PRELIMINARY HYDROLOGY REPORT

for

RAMONA & WEBSTER

Located in the City of Perris
County of Riverside

Prepared For:

PROLOGIS
Ahead of what's next

3546 Concour St., Suite 100
Ontario, CA 91764
Tel: (909) 673-8727

Prepared by:

adkan ENGINEERS

6879 Airport Drive
Riverside, CA 92504
Tel (951) 688-0241
Fax (951) 688-0599

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adkan ENGINEERS
CIVIL ENGINEERING • SURVEYING • PLANNING
6879 AIRPORT DRIVE, RIVERSIDE, CA 92504
Tel: 951.688.0241 • Fax: 951.688.0599
www.adkan.com

Table of Contents

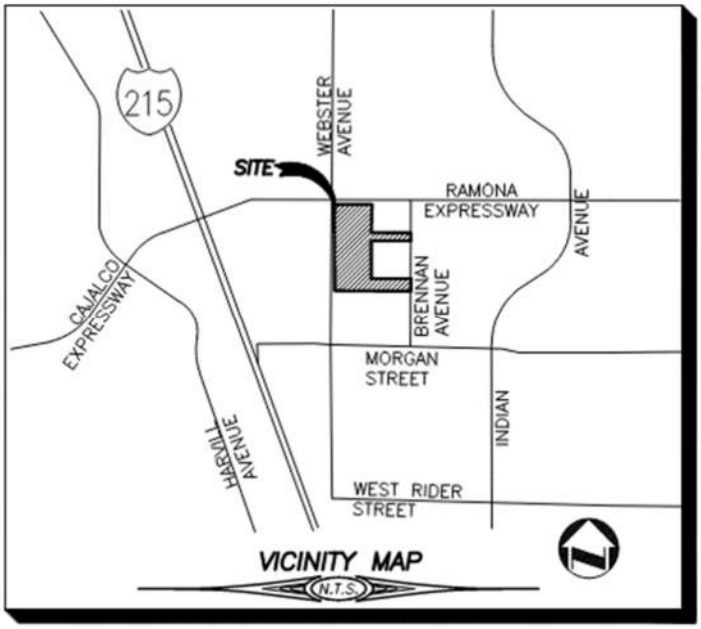
1. Purpose

The purpose of this study is to substantiate the hydrology design for Ramona Express and Webster Avenue. Adkan Engineers has prepared this study to ensure that adequate size and proper operation of drainage facilities are incorporated into the Post-Development project site.

2. Project Description

The Ramona & Webster Project is located at the southeast corner of Ramona Expressway and Webster Avenue. The site condition will propose a commercial/industrial warehouse (approximately 551,700 square-feet) on roughly 29.45 acres. The project proposes an impervious area of 1,103,768 sq. ft., which includes the roof and parking lot. The parking lot, drive aisle, and walkways are estimated to be 557,020 sq. feet. The pervious area is approximately 115,075 sq. ft. for the landscaping.

A. Vicinity Map



3. Pre-Development Hydrology

The existing land use is currently vacant and undeveloped with the exception for the southeast portion of the site that is occupied as an unpaved storage yard for the existing warehouse building. The storage yard will be cleared prior to grading. The existing topography slopes approximately 0.9% in a southwest to north east direction. Existing elevations range from approximately 1486 in the southwest corner to 1471 in the northeast corner (NAVD88). The existing drainage path is characterized by sheet flows that follow the existing topography.

Table 1	North Drainage Area	South Drainage Area
Q10 (cfs)	21.52	6.48
Q100 (cfs)	36.67	10.87
TC (min)	27.81	22.66
Acres	23.26	6.50

4. Post-Development Hydrology

The planned site condition will propose a commercial/industrial warehouse (approximately 551,700 square-feet) on roughly 29.45 acres. All on-site flows that will not be self-treated will be captured and treated before continuing to public facilities. The site proposes, 2 locations for underground chambers, 2 pumps, 2 filtera bioscapes, and 2 bioretention basin. The 2 bioretention basins will have overflow drainage structures. The Bioretention basin near the southwest corner of the proposed warehouse to treat the landscape area in that region. The northwest area of the project will be self-treating. The remaining bioretention basin will be treating the northern entrance of Brennan Avenue.

The initial bioretention basin location was at the north landscape area, however, there is an existing easement that was not indicated on the title report. Therefore, the bioretention basin had to be relocated. A reinforced concrete box (RCB) will replace the existing trapezoidal channel and match existing inverts along Ramona Expressway. The central area flows will be directed to catch basins with DrainPac filters that empty into proposed Contech CMP 96" non-perforated underground chambers that provides storage volume. The drop inlet DrainPac is designed for drop inlet type storm drains. They are installed in a self-supported configuration on the lip of the catch basin underneath the traffic grate. Once the chambers begin to fill, a proposed Jensen 348-S Series lift station will simultaneously force runoff into a Contech bioscape filterra system for treatment before being released into the public system. Similar underground chambers and bioscape filterrra system will be applied to the southern part of the project except for a smaller lift station, Jensen 248-S Series.

The project will not be impacted by offsite flows. There will be drought tolerant landscape area at all self-treating locations and the trash enclosures which will be covered. The proposed project is within a HCOC exemption area. Proposed land use flowrates will not be required to match existing land use flowrates.

Table 2	North Drainage Area	South Drainage Area
Q10 (cfs)	34.75	8.80
Q100 (cfs)	55.24	13.93
TC (min)	12.98	11.61
Acres	21.68	5.35

5. Method of Analysis

The site hydrology was based upon Riverside County Flood Control and Water Conversation District Hydrology Manual, from which pertinent soil and rainfall information was obtained.

Storm flows were determined by the "RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM", Riverside County Flood Control & Water Conservation District 1978 Hydrology Manual, produced by Bondamin Engineering.

6. Conclusion

The hydrologic calculations provided herein substantiate the design of the Post-Development project and indicate the following:

- Facilities will convey the 10 & 100 year storm events. Table 1 shows the pre-development and Table 2 shows the post-development peak flow rates for the 10-year and 100-year storm events.
- All inlets will provide emergency overflows in the event all inlets are plugged.

Therefore, it is our conclusion this project **does not** negatively impact the local community or watershed goals.

Section 1

Pre-Development 10 & 100 year Hydrology (Rational Method)

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 03/08/23 File:ex10.out

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

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

Program License Serial Number 5006

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

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation = 0.500(In.)
100 year, 1 hour precipitation = 1.300(In.)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.829(In/Hr)
Slope of intensity duration curve = 0.5000

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

Initial area flow distance = 1000.000(Ft.)
Top (of initial area) elevation = 1481.000(Ft.)
Bottom (of initial area) elevation = 1474.000(Ft.)
Difference in elevation = 7.000(Ft.)
Slope = 0.00700 s(percent)= 0.70
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 22.660 min.
Rainfall intensity = 1.349(In/Hr) for a 10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.740
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) = 82.00
Pervious area fraction = 1.000; Impervious fraction = 0.000
Initial subarea runoff = 6.486(CFS)
Total initial stream area = 6.500(Ac.)
Pervious area fraction = 1.000
End of computations, total study area = 6.50 (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 = 82.0

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              Riverside County Rational Hydrology Program
CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
       Rational Hydrology Study        Date: 03/08/23  File:ex110.out
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********
 English (in-lb) Units used in input data file
------------------------------------------------------------------------
Program License Serial Number 5006
------------------------------------------------------------------------
Rational Method Hydrology Program based on
Riverside County Flood Control & Water Conservation District 1978 hydrology manual
Storm event (year) =   10.00 Antecedent Moisture Condition = 2
2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.300(In.)
Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.829(In/Hr)
Slope of intensity duration curve = 0.5000

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Process from Point/Station        3.000 to Point/Station        4.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   967.000(Ft.)
Top (of initial area) elevation =  1486.000(Ft.)
Bottom (of initial area) elevation =  1476.500(Ft.)
Difference in elevation =     9.500(Ft.)
Slope =    0.00982  s(percent)=       0.98
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   20.892 min.
Rainfall intensity =      1.405(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.745
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)  =  82.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      8.100(CFS)
Total initial stream area =        7.740(Ac.)
Pervious area fraction = 1.000

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Process from Point/Station        4.000 to Point/Station        5.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1476.500(Ft.)
End of natural channel elevation =   1472.000(Ft.)
Length of natural channel  =   937.000(Ft.)
Estimated mean flow rate at midpoint of channel =     16.222(CFS)
Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   1.96(Ft/s)
Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0048
Corrected/adjusted channel slope =  0.0048
Travel time =    7.95 min.     TC =   28.85  min.
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.723
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)  =  82.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.196(In/Hr) for a    10.0 year storm
Subarea runoff =     13.418(CFS) for     15.520(Ac.)
Total runoff =     21.519(CFS)       Total area =      23.260(Ac.)
End of computations, total study area =           23.26 (Ac.)
The following figures maybe used for a unit hydrograph study of the same area.
Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number =  82.0
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                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 03/08/23  File:ex100.out
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 *********   Hydrology Study Control Information **********

