Preliminary Hydrology Analysis
TTM 32372 – 'Stoneridge Industrial'

Prepared for

Richland Communities

August 2021

Hunsaker & Associates

PRELIMINARY HYDROLOGY ANALYSIS
Tentative Tract Map 32372
Stoneridge Industrial

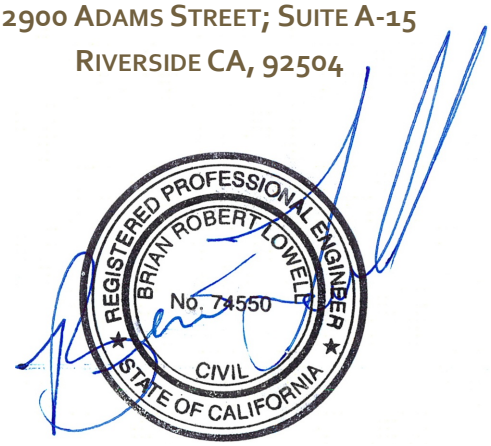
FOR

RICHLAND COMMUNITIES
3161 MICHELSON, SUITE 425
IRVINE, CA 92612
(949) 261-7016

COUNTY OF RIVERSIDE
CALIFORNIA

PREPARED BY:

HUNSAKER & ASSOCIATES
IRVINE, INC.
PLANNING ▪ ENGINEERING ▪ SURVEYING
2900 ADAMS STREET; SUITE A-15
RIVERSIDE CA, 92504



Brian R. Lowell, R.C.E. 74550

August 2021

W.O. # 3763-7

TABLE OF CONTENTS

SECTION 1 – SUMMARY ____ 1-1
INTRODUCTION ____ 1-1
EXISTING CONDITIONS ____ 1-1
PROPOSED DRAINAGE FACILITIES ____ 1-1
METHODOLOGY ____ 1-4
CONCLUSION ____ 1-4
LOCATION MAP ____ 1-5
SECTION 2 – RIVERSIDE COUNTY FLOOD CONTROL DATA ____ 2-1
RIVERSIDE COUNTY SOIL GROUP MAP – PERRIS PLATE C1-30 ____ 2-2
SLOPE-INTENSITY DURATION CURVE ____ 2-3
INTENSITY DURATION CURVE ____ 2-4
SECTION 3 – RATIONAL METHOD ANALYSIS ____ 3-1
SECTION 4 – UNIT HYDROGRAPH ANALYSIS ____ 4-1
SECTION 5 – SOILS DATA ____ 5-1
WEB SOIL SURVEY DATA ____ 5-2
GEOTECHNICAL INVESTIGATION – LGC GEOTECHNICAL INC. (SEPTEMBER 2019) ____ 5-7
SECTION 6 – HYDROLOGY MAPS ____ 6-1

SECTION 1 - Summary

Introduction

Hunsaker and Associates is pleased to present the backup hydrology and hydraulics that will be used for the planning phase of the Stoneridge Industrial Site in the unincorporated portion of Riverside County, near the City of Perris California.

The proposed industrial development is located east of the City of Perris, west of the City of Nuevo and south of the Lake Perris Reservoir in the unincorporated portion of Riverside County, California. The project is located on approximately 582.6 acres owned by Richland Communities. Previously, the site was proposed for a mixed-use development featuring commercial, residential, Sports Park, open space and associated improvements. The proposed development will consist of industrial, retail and associated open space/landscaping, streets and supporting infrastructure. The proposed industrial and mixed use development will consist of approximately 22 buildings. Additionally, the project will have conservation/floodplain areas east of the development and conservation areas west of the development. Generally, the project is situated 4 miles east of Interstate 215 and south of the Ramona Expressway, as shown on the included vicinity map.

Existing Conditions

The project site, TTM 32372, consists of vacant undeveloped land. This area is comprised of various soil types, as is shown on the included soils map. The site is situated within the San Jacinto River sub-watershed portion of the Santa Ana River watershed. Furthermore, the project lies along the northwesterly banks of the San Jacinto River. The topography of the site is typical of the Perris Valley in that it exhibits gently rolling topography with elevations ranging from approximately 1425 feet to 1695 feet above mean sea level.

Proposed Drainage Facilities

The proposed development, TTM 32372, divides the site into three onsite drainage areas 'A', 'B', and 'C'; furthermore it also accounts for 2 existing offsite areas 'D' and 'E' that will flow through the proposed development separate from the on-site storm drain to the San Jacinto River. Generally, the site drains south and easterly towards and into the San Jacinto River. Each drainage management area will be tributary to one of three detention basins that are sized to mitigate any increase in storm volume, increase in peak flow rate as well as meeting hydromodification requirements. Water quality objectives will be achieved through implementation of individual on lot 'Modular Wetland Systems (MWS)'. Please refer to the preliminary water quality management plan (P.W.Q.M.P.) prepared for this project by Hunsaker & Associates.

All flows generated from the project will eventually be conveyed to the San Jacinto River, where it will follow the natural path of the San Jacinto River Sub-Watershed towards the natural low point, Lake Elsinore.

Drainage Management Area 'A'

Drainage management area 'A' consists of northeasterly most 89.6 acres. Run-off from DMA 'A' is collected by a series of catch basins which are connected to the proposed public storm drain system within the development, flowing easterly towards and into proposed detention basin 'A', located in the northeastern most corner of the site. Basin 'A' will be sized to mitigate any increase in storm volume, increase in peak flow rate as well as meeting hydromodification requirements. Generally, the DMA drains easterly towards the San Jacinto River. Effluent from basin 'A' will follow the natural drainage course and flow south easterly towards and into the San Jacinto River.

The proposed development will increase the peak flow rate and volume of storm water run-off. The largest peak flow rate increase is anticipated to be during the 10 year 1 hour storm event, where the anticipated flow rate increased by 32.0 cfs, as compared to natural condition. This increase will be mitigated by the proposed detention basin 'A'.

DRAINAGE MANAGEMENT AREA 'A' – UNIT HYDROGRAPH – PEAK FLOW RATE (cfs)						
	10 YEAR			100 YEAR		
	Existing	Proposed	Mitigation Flowrate	Existing	Proposed	Mitigation Flowrate
1 HOUR	109.7	141.7	**32.0**	208.6	234.9	**26.3**
3 HOUR	57.7	82.6	**24.9**	117.6	132.4	**14.8**
6 HOUR	45.9	70.7	**24.8**	104.4	119.6	**15.2**
24 HOUR	3.3	24.7	**21.4**	33.8	43.3	**9.5**

The largest storm volume increase was experienced during the 10 year 24 hour storm event, where the anticipated run-off is increased by 13.13 acre-feet from the natural condition. This increase is being mitigated by the proposed infiltration/detention basin located on the southern corner of the site.

DRAINAGE MANAGEMENT AREA 'A' – UNIT HYDROGRAPH – STORM VOLUME (Ac-Ft)						
	10 YEAR			100 YEAR		
	Existing	Proposed	Mitigation Volume	Existing	Proposed	Mitigation Volume
1 HOUR	2.95	4.84	**1.89**	7.54	8.40	**0.86**
3 HOUR	2.76	7.34	**4.58**	9.25	11.85	**2.60**
6 HOUR	2.77	9.63	**6.86**	10.49	15.97	**5.48**
24 HOUR	1.94	15.07	**13.13**	11.14	24.17	**13.03**

Drainage Management Area 'B'

Drainage management area 'B' consists of central most 560.2 acres. Run-off from DMA 'B' is collected by a series of catch basins which are connected to the proposed public storm drain system within the development, flowing northeasterly towards and into proposed detention basin 'B', located in the northeastern most corner of DMA 'B'. Basin 'B' will be sized to mitigate any increase in storm volume, increase in peak flow rate as well as meeting hydromodification requirements. Generally, the DMA drains northeasterly towards the San Jacinto River. Effluent from basin 'B' will follow the natural drainage course and flow south easterly towards and into the San Jacinto River.

The proposed development will increase the peak flow rate and volume of storm water run-off. The largest peak flow rate increase is anticipated to be during the 100 year 3 hour storm event, where the anticipated flow rate increased by 216.2 cfs, as compared to natural condition. This increase will be mitigated by the proposed detention basin 'B'.

DRAINAGE MANAGEMENT AREA 'B' – UNIT HYDROGRAPH – PEAK FLOW RATE (cfs)						
	10 YEAR			100 YEAR		
	Existing	Proposed	Mitigation Flowrate	Existing	Proposed	Mitigation Flowrate
1 HOUR	206.0	373.4	**167.4**	426.1	626.9	**200.8**
3 HOUR	145.3	361.5	**216.2**	317.0	421.9	**104.9**
6 HOUR	120.7	230.8	**110.1**	296.4	392.2	**95.8**
24 HOUR	17.0	88.6	**71.6**	116.5	154.9	**38.4**

The largest storm volume increase was experienced during the 10 year 24 hour storm event, where the anticipated run-off is increased by 48.1 acre feet from the natural condition. This increase is being mitigated by the proposed infiltration/detention basin located on the southern corner of the site.

DRAINAGE MANAGEMENT AREA 'B' – UNIT HYDROGRAPH – STORM VOLUME (Ac-Ft)						
	10 YEAR			100 YEAR		
	Existing	Proposed	Mitigation Volume	Existing	Proposed	Mitigation Volume
1 HOUR	11.7	17.9	**6.2**	28.3	31.0	**2.7**
3 HOUR	11.2	27.1	**15.9**	35.6	43.9	**8.3**
6 HOUR	11.3	35.6	**24.3**	41.5	59.1	**17.6**
24 HOUR	7.5	55.6	**48.1**	45.0	89.5	**44.5**

Drainage Management Area 'C'

Similarly, drainage management area 'C' consists of southernmost 53.0 acres plus an additional 15.9 acres off-site to the west that are tributary to the site. Run-off from DMA 'C' is collected by a series of catch basins which are connected to the proposed public storm drain system within the development, flowing southerly towards and into proposed detention basin 'C', located in the southernmost corner of the project site. Basin 'C' will be sized to mitigate any increase in storm volume, increase in peak flow rate as well as meeting hydromodification requirements. Generally, the DMA drains southerly towards the San Jacinto River. Effluent from basin 'C' will follow the natural drainage course and flow southerly towards and into the San Jacinto River.

The proposed development will increase the peak flow rate and volume of storm water run-off. The largest peak flow rate increase is anticipated to be during the 10 year 6 hour storm event, where the anticipated flow rate increased by 18.9 cfs, as compared to natural condition. This increase will be mitigated by the proposed detention basin 'C'.

DRAINAGE MANAGEMENT AREA 'C' – UNIT HYDROGRAPH – PEAK FLOW RATE (cfs)						
	10 YEAR			100 YEAR		
	Existing	Proposed	Mitigation Flowrate	Existing	Proposed	Mitigation Flowrate
1 HOUR	94.1	105.6	**11.5**	173.8	174.9	**1.1**
3 HOUR	48.5	65.6	**17.1**	94.8	104.6	**9.8**
6 HOUR	38.8	57.7	**18.9**	84.1	96.8	**12.7**
24 HOUR	4.3	19.1	**14.8**	27.3	33.9	**6.6**

The largest storm volume increase was experienced during the 10 year 24 hour storm event, where the anticipated run-off is increased by 10.0 acre feet from the natural condition. This increase is being mitigated by the proposed infiltration/detention basin located on the southern corner of the site.

DRAINAGE MANAGEMENT AREA 'C' – UNIT HYDROGRAPH – STORM VOLUME (Ac-Ft)						
	10 YEAR			100 YEAR		
	Existing	Proposed	Mitigation Volume	Existing	Proposed	Mitigation Volume
1 HOUR	2.4	3.7	**1.3**	5.9	6.5	**0.6**
3 HOUR	2.3	5.7	**3.4**	7.4	9.2	**1.8**
6 HOUR	2.3	7.4	**5.1**	8.6	12.4	**3.8**
24 HOUR	1.6	11.6	**10.0**	9.3	18.8	**9.5**

Drainage Management Areas 'D' & 'E'

These areas lead all of their flows into the proposed commercial development. Thus, a separate storm drain that will not be treated will be proposed so that the existing flows can reach the San Jacinto River. Area D and Area E flowrates are 282.8 cfs and 206.8 cfs respectively. The flowrates will be used to design the adequate capacity of offsite storm drain.

Hydromodification (Hydraulic Condition of Concern ~ H.C.O.C.)

Development of the site is anticipated to both increase the storm run-off volume and decrease the time of concentration. 'Hydromodification' will be addressed by mimicking the pre-development hydrograph with the post-development hydrograph for the 2-year, 24-hour return frequency storm. By sizing the detention basins 'A'. 'B' and 'C' to capture and detain the largest storm volume increase, the detention basins will then be able address hydromodification by slowly metering out the retained volume at a flow rate less than or equal to the pre-development condition flow rates. Basin routing and outlet structure details are not included within this analysis, and will be provided during the final engineering phase of the project.

Methodology

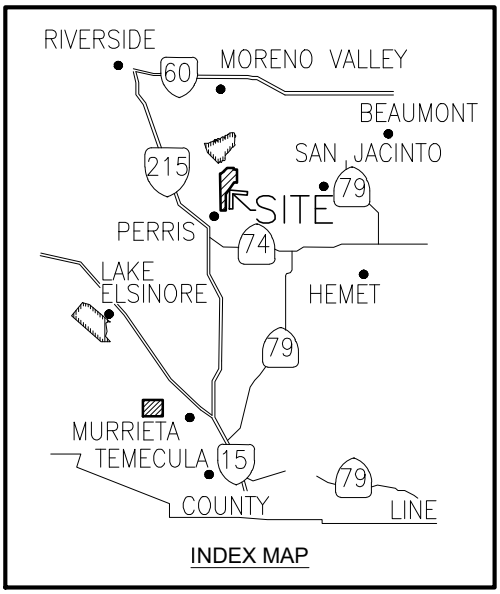
This hydrology report is to be used only to analyze flow to, through, and out of the site using the Riverside County Rational Method. In regard to pipe sizing, the hydrology programs were utilized only as a tool for obtaining preliminary sizing of the storm drain facilities by allowing the program to determine minimum pipe sizes. The actual storm drain system and pipe sizes shall be designed per Riverside County Flood Control District criteria during final engineering. Civil Design Version 7.0 Computer Software Program and AES Engineering Software 2011 version were used in generating the hydrological and hydraulic analysis for this report.

Conclusion

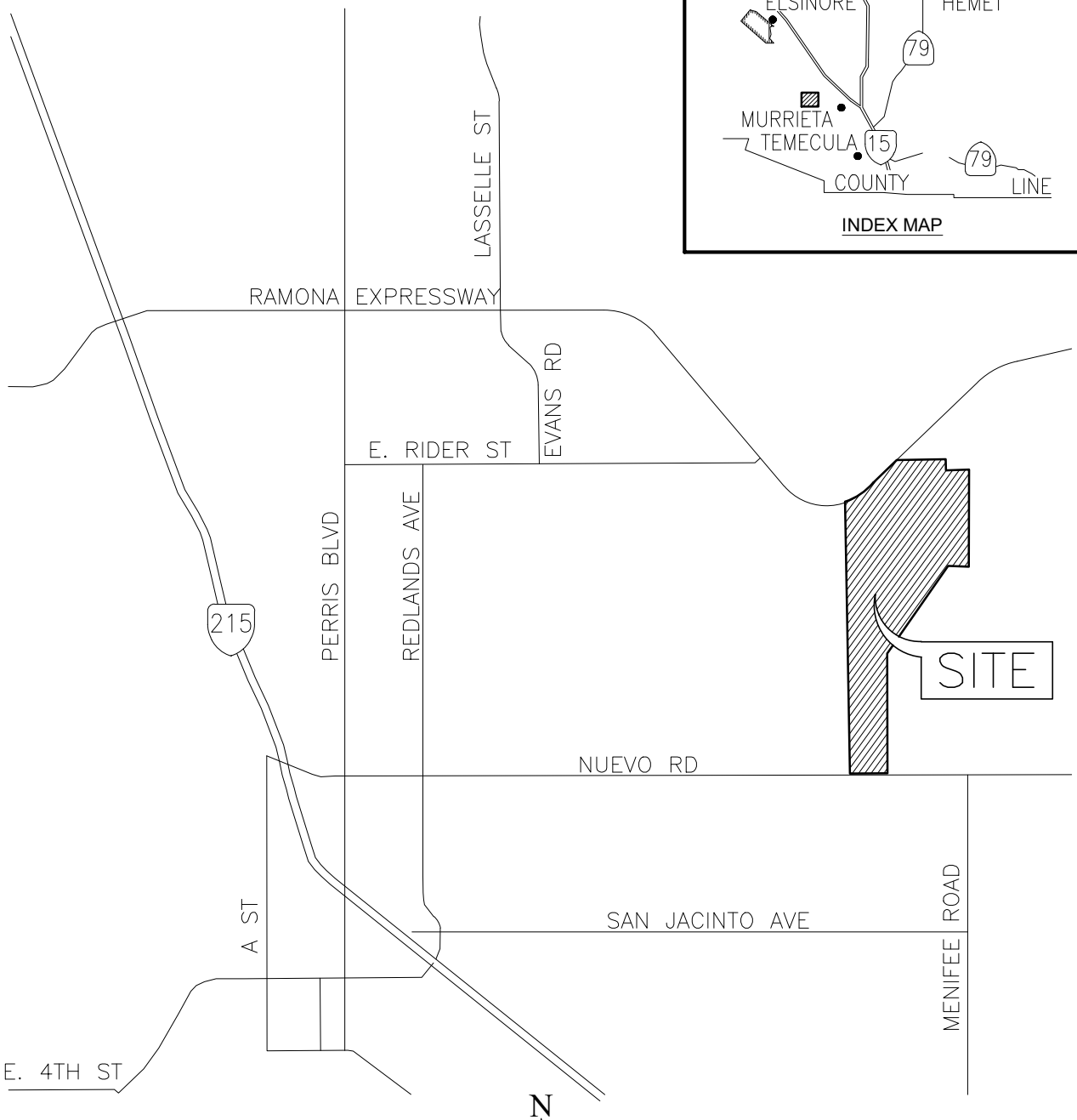
Based upon the results of this preliminary report, it is expected that drainage facilities discussed above will adequately protect the site area from flood damage associated with the 100-year storm event. The proposed facilities, with ultimate development and adequate maintenance, will convey flows safely through the site area in accordance with Riverside County requirements.

SECTION 2 - Riverside County Flood Control Data

- Riverside County Soil Group Map – Perris Plate C1-30
- Slope-Intensity Duration Curve
- Intensity Duration Curve



INDEX MAP



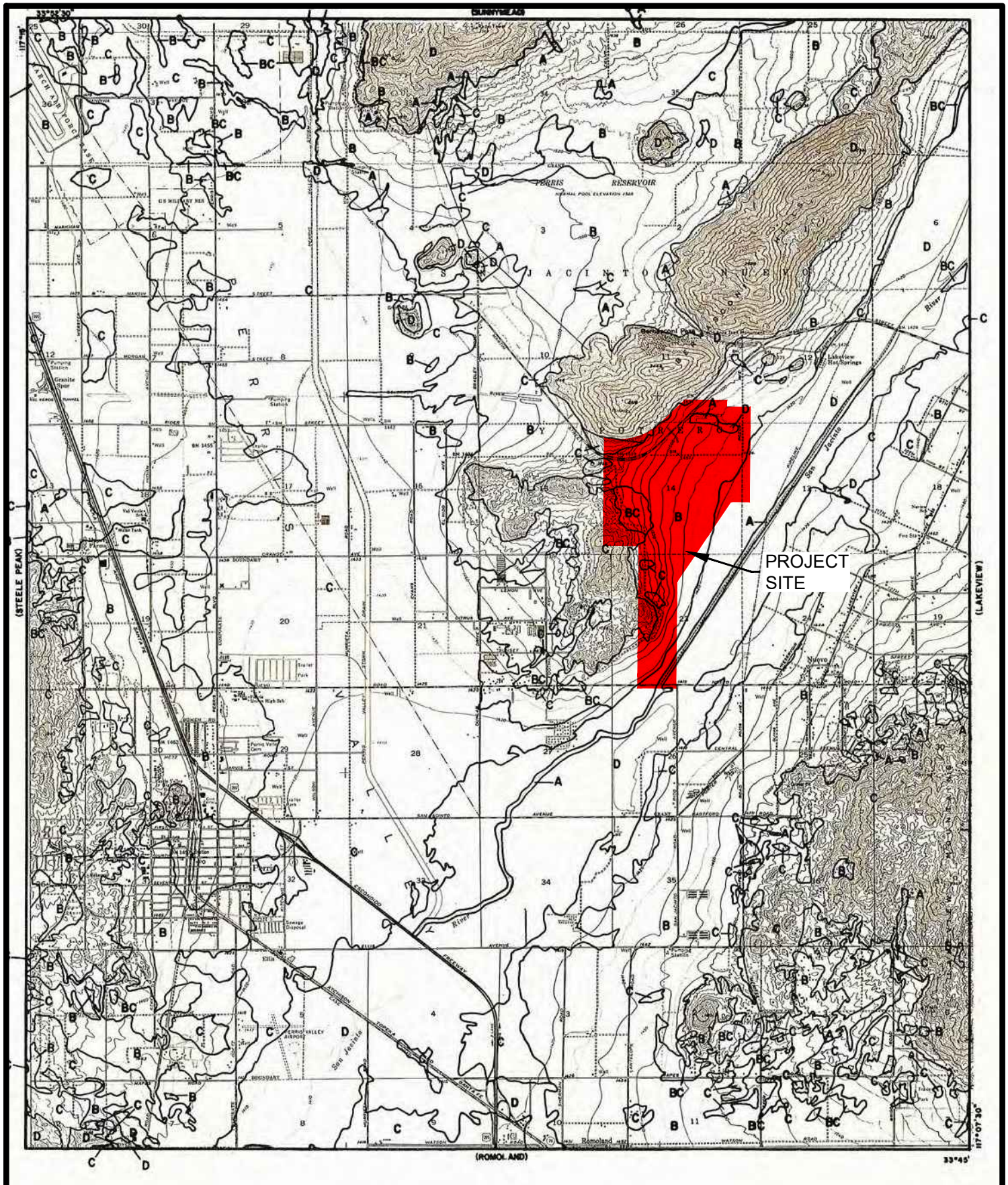
NOT TO SCALE

HUNSAKER & ASSOCIATES
IRVINE, INC
INLAND EMPIRE REGION
2900 ADAMS STREET, SUITE A-15
RIVERSIDE CA 92504 (951)352-7200
PLANNING/ENGINEERING/SURVEYING/GOVERNMENT RELATIONS

FIGURE 1: VICINITY MAP

THOMAS BROTHERS MAPS:
PAGE 927, GRID H7 & J7
A.P.N.: 906-250-020 - 047

H:\00667\Planning\Drainage\Parts\Maps\00667-Vicinity-Fig-1.dwg



LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC&WCD

HYDROLOGY MANUAL

0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR PERRIS

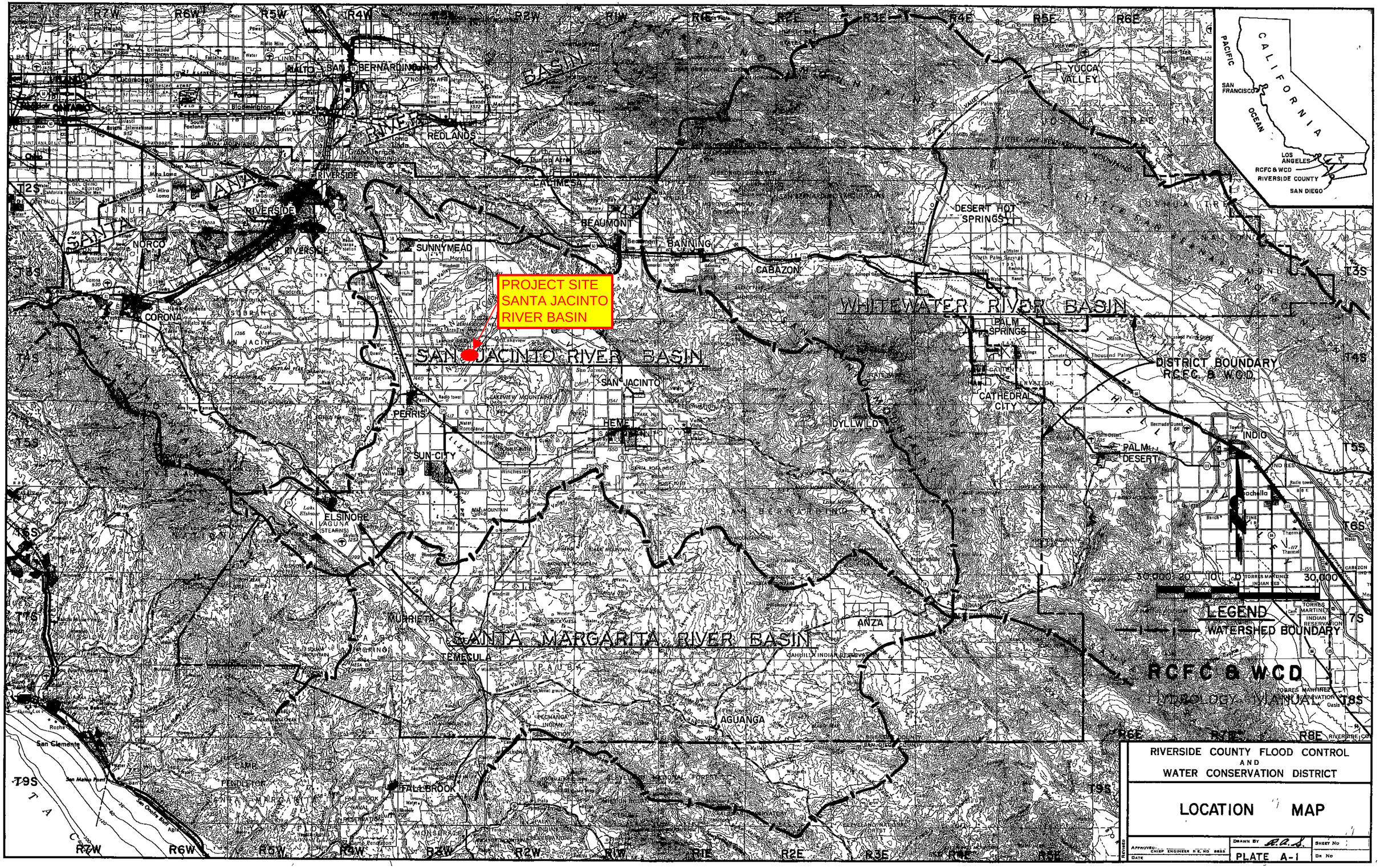
PLATE C-I.30

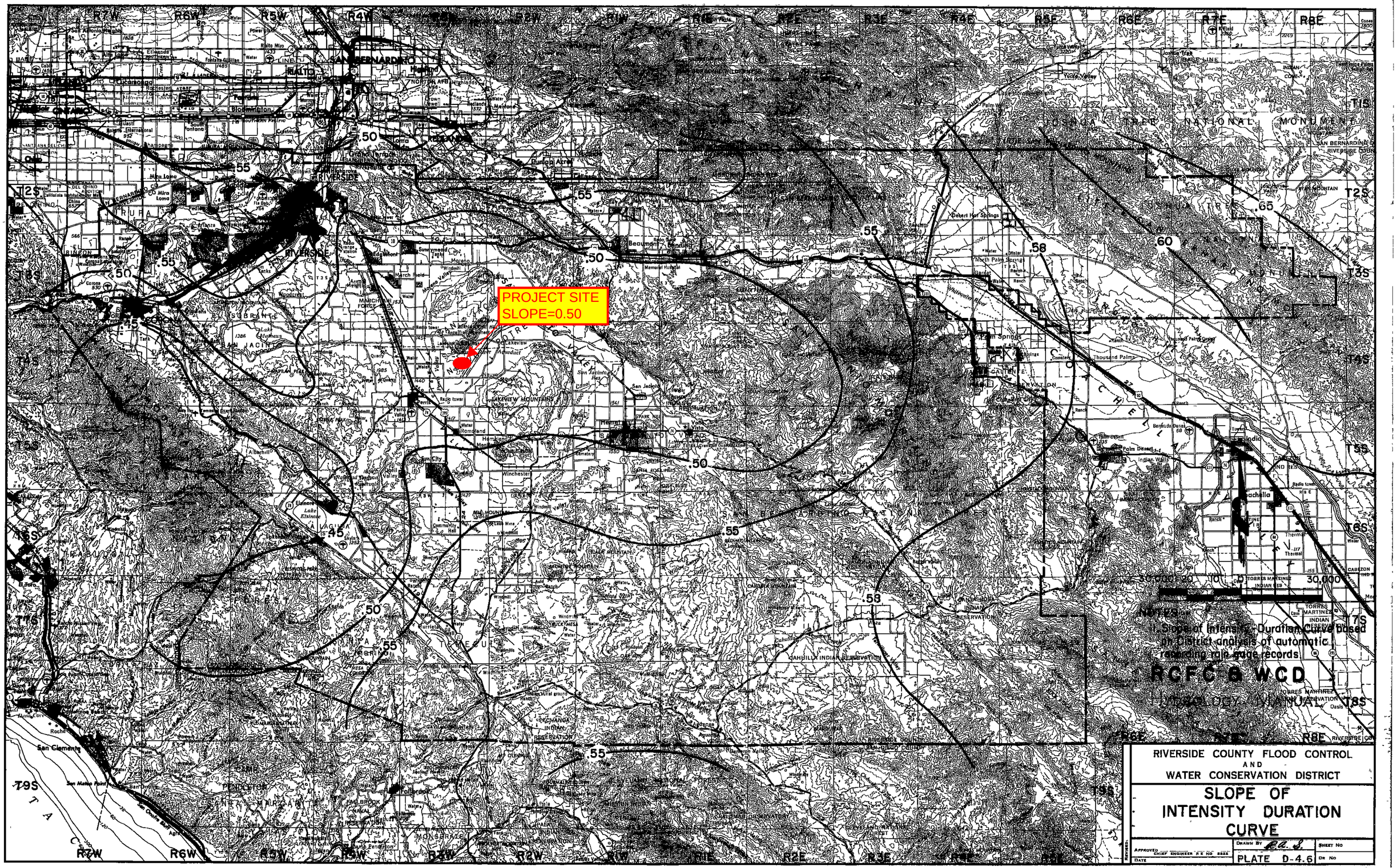
HUNSAKER & ASSOCIATES
IRVINE, INC
INLAND EMPIRE REGION
2900 ADAMS STREET, SUITE A-15
RIVERSIDE CA 92504 (951)352-7200
PLANNING/ENGINEERING/SURVEYING/GOVERNMENT RELATIONS

N
W HUNSAKER E
S

FIGURE 2: AERIAL PHOTOGRAPH

H:\00667\Planning\Drainage\Parts\Maps\00200-Vicinity-Fig-2-Aerial.dwg


PROJECT SITE
SANTA JACINTO
RIVER BASIN
SAN JACINTO RIVER BASIN
SANTA MARGARITA RIVER BASIN
WHITEWATER RIVER BASIN
SAN BERNARDINO
RIVERSIDE
CORONA
NORCO
SUNNYMEAD
BEAUMONT
BANNING
CABAZON
DESERT HOT SPRINGS
YUCCA VALLEY
PALM SPRINGS
CATHEDRAL CITY
DISTRICT BOUNDARY
RCFC & WCD
DYLLWILD
HEMET
SAN JACINTO
PERRIS
SUN CITY
MURRIETA
TEMECULA
ELSINORE
LAKE ELSINORE
ANZA
AGUANGA
FALLBROOK
PENDLETON
CAMP
SAN CLEMENTE
INDIO
PALM DESERT
CALIFORNIA
PACIFIC OCEAN
SAN FRANCISCO
LOS ANGELES
RCFC & WCD
RIVERSIDE COUNTY
SAN DIEGO
30,000 20 10 0 30,000
LEGEND
WATERSHED BOUNDARY
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
LOCATION MAP
PLATE A-1
DRAWN BY R.A.S.
SHEET NO
DR NO
APPROVED: CHIEF ENGINEER R.E. NO 6855
DATE
Revised


PROJECT SITE
SLOPE=0.50
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
SLOPE OF
INTENSITY DURATION
CURVE
DRAWN BY
SHEET NO
APPROVED CHIEF ENGINEER R.E. NO. 8822
DATE
PLATE D-4.6
DR NO
NOTES
1. Slope of Intensity-Duration Curve based on District analysis of automatic recording rain gage records
RCFC & WCD
HYDROLOGY MANUAL

PROJECT SITE
INTENSITY = 0.45

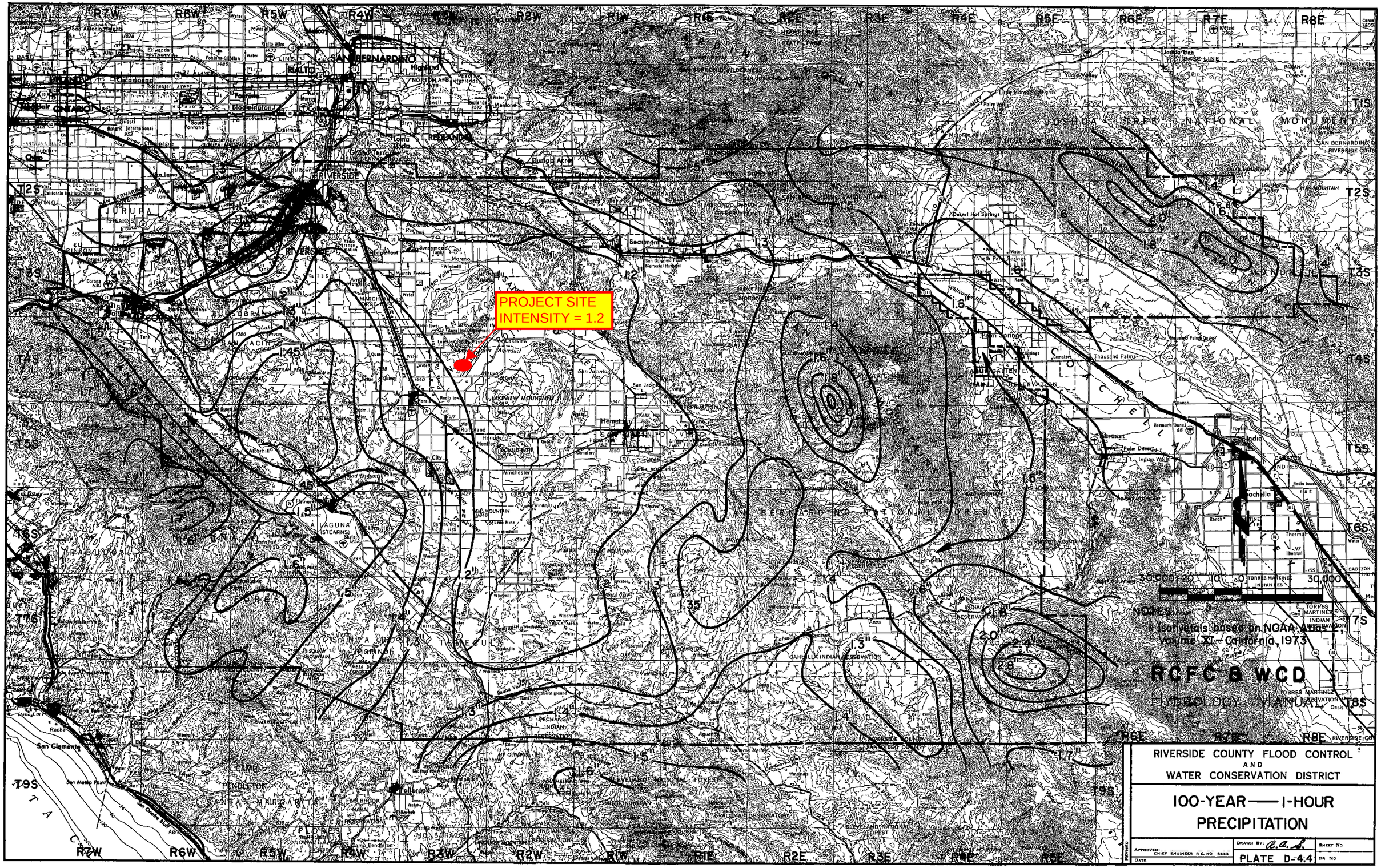
NOTES:
1. Isohyetals based on NOAA Atlas 2, Volume XI - California, 1973

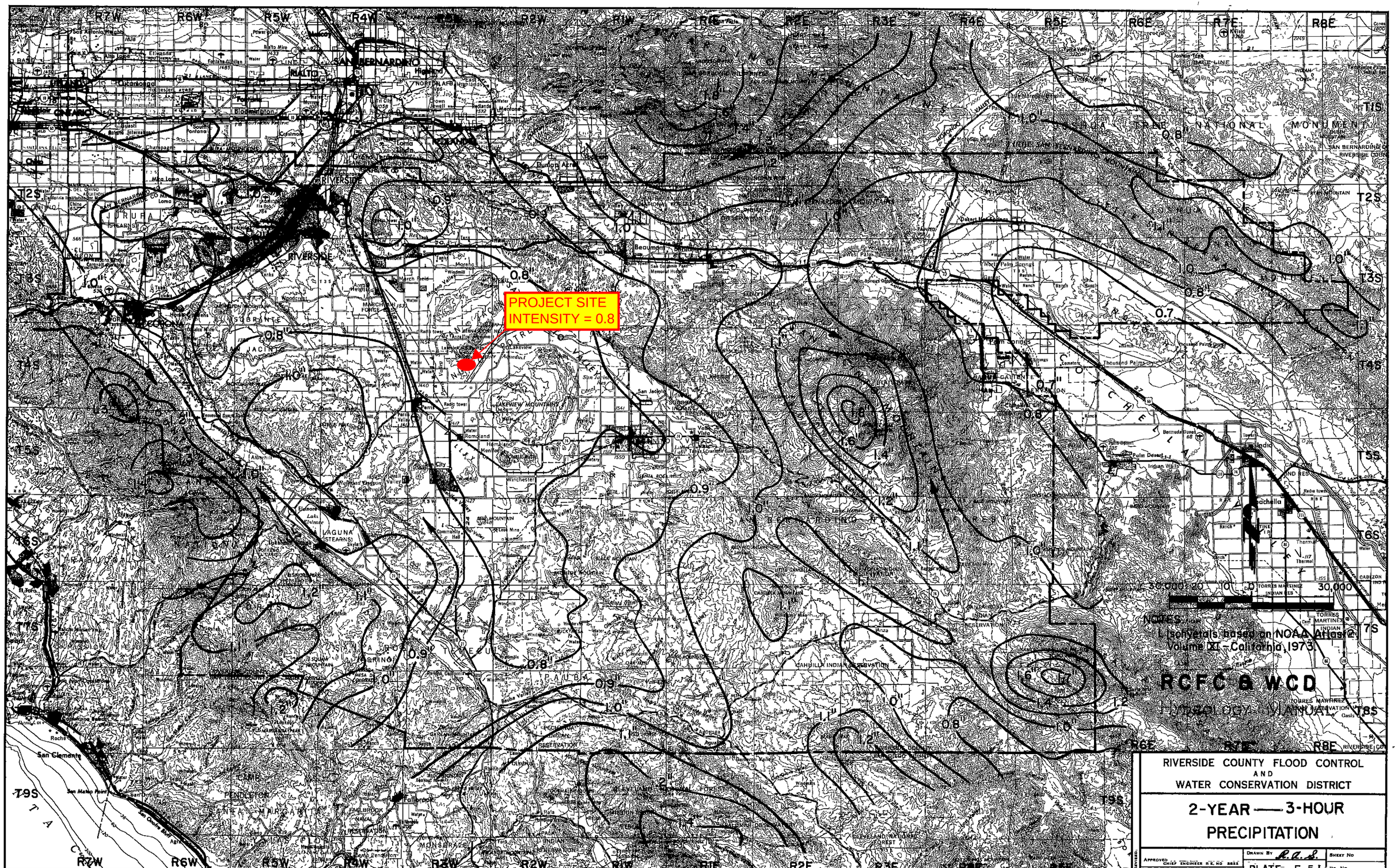
RCFC & WCD
HYDROLOGY MANUAL

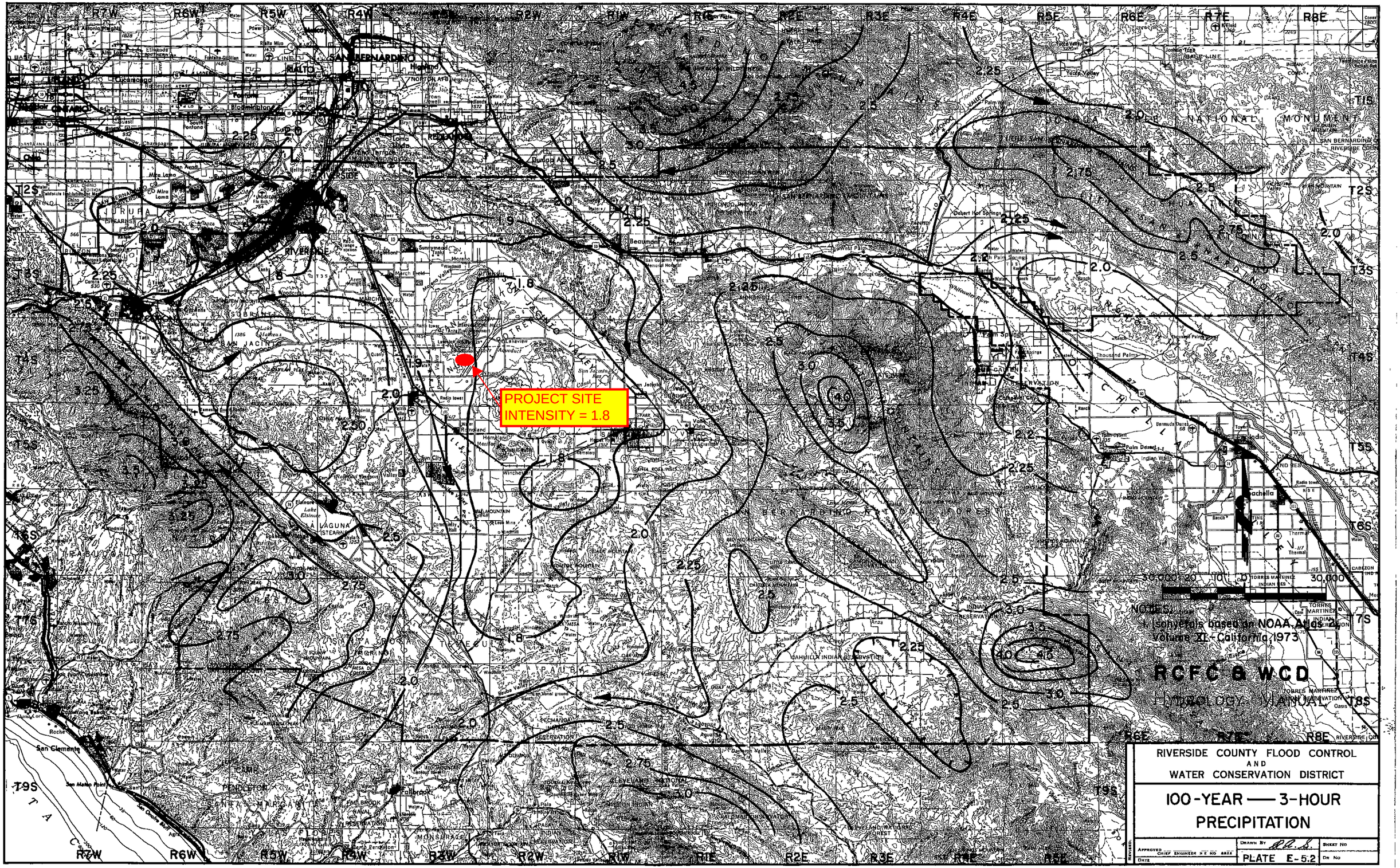
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT

2-YEAR — 1-HOUR
PRECIPITATION

APPROVED _____ CHIEF ENGINEER R.E. NO. 8882
DATE _____
DRAWN BY R.A.S.
PLATE D-4.3
SHEET NO
DR NO


PROJECT SITE
INTENSITY = 1.2
1.5"
2"
1.6"
1.7"
1.3"
1.4"
1.2"
1.45"
1.35"
1.8"
2.0"
2.4"
2.8"
3.2"
3.6"
4"
5"
6"
8"
10"
12"
14"
16"
18"
20"
22"
24"
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E
R3E
R4E
R5E
R6E
R7E
R8E
T2S
T3S
T4S
T5S
T6S
T7S
T8S
T9S
SAN BERNARDINO
RIVERSIDE
RIALTO
COLTON
REDLANDS
NORTON AFB
JURUPA
MARCH FIELD
Beaumont
Banning
Hemet
San Jacinto
Perris
Lake Elsinore
Corona
Temecula
Murrieta
Fallbrook
Vista
San Clemente
Oceanside
Escondido
Palm Springs
Cathedral City
Rancho Mirage
Palm Desert
Indio
Coachella
La Quinta
Thousand Palms
Desert Hot Springs
North Palm Springs
Whitewater
Morongo Valley
Yucca Valley
Joshua Tree
JOSHUA TREE NATIONAL MONUMENT
SAN BERNARDINO MOUNTAINS
SAN JACINTO MOUNTAINS
SAN JACINTO PEAK
SAN GORGONIO MOUNTAIN
LAKEVIEW MOUNTAINS
SANTA ROSA MOUNTAINS
SANTA ANA MOUNTAINS
SAN JACINTO RIVER
SANTA ANA RIVER
SANTA MARGARITA RIVER
SAN LUIS REY RIVER
SAN DIEGUITO RIVER
SAN JACINTO FAULT
SAN ANDREAS FAULT
CLEVELAND NATIONAL FOREST
CAMP PENDLETON
MARINE CORPS BASE
TWENTYNINE PALMS
SAN JACINTO WILDLIFE AREA
SAN JACINTO STATE PARK
SAN JACINTO WILDERNESS
SAN BERNARDINO NATIONAL FOREST
MORONGO INDIAN RESERVATION
AGUA CALIENTE INDIAN RESERVATION
CABAZON INDIAN RESERVATION
TORRES MARTINEZ INDIAN RESERVATION
SANTA ROSA INDIAN RESERVATION
PECHANGA INDIAN RESERVATION
SOBOBA INDIAN RESERVATION
SAN MANUEL INDIAN RESERVATION
MISSION INDIAN RESERVATION
SAN LUIS REY INDIAN RESERVATION
PALA INDIAN RESERVATION
RINCON INDIAN RESERVATION
SAN PASQUAL INDIAN RESERVATION
30,000 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. 6855
DATE
DRAWN BY: A.A.L.
PLATE D-4.4
SHEET NO
DR NO
REVISED


PROJECT SITE
INTENSITY = 0.8
0.8
0.7
1.0
1.2
1.4
1.6
0.9
1.1
2.0
30,000
Notes:
Isohyetals based on NOAA Atlas 2
Volume XI - California, 1973.
RCFC & WCD
FEBRUARY, 1978 MANUAL
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
2-YEAR — 3-HOUR
PRECIPITATION
DRAWN BY R.A.S.
SHEET NO
PLATE E-5.1
APPROVED CHIEF ENGINEER R.E. NO 6825
DATE
DR NO
REVISED


PROJECT SITE
INTENSITY = 1.8
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 — 3-HOUR
PRECIPITATION
PLATE E-5.2

PROJECT SITE
INTENSITY = 1.0

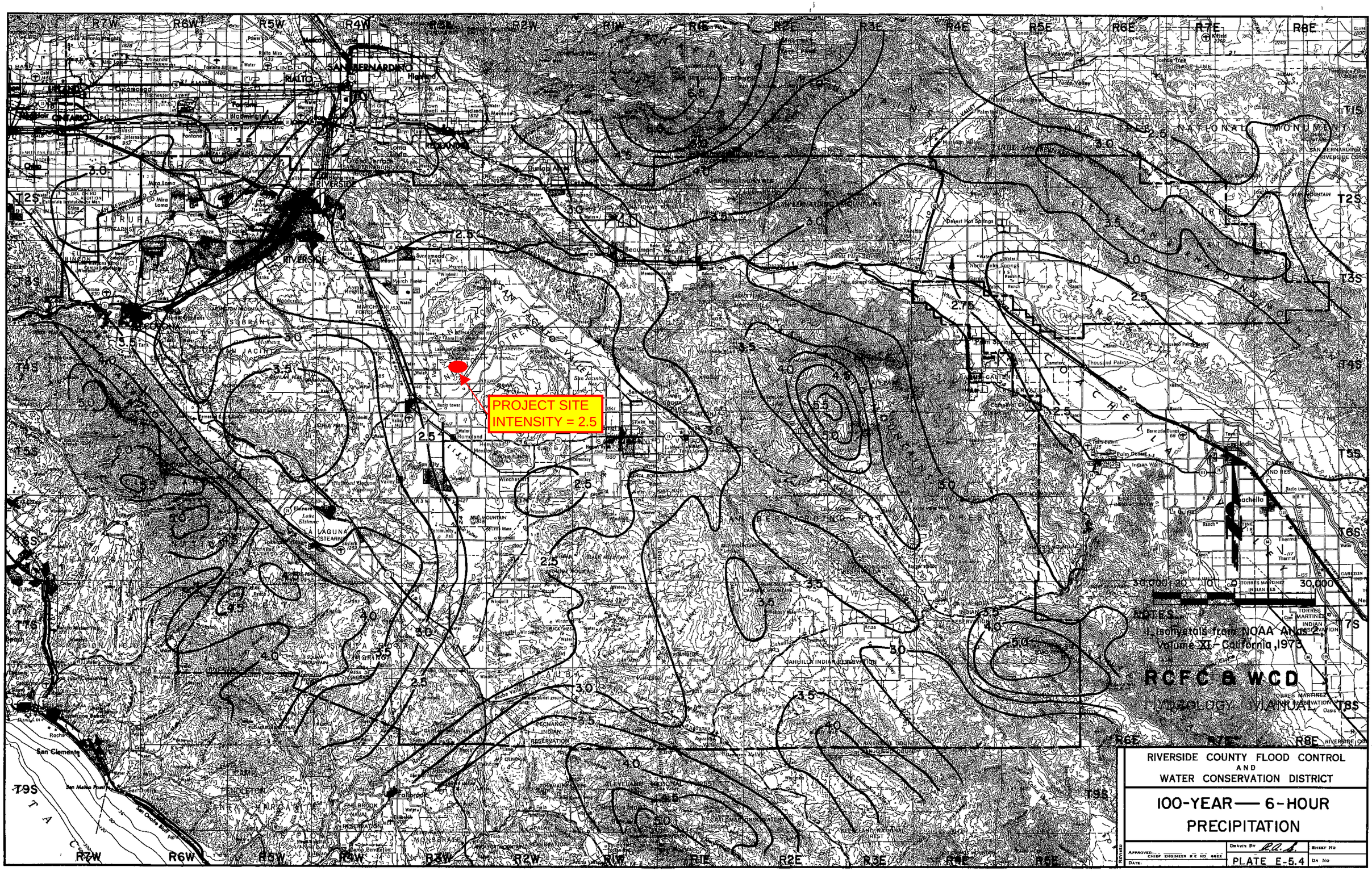
NOTES
1. Isohyetals from NOAA Atlas 2, Volume XI - California, 1973

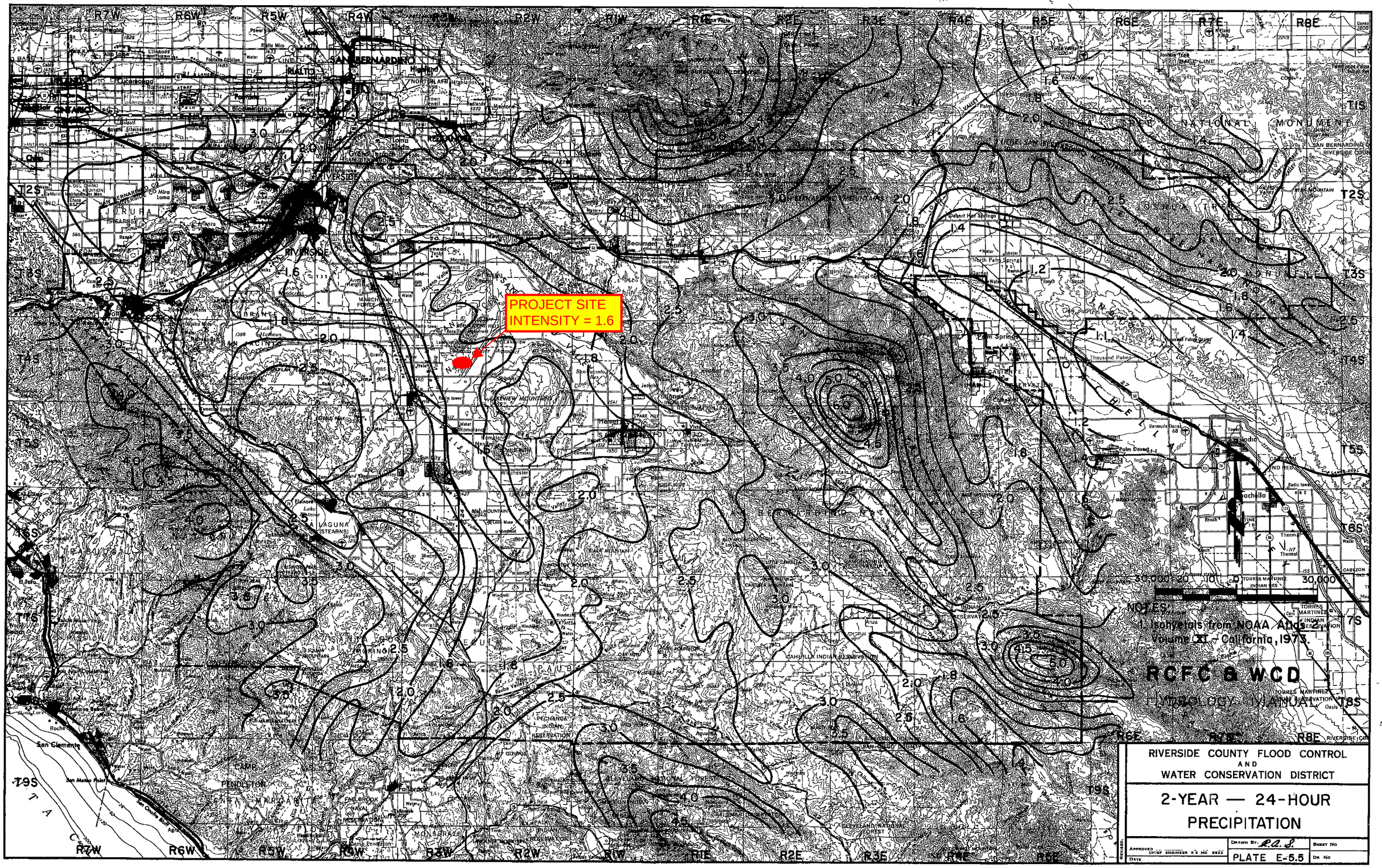
RCFC & WCD
HYDROLOGY MANUAL

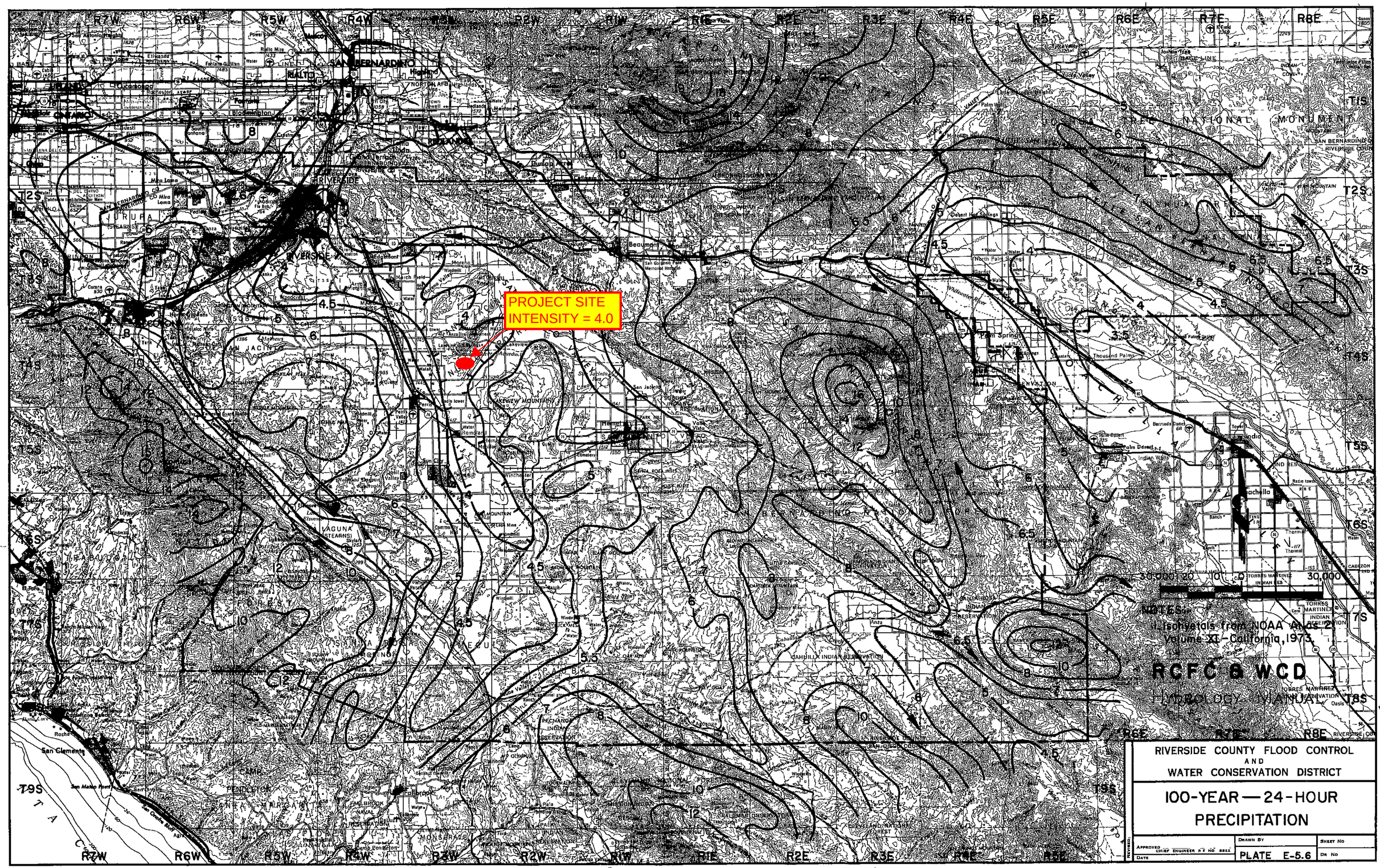
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT

2-YEAR — 6-HOUR PRECIPITATION

APPROVED CHIEF ENGINEER R.E. NO. 6822	DRAWN BY:	SHEET NO
DATE	PLATE E-5.3	DR NO
REVISED		


PROJECT SITE
INTENSITY = 2.5
NOTES:
1. Isohyetals from NOAA Atlas 2, Volume XI - California, 1973
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
100-YEAR — 6-HOUR PRECIPITATION
PLATE E-5.4


PROJECT SITE
INTENSITY = 1.6
NOTES
1. Isohyetals from NOAA Atlas 2, Volume XI - California, 1973.
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT
2-YEAR — 24-HOUR PRECIPITATION
DRAWN BY: R.C.S.
PLATE E-5.5


PROJECT SITE
INTENSITY = 4.0
NOTES:
1. Isohyetals from NOAA Atlas 2,
Volume XI - California, 1973.
RCFC & WCD
HYDROLOGY MANUAL
RIVERSIDE COUNTY FLOOD CONTROL
AND
WATER CONSERVATION DISTRICT
100-YEAR — 24-HOUR
PRECIPITATION
APPROVED CHIEF ENGINEER R.C.F.C. & W.C.D.
DATE
DRAWN BY
PLATE E-5.6
SHEET NO
DR NO
REVISED

SECTION 3 – Hydrology Calculations

- Rational Hydrology Analysis
  - AREA A
    - PRE-DEVELOPMENT CONDITION
      - Area 'A' – 10 Year Pre-Development Condition – Rational Method
      - Area 'A' – 100 Year Pre-Development Condition – Rational Method
    - POST-DEVELOPMENT CONDITION
      - Area 'A' – 10 Year Post-Development Condition – Rational Method
      - Area 'A' – 100 Year Post-Development Condition – Rational Method
  - AREA B
    - PRE-DEVELOPMENT CONDITION
      - Area 'B' – 10 Year Pre-Development Condition – Rational Method
      - Area 'B' – 100 Year Pre-Development Condition – Rational Method
    - POST-DEVELOPMENT CONDITION
      - Area 'A' – 10 Year Post-Development Condition – Rational Method
      - Area 'B' – 100 Year Post-Development Condition – Rational Method
  - AREA C
    - PRE-DEVELOPMENT CONDITION
      - Area 'C' – 10 Year Pre-Development Condition – Rational Method
      - Area 'C' – 100 Year Pre-Development Condition – Rational Method
    - POST-DEVELOPMENT CONDITION
      - Area 'C' – 10 Year Post-Development Condition – Rational Method
      - Area 'C' – 100 Year Post-Development Condition – Rational Method
  - AREA D
    - POST-DEVELOPMENT CONDITION
      - Area 'D' – 10 Year Post-Development Condition – Rational Method
      - Area 'D' – 100 Year Post-Development Condition – Rational Method
  - AREA E
    - POST-DEVELOPMENT CONDITION
      - Area 'D' – 10 Year Post-Development Condition – Rational Method
      - Area 'D' – 100 Year Post-Development Condition – Rational Method

Area A

- **PRE-DEVELOPMENT CONDITION**
  - **Area 'A' – 10 Year Pre-Development Condition – Rational Method**
  - **Area 'A' – 100 Year Pre-Development Condition – Rational Method**

```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 06/12/20  File:EXA010.out
------------------------------------------------------------------------
STONERIDGE - PRELIMINARY HYDROLOGY STUDY - AREA 'A'
EXISTING CONDITION RATIONAL METHOD - 10 YEAR STORM
HUNSAKER & ASSOCIATES, MAY 2020
BY: BRIAN LOWELL, PE AND ALEX ANDAYA
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

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


Program License Serial Number 6406

------------------------------------------------------------------------
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 =  0.450(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.759(In/Hr)
Slope of intensity duration curve = 0.5000




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   651.000(Ft.)
Top (of initial area) elevation =  1516.000(Ft.)
Bottom (of initial area) elevation =  1483.000(Ft.)
Difference in elevation =    33.000(Ft.)
Slope =    0.05069  s(percent)=       5.07
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.845 min.
Rainfall intensity =      1.639(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.732
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 =      7.321(CFS)
Total initial stream area =        6.100(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1483.000(Ft.)
End of natural channel elevation =   1449.000(Ft.)
```

```
Length of natural channel  =  1083.000(Ft.)
Estimated mean flow rate at midpoint of channel =     21.964(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 =   5.45(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0314
Corrected/adjusted channel slope =  0.0314
Travel time =    3.31 min.     TC =   16.16  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.716
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
Rainfall intensity =      1.462(In/Hr) for a    10.0 year storm
Subarea runoff =     25.530(CFS) for     24.400(Ac.)
Total runoff =     32.851(CFS)        Total area =      30.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1449.000(Ft.)
End of natural channel elevation =   1428.000(Ft.)
Length of natural channel  =   955.000(Ft.)
Estimated mean flow rate at midpoint of channel =     65.810(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 =   6.22(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0220
Corrected/adjusted channel slope =  0.0220
Travel time =    2.56 min.     TC =   18.72  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.707
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.980
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.020
RI index for soil(AMC 2)  =  78.22
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.358(In/Hr) for a    10.0 year storm
Subarea runoff =     58.743(CFS) for     61.200(Ac.)
Total runoff =     91.594(CFS)        Total area =      91.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1428.000(Ft.)
End of natural channel elevation =   1420.500(Ft.)
Length of natural channel  =  1832.000(Ft.)
Estimated mean flow rate at midpoint of channel =    103.880(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 =   3.07(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0041
Corrected/adjusted channel slope =  0.0041
Travel time =    9.94 min.     TC =   28.66  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.777
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.050
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.950
RI index for soil(AMC 2)  =  88.45
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.098(In/Hr) for a    10.0 year storm
Subarea runoff =     20.973(CFS) for     24.600(Ac.)
Total runoff =    112.567(CFS)        Total area =     116.300(Ac.)
End of computations, total study area =          116.30 (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 =  80.3
```

```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 06/12/20  File:EXA100.out
------------------------------------------------------------------------
STONERIDGE - PRELIMINARY HYDROLOGY STUDY - AREA 'A'
EXISTING CONDITION RATIONAL METHOD - 10 YEAR STORM
HUNSAKER & ASSOCIATES, MAY 2020
BY: BRIAN LOWELL, PE AND ALEX ANDAYA
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

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


Program License Serial Number 6406

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

Storm event (year) =  100.00 Antecedent Moisture Condition = 3

2 year, 1 hour precipitation =  0.450(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.200(In/Hr)
Slope of intensity duration curve = 0.5000




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   651.000(Ft.)
Top (of initial area) elevation =  1516.000(Ft.)
Bottom (of initial area) elevation =  1483.000(Ft.)
Difference in elevation =    33.000(Ft.)
Slope =    0.05069  s(percent)=       5.07
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.845 min.
Rainfall intensity =      2.594(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.850
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 3)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     13.453(CFS)
Total initial stream area =        6.100(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1483.000(Ft.)
```

```
End of natural channel elevation =   1449.000(Ft.)
Length of natural channel  =  1083.000(Ft.)
Estimated mean flow rate at midpoint of channel =     40.359(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 =   6.45(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0314
Corrected/adjusted channel slope =  0.0314
Travel time =    2.80 min.     TC =   15.64  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.846
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 3)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.350(In/Hr) for a   100.0 year storm
Subarea runoff =     48.485(CFS) for     24.400(Ac.)
Total runoff =     61.938(CFS)        Total area =      30.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1449.000(Ft.)
End of natural channel elevation =   1428.000(Ft.)
Length of natural channel  =   955.000(Ft.)
Estimated mean flow rate at midpoint of channel =    124.079(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 =   7.51(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0220
Corrected/adjusted channel slope =  0.0220
Travel time =    2.12 min.     TC =   17.76  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.843
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.980
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.020
RI index for soil(AMC 3)  =  89.93
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.206(In/Hr) for a   100.0 year storm
Subarea runoff =    113.780(CFS) for     61.200(Ac.)
Total runoff =    175.718(CFS)        Total area =      91.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1428.000(Ft.)
End of natural channel elevation =   1420.500(Ft.)
Length of natural channel  =  1832.000(Ft.)
Estimated mean flow rate at midpoint of channel =    199.287(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 =   3.75(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0041
Corrected/adjusted channel slope =  0.0041
Travel time =    8.15 min.     TC =   25.91  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.869
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.050
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.950
RI index for soil(AMC 3)  =  95.38
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.826(In/Hr) for a   100.0 year storm
Subarea runoff =     39.050(CFS) for     24.600(Ac.)
Total runoff =    214.768(CFS)        Total area =     116.300(Ac.)
End of computations, total study area =          116.30 (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 =  80.3
```

Area A

- **POST-DEVELOPMENT CONDITION**
  - **Area 'A' – 10 Year Post-Development Condition – Rational Method**
  - **Area 'A' – 100 Year Post-Development Condition – Rational Method**

```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 06/06/20  File:PRA010.out
------------------------------------------------------------------------
STONERIDGE - PRELIMINARY HYDROLOGY STUDY - AREA 'A'
PROPOSED CONDITION RATIONAL METHOD - 10 YEAR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

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


Program License Serial Number 6406

------------------------------------------------------------------------
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 =  0.450(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.759(In/Hr)
Slope of intensity duration curve = 0.5000




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   561.000(Ft.)
Top (of initial area) elevation =  1515.000(Ft.)
Bottom (of initial area) elevation =  1469.000(Ft.)
Difference in elevation =    46.000(Ft.)
Slope =    0.08200  s(percent)=       8.20
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.222 min.
Rainfall intensity =      2.356(In/Hr) for a    10.0 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
Initial subarea runoff =     20.136(CFS)
Total initial stream area =        9.800(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
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
Time of concentration =     6.22 min.
Rainfall intensity =      2.356(In/Hr) for a    10.0 year storm
Subarea runoff =     14.178(CFS) for      6.900(Ac.)
Total runoff =     34.314(CFS)       Total area =      16.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1462.600(Ft.)
End of street segment elevation =  1430.800(Ft.)
Length of street segment  =  1779.000(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  =  39.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  22.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     37.170(CFS)
Depth of flow =   0.648(Ft.), Average velocity =   5.379(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  26.046(Ft.)
Flow velocity =   5.38(Ft/s)
Travel time =    5.51 min.     TC =   11.73  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.866
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 =      1.715(In/Hr) for a    10.0 year storm
Subarea runoff =      5.644(CFS) for      3.800(Ac.)
Total runoff =     39.958(CFS)       Total area =      20.500(Ac.)
Street flow at end of street =     39.958(CFS)
Half street flow at end of street =     39.958(CFS)
Depth of flow =   0.662(Ft.), Average velocity =   5.476(Ft/s)
Flow width (from curb towards crown)=  26.778(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     20.500(Ac.)
Runoff from this stream =     39.958(CFS)
Time of concentration =   11.73 min.
Rainfall intensity =     1.715(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      114.000 to Point/Station      103.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   947.000(Ft.)
```

```
Top (of initial area) elevation =  1458.800(Ft.)
Bottom (of initial area) elevation =     0.000(Ft.)
Difference in elevation =  1458.800(Ft.)
Slope =    1.54044  s(percent)=     154.04
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 =      2.628(In/Hr) for a    10.0 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 =     14.474(CFS)
Total initial stream area =        6.300(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      114.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      6.300(Ac.)
Runoff from this stream =     14.474(CFS)
Time of concentration =    5.00 min.
Rainfall intensity =     2.628(In/Hr)
Summary of stream data:

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


1       39.958     11.73                 1.715
2       14.474      5.00                 2.628
Largest stream flow has longer time of concentration
Qp =     39.958 + sum of
          Qb         Ia/Ib
          14.474 *    0.653 =      9.448
Qp =     49.406

Total of 2 streams to confluence:
Flow rates before confluence point:
      39.958      14.474
Area of streams before confluence:
       20.500        6.300
Results of confluence:
Total flow rate =     49.406(CFS)
Time of concentration =    11.735 min.
Effective stream area after confluence =     26.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      150.000 to Point/Station      103.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.869
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.800
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.200
RI index for soil(AMC 2)  =  59.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    11.73 min.
Rainfall intensity =      1.715(In/Hr) for a    10.0 year storm
Subarea runoff =      4.025(CFS) for      2.700(Ac.)
Total runoff =     53.431(CFS)        Total area =      29.500(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1424.800(Ft.)
Downstream point/station elevation =  1424.300(Ft.)
Pipe length  =    48.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    53.431(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    53.431(CFS)
Normal flow depth in pipe =   26.77(In.)
Flow top width inside pipe =   25.84(In.)
Critical Depth =   28.67(In.)
Pipe flow velocity =     10.36(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    11.81 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     29.500(Ac.)
Runoff from this stream =     53.431(CFS)
Time of concentration =   11.81 min.
Rainfall intensity =     1.710(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      106.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   868.000(Ft.)
Top (of initial area) elevation =  1480.000(Ft.)
Bottom (of initial area) elevation =  1463.800(Ft.)
Difference in elevation =    16.200(Ft.)
Slope =    0.01866  s(percent)=       1.87
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.962 min.
Rainfall intensity =      1.862(In/Hr) for a    10.0 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
Initial subarea runoff =      9.368(CFS)
Total initial stream area =        5.800(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      151.000 to Point/Station      106.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.868
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.950
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.050
RI index for soil(AMC 2)  =  56.95
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =     9.96 min.
Rainfall intensity =      1.862(In/Hr) for a    10.0 year storm
Subarea runoff =      8.083(CFS) for      5.000(Ac.)
Total runoff =     17.451(CFS)       Total area =      10.800(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
Top of street segment elevation =  1463.800(Ft.)
End of street segment elevation =  1460.300(Ft.)
Length of street segment  =   464.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  18.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     26.537(CFS)
Depth of flow =   0.546(Ft.), Average velocity =   2.902(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    1.85(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  20.984(Ft.)
Flow velocity =   2.90(Ft/s)
Travel time =    2.67 min.     TC =   12.63  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 =      1.654(In/Hr) for a    10.0 year storm
Subarea runoff =     18.024(CFS) for     12.600(Ac.)
Total runoff =     35.475(CFS)        Total area =      23.400(Ac.)
Street flow at end of street =     35.475(CFS)
Half street flow at end of street =     17.738(CFS)
Depth of flow =   0.592(Ft.), Average velocity =   3.112(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    3.69(Ft.)
Flow width (from curb towards crown)=  22.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      108.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  1454.300(Ft.)
Downstream point/station elevation =  1433.000(Ft.)
Pipe length  =   788.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    35.475(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    35.475(CFS)
Normal flow depth in pipe =   18.75(In.)
Flow top width inside pipe =   19.84(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.48(Ft/s)
Travel time through pipe =    0.97 min.
Time of concentration (TC) =    13.60 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      108.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________________
```

```
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     23.400(Ac.)
Runoff from this stream =     35.475(CFS)
Time of concentration =   13.60 min.
Rainfall intensity =     1.593(In/Hr)
Summary of stream data:

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


1       35.475     13.60                 1.593
Largest stream flow has longer time of concentration
Qp =     35.475 + sum of
Qp =     35.475

Total of 1 streams to confluence:
Flow rates before confluence point:
      35.475
Area of streams before confluence:
       23.400
Results of confluence:
Total flow rate =     35.475(CFS)
Time of concentration =    13.601 min.
Effective stream area after confluence =     23.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      110.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   754.000(Ft.)
Top (of initial area) elevation =  1462.800(Ft.)
Bottom (of initial area) elevation =  1458.000(Ft.)
Difference in elevation =     4.800(Ft.)
Slope =    0.00637  s(percent)=       0.64
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.676 min.
Rainfall intensity =      1.720(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.866
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 =     13.550(CFS)
Total initial stream area =        9.100(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      111.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1458.000(Ft.)
Downstream point elevation =  1451.000(Ft.)
Channel length thru subarea  =   735.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =   6.000
Slope or 'Z' of right channel bank =   6.000
Estimated mean flow rate at midpoint of channel =     17.422(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.250(Ft.)
Flow(q) thru subarea =     17.422(CFS)
Depth of flow =   0.866(Ft.), Average velocity =   7.842(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =    3.000(Ft.)
Flow Velocity =    7.84(Ft/s)
Travel time  =    1.56 min.
Time of concentration =   13.24 min.
```

```
Sub-Channel No. 1 Critical depth =      1.141(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    5.718(Ft/s)
  '     '       '     Critical flow area =      3.047(Sq.Ft)

ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
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 =      1.615(In/Hr) for a    10.0 year storm
Subarea runoff =      7.679(CFS) for      5.500(Ac.)
Total runoff =     21.229(CFS)        Total area =      14.600(Ac.)
Depth of flow =   0.959(Ft.), Average velocity =   8.487(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth

Sub-Channel No. 1 Critical depth =      1.281(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    6.120(Ft/s)
  '     '       '     Critical flow area =      3.469(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      108.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1446.000(Ft.)
Downstream point/station elevation =  1433.000(Ft.)
Pipe length  =   146.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    21.229(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    21.229(CFS)
Normal flow depth in pipe =   10.85(In.)
Flow top width inside pipe =   17.61(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.05(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    13.37 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      108.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     14.600(Ac.)
Runoff from this stream =     21.229(CFS)
Time of concentration =   13.37 min.
Rainfall intensity =     1.607(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      112.000 to Point/Station      113.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   862.000(Ft.)
Top (of initial area) elevation =  1460.500(Ft.)
Bottom (of initial area) elevation =  1455.000(Ft.)
Difference in elevation =     5.500(Ft.)
Slope =    0.00638  s(percent)=       0.64
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.313 min.
Rainfall intensity =      1.675(In/Hr) for a    10.0 year storm
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
Initial subarea runoff =      7.535(CFS)
Total initial stream area =        5.200(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      113.000 to Point/Station      108.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1449.000(Ft.)
Downstream point/station elevation =  1433.000(Ft.)
Pipe length  =   130.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.535(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     7.535(CFS)
Normal flow depth in pipe =    6.72(In.)
Flow top width inside pipe =   11.91(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.65(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    12.44 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      113.000 to Point/Station      108.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 3
Stream flow area =      5.200(Ac.)
Runoff from this stream =      7.535(CFS)
Time of concentration =   12.44 min.
Rainfall intensity =     1.666(In/Hr)
Summary of stream data:

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


1       35.475     13.60                 1.593
2       21.229     13.37                 1.607
3        7.535     12.44                 1.666
Largest stream flow has longer time of concentration
Qp =     35.475 + sum of
          Qb         Ia/Ib
          21.229 *    0.991 =     21.045
          Qb         Ia/Ib
           7.535 *    0.956 =      7.207
Qp =     63.727

Total of 3 streams to confluence:
Flow rates before confluence point:
      35.475      21.229       7.535
Area of streams before confluence:
       23.400       14.600        5.200
Results of confluence:
Total flow rate =     63.727(CFS)
Time of concentration =    13.601 min.
Effective stream area after confluence =     43.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1433.000(Ft.)
Downstream point/station elevation =  1424.300(Ft.)
Pipe length  =   364.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    63.727(CFS)
```

```
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    63.727(CFS)
Normal flow depth in pipe =   24.75(In.)
Flow top width inside pipe =   22.80(In.)
Critical depth could not be calculated.
Pipe flow velocity =     14.72(Ft/s)
Travel time through pipe =    0.41 min.
Time of concentration (TC) =    14.01 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      104.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     43.200(Ac.)
Runoff from this stream =     63.727(CFS)
Time of concentration =   14.01 min.
Rainfall intensity =     1.570(In/Hr)
Summary of stream data:

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


1       53.431     11.81               1.710
2       63.727     14.01               1.570
Largest stream flow has longer time of concentration
Qp =     63.727 + sum of
          Qb         Ia/Ib
          53.431 *    0.918 =     49.055
Qp =    112.782

Total of 2 main streams to confluence:
Flow rates before confluence point:
      53.431      63.727
Area of streams before confluence:
       29.500       43.200


Results of confluence:
Total flow rate =    112.782(CFS)
Time of concentration =    14.013 min.
Effective stream area after confluence  =     72.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      118.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1424.300(Ft.)
Downstream point/station elevation =  1422.800(Ft.)
Pipe length  =   140.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   112.782(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =   112.782(CFS)
Normal flow depth in pipe =   33.42(In.)
Flow top width inside pipe =   39.34(In.)
Critical Depth =   38.67(In.)
Pipe flow velocity =     12.83(Ft/s)
Travel time through pipe =    0.18 min.
Time of concentration (TC) =    14.20 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      118.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     72.700(Ac.)
Runoff from this stream =    112.782(CFS)
Time of concentration =   14.20 min.
```

```
Rainfall intensity =     1.560(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      119.000 to Point/Station      120.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   800.000(Ft.)
Top (of initial area) elevation =  1464.900(Ft.)
Bottom (of initial area) elevation =  1459.000(Ft.)
Difference in elevation =     5.900(Ft.)
Slope =    0.00738  s(percent)=       0.74
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.609 min.
Rainfall intensity =      1.724(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.866
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 =      1.792(CFS)
Total initial stream area =        1.200(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      120.000 to Point/Station      116.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1459.000(Ft.)
End of street segment elevation =  1433.000(Ft.)
Length of street segment  =   988.000(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  =  39.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  22.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      3.074(CFS)
Depth of flow =   0.302(Ft.), Average velocity =   3.431(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.770(Ft.)
Flow velocity =   3.43(Ft/s)
Travel time =    4.80 min.     TC =   16.41  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.862
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 =      1.451(In/Hr) for a    10.0 year storm
Subarea runoff =      2.501(CFS) for      2.000(Ac.)
Total runoff =      4.294(CFS)       Total area =       3.200(Ac.)
Street flow at end of street =      4.294(CFS)
Half street flow at end of street =      4.294(CFS)
Depth of flow =   0.330(Ft.), Average velocity =   3.700(Ft/s)
Flow width (from curb towards crown)=  10.168(Ft.)


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

```
Process from Point/Station      116.000 to Point/Station      118.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1427.000(Ft.)
Downstream point/station elevation =  1422.800(Ft.)
Pipe length  =   160.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.294(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.294(CFS)
Normal flow depth in pipe =    7.71(In.)
Flow top width inside pipe =   11.50(In.)
Critical Depth =   10.45(In.)
Pipe flow velocity =      8.05(Ft/s)
Travel time through pipe =    0.33 min.
Time of concentration (TC) =    16.74 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      116.000 to Point/Station      118.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.200(Ac.)
Runoff from this stream =      4.294(CFS)
Time of concentration =   16.74 min.
Rainfall intensity =     1.436(In/Hr)
Summary of stream data:

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


1      112.782     14.20                 1.560
2        4.294     16.74                 1.436
Largest stream flow has longer or shorter time of concentration
Qp =    112.782 + sum of
          Qa          Tb/Ta
           4.294 *    0.848 =      3.641
Qp =    116.423

Total of 2 streams to confluence:
Flow rates before confluence point:
     112.782       4.294
Area of streams before confluence:
       72.700        3.200
Results of confluence:
Total flow rate =    116.423(CFS)
Time of concentration =    14.195 min.
Effective stream area after confluence =     75.900(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      117.000 to Point/Station      118.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
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
Time of concentration =    14.20 min.
Rainfall intensity =      1.560(In/Hr) for a    10.0 year storm
Subarea runoff =     18.322(CFS) for     13.600(Ac.)
Total runoff =    134.744(CFS)        Total area =      89.500(Ac.)
End of computations, total study area =           89.50 (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 =  56.2
```

```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 06/06/20  File:PRA100.out
------------------------------------------------------------------------
STONERIDGE - PRELIMINARY HYDROLOGY STUDY - AREA 'A'
PROPOSED CONDITION RATIONAL METHOD - 100 YEAR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

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


Program License Serial Number 6406

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

Storm event (year) =  100.00 Antecedent Moisture Condition = 3

2 year, 1 hour precipitation =  0.450(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.200(In/Hr)
Slope of intensity duration curve = 0.5000




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      100.000 to Point/Station      101.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   561.000(Ft.)
Top (of initial area) elevation =  1515.000(Ft.)
Bottom (of initial area) elevation =  1469.000(Ft.)
Difference in elevation =    46.000(Ft.)
Slope =    0.08200  s(percent)=       8.20
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.222 min.
Rainfall intensity =      3.726(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.890
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     32.513(CFS)
Total initial stream area =        9.800(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      101.000 to Point/Station      102.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.890
```

```
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =     6.22 min.
Rainfall intensity =      3.726(In/Hr) for a   100.0 year storm
Subarea runoff =     22.892(CFS) for      6.900(Ac.)
Total runoff =     55.404(CFS)       Total area =      16.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1462.600(Ft.)
End of street segment elevation =  1430.800(Ft.)
Length of street segment  =  1779.000(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  =  39.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  22.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     60.079(CFS)
Depth of flow =   0.763(Ft.), Average velocity =   5.763(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    3.84(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  31.803(Ft.)
Flow velocity =   5.76(Ft/s)
Travel time =    5.15 min.     TC =   11.37  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.887
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.757(In/Hr) for a   100.0 year storm
Subarea runoff =      9.297(CFS) for      3.800(Ac.)
Total runoff =     64.701(CFS)       Total area =      20.500(Ac.)
Street flow at end of street =     64.701(CFS)
Half street flow at end of street =     64.701(CFS)
Depth of flow =   0.781(Ft.), Average velocity =   5.831(Ft/s)
Warning: depth of flow exceeds top of curb
Distance that curb overflow reaches into property =    4.58(Ft.)
Flow width (from curb towards crown)=  32.721(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      102.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     20.500(Ac.)
Runoff from this stream =     64.701(CFS)
Time of concentration =   11.37 min.
Rainfall intensity =     2.757(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      114.000 to Point/Station      103.000
```

```
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________
Initial area flow distance =   947.000(Ft.)
Top (of initial area) elevation =  1458.800(Ft.)
Bottom (of initial area) elevation =     0.000(Ft.)
Difference in elevation =  1458.800(Ft.)
Slope =    1.54044  s(percent)=     154.04
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 =      4.157(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 = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     23.340(CFS)
Total initial stream area =        6.300(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      114.000 to Point/Station      103.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      6.300(Ac.)
Runoff from this stream =     23.340(CFS)
Time of concentration =    5.00 min.
Rainfall intensity =     4.157(In/Hr)
Summary of stream data:

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


1       64.701     11.37                2.757
2       23.340      5.00                4.157
Largest stream flow has longer time of concentration
Qp =     64.701 + sum of
          Qb         Ia/Ib
          23.340 *    0.663 =     15.479
Qp =     80.181

Total of 2 streams to confluence:
Flow rates before confluence point:
      64.701      23.340
Area of streams before confluence:
       20.500        6.300
Results of confluence:
Total flow rate =     80.181(CFS)
Time of concentration =    11.367 min.
Effective stream area after confluence =     26.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      150.000 to Point/Station      103.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.889
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.800
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.200
RI index for soil(AMC 3)  =  77.84
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    11.37 min.
Rainfall intensity =      2.757(In/Hr) for a   100.0 year storm
```

```
Subarea runoff =      6.618(CFS) for      2.700(Ac.)
Total runoff =     86.799(CFS)        Total area =      29.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1424.800(Ft.)
Downstream point/station elevation =  1424.300(Ft.)
Pipe length  =    48.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    86.799(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    86.799(CFS)
Normal flow depth in pipe =   33.09(In.)
Flow top width inside pipe =   27.96(In.)
Critical Depth =   34.70(In.)
Pipe flow velocity =     11.56(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    11.44 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      103.000 to Point/Station      104.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     29.500(Ac.)
Runoff from this stream =     86.799(CFS)
Time of concentration =   11.44 min.
Rainfall intensity =     2.749(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      105.000 to Point/Station      106.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   868.000(Ft.)
Top (of initial area) elevation =  1480.000(Ft.)
Bottom (of initial area) elevation =  1463.800(Ft.)
Difference in elevation =    16.200(Ft.)
Slope =    0.01866  s(percent)=       1.87
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.962 min.
Rainfall intensity =      2.945(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 = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     15.170(CFS)
Total initial stream area =        5.800(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      151.000 to Point/Station      106.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.889
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.950
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.050
RI index for soil(AMC 3)  =  75.56
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =     9.96 min.
```

```
Rainfall intensity =      2.945(In/Hr) for a   100.0 year storm
Subarea runoff =     13.083(CFS) for      5.000(Ac.)
Total runoff =     28.253(CFS)        Total area =      10.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      106.000 to Point/Station      107.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1463.800(Ft.)
End of street segment elevation =  1460.300(Ft.)
Length of street segment  =   464.000(Ft.)
Height of curb above gutter flowline  =    6.0(In.)
Width of half street (curb to crown)  =  22.000(Ft.)
Distance from crown to crossfall grade break  =  18.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [2] side(s) of the street
Distance from curb to property line  =  10.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =     43.115(CFS)
Depth of flow =   0.624(Ft.), Average velocity =   3.302(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    4.95(Ft.)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  22.000(Ft.)
Flow velocity =   3.30(Ft/s)
Travel time =    2.34 min.     TC =   12.30  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.887
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.650(In/Hr) for a   100.0 year storm
Subarea runoff =     29.615(CFS) for     12.600(Ac.)
Total runoff =     57.868(CFS)        Total area =      23.400(Ac.)
Street flow at end of street =     57.868(CFS)
Half street flow at end of street =     28.934(CFS)
Depth of flow =   0.677(Ft.), Average velocity =   3.605(Ft/s)
Warning: depth of flow exceeds top of curb
Note:  depth of flow exceeds top of street crown.
Distance that curb overflow reaches into property =    7.09(Ft.)
Flow width (from curb towards crown)=  22.000(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      108.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1454.300(Ft.)
Downstream point/station elevation =  1433.000(Ft.)
Pipe length  =   788.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    57.868(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    57.868(CFS)
Normal flow depth in pipe =   21.42(In.)
Flow top width inside pipe =   27.11(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.45(Ft/s)
Travel time through pipe =    0.85 min.
Time of concentration (TC) =    13.15 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      107.000 to Point/Station      108.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     23.400(Ac.)
Runoff from this stream =     57.868(CFS)
Time of concentration =   13.15 min.
Rainfall intensity =     2.563(In/Hr)
Summary of stream data:

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


1       57.868     13.15                2.563
Largest stream flow has longer time of concentration
Qp =     57.868 + sum of
Qp =     57.868

Total of 1 streams to confluence:
Flow rates before confluence point:
      57.868
Area of streams before confluence:
       23.400
Results of confluence:
Total flow rate =     57.868(CFS)
Time of concentration =    13.154 min.
Effective stream area after confluence =     23.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      109.000 to Point/Station      110.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________________
Initial area flow distance =   754.000(Ft.)
Top (of initial area) elevation =  1462.800(Ft.)
Bottom (of initial area) elevation =  1458.000(Ft.)
Difference in elevation =     4.800(Ft.)
Slope =    0.00637  s(percent)=       0.64
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.676 min.
Rainfall intensity =      2.720(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 = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     21.963(CFS)
Total initial stream area =        9.100(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      110.000 to Point/Station      111.000
**** IMPROVED CHANNEL TRAVEL TIME ****
_____________________________________________________________________________
Upstream point elevation =  1458.000(Ft.)
Downstream point elevation =  1451.000(Ft.)
Channel length thru subarea  =   735.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =   6.000
Slope or 'Z' of right channel bank =   6.000
Estimated mean flow rate at midpoint of channel =     28.301(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.250(Ft.)
Flow(q) thru subarea =     28.301(CFS)
Depth of flow =   1.116(Ft.), Average velocity =   9.521(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =    3.000(Ft.)
```

```
Flow Velocity =    9.52(Ft/s)
Travel time  =    1.29 min.
Time of concentration =   12.96 min.

Sub-Channel No. 1 Critical depth =      1.531(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    6.708(Ft/s)
  '     '       '     Critical flow area =      4.219(Sq.Ft)

ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.887
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.582(In/Hr) for a   100.0 year storm
Subarea runoff =     12.590(CFS) for      5.500(Ac.)
Total runoff =     34.553(CFS)       Total area =      14.600(Ac.)
Depth of flow =   1.242(Ft.), Average velocity =  10.313(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth

Sub-Channel No. 1 Critical depth =      1.719(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    7.227(Ft/s)
  '     '       '     Critical flow area =      4.781(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      108.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1446.000(Ft.)
Downstream point/station elevation =  1433.000(Ft.)
Pipe length  =   146.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    34.553(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    34.553(CFS)
Normal flow depth in pipe =   13.34(In.)
Flow top width inside pipe =   20.22(In.)
Critical depth could not be calculated.
Pipe flow velocity =     21.46(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    13.08 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      111.000 to Point/Station      108.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     14.600(Ac.)
Runoff from this stream =     34.553(CFS)
Time of concentration =   13.08 min.
Rainfall intensity =     2.571(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      112.000 to Point/Station      113.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   862.000(Ft.)
Top (of initial area) elevation =  1460.500(Ft.)
Bottom (of initial area) elevation =  1455.000(Ft.)
Difference in elevation =     5.500(Ft.)
Slope =    0.00638  s(percent)=       0.64
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.313 min.
```

```
Rainfall intensity =      2.649(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 = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     12.218(CFS)
Total initial stream area =        5.200(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      113.000 to Point/Station      108.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1449.000(Ft.)
Downstream point/station elevation =  1433.000(Ft.)
Pipe length  =   130.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    12.218(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =    12.218(CFS)
Normal flow depth in pipe =    9.61(In.)
Flow top width inside pipe =    9.59(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.14(Ft/s)
Travel time through pipe =    0.12 min.
Time of concentration (TC) =    12.43 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      113.000 to Point/Station      108.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 3
Stream flow area =      5.200(Ac.)
Runoff from this stream =     12.218(CFS)
Time of concentration =   12.43 min.
Rainfall intensity =     2.636(In/Hr)
Summary of stream data:

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


1       57.868     13.15                2.563
2       34.553     13.08                2.571
3       12.218     12.43                2.636
Largest stream flow has longer time of concentration
Qp =     57.868 + sum of
          Qb         Ia/Ib
          34.553 *    0.997 =     34.451
          Qb         Ia/Ib
          12.218 *    0.972 =     11.878
Qp =    104.196

Total of 3 streams to confluence:
Flow rates before confluence point:
      57.868      34.553      12.218
Area of streams before confluence:
       23.400       14.600        5.200
Results of confluence:
Total flow rate =    104.196(CFS)
Time of concentration =    13.154 min.
Effective stream area after confluence =     43.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      104.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
```

```
Upstream point/station elevation =  1433.000(Ft.)
Downstream point/station elevation =  1424.300(Ft.)
Pipe length  =   364.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   104.196(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =   104.196(CFS)
Normal flow depth in pipe =   29.86(In.)
Flow top width inside pipe =   27.08(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.62(Ft/s)
Travel time through pipe =    0.36 min.
Time of concentration (TC) =    13.52 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      108.000 to Point/Station      104.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     43.200(Ac.)
Runoff from this stream =    104.196(CFS)
Time of concentration =   13.52 min.
Rainfall intensity =     2.528(In/Hr)
Summary of stream data:

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


1       86.799     11.44               2.749
2      104.196     13.52               2.528
Largest stream flow has longer time of concentration
Qp =    104.196 + sum of
          Qb          Ia/Ib
          86.799 *    0.920 =     79.834
Qp =    184.031

Total of 2 main streams to confluence:
Flow rates before confluence point:
      86.799     104.196
Area of streams before confluence:
       29.500       43.200


Results of confluence:
Total flow rate =    184.031(CFS)
Time of concentration =    13.519 min.
Effective stream area after confluence  =     72.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      118.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1424.300(Ft.)
Downstream point/station elevation =  1422.800(Ft.)
Pipe length  =   140.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   184.031(CFS)
Nearest computed pipe diameter  =     51.00(In.)
Calculated individual pipe flow  =   184.031(CFS)
Normal flow depth in pipe =   44.81(In.)
Flow top width inside pipe =   33.30(In.)
Critical Depth =   46.58(In.)
Pipe flow velocity =     13.94(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =    13.69 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      104.000 to Point/Station      118.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
```

```
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     72.700(Ac.)
Runoff from this stream =    184.031(CFS)
Time of concentration =   13.69 min.
Rainfall intensity =     2.513(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      119.000 to Point/Station      120.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   800.000(Ft.)
Top (of initial area) elevation =  1464.900(Ft.)
Bottom (of initial area) elevation =  1459.000(Ft.)
Difference in elevation =     5.900(Ft.)
Slope =    0.00738  s(percent)=       0.74
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.609 min.
Rainfall intensity =      2.728(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 = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      2.905(CFS)
Total initial stream area =        1.200(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      120.000 to Point/Station      116.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1459.000(Ft.)
End of street segment elevation =  1433.000(Ft.)
Length of street segment  =   988.000(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  =  39.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  22.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      5.014(CFS)
Depth of flow =   0.344(Ft.), Average velocity =   3.834(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.868(Ft.)
Flow velocity =   3.83(Ft/s)
Travel time =    4.29 min.     TC =   15.90  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.885
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.331(In/Hr) for a   100.0 year storm
Subarea runoff =      4.128(CFS) for      2.000(Ac.)
Total runoff =      7.032(CFS)       Total area =       3.200(Ac.)
Street flow at end of street =      7.032(CFS)
Half street flow at end of street =      7.032(CFS)
Depth of flow =   0.377(Ft.), Average velocity =   4.151(Ft/s)
```

```
Flow width (from curb towards crown)=  12.520(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      116.000 to Point/Station      118.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1427.000(Ft.)
Downstream point/station elevation =  1422.800(Ft.)
Pipe length  =   160.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.032(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     7.032(CFS)
Normal flow depth in pipe =    9.00(In.)
Flow top width inside pipe =   14.70(In.)
Critical Depth =   12.74(In.)
Pipe flow velocity =      9.15(Ft/s)
Travel time through pipe =    0.29 min.
Time of concentration (TC) =    16.20 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      116.000 to Point/Station      118.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.200(Ac.)
Runoff from this stream =      7.032(CFS)
Time of concentration =   16.20 min.
Rainfall intensity =     2.310(In/Hr)
Summary of stream data:

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


1      184.031     13.69                 2.513
2        7.032     16.20                 2.310
Largest stream flow has longer or shorter time of concentration
Qp =    184.031 + sum of
          Qa          Tb/Ta
           7.032 *    0.845 =      5.943
Qp =    189.974

Total of 2 streams to confluence:
Flow rates before confluence point:
     184.031       7.032
Area of streams before confluence:
       72.700        3.200
Results of confluence:
Total flow rate =    189.974(CFS)
Time of concentration =    13.686 min.
Effective stream area after confluence =     75.900(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      117.000 to Point/Station      118.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.886
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =    13.69 min.
Rainfall intensity =      2.513(In/Hr) for a   100.0 year storm
Subarea runoff =     30.287(CFS) for     13.600(Ac.)
Total runoff =    220.261(CFS)       Total area =      89.500(Ac.)
End of computations, total study area =           89.50 (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 =  56.2
```

Area B

➢ PRE-DEVELOPMENT CONDITION

- ❖ Area 'B' – 10 Year Pre-Development Condition – Rational Method
- ❖ Area 'B' – 100 Year Pre-Development Condition – Rational Method

```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 06/27/20  File:EXB010.out
------------------------------------------------------------------------
STONERIDGE - PRELIMINARY HYDROLOGY STUDY - AREA 'B'
EXISTING CONDITION RATIONAL METHOD - 10 YEAR STORM
HUNSAKER & ASSOCIATES, MAY 2020
BY: BRIAN LOWELL, PE AND ALEX ANDAYA
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

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


Program License Serial Number 6406

------------------------------------------------------------------------
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 =  0.450(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.759(In/Hr)
Slope of intensity duration curve = 0.5000




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   458.000(Ft.)
Top (of initial area) elevation =  1510.000(Ft.)
Bottom (of initial area) elevation =  1494.000(Ft.)
Difference in elevation =    16.000(Ft.)
Slope =    0.03493  s(percent)=       3.49
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.022 min.
Rainfall intensity =      1.695(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.737
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 =     12.482(CFS)
Total initial stream area =       10.000(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1494.000(Ft.)
End of natural channel elevation =   1427.900(Ft.)
Length of natural channel  =  2333.000(Ft.)
Estimated mean flow rate at midpoint of channel =     91.554(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 =   7.78(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0283
Corrected/adjusted channel slope =  0.0283
Travel time =    5.00 min.     TC =   17.02  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.713
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 =      1.424(In/Hr) for a    10.0 year storm
Subarea runoff =    128.611(CFS) for    126.700(Ac.)
Total runoff =    141.093(CFS)        Total area =     136.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1427.900(Ft.)
Downstream point/station elevation =  1388.000(Ft.)
Pipe length  =  4664.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   141.093(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =   141.093(CFS)
Normal flow depth in pipe =   42.94(In.)
Flow top width inside pipe =   29.49(In.)
Critical Depth =   42.26(In.)
Pipe flow velocity =     11.91(Ft/s)
Travel time through pipe =    6.53 min.
Time of concentration (TC) =    23.55 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    136.700(Ac.)
Runoff from this stream =    141.093(CFS)
Time of concentration =   23.55 min.
Rainfall intensity =     1.211(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   592.000(Ft.)
Top (of initial area) elevation =  1517.000(Ft.)
Bottom (of initial area) elevation =  1486.000(Ft.)
Difference in elevation =    31.000(Ft.)
Slope =    0.05236  s(percent)=       5.24
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.286 min.
Rainfall intensity =      1.676(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.744
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.850
```

```
Decimal fraction soil group C = 0.150
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.20
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      8.736(CFS)
Total initial stream area =        7.000(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      206.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1486.000(Ft.)
End of natural channel elevation =   1427.000(Ft.)
Length of natural channel  =  2011.000(Ft.)
Estimated mean flow rate at midpoint of channel =     59.718(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 =   6.98(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0293
Corrected/adjusted channel slope =  0.0293
Travel time =    4.80 min.     TC =   17.09  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.715
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)  =  78.40
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.421(In/Hr) for a    10.0 year storm
Subarea runoff =     83.054(CFS) for     81.700(Ac.)
Total runoff =     91.790(CFS)        Total area =      88.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      206.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1427.000(Ft.)
Downstream point/station elevation =  1388.000(Ft.)
Pipe length  =  2946.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    91.790(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    91.790(CFS)
Normal flow depth in pipe =   30.84(In.)
Flow top width inside pipe =   31.72(In.)
Critical Depth =   35.37(In.)
Pipe flow velocity =     13.05(Ft/s)
Travel time through pipe =    3.76 min.
Time of concentration (TC) =    20.85 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      206.000 to Point/Station      203.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     88.700(Ac.)
Runoff from this stream =     91.790(CFS)
Time of concentration =   20.85 min.
Rainfall intensity =     1.287(In/Hr)
Program is now starting with Main Stream No. 3
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      207.000 to Point/Station      208.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   561.000(Ft.)
Top (of initial area) elevation =  1539.000(Ft.)
Bottom (of initial area) elevation =  1483.000(Ft.)
Difference in elevation =    56.000(Ft.)
Slope =    0.09982  s(percent)=       9.98
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.569 min.
Rainfall intensity =      1.807(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.769
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.600
Decimal fraction soil group C = 0.400
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  81.20
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     10.281(CFS)
Total initial stream area =        7.400(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      208.000 to Point/Station      209.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of natural channel elevation =   1483.000(Ft.)
End of natural channel elevation =   1430.000(Ft.)
Length of natural channel  =  1442.000(Ft.)
Estimated mean flow rate at midpoint of channel =     61.062(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 =   7.86(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0368
Corrected/adjusted channel slope =  0.0368
Travel time =    3.06 min.     TC =   13.62  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
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)  =  78.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.592(In/Hr) for a    10.0 year storm
Subarea runoff =     84.713(CFS) for     73.100(Ac.)
Total runoff =     94.994(CFS)        Total area =      80.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      209.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1430.000(Ft.)
Downstream point/station elevation =  1388.000(Ft.)
Pipe length  =  1563.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    94.994(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    94.994(CFS)
Normal flow depth in pipe =   25.92(In.)
```

```
Flow top width inside pipe =   32.33(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.42(Ft/s)
Travel time through pipe =    1.50 min.
Time of concentration (TC) =    15.12 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      209.000 to Point/Station      203.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     80.500(Ac.)
Runoff from this stream =     94.994(CFS)
Time of concentration =   15.12 min.
Rainfall intensity =     1.511(In/Hr)
Program is now starting with Main Stream No. 4


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      211.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   460.000(Ft.)
Top (of initial area) elevation =  1548.000(Ft.)
Bottom (of initial area) elevation =  1510.000(Ft.)
Difference in elevation =    38.000(Ft.)
Slope =    0.08261  s(percent)=       8.26
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.139 min.
Rainfall intensity =      1.845(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.765
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)  =  80.40
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      3.954(CFS)
Total initial stream area =        2.800(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      211.000 to Point/Station      212.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1510.000(Ft.)
End of natural channel elevation =   1455.000(Ft.)
Length of natural channel  =   910.000(Ft.)
Estimated mean flow rate at midpoint of channel =     18.357(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 =   7.20(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0604
Corrected/adjusted channel slope =  0.0604
Travel time =    2.11 min.     TC =   12.25  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.751
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.750
Decimal fraction soil group C = 0.250
Decimal fraction soil group D = 0.000
```

```
RI index for soil(AMC 2)  =  80.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.679(In/Hr) for a    10.0 year storm
Subarea runoff =     25.722(CFS) for     20.400(Ac.)
Total runoff =     29.676(CFS)        Total area =      23.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      212.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1455.000(Ft.)
Downstream point/station elevation =  1388.000(Ft.)
Pipe length  =  1469.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    29.676(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    29.676(CFS)
Normal flow depth in pipe =   15.23(In.)
Flow top width inside pipe =   18.74(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.86(Ft/s)
Travel time through pipe =    1.54 min.
Time of concentration (TC) =    13.79 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      212.000 to Point/Station      203.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 4
Stream flow area =     23.200(Ac.)
Runoff from this stream =     29.676(CFS)
Time of concentration =   13.79 min.
Rainfall intensity =     1.582(In/Hr)
Summary of stream data:

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


1      141.093     23.55               1.211
2       91.790     20.85               1.287
3       94.994     15.12               1.511
4       29.676     13.79               1.582
Largest stream flow has longer time of concentration
Qp =    141.093 + sum of
          Qb         Ia/Ib
          91.790 *    0.941 =     86.377
          Qb         Ia/Ib
          94.994 *    0.801 =     76.124
          Qb         Ia/Ib
          29.676 *    0.765 =     22.709
Qp =    326.303

Total of 4 main streams to confluence:
Flow rates before confluence point:
     141.093      91.790      94.994      29.676
Area of streams before confluence:
      136.700       88.700       80.500       23.200


Results of confluence:
Total flow rate =    326.303(CFS)
Time of concentration =    23.546 min.
Effective stream area after confluence  =    329.100(Ac.)
End of computations, total study area =          329.10 (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 =  78.4
```

```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 06/27/20  File:exb100.out
------------------------------------------------------------------------
STONERIDGE - PRELIMINARY HYDROLOGY STUDY – AREA 'B'
EXISTING CONDITION RATIONAL METHOD - 100 YEAR STORM
HUNSAKER & ASSOCIATES, MAY 2020
BY: BRIAN LOWELL, PE AND ALEX ANDAYA
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

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


Program License Serial Number 6406

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

Storm event (year) =  100.00 Antecedent Moisture Condition = 3

2 year, 1 hour precipitation =  0.450(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.200(In/Hr)
Slope of intensity duration curve = 0.5000




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   458.000(Ft.)
Top (of initial area) elevation =  1510.000(Ft.)
Bottom (of initial area) elevation =  1494.000(Ft.)
Difference in elevation =    16.000(Ft.)
Slope =    0.03493  s(percent)=       3.49
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.022 min.
Rainfall intensity =      2.681(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.852
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 3)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     22.837(CFS)
Total initial stream area =       10.000(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1494.000(Ft.)
End of natural channel elevation =   1427.900(Ft.)
Length of natural channel  =  2333.000(Ft.)
Estimated mean flow rate at midpoint of channel =    167.513(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 =   9.35(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0283
Corrected/adjusted channel slope =  0.0283
Travel time =    4.16 min.     TC =   16.18  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.845
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 3)  =  89.85
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.311(In/Hr) for a   100.0 year storm
Subarea runoff =    247.357(CFS) for    126.700(Ac.)
Total runoff =    270.195(CFS)        Total area =     136.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1427.900(Ft.)
Downstream point/station elevation =  1388.000(Ft.)
Pipe length  =  4664.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   270.195(CFS)
Nearest computed pipe diameter  =     63.00(In.)
Calculated individual pipe flow  =   270.195(CFS)
Normal flow depth in pipe =   50.81(In.)
Flow top width inside pipe =   49.77(In.)
Critical Depth =   54.83(In.)
Pipe flow velocity =     14.45(Ft/s)
Travel time through pipe =    5.38 min.
Time of concentration (TC) =    21.56 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      203.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    136.700(Ac.)
Runoff from this stream =    270.195(CFS)
Time of concentration =   21.56 min.
Rainfall intensity =     2.002(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   592.000(Ft.)
Top (of initial area) elevation =  1517.000(Ft.)
Bottom (of initial area) elevation =  1486.000(Ft.)
Difference in elevation =    31.000(Ft.)
Slope =    0.05236  s(percent)=       5.24
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.286 min.
Rainfall intensity =      2.652(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.855
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.850
```

```
Decimal fraction soil group C = 0.150
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  90.52
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     15.871(CFS)
Total initial stream area =        7.000(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      206.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1486.000(Ft.)
End of natural channel elevation =   1427.000(Ft.)
Length of natural channel  =  2011.000(Ft.)
Estimated mean flow rate at midpoint of channel =    108.492(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 =   8.33(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0293
Corrected/adjusted channel slope =  0.0293
Travel time =    4.02 min.     TC =   16.31  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.846
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 3)  =  90.04
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.302(In/Hr) for a   100.0 year storm
Subarea runoff =    159.054(CFS) for     81.700(Ac.)
Total runoff =    174.925(CFS)        Total area =      88.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      206.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1427.000(Ft.)
Downstream point/station elevation =  1388.000(Ft.)
Pipe length  =  2946.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   174.925(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =   174.925(CFS)
Normal flow depth in pipe =   42.56(In.)
Flow top width inside pipe =   30.43(In.)
Critical Depth =   45.02(In.)
Pipe flow velocity =     14.85(Ft/s)
Travel time through pipe =    3.31 min.
Time of concentration (TC) =    19.61 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      206.000 to Point/Station      203.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     88.700(Ac.)
Runoff from this stream =    174.925(CFS)
Time of concentration =   19.61 min.
Rainfall intensity =     2.099(In/Hr)
Program is now starting with Main Stream No. 3
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      207.000 to Point/Station      208.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   561.000(Ft.)
Top (of initial area) elevation =  1539.000(Ft.)
Bottom (of initial area) elevation =  1483.000(Ft.)
Difference in elevation =    56.000(Ft.)
Slope =    0.09982  s(percent)=       9.98
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.569 min.
Rainfall intensity =      2.859(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.864
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.600
Decimal fraction soil group C = 0.400
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  91.72
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     18.273(CFS)
Total initial stream area =        7.400(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      208.000 to Point/Station      209.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of natural channel elevation =   1483.000(Ft.)
End of natural channel elevation =   1430.000(Ft.)
Length of natural channel  =  1442.000(Ft.)
Estimated mean flow rate at midpoint of channel =    108.528(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 =   9.33(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0368
Corrected/adjusted channel slope =  0.0368
Travel time =    2.58 min.     TC =   13.15  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.850
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 3)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.564(In/Hr) for a   100.0 year storm
Subarea runoff =    159.259(CFS) for     73.100(Ac.)
Total runoff =    177.532(CFS)        Total area =      80.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      209.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1430.000(Ft.)
Downstream point/station elevation =  1388.000(Ft.)
Pipe length  =  1563.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   177.532(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =   177.532(CFS)
Normal flow depth in pipe =   33.23(In.)
```

```
Flow top width inside pipe =   39.55(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.30(Ft/s)
Travel time through pipe =    1.28 min.
Time of concentration (TC) =    14.43 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      209.000 to Point/Station      203.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     80.500(Ac.)
Runoff from this stream =    177.532(CFS)
Time of concentration =   14.43 min.
Rainfall intensity =     2.447(In/Hr)
Program is now starting with Main Stream No. 4


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      211.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   460.000(Ft.)
Top (of initial area) elevation =  1548.000(Ft.)
Bottom (of initial area) elevation =  1510.000(Ft.)
Difference in elevation =    38.000(Ft.)
Slope =    0.08261  s(percent)=       8.26
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.139 min.
Rainfall intensity =      2.919(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.862
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 3)  =  91.24
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      7.047(CFS)
Total initial stream area =        2.800(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      211.000 to Point/Station      212.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1510.000(Ft.)
End of natural channel elevation =   1455.000(Ft.)
Length of natural channel  =   910.000(Ft.)
Estimated mean flow rate at midpoint of channel =     32.720(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 =   8.43(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0604
Corrected/adjusted channel slope =  0.0604
Travel time =    1.80 min.     TC =   11.94  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.858
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.750
Decimal fraction soil group C = 0.250
Decimal fraction soil group D = 0.000
```

```
RI index for soil(AMC 3)  =  91.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.690(In/Hr) for a   100.0 year storm
Subarea runoff =     47.088(CFS) for     20.400(Ac.)
Total runoff =     54.135(CFS)        Total area =      23.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      212.000 to Point/Station      203.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1455.000(Ft.)
Downstream point/station elevation =  1388.000(Ft.)
Pipe length  =  1469.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    54.135(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    54.135(CFS)
Normal flow depth in pipe =   18.59(In.)
Flow top width inside pipe =   25.01(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.56(Ft/s)
Travel time through pipe =    1.32 min.
Time of concentration (TC) =    13.26 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      212.000 to Point/Station      203.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 4
Stream flow area =     23.200(Ac.)
Runoff from this stream =     54.135(CFS)
Time of concentration =   13.26 min.
Rainfall intensity =     2.553(In/Hr)
Summary of stream data:

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


1      270.195     21.56               2.002
2      174.925     19.61               2.099
3      177.532     14.43               2.447
4       54.135     13.26               2.553
Largest stream flow has longer time of concentration
Qp =    270.195 + sum of
          Qb         Ia/Ib
         174.925 *    0.954 =    166.838
          Qb         Ia/Ib
         177.532 *    0.818 =    145.225
          Qb         Ia/Ib
          54.135 *    0.784 =     42.446
Qp =    624.703

Total of 4 main streams to confluence:
Flow rates before confluence point:
     270.195     174.925     177.532      54.135
Area of streams before confluence:
      136.700       88.700       80.500       23.200


Results of confluence:
Total flow rate =    624.703(CFS)
Time of concentration =    21.563 min.
Effective stream area after confluence  =    329.100(Ac.)
End of computations, total study area =          329.10 (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 =  78.4
```

Area B

➢ POST-DEVELOPMENT CONDITION

- ❖ Area 'B' – 10 Year Post-Development Condition – Rational Method
- ❖ Area 'B' – 100 Year Post-Development Condition – Rational Method

```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 06/23/20  File:PRB010.out
------------------------------------------------------------------------
STONERIDGE - PRELIMINARY HYDROLOGY STUDY - AREA 'B'
PROPOSED CONDITION RATIONAL METHOD - 10 YEAR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

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


Program License Serial Number 6406

------------------------------------------------------------------------
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 =  0.450(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.759(In/Hr)
Slope of intensity duration curve = 0.5000




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1617.000(Ft.)
Bottom (of initial area) elevation =  1551.000(Ft.)
Difference in elevation =    66.000(Ft.)
Slope =    0.06600  s(percent)=       6.60
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.189 min.
Rainfall intensity =      2.053(In/Hr) for a    10.0 year storm
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
Initial subarea runoff =      2.678(CFS)
Total initial stream area =        1.500(Ac.)
Pervious area fraction = 0.100



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1551.000(Ft.)
End of street segment elevation =  1506.000(Ft.)
Length of street segment  =  1139.000(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  =  39.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  21.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      5.922(CFS)
Depth of flow =   0.341(Ft.), Average velocity =   4.658(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.698(Ft.)
Flow velocity =   4.66(Ft/s)
Travel time =    4.08 min.     TC =   12.26  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 =      1.678(In/Hr) for a    10.0 year storm
Subarea runoff =      6.389(CFS) for      4.400(Ac.)
Total runoff =      9.067(CFS)       Total area =       5.900(Ac.)
Street flow at end of street =      9.067(CFS)
Half street flow at end of street =      9.067(CFS)
Depth of flow =   0.382(Ft.), Average velocity =   5.148(Ft/s)
Flow width (from curb towards crown)=  12.785(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      5.900(Ac.)
Runoff from this stream =      9.067(CFS)
Time of concentration =   12.26 min.
Rainfall intensity =     1.678(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      202.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   682.000(Ft.)
Top (of initial area) elevation =  1512.800(Ft.)
Bottom (of initial area) elevation =  1506.000(Ft.)
Difference in elevation =     6.800(Ft.)
Slope =    0.00997  s(percent)=       1.00
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.254 min.
Rainfall intensity =      1.835(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.867
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 =      9.389(CFS)
Total initial stream area =        5.900(Ac.)
Pervious area fraction = 0.100


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

```
Process from Point/Station      203.000 to Point/Station      202.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      5.900(Ac.)
Runoff from this stream =      9.389(CFS)
Time of concentration =   10.25 min.
Rainfall intensity =     1.835(In/Hr)
Summary of stream data:

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


1        9.067     12.26                 1.678
2        9.389     10.25                 1.835
Largest stream flow has longer or shorter time of concentration
Qp =      9.389 + sum of
          Qa          Tb/Ta
           9.067 *    0.836 =      7.581
Qp =     16.971

Total of 2 streams to confluence:
Flow rates before confluence point:
       9.067       9.389
Area of streams before confluence:
        5.900        5.900
Results of confluence:
Total flow rate =     16.971(CFS)
Time of concentration =    10.254 min.
Effective stream area after confluence =     11.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      204.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________
Upstream point/station elevation =  1500.000(Ft.)
Downstream point/station elevation =  1498.900(Ft.)
Pipe length  =    61.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.971(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    16.971(CFS)
Normal flow depth in pipe =   14.18(In.)
Flow top width inside pipe =   19.67(In.)
Critical Depth =   18.13(In.)
Pipe flow velocity =      9.82(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =    10.36 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________
Upstream point/station elevation =  1498.900(Ft.)
Downstream point/station elevation =  1475.400(Ft.)
Pipe length  =   842.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.971(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    16.971(CFS)
Normal flow depth in pipe =   14.25(In.)
Flow top width inside pipe =   14.62(In.)
Critical depth could not be calculated.
Pipe flow velocity =     11.31(Ft/s)
Travel time through pipe =    1.24 min.
Time of concentration (TC) =    11.60 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** CONFLUENCE OF MINOR STREAMS ****
____________________________________________________________________
```

```
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     11.800(Ac.)
Runoff from this stream =     16.971(CFS)
Time of concentration =   11.60 min.
Rainfall intensity =     1.725(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      206.000 to Point/Station      207.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   526.000(Ft.)
Top (of initial area) elevation =  1498.100(Ft.)
Bottom (of initial area) elevation =  1493.800(Ft.)
Difference in elevation =     4.300(Ft.)
Slope =    0.00817  s(percent)=       0.82
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.617 min.
Rainfall intensity =      1.895(In/Hr) for a    10.0 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
Initial subarea runoff =      7.565(CFS)
Total initial stream area =        4.600(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      207.000 to Point/Station      208.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1493.800(Ft.)
Downstream point elevation =  1484.000(Ft.)
Channel length thru subarea  =   922.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =  12.000
Slope or 'Z' of right channel bank =  12.000
Estimated mean flow rate at midpoint of channel =     14.108(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =     14.108(CFS)
Depth of flow =   0.524(Ft.), Average velocity =   4.296(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =   12.000(Ft.)
Flow Velocity =    4.30(Ft/s)
Travel time  =    3.58 min.
Time of concentration =   13.19 min.

Sub-Channel No. 1 Critical depth =      0.602(Ft.)
  '     '       '     Critical flow top width =     12.000(Ft.)
  '     '       '     Critical flow velocity=    3.344(Ft/s)
  '     '       '     Critical flow area =      4.219(Sq.Ft)

ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
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 =      1.618(In/Hr) for a    10.0 year storm
Subarea runoff =     13.007(CFS) for      9.300(Ac.)
Total runoff =     20.572(CFS)       Total area =      13.900(Ac.)
Depth of flow =   0.593(Ft.), Average velocity =   4.995(Ft/s)
!!Warning: Water is above left or right bank elevations
```

```
ERROR - Channel depth exceeds maximum allowable depth

Sub-Channel No. 1 Critical depth =      0.703(Ft.)
  '     '       '     Critical flow top width =     12.000(Ft.)
  '     '       '     Critical flow velocity=    3.783(Ft/s)
  '     '       '     Critical flow area =      5.438(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      208.000 to Point/Station      205.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1478.000(Ft.)
Downstream point/station elevation =  1475.400(Ft.)
Pipe length  =   124.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    20.572(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    20.572(CFS)
Normal flow depth in pipe =   15.52(In.)
Flow top width inside pipe =   18.45(In.)
Critical Depth =   19.34(In.)
Pipe flow velocity =     10.79(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =    13.39 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      208.000 to Point/Station      205.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     13.900(Ac.)
Runoff from this stream =     20.572(CFS)
Time of concentration =   13.39 min.
Rainfall intensity =     1.606(In/Hr)
Summary of stream data:

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


1       16.971     11.60                1.725
2       20.572     13.39                1.606
Largest stream flow has longer time of concentration
Qp =     20.572 + sum of
          Qb         Ia/Ib
          16.971 *    0.931 =     15.797
Qp =     36.369

Total of 2 streams to confluence:
Flow rates before confluence point:
      16.971      20.572
Area of streams before confluence:
       11.800       13.900
Results of confluence:
Total flow rate =     36.369(CFS)
Time of concentration =    13.385 min.
Effective stream area after confluence =     25.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      209.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1475.400(Ft.)
Downstream point/station elevation =  1455.400(Ft.)
Pipe length  =   622.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    36.369(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    36.369(CFS)
Normal flow depth in pipe =   17.74(In.)
Flow top width inside pipe =   21.07(In.)
```

```
Critical depth could not be calculated.
Pipe flow velocity =     14.61(Ft/s)
Travel time through pipe =    0.71 min.
Time of concentration (TC) =    14.10 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      209.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     25.700(Ac.)
Runoff from this stream =     36.369(CFS)
Time of concentration =   14.10 min.
Rainfall intensity =     1.565(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      211.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   484.000(Ft.)
Top (of initial area) elevation =  1466.800(Ft.)
Bottom (of initial area) elevation =  1461.200(Ft.)
Difference in elevation =     5.600(Ft.)
Slope =    0.01157  s(percent)=       1.16
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.677 min.
Rainfall intensity =      1.995(In/Hr) for a    10.0 year storm
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
Initial subarea runoff =     10.574(CFS)
Total initial stream area =        6.100(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      211.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      6.100(Ac.)
Runoff from this stream =     10.574(CFS)
Time of concentration =    8.68 min.
Rainfall intensity =     1.995(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      212.000 to Point/Station      213.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   700.000(Ft.)
Top (of initial area) elevation =  1505.000(Ft.)
Bottom (of initial area) elevation =  1485.000(Ft.)
Difference in elevation =    20.000(Ft.)
Slope =    0.02857  s(percent)=       2.86
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.394 min.
Rainfall intensity =      2.028(In/Hr) for a    10.0 year storm
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
Initial subarea runoff =      2.116(CFS)
Total initial stream area =        1.200(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      213.000 to Point/Station      211.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1485.000(Ft.)
End of street segment elevation =  1461.200(Ft.)
Length of street segment  =   762.000(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  =  39.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  21.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      3.253(CFS)
Depth of flow =   0.300(Ft.), Average velocity =   3.714(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.655(Ft.)
Flow velocity =   3.71(Ft/s)
Travel time =    3.42 min.     TC =   11.81  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.866
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 =      1.710(In/Hr) for a    10.0 year storm
Subarea runoff =      2.220(CFS) for      1.500(Ac.)
Total runoff =      4.336(CFS)        Total area =       2.700(Ac.)
Street flow at end of street =      4.336(CFS)
Half street flow at end of street =      4.336(CFS)
Depth of flow =   0.323(Ft.), Average velocity =   3.961(Ft/s)
Flow width (from curb towards crown)=   9.838(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      213.000 to Point/Station      211.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.700(Ac.)
Runoff from this stream =      4.336(CFS)
Time of concentration =   11.81 min.
Rainfall intensity =     1.710(In/Hr)
Summary of stream data:

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


1       10.574      8.68                1.995
2        4.336     11.81                1.710
Largest stream flow has longer or shorter time of concentration
Qp =     10.574 + sum of
          Qa          Tb/Ta
           4.336 *    0.735 =      3.185
Qp =     13.758
```

```
Total of 2 streams to confluence:
Flow rates before confluence point:
      10.574       4.336
Area of streams before confluence:
        6.100        2.700
Results of confluence:
Total flow rate =     13.758(CFS)
Time of concentration =     8.677 min.
Effective stream area after confluence =      8.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      211.000 to Point/Station      209.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1457.200(Ft.)
Downstream point/station elevation =  1455.400(Ft.)
Pipe length  =    35.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.758(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    13.758(CFS)
Normal flow depth in pipe =   11.55(In.)
Flow top width inside pipe =   12.62(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.57(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     8.72 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      211.000 to Point/Station      209.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      8.800(Ac.)
Runoff from this stream =     13.758(CFS)
Time of concentration =    8.72 min.
Rainfall intensity =     1.990(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      214.000 to Point/Station      215.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   800.000(Ft.)
Top (of initial area) elevation =  1512.200(Ft.)
Bottom (of initial area) elevation =  1491.000(Ft.)
Difference in elevation =    21.200(Ft.)
Slope =    0.02650  s(percent)=       2.65
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.989 min.
Rainfall intensity =      1.960(In/Hr) for a    10.0 year storm
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
Initial subarea runoff =      2.043(CFS)
Total initial stream area =        1.200(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      215.000 to Point/Station      216.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1491.000(Ft.)
```

```
End of street segment elevation =  1461.000(Ft.)
Length of street segment  =   933.000(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  =  39.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  21.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      3.487(CFS)
Depth of flow =   0.304(Ft.), Average velocity =   3.815(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =   8.873(Ft.)
Flow velocity =   3.81(Ft/s)
Travel time =    4.08 min.     TC =   13.07  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 =      1.626(In/Hr) for a    10.0 year storm
Subarea runoff =      2.811(CFS) for      2.000(Ac.)
Total runoff =      4.854(CFS)       Total area =       3.200(Ac.)
Street flow at end of street =      4.854(CFS)
Half street flow at end of street =      4.854(CFS)
Depth of flow =   0.332(Ft.), Average velocity =   4.111(Ft/s)
Flow width (from curb towards crown)=  10.267(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      209.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1457.000(Ft.)
Downstream point/station elevation =  1455.400(Ft.)
Pipe length  =    40.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.854(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.854(CFS)
Normal flow depth in pipe =    7.27(In.)
Flow top width inside pipe =   11.73(In.)
Critical Depth =   10.90(In.)
Pipe flow velocity =      9.76(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    13.13 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      209.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      3.200(Ac.)
Runoff from this stream =      4.854(CFS)
Time of concentration =   13.13 min.
Rainfall intensity =     1.621(In/Hr)
Summary of stream data:

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

```
1       36.369     14.10               1.565
2       13.758      8.72               1.990
3        4.854     13.13               1.621
Largest stream flow has longer time of concentration
Qp =     36.369 + sum of
          Qb         Ia/Ib
          13.758 *    0.787 =     10.822
          Qb         Ia/Ib
           4.854 *    0.965 =      4.686
Qp =     51.877

Total of 3 main streams to confluence:
Flow rates before confluence point:
      36.369      13.758       4.854
Area of streams before confluence:
       25.700        8.800        3.200


Results of confluence:
Total flow rate =     51.877(CFS)
Time of concentration =    14.095 min.
Effective stream area after confluence  =     37.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      209.000 to Point/Station      217.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1455.400(Ft.)
Downstream point/station elevation =  1453.000(Ft.)
Pipe length  =   262.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    51.877(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    51.877(CFS)
Normal flow depth in pipe =   27.84(In.)
Flow top width inside pipe =   23.96(In.)
Critical Depth =   28.33(In.)
Pipe flow velocity =      9.70(Ft/s)
Travel time through pipe =    0.45 min.
Time of concentration (TC) =    14.55 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      209.000 to Point/Station      217.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     37.700(Ac.)
Runoff from this stream =     51.877(CFS)
Time of concentration =   14.55 min.
Rainfall intensity =     1.541(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      218.000 to Point/Station      219.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   667.000(Ft.)
Top (of initial area) elevation =  1583.000(Ft.)
Bottom (of initial area) elevation =  1539.000(Ft.)
Difference in elevation =    44.000(Ft.)
Slope =    0.06597  s(percent)=       6.60
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.304 min.
Rainfall intensity =      1.675(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.735
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 =      4.309(CFS)
Total initial stream area =        3.500(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      219.000 to Point/Station      220.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1539.000(Ft.)
End of natural channel elevation =   1516.000(Ft.)
Length of natural channel  =   763.000(Ft.)
Estimated mean flow rate at midpoint of channel =      8.926(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 =   4.22(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0301
Corrected/adjusted channel slope =  0.0301
Travel time =    3.02 min.     TC =   15.32  min.


