIA STREET, SUITE 120
MURRIETA | CA 92562
951.973.0202 - FMCIVIL.COM

SHEET 1 OF 4 SHEETS

H:\PDATA\26-001 HARVEST LANDING\DWGS\PLNG\ENTITLEMENT\CUP\ALT-3\RETAIL\26-001-CUP_RETAIL-CG-01.DWG ALAN 10/9/2024 9:59 AM

SEE SHEET 4

SEE SHEET 3



SITE PLAN KEYNOTES

1. PAINTED CONCRETE TILT-UP RETAIL / RESTAURANT FACILITY. BUILDING TO BE DESIGNED PER ARCHITECT'S PLANS
2. PAINTED STUCCO FRAMING RETAIL / RESTAURANT FACILITY. BUILDING TO BE DESIGNED PER ARCHITECT'S PLANS
3. ON SITE ACCESSIBLE SIDEWALK AND CURB RAMPS.
4. CONCRETE CURB
5. CONCRETE CURB & GUTTER
6. STANDARD PARKING STALL STRIPING PER STANDARDS SHOWN ON ARCHITECT'S PLANS
7. HANDICAP PARKING STALL STRIPING PER STANDARDS SHOWN ON ARCHITECT'S PLANS
8. PORTLAND CONC. CEMENT (PCC) PAVED TRUCK ACCESS PER ARCHITECT'S PLANS
9. PORTLAND CONC. CEMENT (PCC) PAVED PARKING PER ARCHITECT'S PLANS
10. DEPRESSED LOADING DOCK PER ARCHITECT'S PLANS
11. TRASH COMPACTOR PER ARCHITECT'S PLANS
12. TRASH ENCLOSURES WITH ROOF PER ARCHITECT'S PLANS
13. COMMERCIAL DRIVEWAY APPROACH PER RIVERSIDE COUNTY STD. 207A
14. DETENTION BASIN
15. UNDERGROUND DETENTION CHAMBER SYSTEM - 96" CMP - TOP AND BOTTOM OF PIPE (BOP) ELEVATION PER PLAN
16. LANDSCAPE AREA PER LANDSCAPE ARCHITECT'S PLANS
17. CHAIN LINK FENCE PER ARCHITECT'S PLANS
18. APPROXIMATE LOCATION OF MONUMENT PROJECT SIGNS PER ARCHITECT'S PLANS
19. APPROXIMATE LOCATION OF ELECTRIC TRANSFORMERS
20. RETAINING WALL PER ARCHITECT'S PLANS
21. ASPHALT CONCRETE (AC) PAVED PARKING ARCHITECT'S PLANS
22. PROPOSED CONCRETE RIBBON GUTTER
23. COMPACT PARKING STALL STRIPING PER STANDARDS SHOWN ON ARCHITECT'S PLANS
24. BUS TURNOUT PER RIVERSIDE COUNTY STD. 814

CITY OF PERRIS

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-3 - PARCELS 1-4

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF:	

FMCIVIL ENGINEERS INC.
41870 KALMIA STREET, SUITE 120
MURRIETA | CA 92562
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SHEET 2 OF 4 SHEETS