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

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Program License Serial Number 5006

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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

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.300(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.300(In/Hr)
Slope of intensity duration curve = 0.5000




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Process from Point/Station        1.000 to Point/Station        2.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________________
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1481.000(Ft.)
Bottom (of initial area) elevation =  1474.000(Ft.)
Difference in elevation =     7.000(Ft.)
Slope =    0.00700  s(percent)=       0.70
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   22.660 min.
Rainfall intensity =      2.115(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.791
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)  =  82.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     10.871(CFS)
Total initial stream area =        6.500(Ac.)
Pervious area fraction = 1.000
End of computations, total study area =            6.50 (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 =  82.0
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              Riverside County Rational Hydrology Program
CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
       Rational Hydrology Study        Date: 03/08/23  File:ex1100.out
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 *********   Hydrology Study Control Information **********
 English (in-lb) Units used in input data file
------------------------------------------------------------------------
Program License Serial Number 5006
------------------------------------------------------------------------
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
2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.300(In.)
Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.300(In/Hr)
Slope of intensity duration curve = 0.5000

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Process from Point/Station        3.000 to Point/Station        4.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   967.000(Ft.)
Top (of initial area) elevation =  1486.000(Ft.)
Bottom (of initial area) elevation =  1476.500(Ft.)
Difference in elevation =     9.500(Ft.)
Slope =    0.00982  s(percent)=       0.98
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   20.892 min.
Rainfall intensity =      2.203(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.794
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)  =  82.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     13.547(CFS)
Total initial stream area =        7.740(Ac.)
Pervious area fraction = 1.000

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Process from Point/Station        4.000 to Point/Station        5.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1476.500(Ft.)
End of natural channel elevation =   1472.000(Ft.)
Length of natural channel  =   937.000(Ft.)
Estimated mean flow rate at midpoint of channel =     27.129(CFS)

Natural valley channel type used
L.A. County flood control district formula for channel velocity:
 Velocity(ft/s) = (7 + 8(q(English Units)^.352)(slope^0.5)
Velocity using mean channel flow =   2.26(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0048
Corrected/adjusted channel slope =  0.0048
Travel time =    6.92 min.     TC =   27.81  min.
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.780
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)  =  82.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.909(In/Hr) for a   100.0 year storm
Subarea runoff =     23.126(CFS) for     15.520(Ac.)
Total runoff =     36.673(CFS)       Total area =      23.260(Ac.)
End of computations, total study area =           23.26 (Ac.)
The following figures maybe used for a unit hydrograph study of the same area.
Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number =  82.0
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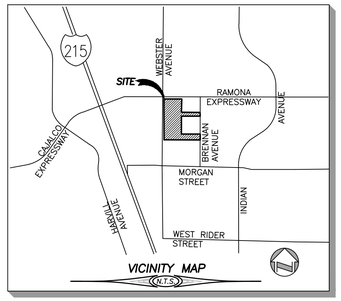
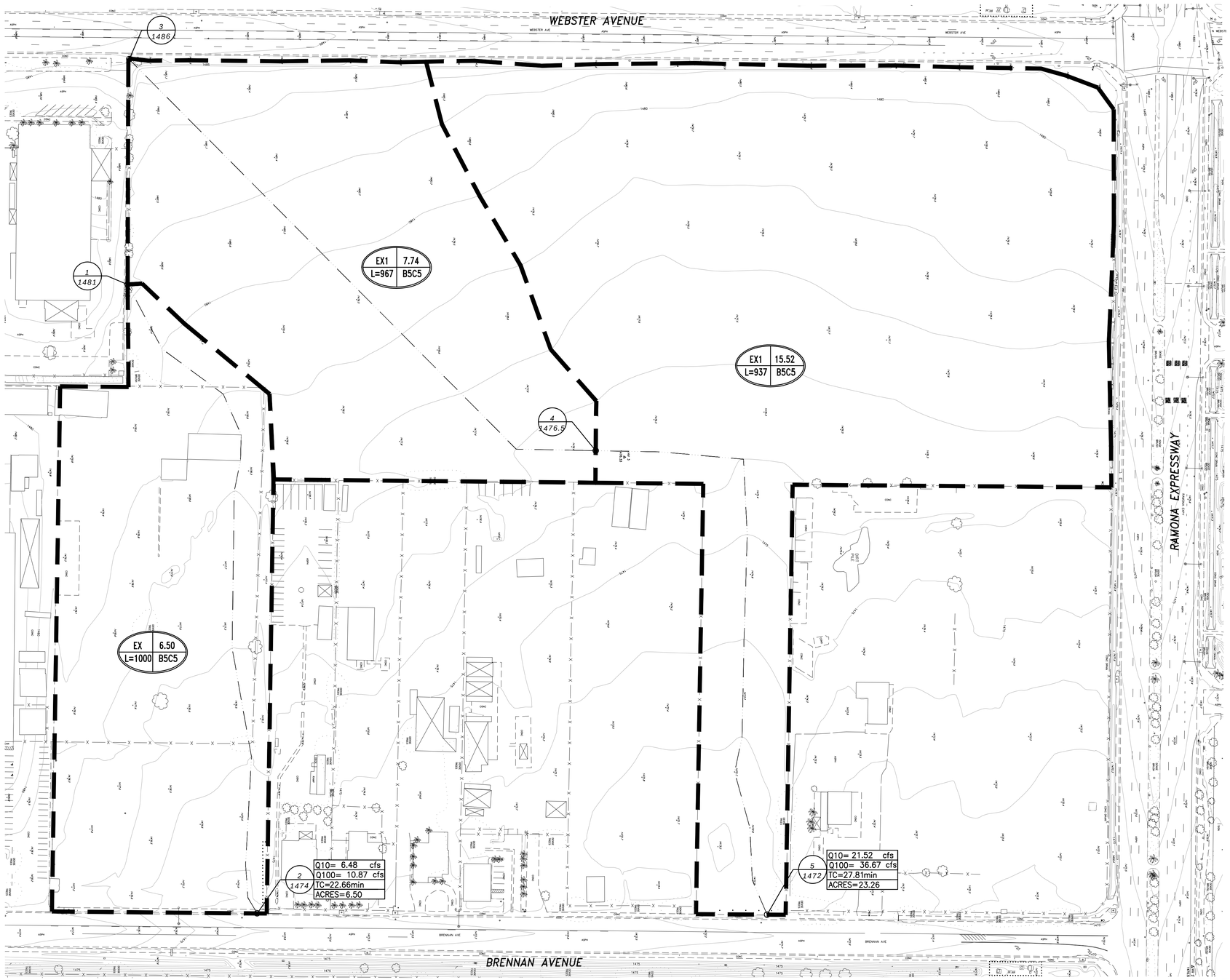
PRE-DEVELOPMENT HYDROLOGY MAP
RAMONA EXPRESS AND WEBSTER AVENUE



LEGEND

- DRAINAGE AREA BOUNDARY
- FLOW PATH
- FLOW ARROW



0 80 240
40 160 320
SCALE: 1" = 80'

PRE DEVELOPMENT HYDROLOGY MAP
PREPARATION DATE: MARCH 2023
REVISION DATE: MAY 2023
JOB NUMBER: 10331
PLANS PREPARED BY:

adkan ENGINEERS
Civil Engineering • Surveying • Planning
6879 Airport Drive, Riverside, CA 92504
Tel:(951) 688-0241 • Fax:(951) 688-0599

PLOT DATE: 5/17/2023 10:57 AM

U:\PROJECTS\PROLOGIS\10331 - RAMONA & WEBSTER\ENGINEERING\HYDROLOGY\10331_EXISTING HYDROLOGY MAP.DWG

Section 2

Post-Development 10 & 100 year Hydrology (Rational Method)

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 04/06/23 File:PRO10.out

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

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

Program License Serial Number 5006

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

Storm event (year) = 10.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation = 0.500(In.)
100 year, 1 hour precipitation = 1.300(In.)

Storm event year = 10.0
Calculated rainfall intensity data:
1 hour intensity = 0.829(In/Hr)
Slope of intensity duration curve = 0.5000

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

Initial area flow distance = 757.000(Ft.)
Top (of initial area) elevation = 1480.100(Ft.)
Bottom (of initial area) elevation = 1475.100(Ft.)
Difference in elevation = 5.000(Ft.)
Slope = 0.00661 s(percent)= 0.66
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.609 min.
Rainfall intensity = 1.885(In/Hr) for a 10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.873
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 = 8.806(CFS)
Total initial stream area = 5.350(Ac.)
Pervious area fraction = 0.100
End of computations, total study area = 5.35 (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 = 62.5

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                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 04/06/23  File:PRO110.out
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

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


Program License Serial Number 5006

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

Storm event (year) =   10.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.300(In.)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.829(In/Hr)
Slope of intensity duration curve = 0.5000




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Process from Point/Station        3.000 to Point/Station        4.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________________
Initial area flow distance =   498.000(Ft.)
Top (of initial area) elevation =  1486.200(Ft.)
Bottom (of initial area) elevation =  1479.510(Ft.)
Difference in elevation =     6.690(Ft.)
Slope =    0.01343  s(percent)=       1.34
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.519 min.
Rainfall intensity =      2.200(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.876
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 =      4.202(CFS)
Total initial stream area =        2.180(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        4.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________________
Upstream point/station elevation =  1479.510(Ft.)
Downstream point/station elevation =  1475.600(Ft.)
Pipe length  =   913.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.202(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     4.202(CFS)
Normal flow depth in pipe =   12.21(In.)
Flow top width inside pipe =   11.67(In.)
Critical Depth =    9.96(In.)
Pipe flow velocity =      3.93(Ft/s)
Travel time through pipe =    3.87 min.
Time of concentration (TC) =    12.39 min.