 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.863
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 =      1.501(In/Hr) for a    10.0 year storm
Subarea runoff =      9.716(CFS) for      7.500(Ac.)
Total runoff =     14.025(CFS)        Total area =      11.000(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      221.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1515.000(Ft.)
Downstream point/station elevation =  1460.000(Ft.)
Pipe length  =   864.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.025(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    14.025(CFS)
Normal flow depth in pipe =   10.73(In.)
Flow top width inside pipe =   13.53(In.)
Critical depth could not be calculated.
Pipe flow velocity =     14.94(Ft/s)
Travel time through pipe =    0.96 min.
Time of concentration (TC) =    16.28 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      221.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     11.000(Ac.)
Runoff from this stream =     14.025(CFS)
Time of concentration =   16.28 min.
Rainfall intensity =     1.456(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      222.000 to Point/Station      223.000
```

```
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   796.000(Ft.)
Top (of initial area) elevation =  1510.000(Ft.)
Bottom (of initial area) elevation =  1466.500(Ft.)
Difference in elevation =    43.500(Ft.)
Slope =    0.05465  s(percent)=       5.46
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.762 min.
Rainfall intensity =      2.109(In/Hr) for a    10.0 year storm
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
Initial subarea runoff =     17.617(CFS)
Total initial stream area =        9.600(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      224.000 to Point/Station      223.000
**** SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
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
Time of concentration =     7.76 min.
Rainfall intensity =      2.109(In/Hr) for a    10.0 year storm
Subarea runoff =     21.104(CFS) for     11.500(Ac.)
Total runoff =     38.721(CFS)        Total area =      21.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      223.000 to Point/Station      221.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1461.500(Ft.)
Downstream point/station elevation =  1460.000(Ft.)
Pipe length  =    64.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    38.721(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    38.721(CFS)
Normal flow depth in pipe =   18.54(In.)
Flow top width inside pipe =   25.05(In.)
Critical Depth =   24.89(In.)
Pipe flow velocity =     13.30(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =     7.84 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      223.000 to Point/Station      221.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     21.100(Ac.)
Runoff from this stream =     38.721(CFS)
Time of concentration =    7.84 min.
Rainfall intensity =     2.098(In/Hr)
Summary of stream data:

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

```
1       14.025     16.28                1.456
2       38.721      7.84                2.098
Largest stream flow has longer or shorter time of concentration
Qp =     38.721 + sum of
          Qa          Tb/Ta
          14.025 *    0.482 =      6.754
Qp =     45.475

Total of 2 streams to confluence:
Flow rates before confluence point:
      14.025      38.721
Area of streams before confluence:
       11.000       21.100
Results of confluence:
Total flow rate =     45.475(CFS)
Time of concentration =     7.842 min.
Effective stream area after confluence =     32.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      221.000 to Point/Station      217.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1460.000(Ft.)
Downstream point/station elevation =  1453.000(Ft.)
Pipe length  =  1235.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    45.475(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    45.475(CFS)
Normal flow depth in pipe =   26.86(In.)
Flow top width inside pipe =   31.34(In.)
Critical Depth =   26.35(In.)
Pipe flow velocity =      8.05(Ft/s)
Travel time through pipe =    2.56 min.
Time of concentration (TC) =    10.40 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      221.000 to Point/Station      217.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     32.100(Ac.)
Runoff from this stream =     45.475(CFS)
Time of concentration =   10.40 min.
Rainfall intensity =     1.822(In/Hr)
Summary of stream data:

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


1       51.877     14.55                1.541
2       45.475     10.40                1.822
Largest stream flow has longer time of concentration
Qp =     51.877 + sum of
          Qb         Ia/Ib
          45.475 *    0.846 =     38.453
Qp =     90.330

Total of 2 main streams to confluence:
Flow rates before confluence point:
      51.877      45.475
Area of streams before confluence:
       37.700       32.100


Results of confluence:
Total flow rate =     90.330(CFS)
Time of concentration =    14.545 min.
Effective stream area after confluence  =     69.800(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      217.000 to Point/Station      225.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1453.000(Ft.)
Downstream point/station elevation =  1449.200(Ft.)
Pipe length  =   767.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    90.330(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =    90.330(CFS)
Normal flow depth in pipe =   40.13(In.)
Flow top width inside pipe =   27.97(In.)
Critical Depth =   35.05(In.)
Pipe flow velocity =      8.69(Ft/s)
Travel time through pipe =    1.47 min.
Time of concentration (TC) =    16.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      217.000 to Point/Station      225.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     69.800(Ac.)
Runoff from this stream =     90.330(CFS)
Time of concentration =   16.02 min.
Rainfall intensity =     1.468(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      226.000 to Point/Station      225.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   781.000(Ft.)
Top (of initial area) elevation =  1465.200(Ft.)
Bottom (of initial area) elevation =  1461.000(Ft.)
Difference in elevation =     4.200(Ft.)
Slope =    0.00538  s(percent)=       0.54
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.248 min.
Rainfall intensity =      1.679(In/Hr) for a    10.0 year storm
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
Initial subarea runoff =      2.179(CFS)
Total initial stream area =        1.500(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      225.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1461.000(Ft.)
Downstream point/station elevation =  1449.200(Ft.)
Pipe length  =     1.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     2.179(CFS)
Nearest computed pipe diameter  =      3.00(In.)
Calculated individual pipe flow  =     2.179(CFS)
Normal flow depth in pipe =    1.88(In.)
Flow top width inside pipe =    2.90(In.)
Critical depth could not be calculated.
Pipe flow velocity =     67.27(Ft/s)
Travel time through pipe =    0.00 min.
```

```
Time of concentration (TC) =    12.25 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      225.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.500(Ac.)
Runoff from this stream =      2.179(CFS)
Time of concentration =   12.25 min.
Rainfall intensity =     1.679(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      227.000 to Point/Station      228.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   989.000(Ft.)
Top (of initial area) elevation =  1482.700(Ft.)
Bottom (of initial area) elevation =  1473.500(Ft.)
Difference in elevation =     9.200(Ft.)
Slope =    0.00930  s(percent)=       0.93
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.064 min.
Rainfall intensity =      1.692(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.866
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 =     10.836(CFS)
Total initial stream area =        7.400(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      228.000 to Point/Station      229.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1473.500(Ft.)
Downstream point elevation =  1460.000(Ft.)
Channel length thru subarea  =  1587.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =   6.000
Slope or 'Z' of right channel bank =   6.000
Estimated mean flow rate at midpoint of channel =     30.419(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.250(Ft.)
Flow(q) thru subarea =     30.419(CFS)
Depth of flow =   1.195(Ft.), Average velocity =   9.474(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =    3.000(Ft.)
Flow Velocity =    9.47(Ft/s)
Travel time  =    2.79 min.
Time of concentration =   14.86 min.

Sub-Channel No. 1 Critical depth =      1.594(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    6.904(Ft/s)
  '     '       '     Critical flow area =      4.406(Sq.Ft)

ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.863
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 =      1.524(In/Hr) for a    10.0 year storm
Subarea runoff =     39.089(CFS) for     29.700(Ac.)
Total runoff =     49.925(CFS)       Total area =      37.100(Ac.)
Depth of flow =   1.566(Ft.), Average velocity =  11.550(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth

Sub-Channel No. 1 Critical depth =      2.188(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    8.069(Ft/s)
  '     '       '     Critical flow area =      6.188(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      229.000 to Point/Station      225.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1454.000(Ft.)
Downstream point/station elevation =  1449.200(Ft.)
Pipe length  =   185.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    49.925(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    49.925(CFS)
Normal flow depth in pipe =   22.13(In.)
Flow top width inside pipe =   20.77(In.)
Critical depth could not be calculated.
Pipe flow velocity =     14.30(Ft/s)
Travel time through pipe =    0.22 min.
Time of concentration (TC) =    15.07 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      229.000 to Point/Station      225.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     37.100(Ac.)
Runoff from this stream =     49.925(CFS)
Time of concentration =   15.07 min.
Rainfall intensity =     1.514(In/Hr)
Summary of stream data:

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


1       90.330     16.02               1.468
2        2.179     12.25               1.679
3       49.925     15.07               1.514
Largest stream flow has longer time of concentration
Qp =     90.330 + sum of
          Qb         Ia/Ib
           2.179 *    0.874 =      1.906
          Qb         Ia/Ib
          49.925 *    0.970 =     48.429
Qp =    140.665

Total of 3 main streams to confluence:
Flow rates before confluence point:
      90.330       2.179      49.925
Area of streams before confluence:
       69.800        1.500       37.100


Results of confluence:
Total flow rate =    140.665(CFS)
Time of concentration =    16.017 min.
```

```
Effective stream area after confluence  =    108.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      230.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1449.200(Ft.)
Downstream point/station elevation =  1429.000(Ft.)
Pipe length  =   784.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   140.665(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =   140.665(CFS)
Normal flow depth in pipe =   34.78(In.)
Flow top width inside pipe =   24.23(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.01(Ft/s)
Travel time through pipe =    0.73 min.
Time of concentration (TC) =    16.74 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      230.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    108.400(Ac.)
Runoff from this stream =    140.665(CFS)
Time of concentration =   16.74 min.
Rainfall intensity =     1.436(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      231.000 to Point/Station      232.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   806.000(Ft.)
Top (of initial area) elevation =  1560.000(Ft.)
Bottom (of initial area) elevation =  1480.000(Ft.)
Difference in elevation =    80.000(Ft.)
Slope =    0.09926  s(percent)=       9.93
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.923 min.
Rainfall intensity =      2.233(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 = 0.800
Decimal fraction soil group C = 0.200
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  58.60
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     18.722(CFS)
Total initial stream area =        9.600(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      232.000 to Point/Station      233.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1480.000(Ft.)
Downstream point elevation =  1475.200(Ft.)
Channel length thru subarea  =  1230.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =   6.000
Slope or 'Z' of right channel bank =   6.000
Estimated mean flow rate at midpoint of channel =     48.160(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.250(Ft.)
Flow(q) thru subarea =     48.160(CFS)
```

```
Depth of flow =   1.906(Ft.), Average velocity =   9.012(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =    3.000(Ft.)
Flow Velocity =    9.01(Ft/s)
Travel time  =    2.27 min.
Time of concentration =    9.20 min.

Sub-Channel No. 1 Critical depth =      2.125(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    8.027(Ft/s)
  '     '       '     Critical flow area =      6.000(Sq.Ft)

ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.869
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 =  0.100; Impervious fraction =  0.900
Rainfall intensity =      1.937(In/Hr) for a    10.0 year storm
Subarea runoff =     58.790(CFS) for     34.900(Ac.)
Total runoff =     77.512(CFS)        Total area =      44.500(Ac.)
Depth of flow =   2.495(Ft.), Average velocity =  10.901(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth

Sub-Channel No. 1 Critical depth =      2.875(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    9.395(Ft/s)
  '     '       '     Critical flow area =      8.250(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      233.000 to Point/Station      234.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1469.200(Ft.)
Downstream point/station elevation =  1460.000(Ft.)
Pipe length  =  1970.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    77.512(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =    77.512(CFS)
Normal flow depth in pipe =   34.59(In.)
Flow top width inside pipe =   37.95(In.)
Critical Depth =   32.55(In.)
Pipe flow velocity =      8.51(Ft/s)
Travel time through pipe =    3.86 min.
Time of concentration (TC) =    13.06 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      233.000 to Point/Station      234.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     44.500(Ac.)
Runoff from this stream =     77.512(CFS)
Time of concentration =   13.06 min.
Rainfall intensity =     1.626(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      235.000 to Point/Station      236.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   390.000(Ft.)
Top (of initial area) elevation =  1496.000(Ft.)
Bottom (of initial area) elevation =  1485.500(Ft.)
Difference in elevation =    10.500(Ft.)
```

```
Slope =    0.02692  s(percent)=       2.69
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.722 min.
Rainfall intensity =      2.266(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.872
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 =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      6.914(CFS)
Total initial stream area =        3.500(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      236.000 to Point/Station      237.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1485.500(Ft.)
Downstream point elevation =  1477.500(Ft.)
Channel length thru subarea  =  1681.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =   6.000
Slope or 'Z' of right channel bank =   6.000
Estimated mean flow rate at midpoint of channel =     22.473(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.250(Ft.)
Flow(q) thru subarea =     22.473(CFS)
Depth of flow =   1.187(Ft.), Average velocity =   7.051(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =    3.000(Ft.)
Flow Velocity =    7.05(Ft/s)
Travel time  =    3.97 min.
Time of concentration =   10.70 min.

Sub-Channel No. 1 Critical depth =      1.328(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    6.226(Ft/s)
  '     '       '     Critical flow area =      3.609(Sq.Ft)

ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.868
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 =  0.100; Impervious fraction =  0.900
Rainfall intensity =      1.797(In/Hr) for a    10.0 year storm
Subarea runoff =     31.032(CFS) for     19.900(Ac.)
Total runoff =     37.945(CFS)       Total area =      23.400(Ac.)
Depth of flow =   1.580(Ft.), Average velocity =   8.695(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth

Sub-Channel No. 1 Critical depth =      1.828(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    7.427(Ft/s)
  '     '       '     Critical flow area =      5.109(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      237.000 to Point/Station      234.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1471.500(Ft.)
Downstream point/station elevation =  1460.000(Ft.)
```

```
Pipe length  =   275.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    37.945(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    37.945(CFS)
Normal flow depth in pipe =   16.55(In.)
Flow top width inside pipe =   22.21(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.43(Ft/s)
Travel time through pipe =    0.28 min.
Time of concentration (TC) =    10.97 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      237.000 to Point/Station      234.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     23.400(Ac.)
Runoff from this stream =     37.945(CFS)
Time of concentration =   10.97 min.
Rainfall intensity =     1.774(In/Hr)
Summary of stream data:

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


1       77.512     13.06                1.626
2       37.945     10.97                1.774
Largest stream flow has longer time of concentration
Qp =     77.512 + sum of
          Qb         Ia/Ib
          37.945 *    0.917 =     34.787
Qp =    112.299

Total of 2 streams to confluence:
Flow rates before confluence point:
      77.512      37.945
Area of streams before confluence:
       44.500       23.400
Results of confluence:
Total flow rate =    112.299(CFS)
Time of concentration =    13.058 min.
Effective stream area after confluence =     67.900(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      234.000 to Point/Station      238.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1460.000(Ft.)
Downstream point/station elevation =  1451.700(Ft.)
Pipe length  =   997.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   112.299(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =   112.299(CFS)
Normal flow depth in pipe =   37.69(In.)
Flow top width inside pipe =   33.20(In.)
Critical Depth =   38.60(In.)
Pipe flow velocity =     11.38(Ft/s)
Travel time through pipe =    1.46 min.
Time of concentration (TC) =    14.52 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      234.000 to Point/Station      238.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     67.900(Ac.)
Runoff from this stream =    112.299(CFS)
Time of concentration =   14.52 min.
Rainfall intensity =     1.542(In/Hr)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      239.000 to Point/Station      240.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1519.500(Ft.)
Bottom (of initial area) elevation =  1496.700(Ft.)
Difference in elevation =    22.800(Ft.)
Slope =    0.02280  s(percent)=       2.28
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.128 min.
Rainfall intensity =      1.846(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.867
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 =      2.402(CFS)
Total initial stream area =        1.500(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      240.000 to Point/Station      241.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1496.700(Ft.)
End of street segment elevation =  1456.900(Ft.)
Length of street segment  =  2114.000(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  =  39.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  21.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      5.589(CFS)
Depth of flow =   0.371(Ft.), Average velocity =   3.460(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  12.202(Ft.)
Flow velocity =   3.46(Ft/s)
Travel time =   10.18 min.     TC =   20.31  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.860
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 =      1.304(In/Hr) for a    10.0 year storm
Subarea runoff =      6.278(CFS) for      5.600(Ac.)
Total runoff =      8.680(CFS)       Total area =       7.100(Ac.)
Street flow at end of street =      8.680(CFS)
Half street flow at end of street =      8.680(CFS)
Depth of flow =   0.419(Ft.), Average velocity =   3.842(Ft/s)
Flow width (from curb towards crown)=  14.603(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      241.000 to Point/Station      238.000
```

```
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  1452.000(Ft.)
Downstream point/station elevation =  1451.700(Ft.)
Pipe length  =    48.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.680(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     8.680(CFS)
Normal flow depth in pipe =   12.87(In.)
Flow top width inside pipe =   20.46(In.)
Critical Depth =   13.14(In.)
Pipe flow velocity =      5.62(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =    20.45 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      241.000 to Point/Station      238.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      7.100(Ac.)
Runoff from this stream =      8.680(CFS)
Time of concentration =   20.45 min.
Rainfall intensity =     1.299(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      242.000 to Point/Station      243.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________
Initial area flow distance =   990.000(Ft.)
Top (of initial area) elevation =  1494.000(Ft.)
Bottom (of initial area) elevation =  1484.200(Ft.)
Difference in elevation =     9.800(Ft.)
Slope =    0.00990  s(percent)=       0.99
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.919 min.
Rainfall intensity =      1.702(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.871
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 =     14.086(CFS)
Total initial stream area =        9.500(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      243.000 to Point/Station      244.000
**** IMPROVED CHANNEL TRAVEL TIME ****
_____________________________________________________________________
Upstream point elevation =  1484.200(Ft.)
Downstream point elevation =  1466.400(Ft.)
Channel length thru subarea  =  1911.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =   6.000
Slope or 'Z' of right channel bank =   6.000
Estimated mean flow rate at midpoint of channel =     37.218(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.250(Ft.)
Flow(q) thru subarea =     37.218(CFS)
Depth of flow =   1.301(Ft.), Average velocity =  10.553(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =    3.000(Ft.)
Flow Velocity =   10.55(Ft/s)
Travel time  =    3.02 min.
Time of concentration =   14.94 min.
```

```
Sub-Channel No. 1 Critical depth =      1.813(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    7.352(Ft/s)
  '     '       '     Critical flow area =      5.063(Sq.Ft)

ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.864
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.980
Decimal fraction soil group C = 0.020
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  56.26
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      1.520(In/Hr) for a    10.0 year storm
Subarea runoff =     46.210(CFS) for     35.200(Ac.)
Total runoff =     60.296(CFS)        Total area =      44.700(Ac.)
Depth of flow =   1.695(Ft.), Average velocity =  12.799(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth

Sub-Channel No. 1 Critical depth =      2.438(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    8.691(Ft/s)
  '     '       '     Critical flow area =      6.938(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      244.000 to Point/Station      238.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1460.000(Ft.)
Downstream point/station elevation =  1451.700(Ft.)
Pipe length  =    83.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    60.296(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    60.296(CFS)
Normal flow depth in pipe =   16.88(In.)
Flow top width inside pipe =   21.93(In.)
Critical depth could not be calculated.
Pipe flow velocity =     25.52(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    14.99 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      244.000 to Point/Station      238.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 3
Stream flow area =     44.700(Ac.)
Runoff from this stream =     60.296(CFS)
Time of concentration =   14.99 min.
Rainfall intensity =     1.518(In/Hr)
Summary of stream data:

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


1      112.299     14.52                1.542
2        8.680     20.45                1.299
3       60.296     14.99                1.518
Largest stream flow has longer or shorter time of concentration
Qp =    112.299 + sum of
          Qa          Tb/Ta
           8.680 *    0.710 =      6.161
          Qa          Tb/Ta
           60.296 *   0.968 =     58.393
Qp =    176.853
```

```
Total of 3 streams to confluence:
Flow rates before confluence point:
     112.299       8.680      60.296
Area of streams before confluence:
       67.900        7.100       44.700
Results of confluence:
Total flow rate =    176.853(CFS)
Time of concentration =    14.519 min.
Effective stream area after confluence =    119.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      238.000 to Point/Station      245.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1451.700(Ft.)
Downstream point/station elevation =  1451.000(Ft.)
Pipe length  =    45.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   176.853(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =   176.853(CFS)
Normal flow depth in pipe =   38.81(In.)
Flow top width inside pipe =   37.77(In.)
Critical Depth =   45.11(In.)
Pipe flow velocity =     16.25(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    14.56 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      238.000 to Point/Station      245.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    119.700(Ac.)
Runoff from this stream =    176.853(CFS)
Time of concentration =   14.56 min.
Rainfall intensity =     1.540(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      214.000 to Point/Station      246.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1512.200(Ft.)
Bottom (of initial area) elevation =  1493.000(Ft.)
Difference in elevation =    19.200(Ft.)
Slope =    0.01920  s(percent)=       1.92
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.482 min.
Rainfall intensity =      1.815(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.867
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 =      2.203(CFS)
Total initial stream area =        1.400(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      246.000 to Point/Station      245.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1493.000(Ft.)
End of street segment elevation =  1457.700(Ft.)
Length of street segment  =  1952.000(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  =  39.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  21.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      5.167(CFS)
Depth of flow =   0.365(Ft.), Average velocity =   3.344(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  11.909(Ft.)
Flow velocity =   3.34(Ft/s)
Travel time =    9.73 min.     TC =   20.21  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.860
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 =      1.307(In/Hr) for a    10.0 year storm
Subarea runoff =      5.845(CFS) for      5.200(Ac.)
Total runoff =      8.048(CFS)       Total area =       6.600(Ac.)
Street flow at end of street =      8.048(CFS)
Half street flow at end of street =      8.048(CFS)
Depth of flow =   0.412(Ft.), Average velocity =   3.716(Ft/s)
Flow width (from curb towards crown)=  14.279(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      245.000 to Point/Station      245.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1457.000(Ft.)
Downstream point/station elevation =  1451.000(Ft.)
Pipe length  =     1.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.048(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     8.048(CFS)
Normal flow depth in pipe =    3.30(In.)
Flow top width inside pipe =    5.97(In.)
Critical depth could not be calculated.
Pipe flow velocity =     72.74(Ft/s)
Travel time through pipe =    0.00 min.
Time of concentration (TC) =    20.21 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      245.000 to Point/Station      245.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      6.600(Ac.)
Runoff from this stream =      8.048(CFS)
Time of concentration =   20.21 min.
Rainfall intensity =     1.307(In/Hr)
Summary of stream data:

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


1      176.853     14.56                1.540
2        8.048     20.21                1.307
Largest stream flow has longer or shorter time of concentration
Qp =    176.853 + sum of
```

```
          Qa          Tb/Ta
           8.048 *    0.721 =      5.799
Qp =    182.652

Total of 2 streams to confluence:
Flow rates before confluence point:
     176.853       8.048
Area of streams before confluence:
      119.700        6.600
Results of confluence:
Total flow rate =    182.652(CFS)
Time of concentration =    14.565 min.
Effective stream area after confluence =    126.300(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      245.000 to Point/Station      247.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1451.000(Ft.)
Downstream point/station elevation =  1445.500(Ft.)
Pipe length  =  1033.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   182.652(CFS)
Nearest computed pipe diameter  =     60.00(In.)
Calculated individual pipe flow  =   182.652(CFS)
Normal flow depth in pipe =   47.20(In.)
Flow top width inside pipe =   49.15(In.)
Critical Depth =   46.45(In.)
Pipe flow velocity =     11.02(Ft/s)
Travel time through pipe =    1.56 min.
Time of concentration (TC) =    16.13 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      245.000 to Point/Station      247.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    126.300(Ac.)
Runoff from this stream =    182.652(CFS)
Time of concentration =   16.13 min.
Rainfall intensity =     1.463(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      248.000 to Point/Station      249.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   671.000(Ft.)
Top (of initial area) elevation =  1471.300(Ft.)
Bottom (of initial area) elevation =  1461.100(Ft.)
Difference in elevation =    10.200(Ft.)
Slope =    0.01520  s(percent)=       1.52
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.363 min.
Rainfall intensity =      1.920(In/Hr) for a    10.0 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
Initial subarea runoff =      4.168(CFS)
Total initial stream area =        2.500(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      249.000 to Point/Station      250.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
```

```
Upstream point elevation =  1461.100(Ft.)
Downstream point elevation =  1450.000(Ft.)
Channel length thru subarea  =  1506.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =   6.000
Slope or 'Z' of right channel bank =   6.000
Estimated mean flow rate at midpoint of channel =     26.164(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.250(Ft.)
Flow(q) thru subarea =     26.164(CFS)
Depth of flow =   1.146(Ft.), Average velocity =   8.544(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =    3.000(Ft.)
Flow Velocity =    8.54(Ft/s)
Travel time  =    2.94 min.
Time of concentration =   12.30 min.

Sub-Channel No. 1 Critical depth =      1.453(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    6.567(Ft/s)
  '     '       '     Critical flow area =      3.984(Sq.Ft)

ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
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 =      1.675(In/Hr) for a    10.0 year storm
Subarea runoff =     43.927(CFS) for     30.300(Ac.)
Total runoff =     48.095(CFS)       Total area =      32.800(Ac.)
Depth of flow =   1.596(Ft.), Average velocity =  10.900(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth

Sub-Channel No. 1 Critical depth =      2.125(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    8.016(Ft/s)
  '     '       '     Critical flow area =      6.000(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      250.000 to Point/Station      247.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1446.100(Ft.)
Downstream point/station elevation =  1445.500(Ft.)
Pipe length  =   120.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    48.095(CFS)
Nearest computed pipe diameter  =     36.00(In.)
Calculated individual pipe flow  =    48.095(CFS)
Normal flow depth in pipe =   30.19(In.)
Flow top width inside pipe =   26.49(In.)
Critical Depth =   27.08(In.)
Pipe flow velocity =      7.60(Ft/s)
Travel time through pipe =    0.26 min.
Time of concentration (TC) =    12.56 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      250.000 to Point/Station      247.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     32.800(Ac.)
Runoff from this stream =     48.095(CFS)
Time of concentration =   12.56 min.
Rainfall intensity =     1.658(In/Hr)
```

```
Summary of stream data:

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


1      182.652     16.13                1.463
2       48.095     12.56                1.658
Largest stream flow has longer time of concentration
Qp =    182.652 + sum of
          Qb         Ia/Ib
          48.095 *    0.883 =     42.452
Qp =    225.105

Total of 2 streams to confluence:
Flow rates before confluence point:
     182.652      48.095
Area of streams before confluence:
      126.300       32.800
Results of confluence:
Total flow rate =    225.105(CFS)
Time of concentration =    16.127 min.
Effective stream area after confluence =    159.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      247.000 to Point/Station      230.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1445.500(Ft.)
Downstream point/station elevation =  1429.000(Ft.)
Pipe length  =  2639.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   225.105(CFS)
Nearest computed pipe diameter  =     63.00(In.)
Calculated individual pipe flow  =   225.105(CFS)
Normal flow depth in pipe =   49.50(In.)
Flow top width inside pipe =   51.70(In.)
Critical Depth =   50.74(In.)
Pipe flow velocity =     12.34(Ft/s)
Travel time through pipe =    3.56 min.
Time of concentration (TC) =    19.69 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      247.000 to Point/Station      230.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    159.100(Ac.)
Runoff from this stream =    225.105(CFS)
Time of concentration =   19.69 min.
Rainfall intensity =     1.324(In/Hr)
Summary of stream data:

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


1      140.665     16.74                1.436
2      225.105     19.69                1.324
Largest stream flow has longer time of concentration
Qp =    225.105 + sum of
          Qb         Ia/Ib
         140.665 *    0.922 =    129.704
Qp =    354.809

Total of 2 main streams to confluence:
Flow rates before confluence point:
     140.665     225.105
Area of streams before confluence:
      108.400      159.100
```

```
Results of confluence:
Total flow rate =    354.809(CFS)
Time of concentration =    19.691 min.
Effective stream area after confluence  =    267.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      230.000 to Point/Station      251.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1429.000(Ft.)
Downstream point/station elevation =  1427.600(Ft.)
Pipe length  =   255.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   354.809(CFS)
Nearest computed pipe diameter  =     75.00(In.)
Calculated individual pipe flow  =   354.809(CFS)
Normal flow depth in pipe =   62.44(In.)
Flow top width inside pipe =   56.01(In.)
Critical Depth =   61.00(In.)
Pipe flow velocity =     12.99(Ft/s)
Travel time through pipe =    0.33 min.
Time of concentration (TC) =    20.02 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      230.000 to Point/Station      251.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    267.500(Ac.)
Runoff from this stream =    354.809(CFS)
Time of concentration =   20.02 min.
Rainfall intensity =     1.313(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      252.000 to Point/Station      253.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   454.000(Ft.)
Top (of initial area) elevation =  1456.450(Ft.)
Bottom (of initial area) elevation =  1452.500(Ft.)
Difference in elevation =     3.950(Ft.)
Slope =    0.00870  s(percent)=       0.87
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.954 min.
Rainfall intensity =      1.964(In/Hr) for a    10.0 year storm
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
Initial subarea runoff =     17.057(CFS)
Total initial stream area =       10.000(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      253.000 to Point/Station      251.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1452.500(Ft.)
Downstream point elevation =  1434.000(Ft.)
Channel length thru subarea  =  2714.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =   6.000
Slope or 'Z' of right channel bank =   6.000
Estimated mean flow rate at midpoint of channel =     54.891(CFS)
Manning's 'N'    = 0.015
```

```
Maximum depth of channel  =    0.250(Ft.)
Flow(q) thru subarea =     54.891(CFS)
Depth of flow =   1.755(Ft.), Average velocity =  11.225(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =    3.000(Ft.)
Flow Velocity =   11.23(Ft/s)
Travel time  =    4.03 min.
Time of concentration =   12.98 min.

Sub-Channel No. 1 Critical depth =      2.313(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    8.364(Ft/s)
  '     '       '     Critical flow area =      6.563(Sq.Ft)

ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
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 =      1.631(In/Hr) for a    10.0 year storm
Subarea runoff =     75.585(CFS) for     53.600(Ac.)
Total runoff =     92.643(CFS)       Total area =      63.600(Ac.)
Depth of flow =   2.356(Ft.), Average velocity =  13.840(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth

Sub-Channel No. 1 Critical depth =      3.219(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    9.982(Ft/s)
  '     '       '     Critical flow area =      9.281(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      251.000 to Point/Station      251.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1434.000(Ft.)
Downstream point/station elevation =  1427.600(Ft.)
Pipe length  =     1.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    92.643(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    92.643(CFS)
Normal flow depth in pipe =    8.09(In.)
Flow top width inside pipe =   14.95(In.)
Critical depth could not be calculated.
Pipe flow velocity =    137.33(Ft/s)
Travel time through pipe =    0.00 min.
Time of concentration (TC) =    12.98 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      251.000 to Point/Station      251.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     63.600(Ac.)
Runoff from this stream =     92.643(CFS)
Time of concentration =   12.98 min.
Rainfall intensity =     1.631(In/Hr)
Summary of stream data:

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


1      354.809     20.02                1.313
2       92.643     12.98                1.631
```

```
Largest stream flow has longer time of concentration
Qp =    354.809 + sum of
          Qb          Ia/Ib
          92.643 *     0.805 =     74.611
Qp =    429.420

Total of 2 streams to confluence:
Flow rates before confluence point:
     354.809      92.643
Area of streams before confluence:
      267.500       63.600
Results of confluence:
Total flow rate =    429.420(CFS)
Time of concentration =    20.018 min.
Effective stream area after confluence =    331.100(Ac.)
End of computations, total study area =          331.10 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.110
Area averaged RI index number =  56.7
```

```
CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 06/23/20  File:PRB100.out
------------------------------------------------------------------------------
STONERIDGE - PRELIMINARY HYDROLOGY STUDY - AREA 'B'
PROPOSED CONDITION RATIONAL METHOD - 100 YEAR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

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


Program License Serial Number 6406

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

Storm event (year) =  100.00 Antecedent Moisture Condition = 3

2 year, 1 hour precipitation =  0.450(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.200(In/Hr)
Slope of intensity duration curve = 0.5000




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      200.000 to Point/Station      201.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1617.000(Ft.)
Bottom (of initial area) elevation =  1551.000(Ft.)
Difference in elevation =    66.000(Ft.)
Slope =    0.06600  s(percent)=       6.60
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.189 min.
Rainfall intensity =      3.248(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.889
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      4.332(CFS)
Total initial stream area =        1.500(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1551.000(Ft.)
End of street segment elevation =  1506.000(Ft.)
Length of street segment  =  1139.000(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  =  39.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
```

```
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  21.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      9.645(CFS)
Depth of flow =   0.389(Ft.), Average velocity =   5.224(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  13.113(Ft.)
Flow velocity =   5.22(Ft/s)
Travel time =    3.63 min.     TC =   11.82  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.887
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.703(In/Hr) for a   100.0 year storm
Subarea runoff =     10.553(CFS) for      4.400(Ac.)
Total runoff =     14.885(CFS)        Total area =       5.900(Ac.)
Street flow at end of street =     14.885(CFS)
Half street flow at end of street =     14.885(CFS)
Depth of flow =   0.439(Ft.), Average velocity =   5.797(Ft/s)
Flow width (from curb towards crown)=  15.623(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      201.000 to Point/Station      202.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      5.900(Ac.)
Runoff from this stream =     14.885(CFS)
Time of concentration =   11.82 min.
Rainfall intensity =     2.703(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      202.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   682.000(Ft.)
Top (of initial area) elevation =  1512.800(Ft.)
Bottom (of initial area) elevation =  1506.000(Ft.)
Difference in elevation =     6.800(Ft.)
Slope =    0.00997  s(percent)=       1.00
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.254 min.
Rainfall intensity =      2.903(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 = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     15.207(CFS)
Total initial stream area =        5.900(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      203.000 to Point/Station      202.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
```

```
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      5.900(Ac.)
Runoff from this stream =     15.207(CFS)
Time of concentration =   10.25 min.
Rainfall intensity =     2.903(In/Hr)
Summary of stream data:

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


1       14.885     11.82                2.703
2       15.207     10.25                2.903
Largest stream flow has longer or shorter time of concentration
Qp =     15.207 + sum of
          Qa          Tb/Ta
          14.885 *    0.867 =     12.910
Qp =     28.117

Total of 2 streams to confluence:
Flow rates before confluence point:
      14.885      15.207
Area of streams before confluence:
        5.900        5.900
Results of confluence:
Total flow rate =     28.117(CFS)
Time of concentration =    10.254 min.
Effective stream area after confluence =     11.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      202.000 to Point/Station      204.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1500.000(Ft.)
Downstream point/station elevation =  1498.900(Ft.)
Pipe length  =    61.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    28.117(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    28.117(CFS)
Normal flow depth in pipe =   18.23(In.)
Flow top width inside pipe =   20.51(In.)
Critical Depth =   21.96(In.)
Pipe flow velocity =     10.98(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    10.35 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1498.900(Ft.)
Downstream point/station elevation =  1475.400(Ft.)
Pipe length  =   842.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    28.117(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    28.117(CFS)
Normal flow depth in pipe =   15.42(In.)
Flow top width inside pipe =   23.00(In.)
Critical Depth =   21.96(In.)
Pipe flow velocity =     13.18(Ft/s)
Travel time through pipe =    1.06 min.
Time of concentration (TC) =    11.41 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      204.000 to Point/Station      205.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     11.800(Ac.)
Runoff from this stream =     28.117(CFS)
```

```
Time of concentration =   11.41 min.
Rainfall intensity =     2.752(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      206.000 to Point/Station      207.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   526.000(Ft.)
Top (of initial area) elevation =  1498.100(Ft.)
Bottom (of initial area) elevation =  1493.800(Ft.)
Difference in elevation =     4.300(Ft.)
Slope =    0.00817  s(percent)=       0.82
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.617 min.
Rainfall intensity =      2.997(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 = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     12.248(CFS)
Total initial stream area =        4.600(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      207.000 to Point/Station      208.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1493.800(Ft.)
Downstream point elevation =  1484.000(Ft.)
Channel length thru subarea  =   922.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =  12.000
Slope or 'Z' of right channel bank =  12.000
Estimated mean flow rate at midpoint of channel =     23.093(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =     23.093(CFS)
Depth of flow =   0.618(Ft.), Average velocity =   5.231(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =   12.000(Ft.)
Flow Velocity =    5.23(Ft/s)
Travel time  =    2.94 min.
Time of concentration =   12.55 min.

Sub-Channel No. 1 Critical depth =      0.734(Ft.)
  '     '       '     Critical flow top width =     12.000(Ft.)
  '     '       '     Critical flow velocity=    3.973(Ft/s)
  '     '       '     Critical flow area =      5.813(Sq.Ft)

ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.887
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.623(In/Hr) for a   100.0 year storm
Subarea runoff =     21.637(CFS) for      9.300(Ac.)
Total runoff =     33.885(CFS)        Total area =      13.900(Ac.)
Depth of flow =   0.713(Ft.), Average velocity =   6.099(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth

Sub-Channel No. 1 Critical depth =      0.875(Ft.)
```

```
'     '       '     Critical flow top width =     12.000(Ft.)
'     '       '     Critical flow velocity=    4.518(Ft/s)
'     '       '     Critical flow area =      7.500(Sq.Ft)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      208.000 to Point/Station      205.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1478.000(Ft.)
Downstream point/station elevation =  1475.400(Ft.)
Pipe length  =   124.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    33.885(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    33.885(CFS)
Normal flow depth in pipe =   20.53(In.)
Flow top width inside pipe =   16.88(In.)
Critical depth could not be calculated.
Pipe flow velocity =     11.85(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =    12.73 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      208.000 to Point/Station      205.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     13.900(Ac.)
Runoff from this stream =     33.885(CFS)
Time of concentration =   12.73 min.
Rainfall intensity =     2.605(In/Hr)
Summary of stream data:

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


1       28.117     11.41                2.752
2       33.885     12.73                2.605
Largest stream flow has longer time of concentration
Qp =     33.885 + sum of
          Qb         Ia/Ib
          28.117 *    0.947 =     26.622
Qp =     60.507

Total of 2 streams to confluence:
Flow rates before confluence point:
      28.117      33.885
Area of streams before confluence:
       11.800       13.900
Results of confluence:
Total flow rate =     60.507(CFS)
Time of concentration =    12.728 min.
Effective stream area after confluence =     25.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      209.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1475.400(Ft.)
Downstream point/station elevation =  1455.400(Ft.)
Pipe length  =   622.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    60.507(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    60.507(CFS)
Normal flow depth in pipe =   20.72(In.)
Flow top width inside pipe =   27.73(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.73(Ft/s)
Travel time through pipe =    0.62 min.
```

```
Time of concentration (TC) =    13.35 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      205.000 to Point/Station      209.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     25.700(Ac.)
Runoff from this stream =     60.507(CFS)
Time of concentration =   13.35 min.
Rainfall intensity =     2.544(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      211.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   484.000(Ft.)
Top (of initial area) elevation =  1466.800(Ft.)
Bottom (of initial area) elevation =  1461.200(Ft.)
Difference in elevation =     5.600(Ft.)
Slope =    0.01157  s(percent)=       1.16
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.677 min.
Rainfall intensity =      3.155(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.889
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     17.108(CFS)
Total initial stream area =        6.100(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      210.000 to Point/Station      211.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      6.100(Ac.)
Runoff from this stream =     17.108(CFS)
Time of concentration =    8.68 min.
Rainfall intensity =     3.155(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      212.000 to Point/Station      213.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   700.000(Ft.)
Top (of initial area) elevation =  1505.000(Ft.)
Bottom (of initial area) elevation =  1485.000(Ft.)
Difference in elevation =    20.000(Ft.)
Slope =    0.02857  s(percent)=       2.86
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.394 min.
Rainfall intensity =      3.208(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.889
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      3.422(CFS)
```

```
Total initial stream area =        1.200(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      213.000 to Point/Station      211.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of street segment elevation =  1485.000(Ft.)
End of street segment elevation =  1461.200(Ft.)
Length of street segment  =   762.000(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  =  39.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  21.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      5.290(CFS)
Depth of flow =   0.341(Ft.), Average velocity =   4.146(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.720(Ft.)
Flow velocity =   4.15(Ft/s)
Travel time =    3.06 min.     TC =   11.46  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.887
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.746(In/Hr) for a   100.0 year storm
Subarea runoff =      3.655(CFS) for      1.500(Ac.)
Total runoff =      7.078(CFS)       Total area =       2.700(Ac.)
Street flow at end of street =      7.078(CFS)
Half street flow at end of street =      7.078(CFS)
Depth of flow =   0.369(Ft.), Average velocity =   4.438(Ft/s)
Flow width (from curb towards crown)=  12.116(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      213.000 to Point/Station      211.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      2.700(Ac.)
Runoff from this stream =      7.078(CFS)
Time of concentration =   11.46 min.
Rainfall intensity =     2.746(In/Hr)
Summary of stream data:

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


1       17.108      8.68                3.155
2        7.078     11.46                2.746
Largest stream flow has longer or shorter time of concentration
Qp =     17.108 + sum of
          Qa          Tb/Ta
           7.078 *    0.757 =      5.360
Qp =     22.468

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

```
      17.108       7.078
Area of streams before confluence:
        6.100        2.700
Results of confluence:
Total flow rate =     22.468(CFS)
Time of concentration =     8.677 min.
Effective stream area after confluence =      8.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      211.000 to Point/Station      209.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1457.200(Ft.)
Downstream point/station elevation =  1455.400(Ft.)
Pipe length  =    35.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    22.468(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    22.468(CFS)
Normal flow depth in pipe =   13.92(In.)
Flow top width inside pipe =   15.07(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.33(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =     8.72 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      211.000 to Point/Station      209.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      8.800(Ac.)
Runoff from this stream =     22.468(CFS)
Time of concentration =    8.72 min.
Rainfall intensity =     3.149(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      214.000 to Point/Station      215.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   800.000(Ft.)
Top (of initial area) elevation =  1512.200(Ft.)
Bottom (of initial area) elevation =  1491.000(Ft.)
Difference in elevation =    21.200(Ft.)
Slope =    0.02650  s(percent)=       2.65
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.989 min.
Rainfall intensity =      3.100(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.889
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      3.306(CFS)
Total initial stream area =        1.200(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      215.000 to Point/Station      216.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1491.000(Ft.)
End of street segment elevation =  1461.000(Ft.)
Length of street segment  =   933.000(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  =  39.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  21.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      5.653(CFS)
Depth of flow =   0.346(Ft.), Average velocity =   4.258(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  10.959(Ft.)
Flow velocity =   4.26(Ft/s)
Travel time =    3.65 min.     TC =   12.64  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.887
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.614(In/Hr) for a   100.0 year storm
Subarea runoff =      4.637(CFS) for      2.000(Ac.)
Total runoff =      7.943(CFS)       Total area =       3.200(Ac.)
Street flow at end of street =      7.943(CFS)
Half street flow at end of street =      7.943(CFS)
Depth of flow =   0.379(Ft.), Average velocity =   4.612(Ft/s)
Flow width (from curb towards crown)=  12.632(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      209.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1457.000(Ft.)
Downstream point/station elevation =  1455.400(Ft.)
Pipe length  =    40.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.943(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     7.943(CFS)
Normal flow depth in pipe =    8.51(In.)
Flow top width inside pipe =   14.86(In.)
Critical Depth =   13.35(In.)
Pipe flow velocity =     11.07(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    12.70 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      216.000 to Point/Station      209.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =      3.200(Ac.)
Runoff from this stream =      7.943(CFS)
Time of concentration =   12.70 min.
Rainfall intensity =     2.608(In/Hr)
Summary of stream data:

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


1       60.507     13.35              2.544
2       22.468      8.72              3.149
3        7.943     12.70              2.608
```

```
Largest stream flow has longer time of concentration
Qp =     60.507 + sum of
          Qb          Ia/Ib
          22.468 *     0.808 =     18.155
          Qb          Ia/Ib
           7.943 *     0.975 =      7.748
Qp =     86.410

Total of 3 main streams to confluence:
Flow rates before confluence point:
      60.507      22.468       7.943
Area of streams before confluence:
       25.700        8.800        3.200


Results of confluence:
Total flow rate =     86.410(CFS)
Time of concentration =    13.348 min.
Effective stream area after confluence  =     37.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      209.000 to Point/Station      217.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1455.400(Ft.)
Downstream point/station elevation =  1453.000(Ft.)
Pipe length  =   262.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    86.410(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =    86.410(CFS)
Normal flow depth in pipe =   31.08(In.)
Flow top width inside pipe =   36.85(In.)
Critical Depth =   34.72(In.)
Pipe flow velocity =     11.32(Ft/s)
Travel time through pipe =    0.39 min.
Time of concentration (TC) =    13.73 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      209.000 to Point/Station      217.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     37.700(Ac.)
Runoff from this stream =     86.410(CFS)
Time of concentration =   13.73 min.
Rainfall intensity =     2.508(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      218.000 to Point/Station      219.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   667.000(Ft.)
Top (of initial area) elevation =  1583.000(Ft.)
Bottom (of initial area) elevation =  1539.000(Ft.)
Difference in elevation =    44.000(Ft.)
Slope =    0.06597  s(percent)=       6.60
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.304 min.
Rainfall intensity =      2.650(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.851
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 3)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      7.896(CFS)
```

```
Total initial stream area =        3.500(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      219.000 to Point/Station      220.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of natural channel elevation =   1539.000(Ft.)
End of natural channel elevation =   1516.000(Ft.)
Length of natural channel  =   763.000(Ft.)
Estimated mean flow rate at midpoint of channel =     16.356(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 =   4.93(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0301
Corrected/adjusted channel slope =  0.0301
Travel time =    2.58 min.     TC =   14.88  min.


 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.886
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.409(In/Hr) for a   100.0 year storm
Subarea runoff =     16.007(CFS) for      7.500(Ac.)
Total runoff =     23.903(CFS)        Total area =      11.000(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      221.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1515.000(Ft.)
Downstream point/station elevation =  1460.000(Ft.)
Pipe length  =   864.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    23.903(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    23.903(CFS)
Normal flow depth in pipe =   13.38(In.)
Flow top width inside pipe =   15.72(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.98(Ft/s)
Travel time through pipe =    0.85 min.
Time of concentration (TC) =    15.73 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      220.000 to Point/Station      221.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     11.000(Ac.)
Runoff from this stream =     23.903(CFS)
Time of concentration =   15.73 min.
Rainfall intensity =     2.343(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      222.000 to Point/Station      223.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   796.000(Ft.)
```

```
Top (of initial area) elevation =  1510.000(Ft.)
Bottom (of initial area) elevation =  1466.500(Ft.)
Difference in elevation =    43.500(Ft.)
Slope =    0.05465  s(percent)=       5.46
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.762 min.
Rainfall intensity =      3.336(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.889
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     28.484(CFS)
Total initial stream area =        9.600(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      224.000 to Point/Station      223.000
**** SUBAREA FLOW ADDITION ****
________________________________________________________________________
COMMERCIAL subarea type
Runoff Coefficient = 0.889
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Time of concentration =     7.76 min.
Rainfall intensity =      3.336(In/Hr) for a   100.0 year storm
Subarea runoff =     34.121(CFS) for     11.500(Ac.)
Total runoff =     62.605(CFS)        Total area =      21.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      223.000 to Point/Station      221.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1461.500(Ft.)
Downstream point/station elevation =  1460.000(Ft.)
Pipe length  =    64.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    62.605(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    62.605(CFS)
Normal flow depth in pipe =   24.52(In.)
Flow top width inside pipe =   23.19(In.)
Critical depth could not be calculated.
Pipe flow velocity =     14.58(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =     7.84 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      223.000 to Point/Station      221.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     21.100(Ac.)
Runoff from this stream =     62.605(CFS)
Time of concentration =    7.84 min.
Rainfall intensity =     3.321(In/Hr)
Summary of stream data:

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


1       23.903     15.73                2.343
2       62.605      7.84                3.321
```

```
Largest stream flow has longer or shorter time of concentration
Qp =     62.605 + sum of
          Qa          Tb/Ta
          23.903 *    0.498 =     11.905
Qp =     74.510

Total of 2 streams to confluence:
Flow rates before confluence point:
      23.903      62.605
Area of streams before confluence:
       11.000       21.100
Results of confluence:
Total flow rate =     74.510(CFS)
Time of concentration =     7.835 min.
Effective stream area after confluence =     32.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      221.000 to Point/Station      217.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1460.000(Ft.)
Downstream point/station elevation =  1453.000(Ft.)
Pipe length  =  1235.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    74.510(CFS)
Nearest computed pipe diameter  =     42.00(In.)
Calculated individual pipe flow  =    74.510(CFS)
Normal flow depth in pipe =   33.84(In.)
Flow top width inside pipe =   33.23(In.)
Critical Depth =   32.42(In.)
Pipe flow velocity =      8.97(Ft/s)
Travel time through pipe =    2.29 min.
Time of concentration (TC) =    10.13 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      221.000 to Point/Station      217.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     32.100(Ac.)
Runoff from this stream =     74.510(CFS)
Time of concentration =   10.13 min.
Rainfall intensity =     2.921(In/Hr)
Summary of stream data:

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


1       86.410     13.73               2.508
2       74.510     10.13               2.921
Largest stream flow has longer time of concentration
Qp =     86.410 + sum of
          Qb         Ia/Ib
          74.510 *    0.859 =     63.988
Qp =    150.398

Total of 2 main streams to confluence:
Flow rates before confluence point:
      86.410      74.510
Area of streams before confluence:
       37.700       32.100


Results of confluence:
Total flow rate =    150.398(CFS)
Time of concentration =    13.734 min.
Effective stream area after confluence  =     69.800(Ac.)


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

```
Process from Point/Station      217.000 to Point/Station      225.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1453.000(Ft.)
Downstream point/station elevation =  1449.200(Ft.)
Pipe length  =   767.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   150.398(CFS)
Nearest computed pipe diameter  =     57.00(In.)
Calculated individual pipe flow  =   150.398(CFS)
Normal flow depth in pipe =   43.97(In.)
Flow top width inside pipe =   47.87(In.)
Critical Depth =   42.71(In.)
Pipe flow velocity =     10.26(Ft/s)
Travel time through pipe =    1.25 min.
Time of concentration (TC) =    14.98 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      217.000 to Point/Station      225.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     69.800(Ac.)
Runoff from this stream =    150.398(CFS)
Time of concentration =   14.98 min.
Rainfall intensity =     2.402(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      226.000 to Point/Station      225.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   781.000(Ft.)
Top (of initial area) elevation =  1465.200(Ft.)
Bottom (of initial area) elevation =  1461.000(Ft.)
Difference in elevation =     4.200(Ft.)
Slope =    0.00538  s(percent)=       0.54
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.248 min.
Rainfall intensity =      2.656(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 = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      3.534(CFS)
Total initial stream area =        1.500(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      225.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1461.000(Ft.)
Downstream point/station elevation =  1449.200(Ft.)
Pipe length  =     1.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     3.534(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     3.534(CFS)
Normal flow depth in pipe =    1.74(In.)
Flow top width inside pipe =    5.44(In.)
Critical depth could not be calculated.
Pipe flow velocity =     74.76(Ft/s)
Travel time through pipe =    0.00 min.
Time of concentration (TC) =    12.25 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      225.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.500(Ac.)
Runoff from this stream =      3.534(CFS)
Time of concentration =   12.25 min.
Rainfall intensity =     2.656(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      227.000 to Point/Station      228.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   989.000(Ft.)
Top (of initial area) elevation =  1482.700(Ft.)
Bottom (of initial area) elevation =  1473.500(Ft.)
Difference in elevation =     9.200(Ft.)
Slope =    0.00930  s(percent)=       0.93
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.064 min.
Rainfall intensity =      2.676(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 = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     17.567(CFS)
Total initial stream area =        7.400(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      228.000 to Point/Station      229.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =  1473.500(Ft.)
Downstream point elevation =  1460.000(Ft.)
Channel length thru subarea  =  1587.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =   6.000
Slope or 'Z' of right channel bank =   6.000
Estimated mean flow rate at midpoint of channel =     49.875(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.250(Ft.)
Flow(q) thru subarea =     49.875(CFS)
Depth of flow =   1.565(Ft.), Average velocity =  11.545(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =    3.000(Ft.)
Flow Velocity =   11.55(Ft/s)
Travel time  =    2.29 min.
Time of concentration =   14.35 min.

Sub-Channel No. 1 Critical depth =      2.172(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    8.122(Ft/s)
  '     '       '     Critical flow area =      6.141(Sq.Ft)

ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.886
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 3)  =  74.80
```

```
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.453(In/Hr) for a   100.0 year storm
Subarea runoff =     64.563(CFS) for     29.700(Ac.)
Total runoff =     82.130(CFS)        Total area =      37.100(Ac.)
Depth of flow =   2.067(Ft.), Average velocity =  14.095(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth

Sub-Channel No. 1 Critical depth =      2.969(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    9.627(Ft/s)
  '     '       '     Critical flow area =      8.531(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      229.000 to Point/Station      225.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1454.000(Ft.)
Downstream point/station elevation =  1449.200(Ft.)
Pipe length  =   185.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    82.130(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    82.130(CFS)
Normal flow depth in pipe =   26.06(In.)
Flow top width inside pipe =   26.89(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.34(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =    14.54 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      229.000 to Point/Station      225.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area =     37.100(Ac.)
Runoff from this stream =     82.130(CFS)
Time of concentration =   14.54 min.
Rainfall intensity =     2.437(In/Hr)
Summary of stream data:

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


1      150.398     14.98               2.402
2        3.534     12.25               2.656
3       82.130     14.54               2.437
Largest stream flow has longer time of concentration
Qp =    150.398 + sum of
          Qb         Ia/Ib
           3.534 *    0.904 =      3.195
          Qb         Ia/Ib
          82.130 *    0.985 =     80.926
Qp =    234.519

Total of 3 main streams to confluence:
Flow rates before confluence point:
     150.398       3.534      82.130
Area of streams before confluence:
       69.800        1.500       37.100


Results of confluence:
Total flow rate =    234.519(CFS)
Time of concentration =    14.980 min.
Effective stream area after confluence  =    108.400(Ac.)
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      230.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1449.200(Ft.)
Downstream point/station elevation =  1429.000(Ft.)
Pipe length  =   784.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   234.519(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =   234.519(CFS)
Normal flow depth in pipe =   40.13(In.)
Flow top width inside pipe =   35.55(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.90(Ft/s)
Travel time through pipe =    0.63 min.
Time of concentration (TC) =    15.60 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      225.000 to Point/Station      230.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =    108.400(Ac.)
Runoff from this stream =    234.519(CFS)
Time of concentration =   15.60 min.
Rainfall intensity =     2.353(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      231.000 to Point/Station      232.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   806.000(Ft.)
Top (of initial area) elevation =  1560.000(Ft.)
Bottom (of initial area) elevation =  1480.000(Ft.)
Difference in elevation =    80.000(Ft.)
Slope =    0.09926  s(percent)=       9.93
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.923 min.
Rainfall intensity =      3.533(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 = 0.800
Decimal fraction soil group C = 0.200
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  76.88
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     30.211(CFS)
Total initial stream area =        9.600(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      232.000 to Point/Station      233.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =  1480.000(Ft.)
Downstream point elevation =  1475.200(Ft.)
Channel length thru subarea  =  1230.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =   6.000
Slope or 'Z' of right channel bank =   6.000
Estimated mean flow rate at midpoint of channel =     78.890(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.250(Ft.)
Flow(q) thru subarea =     78.890(CFS)
Depth of flow =   2.520(Ft.), Average velocity =  10.978(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =    3.000(Ft.)
```

```
Flow Velocity =   10.98(Ft/s)
Travel time  =    1.87 min.
Time of concentration =    8.79 min.

Sub-Channel No. 1 Critical depth =      2.906(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    9.455(Ft/s)
  '     '       '     Critical flow area =      8.344(Sq.Ft)

ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.889
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 3)  =  75.84
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      3.135(In/Hr) for a   100.0 year storm
Subarea runoff =     97.298(CFS) for     34.900(Ac.)
Total runoff =    127.510(CFS)       Total area =      44.500(Ac.)
Depth of flow =   3.320(Ft.), Average velocity =  13.303(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth

Sub-Channel No. 1 Critical depth =      3.938(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=   11.148(Ft/s)
  '     '       '     Critical flow area =     11.438(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      233.000 to Point/Station      234.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1469.200(Ft.)
Downstream point/station elevation =  1460.000(Ft.)
Pipe length  =  1970.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   127.510(CFS)
Nearest computed pipe diameter  =     54.00(In.)
Calculated individual pipe flow  =   127.510(CFS)
Normal flow depth in pipe =   42.00(In.)
Flow top width inside pipe =   44.90(In.)
Critical Depth =   39.87(In.)
Pipe flow velocity =      9.62(Ft/s)
Travel time through pipe =    3.41 min.
Time of concentration (TC) =    12.21 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      233.000 to Point/Station      234.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     44.500(Ac.)
Runoff from this stream =    127.510(CFS)
Time of concentration =   12.21 min.
Rainfall intensity =     2.661(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      235.000 to Point/Station      236.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   390.000(Ft.)
Top (of initial area) elevation =  1496.000(Ft.)
Bottom (of initial area) elevation =  1485.500(Ft.)
Difference in elevation =    10.500(Ft.)
Slope =    0.02692  s(percent)=       2.69
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    6.722 min.
```

```
Rainfall intensity =      3.585(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.890
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 3)  =  74.90
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     11.168(CFS)
Total initial stream area =        3.500(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      236.000 to Point/Station      237.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1485.500(Ft.)
Downstream point elevation =  1477.500(Ft.)
Channel length thru subarea  =  1681.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =   6.000
Slope or 'Z' of right channel bank =   6.000
Estimated mean flow rate at midpoint of channel =     37.228(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.250(Ft.)
Flow(q) thru subarea =     37.228(CFS)
Depth of flow =   1.563(Ft.), Average velocity =   8.628(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =    3.000(Ft.)
Flow Velocity =    8.63(Ft/s)
Travel time  =    3.25 min.
Time of concentration =    9.97 min.

Sub-Channel No. 1 Critical depth =      1.813(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    7.354(Ft/s)
  '     '       '     Critical flow area =      5.063(Sq.Ft)

ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.889
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 3)  =  75.84
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.944(In/Hr) for a   100.0 year storm
Subarea runoff =     52.060(CFS) for     19.900(Ac.)
Total runoff =     63.228(CFS)        Total area =      23.400(Ac.)
Depth of flow =   2.101(Ft.), Average velocity =  10.665(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth

Sub-Channel No. 1 Critical depth =      2.531(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    8.759(Ft/s)
  '     '       '     Critical flow area =      7.219(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      237.000 to Point/Station      234.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1471.500(Ft.)
Downstream point/station elevation =  1460.000(Ft.)
Pipe length  =   275.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    63.228(CFS)
Nearest computed pipe diameter  =     27.00(In.)
```

```
Calculated individual pipe flow  =    63.228(CFS)
Normal flow depth in pipe =   22.08(In.)
Flow top width inside pipe =   20.85(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.16(Ft/s)
Travel time through pipe =    0.25 min.
Time of concentration (TC) =    10.22 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      237.000 to Point/Station      234.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     23.400(Ac.)
Runoff from this stream =     63.228(CFS)
Time of concentration =   10.22 min.
Rainfall intensity =     2.907(In/Hr)
Summary of stream data:

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


1      127.510     12.21                2.661
2       63.228     10.22                2.907
Largest stream flow has longer time of concentration
Qp =    127.510 + sum of
          Qb          Ia/Ib
          63.228 *    0.915 =     57.863
Qp =    185.373

Total of 2 streams to confluence:
Flow rates before confluence point:
     127.510      63.228
Area of streams before confluence:
       44.500       23.400
Results of confluence:
Total flow rate =    185.373(CFS)
Time of concentration =    12.205 min.
Effective stream area after confluence =     67.900(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      234.000 to Point/Station      238.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1460.000(Ft.)
Downstream point/station elevation =  1451.700(Ft.)
Pipe length  =   997.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   185.373(CFS)
Nearest computed pipe diameter  =     54.00(In.)
Calculated individual pipe flow  =   185.373(CFS)
Normal flow depth in pipe =   46.13(In.)
Flow top width inside pipe =   38.12(In.)
Critical Depth =   47.12(In.)
Pipe flow velocity =     12.82(Ft/s)
Travel time through pipe =    1.30 min.
Time of concentration (TC) =    13.50 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      234.000 to Point/Station      238.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =     67.900(Ac.)
Runoff from this stream =    185.373(CFS)
Time of concentration =   13.50 min.
Rainfall intensity =     2.530(In/Hr)


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

```
Process from Point/Station      239.000 to Point/Station      240.000
**** INITIAL AREA EVALUATION ****
----------------------------------------------------------------------
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1519.500(Ft.)
Bottom (of initial area) elevation =  1496.700(Ft.)
Difference in elevation =    22.800(Ft.)
Slope =    0.02280  s(percent)=       2.28
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.128 min.
Rainfall intensity =      2.921(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 = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      3.890(CFS)
Total initial stream area =        1.500(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      240.000 to Point/Station      241.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
----------------------------------------------------------------------
Top of street segment elevation =  1496.700(Ft.)
End of street segment elevation =  1456.900(Ft.)
Length of street segment  =  2114.000(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  =  39.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  21.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      9.183(CFS)
Depth of flow =   0.425(Ft.), Average velocity =   3.895(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  14.937(Ft.)
Flow velocity =   3.89(Ft/s)
Travel time =    9.05 min.     TC =   19.17  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.884
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.123(In/Hr) for a   100.0 year storm
Subarea runoff =     10.512(CFS) for      5.600(Ac.)
Total runoff =     14.402(CFS)        Total area =       7.100(Ac.)
Street flow at end of street =     14.402(CFS)
Half street flow at end of street =     14.402(CFS)
Depth of flow =   0.484(Ft.), Average velocity =   4.344(Ft/s)
Flow width (from curb towards crown)=  17.857(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      241.000 to Point/Station      238.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
----------------------------------------------------------------------
Upstream point/station elevation =  1452.000(Ft.)
```

```
Downstream point/station elevation =  1451.700(Ft.)
Pipe length  =    48.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.402(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    14.402(CFS)
Normal flow depth in pipe =   16.31(In.)
Flow top width inside pipe =   22.40(In.)
Critical Depth =   16.41(In.)
Pipe flow velocity =      6.33(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    19.30 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      241.000 to Point/Station      238.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      7.100(Ac.)
Runoff from this stream =     14.402(CFS)
Time of concentration =   19.30 min.
Rainfall intensity =     2.116(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      242.000 to Point/Station      243.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   990.000(Ft.)
Top (of initial area) elevation =  1494.000(Ft.)
Bottom (of initial area) elevation =  1484.200(Ft.)
Difference in elevation =     9.800(Ft.)
Slope =    0.00990  s(percent)=       0.99
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.919 min.
Rainfall intensity =      2.692(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.890
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 3)  =  80.00
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     22.766(CFS)
Total initial stream area =        9.500(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      243.000 to Point/Station      244.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =  1484.200(Ft.)
Downstream point elevation =  1466.400(Ft.)
Channel length thru subarea  =  1911.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =   6.000
Slope or 'Z' of right channel bank =   6.000
Estimated mean flow rate at midpoint of channel =     61.010(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.250(Ft.)
Flow(q) thru subarea =     61.010(CFS)
Depth of flow =   1.706(Ft.), Average velocity =  12.860(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =    3.000(Ft.)
Flow Velocity =   12.86(Ft/s)
Travel time  =    2.48 min.
Time of concentration =   14.40 min.

Sub-Channel No. 1 Critical depth =      2.469(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    8.677(Ft/s)
```

```
  '     '       '     Critical flow area =      7.031(Sq.Ft)

ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.886
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.980
Decimal fraction soil group C = 0.020
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  75.01
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.450(In/Hr) for a   100.0 year storm
Subarea runoff =     76.419(CFS) for     35.200(Ac.)
Total runoff =     99.185(CFS)       Total area =      44.700(Ac.)
Depth of flow =   2.242(Ft.), Average velocity =  15.619(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth

Sub-Channel No. 1 Critical depth =      3.375(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=   10.173(Ft/s)
  '     '       '     Critical flow area =      9.750(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      244.000 to Point/Station      238.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1460.000(Ft.)
Downstream point/station elevation =  1451.700(Ft.)
Pipe length  =    83.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    99.185(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    99.185(CFS)
Normal flow depth in pipe =   22.45(In.)
Flow top width inside pipe =   20.21(In.)
Critical depth could not be calculated.
Pipe flow velocity =     28.06(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    14.45 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      244.000 to Point/Station      238.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 3
Stream flow area =     44.700(Ac.)
Runoff from this stream =     99.185(CFS)
Time of concentration =   14.45 min.
Rainfall intensity =     2.446(In/Hr)
Summary of stream data:

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


1      185.373     13.50                2.530
2       14.402     19.30                2.116
3       99.185     14.45                2.446
Largest stream flow has longer or shorter time of concentration
Qp =    185.373 + sum of
          Qa          Tb/Ta
          14.402 *    0.700 =     10.074
          Qa          Tb/Ta
          99.185 *    0.935 =     92.699
Qp =    288.146

Total of 3 streams to confluence:
Flow rates before confluence point:
     185.373      14.402      99.185
```

```
Area of streams before confluence:
       67.900        7.100       44.700
Results of confluence:
Total flow rate =    288.146(CFS)
Time of concentration =    13.501 min.
Effective stream area after confluence =    119.700(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      238.000 to Point/Station      245.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1451.700(Ft.)
Downstream point/station elevation =  1451.000(Ft.)
Pipe length  =    45.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   288.146(CFS)
Nearest computed pipe diameter  =     57.00(In.)
Calculated individual pipe flow  =   288.146(CFS)
Normal flow depth in pipe =   47.63(In.)
Flow top width inside pipe =   42.26(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.21(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    13.54 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      238.000 to Point/Station      245.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    119.700(Ac.)
Runoff from this stream =    288.146(CFS)
Time of concentration =   13.54 min.
Rainfall intensity =     2.526(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      214.000 to Point/Station      246.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1512.200(Ft.)
Bottom (of initial area) elevation =  1493.000(Ft.)
Difference in elevation =    19.200(Ft.)
Slope =    0.01920  s(percent)=       1.92
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.482 min.
Rainfall intensity =      2.871(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 = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      3.568(CFS)
Total initial stream area =        1.400(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      246.000 to Point/Station      245.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1493.000(Ft.)
End of street segment elevation =  1457.700(Ft.)
Length of street segment  =  1952.000(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  =  39.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
```

```
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  21.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      8.487(CFS)
Depth of flow =   0.418(Ft.), Average velocity =   3.764(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  14.588(Ft.)
Flow velocity =   3.76(Ft/s)
Travel time =    8.64 min.     TC =   19.13  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.884
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.125(In/Hr) for a   100.0 year storm
Subarea runoff =      9.773(CFS) for      5.200(Ac.)
Total runoff =     13.342(CFS)       Total area =       6.600(Ac.)
Street flow at end of street =     13.342(CFS)
Half street flow at end of street =     13.342(CFS)
Depth of flow =   0.476(Ft.), Average velocity =   4.199(Ft/s)
Flow width (from curb towards crown)=  17.465(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      245.000 to Point/Station      245.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1457.000(Ft.)
Downstream point/station elevation =  1451.000(Ft.)
Pipe length  =     1.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    13.342(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =    13.342(CFS)
Normal flow depth in pipe =    4.77(In.)
Flow top width inside pipe =    4.85(In.)
Critical depth could not be calculated.
Pipe flow velocity =     79.76(Ft/s)
Travel time through pipe =    0.00 min.
Time of concentration (TC) =    19.13 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      245.000 to Point/Station      245.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      6.600(Ac.)
Runoff from this stream =     13.342(CFS)
Time of concentration =   19.13 min.
Rainfall intensity =     2.125(In/Hr)
Summary of stream data:

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


1      288.146     13.54                2.526
2       13.342     19.13                2.125
Largest stream flow has longer or shorter time of concentration
Qp =    288.146 + sum of
          Qa          Tb/Ta
          13.342 *    0.708 =      9.446
Qp =    297.593
```

```
Total of 2 streams to confluence:
Flow rates before confluence point:
     288.146      13.342
Area of streams before confluence:
      119.700        6.600
Results of confluence:
Total flow rate =    297.593(CFS)
Time of concentration =    13.542 min.
Effective stream area after confluence =    126.300(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      245.000 to Point/Station      247.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1451.000(Ft.)
Downstream point/station elevation =  1445.500(Ft.)
Pipe length  =  1033.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   297.593(CFS)
Nearest computed pipe diameter  =     72.00(In.)
Calculated individual pipe flow  =   297.593(CFS)
Normal flow depth in pipe =   56.72(In.)
Flow top width inside pipe =   58.88(In.)
Critical Depth =   56.59(In.)
Pipe flow velocity =     12.45(Ft/s)
Travel time through pipe =    1.38 min.
Time of concentration (TC) =    14.93 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      245.000 to Point/Station      247.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =    126.300(Ac.)
Runoff from this stream =    297.593(CFS)
Time of concentration =   14.93 min.
Rainfall intensity =     2.406(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      248.000 to Point/Station      249.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   671.000(Ft.)
Top (of initial area) elevation =  1471.300(Ft.)
Bottom (of initial area) elevation =  1461.100(Ft.)
Difference in elevation =    10.200(Ft.)
Slope =    0.01520  s(percent)=       1.52
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    9.363 min.
Rainfall intensity =      3.038(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 = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      6.747(CFS)
Total initial stream area =        2.500(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      249.000 to Point/Station      250.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =  1461.100(Ft.)
Downstream point elevation =  1450.000(Ft.)
Channel length thru subarea  =  1506.000(Ft.)
```

```
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =   6.000
Slope or 'Z' of right channel bank =   6.000
Estimated mean flow rate at midpoint of channel =     43.211(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.250(Ft.)
Flow(q) thru subarea =     43.211(CFS)
Depth of flow =   1.504(Ft.), Average velocity =  10.443(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =    3.000(Ft.)
Flow Velocity =   10.44(Ft/s)
Travel time  =    2.40 min.
Time of concentration =   11.77 min.

Sub-Channel No. 1 Critical depth =      1.984(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    7.746(Ft/s)
  '     '       '     Critical flow area =      5.578(Sq.Ft)

ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.887
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.710(In/Hr) for a   100.0 year storm
Subarea runoff =     72.843(CFS) for     30.300(Ac.)
Total runoff =     79.590(CFS)        Total area =      32.800(Ac.)
Depth of flow =   2.115(Ft.), Average velocity =  13.333(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth

Sub-Channel No. 1 Critical depth =      2.938(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    9.433(Ft/s)
  '     '       '     Critical flow area =      8.438(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      250.000 to Point/Station      247.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1446.100(Ft.)
Downstream point/station elevation =  1445.500(Ft.)
Pipe length  =   120.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    79.590(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =    79.590(CFS)
Normal flow depth in pipe =   34.36(In.)
Flow top width inside pipe =   38.24(In.)
Critical Depth =   32.98(In.)
Pipe flow velocity =      8.79(Ft/s)
Travel time through pipe =    0.23 min.
Time of concentration (TC) =    11.99 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      250.000 to Point/Station      247.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =     32.800(Ac.)
Runoff from this stream =     79.590(CFS)
Time of concentration =   11.99 min.
Rainfall intensity =     2.684(In/Hr)
Summary of stream data:

Stream   Flow rate      TC            Rainfall Intensity
```

```
 No.       (CFS)       (min)                 (In/Hr)


1      297.593     14.93                2.406
2       79.590     11.99                2.684
Largest stream flow has longer time of concentration
Qp =    297.593 + sum of
          Qb         Ia/Ib
          79.590 *    0.896 =     71.349
Qp =    368.942

Total of 2 streams to confluence:
Flow rates before confluence point:
     297.593      79.590
Area of streams before confluence:
      126.300       32.800
Results of confluence:
Total flow rate =    368.942(CFS)
Time of concentration =    14.925 min.
Effective stream area after confluence =    159.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      247.000 to Point/Station      230.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1445.500(Ft.)
Downstream point/station elevation =  1429.000(Ft.)
Pipe length  =  2639.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   368.942(CFS)
Nearest computed pipe diameter  =     75.00(In.)
Calculated individual pipe flow  =   368.942(CFS)
Normal flow depth in pipe =   60.66(In.)
Flow top width inside pipe =   58.99(In.)
Critical Depth =   62.05(In.)
Pipe flow velocity =     13.87(Ft/s)
Travel time through pipe =    3.17 min.
Time of concentration (TC) =    18.10 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      247.000 to Point/Station      230.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =    159.100(Ac.)
Runoff from this stream =    368.942(CFS)
Time of concentration =   18.10 min.
Rainfall intensity =     2.185(In/Hr)
Summary of stream data:

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


1      234.519     15.60                2.353
2      368.942     18.10                2.185
Largest stream flow has longer time of concentration
Qp =    368.942 + sum of
          Qb         Ia/Ib
         234.519 *    0.929 =    217.784
Qp =    586.725

Total of 2 main streams to confluence:
Flow rates before confluence point:
     234.519     368.942
Area of streams before confluence:
      108.400      159.100


Results of confluence:
Total flow rate =    586.725(CFS)
```

```
Time of concentration =    18.095 min.
Effective stream area after confluence  =    267.500(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      230.000 to Point/Station      251.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1429.000(Ft.)
Downstream point/station elevation =  1427.600(Ft.)
Pipe length  =   255.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   586.725(CFS)
Nearest computed pipe diameter  =     90.00(In.)
Calculated individual pipe flow  =   586.725(CFS)
Normal flow depth in pipe =   76.50(In.)
Flow top width inside pipe =   64.27(In.)
Critical Depth =   74.74(In.)
Pipe flow velocity =     14.65(Ft/s)
Travel time through pipe =    0.29 min.
Time of concentration (TC) =    18.39 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      230.000 to Point/Station      251.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =    267.500(Ac.)
Runoff from this stream =    586.725(CFS)
Time of concentration =   18.39 min.
Rainfall intensity =     2.168(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      252.000 to Point/Station      253.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   454.000(Ft.)
Top (of initial area) elevation =  1456.450(Ft.)
Bottom (of initial area) elevation =  1452.500(Ft.)
Difference in elevation =     3.950(Ft.)
Slope =    0.00870  s(percent)=       0.87
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.954 min.
Rainfall intensity =      3.106(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.889
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     27.603(CFS)
Total initial stream area =       10.000(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      253.000 to Point/Station      251.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =  1452.500(Ft.)
Downstream point elevation =  1434.000(Ft.)
Channel length thru subarea  =  2714.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =   6.000
Slope or 'Z' of right channel bank =   6.000
Estimated mean flow rate at midpoint of channel =     90.763(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.250(Ft.)
Flow(q) thru subarea =     90.763(CFS)
Depth of flow =   2.329(Ft.), Average velocity =  13.726(Ft/s)
```

```
!!Warning: Water is above left or right bank elevations
Channel flow top width =    3.000(Ft.)
Flow Velocity =   13.73(Ft/s)
Travel time  =    3.30 min.
Time of concentration =   12.25 min.

Sub-Channel No. 1 Critical depth =      3.188(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=    9.879(Ft/s)
  '     '       '     Critical flow area =      9.188(Sq.Ft)

ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.887
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.656(In/Hr) for a   100.0 year storm
Subarea runoff =    126.262(CFS) for     53.600(Ac.)
Total runoff =    153.865(CFS)        Total area =      63.600(Ac.)
Depth of flow =   3.150(Ft.), Average velocity =  16.953(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth

Sub-Channel No. 1 Critical depth =      4.438(Ft.)
  '     '       '     Critical flow top width =      3.000(Ft.)
  '     '       '     Critical flow velocity=   11.893(Ft/s)
  '     '       '     Critical flow area =     12.938(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      251.000 to Point/Station      251.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1434.000(Ft.)
Downstream point/station elevation =  1427.600(Ft.)
Pipe length  =     1.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   153.865(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =   153.865(CFS)
Normal flow depth in pipe =   11.58(In.)
Flow top width inside pipe =   12.59(In.)
Critical depth could not be calculated.
Pipe flow velocity =    151.44(Ft/s)
Travel time through pipe =    0.00 min.
Time of concentration (TC) =    12.25 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      251.000 to Point/Station      251.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     63.600(Ac.)
Runoff from this stream =    153.865(CFS)
Time of concentration =   12.25 min.
Rainfall intensity =     2.656(In/Hr)
Summary of stream data:

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


1      586.725     18.39                2.168
2      153.865     12.25                2.656
Largest stream flow has longer time of concentration
Qp =    586.725 + sum of
         Qb         Ia/Ib
```

```
         153.865 *    0.816 =    125.594
Qp =    712.319

Total of 2 streams to confluence:
Flow rates before confluence point:
     586.725     153.865
Area of streams before confluence:
      267.500       63.600
Results of confluence:
Total flow rate =    712.319(CFS)
Time of concentration =    18.385 min.
Effective stream area after confluence =    331.100(Ac.)
End of computations, total study area =          331.10 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.110
Area averaged RI index number =  56.7
```

Area C

- **PRE-DEVELOPMENT CONDITION**
  - **Area 'C' – 10 Year Pre-Development Condition – Rational Method**
  - **Area 'C' – 100 Year Pre-Development Condition – Rational Method**

```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 06/24/20  File:EXC010.out
------------------------------------------------------------------------
STONERIDGE - PRELIMINARY HYDROLOGY STUDY - AREA 'C'
EXISTING CONDITION RATIONAL METHOD - 10 YEAR STORM
HUNSAKER & ASSOCIATES, MAY 2020
BY: BRIAN LOWELL, PE AND ALEX ANDAYA
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

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


Program License Serial Number 6406

------------------------------------------------------------------------
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 =  0.450(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.759(In/Hr)
Slope of intensity duration curve = 0.5000




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   791.000(Ft.)
Top (of initial area) elevation =  1715.000(Ft.)
Bottom (of initial area) elevation =  1552.000(Ft.)
Difference in elevation =   163.000(Ft.)
Slope =    0.20607  s(percent)=      20.61
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.489 min.
Rainfall intensity =      1.814(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.804
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 =      6.417(CFS)
Total initial stream area =        4.400(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1552.000(Ft.)
End of natural channel elevation =   1456.000(Ft.)
Length of natural channel  =  1144.000(Ft.)
Estimated mean flow rate at midpoint of channel =     19.542(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 =   8.63(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0839
Corrected/adjusted channel slope =  0.0839
Travel time =    2.21 min.     TC =   12.70  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.764
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 =      1.649(In/Hr) for a    10.0 year storm
Subarea runoff =     22.684(CFS) for     18.000(Ac.)
Total runoff =     29.101(CFS)        Total area =      22.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      303.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1456.000(Ft.)
End of natural channel elevation =   1427.000(Ft.)
Length of natural channel  =   585.000(Ft.)
Estimated mean flow rate at midpoint of channel =     60.020(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 =   9.09(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0496
Corrected/adjusted channel slope =  0.0496
Travel time =    1.07 min.     TC =   13.77  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.730
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)  =  78.32
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.583(In/Hr) for a    10.0 year storm
Subarea runoff =     55.005(CFS) for     47.600(Ac.)
Total runoff =     84.105(CFS)        Total area =      70.000(Ac.)
End of computations, total study area =           70.00 (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 =  79.7
```

```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 06/24/20  File:EXC100.out
------------------------------------------------------------------------
STONERIDGE - PRELIMINARY HYDROLOGY STUDY – AREA 'C'
EXISTING CONDITION RATIONAL METHOD - 100 YEAR STORM
HUNSAKER & ASSOCIATES, MAY 2020
BY: BRIAN LOWELL, PE AND ALEX ANDAYA
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

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


Program License Serial Number 6406

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

Storm event (year) =  100.00 Antecedent Moisture Condition = 3

2 year, 1 hour precipitation =  0.450(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.200(In/Hr)
Slope of intensity duration curve = 0.5000




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   791.000(Ft.)
Top (of initial area) elevation =  1715.000(Ft.)
Bottom (of initial area) elevation =  1552.000(Ft.)
Difference in elevation =   163.000(Ft.)
Slope =    0.20607  s(percent)=      20.61
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.489 min.
Rainfall intensity =      2.870(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.876
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 3)  =  94.40
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     11.060(CFS)
Total initial stream area =        4.400(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1552.000(Ft.)
End of natural channel elevation =   1456.000(Ft.)
Length of natural channel  =  1144.000(Ft.)
Estimated mean flow rate at midpoint of channel =     33.684(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 =  10.02(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0839
Corrected/adjusted channel slope =  0.0839
Travel time =    1.90 min.     TC =   12.39  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.863
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 3)  =  92.20
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.640(In/Hr) for a   100.0 year storm
Subarea runoff =     41.023(CFS) for     18.000(Ac.)
Total runoff =     52.084(CFS)       Total area =      22.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      303.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
Top of natural channel elevation =   1456.000(Ft.)
End of natural channel elevation =   1427.000(Ft.)
Length of natural channel  =   585.000(Ft.)
Estimated mean flow rate at midpoint of channel =    107.423(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 =  10.80(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0496
Corrected/adjusted channel slope =  0.0496
Travel time =    0.90 min.     TC =   13.30  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.851
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 3)  =  89.99
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.549(In/Hr) for a   100.0 year storm
Subarea runoff =    103.207(CFS) for     47.600(Ac.)
Total runoff =    155.291(CFS)       Total area =      70.000(Ac.)
End of computations, total study area =           70.00 (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 =  79.7
```

Area C

➢ POST-DEVELOPMENT CONDITION

- ❖ Area 'C' – 10 Year Post-Development Condition – Rational Method
- ❖ Area 'C' – 100 Year Post-Development Condition – Rational Method

```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 06/29/20  File:PRC010.out
------------------------------------------------------------------------
STONERIDGE - PRELIMINARY HYDROLOGY STUDY - AREA 'C'
PROPOSED CONDITION RATIONAL METHOD - 10 YEAR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

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


Program License Serial Number 6406

------------------------------------------------------------------------
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 =  0.450(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.759(In/Hr)
Slope of intensity duration curve = 0.5000




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   791.000(Ft.)
Top (of initial area) elevation =  1560.000(Ft.)
Bottom (of initial area) elevation =  1552.000(Ft.)
Difference in elevation =     8.000(Ft.)
Slope =    0.01011  s(percent)=       1.01
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   19.167 min.
Rainfall intensity =      1.342(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.703
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 =      4.434(CFS)
Total initial stream area =        4.700(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1552.000(Ft.)
End of natural channel elevation =   1466.000(Ft.)
Length of natural channel  =  1088.000(Ft.)
Estimated mean flow rate at midpoint of channel =     10.520(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 =   7.12(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0790
Corrected/adjusted channel slope =  0.0790
Travel time =    2.55 min.     TC =   21.72  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.730
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 =      1.261(In/Hr) for a    10.0 year storm
Subarea runoff =     11.881(CFS) for     12.900(Ac.)
Total runoff =     16.316(CFS)        Total area =      17.600(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      303.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1460.000(Ft.)
Downstream point/station elevation =  1450.700(Ft.)
Pipe length  =    75.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.316(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    16.316(CFS)
Normal flow depth in pipe =    9.40(In.)
Flow top width inside pipe =   14.51(In.)
Critical depth could not be calculated.
Pipe flow velocity =     20.16(Ft/s)
Travel time through pipe =    0.06 min.
Time of concentration (TC) =    21.78 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      303.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     17.600(Ac.)
Runoff from this stream =     16.316(CFS)
Time of concentration =   21.78 min.
Rainfall intensity =     1.259(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      305.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1485.000(Ft.)
Bottom (of initial area) elevation =  1471.200(Ft.)
Difference in elevation =    13.800(Ft.)
Slope =    0.01380  s(percent)=       1.38
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.198 min.
Rainfall intensity =      1.756(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.866
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 =      2.890(CFS)
Total initial stream area =        1.900(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      303.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1471.200(Ft.)
End of street segment elevation =  1456.700(Ft.)
Length of street segment  =  1499.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  38.000(Ft.)
Distance from crown to crossfall grade break  =  34.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  21.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      3.956(CFS)
Depth of flow =   0.369(Ft.), Average velocity =   2.473(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  12.138(Ft.)
Flow velocity =   2.47(Ft/s)
Travel time =   10.10 min.     TC =   21.30  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.859
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 =      1.273(In/Hr) for a    10.0 year storm
Subarea runoff =      2.079(CFS) for      1.900(Ac.)
Total runoff =      4.969(CFS)       Total area =       3.800(Ac.)
Street flow at end of street =      4.969(CFS)
Half street flow at end of street =      4.969(CFS)
Depth of flow =   0.393(Ft.), Average velocity =   2.610(Ft/s)
Flow width (from curb towards crown)=  13.331(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      303.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.800(Ac.)
Runoff from this stream =      4.969(CFS)
Time of concentration =   21.30 min.
Rainfall intensity =     1.273(In/Hr)
Summary of stream data:

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


1       16.316     21.78                1.259
2        4.969     21.30                1.273
Largest stream flow has longer time of concentration
Qp =     16.316 + sum of
          Qb         Ia/Ib
           4.969 *    0.989 =      4.915
Qp =     21.230
```

```
Total of 2 streams to confluence:
Flow rates before confluence point:
      16.316       4.969
Area of streams before confluence:
       17.600        3.800
Results of confluence:
Total flow rate =     21.230(CFS)
Time of concentration =    21.777 min.
Effective stream area after confluence =     21.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      306.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1450.700(Ft.)
Downstream point/station elevation =  1450.400(Ft.)
Pipe length  =    40.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    21.230(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    21.230(CFS)
Normal flow depth in pipe =   18.12(In.)
Flow top width inside pipe =   25.37(In.)
Critical Depth =   19.34(In.)
Pipe flow velocity =      7.48(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    21.87 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      306.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     21.400(Ac.)
Runoff from this stream =     21.230(CFS)
Time of concentration =   21.87 min.
Rainfall intensity =     1.257(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      307.000 to Point/Station      308.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   605.000(Ft.)
Top (of initial area) elevation =  1480.000(Ft.)
Bottom (of initial area) elevation =  1459.000(Ft.)
Difference in elevation =    21.000(Ft.)
Slope =    0.03471  s(percent)=       3.47
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.616 min.
Rainfall intensity =      2.129(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.872
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.850
Decimal fraction soil group C = 0.150
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  57.95
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      7.240(CFS)
Total initial stream area =        3.900(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      309.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1453.000(Ft.)
```

```
Downstream point/station elevation =  1452.700(Ft.)
Pipe length  =    86.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.240(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =     7.240(CFS)
Normal flow depth in pipe =   13.88(In.)
Flow top width inside pipe =   19.89(In.)
Critical Depth =   11.96(In.)
Pipe flow velocity =      4.30(Ft/s)
Travel time through pipe =    0.33 min.
Time of concentration (TC) =     7.95 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      309.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      3.900(Ac.)
Runoff from this stream =      7.240(CFS)
Time of concentration =    7.95 min.
Rainfall intensity =     2.084(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      310.000 to Point/Station      311.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   987.000(Ft.)
Top (of initial area) elevation =  1622.000(Ft.)
Bottom (of initial area) elevation =  1462.000(Ft.)
Difference in elevation =   160.000(Ft.)
Slope =    0.16211  s(percent)=      16.21
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.024 min.
Rainfall intensity =      1.695(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.764
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.550
Decimal fraction soil group C = 0.450
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  81.60
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     11.528(CFS)
Total initial stream area =        8.900(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      311.000 to Point/Station      309.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1457.000(Ft.)
Downstream point/station elevation =  1452.700(Ft.)
Pipe length  =   800.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.528(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    11.528(CFS)
Normal flow depth in pipe =   17.06(In.)
Flow top width inside pipe =   16.39(In.)
Critical Depth =   15.18(In.)
Pipe flow velocity =      5.51(Ft/s)
Travel time through pipe =    2.42 min.
Time of concentration (TC) =    14.45 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      311.000 to Point/Station      309.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      8.900(Ac.)
```

```
Runoff from this stream =     11.528(CFS)
Time of concentration =   14.45 min.
Rainfall intensity =     1.546(In/Hr)
Summary of stream data:

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


1        7.240      7.95                2.084
2       11.528     14.45                1.546
Largest stream flow has longer time of concentration
Qp =     11.528 + sum of
          Qb         Ia/Ib
           7.240 *    0.742 =      5.371
Qp =     16.898

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.240      11.528
Area of streams before confluence:
        3.900        8.900
Results of confluence:
Total flow rate =     16.898(CFS)
Time of concentration =    14.445 min.
Effective stream area after confluence =     12.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      309.000 to Point/Station      306.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1452.700(Ft.)
Downstream point/station elevation =  1450.400(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    16.898(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    16.898(CFS)
Normal flow depth in pipe =   12.98(In.)
Flow top width inside pipe =   20.40(In.)
Critical Depth =   18.10(In.)
Pipe flow velocity =     10.82(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =    14.60 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      309.000 to Point/Station      306.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     12.800(Ac.)
Runoff from this stream =     16.898(CFS)
Time of concentration =   14.60 min.
Rainfall intensity =     1.538(In/Hr)
Summary of stream data:

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


1       21.230     21.87                1.257
2       16.898     14.60                1.538
Largest stream flow has longer time of concentration
Qp =     21.230 + sum of
          Qb         Ia/Ib
          16.898 *    0.817 =     13.808
Qp =     35.038

Total of 2 main streams to confluence:
Flow rates before confluence point:
      21.230      16.898
```

```
Area of streams before confluence:
       21.400       12.800


Results of confluence:
Total flow rate =     35.038(CFS)
Time of concentration =    21.866 min.
Effective stream area after confluence  =     34.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      306.000 to Point/Station      312.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1450.400(Ft.)
Downstream point/station elevation =  1450.100(Ft.)
Pipe length  =    41.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    35.038(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    35.038(CFS)
Normal flow depth in pipe =   24.56(In.)
Flow top width inside pipe =   23.11(In.)
Critical Depth =   24.12(In.)
Pipe flow velocity =      8.15(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    21.95 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      306.000 to Point/Station      312.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     34.200(Ac.)
Runoff from this stream =     35.038(CFS)
Time of concentration =   21.95 min.
Rainfall intensity =     1.254(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      313.000 to Point/Station      314.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1485.500(Ft.)
Bottom (of initial area) elevation =  1471.200(Ft.)
Difference in elevation =    14.300(Ft.)
Slope =    0.01430  s(percent)=       1.43
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.119 min.
Rainfall intensity =      1.762(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.866
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 =      1.985(CFS)
Total initial stream area =        1.300(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      314.000 to Point/Station      312.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1471.200(Ft.)
End of street segment elevation =  1456.700(Ft.)
Length of street segment  =  1659.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  38.000(Ft.)
```

```
Distance from crown to crossfall grade break  =  34.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  21.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      3.278(CFS)
Depth of flow =   0.356(Ft.), Average velocity =   2.276(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  11.462(Ft.)
Flow velocity =   2.28(Ft/s)
Travel time =   12.15 min.     TC =   23.27  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.858
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 =      1.218(In/Hr) for a    10.0 year storm
Subarea runoff =      2.509(CFS) for      2.400(Ac.)
Total runoff =      4.494(CFS)       Total area =       3.700(Ac.)
Street flow at end of street =      4.494(CFS)
Half street flow at end of street =      4.494(CFS)
Depth of flow =   0.388(Ft.), Average velocity =   2.452(Ft/s)
Flow width (from curb towards crown)=  13.063(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      312.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1456.700(Ft.)
Downstream point/station elevation =  1450.100(Ft.)
Pipe length  =     1.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.494(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     4.494(CFS)
Normal flow depth in pipe =    2.30(In.)
Flow top width inside pipe =    5.84(In.)
Critical depth could not be calculated.
Pipe flow velocity =     64.87(Ft/s)
Travel time through pipe =    0.00 min.
Time of concentration (TC) =    23.27 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      312.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.700(Ac.)
Runoff from this stream =      4.494(CFS)
Time of concentration =   23.27 min.
Rainfall intensity =     1.218(In/Hr)
Summary of stream data:

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


1       35.038     21.95                1.254
2        4.494     23.27                1.218
Largest stream flow has longer or shorter time of concentration
Qp =     35.038 + sum of
          Qa          Tb/Ta
```

```
          4.494 *    0.943 =      4.239
Qp =     39.277

Total of 2 streams to confluence:
Flow rates before confluence point:
      35.038       4.494
Area of streams before confluence:
       34.200        3.700
Results of confluence:
Total flow rate =     39.277(CFS)
Time of concentration =    21.950 min.
Effective stream area after confluence =     37.900(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      316.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1450.100(Ft.)
Downstream point/station elevation =  1432.000(Ft.)
Pipe length  =   500.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    39.277(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    39.277(CFS)
Normal flow depth in pipe =   18.00(In.)
Flow top width inside pipe =   20.78(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.53(Ft/s)
Travel time through pipe =    0.54 min.
Time of concentration (TC) =    22.49 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      316.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     37.900(Ac.)
Runoff from this stream =     39.277(CFS)
Time of concentration =   22.49 min.
Rainfall intensity =     1.239(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      248.000 to Point/Station      315.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   949.000(Ft.)
Top (of initial area) elevation =  1471.300(Ft.)
Bottom (of initial area) elevation =  1462.600(Ft.)
Difference in elevation =     8.700(Ft.)
Slope =    0.00917  s(percent)=       0.92
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.901 min.
Rainfall intensity =      1.703(In/Hr) for a    10.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.866
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 =      6.783(CFS)
Total initial stream area =        4.600(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      315.000 to Point/Station      316.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =  1462.600(Ft.)
```

```
Downstream point elevation =  1438.000(Ft.)
Channel length thru subarea  =  2587.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =  12.000
Slope or 'Z' of right channel bank =  12.000
Estimated mean flow rate at midpoint of channel =     21.475(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =     21.475(CFS)
Depth of flow =   0.614(Ft.), Average velocity =   4.915(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =   12.000(Ft.)
Flow Velocity =    4.91(Ft/s)
Travel time  =    8.77 min.
Time of concentration =   20.67 min.

Sub-Channel No. 1 Critical depth =      0.711(Ft.)
  '     '       '     Critical flow top width =     12.000(Ft.)
  '     '       '     Critical flow velocity=    3.883(Ft/s)
  '     '       '     Critical flow area =      5.531(Sq.Ft)

ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.860
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 =      1.292(In/Hr) for a    10.0 year storm
Subarea runoff =     29.330(CFS) for     26.400(Ac.)
Total runoff =     36.112(CFS)       Total area =      31.000(Ac.)
Depth of flow =   0.747(Ft.), Average velocity =   6.050(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth

Sub-Channel No. 1 Critical depth =      0.906(Ft.)
  '     '       '     Critical flow top width =     12.000(Ft.)
  '     '       '     Critical flow velocity=    4.586(Ft/s)
  '     '       '     Critical flow area =      7.875(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      315.000 to Point/Station      316.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     31.000(Ac.)
Runoff from this stream =     36.112(CFS)
Time of concentration =   20.67 min.
Rainfall intensity =     1.292(In/Hr)
Summary of stream data:

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


1       39.277     22.49                1.239
2       36.112     20.67                1.292
Largest stream flow has longer time of concentration
Qp =     39.277 + sum of
          Qb         Ia/Ib
          36.112 *    0.959 =     34.626
Qp =     73.904

Total of 2 streams to confluence:
Flow rates before confluence point:
      39.277      36.112
Area of streams before confluence:
       37.900       31.000
```

```
Results of confluence:
Total flow rate =     73.904(CFS)
Time of concentration =    22.487 min.
Effective stream area after confluence =     68.900(Ac.)
End of computations, total study area =           68.90 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.446
Area averaged RI index number =  65.8
```

```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 06/29/20  File:PRC100.out
------------------------------------------------------------------------
STONERIDGE - PRELIMINARY HYDROLOGY STUDY - AREA 'C'
PROPOSED CONDITION RATIONAL METHOD - 100 YEAR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

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


Program License Serial Number 6406

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

Storm event (year) =  100.00 Antecedent Moisture Condition = 3

2 year, 1 hour precipitation =  0.450(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.200(In/Hr)
Slope of intensity duration curve = 0.5000




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      300.000 to Point/Station      301.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   791.000(Ft.)
Top (of initial area) elevation =  1560.000(Ft.)
Bottom (of initial area) elevation =  1552.000(Ft.)
Difference in elevation =     8.000(Ft.)
Slope =    0.01011  s(percent)=       1.01
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   19.167 min.
Rainfall intensity =      2.123(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.840
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 3)  =  89.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      8.383(CFS)
Total initial stream area =        4.700(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      301.000 to Point/Station      302.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1552.000(Ft.)
End of natural channel elevation =   1466.000(Ft.)
Length of natural channel  =  1088.000(Ft.)
Estimated mean flow rate at midpoint of channel =     19.887(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 =   8.41(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0790
Corrected/adjusted channel slope =  0.0790
Travel time =    2.16 min.     TC =   21.32  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.852
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 3)  =  92.20
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.013(In/Hr) for a   100.0 year storm
Subarea runoff =     22.130(CFS) for     12.900(Ac.)
Total runoff =     30.513(CFS)        Total area =      17.600(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      303.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1460.000(Ft.)
Downstream point/station elevation =  1450.700(Ft.)
Pipe length  =    75.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    30.513(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    30.513(CFS)
Normal flow depth in pipe =   12.46(In.)
Flow top width inside pipe =   16.62(In.)
Critical depth could not be calculated.
Pipe flow velocity =     23.38(Ft/s)
Travel time through pipe =    0.05 min.
Time of concentration (TC) =    21.38 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      302.000 to Point/Station      303.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     17.600(Ac.)
Runoff from this stream =     30.513(CFS)
Time of concentration =   21.38 min.
Rainfall intensity =     2.010(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      304.000 to Point/Station      305.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1485.000(Ft.)
Bottom (of initial area) elevation =  1471.200(Ft.)
Difference in elevation =    13.800(Ft.)
Slope =    0.01380  s(percent)=       1.38
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.198 min.
Rainfall intensity =      2.778(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 = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
```

```
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      4.684(CFS)
Total initial stream area =        1.900(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      303.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1471.200(Ft.)
End of street segment elevation =  1456.700(Ft.)
Length of street segment  =  1499.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  38.000(Ft.)
Distance from crown to crossfall grade break  =  34.000(Ft.)
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  21.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      6.460(CFS)
Depth of flow =   0.423(Ft.), Average velocity =   2.779(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  14.825(Ft.)
Flow velocity =   2.78(Ft/s)
Travel time =    8.99 min.     TC =   20.19  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.884
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.069(In/Hr) for a   100.0 year storm
Subarea runoff =      3.475(CFS) for      1.900(Ac.)
Total runoff =      8.158(CFS)       Total area =       3.800(Ac.)
Street flow at end of street =      8.158(CFS)
Half street flow at end of street =      8.158(CFS)
Depth of flow =   0.452(Ft.), Average velocity =   2.941(Ft/s)
Flow width (from curb towards crown)=  16.272(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      305.000 to Point/Station      303.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.800(Ac.)
Runoff from this stream =      8.158(CFS)
Time of concentration =   20.19 min.
Rainfall intensity =     2.069(In/Hr)
Summary of stream data:

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


1       30.513     21.38                2.010
2        8.158     20.19                2.069
Largest stream flow has longer time of concentration
Qp =     30.513 + sum of
          Qb         Ia/Ib
           8.158 *    0.972 =      7.928
Qp =     38.441
```

```
Total of 2 streams to confluence:
Flow rates before confluence point:
      30.513       8.158
Area of streams before confluence:
       17.600        3.800
Results of confluence:
Total flow rate =     38.441(CFS)
Time of concentration =    21.377 min.
Effective stream area after confluence =     21.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      306.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1450.700(Ft.)
Downstream point/station elevation =  1450.400(Ft.)
Pipe length  =    40.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    38.441(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    38.441(CFS)
Normal flow depth in pipe =   23.16(In.)
Flow top width inside pipe =   30.20(In.)
Critical Depth =   24.78(In.)
Pipe flow velocity =      8.64(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    21.45 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      303.000 to Point/Station      306.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     21.400(Ac.)
Runoff from this stream =     38.441(CFS)
Time of concentration =   21.45 min.
Rainfall intensity =     2.007(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      307.000 to Point/Station      308.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   605.000(Ft.)
Top (of initial area) elevation =  1480.000(Ft.)
Bottom (of initial area) elevation =  1459.000(Ft.)
Difference in elevation =    21.000(Ft.)
Slope =    0.03471  s(percent)=       3.47
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.616 min.
Rainfall intensity =      3.368(In/Hr) for a   100.0 year storm
COMMERCIAL subarea type
Runoff Coefficient = 0.890
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.850
Decimal fraction soil group C = 0.150
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  76.36
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     11.693(CFS)
Total initial stream area =        3.900(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      309.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1453.000(Ft.)
Downstream point/station elevation =  1452.700(Ft.)
```

```
Pipe length  =    86.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    11.693(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    11.693(CFS)
Normal flow depth in pipe =   17.39(In.)
Flow top width inside pipe =   21.44(In.)
Critical Depth =   14.72(In.)
Pipe flow velocity =      4.79(Ft/s)
Travel time through pipe =    0.30 min.
Time of concentration (TC) =     7.91 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      308.000 to Point/Station      309.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
Stream flow area =      3.900(Ac.)
Runoff from this stream =     11.693(CFS)
Time of concentration =    7.91 min.
Rainfall intensity =     3.304(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      310.000 to Point/Station      311.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   987.000(Ft.)
Top (of initial area) elevation =  1622.000(Ft.)
Bottom (of initial area) elevation =  1462.000(Ft.)
Difference in elevation =   160.000(Ft.)
Slope =    0.16211  s(percent)=      16.21
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.024 min.
Rainfall intensity =      2.681(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.862
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.550
Decimal fraction soil group C = 0.450
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  91.96
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     20.577(CFS)
Total initial stream area =        8.900(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      311.000 to Point/Station      309.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1457.000(Ft.)
Downstream point/station elevation =  1452.700(Ft.)
Pipe length  =   800.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    20.577(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    20.577(CFS)
Normal flow depth in pipe =   20.16(In.)
Flow top width inside pipe =   23.49(In.)
Critical Depth =   19.05(In.)
Pipe flow velocity =      6.47(Ft/s)
Travel time through pipe =    2.06 min.
Time of concentration (TC) =    14.09 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      311.000 to Point/Station      309.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      8.900(Ac.)
Runoff from this stream =     20.577(CFS)
```

```
Time of concentration =   14.09 min.
Rainfall intensity =     2.477(In/Hr)
Summary of stream data:

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


1       11.693      7.91                3.304
2       20.577     14.09                2.477
Largest stream flow has longer time of concentration
Qp =     20.577 + sum of
          Qb         Ia/Ib
          11.693 *    0.750 =      8.766
Qp =     29.342

Total of 2 streams to confluence:
Flow rates before confluence point:
      11.693      20.577
Area of streams before confluence:
        3.900        8.900
Results of confluence:
Total flow rate =     29.342(CFS)
Time of concentration =    14.085 min.
Effective stream area after confluence =     12.800(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      309.000 to Point/Station      306.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
____________________________________________________________________________
Upstream point/station elevation =  1452.700(Ft.)
Downstream point/station elevation =  1450.400(Ft.)
Pipe length  =   100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    29.342(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    29.342(CFS)
Normal flow depth in pipe =   17.09(In.)
Flow top width inside pipe =   21.74(In.)
Critical Depth =   22.22(In.)
Pipe flow velocity =     12.27(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =    14.22 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      309.000 to Point/Station      306.000
**** CONFLUENCE OF MAIN STREAMS ****
____________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     12.800(Ac.)
Runoff from this stream =     29.342(CFS)
Time of concentration =   14.22 min.
Rainfall intensity =     2.465(In/Hr)
Summary of stream data:

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


1       38.441     21.45                2.007
2       29.342     14.22                2.465
Largest stream flow has longer time of concentration
Qp =     38.441 + sum of
          Qb         Ia/Ib
          29.342 *    0.814 =     23.890
Qp =     62.331

Total of 2 main streams to confluence:
Flow rates before confluence point:
      38.441      29.342
Area of streams before confluence:
```

```
        21.400       12.800


Results of confluence:
Total flow rate =     62.331(CFS)
Time of concentration =    21.454 min.
Effective stream area after confluence  =     34.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      306.000 to Point/Station      312.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1450.400(Ft.)
Downstream point/station elevation =  1450.100(Ft.)
Pipe length  =    41.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    62.331(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    62.331(CFS)
Normal flow depth in pipe =   28.45(In.)
Flow top width inside pipe =   34.65(In.)
Critical Depth =   30.19(In.)
Pipe flow velocity =      9.61(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    21.52 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      306.000 to Point/Station      312.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     34.200(Ac.)
Runoff from this stream =     62.331(CFS)
Time of concentration =   21.52 min.
Rainfall intensity =     2.003(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      313.000 to Point/Station      314.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =  1000.000(Ft.)
Top (of initial area) elevation =  1485.500(Ft.)
Bottom (of initial area) elevation =  1471.200(Ft.)
Difference in elevation =    14.300(Ft.)
Slope =    0.01430  s(percent)=       1.43
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.119 min.
Rainfall intensity =      2.788(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 = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =      3.216(CFS)
Total initial stream area =        1.300(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      314.000 to Point/Station      312.000
**** STREET FLOW TRAVEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of street segment elevation =  1471.200(Ft.)
End of street segment elevation =  1456.700(Ft.)
Length of street segment  =  1659.000(Ft.)
Height of curb above gutter flowline  =    8.0(In.)
Width of half street (curb to crown)  =  38.000(Ft.)
Distance from crown to crossfall grade break  =  34.000(Ft.)
```

```
Slope from gutter to grade break (v/hz) =   0.020
Slope from grade break to crown (v/hz)  =   0.020
Street flow is on [1] side(s) of the street
Distance from curb to property line  =  21.000(Ft.)
Slope from curb to property line (v/hz) =   0.025
Gutter width =   2.000(Ft.)
Gutter hike from flowline =  2.000(In.)
 Manning's N in gutter =  0.0150
 Manning's N from gutter to grade break =  0.0150
 Manning's N from grade break to crown =  0.0150
Estimated mean flow rate at midpoint of street =      5.350(CFS)
Depth of flow =   0.407(Ft.), Average velocity =   2.556(Ft/s)
Streetflow hydraulics at midpoint of street travel:
Halfstreet flow width =  14.023(Ft.)
Flow velocity =   2.56(Ft/s)
Travel time =   10.82 min.     TC =   21.94  min.
 Adding area flow to street
COMMERCIAL subarea type
Runoff Coefficient = 0.883
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      1.985(In/Hr) for a   100.0 year storm
Subarea runoff =      4.208(CFS) for      2.400(Ac.)
Total runoff =      7.424(CFS)       Total area =       3.700(Ac.)
Street flow at end of street =      7.424(CFS)
Half street flow at end of street =      7.424(CFS)
Depth of flow =   0.447(Ft.), Average velocity =   2.766(Ft/s)
Flow width (from curb towards crown)=  15.992(Ft.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      312.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1456.700(Ft.)
Downstream point/station elevation =  1450.100(Ft.)
Pipe length  =     1.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     7.424(CFS)
Nearest computed pipe diameter  =      6.00(In.)
Calculated individual pipe flow  =     7.424(CFS)
Normal flow depth in pipe =    3.05(In.)
Flow top width inside pipe =    6.00(In.)
Critical depth could not be calculated.
Pipe flow velocity =     73.96(Ft/s)
Travel time through pipe =    0.00 min.
Time of concentration (TC) =    21.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      312.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =      3.700(Ac.)
Runoff from this stream =      7.424(CFS)
Time of concentration =   21.94 min.
Rainfall intensity =     1.985(In/Hr)
Summary of stream data:

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


1       62.331     21.52                2.003
2        7.424     21.94                1.985
Largest stream flow has longer or shorter time of concentration
Qp =     62.331 + sum of
          Qa          Tb/Ta
           7.424 *    0.981 =      7.284
```

```
Qp =     69.615

Total of 2 streams to confluence:
Flow rates before confluence point:
      62.331       7.424
Area of streams before confluence:
       34.200        3.700
Results of confluence:
Total flow rate =     69.615(CFS)
Time of concentration =    21.525 min.
Effective stream area after confluence =     37.900(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      316.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1450.100(Ft.)
Downstream point/station elevation =  1432.000(Ft.)
Pipe length  =   500.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    69.615(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    69.615(CFS)
Normal flow depth in pipe =   22.08(In.)
Flow top width inside pipe =   26.45(In.)
Critical depth could not be calculated.
Pipe flow velocity =     17.97(Ft/s)
Travel time through pipe =    0.46 min.
Time of concentration (TC) =    21.99 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      312.000 to Point/Station      316.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     37.900(Ac.)
Runoff from this stream =     69.615(CFS)
Time of concentration =   21.99 min.
Rainfall intensity =     1.982(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      248.000 to Point/Station      315.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   949.000(Ft.)
Top (of initial area) elevation =  1471.300(Ft.)
Bottom (of initial area) elevation =  1462.600(Ft.)
Difference in elevation =     8.700(Ft.)
Slope =    0.00917  s(percent)=       0.92
TC = k(0.300)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.901 min.
Rainfall intensity =      2.694(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 = 1.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Initial subarea runoff =     10.996(CFS)
Total initial stream area =        4.600(Ac.)
Pervious area fraction = 0.100


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      315.000 to Point/Station      316.000
**** IMPROVED CHANNEL TRAVEL TIME ****
______________________________________________________________________________
Upstream point elevation =  1462.600(Ft.)
Downstream point elevation =  1438.000(Ft.)
```

```
Channel length thru subarea  =  2587.000(Ft.)
Channel base width     =    0.000(Ft.)
Slope or 'Z' of left channel bank =  12.000
Slope or 'Z' of right channel bank =  12.000
Estimated mean flow rate at midpoint of channel =     35.896(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    0.500(Ft.)
Flow(q) thru subarea =     35.896(CFS)
Depth of flow =   0.746(Ft.), Average velocity =   6.036(Ft/s)
!!Warning: Water is above left or right bank elevations
Channel flow top width =   12.000(Ft.)
Flow Velocity =    6.04(Ft/s)
Travel time  =    7.14 min.
Time of concentration =   19.04 min.

Sub-Channel No. 1 Critical depth =      0.906(Ft.)
  '     '       '     Critical flow top width =     12.000(Ft.)
  '     '       '     Critical flow velocity=    4.558(Ft/s)
  '     '       '     Critical flow area =      7.875(Sq.Ft)

ERROR - Channel depth exceeds maximum allowable depth
 Adding area flow to channel
COMMERCIAL subarea type
Runoff Coefficient = 0.884
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 3)  =  74.80
Pervious area fraction =  0.100; Impervious fraction =  0.900
Rainfall intensity =      2.130(In/Hr) for a   100.0 year storm
Subarea runoff =     49.727(CFS) for     26.400(Ac.)
Total runoff =     60.723(CFS)        Total area =      31.000(Ac.)
Depth of flow =   0.929(Ft.), Average velocity =   7.448(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth

Sub-Channel No. 1 Critical depth =      1.172(Ft.)
  '     '       '     Critical flow top width =     12.000(Ft.)
  '     '       '     Critical flow velocity=    5.489(Ft/s)
  '     '       '     Critical flow area =     11.063(Sq.Ft)



++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      315.000 to Point/Station      316.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     31.000(Ac.)
Runoff from this stream =     60.723(CFS)
Time of concentration =   19.04 min.
Rainfall intensity =     2.130(In/Hr)
Summary of stream data:

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


1       69.615     21.99                 1.982
2       60.723     19.04                 2.130
Largest stream flow has longer time of concentration
Qp =     69.615 + sum of
          Qb         Ia/Ib
          60.723 *    0.931 =     56.511
Qp =    126.125

Total of 2 streams to confluence:
Flow rates before confluence point:
      69.615      60.723
Area of streams before confluence:
       37.900       31.000
Results of confluence:
```

```
Total flow rate =    126.125(CFS)
Time of concentration =    21.989 min.
Effective stream area after confluence =     68.900(Ac.)
End of computations, total study area =           68.90 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.

Area averaged pervious area fraction(Ap) = 0.446
Area averaged RI index number =  65.8
```

Area D

➢ POST-DEVELOPMENT CONDITION

- ❖ Area 'D' – 10 Year Post-Development Condition – Rational Method
- ❖ Area 'D' – 100 Year Post-Development Condition – Rational Method

```
CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 06/22/20  File:PRD010.out
------------------------------------------------------------------------
STONERIDGE - PRELIMINARY HYDROLOGY STUDY - AREA 'D'
PROPOSED CONDITION RATIONAL METHOD - 10 YEAR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

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


Program License Serial Number 6406

------------------------------------------------------------------------
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 =  0.450(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.759(In/Hr)
Slope of intensity duration curve = 0.5000




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      400.000 to Point/Station      401.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   512.000(Ft.)
Top (of initial area) elevation =  1740.000(Ft.)
Bottom (of initial area) elevation =  1602.000(Ft.)
Difference in elevation =   138.000(Ft.)
Slope =    0.26953  s(percent)=      26.95
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.353 min.
Rainfall intensity =      2.033(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.787
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 =     11.516(CFS)
Total initial stream area =        7.200(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station      402.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of natural channel elevation =   1602.000(Ft.)
End of natural channel elevation =   1560.000(Ft.)
Length of natural channel  =   728.000(Ft.)
Estimated mean flow rate at midpoint of channel =     20.393(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 =   7.24(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0577
Corrected/adjusted channel slope =  0.0577
Travel time =    1.68 min.     TC =   10.03  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.754
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)  =  78.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.855(In/Hr) for a    10.0 year storm
Subarea runoff =     15.531(CFS) for     11.100(Ac.)
Total runoff =     27.047(CFS)        Total area =      18.300(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station      402.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     18.300(Ac.)
Runoff from this stream =     27.047(CFS)
Time of concentration =   10.03 min.
Rainfall intensity =     1.855(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      403.000 to Point/Station      404.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   915.000(Ft.)
Top (of initial area) elevation =  1800.000(Ft.)
Bottom (of initial area) elevation =  1597.000(Ft.)
Difference in elevation =   203.000(Ft.)
Slope =    0.22186  s(percent)=      22.19
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.955 min.
Rainfall intensity =      1.775(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.773
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 =     13.057(CFS)
Total initial stream area =        9.520(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      404.000 to Point/Station      402.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of natural channel elevation =   1597.000(Ft.)
End of natural channel elevation =   1560.000(Ft.)
Length of natural channel  =   659.000(Ft.)
Estimated mean flow rate at midpoint of channel =     18.646(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 =   6.97(Ft/s)
```

```
Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0561
Corrected/adjusted channel slope =  0.0561
Travel time =    1.58 min.     TC =   12.53  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.771
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.400
Decimal fraction soil group C = 0.600
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  82.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.660(In/Hr) for a    10.0 year storm
Subarea runoff =     10.434(CFS) for      8.150(Ac.)
Total runoff =     23.491(CFS)        Total area =      17.670(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      404.000 to Point/Station      402.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     17.670(Ac.)
Runoff from this stream =     23.491(CFS)
Time of concentration =   12.53 min.
Rainfall intensity =     1.660(In/Hr)
Summary of stream data:

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


1       27.047     10.03                1.855
2       23.491     12.53                1.660
Largest stream flow has longer or shorter time of concentration
Qp =     27.047 + sum of
          Qa          Tb/Ta
          23.491 *    0.800 =     18.802
Qp =     45.849

Total of 2 streams to confluence:
Flow rates before confluence point:
      27.047      23.491
Area of streams before confluence:
       18.300       17.670
Results of confluence:
Total flow rate =     45.849(CFS)
Time of concentration =    10.030 min.
Effective stream area after confluence =     35.970(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      402.000 to Point/Station      405.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1560.000(Ft.)
End of natural channel elevation =   1515.000(Ft.)
Length of natural channel  =  1050.000(Ft.)
Estimated mean flow rate at midpoint of channel =     69.939(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 =   8.84(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0429
```

```
Corrected/adjusted channel slope =  0.0429
Travel time =    1.98 min.     TC =   12.01  min.