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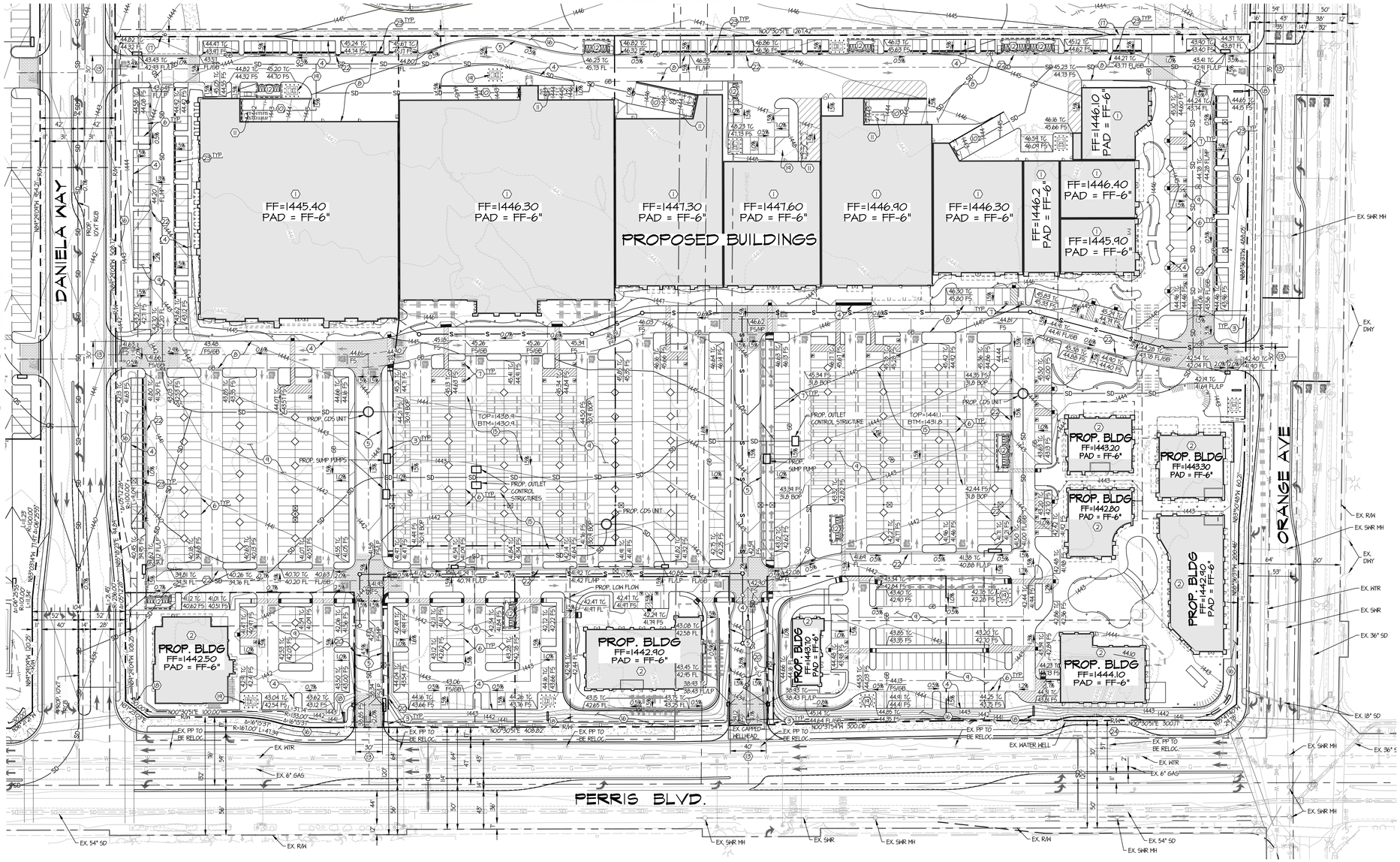
SEE SHEET 4

SEE SHEET 2



SITE PLAN KEYNOTES

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23. COMPACT PARKING STALL STRIPING PER STANDARDS SHOWN ON ARCHITECT'S PLANS
24. BUS TURNOUT PER RIVERSIDE COUNTY STD. 814

SCALE 1"=60'

60 30 0 60 120 180

SCALE: 1"=60'