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Process from Point/Station        4.500 to Point/Station        4.500
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      2.180(Ac.)
Runoff from this stream =      4.202(CFS)
Time of concentration =   12.39 min.
Rainfall intensity =     1.824(In/Hr)
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Process from Point/Station        4.250 to Point/Station        4.500
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   736.000(Ft.)
Top (of initial area) elevation =  1480.000(Ft.)
Bottom (of initial area) elevation =  1475.600(Ft.)
Difference in elevation =     4.400(Ft.)
Slope =    0.00598  s(percent)=       0.60
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.710 min.
Rainfall intensity =      1.877(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.873
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 =     15.551(CFS)
Total initial stream area =        9.490(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station        4.500 to Point/Station        4.500
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      9.490(Ac.)
Runoff from this stream =      15.551(CFS)
Time of concentration =   11.71 min.
Rainfall intensity =     1.877(In/Hr)
Summary of stream data:

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


1        4.202     12.39                 1.824
2       15.551     11.71                 1.877
Largest stream flow has longer or shorter time of concentration
Qp =     15.551 + sum of
          Qa          Tb/Ta
           4.202 *    0.945 =      3.970
Qp =     19.521

Total of 2 streams to confluence:
Flow rates before confluence point:
       4.202      15.551
Area of streams before confluence:
       2.180       9.490
Results of confluence:
Total flow rate =     19.521(CFS)
Time of concentration =    11.710 min.
Effective stream area after confluence =     11.670(Ac.)


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Process from Point/Station        4.500 to Point/Station        6.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1475.600(Ft.)
Downstream point/station elevation =  1469.000(Ft.)
Pipe length  =   350.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    19.521(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    19.521(CFS)
Normal flow depth in pipe =   15.54(In.)
Flow top width inside pipe =   18.42(In.)
Critical Depth =   19.05(In.)
Pipe flow velocity =     10.23(Ft/s)
Travel time through pipe =    0.57 min.
Time of concentration (TC) =    12.28 min.


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Process from Point/Station        6.000 to Point/Station        6.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     11.670(Ac.)
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Runoff from this stream =     19.521(CFS)
Time of concentration =   12.28 min.
Rainfall intensity =     1.833(In/Hr)
Program is now starting with Main Stream No. 2


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Process from Point/Station        7.000 to Point/Station        8.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   469.000(Ft.)
Top (of initial area) elevation =  1483.100(Ft.)
Bottom (of initial area) elevation =  1477.700(Ft.)
Difference in elevation =     5.400(Ft.)
Slope =    0.01151  s(percent)=       1.15
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.577 min.
Rainfall intensity =      2.193(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.876
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 =      5.839(CFS)
Total initial stream area =        3.040(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.000 to Point/Station        9.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1477.700(Ft.)
Downstream point/station elevation =  1475.900(Ft.)
Pipe length  =   299.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.839(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     5.839(CFS)
Normal flow depth in pipe =   11.27(In.)
Flow top width inside pipe =   17.42(In.)
Critical Depth =   11.19(In.)
Pipe flow velocity =      5.01(Ft/s)
Travel time through pipe =    0.99 min.
Time of concentration (TC) =     9.57 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station        9.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      3.040(Ac.)
Runoff from this stream =      5.839(CFS)
Time of concentration =    9.57 min.
Rainfall intensity =     2.076(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.500 to Point/Station        9.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   360.000(Ft.)
Top (of initial area) elevation =  1480.000(Ft.)
Bottom (of initial area) elevation =  1475.900(Ft.)
Difference in elevation =     4.100(Ft.)
Slope =    0.01139  s(percent)=       1.14
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.733 min.
Rainfall intensity =      2.310(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.877
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 =      6.703(CFS)
Total initial stream area =        3.310(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station        9.000 to Point/Station        9.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      3.310(Ac.)
Runoff from this stream =      6.703(CFS)
Time of concentration =    7.73 min.
Rainfall intensity =     2.310(In/Hr)
Summary of stream data:

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


1        5.839      9.57                2.076
2        6.703      7.73                2.310
Largest stream flow has longer or shorter time of concentration
Qp =      6.703 + sum of
          Qa           Tb/Ta
           5.839 *    0.808 =      4.718
Qp =     11.421

Total of 2 streams to confluence:
Flow rates before confluence point:
       5.839       6.703
Area of streams before confluence:
        3.040        3.310
Results of confluence:
Total flow rate =     11.421(CFS)
Time of concentration =     7.733 min.
Effective stream area after confluence =      6.350(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station        6.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________________
Upstream point/station elevation =  1475.200(Ft.)
Downstream point/station elevation =  1469.000(Ft.)
Pipe length  =   279.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.421(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    11.421(CFS)
Normal flow depth in pipe =   11.41(In.)
Flow top width inside pipe =   17.34(In.)
Critical Depth =   15.48(In.)
Pipe flow velocity =      9.67(Ft/s)
Travel time through pipe =    0.48 min.
Time of concentration (TC) =     8.21 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station        6.000
**** CONFLUENCE OF MAIN STREAMS ****
____________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      6.350(Ac.)
Runoff from this stream =     11.421(CFS)
Time of concentration =    8.21 min.
Rainfall intensity =     2.241(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.750 to Point/Station        5.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________________
Initial area flow distance =   472.000(Ft.)
Top (of initial area) elevation =  1480.000(Ft.)
Bottom (of initial area) elevation =  1474.000(Ft.)
Difference in elevation =     6.000(Ft.)
Slope =    0.01271  s(percent)=       1.27
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.431 min.
Rainfall intensity =      2.212(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.876
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 =      5.426(CFS)
Total initial stream area =        2.800(Ac.)
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Pervious area fraction = 0.100

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Process from Point/Station        5.000 to Point/Station        6.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1474.000(Ft.)
Downstream point/station elevation =  1469.000(Ft.)
Pipe length  =    77.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.426(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     5.426(CFS)
Normal flow depth in pipe =    6.68(In.)
Flow top width inside pipe =   11.92(In.)
Critical Depth =   11.24(In.)
Pipe flow velocity =     12.07(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =     8.54 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station        6.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      2.800(Ac.)
Runoff from this stream =      5.426(CFS)
Time of concentration =    8.54 min.
Rainfall intensity =     2.198(In/Hr)
Summary of stream data:

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


1       19.521     12.28               1.833
2       11.421      8.21               2.241
3        5.426      8.54               2.198
Largest stream flow has longer time of concentration
Qp =     19.521 + sum of
          Qb         Ia/Ib
          11.421 *    0.818 =      9.341
          Qb         Ia/Ib
           5.426 *    0.834 =      4.524
Qp =     33.386

Total of 3 main streams to confluence:
Flow rates before confluence point:
      19.521      11.421       5.426
Area of streams before confluence:
       11.670        6.350        2.800


Results of confluence:
Total flow rate =     33.386(CFS)
Time of concentration =    12.280 min.
Effective stream area after confluence  =     20.820(Ac.)


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Process from Point/Station        6.000 to Point/Station       10.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1469.000(Ft.)
Downstream point/station elevation =  1467.000(Ft.)
Pipe length  =   358.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    33.386(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    33.386(CFS)
Normal flow depth in pipe =   23.25(In.)
Flow top width inside pipe =   30.11(In.)
Critical Depth =   23.07(In.)
Pipe flow velocity =      7.46(Ft/s)
Travel time through pipe =    0.80 min.
Time of concentration (TC) =    13.08 min.


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Process from Point/Station       10.000 to Point/Station       10.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     20.820(Ac.)
Runoff from this stream =     33.386(CFS)
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Time of concentration =   13.08 min.
Rainfall intensity =     1.776(In/Hr)


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Process from Point/Station       11.000 to Point/Station       12.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   197.000(Ft.)
Top (of initial area) elevation =  1475.400(Ft.)
Bottom (of initial area) elevation =  1471.200(Ft.)
Difference in elevation =     4.200(Ft.)
Slope =    0.02132  s(percent)=       2.13
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.360 min.
Rainfall intensity =      2.774(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.880
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 =      2.099(CFS)
Total initial stream area =        0.860(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       10.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1471.200(Ft.)
Downstream point/station elevation =  1467.000(Ft.)
Pipe length  =    93.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.099(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     2.099(CFS)
Normal flow depth in pipe =    5.01(In.)
Flow top width inside pipe =    8.94(In.)
Critical Depth =    7.85(In.)
Pipe flow velocity =      8.31(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =     5.55 min.