 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 = 0.800
Decimal fraction soil group C = 0.200
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  79.60
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.695(In/Hr) for a    10.0 year storm
Subarea runoff =     48.003(CFS) for     37.800(Ac.)
Total runoff =     93.852(CFS)        Total area =      73.770(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      405.000 to Point/Station      406.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1513.000(Ft.)
Downstream point/station elevation =  1511.400(Ft.)
Pipe length  =    94.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    93.852(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    93.852(CFS)
Normal flow depth in pipe =   28.17(In.)
Flow top width inside pipe =   34.93(In.)
Critical Depth =   35.62(In.)
Pipe flow velocity =     14.63(Ft/s)
Travel time through pipe =    0.11 min.
Time of concentration (TC) =    12.12 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      405.000 to Point/Station      406.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     73.770(Ac.)
Runoff from this stream =     93.852(CFS)
Time of concentration =   12.12 min.
Rainfall intensity =     1.688(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      403.000 to Point/Station      407.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =     8.600(Ft.)
Top (of initial area) elevation =  1800.000(Ft.)
Bottom (of initial area) elevation =  1610.000(Ft.)
Difference in elevation =   190.000(Ft.)
Slope =   22.09302  s(percent)=    2209.30
TC = k(0.530)*[(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 =      2.628(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.829
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.050
Decimal fraction soil group C = 0.950
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  85.60
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     18.739(CFS)
Total initial stream area =        8.600(Ac.)
Pervious area fraction = 1.000
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      407.000 to Point/Station      408.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of natural channel elevation =   1610.000(Ft.)
End of natural channel elevation =   1540.000(Ft.)
Length of natural channel  =  1202.000(Ft.)
Estimated mean flow rate at midpoint of channel =     38.676(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 =   8.68(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0582
Corrected/adjusted channel slope =  0.0582
Travel time =    2.31 min.     TC =    7.31  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.808
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.200
Decimal fraction soil group C = 0.800
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  84.40
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.173(In/Hr) for a    10.0 year storm
Subarea runoff =     32.152(CFS) for     18.300(Ac.)
Total runoff =     50.891(CFS)        Total area =      26.900(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      408.000 to Point/Station      409.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of natural channel elevation =   1540.000(Ft.)
End of natural channel elevation =   1518.000(Ft.)
Length of natural channel  =   458.000(Ft.)
Estimated mean flow rate at midpoint of channel =     91.755(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 =  10.14(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0480
Corrected/adjusted channel slope =  0.0480
Travel time =    0.75 min.     TC =    8.06  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.802
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)  =  84.00
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.069(In/Hr) for a    10.0 year storm
Subarea runoff =     71.667(CFS) for     43.200(Ac.)
Total runoff =    122.558(CFS)        Total area =      70.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      409.000 to Point/Station      406.000
```

```
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  1517.000(Ft.)
Downstream point/station elevation =  1511.400(Ft.)
Pipe length  =   750.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   122.558(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =   122.558(CFS)
Normal flow depth in pipe =   38.81(In.)
Flow top width inside pipe =   37.77(In.)
Critical Depth =   39.94(In.)
Pipe flow velocity =     11.26(Ft/s)
Travel time through pipe =    1.11 min.
Time of concentration (TC) =     9.17 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      409.000 to Point/Station      406.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     70.100(Ac.)
Runoff from this stream =    122.558(CFS)
Time of concentration =    9.17 min.
Rainfall intensity =     1.940(In/Hr)
Summary of stream data:

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


1       93.852     12.12                1.688
2      122.558      9.17                1.940
Largest stream flow has longer or shorter time of concentration
Qp =    122.558 + sum of
          Qa          Tb/Ta
          93.852 *    0.757 =     71.029
Qp =    193.587

Total of 2 streams to confluence:
Flow rates before confluence point:
      93.852     122.558
Area of streams before confluence:
       73.770       70.100
Results of confluence:
Total flow rate =    193.587(CFS)
Time of concentration =     9.171 min.
Effective stream area after confluence =    143.870(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      406.000 to Point/Station      407.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  1511.400(Ft.)
Downstream point/station elevation =  1428.000(Ft.)
Pipe length  =  3984.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   193.587(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =   193.587(CFS)
Normal flow depth in pipe =   36.66(In.)
Flow top width inside pipe =   40.78(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.79(Ft/s)
Travel time through pipe =    3.53 min.
Time of concentration (TC) =    12.71 min.
End of computations, total study area =          143.87 (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 =  82.3
               Riverside County Rational Hydrology Program
```

```
CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 06/22/20  File:PRD100.out
------------------------------------------------------------------------
STONERIDGE - PRELIMINARY HYDROLOGY STUDY - AREA 'D'
PROPOSED CONDITION RATIONAL METHOD - 100 YEAR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

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


Program License Serial Number 6406

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

Storm event (year) =  100.00 Antecedent Moisture Condition = 3

2 year, 1 hour precipitation =  0.450(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.200(In/Hr)
Slope of intensity duration curve = 0.5000




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      400.000 to Point/Station      401.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   512.000(Ft.)
Top (of initial area) elevation =  1740.000(Ft.)
Bottom (of initial area) elevation =  1602.000(Ft.)
Difference in elevation =   138.000(Ft.)
Slope =    0.26953  s(percent)=      26.95
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    8.353 min.
Rainfall intensity =      3.216(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.870
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 3)  =  92.20
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     20.134(CFS)
Total initial stream area =        7.200(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station      402.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of natural channel elevation =   1602.000(Ft.)
End of natural channel elevation =   1560.000(Ft.)
Length of natural channel  =   728.000(Ft.)
Estimated mean flow rate at midpoint of channel =     35.654(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 =   8.44(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0577
Corrected/adjusted channel slope =  0.0577
Travel time =    1.44 min.     TC =    9.79  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.859
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 3)  =  90.28
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.971(In/Hr) for a   100.0 year storm
Subarea runoff =     28.309(CFS) for     11.100(Ac.)
Total runoff =     48.443(CFS)        Total area =      18.300(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      401.000 to Point/Station      402.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     18.300(Ac.)
Runoff from this stream =     48.443(CFS)
Time of concentration =    9.79 min.
Rainfall intensity =     2.971(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      403.000 to Point/Station      404.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   915.000(Ft.)
Top (of initial area) elevation =  1800.000(Ft.)
Bottom (of initial area) elevation =  1597.000(Ft.)
Difference in elevation =   203.000(Ft.)
Slope =    0.22186  s(percent)=      22.19
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.955 min.
Rainfall intensity =      2.808(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.865
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 3)  =  92.20
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     23.132(CFS)
Total initial stream area =        9.520(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      404.000 to Point/Station      402.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of natural channel elevation =   1597.000(Ft.)
End of natural channel elevation =   1560.000(Ft.)
Length of natural channel  =   659.000(Ft.)
Estimated mean flow rate at midpoint of channel =     33.034(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 =   8.15(Ft/s)
```

```
Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0561
Corrected/adjusted channel slope =  0.0561
Travel time =    1.35 min.     TC =   12.30  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.866
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.400
Decimal fraction soil group C = 0.600
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  92.68
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.650(In/Hr) for a   100.0 year storm
Subarea runoff =     18.695(CFS) for      8.150(Ac.)
Total runoff =     41.827(CFS)        Total area =      17.670(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      404.000 to Point/Station      402.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     17.670(Ac.)
Runoff from this stream =     41.827(CFS)
Time of concentration =   12.30 min.
Rainfall intensity =     2.650(In/Hr)
Summary of stream data:

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


1       48.443      9.79                 2.971
2       41.827     12.30                 2.650
Largest stream flow has longer or shorter time of concentration
Qp =     48.443 + sum of
          Qa          Tb/Ta
          41.827 *    0.796 =     33.286
Qp =     81.729

Total of 2 streams to confluence:
Flow rates before confluence point:
      48.443      41.827
Area of streams before confluence:
       18.300       17.670
Results of confluence:
Total flow rate =     81.729(CFS)
Time of concentration =     9.791 min.
Effective stream area after confluence =     35.970(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      402.000 to Point/Station      405.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1560.000(Ft.)
End of natural channel elevation =   1515.000(Ft.)
Length of natural channel  =  1050.000(Ft.)
Estimated mean flow rate at midpoint of channel =    124.673(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 =  10.50(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0429
```

```
Corrected/adjusted channel slope =  0.0429
Travel time =    1.67 min.     TC =   11.46  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.858
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.800
Decimal fraction soil group C = 0.200
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  90.76
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.746(In/Hr) for a   100.0 year storm
Subarea runoff =     89.023(CFS) for     37.800(Ac.)
Total runoff =    170.753(CFS)        Total area =      73.770(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      405.000 to Point/Station      406.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1513.000(Ft.)
Downstream point/station elevation =  1511.400(Ft.)
Pipe length  =    94.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   170.753(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =   170.753(CFS)
Normal flow depth in pipe =   36.00(In.)
Flow top width inside pipe =   41.57(In.)
Critical Depth =   44.74(In.)
Pipe flow velocity =     16.90(Ft/s)
Travel time through pipe =    0.09 min.
Time of concentration (TC) =    11.55 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      405.000 to Point/Station      406.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     73.770(Ac.)
Runoff from this stream =    170.753(CFS)
Time of concentration =   11.55 min.
Rainfall intensity =     2.735(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      403.000 to Point/Station      407.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =     8.600(Ft.)
Top (of initial area) elevation =  1800.000(Ft.)
Bottom (of initial area) elevation =  1610.000(Ft.)
Difference in elevation =   190.000(Ft.)
Slope =   22.09302  s(percent)=    2209.30
TC = k(0.530)*[(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 =      4.157(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.883
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.050
Decimal fraction soil group C = 0.950
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  94.24
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     31.556(CFS)
Total initial stream area =        8.600(Ac.)
Pervious area fraction = 1.000
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      407.000 to Point/Station      408.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of natural channel elevation =   1610.000(Ft.)
End of natural channel elevation =   1540.000(Ft.)
Length of natural channel  =  1202.000(Ft.)
Estimated mean flow rate at midpoint of channel =     65.130(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 =  10.09(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0582
Corrected/adjusted channel slope =  0.0582
Travel time =    1.99 min.     TC =    6.99  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.877
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.200
Decimal fraction soil group C = 0.800
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  93.64
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      3.517(In/Hr) for a   100.0 year storm
Subarea runoff =     56.466(CFS) for     18.300(Ac.)
Total runoff =     88.022(CFS)        Total area =      26.900(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      408.000 to Point/Station      409.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
______________________________________________________________________________
Top of natural channel elevation =   1540.000(Ft.)
End of natural channel elevation =   1518.000(Ft.)
Length of natural channel  =   458.000(Ft.)
Estimated mean flow rate at midpoint of channel =    158.702(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 =  11.97(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0480
Corrected/adjusted channel slope =  0.0480
Travel time =    0.64 min.     TC =    7.62  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.875
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 3)  =  93.40
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      3.366(In/Hr) for a   100.0 year storm
Subarea runoff =    127.323(CFS) for     43.200(Ac.)
Total runoff =    215.345(CFS)        Total area =      70.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      409.000 to Point/Station      406.000
```

```
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  1517.000(Ft.)
Downstream point/station elevation =  1511.400(Ft.)
Pipe length  =   750.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   215.345(CFS)
Nearest computed pipe diameter  =     60.00(In.)
Calculated individual pipe flow  =   215.345(CFS)
Normal flow depth in pipe =   46.97(In.)
Flow top width inside pipe =   49.48(In.)
Critical Depth =   50.02(In.)
Pipe flow velocity =     13.05(Ft/s)
Travel time through pipe =    0.96 min.
Time of concentration (TC) =     8.58 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      409.000 to Point/Station      406.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     70.100(Ac.)
Runoff from this stream =    215.345(CFS)
Time of concentration =    8.58 min.
Rainfall intensity =     3.173(In/Hr)
Summary of stream data:

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


1      170.753     11.55                2.735
2      215.345      8.58                3.173
Largest stream flow has longer or shorter time of concentration
Qp =    215.345 + sum of
          Qa          Tb/Ta
         170.753 *    0.743 =    126.877
Qp =    342.222

Total of 2 streams to confluence:
Flow rates before confluence point:
     170.753     215.345
Area of streams before confluence:
       73.770       70.100
Results of confluence:
Total flow rate =    342.222(CFS)
Time of concentration =     8.582 min.
Effective stream area after confluence =    143.870(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      406.000 to Point/Station      407.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________
Upstream point/station elevation =  1511.400(Ft.)
Downstream point/station elevation =  1428.000(Ft.)
Pipe length  =  3984.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   342.222(CFS)
Nearest computed pipe diameter  =     57.00(In.)
Calculated individual pipe flow  =   342.222(CFS)
Normal flow depth in pipe =   49.13(In.)
Flow top width inside pipe =   39.34(In.)
Critical depth could not be calculated.
Pipe flow velocity =     21.06(Ft/s)
Travel time through pipe =    3.15 min.
Time of concentration (TC) =    11.74 min.
End of computations, total study area =          143.87 (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 =  82.3
```

Area E

➢ POST-DEVELOPMENT CONDITION

- ❖ Area 'E' – 10 Year Post-Development Condition – Rational Method
- ❖ Area 'E' – 100 Year Post-Development Condition – Rational Method

```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 06/22/20  File:PRE010.out
------------------------------------------------------------------------
STONERIDGE - PRELIMINARY HYDROLOGY STUDY - AREA 'E'
PROPOSED CONDITION RATIONAL METHOD - 10 YEAR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

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


Program License Serial Number 6406

------------------------------------------------------------------------
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 =  0.450(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year =  10.0
Calculated rainfall intensity data:
1 hour intensity =  0.759(In/Hr)
Slope of intensity duration curve = 0.5000




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      500.000 to Point/Station      501.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   908.000(Ft.)
Top (of initial area) elevation =  1780.000(Ft.)
Bottom (of initial area) elevation =  1530.000(Ft.)
Difference in elevation =   250.000(Ft.)
Slope =    0.27533  s(percent)=      27.53
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.460 min.
Rainfall intensity =      1.817(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.792
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.200
Decimal fraction soil group C = 0.800
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  84.40
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     14.398(CFS)
Total initial stream area =       10.000(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      501.000 to Point/Station      502.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1524.000(Ft.)
Downstream point/station elevation =  1522.400(Ft.)
Pipe length  =   315.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    14.398(CFS)
Nearest computed pipe diameter  =     24.00(In.)
```

```
Calculated individual pipe flow  =    14.398(CFS)
Normal flow depth in pipe =   17.67(In.)
Flow top width inside pipe =   21.15(In.)
Critical Depth =   16.41(In.)
Pipe flow velocity =      5.80(Ft/s)
Travel time through pipe =    0.90 min.
Time of concentration (TC) =    11.37 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      501.000 to Point/Station      502.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     10.000(Ac.)
Runoff from this stream =     14.398(CFS)
Time of concentration =   11.37 min.
Rainfall intensity =     1.743(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      503.000 to Point/Station      504.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   476.000(Ft.)
Top (of initial area) elevation =  1867.000(Ft.)
Bottom (of initial area) elevation =  1665.000(Ft.)
Difference in elevation =   202.000(Ft.)
Slope =    0.42437  s(percent)=      42.44
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.409 min.
Rainfall intensity =      2.159(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.815
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.050
Decimal fraction soil group C = 0.950
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  85.60
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      1.936(CFS)
Total initial stream area =        1.100(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      504.000 to Point/Station      502.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1665.000(Ft.)
End of natural channel elevation =   1530.000(Ft.)
Length of natural channel  =   810.000(Ft.)
Estimated mean flow rate at midpoint of channel =     13.375(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 =  10.99(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.1667
Corrected/adjusted channel slope =  0.1667
Travel time =    1.23 min.     TC =    8.64  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.782
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.550
Decimal fraction soil group C = 0.450
Decimal fraction soil group D = 0.000
```

```
RI index for soil(AMC 2)  =  81.60
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.999(In/Hr) for a    10.0 year storm
Subarea runoff =     20.334(CFS) for     13.000(Ac.)
Total runoff =     22.270(CFS)        Total area =      14.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      504.000 to Point/Station      502.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     14.100(Ac.)
Runoff from this stream =     22.270(CFS)
Time of concentration =    8.64 min.
Rainfall intensity =     1.999(In/Hr)
Summary of stream data:

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


1       14.398     11.37                 1.743
2       22.270      8.64                 1.999
Largest stream flow has longer or shorter time of concentration
Qp =     22.270 + sum of
          Qa          Tb/Ta
          14.398 *    0.760 =     10.942
Qp =     33.212

Total of 2 streams to confluence:
Flow rates before confluence point:
      14.398      22.270
Area of streams before confluence:
       10.000       14.100
Results of confluence:
Total flow rate =     33.212(CFS)
Time of concentration =     8.637 min.
Effective stream area after confluence =     24.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      502.000 to Point/Station      508.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1522.400(Ft.)
Downstream point/station elevation =  1466.400(Ft.)
Pipe length  =  1090.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    33.212(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    33.212(CFS)
Normal flow depth in pipe =   15.94(In.)
Flow top width inside pipe =   17.96(In.)
Critical depth could not be calculated.
Pipe flow velocity =     16.95(Ft/s)
Travel time through pipe =    1.07 min.
Time of concentration (TC) =     9.71 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      502.000 to Point/Station      508.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     24.100(Ac.)
Runoff from this stream =     33.212(CFS)
Time of concentration =    9.71 min.
Rainfall intensity =     1.886(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      505.000 to Point/Station      506.000
**** INITIAL AREA EVALUATION ****
```

```
------------------------------------------------------------------------
Initial area flow distance =   548.000(Ft.)
Top (of initial area) elevation =  1880.000(Ft.)
Bottom (of initial area) elevation =  1660.000(Ft.)
Difference in elevation =   220.000(Ft.)
Slope =    0.40146  s(percent)=      40.15
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.926 min.
Rainfall intensity =      2.087(In/Hr) for a    10.0 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 =      4.934(CFS)
Total initial stream area =        2.900(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      506.000 to Point/Station      507.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of natural channel elevation =   1660.000(Ft.)
End of natural channel elevation =   1540.000(Ft.)
Length of natural channel  =   686.000(Ft.)
Estimated mean flow rate at midpoint of channel =     18.715(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 =  12.31(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.1749
Corrected/adjusted channel slope =  0.1749
Travel time =    0.93 min.     TC =    8.85  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.784
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 =      1.975(In/Hr) for a    10.0 year storm
Subarea runoff =     25.073(CFS) for     16.200(Ac.)
Total runoff =     30.007(CFS)        Total area =      19.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      507.000 to Point/Station      508.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1534.000(Ft.)
Downstream point/station elevation =  1466.400(Ft.)
Pipe length  =   330.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    30.007(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    30.007(CFS)
Normal flow depth in pipe =   10.37(In.)
Flow top width inside pipe =   17.79(In.)
Critical depth could not be calculated.
Pipe flow velocity =     28.45(Ft/s)
Travel time through pipe =    0.19 min.
Time of concentration (TC) =     9.05 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      507.000 to Point/Station      508.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     19.100(Ac.)
Runoff from this stream =     30.007(CFS)
Time of concentration =    9.05 min.
Rainfall intensity =     1.953(In/Hr)
Summary of stream data:

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


1       33.212      9.71                1.886
2       30.007      9.05                1.953
Largest stream flow has longer time of concentration
Qp =     33.212 + sum of
          Qb         Ia/Ib
          30.007 *    0.965 =     28.968
Qp =     62.180

Total of 2 streams to confluence:
Flow rates before confluence point:
      33.212      30.007
Area of streams before confluence:
       24.100       19.100
Results of confluence:
Total flow rate =     62.180(CFS)
Time of concentration =     9.709 min.
Effective stream area after confluence =     43.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      508.000 to Point/Station      511.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  1466.400(Ft.)
Downstream point/station elevation =  1463.600(Ft.)
Pipe length  =   560.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    62.180(CFS)
Nearest computed pipe diameter  =     39.00(In.)
Calculated individual pipe flow  =    62.180(CFS)
Normal flow depth in pipe =   35.10(In.)
Flow top width inside pipe =   23.40(In.)
Critical Depth =   30.19(In.)
Pipe flow velocity =      7.91(Ft/s)
Travel time through pipe =    1.18 min.
Time of concentration (TC) =    10.89 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      509.000 to Point/Station      511.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.770
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.550
Decimal fraction soil group C = 0.450
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  81.60
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    10.89 min.
Rainfall intensity =      1.781(In/Hr) for a    10.0 year storm
Subarea runoff =     20.704(CFS) for     15.100(Ac.)
Total runoff =     82.883(CFS)        Total area =      58.300(Ac.)


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

```
Process from Point/Station      511.000 to Point/Station      515.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1463.600(Ft.)
Downstream point/station elevation =  1460.600(Ft.)
Pipe length  =   589.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    82.883(CFS)
Nearest computed pipe diameter  =     45.00(In.)
Calculated individual pipe flow  =    82.883(CFS)
Normal flow depth in pipe =   35.34(In.)
Flow top width inside pipe =   36.95(In.)
Critical Depth =   33.64(In.)
Pipe flow velocity =      8.90(Ft/s)
Travel time through pipe =    1.10 min.
Time of concentration (TC) =    11.99 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      511.000 to Point/Station      515.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     58.300(Ac.)
Runoff from this stream =     82.883(CFS)
Time of concentration =   11.99 min.
Rainfall intensity =     1.697(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      512.000 to Point/Station      513.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   996.000(Ft.)
Top (of initial area) elevation =  1900.000(Ft.)
Bottom (of initial area) elevation =  1670.000(Ft.)
Difference in elevation =   230.000(Ft.)
Slope =    0.23092  s(percent)=      23.09
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.243 min.
Rainfall intensity =      1.752(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.801
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 =     10.805(CFS)
Total initial stream area =        7.700(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      513.000 to Point/Station      514.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of natural channel elevation =   1670.000(Ft.)
End of natural channel elevation =   1550.000(Ft.)
Length of natural channel  =  1228.000(Ft.)
Estimated mean flow rate at midpoint of channel =     20.909(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 =   9.48(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
        Normal channel slope =  0.0977
Corrected/adjusted channel slope =  0.0977
Travel time =    2.16 min.     TC =   13.40  min.
```

```
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.790
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.050
Decimal fraction soil group C = 0.950
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  85.60
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      1.605(In/Hr) for a    10.0 year storm
Subarea runoff =     18.250(CFS) for     14.400(Ac.)
Total runoff =     29.056(CFS)        Total area =      22.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      514.000 to Point/Station      515.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1544.000(Ft.)
Downstream point/station elevation =  1460.600(Ft.)
Pipe length  =   277.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    29.056(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    29.056(CFS)
Normal flow depth in pipe =   10.34(In.)
Flow top width inside pipe =   13.89(In.)
Critical depth could not be calculated.
Pipe flow velocity =     32.23(Ft/s)
Travel time through pipe =    0.14 min.
Time of concentration (TC) =    13.55 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      514.000 to Point/Station      515.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     22.100(Ac.)
Runoff from this stream =     29.056(CFS)
Time of concentration =   13.55 min.
Rainfall intensity =     1.597(In/Hr)
Summary of stream data:

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


1       82.883     11.99                1.697
2       29.056     13.55                1.597
Largest stream flow has longer or shorter time of concentration
Qp =     82.883 + sum of
          Qa          Tb/Ta
          29.056 *    0.885 =     25.723
Qp =    108.606

Total of 2 streams to confluence:
Flow rates before confluence point:
      82.883      29.056
Area of streams before confluence:
       58.300       22.100
Results of confluence:
Total flow rate =    108.606(CFS)
Time of concentration =    11.992 min.
Effective stream area after confluence =     80.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      515.000 to Point/Station      521.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1460.600(Ft.)
Downstream point/station elevation =  1459.300(Ft.)
```

```
Pipe length  =   252.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   108.606(CFS)
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =   108.606(CFS)
Normal flow depth in pipe =   42.19(In.)
Flow top width inside pipe =   31.32(In.)
Critical Depth =   37.84(In.)
Pipe flow velocity =      9.29(Ft/s)
Travel time through pipe =    0.45 min.
Time of concentration (TC) =    12.44 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      515.000 to Point/Station      521.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     80.400(Ac.)
Runoff from this stream =    108.606(CFS)
Time of concentration =   12.44 min.
Rainfall intensity =     1.666(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      516.000 to Point/Station      517.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Initial area flow distance =   937.000(Ft.)
Top (of initial area) elevation =  1728.000(Ft.)
Bottom (of initial area) elevation =  1500.000(Ft.)
Difference in elevation =   228.000(Ft.)
Slope =    0.24333  s(percent)=      24.33
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.858 min.
Rainfall intensity =      1.783(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.794
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.150
Decimal fraction soil group C = 0.850
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  84.80
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      4.812(CFS)
Total initial stream area =        3.400(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      517.000 to Point/Station      520.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =  1494.000(Ft.)
Downstream point/station elevation =  1483.000(Ft.)
Pipe length  =   283.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.812(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =     4.812(CFS)
Normal flow depth in pipe =    7.29(In.)
Flow top width inside pipe =   11.72(In.)
Critical Depth =   10.88(In.)
Pipe flow velocity =      9.63(Ft/s)
Travel time through pipe =    0.49 min.
Time of concentration (TC) =    11.35 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      517.000 to Point/Station      520.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 2 in normal stream number 1
```

```
Stream flow area =      3.400(Ac.)
Runoff from this stream =      4.812(CFS)
Time of concentration =   11.35 min.
Rainfall intensity =     1.744(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      518.000 to Point/Station      519.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   633.000(Ft.)
Top (of initial area) elevation =  1560.000(Ft.)
Bottom (of initial area) elevation =  1529.000(Ft.)
Difference in elevation =    31.000(Ft.)
Slope =    0.04897  s(percent)=       4.90
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.789 min.
Rainfall intensity =      1.643(In/Hr) for a    10.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.789
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.100
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
RI index for soil(AMC 2)  =  85.20
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      5.832(CFS)
Total initial stream area =        4.500(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      519.000 to Point/Station      520.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1520.000(Ft.)
Downstream point/station elevation =  1483.000(Ft.)
Pipe length  =   173.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     5.832(CFS)
Nearest computed pipe diameter  =      9.00(In.)
Calculated individual pipe flow  =     5.832(CFS)
Normal flow depth in pipe =    5.88(In.)
Flow top width inside pipe =    8.56(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.07(Ft/s)
Travel time through pipe =    0.15 min.
Time of concentration (TC) =    12.94 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      519.000 to Point/Station      520.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      4.500(Ac.)
Runoff from this stream =      5.832(CFS)
Time of concentration =   12.94 min.
Rainfall intensity =     1.633(In/Hr)
Summary of stream data:

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


1        4.812     11.35                1.744
2        5.832     12.94                1.633
Largest stream flow has longer time of concentration
Qp =      5.832 + sum of
          Qb          Ia/Ib
           4.812 *    0.936 =      4.506
Qp =     10.338

Total of 2 streams to confluence:
```

```
Flow rates before confluence point:
       4.812       5.832
Area of streams before confluence:
        3.400        4.500
Results of confluence:
Total flow rate =     10.338(CFS)
Time of concentration =    12.940 min.
Effective stream area after confluence =      7.900(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      520.000 to Point/Station      521.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1483.000(Ft.)
Downstream point/station elevation =  1459.300(Ft.)
Pipe length  =   390.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.338(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =    10.338(CFS)
Normal flow depth in pipe =    8.80(In.)
Flow top width inside pipe =   14.77(In.)
Critical depth could not be calculated.
Pipe flow velocity =     13.81(Ft/s)
Travel time through pipe =    0.47 min.
Time of concentration (TC) =    13.41 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      520.000 to Point/Station      521.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      7.900(Ac.)
Runoff from this stream =     10.338(CFS)
Time of concentration =   13.41 min.
Rainfall intensity =     1.604(In/Hr)
Summary of stream data:

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


1      108.606     12.44               1.666
2       10.338     13.41               1.604
Largest stream flow has longer or shorter time of concentration
Qp =    108.606 + sum of
          Qa          Tb/Ta
          10.338 *    0.928 =      9.592
Qp =    118.198

Total of 2 main streams to confluence:
Flow rates before confluence point:
     108.606      10.338
Area of streams before confluence:
       80.400        7.900


Results of confluence:
Total flow rate =    118.198(CFS)
Time of concentration =    12.444 min.
Effective stream area after confluence  =     88.300(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      521.000 to Point/Station      522.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1459.300(Ft.)
Downstream point/station elevation =  1449.000(Ft.)
Pipe length  =   943.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =   118.198(CFS)
```

```
Nearest computed pipe diameter  =     48.00(In.)
Calculated individual pipe flow  =   118.198(CFS)
Normal flow depth in pipe =   35.91(In.)
Flow top width inside pipe =   41.68(In.)
Critical Depth =   39.34(In.)
Pipe flow velocity =     11.73(Ft/s)
Travel time through pipe =    1.34 min.
Time of concentration (TC) =    13.78 min.
End of computations, total study area =           88.30 (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 =  83.5
```

```
                Riverside County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c) 1989 - 2014 Version 9.0
        Rational Hydrology Study        Date: 06/22/20  File:PRE100.out
------------------------------------------------------------------------
STONERIDGE - PRELIMINARY HYDROLOGY STUDY – AREA 'E'
PROPOSED CONDITION RATIONAL METHOD - 100 YEAR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
 *********   Hydrology Study Control Information **********

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

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


Program License Serial Number 6406

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

Storm event (year) =  100.00 Antecedent Moisture Condition = 3

2 year, 1 hour precipitation =  0.450(In.)
100 year, 1 hour precipitation =  1.200(In.)

Storm event year = 100.0
Calculated rainfall intensity data:
1 hour intensity =  1.200(In/Hr)
Slope of intensity duration curve = 0.5000




++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      500.000 to Point/Station      501.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   908.000(Ft.)
Top (of initial area) elevation =  1780.000(Ft.)
Bottom (of initial area) elevation =  1530.000(Ft.)
Difference in elevation =   250.000(Ft.)
Slope =    0.27533  s(percent)=      27.53
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.460 min.
Rainfall intensity =      2.874(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.873
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.200
Decimal fraction soil group C = 0.800
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  93.64
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     25.076(CFS)
Total initial stream area =       10.000(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      501.000 to Point/Station      502.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1524.000(Ft.)
Downstream point/station elevation =  1522.400(Ft.)
Pipe length  =   315.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    25.076(CFS)
Nearest computed pipe diameter  =     30.00(In.)
```

```
Calculated individual pipe flow  =    25.076(CFS)
Normal flow depth in pipe =   21.40(In.)
Flow top width inside pipe =   27.13(In.)
Critical Depth =   20.46(In.)
Pipe flow velocity =      6.69(Ft/s)
Travel time through pipe =    0.78 min.
Time of concentration (TC) =    11.24 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      501.000 to Point/Station      502.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     10.000(Ac.)
Runoff from this stream =     25.076(CFS)
Time of concentration =   11.24 min.
Rainfall intensity =     2.772(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      503.000 to Point/Station      504.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Initial area flow distance =   476.000(Ft.)
Top (of initial area) elevation =  1867.000(Ft.)
Bottom (of initial area) elevation =  1665.000(Ft.)
Difference in elevation =   202.000(Ft.)
Slope =    0.42437  s(percent)=      42.44
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.409 min.
Rainfall intensity =      3.415(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.879
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.050
Decimal fraction soil group C = 0.950
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  94.24
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      3.302(CFS)
Total initial stream area =        1.100(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      504.000 to Point/Station      502.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
________________________________________________________________________
Top of natural channel elevation =   1665.000(Ft.)
End of natural channel elevation =   1530.000(Ft.)
Length of natural channel  =   810.000(Ft.)
Estimated mean flow rate at midpoint of channel =     22.813(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 =  12.68(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.1667
Corrected/adjusted channel slope =  0.1667
Travel time =    1.06 min.     TC =    8.47  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.868
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.550
Decimal fraction soil group C = 0.450
Decimal fraction soil group D = 0.000
```

```
RI index for soil(AMC 3)  =  91.96
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      3.193(In/Hr) for a   100.0 year storm
Subarea runoff =     36.043(CFS) for     13.000(Ac.)
Total runoff =     39.345(CFS)        Total area =      14.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      504.000 to Point/Station      502.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     14.100(Ac.)
Runoff from this stream =     39.345(CFS)
Time of concentration =    8.47 min.
Rainfall intensity =     3.193(In/Hr)
Summary of stream data:

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


1       25.076     11.24                 2.772
2       39.345      8.47                 3.193
Largest stream flow has longer or shorter time of concentration
Qp =     39.345 + sum of
          Qa          Tb/Ta
          25.076 *    0.754 =     18.898
Qp =     58.243

Total of 2 streams to confluence:
Flow rates before confluence point:
      25.076      39.345
Area of streams before confluence:
       10.000       14.100
Results of confluence:
Total flow rate =     58.243(CFS)
Time of concentration =     8.474 min.
Effective stream area after confluence =     24.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      502.000 to Point/Station      508.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1522.400(Ft.)
Downstream point/station elevation =  1466.400(Ft.)
Pipe length  =  1090.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    58.243(CFS)
Nearest computed pipe diameter  =     27.00(In.)
Calculated individual pipe flow  =    58.243(CFS)
Normal flow depth in pipe =   18.77(In.)
Flow top width inside pipe =   24.85(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.74(Ft/s)
Travel time through pipe =    0.92 min.
Time of concentration (TC) =     9.39 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      502.000 to Point/Station      508.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     24.100(Ac.)
Runoff from this stream =     58.243(CFS)
Time of concentration =    9.39 min.
Rainfall intensity =     3.033(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      505.000 to Point/Station      506.000
**** INITIAL AREA EVALUATION ****
```

```
Initial area flow distance =   548.000(Ft.)
Top (of initial area) elevation =  1880.000(Ft.)
Bottom (of initial area) elevation =  1660.000(Ft.)
Difference in elevation =   220.000(Ft.)
Slope =    0.40146  s(percent)=      40.15
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =    7.926 min.
Rainfall intensity =      3.302(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
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 3)  =  94.40
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      8.416(CFS)
Total initial stream area =        2.900(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      506.000 to Point/Station      507.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of natural channel elevation =   1660.000(Ft.)
End of natural channel elevation =   1540.000(Ft.)
Length of natural channel  =   686.000(Ft.)
Estimated mean flow rate at midpoint of channel =     31.921(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 =  14.25(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.1749
Corrected/adjusted channel slope =  0.1749
Travel time =    0.80 min.     TC =    8.73  min.


 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.869
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 3)  =  92.20
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      3.146(In/Hr) for a   100.0 year storm
Subarea runoff =     44.284(CFS) for     16.200(Ac.)
Total runoff =     52.700(CFS)        Total area =      19.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      507.000 to Point/Station      508.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1534.000(Ft.)
Downstream point/station elevation =  1466.400(Ft.)
Pipe length  =   330.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    52.700(CFS)
Nearest computed pipe diameter  =     21.00(In.)
Calculated individual pipe flow  =    52.700(CFS)
Normal flow depth in pipe =   13.38(In.)
Flow top width inside pipe =   20.19(In.)
Critical depth could not be calculated.
Pipe flow velocity =     32.59(Ft/s)
Travel time through pipe =    0.17 min.
Time of concentration (TC) =     8.90 min.
```

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      507.000 to Point/Station      508.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     19.100(Ac.)
Runoff from this stream =     52.700(CFS)
Time of concentration =    8.90 min.
Rainfall intensity =     3.116(In/Hr)
Summary of stream data:

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


1       58.243      9.39                3.033
2       52.700      8.90                3.116
Largest stream flow has longer time of concentration
Qp =     58.243 + sum of
          Qb          Ia/Ib
          52.700 *    0.973 =     51.286
Qp =    109.529

Total of 2 streams to confluence:
Flow rates before confluence point:
      58.243      52.700
Area of streams before confluence:
       24.100       19.100
Results of confluence:
Total flow rate =    109.529(CFS)
Time of concentration =     9.394 min.
Effective stream area after confluence =     43.200(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      508.000 to Point/Station      511.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  1466.400(Ft.)
Downstream point/station elevation =  1463.600(Ft.)
Pipe length  =   560.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   109.529(CFS)
Nearest computed pipe diameter  =     51.00(In.)
Calculated individual pipe flow  =   109.529(CFS)
Normal flow depth in pipe =   38.44(In.)
Flow top width inside pipe =   43.95(In.)
Critical Depth =   37.49(In.)
Pipe flow velocity =      9.55(Ft/s)
Travel time through pipe =    0.98 min.
Time of concentration (TC) =    10.37 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      509.000 to Point/Station      511.000
**** SUBAREA FLOW ADDITION ****
_____________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.865
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.550
Decimal fraction soil group C = 0.450
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  91.96
Pervious area fraction =  1.000; Impervious fraction =  0.000
Time of concentration =    10.37 min.
Rainfall intensity =      2.886(In/Hr) for a   100.0 year storm
Subarea runoff =     37.701(CFS) for     15.100(Ac.)
Total runoff =    147.230(CFS)        Total area =      58.300(Ac.)


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

```
Process from Point/Station      511.000 to Point/Station      515.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1463.600(Ft.)
Downstream point/station elevation =  1460.600(Ft.)
Pipe length  =   589.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   147.230(CFS)
Nearest computed pipe diameter  =     54.00(In.)
Calculated individual pipe flow  =   147.230(CFS)
Normal flow depth in pipe =   47.06(In.)
Flow top width inside pipe =   36.14(In.)
Critical Depth =   42.74(In.)
Pipe flow velocity =     10.00(Ft/s)
Travel time through pipe =    0.98 min.
Time of concentration (TC) =    11.35 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      511.000 to Point/Station      515.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     58.300(Ac.)
Runoff from this stream =    147.230(CFS)
Time of concentration =   11.35 min.
Rainfall intensity =     2.759(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      512.000 to Point/Station      513.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   996.000(Ft.)
Top (of initial area) elevation =  1900.000(Ft.)
Bottom (of initial area) elevation =  1670.000(Ft.)
Difference in elevation =   230.000(Ft.)
Slope =    0.23092  s(percent)=      23.09
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.243 min.
Rainfall intensity =      2.772(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.875
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 3)  =  94.40
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     18.678(CFS)
Total initial stream area =        7.700(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      513.000 to Point/Station      514.000
**** NATURAL CHANNEL TIME + SUBAREA FLOW ADDITION ****
------------------------------------------------------------------------
Top of natural channel elevation =   1670.000(Ft.)
End of natural channel elevation =   1550.000(Ft.)
Length of natural channel  =  1228.000(Ft.)
Estimated mean flow rate at midpoint of channel =     36.143(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 =  11.03(Ft/s)

Correction to map slope used on extremely rugged channels with
drops and waterfalls (Plate D-6.2)
       Normal channel slope =  0.0977
Corrected/adjusted channel slope =  0.0977
Travel time =    1.86 min.     TC =   13.10  min.
```

```
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.872
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.050
Decimal fraction soil group C = 0.950
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  94.24
Pervious area fraction =  1.000; Impervious fraction =  0.000
Rainfall intensity =      2.568(In/Hr) for a   100.0 year storm
Subarea runoff =     32.261(CFS) for     14.400(Ac.)
Total runoff =     50.939(CFS)        Total area =      22.100(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      514.000 to Point/Station      515.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1544.000(Ft.)
Downstream point/station elevation =  1460.600(Ft.)
Pipe length  =   277.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    50.939(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    50.939(CFS)
Normal flow depth in pipe =   13.15(In.)
Flow top width inside pipe =   15.97(In.)
Critical depth could not be calculated.
Pipe flow velocity =     36.82(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    13.22 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      514.000 to Point/Station      515.000
**** CONFLUENCE OF MINOR STREAMS ****
________________________________________________________________________
Along Main Stream number: 1 in normal stream number 2
Stream flow area =     22.100(Ac.)
Runoff from this stream =     50.939(CFS)
Time of concentration =   13.22 min.
Rainfall intensity =     2.556(In/Hr)
Summary of stream data:

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


1      147.230     11.35                2.759
2       50.939     13.22                2.556
Largest stream flow has longer or shorter time of concentration
Qp =    147.230 + sum of
          Qa          Tb/Ta
          50.939 *    0.859 =     43.734
Qp =    190.964

Total of 2 streams to confluence:
Flow rates before confluence point:
     147.230      50.939
Area of streams before confluence:
       58.300       22.100
Results of confluence:
Total flow rate =    190.964(CFS)
Time of concentration =    11.354 min.
Effective stream area after confluence =     80.400(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      515.000 to Point/Station      521.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  1460.600(Ft.)
Downstream point/station elevation =  1459.300(Ft.)
```

```
Pipe length  =   252.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   190.964(CFS)
Nearest computed pipe diameter  =     60.00(In.)
Calculated individual pipe flow  =   190.964(CFS)
Normal flow depth in pipe =   50.44(In.)
Flow top width inside pipe =   43.92(In.)
Critical Depth =   47.39(In.)
Pipe flow velocity =     10.85(Ft/s)
Travel time through pipe =    0.39 min.
Time of concentration (TC) =    11.74 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      515.000 to Point/Station      521.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     80.400(Ac.)
Runoff from this stream =    190.964(CFS)
Time of concentration =   11.74 min.
Rainfall intensity =     2.713(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      516.000 to Point/Station      517.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------------
Initial area flow distance =   937.000(Ft.)
Top (of initial area) elevation =  1728.000(Ft.)
Bottom (of initial area) elevation =  1500.000(Ft.)
Difference in elevation =   228.000(Ft.)
Slope =    0.24333  s(percent)=      24.33
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   10.858 min.
Rainfall intensity =      2.821(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.873
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.150
Decimal fraction soil group C = 0.850
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  93.88
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =      8.374(CFS)
Total initial stream area =        3.400(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      517.000 to Point/Station      520.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------------
Upstream point/station elevation =  1494.000(Ft.)
Downstream point/station elevation =  1483.000(Ft.)
Pipe length  =   283.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.374(CFS)
Nearest computed pipe diameter  =     15.00(In.)
Calculated individual pipe flow  =     8.374(CFS)
Normal flow depth in pipe =    8.87(In.)
Flow top width inside pipe =   14.75(In.)
Critical Depth =   13.58(In.)
Pipe flow velocity =     11.08(Ft/s)
Travel time through pipe =    0.43 min.
Time of concentration (TC) =    11.28 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      517.000 to Point/Station      520.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 1
```

```
Stream flow area =      3.400(Ac.)
Runoff from this stream =      8.374(CFS)
Time of concentration =   11.28 min.
Rainfall intensity =     2.767(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      518.000 to Point/Station      519.000
**** INITIAL AREA EVALUATION ****
------------------------------------------------------------------------
Initial area flow distance =   633.000(Ft.)
Top (of initial area) elevation =  1560.000(Ft.)
Bottom (of initial area) elevation =  1529.000(Ft.)
Difference in elevation =    31.000(Ft.)
Slope =    0.04897  s(percent)=       4.90
TC = k(0.530)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   12.789 min.
Rainfall intensity =      2.599(In/Hr) for a   100.0 year storm
UNDEVELOPED (poor cover) subarea
Runoff Coefficient = 0.872
Decimal fraction soil group A = 0.000
Decimal fraction soil group B = 0.100
Decimal fraction soil group C = 0.900
Decimal fraction soil group D = 0.000
RI index for soil(AMC 3)  =  94.08
Pervious area fraction =  1.000; Impervious fraction =  0.000
Initial subarea runoff =     10.197(CFS)
Total initial stream area =        4.500(Ac.)
Pervious area fraction = 1.000


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      519.000 to Point/Station      520.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1520.000(Ft.)
Downstream point/station elevation =  1483.000(Ft.)
Pipe length  =   173.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    10.197(CFS)
Nearest computed pipe diameter  =     12.00(In.)
Calculated individual pipe flow  =    10.197(CFS)
Normal flow depth in pipe =    6.83(In.)
Flow top width inside pipe =   11.88(In.)
Critical depth could not be calculated.
Pipe flow velocity =     22.09(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =    12.92 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      519.000 to Point/Station      520.000
**** CONFLUENCE OF MINOR STREAMS ****
------------------------------------------------------------------------
Along Main Stream number: 2 in normal stream number 2
Stream flow area =      4.500(Ac.)
Runoff from this stream =     10.197(CFS)
Time of concentration =   12.92 min.
Rainfall intensity =     2.586(In/Hr)
Summary of stream data:

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


1        8.374     11.28                2.767
2       10.197     12.92                2.586
Largest stream flow has longer time of concentration
Qp =     10.197 + sum of
          Qb          Ia/Ib
           8.374 *    0.935 =      7.826
Qp =     18.023

Total of 2 streams to confluence:
```

```
Flow rates before confluence point:
       8.374      10.197
Area of streams before confluence:
        3.400        4.500
Results of confluence:
Total flow rate =     18.023(CFS)
Time of concentration =    12.920 min.
Effective stream area after confluence =      7.900(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      520.000 to Point/Station      521.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1483.000(Ft.)
Downstream point/station elevation =  1459.300(Ft.)
Pipe length  =   390.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    18.023(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =    18.023(CFS)
Normal flow depth in pipe =   11.05(In.)
Flow top width inside pipe =   17.53(In.)
Critical depth could not be calculated.
Pipe flow velocity =     15.83(Ft/s)
Travel time through pipe =    0.41 min.
Time of concentration (TC) =    13.33 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      520.000 to Point/Station      521.000
**** CONFLUENCE OF MAIN STREAMS ****
------------------------------------------------------------------------
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      7.900(Ac.)
Runoff from this stream =     18.023(CFS)
Time of concentration =   13.33 min.
Rainfall intensity =     2.546(In/Hr)
Summary of stream data:

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


1      190.964     11.74               2.713
2       18.023     13.33               2.546
Largest stream flow has longer or shorter time of concentration
Qp =    190.964 + sum of
          Qa          Tb/Ta
          18.023 *    0.881 =     15.874
Qp =    206.838

Total of 2 main streams to confluence:
Flow rates before confluence point:
     190.964      18.023
Area of streams before confluence:
       80.400        7.900


Results of confluence:
Total flow rate =    206.838(CFS)
Time of concentration =    11.741 min.
Effective stream area after confluence  =     88.300(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station      521.000 to Point/Station      522.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
------------------------------------------------------------------------
Upstream point/station elevation =  1459.300(Ft.)
Downstream point/station elevation =  1449.000(Ft.)
Pipe length  =   943.00(Ft.)   Manning's N = 0.015
No. of pipes = 1  Required pipe flow  =   206.838(CFS)
```

```
Nearest computed pipe diameter  =     57.00(In.)
Calculated individual pipe flow  =   206.838(CFS)
Normal flow depth in pipe =   46.97(In.)
Flow top width inside pipe =   43.41(In.)
Critical Depth =   49.30(In.)
Pipe flow velocity =     13.23(Ft/s)
Travel time through pipe =    1.19 min.
Time of concentration (TC) =    12.93 min.
End of computations, total study area =           88.30 (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 =  83.5
```

SECTION 4 – Unit Hydrograph Calculations

- **AREA A**
  - **EXISTING CONDITION**
    - Area 'A' – 10 Year Existing Condition – Unit Hydrograph
    - Area 'A' – 100 Year Existing Condition – Unit Hydrograph
  - **PROPOSED CONDITION**
    - Area 'A' – 10 Year Proposed Condition – Unit Hydrograph
    - Area 'A' – 100 Year Proposed Condition – Unit Hydrograph
- **AREA B**
  - **EXISTING CONDITION**
    - Area 'B' – 10 Year Existing Condition – Unit Hydrograph
    - Area 'B' – 100 Year Existing Condition – Unit Hydrograph
  - **PROPOSED CONDITION**
    - Area 'A' – 10 Year Proposed Condition – Unit Hydrograph
    - Area 'B' – 100 Year Proposed Condition – Unit Hydrograph
- **AREA C**
  - **EXISTING CONDITION**
    - Area 'C' – 10 Year Existing Condition – Unit Hydrograph
    - Area 'C' – 100 Year Existing Condition – Unit Hydrograph
  - **PROPOSED CONDITION**
    - Area 'C' – 10 Year Proposed Condition – Unit Hydrograph
    - Area 'C' – 100 Year Proposed Condition – Unit Hydrograph

Area A

Area 'A' – 10 Year 1 Hour Existing Condition – Unit Hydrograph

```
        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  06/13/20 File: exa010110.out


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6407

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'A'
EXISTING CONDITION UNIT HYDROGRAPH - 10 YEAR 1 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE
------------------------------------------------------------------------
Drainage Area =      89.60(Ac.)  =      0.140 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      89.60(Ac.)  =      0.140 Sq. Mi.
Length along longest watercourse =    2458.00(Ft.)
Length along longest watercourse measured to centroid =    1215.00(Ft.)
Length along longest watercourse =      0.466 Mi.
Length along longest watercourse measured to centroid =      0.230 Mi.
Difference in elevation =      88.00(Ft.)
Slope along watercourse =    189.0317 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.114 Hr.
Lag time =     6.83 Min.
25% of lag time =     1.71 Min.
40% of lag time =     2.73 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]
       89.60           0.45                 40.32

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       89.60           1.20                107.52

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    0.450(In)
Area Averaged 100-Year Rainfall =    1.200(In)

Point rain (area averaged) =    0.759(In)
Areal adjustment factor =   99.92 %
Adjusted average point rain =    0.758(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
    89.600           69.70         0.000
 Total Area Entered =     89.60(Ac.)
```

```
RI     RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%      F
AMC2 AMC-2     (In/Hr)    (Dec.%)      (In/Hr)       (Dec.)     (In/Hr)
69.7  69.7      0.365     0.000         0.365        1.000       0.365
                                                   Sum (F) =    0.365
Area averaged mean soil loss (F) (In/Hr) =  0.365
Minimum soil loss rate ((In/Hr)) =  0.183
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.900
------------------------------------------------------------------------
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         73.227         11.462             10.351
     2   0.167        146.453         41.689             37.645
     3   0.250        219.680         22.054             19.915
     4   0.333        292.907          8.734              7.887
     5   0.417        366.134          5.299              4.785
     6   0.500        439.360          3.455              3.120
     7   0.583        512.587          2.375              2.145
     8   0.667        585.814          1.778              1.606
     9   0.750        659.040          1.259              1.137
    10   0.833        732.267          0.850              0.768
    11   0.917        805.494          1.043              0.942
                              Sum = 100.000   Sum=        90.300
------------------------------------------------------------------------
```

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      0.382       (  0.365)       0.344        0.038
  2   0.17     4.30      0.391       (  0.365)       0.352        0.039
  3   0.25     5.00      0.455          0.365    (  0.409)        0.090
  4   0.33     5.00      0.455          0.365    (  0.409)        0.090
  5   0.42     5.80      0.528          0.365    (  0.475)        0.162
  6   0.50     6.50      0.591          0.365    (  0.532)        0.226
  7   0.58     7.40      0.673          0.365    (  0.606)        0.308
  8   0.67     8.60      0.782          0.365    (  0.704)        0.417
  9   0.75    12.30      1.119          0.365    (  1.007)        0.753
 10   0.83    29.10      2.647          0.365    (  2.382)        2.281
 11   0.92     6.80      0.618          0.365    (  0.557)        0.253
 12   1.00     5.00      0.455          0.365    (  0.409)        0.090
              (Loss Rate Not Used)
    Sum =     100.0                                  Sum =     4.7
      Flood volume = Effective rainfall      0.40(In)
       times area      89.6(Ac.)/[(In)/(Ft.)] =       3.0(Ac.Ft)
      Total soil loss =      0.36(In)
      Total soil loss =     2.706(Ac.Ft)
      Total rainfall =      0.76(In)
      Flood volume =      128665.2 Cubic Feet
      Total soil loss =      117853.3 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =    109.696(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        50.0      100.0     150.0     200.0
  ----------------------------------------------------------------------------
    0+ 5       0.0027       0.40  Q          |          |          |          |
    0+10       0.0154       1.84  Q          |          |          |          |
    0+15       0.0372       3.16  Q          |          |          |          |
    0+20       0.0742       5.38  |Q         |          |          |          |
    0+25       0.1247       7.33  |Q         |          |          |          |
    0+30       0.2022      11.25  | Q        |          |          |          |
    0+35       0.3142      16.27  |  QV      |          |          |          |
    0+40       0.4695      22.55  |    Q V   |          |          |          |
    0+45       0.6953      32.78  |      Q  V|          |          |          |
    0+50       1.1412      64.74  |          | Q  V     |          |          |
    0+55       1.8966     109.70  |          |          |Q   V     |          |
    1+ 0       2.3497      65.78  |          |  Q       |          |V         |
    1+ 5       2.5748      32.69  |      Q   |          |          |   V      |
    1+10       2.7051      18.91  |  Q       |          |          |     V    |
    1+15       2.7877      12.00  | Q        |          |          |      V   |
    1+20       2.8445       8.25  |Q         |          |          |       V  |
    1+25       2.8856       5.96  |Q         |          |          |        V |
    1+30       2.9143       4.17  Q          |          |          |        V |
    1+35       2.9342       2.89  Q          |          |          |        V |
    1+40       2.9510       2.45  Q          |          |          |        V |
    1+45       2.9532       0.31  Q          |          |          |        V |
    1+50       2.9537       0.08  Q          |          |          |         V
  ----------------------------------------------------------------------------
```

Area 'A' – 10 Year 3 Hour Existing Condition – Unit Hydrograph

```
        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  06/13/20 File: exa010310.out


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6407

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'A'
EXISTING CONDITION UNIT HYDROGRAPH - 10 YEAR 3 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE
------------------------------------------------------------------------
Drainage Area =      89.60(Ac.)  =      0.140 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      89.60(Ac.)  =      0.140 Sq. Mi.
Length along longest watercourse =    2458.00(Ft.)
Length along longest watercourse measured to centroid =    1215.00(Ft.)
Length along longest watercourse =      0.466 Mi.
Length along longest watercourse measured to centroid =      0.230 Mi.
Difference in elevation =      88.00(Ft.)
Slope along watercourse =    189.0317 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.114 Hr.
Lag time =     6.83 Min.
25% of lag time =     1.71 Min.
40% of lag time =     2.73 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]
       89.60            0.80                 71.68

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       89.60            1.80                161.28

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    0.800(In)
Area Averaged 100-Year Rainfall =    1.800(In)

Point rain (area averaged) =    1.211(In)
Areal adjustment factor =   99.96 %
Adjusted average point rain =    1.211(In)

Sub-Area Data:
```

```
Area(Ac.)         Runoff Index   Impervious %
    89.600           69.70         0.000
 Total Area Entered =     89.60(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
69.7  69.7      0.365     0.000        0.365       1.000      0.365
                                                 Sum (F) =    0.365
Area averaged mean soil loss (F) (In/Hr) =  0.365
Minimum soil loss rate ((In/Hr)) =  0.183
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.900
------------------------------------------------------------------------

               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         73.227         11.462             10.351
    2   0.167        146.453         41.689             37.645
    3   0.250        219.680         22.054             19.915
    4   0.333        292.907          8.734              7.887
    5   0.417        366.134          5.299              4.785
    6   0.500        439.360          3.455              3.120
    7   0.583        512.587          2.375              2.145
    8   0.667        585.814          1.778              1.606
    9   0.750        659.040          1.259              1.137
   10   0.833        732.267          0.850              0.768
   11   0.917        805.494          1.043              0.942
                                Sum = 100.000   Sum=      90.300
------------------------------------------------------------------------
```

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	0.189	(0.365)	0.170	0.019
2	0.17	1.30	0.189	(0.365)	0.170	0.019
3	0.25	1.10	0.160	(0.365)	0.144	0.016
4	0.33	1.50	0.218	(0.365)	0.196	0.022
5	0.42	1.50	0.218	(0.365)	0.196	0.022
6	0.50	1.80	0.262	(0.365)	0.235	0.026
7	0.58	1.50	0.218	(0.365)	0.196	0.022
8	0.67	1.80	0.262	(0.365)	0.235	0.026
9	0.75	1.80	0.262	(0.365)	0.235	0.026
10	0.83	1.50	0.218	(0.365)	0.196	0.022
11	0.92	1.60	0.232	(0.365)	0.209	0.023
12	1.00	1.80	0.262	(0.365)	0.235	0.026
13	1.08	2.20	0.320	(0.365)	0.288	0.032
14	1.17	2.20	0.320	(0.365)	0.288	0.032
15	1.25	2.20	0.320	(0.365)	0.288	0.032
16	1.33	2.00	0.291	(0.365)	0.262	0.029
17	1.42	2.60	0.378	(0.365)	0.340	0.038
18	1.50	2.70	0.392	(0.365)	0.353	0.039
19	1.58	2.40	0.349	(0.365)	0.314	0.035
20	1.67	2.70	0.392	(0.365)	0.353	0.039
21	1.75	3.30	0.480	0.365	(0.432)	0.114
22	1.83	3.10	0.450	0.365	(0.405)	0.085
23	1.92	2.90	0.421	0.365	(0.379)	0.056
24	2.00	3.00	0.436	0.365	(0.392)	0.071
25	2.08	3.10	0.450	0.365	(0.405)	0.085
26	2.17	4.20	0.610	0.365	(0.549)	0.245
27	2.25	5.00	0.727	0.365	(0.654)	0.361
28	2.33	3.50	0.509	0.365	(0.458)	0.143
29	2.42	6.80	0.988	0.365	(0.889)	0.623
30	2.50	7.30	1.061	0.365	(0.955)	0.696

```
31   2.58     8.20      1.192          0.365    (  1.072)        0.826
32   2.67     5.90      0.857          0.365    (  0.772)        0.492
33   2.75     2.00      0.291       (  0.365)       0.262        0.029
34   2.83     1.80      0.262       (  0.365)       0.235        0.026
35   2.92     1.80      0.262       (  0.365)       0.235        0.026
36   3.00     0.60      0.087       (  0.365)       0.078        0.009
              (Loss Rate Not Used)
   Sum =     100.0                                    Sum =     4.4
      Flood volume = Effective rainfall      0.37(In)
       times area      89.6(Ac.)/[(In)/(Ft.)] =       2.8(Ac.Ft)
      Total soil loss =      0.84(In)
      Total soil loss =     6.283(Ac.Ft)
      Total rainfall =      1.21(In)
      Flood volume =      120157.4 Cubic Feet
      Total soil loss =      273696.2 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     57.674(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        15.0       30.0       45.0       60.0
-------------------------------------------------------------------------------
  0+ 5       0.0013      0.20  Q          |          |          |          |
  0+10       0.0076      0.91  Q          |          |          |          |
  0+15       0.0162      1.25  Q          |          |          |          |
  0+20       0.0255      1.35  Q          |          |          |          |
  0+25       0.0366      1.60  VQ         |          |          |          |
  0+30       0.0490      1.80  VQ         |          |          |          |
  0+35       0.0627      1.99  VQ         |          |          |          |
  0+40       0.0766      2.01  |Q         |          |          |          |
  0+45       0.0914      2.16  |Q         |          |          |          |
  0+50       0.1066      2.21  |Q         |          |          |          |
  0+55       0.1211      2.11  |Q         |          |          |          |
  1+ 0       0.1358      2.13  |Q         |          |          |          |
  1+ 5       0.1516      2.30  |QV        |          |          |          |
  1+10       0.1694      2.58  |QV        |          |          |          |
  1+15       0.1882      2.72  |QV        |          |          |          |
  1+20       0.2071      2.75  |Q V       |          |          |          |
  1+25       0.2262      2.77  |Q V       |          |          |          |
  1+30       0.2474      3.08  | QV       |          |          |          |
  1+35       0.2698      3.25  | QV       |          |          |          |
  1+40       0.2920      3.23  | Q V      |          |          |          |
  1+45       0.3205      4.14  | Q V      |          |          |          |
  1+50       0.3670      6.75  |   QV     |          |          |          |
  1+55       0.4144      6.89  |   Q V    |          |          |          |
  2+ 0       0.4555      5.98  |  Q  V    |          |          |          |
  2+ 5       0.4985      6.24  |   Q  V   |          |          |          |
  2+10       0.5578      8.61  |    Q  V  |          |          |          |
  2+15       0.6692     16.18  |        VQ          |          |          |
  2+20       0.8182     21.64  |          |V  Q      |          |          |
  2+25       0.9702     22.06  |          |   Q      |          |          |
  2+30       1.2338     38.27  |          |      V   |    Q     |          |
  2+35       1.5872     51.33  |          |          |  V       |   Q      |
  2+40       1.9844     57.67  |          |          |       V  |       Q  |
  2+45       2.2984     45.59  |          |          |          Q  V       |
  2+50       2.4655     24.26  |          |     Q    |          |    V     |
  2+55       2.5626     14.09  |        Q |          |          |      V   |
  3+ 0       2.6310      9.93  |     Q    |          |          |       V  |
  3+ 5       2.6777      6.78  |   Q      |          |          |       V  |
  3+10       2.7079      4.38  | Q        |          |          |        V |
  3+15       2.7298      3.19  | Q        |          |          |        V |
  3+20       2.7441      2.08  |Q         |          |          |        V |
  3+25       2.7532      1.32  Q          |          |          |        V |
  3+30       2.7572      0.58  Q          |          |          |        V |
  3+35       2.7578      0.09  Q          |          |          |        V |
  3+40       2.7582      0.05  Q          |          |          |        V |
  3+45       2.7584      0.03  Q          |          |          |        V |
  3+50       2.7584      0.01  Q          |          |          |         V
```

Area 'A' – 10 Year 6 Hour Existing Condition – Unit Hydrograph

```
        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  06/13/20 File: exa010610.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6407

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'A'
EXISTING CONDITION UNIT HYDROGRAPH - 10 YEAR 6 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE
------------------------------------------------------------------------
Drainage Area =      89.60(Ac.)  =      0.140 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      89.60(Ac.)  =      0.140 Sq. Mi.
Length along longest watercourse =    2458.00(Ft.)
Length along longest watercourse measured to centroid =    1215.00(Ft.)
Length along longest watercourse =      0.466 Mi.
Length along longest watercourse measured to centroid =      0.230 Mi.
Difference in elevation =      88.00(Ft.)
Slope along watercourse =    189.0317 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.114 Hr.
Lag time =     6.83 Min.
25% of lag time =     1.71 Min.
40% of lag time =     2.73 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]
       89.60           1.00                 89.60

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       89.60           2.50                224.00

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    1.000(In)
Area Averaged 100-Year Rainfall =    2.500(In)

Point rain (area averaged) =    1.617(In)
Areal adjustment factor =   99.97 %
Adjusted average point rain =    1.617(In)
```

```
Sub-Area Data:
Area(Ac.)          Runoff Index    Impervious %
    89.600            69.70          0.000
 Total Area Entered =     89.60(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-2     (In/Hr)    (Dec.%)      (In/Hr)       (Dec.)    (In/Hr)
69.7  69.7      0.365     0.000         0.365        1.000      0.365
                                                   Sum (F) =    0.365
Area averaged mean soil loss (F) (In/Hr) =  0.365
Minimum soil loss rate ((In/Hr)) =  0.183
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.900
------------------------------------------------------------------------

               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         73.227         11.462             10.351
     2   0.167        146.453         41.689             37.645
     3   0.250        219.680         22.054             19.915
     4   0.333        292.907          8.734              7.887
     5   0.417        366.134          5.299              4.785
     6   0.500        439.360          3.455              3.120
     7   0.583        512.587          2.375              2.145
     8   0.667        585.814          1.778              1.606
     9   0.750        659.040          1.259              1.137
    10   0.833        732.267          0.850              0.768
    11   0.917        805.494          1.043              0.942
                              Sum = 100.000   Sum=       90.300
------------------------------------------------------------------------
```

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	0.097	(0.365)	0.087	0.010
2	0.17	0.60	0.116	(0.365)	0.105	0.012
3	0.25	0.60	0.116	(0.365)	0.105	0.012
4	0.33	0.60	0.116	(0.365)	0.105	0.012
5	0.42	0.60	0.116	(0.365)	0.105	0.012
6	0.50	0.70	0.136	(0.365)	0.122	0.014
7	0.58	0.70	0.136	(0.365)	0.122	0.014
8	0.67	0.70	0.136	(0.365)	0.122	0.014
9	0.75	0.70	0.136	(0.365)	0.122	0.014
10	0.83	0.70	0.136	(0.365)	0.122	0.014
11	0.92	0.70	0.136	(0.365)	0.122	0.014
12	1.00	0.80	0.155	(0.365)	0.140	0.016
13	1.08	0.80	0.155	(0.365)	0.140	0.016
14	1.17	0.80	0.155	(0.365)	0.140	0.016
15	1.25	0.80	0.155	(0.365)	0.140	0.016
16	1.33	0.80	0.155	(0.365)	0.140	0.016
17	1.42	0.80	0.155	(0.365)	0.140	0.016
18	1.50	0.80	0.155	(0.365)	0.140	0.016
19	1.58	0.80	0.155	(0.365)	0.140	0.016
20	1.67	0.80	0.155	(0.365)	0.140	0.016
21	1.75	0.80	0.155	(0.365)	0.140	0.016
22	1.83	0.80	0.155	(0.365)	0.140	0.016
23	1.92	0.80	0.155	(0.365)	0.140	0.016
24	2.00	0.90	0.175	(0.365)	0.157	0.017
25	2.08	0.80	0.155	(0.365)	0.140	0.016
26	2.17	0.90	0.175	(0.365)	0.157	0.017
27	2.25	0.90	0.175	(0.365)	0.157	0.017
28	2.33	0.90	0.175	(0.365)	0.157	0.017

29	2.42	0.90	0.175	(0.365)	0.157	0.017	
30	2.50	0.90	0.175	(0.365)	0.157	0.017	
31	2.58	0.90	0.175	(0.365)	0.157	0.017	
32	2.67	0.90	0.175	(0.365)	0.157	0.017	
33	2.75	1.00	0.194	(0.365)	0.175	0.019	
34	2.83	1.00	0.194	(0.365)	0.175	0.019	
35	2.92	1.00	0.194	(0.365)	0.175	0.019	
36	3.00	1.00	0.194	(0.365)	0.175	0.019	
37	3.08	1.00	0.194	(0.365)	0.175	0.019	
38	3.17	1.10	0.213	(0.365)	0.192	0.021	
39	3.25	1.10	0.213	(0.365)	0.192	0.021	
40	3.33	1.10	0.213	(0.365)	0.192	0.021	
41	3.42	1.20	0.233	(0.365)	0.210	0.023	
42	3.50	1.30	0.252	(0.365)	0.227	0.025	
43	3.58	1.40	0.272	(0.365)	0.244	0.027	
44	3.67	1.40	0.272	(0.365)	0.244	0.027	
45	3.75	1.50	0.291	(0.365)	0.262	0.029	
46	3.83	1.50	0.291	(0.365)	0.262	0.029	
47	3.92	1.60	0.310	(0.365)	0.279	0.031	
48	4.00	1.60	0.310	(0.365)	0.279	0.031	
49	4.08	1.70	0.330	(0.365)	0.297	0.033	
50	4.17	1.80	0.349	(0.365)	0.314	0.035	
51	4.25	1.90	0.369	(0.365)	0.332	0.037	
52	4.33	2.00	0.388	(0.365)	0.349	0.039	
53	4.42	2.10	0.407	0.365	(0.367)	0.042	
54	4.50	2.10	0.407	0.365	(0.367)	0.042	
55	4.58	2.20	0.427	0.365	(0.384)	0.062	
56	4.67	2.30	0.446	0.365	(0.402)	0.081	
57	4.75	2.40	0.466	0.365	(0.419)	0.100	
58	4.83	2.40	0.466	0.365	(0.419)	0.100	
59	4.92	2.50	0.485	0.365	(0.436)	0.120	
60	5.00	2.60	0.504	0.365	(0.454)	0.139	
61	5.08	3.10	0.601	0.365	(0.541)	0.236	
62	5.17	3.60	0.698	0.365	(0.629)	0.333	
63	5.25	3.90	0.757	0.365	(0.681)	0.391	
64	5.33	4.20	0.815	0.365	(0.733)	0.450	
65	5.42	4.70	0.912	0.365	(0.821)	0.547	
66	5.50	5.60	1.086	0.365	(0.978)	0.721	
67	5.58	1.90	0.369	(0.365)	0.332	0.037	
68	5.67	0.90	0.175	(0.365)	0.157	0.017	
69	5.75	0.60	0.116	(0.365)	0.105	0.012	
70	5.83	0.50	0.097	(0.365)	0.087	0.010	
71	5.92	0.30	0.058	(0.365)	0.052	0.006	
72	6.00	0.20	0.039	(0.365)	0.035	0.004	

(Loss Rate Not Used)

Sum = 100.0 Sum = 4.5

Flood volume = Effective rainfall 0.37(In)
times area 89.6(Ac.)/[(In)/(Ft.)] = 2.8(Ac.Ft)
Total soil loss = 1.25(In)
Total soil loss = 9.298(Ac.Ft)
Total rainfall = 1.62(In)
Flood volume = 120784.9 Cubic Feet
Total soil loss = 405015.6 Cubic Feet

Peak flow rate of this hydrograph = 45.931(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	12.5	25.0	37.5	50.0
0+ 5	0.0007	0.10	Q	|	|	|	|
0+10	0.0040	0.49	Q	|	|	|	|
0+15	0.0092	0.75	Q	|	|	|	|
0+20	0.0152	0.87	Q	|	|	|	|
0+25	0.0216	0.93	Q	|	|	|	|
0+30	0.0284	0.99	Q	|	|	|	|
0+35	0.0359	1.09	Q	|	|	|	|
0+40	0.0438	1.15	Q	|	|	|	|

```
0+45      0.0519      1.18  Q          |          |          |          |
0+50      0.0601      1.20  Q          |          |          |          |
0+55      0.0685      1.21  Q          |          |          |          |
1+ 0      0.0770      1.24  QV         |          |          |          |
1+ 5      0.0861      1.31  |Q         |          |          |          |
1+10      0.0954      1.36  |Q         |          |          |          |
1+15      0.1049      1.37  |Q         |          |          |          |
1+20      0.1144      1.38  |Q         |          |          |          |
1+25      0.1239      1.39  |Q         |          |          |          |
1+30      0.1335      1.39  |Q         |          |          |          |
1+35      0.1432      1.40  |QV        |          |          |          |
1+40      0.1528      1.40  |QV        |          |          |          |
1+45      0.1624      1.40  |QV        |          |          |          |
1+50      0.1721      1.40  |QV        |          |          |          |
1+55      0.1818      1.40  |QV        |          |          |          |
2+ 0      0.1915      1.42  |QV        |          |          |          |
2+ 5      0.2017      1.48  |QV        |          |          |          |
2+10      0.2118      1.46  |Q V       |          |          |          |
2+15      0.2222      1.51  |Q V       |          |          |          |
2+20      0.2328      1.54  |Q V       |          |          |          |
2+25      0.2435      1.56  |Q V       |          |          |          |
2+30      0.2543      1.56  |Q V       |          |          |          |
2+35      0.2651      1.57  |Q V       |          |          |          |
2+40      0.2759      1.57  |Q V       |          |          |          |
2+45      0.2869      1.59  |Q  V      |          |          |          |
2+50      0.2984      1.67  |Q  V      |          |          |          |
2+55      0.3101      1.71  |Q  V      |          |          |          |
3+ 0      0.3220      1.72  |Q  V      |          |          |          |
3+ 5      0.3339      1.73  |Q  V      |          |          |          |
3+10      0.3461      1.76  |Q  V      |          |          |          |
3+15      0.3587      1.84  |Q   V     |          |          |          |
3+20      0.3717      1.88  |Q   V     |          |          |          |
3+25      0.3849      1.92  |Q   V     |          |          |          |
3+30      0.3988      2.02  |Q   V     |          |          |          |
3+35      0.4136      2.16  |Q   V     |          |          |          |
3+40      0.4294      2.29  |Q    V    |          |          |          |
3+45      0.4458      2.38  |Q    V    |          |          |          |
3+50      0.4629      2.48  |Q    V    |          |          |          |
3+55      0.4806      2.56  | Q   V    |          |          |          |
4+ 0      0.4989      2.67  | Q    V   |          |          |          |
4+ 5      0.5178      2.74  | Q    V   |          |          |          |
4+10      0.5376      2.87  | Q    V   |          |          |          |
4+15      0.5583      3.02  | Q     V  |          |          |          |
4+20      0.5802      3.18  | Q     V  |          |          |          |
4+25      0.6033      3.36  | Q     V  |          |          |          |
4+30      0.6278      3.56  | Q      V |          |          |          |
4+35      0.6544      3.86  |  Q     V |          |          |          |
4+40      0.6878      4.84  |  Q     V |          |          |          |
4+45      0.7304      6.20  |   Q     V          |          |          |
4+50      0.7820      7.49  |    Q    |V         |          |          |
4+55      0.8394      8.34  |     Q   | V        |          |          |
5+ 0      0.9054      9.59  |      Q  |  V       |          |          |
5+ 5      0.9875     11.91  |        Q|   V      |          |          |
5+10      1.1062     17.24  |         |  Q V     |          |          |
5+15      1.2700     23.78  |         |       VQ|          |          |
5+20      1.4731     29.49  |         |         |V Q       |          |
5+25      1.7158     35.23  |         |         |   V   Q  |          |
5+30      2.0132     43.19  |         |         |       V|   Q      |
5+35      2.3295     45.93  |         |         |        |  V  Q    |
5+40      2.5021     25.06  |         |         Q        |     V    |
5+45      2.5923     13.09  |        Q|         |        |      V   |
5+50      2.6516      8.62  |     Q   |         |        |       V  |
5+55      2.6932      6.04  |   Q     |         |        |       V  |
6+ 0      2.7228      4.29  |  Q      |         |        |        V |
6+ 5      2.7436      3.02  | Q       |         |        |        V |
6+10      2.7572      1.97  |Q        |         |        |        V |
6+15      2.7658      1.25  |Q        |         |        |        V |
6+20      2.7713      0.80  Q         |         |        |        V |
6+25      2.7720      0.10  Q         |         |        |        V |
6+30      2.7724      0.05  Q         |         |        |        V |
6+35      2.7726      0.03  Q         |         |        |        V |
6+40      2.7728      0.02  Q         |         |        |        V |
6+45      2.7728      0.01  Q         |         |        |        V |
```

```
    6+50       2.7728      0.00  Q         |         |         |        V|
-------------------------------------------------------------------------
```

Area 'A' – 10 Year 24 Hour Existing Condition – Unit Hydrograph

```
        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  06/13/20 File: exa0102410.out


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6407

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'A'
EXISTING CONDITION UNIT HYDROGRAPH - 10 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE
------------------------------------------------------------------------
Drainage Area =      89.60(Ac.)  =      0.140 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      89.60(Ac.)  =      0.140 Sq. Mi.
Length along longest watercourse =    2458.00(Ft.)
Length along longest watercourse measured to centroid =    1215.00(Ft.)
Length along longest watercourse =      0.466 Mi.
Length along longest watercourse measured to centroid =      0.230 Mi.
Difference in elevation =      88.00(Ft.)
Slope along watercourse =    189.0317 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.114 Hr.
Lag time =     6.83 Min.
25% of lag time =     1.71 Min.
40% of lag time =     2.73 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]
       89.60            1.60                143.36

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       89.60            4.00                358.40

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    1.600(In)
Area Averaged 100-Year Rainfall =    4.000(In)

Point rain (area averaged) =    2.587(In)
Areal adjustment factor =   99.98 %
Adjusted average point rain =    2.587(In)

Sub-Area Data:
Area(Ac.)         Runoff Index    Impervious %
```

```
          89.600           69.70         0.000
 Total Area Entered =     89.60(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)       (Dec.)    (In/Hr)
69.7  69.7      0.365     0.000        0.365        1.000      0.365
                                                  Sum (F) =    0.365
Area averaged mean soil loss (F) (In/Hr) =  0.365
Minimum soil loss rate ((In/Hr)) =  0.183
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.900
------------------------------------------------------------------------

               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         73.227         11.462             10.351
    2   0.167        146.453         41.689             37.645
    3   0.250        219.680         22.054             19.915
    4   0.333        292.907          8.734              7.887
    5   0.417        366.134          5.299              4.785
    6   0.500        439.360          3.455              3.120
    7   0.583        512.587          2.375              2.145
    8   0.667        585.814          1.778              1.606
    9   0.750        659.040          1.259              1.137
   10   0.833        732.267          0.850              0.768
   11   0.917        805.494          1.043              0.942
                              Sum = 100.000   Sum=       90.300
------------------------------------------------------------------------
```

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	0.021	(0.647)	0.019	0.002
2	0.17	0.07	0.021	(0.645)	0.019	0.002
3	0.25	0.07	0.021	(0.642)	0.019	0.002
4	0.33	0.10	0.031	(0.640)	0.028	0.003
5	0.42	0.10	0.031	(0.637)	0.028	0.003
6	0.50	0.10	0.031	(0.635)	0.028	0.003
7	0.58	0.10	0.031	(0.633)	0.028	0.003
8	0.67	0.10	0.031	(0.630)	0.028	0.003
9	0.75	0.10	0.031	(0.628)	0.028	0.003
10	0.83	0.13	0.041	(0.625)	0.037	0.004
11	0.92	0.13	0.041	(0.623)	0.037	0.004
12	1.00	0.13	0.041	(0.620)	0.037	0.004
13	1.08	0.10	0.031	(0.618)	0.028	0.003
14	1.17	0.10	0.031	(0.615)	0.028	0.003
15	1.25	0.10	0.031	(0.613)	0.028	0.003
16	1.33	0.10	0.031	(0.610)	0.028	0.003
17	1.42	0.10	0.031	(0.608)	0.028	0.003
18	1.50	0.10	0.031	(0.606)	0.028	0.003
19	1.58	0.10	0.031	(0.603)	0.028	0.003
20	1.67	0.10	0.031	(0.601)	0.028	0.003
21	1.75	0.10	0.031	(0.598)	0.028	0.003
22	1.83	0.13	0.041	(0.596)	0.037	0.004
23	1.92	0.13	0.041	(0.594)	0.037	0.004
24	2.00	0.13	0.041	(0.591)	0.037	0.004
25	2.08	0.13	0.041	(0.589)	0.037	0.004
26	2.17	0.13	0.041	(0.586)	0.037	0.004
27	2.25	0.13	0.041	(0.584)	0.037	0.004
28	2.33	0.13	0.041	(0.582)	0.037	0.004
29	2.42	0.13	0.041	(0.579)	0.037	0.004
30	2.50	0.13	0.041	(0.577)	0.037	0.004
31	2.58	0.17	0.052	(0.574)	0.047	0.005

32	2.67	0.17	0.052	(0.572)	0.047	0.005
33	2.75	0.17	0.052	(0.570)	0.047	0.005
34	2.83	0.17	0.052	(0.567)	0.047	0.005
35	2.92	0.17	0.052	(0.565)	0.047	0.005
36	3.00	0.17	0.052	(0.563)	0.047	0.005
37	3.08	0.17	0.052	(0.560)	0.047	0.005
38	3.17	0.17	0.052	(0.558)	0.047	0.005
39	3.25	0.17	0.052	(0.556)	0.047	0.005
40	3.33	0.17	0.052	(0.553)	0.047	0.005
41	3.42	0.17	0.052	(0.551)	0.047	0.005
42	3.50	0.17	0.052	(0.549)	0.047	0.005
43	3.58	0.17	0.052	(0.547)	0.047	0.005
44	3.67	0.17	0.052	(0.544)	0.047	0.005
45	3.75	0.17	0.052	(0.542)	0.047	0.005
46	3.83	0.20	0.062	(0.540)	0.056	0.006
47	3.92	0.20	0.062	(0.537)	0.056	0.006
48	4.00	0.20	0.062	(0.535)	0.056	0.006
49	4.08	0.20	0.062	(0.533)	0.056	0.006
50	4.17	0.20	0.062	(0.531)	0.056	0.006
51	4.25	0.20	0.062	(0.528)	0.056	0.006
52	4.33	0.23	0.072	(0.526)	0.065	0.007
53	4.42	0.23	0.072	(0.524)	0.065	0.007
54	4.50	0.23	0.072	(0.522)	0.065	0.007
55	4.58	0.23	0.072	(0.519)	0.065	0.007
56	4.67	0.23	0.072	(0.517)	0.065	0.007
57	4.75	0.23	0.072	(0.515)	0.065	0.007
58	4.83	0.27	0.083	(0.513)	0.075	0.008
59	4.92	0.27	0.083	(0.510)	0.075	0.008
60	5.00	0.27	0.083	(0.508)	0.075	0.008
61	5.08	0.20	0.062	(0.506)	0.056	0.006
62	5.17	0.20	0.062	(0.504)	0.056	0.006
63	5.25	0.20	0.062	(0.502)	0.056	0.006
64	5.33	0.23	0.072	(0.499)	0.065	0.007
65	5.42	0.23	0.072	(0.497)	0.065	0.007
66	5.50	0.23	0.072	(0.495)	0.065	0.007
67	5.58	0.27	0.083	(0.493)	0.075	0.008
68	5.67	0.27	0.083	(0.491)	0.075	0.008
69	5.75	0.27	0.083	(0.489)	0.075	0.008
70	5.83	0.27	0.083	(0.486)	0.075	0.008
71	5.92	0.27	0.083	(0.484)	0.075	0.008
72	6.00	0.27	0.083	(0.482)	0.075	0.008
73	6.08	0.30	0.093	(0.480)	0.084	0.009
74	6.17	0.30	0.093	(0.478)	0.084	0.009
75	6.25	0.30	0.093	(0.476)	0.084	0.009
76	6.33	0.30	0.093	(0.474)	0.084	0.009
77	6.42	0.30	0.093	(0.471)	0.084	0.009
78	6.50	0.30	0.093	(0.469)	0.084	0.009
79	6.58	0.33	0.103	(0.467)	0.093	0.010
80	6.67	0.33	0.103	(0.465)	0.093	0.010
81	6.75	0.33	0.103	(0.463)	0.093	0.010
82	6.83	0.33	0.103	(0.461)	0.093	0.010
83	6.92	0.33	0.103	(0.459)	0.093	0.010
84	7.00	0.33	0.103	(0.457)	0.093	0.010
85	7.08	0.33	0.103	(0.455)	0.093	0.010
86	7.17	0.33	0.103	(0.453)	0.093	0.010
87	7.25	0.33	0.103	(0.451)	0.093	0.010
88	7.33	0.37	0.114	(0.449)	0.102	0.011
89	7.42	0.37	0.114	(0.446)	0.102	0.011
90	7.50	0.37	0.114	(0.444)	0.102	0.011
91	7.58	0.40	0.124	(0.442)	0.112	0.012
92	7.67	0.40	0.124	(0.440)	0.112	0.012
93	7.75	0.40	0.124	(0.438)	0.112	0.012
94	7.83	0.43	0.135	(0.436)	0.121	0.013
95	7.92	0.43	0.135	(0.434)	0.121	0.013
96	8.00	0.43	0.135	(0.432)	0.121	0.013
97	8.08	0.50	0.155	(0.430)	0.140	0.016
98	8.17	0.50	0.155	(0.428)	0.140	0.016
99	8.25	0.50	0.155	(0.426)	0.140	0.016
100	8.33	0.50	0.155	(0.424)	0.140	0.016
101	8.42	0.50	0.155	(0.422)	0.140	0.016
102	8.50	0.50	0.155	(0.420)	0.140	0.016
103	8.58	0.53	0.166	(0.418)	0.149	0.017
104	8.67	0.53	0.166	(0.416)	0.149	0.017

105	8.75	0.53	0.166	(0.414)	0.149	0.017
106	8.83	0.57	0.176	(0.412)	0.158	0.018
107	8.92	0.57	0.176	(0.410)	0.158	0.018
108	9.00	0.57	0.176	(0.409)	0.158	0.018
109	9.08	0.63	0.197	(0.407)	0.177	0.020
110	9.17	0.63	0.197	(0.405)	0.177	0.020
111	9.25	0.63	0.197	(0.403)	0.177	0.020
112	9.33	0.67	0.207	(0.401)	0.186	0.021
113	9.42	0.67	0.207	(0.399)	0.186	0.021
114	9.50	0.67	0.207	(0.397)	0.186	0.021
115	9.58	0.70	0.217	(0.395)	0.196	0.022
116	9.67	0.70	0.217	(0.393)	0.196	0.022
117	9.75	0.70	0.217	(0.391)	0.196	0.022
118	9.83	0.73	0.228	(0.389)	0.205	0.023
119	9.92	0.73	0.228	(0.388)	0.205	0.023
120	10.00	0.73	0.228	(0.386)	0.205	0.023
121	10.08	0.50	0.155	(0.384)	0.140	0.016
122	10.17	0.50	0.155	(0.382)	0.140	0.016
123	10.25	0.50	0.155	(0.380)	0.140	0.016
124	10.33	0.50	0.155	(0.378)	0.140	0.016
125	10.42	0.50	0.155	(0.376)	0.140	0.016
126	10.50	0.50	0.155	(0.375)	0.140	0.016
127	10.58	0.67	0.207	(0.373)	0.186	0.021
128	10.67	0.67	0.207	(0.371)	0.186	0.021
129	10.75	0.67	0.207	(0.369)	0.186	0.021
130	10.83	0.67	0.207	(0.367)	0.186	0.021
131	10.92	0.67	0.207	(0.366)	0.186	0.021
132	11.00	0.67	0.207	(0.364)	0.186	0.021
133	11.08	0.63	0.197	(0.362)	0.177	0.020
134	11.17	0.63	0.197	(0.360)	0.177	0.020
135	11.25	0.63	0.197	(0.358)	0.177	0.020
136	11.33	0.63	0.197	(0.357)	0.177	0.020
137	11.42	0.63	0.197	(0.355)	0.177	0.020
138	11.50	0.63	0.197	(0.353)	0.177	0.020
139	11.58	0.57	0.176	(0.351)	0.158	0.018
140	11.67	0.57	0.176	(0.350)	0.158	0.018
141	11.75	0.57	0.176	(0.348)	0.158	0.018
142	11.83	0.60	0.186	(0.346)	0.168	0.019
143	11.92	0.60	0.186	(0.344)	0.168	0.019
144	12.00	0.60	0.186	(0.343)	0.168	0.019
145	12.08	0.83	0.259	(0.341)	0.233	0.026
146	12.17	0.83	0.259	(0.339)	0.233	0.026
147	12.25	0.83	0.259	(0.338)	0.233	0.026
148	12.33	0.87	0.269	(0.336)	0.242	0.027
149	12.42	0.87	0.269	(0.334)	0.242	0.027
150	12.50	0.87	0.269	(0.332)	0.242	0.027
151	12.58	0.93	0.290	(0.331)	0.261	0.029
152	12.67	0.93	0.290	(0.329)	0.261	0.029
153	12.75	0.93	0.290	(0.327)	0.261	0.029
154	12.83	0.97	0.300	(0.326)	0.270	0.030
155	12.92	0.97	0.300	(0.324)	0.270	0.030
156	13.00	0.97	0.300	(0.323)	0.270	0.030
157	13.08	1.13	0.352	(0.321)	0.317	0.035
158	13.17	1.13	0.352	(0.319)	0.317	0.035
159	13.25	1.13	0.352	(0.318)	0.317	0.035
160	13.33	1.13	0.352	0.316	(0.317)	0.036
161	13.42	1.13	0.352	0.314	(0.317)	0.037
162	13.50	1.13	0.352	0.313	(0.317)	0.039
163	13.58	0.77	0.238	(0.311)	0.214	0.024
164	13.67	0.77	0.238	(0.310)	0.214	0.024
165	13.75	0.77	0.238	(0.308)	0.214	0.024
166	13.83	0.77	0.238	(0.307)	0.214	0.024
167	13.92	0.77	0.238	(0.305)	0.214	0.024
168	14.00	0.77	0.238	(0.303)	0.214	0.024
169	14.08	0.90	0.279	(0.302)	0.251	0.028
170	14.17	0.90	0.279	(0.300)	0.251	0.028
171	14.25	0.90	0.279	(0.299)	0.251	0.028
172	14.33	0.87	0.269	(0.297)	0.242	0.027
173	14.42	0.87	0.269	(0.296)	0.242	0.027
174	14.50	0.87	0.269	(0.294)	0.242	0.027
175	14.58	0.87	0.269	(0.293)	0.242	0.027
176	14.67	0.87	0.269	(0.291)	0.242	0.027
177	14.75	0.87	0.269	(0.290)	0.242	0.027

178	14.83	0.83	0.259	(0.288)	0.233	0.026
179	14.92	0.83	0.259	(0.287)	0.233	0.026
180	15.00	0.83	0.259	(0.285)	0.233	0.026
181	15.08	0.80	0.248	(0.284)	0.224	0.025
182	15.17	0.80	0.248	(0.282)	0.224	0.025
183	15.25	0.80	0.248	(0.281)	0.224	0.025
184	15.33	0.77	0.238	(0.279)	0.214	0.024
185	15.42	0.77	0.238	(0.278)	0.214	0.024
186	15.50	0.77	0.238	(0.277)	0.214	0.024
187	15.58	0.63	0.197	(0.275)	0.177	0.020
188	15.67	0.63	0.197	(0.274)	0.177	0.020
189	15.75	0.63	0.197	(0.272)	0.177	0.020
190	15.83	0.63	0.197	(0.271)	0.177	0.020
191	15.92	0.63	0.197	(0.270)	0.177	0.020
192	16.00	0.63	0.197	(0.268)	0.177	0.020
193	16.08	0.13	0.041	(0.267)	0.037	0.004
194	16.17	0.13	0.041	(0.265)	0.037	0.004
195	16.25	0.13	0.041	(0.264)	0.037	0.004
196	16.33	0.13	0.041	(0.263)	0.037	0.004
197	16.42	0.13	0.041	(0.261)	0.037	0.004
198	16.50	0.13	0.041	(0.260)	0.037	0.004
199	16.58	0.10	0.031	(0.259)	0.028	0.003
200	16.67	0.10	0.031	(0.257)	0.028	0.003
201	16.75	0.10	0.031	(0.256)	0.028	0.003
202	16.83	0.10	0.031	(0.255)	0.028	0.003
203	16.92	0.10	0.031	(0.254)	0.028	0.003
204	17.00	0.10	0.031	(0.252)	0.028	0.003
205	17.08	0.17	0.052	(0.251)	0.047	0.005
206	17.17	0.17	0.052	(0.250)	0.047	0.005
207	17.25	0.17	0.052	(0.248)	0.047	0.005
208	17.33	0.17	0.052	(0.247)	0.047	0.005
209	17.42	0.17	0.052	(0.246)	0.047	0.005
210	17.50	0.17	0.052	(0.245)	0.047	0.005
211	17.58	0.17	0.052	(0.244)	0.047	0.005
212	17.67	0.17	0.052	(0.242)	0.047	0.005
213	17.75	0.17	0.052	(0.241)	0.047	0.005
214	17.83	0.13	0.041	(0.240)	0.037	0.004
215	17.92	0.13	0.041	(0.239)	0.037	0.004
216	18.00	0.13	0.041	(0.238)	0.037	0.004
217	18.08	0.13	0.041	(0.236)	0.037	0.004
218	18.17	0.13	0.041	(0.235)	0.037	0.004
219	18.25	0.13	0.041	(0.234)	0.037	0.004
220	18.33	0.13	0.041	(0.233)	0.037	0.004
221	18.42	0.13	0.041	(0.232)	0.037	0.004
222	18.50	0.13	0.041	(0.231)	0.037	0.004
223	18.58	0.10	0.031	(0.230)	0.028	0.003
224	18.67	0.10	0.031	(0.228)	0.028	0.003
225	18.75	0.10	0.031	(0.227)	0.028	0.003
226	18.83	0.07	0.021	(0.226)	0.019	0.002
227	18.92	0.07	0.021	(0.225)	0.019	0.002
228	19.00	0.07	0.021	(0.224)	0.019	0.002
229	19.08	0.10	0.031	(0.223)	0.028	0.003
230	19.17	0.10	0.031	(0.222)	0.028	0.003
231	19.25	0.10	0.031	(0.221)	0.028	0.003
232	19.33	0.13	0.041	(0.220)	0.037	0.004
233	19.42	0.13	0.041	(0.219)	0.037	0.004
234	19.50	0.13	0.041	(0.218)	0.037	0.004
235	19.58	0.10	0.031	(0.217)	0.028	0.003
236	19.67	0.10	0.031	(0.216)	0.028	0.003
237	19.75	0.10	0.031	(0.215)	0.028	0.003
238	19.83	0.07	0.021	(0.214)	0.019	0.002
239	19.92	0.07	0.021	(0.213)	0.019	0.002
240	20.00	0.07	0.021	(0.212)	0.019	0.002
241	20.08	0.10	0.031	(0.211)	0.028	0.003
242	20.17	0.10	0.031	(0.210)	0.028	0.003
243	20.25	0.10	0.031	(0.209)	0.028	0.003
244	20.33	0.10	0.031	(0.208)	0.028	0.003
245	20.42	0.10	0.031	(0.208)	0.028	0.003
246	20.50	0.10	0.031	(0.207)	0.028	0.003
247	20.58	0.10	0.031	(0.206)	0.028	0.003
248	20.67	0.10	0.031	(0.205)	0.028	0.003
249	20.75	0.10	0.031	(0.204)	0.028	0.003
250	20.83	0.07	0.021	(0.203)	0.019	0.002

```
251  20.92     0.07      0.021       (  0.202)       0.019        0.002
252  21.00     0.07      0.021       (  0.202)       0.019        0.002
253  21.08     0.10      0.031       (  0.201)       0.028        0.003
254  21.17     0.10      0.031       (  0.200)       0.028        0.003
255  21.25     0.10      0.031       (  0.199)       0.028        0.003
256  21.33     0.07      0.021       (  0.198)       0.019        0.002
257  21.42     0.07      0.021       (  0.198)       0.019        0.002
258  21.50     0.07      0.021       (  0.197)       0.019        0.002
259  21.58     0.10      0.031       (  0.196)       0.028        0.003
260  21.67     0.10      0.031       (  0.196)       0.028        0.003
261  21.75     0.10      0.031       (  0.195)       0.028        0.003
262  21.83     0.07      0.021       (  0.194)       0.019        0.002
263  21.92     0.07      0.021       (  0.193)       0.019        0.002
264  22.00     0.07      0.021       (  0.193)       0.019        0.002
265  22.08     0.10      0.031       (  0.192)       0.028        0.003
266  22.17     0.10      0.031       (  0.192)       0.028        0.003
267  22.25     0.10      0.031       (  0.191)       0.028        0.003
268  22.33     0.07      0.021       (  0.190)       0.019        0.002
269  22.42     0.07      0.021       (  0.190)       0.019        0.002
270  22.50     0.07      0.021       (  0.189)       0.019        0.002
271  22.58     0.07      0.021       (  0.189)       0.019        0.002
272  22.67     0.07      0.021       (  0.188)       0.019        0.002
273  22.75     0.07      0.021       (  0.188)       0.019        0.002
274  22.83     0.07      0.021       (  0.187)       0.019        0.002
275  22.92     0.07      0.021       (  0.187)       0.019        0.002
276  23.00     0.07      0.021       (  0.186)       0.019        0.002
277  23.08     0.07      0.021       (  0.186)       0.019        0.002
278  23.17     0.07      0.021       (  0.185)       0.019        0.002
279  23.25     0.07      0.021       (  0.185)       0.019        0.002
280  23.33     0.07      0.021       (  0.185)       0.019        0.002
281  23.42     0.07      0.021       (  0.184)       0.019        0.002
282  23.50     0.07      0.021       (  0.184)       0.019        0.002
283  23.58     0.07      0.021       (  0.184)       0.019        0.002
284  23.67     0.07      0.021       (  0.183)       0.019        0.002
285  23.75     0.07      0.021       (  0.183)       0.019        0.002
286  23.83     0.07      0.021       (  0.183)       0.019        0.002
287  23.92     0.07      0.021       (  0.183)       0.019        0.002
288  24.00     0.07      0.021       (  0.183)       0.019        0.002
              (Loss Rate Not Used)
    Sum =     100.0                                  Sum =     3.1
      Flood volume = Effective rainfall      0.26(In)
       times area      89.6(Ac.)/[(In)/(Ft.)] =       1.9(Ac.Ft)
      Total soil loss =      2.33(In)
      Total soil loss =    17.380(Ac.Ft)
      Total rainfall =      2.59(In)
      Flood volume =       84318.4 Cubic Feet
      Total soil loss =      757074.3 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =      3.277(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       0.0001      0.02  Q          |         |         |         |
   0+10       0.0008      0.10  Q          |         |         |         |
   0+15       0.0018      0.14  Q          |         |         |         |
   0+20       0.0030      0.17  Q          |         |         |         |
   0+25       0.0044      0.22  Q          |         |         |         |
   0+30       0.0061      0.24  Q          |         |         |         |
   0+35       0.0079      0.26  VQ         |         |         |         |
   0+40       0.0097      0.26  VQ         |         |         |         |
   0+45       0.0116      0.27  VQ         |         |         |         |
   0+50       0.0135      0.28  VQ         |         |         |         |
   0+55       0.0158      0.33  VQ         |         |         |         |
   1+ 0       0.0182      0.35  VQ         |         |         |         |
   1+ 5       0.0206      0.35  VQ         |         |         |         |
   1+10       0.0227      0.31  VQ         |         |         |         |
```

1+15	0.0248	0.30	VQ	|	|	|	|
1+20	0.0268	0.29	VQ	|	|	|	|
1+25	0.0288	0.29	VQ	|	|	|	|
1+30	0.0307	0.29	VQ	|	|	|	|
1+35	0.0327	0.28	VQ	|	|	|	|
1+40	0.0346	0.28	VQ	|	|	|	|
1+45	0.0366	0.28	VQ	|	|	|	|
1+50	0.0386	0.29	VQ	|	|	|	|
1+55	0.0409	0.33	VQ	|	|	|	|
2+ 0	0.0433	0.35	VQ	|	|	|	|
2+ 5	0.0458	0.36	VQ	|	|	|	|
2+10	0.0483	0.36	VQ	|	|	|	|
2+15	0.0508	0.37	|Q	|	|	|	|
2+20	0.0533	0.37	|Q	|	|	|	|
2+25	0.0559	0.37	|Q	|	|	|	|
2+30	0.0585	0.37	|Q	|	|	|	|
2+35	0.0611	0.38	|Q	|	|	|	|
2+40	0.0640	0.42	|Q	|	|	|	|
2+45	0.0671	0.44	|Q	|	|	|	|
2+50	0.0702	0.45	|Q	|	|	|	|
2+55	0.0733	0.46	|Q	|	|	|	|
3+ 0	0.0765	0.46	|Q	|	|	|	|
3+ 5	0.0797	0.46	|Q	|	|	|	|
3+10	0.0829	0.46	|Q	|	|	|	|
3+15	0.0861	0.47	|Q	|	|	|	|
3+20	0.0893	0.47	|Q	|	|	|	|
3+25	0.0925	0.47	|Q	|	|	|	|
3+30	0.0958	0.47	|Q	|	|	|	|
3+35	0.0990	0.47	|QV	|	|	|	|
3+40	0.1022	0.47	|QV	|	|	|	|
3+45	0.1054	0.47	|QV	|	|	|	|
3+50	0.1087	0.48	|QV	|	|	|	|
3+55	0.1123	0.52	| Q	|	|	|	|
4+ 0	0.1160	0.54	| Q	|	|	|	|
4+ 5	0.1197	0.55	| Q	|	|	|	|
4+10	0.1235	0.55	| Q	|	|	|	|
4+15	0.1273	0.55	| Q	|	|	|	|
4+20	0.1313	0.57	| Q	|	|	|	|
4+25	0.1354	0.61	| Q	|	|	|	|
4+30	0.1398	0.63	| Q	|	|	|	|
4+35	0.1442	0.64	| Q	|	|	|	|
4+40	0.1486	0.64	| QV	|	|	|	|
4+45	0.1531	0.65	| QV	|	|	|	|
4+50	0.1576	0.66	| QV	|	|	|	|
4+55	0.1624	0.70	| QV	|	|	|	|
5+ 0	0.1674	0.72	| QV	|	|	|	|
5+ 5	0.1723	0.71	| QV	|	|	|	|
5+10	0.1767	0.64	| QV	|	|	|	|
5+15	0.1809	0.60	| QV	|	|	|	|
5+20	0.1850	0.60	| QV	|	|	|	|
5+25	0.1893	0.63	| QV	|	|	|	|
5+30	0.1937	0.64	| Q V	|	|	|	|
5+35	0.1983	0.66	| Q V	|	|	|	|
5+40	0.2031	0.70	| Q V	|	|	|	|
5+45	0.2080	0.72	| Q V	|	|	|	|
5+50	0.2131	0.73	| Q V	|	|	|	|
5+55	0.2181	0.73	| Q V	|	|	|	|
6+ 0	0.2232	0.74	| Q V	|	|	|	|
6+ 5	0.2284	0.75	| QV	|	|	|	|
6+10	0.2339	0.79	| QV	|	|	|	|
6+15	0.2395	0.82	| QV	|	|	|	|
6+20	0.2452	0.83	| Q V	|	|	|	|
6+25	0.2509	0.83	| Q V	|	|	|	|
6+30	0.2567	0.83	| Q V	|	|	|	|
6+35	0.2625	0.85	| Q V	|	|	|	|
6+40	0.2686	0.89	| Q V	|	|	|	|
6+45	0.2749	0.91	| Q V	|	|	|	|
6+50	0.2812	0.92	| Q V	|	|	|	|
6+55	0.2876	0.92	| Q V	|	|	|	|
7+ 0	0.2940	0.93	| Q V	|	|	|	|
7+ 5	0.3004	0.93	| Q V	|	|	|	|
7+10	0.3068	0.93	| Q V	|	|	|	|
7+15	0.3132	0.93	| Q V	|	|	|	|

```
 7+20      0.3197      0.94  |  Q  V   |         |         |         |
 7+25      0.3265      0.98  |  Q  V   |         |         |         |
 7+30      0.3334      1.01  |   Q V   |         |         |         |
 7+35      0.3405      1.02  |   Q  V  |         |         |         |
 7+40      0.3478      1.07  |   Q  V  |         |         |         |
 7+45      0.3554      1.09  |   Q  V  |         |         |         |
 7+50      0.3630      1.11  |   Q  V  |         |         |         |
 7+55      0.3710      1.16  |   Q  V  |         |         |         |
 8+ 0      0.3792      1.18  |   Q  V  |         |         |         |
 8+ 5      0.3875      1.22  |   Q   V |         |         |         |
 8+10      0.3965      1.30  |    Q  V |         |         |         |
 8+15      0.4058      1.35  |    Q  V |         |         |         |
 8+20      0.4152      1.37  |    Q  V |         |         |         |
 8+25      0.4247      1.38  |    Q  V |         |         |         |
 8+30      0.4342      1.39  |    Q  V |         |         |         |
 8+35      0.4439      1.40  |    Q   V|         |         |         |
 8+40      0.4539      1.45  |    Q   V|         |         |         |
 8+45      0.4640      1.47  |    Q   V|         |         |         |
 8+50      0.4742      1.49  |    Q   V|         |         |         |
 8+55      0.4848      1.54  |     Q   V         |         |         |
 9+ 0      0.4955      1.56  |     Q   V         |         |         |
 9+ 5      0.5065      1.59  |     Q   V         |         |         |
 9+10      0.5180      1.68  |     Q   V         |         |         |
 9+15      0.5299      1.72  |     Q   V         |         |         |
 9+20      0.5420      1.75  |      Q  |V        |         |         |
 9+25      0.5544      1.80  |      Q  |V        |         |         |
 9+30      0.5670      1.83  |      Q  |V        |         |         |
 9+35      0.5798      1.86  |      Q  |V        |         |         |
 9+40      0.5929      1.90  |      Q  | V       |         |         |
 9+45      0.6062      1.93  |      Q  | V       |         |         |
 9+50      0.6196      1.95  |      Q  | V       |         |         |
 9+55      0.6334      2.00  |      Q  |  V      |         |         |
10+ 0      0.6473      2.02  |       Q |  V      |         |         |
10+ 5      0.6608      1.96  |      Q  |  V      |         |         |
10+10      0.6725      1.70  |     Q   |  V      |         |         |
10+15      0.6832      1.56  |     Q   |   V     |         |         |
10+20      0.6936      1.50  |     Q   |   V     |         |         |
10+25      0.7037      1.47  |    Q    |   V     |         |         |
10+30      0.7137      1.45  |    Q    |   V     |         |         |
10+35      0.7239      1.49  |    Q    |   V     |         |         |
10+40      0.7354      1.67  |     Q   |    V    |         |         |
10+45      0.7476      1.77  |      Q  |    V    |         |         |
10+50      0.7600      1.80  |      Q  |    V    |         |         |
10+55      0.7725      1.82  |      Q  |    V    |         |         |
11+ 0      0.7852      1.84  |      Q  |     V   |         |         |
11+ 5      0.7978      1.84  |      Q  |     V   |         |         |
11+10      0.8103      1.81  |      Q  |     V   |         |         |
11+15      0.8226      1.79  |      Q  |     V   |         |         |
11+20      0.8349      1.79  |      Q  |      V  |         |         |
11+25      0.8472      1.79  |      Q  |      V  |         |         |
11+30      0.8595      1.78  |      Q  |      V  |         |         |
11+35      0.8716      1.76  |      Q  |       V |         |         |
11+40      0.8832      1.68  |     Q   |       V |         |         |
11+45      0.8944      1.64  |     Q   |       V |         |         |
11+50      0.9057      1.63  |     Q   |       V |         |         |
11+55      0.9171      1.66  |     Q   |       V |         |         |
12+ 0      0.9286      1.67  |     Q   |        V|         |         |
12+ 5      0.9407      1.75  |      Q  |        V|         |         |
12+10      0.9546      2.03  |       Q |        V|         |         |
12+15      0.9696      2.17  |       Q |         V         |         |
12+20      0.9850      2.24  |       Q |         V         |         |
12+25      1.0010      2.31  |        Q|         V         |         |
12+30      1.0172      2.36  |        Q|          |V       |         |
12+35      1.0338      2.40  |        Q|          |V       |         |
12+40      1.0510      2.50  |        Q|          |V       |         |
12+45      1.0685      2.55  |         Q         | V       |         |
12+50      1.0864      2.59  |         Q         | V       |         |
12+55      1.1046      2.64  |         Q         | V       |         |
13+ 0      1.1230      2.67  |         Q         |  V      |         |
13+ 5      1.1418      2.74  |         Q         |  V      |         |
13+10      1.1621      2.94  |          |Q       |   V     |         |
13+15      1.1831      3.05  |          | Q      |   V     |         |
13+20      1.2045      3.10  |          | Q      |   V     |         |
```

```
13+25    1.2263    3.17  |          | Q        |    V     |          |
13+30    1.2489    3.28  |          |  Q       |    V     |          |
13+35    1.2712    3.23  |          | Q        |     V    |          |
13+40    1.2898    2.71  |          Q          |     V    |          |
13+45    1.3066    2.44  |         Q|          |      V   |          |
13+50    1.3227    2.34  |         Q|          |      V   |          |
13+55    1.3384    2.28  |         Q|          |      V   |          |
14+ 0    1.3538    2.24  |        Q |          |      V   |          |
14+ 5    1.3693    2.25  |         Q|          |       V  |          |
14+10    1.3858    2.39  |         Q|          |       V  |          |
14+15    1.4027    2.46  |         Q|          |       V  |          |
14+20    1.4197    2.47  |         Q|          |        V|          |
14+25    1.4365    2.43  |         Q|          |        V|          |
14+30    1.4532    2.43  |         Q|          |         V          |
14+35    1.4699    2.43  |         Q|          |         V          |
14+40    1.4866    2.43  |         Q|          |         V          |
14+45    1.5034    2.43  |         Q|          |          |V        |
14+50    1.5200    2.42  |         Q|          |          |V        |
14+55    1.5365    2.38  |         Q|          |          |V        |
15+ 0    1.5527    2.36  |         Q|          |          | V       |
15+ 5    1.5689    2.34  |         Q|          |          | V       |
15+10    1.5847    2.30  |         Q|          |          | V       |
15+15    1.6003    2.27  |         Q|          |          |  V      |
15+20    1.6159    2.25  |         Q|          |          |  V      |
15+25    1.6311    2.21  |        Q |          |          |  V      |
15+30    1.6461    2.18  |        Q |          |          |   V     |
15+35    1.6607    2.13  |        Q |          |          |   V     |
15+40    1.6743    1.96  |       Q  |          |          |   V     |
15+45    1.6872    1.88  |       Q  |          |          |   V     |
15+50    1.6999    1.84  |       Q  |          |          |    V    |
15+55    1.7124    1.82  |       Q  |          |          |    V    |
16+ 0    1.7248    1.81  |       Q  |          |          |    V    |
16+ 5    1.7361    1.63  |     Q    |          |          |    V    |
16+10    1.7433    1.04  |    Q     |          |          |     V   |
16+15    1.7483    0.73  | Q        |          |          |     V   |
16+20    1.7525    0.60  | Q        |          |          |     V   |
16+25    1.7561    0.52  | Q        |          |          |     V   |
16+30    1.7594    0.48  |Q         |          |          |     V   |
16+35    1.7623    0.43  |Q         |          |          |     V   |
16+40    1.7649    0.37  |Q         |          |          |     V   |
16+45    1.7671    0.33  |Q         |          |          |     V   |
16+50    1.7693    0.31  |Q         |          |          |     V   |
16+55    1.7713    0.29  |Q         |          |          |     V   |
17+ 0    1.7733    0.29  |Q         |          |          |     V   |
17+ 5    1.7754    0.31  |Q         |          |          |     V   |
17+10    1.7780    0.38  |Q         |          |          |     V   |
17+15    1.7809    0.42  |Q         |          |          |     V   |
17+20    1.7839    0.44  |Q         |          |          |     V   |
17+25    1.7870    0.45  |Q         |          |          |     V   |
17+30    1.7901    0.45  |Q         |          |          |     V   |
17+35    1.7933    0.46  |Q         |          |          |      V  |
17+40    1.7965    0.46  |Q         |          |          |      V  |
17+45    1.7997    0.46  |Q         |          |          |      V  |
17+50    1.8028    0.45  |Q         |          |          |      V  |
17+55    1.8057    0.42  |Q         |          |          |      V  |
18+ 0    1.8084    0.40  |Q         |          |          |      V  |
18+ 5    1.8111    0.39  |Q         |          |          |      V  |
18+10    1.8137    0.38  |Q         |          |          |      V  |
18+15    1.8164    0.38  |Q         |          |          |      V  |
18+20    1.8190    0.38  |Q         |          |          |      V  |
18+25    1.8216    0.38  |Q         |          |          |      V  |
18+30    1.8242    0.38  |Q         |          |          |      V  |
18+35    1.8267    0.36  |Q         |          |          |      V  |
18+40    1.8289    0.32  |Q         |          |          |      V  |
18+45    1.8310    0.30  |Q         |          |          |      V  |
18+50    1.8329    0.28  |Q         |          |          |      V  |
18+55    1.8346    0.24  Q          |          |          |      V  |
19+ 0    1.8361    0.22  Q          |          |          |      V  |
19+ 5    1.8376    0.22  Q          |          |          |      V  |
19+10    1.8393    0.25  Q          |          |          |       V |
19+15    1.8411    0.27  |Q         |          |          |       V |
19+20    1.8431    0.28  |Q         |          |          |       V |
19+25    1.8453    0.32  |Q         |          |          |       V |
```

19+30	1.8477	0.35	|Q	|	|	|	V |
19+35	1.8501	0.34	|Q	|	|	|	V |
19+40	1.8522	0.31	|Q	|	|	|	V |
19+45	1.8542	0.30	|Q	|	|	|	V |
19+50	1.8562	0.28	|Q	|	|	|	V |
19+55	1.8578	0.24	Q	|	|	|	V |
20+ 0	1.8593	0.22	Q	|	|	|	V |
20+ 5	1.8608	0.22	Q	|	|	|	V |
20+10	1.8625	0.25	Q	|	|	|	V |
20+15	1.8643	0.27	|Q	|	|	|	V |
20+20	1.8662	0.27	|Q	|	|	|	V |
20+25	1.8681	0.27	|Q	|	|	|	V |
20+30	1.8700	0.28	|Q	|	|	|	V |
20+35	1.8719	0.28	|Q	|	|	|	V |
20+40	1.8738	0.28	|Q	|	|	|	V |
20+45	1.8757	0.28	|Q	|	|	|	V |
20+50	1.8776	0.27	|Q	|	|	|	V |
20+55	1.8791	0.23	Q	|	|	|	V |
21+ 0	1.8806	0.21	Q	|	|	|	V |
21+ 5	1.8821	0.21	Q	|	|	|	V |
21+10	1.8838	0.25	Q	|	|	|	V |
21+15	1.8856	0.26	|Q	|	|	|	V |
21+20	1.8874	0.26	|Q	|	|	|	V|
21+25	1.8889	0.22	Q	|	|	|	V|
21+30	1.8903	0.21	Q	|	|	|	V|
21+35	1.8918	0.21	Q	|	|	|	V|
21+40	1.8934	0.24	Q	|	|	|	V|
21+45	1.8952	0.26	|Q	|	|	|	V|
21+50	1.8970	0.26	|Q	|	|	|	V|
21+55	1.8986	0.22	Q	|	|	|	V|
22+ 0	1.9000	0.21	Q	|	|	|	V|
22+ 5	1.9014	0.21	Q	|	|	|	V|
22+10	1.9031	0.24	Q	|	|	|	V|
22+15	1.9049	0.26	|Q	|	|	|	V|
22+20	1.9067	0.26	|Q	|	|	|	V|
22+25	1.9082	0.22	Q	|	|	|	V|
22+30	1.9096	0.21	Q	|	|	|	V|
22+35	1.9110	0.20	Q	|	|	|	V|
22+40	1.9123	0.19	Q	|	|	|	V|
22+45	1.9137	0.19	Q	|	|	|	V|
22+50	1.9150	0.19	Q	|	|	|	V|
22+55	1.9163	0.19	Q	|	|	|	V|
23+ 0	1.9176	0.19	Q	|	|	|	V|
23+ 5	1.9189	0.19	Q	|	|	|	V|
23+10	1.9202	0.19	Q	|	|	|	V|
23+15	1.9214	0.19	Q	|	|	|	V|
23+20	1.9227	0.19	Q	|	|	|	V|
23+25	1.9240	0.19	Q	|	|	|	V|
23+30	1.9253	0.19	Q	|	|	|	V|
23+35	1.9266	0.19	Q	|	|	|	V|
23+40	1.9279	0.19	Q	|	|	|	V|
23+45	1.9292	0.19	Q	|	|	|	V|
23+50	1.9305	0.19	Q	|	|	|	V|
23+55	1.9318	0.19	Q	|	|	|	V|
24+ 0	1.9330	0.19	Q	|	|	|	V|
24+ 5	1.9342	0.17	Q	|	|	|	V|
24+10	1.9348	0.09	Q	|	|	|	V|
24+15	1.9351	0.05	Q	|	|	|	V|
24+20	1.9353	0.03	Q	|	|	|	V|
24+25	1.9354	0.02	Q	|	|	|	V|
24+30	1.9355	0.01	Q	|	|	|	V|
24+35	1.9356	0.01	Q	|	|	|	V|
24+40	1.9356	0.01	Q	|	|	|	V|
24+45	1.9357	0.00	Q	|	|	|	V|
24+50	1.9357	0.00	Q	|	|	|	V|

Area 'A' – 100 Year 1 Hour Existing Condition – Unit Hydrograph

```
        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  06/13/20 File: exa1001100.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6407

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'A'
EXISTING CONDITION UNIT HYDROGRAPH - 100 YEAR 1 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE
------------------------------------------------------------------------
Drainage Area =      89.60(Ac.)  =      0.140 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      89.60(Ac.)  =      0.140 Sq. Mi.
Length along longest watercourse =    2458.00(Ft.)
Length along longest watercourse measured to centroid =    1215.00(Ft.)
Length along longest watercourse =      0.466 Mi.
Length along longest watercourse measured to centroid =      0.230 Mi.
Difference in elevation =      88.00(Ft.)
Slope along watercourse =    189.0317 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.114 Hr.
Lag time =     6.83 Min.
25% of lag time =     1.71 Min.
40% of lag time =     2.73 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]
       89.60           0.45                 40.32

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       89.60           1.20                107.52

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    0.450(In)
Area Averaged 100-Year Rainfall =    1.200(In)

Point rain (area averaged) =    1.200(In)
Areal adjustment factor =   99.92 %
Adjusted average point rain =    1.199(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
    89.600           69.70         0.000
```

```
 Total Area Entered =     89.60(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-3     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
69.7  84.8      0.189     0.000        0.189       1.000      0.189
                                                 Sum (F) =    0.189
Area averaged mean soil loss (F) (In/Hr) =  0.189
Minimum soil loss rate ((In/Hr)) =  0.095
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.900
------------------------------------------------------------------------
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         73.227         11.462             10.351
     2   0.167        146.453         41.689             37.645
     3   0.250        219.680         22.054             19.915
     4   0.333        292.907          8.734              7.887
     5   0.417        366.134          5.299              4.785
     6   0.500        439.360          3.455              3.120
     7   0.583        512.587          2.375              2.145
     8   0.667        585.814          1.778              1.606
     9   0.750        659.040          1.259              1.137
    10   0.833        732.267          0.850              0.768
    11   0.917        805.494          1.043              0.942
                                Sum = 100.000   Sum=      90.300
------------------------------------------------------------------------

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      0.604          0.189    (  0.544)        0.415
  2   0.17     4.30      0.619          0.189    (  0.557)        0.430
  3   0.25     5.00      0.719          0.189    (  0.647)        0.530
  4   0.33     5.00      0.719          0.189    (  0.647)        0.530
  5   0.42     5.80      0.835          0.189    (  0.751)        0.645
  6   0.50     6.50      0.935          0.189    (  0.842)        0.746
  7   0.58     7.40      1.065          0.189    (  0.958)        0.876
  8   0.67     8.60      1.237          0.189    (  1.114)        1.048
  9   0.75    12.30      1.770          0.189    (  1.593)        1.581
 10   0.83    29.10      4.187          0.189    (  3.768)        3.998
 11   0.92     6.80      0.978          0.189    (  0.881)        0.789
 12   1.00     5.00      0.719          0.189    (  0.647)        0.530
              (Loss Rate Not Used)
    Sum =     100.0                                  Sum =    12.1
      Flood volume = Effective rainfall      1.01(In)
       times area      89.6(Ac.)/[(In)/(Ft.)] =       7.5(Ac.Ft)
      Total soil loss =      0.19(In)
      Total soil loss =     1.412(Ac.Ft)
      Total rainfall =      1.20(In)
      Flood volume =      328491.9 Cubic Feet
      Total soil loss =       61488.8 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =    208.608(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       75.0     150.0     225.0     300.0
 ------------------------------------------------------------------------
   0+ 5       0.0296      4.30  Q         |         |         |         |
   0+10       0.1680     20.09  V Q       |         |         |         |
   0+15       0.3742     29.95  |V Q      |         |         |         |
   0+20       0.6312     37.31  |  VQ     |         |         |         |
   0+25       0.9246     42.61  |   VQ    |         |         |         |
   0+30       1.2699     50.14  |     Q   |         |         |         |
   0+35       1.6762     58.99  |      QV |         |         |         |
   0+40       2.1554     69.58  |        Q|V        |         |         |
   0+45       2.7494     86.24  |         |Q  V     |         |         |
   0+50       3.6937    137.12  |         |       QV|         |         |
   0+55       5.1304    208.61  |         |         |      Q  |         |
   1+ 0       6.0889    139.16  |         |       Q |         | V       |
   1+ 5       6.6592     82.81  |         |Q        |         |    V    |
   1+10       6.9785     46.37  |     Q   |         |         |      V  |
   1+15       7.1693     27.70  |  Q      |         |         |       V |
   1+20       7.2980     18.69  | Q       |         |         |       V |
   1+25       7.3889     13.20  |Q        |         |         |        V|
   1+30       7.4520      9.16  |Q        |         |         |        V|
   1+35       7.4955      6.31  Q         |         |         |        V|
   1+40       7.5298      4.98  Q         |         |         |        V|
   1+45       7.5377      1.15  Q         |         |         |        V|
   1+50       7.5411      0.50  Q         |         |         |         V
------------------------------------------------------------------------
```

Area 'A' – 100 Year 3 Hour Existing Condition – Unit Hydrograph

```
        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  06/13/20 File: exa1003100.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6407

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'A'
EXISTING CONDITION UNIT HYDROGRAPH - 100 YEAR 3 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE
------------------------------------------------------------------------
Drainage Area =      89.60(Ac.)  =      0.140 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      89.60(Ac.)  =      0.140 Sq. Mi.
Length along longest watercourse =    2458.00(Ft.)
Length along longest watercourse measured to centroid =    1215.00(Ft.)
Length along longest watercourse =      0.466 Mi.
Length along longest watercourse measured to centroid =      0.230 Mi.
Difference in elevation =      88.00(Ft.)
Slope along watercourse =    189.0317 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.114 Hr.
Lag time =     6.83 Min.
25% of lag time =     1.71 Min.
40% of lag time =     2.73 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]
       89.60            0.80                 71.68

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       89.60            1.80                161.28

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    0.800(In)
Area Averaged 100-Year Rainfall =    1.800(In)

Point rain (area averaged) =    1.800(In)
Areal adjustment factor =   99.96 %
Adjusted average point rain =    1.799(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
    89.600           69.70         0.000
```

Total Area Entered = 89.60(Ac.)

RI AMC2	RI AMC-3	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
69.7	84.8	0.189	0.000	0.189	1.000	0.189
					Sum (F) =	0.189

Area averaged mean soil loss (F) (In/Hr) = 0.189
Minimum soil loss rate ((In/Hr)) = 0.095
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

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	73.227	11.462	10.351
2	0.167	146.453	41.689	37.645
3	0.250	219.680	22.054	19.915
4	0.333	292.907	8.734	7.887
5	0.417	366.134	5.299	4.785
6	0.500	439.360	3.455	3.120
7	0.583	512.587	2.375	2.145
8	0.667	585.814	1.778	1.606
9	0.750	659.040	1.259	1.137
10	0.833	732.267	0.850	0.768
11	0.917	805.494	1.043	0.942
			Sum = 100.000 Sum=	90.300

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	0.281	0.189	(0.253)	0.092
2	0.17	1.30	0.281	0.189	(0.253)	0.092
3	0.25	1.10	0.238	0.189	(0.214)	0.048
4	0.33	1.50	0.324	0.189	(0.291)	0.135
5	0.42	1.50	0.324	0.189	(0.291)	0.135
6	0.50	1.80	0.389	0.189	(0.350)	0.200
7	0.58	1.50	0.324	0.189	(0.291)	0.135
8	0.67	1.80	0.389	0.189	(0.350)	0.200
9	0.75	1.80	0.389	0.189	(0.350)	0.200
10	0.83	1.50	0.324	0.189	(0.291)	0.135
11	0.92	1.60	0.345	0.189	(0.311)	0.156
12	1.00	1.80	0.389	0.189	(0.350)	0.200
13	1.08	2.20	0.475	0.189	(0.428)	0.286
14	1.17	2.20	0.475	0.189	(0.428)	0.286
15	1.25	2.20	0.475	0.189	(0.428)	0.286
16	1.33	2.00	0.432	0.189	(0.389)	0.243
17	1.42	2.60	0.561	0.189	(0.505)	0.372
18	1.50	2.70	0.583	0.189	(0.525)	0.394
19	1.58	2.40	0.518	0.189	(0.466)	0.329
20	1.67	2.70	0.583	0.189	(0.525)	0.394
21	1.75	3.30	0.713	0.189	(0.641)	0.523
22	1.83	3.10	0.669	0.189	(0.602)	0.480
23	1.92	2.90	0.626	0.189	(0.564)	0.437
24	2.00	3.00	0.648	0.189	(0.583)	0.459
25	2.08	3.10	0.669	0.189	(0.602)	0.480
26	2.17	4.20	0.907	0.189	(0.816)	0.718
27	2.25	5.00	1.080	0.189	(0.972)	0.891
28	2.33	3.50	0.756	0.189	(0.680)	0.567
29	2.42	6.80	1.468	0.189	(1.321)	1.279
30	2.50	7.30	1.576	0.189	(1.419)	1.387
31	2.58	8.20	1.771	0.189	(1.593)	1.581
32	2.67	5.90	1.274	0.189	(1.147)	1.085

```
 33   2.75     2.00      0.432          0.189    (  0.389)        0.243
 34   2.83     1.80      0.389          0.189    (  0.350)        0.200
 35   2.92     1.80      0.389          0.189    (  0.350)        0.200
 36   3.00     0.60      0.130       (  0.189)       0.117        0.013
              (Loss Rate Not Used)
    Sum =     100.0                                    Sum =    14.9
       Flood volume = Effective rainfall      1.24(In)
        times area      89.6(Ac.)/[(In)/(Ft.)] =       9.2(Ac.Ft)
       Total soil loss =      0.56(In)
       Total soil loss =     4.190(Ac.Ft)
       Total rainfall =      1.80(In)
       Flood volume =      402714.4 Cubic Feet
       Total soil loss =      182502.5 Cubic Feet
       ---------------------------------------------------------------------
        Peak flow rate of this hydrograph =    117.647(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       50.0     100.0     150.0     200.0
  ----------------------------------------------------------------------------
    0+ 5       0.0065      0.95  Q         |         |         |         |
    0+10       0.0368      4.40  Q         |         |         |         |
    0+15       0.0766      5.78  VQ        |         |         |         |
    0+20       0.1164      5.77  VQ        |         |         |         |
    0+25       0.1756      8.60  VQ        |         |         |         |
    0+30       0.2510     10.94  |VQ       |         |         |         |
    0+35       0.3431     13.38  |VQ       |         |         |         |
    0+40       0.4349     13.33  |VQ       |         |         |         |
    0+45       0.5400     15.27  | VQ      |         |         |         |
    0+50       0.6493     15.87  | VQ      |         |         |         |
    0+55       0.7474     14.24  | QV      |         |         |         |
    1+ 0       0.8474     14.52  | QV      |         |         |         |
    1+ 5       0.9655     17.15  |  QV     |         |         |         |
    1+10       1.1123     21.31  |   Q     |         |         |         |
    1+15       1.2731     23.36  |   QV    |         |         |         |
    1+20       1.4371     23.81  |   Q V   |         |         |         |
    1+25       1.6025     24.01  |   Q V   |         |         |         |
    1+30       1.7997     28.63  |    Q V  |         |         |         |
    1+35       2.0149     31.25  |     Q V |         |         |         |
    1+40       2.2274     30.87  |     Q  V|         |         |         |
    1+45       2.4627     34.16  |     Q   V         |         |         |
    1+50       2.7375     39.90  |      Q  |V        |         |         |
    1+55       3.0196     40.96  |       Q |  V      |         |         |
    2+ 0       3.2954     40.04  |       Q |   V     |         |         |
    2+ 5       3.5757     40.70  |       Q |    V    |         |         |
    2+10       3.8814     44.38  |       Q |     V   |         |         |
    2+15       4.2658     55.82  |         |Q      V |         |         |
    2+20       4.7066     64.01  |         | Q       V         |         |
    2+25       5.1518     64.65  |         | Q       | V       |         |
    2+30       5.7634     88.80  |         |      Q  |   V     |         |
    2+35       6.5087    108.21  |         |         |Q      V |         |
    2+40       7.3190    117.65  |         |         |  Q      |V        |
    2+45       7.9946     98.10  |         |         Q|        |   V     |
    2+50       8.4092     60.20  |         | Q       |        |     V   |
    2+55       8.6885     40.56  |       Q |         |        |      V  |
    3+ 0       8.9000     30.71  |     Q   |         |        |       V |
    3+ 5       9.0305     18.94  |  Q      |         |        |        V|
    3+10       9.1097     11.51  | Q       |         |        |        V|
    3+15       9.1649      8.02  |Q        |         |        |        V|
    3+20       9.2012      5.26  |Q        |         |        |        V|
    3+25       9.2245      3.39  Q         |         |        |        V|
    3+30       9.2368      1.78  Q         |         |        |        V|
    3+35       9.2411      0.63  Q         |         |        |        V|
    3+40       9.2436      0.36  Q         |         |        |        V|
    3+45       9.2450      0.20  Q         |         |        |        V|
    3+50       9.2451      0.01  Q         |         |        |         V
  ----------------------------------------------------------------------------
```

Area 'A' – 100 Year 6 Hour Existing Condition – Unit Hydrograph

```
        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  06/13/20 File: exa1006100.out


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6407

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'A'
EXISTING CONDITION UNIT HYDROGRAPH - 100 YEAR 6 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE
------------------------------------------------------------------------
Drainage Area =      89.60(Ac.)  =      0.140 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      89.60(Ac.)  =      0.140 Sq. Mi.
Length along longest watercourse =    2458.00(Ft.)
Length along longest watercourse measured to centroid =    1215.00(Ft.)
Length along longest watercourse =      0.466 Mi.
Length along longest watercourse measured to centroid =      0.230 Mi.
Difference in elevation =      88.00(Ft.)
Slope along watercourse =    189.0317 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.114 Hr.
Lag time =     6.83 Min.
25% of lag time =     1.71 Min.
40% of lag time =     2.73 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]
       89.60           1.00                 89.60

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       89.60           2.50                224.00

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    1.000(In)
Area Averaged 100-Year Rainfall =    2.500(In)

Point rain (area averaged) =    2.500(In)
Areal adjustment factor =   99.97 %
Adjusted average point rain =    2.499(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
    89.600           69.70         0.000
```

Total Area Entered = 89.60(Ac.)

RI AMC2	RI AMC-3	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
69.7	84.8	0.189	0.000	0.189	1.000	0.189
					Sum (F) =	0.189

Area averaged mean soil loss (F) (In/Hr) = 0.189
Minimum soil loss rate ((In/Hr)) = 0.095
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

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	73.227	11.462		10.351
2	0.167	146.453	41.689		37.645
3	0.250	219.680	22.054		19.915
4	0.333	292.907	8.734		7.887
5	0.417	366.134	5.299		4.785
6	0.500	439.360	3.455		3.120
7	0.583	512.587	2.375		2.145
8	0.667	585.814	1.778		1.606
9	0.750	659.040	1.259		1.137
10	0.833	732.267	0.850		0.768
11	0.917	805.494	1.043		0.942
			Sum = 100.000	Sum=	90.300

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	(0.189)		0.135	0.015
2	0.17	0.60	0.180	(0.189)		0.162	0.018
3	0.25	0.60	0.180	(0.189)		0.162	0.018
4	0.33	0.60	0.180	(0.189)		0.162	0.018
5	0.42	0.60	0.180	(0.189)		0.162	0.018
6	0.50	0.70	0.210	(0.189)		0.189	0.021
7	0.58	0.70	0.210	(0.189)		0.189	0.021
8	0.67	0.70	0.210	(0.189)		0.189	0.021
9	0.75	0.70	0.210	(0.189)		0.189	0.021
10	0.83	0.70	0.210	(0.189)		0.189	0.021
11	0.92	0.70	0.210	(0.189)		0.189	0.021
12	1.00	0.80	0.240	0.189	(	0.216)	0.051
13	1.08	0.80	0.240	0.189	(	0.216)	0.051
14	1.17	0.80	0.240	0.189	(	0.216)	0.051
15	1.25	0.80	0.240	0.189	(	0.216)	0.051
16	1.33	0.80	0.240	0.189	(	0.216)	0.051
17	1.42	0.80	0.240	0.189	(	0.216)	0.051
18	1.50	0.80	0.240	0.189	(	0.216)	0.051
19	1.58	0.80	0.240	0.189	(	0.216)	0.051
20	1.67	0.80	0.240	0.189	(	0.216)	0.051
21	1.75	0.80	0.240	0.189	(	0.216)	0.051
22	1.83	0.80	0.240	0.189	(	0.216)	0.051
23	1.92	0.80	0.240	0.189	(	0.216)	0.051
24	2.00	0.90	0.270	0.189	(	0.243)	0.081
25	2.08	0.80	0.240	0.189	(	0.216)	0.051
26	2.17	0.90	0.270	0.189	(	0.243)	0.081
27	2.25	0.90	0.270	0.189	(	0.243)	0.081
28	2.33	0.90	0.270	0.189	(	0.243)	0.081
29	2.42	0.90	0.270	0.189	(	0.243)	0.081
30	2.50	0.90	0.270	0.189	(	0.243)	0.081
31	2.58	0.90	0.270	0.189	(	0.243)	0.081
32	2.67	0.90	0.270	0.189	(	0.243)	0.081

```
 33   2.75     1.00      0.300          0.189    (  0.270)        0.111
 34   2.83     1.00      0.300          0.189    (  0.270)        0.111
 35   2.92     1.00      0.300          0.189    (  0.270)        0.111
 36   3.00     1.00      0.300          0.189    (  0.270)        0.111
 37   3.08     1.00      0.300          0.189    (  0.270)        0.111
 38   3.17     1.10      0.330          0.189    (  0.297)        0.141
 39   3.25     1.10      0.330          0.189    (  0.297)        0.141
 40   3.33     1.10      0.330          0.189    (  0.297)        0.141
 41   3.42     1.20      0.360          0.189    (  0.324)        0.171
 42   3.50     1.30      0.390          0.189    (  0.351)        0.201
 43   3.58     1.40      0.420          0.189    (  0.378)        0.231
 44   3.67     1.40      0.420          0.189    (  0.378)        0.231
 45   3.75     1.50      0.450          0.189    (  0.405)        0.261
 46   3.83     1.50      0.450          0.189    (  0.405)        0.261
 47   3.92     1.60      0.480          0.189    (  0.432)        0.291
 48   4.00     1.60      0.480          0.189    (  0.432)        0.291
 49   4.08     1.70      0.510          0.189    (  0.459)        0.321
 50   4.17     1.80      0.540          0.189    (  0.486)        0.351
 51   4.25     1.90      0.570          0.189    (  0.513)        0.381
 52   4.33     2.00      0.600          0.189    (  0.540)        0.411
 53   4.42     2.10      0.630          0.189    (  0.567)        0.441
 54   4.50     2.10      0.630          0.189    (  0.567)        0.441
 55   4.58     2.20      0.660          0.189    (  0.594)        0.471
 56   4.67     2.30      0.690          0.189    (  0.621)        0.501
 57   4.75     2.40      0.720          0.189    (  0.648)        0.531
 58   4.83     2.40      0.720          0.189    (  0.648)        0.531
 59   4.92     2.50      0.750          0.189    (  0.675)        0.561
 60   5.00     2.60      0.780          0.189    (  0.702)        0.591
 61   5.08     3.10      0.930          0.189    (  0.837)        0.741
 62   5.17     3.60      1.080          0.189    (  0.972)        0.891
 63   5.25     3.90      1.170          0.189    (  1.053)        0.981
 64   5.33     4.20      1.260          0.189    (  1.134)        1.071
 65   5.42     4.70      1.410          0.189    (  1.269)        1.221
 66   5.50     5.60      1.679          0.189    (  1.512)        1.490
 67   5.58     1.90      0.570          0.189    (  0.513)        0.381
 68   5.67     0.90      0.270          0.189    (  0.243)        0.081
 69   5.75     0.60      0.180       (  0.189)       0.162        0.018
 70   5.83     0.50      0.150       (  0.189)       0.135        0.015
 71   5.92     0.30      0.090       (  0.189)       0.081        0.009
 72   6.00     0.20      0.060       (  0.189)       0.054        0.006
               (Loss Rate Not Used)
    Sum =     100.0                                    Sum =    16.9
      Flood volume = Effective rainfall      1.41(In)
       times area      89.6(Ac.)/[(In)/(Ft.)] =      10.5(Ac.Ft)
      Total soil loss =      1.09(In)
      Total soil loss =     8.166(Ac.Ft)
      Total rainfall =      2.50(In)
      Flood volume =      457150.1 Cubic Feet
      Total soil loss =      355719.4 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =    104.405(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       50.0     100.0     150.0     200.0
-------------------------------------------------------------------------
  0+ 5       0.0011      0.16  Q         |         |         |         |
  0+10       0.0062      0.75  Q         |         |         |         |
  0+15       0.0143      1.16  Q         |         |         |         |
  0+20       0.0235      1.34  Q         |         |         |         |
  0+25       0.0334      1.44  Q         |         |         |         |
  0+30       0.0439      1.53  Q         |         |         |         |
  0+35       0.0555      1.68  Q         |         |         |         |
  0+40       0.0677      1.77  Q         |         |         |         |
  0+45       0.0802      1.82  Q         |         |         |         |
  0+50       0.0930      1.85  Q         |         |         |         |
  0+55       0.1059      1.87  Q         |         |         |         |
  1+ 0       0.1210      2.19  Q         |         |         |         |
```