CITY OF PERRIS

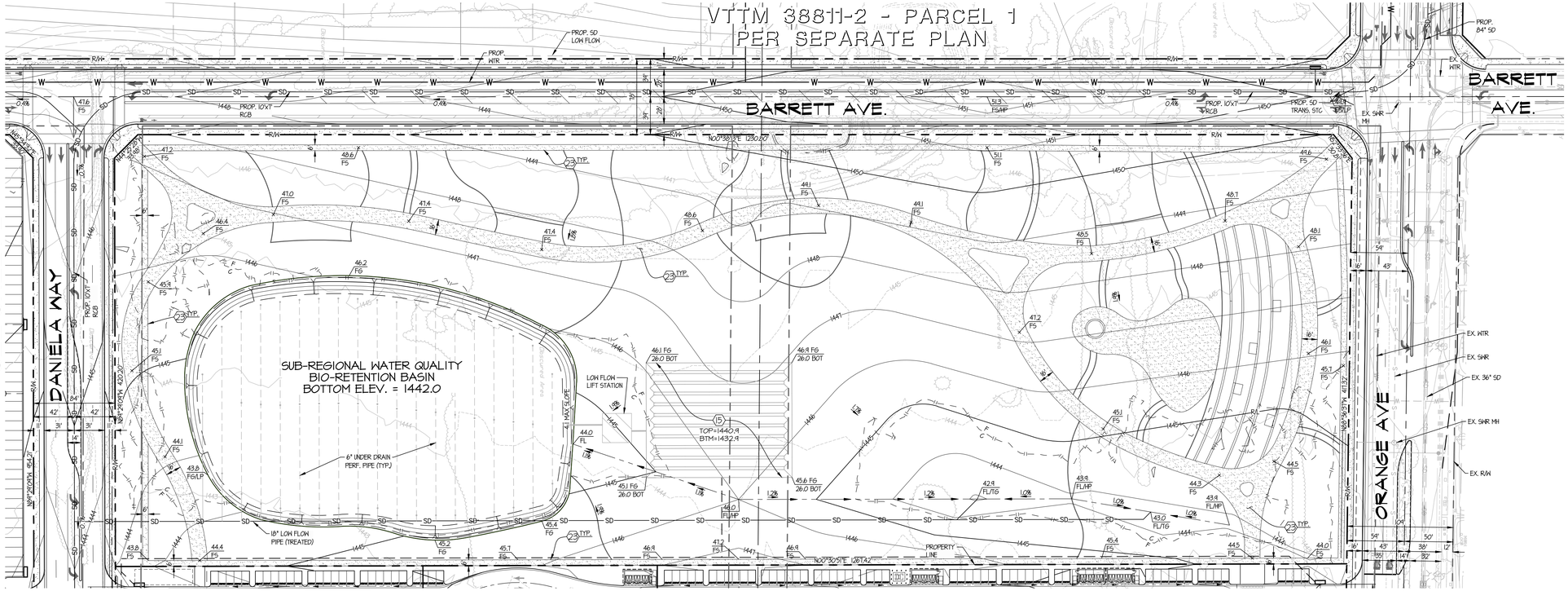
HARVEST LANDING RETAIL CENTER & BUSINESS PARK
CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-3 - PARCELS 5-10

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF.:	

FMCIVIL ENGINEERS INC.
41870 KALMIA STREET, SUITE 120
MURRIETA | CA 92562
951.973.0202 - FMCIVIL.COM

SHEET 3 OF 4 SHEETS

H:\PDATA\20-001 HARVEST LANDING\DWGS\PLNG\ENTITLEMENT\CUP\ALT-3\RETAIL\20-001-CUP_RETAIL-GG-02.DWG ALAN 10/9/2024 4:02 PM



SITE PLAN KEYNOTES

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24. BUS TURNOUT PER RIVERSIDE COUNTY STD. 814

SCALE 1"=60'

60 30 0 60 120 180

SCALE: 1"=60'

CITY OF PERRIS

HARVEST LANDING RETAIL CENTER & BUSINESS PARK
CONCEPTUAL GRADING & DRAINAGE PLAN
VESTING TENTATIVE TRACT MAP 38811-3 - PARCEL 11

SCALE:	AS SHOWN
DATE:	OCT. 2024
DESIGNED:	AJ
CHECKED:	FM
PLN CK REF:	

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41870 KALMIA STREET, SUITE 120
MURRIETA | CA 92562
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SHEET 4 OF 4 SHEETS

H:\DATA\20-001 HARVEST LANDING\DWGS\PLNG\ENTITLEMENT\CUP\ALT-3\RETAIL\20-001-CUP_RETAIL-GG-02.DWG ALAN 10/9/2024 4:02 PM