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Process from Point/Station       10.000 to Point/Station       10.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.860(Ac.)
Runoff from this stream =      2.099(CFS)
Time of concentration =    5.55 min.
Rainfall intensity =     2.727(In/Hr)
Summary of stream data:

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


1       33.386     13.08                 1.776
2        2.099      5.55                 2.727
Largest stream flow has longer time of concentration
Qp =     33.386 + sum of
          Qb          Ia/Ib
           2.099 *    0.651 =      1.367
Qp =     34.753

Total of 2 streams to confluence:
Flow rates before confluence point:
      33.386       2.099
Area of streams before confluence:
       20.820        0.860
Results of confluence:
Total flow rate =     34.753(CFS)
Time of concentration =    13.080 min.
Effective stream area after confluence =     21.680(Ac.)
End of computations, total study area =           21.68 (Ac.)
The following figures maybe used for a unit hydrograph study of the same area.
Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  62.5
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                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 04/06/23  File:PRO210.out
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

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Program License Serial Number 5006

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

Storm event (year) =   10.00 Antecedent Moisture Condition = 2

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.300(In.)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.829(In/Hr)
Slope of intensity duration curve = 0.5000




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Process from Point/Station       13.000 to Point/Station       14.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________________
Initial area flow distance =   287.000(Ft.)
Top (of initial area) elevation =  1485.000(Ft.)
Bottom (of initial area) elevation =  1482.000(Ft.)
Difference in elevation =     3.000(Ft.)
Slope =    0.01045  s(percent)=       1.05
TC = k(0.940)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   22.513 min.
Rainfall intensity =      1.354(In/Hr) for a    10.0 year storm
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.610
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)  =  67.50
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      0.537(CFS)
Total initial stream area =        0.650(Ac.)
Pervious area fraction = 1.000
End of computations, total study area =            0.65 (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 =  67.5
```

Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
Rational Hydrology Study Date: 04/06/23 File:PRO100.out

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

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

Program License Serial Number 5006

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

2 year, 1 hour precipitation = 0.500(In.)
100 year, 1 hour precipitation = 1.300(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity = 1.300(In/Hr)
Slope of intensity duration curve = 0.5000

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

Initial area flow distance = 757.000(Ft.)
Top (of initial area) elevation = 1480.100(Ft.)
Bottom (of initial area) elevation = 1475.100(Ft.)
Difference in elevation = 5.000(Ft.)
Slope = 0.00661 s(percent)= 0.66
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.609 min.
Rainfall intensity = 2.955(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 = 13.927(CFS)
Total initial stream area = 5.350(Ac.)
Pervious area fraction = 0.100
End of computations, total study area = 5.35 (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 = 62.5

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                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 04/06/23  File:PRO1100.out
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 *********   Hydrology Study Control Information **********

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

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Program License Serial Number 5006

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

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.300(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.300(In/Hr)
Slope of intensity duration curve = 0.5000




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Process from Point/Station        3.000 to Point/Station        4.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________________
Initial area flow distance =   498.000(Ft.)
Top (of initial area) elevation =  1486.200(Ft.)
Bottom (of initial area) elevation =  1479.510(Ft.)
Difference in elevation =     6.690(Ft.)
Slope =    0.01343  s(percent)=       1.34
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.519 min.
Rainfall intensity =      3.450(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 = 0.500
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 =      6.642(CFS)
Total initial stream area =        2.180(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.000 to Point/Station        4.500
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________________
Upstream point/station elevation =  1479.510(Ft.)
Downstream point/station elevation =  1475.600(Ft.)
Pipe length  =   913.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.642(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     6.642(CFS)
Normal flow depth in pipe =   14.23(In.)
Flow top width inside pipe =   14.65(In.)
Critical Depth =   11.97(In.)
Pipe flow velocity =      4.43(Ft/s)
Travel time through pipe =    3.43 min.
Time of concentration (TC) =    11.95 min.


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Process from Point/Station        4.500 to Point/Station        4.500
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      2.180(Ac.)
Runoff from this stream =      6.642(CFS)
Time of concentration =   11.95 min.
Rainfall intensity =     2.913(In/Hr)
```

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++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.250 to Point/Station        4.500
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   736.000(Ft.)
Top (of initial area) elevation =  1480.000(Ft.)
Bottom (of initial area) elevation =  1475.600(Ft.)
Difference in elevation =     4.400(Ft.)
Slope =    0.00598  s(percent)=       0.60
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.710 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 = 0.500
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 =     24.596(CFS)
Total initial stream area =        9.490(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station        4.500 to Point/Station        4.500
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      9.490(Ac.)
Runoff from this stream =     24.596(CFS)
Time of concentration =   11.71 min.
Rainfall intensity =     2.943(In/Hr)
Summary of stream data:

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


1        6.642     11.95                 2.913
2       24.596     11.71                 2.943
Largest stream flow has longer or shorter time of concentration
Qp =     24.596 + sum of
          Qa          Tb/Ta
           6.642 *    0.980 =      6.507
Qp =     31.103

Total of 2 streams to confluence:
Flow rates before confluence point:
       6.642      24.596
Area of streams before confluence:
       2.180        9.490
Results of confluence:
Total flow rate =     31.103(CFS)
Time of concentration =    11.710 min.
Effective stream area after confluence =     11.670(Ac.)


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Process from Point/Station        4.500 to Point/Station        6.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1475.600(Ft.)
Downstream point/station elevation =  1469.000(Ft.)
Pipe length  =   350.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    31.103(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    31.103(CFS)
Normal flow depth in pipe =   19.69(In.)
Flow top width inside pipe =   18.43(In.)
Critical Depth =   22.54(In.)
Pipe flow velocity =     11.27(Ft/s)
Travel time through pipe =    0.52 min.
Time of concentration (TC) =    12.23 min.


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Process from Point/Station        6.000 to Point/Station        6.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     11.670(Ac.)
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Runoff from this stream =     31.103(CFS)
Time of concentration =   12.23 min.
Rainfall intensity =     2.880(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        7.000 to Point/Station        8.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   469.000(Ft.)
Top (of initial area) elevation =  1483.100(Ft.)
Bottom (of initial area) elevation =  1477.700(Ft.)
Difference in elevation =     5.400(Ft.)
Slope =    0.01151  s(percent)=       1.15
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.577 min.
Rainfall intensity =      3.438(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 = 0.500
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 =      9.230(CFS)
Total initial stream area =        3.040(Ac.)
Pervious area fraction = 0.100


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Process from Point/Station        8.000 to Point/Station        9.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1477.700(Ft.)
Downstream point/station elevation =  1475.900(Ft.)
Pipe length  =   299.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     9.230(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     9.230(CFS)
Normal flow depth in pipe =   13.57(In.)
Flow top width inside pipe =   20.08(In.)
Critical Depth =   13.57(In.)
Pipe flow velocity =      5.61(Ft/s)
Travel time through pipe =    0.89 min.
Time of concentration (TC) =     9.47 min.