```
    1+ 5       0.1439      3.32  Q          |          |          |          |
    1+10       0.1709      3.92  Q          |          |          |          |
    1+15       0.1995      4.16  Q          |          |          |          |
    1+20       0.2292      4.31  Q          |          |          |          |
    1+25       0.2595      4.40  Q          |          |          |          |
    1+30       0.2902      4.46  QV         |          |          |          |
    1+35       0.3213      4.51  QV         |          |          |          |
    1+40       0.3526      4.55  QV         |          |          |          |
    1+45       0.3840      4.57  QV         |          |          |          |
    1+50       0.4157      4.60  QV         |          |          |          |
    1+55       0.4474      4.60  QV         |          |          |          |
    2+ 0       0.4811      4.91  QV         |          |          |          |
    2+ 5       0.5206      5.73  |Q         |          |          |          |
    2+10       0.5585      5.50  |QV        |          |          |          |
    2+15       0.6017      6.27  |QV        |          |          |          |
    2+20       0.6484      6.78  |QV        |          |          |          |
    2+25       0.6963      6.96  |QV        |          |          |          |
    2+30       0.7451      7.08  |QV        |          |          |          |
    2+35       0.7944      7.16  |Q V       |          |          |          |
    2+40       0.8440      7.21  |Q V       |          |          |          |
    2+45       0.8960      7.55  |Q V       |          |          |          |
    2+50       0.9561      8.72  |Q V       |          |          |          |
    2+55       1.0203      9.32  |Q V       |          |          |          |
    3+ 0       1.0862      9.58  |Q  V      |          |          |          |
    3+ 5       1.1532      9.72  |Q  V      |          |          |          |
    3+10       1.2230     10.13  | Q V      |          |          |          |
    3+15       1.3009     11.32  | Q V      |          |          |          |
    3+20       1.3834     11.97  | Q  V     |          |          |          |
    3+25       1.4698     12.55  | Q  V     |          |          |          |
    3+30       1.5673     14.16  | Q  V     |          |          |          |
    3+35       1.6796     16.32  |  Q  V    |          |          |          |
    3+40       1.8060     18.34  |  Q  V    |          |          |          |
    3+45       1.9415     19.68  |  Q   V   |          |          |          |
    3+50       2.0883     21.32  |   Q  V   |          |          |          |
    3+55       2.2436     22.55  |   Q   V  |          |          |          |
    4+ 0       2.4100     24.15  |   Q    V|          |          |          |
    4+ 5       2.5846     25.35  |    Q   V|          |          |          |
    4+10       2.7721     27.23  |    Q    V          |          |          |
    4+15       2.9756     29.56  |    Q    |V         |          |          |
    4+20       3.1962     32.02  |     Q   | V        |          |          |
    4+25       3.4342     34.57  |     Q   |  V       |          |          |
    4+30       3.6880     36.84  |      Q  |   V      |          |          |
    4+35       3.9521     38.35  |      Q  |    V     |          |          |
    4+40       4.2303     40.40  |       Q |     V    |          |          |
    4+45       4.5254     42.85  |       Q |      V   |          |          |
    4+50       4.8359     45.08  |        Q|       V  |          |          |
    4+55       5.1566     46.56  |        Q|        V|          |          |
    5+ 0       5.4913     48.61  |        Q|         V          |          |
    5+ 5       5.8514     52.28  |         Q          | V        |          |
    5+10       6.2685     60.57  |          | Q       |  V       |          |
    5+15       6.7554     70.69  |          |  Q      |    V     |          |
    5+20       7.3031     79.53  |          |   Q     |      V   |          |
    5+25       7.9119     88.41  |          |    Q    |         V          |
    5+30       8.6055    100.70  |          |         Q          | V        |
    5+35       9.3245    104.41  |          |         Q          |    V     |
    5+40       9.7887     67.40  |          |  Q      |          |      V   |
    5+45      10.0444     37.12  |      Q   |         |          |       V  |
    5+50      10.1987     22.41  |   Q      |         |          |       V  |
    5+55      10.3018     14.97  | Q        |         |          |        V|
    6+ 0      10.3733     10.39  | Q        |         |          |        V|
    6+ 5      10.4230      7.21  |Q         |         |          |        V|
    6+10      10.4556      4.75  Q          |         |          |        V|
    6+15      10.4765      3.03  Q          |         |          |        V|
    6+20      10.4897      1.91  Q          |         |          |        V|
    6+25      10.4931      0.50  Q          |         |          |        V|
    6+30      10.4941      0.13  Q          |         |          |        V|
    6+35      10.4944      0.05  Q          |         |          |        V|
    6+40      10.4946      0.03  Q          |         |          |        V|
    6+45      10.4947      0.01  Q          |         |          |        V|
    6+50      10.4947      0.01  Q          |         |          |         V
-------------------------------------------------------------------------
```

Area 'A' – 100 Year 24 Hour Existing Condition – Unit Hydrograph

```
        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  06/13/20 File: exa10024100.out


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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

Program License Serial Number 6407

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

 English Units used in output format

------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'A'
EXISTING CONDITION UNIT HYDROGRAPH - 100 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE
------------------------------------------------------------------------
Drainage Area =      89.60(Ac.)  =      0.140 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      89.60(Ac.)  =      0.140 Sq. Mi.
Length along longest watercourse =    2458.00(Ft.)
Length along longest watercourse measured to centroid =    1215.00(Ft.)
Length along longest watercourse =      0.466 Mi.
Length along longest watercourse measured to centroid =      0.230 Mi.
Difference in elevation =      88.00(Ft.)
Slope along watercourse =    189.0317 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.114 Hr.
Lag time =     6.83 Min.
25% of lag time =     1.71 Min.
40% of lag time =     2.73 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]
       89.60            1.60                143.36

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       89.60            4.00                358.40

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    1.600(In)
Area Averaged 100-Year Rainfall =    4.000(In)

Point rain (area averaged) =    4.000(In)
Areal adjustment factor =   99.98 %
Adjusted average point rain =    3.999(In)

Sub-Area Data:
Area(Ac.)          Runoff Index    Impervious %
    89.600            69.70          0.000
 Total Area Entered =     89.60(Ac.)
```

RI AMC2	RI AMC-3	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
69.7	84.8	0.189	0.000	0.189	1.000	0.189
					Sum (F) =	0.189

Area averaged mean soil loss (F) (In/Hr) = 0.189
Minimum soil loss rate ((In/Hr)) = 0.095
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

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	73.227	11.462	10.351
2	0.167	146.453	41.689	37.645
3	0.250	219.680	22.054	19.915
4	0.333	292.907	8.734	7.887
5	0.417	366.134	5.299	4.785
6	0.500	439.360	3.455	3.120
7	0.583	512.587	2.375	2.145
8	0.667	585.814	1.778	1.606
9	0.750	659.040	1.259	1.137
10	0.833	732.267	0.850	0.768
11	0.917	805.494	1.043	0.942
			Sum = 100.000	Sum= 90.300

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	0.032	(0.335)	0.029	0.003
2	0.17	0.07	0.032	(0.334)	0.029	0.003
3	0.25	0.07	0.032	(0.333)	0.029	0.003
4	0.33	0.10	0.048	(0.331)	0.043	0.005
5	0.42	0.10	0.048	(0.330)	0.043	0.005
6	0.50	0.10	0.048	(0.329)	0.043	0.005
7	0.58	0.10	0.048	(0.327)	0.043	0.005
8	0.67	0.10	0.048	(0.326)	0.043	0.005
9	0.75	0.10	0.048	(0.325)	0.043	0.005
10	0.83	0.13	0.064	(0.324)	0.058	0.006
11	0.92	0.13	0.064	(0.322)	0.058	0.006
12	1.00	0.13	0.064	(0.321)	0.058	0.006
13	1.08	0.10	0.048	(0.320)	0.043	0.005
14	1.17	0.10	0.048	(0.318)	0.043	0.005
15	1.25	0.10	0.048	(0.317)	0.043	0.005
16	1.33	0.10	0.048	(0.316)	0.043	0.005
17	1.42	0.10	0.048	(0.315)	0.043	0.005
18	1.50	0.10	0.048	(0.313)	0.043	0.005
19	1.58	0.10	0.048	(0.312)	0.043	0.005
20	1.67	0.10	0.048	(0.311)	0.043	0.005
21	1.75	0.10	0.048	(0.310)	0.043	0.005
22	1.83	0.13	0.064	(0.308)	0.058	0.006
23	1.92	0.13	0.064	(0.307)	0.058	0.006
24	2.00	0.13	0.064	(0.306)	0.058	0.006
25	2.08	0.13	0.064	(0.305)	0.058	0.006
26	2.17	0.13	0.064	(0.303)	0.058	0.006
27	2.25	0.13	0.064	(0.302)	0.058	0.006
28	2.33	0.13	0.064	(0.301)	0.058	0.006
29	2.42	0.13	0.064	(0.300)	0.058	0.006
30	2.50	0.13	0.064	(0.299)	0.058	0.006
31	2.58	0.17	0.080	(0.297)	0.072	0.008
32	2.67	0.17	0.080	(0.296)	0.072	0.008
33	2.75	0.17	0.080	(0.295)	0.072	0.008
34	2.83	0.17	0.080	(0.294)	0.072	0.008
35	2.92	0.17	0.080	(0.292)	0.072	0.008

36	3.00	0.17	0.080	(0.291)	0.072	0.008
37	3.08	0.17	0.080	(0.290)	0.072	0.008
38	3.17	0.17	0.080	(0.289)	0.072	0.008
39	3.25	0.17	0.080	(0.288)	0.072	0.008
40	3.33	0.17	0.080	(0.286)	0.072	0.008
41	3.42	0.17	0.080	(0.285)	0.072	0.008
42	3.50	0.17	0.080	(0.284)	0.072	0.008
43	3.58	0.17	0.080	(0.283)	0.072	0.008
44	3.67	0.17	0.080	(0.282)	0.072	0.008
45	3.75	0.17	0.080	(0.281)	0.072	0.008
46	3.83	0.20	0.096	(0.279)	0.086	0.010
47	3.92	0.20	0.096	(0.278)	0.086	0.010
48	4.00	0.20	0.096	(0.277)	0.086	0.010
49	4.08	0.20	0.096	(0.276)	0.086	0.010
50	4.17	0.20	0.096	(0.275)	0.086	0.010
51	4.25	0.20	0.096	(0.273)	0.086	0.010
52	4.33	0.23	0.112	(0.272)	0.101	0.011
53	4.42	0.23	0.112	(0.271)	0.101	0.011
54	4.50	0.23	0.112	(0.270)	0.101	0.011
55	4.58	0.23	0.112	(0.269)	0.101	0.011
56	4.67	0.23	0.112	(0.268)	0.101	0.011
57	4.75	0.23	0.112	(0.267)	0.101	0.011
58	4.83	0.27	0.128	(0.265)	0.115	0.013
59	4.92	0.27	0.128	(0.264)	0.115	0.013
60	5.00	0.27	0.128	(0.263)	0.115	0.013
61	5.08	0.20	0.096	(0.262)	0.086	0.010
62	5.17	0.20	0.096	(0.261)	0.086	0.010
63	5.25	0.20	0.096	(0.260)	0.086	0.010
64	5.33	0.23	0.112	(0.259)	0.101	0.011
65	5.42	0.23	0.112	(0.257)	0.101	0.011
66	5.50	0.23	0.112	(0.256)	0.101	0.011
67	5.58	0.27	0.128	(0.255)	0.115	0.013
68	5.67	0.27	0.128	(0.254)	0.115	0.013
69	5.75	0.27	0.128	(0.253)	0.115	0.013
70	5.83	0.27	0.128	(0.252)	0.115	0.013
71	5.92	0.27	0.128	(0.251)	0.115	0.013
72	6.00	0.27	0.128	(0.250)	0.115	0.013
73	6.08	0.30	0.144	(0.248)	0.130	0.014
74	6.17	0.30	0.144	(0.247)	0.130	0.014
75	6.25	0.30	0.144	(0.246)	0.130	0.014
76	6.33	0.30	0.144	(0.245)	0.130	0.014
77	6.42	0.30	0.144	(0.244)	0.130	0.014
78	6.50	0.30	0.144	(0.243)	0.130	0.014
79	6.58	0.33	0.160	(0.242)	0.144	0.016
80	6.67	0.33	0.160	(0.241)	0.144	0.016
81	6.75	0.33	0.160	(0.240)	0.144	0.016
82	6.83	0.33	0.160	(0.239)	0.144	0.016
83	6.92	0.33	0.160	(0.238)	0.144	0.016
84	7.00	0.33	0.160	(0.236)	0.144	0.016
85	7.08	0.33	0.160	(0.235)	0.144	0.016
86	7.17	0.33	0.160	(0.234)	0.144	0.016
87	7.25	0.33	0.160	(0.233)	0.144	0.016
88	7.33	0.37	0.176	(0.232)	0.158	0.018
89	7.42	0.37	0.176	(0.231)	0.158	0.018
90	7.50	0.37	0.176	(0.230)	0.158	0.018
91	7.58	0.40	0.192	(0.229)	0.173	0.019
92	7.67	0.40	0.192	(0.228)	0.173	0.019
93	7.75	0.40	0.192	(0.227)	0.173	0.019
94	7.83	0.43	0.208	(0.226)	0.187	0.021
95	7.92	0.43	0.208	(0.225)	0.187	0.021
96	8.00	0.43	0.208	(0.224)	0.187	0.021
97	8.08	0.50	0.240	(0.223)	0.216	0.024
98	8.17	0.50	0.240	(0.222)	0.216	0.024
99	8.25	0.50	0.240	(0.221)	0.216	0.024
100	8.33	0.50	0.240	(0.220)	0.216	0.024
101	8.42	0.50	0.240	(0.219)	0.216	0.024
102	8.50	0.50	0.240	(0.218)	0.216	0.024
103	8.58	0.53	0.256	0.217	(0.230)	0.039
104	8.67	0.53	0.256	0.216	(0.230)	0.040
105	8.75	0.53	0.256	0.214	(0.230)	0.041
106	8.83	0.57	0.272	0.213	(0.245)	0.058
107	8.92	0.57	0.272	0.212	(0.245)	0.059
108	9.00	0.57	0.272	0.211	(0.245)	0.060

109	9.08	0.63	0.304	0.210	(0.274)	0.093
110	9.17	0.63	0.304	0.209	(0.274)	0.094
111	9.25	0.63	0.304	0.208	(0.274)	0.095
112	9.33	0.67	0.320	0.207	(0.288)	0.112
113	9.42	0.67	0.320	0.206	(0.288)	0.113
114	9.50	0.67	0.320	0.205	(0.288)	0.114
115	9.58	0.70	0.336	0.205	(0.302)	0.131
116	9.67	0.70	0.336	0.204	(0.302)	0.132
117	9.75	0.70	0.336	0.203	(0.302)	0.133
118	9.83	0.73	0.352	0.202	(0.317)	0.150
119	9.92	0.73	0.352	0.201	(0.317)	0.151
120	10.00	0.73	0.352	0.200	(0.317)	0.152
121	10.08	0.50	0.240	0.199	(0.216)	0.041
122	10.17	0.50	0.240	0.198	(0.216)	0.042
123	10.25	0.50	0.240	0.197	(0.216)	0.043
124	10.33	0.50	0.240	0.196	(0.216)	0.044
125	10.42	0.50	0.240	0.195	(0.216)	0.045
126	10.50	0.50	0.240	0.194	(0.216)	0.046
127	10.58	0.67	0.320	0.193	(0.288)	0.127
128	10.67	0.67	0.320	0.192	(0.288)	0.128
129	10.75	0.67	0.320	0.191	(0.288)	0.129
130	10.83	0.67	0.320	0.190	(0.288)	0.130
131	10.92	0.67	0.320	0.189	(0.288)	0.131
132	11.00	0.67	0.320	0.188	(0.288)	0.132
133	11.08	0.63	0.304	0.187	(0.274)	0.117
134	11.17	0.63	0.304	0.186	(0.274)	0.118
135	11.25	0.63	0.304	0.185	(0.274)	0.118
136	11.33	0.63	0.304	0.185	(0.274)	0.119
137	11.42	0.63	0.304	0.184	(0.274)	0.120
138	11.50	0.63	0.304	0.183	(0.274)	0.121
139	11.58	0.57	0.272	0.182	(0.245)	0.090
140	11.67	0.57	0.272	0.181	(0.245)	0.091
141	11.75	0.57	0.272	0.180	(0.245)	0.092
142	11.83	0.60	0.288	0.179	(0.259)	0.109
143	11.92	0.60	0.288	0.178	(0.259)	0.110
144	12.00	0.60	0.288	0.177	(0.259)	0.111
145	12.08	0.83	0.400	0.176	(0.360)	0.223
146	12.17	0.83	0.400	0.176	(0.360)	0.224
147	12.25	0.83	0.400	0.175	(0.360)	0.225
148	12.33	0.87	0.416	0.174	(0.374)	0.242
149	12.42	0.87	0.416	0.173	(0.374)	0.243
150	12.50	0.87	0.416	0.172	(0.374)	0.244
151	12.58	0.93	0.448	0.171	(0.403)	0.277
152	12.67	0.93	0.448	0.170	(0.403)	0.278
153	12.75	0.93	0.448	0.170	(0.403)	0.278
154	12.83	0.97	0.464	0.169	(0.418)	0.295
155	12.92	0.97	0.464	0.168	(0.418)	0.296
156	13.00	0.97	0.464	0.167	(0.418)	0.297
157	13.08	1.13	0.544	0.166	(0.490)	0.378
158	13.17	1.13	0.544	0.165	(0.490)	0.379
159	13.25	1.13	0.544	0.164	(0.490)	0.379
160	13.33	1.13	0.544	0.164	(0.490)	0.380
161	13.42	1.13	0.544	0.163	(0.490)	0.381
162	13.50	1.13	0.544	0.162	(0.490)	0.382
163	13.58	0.77	0.368	0.161	(0.331)	0.207
164	13.67	0.77	0.368	0.160	(0.331)	0.208
165	13.75	0.77	0.368	0.159	(0.331)	0.208
166	13.83	0.77	0.368	0.159	(0.331)	0.209
167	13.92	0.77	0.368	0.158	(0.331)	0.210
168	14.00	0.77	0.368	0.157	(0.331)	0.211
169	14.08	0.90	0.432	0.156	(0.389)	0.276
170	14.17	0.90	0.432	0.155	(0.389)	0.276
171	14.25	0.90	0.432	0.155	(0.389)	0.277
172	14.33	0.87	0.416	0.154	(0.374)	0.262
173	14.42	0.87	0.416	0.153	(0.374)	0.263
174	14.50	0.87	0.416	0.152	(0.374)	0.264
175	14.58	0.87	0.416	0.151	(0.374)	0.264
176	14.67	0.87	0.416	0.151	(0.374)	0.265
177	14.75	0.87	0.416	0.150	(0.374)	0.266
178	14.83	0.83	0.400	0.149	(0.360)	0.251
179	14.92	0.83	0.400	0.148	(0.360)	0.252
180	15.00	0.83	0.400	0.148	(0.360)	0.252
181	15.08	0.80	0.384	0.147	(0.346)	0.237

182	15.17	0.80	0.384	0.146	(0.346)	0.238
183	15.25	0.80	0.384	0.145	(0.346)	0.239
184	15.33	0.77	0.368	0.145	(0.331)	0.223
185	15.42	0.77	0.368	0.144	(0.331)	0.224
186	15.50	0.77	0.368	0.143	(0.331)	0.225
187	15.58	0.63	0.304	0.142	(0.274)	0.162
188	15.67	0.63	0.304	0.142	(0.274)	0.162
189	15.75	0.63	0.304	0.141	(0.274)	0.163
190	15.83	0.63	0.304	0.140	(0.274)	0.164
191	15.92	0.63	0.304	0.140	(0.274)	0.164
192	16.00	0.63	0.304	0.139	(0.274)	0.165
193	16.08	0.13	0.064	(0.138)	0.058	0.006
194	16.17	0.13	0.064	(0.137)	0.058	0.006
195	16.25	0.13	0.064	(0.137)	0.058	0.006
196	16.33	0.13	0.064	(0.136)	0.058	0.006
197	16.42	0.13	0.064	(0.135)	0.058	0.006
198	16.50	0.13	0.064	(0.135)	0.058	0.006
199	16.58	0.10	0.048	(0.134)	0.043	0.005
200	16.67	0.10	0.048	(0.133)	0.043	0.005
201	16.75	0.10	0.048	(0.133)	0.043	0.005
202	16.83	0.10	0.048	(0.132)	0.043	0.005
203	16.92	0.10	0.048	(0.131)	0.043	0.005
204	17.00	0.10	0.048	(0.131)	0.043	0.005
205	17.08	0.17	0.080	(0.130)	0.072	0.008
206	17.17	0.17	0.080	(0.129)	0.072	0.008
207	17.25	0.17	0.080	(0.129)	0.072	0.008
208	17.33	0.17	0.080	(0.128)	0.072	0.008
209	17.42	0.17	0.080	(0.127)	0.072	0.008
210	17.50	0.17	0.080	(0.127)	0.072	0.008
211	17.58	0.17	0.080	(0.126)	0.072	0.008
212	17.67	0.17	0.080	(0.125)	0.072	0.008
213	17.75	0.17	0.080	(0.125)	0.072	0.008
214	17.83	0.13	0.064	(0.124)	0.058	0.006
215	17.92	0.13	0.064	(0.124)	0.058	0.006
216	18.00	0.13	0.064	(0.123)	0.058	0.006
217	18.08	0.13	0.064	(0.122)	0.058	0.006
218	18.17	0.13	0.064	(0.122)	0.058	0.006
219	18.25	0.13	0.064	(0.121)	0.058	0.006
220	18.33	0.13	0.064	(0.121)	0.058	0.006
221	18.42	0.13	0.064	(0.120)	0.058	0.006
222	18.50	0.13	0.064	(0.119)	0.058	0.006
223	18.58	0.10	0.048	(0.119)	0.043	0.005
224	18.67	0.10	0.048	(0.118)	0.043	0.005
225	18.75	0.10	0.048	(0.118)	0.043	0.005
226	18.83	0.07	0.032	(0.117)	0.029	0.003
227	18.92	0.07	0.032	(0.117)	0.029	0.003
228	19.00	0.07	0.032	(0.116)	0.029	0.003
229	19.08	0.10	0.048	(0.115)	0.043	0.005
230	19.17	0.10	0.048	(0.115)	0.043	0.005
231	19.25	0.10	0.048	(0.114)	0.043	0.005
232	19.33	0.13	0.064	(0.114)	0.058	0.006
233	19.42	0.13	0.064	(0.113)	0.058	0.006
234	19.50	0.13	0.064	(0.113)	0.058	0.006
235	19.58	0.10	0.048	(0.112)	0.043	0.005
236	19.67	0.10	0.048	(0.112)	0.043	0.005
237	19.75	0.10	0.048	(0.111)	0.043	0.005
238	19.83	0.07	0.032	(0.111)	0.029	0.003
239	19.92	0.07	0.032	(0.110)	0.029	0.003
240	20.00	0.07	0.032	(0.110)	0.029	0.003
241	20.08	0.10	0.048	(0.109)	0.043	0.005
242	20.17	0.10	0.048	(0.109)	0.043	0.005
243	20.25	0.10	0.048	(0.108)	0.043	0.005
244	20.33	0.10	0.048	(0.108)	0.043	0.005
245	20.42	0.10	0.048	(0.107)	0.043	0.005
246	20.50	0.10	0.048	(0.107)	0.043	0.005
247	20.58	0.10	0.048	(0.107)	0.043	0.005
248	20.67	0.10	0.048	(0.106)	0.043	0.005
249	20.75	0.10	0.048	(0.106)	0.043	0.005
250	20.83	0.07	0.032	(0.105)	0.029	0.003
251	20.92	0.07	0.032	(0.105)	0.029	0.003
252	21.00	0.07	0.032	(0.104)	0.029	0.003
253	21.08	0.10	0.048	(0.104)	0.043	0.005
254	21.17	0.10	0.048	(0.104)	0.043	0.005

```
255  21.25     0.10      0.048       (  0.103)       0.043        0.005
256  21.33     0.07      0.032       (  0.103)       0.029        0.003
257  21.42     0.07      0.032       (  0.102)       0.029        0.003
258  21.50     0.07      0.032       (  0.102)       0.029        0.003
259  21.58     0.10      0.048       (  0.102)       0.043        0.005
260  21.67     0.10      0.048       (  0.101)       0.043        0.005
261  21.75     0.10      0.048       (  0.101)       0.043        0.005
262  21.83     0.07      0.032       (  0.101)       0.029        0.003
263  21.92     0.07      0.032       (  0.100)       0.029        0.003
264  22.00     0.07      0.032       (  0.100)       0.029        0.003
265  22.08     0.10      0.048       (  0.099)       0.043        0.005
266  22.17     0.10      0.048       (  0.099)       0.043        0.005
267  22.25     0.10      0.048       (  0.099)       0.043        0.005
268  22.33     0.07      0.032       (  0.099)       0.029        0.003
269  22.42     0.07      0.032       (  0.098)       0.029        0.003
270  22.50     0.07      0.032       (  0.098)       0.029        0.003
271  22.58     0.07      0.032       (  0.098)       0.029        0.003
272  22.67     0.07      0.032       (  0.097)       0.029        0.003
273  22.75     0.07      0.032       (  0.097)       0.029        0.003
274  22.83     0.07      0.032       (  0.097)       0.029        0.003
275  22.92     0.07      0.032       (  0.097)       0.029        0.003
276  23.00     0.07      0.032       (  0.096)       0.029        0.003
277  23.08     0.07      0.032       (  0.096)       0.029        0.003
278  23.17     0.07      0.032       (  0.096)       0.029        0.003
279  23.25     0.07      0.032       (  0.096)       0.029        0.003
280  23.33     0.07      0.032       (  0.096)       0.029        0.003
281  23.42     0.07      0.032       (  0.095)       0.029        0.003
282  23.50     0.07      0.032       (  0.095)       0.029        0.003
283  23.58     0.07      0.032       (  0.095)       0.029        0.003
284  23.67     0.07      0.032       (  0.095)       0.029        0.003
285  23.75     0.07      0.032       (  0.095)       0.029        0.003
286  23.83     0.07      0.032       (  0.095)       0.029        0.003
287  23.92     0.07      0.032       (  0.095)       0.029        0.003
288  24.00     0.07      0.032       (  0.095)       0.029        0.003
                (Loss Rate Not Used)
    Sum =     100.0                                  Sum =    17.9
      Flood volume = Effective rainfall      1.49(In)
       times area      89.6(Ac.)/[(In)/(Ft.)] =      11.1(Ac.Ft)
      Total soil loss =      2.51(In)
      Total soil loss =    18.720(Ac.Ft)
      Total rainfall =      4.00(In)
      Flood volume =      485326.7 Cubic Feet
      Total soil loss =      815437.6 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     33.801(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       10.0      20.0      30.0      40.0
 ---------------------------------------------------------------------------
   0+ 5       0.0002      0.03  Q          |         |         |         |
   0+10       0.0013      0.15  Q          |         |         |         |
   0+15       0.0028      0.22  Q          |         |         |         |
   0+20       0.0046      0.26  Q          |         |         |         |
   0+25       0.0069      0.33  Q          |         |         |         |
   0+30       0.0095      0.38  Q          |         |         |         |
   0+35       0.0122      0.40  Q          |         |         |         |
   0+40       0.0150      0.41  Q          |         |         |         |
   0+45       0.0179      0.42  Q          |         |         |         |
   0+50       0.0209      0.44  Q          |         |         |         |
   0+55       0.0244      0.51  Q          |         |         |         |
   1+ 0       0.0281      0.54  Q          |         |         |         |
   1+ 5       0.0318      0.54  Q          |         |         |         |
   1+10       0.0352      0.49  Q          |         |         |         |
   1+15       0.0383      0.46  Q          |         |         |         |
   1+20       0.0414      0.45  Q          |         |         |         |
   1+25       0.0445      0.44  Q          |         |         |         |
   1+30       0.0475      0.44  Q          |         |         |         |
```

1+35	0.0505	0.44	Q	|	|	|	|
1+40	0.0536	0.44	Q	|	|	|	|
1+45	0.0566	0.44	Q	|	|	|	|
1+50	0.0597	0.45	Q	|	|	|	|
1+55	0.0632	0.51	Q	|	|	|	|
2+ 0	0.0669	0.54	Q	|	|	|	|
2+ 5	0.0707	0.55	Q	|	|	|	|
2+10	0.0746	0.56	Q	|	|	|	|
2+15	0.0785	0.57	Q	|	|	|	|
2+20	0.0825	0.57	Q	|	|	|	|
2+25	0.0864	0.57	Q	|	|	|	|
2+30	0.0904	0.58	Q	|	|	|	|
2+35	0.0945	0.59	Q	|	|	|	|
2+40	0.0990	0.65	Q	|	|	|	|
2+45	0.1037	0.69	Q	|	|	|	|
2+50	0.1085	0.70	Q	|	|	|	|
2+55	0.1134	0.71	Q	|	|	|	|
3+ 0	0.1183	0.71	Q	|	|	|	|
3+ 5	0.1232	0.72	Q	|	|	|	|
3+10	0.1282	0.72	Q	|	|	|	|
3+15	0.1331	0.72	Q	|	|	|	|
3+20	0.1381	0.72	Q	|	|	|	|
3+25	0.1431	0.72	Q	|	|	|	|
3+30	0.1480	0.72	Q	|	|	|	|
3+35	0.1530	0.72	Q	|	|	|	|
3+40	0.1580	0.72	Q	|	|	|	|
3+45	0.1630	0.72	Q	|	|	|	|
3+50	0.1681	0.74	Q	|	|	|	|
3+55	0.1736	0.80	Q	|	|	|	|
4+ 0	0.1793	0.83	Q	|	|	|	|
4+ 5	0.1851	0.84	Q	|	|	|	|
4+10	0.1910	0.85	Q	|	|	|	|
4+15	0.1969	0.86	Q	|	|	|	|
4+20	0.2029	0.88	Q	|	|	|	|
4+25	0.2094	0.94	Q	|	|	|	|
4+30	0.2161	0.97	Q	|	|	|	|
4+35	0.2229	0.99	Q	|	|	|	|
4+40	0.2297	1.00	Q	|	|	|	|
4+45	0.2366	1.00	VQ	|	|	|	|
4+50	0.2437	1.02	VQ	|	|	|	|
4+55	0.2511	1.08	VQ	|	|	|	|
5+ 0	0.2588	1.12	VQ	|	|	|	|
5+ 5	0.2664	1.10	VQ	|	|	|	|
5+10	0.2732	0.99	Q	|	|	|	|
5+15	0.2796	0.93	QV	|	|	|	|
5+20	0.2859	0.92	QV	|	|	|	|
5+25	0.2926	0.97	QV	|	|	|	|
5+30	0.2995	0.99	QV	|	|	|	|
5+35	0.3065	1.02	|Q	|	|	|	|
5+40	0.3139	1.08	|Q	|	|	|	|
5+45	0.3216	1.12	|Q	|	|	|	|
5+50	0.3294	1.13	|Q	|	|	|	|
5+55	0.3372	1.14	|Q	|	|	|	|
6+ 0	0.3451	1.14	|Q	|	|	|	|
6+ 5	0.3531	1.16	|Q	|	|	|	|
6+10	0.3616	1.23	|Q	|	|	|	|
6+15	0.3703	1.26	|Q	|	|	|	|
6+20	0.3791	1.28	|Q	|	|	|	|
6+25	0.3879	1.29	|Q	|	|	|	|
6+30	0.3968	1.29	|Q	|	|	|	|
6+35	0.4058	1.31	|Q	|	|	|	|
6+40	0.4153	1.37	|Q	|	|	|	|
6+45	0.4250	1.41	|Q	|	|	|	|
6+50	0.4347	1.42	|Q	|	|	|	|
6+55	0.4446	1.43	|Q	|	|	|	|
7+ 0	0.4545	1.43	|Q	|	|	|	|
7+ 5	0.4644	1.44	|Q	|	|	|	|
7+10	0.4743	1.44	|Q	|	|	|	|
7+15	0.4842	1.44	|Q	|	|	|	|
7+20	0.4943	1.46	|Q	|	|	|	|
7+25	0.5048	1.52	|Q	|	|	|	|
7+30	0.5155	1.55	|Q	|	|	|	|
7+35	0.5264	1.58	|Q	|	|	|	|

```
 7+40      0.5377     1.65  |Q        |         |         |         |
 7+45      0.5494     1.69  |Q        |         |         |         |
 7+50      0.5612     1.72  |QV       |         |         |         |
 7+55      0.5736     1.79  |QV       |         |         |         |
 8+ 0      0.5862     1.83  |QV       |         |         |         |
 8+ 5      0.5991     1.88  |QV       |         |         |         |
 8+10      0.6130     2.01  | Q       |         |         |         |
 8+15      0.6273     2.08  | Q       |         |         |         |
 8+20      0.6419     2.11  | Q       |         |         |         |
 8+25      0.6566     2.13  | Q       |         |         |         |
 8+30      0.6713     2.14  | Q       |         |         |         |
 8+35      0.6872     2.31  | Q       |         |         |         |
 8+40      0.7073     2.91  | Q       |         |         |         |
 8+45      0.7298     3.27  | VQ      |         |         |         |
 8+50      0.7548     3.63  | VQ      |         |         |         |
 8+55      0.7850     4.39  | V Q     |         |         |         |
 9+ 0      0.8183     4.83  | V Q     |         |         |         |
 9+ 5      0.8556     5.41  |  V Q    |         |         |         |
 9+10      0.9024     6.80  |  V  Q   |         |         |         |
 9+15      0.9547     7.59  |  V   Q  |         |         |         |
 9+20      1.0108     8.15  |  V    Q |         |         |         |
 9+25      1.0730     9.03  |  V     Q|         |         |         |
 9+30      1.1389     9.56  |   V    Q|         |         |         |
 9+35      1.2079    10.02  |   V     Q         |         |         |
 9+40      1.2826    10.86  |   V     Q         |         |         |
 9+45      1.3608    11.35  |   V     |Q        |         |         |
 9+50      1.4420    11.79  |    V    |Q        |         |         |
 9+55      1.5289    12.61  |    V    | Q       |         |         |
10+ 0      1.6190    13.09  |    V    |  Q      |         |         |
10+ 5      1.7030    12.19  |     V   | Q       |         |         |
10+10      1.7593     8.18  |     V Q |         |         |         |
10+15      1.8013     6.10  |     Q   |         |         |         |
10+20      1.8381     5.35  |    QV   |         |         |         |
10+25      1.8722     4.94  |   Q V   |         |         |         |
10+30      1.9045     4.70  |   Q V   |         |         |         |
10+35      1.9416     5.38  |    QV   |         |         |         |
10+40      1.9988     8.32  |      VQ |         |         |         |
10+45      2.0668     9.87  |      V Q|         |         |         |
10+50      2.1391    10.50  |      V  Q         |         |         |
10+55      2.2139    10.86  |      V  Q         |         |         |
11+ 0      2.2910    11.20  |       V |Q        |         |         |
11+ 5      2.3687    11.29  |       V |Q        |         |         |
11+10      2.4438    10.90  |       V Q         |         |         |
11+15      2.5178    10.75  |        VQ         |         |         |
11+20      2.5920    10.77  |        VQ         |         |         |
11+25      2.6667    10.85  |        VQ         |         |         |
11+30      2.7417    10.89  |        VQ         |         |         |
11+35      2.8147    10.60  |         Q         |         |         |
11+40      2.8798     9.45  |        QV         |         |         |
11+45      2.9410     8.88  |       Q V         |         |         |
11+50      3.0020     8.86  |       Q V         |         |         |
11+55      3.0666     9.38  |        Q|V        |         |         |
12+ 0      3.1333     9.68  |        Q|V        |         |         |
12+ 5      3.2089    10.98  |         QV        |         |         |
12+10      3.3142    15.30  |         |V   Q    |         |         |
12+15      3.4356    17.62  |         | V    Q  |         |         |
12+20      3.5648    18.76  |         | V     Q |         |         |
12+25      3.7024    19.98  |         |  V     Q|         |         |
12+30      3.8453    20.74  |         |  V      Q         |         |
12+35      3.9935    21.53  |         |   V     |Q        |         |
12+40      4.1525    23.09  |         |   V     |  Q      |         |
12+45      4.3177    23.98  |         |    V    |  Q      |         |
12+50      4.4871    24.60  |         |     V   |   Q     |         |
12+55      4.6631    25.56  |         |     V   |    Q    |         |
13+ 0      4.8427    26.08  |         |      V  |     Q   |         |
13+ 5      5.0300    27.19  |         |       V |      Q  |         |
13+10      5.2395    30.42  |         |       V |         Q         |
13+15      5.4611    32.18  |         |        V|         | Q       |
13+20      5.6879    32.94  |         |         V         | Q       |
13+25      5.9184    33.46  |         |         |V        |  Q      |
13+30      6.1512    33.80  |         |         | V       |  Q      |
13+35      6.3732    32.24  |         |         | V       | Q       |
13+40      6.5510    25.83  |         |         |  V Q    |         |
```

```
13+45      6.7059     22.49  |          |          | Q V      |          |
13+50      6.8522     21.23  |          |          |Q  V      |          |
13+55      6.9936     20.54  |          |          Q    V     |          |
14+ 0      7.1318     20.07  |          |          Q    V     |          |
14+ 5      7.2725     20.42  |          |          Q     V    |          |
14+10      7.4283     22.62  |          |          | Q   V    |          |
14+15      7.5920     23.77  |          |          |  Q   V   |          |
14+20      7.7576     24.05  |          |          |   Q  V   |          |
14+25      7.9205     23.66  |          |          |  Q    V  |          |
14+30      8.0831     23.61  |          |          |  Q     V|          |
14+35      8.2463     23.69  |          |          |  Q     V|          |
14+40      8.4101     23.79  |          |          |  Q      V          |
14+45      8.5746     23.88  |          |          |  Q      V          |
14+50      8.7385     23.80  |          |          |  Q      |V         |
14+55      8.8990     23.30  |          |          |  Q      |V         |
15+ 0      9.0577     23.04  |          |          |  Q      | V        |
15+ 5      9.2147     22.80  |          |          | Q       |  V       |
15+10      9.3674     22.18  |          |          | Q       |  V       |
15+15      9.5181     21.87  |          |          |Q        |   V      |
15+20      9.6669     21.62  |          |          |Q        |   V      |
15+25      9.8114     20.98  |          |          Q         |    V     |
15+30      9.9537     20.66  |          |          Q         |    V     |
15+35     10.0907     19.89  |          |         Q|         |     V    |
15+40     10.2108     17.43  |          |       Q  |         |     V    |
15+45     10.3220     16.15  |          |     Q    |         |      V   |
15+50     10.4299     15.67  |          |    Q     |         |      V   |
15+55     10.5359     15.39  |          |    Q     |         |      V   |
16+ 0     10.6408     15.23  |          |    Q     |         |       V  |
16+ 5     10.7338     13.50  |          |  Q       |         |       V  |
16+10     10.7850      7.43  |        Q |          |         |       V  |
16+15     10.8140      4.21  |    Q     |          |         |       V  |
16+20     10.8341      2.92  | Q        |          |         |       V  |
16+25     10.8486      2.11  | Q        |          |         |       V  |
16+30     10.8598      1.62  |Q         |          |         |       V  |
16+35     10.8685      1.26  |Q         |          |         |        V|
16+40     10.8750      0.95  Q          |          |         |        V|
16+45     10.8801      0.74  Q          |          |         |        V|
16+50     10.8843      0.61  Q          |          |         |        V|
16+55     10.8874      0.45  Q          |          |         |        V|
17+ 0     10.8905      0.44  Q          |          |         |        V|
17+ 5     10.8937      0.47  Q          |          |         |        V|
17+10     10.8978      0.59  Q          |          |         |        V|
17+15     10.9023      0.65  Q          |          |         |        V|
17+20     10.9070      0.68  Q          |          |         |        V|
17+25     10.9117      0.69  Q          |          |         |        V|
17+30     10.9166      0.70  Q          |          |         |        V|
17+35     10.9214      0.71  Q          |          |         |        V|
17+40     10.9264      0.71  Q          |          |         |        V|
17+45     10.9313      0.72  Q          |          |         |        V|
17+50     10.9361      0.70  Q          |          |         |        V|
17+55     10.9406      0.65  Q          |          |         |        V|
18+ 0     10.9448      0.61  Q          |          |         |        V|
18+ 5     10.9490      0.60  Q          |          |         |        V|
18+10     10.9530      0.59  Q          |          |         |        V|
18+15     10.9571      0.59  Q          |          |         |        V|
18+20     10.9611      0.59  Q          |          |         |        V|
18+25     10.9651      0.58  Q          |          |         |        V|
18+30     10.9691      0.58  Q          |          |         |        V|
18+35     10.9730      0.56  Q          |          |         |        V|
18+40     10.9765      0.50  Q          |          |         |        V|
18+45     10.9797      0.47  Q          |          |         |        V|
18+50     10.9827      0.44  Q          |          |         |        V|
18+55     10.9853      0.37  Q          |          |         |        V|
19+ 0     10.9876      0.34  Q          |          |         |        V|
19+ 5     10.9899      0.34  Q          |          |         |        V|
19+10     10.9926      0.39  Q          |          |         |        V|
19+15     10.9954      0.41  Q          |          |         |        V|
19+20     10.9984      0.44  Q          |          |         |        V|
19+25     11.0019      0.50  Q          |          |         |        V|
19+30     11.0055      0.53  Q          |          |         |        V|
19+35     11.0092      0.53  Q          |          |         |        V|
19+40     11.0125      0.48  Q          |          |         |        V|
19+45     11.0157      0.46  Q          |          |         |        V|
```

19+50	11.0186	0.43	Q	|	|	|	V|
19+55	11.0212	0.37	Q	|	|	|	V|
20+ 0	11.0235	0.33	Q	|	|	|	V|
20+ 5	11.0258	0.33	Q	|	|	|	V|
20+10	11.0284	0.39	Q	|	|	|	V|
20+15	11.0313	0.41	Q	|	|	|	V|
20+20	11.0341	0.42	Q	|	|	|	V|
20+25	11.0370	0.42	Q	|	|	|	V|
20+30	11.0400	0.43	Q	|	|	|	V|
20+35	11.0429	0.43	Q	|	|	|	V|
20+40	11.0459	0.43	Q	|	|	|	V|
20+45	11.0488	0.43	Q	|	|	|	V|
20+50	11.0517	0.42	Q	|	|	|	V|
20+55	11.0542	0.36	Q	|	|	|	V|
21+ 0	11.0564	0.32	Q	|	|	|	V|
21+ 5	11.0587	0.33	Q	|	|	|	V|
21+10	11.0613	0.38	Q	|	|	|	V|
21+15	11.0641	0.41	Q	|	|	|	V|
21+20	11.0669	0.40	Q	|	|	|	V|
21+25	11.0693	0.35	Q	|	|	|	V|
21+30	11.0714	0.32	Q	|	|	|	V|
21+35	11.0737	0.32	Q	|	|	|	V|
21+40	11.0763	0.38	Q	|	|	|	V|
21+45	11.0791	0.41	Q	|	|	|	V|
21+50	11.0818	0.40	Q	|	|	|	V|
21+55	11.0842	0.35	Q	|	|	|	V|
22+ 0	11.0864	0.32	Q	|	|	|	V|
22+ 5	11.0886	0.32	Q	|	|	|	V|
22+10	11.0912	0.38	Q	|	|	|	V|
22+15	11.0940	0.41	Q	|	|	|	V|
22+20	11.0967	0.40	Q	|	|	|	V|
22+25	11.0991	0.35	Q	|	|	|	V|
22+30	11.1013	0.32	Q	|	|	|	V|
22+35	11.1034	0.31	Q	|	|	|	V|
22+40	11.1055	0.30	Q	|	|	|	V|
22+45	11.1075	0.30	Q	|	|	|	V|
22+50	11.1095	0.29	Q	|	|	|	V|
22+55	11.1116	0.29	Q	|	|	|	V|
23+ 0	11.1136	0.29	Q	|	|	|	V|
23+ 5	11.1156	0.29	Q	|	|	|	V|
23+10	11.1176	0.29	Q	|	|	|	V|
23+15	11.1196	0.29	Q	|	|	|	V|
23+20	11.1216	0.29	Q	|	|	|	V|
23+25	11.1235	0.29	Q	|	|	|	V|
23+30	11.1255	0.29	Q	|	|	|	V|
23+35	11.1275	0.29	Q	|	|	|	V|
23+40	11.1295	0.29	Q	|	|	|	V|
23+45	11.1315	0.29	Q	|	|	|	V|
23+50	11.1335	0.29	Q	|	|	|	V|
23+55	11.1355	0.29	Q	|	|	|	V|
24+ 0	11.1375	0.29	Q	|	|	|	V|
24+ 5	11.1392	0.26	Q	|	|	|	V|
24+10	11.1402	0.14	Q	|	|	|	V|
24+15	11.1407	0.07	Q	|	|	|	V|
24+20	11.1410	0.05	Q	|	|	|	V|
24+25	11.1412	0.03	Q	|	|	|	V|
24+30	11.1413	0.02	Q	|	|	|	V|
24+35	11.1414	0.01	Q	|	|	|	V|
24+40	11.1415	0.01	Q	|	|	|	V|
24+45	11.1415	0.01	Q	|	|	|	V|
24+50	11.1416	0.00	Q	|	|	|	V|

Area 'A' – 10 Year 1 Hour Proposed Condition – Unit Hydrograph

```
        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  06/13/20 File: PRA010110.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6407

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'A'
PROPOSED CONDITION UNIT HYDROGRAPH - 10 YEAR 1 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE
------------------------------------------------------------------------
Drainage Area =      89.60(Ac.)  =      0.140 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      89.60(Ac.)  =      0.140 Sq. Mi.
Length along longest watercourse =    3028.00(Ft.)
Length along longest watercourse measured to centroid =    1778.00(Ft.)
Length along longest watercourse =      0.573 Mi.
Length along longest watercourse measured to centroid =      0.337 Mi.
Difference in elevation =      81.00(Ft.)
Slope along watercourse =    141.2417 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.075 Hr.
Lag time =     4.51 Min.
25% of lag time =     1.13 Min.
40% of lag time =     1.81 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]
       89.60            0.45                 40.32

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       89.60            1.20                107.52

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    0.450(In)
Area Averaged 100-Year Rainfall =    1.200(In)

Point rain (area averaged) =    0.759(In)
Areal adjustment factor =   99.92 %
Adjusted average point rain =    0.758(In)

Sub-Area Data:
```

```
       Area(Ac.)         Runoff Index   Impervious %
           89.600           55.25         0.850
        Total Area Entered =     89.60(Ac.)


       RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
       AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
       55.3  55.3      0.518     0.850        0.122       1.000      0.122
                                                        Sum (F) =    0.122
       Area averaged mean soil loss (F) (In/Hr) =  0.122
       Minimum soil loss rate ((In/Hr)) =  0.061
       (for 24 hour storm duration)
       Soil low loss rate (decimal) =   0.220
       ------------------------------------------------------------------------
       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        110.764         22.469             20.289
           2   0.167        221.528         48.841             44.103
           3   0.250        332.291         14.220             12.841
           4   0.333        443.055          6.505              5.874
           5   0.417        553.819          3.613              3.263
           6   0.500        664.583          2.239              2.022
           7   0.583        775.346          1.313              1.186
           8   0.667        886.110          0.800              0.723
                                    Sum = 100.000   Sum=       90.300
------------------------------------------------------------------------


 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      0.382       (  0.122)       0.084        0.298
    2   0.17     4.30      0.391       (  0.122)       0.086        0.305
    3   0.25     5.00      0.455       (  0.122)       0.100        0.355
    4   0.33     5.00      0.455       (  0.122)       0.100        0.355
    5   0.42     5.80      0.528       (  0.122)       0.116        0.411
    6   0.50     6.50      0.591          0.122    (  0.130)        0.469
    7   0.58     7.40      0.673          0.122    (  0.148)        0.551
    8   0.67     8.60      0.782          0.122    (  0.172)        0.660
    9   0.75    12.30      1.119          0.122    (  0.246)        0.997
   10   0.83    29.10      2.647          0.122    (  0.582)        2.525
   11   0.92     6.80      0.618          0.122    (  0.136)        0.497
   12   1.00     5.00      0.455       (  0.122)       0.100        0.355
              (Loss Rate Not Used)
      Sum =     100.0                                   Sum =     7.8
        Flood volume = Effective rainfall      0.65(In)
         times area      89.6(Ac.)/[(In)/(Ft.)] =       4.8(Ac.Ft)
        Total soil loss =      0.11(In)
        Total soil loss =     0.820(Ac.Ft)
        Total rainfall =      0.76(In)
        Flood volume =      210814.5 Cubic Feet
        Total soil loss =       35704.0 Cubic Feet
        ------------------------------------------------------------------
         Peak flow rate of this hydrograph =    141.677(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        50.0      100.0     150.0     200.0
  ----------------------------------------------------------------------------
    0+ 5        0.0417       6.05  VQ         |          |          |          |
    0+10        0.1749      19.34  |V Q       |          |          |          |
    0+15        0.3435      24.49  | V Q      |          |          |          |
    0+20        0.5400      28.52  |   VQ     |          |          |          |
    0+25        0.7557      31.33  |     Q    |          |          |          |
    0+30        1.0031      35.92  |      QV  |          |          |          |
    0+35        1.2882      41.40  |       Q V          |          |          |
    0+40        1.6232      48.63  |         Q|  V       |          |          |
    0+45        2.0496      61.92  |          | Q   V    |          |          |
    0+50        2.8072     110.01  |          |          | QV       |          |
    0+55        3.7830     141.68  |          |          |       Q  |V         |
    1+ 0        4.2756      71.54  |          |   Q      |          |    V     |
    1+ 5        4.5680      42.46  |       Q  |          |          |      V   |
    1+10        4.6983      18.92  |  Q       |          |          |       V  |
    1+15        4.7704      10.47  | Q        |          |          |        V |
    1+20        4.8109       5.88  |Q         |          |          |        V |
    1+25        4.8325       3.13  Q          |          |          |        V |
    1+30        4.8379       0.78  Q          |          |          |        V |
    1+35        4.8396       0.26  Q          |          |          |         V
----------------------------------------------------------------------------
```

Area 'A' – 10 Year 3 Hour Proposed Condition – Unit Hydrograph

```
        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  06/13/20 File: PRA010310.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6407

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'A'
PROPOSED CONDITION UNIT HYDROGRAPH - 10 YEAR 3 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE
------------------------------------------------------------------------
Drainage Area =      89.60(Ac.)  =      0.140 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      89.60(Ac.)  =      0.140 Sq. Mi.
Length along longest watercourse =    3028.00(Ft.)
Length along longest watercourse measured to centroid =    1778.00(Ft.)
Length along longest watercourse =      0.573 Mi.
Length along longest watercourse measured to centroid =      0.337 Mi.
Difference in elevation =      81.00(Ft.)
Slope along watercourse =    141.2417 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.075 Hr.
Lag time =     4.51 Min.
25% of lag time =     1.13 Min.
40% of lag time =     1.81 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]
       89.60            0.80                 71.68

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       89.60            1.80                161.28

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    0.800(In)
Area Averaged 100-Year Rainfall =    1.800(In)

Point rain (area averaged) =    1.211(In)
Areal adjustment factor =   99.96 %
Adjusted average point rain =    1.211(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
```

```
          89.600           55.25         0.850
 Total Area Entered =     89.60(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)       (Dec.)    (In/Hr)
55.3  55.3      0.518     0.850        0.122        1.000      0.122
                                                  Sum (F) =    0.122
Area averaged mean soil loss (F) (In/Hr) =  0.122
Minimum soil loss rate ((In/Hr)) =  0.061
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.220
------------------------------------------------------------------------

               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        110.764         22.469            20.289
     2   0.167        221.528         48.841            44.103
     3   0.250        332.291         14.220            12.841
     4   0.333        443.055          6.505             5.874
     5   0.417        553.819          3.613             3.263
     6   0.500        664.583          2.239             2.022
     7   0.583        775.346          1.313             1.186
     8   0.667        886.110          0.800             0.723
                              Sum = 100.000   Sum=      90.300
------------------------------------------------------------------------
```

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	0.189	(0.122)	0.042	0.147
2	0.17	1.30	0.189	(0.122)	0.042	0.147
3	0.25	1.10	0.160	(0.122)	0.035	0.125
4	0.33	1.50	0.218	(0.122)	0.048	0.170
5	0.42	1.50	0.218	(0.122)	0.048	0.170
6	0.50	1.80	0.262	(0.122)	0.058	0.204
7	0.58	1.50	0.218	(0.122)	0.048	0.170
8	0.67	1.80	0.262	(0.122)	0.058	0.204
9	0.75	1.80	0.262	(0.122)	0.058	0.204
10	0.83	1.50	0.218	(0.122)	0.048	0.170
11	0.92	1.60	0.232	(0.122)	0.051	0.181
12	1.00	1.80	0.262	(0.122)	0.058	0.204
13	1.08	2.20	0.320	(0.122)	0.070	0.249
14	1.17	2.20	0.320	(0.122)	0.070	0.249
15	1.25	2.20	0.320	(0.122)	0.070	0.249
16	1.33	2.00	0.291	(0.122)	0.064	0.227
17	1.42	2.60	0.378	(0.122)	0.083	0.295
18	1.50	2.70	0.392	(0.122)	0.086	0.306
19	1.58	2.40	0.349	(0.122)	0.077	0.272
20	1.67	2.70	0.392	(0.122)	0.086	0.306
21	1.75	3.30	0.480	(0.122)	0.105	0.374
22	1.83	3.10	0.450	(0.122)	0.099	0.351
23	1.92	2.90	0.421	(0.122)	0.093	0.329
24	2.00	3.00	0.436	(0.122)	0.096	0.340
25	2.08	3.10	0.450	(0.122)	0.099	0.351
26	2.17	4.20	0.610	0.122	(0.134)	0.488
27	2.25	5.00	0.727	0.122	(0.160)	0.605
28	2.33	3.50	0.509	(0.122)	0.112	0.397
29	2.42	6.80	0.988	0.122	(0.217)	0.866
30	2.50	7.30	1.061	0.122	(0.233)	0.939
31	2.58	8.20	1.192	0.122	(0.262)	1.070
32	2.67	5.90	0.857	0.122	(0.189)	0.736
33	2.75	2.00	0.291	(0.122)	0.064	0.227
34	2.83	1.80	0.262	(0.122)	0.058	0.204

```
 35   2.92     1.80      0.262       (  0.122)       0.058        0.204
 36   3.00     0.60      0.087       (  0.122)       0.019        0.068
              (Loss Rate Not Used)
    Sum =     100.0                                  Sum =    11.8
      Flood volume = Effective rainfall      0.98(In)
       times area      89.6(Ac.)/[(In)/(Ft.)] =       7.3(Ac.Ft)
      Total soil loss =      0.23(In)
      Total soil loss =     1.700(Ac.Ft)
      Total rainfall =      1.21(In)
      Flood volume =      319798.7 Cubic Feet
      Total soil loss =       74054.9 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     82.639(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       22.5      45.0      67.5      90.0
---------------------------------------------------------------------------
  0+ 5       0.0206      2.99  VQ        |         |         |         |
  0+10       0.0860      9.49  V   Q     |         |         |         |
  0+15       0.1612     10.93  V   Q     |         |         |         |
  0+20       0.2419     11.71  |V   Q    |         |         |         |
  0+25       0.3376     13.90  |V    Q   |         |         |         |
  0+30       0.4433     15.34  | V   Q   |         |         |         |
  0+35       0.5570     16.52  |  V   Q  |         |         |         |
  0+40       0.6696     16.35  |  V   Q  |         |         |         |
  0+45       0.7914     17.68  |   V  Q  |         |         |         |
  0+50       0.9111     17.38  |   V  Q  |         |         |         |
  0+55       1.0233     16.30  |    V Q  |         |         |         |
  1+ 0       1.1397     16.90  |     VQ  |         |         |         |
  1+ 5       1.2693     18.82  |     V Q |         |         |         |
  1+10       1.4145     21.08  |      V Q|         |         |         |
  1+15       1.5646     21.79  |       VQ|         |         |         |
  1+20       1.7138     21.66  |        Q|         |         |         |
  1+25       1.8668     22.22  |        QV         |         |         |
  1+30       2.0409     25.29  |         |Q        |         |         |
  1+35       2.2194     25.91  |         |QV       |         |         |
  1+40       2.3957     25.60  |         |Q V      |         |         |
  1+45       2.5905     28.29  |         | Q V     |         |         |
  1+50       2.8054     31.21  |         |  Q V    |         |         |
  1+55       3.0176     30.80  |         |  Q  V   |         |         |
  2+ 0       3.2259     30.24  |         |  Q   V  |         |         |
  2+ 5       3.4380     30.81  |         |  Q    V |         |         |
  2+10       3.6735     34.18  |         |    Q    V         |         |
  2+15       3.9682     42.79  |         |         Q|V        |         |
  2+20       4.2818     45.54  |         |          Q  V     |         |
  2+25       4.6138     48.21  |         |          |Q   V   |         |
  2+30       5.0882     68.88  |         |          |      V  Q         |
  2+35       5.6408     80.23  |         |          |         V    Q    |
  2+40       6.2099     82.64  |         |          |          |  V  Q   |
  2+45       6.6302     61.02  |         |          |      Q   |     V   |
  2+50       6.8754     35.61  |         |    Q     |          |      V  |
  2+55       7.0619     27.08  |         | Q        |          |       V |
  3+ 0       7.2041     20.64  |        Q|          |          |        V|
  3+ 5       7.2798     11.00  |   Q     |          |          |        V|
  3+10       7.3132      4.84  | Q       |          |          |        V|
  3+15       7.3289      2.28  |Q        |          |          |        V|
  3+20       7.3360      1.04  Q         |          |          |        V|
  3+25       7.3397      0.53  Q         |          |          |        V|
  3+30       7.3412      0.23  Q         |          |          |        V|
  3+35       7.3416      0.05  Q         |          |          |         V
---------------------------------------------------------------------------
```

Area 'A' – 10 Year 6 Hour Proposed Condition – Unit Hydrograph

```
        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  06/13/20 File: PRA010610.out


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6407

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'A'
PROPOSED CONDITION UNIT HYDROGRAPH - 10 YEAR 6 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE
------------------------------------------------------------------------
Drainage Area =      89.60(Ac.)  =      0.140 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      89.60(Ac.)  =      0.140 Sq. Mi.
Length along longest watercourse =    3028.00(Ft.)
Length along longest watercourse measured to centroid =    1778.00(Ft.)
Length along longest watercourse =      0.573 Mi.
Length along longest watercourse measured to centroid =      0.337 Mi.
Difference in elevation =      81.00(Ft.)
Slope along watercourse =    141.2417 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.075 Hr.
Lag time =     4.51 Min.
25% of lag time =     1.13 Min.
40% of lag time =     1.81 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]
       89.60           1.00                 89.60

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       89.60           2.50                224.00

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    1.000(In)
Area Averaged 100-Year Rainfall =    2.500(In)

Point rain (area averaged) =    1.617(In)
Areal adjustment factor =   99.97 %
Adjusted average point rain =    1.617(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
    89.600           55.25         0.850
```

```
 Total Area Entered =     89.60(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)       (Dec.)    (In/Hr)
55.3  55.3      0.518     0.850        0.122        1.000      0.122
                                                  Sum (F) =    0.122
Area averaged mean soil loss (F) (In/Hr) =  0.122
Minimum soil loss rate ((In/Hr)) =  0.061
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.220
------------------------------------------------------------------------

               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        110.764         22.469             20.289
     2   0.167        221.528         48.841             44.103
     3   0.250        332.291         14.220             12.841
     4   0.333        443.055          6.505              5.874
     5   0.417        553.819          3.613              3.263
     6   0.500        664.583          2.239              2.022
     7   0.583        775.346          1.313              1.186
     8   0.667        886.110          0.800              0.723
                              Sum = 100.000   Sum=       90.300
------------------------------------------------------------------------
```

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	0.097	(0.122)	0.021	0.076
2	0.17	0.60	0.116	(0.122)	0.026	0.091
3	0.25	0.60	0.116	(0.122)	0.026	0.091
4	0.33	0.60	0.116	(0.122)	0.026	0.091
5	0.42	0.60	0.116	(0.122)	0.026	0.091
6	0.50	0.70	0.136	(0.122)	0.030	0.106
7	0.58	0.70	0.136	(0.122)	0.030	0.106
8	0.67	0.70	0.136	(0.122)	0.030	0.106
9	0.75	0.70	0.136	(0.122)	0.030	0.106
10	0.83	0.70	0.136	(0.122)	0.030	0.106
11	0.92	0.70	0.136	(0.122)	0.030	0.106
12	1.00	0.80	0.155	(0.122)	0.034	0.121
13	1.08	0.80	0.155	(0.122)	0.034	0.121
14	1.17	0.80	0.155	(0.122)	0.034	0.121
15	1.25	0.80	0.155	(0.122)	0.034	0.121
16	1.33	0.80	0.155	(0.122)	0.034	0.121
17	1.42	0.80	0.155	(0.122)	0.034	0.121
18	1.50	0.80	0.155	(0.122)	0.034	0.121
19	1.58	0.80	0.155	(0.122)	0.034	0.121
20	1.67	0.80	0.155	(0.122)	0.034	0.121
21	1.75	0.80	0.155	(0.122)	0.034	0.121
22	1.83	0.80	0.155	(0.122)	0.034	0.121
23	1.92	0.80	0.155	(0.122)	0.034	0.121
24	2.00	0.90	0.175	(0.122)	0.038	0.136
25	2.08	0.80	0.155	(0.122)	0.034	0.121
26	2.17	0.90	0.175	(0.122)	0.038	0.136
27	2.25	0.90	0.175	(0.122)	0.038	0.136
28	2.33	0.90	0.175	(0.122)	0.038	0.136
29	2.42	0.90	0.175	(0.122)	0.038	0.136
30	2.50	0.90	0.175	(0.122)	0.038	0.136
31	2.58	0.90	0.175	(0.122)	0.038	0.136
32	2.67	0.90	0.175	(0.122)	0.038	0.136
33	2.75	1.00	0.194	(0.122)	0.043	0.151
34	2.83	1.00	0.194	(0.122)	0.043	0.151
35	2.92	1.00	0.194	(0.122)	0.043	0.151

36	3.00	1.00	0.194	(	0.122)	0.043	0.151
37	3.08	1.00	0.194	(	0.122)	0.043	0.151
38	3.17	1.10	0.213	(	0.122)	0.047	0.166
39	3.25	1.10	0.213	(	0.122)	0.047	0.166
40	3.33	1.10	0.213	(	0.122)	0.047	0.166
41	3.42	1.20	0.233	(	0.122)	0.051	0.182
42	3.50	1.30	0.252	(	0.122)	0.055	0.197
43	3.58	1.40	0.272	(	0.122)	0.060	0.212
44	3.67	1.40	0.272	(	0.122)	0.060	0.212
45	3.75	1.50	0.291	(	0.122)	0.064	0.227
46	3.83	1.50	0.291	(	0.122)	0.064	0.227
47	3.92	1.60	0.310	(	0.122)	0.068	0.242
48	4.00	1.60	0.310	(	0.122)	0.068	0.242
49	4.08	1.70	0.330	(	0.122)	0.073	0.257
50	4.17	1.80	0.349	(	0.122)	0.077	0.272
51	4.25	1.90	0.369	(	0.122)	0.081	0.287
52	4.33	2.00	0.388	(	0.122)	0.085	0.303
53	4.42	2.10	0.407	(	0.122)	0.090	0.318
54	4.50	2.10	0.407	(	0.122)	0.090	0.318
55	4.58	2.20	0.427	(	0.122)	0.094	0.333
56	4.67	2.30	0.446	(	0.122)	0.098	0.348
57	4.75	2.40	0.466	(	0.122)	0.102	0.363
58	4.83	2.40	0.466	(	0.122)	0.102	0.363
59	4.92	2.50	0.485	(	0.122)	0.107	0.378
60	5.00	2.60	0.504	(	0.122)	0.111	0.393
61	5.08	3.10	0.601		0.122	(0.132)	0.480
62	5.17	3.60	0.698		0.122	(0.154)	0.577
63	5.25	3.90	0.757		0.122	(0.166)	0.635
64	5.33	4.20	0.815		0.122	(0.179)	0.693
65	5.42	4.70	0.912		0.122	(0.201)	0.790
66	5.50	5.60	1.086		0.122	(0.239)	0.965
67	5.58	1.90	0.369	(	0.122)	0.081	0.287
68	5.67	0.90	0.175	(	0.122)	0.038	0.136
69	5.75	0.60	0.116	(	0.122)	0.026	0.091
70	5.83	0.50	0.097	(	0.122)	0.021	0.076
71	5.92	0.30	0.058	(	0.122)	0.013	0.045
72	6.00	0.20	0.039	(	0.122)	0.009	0.030

(Loss Rate Not Used)

Sum = 100.0 Sum = 15.5

Flood volume = Effective rainfall 1.29(In)
times area 89.6(Ac.)/[(In)/(Ft.)] = 9.6(Ac.Ft)
Total soil loss = 0.33(In)
Total soil loss = 2.444(Ac.Ft)
Total rainfall = 1.62(In)
Flood volume = 419345.7 Cubic Feet
Total soil loss = 106454.8 Cubic Feet

Peak flow rate of this hydrograph = 70.661(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	20.0	40.0	60.0	80.0
0+ 5	0.0106	1.54	Q	|	|	|	|
0+10	0.0463	5.18	V Q	|	|	|	|
0+15	0.0932	6.82	V Q	|	|	|	|
0+20	0.1446	7.46	V Q	|	|	|	|
0+25	0.1983	7.80	V Q	|	|	|	|
0+30	0.2555	8.31	|V Q	|	|	|	|
0+35	0.3181	9.09	|V Q	|	|	|	|
0+40	0.3826	9.36	|V Q	|	|	|	|
0+45	0.4478	9.46	|V Q	|	|	|	|
0+50	0.5133	9.51	| V Q	|	|	|	|
0+55	0.5790	9.54	| V Q	|	|	|	|
1+ 0	0.6469	9.87	| V Q	|	|	|	|
1+ 5	0.7195	10.54	| V Q	|	|	|	|
1+10	0.7935	10.74	| V Q	|	|	|	|
1+15	0.8681	10.83	| V Q	|	|	|	|

```
    1+20       0.9430     10.88  |  V Q    |          |          |          |
    1+25       1.0181     10.91  |   VQ    |          |          |          |
    1+30       1.0933     10.93  |   VQ    |          |          |          |
    1+35       1.1687     10.94  |   VQ    |          |          |          |
    1+40       1.2440     10.94  |    Q    |          |          |          |
    1+45       1.3193     10.94  |    Q    |          |          |          |
    1+50       1.3946     10.94  |    Q    |          |          |          |
    1+55       1.4700     10.94  |    QV   |          |          |          |
    2+ 0       1.5474     11.24  |    QV   |          |          |          |
    2+ 5       1.6273     11.60  |    QV   |          |          |          |
    2+10       1.7061     11.44  |    Q V  |          |          |          |
    2+15       1.7887     12.00  |     QV  |          |          |          |
    2+20       1.8724     12.16  |     QV  |          |          |          |
    2+25       1.9566     12.23  |     Q V |          |          |          |
    2+30       2.0411     12.26  |     Q V |          |          |          |
    2+35       2.1257     12.29  |     Q V |          |          |          |
    2+40       2.2104     12.29  |     Q  V|          |          |          |
    2+45       2.2972     12.61  |     Q  V|          |          |          |
    2+50       2.3887     13.28  |     Q  V|          |          |          |
    2+55       2.4815     13.47  |     Q   V          |          |          |
    3+ 0       2.5749     13.56  |     Q   V          |          |          |
    3+ 5       2.6686     13.61  |     Q   |V         |          |          |
    3+10       2.7647     13.95  |     Q   |V         |          |          |
    3+15       2.8655     14.63  |      Q  |V         |          |          |
    3+20       2.9677     14.84  |      Q  | V        |          |          |
    3+25       3.0726     15.24  |      Q  | V        |          |          |
    3+30       3.1846     16.26  |       Q |  V       |          |          |
    3+35       3.3048     17.46  |       Q |  V       |          |          |
    3+40       3.4318     18.43  |        Q|   V      |          |          |
    3+45       3.5632     19.08  |        Q|   V      |          |          |
    3+50       3.7003     19.92  |        Q|    V     |          |          |
    3+55       3.8416     20.52  |         Q    V     |          |          |
    4+ 0       3.9885     21.33  |         Q     V    |          |          |
    4+ 5       4.1395     21.91  |         Q      V   |          |          |
    4+10       4.2980     23.02  |          |Q     V   |          |          |
    4+15       4.4650     24.25  |          | Q     V |          |          |
    4+20       4.6410     25.55  |          | Q      V|          |          |
    4+25       4.8261     26.88  |          |  Q      V          |          |
    4+30       5.0184     27.92  |          |  Q      V          |          |
    4+35       5.2155     28.61  |          |   Q     |V         |          |
    4+40       5.4206     29.78  |          |   Q     | V        |          |
    4+45       5.6345     31.06  |          |    Q    |  V       |          |
    4+50       5.8554     32.07  |          |     Q   |   V      |          |
    4+55       6.0808     32.74  |          |     Q   |    V     |          |
    5+ 0       6.3143     33.89  |          |     Q   |     V    |          |
    5+ 5       6.5664     36.60  |          |       Q |      V   |          |
    5+10       6.8606     42.72  |          |         |Q      V  |          |
    5+15       7.2011     49.45  |          |         |   Q    V|          |
    5+20       7.5802     55.04  |          |         |      Q  |V          |
    5+25       8.0019     61.23  |          |         |         Q  V       |
    5+30       8.4885     70.66  |          |         |          |   Q     |
    5+35       8.9480     66.71  |          |         |          |  Q   V  |
    5+40       9.2032     37.06  |          |       Q |          |       V |
    5+45       9.3572     22.36  |          |Q        |          |       V |
    5+50       9.4606     15.01  |        Q |         |          |        V|
    5+55       9.5333     10.55  |     Q    |         |          |        V|
    6+ 0       9.5806      6.86  |  Q       |         |          |        V|
    6+ 5       9.6079      3.97  |Q         |         |          |        V|
    6+10       9.6180      1.46  Q          |         |          |        V|
    6+15       9.6227      0.69  Q          |         |          |        V|
    6+20       9.6251      0.35  Q          |         |          |        V|
    6+25       9.6262      0.17  Q          |         |          |        V|
    6+30       9.6267      0.07  Q          |         |          |        V|
    6+35       9.6269      0.02  Q          |         |          |         V
----------------------------------------------------------------------------
```

Area 'A' – 10 Year 24 Hour Proposed Condition – Unit Hydrograph

```
        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  06/13/20 File: PRA0102410.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6407

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'A'
PROPOSED CONDITION UNIT HYDROGRAPH - 10 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE
------------------------------------------------------------------------
Drainage Area =      89.60(Ac.)  =      0.140 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      89.60(Ac.)  =      0.140 Sq. Mi.
Length along longest watercourse =    3028.00(Ft.)
Length along longest watercourse measured to centroid =    1778.00(Ft.)
Length along longest watercourse =      0.573 Mi.
Length along longest watercourse measured to centroid =      0.337 Mi.
Difference in elevation =      81.00(Ft.)
Slope along watercourse =    141.2417 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.075 Hr.
Lag time =     4.51 Min.
25% of lag time =     1.13 Min.
40% of lag time =     1.81 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]
       89.60            1.60                143.36

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       89.60            4.00                358.40

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    1.600(In)
Area Averaged 100-Year Rainfall =    4.000(In)

Point rain (area averaged) =    2.587(In)
Areal adjustment factor =   99.98 %
Adjusted average point rain =    2.587(In)

Sub-Area Data:
```

```
Area(Ac.)         Runoff Index    Impervious %
    89.600           55.25          0.850
 Total Area Entered =     89.60(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)       (Dec.)    (In/Hr)
55.3  55.3      0.518     0.850        0.122        1.000      0.122
                                                  Sum (F) =    0.122
Area averaged mean soil loss (F) (In/Hr) =  0.122
Minimum soil loss rate ((In/Hr)) =  0.061
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.220
------------------------------------------------------------------------

               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        110.764         22.469            20.289
     2   0.167        221.528         48.841            44.103
     3   0.250        332.291         14.220            12.841
     4   0.333        443.055          6.505             5.874
     5   0.417        553.819          3.613             3.263
     6   0.500        664.583          2.239             2.022
     7   0.583        775.346          1.313             1.186
     8   0.667        886.110          0.800             0.723
                              Sum = 100.000   Sum=      90.300
------------------------------------------------------------------------
```

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	0.021	(0.216)	0.005	0.016
2	0.17	0.07	0.021	(0.215)	0.005	0.016
3	0.25	0.07	0.021	(0.214)	0.005	0.016
4	0.33	0.10	0.031	(0.213)	0.007	0.024
5	0.42	0.10	0.031	(0.213)	0.007	0.024
6	0.50	0.10	0.031	(0.212)	0.007	0.024
7	0.58	0.10	0.031	(0.211)	0.007	0.024
8	0.67	0.10	0.031	(0.210)	0.007	0.024
9	0.75	0.10	0.031	(0.209)	0.007	0.024
10	0.83	0.13	0.041	(0.209)	0.009	0.032
11	0.92	0.13	0.041	(0.208)	0.009	0.032
12	1.00	0.13	0.041	(0.207)	0.009	0.032
13	1.08	0.10	0.031	(0.206)	0.007	0.024
14	1.17	0.10	0.031	(0.205)	0.007	0.024
15	1.25	0.10	0.031	(0.204)	0.007	0.024
16	1.33	0.10	0.031	(0.204)	0.007	0.024
17	1.42	0.10	0.031	(0.203)	0.007	0.024
18	1.50	0.10	0.031	(0.202)	0.007	0.024
19	1.58	0.10	0.031	(0.201)	0.007	0.024
20	1.67	0.10	0.031	(0.200)	0.007	0.024
21	1.75	0.10	0.031	(0.200)	0.007	0.024
22	1.83	0.13	0.041	(0.199)	0.009	0.032
23	1.92	0.13	0.041	(0.198)	0.009	0.032
24	2.00	0.13	0.041	(0.197)	0.009	0.032
25	2.08	0.13	0.041	(0.196)	0.009	0.032
26	2.17	0.13	0.041	(0.196)	0.009	0.032
27	2.25	0.13	0.041	(0.195)	0.009	0.032
28	2.33	0.13	0.041	(0.194)	0.009	0.032
29	2.42	0.13	0.041	(0.193)	0.009	0.032
30	2.50	0.13	0.041	(0.192)	0.009	0.032
31	2.58	0.17	0.052	(0.192)	0.011	0.040
32	2.67	0.17	0.052	(0.191)	0.011	0.040
33	2.75	0.17	0.052	(0.190)	0.011	0.040

34	2.83	0.17	0.052	(0.189)	0.011	0.040
35	2.92	0.17	0.052	(0.188)	0.011	0.040
36	3.00	0.17	0.052	(0.188)	0.011	0.040
37	3.08	0.17	0.052	(0.187)	0.011	0.040
38	3.17	0.17	0.052	(0.186)	0.011	0.040
39	3.25	0.17	0.052	(0.185)	0.011	0.040
40	3.33	0.17	0.052	(0.185)	0.011	0.040
41	3.42	0.17	0.052	(0.184)	0.011	0.040
42	3.50	0.17	0.052	(0.183)	0.011	0.040
43	3.58	0.17	0.052	(0.182)	0.011	0.040
44	3.67	0.17	0.052	(0.182)	0.011	0.040
45	3.75	0.17	0.052	(0.181)	0.011	0.040
46	3.83	0.20	0.062	(0.180)	0.014	0.048
47	3.92	0.20	0.062	(0.179)	0.014	0.048
48	4.00	0.20	0.062	(0.179)	0.014	0.048
49	4.08	0.20	0.062	(0.178)	0.014	0.048
50	4.17	0.20	0.062	(0.177)	0.014	0.048
51	4.25	0.20	0.062	(0.176)	0.014	0.048
52	4.33	0.23	0.072	(0.175)	0.016	0.056
53	4.42	0.23	0.072	(0.175)	0.016	0.056
54	4.50	0.23	0.072	(0.174)	0.016	0.056
55	4.58	0.23	0.072	(0.173)	0.016	0.056
56	4.67	0.23	0.072	(0.172)	0.016	0.056
57	4.75	0.23	0.072	(0.172)	0.016	0.056
58	4.83	0.27	0.083	(0.171)	0.018	0.065
59	4.92	0.27	0.083	(0.170)	0.018	0.065
60	5.00	0.27	0.083	(0.170)	0.018	0.065
61	5.08	0.20	0.062	(0.169)	0.014	0.048
62	5.17	0.20	0.062	(0.168)	0.014	0.048
63	5.25	0.20	0.062	(0.167)	0.014	0.048
64	5.33	0.23	0.072	(0.167)	0.016	0.056
65	5.42	0.23	0.072	(0.166)	0.016	0.056
66	5.50	0.23	0.072	(0.165)	0.016	0.056
67	5.58	0.27	0.083	(0.164)	0.018	0.065
68	5.67	0.27	0.083	(0.164)	0.018	0.065
69	5.75	0.27	0.083	(0.163)	0.018	0.065
70	5.83	0.27	0.083	(0.162)	0.018	0.065
71	5.92	0.27	0.083	(0.162)	0.018	0.065
72	6.00	0.27	0.083	(0.161)	0.018	0.065
73	6.08	0.30	0.093	(0.160)	0.020	0.073
74	6.17	0.30	0.093	(0.159)	0.020	0.073
75	6.25	0.30	0.093	(0.159)	0.020	0.073
76	6.33	0.30	0.093	(0.158)	0.020	0.073
77	6.42	0.30	0.093	(0.157)	0.020	0.073
78	6.50	0.30	0.093	(0.157)	0.020	0.073
79	6.58	0.33	0.103	(0.156)	0.023	0.081
80	6.67	0.33	0.103	(0.155)	0.023	0.081
81	6.75	0.33	0.103	(0.154)	0.023	0.081
82	6.83	0.33	0.103	(0.154)	0.023	0.081
83	6.92	0.33	0.103	(0.153)	0.023	0.081
84	7.00	0.33	0.103	(0.152)	0.023	0.081
85	7.08	0.33	0.103	(0.152)	0.023	0.081
86	7.17	0.33	0.103	(0.151)	0.023	0.081
87	7.25	0.33	0.103	(0.150)	0.023	0.081
88	7.33	0.37	0.114	(0.150)	0.025	0.089
89	7.42	0.37	0.114	(0.149)	0.025	0.089
90	7.50	0.37	0.114	(0.148)	0.025	0.089
91	7.58	0.40	0.124	(0.148)	0.027	0.097
92	7.67	0.40	0.124	(0.147)	0.027	0.097
93	7.75	0.40	0.124	(0.146)	0.027	0.097
94	7.83	0.43	0.135	(0.146)	0.030	0.105
95	7.92	0.43	0.135	(0.145)	0.030	0.105
96	8.00	0.43	0.135	(0.144)	0.030	0.105
97	8.08	0.50	0.155	(0.144)	0.034	0.121
98	8.17	0.50	0.155	(0.143)	0.034	0.121
99	8.25	0.50	0.155	(0.142)	0.034	0.121
100	8.33	0.50	0.155	(0.142)	0.034	0.121
101	8.42	0.50	0.155	(0.141)	0.034	0.121
102	8.50	0.50	0.155	(0.140)	0.034	0.121
103	8.58	0.53	0.166	(0.140)	0.036	0.129
104	8.67	0.53	0.166	(0.139)	0.036	0.129
105	8.75	0.53	0.166	(0.138)	0.036	0.129
106	8.83	0.57	0.176	(0.138)	0.039	0.137

107	8.92	0.57	0.176	(0.137)	0.039	0.137
108	9.00	0.57	0.176	(0.136)	0.039	0.137
109	9.08	0.63	0.197	(0.136)	0.043	0.153
110	9.17	0.63	0.197	(0.135)	0.043	0.153
111	9.25	0.63	0.197	(0.134)	0.043	0.153
112	9.33	0.67	0.207	(0.134)	0.046	0.161
113	9.42	0.67	0.207	(0.133)	0.046	0.161
114	9.50	0.67	0.207	(0.132)	0.046	0.161
115	9.58	0.70	0.217	(0.132)	0.048	0.169
116	9.67	0.70	0.217	(0.131)	0.048	0.169
117	9.75	0.70	0.217	(0.131)	0.048	0.169
118	9.83	0.73	0.228	(0.130)	0.050	0.178
119	9.92	0.73	0.228	(0.129)	0.050	0.178
120	10.00	0.73	0.228	(0.129)	0.050	0.178
121	10.08	0.50	0.155	(0.128)	0.034	0.121
122	10.17	0.50	0.155	(0.127)	0.034	0.121
123	10.25	0.50	0.155	(0.127)	0.034	0.121
124	10.33	0.50	0.155	(0.126)	0.034	0.121
125	10.42	0.50	0.155	(0.126)	0.034	0.121
126	10.50	0.50	0.155	(0.125)	0.034	0.121
127	10.58	0.67	0.207	(0.124)	0.046	0.161
128	10.67	0.67	0.207	(0.124)	0.046	0.161
129	10.75	0.67	0.207	(0.123)	0.046	0.161
130	10.83	0.67	0.207	(0.123)	0.046	0.161
131	10.92	0.67	0.207	(0.122)	0.046	0.161
132	11.00	0.67	0.207	(0.121)	0.046	0.161
133	11.08	0.63	0.197	(0.121)	0.043	0.153
134	11.17	0.63	0.197	(0.120)	0.043	0.153
135	11.25	0.63	0.197	(0.120)	0.043	0.153
136	11.33	0.63	0.197	(0.119)	0.043	0.153
137	11.42	0.63	0.197	(0.118)	0.043	0.153
138	11.50	0.63	0.197	(0.118)	0.043	0.153
139	11.58	0.57	0.176	(0.117)	0.039	0.137
140	11.67	0.57	0.176	(0.117)	0.039	0.137
141	11.75	0.57	0.176	(0.116)	0.039	0.137
142	11.83	0.60	0.186	(0.115)	0.041	0.145
143	11.92	0.60	0.186	(0.115)	0.041	0.145
144	12.00	0.60	0.186	(0.114)	0.041	0.145
145	12.08	0.83	0.259	(0.114)	0.057	0.202
146	12.17	0.83	0.259	(0.113)	0.057	0.202
147	12.25	0.83	0.259	(0.113)	0.057	0.202
148	12.33	0.87	0.269	(0.112)	0.059	0.210
149	12.42	0.87	0.269	(0.111)	0.059	0.210
150	12.50	0.87	0.269	(0.111)	0.059	0.210
151	12.58	0.93	0.290	(0.110)	0.064	0.226
152	12.67	0.93	0.290	(0.110)	0.064	0.226
153	12.75	0.93	0.290	(0.109)	0.064	0.226
154	12.83	0.97	0.300	(0.109)	0.066	0.234
155	12.92	0.97	0.300	(0.108)	0.066	0.234
156	13.00	0.97	0.300	(0.108)	0.066	0.234
157	13.08	1.13	0.352	(0.107)	0.077	0.274
158	13.17	1.13	0.352	(0.107)	0.077	0.274
159	13.25	1.13	0.352	(0.106)	0.077	0.274
160	13.33	1.13	0.352	(0.105)	0.077	0.274
161	13.42	1.13	0.352	(0.105)	0.077	0.274
162	13.50	1.13	0.352	(0.104)	0.077	0.274
163	13.58	0.77	0.238	(0.104)	0.052	0.186
164	13.67	0.77	0.238	(0.103)	0.052	0.186
165	13.75	0.77	0.238	(0.103)	0.052	0.186
166	13.83	0.77	0.238	(0.102)	0.052	0.186
167	13.92	0.77	0.238	(0.102)	0.052	0.186
168	14.00	0.77	0.238	(0.101)	0.052	0.186
169	14.08	0.90	0.279	(0.101)	0.061	0.218
170	14.17	0.90	0.279	(0.100)	0.061	0.218
171	14.25	0.90	0.279	(0.100)	0.061	0.218
172	14.33	0.87	0.269	(0.099)	0.059	0.210
173	14.42	0.87	0.269	(0.099)	0.059	0.210
174	14.50	0.87	0.269	(0.098)	0.059	0.210
175	14.58	0.87	0.269	(0.098)	0.059	0.210
176	14.67	0.87	0.269	(0.097)	0.059	0.210
177	14.75	0.87	0.269	(0.097)	0.059	0.210
178	14.83	0.83	0.259	(0.096)	0.057	0.202
179	14.92	0.83	0.259	(0.096)	0.057	0.202

180	15.00	0.83	0.259	(0.095)	0.057	0.202
181	15.08	0.80	0.248	(0.095)	0.055	0.194
182	15.17	0.80	0.248	(0.094)	0.055	0.194
183	15.25	0.80	0.248	(0.094)	0.055	0.194
184	15.33	0.77	0.238	(0.093)	0.052	0.186
185	15.42	0.77	0.238	(0.093)	0.052	0.186
186	15.50	0.77	0.238	(0.092)	0.052	0.186
187	15.58	0.63	0.197	(0.092)	0.043	0.153
188	15.67	0.63	0.197	(0.091)	0.043	0.153
189	15.75	0.63	0.197	(0.091)	0.043	0.153
190	15.83	0.63	0.197	(0.090)	0.043	0.153
191	15.92	0.63	0.197	(0.090)	0.043	0.153
192	16.00	0.63	0.197	(0.089)	0.043	0.153
193	16.08	0.13	0.041	(0.089)	0.009	0.032
194	16.17	0.13	0.041	(0.089)	0.009	0.032
195	16.25	0.13	0.041	(0.088)	0.009	0.032
196	16.33	0.13	0.041	(0.088)	0.009	0.032
197	16.42	0.13	0.041	(0.087)	0.009	0.032
198	16.50	0.13	0.041	(0.087)	0.009	0.032
199	16.58	0.10	0.031	(0.086)	0.007	0.024
200	16.67	0.10	0.031	(0.086)	0.007	0.024
201	16.75	0.10	0.031	(0.085)	0.007	0.024
202	16.83	0.10	0.031	(0.085)	0.007	0.024
203	16.92	0.10	0.031	(0.085)	0.007	0.024
204	17.00	0.10	0.031	(0.084)	0.007	0.024
205	17.08	0.17	0.052	(0.084)	0.011	0.040
206	17.17	0.17	0.052	(0.083)	0.011	0.040
207	17.25	0.17	0.052	(0.083)	0.011	0.040
208	17.33	0.17	0.052	(0.082)	0.011	0.040
209	17.42	0.17	0.052	(0.082)	0.011	0.040
210	17.50	0.17	0.052	(0.082)	0.011	0.040
211	17.58	0.17	0.052	(0.081)	0.011	0.040
212	17.67	0.17	0.052	(0.081)	0.011	0.040
213	17.75	0.17	0.052	(0.080)	0.011	0.040
214	17.83	0.13	0.041	(0.080)	0.009	0.032
215	17.92	0.13	0.041	(0.080)	0.009	0.032
216	18.00	0.13	0.041	(0.079)	0.009	0.032
217	18.08	0.13	0.041	(0.079)	0.009	0.032
218	18.17	0.13	0.041	(0.078)	0.009	0.032
219	18.25	0.13	0.041	(0.078)	0.009	0.032
220	18.33	0.13	0.041	(0.078)	0.009	0.032
221	18.42	0.13	0.041	(0.077)	0.009	0.032
222	18.50	0.13	0.041	(0.077)	0.009	0.032
223	18.58	0.10	0.031	(0.077)	0.007	0.024
224	18.67	0.10	0.031	(0.076)	0.007	0.024
225	18.75	0.10	0.031	(0.076)	0.007	0.024
226	18.83	0.07	0.021	(0.075)	0.005	0.016
227	18.92	0.07	0.021	(0.075)	0.005	0.016
228	19.00	0.07	0.021	(0.075)	0.005	0.016
229	19.08	0.10	0.031	(0.074)	0.007	0.024
230	19.17	0.10	0.031	(0.074)	0.007	0.024
231	19.25	0.10	0.031	(0.074)	0.007	0.024
232	19.33	0.13	0.041	(0.073)	0.009	0.032
233	19.42	0.13	0.041	(0.073)	0.009	0.032
234	19.50	0.13	0.041	(0.073)	0.009	0.032
235	19.58	0.10	0.031	(0.072)	0.007	0.024
236	19.67	0.10	0.031	(0.072)	0.007	0.024
237	19.75	0.10	0.031	(0.072)	0.007	0.024
238	19.83	0.07	0.021	(0.071)	0.005	0.016
239	19.92	0.07	0.021	(0.071)	0.005	0.016
240	20.00	0.07	0.021	(0.071)	0.005	0.016
241	20.08	0.10	0.031	(0.070)	0.007	0.024
242	20.17	0.10	0.031	(0.070)	0.007	0.024
243	20.25	0.10	0.031	(0.070)	0.007	0.024
244	20.33	0.10	0.031	(0.070)	0.007	0.024
245	20.42	0.10	0.031	(0.069)	0.007	0.024
246	20.50	0.10	0.031	(0.069)	0.007	0.024
247	20.58	0.10	0.031	(0.069)	0.007	0.024
248	20.67	0.10	0.031	(0.068)	0.007	0.024
249	20.75	0.10	0.031	(0.068)	0.007	0.024
250	20.83	0.07	0.021	(0.068)	0.005	0.016
251	20.92	0.07	0.021	(0.068)	0.005	0.016
252	21.00	0.07	0.021	(0.067)	0.005	0.016

```
253  21.08     0.10      0.031       (  0.067)       0.007        0.024
254  21.17     0.10      0.031       (  0.067)       0.007        0.024
255  21.25     0.10      0.031       (  0.066)       0.007        0.024
256  21.33     0.07      0.021       (  0.066)       0.005        0.016
257  21.42     0.07      0.021       (  0.066)       0.005        0.016
258  21.50     0.07      0.021       (  0.066)       0.005        0.016
259  21.58     0.10      0.031       (  0.065)       0.007        0.024
260  21.67     0.10      0.031       (  0.065)       0.007        0.024
261  21.75     0.10      0.031       (  0.065)       0.007        0.024
262  21.83     0.07      0.021       (  0.065)       0.005        0.016
263  21.92     0.07      0.021       (  0.065)       0.005        0.016
264  22.00     0.07      0.021       (  0.064)       0.005        0.016
265  22.08     0.10      0.031       (  0.064)       0.007        0.024
266  22.17     0.10      0.031       (  0.064)       0.007        0.024
267  22.25     0.10      0.031       (  0.064)       0.007        0.024
268  22.33     0.07      0.021       (  0.064)       0.005        0.016
269  22.42     0.07      0.021       (  0.063)       0.005        0.016
270  22.50     0.07      0.021       (  0.063)       0.005        0.016
271  22.58     0.07      0.021       (  0.063)       0.005        0.016
272  22.67     0.07      0.021       (  0.063)       0.005        0.016
273  22.75     0.07      0.021       (  0.063)       0.005        0.016
274  22.83     0.07      0.021       (  0.062)       0.005        0.016
275  22.92     0.07      0.021       (  0.062)       0.005        0.016
276  23.00     0.07      0.021       (  0.062)       0.005        0.016
277  23.08     0.07      0.021       (  0.062)       0.005        0.016
278  23.17     0.07      0.021       (  0.062)       0.005        0.016
279  23.25     0.07      0.021       (  0.062)       0.005        0.016
280  23.33     0.07      0.021       (  0.062)       0.005        0.016
281  23.42     0.07      0.021       (  0.061)       0.005        0.016
282  23.50     0.07      0.021       (  0.061)       0.005        0.016
283  23.58     0.07      0.021       (  0.061)       0.005        0.016
284  23.67     0.07      0.021       (  0.061)       0.005        0.016
285  23.75     0.07      0.021       (  0.061)       0.005        0.016
286  23.83     0.07      0.021       (  0.061)       0.005        0.016
287  23.92     0.07      0.021       (  0.061)       0.005        0.016
288  24.00     0.07      0.021       (  0.061)       0.005        0.016
              (Loss Rate Not Used)
    Sum =     100.0                                  Sum =    24.2
      Flood volume = Effective rainfall      2.02(In)
       times area      89.6(Ac.)/[(In)/(Ft.)] =      15.1(Ac.Ft)
      Total soil loss =      0.57(In)
      Total soil loss =     4.249(Ac.Ft)
      Total rainfall =      2.59(In)
      Flood volume =      656286.3 Cubic Feet
      Total soil loss =      185106.4 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     24.716(CFS)
      ---------------------------------------------------------------------
      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                        24 - H O U R    S T O R M
                    R u n o f f      H y d r o g r a p h
      ---------------------------------------------------------------------
                  Hydrograph in   5   Minute intervals ((CFS))

      ---------------------------------------------------------------------
 Time(h+m) Volume Ac.Ft   Q(CFS)  0        7.5      15.0      22.5      30.0
 ---------------------------------------------------------------------------
   0+ 5       0.0023      0.33  Q         |         |         |         |
   0+10       0.0094      1.04  VQ        |         |         |         |
   0+15       0.0180      1.25  VQ        |         |         |         |
   0+20       0.0284      1.51  V Q       |         |         |         |
   0+25       0.0416      1.91  V Q       |         |         |         |
   0+30       0.0557      2.05  V Q       |         |         |         |
   0+35       0.0703      2.12  V Q       |         |         |         |
   0+40       0.0851      2.16  V Q       |         |         |         |
   0+45       0.1001      2.17  V Q       |         |         |         |
   0+50       0.1162      2.35  V  Q      |         |         |         |
   0+55       0.1349      2.71  V  Q      |         |         |         |
   1+ 0       0.1543      2.81  V  Q      |         |         |         |
   1+ 5       0.1728      2.69  V  Q      |         |         |         |
   1+10       0.1891      2.37  V  Q      |         |         |         |
   1+15       0.2048      2.28  V  Q      |         |         |         |
   1+20       0.2202      2.24  V Q       |         |         |         |
```

```
1+25      0.2355     2.22  V Q       |         |         |         |
1+30      0.2507     2.20  V Q       |         |         |         |
1+35      0.2658     2.19  V Q       |         |         |         |
1+40      0.2808     2.19  V Q       |         |         |         |
1+45      0.2959     2.19  V Q       |         |         |         |
1+50      0.3121     2.35  V  Q      |         |         |         |
1+55      0.3308     2.71  V  Q      |         |         |         |
2+ 0      0.3501     2.81  V  Q      |         |         |         |
2+ 5      0.3698     2.86  V  Q      |         |         |         |
2+10      0.3897     2.89  |V Q      |         |         |         |
2+15      0.4097     2.90  |V Q      |         |         |         |
2+20      0.4297     2.91  |V Q      |         |         |         |
2+25      0.4498     2.92  |V Q      |         |         |         |
2+30      0.4699     2.92  |V Q      |         |         |         |
2+35      0.4911     3.08  |V  Q     |         |         |         |
2+40      0.5148     3.44  |V  Q     |         |         |         |
2+45      0.5392     3.54  |V  Q     |         |         |         |
2+50      0.5639     3.59  |V  Q     |         |         |         |
2+55      0.5888     3.61  |V  Q     |         |         |         |
3+ 0      0.6138     3.63  |V  Q     |         |         |         |
3+ 5      0.6388     3.64  |V  Q     |         |         |         |
3+10      0.6639     3.65  |V  Q     |         |         |         |
3+15      0.6890     3.65  |V  Q     |         |         |         |
3+20      0.7142     3.65  |V  Q     |         |         |         |
3+25      0.7393     3.65  |V  Q     |         |         |         |
3+30      0.7644     3.65  | V Q     |         |         |         |
3+35      0.7895     3.65  | V Q     |         |         |         |
3+40      0.8146     3.65  | V Q     |         |         |         |
3+45      0.8397     3.65  | V Q     |         |         |         |
3+50      0.8660     3.81  | V  Q    |         |         |         |
3+55      0.8946     4.17  | V  Q    |         |         |         |
4+ 0      0.9240     4.27  | V  Q    |         |         |         |
4+ 5      0.9538     4.32  | V  Q    |         |         |         |
4+10      0.9837     4.34  | V  Q    |         |         |         |
4+15      1.0137     4.36  | V  Q    |         |         |         |
4+20      1.0449     4.53  | V   Q   |         |         |         |
4+25      1.0787     4.90  | V   Q   |         |         |         |
4+30      1.1131     5.00  | V   Q   |         |         |         |
4+35      1.1478     5.05  |  V  Q   |         |         |         |
4+40      1.1828     5.07  |  V  Q   |         |         |         |
4+45      1.2178     5.09  |  V  Q   |         |         |         |
4+50      1.2541     5.26  |  V   Q  |         |         |         |
4+55      1.2928     5.62  |  V   Q  |         |         |         |
5+ 0      1.3323     5.73  |  V   Q  |         |         |         |
5+ 5      1.3698     5.45  |  V   Q  |         |         |         |
5+10      1.4026     4.76  |  V  Q   |         |         |         |
5+15      1.4340     4.57  |  V  Q   |         |         |         |
5+20      1.4661     4.65  |  V  Q   |         |         |         |
5+25      1.5002     4.96  |  V  Q   |         |         |         |
5+30      1.5349     5.03  |   V Q   |         |         |         |
5+35      1.5708     5.22  |   V Q   |         |         |         |
5+40      1.6093     5.59  |   V  Q  |         |         |         |
5+45      1.6487     5.71  |   V  Q  |         |         |         |
5+50      1.6884     5.77  |   V  Q  |         |         |         |
5+55      1.7284     5.80  |   V  Q  |         |         |         |
6+ 0      1.7684     5.82  |   V  Q  |         |         |         |
6+ 5      1.8097     5.99  |   V  Q  |         |         |         |
6+10      1.8535     6.35  |   V   Q |         |         |         |
6+15      1.8979     6.46  |    V  Q |         |         |         |
6+20      1.9427     6.50  |    V  Q |         |         |         |
6+25      1.9877     6.53  |    V  Q |         |         |         |
6+30      2.0328     6.55  |    V  Q |         |         |         |
6+35      2.0791     6.72  |    V  Q |         |         |         |
6+40      2.1279     7.08  |    V   Q|         |         |         |
6+45      2.1774     7.19  |    V   Q|         |         |         |
6+50      2.2272     7.23  |    V   Q|         |         |         |
6+55      2.2772     7.26  |     V  Q|         |         |         |
7+ 0      2.3273     7.28  |     V  Q|         |         |         |
7+ 5      2.3775     7.29  |     V  Q|         |         |         |
7+10      2.4277     7.29  |     V  Q|         |         |         |
7+15      2.4779     7.29  |     V  Q|         |         |         |
7+20      2.5293     7.46  |     V  Q|         |         |         |
7+25      2.5831     7.81  |     V   Q         |         |         |
```

```
 7+30      2.6376     7.92  |      V  Q         |          |          |
 7+35      2.6936     8.13  |      V  Q         |          |          |
 7+40      2.7522     8.51  |      V  |Q        |          |          |
 7+45      2.8116     8.63  |      V  |Q        |          |          |
 7+50      2.8726     8.85  |      V  |Q        |          |          |
 7+55      2.9362     9.24  |      V  | Q       |          |          |
 8+ 0      3.0006     9.36  |      V  | Q       |          |          |
 8+ 5      3.0678     9.74  |       V | Q       |          |          |
 8+10      3.1400    10.49  |       V |  Q      |          |          |
 8+15      3.2138    10.71  |       V |   Q     |          |          |
 8+20      3.2882    10.82  |       V |   Q     |          |          |
 8+25      3.3631    10.87  |       V |   Q     |          |          |
 8+30      3.4383    10.91  |        V|   Q     |          |          |
 8+35      3.5146    11.09  |        V|   Q     |          |          |
 8+40      3.5936    11.46  |        V|    Q    |          |          |
 8+45      3.6732    11.56  |        V|    Q    |          |          |
 8+50      3.7543    11.77  |        V|    Q    |          |          |
 8+55      3.8380    12.16  |         V     Q   |          |          |
 9+ 0      3.9225    12.28  |         V     Q   |          |          |
 9+ 5      4.0097    12.66  |         V     Q   |          |          |
 9+10      4.1020    13.40  |         V      Q  |          |          |
 9+15      4.1959    13.63  |         |V      Q |          |          |
 9+20      4.2916    13.90  |         |V      Q |          |          |
 9+25      4.3902    14.31  |         |V       Q|          |          |
 9+30      4.4897    14.45  |         |V       Q|          |          |
 9+35      4.5908    14.68  |         | V      Q|          |          |
 9+40      4.6946    15.07  |         | V       Q          |          |
 9+45      4.7992    15.19  |         | V       Q          |          |
 9+50      4.9053    15.41  |         |  V      Q          |          |
 9+55      5.0142    15.80  |         |  V      |Q         |          |
10+ 0      5.1238    15.92  |         |  V      |Q         |          |
10+ 5      5.2260    14.83  |         |  V     Q|          |          |
10+10      5.3112    12.37  |         |   V Q   |          |          |
10+15      5.3915    11.66  |         |   VQ    |          |          |
10+20      5.4696    11.34  |         |   VQ    |          |          |
10+25      5.5464    11.16  |         |   Q     |          |          |
10+30      5.6225    11.05  |         |   Q     |          |          |
10+35      5.7038    11.80  |         |    Q    |          |          |
10+40      5.7970    13.54  |         |    V  Q |          |          |
10+45      5.8938    14.06  |         |    V  Q |          |          |
10+50      5.9922    14.29  |         |    V   Q|          |          |
10+55      6.0916    14.43  |         |     V  Q|          |          |
11+ 0      6.1915    14.51  |         |     V  Q|          |          |
11+ 5      6.2906    14.39  |         |     V  Q|          |          |
11+10      6.3875    14.06  |         |     V Q |          |          |
11+15      6.4836    13.96  |         |      VQ |          |          |
11+20      6.5794    13.91  |         |      VQ |          |          |
11+25      6.6751    13.89  |         |      VQ |          |          |
11+30      6.7706    13.87  |         |      VQ |          |          |
11+35      6.8638    13.53  |         |       Q |          |          |
11+40      6.9521    12.81  |         |      QV |          |          |
11+45      7.0389    12.61  |         |     Q V |          |          |
11+50      7.1262    12.68  |         |     Q V |          |          |
11+55      7.2156    12.98  |         |      Q V|          |          |
12+ 0      7.3055    13.05  |         |      Q V|          |          |
12+ 5      7.4035    14.23  |         |       QV|          |          |
12+10      7.5187    16.73  |         |        V| Q        |          |
12+15      7.6391    17.48  |         |         V  Q       |          |
12+20      7.7629    17.98  |         |         V  Q       |          |
12+25      7.8905    18.53  |         |         V   Q      |          |
12+30      8.0196    18.75  |         |         |V  Q      |          |
12+35      8.1518    19.19  |         |         |V   Q     |          |
12+40      8.2893    19.97  |         |         | V   Q    |          |
12+45      8.4283    20.19  |         |         | V   Q    |          |
12+50      8.5692    20.46  |         |         | V    Q   |          |
12+55      8.7130    20.87  |         |         |  V   Q   |          |
13+ 0      8.8577    21.01  |         |         |  V    Q  |          |
13+ 5      9.0085    21.90  |         |         |  V     Q|          |
13+10      9.1718    23.72  |         |         |   V     |Q         |
13+15      9.3388    24.25  |         |         |   V     | Q        |
13+20      9.5076    24.50  |         |         |    V    | Q        |
13+25      9.6772    24.63  |         |         |    V    | Q        |
13+30      9.8474    24.72  |         |         |     V   | Q        |
```

```
13+35      10.0056     22.96  |          |          |      V   Q          |
13+40      10.1369     19.07  |          |          |     QV   |          |
13+45      10.2604     17.93  |          |          |  Q    V  |          |
13+50      10.3803     17.41  |          |          |  Q    V  |          |
13+55      10.4983     17.12  |          |          | Q     V  |          |
14+ 0      10.6149     16.94  |          |          | Q      V |          |
14+ 5      10.7354     17.49  |          |          |  Q     V |          |
14+10      10.8652     18.85  |          |          |     Q  V |          |
14+15      10.9979     19.27  |          |          |     Q   V|          |
14+20      11.1308     19.29  |          |          |     Q   V|          |
14+25      11.2619     19.04  |          |          |     Q   V|          |
14+30      11.3928     19.00  |          |          |     Q    V          |
14+35      11.5236     18.99  |          |          |     Q    V          |
14+40      11.6544     18.99  |          |          |     Q    V          |
14+45      11.7851     18.97  |          |          |     Q    |V         |
14+50      11.9146     18.80  |          |          |     Q    |V         |
14+55      12.0416     18.44  |          |          |    Q     |V         |
15+ 0      12.1678     18.34  |          |          |    Q     | V        |
15+ 5      12.2927     18.12  |          |          |    Q     | V        |
15+10      12.4149     17.74  |          |          |   Q      | V        |
15+15      12.5362     17.62  |          |          |   Q      |  V       |
15+20      12.6561     17.40  |          |          |   Q      |  V       |
15+25      12.7732     17.01  |          |          |  Q       |  V       |
15+30      12.8896     16.89  |          |          |  Q       |   V      |
15+35      13.0010     16.18  |          |          |Q         |   V      |
15+40      13.1024     14.72  |          |         Q|          |   V      |
15+45      13.2008     14.29  |          |         Q|          |    V     |
15+50      13.2979     14.09  |          |        Q |          |    V     |
15+55      13.3942     13.98  |          |        Q |          |    V     |
16+ 0      13.4900     13.92  |          |        Q |          |    V     |
16+ 5      13.5687     11.42  |          |     Q    |          |     V    |
16+10      13.6104      6.06  |        Q |          |          |     V    |
16+15      13.6414      4.50  |     Q    |          |          |     V    |
16+20      13.6675      3.79  |     Q    |          |          |     V    |
16+25      13.6908      3.39  |    Q     |          |          |     V    |
16+30      13.7125      3.15  |    Q     |          |          |     V    |
16+35      13.7321      2.84  |   Q      |          |          |     V    |
16+40      13.7486      2.40  |   Q      |          |          |     V    |
16+45      13.7644      2.29  |   Q      |          |          |     V    |
16+50      13.7799      2.25  |  Q       |          |          |     V    |
16+55      13.7951      2.22  |  Q       |          |          |     V    |
17+ 0      13.8103      2.20  |  Q       |          |          |     V    |
17+ 5      13.8277      2.52  |   Q      |          |          |     V    |
17+10      13.8499      3.23  |    Q     |          |          |     V    |
17+15      13.8736      3.43  |    Q     |          |          |     V    |
17+20      13.8979      3.53  |    Q     |          |          |     V    |
17+25      13.9225      3.58  |    Q     |          |          |     V    |
17+30      13.9474      3.62  |    Q     |          |          |      V   |
17+35      13.9725      3.63  |    Q     |          |          |      V   |
17+40      13.9976      3.65  |    Q     |          |          |      V   |
17+45      14.0227      3.65  |    Q     |          |          |      V   |
17+50      14.0467      3.48  |    Q     |          |          |      V   |
17+55      14.0682      3.13  |    Q     |          |          |      V   |
18+ 0      14.0890      3.02  |    Q     |          |          |      V   |
18+ 5      14.1095      2.97  |   Q      |          |          |      V   |
18+10      14.1298      2.95  |   Q      |          |          |      V   |
18+15      14.1500      2.93  |   Q      |          |          |      V   |
18+20      14.1701      2.92  |   Q      |          |          |      V   |
18+25      14.1902      2.92  |   Q      |          |          |      V   |
18+30      14.2103      2.92  |   Q      |          |          |      V   |
18+35      14.2293      2.75  |   Q      |          |          |      V   |
18+40      14.2458      2.40  |   Q      |          |          |      V   |
18+45      14.2616      2.29  |   Q      |          |          |      V   |
18+50      14.2759      2.08  |  Q       |          |          |      V   |
18+55      14.2876      1.70  |  Q       |          |          |      V   |
19+ 0      14.2985      1.58  |  Q       |          |          |      V   |
19+ 5      14.3101      1.69  |  Q       |          |          |      V   |
19+10      14.3239      2.01  |  Q       |          |          |       V  |
19+15      14.3384      2.10  |  Q       |          |          |       V  |
19+20      14.3542      2.30  |   Q      |          |          |       V  |
19+25      14.3727      2.68  |   Q      |          |          |       V  |
19+30      14.3919      2.80  |   Q      |          |          |       V  |
19+35      14.4104      2.69  |   Q      |          |          |       V  |
```

19+40	14.4267	2.37	| Q	|	|	|	V |
19+45	14.4424	2.28	| Q	|	|	|	V |
19+50	14.4567	2.08	| Q	|	|	|	V |
19+55	14.4684	1.70	| Q	|	|	|	V |
20+ 0	14.4793	1.58	| Q	|	|	|	V |
20+ 5	14.4909	1.69	| Q	|	|	|	V |
20+10	14.5047	2.01	| Q	|	|	|	V |
20+15	14.5192	2.10	| Q	|	|	|	V |
20+20	14.5339	2.14	| Q	|	|	|	V |
20+25	14.5487	2.16	| Q	|	|	|	V |
20+30	14.5637	2.17	| Q	|	|	|	V |
20+35	14.5787	2.18	| Q	|	|	|	V |
20+40	14.5938	2.19	| Q	|	|	|	V |
20+45	14.6089	2.19	| Q	|	|	|	V |
20+50	14.6228	2.02	| Q	|	|	|	V |
20+55	14.6343	1.67	| Q	|	|	|	V |
21+ 0	14.6451	1.56	| Q	|	|	|	V |
21+ 5	14.6566	1.68	| Q	|	|	|	V |
21+10	14.6705	2.01	| Q	|	|	|	V |
21+15	14.6849	2.10	| Q	|	|	|	V |
21+20	14.6985	1.97	| Q	|	|	|	V|
21+25	14.7098	1.64	| Q	|	|	|	V|
21+30	14.7204	1.55	| Q	|	|	|	V|
21+35	14.7320	1.67	| Q	|	|	|	V|
21+40	14.7458	2.01	| Q	|	|	|	V|
21+45	14.7602	2.10	| Q	|	|	|	V|
21+50	14.7738	1.97	| Q	|	|	|	V|
21+55	14.7851	1.64	| Q	|	|	|	V|
22+ 0	14.7958	1.55	| Q	|	|	|	V|
22+ 5	14.8073	1.67	| Q	|	|	|	V|
22+10	14.8211	2.01	| Q	|	|	|	V|
22+15	14.8356	2.10	| Q	|	|	|	V|
22+20	14.8492	1.97	| Q	|	|	|	V|
22+25	14.8604	1.64	| Q	|	|	|	V|
22+30	14.8711	1.55	| Q	|	|	|	V|
22+35	14.8815	1.51	| Q	|	|	|	V|
22+40	14.8918	1.49	|Q	|	|	|	V|
22+45	14.9019	1.47	|Q	|	|	|	V|
22+50	14.9120	1.46	|Q	|	|	|	V|
22+55	14.9220	1.46	|Q	|	|	|	V|
23+ 0	14.9321	1.46	|Q	|	|	|	V|
23+ 5	14.9421	1.46	|Q	|	|	|	V|
23+10	14.9522	1.46	|Q	|	|	|	V|
23+15	14.9622	1.46	|Q	|	|	|	V|
23+20	14.9723	1.46	|Q	|	|	|	V|
23+25	14.9823	1.46	|Q	|	|	|	V|
23+30	14.9923	1.46	|Q	|	|	|	V|
23+35	15.0024	1.46	|Q	|	|	|	V|
23+40	15.0124	1.46	|Q	|	|	|	V|
23+45	15.0225	1.46	|Q	|	|	|	V|
23+50	15.0325	1.46	|Q	|	|	|	V|
23+55	15.0426	1.46	|Q	|	|	|	V|
24+ 0	15.0526	1.46	|Q	|	|	|	V|
24+ 5	15.0604	1.13	|Q	|	|	|	V|
24+10	15.0633	0.42	Q	|	|	|	V|
24+15	15.0647	0.21	Q	|	|	|	V|
24+20	15.0655	0.12	Q	|	|	|	V|
24+25	15.0660	0.06	Q	|	|	|	V|
24+30	15.0662	0.03	Q	|	|	|	V|
24+35	15.0663	0.01	Q	|	|	|	V

Area 'A' – 100 Year 1 Hour Proposed Condition – Unit Hydrograph

```
        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  06/13/20 File: PRA1001100.out


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6407

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'A'
PROPOSED CONDITION UNIT HYDROGRAPH - 100 YEAR 1 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE
------------------------------------------------------------------------
Drainage Area =      89.60(Ac.)  =      0.140 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      89.60(Ac.)  =      0.140 Sq. Mi.
Length along longest watercourse =    3028.00(Ft.)
Length along longest watercourse measured to centroid =    1778.00(Ft.)
Length along longest watercourse =      0.573 Mi.
Length along longest watercourse measured to centroid =      0.337 Mi.
Difference in elevation =      81.00(Ft.)
Slope along watercourse =    141.2417 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.075 Hr.
Lag time =     4.51 Min.
25% of lag time =     1.13 Min.
40% of lag time =     1.81 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]
       89.60            0.45                 40.32

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       89.60            1.20                107.52

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    0.450(In)
Area Averaged 100-Year Rainfall =    1.200(In)

Point rain (area averaged) =    1.200(In)
Areal adjustment factor =   99.92 %
Adjusted average point rain =    1.199(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
    89.600           55.25         0.850
```

```
 Total Area Entered =     89.60(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-3     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
55.3  74.2      0.312     0.850        0.073       1.000      0.073
                                                 Sum (F) =    0.073
Area averaged mean soil loss (F) (In/Hr) =  0.073
Minimum soil loss rate ((In/Hr)) =  0.037
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.220
------------------------------------------------------------------------
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        110.764         22.469            20.289
     2   0.167        221.528         48.841            44.103
     3   0.250        332.291         14.220            12.841
     4   0.333        443.055          6.505             5.874
     5   0.417        553.819          3.613             3.263
     6   0.500        664.583          2.239             2.022
     7   0.583        775.346          1.313             1.186
     8   0.667        886.110          0.800             0.723
                              Sum = 100.000   Sum=      90.300
------------------------------------------------------------------------

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      0.604          0.073    (  0.133)        0.531
  2   0.17     4.30      0.619          0.073    (  0.136)        0.545
  3   0.25     5.00      0.719          0.073    (  0.158)        0.646
  4   0.33     5.00      0.719          0.073    (  0.158)        0.646
  5   0.42     5.80      0.835          0.073    (  0.184)        0.761
  6   0.50     6.50      0.935          0.073    (  0.206)        0.862
  7   0.58     7.40      1.065          0.073    (  0.234)        0.991
  8   0.67     8.60      1.237          0.073    (  0.272)        1.164
  9   0.75    12.30      1.770          0.073    (  0.389)        1.696
 10   0.83    29.10      4.187          0.073    (  0.921)        4.114
 11   0.92     6.80      0.978          0.073    (  0.215)        0.905
 12   1.00     5.00      0.719          0.073    (  0.158)        0.646
               (Loss Rate Not Used)
    Sum =     100.0                                 Sum =    13.5
      Flood volume = Effective rainfall      1.13(In)
       times area      89.6(Ac.)/[(In)/(Ft.)] =       8.4(Ac.Ft)
      Total soil loss =      0.07(In)
      Total soil loss =     0.548(Ac.Ft)
      Total rainfall =      1.20(In)
      Flood volume =      366099.9 Cubic Feet
      Total soil loss =       23880.8 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =    234.870(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       75.0     150.0     225.0     300.0
 ---------------------------------------------------------------------
```

```
    0+ 5       0.0742     10.78  VQ        |         |         |         |
    0+10       0.3118     34.49  |V  Q     |         |         |         |
    0+15       0.6148     43.99  | V  Q    |         |         |         |
    0+20       0.9711     51.74  |   V Q   |         |         |         |
    0+25       1.3650     57.19  |     VQ  |         |         |         |
    0+30       1.8198     66.03  |       Q |         |         |         |
    0+35       2.3402     75.57  |         QV        |         |         |
    0+40       2.9419     87.36  |         |Q  V     |         |         |
    0+45       3.6895    108.55  |         |   Q  V  |         |         |
    0+50       4.9617    184.72  |         |         |  VQ     |         |
    0+55       6.5792    234.87  |         |         |         |Q        |
    1+ 0       7.4280    123.24  |         |     Q   |         |    V    |
    1+ 5       7.9376     74.00  |         Q|        |         |      V  |
    1+10       8.1620     32.58  |   Q     |         |         |       V |
    1+15       8.2854     17.92  | Q       |         |         |        V|
    1+20       8.3546     10.05  |Q        |         |         |        V|
    1+25       8.3915      5.35  Q         |         |         |        V|
    1+30       8.4013      1.42  Q         |         |         |        V|
    1+35       8.4045      0.47  Q         |         |         |         V
------------------------------------------------------------------------
```

Area 'A' – 100 Year 3 Hour Proposed Condition – Unit Hydrograph

```
        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  06/13/20 File: PRA1003100.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6407

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'A'
PROPOSED CONDITION UNIT HYDROGRAPH - 100 YEAR 3 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE
------------------------------------------------------------------------
Drainage Area =      89.60(Ac.)  =      0.140 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      89.60(Ac.)  =      0.140 Sq. Mi.
Length along longest watercourse =    3028.00(Ft.)
Length along longest watercourse measured to centroid =    1778.00(Ft.)
Length along longest watercourse =      0.573 Mi.
Length along longest watercourse measured to centroid =      0.337 Mi.
Difference in elevation =      81.00(Ft.)
Slope along watercourse =    141.2417 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.075 Hr.
Lag time =     4.51 Min.
25% of lag time =     1.13 Min.
40% of lag time =     1.81 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]
       89.60            0.80                 71.68

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       89.60            1.80                161.28

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    0.800(In)
Area Averaged 100-Year Rainfall =    1.800(In)

Point rain (area averaged) =    1.800(In)
Areal adjustment factor =   99.96 %
Adjusted average point rain =    1.799(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
```

```
          89.600           55.25         0.850
 Total Area Entered =     89.60(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-3     (In/Hr)    (Dec.%)     (In/Hr)       (Dec.)    (In/Hr)
55.3  74.2      0.312     0.850        0.073        1.000      0.073
                                                  Sum (F) =    0.073
Area averaged mean soil loss (F) (In/Hr) =  0.073
Minimum soil loss rate ((In/Hr)) =  0.037
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.220
------------------------------------------------------------------------

               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        110.764         22.469            20.289
     2   0.167        221.528         48.841            44.103
     3   0.250        332.291         14.220            12.841
     4   0.333        443.055          6.505             5.874
     5   0.417        553.819          3.613             3.263
     6   0.500        664.583          2.239             2.022
     7   0.583        775.346          1.313             1.186
     8   0.667        886.110          0.800             0.723
                              Sum = 100.000   Sum=      90.300
------------------------------------------------------------------------
```

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	0.281	(0.073)	0.062	0.219
2	0.17	1.30	0.281	(0.073)	0.062	0.219
3	0.25	1.10	0.238	(0.073)	0.052	0.185
4	0.33	1.50	0.324	(0.073)	0.071	0.253
5	0.42	1.50	0.324	(0.073)	0.071	0.253
6	0.50	1.80	0.389	0.073	(0.086)	0.315
7	0.58	1.50	0.324	(0.073)	0.071	0.253
8	0.67	1.80	0.389	0.073	(0.086)	0.315
9	0.75	1.80	0.389	0.073	(0.086)	0.315
10	0.83	1.50	0.324	(0.073)	0.071	0.253
11	0.92	1.60	0.345	0.073	(0.076)	0.272
12	1.00	1.80	0.389	0.073	(0.086)	0.315
13	1.08	2.20	0.475	0.073	(0.105)	0.402
14	1.17	2.20	0.475	0.073	(0.105)	0.402
15	1.25	2.20	0.475	0.073	(0.105)	0.402
16	1.33	2.00	0.432	0.073	(0.095)	0.358
17	1.42	2.60	0.561	0.073	(0.124)	0.488
18	1.50	2.70	0.583	0.073	(0.128)	0.510
19	1.58	2.40	0.518	0.073	(0.114)	0.445
20	1.67	2.70	0.583	0.073	(0.128)	0.510
21	1.75	3.30	0.713	0.073	(0.157)	0.639
22	1.83	3.10	0.669	0.073	(0.147)	0.596
23	1.92	2.90	0.626	0.073	(0.138)	0.553
24	2.00	3.00	0.648	0.073	(0.143)	0.574
25	2.08	3.10	0.669	0.073	(0.147)	0.596
26	2.17	4.20	0.907	0.073	(0.200)	0.833
27	2.25	5.00	1.080	0.073	(0.238)	1.006
28	2.33	3.50	0.756	0.073	(0.166)	0.682
29	2.42	6.80	1.468	0.073	(0.323)	1.395
30	2.50	7.30	1.576	0.073	(0.347)	1.503
31	2.58	8.20	1.771	0.073	(0.390)	1.697
32	2.67	5.90	1.274	0.073	(0.280)	1.200
33	2.75	2.00	0.432	0.073	(0.095)	0.358
34	2.83	1.80	0.389	0.073	(0.086)	0.315

```
 35   2.92     1.80      0.389          0.073    (  0.086)        0.315
 36   3.00     0.60      0.130       (  0.073)       0.029        0.101
              (Loss Rate Not Used)
    Sum =     100.0                                    Sum =    19.0
      Flood volume = Effective rainfall      1.59(In)
       times area      89.6(Ac.)/[(In)/(Ft.)] =      11.9(Ac.Ft)
      Total soil loss =      0.21(In)
      Total soil loss =     1.584(Ac.Ft)
      Total rainfall =      1.80(In)
      Flood volume =      516234.0 Cubic Feet
      Total soil loss =       68982.9 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =    132.441(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        50.0     100.0     150.0     200.0
---------------------------------------------------------------------------
  0+ 5       0.0306      4.44  Q          |          |          |          |
  0+10       0.1278     14.11  V Q        |          |          |          |
  0+15       0.2396     16.23  V  Q       |          |          |          |
  0+20       0.3594     17.40  |V Q       |          |          |          |
  0+25       0.5017     20.66  |V  Q      |          |          |          |
  0+30       0.6603     23.04  | V Q      |          |          |          |
  0+35       0.8330     25.08  | V  Q     |          |          |          |
  0+40       1.0031     24.70  |  VQ      |          |          |          |
  0+45       1.1899     27.12  |   VQ     |          |          |          |
  0+50       1.3727     26.55  |   VQ     |          |          |          |
  0+55       1.5416     24.52  |   QV     |          |          |          |
  1+ 0       1.7179     25.60  |    Q     |          |          |          |
  1+ 5       1.9192     29.24  |    QV    |          |          |          |
  1+10       2.1502     33.54  |     QV   |          |          |          |
  1+15       2.3905     34.89  |     Q V  |          |          |          |
  1+20       2.6289     34.62  |     Q V  |          |          |          |
  1+25       2.8747     35.69  |      Q V |          |          |          |
  1+30       3.1608     41.53  |       Q V|          |          |          |
  1+35       3.4550     42.72  |       Q  |V         |          |          |
  1+40       3.7451     42.13  |       Q  | V        |          |          |
  1+45       4.0706     47.25  |        Q|  V       |          |          |
  1+50       4.4344     52.82  |         Q   V      |          |          |
  1+55       4.7928     52.04  |         Q     V    |          |          |
  2+ 0       5.1439     50.98  |         Q      V   |          |          |
  2+ 5       5.5024     52.06  |         Q       V  |          |          |
  2+10       5.9019     58.00  |          |Q       V|          |          |
  2+15       6.4003     72.37  |          |   Q     |V         |          |
  2+20       6.9280     76.62  |          |    Q    |  V       |          |
  2+25       7.4819     80.44  |          |     Q   |    V     |          |
  2+30       8.2515    111.74  |          |         | Q    V   |          |
  2+35       9.1384    128.78  |          |         |    Q    V|          |
  2+40      10.0506    132.44  |          |         |     Q    |  V       |
  2+45      10.7297     98.61  |          |         Q|         |     V    |
  2+50      11.1214     56.87  |          |Q        |         |      V   |
  2+55      11.4154     42.70  |       Q  |         |         |       V  |
  3+ 0      11.6376     32.26  |     Q    |         |         |        V |
  3+ 5      11.7551     17.06  |  Q       |         |         |        V |
  3+10      11.8072      7.56  |Q         |         |         |        V |
  3+15      11.8316      3.55  Q          |         |         |        V |
  3+20      11.8426      1.60  Q          |         |         |        V |
  3+25      11.8482      0.81  Q          |         |         |        V |
  3+30      11.8506      0.35  Q          |         |         |        V |
  3+35      11.8511      0.07  Q          |         |         |         V
---------------------------------------------------------------------------
```

Area 'A' – 100 Year 6 Hour Proposed Condition – Unit Hydrograph

```
        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  06/13/20 File: PRA1006100.out


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6407

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'A'
PROPOSED CONDITION UNIT HYDROGRAPH - 100 YEAR 6 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE
------------------------------------------------------------------------
Drainage Area =      89.60(Ac.)  =      0.140 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      89.60(Ac.)  =      0.140 Sq. Mi.
Length along longest watercourse =    3028.00(Ft.)
Length along longest watercourse measured to centroid =    1778.00(Ft.)
Length along longest watercourse =      0.573 Mi.
Length along longest watercourse measured to centroid =      0.337 Mi.
Difference in elevation =      81.00(Ft.)
Slope along watercourse =    141.2417 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.075 Hr.
Lag time =     4.51 Min.
25% of lag time =     1.13 Min.
40% of lag time =     1.81 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]
       89.60           1.00                 89.60

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       89.60           2.50                224.00

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    1.000(In)
Area Averaged 100-Year Rainfall =    2.500(In)

Point rain (area averaged) =    2.500(In)
Areal adjustment factor =   99.97 %
Adjusted average point rain =    2.499(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
    89.600           55.25         0.850
```

Total Area Entered = 89.60(Ac.)

RI AMC2	RI AMC-3	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
55.3	74.2	0.312	0.850	0.073	1.000	0.073
					Sum (F) =	0.073

Area averaged mean soil loss (F) (In/Hr) = 0.073
Minimum soil loss rate ((In/Hr)) = 0.037
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.220

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	110.764	22.469	20.289
2	0.167	221.528	48.841	44.103
3	0.250	332.291	14.220	12.841
4	0.333	443.055	6.505	5.874
5	0.417	553.819	3.613	3.263
6	0.500	664.583	2.239	2.022
7	0.583	775.346	1.313	1.186
8	0.667	886.110	0.800	0.723
			Sum = 100.000	Sum= 90.300

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	(0.073)		0.033	0.117
2	0.17	0.60	0.180	(0.073)		0.040	0.140
3	0.25	0.60	0.180	(0.073)		0.040	0.140
4	0.33	0.60	0.180	(0.073)		0.040	0.140
5	0.42	0.60	0.180	(0.073)		0.040	0.140
6	0.50	0.70	0.210	(0.073)		0.046	0.164
7	0.58	0.70	0.210	(0.073)		0.046	0.164
8	0.67	0.70	0.210	(0.073)		0.046	0.164
9	0.75	0.70	0.210	(0.073)		0.046	0.164
10	0.83	0.70	0.210	(0.073)		0.046	0.164
11	0.92	0.70	0.210	(0.073)		0.046	0.164
12	1.00	0.80	0.240	(0.073)		0.053	0.187
13	1.08	0.80	0.240	(0.073)		0.053	0.187
14	1.17	0.80	0.240	(0.073)		0.053	0.187
15	1.25	0.80	0.240	(0.073)		0.053	0.187
16	1.33	0.80	0.240	(0.073)		0.053	0.187
17	1.42	0.80	0.240	(0.073)		0.053	0.187
18	1.50	0.80	0.240	(0.073)		0.053	0.187
19	1.58	0.80	0.240	(0.073)		0.053	0.187
20	1.67	0.80	0.240	(0.073)		0.053	0.187
21	1.75	0.80	0.240	(0.073)		0.053	0.187
22	1.83	0.80	0.240	(0.073)		0.053	0.187
23	1.92	0.80	0.240	(0.073)		0.053	0.187
24	2.00	0.90	0.270	(0.073)		0.059	0.211
25	2.08	0.80	0.240	(0.073)		0.053	0.187
26	2.17	0.90	0.270	(0.073)		0.059	0.211
27	2.25	0.90	0.270	(0.073)		0.059	0.211
28	2.33	0.90	0.270	(0.073)		0.059	0.211
29	2.42	0.90	0.270	(0.073)		0.059	0.211
30	2.50	0.90	0.270	(0.073)		0.059	0.211
31	2.58	0.90	0.270	(0.073)		0.059	0.211
32	2.67	0.90	0.270	(0.073)		0.059	0.211
33	2.75	1.00	0.300	(0.073)		0.066	0.234
34	2.83	1.00	0.300	(0.073)		0.066	0.234
35	2.92	1.00	0.300	(0.073)		0.066	0.234

```
 36   3.00     1.00      0.300       (  0.073)       0.066        0.234
 37   3.08     1.00      0.300       (  0.073)       0.066        0.234
 38   3.17     1.10      0.330       (  0.073)       0.073        0.257
 39   3.25     1.10      0.330       (  0.073)       0.073        0.257
 40   3.33     1.10      0.330       (  0.073)       0.073        0.257
 41   3.42     1.20      0.360          0.073    (  0.079)        0.286
 42   3.50     1.30      0.390          0.073    (  0.086)        0.316
 43   3.58     1.40      0.420          0.073    (  0.092)        0.346
 44   3.67     1.40      0.420          0.073    (  0.092)        0.346
 45   3.75     1.50      0.450          0.073    (  0.099)        0.376
 46   3.83     1.50      0.450          0.073    (  0.099)        0.376
 47   3.92     1.60      0.480          0.073    (  0.106)        0.406
 48   4.00     1.60      0.480          0.073    (  0.106)        0.406
 49   4.08     1.70      0.510          0.073    (  0.112)        0.436
 50   4.17     1.80      0.540          0.073    (  0.119)        0.466
 51   4.25     1.90      0.570          0.073    (  0.125)        0.496
 52   4.33     2.00      0.600          0.073    (  0.132)        0.526
 53   4.42     2.10      0.630          0.073    (  0.139)        0.556
 54   4.50     2.10      0.630          0.073    (  0.139)        0.556
 55   4.58     2.20      0.660          0.073    (  0.145)        0.586
 56   4.67     2.30      0.690          0.073    (  0.152)        0.616
 57   4.75     2.40      0.720          0.073    (  0.158)        0.646
 58   4.83     2.40      0.720          0.073    (  0.158)        0.646
 59   4.92     2.50      0.750          0.073    (  0.165)        0.676
 60   5.00     2.60      0.780          0.073    (  0.172)        0.706
 61   5.08     3.10      0.930          0.073    (  0.205)        0.856
 62   5.17     3.60      1.080          0.073    (  0.238)        1.006
 63   5.25     3.90      1.170          0.073    (  0.257)        1.096
 64   5.33     4.20      1.260          0.073    (  0.277)        1.186
 65   5.42     4.70      1.410          0.073    (  0.310)        1.336
 66   5.50     5.60      1.679          0.073    (  0.369)        1.606
 67   5.58     1.90      0.570          0.073    (  0.125)        0.496
 68   5.67     0.90      0.270       (  0.073)       0.059        0.211
 69   5.75     0.60      0.180       (  0.073)       0.040        0.140
 70   5.83     0.50      0.150       (  0.073)       0.033        0.117
 71   5.92     0.30      0.090       (  0.073)       0.020        0.070
 72   6.00     0.20      0.060       (  0.073)       0.013        0.047
               (Loss Rate Not Used)
    Sum =     100.0                                    Sum =    25.7
      Flood volume = Effective rainfall      2.14(In)
       times area      89.6(Ac.)/[(In)/(Ft.)] =      16.0(Ac.Ft)
      Total soil loss =      0.36(In)
      Total soil loss =     2.691(Ac.Ft)
      Total rainfall =      2.50(In)
      Flood volume =      695652.6 Cubic Feet
      Total soil loss =      117216.9 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =    119.587(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       50.0     100.0     150.0     200.0
-------------------------------------------------------------------------
  0+ 5       0.0164      2.37  Q         |         |         |         |
  0+10       0.0715      8.01  VQ        |         |         |         |
  0+15       0.1441     10.55  V Q       |         |         |         |
  0+20       0.2236     11.53  V Q       |         |         |         |
  0+25       0.3066     12.05  V Q       |         |         |         |
  0+30       0.3950     12.84  V Q       |         |         |         |
  0+35       0.4918     14.06  |VQ       |         |         |         |
  0+40       0.5915     14.47  |VQ       |         |         |         |
  0+45       0.6922     14.63  |VQ       |         |         |         |
  0+50       0.7935     14.70  |VQ       |         |         |         |
  0+55       0.8951     14.75  | Q       |         |         |         |
  1+ 0       1.0001     15.25  | VQ      |         |         |         |
  1+ 5       1.1124     16.30  | VQ      |         |         |         |
  1+10       1.2267     16.60  |  Q      |         |         |         |
  1+15       1.3420     16.74  |  Q      |         |         |         |
```

```
    1+20       1.4578     16.82  |  Q      |          |          |          |
    1+25       1.5739     16.86  |  Q      |          |          |          |
    1+30       1.6903     16.89  |  QV     |          |          |          |
    1+35       1.8067     16.91  |  QV     |          |          |          |
    1+40       1.9232     16.91  |  QV     |          |          |          |
    1+45       2.0396     16.91  |  Q V    |          |          |          |
    1+50       2.1561     16.91  |  Q V    |          |          |          |
    1+55       2.2725     16.91  |  Q V    |          |          |          |
    2+ 0       2.3922     17.38  |  Q V    |          |          |          |
    2+ 5       2.5158     17.94  |  Q  V   |          |          |          |
    2+10       2.6375     17.68  |  Q  V   |          |          |          |
    2+15       2.7653     18.55  |  Q  V   |          |          |          |
    2+20       2.8947     18.79  |  Q   V  |          |          |          |
    2+25       3.0249     18.90  |  Q   V  |          |          |          |
    2+30       3.1555     18.96  |  Q   V  |          |          |          |
    2+35       3.2863     18.99  |  Q    V |          |          |          |
    2+40       3.4172     19.00  |  Q    V |          |          |          |
    2+45       3.5514     19.50  |  Q    V |          |          |          |
    2+50       3.6928     20.53  |   Q    V|          |          |          |
    2+55       3.8363     20.83  |   Q    V|          |          |          |
    3+ 0       3.9806     20.97  |   Q    V|          |          |          |
    3+ 5       4.1256     21.04  |   Q     V          |          |          |
    3+10       4.2741     21.56  |   Q     V          |          |          |
    3+15       4.4299     22.62  |   Q     |V         |          |          |
    3+20       4.5879     22.94  |   Q     |V         |          |          |
    3+25       4.7509     23.67  |   Q     |V         |          |          |
    3+30       4.9275     25.64  |    Q    | V        |          |          |
    3+35       5.1203     28.00  |    Q    | V        |          |          |
    3+40       5.3263     29.90  |    Q    |  V       |          |          |
    3+45       5.5411     31.19  |     Q   |  V       |          |          |
    3+50       5.7673     32.84  |     Q   |   V      |          |          |
    3+55       6.0016     34.03  |     Q   |    V     |          |          |
    4+ 0       6.2472     35.65  |      Q  |    V     |          |          |
    4+ 5       6.5006     36.80  |      Q  |     V    |          |          |
    4+10       6.7691     38.99  |      Q  |     V    |          |          |
    4+15       7.0545     41.44  |       Q |      V   |          |          |
    4+20       7.3576     44.01  |       Q |       V  |          |          |
    4+25       7.6788     46.64  |        Q|        V |          |          |
    4+30       8.0143     48.71  |        Q|         V          |          |
    4+35       8.3591     50.07  |         Q         V          |          |
    4+40       8.7200     52.40  |         Q         |V         |          |
    4+45       9.0983     54.93  |         Q         | V        |          |
    4+50       9.4904     56.93  |         |Q        |  V       |          |
    4+55       9.8916     58.26  |         |Q        |   V      |          |
    5+ 0      10.3086     60.55  |         | Q       |    V     |          |
    5+ 5      10.7596     65.49  |         |  Q      |     V    |          |
    5+10      11.2819     75.83  |         |    Q    |      V   |          |
    5+15      11.8778     86.53  |         |      Q  |       V  |          |
    5+20      12.5343     95.32  |         |        Q|        V |          |
    5+25      13.2571    104.96  |         |         Q          |  V       |
    5+30      14.0807    119.59  |         |         |  Q       |    V     |
    5+35      14.8536    112.22  |         |         | Q        |      V   |
    5+40      15.2845     62.57  |         | Q       |          |       V  |
    5+45      15.5376     36.74  |       Q |         |          |       V  |
    5+50      15.7052     24.34  |   Q     |         |          |        V |
    5+55      15.8218     16.94  |  Q      |         |          |        V |
    6+ 0      15.8972     10.94  | Q       |         |          |        V |
    6+ 5      15.9405      6.29  |Q        |         |          |        V |
    6+10      15.9562      2.29  Q         |         |          |        V |
    6+15      15.9635      1.06  Q         |         |          |        V |
    6+20      15.9672      0.53  Q         |         |          |        V |
    6+25      15.9690      0.26  Q         |         |          |        V |
    6+30      15.9698      0.11  Q         |         |          |        V |
    6+35      15.9700      0.03  Q         |         |          |         V
-------------------------------------------------------------------------
```

Area 'A' – 100 Year 24 Hour Proposed Condition – Unit Hydrograph

```
        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  06/13/20 File: PRA10024100.out


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6407

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'A'
PROPOSED CONDITION UNIT HYDROGRAPH - 100 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE
------------------------------------------------------------------------
Drainage Area =      89.60(Ac.)  =      0.140 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      89.60(Ac.)  =      0.140 Sq. Mi.
Length along longest watercourse =    3028.00(Ft.)
Length along longest watercourse measured to centroid =    1778.00(Ft.)
Length along longest watercourse =      0.573 Mi.
Length along longest watercourse measured to centroid =      0.337 Mi.
Difference in elevation =      81.00(Ft.)
Slope along watercourse =    141.2417 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.075 Hr.
Lag time =     4.51 Min.
25% of lag time =     1.13 Min.
40% of lag time =     1.81 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]
       89.60            1.60                143.36

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       89.60            4.00                358.40

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    1.600(In)
Area Averaged 100-Year Rainfall =    4.000(In)

Point rain (area averaged) =    4.000(In)
Areal adjustment factor =   99.98 %
Adjusted average point rain =    3.999(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
    89.600           55.25         0.850
```

Total Area Entered = 89.60(Ac.)

RI AMC2	RI AMC-3	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
55.3	74.2	0.312	0.850	0.073	1.000	0.073
					Sum (F) =	0.073

Area averaged mean soil loss (F) (In/Hr) = 0.073
Minimum soil loss rate ((In/Hr)) = 0.037
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.220

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	110.764	22.469	20.289
2	0.167	221.528	48.841	44.103
3	0.250	332.291	14.220	12.841
4	0.333	443.055	6.505	5.874
5	0.417	553.819	3.613	3.263
6	0.500	664.583	2.239	2.022
7	0.583	775.346	1.313	1.186
8	0.667	886.110	0.800	0.723
			Sum = 100.000	Sum= 90.300

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	0.032	(0.130)	0.007	0.025
2	0.17	0.07	0.032	(0.130)	0.007	0.025
3	0.25	0.07	0.032	(0.129)	0.007	0.025
4	0.33	0.10	0.048	(0.129)	0.011	0.037
5	0.42	0.10	0.048	(0.128)	0.011	0.037
6	0.50	0.10	0.048	(0.128)	0.011	0.037
7	0.58	0.10	0.048	(0.127)	0.011	0.037
8	0.67	0.10	0.048	(0.127)	0.011	0.037
9	0.75	0.10	0.048	(0.126)	0.011	0.037
10	0.83	0.13	0.064	(0.126)	0.014	0.050
11	0.92	0.13	0.064	(0.125)	0.014	0.050
12	1.00	0.13	0.064	(0.125)	0.014	0.050
13	1.08	0.10	0.048	(0.124)	0.011	0.037
14	1.17	0.10	0.048	(0.124)	0.011	0.037
15	1.25	0.10	0.048	(0.123)	0.011	0.037
16	1.33	0.10	0.048	(0.123)	0.011	0.037
17	1.42	0.10	0.048	(0.122)	0.011	0.037
18	1.50	0.10	0.048	(0.122)	0.011	0.037
19	1.58	0.10	0.048	(0.121)	0.011	0.037
20	1.67	0.10	0.048	(0.121)	0.011	0.037
21	1.75	0.10	0.048	(0.120)	0.011	0.037
22	1.83	0.13	0.064	(0.120)	0.014	0.050
23	1.92	0.13	0.064	(0.119)	0.014	0.050
24	2.00	0.13	0.064	(0.119)	0.014	0.050
25	2.08	0.13	0.064	(0.118)	0.014	0.050
26	2.17	0.13	0.064	(0.118)	0.014	0.050
27	2.25	0.13	0.064	(0.117)	0.014	0.050
28	2.33	0.13	0.064	(0.117)	0.014	0.050
29	2.42	0.13	0.064	(0.116)	0.014	0.050
30	2.50	0.13	0.064	(0.116)	0.014	0.050
31	2.58	0.17	0.080	(0.115)	0.018	0.062
32	2.67	0.17	0.080	(0.115)	0.018	0.062
33	2.75	0.17	0.080	(0.115)	0.018	0.062
34	2.83	0.17	0.080	(0.114)	0.018	0.062
35	2.92	0.17	0.080	(0.114)	0.018	0.062

36	3.00	0.17	0.080	(0.113)	0.018	0.062
37	3.08	0.17	0.080	(0.113)	0.018	0.062
38	3.17	0.17	0.080	(0.112)	0.018	0.062
39	3.25	0.17	0.080	(0.112)	0.018	0.062
40	3.33	0.17	0.080	(0.111)	0.018	0.062
41	3.42	0.17	0.080	(0.111)	0.018	0.062
42	3.50	0.17	0.080	(0.110)	0.018	0.062
43	3.58	0.17	0.080	(0.110)	0.018	0.062
44	3.67	0.17	0.080	(0.109)	0.018	0.062
45	3.75	0.17	0.080	(0.109)	0.018	0.062
46	3.83	0.20	0.096	(0.108)	0.021	0.075
47	3.92	0.20	0.096	(0.108)	0.021	0.075
48	4.00	0.20	0.096	(0.108)	0.021	0.075
49	4.08	0.20	0.096	(0.107)	0.021	0.075
50	4.17	0.20	0.096	(0.107)	0.021	0.075
51	4.25	0.20	0.096	(0.106)	0.021	0.075
52	4.33	0.23	0.112	(0.106)	0.025	0.087
53	4.42	0.23	0.112	(0.105)	0.025	0.087
54	4.50	0.23	0.112	(0.105)	0.025	0.087
55	4.58	0.23	0.112	(0.104)	0.025	0.087
56	4.67	0.23	0.112	(0.104)	0.025	0.087
57	4.75	0.23	0.112	(0.104)	0.025	0.087
58	4.83	0.27	0.128	(0.103)	0.028	0.100
59	4.92	0.27	0.128	(0.103)	0.028	0.100
60	5.00	0.27	0.128	(0.102)	0.028	0.100
61	5.08	0.20	0.096	(0.102)	0.021	0.075
62	5.17	0.20	0.096	(0.101)	0.021	0.075
63	5.25	0.20	0.096	(0.101)	0.021	0.075
64	5.33	0.23	0.112	(0.100)	0.025	0.087
65	5.42	0.23	0.112	(0.100)	0.025	0.087
66	5.50	0.23	0.112	(0.100)	0.025	0.087
67	5.58	0.27	0.128	(0.099)	0.028	0.100
68	5.67	0.27	0.128	(0.099)	0.028	0.100
69	5.75	0.27	0.128	(0.098)	0.028	0.100
70	5.83	0.27	0.128	(0.098)	0.028	0.100
71	5.92	0.27	0.128	(0.097)	0.028	0.100
72	6.00	0.27	0.128	(0.097)	0.028	0.100
73	6.08	0.30	0.144	(0.096)	0.032	0.112
74	6.17	0.30	0.144	(0.096)	0.032	0.112
75	6.25	0.30	0.144	(0.096)	0.032	0.112
76	6.33	0.30	0.144	(0.095)	0.032	0.112
77	6.42	0.30	0.144	(0.095)	0.032	0.112
78	6.50	0.30	0.144	(0.094)	0.032	0.112
79	6.58	0.33	0.160	(0.094)	0.035	0.125
80	6.67	0.33	0.160	(0.094)	0.035	0.125
81	6.75	0.33	0.160	(0.093)	0.035	0.125
82	6.83	0.33	0.160	(0.093)	0.035	0.125
83	6.92	0.33	0.160	(0.092)	0.035	0.125
84	7.00	0.33	0.160	(0.092)	0.035	0.125
85	7.08	0.33	0.160	(0.091)	0.035	0.125
86	7.17	0.33	0.160	(0.091)	0.035	0.125
87	7.25	0.33	0.160	(0.091)	0.035	0.125
88	7.33	0.37	0.176	(0.090)	0.039	0.137
89	7.42	0.37	0.176	(0.090)	0.039	0.137
90	7.50	0.37	0.176	(0.089)	0.039	0.137
91	7.58	0.40	0.192	(0.089)	0.042	0.150
92	7.67	0.40	0.192	(0.089)	0.042	0.150
93	7.75	0.40	0.192	(0.088)	0.042	0.150
94	7.83	0.43	0.208	(0.088)	0.046	0.162
95	7.92	0.43	0.208	(0.087)	0.046	0.162
96	8.00	0.43	0.208	(0.087)	0.046	0.162
97	8.08	0.50	0.240	(0.086)	0.053	0.187
98	8.17	0.50	0.240	(0.086)	0.053	0.187
99	8.25	0.50	0.240	(0.086)	0.053	0.187
100	8.33	0.50	0.240	(0.085)	0.053	0.187
101	8.42	0.50	0.240	(0.085)	0.053	0.187
102	8.50	0.50	0.240	(0.084)	0.053	0.187
103	8.58	0.53	0.256	(0.084)	0.056	0.200
104	8.67	0.53	0.256	(0.084)	0.056	0.200
105	8.75	0.53	0.256	(0.083)	0.056	0.200
106	8.83	0.57	0.272	(0.083)	0.060	0.212
107	8.92	0.57	0.272	(0.083)	0.060	0.212
108	9.00	0.57	0.272	(0.082)	0.060	0.212

109	9.08	0.63	0.304	(0.082)	0.067	0.237
110	9.17	0.63	0.304	(0.081)	0.067	0.237
111	9.25	0.63	0.304	(0.081)	0.067	0.237
112	9.33	0.67	0.320	(0.081)	0.070	0.250
113	9.42	0.67	0.320	(0.080)	0.070	0.250
114	9.50	0.67	0.320	(0.080)	0.070	0.250
115	9.58	0.70	0.336	(0.079)	0.074	0.262
116	9.67	0.70	0.336	(0.079)	0.074	0.262
117	9.75	0.70	0.336	(0.079)	0.074	0.262
118	9.83	0.73	0.352	(0.078)	0.077	0.275
119	9.92	0.73	0.352	(0.078)	0.077	0.275
120	10.00	0.73	0.352	(0.078)	0.077	0.275
121	10.08	0.50	0.240	(0.077)	0.053	0.187
122	10.17	0.50	0.240	(0.077)	0.053	0.187
123	10.25	0.50	0.240	(0.076)	0.053	0.187
124	10.33	0.50	0.240	(0.076)	0.053	0.187
125	10.42	0.50	0.240	(0.076)	0.053	0.187
126	10.50	0.50	0.240	(0.075)	0.053	0.187
127	10.58	0.67	0.320	(0.075)	0.070	0.250
128	10.67	0.67	0.320	(0.075)	0.070	0.250
129	10.75	0.67	0.320	(0.074)	0.070	0.250
130	10.83	0.67	0.320	(0.074)	0.070	0.250
131	10.92	0.67	0.320	(0.073)	0.070	0.250
132	11.00	0.67	0.320	(0.073)	0.070	0.250
133	11.08	0.63	0.304	(0.073)	0.067	0.237
134	11.17	0.63	0.304	(0.072)	0.067	0.237
135	11.25	0.63	0.304	(0.072)	0.067	0.237
136	11.33	0.63	0.304	(0.072)	0.067	0.237
137	11.42	0.63	0.304	(0.071)	0.067	0.237
138	11.50	0.63	0.304	(0.071)	0.067	0.237
139	11.58	0.57	0.272	(0.071)	0.060	0.212
140	11.67	0.57	0.272	(0.070)	0.060	0.212
141	11.75	0.57	0.272	(0.070)	0.060	0.212
142	11.83	0.60	0.288	(0.070)	0.063	0.225
143	11.92	0.60	0.288	(0.069)	0.063	0.225
144	12.00	0.60	0.288	(0.069)	0.063	0.225
145	12.08	0.83	0.400	0.069	(0.088)	0.331
146	12.17	0.83	0.400	0.068	(0.088)	0.332
147	12.25	0.83	0.400	0.068	(0.088)	0.332
148	12.33	0.87	0.416	0.068	(0.092)	0.348
149	12.42	0.87	0.416	0.067	(0.092)	0.349
150	12.50	0.87	0.416	0.067	(0.092)	0.349
151	12.58	0.93	0.448	0.067	(0.099)	0.381
152	12.67	0.93	0.448	0.066	(0.099)	0.382
153	12.75	0.93	0.448	0.066	(0.099)	0.382
154	12.83	0.97	0.464	0.065	(0.102)	0.398
155	12.92	0.97	0.464	0.065	(0.102)	0.399
156	13.00	0.97	0.464	0.065	(0.102)	0.399
157	13.08	1.13	0.544	0.065	(0.120)	0.479
158	13.17	1.13	0.544	0.064	(0.120)	0.480
159	13.25	1.13	0.544	0.064	(0.120)	0.480
160	13.33	1.13	0.544	0.064	(0.120)	0.480
161	13.42	1.13	0.544	0.063	(0.120)	0.481
162	13.50	1.13	0.544	0.063	(0.120)	0.481
163	13.58	0.77	0.368	0.063	(0.081)	0.305
164	13.67	0.77	0.368	0.062	(0.081)	0.306
165	13.75	0.77	0.368	0.062	(0.081)	0.306
166	13.83	0.77	0.368	0.062	(0.081)	0.306
167	13.92	0.77	0.368	0.061	(0.081)	0.307
168	14.00	0.77	0.368	0.061	(0.081)	0.307
169	14.08	0.90	0.432	0.061	(0.095)	0.371
170	14.17	0.90	0.432	0.060	(0.095)	0.372
171	14.25	0.90	0.432	0.060	(0.095)	0.372
172	14.33	0.87	0.416	0.060	(0.092)	0.356
173	14.42	0.87	0.416	0.059	(0.092)	0.356
174	14.50	0.87	0.416	0.059	(0.092)	0.357
175	14.58	0.87	0.416	0.059	(0.092)	0.357
176	14.67	0.87	0.416	0.059	(0.092)	0.357
177	14.75	0.87	0.416	0.058	(0.092)	0.358
178	14.83	0.83	0.400	0.058	(0.088)	0.342
179	14.92	0.83	0.400	0.058	(0.088)	0.342
180	15.00	0.83	0.400	0.057	(0.088)	0.343
181	15.08	0.80	0.384	0.057	(0.084)	0.327

182	15.17	0.80	0.384	0.057	(0.084)	0.327
183	15.25	0.80	0.384	0.056	(0.084)	0.327
184	15.33	0.77	0.368	0.056	(0.081)	0.312
185	15.42	0.77	0.368	0.056	(0.081)	0.312
186	15.50	0.77	0.368	0.056	(0.081)	0.312
187	15.58	0.63	0.304	0.055	(0.067)	0.249
188	15.67	0.63	0.304	0.055	(0.067)	0.249
189	15.75	0.63	0.304	0.055	(0.067)	0.249
190	15.83	0.63	0.304	0.054	(0.067)	0.249
191	15.92	0.63	0.304	0.054	(0.067)	0.250
192	16.00	0.63	0.304	0.054	(0.067)	0.250
193	16.08	0.13	0.064	(0.054)	0.014	0.050
194	16.17	0.13	0.064	(0.053)	0.014	0.050
195	16.25	0.13	0.064	(0.053)	0.014	0.050
196	16.33	0.13	0.064	(0.053)	0.014	0.050
197	16.42	0.13	0.064	(0.053)	0.014	0.050
198	16.50	0.13	0.064	(0.052)	0.014	0.050
199	16.58	0.10	0.048	(0.052)	0.011	0.037
200	16.67	0.10	0.048	(0.052)	0.011	0.037
201	16.75	0.10	0.048	(0.051)	0.011	0.037
202	16.83	0.10	0.048	(0.051)	0.011	0.037
203	16.92	0.10	0.048	(0.051)	0.011	0.037
204	17.00	0.10	0.048	(0.051)	0.011	0.037
205	17.08	0.17	0.080	(0.050)	0.018	0.062
206	17.17	0.17	0.080	(0.050)	0.018	0.062
207	17.25	0.17	0.080	(0.050)	0.018	0.062
208	17.33	0.17	0.080	(0.050)	0.018	0.062
209	17.42	0.17	0.080	(0.049)	0.018	0.062
210	17.50	0.17	0.080	(0.049)	0.018	0.062
211	17.58	0.17	0.080	(0.049)	0.018	0.062
212	17.67	0.17	0.080	(0.049)	0.018	0.062
213	17.75	0.17	0.080	(0.048)	0.018	0.062
214	17.83	0.13	0.064	(0.048)	0.014	0.050
215	17.92	0.13	0.064	(0.048)	0.014	0.050
216	18.00	0.13	0.064	(0.048)	0.014	0.050
217	18.08	0.13	0.064	(0.048)	0.014	0.050
218	18.17	0.13	0.064	(0.047)	0.014	0.050
219	18.25	0.13	0.064	(0.047)	0.014	0.050
220	18.33	0.13	0.064	(0.047)	0.014	0.050
221	18.42	0.13	0.064	(0.047)	0.014	0.050
222	18.50	0.13	0.064	(0.046)	0.014	0.050
223	18.58	0.10	0.048	(0.046)	0.011	0.037
224	18.67	0.10	0.048	(0.046)	0.011	0.037
225	18.75	0.10	0.048	(0.046)	0.011	0.037
226	18.83	0.07	0.032	(0.045)	0.007	0.025
227	18.92	0.07	0.032	(0.045)	0.007	0.025
228	19.00	0.07	0.032	(0.045)	0.007	0.025
229	19.08	0.10	0.048	(0.045)	0.011	0.037
230	19.17	0.10	0.048	(0.045)	0.011	0.037
231	19.25	0.10	0.048	(0.044)	0.011	0.037
232	19.33	0.13	0.064	(0.044)	0.014	0.050
233	19.42	0.13	0.064	(0.044)	0.014	0.050
234	19.50	0.13	0.064	(0.044)	0.014	0.050
235	19.58	0.10	0.048	(0.044)	0.011	0.037
236	19.67	0.10	0.048	(0.043)	0.011	0.037
237	19.75	0.10	0.048	(0.043)	0.011	0.037
238	19.83	0.07	0.032	(0.043)	0.007	0.025
239	19.92	0.07	0.032	(0.043)	0.007	0.025
240	20.00	0.07	0.032	(0.043)	0.007	0.025
241	20.08	0.10	0.048	(0.042)	0.011	0.037
242	20.17	0.10	0.048	(0.042)	0.011	0.037
243	20.25	0.10	0.048	(0.042)	0.011	0.037
244	20.33	0.10	0.048	(0.042)	0.011	0.037
245	20.42	0.10	0.048	(0.042)	0.011	0.037
246	20.50	0.10	0.048	(0.042)	0.011	0.037
247	20.58	0.10	0.048	(0.041)	0.011	0.037
248	20.67	0.10	0.048	(0.041)	0.011	0.037
249	20.75	0.10	0.048	(0.041)	0.011	0.037
250	20.83	0.07	0.032	(0.041)	0.007	0.025
251	20.92	0.07	0.032	(0.041)	0.007	0.025
252	21.00	0.07	0.032	(0.041)	0.007	0.025
253	21.08	0.10	0.048	(0.040)	0.011	0.037
254	21.17	0.10	0.048	(0.040)	0.011	0.037

```
255  21.25     0.10      0.048       (  0.040)       0.011        0.037
256  21.33     0.07      0.032       (  0.040)       0.007        0.025
257  21.42     0.07      0.032       (  0.040)       0.007        0.025
258  21.50     0.07      0.032       (  0.040)       0.007        0.025
259  21.58     0.10      0.048       (  0.039)       0.011        0.037
260  21.67     0.10      0.048       (  0.039)       0.011        0.037
261  21.75     0.10      0.048       (  0.039)       0.011        0.037
262  21.83     0.07      0.032       (  0.039)       0.007        0.025
263  21.92     0.07      0.032       (  0.039)       0.007        0.025
264  22.00     0.07      0.032       (  0.039)       0.007        0.025
265  22.08     0.10      0.048       (  0.039)       0.011        0.037
266  22.17     0.10      0.048       (  0.039)       0.011        0.037
267  22.25     0.10      0.048       (  0.038)       0.011        0.037
268  22.33     0.07      0.032       (  0.038)       0.007        0.025
269  22.42     0.07      0.032       (  0.038)       0.007        0.025
270  22.50     0.07      0.032       (  0.038)       0.007        0.025
271  22.58     0.07      0.032       (  0.038)       0.007        0.025
272  22.67     0.07      0.032       (  0.038)       0.007        0.025
273  22.75     0.07      0.032       (  0.038)       0.007        0.025
274  22.83     0.07      0.032       (  0.038)       0.007        0.025
275  22.92     0.07      0.032       (  0.038)       0.007        0.025
276  23.00     0.07      0.032       (  0.037)       0.007        0.025
277  23.08     0.07      0.032       (  0.037)       0.007        0.025
278  23.17     0.07      0.032       (  0.037)       0.007        0.025
279  23.25     0.07      0.032       (  0.037)       0.007        0.025
280  23.33     0.07      0.032       (  0.037)       0.007        0.025
281  23.42     0.07      0.032       (  0.037)       0.007        0.025
282  23.50     0.07      0.032       (  0.037)       0.007        0.025
283  23.58     0.07      0.032       (  0.037)       0.007        0.025
284  23.67     0.07      0.032       (  0.037)       0.007        0.025
285  23.75     0.07      0.032       (  0.037)       0.007        0.025
286  23.83     0.07      0.032       (  0.037)       0.007        0.025
287  23.92     0.07      0.032       (  0.037)       0.007        0.025
288  24.00     0.07      0.032       (  0.037)       0.007        0.025
                (Loss Rate Not Used)
    Sum =     100.0                                  Sum =     38.8
      Flood volume = Effective rainfall      3.24(In)
       times area      89.6(Ac.)/[(In)/(Ft.)] =      24.2(Ac.Ft)
      Total soil loss =      0.76(In)
      Total soil loss =     5.690(Ac.Ft)
      Total rainfall =      4.00(In)
      Flood volume =     1052888.8 Cubic Feet
      Total soil loss =      247875.5 Cubic Feet
      --------------------------------------------------------------------
       Peak flow rate of this hydrograph =     43.266(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       12.5      25.0      37.5      50.0
 ----------------------------------------------------------------------------
   0+ 5       0.0035      0.51  Q         |         |         |         |
   0+10       0.0146      1.61  VQ        |         |         |         |
   0+15       0.0278      1.93  VQ        |         |         |         |
   0+20       0.0439      2.33  VQ        |         |         |         |
   0+25       0.0643      2.96  V Q       |         |         |         |
   0+30       0.0861      3.17  V Q       |         |         |         |
   0+35       0.1087      3.27  V Q       |         |         |         |
   0+40       0.1316      3.33  V Q       |         |         |         |
   0+45       0.1547      3.36  V Q       |         |         |         |
   0+50       0.1797      3.63  V Q       |         |         |         |
   0+55       0.2085      4.19  V  Q      |         |         |         |
   1+ 0       0.2385      4.35  V  Q      |         |         |         |
   1+ 5       0.2672      4.17  V  Q      |         |         |         |
   1+10       0.2923      3.66  V Q       |         |         |         |
   1+15       0.3166      3.52  V Q       |         |         |         |
   1+20       0.3404      3.46  V Q       |         |         |         |
   1+25       0.3641      3.43  V Q       |         |         |         |
   1+30       0.3875      3.41  V Q       |         |         |         |
```

1+35	0.4109	3.39	V Q	|	|	|	|
1+40	0.4342	3.38	V Q	|	|	|	|
1+45	0.4575	3.38	V Q	|	|	|	|
1+50	0.4825	3.64	V Q	|	|	|	|
1+55	0.5113	4.19	V Q	|	|	|	|
2+ 0	0.5413	4.35	V Q	|	|	|	|
2+ 5	0.5717	4.42	V Q	|	|	|	|
2+10	0.6024	4.46	V Q	|	|	|	|
2+15	0.6333	4.49	|V Q	|	|	|	|
2+20	0.6643	4.50	|V Q	|	|	|	|
2+25	0.6954	4.51	|V Q	|	|	|	|
2+30	0.7264	4.51	|V Q	|	|	|	|
2+35	0.7592	4.76	|V Q	|	|	|	|
2+40	0.7958	5.31	|V Q	|	|	|	|
2+45	0.8335	5.47	|V Q	|	|	|	|
2+50	0.8717	5.55	|V Q	|	|	|	|
2+55	0.9102	5.59	|V Q	|	|	|	|
3+ 0	0.9488	5.61	|V Q	|	|	|	|
3+ 5	0.9876	5.63	|V Q	|	|	|	|
3+10	1.0264	5.64	|V Q	|	|	|	|
3+15	1.0652	5.64	|V Q	|	|	|	|
3+20	1.1041	5.64	|V Q	|	|	|	|
3+25	1.1429	5.64	|V Q	|	|	|	|
3+30	1.1817	5.64	|V Q	|	|	|	|
3+35	1.2205	5.64	| V Q	|	|	|	|
3+40	1.2593	5.64	| V Q	|	|	|	|
3+45	1.2982	5.64	| V Q	|	|	|	|
3+50	1.3387	5.89	| V Q	|	|	|	|
3+55	1.3831	6.44	| V Q	|	|	|	|
4+ 0	1.4285	6.60	| V Q	|	|	|	|
4+ 5	1.4745	6.67	| V Q	|	|	|	|
4+10	1.5208	6.71	| V Q	|	|	|	|
4+15	1.5672	6.74	| V Q	|	|	|	|
4+20	1.6154	7.01	| V Q	|	|	|	|
4+25	1.6676	7.57	| V Q	|	|	|	|
4+30	1.7208	7.73	| V Q	|	|	|	|
4+35	1.7745	7.80	| V Q	|	|	|	|
4+40	1.8285	7.84	| V Q	|	|	|	|
4+45	1.8827	7.87	| V Q	|	|	|	|
4+50	1.9387	8.14	| V Q	|	|	|	|
4+55	1.9986	8.70	| V Q	|	|	|	|
5+ 0	2.0596	8.86	| V Q	|	|	|	|
5+ 5	2.1176	8.42	| V Q	|	|	|	|
5+10	2.1683	7.36	| V Q	|	|	|	|
5+15	2.2170	7.07	| V Q	|	|	|	|
5+20	2.2665	7.19	| V Q	|	|	|	|
5+25	2.3193	7.67	| V Q	|	|	|	|
5+30	2.3728	7.78	| V Q	|	|	|	|
5+35	2.4284	8.07	| V Q	|	|	|	|
5+40	2.4880	8.65	| V Q	|	|	|	|
5+45	2.5488	8.83	| V Q	|	|	|	|
5+50	2.6102	8.92	| V Q	|	|	|	|
5+55	2.6720	8.97	| V Q	|	|	|	|
6+ 0	2.7340	8.99	| V Q	|	|	|	|
6+ 5	2.7978	9.26	| V Q	|	|	|	|
6+10	2.8654	9.82	| V Q	|	|	|	|
6+15	2.9342	9.98	| V Q	|	|	|	|
6+20	3.0034	10.06	| V Q	|	|	|	|
6+25	3.0729	10.10	| V Q	|	|	|	|
6+30	3.1427	10.12	| V Q	|	|	|	|
6+35	3.2142	10.39	| V Q	|	|	|	|
6+40	3.2896	10.95	| V Q	|	|	|	|
6+45	3.3661	11.11	| V Q	|	|	|	|
6+50	3.4432	11.18	| V Q	|	|	|	|
6+55	3.5205	11.22	| V Q	|	|	|	|
7+ 0	3.5979	11.25	| V Q	|	|	|	|
7+ 5	3.6755	11.26	| V Q|	|	|	|	|
7+10	3.7532	11.27	| V Q|	|	|	|	|
7+15	3.8308	11.27	| V Q|	|	|	|	|
7+20	3.9102	11.53	| V Q|	|	|	|	|
7+25	3.9934	12.08	| V Q|	|	|	|	|
7+30	4.0776	12.24	| V Q|	|	|	|	|
7+35	4.1642	12.56	| V Q	|	|	|	|

```
 7+40      4.2548     13.16  |      V  Q         |          |          |
 7+45      4.3467     13.34  |      V  Q         |          |          |
 7+50      4.4409     13.68  |      V  Q         |          |          |
 7+55      4.5393     14.28  |      V  |Q        |          |          |
 8+ 0      4.6389     14.47  |      V  |Q        |          |          |
 8+ 5      4.7426     15.06  |      V  | Q       |          |          |
 8+10      4.8543     16.21  |       V | Q       |          |          |
 8+15      4.9684     16.56  |       V |  Q      |          |          |
 8+20      5.0835     16.72  |       V |  Q      |          |          |
 8+25      5.1993     16.81  |       V |  Q      |          |          |
 8+30      5.3154     16.86  |       V |  Q      |          |          |
 8+35      5.4335     17.15  |       V |  Q      |          |          |
 8+40      5.5555     17.71  |        V|   Q     |          |          |
 8+45      5.6786     17.87  |        V|   Q     |          |          |
 8+50      5.8040     18.20  |        V|   Q     |          |          |
 8+55      5.9334     18.79  |        V|    Q    |          |          |
 9+ 0      6.0641     18.98  |         V    Q    |          |          |
 9+ 5      6.1989     19.57  |         V    Q    |          |          |
 9+10      6.3416     20.72  |         V     Q   |          |          |
 9+15      6.4867     21.07  |         V     Q   |          |          |
 9+20      6.6347     21.48  |         V      Q  |          |          |
 9+25      6.7870     22.13  |         |V     Q  |          |          |
 9+30      6.9409     22.34  |         |V     Q  |          |          |
 9+35      7.0971     22.69  |         |V      Q |          |          |
 9+40      7.2576     23.30  |         | V     Q |          |          |
 9+45      7.4194     23.49  |         | V     Q |          |          |
 9+50      7.5835     23.83  |         | V      Q|          |          |
 9+55      7.7517     24.43  |         | V      Q|          |          |
10+ 0      7.9212     24.61  |         |  V     Q|          |          |
10+ 5      8.0792     22.93  |         |  V    Q |          |          |
10+10      8.2109     19.12  |         |  V Q    |          |          |
10+15      8.3350     18.03  |         |  VQ     |          |          |
10+20      8.4558     17.53  |         |  VQ     |          |          |
10+25      8.5746     17.25  |         |  QV     |          |          |
10+30      8.6922     17.08  |         |  QV     |          |          |
10+35      8.8178     18.24  |         |   Q     |          |          |
10+40      8.9620     20.93  |         |   V Q   |          |          |
10+45      9.1116     21.73  |         |    V Q  |          |          |
10+50      9.2638     22.10  |         |    V Q  |          |          |
10+55      9.4174     22.30  |         |    V Q  |          |          |
11+ 0      9.5719     22.43  |         |    V Q  |          |          |
11+ 5      9.7251     22.25  |         |     VQ  |          |          |
11+10      9.8748     21.74  |         |     VQ  |          |          |
11+15     10.0235     21.58  |         |     VQ  |          |          |
11+20     10.1716     21.51  |         |     VQ  |          |          |
11+25     10.3195     21.47  |         |      Q  |          |          |
11+30     10.4671     21.44  |         |      Q  |          |          |
11+35     10.6112     20.92  |         |     QV  |          |          |
11+40     10.7477     19.81  |         |    Q V  |          |          |
11+45     10.8819     19.49  |         |    Q  V |          |          |
11+50     11.0169     19.60  |         |    Q  V |          |          |
11+55     11.1551     20.07  |         |     Q V |          |          |
12+ 0     11.2940     20.18  |         |     Q V |          |          |
12+ 5     11.4482     22.39  |         |      QV |          |          |
12+10     11.6351     27.13  |         |        V|Q         |          |
12+15     11.8317     28.55  |         |        V| Q        |          |
12+20     12.0351     29.54  |         |        V|  Q       |          |
12+25     12.2461     30.63  |         |         V   Q      |          |
12+30     12.4602     31.09  |         |         V   Q      |          |
12+35     12.6805     31.99  |         |         V    Q     |          |
12+40     12.9116     33.56  |         |         |V    Q    |          |
12+45     13.1460     34.03  |         |         |V     Q   |          |
12+50     13.3842     34.59  |         |         | V    Q  |          |
12+55     13.6283     35.44  |         |         | V     Q |          |
13+ 0     13.8745     35.74  |         |         | V     Q |          |
13+ 5     14.1330     37.53  |         |         |  V      Q          |
13+10     14.4165     41.16  |         |         |  V      | Q        |
13+15     14.7075     42.25  |         |         |   V     |  Q       |
13+20     15.0021     42.77  |         |         |   V     |   Q      |
13+25     15.2987     43.07  |         |         |    V    |   Q      |
13+30     15.5967     43.27  |         |         |    V    |   Q      |
13+35     15.8709     39.82  |         |         |     V   |Q         |
13+40     16.0923     32.14  |         |         |    QV   |          |
```

```
13+45      16.2982     29.91  |          |          |  Q  V    |          |
13+50      16.4973     28.90  |          |          |  Q   V   |          |
13+55      16.6926     28.36  |          |          | Q    V   |          |
14+ 0      16.8856     28.03  |          |          | Q    V   |          |
14+ 5      17.0864     29.15  |          |          |  Q    V  |          |
14+10      17.3059     31.87  |          |          |    Q  V  |          |
14+15      17.5312     32.72  |          |          |     Q  V |          |
14+20      17.7571     32.80  |          |          |     Q  V |          |
14+25      17.9798     32.33  |          |          |    Q   V |          |
14+30      18.2021     32.28  |          |          |    Q    V|          |
14+35      18.4245     32.29  |          |          |    Q    V|          |
14+40      18.6471     32.31  |          |          |    Q    V|          |
14+45      18.8696     32.31  |          |          |    Q    |V          |
14+50      19.0900     31.99  |          |          |    Q    |V          |
14+55      19.3055     31.30  |          |          |    Q    |V          |
15+ 0      19.5199     31.12  |          |          |   Q     | V         |
15+ 5      19.7315     30.73  |          |          |   Q     | V         |
15+10      19.9382     30.00  |          |          |   Q     | V         |
15+15      20.1433     29.79  |          |          |  Q      |  V        |
15+20      20.3456     29.38  |          |          |  Q      |  V        |
15+25      20.5429     28.63  |          |          | Q       |  V        |
15+30      20.7386     28.42  |          |          | Q       |   V       |
15+35      20.9248     27.04  |          |          |Q        |   V       |
15+40      21.0913     24.17  |          |         Q|         |   V       |
15+45      21.2521     23.35  |          |        Q |         |    V      |
15+50      21.4103     22.98  |          |        Q |         |    V      |
15+55      21.5672     22.78  |          |        Q |         |    V      |
16+ 0      21.7234     22.68  |          |        Q |         |    V      |
16+ 5      21.8512     18.56  |          |   Q      |         |     V     |
16+10      21.9179      9.69  |       Q  |          |         |     V     |
16+15      21.9670      7.12  |     Q    |          |         |     V     |
16+20      22.0079      5.95  |    Q     |          |         |     V     |
16+25      22.0444      5.30  |    Q     |          |         |     V     |
16+30      22.0781      4.89  |  Q       |          |         |     V     |
16+35      22.1084      4.40  |  Q       |          |         |     V     |
16+40      22.1339      3.71  | Q        |          |         |     V     |
16+45      22.1583      3.55  | Q        |          |         |     V     |
16+50      22.1823      3.47  | Q        |          |         |     V     |
16+55      22.2059      3.43  | Q        |          |         |     V     |
17+ 0      22.2293      3.41  | Q        |          |         |     V     |
17+ 5      22.2562      3.90  |  Q       |          |         |     V     |
17+10      22.2905      4.99  |  Q       |          |         |     V     |
17+15      22.3271      5.31  |   Q      |          |         |     V     |
17+20      22.3647      5.46  |   Q      |          |         |      V    |
17+25      22.4028      5.54  |   Q      |          |         |      V    |
17+30      22.4413      5.59  |   Q      |          |         |      V    |
17+35      22.4800      5.62  |   Q      |          |         |      V    |
17+40      22.5189      5.64  |   Q      |          |         |      V    |
17+45      22.5577      5.64  |   Q      |          |         |      V    |
17+50      22.5948      5.38  |   Q      |          |         |      V    |
17+55      22.6280      4.83  |  Q       |          |         |      V    |
18+ 0      22.6602      4.67  |  Q       |          |         |      V    |
18+ 5      22.6919      4.60  |  Q       |          |         |      V    |
18+10      22.7233      4.56  |  Q       |          |         |      V    |
18+15      22.7545      4.53  |  Q       |          |         |      V    |
18+20      22.7856      4.52  |  Q       |          |         |      V    |
18+25      22.8167      4.51  |  Q       |          |         |      V    |
18+30      22.8477      4.51  |  Q       |          |         |      V    |
18+35      22.8770      4.26  |  Q       |          |         |      V    |
18+40      22.9026      3.71  | Q        |          |         |      V    |
18+45      22.9270      3.55  | Q        |          |         |      V    |
18+50      22.9491      3.22  | Q        |          |         |      V    |
18+55      22.9672      2.63  | Q        |          |         |       V   |
19+ 0      22.9841      2.44  |Q         |          |         |       V   |
19+ 5      23.0020      2.61  | Q        |          |         |       V   |
19+10      23.0234      3.11  | Q        |          |         |       V   |
19+15      23.0457      3.24  | Q        |          |         |       V   |
19+20      23.0702      3.55  | Q        |          |         |       V   |
19+25      23.0987      4.14  |  Q       |          |         |       V   |
19+30      23.1285      4.32  |  Q       |          |         |       V   |
19+35      23.1571      4.16  |  Q       |          |         |       V   |
19+40      23.1823      3.66  | Q        |          |         |       V   |
19+45      23.2065      3.52  | Q        |          |         |       V   |
```

19+50	23.2286	3.21	| Q	|	|	|	V |
19+55	23.2467	2.63	| Q	|	|	|	V |
20+ 0	23.2636	2.44	|Q	|	|	|	V |
20+ 5	23.2815	2.61	| Q	|	|	|	V |
20+10	23.3029	3.11	| Q	|	|	|	V |
20+15	23.3252	3.24	| Q	|	|	|	V |
20+20	23.3480	3.30	| Q	|	|	|	V |
20+25	23.3709	3.33	| Q	|	|	|	V |
20+30	23.3941	3.36	| Q	|	|	|	V |
20+35	23.4173	3.37	| Q	|	|	|	V |
20+40	23.4406	3.38	| Q	|	|	|	V |
20+45	23.4639	3.38	| Q	|	|	|	V |
20+50	23.4854	3.13	| Q	|	|	|	V |
20+55	23.5032	2.58	| Q	|	|	|	V |
21+ 0	23.5198	2.42	|Q	|	|	|	V |
21+ 5	23.5377	2.60	| Q	|	|	|	V |
21+10	23.5591	3.11	| Q	|	|	|	V |
21+15	23.5815	3.24	| Q	|	|	|	V|
21+20	23.6024	3.05	| Q	|	|	|	V|
21+25	23.6199	2.53	| Q	|	|	|	V|
21+30	23.6364	2.39	|Q	|	|	|	V|
21+35	23.6542	2.59	| Q	|	|	|	V|
21+40	23.6756	3.11	| Q	|	|	|	V|
21+45	23.6979	3.24	| Q	|	|	|	V|
21+50	23.7189	3.05	| Q	|	|	|	V|
21+55	23.7363	2.53	| Q	|	|	|	V|
22+ 0	23.7528	2.39	|Q	|	|	|	V|
22+ 5	23.7706	2.59	| Q	|	|	|	V|
22+10	23.7920	3.11	| Q	|	|	|	V|
22+15	23.8144	3.24	| Q	|	|	|	V|
22+20	23.8354	3.05	| Q	|	|	|	V|
22+25	23.8528	2.53	| Q	|	|	|	V|
22+30	23.8693	2.39	|Q	|	|	|	V|
22+35	23.8854	2.34	|Q	|	|	|	V|
22+40	23.9012	2.30	|Q	|	|	|	V|
22+45	23.9169	2.28	|Q	|	|	|	V|
22+50	23.9325	2.26	|Q	|	|	|	V|
22+55	23.9480	2.25	|Q	|	|	|	V|
23+ 0	23.9636	2.25	|Q	|	|	|	V|
23+ 5	23.9791	2.25	|Q	|	|	|	V|
23+10	23.9946	2.25	|Q	|	|	|	V|
23+15	24.0101	2.25	|Q	|	|	|	V|
23+20	24.0257	2.25	|Q	|	|	|	V|
23+25	24.0412	2.25	|Q	|	|	|	V|
23+30	24.0567	2.25	|Q	|	|	|	V|
23+35	24.0723	2.25	|Q	|	|	|	V|
23+40	24.0878	2.25	|Q	|	|	|	V|
23+45	24.1033	2.25	|Q	|	|	|	V|
23+50	24.1188	2.25	|Q	|	|	|	V|
23+55	24.1344	2.25	|Q	|	|	|	V|
24+ 0	24.1499	2.25	|Q	|	|	|	V|
24+ 5	24.1619	1.75	|Q	|	|	|	V|
24+10	24.1664	0.65	Q	|	|	|	V|
24+15	24.1686	0.33	Q	|	|	|	V|
24+20	24.1699	0.18	Q	|	|	|	V|
24+25	24.1705	0.10	Q	|	|	|	V|
24+30	24.1709	0.05	Q	|	|	|	V|
24+35	24.1710	0.02	Q	|	|	|	V

Area B

Area 'B' – 10 Year 1 Hour Existing Condition – Unit Hydrograph

```
        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  06/27/20 File: EXB010110.out


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format


------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'B'
EXISTING CONDITION UNIT HYDROGRAPH - 10 YEAR 1 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =     331.00(Ac.)  =      0.517 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =     331.00(Ac.)  =      0.517 Sq. Mi.
Length along longest watercourse =    7455.00(Ft.)
Length along longest watercourse measured to centroid =    5892.00(Ft.)
Length along longest watercourse =      1.412 Mi.
Length along longest watercourse measured to centroid =      1.116 Mi.
Difference in elevation =     122.00(Ft.)
Slope along watercourse =     86.4064 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.367 Hr.
Lag time =    22.01 Min.
25% of lag time =     5.50 Min.
40% of lag time =     8.80 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]
      331.00           0.45                148.95

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
      331.00           1.20                397.20

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    0.450(In)
Area Averaged 100-Year Rainfall =    1.200(In)

Point rain (area averaged) =    0.759(In)
Areal adjustment factor =   99.70 %
Adjusted average point rain =    0.756(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
   331.000           72.50         0.000
 Total Area Entered =    331.00(Ac.)
```

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
72.5	72.5	0.333	0.000	0.333	1.000	0.333
					Sum (F) =	0.333

Area averaged mean soil loss (F) (In/Hr) = 0.333
Minimum soil loss rate ((In/Hr)) = 0.166
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

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	22.720	2.056	6.860
2	0.167	45.439	6.466	21.569
3	0.250	68.159	11.378	37.955
4	0.333	90.879	15.374	51.286
5	0.417	113.598	15.551	51.875
6	0.500	136.318	10.899	36.358
7	0.583	159.038	7.020	23.418
8	0.667	181.757	4.723	15.754
9	0.750	204.477	3.502	11.683
10	0.833	227.197	2.929	9.772
11	0.917	249.916	2.457	8.197
12	1.000	272.636	2.137	7.128
13	1.083	295.356	1.853	6.183
14	1.167	318.075	1.552	5.176
15	1.250	340.795	1.369	4.566
16	1.333	363.515	1.299	4.333
17	1.417	386.234	1.030	3.434
18	1.500	408.954	0.978	3.264
19	1.583	431.674	0.777	2.592
20	1.667	454.393	0.726	2.422
21	1.750	477.113	0.696	2.323
22	1.833	499.833	0.682	2.274
23	1.917	522.552	0.592	1.975
24	2.000	545.272	0.500	1.667
25	2.083	567.992	0.471	1.572
26	2.167	590.711	0.411	1.371
27	2.250	613.431	0.393	1.311
28	2.333	636.151	0.326	1.086
29	2.417	658.870	0.311	1.038
30	2.500	681.590	0.244	0.814
31	2.583	704.309	0.227	0.758
32	2.667	727.029	0.227	0.758
33	2.750	749.749	0.227	0.758
34	2.833	772.468	0.227	0.758
35	2.917	795.188	0.227	0.758
36	3.000	817.908	0.162	0.539
		Sum = 100.000	Sum=	333.586

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	0.381	0.333	(	0.343)	0.049
2	0.17	4.30	0.390	0.333	(	0.351)	0.058
3	0.25	5.00	0.454	0.333	(	0.408)	0.121
4	0.33	5.00	0.454	0.333	(	0.408)	0.121
5	0.42	5.80	0.526	0.333	(	0.474)	0.194
6	0.50	6.50	0.590	0.333	(	0.531)	0.257
7	0.58	7.40	0.672	0.333	(	0.604)	0.339
8	0.67	8.60	0.780	0.333	(	0.702)	0.448
9	0.75	12.30	1.116	0.333	(	1.005)	0.784

```
 10   0.83    29.10      2.641          0.333    (  2.377)        2.308
 11   0.92     6.80      0.617          0.333    (  0.555)        0.285
 12   1.00     5.00      0.454          0.333    (  0.408)        0.121
              (Loss Rate Not Used)
    Sum =     100.0                                    Sum =     5.1
      Flood volume = Effective rainfall      0.42(In)
       times area     331.0(Ac.)/[(In)/(Ft.)] =      11.7(Ac.Ft)
      Total soil loss =      0.33(In)
      Total soil loss =     9.171(Ac.Ft)
      Total rainfall =      0.76(In)
      Flood volume =      509185.1 Cubic Feet
      Total soil loss =      399508.7 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =    206.012(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       75.0     150.0     225.0     300.0
---------------------------------------------------------------------------
  0+ 5       0.0023      0.33  Q         |         |         |         |
  0+10       0.0123      1.45  Q         |         |         |         |
  0+15       0.0393      3.93  Q         |         |         |         |
  0+20       0.0954      8.14  VQ        |         |         |         |
  0+25       0.1921     14.04  VQ        |         |         |         |
  0+30       0.3404     21.55  |VQ       |         |         |         |
  0+35       0.5540     31.00  |V  Q     |         |         |         |
  0+40       0.8497     42.94  | V  Q    |         |         |         |
  0+45       1.2624     59.92  |   V  Q  |         |         |         |
  0+50       1.9062     93.48  |     V   | Q       |         |         |
  0+55       2.8726    140.32  |        V|       Q |         |         |
  1+ 0       4.1326    182.95  |         |   V     |   Q     |         |
  1+ 5       5.5514    206.01  |         |       V |      Q  |         |
  1+10       6.8651    190.75  |         |         |  V Q    |         |
  1+15       7.8334    140.60  |         |       Q |     V   |         |
  1+20       8.5014     96.99  |         | Q       |        V|         |
  1+25       8.9726     68.42  |        Q|         |         V         |
  1+30       9.3314     52.10  |     Q   |         |         |V        |
  1+35       9.6276     43.00  |    Q    |         |         | V       |
  1+40       9.8779     36.35  |   Q     |         |         |  V      |
  1+45      10.0944     31.44  |   Q     |         |         |   V     |
  1+50      10.2821     27.25  |  Q      |         |         |    V    |
  1+55      10.4434     23.41  |  Q      |         |         |    V    |
  2+ 0      10.5860     20.71  | Q       |         |         |     V   |
  2+ 5      10.7150     18.73  | Q       |         |         |     V   |
  2+10      10.8245     15.90  | Q       |         |         |      V  |
  2+15      10.9240     14.45  |Q        |         |         |      V  |
  2+20      11.0092     12.36  |Q        |         |         |      V  |
  2+25      11.0878     11.41  |Q        |         |         |      V  |
  2+30      11.1612     10.66  |Q        |         |         |       V |
  2+35      11.2300      9.99  |Q        |         |         |       V |
  2+40      11.2908      8.82  |Q        |         |         |       V |
  2+45      11.3440      7.73  |Q        |         |         |       V |
  2+50      11.3927      7.07  Q         |         |         |       V |
  2+55      11.4361      6.30  Q         |         |         |        V|
  3+ 0      11.4761      5.80  Q         |         |         |        V|
  3+ 5      11.5108      5.04  Q         |         |         |        V|
  3+10      11.5425      4.60  Q         |         |         |        V|
  3+15      11.5694      3.91  Q         |         |         |        V|
  3+20      11.5942      3.60  Q         |         |         |        V|
  3+25      11.6175      3.40  Q         |         |         |        V|
  3+30      11.6394      3.18  Q         |         |         |        V|
  3+35      11.6594      2.89  Q         |         |         |        V|
  3+40      11.6764      2.48  Q         |         |         |        V|
  3+45      11.6871      1.55  Q         |         |         |        V|
  3+50      11.6888      0.25  Q         |         |         |        V|
  3+55      11.6893      0.07  Q         |         |         |         V
---------------------------------------------------------------------------
```

Area 'B' – 10 Year 3 Hour Existing Condition – Unit Hydrograph

```
        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  06/27/20 File: EXB010310.out


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'B'
EXISTING CONDITION UNIT HYDROGRAPH - 10 YEAR 3 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =     331.00(Ac.)  =      0.517 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =     331.00(Ac.)  =      0.517 Sq. Mi.
Length along longest watercourse =    7455.00(Ft.)
Length along longest watercourse measured to centroid =    5892.00(Ft.)
Length along longest watercourse =      1.412 Mi.
Length along longest watercourse measured to centroid =      1.116 Mi.
Difference in elevation =     122.00(Ft.)
Slope along watercourse =     86.4064 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.367 Hr.
Lag time =    22.01 Min.
25% of lag time =     5.50 Min.
40% of lag time =     8.80 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]
      331.00           0.80                264.80

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
      331.00           1.80                595.80

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    0.800(In)
Area Averaged 100-Year Rainfall =    1.800(In)

Point rain (area averaged) =    1.211(In)
Areal adjustment factor =   99.86 %
Adjusted average point rain =    1.210(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
   331.000           72.50         0.000
 Total Area Entered =    331.00(Ac.)
```

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
72.5	72.5	0.333	0.000	0.333	1.000	0.333
					Sum (F) =	0.333

Area averaged mean soil loss (F) (In/Hr) = 0.333
Minimum soil loss rate ((In/Hr)) = 0.166
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

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	22.720	2.056	6.860
2	0.167	45.439	6.466	21.569
3	0.250	68.159	11.378	37.955
4	0.333	90.879	15.374	51.286
5	0.417	113.598	15.551	51.875
6	0.500	136.318	10.899	36.358
7	0.583	159.038	7.020	23.418
8	0.667	181.757	4.723	15.754
9	0.750	204.477	3.502	11.683
10	0.833	227.197	2.929	9.772
11	0.917	249.916	2.457	8.197
12	1.000	272.636	2.137	7.128
13	1.083	295.356	1.853	6.183
14	1.167	318.075	1.552	5.176
15	1.250	340.795	1.369	4.566
16	1.333	363.515	1.299	4.333
17	1.417	386.234	1.030	3.434
18	1.500	408.954	0.978	3.264
19	1.583	431.674	0.777	2.592
20	1.667	454.393	0.726	2.422
21	1.750	477.113	0.696	2.323
22	1.833	499.833	0.682	2.274
23	1.917	522.552	0.592	1.975
24	2.000	545.272	0.500	1.667
25	2.083	567.992	0.471	1.572
26	2.167	590.711	0.411	1.371
27	2.250	613.431	0.393	1.311
28	2.333	636.151	0.326	1.086
29	2.417	658.870	0.311	1.038
30	2.500	681.590	0.244	0.814
31	2.583	704.309	0.227	0.758
32	2.667	727.029	0.227	0.758
33	2.750	749.749	0.227	0.758
34	2.833	772.468	0.227	0.758
35	2.917	795.188	0.227	0.758
36	3.000	817.908	0.162	0.539
			Sum = 100.000	Sum= 333.586

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	0.189	(0.333)		0.170	0.019
2	0.17	1.30	0.189	(0.333)		0.170	0.019
3	0.25	1.10	0.160	(0.333)		0.144	0.016
4	0.33	1.50	0.218	(0.333)		0.196	0.022
5	0.42	1.50	0.218	(0.333)		0.196	0.022
6	0.50	1.80	0.261	(0.333)		0.235	0.026
7	0.58	1.50	0.218	(0.333)		0.196	0.022
8	0.67	1.80	0.261	(0.333)		0.235	0.026

```
 9   0.75     1.80      0.261       (  0.333)       0.235        0.026
10   0.83     1.50      0.218       (  0.333)       0.196        0.022
11   0.92     1.60      0.232       (  0.333)       0.209        0.023
12   1.00     1.80      0.261       (  0.333)       0.235        0.026
13   1.08     2.20      0.319       (  0.333)       0.287        0.032
14   1.17     2.20      0.319       (  0.333)       0.287        0.032
15   1.25     2.20      0.319       (  0.333)       0.287        0.032
16   1.33     2.00      0.290       (  0.333)       0.261        0.029
17   1.42     2.60      0.377          0.333    (  0.340)       0.045
18   1.50     2.70      0.392          0.333    (  0.353)       0.059
19   1.58     2.40      0.348       (  0.333)       0.314        0.035
20   1.67     2.70      0.392          0.333    (  0.353)       0.059
21   1.75     3.30      0.479          0.333    (  0.431)       0.147
22   1.83     3.10      0.450          0.333    (  0.405)       0.117
23   1.92     2.90      0.421          0.333    (  0.379)       0.088
24   2.00     3.00      0.435          0.333    (  0.392)       0.103
25   2.08     3.10      0.450          0.333    (  0.405)       0.117
26   2.17     4.20      0.610          0.333    (  0.549)       0.277
27   2.25     5.00      0.726          0.333    (  0.653)       0.393
28   2.33     3.50      0.508          0.333    (  0.457)       0.176
29   2.42     6.80      0.987          0.333    (  0.888)       0.655
30   2.50     7.30      1.060          0.333    (  0.954)       0.727
31   2.58     8.20      1.190          0.333    (  1.071)       0.858
32   2.67     5.90      0.856          0.333    (  0.771)       0.524
33   2.75     2.00      0.290       (  0.333)       0.261        0.029
34   2.83     1.80      0.261       (  0.333)       0.235        0.026
35   2.92     1.80      0.261       (  0.333)       0.235        0.026
36   3.00     0.60      0.087       (  0.333)       0.078        0.009
              (Loss Rate Not Used)
   Sum =     100.0                                   Sum =     4.9
     Flood volume = Effective rainfall      0.41(In)
      times area     331.0(Ac.)/[(In)/(Ft.)] =      11.2(Ac.Ft)
     Total soil loss =      0.80(In)
     Total soil loss =    22.185(Ac.Ft)
     Total rainfall =      1.21(In)
     Flood volume =      487060.7 Cubic Feet
     Total soil loss =      966374.7 Cubic Feet
     ---------------------------------------------------------------------
      Peak flow rate of this hydrograph =    145.325(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        50.0      100.0     150.0     200.0
-------------------------------------------------------------------------
  0+ 5       0.0009      0.13  Q          |         |         |         |
  0+10       0.0046      0.54  Q          |         |         |         |
  0+15       0.0131      1.23  Q          |         |         |         |
  0+20       0.0281      2.18  Q          |         |         |         |
  0+25       0.0499      3.17  Q          |         |         |         |
  0+30       0.0772      3.96  Q          |         |         |         |
  0+35       0.1090      4.61  Q          |         |         |         |
  0+40       0.1449      5.21  VQ         |         |         |         |
  0+45       0.1843      5.73  VQ         |         |         |         |
  0+50       0.2266      6.14  VQ         |         |         |         |
  0+55       0.2708      6.42  VQ         |         |         |         |
  1+ 0       0.3166      6.65  |Q         |         |         |         |
  1+ 5       0.3639      6.86  |Q         |         |         |         |
  1+10       0.4131      7.15  |Q         |         |         |         |
  1+15       0.4655      7.61  |Q         |         |         |         |
  1+20       0.5216      8.14  |Q         |         |         |         |
  1+25       0.5813      8.67  |QV        |         |         |         |
  1+30       0.6458      9.36  |QV        |         |         |         |
  1+35       0.7161     10.21  | Q        |         |         |         |
  1+40       0.7936     11.25  | Q        |         |         |         |
  1+45       0.8836     13.06  | QV       |         |         |         |
  1+50       0.9924     15.81  |  Q       |         |         |         |
  1+55       1.1250     19.25  |  QV      |         |         |         |
  2+ 0       1.2842     23.12  |   Q      |         |         |         |
```

2+ 5	1.4650	26.26	Q				
2+10	1.6644	28.96	Q				
2+15	1.9013	34.39	Q				
2+20	2.1970	42.93	VQ				
2+25	2.5796	55.56	V Q				
2+30	3.0860	73.53	V Q				
2+35	3.7452	95.71	V Q				
2+40	4.5780	120.92	V Q				
2+45	5.5542	141.75	V Q				
2+50	6.5551	145.33	V Q				
2+55	7.4497	129.90	QV				
3+ 0	8.1469	101.23	Q V				
3+ 5	8.6489	72.89	Q V				
3+10	9.0205	53.97	Q V				
3+15	9.3110	42.18	Q V				
3+20	9.5489	34.54	Q V				
3+25	9.7502	29.22	Q V				
3+30	9.9224	25.01	Q V				
3+35	10.0709	21.57	Q V				
3+40	10.2009	18.87	Q V				
3+45	10.3142	16.46	Q V				
3+50	10.4156	14.72	Q V				
3+55	10.5047	12.94	Q V				
4+ 0	10.5833	11.41	Q V				
4+ 5	10.6533	10.18	Q V				
4+10	10.7168	9.22	Q V				
4+15	10.7755	8.52	Q V				
4+20	10.8291	7.78	Q V				
4+25	10.8772	6.99	Q V				
4+30	10.9197	6.17	Q V				
4+35	10.9581	5.57	Q V				
4+40	10.9923	4.96	Q V				
4+45	11.0227	4.42	Q V				
4+50	11.0496	3.91	Q V				
4+55	11.0735	3.46	Q V				
5+ 0	11.0949	3.11	Q V				
5+ 5	11.1143	2.81	Q V				
5+10	11.1317	2.53	Q V				
5+15	11.1473	2.27	Q V				
5+20	11.1613	2.02	Q V				
5+25	11.1717	1.51	Q V				
5+30	11.1781	0.93	Q V				
5+35	11.1805	0.35	Q V				
5+40	11.1809	0.06	Q V				
5+45	11.1812	0.04	Q V				
5+50	11.1813	0.02	Q V				
5+55	11.1814	0.00	Q V				

Area 'B' – 10 Year 6 Hour Existing Condition – Unit Hydrograph

```
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  06/27/20 File: EXB010610.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'B'
EXISTING CONDITION UNIT HYDROGRAPH - 10 YEAR 6 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =     331.00(Ac.)  =      0.517 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =     331.00(Ac.)  =      0.517 Sq. Mi.
Length along longest watercourse =    7455.00(Ft.)
Length along longest watercourse measured to centroid =    5892.00(Ft.)
Length along longest watercourse =      1.412 Mi.
Length along longest watercourse measured to centroid =      1.116 Mi.
Difference in elevation =     122.00(Ft.)
Slope along watercourse =     86.4064 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.367 Hr.
Lag time =    22.01 Min.
25% of lag time =     5.50 Min.
40% of lag time =     8.80 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]
      331.00           1.00                331.00

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
      331.00           2.50                827.50

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    1.000(In)
Area Averaged 100-Year Rainfall =    2.500(In)

Point rain (area averaged) =    1.617(In)
Areal adjustment factor =   99.89 %
Adjusted average point rain =    1.615(In)

Sub-Area Data:
```

```
Area(Ac.)         Runoff Index    Impervious %
   331.000           72.50          0.000
 Total Area Entered =    331.00(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
72.5  72.5      0.333     0.000        0.333       1.000      0.333
                                                 Sum (F) =    0.333
Area averaged mean soil loss (F) (In/Hr) =  0.333
Minimum soil loss rate ((In/Hr)) =  0.166
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.900
------------------------------------------------------------------------

               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         22.720          2.056              6.860
    2   0.167         45.439          6.466             21.569
    3   0.250         68.159         11.378             37.955
    4   0.333         90.879         15.374             51.286
    5   0.417        113.598         15.551             51.875
    6   0.500        136.318         10.899             36.358
    7   0.583        159.038          7.020             23.418
    8   0.667        181.757          4.723             15.754
    9   0.750        204.477          3.502             11.683
   10   0.833        227.197          2.929              9.772
   11   0.917        249.916          2.457              8.197
   12   1.000        272.636          2.137              7.128
   13   1.083        295.356          1.853              6.183
   14   1.167        318.075          1.552              5.176
   15   1.250        340.795          1.369              4.566
   16   1.333        363.515          1.299              4.333
   17   1.417        386.234          1.030              3.434
   18   1.500        408.954          0.978              3.264
   19   1.583        431.674          0.777              2.592
   20   1.667        454.393          0.726              2.422
   21   1.750        477.113          0.696              2.323
   22   1.833        499.833          0.682              2.274
   23   1.917        522.552          0.592              1.975
   24   2.000        545.272          0.500              1.667
   25   2.083        567.992          0.471              1.572
   26   2.167        590.711          0.411              1.371
   27   2.250        613.431          0.393              1.311
   28   2.333        636.151          0.326              1.086
   29   2.417        658.870          0.311              1.038
   30   2.500        681.590          0.244              0.814
   31   2.583        704.309          0.227              0.758
   32   2.667        727.029          0.227              0.758
   33   2.750        749.749          0.227              0.758
   34   2.833        772.468          0.227              0.758
   35   2.917        795.188          0.227              0.758
   36   3.000        817.908          0.162              0.539
                                Sum = 100.000    Sum=     333.586
------------------------------------------------------------------------

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      0.097       (  0.333)       0.087        0.010
  2   0.17     0.60      0.116       (  0.333)       0.105        0.012
  3   0.25     0.60      0.116       (  0.333)       0.105        0.012
  4   0.33     0.60      0.116       (  0.333)       0.105        0.012
  5   0.42     0.60      0.116       (  0.333)       0.105        0.012
```

6	0.50	0.70	0.136	(0.333)	0.122	0.014
7	0.58	0.70	0.136	(0.333)	0.122	0.014
8	0.67	0.70	0.136	(0.333)	0.122	0.014
9	0.75	0.70	0.136	(0.333)	0.122	0.014
10	0.83	0.70	0.136	(0.333)	0.122	0.014
11	0.92	0.70	0.136	(0.333)	0.122	0.014
12	1.00	0.80	0.155	(0.333)	0.140	0.016
13	1.08	0.80	0.155	(0.333)	0.140	0.016
14	1.17	0.80	0.155	(0.333)	0.140	0.016
15	1.25	0.80	0.155	(0.333)	0.140	0.016
16	1.33	0.80	0.155	(0.333)	0.140	0.016
17	1.42	0.80	0.155	(0.333)	0.140	0.016
18	1.50	0.80	0.155	(0.333)	0.140	0.016
19	1.58	0.80	0.155	(0.333)	0.140	0.016
20	1.67	0.80	0.155	(0.333)	0.140	0.016
21	1.75	0.80	0.155	(0.333)	0.140	0.016
22	1.83	0.80	0.155	(0.333)	0.140	0.016
23	1.92	0.80	0.155	(0.333)	0.140	0.016
24	2.00	0.90	0.174	(0.333)	0.157	0.017
25	2.08	0.80	0.155	(0.333)	0.140	0.016
26	2.17	0.90	0.174	(0.333)	0.157	0.017
27	2.25	0.90	0.174	(0.333)	0.157	0.017
28	2.33	0.90	0.174	(0.333)	0.157	0.017
29	2.42	0.90	0.174	(0.333)	0.157	0.017
30	2.50	0.90	0.174	(0.333)	0.157	0.017
31	2.58	0.90	0.174	(0.333)	0.157	0.017
32	2.67	0.90	0.174	(0.333)	0.157	0.017
33	2.75	1.00	0.194	(0.333)	0.174	0.019
34	2.83	1.00	0.194	(0.333)	0.174	0.019
35	2.92	1.00	0.194	(0.333)	0.174	0.019
36	3.00	1.00	0.194	(0.333)	0.174	0.019
37	3.08	1.00	0.194	(0.333)	0.174	0.019
38	3.17	1.10	0.213	(0.333)	0.192	0.021
39	3.25	1.10	0.213	(0.333)	0.192	0.021
40	3.33	1.10	0.213	(0.333)	0.192	0.021
41	3.42	1.20	0.233	(0.333)	0.209	0.023
42	3.50	1.30	0.252	(0.333)	0.227	0.025
43	3.58	1.40	0.271	(0.333)	0.244	0.027
44	3.67	1.40	0.271	(0.333)	0.244	0.027
45	3.75	1.50	0.291	(0.333)	0.262	0.029
46	3.83	1.50	0.291	(0.333)	0.262	0.029
47	3.92	1.60	0.310	(0.333)	0.279	0.031
48	4.00	1.60	0.310	(0.333)	0.279	0.031
49	4.08	1.70	0.330	(0.333)	0.297	0.033
50	4.17	1.80	0.349	(0.333)	0.314	0.035
51	4.25	1.90	0.368	(0.333)	0.331	0.037
52	4.33	2.00	0.388	0.333	(0.349)	0.055
53	4.42	2.10	0.407	0.333	(0.366)	0.075
54	4.50	2.10	0.407	0.333	(0.366)	0.075
55	4.58	2.20	0.426	0.333	(0.384)	0.094
56	4.67	2.30	0.446	0.333	(0.401)	0.113
57	4.75	2.40	0.465	0.333	(0.419)	0.133
58	4.83	2.40	0.465	0.333	(0.419)	0.133
59	4.92	2.50	0.485	0.333	(0.436)	0.152
60	5.00	2.60	0.504	0.333	(0.454)	0.171
61	5.08	3.10	0.601	0.333	(0.541)	0.268
62	5.17	3.60	0.698	0.333	(0.628)	0.365
63	5.25	3.90	0.756	0.333	(0.680)	0.423
64	5.33	4.20	0.814	0.333	(0.733)	0.482
65	5.42	4.70	0.911	0.333	(0.820)	0.579
66	5.50	5.60	1.085	0.333	(0.977)	0.753
67	5.58	1.90	0.368	(0.333)	0.331	0.037
68	5.67	0.90	0.174	(0.333)	0.157	0.017
69	5.75	0.60	0.116	(0.333)	0.105	0.012
70	5.83	0.50	0.097	(0.333)	0.087	0.010
71	5.92	0.30	0.058	(0.333)	0.052	0.006
72	6.00	0.20	0.039	(0.333)	0.035	0.004

(Loss Rate Not Used)

Sum = 100.0 Sum = 4.9

Flood volume = Effective rainfall 0.41(In)
times area 331.0(Ac.)/[(In)/(Ft.)] = 11.3(Ac.Ft)
Total soil loss = 1.21(In)
Total soil loss = 33.238(Ac.Ft)

```
      Total rainfall =      1.62(In)
      Flood volume =      492944.1 Cubic Feet
      Total soil loss =     1447853.9 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =    120.750(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       50.0     100.0     150.0     200.0
---------------------------------------------------------------------------
  0+ 5       0.0005      0.07  Q         |         |         |         |
  0+10       0.0024      0.29  Q         |         |         |         |
  0+15       0.0073      0.70  Q         |         |         |         |
  0+20       0.0160      1.27  Q         |         |         |         |
  0+25       0.0289      1.87  Q         |         |         |         |
  0+30       0.0450      2.34  Q         |         |         |         |
  0+35       0.0635      2.68  Q         |         |         |         |
  0+40       0.0838      2.95  Q         |         |         |         |
  0+45       0.1058      3.19  Q         |         |         |         |
  0+50       0.1293      3.41  Q         |         |         |         |
  0+55       0.1539      3.58  Q         |         |         |         |
  1+ 0       0.1796      3.72  Q         |         |         |         |
  1+ 5       0.2062      3.87  Q         |         |         |         |
  1+10       0.2340      4.03  Q         |         |         |         |
  1+15       0.2629      4.20  Q         |         |         |         |
  1+20       0.2930      4.37  QV        |         |         |         |
  1+25       0.3239      4.49  QV        |         |         |         |
  1+30       0.3555      4.59  QV        |         |         |         |
  1+35       0.3876      4.66  QV        |         |         |         |
  1+40       0.4202      4.72  QV        |         |         |         |
  1+45       0.4531      4.78  QV        |         |         |         |
  1+50       0.4863      4.83  QV        |         |         |         |
  1+55       0.5198      4.87  QV        |         |         |         |
  2+ 0       0.5537      4.92  QV        |         |         |         |
  2+ 5       0.5880      4.98  Q V       |         |         |         |
  2+10       0.6229      5.06  |QV       |         |         |         |
  2+15       0.6584      5.15  |QV       |         |         |         |
  2+20       0.6945      5.25  |QV       |         |         |         |
  2+25       0.7313      5.34  |QV       |         |         |         |
  2+30       0.7687      5.44  |QV       |         |         |         |
  2+35       0.8067      5.51  |QV       |         |         |         |
  2+40       0.8450      5.56  |QV       |         |         |         |
  2+45       0.8836      5.62  |Q V      |         |         |         |
  2+50       0.9228      5.69  |Q V      |         |         |         |
  2+55       0.9628      5.80  |Q V      |         |         |         |
  3+ 0       1.0035      5.92  |Q V      |         |         |         |
  3+ 5       1.0451      6.04  |Q V      |         |         |         |
  3+10       1.0874      6.14  |Q V      |         |         |         |
  3+15       1.1304      6.24  |Q V      |         |         |         |
  3+20       1.1741      6.35  |Q  V     |         |         |         |
  3+25       1.2189      6.50  |Q  V     |         |         |         |
  3+30       1.2649      6.68  |Q  V     |         |         |         |
  3+35       1.3124      6.90  |Q  V     |         |         |         |
  3+40       1.3619      7.18  |Q  V     |         |         |         |
  3+45       1.4137      7.52  |Q  V     |         |         |         |
  3+50       1.4679      7.87  |Q   V    |         |         |         |
  3+55       1.5244      8.21  |Q   V    |         |         |         |
  4+ 0       1.5831      8.52  |Q   V    |         |         |         |
  4+ 5       1.6439      8.83  |Q   V    |         |         |         |
  4+10       1.7069      9.15  |Q    V   |         |         |         |
  4+15       1.7723      9.50  |Q    V   |         |         |         |
  4+20       1.8412     10.01  | Q   V   |         |         |         |
  4+25       1.9165     10.93  | Q   V   |         |         |         |
  4+30       2.0020     12.42  | Q    V  |         |         |         |
  4+35       2.1020     14.52  | Q    V  |         |         |         |
  4+40       2.2208     17.24  |  Q   V  |         |         |         |
  4+45       2.3610     20.36  |   Q   V |         |         |         |
  4+50       2.5246     23.77  |   Q   V |         |         |         |
```

```
    4+55       2.7139     27.48  |    Q   V|          |          |          |
    5+ 0       2.9298     31.35  |     Q   V          |          |          |
    5+ 5       3.1765     35.82  |      Q  |V         |          |          |
    5+10       3.4670     42.18  |       Q | V        |          |          |
    5+15       3.8230     51.69  |         Q  V       |          |          |
    5+20       4.2688     64.73  |          | Q  V    |          |          |
    5+25       4.8257     80.86  |          |     QV  |          |          |
    5+30       5.5101     99.37  |          |        Q|          |          |
    5+35       6.3011    114.85  |          |         | Q        |          |
    5+40       7.1327    120.75  |          |         |   QV     |          |
    5+45       7.9180    114.03  |          |         | Q    V   |          |
    5+50       8.5658     94.06  |          |        Q |          V          |
    5+55       9.0353     68.18  |          |  Q       |          |V         |
    6+ 0       9.3765     49.54  |         Q|          |          |  V       |
    6+ 5       9.6392     38.14  |       Q  |          |          |   V      |
    6+10       9.8536     31.14  |      Q   |          |          |   V      |
    6+15      10.0355     26.40  |    Q     |          |          |    V     |
    6+20      10.1910     22.59  |   Q      |          |          |     V    |
    6+25      10.3256     19.53  |  Q       |          |          |     V    |
    6+30      10.4424     16.96  |  Q       |          |          |     V    |
    6+35      10.5441     14.77  | Q        |          |          |      V   |
    6+40      10.6342     13.08  | Q        |          |          |      V   |
    6+45      10.7146     11.66  | Q        |          |          |      V   |
    6+50      10.7847     10.18  | Q        |          |          |       V  |
    6+55      10.8480      9.20  |Q         |          |          |       V  |
    7+ 0      10.9042      8.15  |Q         |          |          |       V  |
    7+ 5      10.9558      7.50  |Q         |          |          |       V  |
    7+10      11.0032      6.88  |Q         |          |          |       V  |
    7+15      11.0463      6.26  |Q         |          |          |        V|
    7+20      11.0844      5.53  |Q         |          |          |        V|
    7+25      11.1181      4.90  Q          |          |          |        V|
    7+30      11.1486      4.42  Q          |          |          |        V|
    7+35      11.1756      3.92  Q          |          |          |        V|
    7+40      11.1997      3.50  Q          |          |          |        V|
    7+45      11.2207      3.06  Q          |          |          |        V|
    7+50      11.2396      2.74  Q          |          |          |        V|
    7+55      11.2562      2.41  Q          |          |          |        V|
    8+ 0      11.2714      2.21  Q          |          |          |        V|
    8+ 5      11.2850      1.97  Q          |          |          |        V|
    8+10      11.2965      1.68  Q          |          |          |        V|
    8+15      11.3058      1.34  Q          |          |          |        V|
    8+20      11.3123      0.95  Q          |          |          |        V|
    8+25      11.3155      0.47  Q          |          |          |        V|
    8+30      11.3159      0.06  Q          |          |          |        V|
    8+35      11.3162      0.03  Q          |          |          |        V|
    8+40      11.3163      0.02  Q          |          |          |        V|
    8+45      11.3164      0.01  Q          |          |          |        V|
    8+50      11.3164      0.01  Q          |          |          |        V|
    8+55      11.3164      0.00  Q          |          |          |        V|
-------------------------------------------------------------------------
```

Area 'B' – 10 Year 24 Hour Existing Condition – Unit Hydrograph

```
        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  06/27/20 File: EXB0102410.out


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'B'
EXISTING CONDITION UNIT HYDROGRAPH - 10 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =     331.00(Ac.)  =      0.517 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =     331.00(Ac.)  =      0.517 Sq. Mi.
Length along longest watercourse =    7455.00(Ft.)
Length along longest watercourse measured to centroid =    5892.00(Ft.)
Length along longest watercourse =      1.412 Mi.
Length along longest watercourse measured to centroid =      1.116 Mi.
Difference in elevation =     122.00(Ft.)
Slope along watercourse =     86.4064 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.367 Hr.
Lag time =    22.01 Min.
25% of lag time =     5.50 Min.
40% of lag time =     8.80 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]
      331.00           1.60                529.60

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
      331.00           4.00               1324.00

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    1.600(In)
Area Averaged 100-Year Rainfall =    4.000(In)

Point rain (area averaged) =    2.587(In)
Areal adjustment factor =   99.94 %
Adjusted average point rain =    2.586(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
   331.000           72.50         0.000
 Total Area Entered =    331.00(Ac.)
```

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
72.5	72.5	0.333	0.000	0.333	1.000	0.333
					Sum (F) =	0.333

Area averaged mean soil loss (F) (In/Hr) = 0.333
Minimum soil loss rate ((In/Hr)) = 0.166
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

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	22.720	2.056	6.860
2	0.167	45.439	6.466	21.569
3	0.250	68.159	11.378	37.955
4	0.333	90.879	15.374	51.286
5	0.417	113.598	15.551	51.875
6	0.500	136.318	10.899	36.358
7	0.583	159.038	7.020	23.418
8	0.667	181.757	4.723	15.754
9	0.750	204.477	3.502	11.683
10	0.833	227.197	2.929	9.772
11	0.917	249.916	2.457	8.197
12	1.000	272.636	2.137	7.128
13	1.083	295.356	1.853	6.183
14	1.167	318.075	1.552	5.176
15	1.250	340.795	1.369	4.566
16	1.333	363.515	1.299	4.333
17	1.417	386.234	1.030	3.434
18	1.500	408.954	0.978	3.264
19	1.583	431.674	0.777	2.592
20	1.667	454.393	0.726	2.422
21	1.750	477.113	0.696	2.323
22	1.833	499.833	0.682	2.274
23	1.917	522.552	0.592	1.975
24	2.000	545.272	0.500	1.667
25	2.083	567.992	0.471	1.572
26	2.167	590.711	0.411	1.371
27	2.250	613.431	0.393	1.311
28	2.333	636.151	0.326	1.086
29	2.417	658.870	0.311	1.038
30	2.500	681.590	0.244	0.814
31	2.583	704.309	0.227	0.758
32	2.667	727.029	0.227	0.758
33	2.750	749.749	0.227	0.758
34	2.833	772.468	0.227	0.758
35	2.917	795.188	0.227	0.758
36	3.000	817.908	0.162	0.539
			Sum = 100.000	Sum= 333.586

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	0.021	(0.589)	0.019	0.002
2	0.17	0.07	0.021	(0.587)	0.019	0.002
3	0.25	0.07	0.021	(0.585)	0.019	0.002
4	0.33	0.10	0.031	(0.583)	0.028	0.003
5	0.42	0.10	0.031	(0.580)	0.028	0.003
6	0.50	0.10	0.031	(0.578)	0.028	0.003
7	0.58	0.10	0.031	(0.576)	0.028	0.003
8	0.67	0.10	0.031	(0.574)	0.028	0.003

9	0.75	0.10	0.031	(0.571)	0.028	0.003
10	0.83	0.13	0.041	(0.569)	0.037	0.004
11	0.92	0.13	0.041	(0.567)	0.037	0.004
12	1.00	0.13	0.041	(0.565)	0.037	0.004
13	1.08	0.10	0.031	(0.562)	0.028	0.003
14	1.17	0.10	0.031	(0.560)	0.028	0.003
15	1.25	0.10	0.031	(0.558)	0.028	0.003
16	1.33	0.10	0.031	(0.556)	0.028	0.003
17	1.42	0.10	0.031	(0.553)	0.028	0.003
18	1.50	0.10	0.031	(0.551)	0.028	0.003
19	1.58	0.10	0.031	(0.549)	0.028	0.003
20	1.67	0.10	0.031	(0.547)	0.028	0.003
21	1.75	0.10	0.031	(0.545)	0.028	0.003
22	1.83	0.13	0.041	(0.542)	0.037	0.004
23	1.92	0.13	0.041	(0.540)	0.037	0.004
24	2.00	0.13	0.041	(0.538)	0.037	0.004
25	2.08	0.13	0.041	(0.536)	0.037	0.004
26	2.17	0.13	0.041	(0.534)	0.037	0.004
27	2.25	0.13	0.041	(0.532)	0.037	0.004
28	2.33	0.13	0.041	(0.529)	0.037	0.004
29	2.42	0.13	0.041	(0.527)	0.037	0.004
30	2.50	0.13	0.041	(0.525)	0.037	0.004
31	2.58	0.17	0.052	(0.523)	0.047	0.005
32	2.67	0.17	0.052	(0.521)	0.047	0.005
33	2.75	0.17	0.052	(0.519)	0.047	0.005
34	2.83	0.17	0.052	(0.517)	0.047	0.005
35	2.92	0.17	0.052	(0.514)	0.047	0.005
36	3.00	0.17	0.052	(0.512)	0.047	0.005
37	3.08	0.17	0.052	(0.510)	0.047	0.005
38	3.17	0.17	0.052	(0.508)	0.047	0.005
39	3.25	0.17	0.052	(0.506)	0.047	0.005
40	3.33	0.17	0.052	(0.504)	0.047	0.005
41	3.42	0.17	0.052	(0.502)	0.047	0.005
42	3.50	0.17	0.052	(0.500)	0.047	0.005
43	3.58	0.17	0.052	(0.498)	0.047	0.005
44	3.67	0.17	0.052	(0.495)	0.047	0.005
45	3.75	0.17	0.052	(0.493)	0.047	0.005
46	3.83	0.20	0.062	(0.491)	0.056	0.006
47	3.92	0.20	0.062	(0.489)	0.056	0.006
48	4.00	0.20	0.062	(0.487)	0.056	0.006
49	4.08	0.20	0.062	(0.485)	0.056	0.006
50	4.17	0.20	0.062	(0.483)	0.056	0.006
51	4.25	0.20	0.062	(0.481)	0.056	0.006
52	4.33	0.23	0.072	(0.479)	0.065	0.007
53	4.42	0.23	0.072	(0.477)	0.065	0.007
54	4.50	0.23	0.072	(0.475)	0.065	0.007
55	4.58	0.23	0.072	(0.473)	0.065	0.007
56	4.67	0.23	0.072	(0.471)	0.065	0.007
57	4.75	0.23	0.072	(0.469)	0.065	0.007
58	4.83	0.27	0.083	(0.467)	0.074	0.008
59	4.92	0.27	0.083	(0.465)	0.074	0.008
60	5.00	0.27	0.083	(0.463)	0.074	0.008
61	5.08	0.20	0.062	(0.461)	0.056	0.006
62	5.17	0.20	0.062	(0.459)	0.056	0.006
63	5.25	0.20	0.062	(0.457)	0.056	0.006
64	5.33	0.23	0.072	(0.455)	0.065	0.007
65	5.42	0.23	0.072	(0.453)	0.065	0.007
66	5.50	0.23	0.072	(0.451)	0.065	0.007
67	5.58	0.27	0.083	(0.449)	0.074	0.008
68	5.67	0.27	0.083	(0.447)	0.074	0.008
69	5.75	0.27	0.083	(0.445)	0.074	0.008
70	5.83	0.27	0.083	(0.443)	0.074	0.008
71	5.92	0.27	0.083	(0.441)	0.074	0.008
72	6.00	0.27	0.083	(0.439)	0.074	0.008
73	6.08	0.30	0.093	(0.437)	0.084	0.009
74	6.17	0.30	0.093	(0.435)	0.084	0.009
75	6.25	0.30	0.093	(0.433)	0.084	0.009
76	6.33	0.30	0.093	(0.431)	0.084	0.009
77	6.42	0.30	0.093	(0.429)	0.084	0.009
78	6.50	0.30	0.093	(0.427)	0.084	0.009
79	6.58	0.33	0.103	(0.425)	0.093	0.010
80	6.67	0.33	0.103	(0.423)	0.093	0.010
81	6.75	0.33	0.103	(0.422)	0.093	0.010

82	6.83	0.33	0.103	(0.420)	0.093	0.010
83	6.92	0.33	0.103	(0.418)	0.093	0.010
84	7.00	0.33	0.103	(0.416)	0.093	0.010
85	7.08	0.33	0.103	(0.414)	0.093	0.010
86	7.17	0.33	0.103	(0.412)	0.093	0.010
87	7.25	0.33	0.103	(0.410)	0.093	0.010
88	7.33	0.37	0.114	(0.408)	0.102	0.011
89	7.42	0.37	0.114	(0.406)	0.102	0.011
90	7.50	0.37	0.114	(0.405)	0.102	0.011
91	7.58	0.40	0.124	(0.403)	0.112	0.012
92	7.67	0.40	0.124	(0.401)	0.112	0.012
93	7.75	0.40	0.124	(0.399)	0.112	0.012
94	7.83	0.43	0.134	(0.397)	0.121	0.013
95	7.92	0.43	0.134	(0.395)	0.121	0.013
96	8.00	0.43	0.134	(0.394)	0.121	0.013
97	8.08	0.50	0.155	(0.392)	0.140	0.016
98	8.17	0.50	0.155	(0.390)	0.140	0.016
99	8.25	0.50	0.155	(0.388)	0.140	0.016
100	8.33	0.50	0.155	(0.386)	0.140	0.016
101	8.42	0.50	0.155	(0.384)	0.140	0.016
102	8.50	0.50	0.155	(0.383)	0.140	0.016
103	8.58	0.53	0.165	(0.381)	0.149	0.017
104	8.67	0.53	0.165	(0.379)	0.149	0.017
105	8.75	0.53	0.165	(0.377)	0.149	0.017
106	8.83	0.57	0.176	(0.375)	0.158	0.018
107	8.92	0.57	0.176	(0.374)	0.158	0.018
108	9.00	0.57	0.176	(0.372)	0.158	0.018
109	9.08	0.63	0.197	(0.370)	0.177	0.020
110	9.17	0.63	0.197	(0.368)	0.177	0.020
111	9.25	0.63	0.197	(0.367)	0.177	0.020
112	9.33	0.67	0.207	(0.365)	0.186	0.021
113	9.42	0.67	0.207	(0.363)	0.186	0.021
114	9.50	0.67	0.207	(0.361)	0.186	0.021
115	9.58	0.70	0.217	(0.360)	0.195	0.022
116	9.67	0.70	0.217	(0.358)	0.195	0.022
117	9.75	0.70	0.217	(0.356)	0.195	0.022
118	9.83	0.73	0.228	(0.355)	0.205	0.023
119	9.92	0.73	0.228	(0.353)	0.205	0.023
120	10.00	0.73	0.228	(0.351)	0.205	0.023
121	10.08	0.50	0.155	(0.349)	0.140	0.016
122	10.17	0.50	0.155	(0.348)	0.140	0.016
123	10.25	0.50	0.155	(0.346)	0.140	0.016
124	10.33	0.50	0.155	(0.344)	0.140	0.016
125	10.42	0.50	0.155	(0.343)	0.140	0.016
126	10.50	0.50	0.155	(0.341)	0.140	0.016
127	10.58	0.67	0.207	(0.339)	0.186	0.021
128	10.67	0.67	0.207	(0.338)	0.186	0.021
129	10.75	0.67	0.207	(0.336)	0.186	0.021
130	10.83	0.67	0.207	(0.334)	0.186	0.021
131	10.92	0.67	0.207	(0.333)	0.186	0.021
132	11.00	0.67	0.207	(0.331)	0.186	0.021
133	11.08	0.63	0.197	(0.329)	0.177	0.020
134	11.17	0.63	0.197	(0.328)	0.177	0.020
135	11.25	0.63	0.197	(0.326)	0.177	0.020
136	11.33	0.63	0.197	(0.325)	0.177	0.020
137	11.42	0.63	0.197	(0.323)	0.177	0.020
138	11.50	0.63	0.197	(0.321)	0.177	0.020
139	11.58	0.57	0.176	(0.320)	0.158	0.018
140	11.67	0.57	0.176	(0.318)	0.158	0.018
141	11.75	0.57	0.176	(0.317)	0.158	0.018
142	11.83	0.60	0.186	(0.315)	0.168	0.019
143	11.92	0.60	0.186	(0.314)	0.168	0.019
144	12.00	0.60	0.186	(0.312)	0.168	0.019
145	12.08	0.83	0.259	(0.310)	0.233	0.026
146	12.17	0.83	0.259	(0.309)	0.233	0.026
147	12.25	0.83	0.259	(0.307)	0.233	0.026
148	12.33	0.87	0.269	(0.306)	0.242	0.027
149	12.42	0.87	0.269	(0.304)	0.242	0.027
150	12.50	0.87	0.269	(0.303)	0.242	0.027
151	12.58	0.93	0.290	(0.301)	0.261	0.029
152	12.67	0.93	0.290	(0.300)	0.261	0.029
153	12.75	0.93	0.290	(0.298)	0.261	0.029
154	12.83	0.97	0.300	(0.297)	0.270	0.030

155	12.92	0.97	0.300	(0.295)	0.270	0.030
156	13.00	0.97	0.300	(0.294)	0.270	0.030
157	13.08	1.13	0.352	0.292	(0.316)	0.060
158	13.17	1.13	0.352	0.291	(0.316)	0.061
159	13.25	1.13	0.352	0.289	(0.316)	0.062
160	13.33	1.13	0.352	0.288	(0.316)	0.064
161	13.42	1.13	0.352	0.286	(0.316)	0.065
162	13.50	1.13	0.352	0.285	(0.316)	0.067
163	13.58	0.77	0.238	(0.283)	0.214	0.024
164	13.67	0.77	0.238	(0.282)	0.214	0.024
165	13.75	0.77	0.238	(0.280)	0.214	0.024
166	13.83	0.77	0.238	(0.279)	0.214	0.024
167	13.92	0.77	0.238	(0.278)	0.214	0.024
168	14.00	0.77	0.238	(0.276)	0.214	0.024
169	14.08	0.90	0.279	(0.275)	0.251	0.028
170	14.17	0.90	0.279	(0.273)	0.251	0.028
171	14.25	0.90	0.279	(0.272)	0.251	0.028
172	14.33	0.87	0.269	(0.271)	0.242	0.027
173	14.42	0.87	0.269	(0.269)	0.242	0.027
174	14.50	0.87	0.269	(0.268)	0.242	0.027
175	14.58	0.87	0.269	(0.266)	0.242	0.027
176	14.67	0.87	0.269	(0.265)	0.242	0.027
177	14.75	0.87	0.269	(0.264)	0.242	0.027
178	14.83	0.83	0.259	(0.262)	0.233	0.026
179	14.92	0.83	0.259	(0.261)	0.233	0.026
180	15.00	0.83	0.259	(0.260)	0.233	0.026
181	15.08	0.80	0.248	(0.258)	0.223	0.025
182	15.17	0.80	0.248	(0.257)	0.223	0.025
183	15.25	0.80	0.248	(0.256)	0.223	0.025
184	15.33	0.77	0.238	(0.254)	0.214	0.024
185	15.42	0.77	0.238	(0.253)	0.214	0.024
186	15.50	0.77	0.238	(0.252)	0.214	0.024
187	15.58	0.63	0.197	(0.251)	0.177	0.020
188	15.67	0.63	0.197	(0.249)	0.177	0.020
189	15.75	0.63	0.197	(0.248)	0.177	0.020
190	15.83	0.63	0.197	(0.247)	0.177	0.020
191	15.92	0.63	0.197	(0.245)	0.177	0.020
192	16.00	0.63	0.197	(0.244)	0.177	0.020
193	16.08	0.13	0.041	(0.243)	0.037	0.004
194	16.17	0.13	0.041	(0.242)	0.037	0.004
195	16.25	0.13	0.041	(0.240)	0.037	0.004
196	16.33	0.13	0.041	(0.239)	0.037	0.004
197	16.42	0.13	0.041	(0.238)	0.037	0.004
198	16.50	0.13	0.041	(0.237)	0.037	0.004
199	16.58	0.10	0.031	(0.236)	0.028	0.003
200	16.67	0.10	0.031	(0.234)	0.028	0.003
201	16.75	0.10	0.031	(0.233)	0.028	0.003
202	16.83	0.10	0.031	(0.232)	0.028	0.003
203	16.92	0.10	0.031	(0.231)	0.028	0.003
204	17.00	0.10	0.031	(0.230)	0.028	0.003
205	17.08	0.17	0.052	(0.229)	0.047	0.005
206	17.17	0.17	0.052	(0.227)	0.047	0.005
207	17.25	0.17	0.052	(0.226)	0.047	0.005
208	17.33	0.17	0.052	(0.225)	0.047	0.005
209	17.42	0.17	0.052	(0.224)	0.047	0.005
210	17.50	0.17	0.052	(0.223)	0.047	0.005
211	17.58	0.17	0.052	(0.222)	0.047	0.005
212	17.67	0.17	0.052	(0.221)	0.047	0.005
213	17.75	0.17	0.052	(0.220)	0.047	0.005
214	17.83	0.13	0.041	(0.218)	0.037	0.004
215	17.92	0.13	0.041	(0.217)	0.037	0.004
216	18.00	0.13	0.041	(0.216)	0.037	0.004
217	18.08	0.13	0.041	(0.215)	0.037	0.004
218	18.17	0.13	0.041	(0.214)	0.037	0.004
219	18.25	0.13	0.041	(0.213)	0.037	0.004
220	18.33	0.13	0.041	(0.212)	0.037	0.004
221	18.42	0.13	0.041	(0.211)	0.037	0.004
222	18.50	0.13	0.041	(0.210)	0.037	0.004
223	18.58	0.10	0.031	(0.209)	0.028	0.003
224	18.67	0.10	0.031	(0.208)	0.028	0.003
225	18.75	0.10	0.031	(0.207)	0.028	0.003
226	18.83	0.07	0.021	(0.206)	0.019	0.002
227	18.92	0.07	0.021	(0.205)	0.019	0.002

```
228  19.00     0.07      0.021       (  0.204)       0.019        0.002
229  19.08     0.10      0.031       (  0.203)       0.028        0.003
230  19.17     0.10      0.031       (  0.202)       0.028        0.003
231  19.25     0.10      0.031       (  0.201)       0.028        0.003
232  19.33     0.13      0.041       (  0.200)       0.037        0.004
233  19.42     0.13      0.041       (  0.199)       0.037        0.004
234  19.50     0.13      0.041       (  0.198)       0.037        0.004
235  19.58     0.10      0.031       (  0.197)       0.028        0.003
236  19.67     0.10      0.031       (  0.197)       0.028        0.003
237  19.75     0.10      0.031       (  0.196)       0.028        0.003
238  19.83     0.07      0.021       (  0.195)       0.019        0.002
239  19.92     0.07      0.021       (  0.194)       0.019        0.002
240  20.00     0.07      0.021       (  0.193)       0.019        0.002
241  20.08     0.10      0.031       (  0.192)       0.028        0.003
242  20.17     0.10      0.031       (  0.191)       0.028        0.003
243  20.25     0.10      0.031       (  0.191)       0.028        0.003
244  20.33     0.10      0.031       (  0.190)       0.028        0.003
245  20.42     0.10      0.031       (  0.189)       0.028        0.003
246  20.50     0.10      0.031       (  0.188)       0.028        0.003
247  20.58     0.10      0.031       (  0.187)       0.028        0.003
248  20.67     0.10      0.031       (  0.187)       0.028        0.003
249  20.75     0.10      0.031       (  0.186)       0.028        0.003
250  20.83     0.07      0.021       (  0.185)       0.019        0.002
251  20.92     0.07      0.021       (  0.184)       0.019        0.002
252  21.00     0.07      0.021       (  0.184)       0.019        0.002
253  21.08     0.10      0.031       (  0.183)       0.028        0.003
254  21.17     0.10      0.031       (  0.182)       0.028        0.003
255  21.25     0.10      0.031       (  0.181)       0.028        0.003
256  21.33     0.07      0.021       (  0.181)       0.019        0.002
257  21.42     0.07      0.021       (  0.180)       0.019        0.002
258  21.50     0.07      0.021       (  0.179)       0.019        0.002
259  21.58     0.10      0.031       (  0.179)       0.028        0.003
260  21.67     0.10      0.031       (  0.178)       0.028        0.003
261  21.75     0.10      0.031       (  0.177)       0.028        0.003
262  21.83     0.07      0.021       (  0.177)       0.019        0.002
263  21.92     0.07      0.021       (  0.176)       0.019        0.002
264  22.00     0.07      0.021       (  0.176)       0.019        0.002
265  22.08     0.10      0.031       (  0.175)       0.028        0.003
266  22.17     0.10      0.031       (  0.174)       0.028        0.003
267  22.25     0.10      0.031       (  0.174)       0.028        0.003
268  22.33     0.07      0.021       (  0.173)       0.019        0.002
269  22.42     0.07      0.021       (  0.173)       0.019        0.002
270  22.50     0.07      0.021       (  0.172)       0.019        0.002
271  22.58     0.07      0.021       (  0.172)       0.019        0.002
272  22.67     0.07      0.021       (  0.171)       0.019        0.002
273  22.75     0.07      0.021       (  0.171)       0.019        0.002
274  22.83     0.07      0.021       (  0.170)       0.019        0.002
275  22.92     0.07      0.021       (  0.170)       0.019        0.002
276  23.00     0.07      0.021       (  0.170)       0.019        0.002
277  23.08     0.07      0.021       (  0.169)       0.019        0.002
278  23.17     0.07      0.021       (  0.169)       0.019        0.002
279  23.25     0.07      0.021       (  0.168)       0.019        0.002
280  23.33     0.07      0.021       (  0.168)       0.019        0.002
281  23.42     0.07      0.021       (  0.168)       0.019        0.002
282  23.50     0.07      0.021       (  0.167)       0.019        0.002
283  23.58     0.07      0.021       (  0.167)       0.019        0.002
284  23.67     0.07      0.021       (  0.167)       0.019        0.002
285  23.75     0.07      0.021       (  0.167)       0.019        0.002
286  23.83     0.07      0.021       (  0.167)       0.019        0.002
287  23.92     0.07      0.021       (  0.166)       0.019        0.002
288  24.00     0.07      0.021       (  0.166)       0.019        0.002
               (Loss Rate Not Used)
    Sum =     100.0                                  Sum =      3.3
      Flood volume = Effective rainfall      0.27(In)
       times area     331.0(Ac.)/[(In)/(Ft.)] =       7.5(Ac.Ft)
      Total soil loss =      2.31(In)
      Total soil loss =    63.803(Ac.Ft)
      Total rainfall =      2.59(In)
      Flood volume =      327524.1 Cubic Feet
      Total soil loss =     2779280.1 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     17.008(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	0.0001	0.01	Q				
0+10	0.0005	0.06	Q				
0+15	0.0014	0.14	Q				
0+20	0.0032	0.25	Q				
0+25	0.0058	0.38	Q				
0+30	0.0092	0.49	Q				
0+35	0.0133	0.60	VQ				
0+40	0.0180	0.68	VQ				
0+45	0.0231	0.74	VQ				
0+50	0.0286	0.80	VQ				
0+55	0.0345	0.85	VQ				
1+ 0	0.0408	0.92	VQ				
1+ 5	0.0476	0.99	VQ				
1+10	0.0547	1.04	V Q				
1+15	0.0620	1.05	V Q				
1+20	0.0691	1.04	V Q				
1+25	0.0761	1.01	V Q				
1+30	0.0830	1.00	VQ				
1+35	0.0899	1.00	VQ				
1+40	0.0967	1.00	VQ				
1+45	0.1036	1.00	VQ				
1+50	0.1106	1.01	V Q				
1+55	0.1177	1.04	V Q				
2+ 0	0.1251	1.08	V Q				
2+ 5	0.1330	1.14	V Q				
2+10	0.1412	1.19	V Q				
2+15	0.1497	1.23	V Q				
2+20	0.1583	1.26	V Q				
2+25	0.1672	1.28	V Q				
2+30	0.1761	1.29	V Q				
2+35	0.1851	1.31	V Q				
2+40	0.1944	1.34	|VQ				
2+45	0.2039	1.39	|VQ				
2+50	0.2140	1.45	|VQ				
2+55	0.2244	1.52	|V Q				
3+ 0	0.2351	1.56	|V Q				
3+ 5	0.2461	1.59	|V Q				
3+10	0.2572	1.61	|V Q				
3+15	0.2683	1.62	|V Q				
3+20	0.2796	1.64	|V Q				
3+25	0.2909	1.65	|V Q				
3+30	0.3024	1.66	|V Q				
3+35	0.3138	1.67	|V Q				
3+40	0.3254	1.67	|V Q				
3+45	0.3369	1.68	|V Q				
3+50	0.3486	1.69	|V Q				
3+55	0.3604	1.72	|V Q				
4+ 0	0.3725	1.76	|V Q				
4+ 5	0.3851	1.82	| VQ				
4+10	0.3980	1.88	| VQ				
4+15	0.4112	1.92	| VQ				
4+20	0.4246	1.95	| VQ				
4+25	0.4383	1.99	| VQ				
4+30	0.4524	2.05	| V Q				
4+35	0.4670	2.11	| V Q				
4+40	0.4820	2.18	| V Q				
4+45	0.4973	2.22	| V Q				
4+50	0.5128	2.26	| V Q				
4+55	0.5287	2.31	| V Q				
5+ 0	0.5450	2.36	| V Q				
5+ 5	0.5617	2.42	| V Q				
5+10	0.5785	2.44	| VQ				
5+15	0.5951	2.41	| VQ				
5+20	0.6112	2.35	| VQ				

```
  5+25      0.6270     2.29  |  VQ     |         |         |         |
  5+30      0.6426     2.27  |  VQ     |         |         |         |
  5+35      0.6584     2.30  |  VQ     |         |         |         |
  5+40      0.6747     2.36  |  VQ     |         |         |         |
  5+45      0.6913     2.42  |  VQ     |         |         |         |
  5+50      0.7085     2.49  |  VQ     |         |         |         |
  5+55      0.7260     2.55  |  V Q    |         |         |         |
  6+ 0      0.7439     2.59  |  V Q    |         |         |         |
  6+ 5      0.7620     2.63  |   VQ    |         |         |         |
  6+10      0.7804     2.67  |   VQ    |         |         |         |
  6+15      0.7992     2.73  |   VQ    |         |         |         |
  6+20      0.8185     2.80  |   VQ    |         |         |         |
  6+25      0.8382     2.86  |   VQ    |         |         |         |
  6+30      0.8582     2.91  |   VQ    |         |         |         |
  6+35      0.8785     2.95  |   VQ    |         |         |         |
  6+40      0.8992     3.00  |   VQ    |         |         |         |
  6+45      0.9202     3.05  |   V Q   |         |         |         |
  6+50      0.9417     3.12  |    VQ   |         |         |         |
  6+55      0.9636     3.19  |    VQ   |         |         |         |
  7+ 0      0.9859     3.24  |    VQ   |         |         |         |
  7+ 5      1.0084     3.27  |    VQ   |         |         |         |
  7+10      1.0312     3.30  |    VQ   |         |         |         |
  7+15      1.0540     3.32  |    VQ   |         |         |         |
  7+20      1.0770     3.34  |    VQ   |         |         |         |
  7+25      1.1002     3.38  |    VQ   |         |         |         |
  7+30      1.1239     3.43  |    VQ   |         |         |         |
  7+35      1.1480     3.50  |     VQ  |         |         |         |
  7+40      1.1727     3.59  |     VQ  |         |         |         |
  7+45      1.1979     3.67  |     VQ  |         |         |         |
  7+50      1.2239     3.76  |     VQ  |         |         |         |
  7+55      1.2504     3.86  |     VQ  |         |         |         |
  8+ 0      1.2777     3.96  |     VQ  |         |         |         |
  8+ 5      1.3057     4.06  |     V Q |         |         |         |
  8+10      1.3345     4.19  |      VQ |         |         |         |
  8+15      1.3644     4.33  |      VQ |         |         |         |
  8+20      1.3952     4.48  |      VQ |         |         |         |
  8+25      1.4271     4.62  |      V Q|         |         |         |
  8+30      1.4597     4.73  |      V Q|         |         |         |
  8+35      1.4928     4.81  |      V Q|         |         |         |
  8+40      1.5264     4.88  |       VQ|         |         |         |
  8+45      1.5605     4.96  |       VQ|         |         |         |
  8+50      1.5954     5.06  |       V Q         |         |         |
  8+55      1.6309     5.16  |       V Q         |         |         |
  9+ 0      1.6672     5.27  |       V Q         |         |         |
  9+ 5      1.7043     5.38  |        VQ         |         |         |
  9+10      1.7423     5.52  |        V|Q        |         |         |
  9+15      1.7813     5.66  |        V|Q        |         |         |
  9+20      1.8214     5.83  |        V|Q        |         |         |
  9+25      1.8627     5.99  |        V|Q        |         |         |
  9+30      1.9050     6.14  |         V Q       |         |         |
  9+35      1.9482     6.28  |         V Q       |         |         |
  9+40      1.9923     6.41  |         V Q       |         |         |
  9+45      2.0373     6.53  |         V  Q      |         |         |
  9+50      2.0832     6.65  |         |V Q      |         |         |
  9+55      2.1299     6.78  |         |V Q      |         |         |
 10+ 0      2.1774     6.90  |         |V Q      |         |         |
 10+ 5      2.2253     6.96  |         |V Q      |         |         |
 10+10      2.2729     6.91  |         | VQ      |         |         |
 10+15      2.3191     6.71  |         | VQ      |         |         |
 10+20      2.3631     6.40  |         | Q       |         |         |
 10+25      2.4049     6.07  |         | Q       |         |         |
 10+30      2.4451     5.84  |         |Q V      |         |         |
 10+35      2.4847     5.74  |         |Q V      |         |         |
 10+40      2.5244     5.76  |         |Q V      |         |         |
 10+45      2.5650     5.90  |         |Q V      |         |         |
 10+50      2.6072     6.12  |         | QV      |         |         |
 10+55      2.6509     6.35  |         | Q V     |         |         |
 11+ 0      2.6956     6.50  |         |  QV     |         |         |
 11+ 5      2.7410     6.59  |         |  QV     |         |         |
 11+10      2.7866     6.62  |         |  QV     |         |         |
 11+15      2.8322     6.62  |         |  Q V    |         |         |
 11+20      2.8776     6.60  |         |  Q V    |         |         |
 11+25      2.9229     6.57  |         |  Q V    |         |         |
```

```
11+30    2.9680    6.55  |          |  Q V     |          |          |
11+35    3.0130    6.54  |          |  Q  V    |          |          |
11+40    3.0577    6.49  |          | Q   V    |          |          |
11+45    3.1019    6.41  |          | Q   V    |          |          |
11+50    3.1454    6.32  |          | Q   V    |          |          |
11+55    3.1883    6.23  |          | Q   V    |          |          |
12+ 0    3.2310    6.20  |          | Q    V   |          |          |
12+ 5    3.2740    6.25  |          | Q    V   |          |          |
12+10    3.3183    6.43  |          | Q    V   |          |          |
12+15    3.3645    6.71  |          |  Q   V   |          |          |
12+20    3.4134    7.10  |          |   Q   V  |          |          |
12+25    3.4650    7.50  |          |   Q   V  |          |          |
12+30    3.5187    7.80  |          |    Q  V  |          |          |
12+35    3.5740    8.03  |          |     Q  V|          |          |
12+40    3.6308    8.24  |          |     Q  V|          |          |
12+45    3.6889    8.44  |          |     Q  V|          |          |
12+50    3.7484    8.64  |          |      Q V|          |          |
12+55    3.8094    8.84  |          |      Q  V          |          |
13+ 0    3.8715    9.02  |          |       Q V          |          |
13+ 5    3.9361    9.38  |          |       Q V          |          |
13+10    4.0061   10.16  |          |         QV         |          |
13+15    4.0848   11.43  |          |          |VQ       |          |
13+20    4.1751   13.12  |          |          | V   Q   |          |
13+25    4.2777   14.89  |          |          | V      Q|          |
13+30    4.3898   16.27  |          |          |  V      | Q        |
13+35    4.5069   17.01  |          |          |  V      |   Q      |
13+40    4.6232   16.88  |          |          |   V     |  Q       |
13+45    4.7326   15.88  |          |          |    V    |Q         |
13+50    4.8304   14.20  |          |          |    V  Q |          |
13+55    4.9156   12.38  |          |          |   Q V   |          |
14+ 0    4.9924   11.15  |          |          | Q   V   |          |
14+ 5    5.0643   10.45  |          |         Q    V   |          |
14+10    5.1338   10.09  |          |         Q     V  |          |
14+15    5.2024    9.95  |          |        Q|     V  |          |
14+20    5.2708    9.93  |          |        Q|      V |          |
14+25    5.3391    9.92  |          |        Q|      V |          |
14+30    5.4071    9.87  |          |        Q|      V |          |
14+35    5.4744    9.77  |          |        Q|       V|          |
14+40    5.5410    9.67  |          |        Q|       V|          |
14+45    5.6070    9.59  |          |        Q|       V|          |
14+50    5.6724    9.51  |          |        Q|        V          |
14+55    5.7375    9.44  |          |       Q |        V          |
15+ 0    5.8019    9.35  |          |       Q |        V          |
15+ 5    5.8656    9.26  |          |       Q |         |V        |
15+10    5.9287    9.15  |          |       Q |         |V        |
15+15    5.9909    9.04  |          |       Q |         |V        |
15+20    6.0523    8.92  |          |      Q  |         | V       |
15+25    6.1129    8.79  |          |      Q  |         | V       |
15+30    6.1726    8.67  |          |      Q  |         | V       |
15+35    6.2314    8.53  |          |      Q  |         |  V      |
15+40    6.2888    8.34  |          |     Q   |         |  V      |
15+45    6.3446    8.10  |          |     Q   |         |  V      |
15+50    6.3986    7.84  |          |    Q    |         |   V     |
15+55    6.4508    7.58  |          |    Q    |         |   V     |
16+ 0    6.5018    7.40  |          |   Q     |         |   V     |
16+ 5    6.5510    7.15  |          |   Q     |         |   V     |
16+10    6.5972    6.71  |          |  Q      |         |    V    |
16+15    6.6388    6.03  |          | Q       |         |    V    |
16+20    6.6743    5.15  |         Q        |         |    V    |
16+25    6.7037    4.27  |       Q  |       |         |    V    |
16+30    6.7288    3.65  |      Q   |       |         |    V    |
16+35    6.7511    3.24  |     Q    |       |         |    V    |
16+40    6.7715    2.95  |    Q     |       |         |     V   |
16+45    6.7901    2.70  |    Q     |       |         |     V   |
16+50    6.8071    2.48  |   Q      |       |         |     V   |
16+55    6.8228    2.28  |   Q      |       |         |     V   |
17+ 0    6.8374    2.11  |   Q      |       |         |     V   |
17+ 5    6.8511    1.99  |  Q       |       |         |     V   |
17+10    6.8643    1.92  |  Q       |       |         |     V   |
17+15    6.8774    1.90  |  Q       |       |         |     V   |
17+20    6.8907    1.92  |  Q       |       |         |     V   |
17+25    6.9041    1.95  |  Q       |       |         |     V   |
17+30    6.9176    1.96  |  Q       |       |         |     V   |
```

```
17+35       6.9311      1.95  |  Q      |         |         |     V   |
17+40       6.9444      1.94  |  Q      |         |         |     V   |
17+45       6.9576      1.91  |  Q      |         |         |      V  |
17+50       6.9705      1.88  |  Q      |         |         |      V  |
17+55       6.9832      1.83  |  Q      |         |         |      V  |
18+ 0       6.9954      1.77  |  Q      |         |         |      V  |
18+ 5       7.0071      1.70  |  Q      |         |         |      V  |
18+10       7.0184      1.63  |  Q      |         |         |      V  |
18+15       7.0292      1.58  |  Q      |         |         |      V  |
18+20       7.0398      1.54  |  Q      |         |         |      V  |
18+25       7.0502      1.51  |  Q      |         |         |      V  |
18+30       7.0605      1.49  | Q       |         |         |      V  |
18+35       7.0706      1.46  | Q       |         |         |      V  |
18+40       7.0804      1.42  | Q       |         |         |      V  |
18+45       7.0898      1.37  | Q       |         |         |      V  |
18+50       7.0987      1.29  | Q       |         |         |      V  |
18+55       7.1070      1.20  | Q       |         |         |      V  |
19+ 0       7.1147      1.12  | Q       |         |         |      V  |
19+ 5       7.1219      1.04  | Q       |         |         |      V  |
19+10       7.1287      1.00  |Q        |         |         |      V  |
19+15       7.1355      0.98  |Q        |         |         |      V  |
19+20       7.1425      1.01  | Q       |         |         |      V  |
19+25       7.1497      1.06  | Q       |         |         |       V |
19+30       7.1574      1.11  | Q       |         |         |       V |
19+35       7.1655      1.17  | Q       |         |         |       V |
19+40       7.1737      1.20  | Q       |         |         |       V |
19+45       7.1820      1.20  | Q       |         |         |       V |
19+50       7.1900      1.16  | Q       |         |         |       V |
19+55       7.1976      1.10  | Q       |         |         |       V |
20+ 0       7.2047      1.04  | Q       |         |         |       V |
20+ 5       7.2114      0.97  |Q        |         |         |       V |
20+10       7.2179      0.93  |Q        |         |         |       V |
20+15       7.2242      0.93  |Q        |         |         |       V |
20+20       7.2308      0.95  |Q        |         |         |       V |
20+25       7.2376      0.98  |Q        |         |         |       V |
20+30       7.2445      1.01  | Q       |         |         |       V |
20+35       7.2515      1.02  | Q       |         |         |       V |
20+40       7.2585      1.02  | Q       |         |         |       V |
20+45       7.2656      1.02  | Q       |         |         |       V |
20+50       7.2726      1.02  | Q       |         |         |       V |
20+55       7.2794      1.00  |Q        |         |         |       V |
21+ 0       7.2860      0.96  |Q        |         |         |       V |
21+ 5       7.2923      0.91  |Q        |         |         |       V |
21+10       7.2984      0.88  |Q        |         |         |       V |
21+15       7.3045      0.89  |Q        |         |         |       V |
21+20       7.3108      0.91  |Q        |         |         |       V |
21+25       7.3171      0.92  |Q        |         |         |       V |
21+30       7.3234      0.91  |Q        |         |         |       V |
21+35       7.3294      0.88  |Q        |         |         |       V |
21+40       7.3353      0.85  |Q        |         |         |        V|
21+45       7.3412      0.86  |Q        |         |         |        V|
21+50       7.3473      0.89  |Q        |         |         |        V|
21+55       7.3535      0.91  |Q        |         |         |        V|
22+ 0       7.3597      0.90  |Q        |         |         |        V|
22+ 5       7.3657      0.87  |Q        |         |         |        V|
22+10       7.3715      0.84  |Q        |         |         |        V|
22+15       7.3774      0.85  |Q        |         |         |        V|
22+20       7.3834      0.88  |Q        |         |         |        V|
22+25       7.3896      0.90  |Q        |         |         |        V|
22+30       7.3957      0.89  |Q        |         |         |        V|
22+35       7.4016      0.85  |Q        |         |         |        V|
22+40       7.4072      0.81  |Q        |         |         |        V|
22+45       7.4125      0.78  |Q        |         |         |        V|
22+50       7.4177      0.76  |Q        |         |         |        V|
22+55       7.4229      0.75  |Q        |         |         |        V|
23+ 0       7.4280      0.74  |Q        |         |         |        V|
23+ 5       7.4331      0.73  |Q        |         |         |        V|
23+10       7.4381      0.73  |Q        |         |         |        V|
23+15       7.4431      0.72  |Q        |         |         |        V|
23+20       7.4480      0.72  |Q        |         |         |        V|
23+25       7.4530      0.72  |Q        |         |         |        V|
23+30       7.4579      0.71  |Q        |         |         |        V|
23+35       7.4628      0.71  |Q        |         |         |        V|
```