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Process from Point/Station        9.000 to Point/Station        9.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      3.040(Ac.)
Runoff from this stream =      9.230(CFS)
Time of concentration =    9.47 min.
Rainfall intensity =     3.273(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        8.500 to Point/Station        9.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   360.000(Ft.)
Top (of initial area) elevation =  1480.000(Ft.)
Bottom (of initial area) elevation =  1475.900(Ft.)
Difference in elevation =     4.100(Ft.)
Slope =    0.01139  s(percent)=       1.14
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.733 min.
Rainfall intensity =      3.621(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 = 0.500
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 =     10.592(CFS)
Total initial stream area =        3.310(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

```
Process from Point/Station        9.000 to Point/Station        9.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      3.310(Ac.)
Runoff from this stream =     10.592(CFS)
Time of concentration =    7.73 min.
Rainfall intensity =     3.621(In/Hr)
Summary of stream data:

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


1        9.230      9.47                 3.273
2       10.592      7.73                 3.621
Largest stream flow has longer or shorter time of concentration
Qp =     10.592 + sum of
          Qa           Tb/Ta
           9.230 *    0.817 =      7.540
Qp =     18.132

Total of 2 streams to confluence:
Flow rates before confluence point:
       9.230      10.592
Area of streams before confluence:
        3.040        3.310
Results of confluence:
Total flow rate =     18.132(CFS)
Time of concentration =     7.733 min.
Effective stream area after confluence =      6.350(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        9.000 to Point/Station        6.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________________
Upstream point/station elevation =  1475.200(Ft.)
Downstream point/station elevation =  1469.000(Ft.)
Pipe length  =   279.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    18.132(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    18.132(CFS)
Normal flow depth in pipe =   13.79(In.)
Flow top width inside pipe =   19.94(In.)
Critical Depth =   18.59(In.)
Pipe flow velocity =     10.83(Ft/s)
Travel time through pipe =    0.43 min.
Time of concentration (TC) =     8.16 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station        6.000
**** CONFLUENCE OF MAIN STREAMS ****
____________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      6.350(Ac.)
Runoff from this stream =     18.132(CFS)
Time of concentration =    8.16 min.
Rainfall intensity =     3.525(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        4.750 to Point/Station        5.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________________
Initial area flow distance =   472.000(Ft.)
Top (of initial area) elevation =  1480.000(Ft.)
Bottom (of initial area) elevation =  1474.000(Ft.)
Difference in elevation =     6.000(Ft.)
Slope =    0.01271  s(percent)=       1.27
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.431 min.
Rainfall intensity =      3.468(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 = 0.500
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 =      8.576(CFS)
Total initial stream area =        2.800(Ac.)
```

```
Pervious area fraction = 0.100

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        5.000 to Point/Station        6.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1474.000(Ft.)
Downstream point/station elevation =  1469.000(Ft.)
Pipe length  =    77.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.576(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     8.576(CFS)
Normal flow depth in pipe =    9.28(In.)
Flow top width inside pipe =   10.05(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.15(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     8.53 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station        6.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      2.800(Ac.)
Runoff from this stream =      8.576(CFS)
Time of concentration =    8.53 min.
Rainfall intensity =     3.448(In/Hr)
Summary of stream data:

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


1       31.103     12.23               2.880
2       18.132      8.16               3.525
3        8.576      8.53               3.448
Largest stream flow has longer time of concentration
Qp =     31.103 + sum of
          Qb         Ia/Ib
          18.132 *    0.817 =     14.815
          Qb         Ia/Ib
           8.576 *    0.835 =      7.162
Qp =     53.080

Total of 3 main streams to confluence:
Flow rates before confluence point:
      31.103      18.132       8.576
Area of streams before confluence:
       11.670        6.350        2.800


Results of confluence:
Total flow rate =     53.080(CFS)
Time of concentration =    12.228 min.
Effective stream area after confluence  =     20.820(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station        6.000 to Point/Station       10.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1469.000(Ft.)
Downstream point/station elevation =  1467.000(Ft.)
Pipe length  =   358.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    53.080(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    53.080(CFS)
Normal flow depth in pipe =   32.25(In.)
Flow top width inside pipe =   21.99(In.)
Critical Depth =   28.41(In.)
Pipe flow velocity =      7.94(Ft/s)
Travel time through pipe =    0.75 min.
Time of concentration (TC) =    12.98 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       10.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     20.820(Ac.)
Runoff from this stream =     53.080(CFS)
```

```
Time of concentration =   12.98 min.
Rainfall intensity =     2.795(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       11.000 to Point/Station       12.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   197.000(Ft.)
Top (of initial area) elevation =  1475.400(Ft.)
Bottom (of initial area) elevation =  1471.200(Ft.)
Difference in elevation =     4.200(Ft.)
Slope =    0.02132  s(percent)=       2.13
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    5.360 min.
Rainfall intensity =      4.350(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 = 0.500
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 =      3.314(CFS)
Total initial stream area =        0.860(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       12.000 to Point/Station       10.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1471.200(Ft.)
Downstream point/station elevation =  1467.000(Ft.)
Pipe length  =    93.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.314(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     3.314(CFS)
Normal flow depth in pipe =    6.95(In.)
Flow top width inside pipe =    7.55(In.)
Critical depth could not be calculated.
Pipe flow velocity =      9.05(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =     5.53 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       10.000 to Point/Station       10.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      0.860(Ac.)
Runoff from this stream =      3.314(CFS)
Time of concentration =    5.53 min.
Rainfall intensity =     4.282(In/Hr)
Summary of stream data:

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


1       53.080     12.98                 2.795
2        3.314      5.53                 4.282
Largest stream flow has longer time of concentration
Qp =     53.080 + sum of
          Qb          Ia/Ib
           3.314 *    0.653 =      2.164
Qp =     55.243

Total of 2 streams to confluence:
Flow rates before confluence point:
      53.080       3.314
Area of streams before confluence:
       20.820        0.860
Results of confluence:
Total flow rate =     55.243(CFS)
Time of concentration =    12.979 min.
Effective stream area after confluence =     21.680(Ac.)
End of computations, total study area =           21.68 (Ac.)
The following figures maybe used for a unit hydrograph study of the same area.
Area averaged pervious area fraction(Ap) = 0.100
Area averaged RI index number =  62.5
```

```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 04/06/23  File:PRO2100.out
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

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


Program License Serial Number 5006

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

2 year, 1 hour precipitation =  0.500(In.)
100 year, 1 hour precipitation =  1.300(In.)

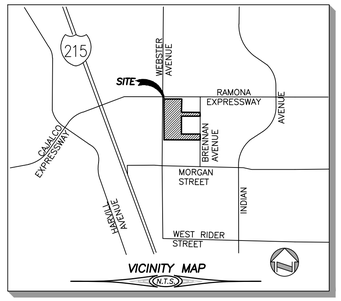
Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.300(In/Hr)
Slope of intensity duration curve = 0.5000




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       13.000 to Point/Station       14.000
**** INITIAL AREA EVALUATION ****
____________________________________________________________________________
Initial area flow distance =   287.000(Ft.)
Top (of initial area) elevation =  1485.000(Ft.)
Bottom (of initial area) elevation =  1482.000(Ft.)
Difference in elevation =     3.000(Ft.)
Slope =    0.01045  s(percent)=       1.05
TC = k(0.940)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   22.513 min.
Rainfall intensity =      2.122(In/Hr) for a   100.0 year storm
UNDEVELOPED (good cover) subarea
Runoff Coefficient = 0.691
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)  =  67.50
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      0.953(CFS)
Total initial stream area =        0.650(Ac.)
Pervious area fraction = 1.000
End of computations, total study area =            0.65 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

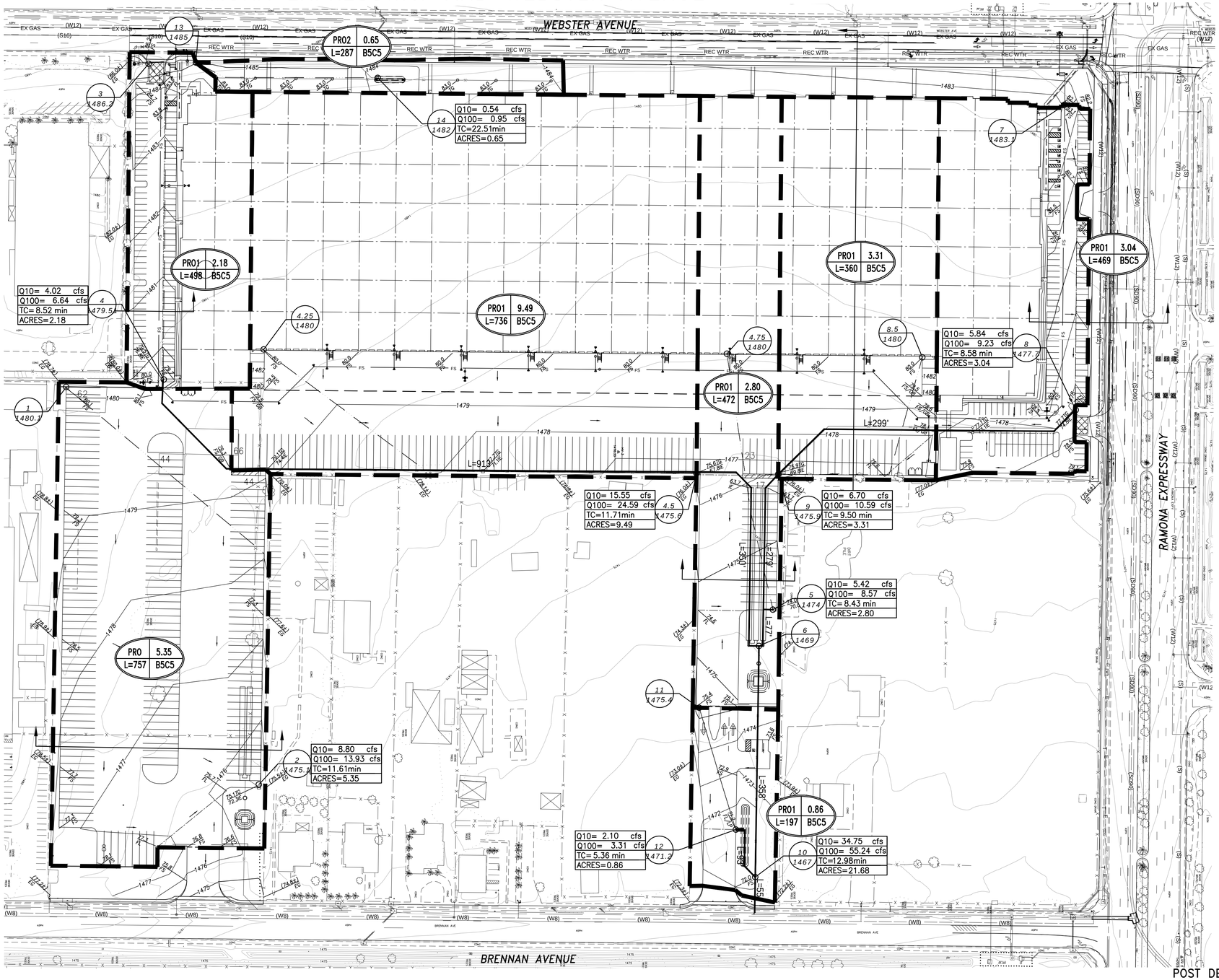
Area averaged pervious area fraction(Ap) = 1.000
Area averaged RI index number =  67.5
```