23+40	7.4676	0.71	|Q	|	|	|	V|
23+45	7.4725	0.70	|Q	|	|	|	V|
23+50	7.4773	0.70	|Q	|	|	|	V|
23+55	7.4822	0.70	|Q	|	|	|	V|
24+ 0	7.4870	0.70	|Q	|	|	|	V|
24+ 5	7.4917	0.69	|Q	|	|	|	V|
24+10	7.4961	0.64	|Q	|	|	|	V|
24+15	7.5000	0.56	|Q	|	|	|	V|
24+20	7.5031	0.45	Q	|	|	|	V|
24+25	7.5055	0.35	Q	|	|	|	V|
24+30	7.5073	0.27	Q	|	|	|	V|
24+35	7.5088	0.22	Q	|	|	|	V|
24+40	7.5101	0.19	Q	|	|	|	V|
24+45	7.5112	0.16	Q	|	|	|	V|
24+50	7.5122	0.14	Q	|	|	|	V|
24+55	7.5131	0.12	Q	|	|	|	V|
25+ 0	7.5138	0.11	Q	|	|	|	V|
25+ 5	7.5145	0.10	Q	|	|	|	V|
25+10	7.5151	0.08	Q	|	|	|	V|
25+15	7.5156	0.07	Q	|	|	|	V|
25+20	7.5160	0.07	Q	|	|	|	V|
25+25	7.5164	0.06	Q	|	|	|	V|
25+30	7.5168	0.05	Q	|	|	|	V|
25+35	7.5171	0.05	Q	|	|	|	V|
25+40	7.5174	0.04	Q	|	|	|	V|
25+45	7.5176	0.04	Q	|	|	|	V|
25+50	7.5178	0.03	Q	|	|	|	V|
25+55	7.5180	0.03	Q	|	|	|	V|
26+ 0	7.5182	0.02	Q	|	|	|	V|
26+ 5	7.5183	0.02	Q	|	|	|	V|
26+10	7.5184	0.02	Q	|	|	|	V|
26+15	7.5185	0.02	Q	|	|	|	V|
26+20	7.5186	0.01	Q	|	|	|	V|
26+25	7.5187	0.01	Q	|	|	|	V|
26+30	7.5188	0.01	Q	|	|	|	V|
26+35	7.5188	0.01	Q	|	|	|	V|
26+40	7.5189	0.01	Q	|	|	|	V|
26+45	7.5189	0.00	Q	|	|	|	V|
26+50	7.5189	0.00	Q	|	|	|	V|
26+55	7.5189	0.00	Q	|	|	|	V

Area 'B' – 100 Year 1 Hour Existing Condition – Unit Hydrograph

```
        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  06/27/20 File: EXB1001100.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'B'
EXISTING CONDITION UNIT HYDROGRAPH - 100 YEAR 1 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =     331.00(Ac.)  =      0.517 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =     331.00(Ac.)  =      0.517 Sq. Mi.
Length along longest watercourse =    7455.00(Ft.)
Length along longest watercourse measured to centroid =    5892.00(Ft.)
Length along longest watercourse =      1.412 Mi.
Length along longest watercourse measured to centroid =      1.116 Mi.
Difference in elevation =     122.00(Ft.)
Slope along watercourse =     86.4064 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.367 Hr.
Lag time =    22.01 Min.
25% of lag time =     5.50 Min.
40% of lag time =     8.80 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]
      331.00           0.45                148.95

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
      331.00           1.20                397.20

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    0.450(In)
Area Averaged 100-Year Rainfall =    1.200(In)

Point rain (area averaged) =    1.200(In)
Areal adjustment factor =   99.70 %
Adjusted average point rain =    1.196(In)

Sub-Area Data:
```

```
Area(Ac.)         Runoff Index    Impervious %
   331.000           72.50          0.000
 Total Area Entered =    331.00(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-3     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
72.5  86.5      0.170     0.000        0.170       1.000      0.170
                                                 Sum (F) =    0.170
Area averaged mean soil loss (F) (In/Hr) =  0.170
Minimum soil loss rate ((In/Hr)) =  0.085
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.900
------------------------------------------------------------------------
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         22.720          2.056             6.860
    2   0.167         45.439          6.466            21.569
    3   0.250         68.159         11.378            37.955
    4   0.333         90.879         15.374            51.286
    5   0.417        113.598         15.551            51.875
    6   0.500        136.318         10.899            36.358
    7   0.583        159.038          7.020            23.418
    8   0.667        181.757          4.723            15.754
    9   0.750        204.477          3.502            11.683
   10   0.833        227.197          2.929             9.772
   11   0.917        249.916          2.457             8.197
   12   1.000        272.636          2.137             7.128
   13   1.083        295.356          1.853             6.183
   14   1.167        318.075          1.552             5.176
   15   1.250        340.795          1.369             4.566
   16   1.333        363.515          1.299             4.333
   17   1.417        386.234          1.030             3.434
   18   1.500        408.954          0.978             3.264
   19   1.583        431.674          0.777             2.592
   20   1.667        454.393          0.726             2.422
   21   1.750        477.113          0.696             2.323
   22   1.833        499.833          0.682             2.274
   23   1.917        522.552          0.592             1.975
   24   2.000        545.272          0.500             1.667
   25   2.083        567.992          0.471             1.572
   26   2.167        590.711          0.411             1.371
   27   2.250        613.431          0.393             1.311
   28   2.333        636.151          0.326             1.086
   29   2.417        658.870          0.311             1.038
   30   2.500        681.590          0.244             0.814
   31   2.583        704.309          0.227             0.758
   32   2.667        727.029          0.227             0.758
   33   2.750        749.749          0.227             0.758
   34   2.833        772.468          0.227             0.758
   35   2.917        795.188          0.227             0.758
   36   3.000        817.908          0.162             0.539
                                 Sum = 100.000   Sum=    333.586
------------------------------------------------------------------------

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      0.603          0.170    (  0.543)        0.433
  2   0.17     4.30      0.617          0.170    (  0.556)        0.447
  3   0.25     5.00      0.718          0.170    (  0.646)        0.548
```

```
  4   0.33     5.00      0.718          0.170    (  0.646)        0.548
  5   0.42     5.80      0.833          0.170    (  0.749)        0.663
  6   0.50     6.50      0.933          0.170    (  0.840)        0.763
  7   0.58     7.40      1.062          0.170    (  0.956)        0.893
  8   0.67     8.60      1.235          0.170    (  1.111)        1.065
  9   0.75    12.30      1.766          0.170    (  1.589)        1.596
 10   0.83    29.10      4.178          0.170    (  3.760)        4.008
 11   0.92     6.80      0.976          0.170    (  0.879)        0.806
 12   1.00     5.00      0.718          0.170    (  0.646)        0.548
             (Loss Rate Not Used)
    Sum =     100.0                                    Sum =    12.3
      Flood volume = Effective rainfall      1.03(In)
       times area     331.0(Ac.)/[(In)/(Ft.)] =      28.3(Ac.Ft)
      Total soil loss =      0.17(In)
      Total soil loss =     4.686(Ac.Ft)
      Total rainfall =      1.20(In)
      Flood volume =     1233371.0 Cubic Feet
      Total soil loss =      204139.9 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =    426.081(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      125.0     250.0     375.0     500.0
-------------------------------------------------------------------------
  0+ 5       0.0205      2.97  Q         |         |         |         |
  0+10       0.1060     12.42  Q         |         |         |         |
  0+15       0.3117     29.86  V Q       |         |         |         |
  0+20       0.6891     54.80  V   Q     |         |         |         |
  0+25       1.2581     82.62  |V    Q   |         |         |         |
  0+30       1.9980    107.44  | V     Q |         |         |         |
  0+35       2.8985    130.75  |   V     Q         |         |         |
  0+40       3.9677    155.25  |    V    | Q       |         |         |
  0+45       5.2506    186.28  |      V  |   Q     |         |         |
  0+50       6.9231    242.85  |        V|        Q|         |         |
  0+55       9.1259    319.86  |         | V       |    Q    |         |
  1+ 0      11.8108    389.84  |         |     V   |         |Q        |
  1+ 5      14.7452    426.08  |         |         V         |   Q     |
  1+10      17.4731    396.09  |         |         |   V     |Q        |
  1+15      19.5727    304.86  |         |         |   Q  V  |         |
  1+20      21.0820    219.14  |         |      Q  |        V|         |
  1+25      22.1611    156.70  |         | Q       |         |V        |
  1+30      22.9813    119.08  |        Q|         |         | V       |
  1+35      23.6512     97.27  |      Q  |         |         |  V      |
  1+40      24.2159     81.99  |     Q   |         |         |   V     |
  1+45      24.7042     70.90  |    Q    |         |         |   V     |
  1+50      25.1284     61.60  |   Q     |         |         |    V    |
  1+55      25.4956     53.31  |   Q     |         |         |     V   |
  2+ 0      25.8198     47.08  |  Q      |         |         |     V   |
  2+ 5      26.1113     42.32  |  Q      |         |         |     V   |
  2+10      26.3626     36.48  | Q       |         |         |      V  |
  2+15      26.5901     33.03  | Q       |         |         |      V  |
  2+20      26.7868     28.57  | Q       |         |         |      V  |
  2+25      26.9673     26.21  | Q       |         |         |       V |
  2+30      27.1337     24.16  |Q        |         |         |       V |
  2+35      27.2882     22.43  |Q        |         |         |       V |
  2+40      27.4259     19.99  |Q        |         |         |       V |
  2+45      27.5479     17.72  |Q        |         |         |       V |
  2+50      27.6589     16.12  |Q        |         |         |        V|
  2+55      27.7586     14.48  |Q        |         |         |        V|
  3+ 0      27.8501     13.28  |Q        |         |         |        V|
  3+ 5      27.9294     11.52  Q         |         |         |        V|
  3+10      28.0006     10.33  Q         |         |         |        V|
  3+15      28.0610      8.77  Q         |         |         |        V|
  3+20      28.1154      7.90  Q         |         |         |        V|
  3+25      28.1650      7.20  Q         |         |         |        V|
  3+30      28.2102      6.57  Q         |         |         |        V|
  3+35      28.2505      5.85  Q         |         |         |        V|
```

```
    3+40      28.2844      4.93  Q          |          |          |         V|
    3+45      28.3064      3.19  Q          |          |          |         V|
    3+50      28.3123      0.85  Q          |          |          |         V|
    3+55      28.3143      0.30  Q          |          |          |          V
-------------------------------------------------------------------------------
```

Area 'B' – 100 Year 3 Hour Existing Condition – Unit Hydrograph

```
        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  06/27/20 File: EXB1003100.out


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'B'
EXISTING CONDITION UNIT HYDROGRAPH - 100 YEAR 3 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =     331.00(Ac.)  =      0.517 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =     331.00(Ac.)  =      0.517 Sq. Mi.
Length along longest watercourse =    7455.00(Ft.)
Length along longest watercourse measured to centroid =    5892.00(Ft.)
Length along longest watercourse =      1.412 Mi.
Length along longest watercourse measured to centroid =      1.116 Mi.
Difference in elevation =     122.00(Ft.)
Slope along watercourse =     86.4064 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.367 Hr.
Lag time =    22.01 Min.
25% of lag time =     5.50 Min.
40% of lag time =     8.80 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]
      331.00           0.80                264.80

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
      331.00           1.80                595.80

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    0.800(In)
Area Averaged 100-Year Rainfall =    1.800(In)

Point rain (area averaged) =    1.800(In)
Areal adjustment factor =   99.86 %
Adjusted average point rain =    1.797(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
   331.000           72.50         0.000
 Total Area Entered =    331.00(Ac.)
```

RI AMC2	RI AMC-3	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
72.5	86.5	0.170	0.000	0.170	1.000	0.170
					Sum (F) =	0.170

Area averaged mean soil loss (F) (In/Hr) = 0.170
Minimum soil loss rate ((In/Hr)) = 0.085
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

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	22.720	2.056	6.860
2	0.167	45.439	6.466	21.569
3	0.250	68.159	11.378	37.955
4	0.333	90.879	15.374	51.286
5	0.417	113.598	15.551	51.875
6	0.500	136.318	10.899	36.358
7	0.583	159.038	7.020	23.418
8	0.667	181.757	4.723	15.754
9	0.750	204.477	3.502	11.683
10	0.833	227.197	2.929	9.772
11	0.917	249.916	2.457	8.197
12	1.000	272.636	2.137	7.128
13	1.083	295.356	1.853	6.183
14	1.167	318.075	1.552	5.176
15	1.250	340.795	1.369	4.566
16	1.333	363.515	1.299	4.333
17	1.417	386.234	1.030	3.434
18	1.500	408.954	0.978	3.264
19	1.583	431.674	0.777	2.592
20	1.667	454.393	0.726	2.422
21	1.750	477.113	0.696	2.323
22	1.833	499.833	0.682	2.274
23	1.917	522.552	0.592	1.975
24	2.000	545.272	0.500	1.667
25	2.083	567.992	0.471	1.572
26	2.167	590.711	0.411	1.371
27	2.250	613.431	0.393	1.311
28	2.333	636.151	0.326	1.086
29	2.417	658.870	0.311	1.038
30	2.500	681.590	0.244	0.814
31	2.583	704.309	0.227	0.758
32	2.667	727.029	0.227	0.758
33	2.750	749.749	0.227	0.758
34	2.833	772.468	0.227	0.758
35	2.917	795.188	0.227	0.758
36	3.000	817.908	0.162	0.539
			Sum = 100.000	Sum= 333.586

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	0.280	0.170	(	0.252)	0.110
2	0.17	1.30	0.280	0.170	(	0.252)	0.110
3	0.25	1.10	0.237	0.170	(	0.214)	0.067
4	0.33	1.50	0.324	0.170	(	0.291)	0.154
5	0.42	1.50	0.324	0.170	(	0.291)	0.154
6	0.50	1.80	0.388	0.170	(	0.349)	0.218
7	0.58	1.50	0.324	0.170	(	0.291)	0.154
8	0.67	1.80	0.388	0.170	(	0.349)	0.218

```
 9   0.75     1.80      0.388          0.170    (  0.349)        0.218
10   0.83     1.50      0.324          0.170    (  0.291)        0.154
11   0.92     1.60      0.345          0.170    (  0.311)        0.175
12   1.00     1.80      0.388          0.170    (  0.349)        0.218
13   1.08     2.20      0.475          0.170    (  0.427)        0.305
14   1.17     2.20      0.475          0.170    (  0.427)        0.305
15   1.25     2.20      0.475          0.170    (  0.427)        0.305
16   1.33     2.00      0.431          0.170    (  0.388)        0.261
17   1.42     2.60      0.561          0.170    (  0.505)        0.391
18   1.50     2.70      0.582          0.170    (  0.524)        0.412
19   1.58     2.40      0.518          0.170    (  0.466)        0.348
20   1.67     2.70      0.582          0.170    (  0.524)        0.412
21   1.75     3.30      0.712          0.170    (  0.641)        0.542
22   1.83     3.10      0.669          0.170    (  0.602)        0.499
23   1.92     2.90      0.625          0.170    (  0.563)        0.456
24   2.00     3.00      0.647          0.170    (  0.582)        0.477
25   2.08     3.10      0.669          0.170    (  0.602)        0.499
26   2.17     4.20      0.906          0.170    (  0.815)        0.736
27   2.25     5.00      1.078          0.170    (  0.971)        0.909
28   2.33     3.50      0.755          0.170    (  0.679)        0.585
29   2.42     6.80      1.467          0.170    (  1.320)        1.297
30   2.50     7.30      1.575          0.170    (  1.417)        1.405
31   2.58     8.20      1.769          0.170    (  1.592)        1.599
32   2.67     5.90      1.273          0.170    (  1.145)        1.103
33   2.75     2.00      0.431          0.170    (  0.388)        0.261
34   2.83     1.80      0.388          0.170    (  0.349)        0.218
35   2.92     1.80      0.388          0.170    (  0.349)        0.218
36   3.00     0.60      0.129       (  0.170)       0.116        0.013
              (Loss Rate Not Used)
   Sum =     100.0                                  Sum =    15.5
     Flood volume = Effective rainfall      1.29(In)
      times area     331.0(Ac.)/[(In)/(Ft.)] =      35.6(Ac.Ft)
     Total soil loss =      0.51(In)
     Total soil loss =    13.936(Ac.Ft)
     Total rainfall =      1.80(In)
     Flood volume =     1552551.9 Cubic Feet
     Total soil loss =      607070.1 Cubic Feet
     ---------------------------------------------------------------------
      Peak flow rate of this hydrograph =    316.991(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      100.0     200.0     300.0     400.0
-------------------------------------------------------------------------
  0+ 5       0.0052      0.76  Q         |         |         |         |
  0+10       0.0269      3.14  Q         |         |         |         |
  0+15       0.0754      7.04  Q         |         |         |         |
  0+20       0.1606     12.37  VQ        |         |         |         |
  0+25       0.2868     18.33  VQ        |         |         |         |
  0+30       0.4512     23.86  V Q       |         |         |         |
  0+35       0.6549     29.59  V Q       |         |         |         |
  0+40       0.9011     35.74  |V Q      |         |         |         |
  0+45       1.1864     41.42  |V  Q     |         |         |         |
  0+50       1.5024     45.89  |V  Q     |         |         |         |
  0+55       1.8380     48.72  | V Q     |         |         |         |
  1+ 0       2.1887     50.92  | V  Q    |         |         |         |
  1+ 5       2.5536     52.98  | V  Q    |         |         |         |
  1+10       2.9423     56.45  |  V Q    |         |         |         |
  1+15       3.3724     62.45  |  V  Q   |         |         |         |
  1+20       3.8513     69.54  |   V Q   |         |         |         |
  1+25       4.3763     76.22  |   V  Q  |         |         |         |
  1+30       4.9430     82.29  |    V  Q |         |         |         |
  1+35       5.5507     88.24  |     V Q |         |         |         |
  1+40       6.2039     94.84  |     V  Q|         |         |         |
  1+45       6.9120    102.81  |      V  Q         |         |         |
  1+50       7.6752    110.82  |       V |Q        |         |         |
  1+55       8.4949    119.02  |         V|Q       |         |         |
  2+ 0       9.3727    127.45  |          V Q      |         |         |
```

```
    2+ 5      10.2973    134.26  |          |V Q       |          |          |
    2+10      11.2615    140.01  |          | V Q      |          |          |
    2+15      12.2912    149.51  |          |  VQ      |          |          |
    2+20      13.4167    163.42  |          |    VQ    |          |          |
    2+25      14.6787    183.25  |          |     V Q  |          |          |
    2+30      16.1309    210.85  |          |       V  |Q         |          |
    2+35      17.8150    244.54  |          |        V |   Q      |          |
    2+40      19.7625    282.77  |          |          | V     Q  |          |
    2+45      21.9224    313.62  |          |          |   V      |Q         |
    2+50      24.1055    316.99  |          |          |      V   |Q         |
    2+55      26.1009    289.73  |          |          |       QV |          |
    3+ 0      27.7500    239.45  |          |          |  Q       |V         |
    3+ 5      29.0334    186.36  |          |        Q |          | V        |
    3+10      30.0385    145.93  |          |   Q      |          |  V       |
    3+15      30.8350    115.66  |          |Q         |          |   V      |
    3+20      31.4733     92.68  |        Q |          |          |    V     |
    3+25      32.0011     76.63  |      Q   |          |          |    V     |
    3+30      32.4477     64.85  |     Q    |          |          |     V    |
    3+35      32.8324     55.85  |    Q     |          |          |     V    |
    3+40      33.1686     48.82  |   Q      |          |          |      V   |
    3+45      33.4626     42.69  |   Q      |          |          |      V   |
    3+50      33.7244     38.01  |  Q       |          |          |      V   |
    3+55      33.9554     33.54  |  Q       |          |          |       V  |
    4+ 0      34.1594     29.61  | Q        |          |          |       V  |
    4+ 5      34.3410     26.37  | Q        |          |          |       V  |
    4+10      34.5042     23.70  | Q        |          |          |       V  |
    4+15      34.6526     21.55  | Q        |          |          |       V  |
    4+20      34.7871     19.53  |Q         |          |          |        V |
    4+25      34.9072     17.43  |Q         |          |          |        V |
    4+30      35.0134     15.42  |Q         |          |          |        V |
    4+35      35.1085     13.81  |Q         |          |          |        V |
    4+40      35.1927     12.24  |Q         |          |          |        V |
    4+45      35.2671     10.80  |Q         |          |          |        V |
    4+50      35.3323      9.47  Q          |          |          |        V |
    4+55      35.3896      8.32  Q          |          |          |        V |
    5+ 0      35.4402      7.35  Q          |          |          |        V |
    5+ 5      35.4850      6.50  Q          |          |          |        V |
    5+10      35.5244      5.72  Q          |          |          |        V |
    5+15      35.5591      5.03  Q          |          |          |        V |
    5+20      35.5891      4.37  Q          |          |          |        V |
    5+25      35.6122      3.35  Q          |          |          |        V |
    5+30      35.6276      2.24  Q          |          |          |        V |
    5+35      35.6354      1.13  Q          |          |          |        V |
    5+40      35.6387      0.48  Q          |          |          |        V |
    5+45      35.6408      0.29  Q          |          |          |        V |
    5+50      35.6416      0.13  Q          |          |          |        V |
    5+55      35.6417      0.01  Q          |          |          |         V
-------------------------------------------------------------------------
```

Area 'B' – 100 Year 6 Hour Existing Condition – Unit Hydrograph

```
        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  06/27/20 File: EXB1006100.out


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'B'
EXISTING CONDITION UNIT HYDROGRAPH - 100 YEAR 6 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =     331.00(Ac.)  =      0.517 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =     331.00(Ac.)  =      0.517 Sq. Mi.
Length along longest watercourse =    7455.00(Ft.)
Length along longest watercourse measured to centroid =    5892.00(Ft.)
Length along longest watercourse =      1.412 Mi.
Length along longest watercourse measured to centroid =      1.116 Mi.
Difference in elevation =     122.00(Ft.)
Slope along watercourse =     86.4064 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.367 Hr.
Lag time =    22.01 Min.
25% of lag time =     5.50 Min.
40% of lag time =     8.80 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]
      331.00           1.00                331.00

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
      331.00           2.50                827.50

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    1.000(In)
Area Averaged 100-Year Rainfall =    2.500(In)

Point rain (area averaged) =    2.500(In)
Areal adjustment factor =   99.89 %
Adjusted average point rain =    2.497(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
   331.000           72.50         0.000
 Total Area Entered =    331.00(Ac.)
```

RI AMC2	RI AMC-3	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
72.5	86.5	0.170	0.000	0.170	1.000	0.170
					Sum (F) =	0.170

Area averaged mean soil loss (F) (In/Hr) = 0.170
Minimum soil loss rate ((In/Hr)) = 0.085
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.900

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	22.720	2.056	6.860
2	0.167	45.439	6.466	21.569
3	0.250	68.159	11.378	37.955
4	0.333	90.879	15.374	51.286
5	0.417	113.598	15.551	51.875
6	0.500	136.318	10.899	36.358
7	0.583	159.038	7.020	23.418
8	0.667	181.757	4.723	15.754
9	0.750	204.477	3.502	11.683
10	0.833	227.197	2.929	9.772
11	0.917	249.916	2.457	8.197
12	1.000	272.636	2.137	7.128
13	1.083	295.356	1.853	6.183
14	1.167	318.075	1.552	5.176
15	1.250	340.795	1.369	4.566
16	1.333	363.515	1.299	4.333
17	1.417	386.234	1.030	3.434
18	1.500	408.954	0.978	3.264
19	1.583	431.674	0.777	2.592
20	1.667	454.393	0.726	2.422
21	1.750	477.113	0.696	2.323
22	1.833	499.833	0.682	2.274
23	1.917	522.552	0.592	1.975
24	2.000	545.272	0.500	1.667
25	2.083	567.992	0.471	1.572
26	2.167	590.711	0.411	1.371
27	2.250	613.431	0.393	1.311
28	2.333	636.151	0.326	1.086
29	2.417	658.870	0.311	1.038
30	2.500	681.590	0.244	0.814
31	2.583	704.309	0.227	0.758
32	2.667	727.029	0.227	0.758
33	2.750	749.749	0.227	0.758
34	2.833	772.468	0.227	0.758
35	2.917	795.188	0.227	0.758
36	3.000	817.908	0.162	0.539
			Sum = 100.000	Sum= 333.586

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	(0.170)		0.135	0.015
2	0.17	0.60	0.180	(0.170)		0.162	0.018
3	0.25	0.60	0.180	(0.170)		0.162	0.018
4	0.33	0.60	0.180	(0.170)		0.162	0.018
5	0.42	0.60	0.180	(0.170)		0.162	0.018
6	0.50	0.70	0.210	0.170	(	0.189)	0.040
7	0.58	0.70	0.210	0.170	(	0.189)	0.040
8	0.67	0.70	0.210	0.170	(	0.189)	0.040

9	0.75	0.70	0.210	0.170	(0.189)	0.040
10	0.83	0.70	0.210	0.170	(0.189)	0.040
11	0.92	0.70	0.210	0.170	(0.189)	0.040
12	1.00	0.80	0.240	0.170	(0.216)	0.070
13	1.08	0.80	0.240	0.170	(0.216)	0.070
14	1.17	0.80	0.240	0.170	(0.216)	0.070
15	1.25	0.80	0.240	0.170	(0.216)	0.070
16	1.33	0.80	0.240	0.170	(0.216)	0.070
17	1.42	0.80	0.240	0.170	(0.216)	0.070
18	1.50	0.80	0.240	0.170	(0.216)	0.070
19	1.58	0.80	0.240	0.170	(0.216)	0.070
20	1.67	0.80	0.240	0.170	(0.216)	0.070
21	1.75	0.80	0.240	0.170	(0.216)	0.070
22	1.83	0.80	0.240	0.170	(0.216)	0.070
23	1.92	0.80	0.240	0.170	(0.216)	0.070
24	2.00	0.90	0.270	0.170	(0.243)	0.100
25	2.08	0.80	0.240	0.170	(0.216)	0.070
26	2.17	0.90	0.270	0.170	(0.243)	0.100
27	2.25	0.90	0.270	0.170	(0.243)	0.100
28	2.33	0.90	0.270	0.170	(0.243)	0.100
29	2.42	0.90	0.270	0.170	(0.243)	0.100
30	2.50	0.90	0.270	0.170	(0.243)	0.100
31	2.58	0.90	0.270	0.170	(0.243)	0.100
32	2.67	0.90	0.270	0.170	(0.243)	0.100
33	2.75	1.00	0.300	0.170	(0.270)	0.130
34	2.83	1.00	0.300	0.170	(0.270)	0.130
35	2.92	1.00	0.300	0.170	(0.270)	0.130
36	3.00	1.00	0.300	0.170	(0.270)	0.130
37	3.08	1.00	0.300	0.170	(0.270)	0.130
38	3.17	1.10	0.330	0.170	(0.297)	0.160
39	3.25	1.10	0.330	0.170	(0.297)	0.160
40	3.33	1.10	0.330	0.170	(0.297)	0.160
41	3.42	1.20	0.360	0.170	(0.324)	0.190
42	3.50	1.30	0.390	0.170	(0.351)	0.220
43	3.58	1.40	0.420	0.170	(0.378)	0.250
44	3.67	1.40	0.420	0.170	(0.378)	0.250
45	3.75	1.50	0.449	0.170	(0.405)	0.280
46	3.83	1.50	0.449	0.170	(0.405)	0.280
47	3.92	1.60	0.479	0.170	(0.432)	0.310
48	4.00	1.60	0.479	0.170	(0.432)	0.310
49	4.08	1.70	0.509	0.170	(0.458)	0.340
50	4.17	1.80	0.539	0.170	(0.485)	0.369
51	4.25	1.90	0.569	0.170	(0.512)	0.399
52	4.33	2.00	0.599	0.170	(0.539)	0.429
53	4.42	2.10	0.629	0.170	(0.566)	0.459
54	4.50	2.10	0.629	0.170	(0.566)	0.459
55	4.58	2.20	0.659	0.170	(0.593)	0.489
56	4.67	2.30	0.689	0.170	(0.620)	0.519
57	4.75	2.40	0.719	0.170	(0.647)	0.549
58	4.83	2.40	0.719	0.170	(0.647)	0.549
59	4.92	2.50	0.749	0.170	(0.674)	0.579
60	5.00	2.60	0.779	0.170	(0.701)	0.609
61	5.08	3.10	0.929	0.170	(0.836)	0.759
62	5.17	3.60	1.079	0.170	(0.971)	0.909
63	5.25	3.90	1.169	0.170	(1.052)	0.999
64	5.33	4.20	1.259	0.170	(1.133)	1.089
65	5.42	4.70	1.408	0.170	(1.268)	1.238
66	5.50	5.60	1.678	0.170	(1.510)	1.508
67	5.58	1.90	0.569	0.170	(0.512)	0.399
68	5.67	0.90	0.270	0.170	(0.243)	0.100
69	5.75	0.60	0.180	(0.170)	0.162	0.018
70	5.83	0.50	0.150	(0.170)	0.135	0.015
71	5.92	0.30	0.090	(0.170)	0.081	0.009
72	6.00	0.20	0.060	(0.170)	0.054	0.006

(Loss Rate Not Used)

Sum = 100.0 Sum = 18.0

Flood volume = Effective rainfall 1.50(In)
times area 331.0(Ac.)/[(In)/(Ft.)] = 41.5(Ac.Ft)
Total soil loss = 0.99(In)
Total soil loss = 27.393(Ac.Ft)
Total rainfall = 2.50(In)
Flood volume = 1807156.0 Cubic Feet
Total soil loss = 1193251.2 Cubic Feet

```
------------------------------------------------------------------------
 Peak flow rate of this hydrograph =    296.380(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	75.0	150.0	225.0	300.0
0+ 5	0.0007	0.10	Q	|	|	|	|
0+10	0.0038	0.45	Q	|	|	|	|
0+15	0.0112	1.08	Q	|	|	|	|
0+20	0.0247	1.96	Q	|	|	|	|
0+25	0.0447	2.89	Q	|	|	|	|
0+30	0.0705	3.75	Q	|	|	|	|
0+35	0.1027	4.68	Q	|	|	|	|
0+40	0.1427	5.81	Q	|	|	|	|
0+45	0.1920	7.16	Q	|	|	|	|
0+50	0.2504	8.48	VQ	|	|	|	|
0+55	0.3153	9.43	VQ	|	|	|	|
1+ 0	0.3861	10.28	VQ	|	|	|	|
1+ 5	0.4645	11.38	VQ	|	|	|	|
1+10	0.5531	12.87	VQ	|	|	|	|
1+15	0.6544	14.71	VQ	|	|	|	|
1+20	0.7682	16.52	V Q	|	|	|	|
1+25	0.8910	17.83	V Q	|	|	|	|
1+30	1.0199	18.73	V Q	|	|	|	|
1+35	1.1533	19.36	|VQ	|	|	|	|
1+40	1.2900	19.86	|VQ	|	|	|	|
1+45	1.4297	20.29	|VQ	|	|	|	|
1+50	1.5719	20.65	|VQ	|	|	|	|
1+55	1.7163	20.97	|VQ	|	|	|	|
2+ 0	1.8640	21.45	|VQ	|	|	|	|
2+ 5	2.0164	22.13	|VQ	|	|	|	|
2+10	2.1751	23.04	| VQ	|	|	|	|
2+15	2.3423	24.28	| VQ	|	|	|	|
2+20	2.5187	25.61	| VQ	|	|	|	|
2+25	2.7035	26.83	| VQ	|	|	|	|
2+30	2.8972	28.13	| VQ	|	|	|	|
2+35	3.0976	29.10	| VQ	|	|	|	|
2+40	3.3028	29.80	| Q	|	|	|	|
2+45	3.5130	30.52	| VQ	|	|	|	|
2+50	3.7305	31.57	| VQ	|	|	|	|
2+55	3.9581	33.05	| VQ	|	|	|	|
3+ 0	4.1983	34.88	| Q	|	|	|	|
3+ 5	4.4508	36.68	| Q	|	|	|	|
3+10	4.7139	38.19	| VQ	|	|	|	|
3+15	4.9876	39.74	| VQ	|	|	|	|
3+20	5.2735	41.51	| Q	|	|	|	|
3+25	5.5748	43.76	| Q	|	|	|	|
3+30	5.8956	46.57	| VQ	|	|	|	|
3+35	6.2400	50.01	| Q	|	|	|	|
3+40	6.6143	54.35	| VQ	|	|	|	|
3+45	7.0243	59.53	| VQ	|	|	|	|
3+50	7.4716	64.95	| VQ	|	|	|	|
3+55	7.9547	70.15	| V Q|	|	|	|	|
4+ 0	8.4715	75.03	| V Q	|	|	|	|
4+ 5	9.0211	79.81	| V Q	|	|	|	|
4+10	9.6047	84.74	| V|Q	|	|	|	|
4+15	10.2255	90.14	| V| Q	|	|	|	|
4+20	10.8883	96.23	| V Q	|	|	|	|
4+25	11.5993	103.24	| |V Q	|	|	|	|
4+30	12.3619	110.73	| |V Q	|	|	|	|
4+35	13.1760	118.21	| | V Q	|	|	|	|
4+40	14.0403	125.50	| | V Q	|	|	|	|
4+45	14.9535	132.60	| | V Q	|	|	|	|
4+50	15.9154	139.66	| | V Q |	|	|	|	|
4+55	16.9270	146.89	| | V Q|	|	|	|	|
5+ 0	17.9885	154.13	| | V Q	|	|	|	|
5+ 5	19.1052	162.14	| | V |Q	|	|	|	|

```
    5+10      20.2962    172.94  |          |         V|  Q       |          |
    5+15      21.5943    188.48  |          |          V    Q     |          |
    5+20      23.0365    209.40  |          |          | V    Q   |          |
    5+25      24.6549    235.00  |          |          |  V       |Q         |
    5+30      26.4746    264.22  |          |          |    V     |    Q     |
    5+35      28.4628    288.68  |          |          |       V  |       Q  |
    5+40      30.5039    296.38  |          |          |          V|         Q|
    5+45      32.4325    280.02  |          |          |           |V     Q   |
    5+50      34.0690    237.62  |          |          |           |QV        |
    5+55      35.3174    181.27  |          |          |   Q       |   V      |
    6+ 0      36.2471    134.99  |          |        Q  |           |   V      |
    6+ 5      36.9634    104.01  |          |  Q        |           |    V     |
    6+10      37.5449     84.44  |          |Q          |           |     V    |
    6+15      38.0365     71.37  |         Q|           |           |     V    |
    6+20      38.4590     61.35  |        Q |           |           |      V   |
    6+25      38.8261     53.30  |       Q  |           |           |      V   |
    6+30      39.1466     46.53  |      Q   |           |           |      V   |
    6+35      39.4271     40.73  |     Q    |           |           |       V  |
    6+40      39.6751     36.02  |    Q     |           |           |       V  |
    6+45      39.8959     32.05  |    Q     |           |           |       V  |
    6+50      40.0902     28.22  |   Q      |           |           |       V  |
    6+55      40.2642     25.26  |   Q      |           |           |       V  |
    7+ 0      40.4188     22.45  |  Q       |           |           |       V  |
    7+ 5      40.5588     20.34  |  Q       |           |           |        V|
    7+10      40.6860     18.46  |  Q       |           |           |        V|
    7+15      40.8007     16.65  |  Q       |           |           |        V|
    7+20      40.9020     14.72  |Q         |           |           |        V|
    7+25      40.9913     12.96  |Q         |           |           |        V|
    7+30      41.0706     11.52  |Q         |           |           |        V|
    7+35      41.1405     10.14  |Q         |           |           |        V|
    7+40      41.2021      8.95  |Q         |           |           |        V|
    7+45      41.2557      7.78  |Q         |           |           |        V|
    7+50      41.3028      6.84  Q          |           |           |        V|
    7+55      41.3437      5.94  Q          |           |           |        V|
    8+ 0      41.3798      5.25  Q          |           |           |        V|
    8+ 5      41.4115      4.60  Q          |           |           |        V|
    8+10      41.4382      3.87  Q          |           |           |        V|
    8+15      41.4595      3.09  Q          |           |           |        V|
    8+20      41.4748      2.23  Q          |           |           |        V|
    8+25      41.4833      1.23  Q          |           |           |        V|
    8+30      41.4855      0.33  Q          |           |           |        V|
    8+35      41.4861      0.09  Q          |           |           |        V|
    8+40      41.4864      0.03  Q          |           |           |        V|
    8+45      41.4865      0.02  Q          |           |           |        V|
    8+50      41.4866      0.01  Q          |           |           |        V|
    8+55      41.4866      0.00  Q          |           |           |         V
-------------------------------------------------------------------------
```

Area 'B' – 100 Year 24 Hour Existing Condition – Unit Hydrograph

```
        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  06/27/20 File: EXB10024100.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'B'
EXISTING CONDITION UNIT HYDROGRAPH - 100 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =     331.00(Ac.)  =      0.517 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =     331.00(Ac.)  =      0.517 Sq. Mi.
Length along longest watercourse =    7455.00(Ft.)
Length along longest watercourse measured to centroid =    5892.00(Ft.)
Length along longest watercourse =      1.412 Mi.
Length along longest watercourse measured to centroid =      1.116 Mi.
Difference in elevation =     122.00(Ft.)
Slope along watercourse =     86.4064 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.367 Hr.
Lag time =    22.01 Min.
25% of lag time =     5.50 Min.
40% of lag time =     8.80 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]
      331.00           1.60                529.60

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
      331.00           4.00               1324.00

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    1.600(In)
Area Averaged 100-Year Rainfall =    4.000(In)

Point rain (area averaged) =    4.000(In)
Areal adjustment factor =   99.94 %
Adjusted average point rain =    3.997(In)

Sub-Area Data:
```

```
Area(Ac.)         Runoff Index    Impervious %
   331.000           72.50          0.000
 Total Area Entered =    331.00(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-3     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
72.5  86.5      0.170     0.000        0.170       1.000      0.170
                                                 Sum (F) =    0.170
Area averaged mean soil loss (F) (In/Hr) =  0.170
Minimum soil loss rate ((In/Hr)) =  0.085
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.900
------------------------------------------------------------------------

               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         22.720          2.056              6.860
    2   0.167         45.439          6.466             21.569
    3   0.250         68.159         11.378             37.955
    4   0.333         90.879         15.374             51.286
    5   0.417        113.598         15.551             51.875
    6   0.500        136.318         10.899             36.358
    7   0.583        159.038          7.020             23.418
    8   0.667        181.757          4.723             15.754
    9   0.750        204.477          3.502             11.683
   10   0.833        227.197          2.929              9.772
   11   0.917        249.916          2.457              8.197
   12   1.000        272.636          2.137              7.128
   13   1.083        295.356          1.853              6.183
   14   1.167        318.075          1.552              5.176
   15   1.250        340.795          1.369              4.566
   16   1.333        363.515          1.299              4.333
   17   1.417        386.234          1.030              3.434
   18   1.500        408.954          0.978              3.264
   19   1.583        431.674          0.777              2.592
   20   1.667        454.393          0.726              2.422
   21   1.750        477.113          0.696              2.323
   22   1.833        499.833          0.682              2.274
   23   1.917        522.552          0.592              1.975
   24   2.000        545.272          0.500              1.667
   25   2.083        567.992          0.471              1.572
   26   2.167        590.711          0.411              1.371
   27   2.250        613.431          0.393              1.311
   28   2.333        636.151          0.326              1.086
   29   2.417        658.870          0.311              1.038
   30   2.500        681.590          0.244              0.814
   31   2.583        704.309          0.227              0.758
   32   2.667        727.029          0.227              0.758
   33   2.750        749.749          0.227              0.758
   34   2.833        772.468          0.227              0.758
   35   2.917        795.188          0.227              0.758
   36   3.000        817.908          0.162              0.539
                                Sum = 100.000    Sum=     333.586
------------------------------------------------------------------------

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      0.032       (  0.301)      0.029        0.003
  2   0.17     0.07      0.032       (  0.300)      0.029        0.003
  3   0.25     0.07      0.032       (  0.299)      0.029        0.003
  4   0.33     0.10      0.048       (  0.298)      0.043        0.005
  5   0.42     0.10      0.048       (  0.297)      0.043        0.005
```

6	0.50	0.10	0.048	(0.295)	0.043	0.005
7	0.58	0.10	0.048	(0.294)	0.043	0.005
8	0.67	0.10	0.048	(0.293)	0.043	0.005
9	0.75	0.10	0.048	(0.292)	0.043	0.005
10	0.83	0.13	0.064	(0.291)	0.058	0.006
11	0.92	0.13	0.064	(0.290)	0.058	0.006
12	1.00	0.13	0.064	(0.288)	0.058	0.006
13	1.08	0.10	0.048	(0.287)	0.043	0.005
14	1.17	0.10	0.048	(0.286)	0.043	0.005
15	1.25	0.10	0.048	(0.285)	0.043	0.005
16	1.33	0.10	0.048	(0.284)	0.043	0.005
17	1.42	0.10	0.048	(0.283)	0.043	0.005
18	1.50	0.10	0.048	(0.282)	0.043	0.005
19	1.58	0.10	0.048	(0.281)	0.043	0.005
20	1.67	0.10	0.048	(0.279)	0.043	0.005
21	1.75	0.10	0.048	(0.278)	0.043	0.005
22	1.83	0.13	0.064	(0.277)	0.058	0.006
23	1.92	0.13	0.064	(0.276)	0.058	0.006
24	2.00	0.13	0.064	(0.275)	0.058	0.006
25	2.08	0.13	0.064	(0.274)	0.058	0.006
26	2.17	0.13	0.064	(0.273)	0.058	0.006
27	2.25	0.13	0.064	(0.272)	0.058	0.006
28	2.33	0.13	0.064	(0.271)	0.058	0.006
29	2.42	0.13	0.064	(0.269)	0.058	0.006
30	2.50	0.13	0.064	(0.268)	0.058	0.006
31	2.58	0.17	0.080	(0.267)	0.072	0.008
32	2.67	0.17	0.080	(0.266)	0.072	0.008
33	2.75	0.17	0.080	(0.265)	0.072	0.008
34	2.83	0.17	0.080	(0.264)	0.072	0.008
35	2.92	0.17	0.080	(0.263)	0.072	0.008
36	3.00	0.17	0.080	(0.262)	0.072	0.008
37	3.08	0.17	0.080	(0.261)	0.072	0.008
38	3.17	0.17	0.080	(0.260)	0.072	0.008
39	3.25	0.17	0.080	(0.259)	0.072	0.008
40	3.33	0.17	0.080	(0.257)	0.072	0.008
41	3.42	0.17	0.080	(0.256)	0.072	0.008
42	3.50	0.17	0.080	(0.255)	0.072	0.008
43	3.58	0.17	0.080	(0.254)	0.072	0.008
44	3.67	0.17	0.080	(0.253)	0.072	0.008
45	3.75	0.17	0.080	(0.252)	0.072	0.008
46	3.83	0.20	0.096	(0.251)	0.086	0.010
47	3.92	0.20	0.096	(0.250)	0.086	0.010
48	4.00	0.20	0.096	(0.249)	0.086	0.010
49	4.08	0.20	0.096	(0.248)	0.086	0.010
50	4.17	0.20	0.096	(0.247)	0.086	0.010
51	4.25	0.20	0.096	(0.246)	0.086	0.010
52	4.33	0.23	0.112	(0.245)	0.101	0.011
53	4.42	0.23	0.112	(0.244)	0.101	0.011
54	4.50	0.23	0.112	(0.243)	0.101	0.011
55	4.58	0.23	0.112	(0.242)	0.101	0.011
56	4.67	0.23	0.112	(0.241)	0.101	0.011
57	4.75	0.23	0.112	(0.240)	0.101	0.011
58	4.83	0.27	0.128	(0.238)	0.115	0.013
59	4.92	0.27	0.128	(0.237)	0.115	0.013
60	5.00	0.27	0.128	(0.236)	0.115	0.013
61	5.08	0.20	0.096	(0.235)	0.086	0.010
62	5.17	0.20	0.096	(0.234)	0.086	0.010
63	5.25	0.20	0.096	(0.233)	0.086	0.010
64	5.33	0.23	0.112	(0.232)	0.101	0.011
65	5.42	0.23	0.112	(0.231)	0.101	0.011
66	5.50	0.23	0.112	(0.230)	0.101	0.011
67	5.58	0.27	0.128	(0.229)	0.115	0.013
68	5.67	0.27	0.128	(0.228)	0.115	0.013
69	5.75	0.27	0.128	(0.227)	0.115	0.013
70	5.83	0.27	0.128	(0.226)	0.115	0.013
71	5.92	0.27	0.128	(0.225)	0.115	0.013
72	6.00	0.27	0.128	(0.224)	0.115	0.013
73	6.08	0.30	0.144	(0.223)	0.130	0.014
74	6.17	0.30	0.144	(0.222)	0.130	0.014
75	6.25	0.30	0.144	(0.221)	0.130	0.014
76	6.33	0.30	0.144	(0.220)	0.130	0.014
77	6.42	0.30	0.144	(0.219)	0.130	0.014
78	6.50	0.30	0.144	(0.218)	0.130	0.014

79	6.58	0.33	0.160	(0.217)	0.144	0.016
80	6.67	0.33	0.160	(0.216)	0.144	0.016
81	6.75	0.33	0.160	(0.215)	0.144	0.016
82	6.83	0.33	0.160	(0.214)	0.144	0.016
83	6.92	0.33	0.160	(0.213)	0.144	0.016
84	7.00	0.33	0.160	(0.212)	0.144	0.016
85	7.08	0.33	0.160	(0.212)	0.144	0.016
86	7.17	0.33	0.160	(0.211)	0.144	0.016
87	7.25	0.33	0.160	(0.210)	0.144	0.016
88	7.33	0.37	0.176	(0.209)	0.158	0.018
89	7.42	0.37	0.176	(0.208)	0.158	0.018
90	7.50	0.37	0.176	(0.207)	0.158	0.018
91	7.58	0.40	0.192	(0.206)	0.173	0.019
92	7.67	0.40	0.192	(0.205)	0.173	0.019
93	7.75	0.40	0.192	(0.204)	0.173	0.019
94	7.83	0.43	0.208	(0.203)	0.187	0.021
95	7.92	0.43	0.208	(0.202)	0.187	0.021
96	8.00	0.43	0.208	(0.201)	0.187	0.021
97	8.08	0.50	0.240	0.200	(0.216)	0.040
98	8.17	0.50	0.240	0.199	(0.216)	0.041
99	8.25	0.50	0.240	0.198	(0.216)	0.042
100	8.33	0.50	0.240	0.197	(0.216)	0.042
101	8.42	0.50	0.240	0.196	(0.216)	0.043
102	8.50	0.50	0.240	0.196	(0.216)	0.044
103	8.58	0.53	0.256	0.195	(0.230)	0.061
104	8.67	0.53	0.256	0.194	(0.230)	0.062
105	8.75	0.53	0.256	0.193	(0.230)	0.063
106	8.83	0.57	0.272	0.192	(0.245)	0.080
107	8.92	0.57	0.272	0.191	(0.245)	0.081
108	9.00	0.57	0.272	0.190	(0.245)	0.082
109	9.08	0.63	0.304	0.189	(0.273)	0.115
110	9.17	0.63	0.304	0.188	(0.273)	0.116
111	9.25	0.63	0.304	0.187	(0.273)	0.116
112	9.33	0.67	0.320	0.186	(0.288)	0.133
113	9.42	0.67	0.320	0.186	(0.288)	0.134
114	9.50	0.67	0.320	0.185	(0.288)	0.135
115	9.58	0.70	0.336	0.184	(0.302)	0.152
116	9.67	0.70	0.336	0.183	(0.302)	0.153
117	9.75	0.70	0.336	0.182	(0.302)	0.154
118	9.83	0.73	0.352	0.181	(0.317)	0.171
119	9.92	0.73	0.352	0.180	(0.317)	0.171
120	10.00	0.73	0.352	0.179	(0.317)	0.172
121	10.08	0.50	0.240	0.179	(0.216)	0.061
122	10.17	0.50	0.240	0.178	(0.216)	0.062
123	10.25	0.50	0.240	0.177	(0.216)	0.063
124	10.33	0.50	0.240	0.176	(0.216)	0.064
125	10.42	0.50	0.240	0.175	(0.216)	0.065
126	10.50	0.50	0.240	0.174	(0.216)	0.066
127	10.58	0.67	0.320	0.173	(0.288)	0.146
128	10.67	0.67	0.320	0.173	(0.288)	0.147
129	10.75	0.67	0.320	0.172	(0.288)	0.148
130	10.83	0.67	0.320	0.171	(0.288)	0.149
131	10.92	0.67	0.320	0.170	(0.288)	0.150
132	11.00	0.67	0.320	0.169	(0.288)	0.151
133	11.08	0.63	0.304	0.168	(0.273)	0.135
134	11.17	0.63	0.304	0.168	(0.273)	0.136
135	11.25	0.63	0.304	0.167	(0.273)	0.137
136	11.33	0.63	0.304	0.166	(0.273)	0.138
137	11.42	0.63	0.304	0.165	(0.273)	0.139
138	11.50	0.63	0.304	0.164	(0.273)	0.140
139	11.58	0.57	0.272	0.163	(0.245)	0.108
140	11.67	0.57	0.272	0.163	(0.245)	0.109
141	11.75	0.57	0.272	0.162	(0.245)	0.110
142	11.83	0.60	0.288	0.161	(0.259)	0.127
143	11.92	0.60	0.288	0.160	(0.259)	0.128
144	12.00	0.60	0.288	0.159	(0.259)	0.128
145	12.08	0.83	0.400	0.159	(0.360)	0.241
146	12.17	0.83	0.400	0.158	(0.360)	0.242
147	12.25	0.83	0.400	0.157	(0.360)	0.243
148	12.33	0.87	0.416	0.156	(0.374)	0.260
149	12.42	0.87	0.416	0.155	(0.374)	0.260
150	12.50	0.87	0.416	0.155	(0.374)	0.261
151	12.58	0.93	0.448	0.154	(0.403)	0.294

152	12.67	0.93	0.448	0.153	(0.403)	0.295
153	12.75	0.93	0.448	0.152	(0.403)	0.295
154	12.83	0.97	0.464	0.152	(0.417)	0.312
155	12.92	0.97	0.464	0.151	(0.417)	0.313
156	13.00	0.97	0.464	0.150	(0.417)	0.314
157	13.08	1.13	0.544	0.149	(0.489)	0.394
158	13.17	1.13	0.544	0.149	(0.489)	0.395
159	13.25	1.13	0.544	0.148	(0.489)	0.396
160	13.33	1.13	0.544	0.147	(0.489)	0.397
161	13.42	1.13	0.544	0.146	(0.489)	0.397
162	13.50	1.13	0.544	0.146	(0.489)	0.398
163	13.58	0.77	0.368	0.145	(0.331)	0.223
164	13.67	0.77	0.368	0.144	(0.331)	0.224
165	13.75	0.77	0.368	0.143	(0.331)	0.224
166	13.83	0.77	0.368	0.143	(0.331)	0.225
167	13.92	0.77	0.368	0.142	(0.331)	0.226
168	14.00	0.77	0.368	0.141	(0.331)	0.227
169	14.08	0.90	0.432	0.140	(0.389)	0.291
170	14.17	0.90	0.432	0.140	(0.389)	0.292
171	14.25	0.90	0.432	0.139	(0.389)	0.293
172	14.33	0.87	0.416	0.138	(0.374)	0.277
173	14.42	0.87	0.416	0.138	(0.374)	0.278
174	14.50	0.87	0.416	0.137	(0.374)	0.279
175	14.58	0.87	0.416	0.136	(0.374)	0.280
176	14.67	0.87	0.416	0.135	(0.374)	0.280
177	14.75	0.87	0.416	0.135	(0.374)	0.281
178	14.83	0.83	0.400	0.134	(0.360)	0.266
179	14.92	0.83	0.400	0.133	(0.360)	0.266
180	15.00	0.83	0.400	0.133	(0.360)	0.267
181	15.08	0.80	0.384	0.132	(0.345)	0.252
182	15.17	0.80	0.384	0.131	(0.345)	0.252
183	15.25	0.80	0.384	0.131	(0.345)	0.253
184	15.33	0.77	0.368	0.130	(0.331)	0.238
185	15.42	0.77	0.368	0.129	(0.331)	0.238
186	15.50	0.77	0.368	0.129	(0.331)	0.239
187	15.58	0.63	0.304	0.128	(0.273)	0.176
188	15.67	0.63	0.304	0.127	(0.273)	0.176
189	15.75	0.63	0.304	0.127	(0.273)	0.177
190	15.83	0.63	0.304	0.126	(0.273)	0.178
191	15.92	0.63	0.304	0.125	(0.273)	0.178
192	16.00	0.63	0.304	0.125	(0.273)	0.179
193	16.08	0.13	0.064	(0.124)	0.058	0.006
194	16.17	0.13	0.064	(0.123)	0.058	0.006
195	16.25	0.13	0.064	(0.123)	0.058	0.006
196	16.33	0.13	0.064	(0.122)	0.058	0.006
197	16.42	0.13	0.064	(0.122)	0.058	0.006
198	16.50	0.13	0.064	(0.121)	0.058	0.006
199	16.58	0.10	0.048	(0.120)	0.043	0.005
200	16.67	0.10	0.048	(0.120)	0.043	0.005
201	16.75	0.10	0.048	(0.119)	0.043	0.005
202	16.83	0.10	0.048	(0.119)	0.043	0.005
203	16.92	0.10	0.048	(0.118)	0.043	0.005
204	17.00	0.10	0.048	(0.117)	0.043	0.005
205	17.08	0.17	0.080	(0.117)	0.072	0.008
206	17.17	0.17	0.080	(0.116)	0.072	0.008
207	17.25	0.17	0.080	(0.116)	0.072	0.008
208	17.33	0.17	0.080	(0.115)	0.072	0.008
209	17.42	0.17	0.080	(0.114)	0.072	0.008
210	17.50	0.17	0.080	(0.114)	0.072	0.008
211	17.58	0.17	0.080	(0.113)	0.072	0.008
212	17.67	0.17	0.080	(0.113)	0.072	0.008
213	17.75	0.17	0.080	(0.112)	0.072	0.008
214	17.83	0.13	0.064	(0.112)	0.058	0.006
215	17.92	0.13	0.064	(0.111)	0.058	0.006
216	18.00	0.13	0.064	(0.111)	0.058	0.006
217	18.08	0.13	0.064	(0.110)	0.058	0.006
218	18.17	0.13	0.064	(0.109)	0.058	0.006
219	18.25	0.13	0.064	(0.109)	0.058	0.006
220	18.33	0.13	0.064	(0.108)	0.058	0.006
221	18.42	0.13	0.064	(0.108)	0.058	0.006
222	18.50	0.13	0.064	(0.107)	0.058	0.006
223	18.58	0.10	0.048	(0.107)	0.043	0.005
224	18.67	0.10	0.048	(0.106)	0.043	0.005

```
225  18.75     0.10      0.048       (  0.106)       0.043        0.005
226  18.83     0.07      0.032       (  0.105)       0.029        0.003
227  18.92     0.07      0.032       (  0.105)       0.029        0.003
228  19.00     0.07      0.032       (  0.104)       0.029        0.003
229  19.08     0.10      0.048       (  0.104)       0.043        0.005
230  19.17     0.10      0.048       (  0.103)       0.043        0.005
231  19.25     0.10      0.048       (  0.103)       0.043        0.005
232  19.33     0.13      0.064       (  0.102)       0.058        0.006
233  19.42     0.13      0.064       (  0.102)       0.058        0.006
234  19.50     0.13      0.064       (  0.101)       0.058        0.006
235  19.58     0.10      0.048       (  0.101)       0.043        0.005
236  19.67     0.10      0.048       (  0.100)       0.043        0.005
237  19.75     0.10      0.048       (  0.100)       0.043        0.005
238  19.83     0.07      0.032       (  0.100)       0.029        0.003
239  19.92     0.07      0.032       (  0.099)       0.029        0.003
240  20.00     0.07      0.032       (  0.099)       0.029        0.003
241  20.08     0.10      0.048       (  0.098)       0.043        0.005
242  20.17     0.10      0.048       (  0.098)       0.043        0.005
243  20.25     0.10      0.048       (  0.097)       0.043        0.005
244  20.33     0.10      0.048       (  0.097)       0.043        0.005
245  20.42     0.10      0.048       (  0.097)       0.043        0.005
246  20.50     0.10      0.048       (  0.096)       0.043        0.005
247  20.58     0.10      0.048       (  0.096)       0.043        0.005
248  20.67     0.10      0.048       (  0.095)       0.043        0.005
249  20.75     0.10      0.048       (  0.095)       0.043        0.005
250  20.83     0.07      0.032       (  0.095)       0.029        0.003
251  20.92     0.07      0.032       (  0.094)       0.029        0.003
252  21.00     0.07      0.032       (  0.094)       0.029        0.003
253  21.08     0.10      0.048       (  0.093)       0.043        0.005
254  21.17     0.10      0.048       (  0.093)       0.043        0.005
255  21.25     0.10      0.048       (  0.093)       0.043        0.005
256  21.33     0.07      0.032       (  0.092)       0.029        0.003
257  21.42     0.07      0.032       (  0.092)       0.029        0.003
258  21.50     0.07      0.032       (  0.092)       0.029        0.003
259  21.58     0.10      0.048       (  0.091)       0.043        0.005
260  21.67     0.10      0.048       (  0.091)       0.043        0.005
261  21.75     0.10      0.048       (  0.091)       0.043        0.005
262  21.83     0.07      0.032       (  0.090)       0.029        0.003
263  21.92     0.07      0.032       (  0.090)       0.029        0.003
264  22.00     0.07      0.032       (  0.090)       0.029        0.003
265  22.08     0.10      0.048       (  0.089)       0.043        0.005
266  22.17     0.10      0.048       (  0.089)       0.043        0.005
267  22.25     0.10      0.048       (  0.089)       0.043        0.005
268  22.33     0.07      0.032       (  0.089)       0.029        0.003
269  22.42     0.07      0.032       (  0.088)       0.029        0.003
270  22.50     0.07      0.032       (  0.088)       0.029        0.003
271  22.58     0.07      0.032       (  0.088)       0.029        0.003
272  22.67     0.07      0.032       (  0.088)       0.029        0.003
273  22.75     0.07      0.032       (  0.087)       0.029        0.003
274  22.83     0.07      0.032       (  0.087)       0.029        0.003
275  22.92     0.07      0.032       (  0.087)       0.029        0.003
276  23.00     0.07      0.032       (  0.087)       0.029        0.003
277  23.08     0.07      0.032       (  0.086)       0.029        0.003
278  23.17     0.07      0.032       (  0.086)       0.029        0.003
279  23.25     0.07      0.032       (  0.086)       0.029        0.003
280  23.33     0.07      0.032       (  0.086)       0.029        0.003
281  23.42     0.07      0.032       (  0.086)       0.029        0.003
282  23.50     0.07      0.032       (  0.086)       0.029        0.003
283  23.58     0.07      0.032       (  0.085)       0.029        0.003
284  23.67     0.07      0.032       (  0.085)       0.029        0.003
285  23.75     0.07      0.032       (  0.085)       0.029        0.003
286  23.83     0.07      0.032       (  0.085)       0.029        0.003
287  23.92     0.07      0.032       (  0.085)       0.029        0.003
288  24.00     0.07      0.032       (  0.085)       0.029        0.003
               (Loss Rate Not Used)
    Sum =     100.0                                  Sum =    19.6
      Flood volume = Effective rainfall      1.63(In)
       times area     331.0(Ac.)/[(In)/(Ft.)] =      45.0(Ac.Ft)
      Total soil loss =      2.36(In)
      Total soil loss =    65.214(Ac.Ft)
      Total rainfall =      4.00(In)
      Flood volume =     1962293.9 Cubic Feet
      Total soil loss =     2840719.0 Cubic Feet
```

Peak flow rate of this hydrograph = 116.514(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	50.0	100.0	150.0	200.0
0+ 5	0.0002	0.02	Q				
0+10	0.0008	0.09	Q				
0+15	0.0022	0.21	Q				
0+20	0.0049	0.39	Q				
0+25	0.0090	0.59	Q				
0+30	0.0142	0.77	Q				
0+35	0.0206	0.92	Q				
0+40	0.0278	1.06	Q				
0+45	0.0358	1.15	Q				
0+50	0.0442	1.23	Q				
0+55	0.0533	1.32	Q				
1+ 0	0.0631	1.42	Q				
1+ 5	0.0736	1.53	Q				
1+10	0.0846	1.60	Q				
1+15	0.0958	1.63	Q				
1+20	0.1069	1.61	Q				
1+25	0.1177	1.57	Q				
1+30	0.1283	1.55	Q				
1+35	0.1389	1.54	Q				
1+40	0.1495	1.54	Q				
1+45	0.1602	1.55	Q				
1+50	0.1710	1.56	Q				
1+55	0.1820	1.60	Q				
2+ 0	0.1935	1.67	Q				
2+ 5	0.2056	1.76	Q				
2+10	0.2183	1.84	Q				
2+15	0.2314	1.91	Q				
2+20	0.2448	1.95	Q				
2+25	0.2584	1.98	Q				
2+30	0.2722	2.00	Q				
2+35	0.2861	2.03	Q				
2+40	0.3005	2.08	Q				
2+45	0.3153	2.15	Q				
2+50	0.3308	2.25	Q				
2+55	0.3469	2.34	Q				
3+ 0	0.3635	2.41	Q				
3+ 5	0.3804	2.46	Q				
3+10	0.3975	2.49	Q				
3+15	0.4148	2.51	Q				
3+20	0.4323	2.53	Q				
3+25	0.4498	2.55	Q				
3+30	0.4674	2.56	Q				
3+35	0.4852	2.57	Q				
3+40	0.5030	2.59	Q				
3+45	0.5209	2.60	Q				
3+50	0.5389	2.62	Q				
3+55	0.5572	2.66	Q				
4+ 0	0.5759	2.72	Q				
4+ 5	0.5953	2.81	Q				
4+10	0.6153	2.90	Q				
4+15	0.6357	2.96	Q				
4+20	0.6564	3.02	Q				
4+25	0.6776	3.08	Q				
4+30	0.6994	3.16	Q				
4+35	0.7219	3.26	Q				
4+40	0.7451	3.36	Q				
4+45	0.7688	3.44	Q				
4+50	0.7928	3.50	Q				
4+55	0.8174	3.57	Q				
5+ 0	0.8426	3.65	Q				
5+ 5	0.8683	3.74	Q				

```
 5+10      0.8943     3.77  Q          |          |          |          |
 5+15      0.9200     3.73  Q          |          |          |          |
 5+20      0.9450     3.63  Q          |          |          |          |
 5+25      0.9693     3.53  Q          |          |          |          |
 5+30      0.9935     3.51  Q          |          |          |          |
 5+35      1.0179     3.55  Q          |          |          |          |
 5+40      1.0430     3.64  Q          |          |          |          |
 5+45      1.0688     3.74  Q          |          |          |          |
 5+50      1.0953     3.85  Q          |          |          |          |
 5+55      1.1224     3.94  Q          |          |          |          |
 6+ 0      1.1501     4.01  QV         |          |          |          |
 6+ 5      1.1781     4.07  QV         |          |          |          |
 6+10      1.2065     4.13  QV         |          |          |          |
 6+15      1.2356     4.22  QV         |          |          |          |
 6+20      1.2654     4.32  QV         |          |          |          |
 6+25      1.2958     4.42  QV         |          |          |          |
 6+30      1.3268     4.50  QV         |          |          |          |
 6+35      1.3582     4.56  QV         |          |          |          |
 6+40      1.3901     4.63  QV         |          |          |          |
 6+45      1.4226     4.72  QV         |          |          |          |
 6+50      1.4558     4.83  QV         |          |          |          |
 6+55      1.4897     4.93  QV         |          |          |          |
 7+ 0      1.5242     5.00  |Q         |          |          |          |
 7+ 5      1.5590     5.06  |Q         |          |          |          |
 7+10      1.5941     5.10  |Q         |          |          |          |
 7+15      1.6294     5.13  |Q         |          |          |          |
 7+20      1.6650     5.16  |Q         |          |          |          |
 7+25      1.7009     5.22  |Q         |          |          |          |
 7+30      1.7375     5.30  |Q         |          |          |          |
 7+35      1.7747     5.41  |Q         |          |          |          |
 7+40      1.8129     5.54  |Q         |          |          |          |
 7+45      1.8520     5.68  |Q         |          |          |          |
 7+50      1.8920     5.82  |Q         |          |          |          |
 7+55      1.9331     5.97  |Q         |          |          |          |
 8+ 0      1.9753     6.11  |Q         |          |          |          |
 8+ 5      2.0193     6.39  |Q         |          |          |          |
 8+10      2.0670     6.93  |Q         |          |          |          |
 8+15      2.1206     7.77  |Q         |          |          |          |
 8+20      2.1817     8.88  |Q         |          |          |          |
 8+25      2.2507    10.02  |VQ        |          |          |          |
 8+30      2.3258    10.91  | Q        |          |          |          |
 8+35      2.4063    11.69  | Q        |          |          |          |
 8+40      2.4929    12.57  | Q        |          |          |          |
 8+45      2.5870    13.66  | Q        |          |          |          |
 8+50      2.6905    15.03  | VQ       |          |          |          |
 8+55      2.8050    16.63  | VQ       |          |          |          |
 9+ 0      2.9305    18.22  | VQ       |          |          |          |
 9+ 5      3.0684    20.03  | V Q      |          |          |          |
 9+10      3.2211    22.17  | V Q      |          |          |          |
 9+15      3.3900    24.52  |  VQ      |          |          |          |
 9+20      3.5771    27.17  |  V Q     |          |          |          |
 9+25      3.7830    29.90  |  V Q     |          |          |          |
 9+30      4.0056    32.32  |  V  Q    |          |          |          |
 9+35      4.2438    34.59  |  V  Q    |          |          |          |
 9+40      4.4974    36.82  |  V   Q   |          |          |          |
 9+45      4.7653    38.90  |   V  Q   |          |          |          |
 9+50      5.0477    41.01  |   V   Q  |          |          |          |
 9+55      5.3450    43.16  |   V   Q  |          |          |          |
10+ 0      5.6564    45.21  |    V   Q|          |          |          |
10+ 5      5.9761    46.42  |    V   Q|          |          |          |
10+10      6.2915    45.80  |    V   Q|          |          |          |
10+15      6.5875    42.98  |    V  Q  |          |          |          |
10+20      6.8519    38.39  |     VQ   |          |          |          |
10+25      7.0829    33.54  |     Q    |          |          |          |
10+30      7.2916    30.31  |     Q    |          |          |          |
10+35      7.4914    29.01  |    QV    |          |          |          |
10+40      7.6957    29.67  |    QV    |          |          |          |
10+45      7.9165    32.06  |     QV   |          |          |          |
10+50      8.1623    35.69  |      Q   |          |          |          |
10+55      8.4344    39.50  |      Q   |          |          |          |
11+ 0      8.7247    42.16  |      VQ  |          |          |          |
11+ 5      9.0259    43.74  |       Q  |          |          |          |
11+10      9.3328    44.56  |       Q  |          |          |          |
```

```
11+15       9.6416     44.84  |       Q |         |         |         |
11+20       9.9498     44.76  |       Q |         |         |         |
11+25      10.2572     44.63  |       QV|         |         |         |
11+30      10.5648     44.66  |       QV|         |         |         |
11+35      10.8724     44.67  |       QV|         |         |         |
11+40      11.1771     44.25  |       QV|         |         |         |
11+45      11.4755     43.32  |       Q V         |         |         |
11+50      11.7653     42.08  |       Q V         |         |         |
11+55      12.0480     41.04  |       Q V         |         |         |
12+ 0      12.3288     40.78  |       Q V         |         |         |
12+ 5      12.6172     41.87  |       Q |V        |         |         |
12+10      12.9263     44.88  |       Q |V        |         |         |
12+15      13.2679     49.61  |        Q|V        |         |         |
12+20      13.6523     55.81  |         |QV       |         |         |
12+25      14.0809     62.23  |         | Q       |         |         |
12+30      14.5433     67.15  |         | VQ      |         |         |
12+35      15.0326     71.05  |         |  VQ     |         |         |
12+40      15.5461     74.56  |         |  VQ     |         |         |
12+45      16.0825     77.89  |         |   VQ    |         |         |
12+50      16.6424     81.30  |         |   V Q   |         |         |
12+55      17.2256     84.67  |         |    VQ   |         |         |
13+ 0      17.8291     87.64  |         |    V Q  |         |         |
13+ 5      18.4551     90.89  |         |     V Q |         |         |
13+10      19.1089     94.93  |         |     V Q |         |         |
13+15      19.7964     99.83  |         |      V Q|         |         |
13+20      20.5227    105.47  |         |       V |Q        |         |
13+25      21.2863    110.88  |         |       V | Q       |         |
13+30      22.0777    114.91  |         |        V| Q       |         |
13+35      22.8801    116.51  |         |         V  Q      |         |
13+40      23.6710    114.83  |         |          |VQ      |         |
13+45      24.4277    109.88  |         |          |Q       |         |
13+50      25.1330    102.40  |         |          Q V      |         |
13+55      25.7846     94.61  |         |       Q | V       |         |
14+ 0      26.4004     89.42  |         |       Q |  V      |         |
14+ 5      26.9984     86.83  |         |       Q |  V      |         |
14+10      27.5935     86.41  |         |       Q |   V     |         |
14+15      28.1974     87.69  |         |       Q |    V    |         |
14+20      28.8171     89.98  |         |       Q |    V    |         |
14+25      29.4525     92.26  |         |        Q |     V  |         |
14+30      30.0959     93.42  |         |        Q |     V  |         |
14+35      30.7410     93.66  |         |        Q |      V |         |
14+40      31.3853     93.55  |         |        Q |      V |         |
14+45      32.0293     93.52  |         |        Q |       V|         |
14+50      32.6730     93.47  |         |        Q |        V|        |
14+55      33.3159     93.34  |         |        Q |        V|        |
15+ 0      33.9558     92.92  |         |        Q |         V        |
15+ 5      34.5907     92.18  |         |        Q |         V        |
15+10      35.2186     91.18  |         |        Q |          |V      |
15+15      35.8394     90.14  |         |        Q |          |V      |
15+20      36.4522     88.97  |         |       Q  |          | V     |
15+25      37.0560     87.68  |         |       Q  |          | V     |
15+30      37.6516     86.47  |         |       Q  |          |  V    |
15+35      38.2356     84.80  |         |      Q   |          |  V    |
15+40      38.8029     82.37  |         |      Q   |          |   V   |
15+45      39.3484     79.22  |         |     Q    |          |   V   |
15+50      39.8684     75.50  |         |     Q    |          |    V  |
15+55      40.3636     71.90  |         |    Q     |          |    V  |
16+ 0      40.8416     69.40  |         |  Q       |          |     V |
16+ 5      41.2998     66.53  |         |  Q       |          |     V |
16+10      41.7244     61.66  |         | Q        |          |      V|
16+15      42.0978     54.21  |         Q          |          |      V|
16+20      42.4047     44.57  |        Q |         |          |      V|
16+25      42.6453     34.93  |      Q   |         |          |      V|
16+30      42.8385     28.05  |     Q    |         |          |       V
16+35      43.0007     23.55  |    Q     |         |          |       V
16+40      43.1415     20.43  |    Q     |         |          |       V
16+45      43.2657     18.03  |  Q       |         |          |       V
16+50      43.3756     15.96  |  Q       |         |          |       V
16+55      43.4736     14.23  | Q        |         |          |       V
17+ 0      43.5611     12.70  | Q        |         |          |       V
17+ 5      43.6395     11.39  | Q        |         |          |       V
17+10      43.7107     10.33  | Q        |         |          |       V
17+15      43.7758      9.45  |Q         |         |          |       V
```

```
17+20      43.8355      8.67  |Q        |         |         |        V |
17+25      43.8911      8.07  |Q        |         |         |        V |
17+30      43.9426      7.48  |Q        |         |         |         V|
17+35      43.9906      6.97  |Q        |         |         |         V|
17+40      44.0352      6.48  |Q        |         |         |         V|
17+45      44.0765      6.00  |Q        |         |         |         V|
17+50      44.1147      5.54  |Q        |         |         |         V|
17+55      44.1498      5.10  |Q        |         |         |         V|
18+ 0      44.1822      4.70  Q         |         |         |         V|
18+ 5      44.2119      4.31  Q         |         |         |         V|
18+10      44.2391      3.95  Q         |         |         |         V|
18+15      44.2640      3.62  Q         |         |         |         V|
18+20      44.2872      3.36  Q         |         |         |         V|
18+25      44.3087      3.12  Q         |         |         |         V|
18+30      44.3289      2.94  Q         |         |         |         V|
18+35      44.3481      2.79  Q         |         |         |         V|
18+40      44.3661      2.62  Q         |         |         |         V|
18+45      44.3828      2.42  Q         |         |         |         V|
18+50      44.3979      2.19  Q         |         |         |         V|
18+55      44.4113      1.94  Q         |         |         |         V|
19+ 0      44.4232      1.73  Q         |         |         |         V|
19+ 5      44.4343      1.61  Q         |         |         |         V|
19+10      44.4449      1.54  Q         |         |         |         V|
19+15      44.4553      1.52  Q         |         |         |         V|
19+20      44.4661      1.56  Q         |         |         |         V|
19+25      44.4773      1.64  Q         |         |         |         V|
19+30      44.4892      1.72  Q         |         |         |         V|
19+35      44.5016      1.80  Q         |         |         |         V|
19+40      44.5144      1.86  Q         |         |         |         V|
19+45      44.5272      1.85  Q         |         |         |         V|
19+50      44.5396      1.80  Q         |         |         |         V|
19+55      44.5513      1.70  Q         |         |         |         V|
20+ 0      44.5623      1.60  Q         |         |         |         V|
20+ 5      44.5727      1.51  Q         |         |         |         V|
20+10      44.5826      1.44  Q         |         |         |         V|
20+15      44.5925      1.44  Q         |         |         |         V|
20+20      44.6027      1.47  Q         |         |         |         V|
20+25      44.6131      1.52  Q         |         |         |         V|
20+30      44.6238      1.56  Q         |         |         |         V|
20+35      44.6347      1.57  Q         |         |         |         V|
20+40      44.6455      1.58  Q         |         |         |         V|
20+45      44.6564      1.58  Q         |         |         |         V|
20+50      44.6672      1.57  Q         |         |         |         V|
20+55      44.6778      1.54  Q         |         |         |         V|
21+ 0      44.6880      1.48  Q         |         |         |         V|
21+ 5      44.6978      1.41  Q         |         |         |         V|
21+10      44.7072      1.37  Q         |         |         |         V|
21+15      44.7166      1.37  Q         |         |         |         V|
21+20      44.7263      1.40  Q         |         |         |         V|
21+25      44.7361      1.43  Q         |         |         |         V|
21+30      44.7458      1.40  Q         |         |         |         V|
21+35      44.7551      1.36  Q         |         |         |         V|
21+40      44.7642      1.32  Q         |         |         |         V|
21+45      44.7733      1.33  Q         |         |         |         V|
21+50      44.7828      1.37  Q         |         |         |         V|
21+55      44.7924      1.40  Q         |         |         |         V|
22+ 0      44.8020      1.38  Q         |         |         |         V|
22+ 5      44.8112      1.34  Q         |         |         |         V|
22+10      44.8202      1.31  Q         |         |         |         V|
22+15      44.8293      1.32  Q         |         |         |         V|
22+20      44.8386      1.36  Q         |         |         |         V|
22+25      44.8482      1.39  Q         |         |         |         V|
22+30      44.8576      1.37  Q         |         |         |         V|
22+35      44.8667      1.32  Q         |         |         |         V|
22+40      44.8753      1.25  Q         |         |         |         V|
22+45      44.8836      1.20  Q         |         |         |         V|
22+50      44.8917      1.17  Q         |         |         |         V|
22+55      44.8996      1.16  Q         |         |         |         V|
23+ 0      44.9075      1.15  Q         |         |         |         V|
23+ 5      44.9153      1.13  Q         |         |         |         V|
23+10      44.9231      1.13  Q         |         |         |         V|
23+15      44.9308      1.12  Q         |         |         |         V|
23+20      44.9385      1.11  Q         |         |         |         V|
```

23+25	44.9461	1.11	Q	|	|	|	V|
23+30	44.9537	1.10	Q	|	|	|	V|
23+35	44.9612	1.10	Q	|	|	|	V|
23+40	44.9688	1.09	Q	|	|	|	V|
23+45	44.9763	1.09	Q	|	|	|	V|
23+50	44.9838	1.09	Q	|	|	|	V|
23+55	44.9912	1.09	Q	|	|	|	V|
24+ 0	44.9987	1.08	Q	|	|	|	V|
24+ 5	45.0060	1.06	Q	|	|	|	V|
24+10	45.0128	0.99	Q	|	|	|	V|
24+15	45.0188	0.87	Q	|	|	|	V|
24+20	45.0236	0.70	Q	|	|	|	V|
24+25	45.0273	0.53	Q	|	|	|	V|
24+30	45.0302	0.42	Q	|	|	|	V|
24+35	45.0325	0.34	Q	|	|	|	V|
24+40	45.0345	0.29	Q	|	|	|	V|
24+45	45.0362	0.25	Q	|	|	|	V|
24+50	45.0377	0.22	Q	|	|	|	V|
24+55	45.0390	0.19	Q	|	|	|	V|
25+ 0	45.0402	0.17	Q	|	|	|	V|
25+ 5	45.0412	0.15	Q	|	|	|	V|
25+10	45.0421	0.13	Q	|	|	|	V|
25+15	45.0429	0.11	Q	|	|	|	V|
25+20	45.0436	0.10	Q	|	|	|	V|
25+25	45.0442	0.09	Q	|	|	|	V|
25+30	45.0447	0.08	Q	|	|	|	V|
25+35	45.0452	0.07	Q	|	|	|	V|
25+40	45.0457	0.06	Q	|	|	|	V|
25+45	45.0461	0.06	Q	|	|	|	V|
25+50	45.0464	0.05	Q	|	|	|	V|
25+55	45.0467	0.04	Q	|	|	|	V|
26+ 0	45.0469	0.04	Q	|	|	|	V|
26+ 5	45.0471	0.03	Q	|	|	|	V|
26+10	45.0473	0.03	Q	|	|	|	V|
26+15	45.0475	0.02	Q	|	|	|	V|
26+20	45.0476	0.02	Q	|	|	|	V|
26+25	45.0477	0.02	Q	|	|	|	V|
26+30	45.0478	0.01	Q	|	|	|	V|
26+35	45.0479	0.01	Q	|	|	|	V|
26+40	45.0480	0.01	Q	|	|	|	V|
26+45	45.0480	0.01	Q	|	|	|	V|
26+50	45.0481	0.00	Q	|	|	|	V|
26+55	45.0481	0.00	Q	|	|	|	V

Area 'B' – 10 Year 1 Hour Proposed Condition – Unit Hydrograph

```
        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  06/24/20 File: PRB010110.out


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'B'
PROPOSED CONDITION UNIT HYDROGRAPH - 10 YEAR 1 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =     331.02(Ac.)  =      0.517 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =     331.02(Ac.)  =      0.517 Sq. Mi.
Length along longest watercourse =    9118.00(Ft.)
Length along longest watercourse measured to centroid =    5186.00(Ft.)
Length along longest watercourse =      1.727 Mi.
Length along longest watercourse measured to centroid =      0.982 Mi.
Difference in elevation =     132.40(Ft.)
Slope along watercourse =     76.6694 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.193 Hr.
Lag time =    11.58 Min.
25% of lag time =     2.89 Min.
40% of lag time =     4.63 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]
      331.02           0.45                148.96

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
      331.02           1.20                397.22

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    0.450(In)
Area Averaged 100-Year Rainfall =    1.200(In)

Point rain (area averaged) =    0.759(In)
Areal adjustment factor =   99.70 %
Adjusted average point rain =    0.756(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
   331.020           56.39         0.850
 Total Area Entered =    331.02(Ac.)
```

```
RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)      (Dec.)    (In/Hr)
56.4  56.4      0.507     0.850        0.119       1.000      0.119
                                                 Sum (F) =    0.119
Area averaged mean soil loss (F) (In/Hr) =  0.119
Minimum soil loss rate ((In/Hr)) =  0.060
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.220
------------------------------------------------------------------------
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         43.191          4.894             16.327
    2   0.167         86.383         20.447             68.213
    3   0.250        129.574         28.137             93.868
    4   0.333        172.766         15.869             52.940
    5   0.417        215.957          7.734             25.802
    6   0.500        259.149          5.143             17.157
    7   0.583        302.340          3.842             12.816
    8   0.667        345.532          2.870              9.574
    9   0.750        388.723          2.314              7.719
   10   0.833        431.915          1.763              5.880
   11   0.917        475.106          1.385              4.621
   12   1.000        518.298          1.272              4.245
   13   1.083        561.489          1.001              3.341
   14   1.167        604.681          0.823              2.745
   15   1.250        647.872          0.673              2.246
   16   1.333        691.064          0.527              1.757
   17   1.417        734.255          0.432              1.442
   18   1.500        777.447          0.432              1.441
   19   1.583        820.638          0.441              1.473
                                Sum = 100.000   Sum=     333.606
------------------------------------------------------------------------

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      0.381       (  0.119)      0.084        0.297
  2   0.17     4.30      0.390       (  0.119)      0.086        0.304
  3   0.25     5.00      0.454       (  0.119)      0.100        0.354
  4   0.33     5.00      0.454       (  0.119)      0.100        0.354
  5   0.42     5.80      0.526       (  0.119)      0.116        0.411
  6   0.50     6.50      0.590          0.119    (  0.130)        0.471
  7   0.58     7.40      0.672          0.119    (  0.148)        0.552
  8   0.67     8.60      0.780          0.119    (  0.172)        0.661
  9   0.75    12.30      1.116          0.119    (  0.246)        0.997
 10   0.83    29.10      2.641          0.119    (  0.581)        2.522
 11   0.92     6.80      0.617          0.119    (  0.136)        0.498
 12   1.00     5.00      0.454       (  0.119)      0.100        0.354
              (Loss Rate Not Used)
    Sum =     100.0                                  Sum =     7.8
      Flood volume = Effective rainfall      0.65(In)
       times area     331.0(Ac.)/[(In)/(Ft.)] =      17.9(Ac.Ft)
      Total soil loss =      0.11(In)
      Total soil loss =     2.987(Ac.Ft)
      Total rainfall =      0.76(In)
      Flood volume =      778613.3 Cubic Feet
      Total soil loss =      130135.3 Cubic Feet
      ---------------------------------------------------------------
       Peak flow rate of this hydrograph =    373.442(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      100.0     200.0     300.0     400.0
 ------------------------------------------------------------------------
   0+ 5       0.0334      4.86  Q         |         |         |         |
   0+10       0.2074     25.26  V Q       |         |         |         |
   0+15       0.5826     54.48  |V   Q    |         |         |         |
   0+20       1.0941     74.27  | V    Q  |         |         |         |
   0+25       1.6995     87.90  |  V    Q |         |         |         |
   0+30       2.3928    100.66  |    V    Q         |         |         |
   0+35       3.1961    116.64  |      V  |Q        |         |         |
   0+40       4.1357    136.43  |        V|  Q      |         |         |
   0+45       5.2698    164.67  |         |V    Q   |         |         |
   0+50       6.8666    231.86  |         |    V    |  Q      |         |
   0+55       9.2483    345.82  |         |         V         |   Q     |
   1+ 0      11.8202    373.44  |         |         |     V   |      Q  |
   1+ 5      13.6272    262.37  |         |         |     Q   V         |
   1+10      14.7748    166.64  |         |     Q   |         |  V      |
   1+15      15.5127    107.14  |         Q         |         |   V     |
   1+20      16.0307     75.21  |       Q |         |         |    V    |
   1+25      16.4224     56.87  |     Q   |         |         |     V   |
   1+30      16.7326     45.04  |    Q    |         |         |      V  |
   1+35      16.9775     35.56  |  Q      |         |         |      V  |
   1+40      17.1740     28.54  | Q       |         |         |       V |
   1+45      17.3389     23.94  | Q       |         |         |       V |
   1+50      17.4709     19.17  |Q        |         |         |        V|
   1+55      17.5782     15.58  |Q        |         |         |        V|
   2+ 0      17.6637     12.42  |Q        |         |         |        V|
   2+ 5      17.7307      9.73  Q         |         |         |        V|
   2+10      17.7839      7.72  Q         |         |         |        V|
   2+15      17.8283      6.45  Q         |         |         |        V|
   2+20      17.8623      4.94  Q         |         |         |        V|
   2+25      17.8709      1.24  Q         |         |         |        V|
   2+30      17.8745      0.52  Q         |         |         |         V
------------------------------------------------------------------------
```

Area 'B' – 10 Year 3 Hour Proposed Condition – Unit Hydrograph

```
        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  06/24/20 File: PRB010310.out


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'B'
PROPOSED CONDITION UNIT HYDROGRAPH - 10 YEAR 3 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =     331.02(Ac.)  =      0.517 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =     331.02(Ac.)  =      0.517 Sq. Mi.
Length along longest watercourse =    9118.00(Ft.)
Length along longest watercourse measured to centroid =    5186.00(Ft.)
Length along longest watercourse =      1.727 Mi.
Length along longest watercourse measured to centroid =      0.982 Mi.
Difference in elevation =     132.40(Ft.)
Slope along watercourse =     76.6694 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.193 Hr.
Lag time =    11.58 Min.
25% of lag time =     2.89 Min.
40% of lag time =     4.63 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]
      331.02           0.80                 264.82

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
      331.02           1.80                 595.84

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    0.800(In)
Area Averaged 100-Year Rainfall =    1.800(In)

Point rain (area averaged) =    1.211(In)
Areal adjustment factor =   99.86 %
Adjusted average point rain =    1.210(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
   331.020           56.39         0.850
 Total Area Entered =    331.02(Ac.)
```

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
56.4	56.4	0.507	0.850	0.119	1.000	0.119
					Sum (F) =	0.119

Area averaged mean soil loss (F) (In/Hr) = 0.119
Minimum soil loss rate ((In/Hr)) = 0.060
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.220

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	43.191	4.894	16.327
2	0.167	86.383	20.447	68.213
3	0.250	129.574	28.137	93.868
4	0.333	172.766	15.869	52.940
5	0.417	215.957	7.734	25.802
6	0.500	259.149	5.143	17.157
7	0.583	302.340	3.842	12.816
8	0.667	345.532	2.870	9.574
9	0.750	388.723	2.314	7.719
10	0.833	431.915	1.763	5.880
11	0.917	475.106	1.385	4.621
12	1.000	518.298	1.272	4.245
13	1.083	561.489	1.001	3.341
14	1.167	604.681	0.823	2.745
15	1.250	647.872	0.673	2.246
16	1.333	691.064	0.527	1.757
17	1.417	734.255	0.432	1.442
18	1.500	777.447	0.432	1.441
19	1.583	820.638	0.441	1.473
			Sum = 100.000	Sum= 333.606

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	0.189	(0.119)	0.042	0.147
2	0.17	1.30	0.189	(0.119)	0.042	0.147
3	0.25	1.10	0.160	(0.119)	0.035	0.125
4	0.33	1.50	0.218	(0.119)	0.048	0.170
5	0.42	1.50	0.218	(0.119)	0.048	0.170
6	0.50	1.80	0.261	(0.119)	0.057	0.204
7	0.58	1.50	0.218	(0.119)	0.048	0.170
8	0.67	1.80	0.261	(0.119)	0.057	0.204
9	0.75	1.80	0.261	(0.119)	0.057	0.204
10	0.83	1.50	0.218	(0.119)	0.048	0.170
11	0.92	1.60	0.232	(0.119)	0.051	0.181
12	1.00	1.80	0.261	(0.119)	0.057	0.204
13	1.08	2.20	0.319	(0.119)	0.070	0.249
14	1.17	2.20	0.319	(0.119)	0.070	0.249
15	1.25	2.20	0.319	(0.119)	0.070	0.249
16	1.33	2.00	0.290	(0.119)	0.064	0.226
17	1.42	2.60	0.377	(0.119)	0.083	0.294
18	1.50	2.70	0.392	(0.119)	0.086	0.306
19	1.58	2.40	0.348	(0.119)	0.077	0.272
20	1.67	2.70	0.392	(0.119)	0.086	0.306
21	1.75	3.30	0.479	(0.119)	0.105	0.374
22	1.83	3.10	0.450	(0.119)	0.099	0.351
23	1.92	2.90	0.421	(0.119)	0.093	0.328
24	2.00	3.00	0.435	(0.119)	0.096	0.340
25	2.08	3.10	0.450	(0.119)	0.099	0.351

```
 26   2.17     4.20      0.610          0.119    (  0.134)        0.491
 27   2.25     5.00      0.726          0.119    (  0.160)        0.607
 28   2.33     3.50      0.508       (  0.119)       0.112        0.396
 29   2.42     6.80      0.987          0.119    (  0.217)        0.868
 30   2.50     7.30      1.060          0.119    (  0.233)        0.941
 31   2.58     8.20      1.190          0.119    (  0.262)        1.071
 32   2.67     5.90      0.856          0.119    (  0.188)        0.737
 33   2.75     2.00      0.290       (  0.119)       0.064        0.226
 34   2.83     1.80      0.261       (  0.119)       0.057        0.204
 35   2.92     1.80      0.261       (  0.119)       0.057        0.204
 36   3.00     0.60      0.087       (  0.119)       0.019        0.068
              (Loss Rate Not Used)
    Sum =     100.0                                    Sum =    11.8
      Flood volume = Effective rainfall      0.98(In)
       times area     331.0(Ac.)/[(In)/(Ft.)] =      27.1(Ac.Ft)
      Total soil loss =      0.23(In)
      Total soil loss =     6.238(Ac.Ft)
      Total rainfall =      1.21(In)
      Flood volume =     1181786.5 Cubic Feet
      Total soil loss =      271736.5 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =    261.546(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       75.0     150.0     225.0     300.0
-------------------------------------------------------------------------
  0+ 5       0.0166      2.40  Q         |         |         |         |
  0+10       0.1023     12.45  VQ        |         |         |         |
  0+15       0.2807     25.90  V  Q      |         |         |         |
  0+20       0.5072     32.89  V   Q     |         |         |         |
  0+25       0.7666     37.66  |V   Q    |         |         |         |
  0+30       1.0682     43.79  |V   Q    |         |         |         |
  0+35       1.4075     49.26  | V   Q   |         |         |         |
  0+40       1.7716     52.88  | V    Q  |         |         |         |
  0+45       2.1533     55.43  |  V   Q  |         |         |         |
  0+50       2.5553     58.37  |  V   Q  |         |         |         |
  0+55       2.9595     58.68  |   V  Q  |         |         |         |
  1+ 0       3.3603     58.20  |   V  Q  |         |         |         |
  1+ 5       3.7796     60.88  |    V  Q |         |         |         |
  1+10       4.2391     66.71  |     V Q |         |         |         |
  1+15       4.7390     72.58  |     V  Q|         |         |         |
  1+20       5.2591     75.52  |      V  Q         |         |         |
  1+25       5.7890     76.94  |       V Q         |         |         |
  1+30       6.3465     80.95  |         VQ        |         |         |
  1+35       6.9485     87.42  |          VQ       |         |         |
  1+40       7.5710     90.38  |          |VQ      |         |         |
  1+45       8.2120     93.08  |          | Q      |         |         |
  1+50       8.9031    100.35  |          |  Q     |         |         |
  1+55       9.6393    106.89  |          |   Q    |         |         |
  2+ 0      10.3844    108.19  |          |   QV   |         |         |
  2+ 5      11.1310    108.40  |          |   Q V  |         |         |
  2+10      11.9064    112.59  |          |    Q V |         |         |
  2+15      12.7743    126.03  |          |     Q V|         |         |
  2+20      13.7722    144.89  |          |        QV        |         |
  2+25      14.8563    157.41  |          |         QV       |         |
  2+30      16.1058    181.42  |          |          |  VQ   |         |
  2+35      17.6729    227.55  |          |          |     V   Q       |
  2+40      19.4742    261.55  |          |          |       V |   Q   |
  2+45      21.2525    258.20  |          |          |         |V  Q   |
  2+50      22.6865    208.22  |          |          |      Q  |  V    |
  2+55      23.7308    151.63  |          |         Q        |   V   |
  3+ 0      24.5511    119.11  |          |    Q     |       |     V |
  3+ 5      25.2025     94.58  |          | Q        |       |      V|
  3+10      25.6726     68.26  |         Q|          |       |      V|
  3+15      26.0039     48.12  |     Q    |          |       |       V|
  3+20      26.2537     36.26  |   Q      |          |       |       V|
  3+25      26.4497     28.46  |  Q       |          |       |       V|
```

```
    3+30      26.6073     22.89  |  Q      |         |         |        V|
    3+35      26.7348     18.51  | Q       |         |         |        V|
    3+40      26.8370     14.84  |Q        |         |         |        V|
    3+45      26.9181     11.77  |Q        |         |         |        V|
    3+50      26.9815      9.21  |Q        |         |         |        V|
    3+55      27.0333      7.51  |Q        |         |         |        V|
    4+ 0      27.0721      5.64  Q         |         |         |        V|
    4+ 5      27.0994      3.97  Q         |         |         |        V|
    4+10      27.1147      2.22  Q         |         |         |        V|
    4+15      27.1219      1.04  Q         |         |         |        V|
    4+20      27.1267      0.69  Q         |         |         |        V|
    4+25      27.1294      0.40  Q         |         |         |        V|
    4+30      27.1301      0.10  Q         |         |         |        V|
--------------------------------------------------------------------------
```

Area 'B' – 10 Year 6 Hour Proposed Condition – Unit Hydrograph

```
        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  06/24/20 File: PRB010610.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'B'
PROPOSED CONDITION UNIT HYDROGRAPH - 10 YEAR 6 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =     331.02(Ac.)  =      0.517 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =     331.02(Ac.)  =      0.517 Sq. Mi.
Length along longest watercourse =    9118.00(Ft.)
Length along longest watercourse measured to centroid =    5186.00(Ft.)
Length along longest watercourse =      1.727 Mi.
Length along longest watercourse measured to centroid =      0.982 Mi.
Difference in elevation =     132.40(Ft.)
Slope along watercourse =     76.6694 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.193 Hr.
Lag time =    11.58 Min.
25% of lag time =     2.89 Min.
40% of lag time =     4.63 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]
      331.02           1.00                331.02

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
      331.02           2.50                827.55

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    1.000(In)
Area Averaged 100-Year Rainfall =    2.500(In)

Point rain (area averaged) =    1.617(In)
Areal adjustment factor =   99.89 %
Adjusted average point rain =    1.615(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
```

```
   331.020           56.39         0.850
 Total Area Entered =    331.02(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)       (Dec.)    (In/Hr)
56.4  56.4      0.507     0.850        0.119        1.000      0.119
                                                  Sum (F) =    0.119
Area averaged mean soil loss (F) (In/Hr) =  0.119
Minimum soil loss rate ((In/Hr)) =  0.060
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.220
------------------------------------------------------------------------

               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         43.191          4.894            16.327
     2   0.167         86.383         20.447            68.213
     3   0.250        129.574         28.137            93.868
     4   0.333        172.766         15.869            52.940
     5   0.417        215.957          7.734            25.802
     6   0.500        259.149          5.143            17.157
     7   0.583        302.340          3.842            12.816
     8   0.667        345.532          2.870             9.574
     9   0.750        388.723          2.314             7.719
    10   0.833        431.915          1.763             5.880
    11   0.917        475.106          1.385             4.621
    12   1.000        518.298          1.272             4.245
    13   1.083        561.489          1.001             3.341
    14   1.167        604.681          0.823             2.745
    15   1.250        647.872          0.673             2.246
    16   1.333        691.064          0.527             1.757
    17   1.417        734.255          0.432             1.442
    18   1.500        777.447          0.432             1.441
    19   1.583        820.638          0.441             1.473
                                 Sum = 100.000   Sum=     333.606
------------------------------------------------------------------------

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      0.097       (  0.119)      0.021        0.076
  2   0.17     0.60      0.116       (  0.119)      0.026        0.091
  3   0.25     0.60      0.116       (  0.119)      0.026        0.091
  4   0.33     0.60      0.116       (  0.119)      0.026        0.091
  5   0.42     0.60      0.116       (  0.119)      0.026        0.091
  6   0.50     0.70      0.136       (  0.119)      0.030        0.106
  7   0.58     0.70      0.136       (  0.119)      0.030        0.106
  8   0.67     0.70      0.136       (  0.119)      0.030        0.106
  9   0.75     0.70      0.136       (  0.119)      0.030        0.106
 10   0.83     0.70      0.136       (  0.119)      0.030        0.106
 11   0.92     0.70      0.136       (  0.119)      0.030        0.106
 12   1.00     0.80      0.155       (  0.119)      0.034        0.121
 13   1.08     0.80      0.155       (  0.119)      0.034        0.121
 14   1.17     0.80      0.155       (  0.119)      0.034        0.121
 15   1.25     0.80      0.155       (  0.119)      0.034        0.121
 16   1.33     0.80      0.155       (  0.119)      0.034        0.121
 17   1.42     0.80      0.155       (  0.119)      0.034        0.121
 18   1.50     0.80      0.155       (  0.119)      0.034        0.121
 19   1.58     0.80      0.155       (  0.119)      0.034        0.121
 20   1.67     0.80      0.155       (  0.119)      0.034        0.121
 21   1.75     0.80      0.155       (  0.119)      0.034        0.121
 22   1.83     0.80      0.155       (  0.119)      0.034        0.121
 23   1.92     0.80      0.155       (  0.119)      0.034        0.121
```

24	2.00	0.90	0.174	(0.119)	0.038	0.136	
25	2.08	0.80	0.155	(0.119)	0.034	0.121	
26	2.17	0.90	0.174	(0.119)	0.038	0.136	
27	2.25	0.90	0.174	(0.119)	0.038	0.136	
28	2.33	0.90	0.174	(0.119)	0.038	0.136	
29	2.42	0.90	0.174	(0.119)	0.038	0.136	
30	2.50	0.90	0.174	(0.119)	0.038	0.136	
31	2.58	0.90	0.174	(0.119)	0.038	0.136	
32	2.67	0.90	0.174	(0.119)	0.038	0.136	
33	2.75	1.00	0.194	(0.119)	0.043	0.151	
34	2.83	1.00	0.194	(0.119)	0.043	0.151	
35	2.92	1.00	0.194	(0.119)	0.043	0.151	
36	3.00	1.00	0.194	(0.119)	0.043	0.151	
37	3.08	1.00	0.194	(0.119)	0.043	0.151	
38	3.17	1.10	0.213	(0.119)	0.047	0.166	
39	3.25	1.10	0.213	(0.119)	0.047	0.166	
40	3.33	1.10	0.213	(0.119)	0.047	0.166	
41	3.42	1.20	0.233	(0.119)	0.051	0.181	
42	3.50	1.30	0.252	(0.119)	0.055	0.197	
43	3.58	1.40	0.271	(0.119)	0.060	0.212	
44	3.67	1.40	0.271	(0.119)	0.060	0.212	
45	3.75	1.50	0.291	(0.119)	0.064	0.227	
46	3.83	1.50	0.291	(0.119)	0.064	0.227	
47	3.92	1.60	0.310	(0.119)	0.068	0.242	
48	4.00	1.60	0.310	(0.119)	0.068	0.242	
49	4.08	1.70	0.330	(0.119)	0.072	0.257	
50	4.17	1.80	0.349	(0.119)	0.077	0.272	
51	4.25	1.90	0.368	(0.119)	0.081	0.287	
52	4.33	2.00	0.388	(0.119)	0.085	0.302	
53	4.42	2.10	0.407	(0.119)	0.090	0.317	
54	4.50	2.10	0.407	(0.119)	0.090	0.317	
55	4.58	2.20	0.426	(0.119)	0.094	0.333	
56	4.67	2.30	0.446	(0.119)	0.098	0.348	
57	4.75	2.40	0.465	(0.119)	0.102	0.363	
58	4.83	2.40	0.465	(0.119)	0.102	0.363	
59	4.92	2.50	0.485	(0.119)	0.107	0.378	
60	5.00	2.60	0.504	(0.119)	0.111	0.393	
61	5.08	3.10	0.601	0.119	(0.132)	0.482	
62	5.17	3.60	0.698	0.119	(0.154)	0.579	
63	5.25	3.90	0.756	0.119	(0.166)	0.637	
64	5.33	4.20	0.814	0.119	(0.179)	0.695	
65	5.42	4.70	0.911	0.119	(0.200)	0.792	
66	5.50	5.60	1.085	0.119	(0.239)	0.966	
67	5.58	1.90	0.368	(0.119)	0.081	0.287	
68	5.67	0.90	0.174	(0.119)	0.038	0.136	
69	5.75	0.60	0.116	(0.119)	0.026	0.091	
70	5.83	0.50	0.097	(0.119)	0.021	0.076	
71	5.92	0.30	0.058	(0.119)	0.013	0.045	
72	6.00	0.20	0.039	(0.119)	0.009	0.030	

(Loss Rate Not Used)

Sum = 100.0 Sum = 15.5

Flood volume = Effective rainfall 1.29(In)
times area 331.0(Ac.)/[(In)/(Ft.)] = 35.6(Ac.Ft)
Total soil loss = 0.33(In)
Total soil loss = 8.985(Ac.Ft)
Total rainfall = 1.62(In)
Flood volume = 1549533.8 Cubic Feet
Total soil loss = 391381.3 Cubic Feet

Peak flow rate of this hydrograph = 230.770(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	75.0	150.0	225.0	300.0
0+ 5	0.0085	1.23	Q	|	|	|	|
0+10	0.0542	6.64	Q	|	|	|	|
0+15	0.1560	14.77	VQ	|	|	|	|

```
0+20      0.2951     20.20  V Q       |         |         |         |
0+25      0.4531     22.95  V  Q      |         |         |         |
0+30      0.6245     24.88  V  Q      |         |         |         |
0+35      0.8114     27.14  V  Q      |         |         |         |
0+40      1.0145     29.48  |V Q      |         |         |         |
0+45      1.2281     31.01  |V  Q     |         |         |         |
0+50      1.4482     31.96  |V  Q     |         |         |         |
0+55      1.6731     32.66  |V  Q     |         |         |         |
1+ 0      1.9038     33.49  | V Q     |         |         |         |
1+ 5      2.1448     34.99  | V Q     |         |         |         |
1+10      2.3981     36.78  | V Q     |         |         |         |
1+15      2.6590     37.88  | V  Q    |         |         |         |
1+20      2.9242     38.51  |  V Q    |         |         |         |
1+25      3.1926     38.97  |  V Q    |         |         |         |
1+30      3.4636     39.34  |  V Q    |         |         |         |
1+35      3.7367     39.66  |   VQ    |         |         |         |
1+40      4.0111     39.84  |   VQ    |         |         |         |
1+45      4.2862     39.95  |   VQ    |         |         |         |
1+50      4.5620     40.04  |    Q    |         |         |         |
1+55      4.8384     40.13  |    Q    |         |         |         |
2+ 0      5.1170     40.45  |    Q    |         |         |         |
2+ 5      5.4013     41.28  |    QV   |         |         |         |
2+10      5.6901     41.95  |    QV   |         |         |         |
2+15      5.9820     42.38  |    QV   |         |         |         |
2+20      6.2811     43.42  |    Q V  |         |         |         |
2+25      6.5848     44.11  |    Q V  |         |         |         |
2+30      6.8910     44.45  |    Q V  |         |         |         |
2+35      7.1986     44.67  |    Q  V |         |         |         |
2+40      7.5074     44.83  |    Q  V |         |         |         |
2+45      7.8186     45.20  |     Q V |         |         |         |
2+50      8.1377     46.32  |     Q  V|         |         |         |
2+55      8.4670     47.83  |     Q  V|         |         |         |
3+ 0      8.8023     48.68  |     Q  V|         |         |         |
3+ 5      9.1407     49.13  |     Q   V         |         |         |
3+10      9.4829     49.68  |     Q   V         |         |         |
3+15      9.8337     50.94  |     Q   |V        |         |         |
3+20     10.1955     52.53  |      Q  |V        |         |         |
3+25     10.5655     53.72  |      Q  |V        |         |         |
3+30     10.9477     55.50  |      Q  | V       |         |         |
3+35     11.3509     58.53  |      Q  | V       |         |         |
3+40     11.7783     62.07  |       Q |  V      |         |         |
3+45     12.2268     65.12  |       Q |  V      |         |         |
3+50     12.6935     67.76  |        Q|   V     |         |         |
3+55     13.1783     70.39  |        Q|   V     |         |         |
4+ 0     13.6805     72.92  |        Q|    V    |         |         |
4+ 5     14.2006     75.52  |         Q    V    |         |         |
4+10     14.7397     78.28  |         Q     V   |         |         |
4+15     15.3038     81.90  |         Q      V  |         |         |
4+20     15.8965     86.06  |         |Q     V  |         |         |
4+25     16.5196     90.48  |         | Q     V |         |         |
4+30     17.1724     94.79  |         | Q      V|         |         |
4+35     17.8504     98.44  |         |  Q      V         |         |
4+40     18.5514    101.78  |         |  Q      V         |         |
4+45     19.2799    105.79  |         |   Q     |V        |         |
4+50     20.0377    110.02  |         |   Q     | V       |         |
4+55     20.8203    113.64  |         |    Q    |  V      |         |
5+ 0     21.6259    116.97  |         |    Q    |   V     |         |
5+ 5     22.4674    122.18  |         |     Q   |    V    |         |
5+10     23.3834    133.00  |         |      Q  |     V   |         |
5+15     24.4222    150.84  |         |         Q      V  |         |
5+20     25.5986    170.80  |         |         | Q     V |         |
5+25     26.9082    190.16  |         |         |   Q    V|         |
5+30     28.3745    212.90  |         |         |       Q |V        |
5+35     29.9638    230.77  |         |         |         Q  V      |
5+40     31.3999    208.52  |         |         |      Q  |    V    |
5+45     32.4269    149.13  |         |         Q|        |     V   |
5+50     33.1476    104.64  |         |  Q      |        |      V  |
5+55     33.6968     79.75  |         Q         |        |      V  |
6+ 0     34.1308     63.00  |       Q |         |        |       V |
6+ 5     34.4699     49.24  |     Q   |         |        |       V |
6+10     34.7292     37.65  |    Q    |         |        |        V|
6+15     34.9231     28.15  |  Q      |         |        |        V|
6+20     35.0735     21.84  | Q       |         |        |        V|
```

```
    6+25      35.1945     17.58  | Q       |         |         |        V|
    6+30      35.2908     13.98  |Q        |         |         |        V|
    6+35      35.3677     11.16  |Q        |         |         |        V|
    6+40      35.4284      8.82  |Q        |         |         |        V|
    6+45      35.4753      6.81  Q         |         |         |        V|
    6+50      35.5112      5.20  Q         |         |         |        V|
    6+55      35.5381      3.91  Q         |         |         |        V|
    7+ 0      35.5559      2.59  Q         |         |         |        V|
    7+ 5      35.5633      1.07  Q         |         |         |        V|
    7+10      35.5673      0.59  Q         |         |         |        V|
    7+15      35.5698      0.36  Q         |         |         |        V|
    7+20      35.5713      0.22  Q         |         |         |        V|
    7+25      35.5721      0.11  Q         |         |         |        V|
    7+30      35.5724      0.04  Q         |         |         |        V|
--------------------------------------------------------------------------
```

Area 'B' – 10 Year 24 Hour Proposed Condition – Unit Hydrograph

```
        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  06/24/20 File: PRB0102410.out


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'B'
PROPOSED CONDITION UNIT HYDROGRAPH - 10 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =     331.02(Ac.)  =      0.517 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =     331.02(Ac.)  =      0.517 Sq. Mi.
Length along longest watercourse =    9118.00(Ft.)
Length along longest watercourse measured to centroid =    5186.00(Ft.)
Length along longest watercourse =      1.727 Mi.
Length along longest watercourse measured to centroid =      0.982 Mi.
Difference in elevation =     132.40(Ft.)
Slope along watercourse =     76.6694 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.193 Hr.
Lag time =    11.58 Min.
25% of lag time =     2.89 Min.
40% of lag time =     4.63 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]
      331.02           1.60                529.63

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
      331.02           4.00               1324.08

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    1.600(In)
Area Averaged 100-Year Rainfall =    4.000(In)

Point rain (area averaged) =    2.587(In)
Areal adjustment factor =   99.94 %
Adjusted average point rain =    2.586(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
   331.020           56.39         0.850
```

Total Area Entered = 331.02(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
56.4	56.4	0.507	0.850	0.119	1.000	0.119
					Sum (F) =	0.119

Area averaged mean soil loss (F) (In/Hr) = 0.119
Minimum soil loss rate ((In/Hr)) = 0.060
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.220

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	43.191	4.894	16.327
2	0.167	86.383	20.447	68.213
3	0.250	129.574	28.137	93.868
4	0.333	172.766	15.869	52.940
5	0.417	215.957	7.734	25.802
6	0.500	259.149	5.143	17.157
7	0.583	302.340	3.842	12.816
8	0.667	345.532	2.870	9.574
9	0.750	388.723	2.314	7.719
10	0.833	431.915	1.763	5.880
11	0.917	475.106	1.385	4.621
12	1.000	518.298	1.272	4.245
13	1.083	561.489	1.001	3.341
14	1.167	604.681	0.823	2.745
15	1.250	647.872	0.673	2.246
16	1.333	691.064	0.527	1.757
17	1.417	734.255	0.432	1.442
18	1.500	777.447	0.432	1.441
19	1.583	820.638	0.441	1.473
			Sum = 100.000	Sum= 333.606

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	0.021	(0.211)	0.005	0.016
2	0.17	0.07	0.021	(0.210)	0.005	0.016
3	0.25	0.07	0.021	(0.210)	0.005	0.016
4	0.33	0.10	0.031	(0.209)	0.007	0.024
5	0.42	0.10	0.031	(0.208)	0.007	0.024
6	0.50	0.10	0.031	(0.207)	0.007	0.024
7	0.58	0.10	0.031	(0.206)	0.007	0.024
8	0.67	0.10	0.031	(0.205)	0.007	0.024
9	0.75	0.10	0.031	(0.205)	0.007	0.024
10	0.83	0.13	0.041	(0.204)	0.009	0.032
11	0.92	0.13	0.041	(0.203)	0.009	0.032
12	1.00	0.13	0.041	(0.202)	0.009	0.032
13	1.08	0.10	0.031	(0.201)	0.007	0.024
14	1.17	0.10	0.031	(0.201)	0.007	0.024
15	1.25	0.10	0.031	(0.200)	0.007	0.024
16	1.33	0.10	0.031	(0.199)	0.007	0.024
17	1.42	0.10	0.031	(0.198)	0.007	0.024
18	1.50	0.10	0.031	(0.197)	0.007	0.024
19	1.58	0.10	0.031	(0.197)	0.007	0.024
20	1.67	0.10	0.031	(0.196)	0.007	0.024
21	1.75	0.10	0.031	(0.195)	0.007	0.024
22	1.83	0.13	0.041	(0.194)	0.009	0.032
23	1.92	0.13	0.041	(0.194)	0.009	0.032
24	2.00	0.13	0.041	(0.193)	0.009	0.032

25	2.08	0.13	0.041	(0.192)	0.009	0.032
26	2.17	0.13	0.041	(0.191)	0.009	0.032
27	2.25	0.13	0.041	(0.190)	0.009	0.032
28	2.33	0.13	0.041	(0.190)	0.009	0.032
29	2.42	0.13	0.041	(0.189)	0.009	0.032
30	2.50	0.13	0.041	(0.188)	0.009	0.032
31	2.58	0.17	0.052	(0.187)	0.011	0.040
32	2.67	0.17	0.052	(0.187)	0.011	0.040
33	2.75	0.17	0.052	(0.186)	0.011	0.040
34	2.83	0.17	0.052	(0.185)	0.011	0.040
35	2.92	0.17	0.052	(0.184)	0.011	0.040
36	3.00	0.17	0.052	(0.184)	0.011	0.040
37	3.08	0.17	0.052	(0.183)	0.011	0.040
38	3.17	0.17	0.052	(0.182)	0.011	0.040
39	3.25	0.17	0.052	(0.181)	0.011	0.040
40	3.33	0.17	0.052	(0.180)	0.011	0.040
41	3.42	0.17	0.052	(0.180)	0.011	0.040
42	3.50	0.17	0.052	(0.179)	0.011	0.040
43	3.58	0.17	0.052	(0.178)	0.011	0.040
44	3.67	0.17	0.052	(0.177)	0.011	0.040
45	3.75	0.17	0.052	(0.177)	0.011	0.040
46	3.83	0.20	0.062	(0.176)	0.014	0.048
47	3.92	0.20	0.062	(0.175)	0.014	0.048
48	4.00	0.20	0.062	(0.174)	0.014	0.048
49	4.08	0.20	0.062	(0.174)	0.014	0.048
50	4.17	0.20	0.062	(0.173)	0.014	0.048
51	4.25	0.20	0.062	(0.172)	0.014	0.048
52	4.33	0.23	0.072	(0.172)	0.016	0.056
53	4.42	0.23	0.072	(0.171)	0.016	0.056
54	4.50	0.23	0.072	(0.170)	0.016	0.056
55	4.58	0.23	0.072	(0.169)	0.016	0.056
56	4.67	0.23	0.072	(0.169)	0.016	0.056
57	4.75	0.23	0.072	(0.168)	0.016	0.056
58	4.83	0.27	0.083	(0.167)	0.018	0.065
59	4.92	0.27	0.083	(0.166)	0.018	0.065
60	5.00	0.27	0.083	(0.166)	0.018	0.065
61	5.08	0.20	0.062	(0.165)	0.014	0.048
62	5.17	0.20	0.062	(0.164)	0.014	0.048
63	5.25	0.20	0.062	(0.164)	0.014	0.048
64	5.33	0.23	0.072	(0.163)	0.016	0.056
65	5.42	0.23	0.072	(0.162)	0.016	0.056
66	5.50	0.23	0.072	(0.161)	0.016	0.056
67	5.58	0.27	0.083	(0.161)	0.018	0.065
68	5.67	0.27	0.083	(0.160)	0.018	0.065
69	5.75	0.27	0.083	(0.159)	0.018	0.065
70	5.83	0.27	0.083	(0.159)	0.018	0.065
71	5.92	0.27	0.083	(0.158)	0.018	0.065
72	6.00	0.27	0.083	(0.157)	0.018	0.065
73	6.08	0.30	0.093	(0.157)	0.020	0.073
74	6.17	0.30	0.093	(0.156)	0.020	0.073
75	6.25	0.30	0.093	(0.155)	0.020	0.073
76	6.33	0.30	0.093	(0.154)	0.020	0.073
77	6.42	0.30	0.093	(0.154)	0.020	0.073
78	6.50	0.30	0.093	(0.153)	0.020	0.073
79	6.58	0.33	0.103	(0.152)	0.023	0.081
80	6.67	0.33	0.103	(0.152)	0.023	0.081
81	6.75	0.33	0.103	(0.151)	0.023	0.081
82	6.83	0.33	0.103	(0.150)	0.023	0.081
83	6.92	0.33	0.103	(0.150)	0.023	0.081
84	7.00	0.33	0.103	(0.149)	0.023	0.081
85	7.08	0.33	0.103	(0.148)	0.023	0.081
86	7.17	0.33	0.103	(0.148)	0.023	0.081
87	7.25	0.33	0.103	(0.147)	0.023	0.081
88	7.33	0.37	0.114	(0.146)	0.025	0.089
89	7.42	0.37	0.114	(0.146)	0.025	0.089
90	7.50	0.37	0.114	(0.145)	0.025	0.089
91	7.58	0.40	0.124	(0.144)	0.027	0.097
92	7.67	0.40	0.124	(0.144)	0.027	0.097
93	7.75	0.40	0.124	(0.143)	0.027	0.097
94	7.83	0.43	0.134	(0.142)	0.030	0.105
95	7.92	0.43	0.134	(0.142)	0.030	0.105
96	8.00	0.43	0.134	(0.141)	0.030	0.105
97	8.08	0.50	0.155	(0.140)	0.034	0.121

98	8.17	0.50	0.155	(0.140)	0.034	0.121
99	8.25	0.50	0.155	(0.139)	0.034	0.121
100	8.33	0.50	0.155	(0.138)	0.034	0.121
101	8.42	0.50	0.155	(0.138)	0.034	0.121
102	8.50	0.50	0.155	(0.137)	0.034	0.121
103	8.58	0.53	0.165	(0.136)	0.036	0.129
104	8.67	0.53	0.165	(0.136)	0.036	0.129
105	8.75	0.53	0.165	(0.135)	0.036	0.129
106	8.83	0.57	0.176	(0.134)	0.039	0.137
107	8.92	0.57	0.176	(0.134)	0.039	0.137
108	9.00	0.57	0.176	(0.133)	0.039	0.137
109	9.08	0.63	0.197	(0.133)	0.043	0.153
110	9.17	0.63	0.197	(0.132)	0.043	0.153
111	9.25	0.63	0.197	(0.131)	0.043	0.153
112	9.33	0.67	0.207	(0.131)	0.046	0.161
113	9.42	0.67	0.207	(0.130)	0.046	0.161
114	9.50	0.67	0.207	(0.129)	0.046	0.161
115	9.58	0.70	0.217	(0.129)	0.048	0.169
116	9.67	0.70	0.217	(0.128)	0.048	0.169
117	9.75	0.70	0.217	(0.128)	0.048	0.169
118	9.83	0.73	0.228	(0.127)	0.050	0.177
119	9.92	0.73	0.228	(0.126)	0.050	0.177
120	10.00	0.73	0.228	(0.126)	0.050	0.177
121	10.08	0.50	0.155	(0.125)	0.034	0.121
122	10.17	0.50	0.155	(0.125)	0.034	0.121
123	10.25	0.50	0.155	(0.124)	0.034	0.121
124	10.33	0.50	0.155	(0.123)	0.034	0.121
125	10.42	0.50	0.155	(0.123)	0.034	0.121
126	10.50	0.50	0.155	(0.122)	0.034	0.121
127	10.58	0.67	0.207	(0.122)	0.046	0.161
128	10.67	0.67	0.207	(0.121)	0.046	0.161
129	10.75	0.67	0.207	(0.120)	0.046	0.161
130	10.83	0.67	0.207	(0.120)	0.046	0.161
131	10.92	0.67	0.207	(0.119)	0.046	0.161
132	11.00	0.67	0.207	(0.119)	0.046	0.161
133	11.08	0.63	0.197	(0.118)	0.043	0.153
134	11.17	0.63	0.197	(0.117)	0.043	0.153
135	11.25	0.63	0.197	(0.117)	0.043	0.153
136	11.33	0.63	0.197	(0.116)	0.043	0.153
137	11.42	0.63	0.197	(0.116)	0.043	0.153
138	11.50	0.63	0.197	(0.115)	0.043	0.153
139	11.58	0.57	0.176	(0.115)	0.039	0.137
140	11.67	0.57	0.176	(0.114)	0.039	0.137
141	11.75	0.57	0.176	(0.113)	0.039	0.137
142	11.83	0.60	0.186	(0.113)	0.041	0.145
143	11.92	0.60	0.186	(0.112)	0.041	0.145
144	12.00	0.60	0.186	(0.112)	0.041	0.145
145	12.08	0.83	0.259	(0.111)	0.057	0.202
146	12.17	0.83	0.259	(0.111)	0.057	0.202
147	12.25	0.83	0.259	(0.110)	0.057	0.202
148	12.33	0.87	0.269	(0.110)	0.059	0.210
149	12.42	0.87	0.269	(0.109)	0.059	0.210
150	12.50	0.87	0.269	(0.108)	0.059	0.210
151	12.58	0.93	0.290	(0.108)	0.064	0.226
152	12.67	0.93	0.290	(0.107)	0.064	0.226
153	12.75	0.93	0.290	(0.107)	0.064	0.226
154	12.83	0.97	0.300	(0.106)	0.066	0.234
155	12.92	0.97	0.300	(0.106)	0.066	0.234
156	13.00	0.97	0.300	(0.105)	0.066	0.234
157	13.08	1.13	0.352	(0.105)	0.077	0.274
158	13.17	1.13	0.352	(0.104)	0.077	0.274
159	13.25	1.13	0.352	(0.104)	0.077	0.274
160	13.33	1.13	0.352	(0.103)	0.077	0.274
161	13.42	1.13	0.352	(0.103)	0.077	0.274
162	13.50	1.13	0.352	(0.102)	0.077	0.274
163	13.58	0.77	0.238	(0.101)	0.052	0.186
164	13.67	0.77	0.238	(0.101)	0.052	0.186
165	13.75	0.77	0.238	(0.100)	0.052	0.186
166	13.83	0.77	0.238	(0.100)	0.052	0.186
167	13.92	0.77	0.238	(0.099)	0.052	0.186
168	14.00	0.77	0.238	(0.099)	0.052	0.186
169	14.08	0.90	0.279	(0.098)	0.061	0.218
170	14.17	0.90	0.279	(0.098)	0.061	0.218

171	14.25	0.90	0.279	(0.097)	0.061	0.218
172	14.33	0.87	0.269	(0.097)	0.059	0.210
173	14.42	0.87	0.269	(0.096)	0.059	0.210
174	14.50	0.87	0.269	(0.096)	0.059	0.210
175	14.58	0.87	0.269	(0.095)	0.059	0.210
176	14.67	0.87	0.269	(0.095)	0.059	0.210
177	14.75	0.87	0.269	(0.094)	0.059	0.210
178	14.83	0.83	0.259	(0.094)	0.057	0.202
179	14.92	0.83	0.259	(0.094)	0.057	0.202
180	15.00	0.83	0.259	(0.093)	0.057	0.202
181	15.08	0.80	0.248	(0.093)	0.055	0.194
182	15.17	0.80	0.248	(0.092)	0.055	0.194
183	15.25	0.80	0.248	(0.092)	0.055	0.194
184	15.33	0.77	0.238	(0.091)	0.052	0.186
185	15.42	0.77	0.238	(0.091)	0.052	0.186
186	15.50	0.77	0.238	(0.090)	0.052	0.186
187	15.58	0.63	0.197	(0.090)	0.043	0.153
188	15.67	0.63	0.197	(0.089)	0.043	0.153
189	15.75	0.63	0.197	(0.089)	0.043	0.153
190	15.83	0.63	0.197	(0.088)	0.043	0.153
191	15.92	0.63	0.197	(0.088)	0.043	0.153
192	16.00	0.63	0.197	(0.087)	0.043	0.153
193	16.08	0.13	0.041	(0.087)	0.009	0.032
194	16.17	0.13	0.041	(0.087)	0.009	0.032
195	16.25	0.13	0.041	(0.086)	0.009	0.032
196	16.33	0.13	0.041	(0.086)	0.009	0.032
197	16.42	0.13	0.041	(0.085)	0.009	0.032
198	16.50	0.13	0.041	(0.085)	0.009	0.032
199	16.58	0.10	0.031	(0.084)	0.007	0.024
200	16.67	0.10	0.031	(0.084)	0.007	0.024
201	16.75	0.10	0.031	(0.084)	0.007	0.024
202	16.83	0.10	0.031	(0.083)	0.007	0.024
203	16.92	0.10	0.031	(0.083)	0.007	0.024
204	17.00	0.10	0.031	(0.082)	0.007	0.024
205	17.08	0.17	0.052	(0.082)	0.011	0.040
206	17.17	0.17	0.052	(0.081)	0.011	0.040
207	17.25	0.17	0.052	(0.081)	0.011	0.040
208	17.33	0.17	0.052	(0.081)	0.011	0.040
209	17.42	0.17	0.052	(0.080)	0.011	0.040
210	17.50	0.17	0.052	(0.080)	0.011	0.040
211	17.58	0.17	0.052	(0.079)	0.011	0.040
212	17.67	0.17	0.052	(0.079)	0.011	0.040
213	17.75	0.17	0.052	(0.079)	0.011	0.040
214	17.83	0.13	0.041	(0.078)	0.009	0.032
215	17.92	0.13	0.041	(0.078)	0.009	0.032
216	18.00	0.13	0.041	(0.077)	0.009	0.032
217	18.08	0.13	0.041	(0.077)	0.009	0.032
218	18.17	0.13	0.041	(0.077)	0.009	0.032
219	18.25	0.13	0.041	(0.076)	0.009	0.032
220	18.33	0.13	0.041	(0.076)	0.009	0.032
221	18.42	0.13	0.041	(0.076)	0.009	0.032
222	18.50	0.13	0.041	(0.075)	0.009	0.032
223	18.58	0.10	0.031	(0.075)	0.007	0.024
224	18.67	0.10	0.031	(0.074)	0.007	0.024
225	18.75	0.10	0.031	(0.074)	0.007	0.024
226	18.83	0.07	0.021	(0.074)	0.005	0.016
227	18.92	0.07	0.021	(0.073)	0.005	0.016
228	19.00	0.07	0.021	(0.073)	0.005	0.016
229	19.08	0.10	0.031	(0.073)	0.007	0.024
230	19.17	0.10	0.031	(0.072)	0.007	0.024
231	19.25	0.10	0.031	(0.072)	0.007	0.024
232	19.33	0.13	0.041	(0.072)	0.009	0.032
233	19.42	0.13	0.041	(0.071)	0.009	0.032
234	19.50	0.13	0.041	(0.071)	0.009	0.032
235	19.58	0.10	0.031	(0.071)	0.007	0.024
236	19.67	0.10	0.031	(0.070)	0.007	0.024
237	19.75	0.10	0.031	(0.070)	0.007	0.024
238	19.83	0.07	0.021	(0.070)	0.005	0.016
239	19.92	0.07	0.021	(0.069)	0.005	0.016
240	20.00	0.07	0.021	(0.069)	0.005	0.016
241	20.08	0.10	0.031	(0.069)	0.007	0.024
242	20.17	0.10	0.031	(0.069)	0.007	0.024
243	20.25	0.10	0.031	(0.068)	0.007	0.024