POST-DEVELOPMENT HYDROLOGY MAP
RAMONA EXPRESSWAY AND WEBSTER AVENUE



LEGEND

- DRAINAGE AREA BOUNDARY
- FLOW PATH
- FLOW ARROW



0 80 240
40 160 320
SCALE: 1" = 80'

POST DEVELOPMENT HYDROLOGY MAP

PREPARATION DATE: MARCH 2023
REVISION DATE: MAY 2023
JOB NUMBER: 10331
PLANS PREPARED BY:

adkan ENGINEERS
Civil Engineering • Surveying • Planning
6879 Airport Drive, Riverside, CA 92504
Tel:(951) 688-0241 • Fax:(951) 688-0599

PLOT DATE: 5/17/2023 11:00 AM

U:\PROJECTS\PROLOGIS\10331 - RAMONA & WEBSTER\ENGINEERING\HYDROLOGY\10331_PROPOSED HYDROLOGY MAP.DWG

Section 3

Inlet Calculations

NODE 2
Worksheet for Curb Inlet In Sag

Project Description	
Worksheet	NODE 2
Type	Curb Inlet In Sag
Solve For	Spread

Input Data		
Discharge	13.93	cfs
Gutter Width	1.00	ft
Gutter Cross Slope	0.080000	ft/ft
Road Cross Slope	0.020000	ft/ft
Curb Opening Length	21.00	ft
Opening Height	0.67	ft
Curb Throat Type	Horizontal	
Local Depression	4.0	in
Local Depression Width	2.00	ft

Results		
Spread	19.64	ft
Throat Incline Angle	90.00	degrees
Depth	0.45	ft
Gutter Depression	0.7	in
Total Depression	4.7	in

NODE 4
Worksheet for Combination Inlet On Grade

Project Description	
Worksheet	NODE 4
Type	Combination Inlet On Grade
Solve For	Efficiency

Input Data		
Discharge	6.64	cfs
Local Depression	4.0	in
Local Depression Width	2.00	ft
Slope	0.005000	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.080000	ft/ft
Road Cross Slope	0.020000	ft/ft
Mannings Coefficient	0.013	
Curb Opening Length	14.00	ft
Grate Width	2.00	ft
Grate Length	2.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.0	%

Options	
Calculation Option	Use Both
Grate Flow Option	Exclude None

Results		
Efficiency	1.00	
Intercepted Flow	6.64	cfs
Bypass Flow	0.00	cfs
Spread	14.78	ft
Depth	0.07	ft
Flow Area	3.4e-2	ft²
Gutter Depression	1.4	in
Total Depression	5.4	in
Velocity	1.07	ft/s
Splash Over Velocity	5.66	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	0.11	
Grate Flow Ratio	1.00	
Equivalent Cross Slope	0.110464	ft/ft
Active Grate Length	1.00	ft
Length Factor	0.94	
Total Interception Length	13.77	ft

NODE 4.5
Worksheet for Combination Inlet In Sag

Project Description	
Worksheet	NODE 4.5
Type	Combination Inlet In Sag
Solve For	Spread

Input Data		
Discharge	24.59	cfs
Local Depression	4.0	in
Local Depression Width	2.00	ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.080000	ft/ft
Road Cross Slope	0.020000	ft/ft
Curb Opening Length	21.00	ft
Opening Height	0.67	ft
Curb Throat Type	Horizontal	
Grate Width	2.00	ft
Grate Length	2.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.0	%

Options	
Calculation Option	Use Both

Results		
Spread	21.12	ft
Throat Incline Angle	90.00	degrees
Depth	0.54	ft
Gutter Depression	1.4	in
Total Depression	5.4	in
Open Grate Area	1.8	ft²
Active Grate Weir Length	4.00	ft

NODE 5
Worksheet for Curb Inlet In Sag

Project Description	
Worksheet	NODE 5
Type	Curb Inlet In Sag
Solve For	Spread

Input Data		
Discharge	8.57	cfs
Gutter Width	1.00	ft
Gutter Cross Slope	0.080000	ft/ft
Road Cross Slope	0.020000	ft/ft
Curb Opening Length	21.00	ft
Opening Height	0.67	ft
Curb Throat Type	Horizontal	
Local Depression	4.0	in
Local Depression Width	2.00	ft

Results		
Spread	14.21	ft
Throat Incline Angle	90.00	degrees
Depth	0.34	ft
Gutter Depression	0.7	in
Total Depression	4.7	in

NODE 8
Worksheet for Curb Inlet In Sag

Project Description	
Worksheet	NODE 8
Type	Curb Inlet In Sag
Solve For	Spread

Input Data		
Discharge	9.23	cfs
Gutter Width	1.00	ft
Gutter Cross Slope	0.080000	ft/ft
Road Cross Slope	0.020000	ft/ft
Curb Opening Length	14.00	ft
Opening Height	0.67	ft
Curb Throat Type	Horizontal	
Local Depression	4.0	in
Local Depression Width	2.00	ft

Results		
Spread	18.66	ft
Throat Incline Angle	90.00	degrees
Depth	0.43	ft
Gutter Depression	0.7	in
Total Depression	4.7	in

NODE 9
Worksheet for Curb Inlet In Sag

Project Description	
Worksheet	NODE 9
Type	Combination Inlet On Grade
Solve For	Efficiency

Input Data		
Discharge	10.59	cfs
Local Depression	4.0	in
Local Depression Width	2.00	ft
Slope	0.005000	ft/ft
Gutter Width	2.00	ft
Gutter Cross Slope	0.080000	ft/ft
Road Cross Slope	0.020000	ft/ft
Mannings Coefficient	0.013	
Curb Opening Length	21.00	ft
Grate Width	2.00	ft
Grate Length	2.00	ft
Grate Type	P-50 mm (P-1-7/8")	
Clogging	50.0	%

Options	
Calculation Option	Use Both
Grate Flow Option	Exclude None

Results		
Efficiency	1.00	
Intercepted Flow	10.59	cfs
Bypass Flow	0.00	cfs
Spread	17.85	ft
Depth	0.48	ft
Flow Area	0.0	ft²
Gutter Depression	1.4	in
Total Depression	5.4	in
Velocity	0.00	ft/s
Splash Over Velocity	5.66	ft/s
Frontal Flow Factor	1.00	
Side Flow Factor	1.00	
Grate Flow Ratio	1.00	
Equivalent Cross Slope	0.094884	ft/ft
Active Grate Length	1.00	ft
Length Factor	1.09	
Total Interception Length	18.35	ft

NODE 12
Worksheet for Curb Inlet In Sag

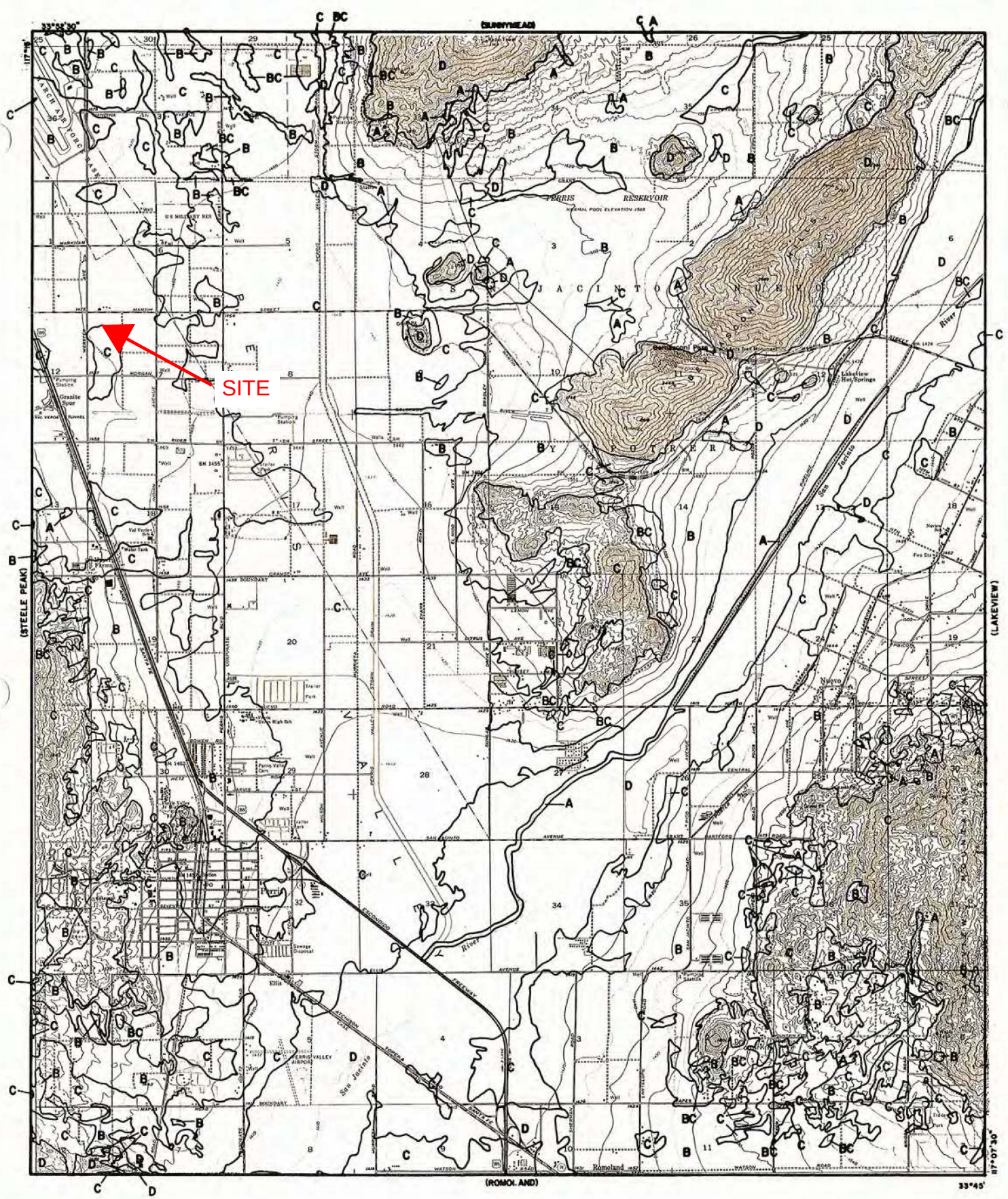
Project Description	
Worksheet	NODE 12
Flow Element	Rectangular Channel
Method	Manning's Formula
Solve For	Channel Depth

Input Data		
Mannings Coefficient	0.013	
Slope	0.005000	ft/ft
Bottom Width	7.00	ft
Discharge	3.31	cfs

Results		
Depth	0.19	ft
Flow Area	1.3	ft²
Wetted Perimeter	7.37	ft
Top Width	7.00	ft
Critical Depth	0.19	ft
Critical Slope	0.004591	ft/ft
Velocity	2.54	ft/s
Velocity Head	0.10	ft
Specific Energy	0.29	ft
Froude Number	1.04	
Flow Type	Supercritical	

Section 4

Riverside County Plates



LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC&WCD

HYDROLOGY MANUAL

N

0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR PERRIS

B-50%
C-50%

PLATE C-1.30

RUNOFF INDEX NUMBERS OF HYDROLOGIC SOIL-COVER COMPLEXES FOR PERVIOUS AREAS-AMC II

Cover Type (3)	Quality of Cover (2)	Soil Group A	B	C	D
NATURAL COVERS -					
Barren (Rockland, eroded and graded land)		78	86	91	93
Chaparrel, Broadleaf (Manzonita, ceanothus and scrub oak)	Poor	53	70	80	85
	Fair	40	63	75	81
	Good	31	57	71	78
Chaparrel, Narrowleaf (Chamise and redshank)	Poor	71	82	88	91
	Fair	55	72	81	86
Grass, Annual or Perennial	Poor	67	78	86	89
	Fair	50	69	79	84
	Good	38	61	74	80
Meadows or Cienegas (Areas with seasonally high water table, principal vegetation is sod forming grass)	Poor	63	77	85	88
	Fair	51	70	80	84
	Good	30	58	72	78
Open Brush (Soft wood shrubs - buckwheat, sage, etc.)	Poor	62	76	84	88
	Fair	46	66	77	83
	Good	41	63	75	81
Woodland (Coniferous or broadleaf trees predominate. Canopy density is at least 50 percent)	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	28	55	70	77
Woodland, Grass (Coniferous or broadleaf trees with canopy density from 20 to 50 percent)	Poor	57	73	82	86
	Fair	44	65	77	82
	Good	33	58	72	79
URBAN COVERS -					
Residential or Commercial Landscaping (Lawn, shrubs, etc.)	Good	32	56	69	75
Turf (Irrigated and mowed grass)	Poor	58	74	83	87
	Fair	44	65	77	82
	Good	33	58	72	79
AGRICULTURAL COVERS -					
Fallow (Land plowed but not tilled or seeded)		76	85	90	92

RCFC & WCD
HYDROLOGY MANUAL

RUNOFF INDEX NUMBERS FOR PERVIOUS AREA

PLATE D-5.5 (1 of 2)

ACTUAL IMPERVIOUS COVER

Land Use (1)	Range-Percent	Recommended Value For Average Conditions-Percent(2)
Natural or Agriculture	0 - 10	0
Single Family Residential: (3)		
40,000 S. F. (1 Acre) Lots	10 - 25	20
20,000 S. F. (½ Acre) Lots	30 - 45	40
7,200 - 10,000 S. F. Lots	45 - 55	50
Multiple Family Residential:		
Condominiums	45 - 70	65
Apartments	65 - 90	80
Mobile Home Park	60 - 85	75
Commercial, Downtown Business or Industrial	80 -100	90

Notes:

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

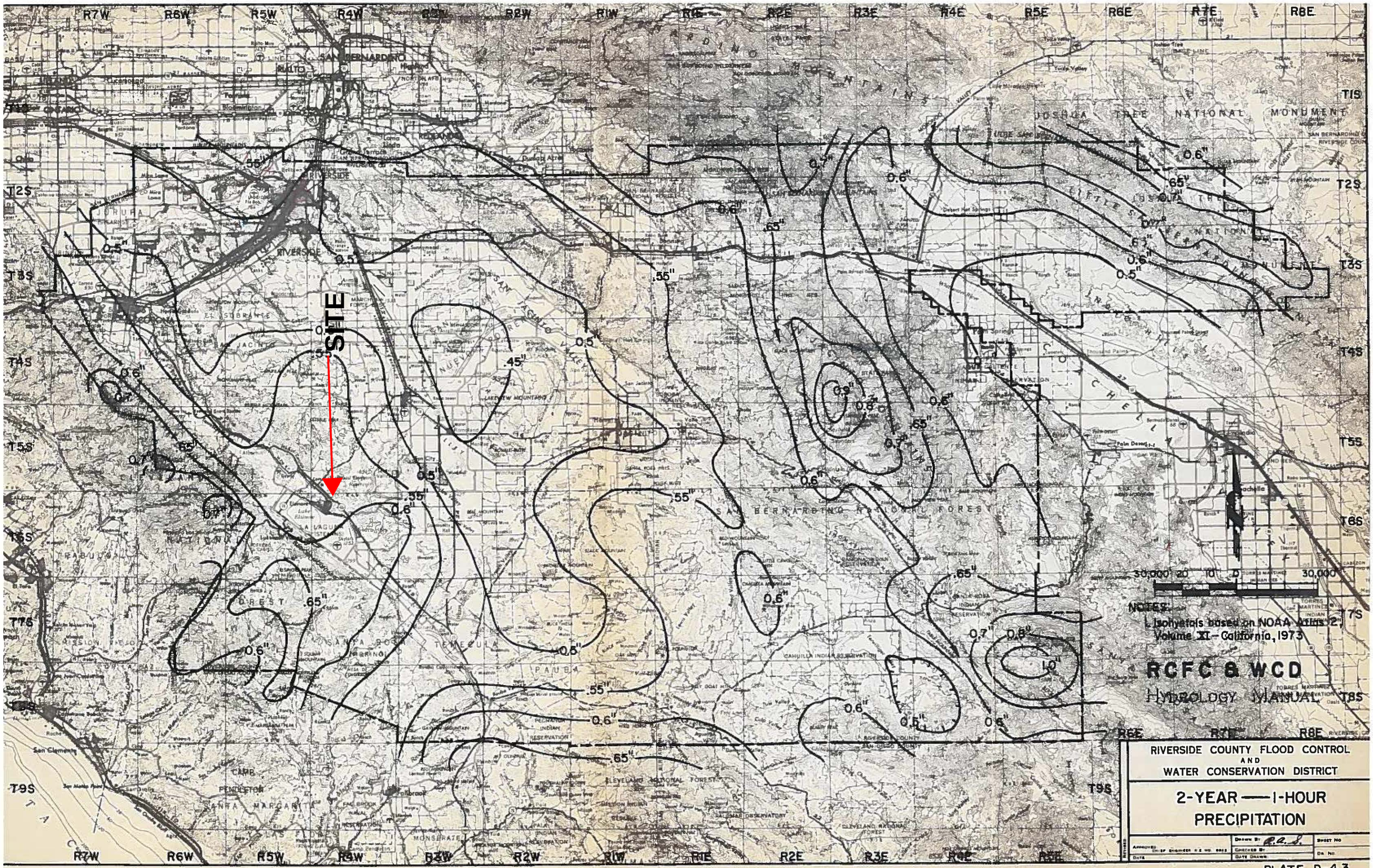
2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some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