```
244  20.33     0.10      0.031       (  0.068)       0.007        0.024
245  20.42     0.10      0.031       (  0.068)       0.007        0.024
246  20.50     0.10      0.031       (  0.067)       0.007        0.024
247  20.58     0.10      0.031       (  0.067)       0.007        0.024
248  20.67     0.10      0.031       (  0.067)       0.007        0.024
249  20.75     0.10      0.031       (  0.067)       0.007        0.024
250  20.83     0.07      0.021       (  0.066)       0.005        0.016
251  20.92     0.07      0.021       (  0.066)       0.005        0.016
252  21.00     0.07      0.021       (  0.066)       0.005        0.016
253  21.08     0.10      0.031       (  0.065)       0.007        0.024
254  21.17     0.10      0.031       (  0.065)       0.007        0.024
255  21.25     0.10      0.031       (  0.065)       0.007        0.024
256  21.33     0.07      0.021       (  0.065)       0.005        0.016
257  21.42     0.07      0.021       (  0.064)       0.005        0.016
258  21.50     0.07      0.021       (  0.064)       0.005        0.016
259  21.58     0.10      0.031       (  0.064)       0.007        0.024
260  21.67     0.10      0.031       (  0.064)       0.007        0.024
261  21.75     0.10      0.031       (  0.064)       0.007        0.024
262  21.83     0.07      0.021       (  0.063)       0.005        0.016
263  21.92     0.07      0.021       (  0.063)       0.005        0.016
264  22.00     0.07      0.021       (  0.063)       0.005        0.016
265  22.08     0.10      0.031       (  0.063)       0.007        0.024
266  22.17     0.10      0.031       (  0.062)       0.007        0.024
267  22.25     0.10      0.031       (  0.062)       0.007        0.024
268  22.33     0.07      0.021       (  0.062)       0.005        0.016
269  22.42     0.07      0.021       (  0.062)       0.005        0.016
270  22.50     0.07      0.021       (  0.062)       0.005        0.016
271  22.58     0.07      0.021       (  0.062)       0.005        0.016
272  22.67     0.07      0.021       (  0.061)       0.005        0.016
273  22.75     0.07      0.021       (  0.061)       0.005        0.016
274  22.83     0.07      0.021       (  0.061)       0.005        0.016
275  22.92     0.07      0.021       (  0.061)       0.005        0.016
276  23.00     0.07      0.021       (  0.061)       0.005        0.016
277  23.08     0.07      0.021       (  0.061)       0.005        0.016
278  23.17     0.07      0.021       (  0.060)       0.005        0.016
279  23.25     0.07      0.021       (  0.060)       0.005        0.016
280  23.33     0.07      0.021       (  0.060)       0.005        0.016
281  23.42     0.07      0.021       (  0.060)       0.005        0.016
282  23.50     0.07      0.021       (  0.060)       0.005        0.016
283  23.58     0.07      0.021       (  0.060)       0.005        0.016
284  23.67     0.07      0.021       (  0.060)       0.005        0.016
285  23.75     0.07      0.021       (  0.060)       0.005        0.016
286  23.83     0.07      0.021       (  0.060)       0.005        0.016
287  23.92     0.07      0.021       (  0.060)       0.005        0.016
288  24.00     0.07      0.021       (  0.060)       0.005        0.016
               (Loss Rate Not Used)
    Sum =     100.0                                  Sum =    24.2
      Flood volume = Effective rainfall      2.02(In)
       times area     331.0(Ac.)/[(In)/(Ft.)] =      55.6(Ac.Ft)
      Total soil loss =      0.57(In)
      Total soil loss =    15.692(Ac.Ft)
      Total rainfall =      2.59(In)
      Flood volume =     2423453.6 Cubic Feet
      Total soil loss =      683538.2 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     88.558(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       22.5      45.0      67.5      90.0
 ---------------------------------------------------------------------------
   0+ 5       0.0018      0.26  Q         |         |         |         |
   0+10       0.0112      1.36  Q         |         |         |         |
   0+15       0.0310      2.88  VQ        |         |         |         |
   0+20       0.0577      3.87  VQ        |         |         |         |
   0+25       0.0910      4.83  V Q       |         |         |         |
   0+30       0.1314      5.87  V Q       |         |         |         |
   0+35       0.1762      6.50  V Q       |         |         |         |
```

```
0+40      0.2234     6.87  V  Q      |          |          |          |
0+45      0.2725     7.13  V  Q      |          |          |          |
0+50      0.3239     7.46  V  Q      |          |          |          |
0+55      0.3801     8.16  V  Q      |          |          |          |
1+ 0      0.4424     9.05  V   Q     |          |          |          |
1+ 5      0.5075     9.45  V   Q     |          |          |          |
1+10      0.5708     9.19  V   Q     |          |          |          |
1+15      0.6302     8.64  V  Q      |          |          |          |
1+20      0.6879     8.37  V  Q      |          |          |          |
1+25      0.7449     8.28  V  Q      |          |          |          |
1+30      0.8017     8.25  V  Q      |          |          |          |
1+35      0.8584     8.23  V  Q      |          |          |          |
1+40      0.9149     8.20  V  Q      |          |          |          |
1+45      0.9713     8.19  V  Q      |          |          |          |
1+50      1.0285     8.31  V  Q      |          |          |          |
1+55      1.0894     8.84  V  Q      |          |          |          |
2+ 0      1.1554     9.59  V   Q     |          |          |          |
2+ 5      1.2243    10.00  V   Q     |          |          |          |
2+10      1.2945    10.20  V   Q     |          |          |          |
2+15      1.3656    10.33  V   Q     |          |          |          |
2+20      1.4375    10.43  |V  Q     |          |          |          |
2+25      1.5098    10.50  |V  Q     |          |          |          |
2+30      1.5824    10.55  |V  Q     |          |          |          |
2+35      1.6562    10.71  |V  Q     |          |          |          |
2+40      1.7340    11.30  |V   Q    |          |          |          |
2+45      1.8173    12.09  |V   Q    |          |          |          |
2+50      1.9038    12.55  |V   Q    |          |          |          |
2+55      1.9918    12.78  |V   Q    |          |          |          |
3+ 0      2.0809    12.94  |V   Q    |          |          |          |
3+ 5      2.1708    13.05  |V   Q    |          |          |          |
3+10      2.2613    13.14  |V   Q    |          |          |          |
3+15      2.3523    13.22  |V   Q    |          |          |          |
3+20      2.4437    13.28  |V   Q    |          |          |          |
3+25      2.5354    13.31  |V   Q    |          |          |          |
3+30      2.6273    13.35  |V   Q    |          |          |          |
3+35      2.7194    13.37  |V   Q    |          |          |          |
3+40      2.8117    13.40  | V  Q    |          |          |          |
3+45      2.9041    13.41  | V  Q    |          |          |          |
3+50      2.9975    13.56  | V   Q   |          |          |          |
3+55      3.0947    14.12  | V   Q   |          |          |          |
4+ 0      3.1973    14.89  | V   Q   |          |          |          |
4+ 5      3.3029    15.33  | V   Q   |          |          |          |
4+10      3.4099    15.54  | V   Q   |          |          |          |
4+15      3.5179    15.68  | V   Q   |          |          |          |
4+20      3.6275    15.91  | V    Q  |          |          |          |
4+25      3.7414    16.54  | V    Q  |          |          |          |
4+30      3.8609    17.36  | V    Q  |          |          |          |
4+35      3.9838    17.84  | V    Q  |          |          |          |
4+40      4.1083    18.08  | V     Q |          |          |          |
4+45      4.2340    18.25  |  V    Q |          |          |          |
4+50      4.3615    18.52  |  V    Q |          |          |          |
4+55      4.4935    19.17  |  V    Q |          |          |          |
5+ 0      4.6313    20.00  |  V    Q |          |          |          |
5+ 5      4.7706    20.23  |  V    Q |          |          |          |
5+10      4.9041    19.39  |  V    Q |          |          |          |
5+15      5.0285    18.05  |  V    Q |          |          |          |
5+20      5.1488    17.47  |  V   Q  |          |          |          |
5+25      5.2708    17.71  |  V   Q  |          |          |          |
5+30      5.3966    18.27  |  V    Q |          |          |          |
5+35      5.5253    18.68  |  V    Q |          |          |          |
5+40      5.6584    19.34  |   V   Q |          |          |          |
5+45      5.7972    20.15  |   V   Q |          |          |          |
5+50      5.9393    20.63  |   V    Q|          |          |          |
5+55      6.0830    20.86  |   V    Q|          |          |          |
6+ 0      6.2277    21.01  |   V    Q|          |          |          |
6+ 5      6.3741    21.25  |   V    Q|          |          |          |
6+10      6.5248    21.89  |   V    Q|          |          |          |
6+15      6.6812    22.72  |   V     Q          |          |          |
6+20      6.8410    23.20  |   V     Q          |          |          |
6+25      7.0025    23.45  |    V    Q          |          |          |
6+30      7.1651    23.61  |    V    Q          |          |          |
6+35      7.3295    23.87  |    V    Q          |          |          |
6+40      7.4984    24.53  |    V    Q          |          |          |
```

```
 6+45      7.6732     25.38  |    V    |Q        |         |         |
 6+50      7.8514     25.88  |    V    |Q        |         |         |
 6+55      8.0314     26.14  |    V    |Q        |         |         |
 7+ 0      8.2127     26.32  |    V    |Q        |         |         |
 7+ 5      8.3949     26.46  |     V   |Q        |         |         |
 7+10      8.5779     26.56  |     V   |Q        |         |         |
 7+15      8.7614     26.64  |     V   |Q        |         |         |
 7+20      8.9462     26.84  |     V   |Q        |         |         |
 7+25      9.1351     27.44  |     V   | Q       |         |         |
 7+30      9.3296     28.24  |     V   | Q       |         |         |
 7+35      9.5282     28.84  |     V   | Q       |         |         |
 7+40      9.7322     29.62  |     V   |  Q      |         |         |
 7+45      9.9425     30.53  |      V  |  Q      |         |         |
 7+50     10.1574     31.21  |      V  |  Q      |         |         |
 7+55     10.3782     32.06  |      V  |   Q     |         |         |
 8+ 0     10.6056     33.03  |      V  |   Q     |         |         |
 8+ 5     10.8390     33.88  |      V  |    Q    |         |         |
 8+10     11.0821     35.30  |      V  |    Q    |         |         |
 8+15     11.3373     37.05  |       V |     Q   |         |         |
 8+20     11.5996     38.09  |       V |     Q   |         |         |
 8+25     11.8657     38.64  |       V |      Q  |         |         |
 8+30     12.1346     39.03  |       V |      Q  |         |         |
 8+35     12.4063     39.46  |       V |      Q  |         |         |
 8+40     12.6834     40.24  |        V|      Q  |         |         |
 8+45     12.9670     41.18  |        V|       Q |         |         |
 8+50     13.2555     41.89  |        V|       Q |         |         |
 8+55     13.5500     42.76  |        V|        Q|         |         |
 9+ 0     13.8513     43.75  |        V|        Q|         |         |
 9+ 5     14.1586     44.62  |         V        Q|         |         |
 9+10     14.4759     46.07  |         V         Q         |         |
 9+15     14.8053     47.83  |         V         |Q        |         |
 9+20     15.1429     49.01  |         V         |Q        |         |
 9+25     15.4880     50.11  |         |V        | Q       |         |
 9+30     15.8411     51.27  |         |V        | Q       |         |
 9+35     16.2001     52.13  |         |V        |  Q      |         |
 9+40     16.5659     53.11  |         |V        |  Q      |         |
 9+45     16.9390     54.18  |         | V       |   Q     |         |
 9+50     17.3176     54.98  |         | V       |   Q     |         |
 9+55     17.7028     55.92  |         | V       |   Q     |         |
10+ 0     18.0952     56.98  |         |  V      |    Q    |         |
10+ 5     18.4858     56.71  |         |  V      |    Q    |         |
10+10     18.8524     53.24  |         |  V      |  Q      |         |
10+15     19.1845     48.22  |         |  V      |Q        |         |
10+20     19.4975     45.45  |         |   V     Q         |         |
10+25     19.8016     44.15  |         |   V    Q|         |         |
10+30     20.0999     43.32  |         |   V    Q|         |         |
10+35     20.3985     43.36  |         |   V    Q|         |         |
10+40     20.7129     45.65  |         |   V     Q         |         |
10+45     21.0508     49.06  |         |    V    |Q        |         |
10+50     21.4015     50.92  |         |    V    | Q       |         |
10+55     21.7578     51.73  |         |    V    | Q       |         |
11+ 0     22.1174     52.22  |         |    V    |  Q      |         |
11+ 5     22.4785     52.44  |         |     V   |  Q      |         |
11+10     22.8376     52.13  |         |     V   |  Q      |         |
11+15     23.1927     51.57  |         |     V   | Q       |         |
11+20     23.5460     51.29  |         |     V   | Q       |         |
11+25     23.8985     51.19  |         |      V  | Q       |         |
11+30     24.2507     51.14  |         |      V  | Q       |         |
11+35     24.6008     50.83  |         |      V  | Q       |         |
11+40     24.9435     49.76  |         |      V  | Q       |         |
11+45     25.2759     48.27  |         |       V |Q        |         |
11+50     25.6035     47.57  |         |       V |Q        |         |
11+55     25.9322     47.73  |         |       V |Q        |         |
12+ 0     26.2644     48.23  |         |       V |Q        |         |
12+ 5     26.6046     49.41  |         |        V|Q        |         |
12+10     26.9717     53.29  |         |        V|  Q      |         |
12+15     27.3752     58.59  |         |        V|     Q   |         |
12+20     27.8002     61.71  |         |        V|      Q  |         |
12+25     28.2389     63.71  |         |         V       Q |         |
12+30     28.6895     65.42  |         |         V        Q|         |
12+35     29.1496     66.81  |         |         V        Q|         |
12+40     29.6225     68.66  |         |         |V        Q         |
12+45     30.1097     70.75  |         |         |V        |Q        |
```

```
12+50      30.6067     72.17  |          |          | V        | Q        |
12+55      31.1127     73.47  |          |          | V        | Q        |
13+ 0      31.6279     74.80  |          |          | V        |  Q       |
13+ 5      32.1535     76.32  |          |          |  V       |  Q       |
13+10      32.7020     79.64  |          |          |  V       |    Q     |
13+15      33.2796     83.87  |          |          |  V       |      Q   |
13+20      33.8742     86.34  |          |          |   V      |       Q  |
13+25      34.4777     87.64  |          |          |   V      |       Q  |
13+30      35.0876     88.56  |          |          |    V     |        Q |
13+35      35.6925     87.82  |          |          |    V     |        Q |
13+40      36.2589     82.25  |          |          |     V    |     Q    |
13+45      36.7707     74.31  |          |          |     V    |  Q       |
13+50      37.2522     69.91  |          |          |     V    | Q        |
13+55      37.7195     67.85  |          |          |      V   Q          |
14+ 0      38.1778     66.54  |          |          |      V Q |          |
14+ 5      38.6330     66.10  |          |          |      V Q |          |
14+10      39.0984     67.58  |          |          |       V Q          |
14+15      39.5807     70.03  |          |          |       V |Q         |
14+20      40.0708     71.16  |          |          |       V |Q         |
14+25      40.5604     71.09  |          |          |         V|Q        |
14+30      41.0465     70.57  |          |          |         V|Q        |
14+35      41.5308     70.32  |          |          |         V|Q        |
14+40      42.0141     70.18  |          |          |          VQ        |
14+45      42.4968     70.09  |          |          |          VQ        |
14+50      42.9781     69.89  |          |          |          VQ        |
14+55      43.4553     69.28  |          |          |          QV        |
15+ 0      43.9269     68.47  |          |          |          QV        |
15+ 5      44.3941     67.84  |          |          |          QV        |
15+10      44.8564     67.13  |          |          |         Q| V       |
15+15      45.3129     66.28  |          |          |         Q| V       |
15+20      45.7650     65.64  |          |          |         Q| V       |
15+25      46.2115     64.83  |          |          |        Q |  V      |
15+30      46.6516     63.90  |          |          |        Q |  V      |
15+35      47.0843     62.83  |          |          |       Q  |  V      |
15+40      47.4995     60.29  |          |          |     Q    |   V     |
15+45      47.8922     57.02  |          |          |    Q     |   V     |
15+50      48.2718     55.12  |          |          |   Q      |   V     |
15+55      48.6447     54.15  |          |          |   Q      |   V     |
16+ 0      49.0130     53.48  |          |          |  Q       |    V    |
16+ 5      49.3642     51.00  |          |          | Q        |    V    |
16+10      49.6559     42.36  |          |        Q |          |    V    |
16+15      49.8673     30.68  |          |  Q       |          |    V    |
16+20      50.0327     24.03  |          |Q         |          |    V    |
16+25      50.1755     20.72  |         Q|          |          |     V   |
16+30      50.3027     18.48  |        Q |          |          |     V   |
16+35      50.4175     16.66  |       Q  |          |          |     V   |
16+40      50.5197     14.85  |     Q    |          |          |     V   |
16+45      50.6098     13.07  |    Q     |          |          |     V   |
16+50      50.6915     11.87  |    Q     |          |          |     V   |
16+55      50.7676     11.05  |   Q      |          |          |     V   |
17+ 0      50.8389     10.35  |   Q      |          |          |     V   |
17+ 5      50.9082     10.06  |   Q      |          |          |     V   |
17+10      50.9823     10.75  |   Q      |          |          |     V   |
17+15      51.0645     11.93  |    Q     |          |          |     V   |
17+20      51.1507     12.53  |    Q     |          |          |     V   |
17+25      51.2384     12.73  |    Q     |          |          |     V   |
17+30      51.3266     12.80  |    Q     |          |          |     V   |
17+35      51.4148     12.80  |    Q     |          |          |     V   |
17+40      51.5039     12.94  |    Q     |          |          |      V  |
17+45      51.5937     13.04  |    Q     |          |          |      V  |
17+50      51.6832     12.99  |    Q     |          |          |      V  |
17+55      51.7693     12.50  |    Q     |          |          |      V  |
18+ 0      51.8505     11.80  |    Q     |          |          |      V  |
18+ 5      51.9292     11.42  |    Q     |          |          |      V  |
18+10      52.0067     11.25  |    Q     |          |          |      V  |
18+15      52.0835     11.15  |   Q      |          |          |      V  |
18+20      52.1598     11.08  |   Q      |          |          |      V  |
18+25      52.2357     11.02  |   Q      |          |          |      V  |
18+30      52.3113     10.98  |   Q      |          |          |      V  |
18+35      52.3859     10.83  |   Q      |          |          |      V  |
18+40      52.4564     10.24  |   Q      |          |          |      V  |
18+45      52.5214      9.45  |   Q      |          |          |      V  |
18+50      52.5825      8.86  |  Q       |          |          |      V  |
```

18+55	52.6381	8.08	Q				V
19+ 0	52.6875	7.17	Q				V
19+ 5	52.7340	6.75	Q				V
19+10	52.7822	7.01	Q				V
19+15	52.8343	7.55	Q				V
19+20	52.8890	7.95	Q				V
19+25	52.9482	8.59	Q				V
19+30	53.0128	9.39	Q				V
19+35	53.0798	9.72	Q				V
19+40	53.1444	9.39	Q				V
19+45	53.2049	8.78	Q				V
19+50	53.2623	8.33	Q				V
19+55	53.3150	7.66	Q				V
20+ 0	53.3621	6.83	Q				V
20+ 5	53.4066	6.48	Q				V
20+10	53.4534	6.79	Q				V
20+15	53.5043	7.39	Q				V
20+20	53.5572	7.69	Q				V
20+25	53.6111	7.82	Q				V
20+30	53.6654	7.89	Q				V
20+35	53.7201	7.95	Q				V
20+40	53.7751	7.98	Q				V
20+45	53.8301	8.00	Q				V
20+50	53.8844	7.88	Q				V
20+55	53.9350	7.34	Q				V
21+ 0	53.9803	6.58	Q				V
21+ 5	54.0236	6.29	Q				V
21+10	54.0693	6.64	Q				V
21+15	54.1194	7.27	Q				V
21+20	54.1708	7.46	Q				V
21+25	54.2193	7.05	Q				V
21+30	54.2633	6.38	Q				V
21+35	54.3057	6.16	Q				V
21+40	54.3507	6.54	Q				V
21+45	54.4002	7.19	Q				V
21+50	54.4512	7.40	Q				V
21+55	54.4993	6.99	Q				V
22+ 0	54.5429	6.33	Q				V
22+ 5	54.5849	6.10	Q				V
22+10	54.6296	6.49	Q				V
22+15	54.6789	7.15	Q				V
22+20	54.7296	7.36	Q				V
22+25	54.7776	6.97	Q				V
22+30	54.8211	6.32	Q				V
22+35	54.8622	5.97	Q				V
22+40	54.9022	5.81	Q				V
22+45	54.9415	5.71	Q				V
22+50	54.9803	5.63	Q				V
22+55	55.0187	5.58	Q				V
23+ 0	55.0568	5.54	Q				V
23+ 5	55.0949	5.52	Q				V
23+10	55.1327	5.49	Q				V
23+15	55.1703	5.46	Q				V
23+20	55.2078	5.44	Q				V
23+25	55.2452	5.43	Q				V
23+30	55.2825	5.42	Q				V
23+35	55.3199	5.42	Q				V
23+40	55.3571	5.41	Q				V
23+45	55.3943	5.40	Q				V
23+50	55.4314	5.39	Q				V
23+55	55.4685	5.39	Q				V
24+ 0	55.5055	5.39	Q				V
24+ 5	55.5408	5.12	Q				V
24+10	55.5685	4.02	Q				V
24+15	55.5858	2.51	Q				V
24+20	55.5971	1.65	Q				V
24+25	55.6056	1.23	Q				V
24+30	55.6122	0.96	Q				V
24+35	55.6174	0.75	Q				V
24+40	55.6215	0.60	Q				V
24+45	55.6247	0.47	Q				V
24+50	55.6273	0.38	Q				V
24+55	55.6294	0.30	Q				V

```
   25+ 0      55.6310      0.23  Q          |          |          |         V|
   25+ 5      55.6323      0.18  Q          |          |          |         V|
   25+10      55.6332      0.13  Q          |          |          |         V|
   25+15      55.6339      0.10  Q          |          |          |         V|
   25+20      55.6344      0.07  Q          |          |          |         V|
   25+25      55.6347      0.05  Q          |          |          |         V|
   25+30      55.6348      0.02  Q          |          |          |         V|
-------------------------------------------------------------------------------
```

Area 'B' – 100 Year 1 Hour Proposed Condition – Unit Hydrograph

```
        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  06/24/20 File: PRB1001100.out


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'B'
PROPOSED CONDITION UNIT HYDROGRAPH - 100 YEAR 1 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =     331.02(Ac.)  =      0.517 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =     331.02(Ac.)  =      0.517 Sq. Mi.
Length along longest watercourse =    9118.00(Ft.)
Length along longest watercourse measured to centroid =    5186.00(Ft.)
Length along longest watercourse =      1.727 Mi.
Length along longest watercourse measured to centroid =      0.982 Mi.
Difference in elevation =     132.40(Ft.)
Slope along watercourse =     76.6694 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.193 Hr.
Lag time =    11.58 Min.
25% of lag time =     2.89 Min.
40% of lag time =     4.63 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]
      331.02           0.45                148.96

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
      331.02           1.20                397.22

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    0.450(In)
Area Averaged 100-Year Rainfall =    1.200(In)

Point rain (area averaged) =    1.200(In)
Areal adjustment factor =   99.70 %
Adjusted average point rain =    1.196(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
   331.020           56.39         0.850
 Total Area Entered =    331.02(Ac.)
```

RI AMC2	RI AMC-3	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
56.4	75.1	0.302	0.850	0.071	1.000	0.071
					Sum (F) =	0.071

Area averaged mean soil loss (F) (In/Hr) = 0.071
Minimum soil loss rate ((In/Hr)) = 0.035
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.220

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	43.191	4.894	16.327
2	0.167	86.383	20.447	68.213
3	0.250	129.574	28.137	93.868
4	0.333	172.766	15.869	52.940
5	0.417	215.957	7.734	25.802
6	0.500	259.149	5.143	17.157
7	0.583	302.340	3.842	12.816
8	0.667	345.532	2.870	9.574
9	0.750	388.723	2.314	7.719
10	0.833	431.915	1.763	5.880
11	0.917	475.106	1.385	4.621
12	1.000	518.298	1.272	4.245
13	1.083	561.489	1.001	3.341
14	1.167	604.681	0.823	2.745
15	1.250	647.872	0.673	2.246
16	1.333	691.064	0.527	1.757
17	1.417	734.255	0.432	1.442
18	1.500	777.447	0.432	1.441
19	1.583	820.638	0.441	1.473
			Sum = 100.000	Sum= 333.606

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	0.603	0.071	(0.133)	0.532
2	0.17	4.30	0.617	0.071	(0.136)	0.546
3	0.25	5.00	0.718	0.071	(0.158)	0.647
4	0.33	5.00	0.718	0.071	(0.158)	0.647
5	0.42	5.80	0.833	0.071	(0.183)	0.762
6	0.50	6.50	0.933	0.071	(0.205)	0.862
7	0.58	7.40	1.062	0.071	(0.234)	0.992
8	0.67	8.60	1.235	0.071	(0.272)	1.164
9	0.75	12.30	1.766	0.071	(0.388)	1.695
10	0.83	29.10	4.178	0.071	(0.919)	4.107
11	0.92	6.80	0.976	0.071	(0.215)	0.905
12	1.00	5.00	0.718	0.071	(0.158)	0.647
		(Loss Rate Not Used)				
Sum =		100.0			Sum =	13.5

Flood volume = Effective rainfall 1.13(In)
times area 331.0(Ac.)/[(In)/(Ft.)] = 31.0(Ac.Ft)
Total soil loss = 0.07(In)
Total soil loss = 1.956(Ac.Ft)
Total rainfall = 1.20(In)
Flood volume = 1352410.6 Cubic Feet
Total soil loss = 85186.9 Cubic Feet

Peak flow rate of this hydrograph = 626.852(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      175.0     350.0     525.0     700.0
 ------------------------------------------------------------------------
   0+ 5       0.0599      8.69  Q         |         |         |         |
   0+10       0.3714     45.24  V Q       |         |         |         |
   0+15       1.0452     97.83  |V   Q     |         |         |         |
   0+20       1.9696    134.22  | V    Q   |         |         |         |
   0+25       3.0718    160.04  |  V     Q|         |         |         |
   0+30       4.3414    184.34  |    V    Q         |         |         |
   0+35       5.8136    213.76  |      V  | Q       |         |         |
   0+40       7.5211    247.92  |        V|   Q     |         |         |
   0+45       9.5480    294.32  |         | V   Q   |         |         |
   0+50      12.3150    401.76  |         |    V    | Q       |         |
   0+55      16.3298    582.94  |         |         |V        |  Q      |
   1+ 0      20.6469    626.85  |         |         |     V   |    Q    |
   1+ 5      23.7337    448.20  |         |         |    Q    V         |
   1+10      25.7201    288.42  |         |     Q   |         |  V      |
   1+15      26.9934    184.88  |         Q         |         |   V     |
   1+20      27.8838    129.29  |       Q |         |         |    V    |
   1+25      28.5570     97.74  |     Q   |         |         |     V   |
   1+30      29.0898     77.37  |    Q    |         |         |      V  |
   1+35      29.5111     61.17  |  Q      |         |         |       V |
   1+40      29.8490     49.07  | Q       |         |         |       V |
   1+45      30.1316     41.02  | Q       |         |         |       V |
   1+50      30.3580     32.87  |Q        |         |         |        V|
   1+55      30.5419     26.71  |Q        |         |         |        V|
   2+ 0      30.6882     21.24  |Q        |         |         |        V|
   2+ 5      30.8026     16.61  Q         |         |         |        V|
   2+10      30.8930     13.13  Q         |         |         |        V|
   2+15      30.9678     10.86  Q         |         |         |        V|
   2+20      31.0249      8.29  Q         |         |         |        V|
   2+25      31.0405      2.27  Q         |         |         |        V|
   2+30      31.0471      0.95  Q         |         |         |        V|
------------------------------------------------------------------------
```

Area 'B' – 100 Year 3 Hour Proposed Condition – Unit Hydrograph

```
        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  06/24/20 File: PRB1003100.out


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'B'
PROPOSED CONDITION UNIT HYDROGRAPH - 100 YEAR 3 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =     331.02(Ac.)  =      0.517 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =     331.02(Ac.)  =      0.517 Sq. Mi.
Length along longest watercourse =    9118.00(Ft.)
Length along longest watercourse measured to centroid =    5186.00(Ft.)
Length along longest watercourse =      1.727 Mi.
Length along longest watercourse measured to centroid =      0.982 Mi.
Difference in elevation =     132.40(Ft.)
Slope along watercourse =     76.6694 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.193 Hr.
Lag time =    11.58 Min.
25% of lag time =     2.89 Min.
40% of lag time =     4.63 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]
      331.02           0.80                 264.82

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
      331.02           1.80                 595.84

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    0.800(In)
Area Averaged 100-Year Rainfall =    1.800(In)

Point rain (area averaged) =    1.800(In)
Areal adjustment factor =   99.86 %
Adjusted average point rain =    1.797(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
   331.020           56.39         0.850
```

Total Area Entered = 331.02(Ac.)

RI AMC2	RI AMC-3	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
56.4	75.1	0.302	0.850	0.071	1.000	0.071
					Sum (F) =	0.071

Area averaged mean soil loss (F) (In/Hr) = 0.071
Minimum soil loss rate ((In/Hr)) = 0.035
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.220

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	43.191	4.894	16.327
2	0.167	86.383	20.447	68.213
3	0.250	129.574	28.137	93.868
4	0.333	172.766	15.869	52.940
5	0.417	215.957	7.734	25.802
6	0.500	259.149	5.143	17.157
7	0.583	302.340	3.842	12.816
8	0.667	345.532	2.870	9.574
9	0.750	388.723	2.314	7.719
10	0.833	431.915	1.763	5.880
11	0.917	475.106	1.385	4.621
12	1.000	518.298	1.272	4.245
13	1.083	561.489	1.001	3.341
14	1.167	604.681	0.823	2.745
15	1.250	647.872	0.673	2.246
16	1.333	691.064	0.527	1.757
17	1.417	734.255	0.432	1.442
18	1.500	777.447	0.432	1.441
19	1.583	820.638	0.441	1.473
		Sum = 100.000	Sum=	333.606

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	0.280	(0.071)	0.062	0.219
2	0.17	1.30	0.280	(0.071)	0.062	0.219
3	0.25	1.10	0.237	(0.071)	0.052	0.185
4	0.33	1.50	0.324	0.071	(0.071)	0.253
5	0.42	1.50	0.324	0.071	(0.071)	0.253
6	0.50	1.80	0.388	0.071	(0.085)	0.317
7	0.58	1.50	0.324	0.071	(0.071)	0.253
8	0.67	1.80	0.388	0.071	(0.085)	0.317
9	0.75	1.80	0.388	0.071	(0.085)	0.317
10	0.83	1.50	0.324	0.071	(0.071)	0.253
11	0.92	1.60	0.345	0.071	(0.076)	0.274
12	1.00	1.80	0.388	0.071	(0.085)	0.317
13	1.08	2.20	0.475	0.071	(0.104)	0.404
14	1.17	2.20	0.475	0.071	(0.104)	0.404
15	1.25	2.20	0.475	0.071	(0.104)	0.404
16	1.33	2.00	0.431	0.071	(0.095)	0.360
17	1.42	2.60	0.561	0.071	(0.123)	0.490
18	1.50	2.70	0.582	0.071	(0.128)	0.511
19	1.58	2.40	0.518	0.071	(0.114)	0.447
20	1.67	2.70	0.582	0.071	(0.128)	0.511
21	1.75	3.30	0.712	0.071	(0.157)	0.641
22	1.83	3.10	0.669	0.071	(0.147)	0.598
23	1.92	2.90	0.625	0.071	(0.138)	0.555
24	2.00	3.00	0.647	0.071	(0.142)	0.576

```
25   2.08     3.10      0.669          0.071    (  0.147)        0.598
26   2.17     4.20      0.906          0.071    (  0.199)        0.835
27   2.25     5.00      1.078          0.071    (  0.237)        1.008
28   2.33     3.50      0.755          0.071    (  0.166)        0.684
29   2.42     6.80      1.467          0.071    (  0.323)        1.396
30   2.50     7.30      1.575          0.071    (  0.346)        1.504
31   2.58     8.20      1.769          0.071    (  0.389)        1.698
32   2.67     5.90      1.273          0.071    (  0.280)        1.202
33   2.75     2.00      0.431          0.071    (  0.095)        0.360
34   2.83     1.80      0.388          0.071    (  0.085)        0.317
35   2.92     1.80      0.388          0.071    (  0.085)        0.317
36   3.00     0.60      0.129       (  0.071)       0.028        0.101
             (Loss Rate Not Used)
   Sum =     100.0                                    Sum =    19.1
      Flood volume = Effective rainfall      1.59(In)
       times area     331.0(Ac.)/[(In)/(Ft.)] =      43.9(Ac.Ft)
      Total soil loss =      0.21(In)
      Total soil loss =     5.684(Ac.Ft)
      Total rainfall =      1.80(In)
      Flood volume =     1912156.0 Cubic Feet
      Total soil loss =      247596.4 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =    421.870(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      125.0     250.0     375.0     500.0
-------------------------------------------------------------------------
  0+ 5       0.0246      3.57  Q         |         |         |         |
  0+10       0.1520     18.50  VQ        |         |         |         |
  0+15       0.4171     38.49  V  Q      |         |         |         |
  0+20       0.7537     48.88  V  Q      |         |         |         |
  0+25       1.1393     55.98  |V  Q     |         |         |         |
  0+30       1.5894     65.35  |V   Q    |         |         |         |
  0+35       2.1006     74.23  |V   Q    |         |         |         |
  0+40       2.6530     80.21  | V   Q   |         |         |         |
  0+45       3.2342     84.39  | V   Q   |         |         |         |
  0+50       3.8505     89.49  |  V   Q  |         |         |         |
  0+55       4.4682     89.69  |   V  Q  |         |         |         |
  1+ 0       5.0772     88.43  |   V  Q  |         |         |         |
  1+ 5       5.7195     93.26  |    V Q  |         |         |         |
  1+10       6.4368    104.15  |    V  Q |         |         |         |
  1+15       7.2298    115.15  |     V  Q|         |         |         |
  1+20       8.0604    120.60  |      V Q|         |         |         |
  1+25       8.9088    123.18  |       VQ|         |         |         |
  1+30       9.8089    130.70  |       V Q         |         |         |
  1+35      10.7932    142.92  |        V|Q        |         |         |
  1+40      11.8163    148.55  |         VQ        |         |         |
  1+45      12.8747    153.68  |         |VQ       |         |         |
  1+50      14.0283    167.49  |         | VQ      |         |         |
  1+55      15.2677    179.96  |         |  VQ     |         |         |
  2+ 0      16.5241    182.44  |         |   QV    |         |         |
  2+ 5      17.7833    182.84  |         |   Q V   |         |         |
  2+10      19.0942    190.35  |         |    Q V  |         |         |
  2+15      20.5626    213.20  |         |      QV |         |         |
  2+20      22.2457    244.39  |         |        QV         |         |
  2+25      24.0665    264.38  |         |          |Q       |         |
  2+30      26.1381    300.80  |         |          |  VQ    |         |
  2+35      28.6899    370.52  |         |          |     V  Q|         |
  2+40      31.5954    421.87  |         |          |       V |  Q      |
  2+45      34.4608    416.06  |         |          |         |V Q      |
  2+50      36.7777    336.42  |         |          |     Q   |  V      |
  2+55      38.4601    244.28  |         |          |       Q|     V    |
  3+ 0      39.7733    190.68  |         |     Q    |         |      V   |
  3+ 5      40.8120    150.81  |         | Q        |         |       V  |
  3+10      41.5616    108.85  |         Q |        |         |       V  |
  3+15      42.0923     77.06  |      Q   |        |         |        V |
  3+20      42.4932     58.22  |   Q      |        |         |        V |
```

```
    3+25      42.8081     45.72  |  Q      |         |         |        V|
    3+30      43.0612     36.76  | Q       |         |         |        V|
    3+35      43.2660     29.74  | Q       |         |         |        V|
    3+40      43.4301     23.83  |Q        |         |         |        V|
    3+45      43.5600     18.86  |Q        |         |         |        V|
    3+50      43.6615     14.74  |Q        |         |         |        V|
    3+55      43.7439     11.96  Q         |         |         |        V|
    4+ 0      43.8055      8.95  Q         |         |         |        V|
    4+ 5      43.8489      6.30  Q         |         |         |        V|
    4+10      43.8733      3.53  Q         |         |         |        V|
    4+15      43.8844      1.62  Q         |         |         |        V|
    4+20      43.8918      1.07  Q         |         |         |        V|
    4+25      43.8960      0.61  Q         |         |         |        V|
    4+30      43.8971      0.15  Q         |         |         |         V
--------------------------------------------------------------------------
```

Area 'B' – 100 Year 6 Hour Proposed Condition – Unit Hydrograph

```
        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  06/24/20 File: PRB1006100.out


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'B'
PROPOSED CONDITION UNIT HYDROGRAPH - 100 YEAR 6 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =     331.02(Ac.)  =      0.517 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =     331.02(Ac.)  =      0.517 Sq. Mi.
Length along longest watercourse =    9118.00(Ft.)
Length along longest watercourse measured to centroid =    5186.00(Ft.)
Length along longest watercourse =      1.727 Mi.
Length along longest watercourse measured to centroid =      0.982 Mi.
Difference in elevation =     132.40(Ft.)
Slope along watercourse =     76.6694 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.193 Hr.
Lag time =    11.58 Min.
25% of lag time =     2.89 Min.
40% of lag time =     4.63 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]
      331.02           1.00                331.02

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
      331.02           2.50                827.55

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    1.000(In)
Area Averaged 100-Year Rainfall =    2.500(In)

Point rain (area averaged) =    2.500(In)
Areal adjustment factor =   99.89 %
Adjusted average point rain =    2.497(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
   331.020           56.39         0.850
```

Total Area Entered = 331.02(Ac.)

RI AMC2	RI AMC-3	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
56.4	75.1	0.302	0.850	0.071	1.000	0.071
					Sum (F) =	0.071

Area averaged mean soil loss (F) (In/Hr) = 0.071
Minimum soil loss rate ((In/Hr)) = 0.035
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.220

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	43.191	4.894	16.327
2	0.167	86.383	20.447	68.213
3	0.250	129.574	28.137	93.868
4	0.333	172.766	15.869	52.940
5	0.417	215.957	7.734	25.802
6	0.500	259.149	5.143	17.157
7	0.583	302.340	3.842	12.816
8	0.667	345.532	2.870	9.574
9	0.750	388.723	2.314	7.719
10	0.833	431.915	1.763	5.880
11	0.917	475.106	1.385	4.621
12	1.000	518.298	1.272	4.245
13	1.083	561.489	1.001	3.341
14	1.167	604.681	0.823	2.745
15	1.250	647.872	0.673	2.246
16	1.333	691.064	0.527	1.757
17	1.417	734.255	0.432	1.442
18	1.500	777.447	0.432	1.441
19	1.583	820.638	0.441	1.473
		Sum = 100.000	Sum=	333.606

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	(0.071)	0.033	0.117
2	0.17	0.60	0.180	(0.071)	0.040	0.140
3	0.25	0.60	0.180	(0.071)	0.040	0.140
4	0.33	0.60	0.180	(0.071)	0.040	0.140
5	0.42	0.60	0.180	(0.071)	0.040	0.140
6	0.50	0.70	0.210	(0.071)	0.046	0.164
7	0.58	0.70	0.210	(0.071)	0.046	0.164
8	0.67	0.70	0.210	(0.071)	0.046	0.164
9	0.75	0.70	0.210	(0.071)	0.046	0.164
10	0.83	0.70	0.210	(0.071)	0.046	0.164
11	0.92	0.70	0.210	(0.071)	0.046	0.164
12	1.00	0.80	0.240	(0.071)	0.053	0.187
13	1.08	0.80	0.240	(0.071)	0.053	0.187
14	1.17	0.80	0.240	(0.071)	0.053	0.187
15	1.25	0.80	0.240	(0.071)	0.053	0.187
16	1.33	0.80	0.240	(0.071)	0.053	0.187
17	1.42	0.80	0.240	(0.071)	0.053	0.187
18	1.50	0.80	0.240	(0.071)	0.053	0.187
19	1.58	0.80	0.240	(0.071)	0.053	0.187
20	1.67	0.80	0.240	(0.071)	0.053	0.187
21	1.75	0.80	0.240	(0.071)	0.053	0.187
22	1.83	0.80	0.240	(0.071)	0.053	0.187
23	1.92	0.80	0.240	(0.071)	0.053	0.187
24	2.00	0.90	0.270	(0.071)	0.059	0.210

```
 25   2.08     0.80     0.240       (  0.071)       0.053        0.187
 26   2.17     0.90     0.270       (  0.071)       0.059        0.210
 27   2.25     0.90     0.270       (  0.071)       0.059        0.210
 28   2.33     0.90     0.270       (  0.071)       0.059        0.210
 29   2.42     0.90     0.270       (  0.071)       0.059        0.210
 30   2.50     0.90     0.270       (  0.071)       0.059        0.210
 31   2.58     0.90     0.270       (  0.071)       0.059        0.210
 32   2.67     0.90     0.270       (  0.071)       0.059        0.210
 33   2.75     1.00     0.300       (  0.071)       0.066        0.234
 34   2.83     1.00     0.300       (  0.071)       0.066        0.234
 35   2.92     1.00     0.300       (  0.071)       0.066        0.234
 36   3.00     1.00     0.300       (  0.071)       0.066        0.234
 37   3.08     1.00     0.300       (  0.071)       0.066        0.234
 38   3.17     1.10     0.330          0.071    (  0.073)        0.259
 39   3.25     1.10     0.330          0.071    (  0.073)        0.259
 40   3.33     1.10     0.330          0.071    (  0.073)        0.259
 41   3.42     1.20     0.360          0.071    (  0.079)        0.289
 42   3.50     1.30     0.390          0.071    (  0.086)        0.319
 43   3.58     1.40     0.420          0.071    (  0.092)        0.349
 44   3.67     1.40     0.420          0.071    (  0.092)        0.349
 45   3.75     1.50     0.449          0.071    (  0.099)        0.379
 46   3.83     1.50     0.449          0.071    (  0.099)        0.379
 47   3.92     1.60     0.479          0.071    (  0.105)        0.409
 48   4.00     1.60     0.479          0.071    (  0.105)        0.409
 49   4.08     1.70     0.509          0.071    (  0.112)        0.439
 50   4.17     1.80     0.539          0.071    (  0.119)        0.468
 51   4.25     1.90     0.569          0.071    (  0.125)        0.498
 52   4.33     2.00     0.599          0.071    (  0.132)        0.528
 53   4.42     2.10     0.629          0.071    (  0.138)        0.558
 54   4.50     2.10     0.629          0.071    (  0.138)        0.558
 55   4.58     2.20     0.659          0.071    (  0.145)        0.588
 56   4.67     2.30     0.689          0.071    (  0.152)        0.618
 57   4.75     2.40     0.719          0.071    (  0.158)        0.648
 58   4.83     2.40     0.719          0.071    (  0.158)        0.648
 59   4.92     2.50     0.749          0.071    (  0.165)        0.678
 60   5.00     2.60     0.779          0.071    (  0.171)        0.708
 61   5.08     3.10     0.929          0.071    (  0.204)        0.858
 62   5.17     3.60     1.079          0.071    (  0.237)        1.008
 63   5.25     3.90     1.169          0.071    (  0.257)        1.098
 64   5.33     4.20     1.259          0.071    (  0.277)        1.188
 65   5.42     4.70     1.408          0.071    (  0.310)        1.338
 66   5.50     5.60     1.678          0.071    (  0.369)        1.607
 67   5.58     1.90     0.569          0.071    (  0.125)        0.498
 68   5.67     0.90     0.270       (  0.071)       0.059        0.210
 69   5.75     0.60     0.180       (  0.071)       0.040        0.140
 70   5.83     0.50     0.150       (  0.071)       0.033        0.117
 71   5.92     0.30     0.090       (  0.071)       0.020        0.070
 72   6.00     0.20     0.060       (  0.071)       0.013        0.047
               (Loss Rate Not Used)
    Sum =     100.0                                  Sum =    25.7
      Flood volume = Effective rainfall      2.14(In)
       times area     331.0(Ac.)/[(In)/(Ft.)] =      59.1(Ac.Ft)
      Total soil loss =      0.35(In)
      Total soil loss =     9.769(Ac.Ft)
      Total rainfall =      2.50(In)
      Flood volume =     2575059.3 Cubic Feet
      Total soil loss =      425529.0 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =    392.178(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      100.0     200.0     300.0     400.0
-------------------------------------------------------------------------
  0+ 5       0.0131      1.91  Q         |         |         |         |
  0+10       0.0839     10.27  VQ        |         |         |         |
  0+15       0.2411     22.84  V Q       |         |         |         |
  0+20       0.4562     31.22  V  Q      |         |         |         |
```

```
0+25       0.7005     35.48  V  Q      |          |          |          |
0+30       0.9655     38.47  V  Q      |          |          |          |
0+35       1.2545     41.96  V   Q     |          |          |          |
0+40       1.5684     45.58  |V  Q     |          |          |          |
0+45       1.8985     47.94  |V  Q     |          |          |          |
0+50       2.2389     49.41  |V  Q     |          |          |          |
0+55       2.5866     50.49  |V   Q    |          |          |          |
1+ 0       2.9432     51.78  |V   Q    |          |          |          |
1+ 5       3.3157     54.09  | V  Q    |          |          |          |
1+10       3.7074     56.86  | V  Q    |          |          |          |
1+15       4.1107     58.57  | V  Q    |          |          |          |
1+20       4.5207     59.54  |  V Q    |          |          |          |
1+25       4.9356     60.25  |  V  Q   |          |          |          |
1+30       5.3545     60.83  |  V  Q   |          |          |          |
1+35       5.7768     61.32  |  V  Q   |          |          |          |
1+40       6.2010     61.59  |   V Q   |          |          |          |
1+45       6.6264     61.77  |   V Q   |          |          |          |
1+50       7.0527     61.91  |   V Q   |          |          |          |
1+55       7.4800     62.04  |    VQ   |          |          |          |
2+ 0       7.9107     62.53  |    VQ   |          |          |          |
2+ 5       8.3502     63.81  |    VQ   |          |          |          |
2+10       8.7968     64.85  |    VQ   |          |          |          |
2+15       9.2480     65.53  |     Q   |          |          |          |
2+20       9.7103     67.12  |     Q   |          |          |          |
2+25      10.1799     68.19  |     Q   |          |          |          |
2+30      10.6532     68.73  |     QV  |          |          |          |
2+35      11.1288     69.05  |     QV  |          |          |          |
2+40      11.6061     69.31  |     QV  |          |          |          |
2+45      12.0873     69.87  |     Q V |          |          |          |
2+50      12.5805     71.62  |      QV |          |          |          |
2+55      13.0898     73.94  |      QV |          |          |          |
3+ 0      13.6081     75.26  |      Q V|          |          |          |
3+ 5      14.1312     75.95  |      Q V|          |          |          |
3+10      14.6603     76.83  |      Q V|          |          |          |
3+15      15.2037     78.89  |      Q  V          |          |          |
3+20      15.7650     81.50  |       Q V          |          |          |
3+25      16.3403     83.54  |       Q |V         |          |          |
3+30      16.9388     86.89  |       Q |V         |          |          |
3+35      17.5777     92.78  |        Q|V         |          |          |
3+40      18.2642     99.68  |        Q| V        |          |          |
3+45      18.9919    105.66  |         Q V        |          |          |
3+50      19.7552    110.84  |         |Q V       |          |          |
3+55      20.5542    116.01  |         |Q V       |          |          |
4+ 0      21.3875    120.99  |         | Q V      |          |          |
4+ 5      22.2560    126.11  |         | Q  V     |          |          |
4+10      23.1620    131.56  |         |  Q V     |          |          |
4+15      24.1173    138.71  |         |  Q  V    |          |          |
4+20      25.1294    146.95  |         |   Q  V   |          |          |
4+25      26.2016    155.68  |         |    Q V   |          |          |
4+30      27.3326    164.23  |         |     Q V  |          |          |
4+35      28.5134    171.45  |         |      Q V|          |          |
4+40      29.7397    178.07  |         |      Q  V          |          |
4+45      31.0208    186.01  |         |       Q V          |          |
4+50      32.3596    194.40  |         |        Q|V         |          |
4+55      33.7479    201.58  |         |         Q V        |          |
5+ 0      35.1816    208.17  |         |         Q  V       |          |
5+ 5      36.6836    218.08  |         |         |Q  V      |          |
5+10      38.3162    237.06  |         |         |  Q V     |          |
5+15      40.1529    266.69  |         |         |     QV   |          |
5+20      42.2105    298.76  |         |         |       VQ|          |
5+25      44.4793    329.42  |         |         |         V Q        |
5+30      46.9937    365.10  |         |         |         |V    Q    |
5+35      49.6947    392.18  |         |         |         |  V     Q|
5+40      52.1271    353.19  |         |         |         |    Q     |
5+45      53.8653    252.39  |         |         |    Q    |     V    |
5+50      55.0746    175.58  |         |       Q |         |      V   |
5+55      55.9897    132.87  |         |  Q      |         |      V   |
6+ 0      56.7106    104.68  |         Q         |         |       V  |
6+ 5      57.2742     81.83  |       Q |         |         |       V  |
6+10      57.7062     62.73  |     Q   |         |         |        V|
6+15      58.0307     47.12  |   Q     |         |         |        V|
6+20      58.2830     36.63  |  Q      |         |         |        V|
6+25      58.4861     29.50  | Q       |         |         |        V|
```

```
    6+30      58.6478     23.47  | Q       |         |         |        V|
    6+35      58.7765     18.69  |Q        |         |         |        V|
    6+40      58.8779     14.73  |Q        |         |         |        V|
    6+45      58.9561     11.35  |Q        |         |         |        V|
    6+50      59.0155      8.64  Q         |         |         |        V|
    6+55      59.0599      6.45  Q         |         |         |        V|
    7+ 0      59.0892      4.25  Q         |         |         |        V|
    7+ 5      59.1011      1.73  Q         |         |         |        V|
    7+10      59.1074      0.91  Q         |         |         |        V|
    7+15      59.1112      0.56  Q         |         |         |        V|
    7+20      59.1136      0.34  Q         |         |         |        V|
    7+25      59.1148      0.17  Q         |         |         |        V|
    7+30      59.1152      0.07  Q         |         |         |         V
-------------------------------------------------------------------------
```

Area 'B' – 100 Year 24 Hour Proposed Condition – Unit Hydrograph

```
        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  06/24/20 File: PRB10024100.out


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'B'
PROPOSED CONDITION UNIT HYDROGRAPH - 100 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =     331.02(Ac.)  =      0.517 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =     331.02(Ac.)  =      0.517 Sq. Mi.
Length along longest watercourse =    9118.00(Ft.)
Length along longest watercourse measured to centroid =    5186.00(Ft.)
Length along longest watercourse =      1.727 Mi.
Length along longest watercourse measured to centroid =      0.982 Mi.
Difference in elevation =     132.40(Ft.)
Slope along watercourse =     76.6694 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.193 Hr.
Lag time =    11.58 Min.
25% of lag time =     2.89 Min.
40% of lag time =     4.63 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]
      331.02           1.60                529.63

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
      331.02           4.00               1324.08

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    1.600(In)
Area Averaged 100-Year Rainfall =    4.000(In)

Point rain (area averaged) =    4.000(In)
Areal adjustment factor =   99.94 %
Adjusted average point rain =    3.997(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
   331.020           56.39         0.850
```

Total Area Entered = 331.02(Ac.)

RI AMC2	RI AMC-3	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
56.4	75.1	0.302	0.850	0.071	1.000	0.071
					Sum (F) =	0.071

Area averaged mean soil loss (F) (In/Hr) = 0.071
Minimum soil loss rate ((In/Hr)) = 0.035
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.220

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	43.191	4.894	16.327
2	0.167	86.383	20.447	68.213
3	0.250	129.574	28.137	93.868
4	0.333	172.766	15.869	52.940
5	0.417	215.957	7.734	25.802
6	0.500	259.149	5.143	17.157
7	0.583	302.340	3.842	12.816
8	0.667	345.532	2.870	9.574
9	0.750	388.723	2.314	7.719
10	0.833	431.915	1.763	5.880
11	0.917	475.106	1.385	4.621
12	1.000	518.298	1.272	4.245
13	1.083	561.489	1.001	3.341
14	1.167	604.681	0.823	2.745
15	1.250	647.872	0.673	2.246
16	1.333	691.064	0.527	1.757
17	1.417	734.255	0.432	1.442
18	1.500	777.447	0.432	1.441
19	1.583	820.638	0.441	1.473
		Sum = 100.000	Sum=	333.606

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	0.032	(0.126)	0.007	0.025
2	0.17	0.07	0.032	(0.125)	0.007	0.025
3	0.25	0.07	0.032	(0.125)	0.007	0.025
4	0.33	0.10	0.048	(0.124)	0.011	0.037
5	0.42	0.10	0.048	(0.124)	0.011	0.037
6	0.50	0.10	0.048	(0.123)	0.011	0.037
7	0.58	0.10	0.048	(0.123)	0.011	0.037
8	0.67	0.10	0.048	(0.122)	0.011	0.037
9	0.75	0.10	0.048	(0.122)	0.011	0.037
10	0.83	0.13	0.064	(0.121)	0.014	0.050
11	0.92	0.13	0.064	(0.121)	0.014	0.050
12	1.00	0.13	0.064	(0.120)	0.014	0.050
13	1.08	0.10	0.048	(0.120)	0.011	0.037
14	1.17	0.10	0.048	(0.119)	0.011	0.037
15	1.25	0.10	0.048	(0.119)	0.011	0.037
16	1.33	0.10	0.048	(0.118)	0.011	0.037
17	1.42	0.10	0.048	(0.118)	0.011	0.037
18	1.50	0.10	0.048	(0.118)	0.011	0.037
19	1.58	0.10	0.048	(0.117)	0.011	0.037
20	1.67	0.10	0.048	(0.117)	0.011	0.037
21	1.75	0.10	0.048	(0.116)	0.011	0.037
22	1.83	0.13	0.064	(0.116)	0.014	0.050
23	1.92	0.13	0.064	(0.115)	0.014	0.050
24	2.00	0.13	0.064	(0.115)	0.014	0.050

25	2.08	0.13	0.064	(0.114)	0.014	0.050
26	2.17	0.13	0.064	(0.114)	0.014	0.050
27	2.25	0.13	0.064	(0.113)	0.014	0.050
28	2.33	0.13	0.064	(0.113)	0.014	0.050
29	2.42	0.13	0.064	(0.112)	0.014	0.050
30	2.50	0.13	0.064	(0.112)	0.014	0.050
31	2.58	0.17	0.080	(0.112)	0.018	0.062
32	2.67	0.17	0.080	(0.111)	0.018	0.062
33	2.75	0.17	0.080	(0.111)	0.018	0.062
34	2.83	0.17	0.080	(0.110)	0.018	0.062
35	2.92	0.17	0.080	(0.110)	0.018	0.062
36	3.00	0.17	0.080	(0.109)	0.018	0.062
37	3.08	0.17	0.080	(0.109)	0.018	0.062
38	3.17	0.17	0.080	(0.108)	0.018	0.062
39	3.25	0.17	0.080	(0.108)	0.018	0.062
40	3.33	0.17	0.080	(0.107)	0.018	0.062
41	3.42	0.17	0.080	(0.107)	0.018	0.062
42	3.50	0.17	0.080	(0.107)	0.018	0.062
43	3.58	0.17	0.080	(0.106)	0.018	0.062
44	3.67	0.17	0.080	(0.106)	0.018	0.062
45	3.75	0.17	0.080	(0.105)	0.018	0.062
46	3.83	0.20	0.096	(0.105)	0.021	0.075
47	3.92	0.20	0.096	(0.104)	0.021	0.075
48	4.00	0.20	0.096	(0.104)	0.021	0.075
49	4.08	0.20	0.096	(0.103)	0.021	0.075
50	4.17	0.20	0.096	(0.103)	0.021	0.075
51	4.25	0.20	0.096	(0.103)	0.021	0.075
52	4.33	0.23	0.112	(0.102)	0.025	0.087
53	4.42	0.23	0.112	(0.102)	0.025	0.087
54	4.50	0.23	0.112	(0.101)	0.025	0.087
55	4.58	0.23	0.112	(0.101)	0.025	0.087
56	4.67	0.23	0.112	(0.100)	0.025	0.087
57	4.75	0.23	0.112	(0.100)	0.025	0.087
58	4.83	0.27	0.128	(0.100)	0.028	0.100
59	4.92	0.27	0.128	(0.099)	0.028	0.100
60	5.00	0.27	0.128	(0.099)	0.028	0.100
61	5.08	0.20	0.096	(0.098)	0.021	0.075
62	5.17	0.20	0.096	(0.098)	0.021	0.075
63	5.25	0.20	0.096	(0.097)	0.021	0.075
64	5.33	0.23	0.112	(0.097)	0.025	0.087
65	5.42	0.23	0.112	(0.097)	0.025	0.087
66	5.50	0.23	0.112	(0.096)	0.025	0.087
67	5.58	0.27	0.128	(0.096)	0.028	0.100
68	5.67	0.27	0.128	(0.095)	0.028	0.100
69	5.75	0.27	0.128	(0.095)	0.028	0.100
70	5.83	0.27	0.128	(0.094)	0.028	0.100
71	5.92	0.27	0.128	(0.094)	0.028	0.100
72	6.00	0.27	0.128	(0.094)	0.028	0.100
73	6.08	0.30	0.144	(0.093)	0.032	0.112
74	6.17	0.30	0.144	(0.093)	0.032	0.112
75	6.25	0.30	0.144	(0.092)	0.032	0.112
76	6.33	0.30	0.144	(0.092)	0.032	0.112
77	6.42	0.30	0.144	(0.092)	0.032	0.112
78	6.50	0.30	0.144	(0.091)	0.032	0.112
79	6.58	0.33	0.160	(0.091)	0.035	0.125
80	6.67	0.33	0.160	(0.090)	0.035	0.125
81	6.75	0.33	0.160	(0.090)	0.035	0.125
82	6.83	0.33	0.160	(0.089)	0.035	0.125
83	6.92	0.33	0.160	(0.089)	0.035	0.125
84	7.00	0.33	0.160	(0.089)	0.035	0.125
85	7.08	0.33	0.160	(0.088)	0.035	0.125
86	7.17	0.33	0.160	(0.088)	0.035	0.125
87	7.25	0.33	0.160	(0.087)	0.035	0.125
88	7.33	0.37	0.176	(0.087)	0.039	0.137
89	7.42	0.37	0.176	(0.087)	0.039	0.137
90	7.50	0.37	0.176	(0.086)	0.039	0.137
91	7.58	0.40	0.192	(0.086)	0.042	0.150
92	7.67	0.40	0.192	(0.085)	0.042	0.150
93	7.75	0.40	0.192	(0.085)	0.042	0.150
94	7.83	0.43	0.208	(0.085)	0.046	0.162
95	7.92	0.43	0.208	(0.084)	0.046	0.162
96	8.00	0.43	0.208	(0.084)	0.046	0.162
97	8.08	0.50	0.240	(0.084)	0.053	0.187

98	8.17	0.50	0.240	(0.083)	0.053	0.187
99	8.25	0.50	0.240	(0.083)	0.053	0.187
100	8.33	0.50	0.240	(0.082)	0.053	0.187
101	8.42	0.50	0.240	(0.082)	0.053	0.187
102	8.50	0.50	0.240	(0.082)	0.053	0.187
103	8.58	0.53	0.256	(0.081)	0.056	0.200
104	8.67	0.53	0.256	(0.081)	0.056	0.200
105	8.75	0.53	0.256	(0.080)	0.056	0.200
106	8.83	0.57	0.272	(0.080)	0.060	0.212
107	8.92	0.57	0.272	(0.080)	0.060	0.212
108	9.00	0.57	0.272	(0.079)	0.060	0.212
109	9.08	0.63	0.304	(0.079)	0.067	0.237
110	9.17	0.63	0.304	(0.079)	0.067	0.237
111	9.25	0.63	0.304	(0.078)	0.067	0.237
112	9.33	0.67	0.320	(0.078)	0.070	0.249
113	9.42	0.67	0.320	(0.077)	0.070	0.249
114	9.50	0.67	0.320	(0.077)	0.070	0.249
115	9.58	0.70	0.336	(0.077)	0.074	0.262
116	9.67	0.70	0.336	(0.076)	0.074	0.262
117	9.75	0.70	0.336	(0.076)	0.074	0.262
118	9.83	0.73	0.352	0.076	(0.077)	0.276
119	9.92	0.73	0.352	0.075	(0.077)	0.277
120	10.00	0.73	0.352	0.075	(0.077)	0.277
121	10.08	0.50	0.240	(0.075)	0.053	0.187
122	10.17	0.50	0.240	(0.074)	0.053	0.187
123	10.25	0.50	0.240	(0.074)	0.053	0.187
124	10.33	0.50	0.240	(0.073)	0.053	0.187
125	10.42	0.50	0.240	(0.073)	0.053	0.187
126	10.50	0.50	0.240	(0.073)	0.053	0.187
127	10.58	0.67	0.320	(0.072)	0.070	0.249
128	10.67	0.67	0.320	(0.072)	0.070	0.249
129	10.75	0.67	0.320	(0.072)	0.070	0.249
130	10.83	0.67	0.320	(0.071)	0.070	0.249
131	10.92	0.67	0.320	(0.071)	0.070	0.249
132	11.00	0.67	0.320	(0.071)	0.070	0.249
133	11.08	0.63	0.304	(0.070)	0.067	0.237
134	11.17	0.63	0.304	(0.070)	0.067	0.237
135	11.25	0.63	0.304	(0.070)	0.067	0.237
136	11.33	0.63	0.304	(0.069)	0.067	0.237
137	11.42	0.63	0.304	(0.069)	0.067	0.237
138	11.50	0.63	0.304	(0.069)	0.067	0.237
139	11.58	0.57	0.272	(0.068)	0.060	0.212
140	11.67	0.57	0.272	(0.068)	0.060	0.212
141	11.75	0.57	0.272	(0.068)	0.060	0.212
142	11.83	0.60	0.288	(0.067)	0.063	0.224
143	11.92	0.60	0.288	(0.067)	0.063	0.224
144	12.00	0.60	0.288	(0.067)	0.063	0.224
145	12.08	0.83	0.400	0.066	(0.088)	0.334
146	12.17	0.83	0.400	0.066	(0.088)	0.334
147	12.25	0.83	0.400	0.066	(0.088)	0.334
148	12.33	0.87	0.416	0.065	(0.091)	0.351
149	12.42	0.87	0.416	0.065	(0.091)	0.351
150	12.50	0.87	0.416	0.065	(0.091)	0.351
151	12.58	0.93	0.448	0.064	(0.098)	0.384
152	12.67	0.93	0.448	0.064	(0.098)	0.384
153	12.75	0.93	0.448	0.064	(0.098)	0.384
154	12.83	0.97	0.464	0.063	(0.102)	0.400
155	12.92	0.97	0.464	0.063	(0.102)	0.401
156	13.00	0.97	0.464	0.063	(0.102)	0.401
157	13.08	1.13	0.544	0.062	(0.120)	0.481
158	13.17	1.13	0.544	0.062	(0.120)	0.482
159	13.25	1.13	0.544	0.062	(0.120)	0.482
160	13.33	1.13	0.544	0.061	(0.120)	0.482
161	13.42	1.13	0.544	0.061	(0.120)	0.483
162	13.50	1.13	0.544	0.061	(0.120)	0.483
163	13.58	0.77	0.368	0.060	(0.081)	0.307
164	13.67	0.77	0.368	0.060	(0.081)	0.308
165	13.75	0.77	0.368	0.060	(0.081)	0.308
166	13.83	0.77	0.368	0.059	(0.081)	0.308
167	13.92	0.77	0.368	0.059	(0.081)	0.309
168	14.00	0.77	0.368	0.059	(0.081)	0.309
169	14.08	0.90	0.432	0.059	(0.095)	0.373
170	14.17	0.90	0.432	0.058	(0.095)	0.373

171	14.25	0.90	0.432	0.058	(0.095)	0.374
172	14.33	0.87	0.416	0.058	(0.091)	0.358
173	14.42	0.87	0.416	0.057	(0.091)	0.358
174	14.50	0.87	0.416	0.057	(0.091)	0.359
175	14.58	0.87	0.416	0.057	(0.091)	0.359
176	14.67	0.87	0.416	0.057	(0.091)	0.359
177	14.75	0.87	0.416	0.056	(0.091)	0.359
178	14.83	0.83	0.400	0.056	(0.088)	0.344
179	14.92	0.83	0.400	0.056	(0.088)	0.344
180	15.00	0.83	0.400	0.055	(0.088)	0.344
181	15.08	0.80	0.384	0.055	(0.084)	0.329
182	15.17	0.80	0.384	0.055	(0.084)	0.329
183	15.25	0.80	0.384	0.055	(0.084)	0.329
184	15.33	0.77	0.368	0.054	(0.081)	0.314
185	15.42	0.77	0.368	0.054	(0.081)	0.314
186	15.50	0.77	0.368	0.054	(0.081)	0.314
187	15.58	0.63	0.304	0.053	(0.067)	0.250
188	15.67	0.63	0.304	0.053	(0.067)	0.251
189	15.75	0.63	0.304	0.053	(0.067)	0.251
190	15.83	0.63	0.304	0.053	(0.067)	0.251
191	15.92	0.63	0.304	0.052	(0.067)	0.251
192	16.00	0.63	0.304	0.052	(0.067)	0.252
193	16.08	0.13	0.064	(0.052)	0.014	0.050
194	16.17	0.13	0.064	(0.052)	0.014	0.050
195	16.25	0.13	0.064	(0.051)	0.014	0.050
196	16.33	0.13	0.064	(0.051)	0.014	0.050
197	16.42	0.13	0.064	(0.051)	0.014	0.050
198	16.50	0.13	0.064	(0.050)	0.014	0.050
199	16.58	0.10	0.048	(0.050)	0.011	0.037
200	16.67	0.10	0.048	(0.050)	0.011	0.037
201	16.75	0.10	0.048	(0.050)	0.011	0.037
202	16.83	0.10	0.048	(0.049)	0.011	0.037
203	16.92	0.10	0.048	(0.049)	0.011	0.037
204	17.00	0.10	0.048	(0.049)	0.011	0.037
205	17.08	0.17	0.080	(0.049)	0.018	0.062
206	17.17	0.17	0.080	(0.048)	0.018	0.062
207	17.25	0.17	0.080	(0.048)	0.018	0.062
208	17.33	0.17	0.080	(0.048)	0.018	0.062
209	17.42	0.17	0.080	(0.048)	0.018	0.062
210	17.50	0.17	0.080	(0.048)	0.018	0.062
211	17.58	0.17	0.080	(0.047)	0.018	0.062
212	17.67	0.17	0.080	(0.047)	0.018	0.062
213	17.75	0.17	0.080	(0.047)	0.018	0.062
214	17.83	0.13	0.064	(0.047)	0.014	0.050
215	17.92	0.13	0.064	(0.046)	0.014	0.050
216	18.00	0.13	0.064	(0.046)	0.014	0.050
217	18.08	0.13	0.064	(0.046)	0.014	0.050
218	18.17	0.13	0.064	(0.046)	0.014	0.050
219	18.25	0.13	0.064	(0.045)	0.014	0.050
220	18.33	0.13	0.064	(0.045)	0.014	0.050
221	18.42	0.13	0.064	(0.045)	0.014	0.050
222	18.50	0.13	0.064	(0.045)	0.014	0.050
223	18.58	0.10	0.048	(0.045)	0.011	0.037
224	18.67	0.10	0.048	(0.044)	0.011	0.037
225	18.75	0.10	0.048	(0.044)	0.011	0.037
226	18.83	0.07	0.032	(0.044)	0.007	0.025
227	18.92	0.07	0.032	(0.044)	0.007	0.025
228	19.00	0.07	0.032	(0.044)	0.007	0.025
229	19.08	0.10	0.048	(0.043)	0.011	0.037
230	19.17	0.10	0.048	(0.043)	0.011	0.037
231	19.25	0.10	0.048	(0.043)	0.011	0.037
232	19.33	0.13	0.064	(0.043)	0.014	0.050
233	19.42	0.13	0.064	(0.042)	0.014	0.050
234	19.50	0.13	0.064	(0.042)	0.014	0.050
235	19.58	0.10	0.048	(0.042)	0.011	0.037
236	19.67	0.10	0.048	(0.042)	0.011	0.037
237	19.75	0.10	0.048	(0.042)	0.011	0.037
238	19.83	0.07	0.032	(0.042)	0.007	0.025
239	19.92	0.07	0.032	(0.041)	0.007	0.025
240	20.00	0.07	0.032	(0.041)	0.007	0.025
241	20.08	0.10	0.048	(0.041)	0.011	0.037
242	20.17	0.10	0.048	(0.041)	0.011	0.037
243	20.25	0.10	0.048	(0.041)	0.011	0.037

```
244  20.33     0.10      0.048       (  0.040)       0.011        0.037
245  20.42     0.10      0.048       (  0.040)       0.011        0.037
246  20.50     0.10      0.048       (  0.040)       0.011        0.037
247  20.58     0.10      0.048       (  0.040)       0.011        0.037
248  20.67     0.10      0.048       (  0.040)       0.011        0.037
249  20.75     0.10      0.048       (  0.040)       0.011        0.037
250  20.83     0.07      0.032       (  0.039)       0.007        0.025
251  20.92     0.07      0.032       (  0.039)       0.007        0.025
252  21.00     0.07      0.032       (  0.039)       0.007        0.025
253  21.08     0.10      0.048       (  0.039)       0.011        0.037
254  21.17     0.10      0.048       (  0.039)       0.011        0.037
255  21.25     0.10      0.048       (  0.039)       0.011        0.037
256  21.33     0.07      0.032       (  0.039)       0.007        0.025
257  21.42     0.07      0.032       (  0.038)       0.007        0.025
258  21.50     0.07      0.032       (  0.038)       0.007        0.025
259  21.58     0.10      0.048       (  0.038)       0.011        0.037
260  21.67     0.10      0.048       (  0.038)       0.011        0.037
261  21.75     0.10      0.048       (  0.038)       0.011        0.037
262  21.83     0.07      0.032       (  0.038)       0.007        0.025
263  21.92     0.07      0.032       (  0.038)       0.007        0.025
264  22.00     0.07      0.032       (  0.037)       0.007        0.025
265  22.08     0.10      0.048       (  0.037)       0.011        0.037
266  22.17     0.10      0.048       (  0.037)       0.011        0.037
267  22.25     0.10      0.048       (  0.037)       0.011        0.037
268  22.33     0.07      0.032       (  0.037)       0.007        0.025
269  22.42     0.07      0.032       (  0.037)       0.007        0.025
270  22.50     0.07      0.032       (  0.037)       0.007        0.025
271  22.58     0.07      0.032       (  0.037)       0.007        0.025
272  22.67     0.07      0.032       (  0.037)       0.007        0.025
273  22.75     0.07      0.032       (  0.036)       0.007        0.025
274  22.83     0.07      0.032       (  0.036)       0.007        0.025
275  22.92     0.07      0.032       (  0.036)       0.007        0.025
276  23.00     0.07      0.032       (  0.036)       0.007        0.025
277  23.08     0.07      0.032       (  0.036)       0.007        0.025
278  23.17     0.07      0.032       (  0.036)       0.007        0.025
279  23.25     0.07      0.032       (  0.036)       0.007        0.025
280  23.33     0.07      0.032       (  0.036)       0.007        0.025
281  23.42     0.07      0.032       (  0.036)       0.007        0.025
282  23.50     0.07      0.032       (  0.036)       0.007        0.025
283  23.58     0.07      0.032       (  0.036)       0.007        0.025
284  23.67     0.07      0.032       (  0.036)       0.007        0.025
285  23.75     0.07      0.032       (  0.036)       0.007        0.025
286  23.83     0.07      0.032       (  0.036)       0.007        0.025
287  23.92     0.07      0.032       (  0.035)       0.007        0.025
288  24.00     0.07      0.032       (  0.035)       0.007        0.025
               (Loss Rate Not Used)
    Sum =     100.0                                  Sum =    38.9
      Flood volume = Effective rainfall      3.24(In)
       times area     331.0(Ac.)/[(In)/(Ft.)] =      89.5(Ac.Ft)
      Total soil loss =      0.75(In)
      Total soil loss =    20.769(Ac.Ft)
      Total rainfall =      4.00(In)
      Flood volume =     3898583.6 Cubic Feet
      Total soil loss =      904719.4 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =    154.894(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       50.0     100.0     150.0     200.0
 ---------------------------------------------------------------------------
   0+ 5       0.0028      0.41  Q         |         |         |         |
   0+10       0.0173      2.11  Q         |         |         |         |
   0+15       0.0480      4.45  Q         |         |         |         |
   0+20       0.0892      5.98  VQ        |         |         |         |
   0+25       0.1406      7.47  VQ        |         |         |         |
   0+30       0.2031      9.07  VQ        |         |         |         |
   0+35       0.2723     10.05  V Q       |         |         |         |
```

```
0+40      0.3454    10.61  V Q       |         |         |         |
0+45      0.4213    11.02  V Q       |         |         |         |
0+50      0.5007    11.53  V Q       |         |         |         |
0+55      0.5876    12.62  V Q       |         |         |         |
1+ 0      0.6840    13.99  V Q       |         |         |         |
1+ 5      0.7846    14.60  V Q       |         |         |         |
1+10      0.8824    14.20  V Q       |         |         |         |
1+15      0.9743    13.35  V Q       |         |         |         |
1+20      1.0634    12.94  V Q       |         |         |         |
1+25      1.1516    12.81  V Q       |         |         |         |
1+30      1.2394    12.75  V Q       |         |         |         |
1+35      1.3271    12.72  V Q       |         |         |         |
1+40      1.4144    12.68  V Q       |         |         |         |
1+45      1.5015    12.65  V Q       |         |         |         |
1+50      1.5900    12.84  V Q       |         |         |         |
1+55      1.6842    13.67  V Q       |         |         |         |
2+ 0      1.7862    14.82  V Q       |         |         |         |
2+ 5      1.8927    15.46  V  Q      |         |         |         |
2+10      2.0013    15.77  V  Q      |         |         |         |
2+15      2.1112    15.97  V  Q      |         |         |         |
2+20      2.2223    16.13  V  Q      |         |         |         |
2+25      2.3341    16.23  |V Q      |         |         |         |
2+30      2.4464    16.31  |V Q      |         |         |         |
2+35      2.5604    16.56  |V Q      |         |         |         |
2+40      2.6808    17.47  |V Q      |         |         |         |
2+45      2.8095    18.70  |V Q      |         |         |         |
2+50      2.9432    19.40  |V Q      |         |         |         |
2+55      3.0792    19.76  |V Q      |         |         |         |
3+ 0      3.2169    20.00  |V Q      |         |         |         |
3+ 5      3.3559    20.18  |V  Q     |         |         |         |
3+10      3.4958    20.32  |V  Q     |         |         |         |
3+15      3.6366    20.43  |V  Q     |         |         |         |
3+20      3.7779    20.52  |V  Q     |         |         |         |
3+25      3.9197    20.58  |V  Q     |         |         |         |
3+30      4.0618    20.63  |V  Q     |         |         |         |
3+35      4.2042    20.68  |V  Q     |         |         |         |
3+40      4.3468    20.71  |V  Q     |         |         |         |
3+45      4.4896    20.74  | V Q     |         |         |         |
3+50      4.6340    20.96  | V Q     |         |         |         |
3+55      4.7844    21.83  | V Q     |         |         |         |
4+ 0      4.9429    23.02  | V Q     |         |         |         |
4+ 5      5.1061    23.70  | V Q     |         |         |         |
4+10      5.2716    24.02  | V Q     |         |         |         |
4+15      5.4385    24.24  | V Q     |         |         |         |
4+20      5.6079    24.60  | V Q     |         |         |         |
4+25      5.7840    25.57  | V  Q    |         |         |         |
4+30      5.9689    26.84  | V  Q    |         |         |         |
4+35      6.1588    27.57  | V  Q    |         |         |         |
4+40      6.3513    27.95  | V  Q    |         |         |         |
4+45      6.5457    28.22  | V  Q    |         |         |         |
4+50      6.7428    28.63  |  V Q    |         |         |         |
4+55      6.9469    29.63  |  V Q    |         |         |         |
5+ 0      7.1598    30.93  |  V  Q   |         |         |         |
5+ 5      7.3752    31.27  |  V  Q   |         |         |         |
5+10      7.5816    29.97  |  V Q    |         |         |         |
5+15      7.7739    27.91  |  V Q    |         |         |         |
5+20      7.9599    27.01  |  V Q    |         |         |         |
5+25      8.1485    27.38  |  V Q    |         |         |         |
5+30      8.3430    28.24  |  V Q    |         |         |         |
5+35      8.5419    28.88  |  V Q    |         |         |         |
5+40      8.7477    29.89  |  V Q    |         |         |         |
5+45      8.9623    31.16  |   V Q   |         |         |         |
5+50      9.1819    31.89  |   V Q   |         |         |         |
5+55      9.4041    32.25  |   V Q   |         |         |         |
6+ 0      9.6278    32.48  |   V Q   |         |         |         |
6+ 5      9.8541    32.86  |   V Q   |         |         |         |
6+10     10.0871    33.84  |   V Q   |         |         |         |
6+15     10.3290    35.12  |   V  Q  |         |         |         |
6+20     10.5760    35.87  |   V  Q  |         |         |         |
6+25     10.8256    36.25  |   V  Q  |         |         |         |
6+30     11.0771    36.51  |   V  Q  |         |         |         |
6+35     11.3312    36.90  |    V Q  |         |         |         |
6+40     11.5923    37.92  |    V Q  |         |         |         |
```

```
 6+45      11.8625     39.23  |    V Q  |         |         |         |
 6+50      12.1380     40.01  |    V  Q |         |         |         |
 6+55      12.4163     40.40  |    V  Q |         |         |         |
 7+ 0      12.6966     40.69  |    V  Q |         |         |         |
 7+ 5      12.9783     40.91  |    V  Q |         |         |         |
 7+10      13.2611     41.06  |    V  Q |         |         |         |
 7+15      13.5448     41.19  |     V Q |         |         |         |
 7+20      13.8305     41.49  |     V Q |         |         |         |
 7+25      14.1226     42.41  |     V Q |         |         |         |
 7+30      14.4233     43.66  |     V Q |         |         |         |
 7+35      14.7303     44.58  |     V Q |         |         |         |
 7+40      15.0456     45.79  |     V  Q|         |         |         |
 7+45      15.3707     47.20  |     V  Q|         |         |         |
 7+50      15.7030     48.25  |      V Q|         |         |         |
 7+55      16.0443     49.56  |      V Q|         |         |         |
 8+ 0      16.3960     51.06  |      V  Q         |         |         |
 8+ 5      16.7567     52.38  |      V  Q         |         |         |
 8+10      17.1326     54.58  |      V  Q         |         |         |
 8+15      17.5271     57.29  |      V  |Q        |         |         |
 8+20      17.9326     58.88  |       V |Q        |         |         |
 8+25      18.3440     59.74  |       V |Q        |         |         |
 8+30      18.7596     60.34  |       V | Q       |         |         |
 8+35      19.1797     61.00  |       V | Q       |         |         |
 8+40      19.6081     62.20  |       V | Q       |         |         |
 8+45      20.0466     63.67  |       V | Q       |         |         |
 8+50      20.4926     64.76  |        V| Q       |         |         |
 8+55      20.9478     66.10  |        V|  Q      |         |         |
 9+ 0      21.4137     67.64  |        V|  Q      |         |         |
 9+ 5      21.8888     68.99  |        V|  Q      |         |         |
 9+10      22.3793     71.22  |         V   Q     |         |         |
 9+15      22.8885     73.95  |         V   Q     |         |         |
 9+20      23.4103     75.77  |         V    Q    |         |         |
 9+25      23.9439     77.47  |         V    Q    |         |         |
 9+30      24.4898     79.26  |         V    Q    |         |         |
 9+35      25.0448     80.60  |         |V    Q   |         |         |
 9+40      25.6103     82.10  |         |V    Q   |         |         |
 9+45      26.1871     83.76  |         |V    Q   |         |         |
 9+50      26.7727     85.02  |         |V     Q  |         |         |
 9+55      27.3692     86.61  |         | V    Q  |         |         |
10+ 0      27.9783     88.44  |         | V    Q  |         |         |
10+ 5      28.5854     88.15  |         | V    Q  |         |         |
10+10      29.1550     82.70  |         |  V  Q   |         |         |
10+15      29.6699     74.76  |         |  VQ     |         |         |
10+20      30.1546     70.38  |         |  VQ     |         |         |
10+25      30.6253     68.34  |         |  Q      |         |         |
10+30      31.0869     67.03  |         |  Q      |         |         |
10+35      31.5490     67.09  |         |  QV     |         |         |
10+40      32.0352     70.61  |         |   Q     |         |         |
10+45      32.5578     75.88  |         |   VQ    |         |         |
10+50      33.1002     78.75  |         |   VQ    |         |         |
10+55      33.6511     80.00  |         |    VQ   |         |         |
11+ 0      34.2072     80.74  |         |    VQ   |         |         |
11+ 5      34.7657     81.08  |         |    VQ   |         |         |
11+10      35.3208     80.61  |         |    VQ   |         |         |
11+15      35.8699     79.74  |         |    QV   |         |         |
11+20      36.4161     79.31  |         |    QV   |         |         |
11+25      36.9612     79.14  |         |    QV   |         |         |
11+30      37.5057     79.07  |         |    QV   |         |         |
11+35      38.0469     78.57  |         |    Q V  |         |         |
11+40      38.5766     76.92  |         |    Q V  |         |         |
11+45      39.0906     74.62  |         |   Q  V  |         |         |
11+50      39.5971     73.54  |         |   Q  V  |         |         |
11+55      40.1052     73.78  |         |   Q  V  |         |         |
12+ 0      40.6187     74.56  |         |   Q   V |         |         |
12+ 5      41.1472     76.74  |         |    Q  V |         |         |
12+10      41.7274     84.23  |         |      Q V|         |         |
12+15      42.3782     94.50  |         |        Q|         |         |
12+20      43.0709    100.59  |         |         VQ        |         |
12+25      43.7910    104.56  |         |         VQ        |         |
12+30      44.5347    107.99  |         |         V|Q       |         |
12+35      45.2979    110.82  |         |          V Q      |         |
12+40      46.0868    114.54  |         |          V Q      |         |
12+45      46.9046    118.75  |         |          V  Q     |         |
```

```
12+50      47.7424    121.65  |          |          |V  Q      |          |
12+55      48.5987    124.32  |          |          |V  Q      |          |
13+ 0      49.4737    127.06  |          |          | V  Q     |          |
13+ 5      50.3702    130.16  |          |          | V   Q    |          |
13+10      51.3125    136.84  |          |          | V    Q   |          |
13+15      52.3132    145.30  |          |          |  V     Q|          |
13+20      53.3483    150.29  |          |          |  V      Q          |
13+25      54.4018    152.97  |          |          |   V     Q          |
13+30      55.4686    154.89  |          |          |   V     Q          |
13+35      56.5260    153.54  |          |          |    V    Q          |
13+40      57.5080    142.59  |          |          |    V  Q  |          |
13+45      58.3824    126.96  |          |          |    QV    |          |
13+50      59.1975    118.35  |          |          |  Q  V    |          |
13+55      59.9851    114.37  |          |          | Q   V    |          |
14+ 0      60.7556    111.87  |          |          | Q    V   |          |
14+ 5      61.5208    111.11  |          |          | Q    V   |          |
14+10      62.3069    114.13  |          |          | Q    V   |          |
14+15      63.1270    119.08  |          |          |  Q    V  |          |
14+20      63.9634    121.44  |          |          |   Q   V  |          |
14+25      64.7995    121.40  |          |          |   Q   V  |          |
14+30      65.6292    120.47  |          |          |   Q    V|          |
14+35      66.4561    120.07  |          |          |   Q    V|          |
14+40      67.2817    119.89  |          |          |  Q      V          |
14+45      68.1069    119.81  |          |          |  Q      V          |
14+50      68.9299    119.51  |          |          |  Q      V          |
14+55      69.7454    118.40  |          |          |  Q      |V         |
15+ 0      70.5504    116.89  |          |          |  Q      |V         |
15+ 5      71.3475    115.74  |          |          |  Q      |V         |
15+10      72.1356    114.43  |          |          | Q       | V        |
15+15      72.9127    112.83  |          |          | Q       | V        |
15+20      73.6817    111.67  |          |          | Q       | V        |
15+25      74.4404    110.16  |          |          | Q       |  V       |
15+30      75.1870    108.41  |          |          |Q        |  V       |
15+35      75.9196    106.38  |          |          |Q        |  V       |
15+40      76.6182    101.44  |          |         Q|         |   V      |
15+45      77.2728     95.04  |          |        Q|         |   V      |
15+50      77.9020     91.37  |          |       Q |         |   V      |
15+55      78.5186     89.53  |          |      Q  |         |    V     |
16+ 0      79.1267     88.30  |          |      Q  |         |    V     |
16+ 5      79.7059     84.09  |          |     Q   |         |    V     |
16+10      80.1855     69.63  |          |  Q      |         |    V     |
16+15      80.5305     50.10  |          |Q        |         |    V     |
16+20      80.7987     38.95  |       Q  |         |         |     V    |
16+25      81.0287     33.40  |     Q    |         |         |     V    |
16+30      81.2327     29.62  |    Q     |         |         |     V    |
16+35      81.4157     26.57  |    Q     |         |         |     V    |
16+40      81.5783     23.60  |   Q      |         |         |     V    |
16+45      81.7209     20.71  |   Q      |         |         |     V    |
16+50      81.8499     18.73  |  Q       |         |         |     V    |
16+55      81.9697     17.39  |  Q       |         |         |     V    |
17+ 0      82.0815     16.23  |  Q       |         |         |     V    |
17+ 5      82.1897     15.71  |  Q       |         |         |     V    |
17+10      82.3050     16.74  |  Q       |         |         |     V    |
17+15      82.4326     18.54  |  Q       |         |         |     V    |
17+20      82.5665     19.43  |  Q       |         |         |     V    |
17+25      82.7023     19.73  |  Q       |         |         |     V    |
17+30      82.8388     19.81  |  Q       |         |         |      V   |
17+35      82.9751     19.79  |  Q       |         |         |      V   |
17+40      83.1128     20.00  |  Q       |         |         |      V   |
17+45      83.2517     20.16  |   Q      |         |         |      V   |
17+50      83.3900     20.08  |   Q      |         |         |      V   |
17+55      83.5231     19.33  |  Q       |         |         |      V   |
18+ 0      83.6488     18.25  |  Q       |         |         |      V   |
18+ 5      83.7703     17.65  |  Q       |         |         |      V   |
18+10      83.8901     17.40  |  Q       |         |         |      V   |
18+15      84.0089     17.24  |  Q       |         |         |      V   |
18+20      84.1268     17.12  |  Q       |         |         |      V   |
18+25      84.2441     17.04  |  Q       |         |         |      V   |
18+30      84.3611     16.98  |  Q       |         |         |      V   |
18+35      84.4764     16.74  |  Q       |         |         |      V   |
18+40      84.5854     15.83  |  Q       |         |         |      V   |
18+45      84.6860     14.61  | Q        |         |         |      V   |
18+50      84.7803     13.70  | Q        |         |         |      V   |
```

```
18+55      84.8664     12.49  | Q       |         |         |      V  |
19+ 0      84.9427     11.08  | Q       |         |         |      V  |
19+ 5      85.0146     10.44  | Q       |         |         |      V  |
19+10      85.0891     10.83  | Q       |         |         |       V |
19+15      85.1696     11.67  | Q       |         |         |       V |
19+20      85.2542     12.29  | Q       |         |         |       V |
19+25      85.3457     13.28  | Q       |         |         |       V |
19+30      85.4457     14.52  | Q       |         |         |       V |
19+35      85.5491     15.02  |  Q      |         |         |       V |
19+40      85.6491     14.52  | Q       |         |         |       V |
19+45      85.7426     13.58  | Q       |         |         |       V |
19+50      85.8313     12.88  | Q       |         |         |       V |
19+55      85.9128     11.83  | Q       |         |         |       V |
20+ 0      85.9855     10.55  | Q       |         |         |       V |
20+ 5      86.0545     10.01  | Q       |         |         |       V |
20+10      86.1267     10.49  | Q       |         |         |       V |
20+15      86.2054     11.42  | Q       |         |         |       V |
20+20      86.2873     11.89  | Q       |         |         |       V |
20+25      86.3705     12.09  | Q       |         |         |       V |
20+30      86.4545     12.20  | Q       |         |         |       V |
20+35      86.5391     12.28  | Q       |         |         |       V |
20+40      86.6240     12.33  | Q       |         |         |       V |
20+45      86.7092     12.36  | Q       |         |         |       V |
20+50      86.7931     12.19  | Q       |         |         |       V |
20+55      86.8712     11.34  | Q       |         |         |       V |
21+ 0      86.9413     10.18  | Q       |         |         |       V |
21+ 5      87.0082      9.72  |Q        |         |         |       V |
21+10      87.0790     10.27  | Q       |         |         |       V |
21+15      87.1563     11.23  | Q       |         |         |       V |
21+20      87.2358     11.53  | Q       |         |         |       V |
21+25      87.3109     10.90  | Q       |         |         |        V|
21+30      87.3788      9.87  |Q        |         |         |        V|
21+35      87.4444      9.52  |Q        |         |         |        V|
21+40      87.5140     10.11  | Q       |         |         |        V|
21+45      87.5905     11.11  | Q       |         |         |        V|
21+50      87.6692     11.44  | Q       |         |         |        V|
21+55      87.7437     10.81  | Q       |         |         |        V|
22+ 0      87.8111      9.78  |Q        |         |         |        V|
22+ 5      87.8760      9.43  |Q        |         |         |        V|
22+10      87.9452     10.04  | Q       |         |         |        V|
22+15      88.0213     11.05  | Q       |         |         |        V|
22+20      88.0997     11.38  | Q       |         |         |        V|
22+25      88.1739     10.77  | Q       |         |         |        V|
22+30      88.2411      9.76  |Q        |         |         |        V|
22+35      88.3047      9.23  |Q        |         |         |        V|
22+40      88.3665      8.98  |Q        |         |         |        V|
22+45      88.4273      8.82  |Q        |         |         |        V|
22+50      88.4872      8.70  |Q        |         |         |        V|
22+55      88.5466      8.62  |Q        |         |         |        V|
23+ 0      88.6056      8.57  |Q        |         |         |        V|
23+ 5      88.6644      8.53  |Q        |         |         |        V|
23+10      88.7228      8.49  |Q        |         |         |        V|
23+15      88.7810      8.45  |Q        |         |         |        V|
23+20      88.8389      8.41  |Q        |         |         |        V|
23+25      88.8968      8.39  |Q        |         |         |        V|
23+30      88.9545      8.38  |Q        |         |         |        V|
23+35      89.0122      8.38  |Q        |         |         |        V|
23+40      89.0698      8.36  |Q        |         |         |        V|
23+45      89.1273      8.34  |Q        |         |         |        V|
23+50      89.1846      8.33  |Q        |         |         |        V|
23+55      89.2419      8.33  |Q        |         |         |        V|
24+ 0      89.2993      8.33  |Q        |         |         |        V|
24+ 5      89.3538      7.92  |Q        |         |         |        V|
24+10      89.3966      6.22  |Q        |         |         |        V|
24+15      89.4233      3.87  Q         |         |         |        V|
24+20      89.4409      2.55  Q         |         |         |        V|
24+25      89.4540      1.91  Q         |         |         |        V|
24+30      89.4642      1.48  Q         |         |         |        V|
24+35      89.4722      1.16  Q         |         |         |        V|
24+40      89.4785      0.92  Q         |         |         |        V|
24+45      89.4836      0.73  Q         |         |         |        V|
24+50      89.4876      0.58  Q         |         |         |        V|
24+55      89.4908      0.47  Q         |         |         |        V|
```

```
   25+ 0      89.4933      0.36  Q          |          |          |         V|
   25+ 5      89.4952      0.28  Q          |          |          |         V|
   25+10      89.4966      0.21  Q          |          |          |         V|
   25+15      89.4977      0.15  Q          |          |          |         V|
   25+20      89.4984      0.11  Q          |          |          |         V|
   25+25      89.4989      0.07  Q          |          |          |         V|
   25+30      89.4992      0.04  Q          |          |          |          V
-------------------------------------------------------------------------------
```

Area C

Area 'C' – 10 Year 1 Hour Existing Condition – Unit Hydrograph

```
        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  06/16/20 File: EXC010110.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'C'
EXISTING CONDITION UNIT HYDROGRAPH - 10 YEAR 1 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =      68.90(Ac.)  =      0.108 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      68.90(Ac.)  =      0.108 Sq. Mi.
Length along longest watercourse =    2520.00(Ft.)
Length along longest watercourse measured to centroid =     851.00(Ft.)
Length along longest watercourse =      0.477 Mi.
Length along longest watercourse measured to centroid =      0.161 Mi.
Difference in elevation =     288.00(Ft.)
Slope along watercourse =    603.4286 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.080 Hr.
Lag time =     4.83 Min.
25% of lag time =     1.21 Min.
40% of lag time =     1.93 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]
       68.90            0.45                 31.01

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       68.90            1.20                 82.68

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    0.450(In)
Area Averaged 100-Year Rainfall =    1.200(In)

Point rain (area averaged) =    0.759(In)
Areal adjustment factor =   99.94 %
Adjusted average point rain =    0.758(In)
```

```
       Sub-Area Data:
       Area(Ac.)          Runoff Index    Impervious %
           68.900            72.23          0.000
        Total Area Entered =     68.90(Ac.)


       RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
       AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)       (Dec.)    (In/Hr)
       72.2  72.2      0.336     0.000        0.336        1.000      0.336
                                                          Sum (F) =   0.336
       Area averaged mean soil loss (F) (In/Hr) =  0.336
       Minimum soil loss rate ((In/Hr)) =  0.168
       (for 24 hour storm duration)
       Soil low loss rate (decimal) =   0.900
       ------------------------------------------------------------------------
       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        103.538         20.284             14.085
           2   0.167        207.077         48.627             33.766
           3   0.250        310.615         15.124             10.502
           4   0.333        414.154          6.877              4.776
           5   0.417        517.692          3.840              2.666
           6   0.500        621.230          2.468              1.714
           7   0.583        724.769          1.493              1.036
           8   0.667        828.307          1.286              0.893
                                    Sum = 100.000    Sum=      69.438
------------------------------------------------------------------------


 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      0.382          0.336    (  0.344)        0.046
   2   0.17     4.30      0.391          0.336    (  0.352)        0.055
   3   0.25     5.00      0.455          0.336    (  0.409)        0.119
   4   0.33     5.00      0.455          0.336    (  0.409)        0.119
   5   0.42     5.80      0.528          0.336    (  0.475)        0.192
   6   0.50     6.50      0.591          0.336    (  0.532)        0.256
   7   0.58     7.40      0.673          0.336    (  0.606)        0.337
   8   0.67     8.60      0.782          0.336    (  0.704)        0.447
   9   0.75    12.30      1.119          0.336    (  1.007)        0.783
  10   0.83    29.10      2.647          0.336    (  2.383)        2.312
  11   0.92     6.80      0.619          0.336    (  0.557)        0.283
  12   1.00     5.00      0.455          0.336    (  0.409)        0.119
               (Loss Rate Not Used)
     Sum =     100.0                                    Sum =     5.1
       Flood volume = Effective rainfall      0.42(In)
        times area      68.9(Ac.)/[(In)/(Ft.)] =       2.4(Ac.Ft)
       Total soil loss =      0.34(In)
       Total soil loss =     1.927(Ac.Ft)
       Total rainfall =      0.76(In)
       Flood volume =      105644.3 Cubic Feet
       Total soil loss =       83957.4 Cubic Feet
       ------------------------------------------------------------------------
        Peak flow rate of this hydrograph =     94.087(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        25.0       50.0       75.0      100.0
 ------------------------------------------------------------------------------
   0+ 5       0.0045       0.65  Q          |          |          |          |
   0+10       0.0207       2.35  Q          |          |          |          |
   0+15       0.0485       4.04  VQ         |          |          |          |
   0+20       0.0933       6.51  |VQ        |          |          |          |
   0+25       0.1510       8.37  | VQ       |          |          |          |
   0+30       0.2346      12.14  |  VQ      |          |          |          |
   0+35       0.3478      16.44  |    VQ    |          |          |          |
   0+40       0.4988      21.92  |       Q  |          |          |          |
   0+45       0.7177      31.78  |          |VQ        |          |          |
   0+50       1.1762      66.58  |          |        V |     Q    |          |
   0+55       1.8242      94.09  |          |          |          V       Q  |
   1+ 0       2.1098      41.47  |          |     Q    |          |   V      |
   1+ 5       2.2577      21.48  |       Q  |          |          |      V   |
   1+10       2.3327      10.88  |   Q      |          |          |       V  |
   1+15       2.3774       6.50  | Q        |          |          |         V|
   1+20       2.4043       3.90  |Q         |          |          |         V|
   1+25       2.4219       2.56  |Q         |          |          |         V|
   1+30       2.4245       0.38  Q          |          |          |         V|
   1+35       2.4253       0.11  Q          |          |          |         V|
------------------------------------------------------------------------------
```

Area 'C' – 10 Year 3 Hour Existing Condition – Unit Hydrograph

```
        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  06/16/20 File: EXC010310.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'C'
EXISTING CONDITION UNIT HYDROGRAPH - 10 YEAR 3 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =      68.90(Ac.)  =      0.108 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      68.90(Ac.)  =      0.108 Sq. Mi.
Length along longest watercourse =    2520.00(Ft.)
Length along longest watercourse measured to centroid =     851.00(Ft.)
Length along longest watercourse =      0.477 Mi.
Length along longest watercourse measured to centroid =      0.161 Mi.
Difference in elevation =     288.00(Ft.)
Slope along watercourse =    603.4286 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.080 Hr.
Lag time =     4.83 Min.
25% of lag time =     1.21 Min.
40% of lag time =     1.93 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]
       68.90            0.80                 55.12

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       68.90            1.80                124.02

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    0.800(In)
Area Averaged 100-Year Rainfall =    1.800(In)

Point rain (area averaged) =    1.211(In)
Areal adjustment factor =   99.97 %
Adjusted average point rain =    1.211(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
```

```
          68.900           72.23         0.000
 Total Area Entered =     68.90(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)       (Dec.)    (In/Hr)
72.2  72.2      0.336     0.000        0.336        1.000      0.336
                                                  Sum (F) =    0.336
Area averaged mean soil loss (F) (In/Hr) =  0.336
Minimum soil loss rate ((In/Hr)) =  0.168
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.900
------------------------------------------------------------------------

               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        103.538         20.284            14.085
    2   0.167        207.077         48.627            33.766
    3   0.250        310.615         15.124            10.502
    4   0.333        414.154          6.877             4.776
    5   0.417        517.692          3.840             2.666
    6   0.500        621.230          2.468             1.714
    7   0.583        724.769          1.493             1.036
    8   0.667        828.307          1.286             0.893
                              Sum = 100.000   Sum=      69.438
------------------------------------------------------------------------
```

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	0.189	(0.336)	0.170	0.019
2	0.17	1.30	0.189	(0.336)	0.170	0.019
3	0.25	1.10	0.160	(0.336)	0.144	0.016
4	0.33	1.50	0.218	(0.336)	0.196	0.022
5	0.42	1.50	0.218	(0.336)	0.196	0.022
6	0.50	1.80	0.262	(0.336)	0.235	0.026
7	0.58	1.50	0.218	(0.336)	0.196	0.022
8	0.67	1.80	0.262	(0.336)	0.235	0.026
9	0.75	1.80	0.262	(0.336)	0.235	0.026
10	0.83	1.50	0.218	(0.336)	0.196	0.022
11	0.92	1.60	0.233	(0.336)	0.209	0.023
12	1.00	1.80	0.262	(0.336)	0.235	0.026
13	1.08	2.20	0.320	(0.336)	0.288	0.032
14	1.17	2.20	0.320	(0.336)	0.288	0.032
15	1.25	2.20	0.320	(0.336)	0.288	0.032
16	1.33	2.00	0.291	(0.336)	0.262	0.029
17	1.42	2.60	0.378	0.336	(0.340)	0.042
18	1.50	2.70	0.392	0.336	(0.353)	0.057
19	1.58	2.40	0.349	(0.336)	0.314	0.035
20	1.67	2.70	0.392	0.336	(0.353)	0.057
21	1.75	3.30	0.480	0.336	(0.432)	0.144
22	1.83	3.10	0.451	0.336	(0.405)	0.115
23	1.92	2.90	0.421	0.336	(0.379)	0.086
24	2.00	3.00	0.436	0.336	(0.392)	0.100
25	2.08	3.10	0.451	0.336	(0.405)	0.115
26	2.17	4.20	0.610	0.336	(0.549)	0.275
27	2.25	5.00	0.727	0.336	(0.654)	0.391
28	2.33	3.50	0.509	0.336	(0.458)	0.173
29	2.42	6.80	0.988	0.336	(0.889)	0.653
30	2.50	7.30	1.061	0.336	(0.955)	0.725
31	2.58	8.20	1.192	0.336	(1.072)	0.856
32	2.67	5.90	0.857	0.336	(0.772)	0.522
33	2.75	2.00	0.291	(0.336)	0.262	0.029
34	2.83	1.80	0.262	(0.336)	0.235	0.026

```
 35   2.92     1.80      0.262       (  0.336)       0.235        0.026
 36   3.00     0.60      0.087       (  0.336)       0.078        0.009
              (Loss Rate Not Used)
    Sum =     100.0                                   Sum =     4.8
      Flood volume = Effective rainfall      0.40(In)
       times area      68.9(Ac.)/[(In)/(Ft.)] =       2.3(Ac.Ft)
      Total soil loss =      0.81(In)
      Total soil loss =     4.643(Ac.Ft)
      Total rainfall =      1.21(In)
      Flood volume =      100624.9 Cubic Feet
      Total soil loss =      202265.4 Cubic Feet
      --------------------------------------------------------------------
       Peak flow rate of this hydrograph =     48.527(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       0.0018      0.27  Q          |          |          |          |
  0+10       0.0081      0.90  Q          |          |          |          |
  0+15       0.0154      1.06  Q          |          |          |          |
  0+20       0.0232      1.14  Q          |          |          |          |
  0+25       0.0325      1.35  VQ         |          |          |          |
  0+30       0.0428      1.49  VQ         |          |          |          |
  0+35       0.0539      1.62  VQ         |          |          |          |
  0+40       0.0650      1.61  |Q         |          |          |          |
  0+45       0.0770      1.74  |Q         |          |          |          |
  0+50       0.0888      1.71  |Q         |          |          |          |
  0+55       0.0998      1.61  |Q         |          |          |          |
  1+ 0       0.1113      1.66  |Q         |          |          |          |
  1+ 5       0.1240      1.84  |QV        |          |          |          |
  1+10       0.1382      2.07  |QV        |          |          |          |
  1+15       0.1530      2.14  |QV        |          |          |          |
  1+20       0.1677      2.13  |QV        |          |          |          |
  1+25       0.1831      2.24  |Q V       |          |          |          |
  1+30       0.2028      2.87  | QV       |          |          |          |
  1+35       0.2248      3.19  | QV       |          |          |          |
  1+40       0.2452      2.97  | Q V      |          |          |          |
  1+45       0.2783      4.80  |  QV      |          |          |          |
  1+50       0.3301      7.52  |    VQ    |          |          |          |
  1+55       0.3792      7.13  |    QV    |          |          |          |
  2+ 0       0.4241      6.51  |    Q V   |          |          |          |
  2+ 5       0.4725      7.02  |    Q  V  |          |          |          |
  2+10       0.5403      9.86  |      Q V |          |          |          |
  2+15       0.6581     17.10  |          |V Q       |          |          |
  2+20       0.7941     19.74  |          |  V Q     |          |          |
  2+25       0.9396     21.13  |          |     Q    |          |          |
  2+30       1.1948     37.06  |          |          V          Q|          |
  2+35       1.5114     45.97  |          |          |     V    |     Q    |
  2+40       1.8456     48.53  |          |          |          |V      Q  |
  2+45       2.0741     33.18  |          |          |     Q    |    V     |
  2+50       2.1740     14.50  |          |Q         |          |      V   |
  2+55       2.2319      8.41  |     Q    |          |          |       V  |
  3+ 0       2.2706      5.61  |   Q      |          |          |        V |
  3+ 5       2.2927      3.20  | Q        |          |          |        V |
  3+10       2.3040      1.64  |Q         |          |          |        V |
  3+15       2.3085      0.65  Q          |          |          |        V |
  3+20       2.3093      0.12  Q          |          |          |        V |
  3+25       2.3098      0.07  Q          |          |          |        V |
  3+30       2.3100      0.03  Q          |          |          |        V |
  3+35       2.3100      0.01  Q          |          |          |         V
-------------------------------------------------------------------------
```

Area 'C' – 10 Year 6 Hour Existing Condition – Unit Hydrograph

```
        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  06/16/20 File: EXC010610.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'C'
EXISTING CONDITION UNIT HYDROGRAPH - 10 YEAR 6 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =      68.90(Ac.)  =      0.108 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      68.90(Ac.)  =      0.108 Sq. Mi.
Length along longest watercourse =    2520.00(Ft.)
Length along longest watercourse measured to centroid =     851.00(Ft.)
Length along longest watercourse =      0.477 Mi.
Length along longest watercourse measured to centroid =      0.161 Mi.
Difference in elevation =     288.00(Ft.)
Slope along watercourse =    603.4286 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.080 Hr.
Lag time =     4.83 Min.
25% of lag time =     1.21 Min.
40% of lag time =     1.93 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]
       68.90            1.00                 68.90

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       68.90            2.50                172.25

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    1.000(In)
Area Averaged 100-Year Rainfall =    2.500(In)

Point rain (area averaged) =    1.617(In)
Areal adjustment factor =   99.98 %
Adjusted average point rain =    1.617(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
```

```
          68.900           72.23         0.000
 Total Area Entered =     68.90(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)       (Dec.)    (In/Hr)
72.2  72.2      0.336     0.000        0.336        1.000      0.336
                                                  Sum (F) =    0.336
Area averaged mean soil loss (F) (In/Hr) =  0.336
Minimum soil loss rate ((In/Hr)) =  0.168
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.900
------------------------------------------------------------------------

               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        103.538         20.284            14.085
     2   0.167        207.077         48.627            33.766
     3   0.250        310.615         15.124            10.502
     4   0.333        414.154          6.877             4.776
     5   0.417        517.692          3.840             2.666
     6   0.500        621.230          2.468             1.714
     7   0.583        724.769          1.493             1.036
     8   0.667        828.307          1.286             0.893
                              Sum = 100.000   Sum=      69.438
------------------------------------------------------------------------
```

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	0.097	(0.336)	0.087	0.010
2	0.17	0.60	0.116	(0.336)	0.105	0.012
3	0.25	0.60	0.116	(0.336)	0.105	0.012
4	0.33	0.60	0.116	(0.336)	0.105	0.012
5	0.42	0.60	0.116	(0.336)	0.105	0.012
6	0.50	0.70	0.136	(0.336)	0.122	0.014
7	0.58	0.70	0.136	(0.336)	0.122	0.014
8	0.67	0.70	0.136	(0.336)	0.122	0.014
9	0.75	0.70	0.136	(0.336)	0.122	0.014
10	0.83	0.70	0.136	(0.336)	0.122	0.014
11	0.92	0.70	0.136	(0.336)	0.122	0.014
12	1.00	0.80	0.155	(0.336)	0.140	0.016
13	1.08	0.80	0.155	(0.336)	0.140	0.016
14	1.17	0.80	0.155	(0.336)	0.140	0.016
15	1.25	0.80	0.155	(0.336)	0.140	0.016
16	1.33	0.80	0.155	(0.336)	0.140	0.016
17	1.42	0.80	0.155	(0.336)	0.140	0.016
18	1.50	0.80	0.155	(0.336)	0.140	0.016
19	1.58	0.80	0.155	(0.336)	0.140	0.016
20	1.67	0.80	0.155	(0.336)	0.140	0.016
21	1.75	0.80	0.155	(0.336)	0.140	0.016
22	1.83	0.80	0.155	(0.336)	0.140	0.016
23	1.92	0.80	0.155	(0.336)	0.140	0.016
24	2.00	0.90	0.175	(0.336)	0.157	0.017
25	2.08	0.80	0.155	(0.336)	0.140	0.016
26	2.17	0.90	0.175	(0.336)	0.157	0.017
27	2.25	0.90	0.175	(0.336)	0.157	0.017
28	2.33	0.90	0.175	(0.336)	0.157	0.017
29	2.42	0.90	0.175	(0.336)	0.157	0.017
30	2.50	0.90	0.175	(0.336)	0.157	0.017
31	2.58	0.90	0.175	(0.336)	0.157	0.017
32	2.67	0.90	0.175	(0.336)	0.157	0.017
33	2.75	1.00	0.194	(0.336)	0.175	0.019
34	2.83	1.00	0.194	(0.336)	0.175	0.019

```
 35   2.92     1.00      0.194       (  0.336)       0.175        0.019
 36   3.00     1.00      0.194       (  0.336)       0.175        0.019
 37   3.08     1.00      0.194       (  0.336)       0.175        0.019
 38   3.17     1.10      0.213       (  0.336)       0.192        0.021
 39   3.25     1.10      0.213       (  0.336)       0.192        0.021
 40   3.33     1.10      0.213       (  0.336)       0.192        0.021
 41   3.42     1.20      0.233       (  0.336)       0.210        0.023
 42   3.50     1.30      0.252       (  0.336)       0.227        0.025
 43   3.58     1.40      0.272       (  0.336)       0.244        0.027
 44   3.67     1.40      0.272       (  0.336)       0.244        0.027
 45   3.75     1.50      0.291       (  0.336)       0.262        0.029
 46   3.83     1.50      0.291       (  0.336)       0.262        0.029
 47   3.92     1.60      0.310       (  0.336)       0.279        0.031
 48   4.00     1.60      0.310       (  0.336)       0.279        0.031
 49   4.08     1.70      0.330       (  0.336)       0.297        0.033
 50   4.17     1.80      0.349       (  0.336)       0.314        0.035
 51   4.25     1.90      0.369       (  0.336)       0.332        0.037
 52   4.33     2.00      0.388          0.336    (  0.349)       0.052
 53   4.42     2.10      0.407          0.336    (  0.367)       0.072
 54   4.50     2.10      0.407          0.336    (  0.367)       0.072
 55   4.58     2.20      0.427          0.336    (  0.384)       0.091
 56   4.67     2.30      0.446          0.336    (  0.402)       0.111
 57   4.75     2.40      0.466          0.336    (  0.419)       0.130
 58   4.83     2.40      0.466          0.336    (  0.419)       0.130
 59   4.92     2.50      0.485          0.336    (  0.437)       0.149
 60   5.00     2.60      0.504          0.336    (  0.454)       0.169
 61   5.08     3.10      0.601          0.336    (  0.541)       0.266
 62   5.17     3.60      0.698          0.336    (  0.629)       0.363
 63   5.25     3.90      0.757          0.336    (  0.681)       0.421
 64   5.33     4.20      0.815          0.336    (  0.733)       0.479
 65   5.42     4.70      0.912          0.336    (  0.821)       0.576
 66   5.50     5.60      1.086          0.336    (  0.978)       0.751
 67   5.58     1.90      0.369       (  0.336)       0.332        0.037
 68   5.67     0.90      0.175       (  0.336)       0.157        0.017
 69   5.75     0.60      0.116       (  0.336)       0.105        0.012
 70   5.83     0.50      0.097       (  0.336)       0.087        0.010
 71   5.92     0.30      0.058       (  0.336)       0.052        0.006
 72   6.00     0.20      0.039       (  0.336)       0.035        0.004
              (Loss Rate Not Used)
    Sum =     100.0                                  Sum =     4.9
      Flood volume = Effective rainfall      0.41(In)
       times area      68.9(Ac.)/[(In)/(Ft.)] =       2.3(Ac.Ft)
      Total soil loss =      1.21(In)
      Total soil loss =     6.946(Ac.Ft)
      Total rainfall =      1.62(In)
      Flood volume =      101800.1 Cubic Feet
      Total soil loss =      302555.2 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     38.822(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       10.0      20.0      30.0      40.0
-------------------------------------------------------------------------
  0+ 5       0.0009      0.14  Q          |         |         |         |
  0+10       0.0043      0.49  Q          |         |         |         |
  0+15       0.0089      0.66  Q          |         |         |         |
  0+20       0.0139      0.73  Q          |         |         |         |
  0+25       0.0191      0.76  Q          |         |         |         |
  0+30       0.0247      0.81  Q          |         |         |         |
  0+35       0.0308      0.89  Q          |         |         |         |
  0+40       0.0372      0.92  Q          |         |         |         |
  0+45       0.0436      0.93  Q          |         |         |         |
  0+50       0.0500      0.94  Q          |         |         |         |
  0+55       0.0565      0.94  Q          |         |         |         |
  1+ 0       0.0632      0.97  QV         |         |         |         |
  1+ 5       0.0703      1.04  |Q         |         |         |         |
  1+10       0.0776      1.06  |Q         |         |         |         |
```

```
    1+15       0.0849      1.07  |Q        |         |         |         |
    1+20       0.0923      1.07  |Q        |         |         |         |
    1+25       0.0997      1.07  |Q        |         |         |         |
    1+30       0.1071      1.08  |Q        |         |         |         |
    1+35       0.1145      1.08  |Q        |         |         |         |
    1+40       0.1220      1.08  |QV       |         |         |         |
    1+45       0.1294      1.08  |QV       |         |         |         |
    1+50       0.1368      1.08  |QV       |         |         |         |
    1+55       0.1442      1.08  |QV       |         |         |         |
    2+ 0       0.1519      1.11  |QV       |         |         |         |
    2+ 5       0.1597      1.14  |QV       |         |         |         |
    2+10       0.1675      1.13  |QV       |         |         |         |
    2+15       0.1756      1.18  |Q V      |         |         |         |
    2+20       0.1839      1.20  |Q V      |         |         |         |
    2+25       0.1922      1.20  |Q V      |         |         |         |
    2+30       0.2005      1.21  |Q V      |         |         |         |
    2+35       0.2088      1.21  |Q V      |         |         |         |
    2+40       0.2172      1.21  |Q V      |         |         |         |
    2+45       0.2257      1.24  |Q V      |         |         |         |
    2+50       0.2347      1.31  |Q  V     |         |         |         |
    2+55       0.2438      1.33  |Q  V     |         |         |         |
    3+ 0       0.2530      1.34  |Q  V     |         |         |         |
    3+ 5       0.2623      1.34  |Q  V     |         |         |         |
    3+10       0.2717      1.37  |Q  V     |         |         |         |
    3+15       0.2816      1.44  |Q  V     |         |         |         |
    3+20       0.2917      1.46  |Q  V     |         |         |         |
    3+25       0.3020      1.50  |Q   V    |         |         |         |
    3+30       0.3130      1.60  |Q   V    |         |         |         |
    3+35       0.3248      1.71  |Q   V    |         |         |         |
    3+40       0.3372      1.81  |Q   V    |         |         |         |
    3+45       0.3501      1.87  |Q   V    |         |         |         |
    3+50       0.3636      1.96  |Q    V   |         |         |         |
    3+55       0.3775      2.02  | Q   V   |         |         |         |
    4+ 0       0.3919      2.10  | Q   V   |         |         |         |
    4+ 5       0.4068      2.15  | Q   V   |         |         |         |
    4+10       0.4223      2.26  | Q    V  |         |         |         |
    4+15       0.4387      2.38  | Q    V  |         |         |         |
    4+20       0.4573      2.70  | Q    V  |         |         |         |
    4+25       0.4817      3.53  |  Q    V |         |         |         |
    4+30       0.5118      4.37  |   Q   V |         |         |         |
    4+35       0.5457      4.93  |   Q    V|         |         |         |
    4+40       0.5870      6.00  |     Q   V         |         |         |
    4+45       0.6367      7.22  |      Q  V         |         |         |
    4+50       0.6933      8.22  |       Q |V        |         |         |
    4+55       0.7545      8.87  |       Q | V       |         |         |
    5+ 0       0.8233     10.00  |         Q|   V     |         |         |
    5+ 5       0.9082     12.33  |          | Q  V    |         |         |
    5+10       1.0277     17.34  |          |      Q  |         |         |
    5+15       1.1836     22.64  |          |         V Q       |         |
    5+20       1.3696     27.01  |          |         |  V   Q  |         |
    5+25       1.5882     31.73  |          |         |      V  |Q        |
    5+30       1.8555     38.82  |          |         |         |V      Q |
    5+35       2.1062     36.40  |          |         |         |     Q   |
    5+40       2.2078     14.75  |          |   Q     |         |      V  |
    5+45       2.2618      7.85  |      Q   |         |         |       V |
    5+50       2.2945      4.75  |   Q      |         |         |        V|
    5+55       2.3154      3.03  |  Q       |         |         |        V|
    6+ 0       2.3279      1.81  |Q         |         |         |        V|
    6+ 5       2.3348      1.01  |Q         |         |         |        V|
    6+10       2.3360      0.17  Q          |         |         |        V|
    6+15       2.3365      0.08  Q          |         |         |        V|
    6+20       2.3368      0.04  Q          |         |         |        V|
    6+25       2.3369      0.02  Q          |         |         |        V|
    6+30       2.3370      0.01  Q          |         |         |        V|
    6+35       2.3370      0.00  Q          |         |         |         V
---------------------------------------------------------------------------
```

Area 'C' – 10 Year 24 Hour Existing Condition – Unit Hydrograph

```
        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  06/16/20 File: EXC0102410.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'C'
EXISTING CONDITION UNIT HYDROGRAPH - 10 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =      68.90(Ac.)  =      0.108 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      68.90(Ac.)  =      0.108 Sq. Mi.
Length along longest watercourse =    2520.00(Ft.)
Length along longest watercourse measured to centroid =     851.00(Ft.)
Length along longest watercourse =      0.477 Mi.
Length along longest watercourse measured to centroid =      0.161 Mi.
Difference in elevation =     288.00(Ft.)
Slope along watercourse =    603.4286 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.080 Hr.
Lag time =     4.83 Min.
25% of lag time =     1.21 Min.
40% of lag time =     1.93 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]
       68.90            1.60                110.24

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       68.90            4.00                275.60

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    1.600(In)
Area Averaged 100-Year Rainfall =    4.000(In)

Point rain (area averaged) =    2.587(In)
Areal adjustment factor =   99.99 %
Adjusted average point rain =    2.587(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
```

```
          68.900           72.23         0.000
 Total Area Entered =     68.90(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)       (Dec.)    (In/Hr)
72.2  72.2      0.336     0.000        0.336        1.000      0.336
                                                  Sum (F) =    0.336
Area averaged mean soil loss (F) (In/Hr) =  0.336
Minimum soil loss rate ((In/Hr)) =  0.168
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.900
------------------------------------------------------------------------

               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        103.538         20.284            14.085
    2   0.167        207.077         48.627            33.766
    3   0.250        310.615         15.124            10.502
    4   0.333        414.154          6.877             4.776
    5   0.417        517.692          3.840             2.666
    6   0.500        621.230          2.468             1.714
    7   0.583        724.769          1.493             1.036
    8   0.667        828.307          1.286             0.893
                              Sum = 100.000   Sum=      69.438
------------------------------------------------------------------------
```

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	0.021	(0.595)	0.019	0.002
2	0.17	0.07	0.021	(0.593)	0.019	0.002
3	0.25	0.07	0.021	(0.590)	0.019	0.002
4	0.33	0.10	0.031	(0.588)	0.028	0.003
5	0.42	0.10	0.031	(0.586)	0.028	0.003
6	0.50	0.10	0.031	(0.584)	0.028	0.003
7	0.58	0.10	0.031	(0.581)	0.028	0.003
8	0.67	0.10	0.031	(0.579)	0.028	0.003
9	0.75	0.10	0.031	(0.577)	0.028	0.003
10	0.83	0.13	0.041	(0.575)	0.037	0.004
11	0.92	0.13	0.041	(0.572)	0.037	0.004
12	1.00	0.13	0.041	(0.570)	0.037	0.004
13	1.08	0.10	0.031	(0.568)	0.028	0.003
14	1.17	0.10	0.031	(0.566)	0.028	0.003
15	1.25	0.10	0.031	(0.563)	0.028	0.003
16	1.33	0.10	0.031	(0.561)	0.028	0.003
17	1.42	0.10	0.031	(0.559)	0.028	0.003
18	1.50	0.10	0.031	(0.557)	0.028	0.003
19	1.58	0.10	0.031	(0.554)	0.028	0.003
20	1.67	0.10	0.031	(0.552)	0.028	0.003
21	1.75	0.10	0.031	(0.550)	0.028	0.003
22	1.83	0.13	0.041	(0.548)	0.037	0.004
23	1.92	0.13	0.041	(0.545)	0.037	0.004
24	2.00	0.13	0.041	(0.543)	0.037	0.004
25	2.08	0.13	0.041	(0.541)	0.037	0.004
26	2.17	0.13	0.041	(0.539)	0.037	0.004
27	2.25	0.13	0.041	(0.537)	0.037	0.004
28	2.33	0.13	0.041	(0.535)	0.037	0.004
29	2.42	0.13	0.041	(0.532)	0.037	0.004
30	2.50	0.13	0.041	(0.530)	0.037	0.004
31	2.58	0.17	0.052	(0.528)	0.047	0.005
32	2.67	0.17	0.052	(0.526)	0.047	0.005
33	2.75	0.17	0.052	(0.524)	0.047	0.005
34	2.83	0.17	0.052	(0.522)	0.047	0.005

35	2.92	0.17	0.052	(0.519)	0.047	0.005
36	3.00	0.17	0.052	(0.517)	0.047	0.005
37	3.08	0.17	0.052	(0.515)	0.047	0.005
38	3.17	0.17	0.052	(0.513)	0.047	0.005
39	3.25	0.17	0.052	(0.511)	0.047	0.005
40	3.33	0.17	0.052	(0.509)	0.047	0.005
41	3.42	0.17	0.052	(0.507)	0.047	0.005
42	3.50	0.17	0.052	(0.504)	0.047	0.005
43	3.58	0.17	0.052	(0.502)	0.047	0.005
44	3.67	0.17	0.052	(0.500)	0.047	0.005
45	3.75	0.17	0.052	(0.498)	0.047	0.005
46	3.83	0.20	0.062	(0.496)	0.056	0.006
47	3.92	0.20	0.062	(0.494)	0.056	0.006
48	4.00	0.20	0.062	(0.492)	0.056	0.006
49	4.08	0.20	0.062	(0.490)	0.056	0.006
50	4.17	0.20	0.062	(0.488)	0.056	0.006
51	4.25	0.20	0.062	(0.486)	0.056	0.006
52	4.33	0.23	0.072	(0.484)	0.065	0.007
53	4.42	0.23	0.072	(0.481)	0.065	0.007
54	4.50	0.23	0.072	(0.479)	0.065	0.007
55	4.58	0.23	0.072	(0.477)	0.065	0.007
56	4.67	0.23	0.072	(0.475)	0.065	0.007
57	4.75	0.23	0.072	(0.473)	0.065	0.007
58	4.83	0.27	0.083	(0.471)	0.075	0.008
59	4.92	0.27	0.083	(0.469)	0.075	0.008
60	5.00	0.27	0.083	(0.467)	0.075	0.008
61	5.08	0.20	0.062	(0.465)	0.056	0.006
62	5.17	0.20	0.062	(0.463)	0.056	0.006
63	5.25	0.20	0.062	(0.461)	0.056	0.006
64	5.33	0.23	0.072	(0.459)	0.065	0.007
65	5.42	0.23	0.072	(0.457)	0.065	0.007
66	5.50	0.23	0.072	(0.455)	0.065	0.007
67	5.58	0.27	0.083	(0.453)	0.075	0.008
68	5.67	0.27	0.083	(0.451)	0.075	0.008
69	5.75	0.27	0.083	(0.449)	0.075	0.008
70	5.83	0.27	0.083	(0.447)	0.075	0.008
71	5.92	0.27	0.083	(0.445)	0.075	0.008
72	6.00	0.27	0.083	(0.443)	0.075	0.008
73	6.08	0.30	0.093	(0.441)	0.084	0.009
74	6.17	0.30	0.093	(0.439)	0.084	0.009
75	6.25	0.30	0.093	(0.437)	0.084	0.009
76	6.33	0.30	0.093	(0.435)	0.084	0.009
77	6.42	0.30	0.093	(0.433)	0.084	0.009
78	6.50	0.30	0.093	(0.431)	0.084	0.009
79	6.58	0.33	0.103	(0.429)	0.093	0.010
80	6.67	0.33	0.103	(0.427)	0.093	0.010
81	6.75	0.33	0.103	(0.426)	0.093	0.010
82	6.83	0.33	0.103	(0.424)	0.093	0.010
83	6.92	0.33	0.103	(0.422)	0.093	0.010
84	7.00	0.33	0.103	(0.420)	0.093	0.010
85	7.08	0.33	0.103	(0.418)	0.093	0.010
86	7.17	0.33	0.103	(0.416)	0.093	0.010
87	7.25	0.33	0.103	(0.414)	0.093	0.010
88	7.33	0.37	0.114	(0.412)	0.102	0.011
89	7.42	0.37	0.114	(0.410)	0.102	0.011
90	7.50	0.37	0.114	(0.408)	0.102	0.011
91	7.58	0.40	0.124	(0.407)	0.112	0.012
92	7.67	0.40	0.124	(0.405)	0.112	0.012
93	7.75	0.40	0.124	(0.403)	0.112	0.012
94	7.83	0.43	0.135	(0.401)	0.121	0.013
95	7.92	0.43	0.135	(0.399)	0.121	0.013
96	8.00	0.43	0.135	(0.397)	0.121	0.013
97	8.08	0.50	0.155	(0.395)	0.140	0.016
98	8.17	0.50	0.155	(0.394)	0.140	0.016
99	8.25	0.50	0.155	(0.392)	0.140	0.016
100	8.33	0.50	0.155	(0.390)	0.140	0.016
101	8.42	0.50	0.155	(0.388)	0.140	0.016
102	8.50	0.50	0.155	(0.386)	0.140	0.016
103	8.58	0.53	0.166	(0.384)	0.149	0.017
104	8.67	0.53	0.166	(0.383)	0.149	0.017
105	8.75	0.53	0.166	(0.381)	0.149	0.017
106	8.83	0.57	0.176	(0.379)	0.158	0.018
107	8.92	0.57	0.176	(0.377)	0.158	0.018