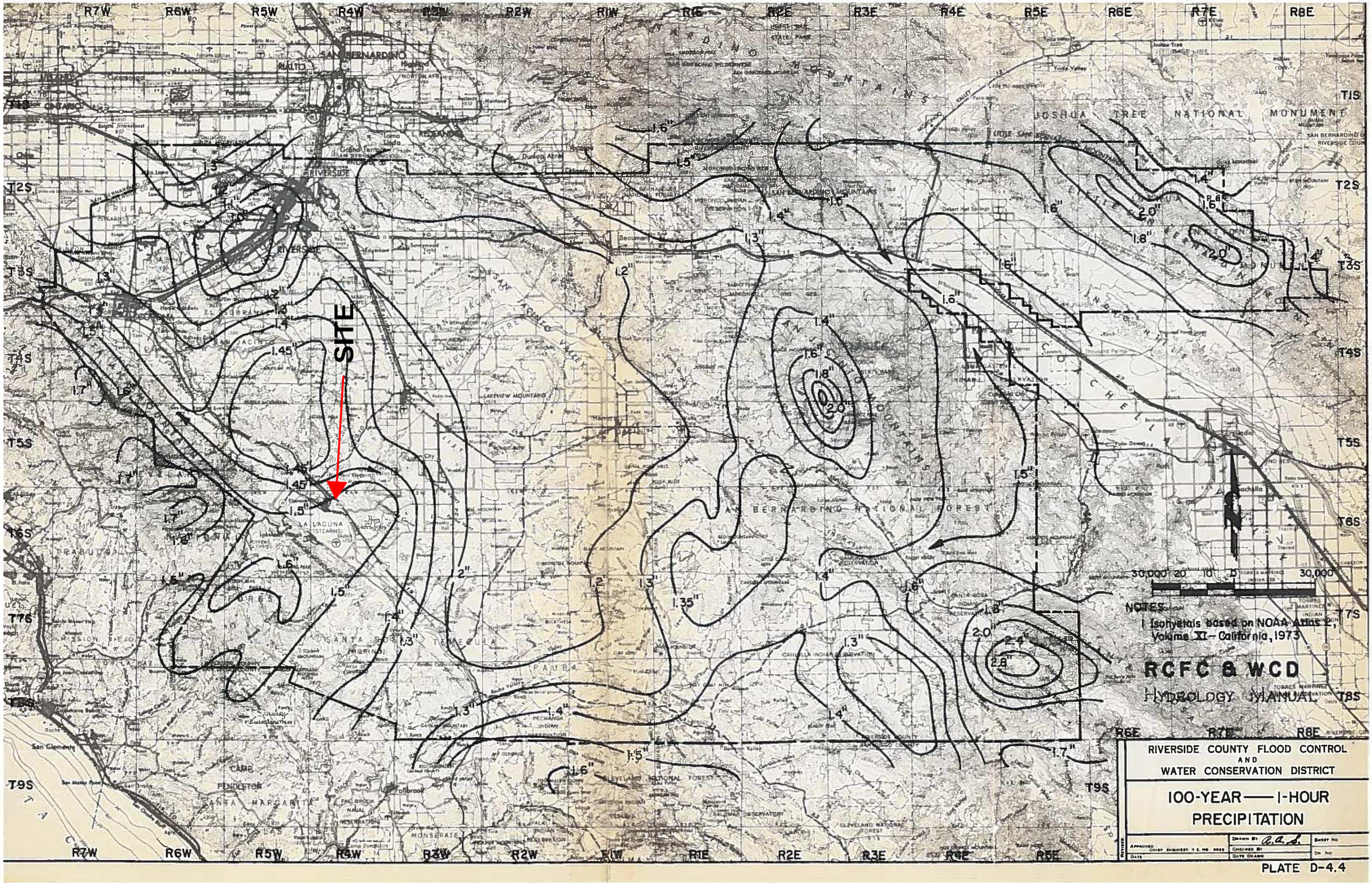
3. For typical horse ranch subdivisions increase impervious area 5 percent over the values recommended in the table above.

RCFC & WCD
HYDROLOGY MANUAL

IMPERVIOUS COVER FOR DEVELOPED AREAS

PLATE D-5.6


SITE
.55"
0.5"
0.6"
0.7"
.65"
.45"
0.9"
1.0"
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



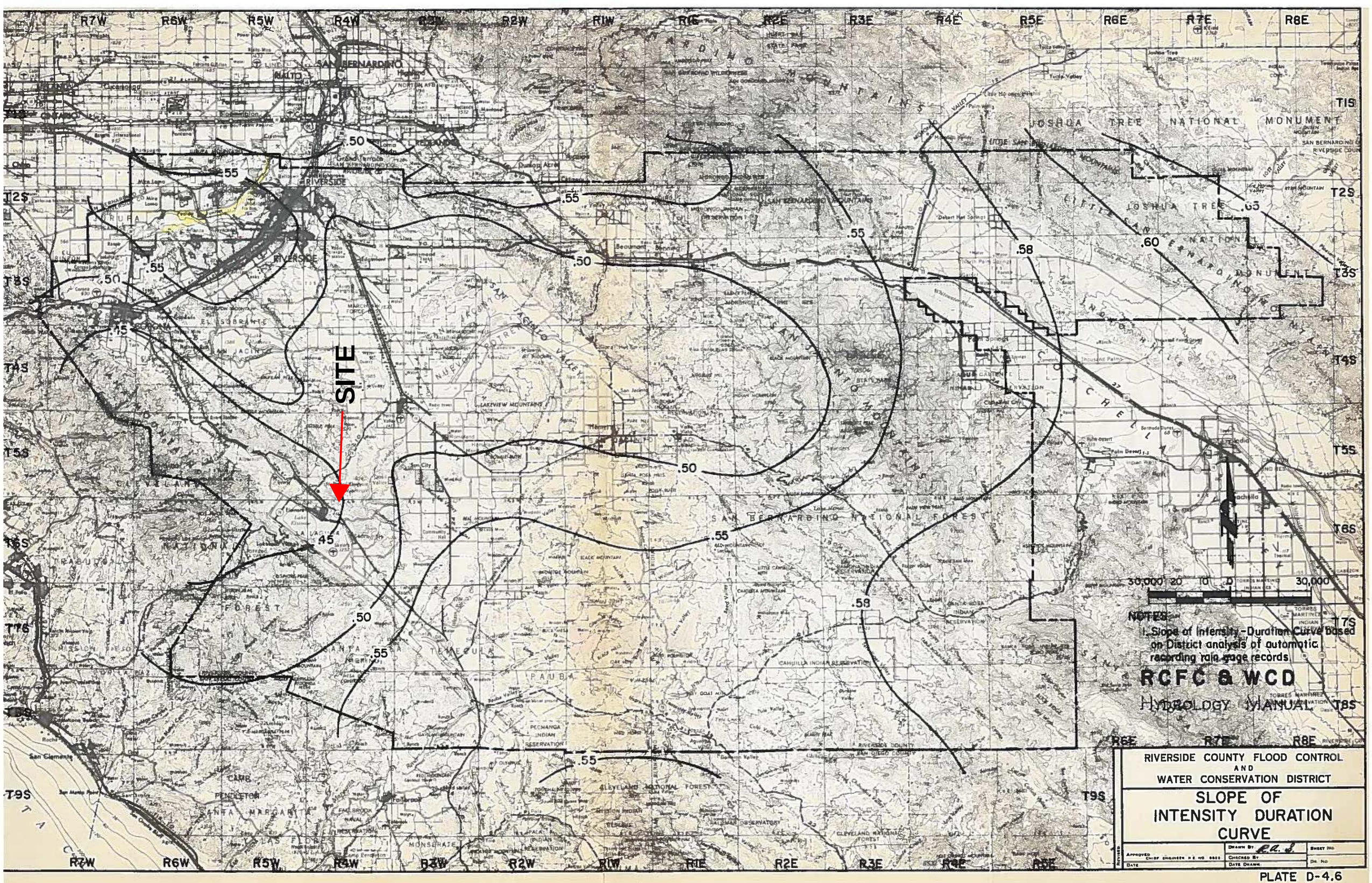
NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI – California, 1973

RCFC & WCD
HYDROLOGY MANUAL

RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

100-YEAR — 1-HOUR PRECIPITATION

PLATE D-4.4


SITE
.50
.55
.45
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NOTES:
1. Slope of Intensity-Duration Curve based on District analysis of automatic recording rain gage records.
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
SLOPE OF INTENSITY DURATION CURVE
PLATE D-4.6