108	9.00	0.57	0.176	(0.375)	0.158	0.018
109	9.08	0.63	0.197	(0.374)	0.177	0.020
110	9.17	0.63	0.197	(0.372)	0.177	0.020
111	9.25	0.63	0.197	(0.370)	0.177	0.020
112	9.33	0.67	0.207	(0.368)	0.186	0.021
113	9.42	0.67	0.207	(0.367)	0.186	0.021
114	9.50	0.67	0.207	(0.365)	0.186	0.021
115	9.58	0.70	0.217	(0.363)	0.196	0.022
116	9.67	0.70	0.217	(0.361)	0.196	0.022
117	9.75	0.70	0.217	(0.360)	0.196	0.022
118	9.83	0.73	0.228	(0.358)	0.205	0.023
119	9.92	0.73	0.228	(0.356)	0.205	0.023
120	10.00	0.73	0.228	(0.354)	0.205	0.023
121	10.08	0.50	0.155	(0.353)	0.140	0.016
122	10.17	0.50	0.155	(0.351)	0.140	0.016
123	10.25	0.50	0.155	(0.349)	0.140	0.016
124	10.33	0.50	0.155	(0.348)	0.140	0.016
125	10.42	0.50	0.155	(0.346)	0.140	0.016
126	10.50	0.50	0.155	(0.344)	0.140	0.016
127	10.58	0.67	0.207	(0.343)	0.186	0.021
128	10.67	0.67	0.207	(0.341)	0.186	0.021
129	10.75	0.67	0.207	(0.339)	0.186	0.021
130	10.83	0.67	0.207	(0.338)	0.186	0.021
131	10.92	0.67	0.207	(0.336)	0.186	0.021
132	11.00	0.67	0.207	(0.334)	0.186	0.021
133	11.08	0.63	0.197	(0.333)	0.177	0.020
134	11.17	0.63	0.197	(0.331)	0.177	0.020
135	11.25	0.63	0.197	(0.329)	0.177	0.020
136	11.33	0.63	0.197	(0.328)	0.177	0.020
137	11.42	0.63	0.197	(0.326)	0.177	0.020
138	11.50	0.63	0.197	(0.325)	0.177	0.020
139	11.58	0.57	0.176	(0.323)	0.158	0.018
140	11.67	0.57	0.176	(0.321)	0.158	0.018
141	11.75	0.57	0.176	(0.320)	0.158	0.018
142	11.83	0.60	0.186	(0.318)	0.168	0.019
143	11.92	0.60	0.186	(0.317)	0.168	0.019
144	12.00	0.60	0.186	(0.315)	0.168	0.019
145	12.08	0.83	0.259	(0.313)	0.233	0.026
146	12.17	0.83	0.259	(0.312)	0.233	0.026
147	12.25	0.83	0.259	(0.310)	0.233	0.026
148	12.33	0.87	0.269	(0.309)	0.242	0.027
149	12.42	0.87	0.269	(0.307)	0.242	0.027
150	12.50	0.87	0.269	(0.306)	0.242	0.027
151	12.58	0.93	0.290	(0.304)	0.261	0.029
152	12.67	0.93	0.290	(0.303)	0.261	0.029
153	12.75	0.93	0.290	(0.301)	0.261	0.029
154	12.83	0.97	0.300	(0.299)	0.270	0.030
155	12.92	0.97	0.300	(0.298)	0.270	0.030
156	13.00	0.97	0.300	(0.296)	0.270	0.030
157	13.08	1.13	0.352	0.295	(0.317)	0.057
158	13.17	1.13	0.352	0.293	(0.317)	0.058
159	13.25	1.13	0.352	0.292	(0.317)	0.060
160	13.33	1.13	0.352	0.290	(0.317)	0.061
161	13.42	1.13	0.352	0.289	(0.317)	0.063
162	13.50	1.13	0.352	0.288	(0.317)	0.064
163	13.58	0.77	0.238	(0.286)	0.214	0.024
164	13.67	0.77	0.238	(0.285)	0.214	0.024
165	13.75	0.77	0.238	(0.283)	0.214	0.024
166	13.83	0.77	0.238	(0.282)	0.214	0.024
167	13.92	0.77	0.238	(0.280)	0.214	0.024
168	14.00	0.77	0.238	(0.279)	0.214	0.024
169	14.08	0.90	0.279	(0.277)	0.251	0.028
170	14.17	0.90	0.279	(0.276)	0.251	0.028
171	14.25	0.90	0.279	(0.275)	0.251	0.028
172	14.33	0.87	0.269	(0.273)	0.242	0.027
173	14.42	0.87	0.269	(0.272)	0.242	0.027
174	14.50	0.87	0.269	(0.270)	0.242	0.027
175	14.58	0.87	0.269	(0.269)	0.242	0.027
176	14.67	0.87	0.269	(0.268)	0.242	0.027
177	14.75	0.87	0.269	(0.266)	0.242	0.027
178	14.83	0.83	0.259	(0.265)	0.233	0.026
179	14.92	0.83	0.259	(0.264)	0.233	0.026
180	15.00	0.83	0.259	(0.262)	0.233	0.026

181	15.08	0.80	0.248	(0.261)	0.224	0.025
182	15.17	0.80	0.248	(0.260)	0.224	0.025
183	15.25	0.80	0.248	(0.258)	0.224	0.025
184	15.33	0.77	0.238	(0.257)	0.214	0.024
185	15.42	0.77	0.238	(0.256)	0.214	0.024
186	15.50	0.77	0.238	(0.254)	0.214	0.024
187	15.58	0.63	0.197	(0.253)	0.177	0.020
188	15.67	0.63	0.197	(0.252)	0.177	0.020
189	15.75	0.63	0.197	(0.250)	0.177	0.020
190	15.83	0.63	0.197	(0.249)	0.177	0.020
191	15.92	0.63	0.197	(0.248)	0.177	0.020
192	16.00	0.63	0.197	(0.247)	0.177	0.020
193	16.08	0.13	0.041	(0.245)	0.037	0.004
194	16.17	0.13	0.041	(0.244)	0.037	0.004
195	16.25	0.13	0.041	(0.243)	0.037	0.004
196	16.33	0.13	0.041	(0.242)	0.037	0.004
197	16.42	0.13	0.041	(0.240)	0.037	0.004
198	16.50	0.13	0.041	(0.239)	0.037	0.004
199	16.58	0.10	0.031	(0.238)	0.028	0.003
200	16.67	0.10	0.031	(0.237)	0.028	0.003
201	16.75	0.10	0.031	(0.235)	0.028	0.003
202	16.83	0.10	0.031	(0.234)	0.028	0.003
203	16.92	0.10	0.031	(0.233)	0.028	0.003
204	17.00	0.10	0.031	(0.232)	0.028	0.003
205	17.08	0.17	0.052	(0.231)	0.047	0.005
206	17.17	0.17	0.052	(0.230)	0.047	0.005
207	17.25	0.17	0.052	(0.228)	0.047	0.005
208	17.33	0.17	0.052	(0.227)	0.047	0.005
209	17.42	0.17	0.052	(0.226)	0.047	0.005
210	17.50	0.17	0.052	(0.225)	0.047	0.005
211	17.58	0.17	0.052	(0.224)	0.047	0.005
212	17.67	0.17	0.052	(0.223)	0.047	0.005
213	17.75	0.17	0.052	(0.222)	0.047	0.005
214	17.83	0.13	0.041	(0.221)	0.037	0.004
215	17.92	0.13	0.041	(0.219)	0.037	0.004
216	18.00	0.13	0.041	(0.218)	0.037	0.004
217	18.08	0.13	0.041	(0.217)	0.037	0.004
218	18.17	0.13	0.041	(0.216)	0.037	0.004
219	18.25	0.13	0.041	(0.215)	0.037	0.004
220	18.33	0.13	0.041	(0.214)	0.037	0.004
221	18.42	0.13	0.041	(0.213)	0.037	0.004
222	18.50	0.13	0.041	(0.212)	0.037	0.004
223	18.58	0.10	0.031	(0.211)	0.028	0.003
224	18.67	0.10	0.031	(0.210)	0.028	0.003
225	18.75	0.10	0.031	(0.209)	0.028	0.003
226	18.83	0.07	0.021	(0.208)	0.019	0.002
227	18.92	0.07	0.021	(0.207)	0.019	0.002
228	19.00	0.07	0.021	(0.206)	0.019	0.002
229	19.08	0.10	0.031	(0.205)	0.028	0.003
230	19.17	0.10	0.031	(0.204)	0.028	0.003
231	19.25	0.10	0.031	(0.203)	0.028	0.003
232	19.33	0.13	0.041	(0.202)	0.037	0.004
233	19.42	0.13	0.041	(0.201)	0.037	0.004
234	19.50	0.13	0.041	(0.200)	0.037	0.004
235	19.58	0.10	0.031	(0.199)	0.028	0.003
236	19.67	0.10	0.031	(0.198)	0.028	0.003
237	19.75	0.10	0.031	(0.198)	0.028	0.003
238	19.83	0.07	0.021	(0.197)	0.019	0.002
239	19.92	0.07	0.021	(0.196)	0.019	0.002
240	20.00	0.07	0.021	(0.195)	0.019	0.002
241	20.08	0.10	0.031	(0.194)	0.028	0.003
242	20.17	0.10	0.031	(0.193)	0.028	0.003
243	20.25	0.10	0.031	(0.192)	0.028	0.003
244	20.33	0.10	0.031	(0.192)	0.028	0.003
245	20.42	0.10	0.031	(0.191)	0.028	0.003
246	20.50	0.10	0.031	(0.190)	0.028	0.003
247	20.58	0.10	0.031	(0.189)	0.028	0.003
248	20.67	0.10	0.031	(0.188)	0.028	0.003
249	20.75	0.10	0.031	(0.188)	0.028	0.003
250	20.83	0.07	0.021	(0.187)	0.019	0.002
251	20.92	0.07	0.021	(0.186)	0.019	0.002
252	21.00	0.07	0.021	(0.185)	0.019	0.002
253	21.08	0.10	0.031	(0.185)	0.028	0.003

```
254  21.17     0.10      0.031       (  0.184)       0.028        0.003
255  21.25     0.10      0.031       (  0.183)       0.028        0.003
256  21.33     0.07      0.021       (  0.182)       0.019        0.002
257  21.42     0.07      0.021       (  0.182)       0.019        0.002
258  21.50     0.07      0.021       (  0.181)       0.019        0.002
259  21.58     0.10      0.031       (  0.180)       0.028        0.003
260  21.67     0.10      0.031       (  0.180)       0.028        0.003
261  21.75     0.10      0.031       (  0.179)       0.028        0.003
262  21.83     0.07      0.021       (  0.178)       0.019        0.002
263  21.92     0.07      0.021       (  0.178)       0.019        0.002
264  22.00     0.07      0.021       (  0.177)       0.019        0.002
265  22.08     0.10      0.031       (  0.177)       0.028        0.003
266  22.17     0.10      0.031       (  0.176)       0.028        0.003
267  22.25     0.10      0.031       (  0.176)       0.028        0.003
268  22.33     0.07      0.021       (  0.175)       0.019        0.002
269  22.42     0.07      0.021       (  0.174)       0.019        0.002
270  22.50     0.07      0.021       (  0.174)       0.019        0.002
271  22.58     0.07      0.021       (  0.173)       0.019        0.002
272  22.67     0.07      0.021       (  0.173)       0.019        0.002
273  22.75     0.07      0.021       (  0.172)       0.019        0.002
274  22.83     0.07      0.021       (  0.172)       0.019        0.002
275  22.92     0.07      0.021       (  0.172)       0.019        0.002
276  23.00     0.07      0.021       (  0.171)       0.019        0.002
277  23.08     0.07      0.021       (  0.171)       0.019        0.002
278  23.17     0.07      0.021       (  0.170)       0.019        0.002
279  23.25     0.07      0.021       (  0.170)       0.019        0.002
280  23.33     0.07      0.021       (  0.170)       0.019        0.002
281  23.42     0.07      0.021       (  0.169)       0.019        0.002
282  23.50     0.07      0.021       (  0.169)       0.019        0.002
283  23.58     0.07      0.021       (  0.169)       0.019        0.002
284  23.67     0.07      0.021       (  0.169)       0.019        0.002
285  23.75     0.07      0.021       (  0.168)       0.019        0.002
286  23.83     0.07      0.021       (  0.168)       0.019        0.002
287  23.92     0.07      0.021       (  0.168)       0.019        0.002
288  24.00     0.07      0.021       (  0.168)       0.019        0.002
               (Loss Rate Not Used)
    Sum =     100.0                                  Sum =      3.3
      Flood volume = Effective rainfall      0.27(In)
       times area      68.9(Ac.)/[(In)/(Ft.)] =       1.6(Ac.Ft)
      Total soil loss =      2.32(In)
      Total soil loss =    13.295(Ac.Ft)
      Total rainfall =      2.59(In)
      Flood volume =       67884.2 Cubic Feet
      Total soil loss =      579150.4 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =      4.272(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       0.0002      0.03  Q          |         |         |         |
   0+10       0.0009      0.10  Q          |         |         |         |
   0+15       0.0017      0.12  Q          |         |         |         |
   0+20       0.0027      0.15  Q          |         |         |         |
   0+25       0.0040      0.19  Q          |         |         |         |
   0+30       0.0054      0.20  Q          |         |         |         |
   0+35       0.0068      0.21  Q          |         |         |         |
   0+40       0.0083      0.21  Q          |         |         |         |
   0+45       0.0097      0.21  Q          |         |         |         |
   0+50       0.0113      0.23  Q          |         |         |         |
   0+55       0.0131      0.27  VQ         |         |         |         |
   1+ 0       0.0150      0.28  VQ         |         |         |         |
   1+ 5       0.0169      0.27  VQ         |         |         |         |
   1+10       0.0185      0.23  Q          |         |         |         |
   1+15       0.0200      0.23  Q          |         |         |         |
   1+20       0.0216      0.22  Q          |         |         |         |
   1+25       0.0231      0.22  Q          |         |         |         |
```

```
1+30      0.0246      0.22  Q          |          |          |          |
1+35      0.0261      0.22  Q          |          |          |          |
1+40      0.0276      0.22  Q          |          |          |          |
1+45      0.0290      0.22  Q          |          |          |          |
1+50      0.0306      0.23  Q          |          |          |          |
1+55      0.0324      0.27  VQ         |          |          |          |
2+ 0      0.0344      0.28  VQ         |          |          |          |
2+ 5      0.0363      0.28  VQ         |          |          |          |
2+10      0.0382      0.28  VQ         |          |          |          |
2+15      0.0402      0.29  |Q         |          |          |          |
2+20      0.0422      0.29  |Q         |          |          |          |
2+25      0.0442      0.29  |Q         |          |          |          |
2+30      0.0461      0.29  |Q         |          |          |          |
2+35      0.0482      0.30  |Q         |          |          |          |
2+40      0.0505      0.34  |Q         |          |          |          |
2+45      0.0529      0.35  |Q         |          |          |          |
2+50      0.0554      0.35  |Q         |          |          |          |
2+55      0.0578      0.36  |Q         |          |          |          |
3+ 0      0.0603      0.36  |Q         |          |          |          |
3+ 5      0.0628      0.36  |Q         |          |          |          |
3+10      0.0652      0.36  |Q         |          |          |          |
3+15      0.0677      0.36  |Q         |          |          |          |
3+20      0.0702      0.36  |Q         |          |          |          |
3+25      0.0727      0.36  |Q         |          |          |          |
3+30      0.0751      0.36  |Q         |          |          |          |
3+35      0.0776      0.36  |Q         |          |          |          |
3+40      0.0801      0.36  |QV        |          |          |          |
3+45      0.0826      0.36  |QV        |          |          |          |
3+50      0.0851      0.37  |QV        |          |          |          |
3+55      0.0880      0.41  |QV        |          |          |          |
4+ 0      0.0908      0.42  |QV        |          |          |          |
4+ 5      0.0938      0.42  |QV        |          |          |          |
4+10      0.0967      0.43  |QV        |          |          |          |
4+15      0.0997      0.43  |QV        |          |          |          |
4+20      0.1027      0.45  |QV        |          |          |          |
4+25      0.1060      0.48  |QV        |          |          |          |
4+30      0.1094      0.49  |QV        |          |          |          |
4+35      0.1129      0.50  |QV        |          |          |          |
4+40      0.1163      0.50  |QV        |          |          |          |
4+45      0.1197      0.50  | QV       |          |          |          |
4+50      0.1233      0.52  | QV       |          |          |          |
4+55      0.1271      0.55  | QV       |          |          |          |
5+ 0      0.1310      0.56  | QV       |          |          |          |
5+ 5      0.1347      0.54  | QV       |          |          |          |
5+10      0.1380      0.47  |Q V       |          |          |          |
5+15      0.1411      0.45  |Q V       |          |          |          |
5+20      0.1442      0.46  |Q V       |          |          |          |
5+25      0.1476      0.49  |Q V       |          |          |          |
5+30      0.1510      0.50  |Q V       |          |          |          |
5+35      0.1545      0.51  | QV       |          |          |          |
5+40      0.1583      0.55  | Q V      |          |          |          |
5+45      0.1622      0.56  | Q V      |          |          |          |
5+50      0.1661      0.57  | Q V      |          |          |          |
5+55      0.1700      0.57  | Q V      |          |          |          |
6+ 0      0.1740      0.57  | Q V      |          |          |          |
6+ 5      0.1780      0.59  | Q V      |          |          |          |
6+10      0.1823      0.62  | Q V      |          |          |          |
6+15      0.1867      0.64  | Q V      |          |          |          |
6+20      0.1911      0.64  | Q V      |          |          |          |
6+25      0.1956      0.64  | Q  V     |          |          |          |
6+30      0.2000      0.65  | Q  V     |          |          |          |
6+35      0.2046      0.66  | Q  V     |          |          |          |
6+40      0.2094      0.70  | Q  V     |          |          |          |
6+45      0.2142      0.71  | Q  V     |          |          |          |
6+50      0.2191      0.71  | Q  V     |          |          |          |
6+55      0.2241      0.72  | Q  V     |          |          |          |
7+ 0      0.2290      0.72  | Q  V     |          |          |          |
7+ 5      0.2339      0.72  | Q   V    |          |          |          |
7+10      0.2389      0.72  | Q   V    |          |          |          |
7+15      0.2438      0.72  | Q   V    |          |          |          |
7+20      0.2489      0.73  | Q   V    |          |          |          |
7+25      0.2542      0.77  |  Q  V    |          |          |          |
7+30      0.2596      0.78  |  Q  V    |          |          |          |
```

```
 7+35      0.2651      0.80  |  Q  V   |         |         |         |
 7+40      0.2708      0.84  |  Q  V   |         |         |         |
 7+45      0.2767      0.85  |  Q   V  |         |         |         |
 7+50      0.2827      0.87  |  Q   V  |         |         |         |
 7+55      0.2889      0.91  |  Q   V  |         |         |         |
 8+ 0      0.2953      0.92  |  Q   V  |         |         |         |
 8+ 5      0.3018      0.96  |  Q   V  |         |         |         |
 8+10      0.3089      1.03  |   Q  V  |         |         |         |
 8+15      0.3162      1.05  |   Q   V |         |         |         |
 8+20      0.3235      1.06  |   Q   V |         |         |         |
 8+25      0.3309      1.07  |   Q   V |         |         |         |
 8+30      0.3383      1.07  |   Q   V |         |         |         |
 8+35      0.3458      1.09  |   Q   V |         |         |         |
 8+40      0.3536      1.13  |   Q    V|         |         |         |
 8+45      0.3614      1.14  |   Q    V|         |         |         |
 8+50      0.3694      1.16  |   Q    V|         |         |         |
 8+55      0.3776      1.20  |   Q    V|         |         |         |
 9+ 0      0.3860      1.21  |   Q    V|         |         |         |
 9+ 5      0.3945      1.24  |   Q     V         |         |         |
 9+10      0.4036      1.32  |    Q    V         |         |         |
 9+15      0.4128      1.34  |    Q    V         |         |         |
 9+20      0.4222      1.37  |    Q    V         |         |         |
 9+25      0.4319      1.41  |    Q    |V        |         |         |
 9+30      0.4417      1.42  |    Q    |V        |         |         |
 9+35      0.4517      1.44  |    Q    |V        |         |         |
 9+40      0.4619      1.48  |    Q    |V        |         |         |
 9+45      0.4722      1.50  |    Q    | V       |         |         |
 9+50      0.4827      1.52  |     Q   | V       |         |         |
 9+55      0.4934      1.56  |     Q   | V       |         |         |
10+ 0      0.5042      1.57  |     Q   | V       |         |         |
10+ 5      0.5143      1.47  |    Q    |  V      |         |         |
10+10      0.5228      1.23  |   Q     |  V      |         |         |
10+15      0.5308      1.16  |   Q     |  V      |         |         |
10+20      0.5385      1.12  |   Q     |  V      |         |         |
10+25      0.5461      1.10  |   Q     |   V     |         |         |
10+30      0.5536      1.09  |   Q     |   V     |         |         |
10+35      0.5616      1.16  |   Q     |   V     |         |         |
10+40      0.5707      1.33  |    Q    |   V     |         |         |
10+45      0.5802      1.38  |    Q    |   V     |         |         |
10+50      0.5899      1.41  |    Q    |    V    |         |         |
10+55      0.5997      1.42  |    Q    |    V    |         |         |
11+ 0      0.6095      1.43  |    Q    |    V    |         |         |
11+ 5      0.6193      1.42  |    Q    |    V    |         |         |
11+10      0.6289      1.39  |    Q    |     V   |         |         |
11+15      0.6383      1.38  |    Q    |     V   |         |         |
11+20      0.6478      1.37  |    Q    |     V   |         |         |
11+25      0.6572      1.37  |    Q    |     V   |         |         |
11+30      0.6666      1.37  |    Q    |      V  |         |         |
11+35      0.6759      1.34  |    Q    |      V  |         |         |
11+40      0.6846      1.27  |    Q    |      V  |         |         |
11+45      0.6932      1.25  |   Q     |      V  |         |         |
11+50      0.7018      1.25  |   Q     |       V |         |         |
11+55      0.7106      1.28  |    Q    |       V |         |         |
12+ 0      0.7194      1.29  |    Q    |       V |         |         |
12+ 5      0.7290      1.39  |    Q    |       V |         |         |
12+10      0.7403      1.64  |     Q   |        V|         |         |
12+15      0.7521      1.71  |     Q   |        V|         |         |
12+20      0.7643      1.77  |      Q  |        V|         |         |
12+25      0.7768      1.82  |      Q  |        V|         |         |
12+30      0.7895      1.84  |      Q  |         V         |         |
12+35      0.8025      1.89  |      Q  |         V         |         |
12+40      0.8160      1.96  |      Q  |         V         |         |
12+45      0.8297      1.99  |      Q  |         |V        |         |
12+50      0.8436      2.01  |       Q |         |V        |         |
12+55      0.8577      2.05  |       Q |         | V       |         |
13+ 0      0.8720      2.07  |       Q |         | V       |         |
13+ 5      0.8889      2.46  |        Q|         | V       |         |
13+10      0.9122      3.39  |         |  Q      |  V      |         |
13+15      0.9380      3.75  |         |   Q     |   V     |         |
13+20      0.9653      3.96  |         |    Q    |   V     |         |
13+25      0.9937      4.13  |         |     Q   |    V    |         |
13+30      1.0232      4.27  |         |      Q  |     V   |         |
13+35      1.0494      3.81  |         |    Q    |     V   |         |
```

13+40	1.0666	2.49	| Q|	|	| V |	|
13+45	1.0809	2.08	| Q |	|	| V |	|
13+50	1.0940	1.90	| Q |	|	| V |	|
13+55	1.1064	1.80	| Q |	|	| V |	|
14+ 0	1.1183	1.73	| Q |	|	| V |	|
14+ 5	1.1303	1.75	| Q |	|	| V|	|
14+10	1.1431	1.85	| Q |	|	| V|	|
14+15	1.1561	1.90	| Q |	|	| V|	|
14+20	1.1692	1.90	| Q |	|	| V	|
14+25	1.1821	1.88	| Q |	|	| V	|
14+30	1.1950	1.87	| Q |	|	| V	|
14+35	1.2079	1.87	| Q |	|	| |V	|
14+40	1.2208	1.87	| Q |	|	| |V	|
14+45	1.2337	1.87	| Q |	|	| |V	|
14+50	1.2465	1.86	| Q |	|	| |V	|
14+55	1.2590	1.82	| Q |	|	| | V	|
15+ 0	1.2715	1.81	| Q |	|	| | V	|
15+ 5	1.2838	1.79	| Q |	|	| | V	|
15+10	1.2959	1.75	| Q |	|	| | V	|
15+15	1.3079	1.74	| Q |	|	| | V	|
15+20	1.3197	1.72	| Q |	|	| | V	|
15+25	1.3313	1.68	| Q |	|	| | V	|
15+30	1.3427	1.67	| Q |	|	| | V	|
15+35	1.3538	1.60	| Q |	|	| | V	|
15+40	1.3638	1.46	| Q |	|	| | V	|
15+45	1.3736	1.41	| Q |	|	| | V	|
15+50	1.3832	1.39	| Q |	|	| | V	|
15+55	1.3927	1.38	| Q |	|	| | V	|
16+ 0	1.4021	1.37	| Q |	|	| | V	|
16+ 5	1.4101	1.15	| Q |	|	| | V	|
16+10	1.4143	0.62	| Q |	|	| | V	|
16+15	1.4175	0.46	|Q |	|	| | V	|
16+20	1.4202	0.39	|Q |	|	| | V	|
16+25	1.4225	0.34	|Q |	|	| | V	|
16+30	1.4247	0.32	|Q |	|	| | V	|
16+35	1.4267	0.29	|Q |	|	| | V	|
16+40	1.4283	0.24	Q |	|	| | V	|
16+45	1.4299	0.23	Q |	|	| | V	|
16+50	1.4314	0.22	Q |	|	| | V	|
16+55	1.4329	0.22	Q |	|	| | V	|
17+ 0	1.4344	0.22	Q |	|	| | V	|
17+ 5	1.4361	0.25	Q |	|	| | V	|
17+10	1.4383	0.31	|Q |	|	| | V	|
17+15	1.4406	0.34	|Q |	|	| | V	|
17+20	1.4430	0.35	|Q |	|	| | V	|
17+25	1.4454	0.35	|Q |	|	| | V	|
17+30	1.4479	0.36	|Q |	|	| | V	|
17+35	1.4503	0.36	|Q |	|	| | V	|
17+40	1.4528	0.36	|Q |	|	| | V	|
17+45	1.4553	0.36	|Q |	|	| | V	|
17+50	1.4577	0.34	|Q |	|	| | V	|
17+55	1.4598	0.31	|Q |	|	| | V	|
18+ 0	1.4619	0.30	|Q |	|	| | V	|
18+ 5	1.4639	0.29	|Q |	|	| | V	|
18+10	1.4659	0.29	|Q |	|	| | V	|
18+15	1.4679	0.29	|Q |	|	| | V	|
18+20	1.4699	0.29	|Q |	|	| | V	|
18+25	1.4719	0.29	|Q |	|	| | V	|
18+30	1.4738	0.29	|Q |	|	| | V	|
18+35	1.4757	0.27	|Q |	|	| | V	|
18+40	1.4774	0.24	Q |	|	| | V	|
18+45	1.4789	0.23	Q |	|	| | V	|
18+50	1.4803	0.21	Q |	|	| | V	|
18+55	1.4815	0.17	Q |	|	| | V	|
19+ 0	1.4826	0.16	Q |	|	| | V	|
19+ 5	1.4837	0.17	Q |	|	| | V	|
19+10	1.4851	0.20	Q |	|	| | V	|
19+15	1.4865	0.21	Q |	|	| | V	|
19+20	1.4881	0.22	Q |	|	| | V	|
19+25	1.4899	0.26	|Q |	|	| | V	|
19+30	1.4918	0.27	|Q |	|	| | V	|
19+35	1.4936	0.27	|Q |	|	| | V	|
19+40	1.4952	0.23	Q |	|	| | V	|

19+45	1.4968	0.23	Q	|	|	|	V |
19+50	1.4982	0.21	Q	|	|	|	V |
19+55	1.4993	0.17	Q	|	|	|	V |
20+ 0	1.5004	0.16	Q	|	|	|	V |
20+ 5	1.5016	0.17	Q	|	|	|	V |
20+10	1.5029	0.20	Q	|	|	|	V |
20+15	1.5043	0.21	Q	|	|	|	V |
20+20	1.5058	0.21	Q	|	|	|	V |
20+25	1.5073	0.21	Q	|	|	|	V |
20+30	1.5087	0.21	Q	|	|	|	V |
20+35	1.5102	0.21	Q	|	|	|	V |
20+40	1.5117	0.22	Q	|	|	|	V |
20+45	1.5132	0.22	Q	|	|	|	V |
20+50	1.5146	0.20	Q	|	|	|	V |
20+55	1.5157	0.17	Q	|	|	|	V |
21+ 0	1.5168	0.16	Q	|	|	|	V |
21+ 5	1.5179	0.16	Q	|	|	|	V |
21+10	1.5193	0.20	Q	|	|	|	V |
21+15	1.5207	0.21	Q	|	|	|	V|
21+20	1.5220	0.20	Q	|	|	|	V|
21+25	1.5232	0.16	Q	|	|	|	V|
21+30	1.5242	0.15	Q	|	|	|	V|
21+35	1.5253	0.16	Q	|	|	|	V|
21+40	1.5267	0.20	Q	|	|	|	V|
21+45	1.5281	0.21	Q	|	|	|	V|
21+50	1.5295	0.20	Q	|	|	|	V|
21+55	1.5306	0.16	Q	|	|	|	V|
22+ 0	1.5316	0.15	Q	|	|	|	V|
22+ 5	1.5328	0.16	Q	|	|	|	V|
22+10	1.5341	0.20	Q	|	|	|	V|
22+15	1.5355	0.21	Q	|	|	|	V|
22+20	1.5369	0.20	Q	|	|	|	V|
22+25	1.5380	0.16	Q	|	|	|	V|
22+30	1.5391	0.15	Q	|	|	|	V|
22+35	1.5401	0.15	Q	|	|	|	V|
22+40	1.5411	0.15	Q	|	|	|	V|
22+45	1.5421	0.15	Q	|	|	|	V|
22+50	1.5431	0.14	Q	|	|	|	V|
22+55	1.5441	0.14	Q	|	|	|	V|
23+ 0	1.5451	0.14	Q	|	|	|	V|
23+ 5	1.5461	0.14	Q	|	|	|	V|
23+10	1.5471	0.14	Q	|	|	|	V|
23+15	1.5481	0.14	Q	|	|	|	V|
23+20	1.5490	0.14	Q	|	|	|	V|
23+25	1.5500	0.14	Q	|	|	|	V|
23+30	1.5510	0.14	Q	|	|	|	V|
23+35	1.5520	0.14	Q	|	|	|	V|
23+40	1.5530	0.14	Q	|	|	|	V|
23+45	1.5540	0.14	Q	|	|	|	V|
23+50	1.5550	0.14	Q	|	|	|	V|
23+55	1.5560	0.14	Q	|	|	|	V|
24+ 0	1.5570	0.14	Q	|	|	|	V|
24+ 5	1.5578	0.11	Q	|	|	|	V|
24+10	1.5581	0.04	Q	|	|	|	V|
24+15	1.5582	0.02	Q	|	|	|	V|
24+20	1.5583	0.01	Q	|	|	|	V|
24+25	1.5584	0.01	Q	|	|	|	V|
24+30	1.5584	0.00	Q	|	|	|	V|
24+35	1.5584	0.00	Q	|	|	|	V|

Area 'C' – 100 Year 1 Hour Existing Condition – Unit Hydrograph

```
        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  06/16/20 File: EXC1001100.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'C'
EXISTING CONDITION UNIT HYDROGRAPH - 100 YEAR 1 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =      68.90(Ac.)  =      0.108 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      68.90(Ac.)  =      0.108 Sq. Mi.
Length along longest watercourse =    2520.00(Ft.)
Length along longest watercourse measured to centroid =     851.00(Ft.)
Length along longest watercourse =      0.477 Mi.
Length along longest watercourse measured to centroid =      0.161 Mi.
Difference in elevation =     288.00(Ft.)
Slope along watercourse =    603.4286 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.080 Hr.
Lag time =     4.83 Min.
25% of lag time =     1.21 Min.
40% of lag time =     1.93 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]
       68.90            0.45                 31.01

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       68.90            1.20                 82.68

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    0.450(In)
Area Averaged 100-Year Rainfall =    1.200(In)

Point rain (area averaged) =    1.200(In)
Areal adjustment factor =   99.94 %
Adjusted average point rain =    1.199(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
```

```
          68.900           72.23         0.000
        Total Area Entered =     68.90(Ac.)


      RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
      AMC2 AMC-3     (In/Hr)    (Dec.%)     (In/Hr)       (Dec.)    (In/Hr)
      72.2  86.3      0.172     0.000         0.172        1.000      0.172
                                                          Sum (F) =    0.172
      Area averaged mean soil loss (F) (In/Hr) =  0.172
      Minimum soil loss rate ((In/Hr)) =  0.086
      (for 24 hour storm duration)
      Soil low loss rate (decimal) =   0.900
      ------------------------------------------------------------------------
      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        103.538         20.284            14.085
          2   0.167        207.077         48.627            33.766
          3   0.250        310.615         15.124            10.502
          4   0.333        414.154          6.877             4.776
          5   0.417        517.692          3.840             2.666
          6   0.500        621.230          2.468             1.714
          7   0.583        724.769          1.493             1.036
          8   0.667        828.307          1.286             0.893
                                  Sum = 100.000   Sum=      69.438
------------------------------------------------------------------------


 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      0.604          0.172    (  0.544)        0.433
    2   0.17     4.30      0.619          0.172    (  0.557)        0.447
    3   0.25     5.00      0.720          0.172    (  0.648)        0.548
    4   0.33     5.00      0.720          0.172    (  0.648)        0.548
    5   0.42     5.80      0.835          0.172    (  0.751)        0.663
    6   0.50     6.50      0.935          0.172    (  0.842)        0.764
    7   0.58     7.40      1.065          0.172    (  0.958)        0.893
    8   0.67     8.60      1.238          0.172    (  1.114)        1.066
    9   0.75    12.30      1.770          0.172    (  1.593)        1.598
   10   0.83    29.10      4.188          0.172    (  3.769)        4.016
   11   0.92     6.80      0.979          0.172    (  0.881)        0.807
   12   1.00     5.00      0.720          0.172    (  0.648)        0.548
              (Loss Rate Not Used)
      Sum =     100.0                                 Sum =    12.3
        Flood volume = Effective rainfall      1.03(In)
         times area      68.9(Ac.)/[(In)/(Ft.)] =       5.9(Ac.Ft)
        Total soil loss =      0.17(In)
        Total soil loss =     0.986(Ac.Ft)
        Total rainfall =      1.20(In)
        Flood volume =      256985.9 Cubic Feet
        Total soil loss =       42955.1 Cubic Feet
        ------------------------------------------------------------------------
         Peak flow rate of this hydrograph =    173.803(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       50.0     100.0     150.0     200.0
```

```
 ------------------------------------------------------------------------
   0+ 5       0.0420      6.10  VQ        |          |          |          |
   0+10       0.1861     20.92  |V  Q      |          |          |          |
   0+15       0.3746     27.37  | V  Q     |          |          |          |
   0+20       0.6018     32.99  |   V Q    |          |          |          |
   0+25       0.8559     36.90  |    V Q   |          |          |          |
   0+30       1.1552     43.47  |      VQ  |          |          |          |
   0+35       1.5040     50.65  |         Q|          |          |          |
   0+40       1.9148     59.64  |          |QV        |          |          |
   0+45       2.4330     75.24  |          |    QV    |          |          |
   0+50       3.3303    130.29  |          |          | V   Q    |          |
   0+55       4.5273    173.80  |          |          |         V   Q      |
   1+ 0       5.1510     90.57  |          |       Q  |          |   V      |
   1+ 5       5.5221     53.87  |          |Q         |          |      V   |
   1+10       5.6940     24.97  |   Q      |          |          |       V  |
   1+15       5.7923     14.27  | Q        |          |          |        V |
   1+20       5.8504      8.44  |Q         |          |          |        V |
   1+25       5.8873      5.36  |Q         |          |          |        V |
   1+30       5.8962      1.29  Q          |          |          |        V |
   1+35       5.8996      0.49  Q          |          |          |         V
------------------------------------------------------------------------
```

Area 'C' – 100 Year 3 Hour Existing Condition – Unit Hydrograph

```
        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  06/16/20 File: EXC1003100.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'C'
EXISTING CONDITION UNIT HYDROGRAPH - 100 YEAR 3 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =      68.90(Ac.)  =      0.108 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      68.90(Ac.)  =      0.108 Sq. Mi.
Length along longest watercourse =    2520.00(Ft.)
Length along longest watercourse measured to centroid =     851.00(Ft.)
Length along longest watercourse =      0.477 Mi.
Length along longest watercourse measured to centroid =      0.161 Mi.
Difference in elevation =     288.00(Ft.)
Slope along watercourse =    603.4286 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.080 Hr.
Lag time =     4.83 Min.
25% of lag time =     1.21 Min.
40% of lag time =     1.93 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]
       68.90            0.80                 55.12

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       68.90            1.80                124.02

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    0.800(In)
Area Averaged 100-Year Rainfall =    1.800(In)

Point rain (area averaged) =    1.800(In)
Areal adjustment factor =   99.97 %
Adjusted average point rain =    1.799(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
```

```
          68.900           72.23         0.000
 Total Area Entered =     68.90(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-3     (In/Hr)    (Dec.%)     (In/Hr)       (Dec.)    (In/Hr)
72.2  86.3      0.172     0.000        0.172        1.000      0.172
                                                  Sum (F) =    0.172
Area averaged mean soil loss (F) (In/Hr) =  0.172
Minimum soil loss rate ((In/Hr)) =  0.086
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.900
------------------------------------------------------------------------

               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        103.538         20.284            14.085
    2   0.167        207.077         48.627            33.766
    3   0.250        310.615         15.124            10.502
    4   0.333        414.154          6.877             4.776
    5   0.417        517.692          3.840             2.666
    6   0.500        621.230          2.468             1.714
    7   0.583        724.769          1.493             1.036
    8   0.667        828.307          1.286             0.893
                              Sum = 100.000   Sum=      69.438
------------------------------------------------------------------------
```

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	0.281	0.172	(	0.253)	0.109
2	0.17	1.30	0.281	0.172	(	0.253)	0.109
3	0.25	1.10	0.238	0.172	(	0.214)	0.066
4	0.33	1.50	0.324	0.172	(	0.292)	0.152
5	0.42	1.50	0.324	0.172	(	0.292)	0.152
6	0.50	1.80	0.389	0.172	(	0.350)	0.217
7	0.58	1.50	0.324	0.172	(	0.292)	0.152
8	0.67	1.80	0.389	0.172	(	0.350)	0.217
9	0.75	1.80	0.389	0.172	(	0.350)	0.217
10	0.83	1.50	0.324	0.172	(	0.292)	0.152
11	0.92	1.60	0.345	0.172	(	0.311)	0.174
12	1.00	1.80	0.389	0.172	(	0.350)	0.217
13	1.08	2.20	0.475	0.172	(	0.428)	0.303
14	1.17	2.20	0.475	0.172	(	0.428)	0.303
15	1.25	2.20	0.475	0.172	(	0.428)	0.303
16	1.33	2.00	0.432	0.172	(	0.389)	0.260
17	1.42	2.60	0.561	0.172	(	0.505)	0.390
18	1.50	2.70	0.583	0.172	(	0.525)	0.411
19	1.58	2.40	0.518	0.172	(	0.466)	0.346
20	1.67	2.70	0.583	0.172	(	0.525)	0.411
21	1.75	3.30	0.713	0.172	(	0.641)	0.541
22	1.83	3.10	0.669	0.172	(	0.602)	0.498
23	1.92	2.90	0.626	0.172	(	0.564)	0.454
24	2.00	3.00	0.648	0.172	(	0.583)	0.476
25	2.08	3.10	0.669	0.172	(	0.602)	0.498
26	2.17	4.20	0.907	0.172	(	0.816)	0.735
27	2.25	5.00	1.080	0.172	(	0.972)	0.908
28	2.33	3.50	0.756	0.172	(	0.680)	0.584
29	2.42	6.80	1.468	0.172	(	1.322)	1.297
30	2.50	7.30	1.576	0.172	(	1.419)	1.405
31	2.58	8.20	1.771	0.172	(	1.594)	1.599
32	2.67	5.90	1.274	0.172	(	1.147)	1.102
33	2.75	2.00	0.432	0.172	(	0.389)	0.260
34	2.83	1.80	0.389	0.172	(	0.350)	0.217

```
 35   2.92     1.80      0.389          0.172    (  0.350)        0.217
 36   3.00     0.60      0.130       (  0.172)       0.117        0.013
              (Loss Rate Not Used)
    Sum =     100.0                                    Sum =    15.5
      Flood volume = Effective rainfall      1.29(In)
       times area      68.9(Ac.)/[(In)/(Ft.)] =       7.4(Ac.Ft)
      Total soil loss =      0.51(In)
      Total soil loss =     2.932(Ac.Ft)
      Total rainfall =      1.80(In)
      Flood volume =      322340.9 Cubic Feet
      Total soil loss =      127715.9 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     94.826(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       25.0      50.0      75.0     100.0
---------------------------------------------------------------------------
  0+ 5       0.0106      1.54  Q         |         |         |         |
  0+10       0.0465      5.22  V Q       |         |         |         |
  0+15       0.0861      5.75  V Q       |         |         |         |
  0+20       0.1277      6.03  V Q       |         |         |         |
  0+25       0.1882      8.79  |V Q      |         |         |         |
  0+30       0.2611     10.59  |V  Q     |         |         |         |
  0+35       0.3456     12.27  |V  Q     |         |         |         |
  0+40       0.4278     11.93  | V Q     |         |         |         |
  0+45       0.5232     13.85  | V  Q    |         |         |         |
  0+50       0.6165     13.54  |  V Q    |         |         |         |
  0+55       0.6989     11.98  |  VQ     |         |         |         |
  1+ 0       0.7868     12.76  |   VQ    |         |         |         |
  1+ 5       0.8933     15.46  |   V Q   |         |         |         |
  1+10       1.0226     18.77  |    V Q  |         |         |         |
  1+15       1.1595     19.89  |     VQ  |         |         |         |
  1+20       1.2957     19.78  |      Q  |         |         |         |
  1+25       1.4363     20.41  |      VQ |         |         |         |
  1+30       1.6075     24.85  |       VQ|         |         |         |
  1+35       1.7862     25.95  |        VQ         |         |         |
  1+40       1.9617     25.48  |         Q         |         |         |
  1+45       2.1628     29.19  |         |Q        |         |         |
  1+50       2.3940     33.57  |         | VQ      |         |         |
  1+55       2.6222     33.13  |         |  QV     |         |         |
  2+ 0       2.8449     32.34  |         | Q  V    |         |         |
  2+ 5       3.0730     33.12  |         |  Q  V   |         |         |
  2+10       3.3302     37.34  |         |   Q   V |         |         |
  2+15       3.6616     48.13  |         |        Q|         |         |
  2+20       4.0201     52.05  |         |         QV        |         |
  2+25       4.3928     54.12  |         |         |Q V      |         |
  2+30       4.9285     77.79  |         |         |     V   |Q        |
  2+35       5.5554     91.02  |         |         |         V     Q   |
  2+40       6.2085     94.83  |         |         |         |  V   Q  |
  2+45       6.6939     70.47  |         |         |       Q |     V   |
  2+50       6.9587     38.45  |         |    Q    |         |      V  |
  2+55       7.1441     26.93  |         Q         |         |       V |
  3+ 0       7.2773     19.33  |       Q |         |         |        V|
  3+ 5       7.3410      9.25  |  Q      |         |         |        V|
  3+10       7.3738      4.77  |Q        |         |         |        V|
  3+15       7.3894      2.27  Q         |         |         |        V|
  3+20       7.3954      0.86  Q         |         |         |        V|
  3+25       7.3984      0.44  Q         |         |         |        V|
  3+30       7.3999      0.21  Q         |         |         |        V|
  3+35       7.3999      0.01  Q         |         |         |         V
---------------------------------------------------------------------------
```

Area 'C' – 100 Year 6 Hour Existing Condition – Unit Hydrograph

```
        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  06/16/20 File: EXC1006100.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'C'
EXISTING CONDITION UNIT HYDROGRAPH - 100 YEAR 6 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =      68.90(Ac.)  =      0.108 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      68.90(Ac.)  =      0.108 Sq. Mi.
Length along longest watercourse =    2520.00(Ft.)
Length along longest watercourse measured to centroid =     851.00(Ft.)
Length along longest watercourse =      0.477 Mi.
Length along longest watercourse measured to centroid =      0.161 Mi.
Difference in elevation =     288.00(Ft.)
Slope along watercourse =    603.4286 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.080 Hr.
Lag time =     4.83 Min.
25% of lag time =     1.21 Min.
40% of lag time =     1.93 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]
       68.90            1.00                 68.90

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       68.90            2.50                172.25

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    1.000(In)
Area Averaged 100-Year Rainfall =    2.500(In)

Point rain (area averaged) =    2.500(In)
Areal adjustment factor =   99.98 %
Adjusted average point rain =    2.499(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
```

```
          68.900           72.23         0.000
 Total Area Entered =     68.90(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-3     (In/Hr)    (Dec.%)     (In/Hr)       (Dec.)    (In/Hr)
72.2  86.3      0.172     0.000        0.172        1.000      0.172
                                                  Sum (F) =    0.172
Area averaged mean soil loss (F) (In/Hr) =  0.172
Minimum soil loss rate ((In/Hr)) =  0.086
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.900
------------------------------------------------------------------------

               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        103.538         20.284            14.085
    2   0.167        207.077         48.627            33.766
    3   0.250        310.615         15.124            10.502
    4   0.333        414.154          6.877             4.776
    5   0.417        517.692          3.840             2.666
    6   0.500        621.230          2.468             1.714
    7   0.583        724.769          1.493             1.036
    8   0.667        828.307          1.286             0.893
                              Sum = 100.000   Sum=      69.438
------------------------------------------------------------------------
```

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	(0.172)	0.135	0.015
2	0.17	0.60	0.180	(0.172)	0.162	0.018
3	0.25	0.60	0.180	(0.172)	0.162	0.018
4	0.33	0.60	0.180	(0.172)	0.162	0.018
5	0.42	0.60	0.180	(0.172)	0.162	0.018
6	0.50	0.70	0.210	0.172	(0.189)	0.038
7	0.58	0.70	0.210	0.172	(0.189)	0.038
8	0.67	0.70	0.210	0.172	(0.189)	0.038
9	0.75	0.70	0.210	0.172	(0.189)	0.038
10	0.83	0.70	0.210	0.172	(0.189)	0.038
11	0.92	0.70	0.210	0.172	(0.189)	0.038
12	1.00	0.80	0.240	0.172	(0.216)	0.068
13	1.08	0.80	0.240	0.172	(0.216)	0.068
14	1.17	0.80	0.240	0.172	(0.216)	0.068
15	1.25	0.80	0.240	0.172	(0.216)	0.068
16	1.33	0.80	0.240	0.172	(0.216)	0.068
17	1.42	0.80	0.240	0.172	(0.216)	0.068
18	1.50	0.80	0.240	0.172	(0.216)	0.068
19	1.58	0.80	0.240	0.172	(0.216)	0.068
20	1.67	0.80	0.240	0.172	(0.216)	0.068
21	1.75	0.80	0.240	0.172	(0.216)	0.068
22	1.83	0.80	0.240	0.172	(0.216)	0.068
23	1.92	0.80	0.240	0.172	(0.216)	0.068
24	2.00	0.90	0.270	0.172	(0.243)	0.098
25	2.08	0.80	0.240	0.172	(0.216)	0.068
26	2.17	0.90	0.270	0.172	(0.243)	0.098
27	2.25	0.90	0.270	0.172	(0.243)	0.098
28	2.33	0.90	0.270	0.172	(0.243)	0.098
29	2.42	0.90	0.270	0.172	(0.243)	0.098
30	2.50	0.90	0.270	0.172	(0.243)	0.098
31	2.58	0.90	0.270	0.172	(0.243)	0.098
32	2.67	0.90	0.270	0.172	(0.243)	0.098
33	2.75	1.00	0.300	0.172	(0.270)	0.128
34	2.83	1.00	0.300	0.172	(0.270)	0.128

```
 35   2.92     1.00      0.300          0.172    (  0.270)        0.128
 36   3.00     1.00      0.300          0.172    (  0.270)        0.128
 37   3.08     1.00      0.300          0.172    (  0.270)        0.128
 38   3.17     1.10      0.330          0.172    (  0.297)        0.158
 39   3.25     1.10      0.330          0.172    (  0.297)        0.158
 40   3.33     1.10      0.330          0.172    (  0.297)        0.158
 41   3.42     1.20      0.360          0.172    (  0.324)        0.188
 42   3.50     1.30      0.390          0.172    (  0.351)        0.218
 43   3.58     1.40      0.420          0.172    (  0.378)        0.248
 44   3.67     1.40      0.420          0.172    (  0.378)        0.248
 45   3.75     1.50      0.450          0.172    (  0.405)        0.278
 46   3.83     1.50      0.450          0.172    (  0.405)        0.278
 47   3.92     1.60      0.480          0.172    (  0.432)        0.308
 48   4.00     1.60      0.480          0.172    (  0.432)        0.308
 49   4.08     1.70      0.510          0.172    (  0.459)        0.338
 50   4.17     1.80      0.540          0.172    (  0.486)        0.368
 51   4.25     1.90      0.570          0.172    (  0.513)        0.398
 52   4.33     2.00      0.600          0.172    (  0.540)        0.428
 53   4.42     2.10      0.630          0.172    (  0.567)        0.458
 54   4.50     2.10      0.630          0.172    (  0.567)        0.458
 55   4.58     2.20      0.660          0.172    (  0.594)        0.488
 56   4.67     2.30      0.690          0.172    (  0.621)        0.518
 57   4.75     2.40      0.720          0.172    (  0.648)        0.548
 58   4.83     2.40      0.720          0.172    (  0.648)        0.548
 59   4.92     2.50      0.750          0.172    (  0.675)        0.578
 60   5.00     2.60      0.780          0.172    (  0.702)        0.608
 61   5.08     3.10      0.930          0.172    (  0.837)        0.758
 62   5.17     3.60      1.080          0.172    (  0.972)        0.908
 63   5.25     3.90      1.170          0.172    (  1.053)        0.998
 64   5.33     4.20      1.260          0.172    (  1.134)        1.088
 65   5.42     4.70      1.410          0.172    (  1.269)        1.238
 66   5.50     5.60      1.680          0.172    (  1.512)        1.508
 67   5.58     1.90      0.570          0.172    (  0.513)        0.398
 68   5.67     0.90      0.270          0.172    (  0.243)        0.098
 69   5.75     0.60      0.180       (  0.172)       0.162        0.018
 70   5.83     0.50      0.150       (  0.172)       0.135        0.015
 71   5.92     0.30      0.090       (  0.172)       0.081        0.009
 72   6.00     0.20      0.060       (  0.172)       0.054        0.006
              (Loss Rate Not Used)
    Sum =     100.0                                    Sum =    18.0
      Flood volume = Effective rainfall      1.50(In)
       times area      68.9(Ac.)/[(In)/(Ft.)] =       8.6(Ac.Ft)
      Total soil loss =      1.00(In)
      Total soil loss =     5.758(Ac.Ft)
      Total rainfall =      2.50(In)
      Flood volume =      374287.9 Cubic Feet
      Total soil loss =      250831.5 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     84.140(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       22.5      45.0      67.5      90.0
-------------------------------------------------------------------------
  0+ 5       0.0015      0.21  Q         |         |         |         |
  0+10       0.0067      0.76  Q         |         |         |         |
  0+15       0.0137      1.02  Q         |         |         |         |
  0+20       0.0214      1.12  Q         |         |         |         |
  0+25       0.0295      1.18  Q         |         |         |         |
  0+30       0.0398      1.50  Q         |         |         |         |
  0+35       0.0550      2.20  Q         |         |         |         |
  0+40       0.0717      2.43  VQ        |         |         |         |
  0+45       0.0891      2.53  VQ        |         |         |         |
  0+50       0.1069      2.58  VQ        |         |         |         |
  0+55       0.1249      2.62  VQ        |         |         |         |
  1+ 0       0.1459      3.06  VQ        |         |         |         |
  1+ 5       0.1741      4.09  VQ        |         |         |         |
  1+10       0.2045      4.41  VQ        |         |         |         |
```

```
    1+15       0.2358      4.55  |VQ       |          |          |          |
    1+20       0.2677      4.63  |VQ       |          |          |          |
    1+25       0.2999      4.68  |VQ       |          |          |          |
    1+30       0.3323      4.71  |VQ       |          |          |          |
    1+35       0.3650      4.74  |VQ       |          |          |          |
    1+40       0.3976      4.74  |VQ       |          |          |          |
    1+45       0.4302      4.74  | Q       |          |          |          |
    1+50       0.4629      4.74  | Q       |          |          |          |
    1+55       0.4955      4.74  | Q       |          |          |          |
    2+ 0       0.5310      5.16  | Q       |          |          |          |
    2+ 5       0.5706      5.75  | Q       |          |          |          |
    2+10       0.6083      5.48  | Q       |          |          |          |
    2+15       0.6519      6.32  | QV      |          |          |          |
    2+20       0.6971      6.57  | QV      |          |          |          |
    2+25       0.7431      6.68  | QV      |          |          |          |
    2+30       0.7896      6.74  | QV      |          |          |          |
    2+35       0.8363      6.79  |  Q      |          |          |          |
    2+40       0.8831      6.79  |  QV     |          |          |          |
    2+45       0.9330      7.24  |  QV     |          |          |          |
    2+50       0.9899      8.26  |  QV     |          |          |          |
    2+55       1.0489      8.57  |  QV     |          |          |          |
    3+ 0       1.1090      8.72  |  Q V    |          |          |          |
    3+ 5       1.1695      8.80  |  Q V    |          |          |          |
    3+10       1.2334      9.27  |   QV    |          |          |          |
    3+15       1.3044     10.31  |   Q V   |          |          |          |
    3+20       1.3778     10.66  |   Q V   |          |          |          |
    3+25       1.4551     11.22  |   Q V   |          |          |          |
    3+30       1.5428     12.74  |    Q V  |          |          |          |
    3+35       1.6430     14.54  |     QV  |          |          |          |
    3+40       1.7535     16.04  |      QV |          |          |          |
    3+45       1.8708     17.03  |      QV |          |          |          |
    3+50       1.9969     18.32  |       QV|          |          |          |
    3+55       2.1293     19.22  |       QV|          |          |          |
    4+ 0       2.2704     20.49  |        QV          |          |          |
    4+ 5       2.4175     21.36  |        Q|V         |          |          |
    4+10       2.5760     23.02  |         QV         |          |          |
    4+15       2.7474     24.88  |          |QV       |          |          |
    4+20       2.9323     26.85  |          |Q V      |          |          |
    4+25       3.1311     28.86  |          | Q V     |          |          |
    4+30       3.3411     30.49  |          |  Q V    |          |          |
    4+35       3.5583     31.53  |          |   Q V   |          |          |
    4+40       3.7876     33.30  |          |   Q  V  |          |          |
    4+45       4.0303     35.24  |          |    Q  V |          |          |
    4+50       4.2839     36.82  |          |     Q  V|          |          |
    4+55       4.5445     37.84  |          |     Q   |V         |          |
    5+ 0       4.8171     39.58  |          |      Q  | V       |          |
    5+ 5       5.1145     43.18  |          |        Q|  V      |          |
    5+10       5.4653     50.93  |          |         | Q  V    |          |
    5+15       5.8725     59.12  |          |         |     QV  |          |
    5+20       6.3262     65.88  |          |         |        Q|          |
    5+25       6.8302     73.18  |          |         |         |VQ        |
    5+30       7.4097     84.14  |          |         |         |   V  Q   |
    5+35       7.9627     80.31  |          |         |         |    Q V   |
    5+40       8.2577     42.82  |          |        Q|         |       V  |
    5+45       8.4090     21.97  |         Q|         |         |        V |
    5+50       8.4911     11.92  |    Q     |         |         |        V |
    5+55       8.5406      7.20  |  Q       |         |         |        V |
    6+ 0       8.5699      4.25  |Q         |         |         |        V |
    6+ 5       8.5860      2.35  |Q         |         |         |        V |
    6+10       8.5904      0.63  Q          |         |         |        V |
    6+15       8.5917      0.18  Q          |         |         |        V |
    6+20       8.5921      0.06  Q          |         |         |        V |
    6+25       8.5923      0.03  Q          |         |         |        V |
    6+30       8.5924      0.01  Q          |         |         |        V |
    6+35       8.5925      0.01  Q          |         |         |         V
-------------------------------------------------------------------------
```

Area 'C' – 100 Year 24 Hour Existing Condition – Unit Hydrograph

```
        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  06/16/20 File: EXC10024100.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'C'
EXISTING CONDITION UNIT HYDROGRAPH - 100 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =      68.90(Ac.)  =      0.108 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      68.90(Ac.)  =      0.108 Sq. Mi.
Length along longest watercourse =    2520.00(Ft.)
Length along longest watercourse measured to centroid =     851.00(Ft.)
Length along longest watercourse =      0.477 Mi.
Length along longest watercourse measured to centroid =      0.161 Mi.
Difference in elevation =     288.00(Ft.)
Slope along watercourse =    603.4286 Ft./Mi.
Average Manning's 'N' = 0.030
Lag time =    0.080 Hr.
Lag time =     4.83 Min.
25% of lag time =     1.21 Min.
40% of lag time =     1.93 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]
       68.90            1.60                110.24

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       68.90            4.00                275.60

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    1.600(In)
Area Averaged 100-Year Rainfall =    4.000(In)

Point rain (area averaged) =    4.000(In)
Areal adjustment factor =   99.99 %
Adjusted average point rain =    3.999(In)
```

```
Sub-Area Data:
Area(Ac.)          Runoff Index    Impervious %
    68.900            72.23          0.000
 Total Area Entered =     68.90(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-3     (In/Hr)    (Dec.%)     (In/Hr)       (Dec.)    (In/Hr)
72.2  86.3      0.172     0.000        0.172        1.000      0.172
                                                  Sum (F) =    0.172
Area averaged mean soil loss (F) (In/Hr) =  0.172
Minimum soil loss rate ((In/Hr)) =  0.086
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.900
------------------------------------------------------------------------

               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        103.538         20.284             14.085
     2   0.167        207.077         48.627             33.766
     3   0.250        310.615         15.124             10.502
     4   0.333        414.154          6.877              4.776
     5   0.417        517.692          3.840              2.666
     6   0.500        621.230          2.468              1.714
     7   0.583        724.769          1.493              1.036
     8   0.667        828.307          1.286              0.893
                              Sum = 100.000   Sum=       69.438
------------------------------------------------------------------------
```

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	0.032	(0.304)	0.029	0.003
2	0.17	0.07	0.032	(0.303)	0.029	0.003
3	0.25	0.07	0.032	(0.302)	0.029	0.003
4	0.33	0.10	0.048	(0.301)	0.043	0.005
5	0.42	0.10	0.048	(0.300)	0.043	0.005
6	0.50	0.10	0.048	(0.299)	0.043	0.005
7	0.58	0.10	0.048	(0.297)	0.043	0.005
8	0.67	0.10	0.048	(0.296)	0.043	0.005
9	0.75	0.10	0.048	(0.295)	0.043	0.005
10	0.83	0.13	0.064	(0.294)	0.058	0.006
11	0.92	0.13	0.064	(0.293)	0.058	0.006
12	1.00	0.13	0.064	(0.292)	0.058	0.006
13	1.08	0.10	0.048	(0.290)	0.043	0.005
14	1.17	0.10	0.048	(0.289)	0.043	0.005
15	1.25	0.10	0.048	(0.288)	0.043	0.005
16	1.33	0.10	0.048	(0.287)	0.043	0.005
17	1.42	0.10	0.048	(0.286)	0.043	0.005
18	1.50	0.10	0.048	(0.285)	0.043	0.005
19	1.58	0.10	0.048	(0.284)	0.043	0.005
20	1.67	0.10	0.048	(0.282)	0.043	0.005
21	1.75	0.10	0.048	(0.281)	0.043	0.005
22	1.83	0.13	0.064	(0.280)	0.058	0.006
23	1.92	0.13	0.064	(0.279)	0.058	0.006
24	2.00	0.13	0.064	(0.278)	0.058	0.006
25	2.08	0.13	0.064	(0.277)	0.058	0.006
26	2.17	0.13	0.064	(0.276)	0.058	0.006
27	2.25	0.13	0.064	(0.275)	0.058	0.006
28	2.33	0.13	0.064	(0.273)	0.058	0.006
29	2.42	0.13	0.064	(0.272)	0.058	0.006
30	2.50	0.13	0.064	(0.271)	0.058	0.006
31	2.58	0.17	0.080	(0.270)	0.072	0.008
32	2.67	0.17	0.080	(0.269)	0.072	0.008

33	2.75	0.17	0.080	(0.268)	0.072	0.008
34	2.83	0.17	0.080	(0.267)	0.072	0.008
35	2.92	0.17	0.080	(0.266)	0.072	0.008
36	3.00	0.17	0.080	(0.265)	0.072	0.008
37	3.08	0.17	0.080	(0.264)	0.072	0.008
38	3.17	0.17	0.080	(0.262)	0.072	0.008
39	3.25	0.17	0.080	(0.261)	0.072	0.008
40	3.33	0.17	0.080	(0.260)	0.072	0.008
41	3.42	0.17	0.080	(0.259)	0.072	0.008
42	3.50	0.17	0.080	(0.258)	0.072	0.008
43	3.58	0.17	0.080	(0.257)	0.072	0.008
44	3.67	0.17	0.080	(0.256)	0.072	0.008
45	3.75	0.17	0.080	(0.255)	0.072	0.008
46	3.83	0.20	0.096	(0.254)	0.086	0.010
47	3.92	0.20	0.096	(0.253)	0.086	0.010
48	4.00	0.20	0.096	(0.252)	0.086	0.010
49	4.08	0.20	0.096	(0.251)	0.086	0.010
50	4.17	0.20	0.096	(0.249)	0.086	0.010
51	4.25	0.20	0.096	(0.248)	0.086	0.010
52	4.33	0.23	0.112	(0.247)	0.101	0.011
53	4.42	0.23	0.112	(0.246)	0.101	0.011
54	4.50	0.23	0.112	(0.245)	0.101	0.011
55	4.58	0.23	0.112	(0.244)	0.101	0.011
56	4.67	0.23	0.112	(0.243)	0.101	0.011
57	4.75	0.23	0.112	(0.242)	0.101	0.011
58	4.83	0.27	0.128	(0.241)	0.115	0.013
59	4.92	0.27	0.128	(0.240)	0.115	0.013
60	5.00	0.27	0.128	(0.239)	0.115	0.013
61	5.08	0.20	0.096	(0.238)	0.086	0.010
62	5.17	0.20	0.096	(0.237)	0.086	0.010
63	5.25	0.20	0.096	(0.236)	0.086	0.010
64	5.33	0.23	0.112	(0.235)	0.101	0.011
65	5.42	0.23	0.112	(0.234)	0.101	0.011
66	5.50	0.23	0.112	(0.233)	0.101	0.011
67	5.58	0.27	0.128	(0.232)	0.115	0.013
68	5.67	0.27	0.128	(0.231)	0.115	0.013
69	5.75	0.27	0.128	(0.230)	0.115	0.013
70	5.83	0.27	0.128	(0.229)	0.115	0.013
71	5.92	0.27	0.128	(0.228)	0.115	0.013
72	6.00	0.27	0.128	(0.227)	0.115	0.013
73	6.08	0.30	0.144	(0.226)	0.130	0.014
74	6.17	0.30	0.144	(0.225)	0.130	0.014
75	6.25	0.30	0.144	(0.224)	0.130	0.014
76	6.33	0.30	0.144	(0.223)	0.130	0.014
77	6.42	0.30	0.144	(0.222)	0.130	0.014
78	6.50	0.30	0.144	(0.221)	0.130	0.014
79	6.58	0.33	0.160	(0.220)	0.144	0.016
80	6.67	0.33	0.160	(0.219)	0.144	0.016
81	6.75	0.33	0.160	(0.218)	0.144	0.016
82	6.83	0.33	0.160	(0.217)	0.144	0.016
83	6.92	0.33	0.160	(0.216)	0.144	0.016
84	7.00	0.33	0.160	(0.215)	0.144	0.016
85	7.08	0.33	0.160	(0.214)	0.144	0.016
86	7.17	0.33	0.160	(0.213)	0.144	0.016
87	7.25	0.33	0.160	(0.212)	0.144	0.016
88	7.33	0.37	0.176	(0.211)	0.158	0.018
89	7.42	0.37	0.176	(0.210)	0.158	0.018
90	7.50	0.37	0.176	(0.209)	0.158	0.018
91	7.58	0.40	0.192	(0.208)	0.173	0.019
92	7.67	0.40	0.192	(0.207)	0.173	0.019
93	7.75	0.40	0.192	(0.206)	0.173	0.019
94	7.83	0.43	0.208	(0.205)	0.187	0.021
95	7.92	0.43	0.208	(0.204)	0.187	0.021
96	8.00	0.43	0.208	(0.203)	0.187	0.021
97	8.08	0.50	0.240	0.202	(0.216)	0.038
98	8.17	0.50	0.240	0.201	(0.216)	0.039
99	8.25	0.50	0.240	0.200	(0.216)	0.040
100	8.33	0.50	0.240	0.199	(0.216)	0.040
101	8.42	0.50	0.240	0.199	(0.216)	0.041
102	8.50	0.50	0.240	0.198	(0.216)	0.042
103	8.58	0.53	0.256	0.197	(0.230)	0.059
104	8.67	0.53	0.256	0.196	(0.230)	0.060
105	8.75	0.53	0.256	0.195	(0.230)	0.061

106	8.83	0.57	0.272	0.194	(0.245)	0.078
107	8.92	0.57	0.272	0.193	(0.245)	0.079
108	9.00	0.57	0.272	0.192	(0.245)	0.080
109	9.08	0.63	0.304	0.191	(0.274)	0.113
110	9.17	0.63	0.304	0.190	(0.274)	0.114
111	9.25	0.63	0.304	0.189	(0.274)	0.115
112	9.33	0.67	0.320	0.188	(0.288)	0.131
113	9.42	0.67	0.320	0.188	(0.288)	0.132
114	9.50	0.67	0.320	0.187	(0.288)	0.133
115	9.58	0.70	0.336	0.186	(0.302)	0.150
116	9.67	0.70	0.336	0.185	(0.302)	0.151
117	9.75	0.70	0.336	0.184	(0.302)	0.152
118	9.83	0.73	0.352	0.183	(0.317)	0.169
119	9.92	0.73	0.352	0.182	(0.317)	0.170
120	10.00	0.73	0.352	0.181	(0.317)	0.171
121	10.08	0.50	0.240	0.180	(0.216)	0.059
122	10.17	0.50	0.240	0.180	(0.216)	0.060
123	10.25	0.50	0.240	0.179	(0.216)	0.061
124	10.33	0.50	0.240	0.178	(0.216)	0.062
125	10.42	0.50	0.240	0.177	(0.216)	0.063
126	10.50	0.50	0.240	0.176	(0.216)	0.064
127	10.58	0.67	0.320	0.175	(0.288)	0.145
128	10.67	0.67	0.320	0.174	(0.288)	0.146
129	10.75	0.67	0.320	0.174	(0.288)	0.146
130	10.83	0.67	0.320	0.173	(0.288)	0.147
131	10.92	0.67	0.320	0.172	(0.288)	0.148
132	11.00	0.67	0.320	0.171	(0.288)	0.149
133	11.08	0.63	0.304	0.170	(0.274)	0.134
134	11.17	0.63	0.304	0.169	(0.274)	0.135
135	11.25	0.63	0.304	0.169	(0.274)	0.135
136	11.33	0.63	0.304	0.168	(0.274)	0.136
137	11.42	0.63	0.304	0.167	(0.274)	0.137
138	11.50	0.63	0.304	0.166	(0.274)	0.138
139	11.58	0.57	0.272	0.165	(0.245)	0.107
140	11.67	0.57	0.272	0.164	(0.245)	0.108
141	11.75	0.57	0.272	0.164	(0.245)	0.108
142	11.83	0.60	0.288	0.163	(0.259)	0.125
143	11.92	0.60	0.288	0.162	(0.259)	0.126
144	12.00	0.60	0.288	0.161	(0.259)	0.127
145	12.08	0.83	0.400	0.160	(0.360)	0.240
146	12.17	0.83	0.400	0.160	(0.360)	0.240
147	12.25	0.83	0.400	0.159	(0.360)	0.241
148	12.33	0.87	0.416	0.158	(0.374)	0.258
149	12.42	0.87	0.416	0.157	(0.374)	0.259
150	12.50	0.87	0.416	0.156	(0.374)	0.260
151	12.58	0.93	0.448	0.156	(0.403)	0.292
152	12.67	0.93	0.448	0.155	(0.403)	0.293
153	12.75	0.93	0.448	0.154	(0.403)	0.294
154	12.83	0.97	0.464	0.153	(0.418)	0.311
155	12.92	0.97	0.464	0.152	(0.418)	0.312
156	13.00	0.97	0.464	0.152	(0.418)	0.312
157	13.08	1.13	0.544	0.151	(0.490)	0.393
158	13.17	1.13	0.544	0.150	(0.490)	0.394
159	13.25	1.13	0.544	0.149	(0.490)	0.395
160	13.33	1.13	0.544	0.149	(0.490)	0.395
161	13.42	1.13	0.544	0.148	(0.490)	0.396
162	13.50	1.13	0.544	0.147	(0.490)	0.397
163	13.58	0.77	0.368	0.146	(0.331)	0.222
164	13.67	0.77	0.368	0.146	(0.331)	0.222
165	13.75	0.77	0.368	0.145	(0.331)	0.223
166	13.83	0.77	0.368	0.144	(0.331)	0.224
167	13.92	0.77	0.368	0.143	(0.331)	0.225
168	14.00	0.77	0.368	0.143	(0.331)	0.225
169	14.08	0.90	0.432	0.142	(0.389)	0.290
170	14.17	0.90	0.432	0.141	(0.389)	0.291
171	14.25	0.90	0.432	0.140	(0.389)	0.291
172	14.33	0.87	0.416	0.140	(0.374)	0.276
173	14.42	0.87	0.416	0.139	(0.374)	0.277
174	14.50	0.87	0.416	0.138	(0.374)	0.278
175	14.58	0.87	0.416	0.138	(0.374)	0.278
176	14.67	0.87	0.416	0.137	(0.374)	0.279
177	14.75	0.87	0.416	0.136	(0.374)	0.280
178	14.83	0.83	0.400	0.136	(0.360)	0.264

179	14.92	0.83	0.400	0.135	(0.360)	0.265
180	15.00	0.83	0.400	0.134	(0.360)	0.266
181	15.08	0.80	0.384	0.133	(0.346)	0.250
182	15.17	0.80	0.384	0.133	(0.346)	0.251
183	15.25	0.80	0.384	0.132	(0.346)	0.252
184	15.33	0.77	0.368	0.131	(0.331)	0.237
185	15.42	0.77	0.368	0.131	(0.331)	0.237
186	15.50	0.77	0.368	0.130	(0.331)	0.238
187	15.58	0.63	0.304	0.129	(0.274)	0.175
188	15.67	0.63	0.304	0.129	(0.274)	0.175
189	15.75	0.63	0.304	0.128	(0.274)	0.176
190	15.83	0.63	0.304	0.127	(0.274)	0.177
191	15.92	0.63	0.304	0.127	(0.274)	0.177
192	16.00	0.63	0.304	0.126	(0.274)	0.178
193	16.08	0.13	0.064	(0.125)	0.058	0.006
194	16.17	0.13	0.064	(0.125)	0.058	0.006
195	16.25	0.13	0.064	(0.124)	0.058	0.006
196	16.33	0.13	0.064	(0.124)	0.058	0.006
197	16.42	0.13	0.064	(0.123)	0.058	0.006
198	16.50	0.13	0.064	(0.122)	0.058	0.006
199	16.58	0.10	0.048	(0.122)	0.043	0.005
200	16.67	0.10	0.048	(0.121)	0.043	0.005
201	16.75	0.10	0.048	(0.120)	0.043	0.005
202	16.83	0.10	0.048	(0.120)	0.043	0.005
203	16.92	0.10	0.048	(0.119)	0.043	0.005
204	17.00	0.10	0.048	(0.119)	0.043	0.005
205	17.08	0.17	0.080	(0.118)	0.072	0.008
206	17.17	0.17	0.080	(0.117)	0.072	0.008
207	17.25	0.17	0.080	(0.117)	0.072	0.008
208	17.33	0.17	0.080	(0.116)	0.072	0.008
209	17.42	0.17	0.080	(0.116)	0.072	0.008
210	17.50	0.17	0.080	(0.115)	0.072	0.008
211	17.58	0.17	0.080	(0.115)	0.072	0.008
212	17.67	0.17	0.080	(0.114)	0.072	0.008
213	17.75	0.17	0.080	(0.113)	0.072	0.008
214	17.83	0.13	0.064	(0.113)	0.058	0.006
215	17.92	0.13	0.064	(0.112)	0.058	0.006
216	18.00	0.13	0.064	(0.112)	0.058	0.006
217	18.08	0.13	0.064	(0.111)	0.058	0.006
218	18.17	0.13	0.064	(0.111)	0.058	0.006
219	18.25	0.13	0.064	(0.110)	0.058	0.006
220	18.33	0.13	0.064	(0.110)	0.058	0.006
221	18.42	0.13	0.064	(0.109)	0.058	0.006
222	18.50	0.13	0.064	(0.108)	0.058	0.006
223	18.58	0.10	0.048	(0.108)	0.043	0.005
224	18.67	0.10	0.048	(0.107)	0.043	0.005
225	18.75	0.10	0.048	(0.107)	0.043	0.005
226	18.83	0.07	0.032	(0.106)	0.029	0.003
227	18.92	0.07	0.032	(0.106)	0.029	0.003
228	19.00	0.07	0.032	(0.105)	0.029	0.003
229	19.08	0.10	0.048	(0.105)	0.043	0.005
230	19.17	0.10	0.048	(0.104)	0.043	0.005
231	19.25	0.10	0.048	(0.104)	0.043	0.005
232	19.33	0.13	0.064	(0.103)	0.058	0.006
233	19.42	0.13	0.064	(0.103)	0.058	0.006
234	19.50	0.13	0.064	(0.102)	0.058	0.006
235	19.58	0.10	0.048	(0.102)	0.043	0.005
236	19.67	0.10	0.048	(0.102)	0.043	0.005
237	19.75	0.10	0.048	(0.101)	0.043	0.005
238	19.83	0.07	0.032	(0.101)	0.029	0.003
239	19.92	0.07	0.032	(0.100)	0.029	0.003
240	20.00	0.07	0.032	(0.100)	0.029	0.003
241	20.08	0.10	0.048	(0.099)	0.043	0.005
242	20.17	0.10	0.048	(0.099)	0.043	0.005
243	20.25	0.10	0.048	(0.098)	0.043	0.005
244	20.33	0.10	0.048	(0.098)	0.043	0.005
245	20.42	0.10	0.048	(0.098)	0.043	0.005
246	20.50	0.10	0.048	(0.097)	0.043	0.005
247	20.58	0.10	0.048	(0.097)	0.043	0.005
248	20.67	0.10	0.048	(0.096)	0.043	0.005
249	20.75	0.10	0.048	(0.096)	0.043	0.005
250	20.83	0.07	0.032	(0.096)	0.029	0.003
251	20.92	0.07	0.032	(0.095)	0.029	0.003

```
252  21.00     0.07      0.032       (  0.095)       0.029        0.003
253  21.08     0.10      0.048       (  0.094)       0.043        0.005
254  21.17     0.10      0.048       (  0.094)       0.043        0.005
255  21.25     0.10      0.048       (  0.094)       0.043        0.005
256  21.33     0.07      0.032       (  0.093)       0.029        0.003
257  21.42     0.07      0.032       (  0.093)       0.029        0.003
258  21.50     0.07      0.032       (  0.093)       0.029        0.003
259  21.58     0.10      0.048       (  0.092)       0.043        0.005
260  21.67     0.10      0.048       (  0.092)       0.043        0.005
261  21.75     0.10      0.048       (  0.092)       0.043        0.005
262  21.83     0.07      0.032       (  0.091)       0.029        0.003
263  21.92     0.07      0.032       (  0.091)       0.029        0.003
264  22.00     0.07      0.032       (  0.091)       0.029        0.003
265  22.08     0.10      0.048       (  0.090)       0.043        0.005
266  22.17     0.10      0.048       (  0.090)       0.043        0.005
267  22.25     0.10      0.048       (  0.090)       0.043        0.005
268  22.33     0.07      0.032       (  0.090)       0.029        0.003
269  22.42     0.07      0.032       (  0.089)       0.029        0.003
270  22.50     0.07      0.032       (  0.089)       0.029        0.003
271  22.58     0.07      0.032       (  0.089)       0.029        0.003
272  22.67     0.07      0.032       (  0.088)       0.029        0.003
273  22.75     0.07      0.032       (  0.088)       0.029        0.003
274  22.83     0.07      0.032       (  0.088)       0.029        0.003
275  22.92     0.07      0.032       (  0.088)       0.029        0.003
276  23.00     0.07      0.032       (  0.088)       0.029        0.003
277  23.08     0.07      0.032       (  0.087)       0.029        0.003
278  23.17     0.07      0.032       (  0.087)       0.029        0.003
279  23.25     0.07      0.032       (  0.087)       0.029        0.003
280  23.33     0.07      0.032       (  0.087)       0.029        0.003
281  23.42     0.07      0.032       (  0.087)       0.029        0.003
282  23.50     0.07      0.032       (  0.086)       0.029        0.003
283  23.58     0.07      0.032       (  0.086)       0.029        0.003
284  23.67     0.07      0.032       (  0.086)       0.029        0.003
285  23.75     0.07      0.032       (  0.086)       0.029        0.003
286  23.83     0.07      0.032       (  0.086)       0.029        0.003
287  23.92     0.07      0.032       (  0.086)       0.029        0.003
288  24.00     0.07      0.032       (  0.086)       0.029        0.003
               (Loss Rate Not Used)
    Sum =     100.0                                  Sum =    19.4
      Flood volume = Effective rainfall      1.62(In)
       times area      68.9(Ac.)/[(In)/(Ft.)] =       9.3(Ac.Ft)
      Total soil loss =      2.38(In)
      Total soil loss =    13.658(Ac.Ft)
      Total rainfall =      4.00(In)
      Flood volume =      405355.3 Cubic Feet
      Total soil loss =      594938.1 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     27.338(CFS)
      ---------------------------------------------------------------------
      +++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                        24 - H O U R    S T O R M
                   R u n o f f      H y d r o g r a p h
      ---------------------------------------------------------------------
                  Hydrograph in   5   Minute intervals ((CFS))

      ---------------------------------------------------------------------
 Time(h+m) Volume Ac.Ft   Q(CFS)  0        7.5      15.0      22.5      30.0
 ------------------------------------------------------------------------
   0+ 5       0.0003      0.05  Q          |          |          |          |
   0+10       0.0014      0.15  Q          |          |          |          |
   0+15       0.0027      0.19  Q          |          |          |          |
   0+20       0.0042      0.22  Q          |          |          |          |
   0+25       0.0062      0.29  Q          |          |          |          |
   0+30       0.0083      0.31  Q          |          |          |          |
   0+35       0.0105      0.32  Q          |          |          |          |
   0+40       0.0128      0.33  Q          |          |          |          |
   0+45       0.0150      0.33  Q          |          |          |          |
   0+50       0.0175      0.35  Q          |          |          |          |
   0+55       0.0203      0.41  Q          |          |          |          |
   1+ 0       0.0233      0.43  Q          |          |          |          |
   1+ 5       0.0261      0.41  Q          |          |          |          |
   1+10       0.0286      0.36  Q          |          |          |          |
   1+15       0.0310      0.35  Q          |          |          |          |
```

1+20	0.0333	0.34	Q	|	|	|	|
1+25	0.0357	0.34	Q	|	|	|	|
1+30	0.0380	0.34	Q	|	|	|	|
1+35	0.0403	0.33	Q	|	|	|	|
1+40	0.0426	0.33	Q	|	|	|	|
1+45	0.0449	0.33	Q	|	|	|	|
1+50	0.0473	0.36	Q	|	|	|	|
1+55	0.0502	0.41	Q	|	|	|	|
2+ 0	0.0531	0.43	Q	|	|	|	|
2+ 5	0.0561	0.43	Q	|	|	|	|
2+10	0.0591	0.44	Q	|	|	|	|
2+15	0.0622	0.44	Q	|	|	|	|
2+20	0.0652	0.44	Q	|	|	|	|
2+25	0.0683	0.44	Q	|	|	|	|
2+30	0.0713	0.44	Q	|	|	|	|
2+35	0.0746	0.47	Q	|	|	|	|
2+40	0.0781	0.52	Q	|	|	|	|
2+45	0.0818	0.54	Q	|	|	|	|
2+50	0.0856	0.55	Q	|	|	|	|
2+55	0.0894	0.55	Q	|	|	|	|
3+ 0	0.0932	0.55	Q	|	|	|	|
3+ 5	0.0970	0.55	Q	|	|	|	|
3+10	0.1008	0.56	Q	|	|	|	|
3+15	0.1047	0.56	Q	|	|	|	|
3+20	0.1085	0.56	Q	|	|	|	|
3+25	0.1123	0.56	Q	|	|	|	|
3+30	0.1162	0.56	Q	|	|	|	|
3+35	0.1200	0.56	Q	|	|	|	|
3+40	0.1238	0.56	Q	|	|	|	|
3+45	0.1276	0.56	Q	|	|	|	|
3+50	0.1316	0.58	Q	|	|	|	|
3+55	0.1360	0.63	Q	|	|	|	|
4+ 0	0.1404	0.65	Q	|	|	|	|
4+ 5	0.1450	0.66	Q	|	|	|	|
4+10	0.1495	0.66	Q	|	|	|	|
4+15	0.1541	0.66	Q	|	|	|	|
4+20	0.1588	0.69	Q	|	|	|	|
4+25	0.1639	0.74	Q	|	|	|	|
4+30	0.1692	0.76	VQ	|	|	|	|
4+35	0.1745	0.77	VQ	|	|	|	|
4+40	0.1798	0.77	VQ	|	|	|	|
4+45	0.1851	0.77	VQ	|	|	|	|
4+50	0.1906	0.80	VQ	|	|	|	|
4+55	0.1965	0.85	VQ	|	|	|	|
5+ 0	0.2025	0.87	VQ	|	|	|	|
5+ 5	0.2083	0.83	VQ	|	|	|	|
5+10	0.2133	0.73	Q	|	|	|	|
5+15	0.2181	0.70	Q	|	|	|	|
5+20	0.2230	0.71	Q	|	|	|	|
5+25	0.2282	0.76	VQ	|	|	|	|
5+30	0.2335	0.77	|Q	|	|	|	|
5+35	0.2389	0.79	|Q	|	|	|	|
5+40	0.2448	0.85	|Q	|	|	|	|
5+45	0.2507	0.87	|Q	|	|	|	|
5+50	0.2568	0.88	|Q	|	|	|	|
5+55	0.2629	0.88	|Q	|	|	|	|
6+ 0	0.2690	0.89	|Q	|	|	|	|
6+ 5	0.2752	0.91	|Q	|	|	|	|
6+10	0.2819	0.97	|Q	|	|	|	|
6+15	0.2887	0.98	|Q	|	|	|	|
6+20	0.2955	0.99	|Q	|	|	|	|
6+25	0.3023	0.99	|Q	|	|	|	|
6+30	0.3092	1.00	|Q	|	|	|	|
6+35	0.3162	1.02	|Q	|	|	|	|
6+40	0.3237	1.08	|Q	|	|	|	|
6+45	0.3312	1.09	|Q	|	|	|	|
6+50	0.3388	1.10	|Q	|	|	|	|
6+55	0.3464	1.11	|Q	|	|	|	|
7+ 0	0.3540	1.11	|Q	|	|	|	|
7+ 5	0.3617	1.11	|Q	|	|	|	|
7+10	0.3693	1.11	|Q	|	|	|	|
7+15	0.3770	1.11	|Q	|	|	|	|
7+20	0.3848	1.13	|Q	|	|	|	|

```
 7+25      0.3930     1.19  |Q        |         |         |         |
 7+30      0.4013     1.20  |Q        |         |         |         |
 7+35      0.4098     1.24  |Q        |         |         |         |
 7+40      0.4187     1.29  |Q        |         |         |         |
 7+45      0.4277     1.31  |Q        |         |         |         |
 7+50      0.4370     1.34  |Q        |         |         |         |
 7+55      0.4467     1.40  |Q        |         |         |         |
 8+ 0      0.4565     1.42  |Q        |         |         |         |
 8+ 5      0.4680     1.67  | Q       |         |         |         |
 8+10      0.4835     2.26  | VQ      |         |         |         |
 8+15      0.5006     2.48  | VQ      |         |         |         |
 8+20      0.5187     2.62  | VQ      |         |         |         |
 8+25      0.5375     2.73  | VQ      |         |         |         |
 8+30      0.5569     2.82  | VQ      |         |         |         |
 8+35      0.5784     3.12  | V Q     |         |         |         |
 8+40      0.6042     3.74  | V Q     |         |         |         |
 8+45      0.6315     3.97  | V  Q    |         |         |         |
 8+50      0.6614     4.34  | V  Q    |         |         |         |
 8+55      0.6958     4.99  | V   Q   |         |         |         |
 9+ 0      0.7319     5.25  |  V  Q   |         |         |         |
 9+ 5      0.7722     5.85  |  V   Q  |         |         |         |
 9+10      0.8208     7.06  |  V     Q|         |         |         |
 9+15      0.8724     7.48  |  V     Q|         |         |         |
 9+20      0.9270     7.94  |  V      Q         |         |         |
 9+25      0.9866     8.64  |   V     |Q        |         |         |
 9+30      1.0481     8.93  |   V     |Q        |         |         |
 9+35      1.1123     9.33  |   V     | Q       |         |         |
 9+40      1.1812    10.00  |    V    |  Q      |         |         |
 9+45      1.2518    10.26  |    V    |  Q      |         |         |
 9+50      1.3251    10.64  |    V    |   Q     |         |         |
 9+55      1.4029    11.30  |     V   |    Q    |         |         |
10+ 0      1.4825    11.55  |     V   |    Q    |         |         |
10+ 5      1.5522    10.13  |     V   |  Q      |         |         |
10+10      1.5968     6.46  |     V Q |         |         |         |
10+15      1.6338     5.38  |      Q  |         |         |         |
10+20      1.6677     4.92  |     QV  |         |         |         |
10+25      1.7000     4.69  |     QV  |         |         |         |
10+30      1.7314     4.56  |     QV  |         |         |         |
10+35      1.7702     5.63  |      Q  |         |         |         |
10+40      1.8274     8.30  |      V  |Q        |         |         |
10+45      1.8907     9.20  |       V | Q       |         |         |
10+50      1.9571     9.64  |       V | Q       |         |         |
10+55      2.0253     9.91  |       V |  Q      |         |         |
11+ 0      2.0949    10.11  |        V|  Q      |         |         |
11+ 5      2.1639    10.02  |        V|  Q      |         |         |
11+10      2.2301     9.61  |        V| Q       |         |         |
11+15      2.2956     9.50  |        V| Q       |         |         |
11+20      2.3609     9.48  |         V Q       |         |         |
11+25      2.4263     9.50  |         V Q       |         |         |
11+30      2.4920     9.53  |         V Q       |         |         |
11+35      2.5548     9.12  |         V Q       |         |         |
11+40      2.6104     8.08  |         QV        |         |         |
11+45      2.6642     7.80  |         QV        |         |         |
11+50      2.7188     7.93  |         QV        |         |         |
11+55      2.7770     8.44  |         |Q        |         |         |
12+ 0      2.8363     8.61  |         |QV       |         |         |
12+ 5      2.9072    10.29  |         | VQ      |         |         |
12+10      3.0046    14.15  |         | V     Q |         |         |
12+15      3.1107    15.41  |         |  V      Q         |         |
12+20      3.2225    16.24  |         |  V      |Q        |         |
12+25      3.3406    17.15  |         |   V     | Q       |         |
12+30      3.4616    17.56  |         |   V     |  Q      |         |
12+35      3.5873    18.26  |         |    V    |   Q     |         |
12+40      3.7219    19.54  |         |    V    |     Q   |         |
12+45      3.8593    19.96  |         |     V   |     Q   |         |
12+50      3.9999    20.41  |         |      V  |      Q  |         |
12+55      4.1452    21.10  |         |      V  |       Q |         |
13+ 0      4.2924    21.38  |         |       V |       Q |         |
13+ 5      4.4486    22.67  |         |        V|         Q         |
13+10      4.6241    25.50  |         |        V|         |  Q      |
13+15      4.8061    26.42  |         |         V         |    Q    |
13+20      4.9911    26.87  |         |         |V        |    Q    |
13+25      5.1781    27.15  |         |         | V       |     Q   |
```

```
13+30    5.3664   27.34  |          |          |  V       |     Q    |
13+35    5.5385   24.99  |          |          |  V       |  Q       |
13+40    5.6705   19.17  |          |          |   VQ     |          |
13+45    5.7902   17.37  |          |          |  QV      |          |
13+50    5.9044   16.59  |          |          | Q  V     |          |
13+55    6.0158   16.17  |          |          |Q   V     |          |
14+ 0    6.1254   15.92  |          |          |Q    V    |          |
14+ 5    6.2403   16.69  |          |          | Q   V    |          |
14+10    6.3694   18.74  |          |          |   Q  V   |          |
14+15    6.5035   19.47  |          |          |    Q V   |          |
14+20    6.6384   19.60  |          |          |     Q V  |          |
14+25    6.7712   19.28  |          |          |    Q   V|          |
14+30    6.9039   19.27  |          |          |    Q   V|          |
14+35    7.0369   19.31  |          |          |    Q    V          |
14+40    7.1703   19.37  |          |          |    Q    V          |
14+45    7.3038   19.39  |          |          |    Q    |V         |
14+50    7.4361   19.20  |          |          |    Q    |V         |
14+55    7.5648   18.69  |          |          |   Q      | V        |
15+ 0    7.6927   18.57  |          |          |   Q      |  V       |
15+ 5    7.8189   18.32  |          |          |   Q      |  V       |
15+10    7.9414   17.79  |          |          |  Q       |   V      |
15+15    8.0629   17.64  |          |          |  Q       |   V      |
15+20    8.1825   17.37  |          |          |  Q       |    V     |
15+25    8.2983   16.82  |          |          | Q        |    V     |
15+30    8.4131   16.67  |          |          | Q        |     V    |
15+35    8.5213   15.72  |          |         Q|          |     V    |
15+40    8.6146   13.55  |          |       Q  |          |      V   |
15+45    8.7034   12.89  |          |     Q    |          |      V   |
15+50    8.7903   12.62  |          |    Q     |          |      V   |
15+55    8.8762   12.48  |          |    Q     |          |       V  |
16+ 0    8.9617   12.41  |          |    Q     |          |       V  |
16+ 5    9.0304    9.97  |          |  Q       |          |       V  |
16+10    9.0588    4.13  |     Q    |          |          |       V  |
16+15    9.0749    2.34  |   Q      |          |          |        V|
16+20    9.0854    1.52  | Q        |          |          |        V|
16+25    9.0928    1.07  |Q         |          |          |        V|
16+30    9.0981    0.77  |Q         |          |          |        V|
16+35    9.1021    0.58  Q          |          |          |        V|
16+40    9.1046    0.37  Q          |          |          |        V|
16+45    9.1070    0.35  Q          |          |          |        V|
16+50    9.1094    0.34  Q          |          |          |        V|
16+55    9.1117    0.34  Q          |          |          |        V|
17+ 0    9.1140    0.34  Q          |          |          |        V|
17+ 5    9.1166    0.38  Q          |          |          |        V|
17+10    9.1200    0.49  Q          |          |          |        V|
17+15    9.1236    0.52  Q          |          |          |        V|
17+20    9.1273    0.54  Q          |          |          |        V|
17+25    9.1310    0.54  Q          |          |          |        V|
17+30    9.1348    0.55  Q          |          |          |        V|
17+35    9.1386    0.55  Q          |          |          |        V|
17+40    9.1424    0.56  Q          |          |          |        V|
17+45    9.1463    0.56  Q          |          |          |        V|
17+50    9.1499    0.53  Q          |          |          |        V|
17+55    9.1532    0.48  Q          |          |          |        V|
18+ 0    9.1564    0.46  Q          |          |          |        V|
18+ 5    9.1596    0.45  Q          |          |          |        V|
18+10    9.1627    0.45  Q          |          |          |        V|
18+15    9.1657    0.45  Q          |          |          |        V|
18+20    9.1688    0.45  Q          |          |          |        V|
18+25    9.1719    0.44  Q          |          |          |        V|
18+30    9.1749    0.44  Q          |          |          |        V|
18+35    9.1778    0.42  Q          |          |          |        V|
18+40    9.1804    0.37  Q          |          |          |        V|
18+45    9.1828    0.35  Q          |          |          |        V|
18+50    9.1850    0.32  Q          |          |          |        V|
18+55    9.1868    0.26  Q          |          |          |        V|
19+ 0    9.1885    0.24  Q          |          |          |        V|
19+ 5    9.1903    0.26  Q          |          |          |        V|
19+10    9.1923    0.30  Q          |          |          |        V|
19+15    9.1945    0.32  Q          |          |          |        V|
19+20    9.1969    0.35  Q          |          |          |        V|
19+25    9.1997    0.40  Q          |          |          |        V|
19+30    9.2026    0.42  Q          |          |          |        V|
```

19+35	9.2055	0.41	Q	|	|	|	V|
19+40	9.2080	0.36	Q	|	|	|	V|
19+45	9.2104	0.35	Q	|	|	|	V|
19+50	9.2126	0.32	Q	|	|	|	V|
19+55	9.2144	0.26	Q	|	|	|	V|
20+ 0	9.2160	0.24	Q	|	|	|	V|
20+ 5	9.2178	0.26	Q	|	|	|	V|
20+10	9.2199	0.30	Q	|	|	|	V|
20+15	9.2221	0.32	Q	|	|	|	V|
20+20	9.2243	0.32	Q	|	|	|	V|
20+25	9.2266	0.33	Q	|	|	|	V|
20+30	9.2289	0.33	Q	|	|	|	V|
20+35	9.2312	0.33	Q	|	|	|	V|
20+40	9.2335	0.33	Q	|	|	|	V|
20+45	9.2357	0.33	Q	|	|	|	V|
20+50	9.2379	0.31	Q	|	|	|	V|
20+55	9.2397	0.26	Q	|	|	|	V|
21+ 0	9.2413	0.24	Q	|	|	|	V|
21+ 5	9.2431	0.25	Q	|	|	|	V|
21+10	9.2452	0.30	Q	|	|	|	V|
21+15	9.2474	0.32	Q	|	|	|	V|
21+20	9.2494	0.30	Q	|	|	|	V|
21+25	9.2512	0.25	Q	|	|	|	V|
21+30	9.2528	0.24	Q	|	|	|	V|
21+35	9.2545	0.25	Q	|	|	|	V|
21+40	9.2566	0.30	Q	|	|	|	V|
21+45	9.2588	0.32	Q	|	|	|	V|
21+50	9.2609	0.30	Q	|	|	|	V|
21+55	9.2627	0.25	Q	|	|	|	V|
22+ 0	9.2643	0.24	Q	|	|	|	V|
22+ 5	9.2660	0.25	Q	|	|	|	V|
22+10	9.2681	0.30	Q	|	|	|	V|
22+15	9.2703	0.32	Q	|	|	|	V|
22+20	9.2724	0.30	Q	|	|	|	V|
22+25	9.2741	0.25	Q	|	|	|	V|
22+30	9.2758	0.24	Q	|	|	|	V|
22+35	9.2774	0.23	Q	|	|	|	V|
22+40	9.2789	0.23	Q	|	|	|	V|
22+45	9.2805	0.23	Q	|	|	|	V|
22+50	9.2820	0.22	Q	|	|	|	V|
22+55	9.2836	0.22	Q	|	|	|	V|
23+ 0	9.2851	0.22	Q	|	|	|	V|
23+ 5	9.2866	0.22	Q	|	|	|	V|
23+10	9.2881	0.22	Q	|	|	|	V|
23+15	9.2897	0.22	Q	|	|	|	V|
23+20	9.2912	0.22	Q	|	|	|	V|
23+25	9.2927	0.22	Q	|	|	|	V|
23+30	9.2943	0.22	Q	|	|	|	V|
23+35	9.2958	0.22	Q	|	|	|	V|
23+40	9.2973	0.22	Q	|	|	|	V|
23+45	9.2989	0.22	Q	|	|	|	V|
23+50	9.3004	0.22	Q	|	|	|	V|
23+55	9.3019	0.22	Q	|	|	|	V|
24+ 0	9.3035	0.22	Q	|	|	|	V|
24+ 5	9.3047	0.18	Q	|	|	|	V|
24+10	9.3052	0.07	Q	|	|	|	V|
24+15	9.3054	0.04	Q	|	|	|	V|
24+20	9.3055	0.02	Q	|	|	|	V|
24+25	9.3056	0.01	Q	|	|	|	V|
24+30	9.3057	0.01	Q	|	|	|	V|
24+35	9.3057	0.00	Q	|	|	|	V

Area 'C' – 10 Year 1 Hour Proposed Condition – Unit Hydrograph

```
        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  06/16/20 File: PRC010110.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'C'
PROPOSED CONDITION UNIT HYDROGRAPH - 10 YEAR 1 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =      68.90(Ac.)  =      0.108 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      68.90(Ac.)  =      0.108 Sq. Mi.
Length along longest watercourse =    2643.00(Ft.)
Length along longest watercourse measured to centroid =    1184.00(Ft.)
Length along longest watercourse =      0.501 Mi.
Length along longest watercourse measured to centroid =      0.224 Mi.
Difference in elevation =     128.00(Ft.)
Slope along watercourse =    255.7094 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.055 Hr.
Lag time =     3.28 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]
       68.90            0.45                 31.01

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       68.90            1.20                 82.68

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    0.450(In)
Area Averaged 100-Year Rainfall =    1.200(In)

Point rain (area averaged) =    0.759(In)
Areal adjustment factor =   99.94 %
Adjusted average point rain =    0.758(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
```

```
          68.900           58.90         0.850
        Total Area Entered =     68.90(Ac.)


      RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
      AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)       (Dec.)    (In/Hr)
      58.9  58.9      0.481     0.850        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)) =  0.057
      (for 24 hour storm duration)
      Soil low loss rate (decimal) =   0.220
      ------------------------------------------------------------------------
      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        152.377         33.745            23.432
          2   0.167        304.754         46.835            32.521
          3   0.250        457.131         11.045             7.669
          4   0.333        609.508          4.812             3.341
          5   0.417        761.885          2.398             1.665
          6   0.500        914.262          1.165             0.809
                                  Sum = 100.000    Sum=      69.438
------------------------------------------------------------------------

 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      0.382       (  0.113)       0.084        0.298
    2   0.17     4.30      0.391       (  0.113)       0.086        0.305
    3   0.25     5.00      0.455       (  0.113)       0.100        0.355
    4   0.33     5.00      0.455       (  0.113)       0.100        0.355
    5   0.42     5.80      0.528          0.113    (  0.116)        0.415
    6   0.50     6.50      0.591          0.113    (  0.130)        0.478
    7   0.58     7.40      0.673          0.113    (  0.148)        0.560
    8   0.67     8.60      0.782          0.113    (  0.172)        0.669
    9   0.75    12.30      1.119          0.113    (  0.246)        1.006
   10   0.83    29.10      2.647          0.113    (  0.582)        2.534
   11   0.92     6.80      0.619          0.113    (  0.136)        0.506
   12   1.00     5.00      0.455       (  0.113)       0.100        0.355
              (Loss Rate Not Used)
      Sum =     100.0                                  Sum =     7.8
        Flood volume = Effective rainfall      0.65(In)
         times area      68.9(Ac.)/[(In)/(Ft.)] =       3.7(Ac.Ft)
        Total soil loss =      0.11(In)
        Total soil loss =     0.604(Ac.Ft)
        Total rainfall =      0.76(In)
        Flood volume =      163300.4 Cubic Feet
        Total soil loss =       26301.3 Cubic Feet
        ------------------------------------------------------------------------
         Peak flow rate of this hydrograph =    105.583(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       50.0     100.0     150.0     200.0
  ----------------------------------------------------------------------------
    0+ 5       0.0481      6.99  VQ        |         |         |         |
```

```
    0+10       0.1642     16.85  |V Q      |          |          |          |
    0+15       0.3056     20.53  |  VQ     |          |          |          |
    0+20       0.4653     23.20  |   Q     |          |          |          |
    0+25       0.6410     25.50  |    QV   |          |          |          |
    0+30       0.8432     29.36  |    Q  V |          |          |          |
    0+35       1.0766     33.90  |     Q   |V         |          |          |
    0+40       1.3510     39.85  |      Q  |   V      |          |          |
    0+45       1.7108     52.23  |         Q        V |          |          |
    0+50       2.4014    100.28  |          |          Q    V    |          |
    0+55       3.1286    105.58  |          |          |Q         |  V       |
    1+ 0       3.4670     49.14  |         Q|          |          |     V    |
    1+ 5       3.6468     26.11  |    Q     |          |          |       V  |
    1+10       3.7119      9.45  |Q         |          |          |         V|
    1+15       3.7400      4.08  Q          |          |          |         V|
    1+20       3.7469      1.00  Q          |          |          |         V|
    1+25       3.7489      0.29  Q          |          |          |         V|
-------------------------------------------------------------------------
```

Area 'C' – 10 Year 3 Hour Proposed Condition – Unit Hydrograph

```
        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  06/16/20 File: PRC010310.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'C'
PROPOSED CONDITION UNIT HYDROGRAPH - 10 YEAR 3 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =      68.90(Ac.)  =      0.108 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      68.90(Ac.)  =      0.108 Sq. Mi.
Length along longest watercourse =    2643.00(Ft.)
Length along longest watercourse measured to centroid =    1184.00(Ft.)
Length along longest watercourse =      0.501 Mi.
Length along longest watercourse measured to centroid =      0.224 Mi.
Difference in elevation =     128.00(Ft.)
Slope along watercourse =    255.7094 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.055 Hr.
Lag time =     3.28 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]
       68.90            0.80                55.12

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       68.90            1.80               124.02

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    0.800(In)
Area Averaged 100-Year Rainfall =    1.800(In)

Point rain (area averaged) =    1.211(In)
Areal adjustment factor =   99.97 %
Adjusted average point rain =    1.211(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
    68.900           58.90         0.850
```

Total Area Entered = 68.90(Ac.)

RI AMC2	RI AMC-2	Infil. Rate (In/Hr)	Impervious (Dec.%)	Adj. Infil. Rate (In/Hr)	Area% (Dec.)	F (In/Hr)
58.9	58.9	0.481	0.850	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)) = 0.057
(for 24 hour storm duration)
Soil low loss rate (decimal) = 0.220

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	152.377	33.745	23.432
2	0.167	304.754	46.835	32.521
3	0.250	457.131	11.045	7.669
4	0.333	609.508	4.812	3.341
5	0.417	761.885	2.398	1.665
6	0.500	914.262	1.165	0.809
			Sum = 100.000	Sum= 69.438

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	0.189	(0.113)	0.042	0.147
2	0.17	1.30	0.189	(0.113)	0.042	0.147
3	0.25	1.10	0.160	(0.113)	0.035	0.125
4	0.33	1.50	0.218	(0.113)	0.048	0.170
5	0.42	1.50	0.218	(0.113)	0.048	0.170
6	0.50	1.80	0.262	(0.113)	0.058	0.204
7	0.58	1.50	0.218	(0.113)	0.048	0.170
8	0.67	1.80	0.262	(0.113)	0.058	0.204
9	0.75	1.80	0.262	(0.113)	0.058	0.204
10	0.83	1.50	0.218	(0.113)	0.048	0.170
11	0.92	1.60	0.233	(0.113)	0.051	0.181
12	1.00	1.80	0.262	(0.113)	0.058	0.204
13	1.08	2.20	0.320	(0.113)	0.070	0.249
14	1.17	2.20	0.320	(0.113)	0.070	0.249
15	1.25	2.20	0.320	(0.113)	0.070	0.249
16	1.33	2.00	0.291	(0.113)	0.064	0.227
17	1.42	2.60	0.378	(0.113)	0.083	0.295
18	1.50	2.70	0.392	(0.113)	0.086	0.306
19	1.58	2.40	0.349	(0.113)	0.077	0.272
20	1.67	2.70	0.392	(0.113)	0.086	0.306
21	1.75	3.30	0.480	(0.113)	0.106	0.374
22	1.83	3.10	0.451	(0.113)	0.099	0.351
23	1.92	2.90	0.421	(0.113)	0.093	0.329
24	2.00	3.00	0.436	(0.113)	0.096	0.340
25	2.08	3.10	0.451	(0.113)	0.099	0.351
26	2.17	4.20	0.610	0.113	(0.134)	0.497
27	2.25	5.00	0.727	0.113	(0.160)	0.614
28	2.33	3.50	0.509	(0.113)	0.112	0.397
29	2.42	6.80	0.988	0.113	(0.217)	0.875
30	2.50	7.30	1.061	0.113	(0.233)	0.948
31	2.58	8.20	1.192	0.113	(0.262)	1.079
32	2.67	5.90	0.857	0.113	(0.189)	0.744
33	2.75	2.00	0.291	(0.113)	0.064	0.227
34	2.83	1.80	0.262	(0.113)	0.058	0.204
35	2.92	1.80	0.262	(0.113)	0.058	0.204
36	3.00	0.60	0.087	(0.113)	0.019	0.068

(Loss Rate Not Used)

```
    Sum =     100.0                                    Sum =    11.9
      Flood volume = Effective rainfall      0.99(In)
       times area      68.9(Ac.)/[(In)/(Ft.)] =       5.7(Ac.Ft)
      Total soil loss =      0.22(In)
      Total soil loss =     1.282(Ac.Ft)
      Total rainfall =      1.21(In)
      Flood volume =      247034.4 Cubic Feet
      Total soil loss =       55855.9 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     65.592(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       17.5      35.0      52.5      70.0
 ------------------------------------------------------------------------
   0+ 5       0.0238      3.45  VQ        |         |         |         |
   0+10       0.0806      8.25  V   Q     |         |         |         |
   0+15       0.1416      8.85  V    Q    |         |         |         |
   0+20       0.2081      9.67  |V   Q    |         |         |         |
   0+25       0.2854     11.21  | V   Q   |         |         |         |
   0+30       0.3708     12.40  | V    Q  |         |         |         |
   0+35       0.4591     12.83  |  V   Q  |         |         |         |
   0+40       0.5475     12.83  |  V   Q  |         |         |         |
   0+45       0.6427     13.83  |   V  Q  |         |         |         |
   0+50       0.7339     13.24  |    V Q  |         |         |         |
   0+55       0.8199     12.48  |    V Q  |         |         |         |
   1+ 0       0.9104     13.15  |     VQ  |         |         |         |
   1+ 5       1.0134     14.95  |      VQ |         |         |         |
   1+10       1.1276     16.58  |      V Q|         |         |         |
   1+15       1.2446     17.00  |       VQ|         |         |         |
   1+20       1.3594     16.66  |        Q|         |         |         |
   1+25       1.4807     17.61  |         Q         |         |         |
   1+30       1.6181     19.96  |         |Q        |         |         |
   1+35       1.7557     19.97  |         |QV       |         |         |
   1+40       1.8930     19.94  |         |Q V      |         |         |
   1+45       2.0481     22.51  |         | Q V     |         |         |
   1+50       2.2162     24.42  |         |  Q V    |         |         |
   1+55       2.3797     23.73  |         |  Q  V   |         |         |
   2+ 0       2.5405     23.35  |         |  Q   V  |         |         |
   2+ 5       2.7049     23.87  |         |  Q     V|         |         |
   2+10       2.8956     27.69  |         |    Q    V         |         |
   2+15       3.1382     35.23  |         |         Q V       |         |
   2+20       3.3798     35.09  |         |         Q  V      |         |
   2+25       3.6599     40.66  |         |         |  Q V    |         |
   2+30       4.0518     56.90  |         |         |       V | Q       |
   2+35       4.5035     65.59  |         |         |         |V     Q  |
   2+40       4.9436     63.90  |         |         |         |   V Q   |
   2+45       5.2381     42.76  |         |         |   Q     |     V   |
   2+50       5.4017     23.76  |         |  Q      |         |       V |
   2+55       5.5272     18.21  |         Q         |         |       V |
   3+ 0       5.6144     12.67  |       Q |         |         |        V|
   3+ 5       5.6519      5.44  |  Q      |         |         |        V|
   3+10       5.6638      1.73  Q         |         |         |        V|
   3+15       5.6688      0.73  Q         |         |         |        V|
   3+20       5.6707      0.28  Q         |         |         |        V|
   3+25       5.6711      0.06  Q         |         |         |         V
------------------------------------------------------------------------
```

Area 'C' – 10 Year 6 Hour Proposed Condition – Unit Hydrograph

```
        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  06/16/20 File: PRC010610.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'C'
PROPOSED CONDITION UNIT HYDROGRAPH - 10 YEAR 6 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =      68.90(Ac.)  =      0.108 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      68.90(Ac.)  =      0.108 Sq. Mi.
Length along longest watercourse =    2643.00(Ft.)
Length along longest watercourse measured to centroid =    1184.00(Ft.)
Length along longest watercourse =      0.501 Mi.
Length along longest watercourse measured to centroid =      0.224 Mi.
Difference in elevation =     128.00(Ft.)
Slope along watercourse =    255.7094 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.055 Hr.
Lag time =     3.28 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]
       68.90            1.00                 68.90

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       68.90            2.50                172.25

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    1.000(In)
Area Averaged 100-Year Rainfall =    2.500(In)

Point rain (area averaged) =    1.617(In)
Areal adjustment factor =   99.98 %
Adjusted average point rain =    1.617(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
```

```
          68.900           58.90         0.850
 Total Area Entered =     68.90(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)       (Dec.)    (In/Hr)
58.9  58.9      0.481     0.850        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)) =  0.057
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.220
------------------------------------------------------------------------

               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        152.377         33.745             23.432
    2   0.167        304.754         46.835             32.521
    3   0.250        457.131         11.045              7.669
    4   0.333        609.508          4.812              3.341
    5   0.417        761.885          2.398              1.665
    6   0.500        914.262          1.165              0.809
                              Sum = 100.000   Sum=      69.438
------------------------------------------------------------------------
```

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	0.097	(0.113)	0.021	0.076
2	0.17	0.60	0.116	(0.113)	0.026	0.091
3	0.25	0.60	0.116	(0.113)	0.026	0.091
4	0.33	0.60	0.116	(0.113)	0.026	0.091
5	0.42	0.60	0.116	(0.113)	0.026	0.091
6	0.50	0.70	0.136	(0.113)	0.030	0.106
7	0.58	0.70	0.136	(0.113)	0.030	0.106
8	0.67	0.70	0.136	(0.113)	0.030	0.106
9	0.75	0.70	0.136	(0.113)	0.030	0.106
10	0.83	0.70	0.136	(0.113)	0.030	0.106
11	0.92	0.70	0.136	(0.113)	0.030	0.106
12	1.00	0.80	0.155	(0.113)	0.034	0.121
13	1.08	0.80	0.155	(0.113)	0.034	0.121
14	1.17	0.80	0.155	(0.113)	0.034	0.121
15	1.25	0.80	0.155	(0.113)	0.034	0.121
16	1.33	0.80	0.155	(0.113)	0.034	0.121
17	1.42	0.80	0.155	(0.113)	0.034	0.121
18	1.50	0.80	0.155	(0.113)	0.034	0.121
19	1.58	0.80	0.155	(0.113)	0.034	0.121
20	1.67	0.80	0.155	(0.113)	0.034	0.121
21	1.75	0.80	0.155	(0.113)	0.034	0.121
22	1.83	0.80	0.155	(0.113)	0.034	0.121
23	1.92	0.80	0.155	(0.113)	0.034	0.121
24	2.00	0.90	0.175	(0.113)	0.038	0.136
25	2.08	0.80	0.155	(0.113)	0.034	0.121
26	2.17	0.90	0.175	(0.113)	0.038	0.136
27	2.25	0.90	0.175	(0.113)	0.038	0.136
28	2.33	0.90	0.175	(0.113)	0.038	0.136
29	2.42	0.90	0.175	(0.113)	0.038	0.136
30	2.50	0.90	0.175	(0.113)	0.038	0.136
31	2.58	0.90	0.175	(0.113)	0.038	0.136
32	2.67	0.90	0.175	(0.113)	0.038	0.136
33	2.75	1.00	0.194	(0.113)	0.043	0.151
34	2.83	1.00	0.194	(0.113)	0.043	0.151
35	2.92	1.00	0.194	(0.113)	0.043	0.151
36	3.00	1.00	0.194	(0.113)	0.043	0.151

37	3.08	1.00	0.194	(0.113)	0.043	0.151	
38	3.17	1.10	0.213	(0.113)	0.047	0.166	
39	3.25	1.10	0.213	(0.113)	0.047	0.166	
40	3.33	1.10	0.213	(0.113)	0.047	0.166	
41	3.42	1.20	0.233	(0.113)	0.051	0.182	
42	3.50	1.30	0.252	(0.113)	0.055	0.197	
43	3.58	1.40	0.272	(0.113)	0.060	0.212	
44	3.67	1.40	0.272	(0.113)	0.060	0.212	
45	3.75	1.50	0.291	(0.113)	0.064	0.227	
46	3.83	1.50	0.291	(0.113)	0.064	0.227	
47	3.92	1.60	0.310	(0.113)	0.068	0.242	
48	4.00	1.60	0.310	(0.113)	0.068	0.242	
49	4.08	1.70	0.330	(0.113)	0.073	0.257	
50	4.17	1.80	0.349	(0.113)	0.077	0.272	
51	4.25	1.90	0.369	(0.113)	0.081	0.288	
52	4.33	2.00	0.388	(0.113)	0.085	0.303	
53	4.42	2.10	0.407	(0.113)	0.090	0.318	
54	4.50	2.10	0.407	(0.113)	0.090	0.318	
55	4.58	2.20	0.427	(0.113)	0.094	0.333	
56	4.67	2.30	0.446	(0.113)	0.098	0.348	
57	4.75	2.40	0.466	(0.113)	0.102	0.363	
58	4.83	2.40	0.466	(0.113)	0.102	0.363	
59	4.92	2.50	0.485	(0.113)	0.107	0.378	
60	5.00	2.60	0.504	(0.113)	0.111	0.393	
61	5.08	3.10	0.601	0.113	(0.132)	0.488	
62	5.17	3.60	0.698	0.113	(0.154)	0.585	
63	5.25	3.90	0.757	0.113	(0.166)	0.644	
64	5.33	4.20	0.815	0.113	(0.179)	0.702	
65	5.42	4.70	0.912	0.113	(0.201)	0.799	
66	5.50	5.60	1.086	0.113	(0.239)	0.973	
67	5.58	1.90	0.369	(0.113)	0.081	0.288	
68	5.67	0.90	0.175	(0.113)	0.038	0.136	
69	5.75	0.60	0.116	(0.113)	0.026	0.091	
70	5.83	0.50	0.097	(0.113)	0.021	0.076	
71	5.92	0.30	0.058	(0.113)	0.013	0.045	
72	6.00	0.20	0.039	(0.113)	0.009	0.030	

(Loss Rate Not Used)

Sum = 100.0 Sum = 15.5

Flood volume = Effective rainfall 1.29(In)
times area 68.9(Ac.)/[(In)/(Ft.)] = 7.4(Ac.Ft)
Total soil loss = 0.32(In)
Total soil loss = 1.854(Ac.Ft)
Total rainfall = 1.62(In)
Flood volume = 323583.7 Cubic Feet
Total soil loss = 80771.5 Cubic Feet

Peak flow rate of this hydrograph = 57.716(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	15.0	30.0	45.0	60.0
0+ 5	0.0122	1.77	VQ	|	|	|	|
0+10	0.0438	4.59	V Q	|	|	|	|
0+15	0.0828	5.66	V Q	|	|	|	|
0+20	0.1244	6.03	V Q	|	|	|	|
0+25	0.1671	6.21	V Q	|	|	|	|
0+30	0.2130	6.65	|V Q	|	|	|	|
0+35	0.2622	7.16	|V Q	|	|	|	|
0+40	0.3123	7.27	|V Q	|	|	|	|
0+45	0.3627	7.32	|V Q	|	|	|	|
0+50	0.4133	7.35	| V Q	|	|	|	|
0+55	0.4640	7.36	| V Q	|	|	|	|
1+ 0	0.5171	7.71	| V Q	|	|	|	|
1+ 5	0.5737	8.21	| V Q	|	|	|	|
1+10	0.6310	8.32	| V Q	|	|	|	|
1+15	0.6886	8.37	| V Q	|	|	|	|
1+20	0.7465	8.40	| VQ	|	|	|	|

```
    1+25       0.8044      8.41  |   VQ    |          |          |          |
    1+30       0.8623      8.41  |   VQ    |          |          |          |
    1+35       0.9203      8.41  |   VQ    |          |          |          |
    1+40       0.9782      8.41  |    Q    |          |          |          |
    1+45       1.0361      8.41  |    Q    |          |          |          |
    1+50       1.0940      8.41  |    Q    |          |          |          |
    1+55       1.1520      8.41  |    QV   |          |          |          |
    2+ 0       1.2123      8.77  |    QV   |          |          |          |
    2+ 5       1.2736      8.90  |    QV   |          |          |          |
    2+10       1.3348      8.88  |    Q V  |          |          |          |
    2+15       1.3989      9.31  |     QV  |          |          |          |
    2+20       1.4636      9.40  |     QV  |          |          |          |
    2+25       1.5286      9.44  |     Q V |          |          |          |
    2+30       1.5937      9.45  |     Q V |          |          |          |
    2+35       1.6589      9.46  |     Q V |          |          |          |
    2+40       1.7240      9.46  |     Q  V|          |          |          |
    2+45       1.7916      9.82  |     Q  V|          |          |          |
    2+50       1.8626     10.31  |     Q   V          |          |          |
    2+55       1.9344     10.43  |     Q   V          |          |          |
    3+ 0       2.0066     10.48  |     Q   V          |          |          |
    3+ 5       2.0789     10.50  |      Q  |V         |          |          |
    3+10       2.1538     10.87  |      Q  |V         |          |          |
    3+15       2.2320     11.36  |      Q  | V        |          |          |
    3+20       2.3110     11.48  |      Q  | V        |          |          |
    3+25       2.3929     11.88  |      Q  | V        |          |          |
    3+30       2.4807     12.75  |       Q |  V       |          |          |
    3+35       2.5753     13.73  |        Q|  V       |          |          |
    3+40       2.6744     14.39  |        Q|   V      |          |          |
    3+45       2.7772     14.94  |        Q|   V      |          |          |
    3+50       2.8841     15.52  |         Q    V     |          |          |
    3+55       2.9945     16.02  |         Q     V    |          |          |
    4+ 0       3.1086     16.58  |         |Q    V    |          |          |
    4+ 5       3.2262     17.08  |         |Q     V   |          |          |
    4+10       3.3501     17.99  |         |Q      V  |          |          |
    4+15       3.4808     18.97  |         | Q     V  |          |          |
    4+20       3.6185     20.00  |         |  Q     V|          |          |
    4+25       3.7634     21.04  |         |   Q     V          |          |
    4+30       3.9131     21.74  |         |   Q     |V         |          |
    4+35       4.0667     22.29  |         |   Q     |V         |          |
    4+40       4.2266     23.23  |         |    Q    | V        |          |
    4+45       4.3935     24.23  |         |     Q   |  V       |          |
    4+50       4.5650     24.90  |         |     Q   |   V      |          |
    4+55       4.7403     25.45  |         |     Q   |    V     |          |
    5+ 0       4.9220     26.38  |         |      Q  |     V    |          |
    5+ 5       5.1235     29.25  |         |        Q|      V   |          |
    5+10       5.3631     34.80  |         |         |  Q    V  |          |
    5+15       5.6394     40.12  |         |         |     Q   V          |
    5+20       5.9457     44.48  |         |         |        Q| V        |
    5+25       6.2873     49.59  |         |         |         |  Q       |
    5+30       6.6847     57.72  |         |         |         |    V  Q  |
    5+35       7.0183     48.43  |         |         |         | Q    V   |
    5+40       7.1862     24.38  |         |     Q   |         |       V  |
    5+45       7.2821     13.92  |        Q|         |         |        V |
    5+50       7.3441      9.00  |     Q   |         |         |        V |
    5+55       7.3850      5.94  |  Q      |         |         |        V |
    6+ 0       7.4093      3.53  | Q       |         |         |        V |
    6+ 5       7.4220      1.85  |Q        |         |         |        V |
    6+10       7.4261      0.58  Q         |         |         |        V |
    6+15       7.4277      0.24  Q         |         |         |        V |
    6+20       7.4283      0.09  Q         |         |         |        V |
    6+25       7.4285      0.02  Q         |         |         |        V |
-------------------------------------------------------------------------
```

Area 'C' – 10 Year 24 Hour Proposed Condition – Unit Hydrograph

```
        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  06/16/20 File: PRC0102410.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'C'
PROPOSED CONDITION UNIT HYDROGRAPH - 10 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =      68.90(Ac.)  =      0.108 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      68.90(Ac.)  =      0.108 Sq. Mi.
Length along longest watercourse =    2643.00(Ft.)
Length along longest watercourse measured to centroid =    1184.00(Ft.)
Length along longest watercourse =      0.501 Mi.
Length along longest watercourse measured to centroid =      0.224 Mi.
Difference in elevation =     128.00(Ft.)
Slope along watercourse =    255.7094 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.055 Hr.
Lag time =     3.28 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]
       68.90            1.60                110.24

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       68.90            4.00                275.60

STORM EVENT (YEAR) =   10.00
Area Averaged 2-Year Rainfall =    1.600(In)
Area Averaged 100-Year Rainfall =    4.000(In)

Point rain (area averaged) =    2.587(In)
Areal adjustment factor =   99.99 %
Adjusted average point rain =    2.587(In)
```

```
Sub-Area Data:
Area(Ac.)          Runoff Index    Impervious %
    68.900            58.90          0.850
 Total Area Entered =     68.90(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-2     (In/Hr)    (Dec.%)     (In/Hr)       (Dec.)    (In/Hr)
58.9  58.9      0.481     0.850        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)) =  0.057
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.220
------------------------------------------------------------------------

               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        152.377         33.745            23.432
     2   0.167        304.754         46.835            32.521
     3   0.250        457.131         11.045             7.669
     4   0.333        609.508          4.812             3.341
     5   0.417        761.885          2.398             1.665
     6   0.500        914.262          1.165             0.809
                              Sum = 100.000   Sum=      69.438
------------------------------------------------------------------------
```

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	0.021	(0.200)	0.005	0.016
2	0.17	0.07	0.021	(0.200)	0.005	0.016
3	0.25	0.07	0.021	(0.199)	0.005	0.016
4	0.33	0.10	0.031	(0.198)	0.007	0.024
5	0.42	0.10	0.031	(0.197)	0.007	0.024
6	0.50	0.10	0.031	(0.197)	0.007	0.024
7	0.58	0.10	0.031	(0.196)	0.007	0.024
8	0.67	0.10	0.031	(0.195)	0.007	0.024
9	0.75	0.10	0.031	(0.194)	0.007	0.024
10	0.83	0.13	0.041	(0.194)	0.009	0.032
11	0.92	0.13	0.041	(0.193)	0.009	0.032
12	1.00	0.13	0.041	(0.192)	0.009	0.032
13	1.08	0.10	0.031	(0.191)	0.007	0.024
14	1.17	0.10	0.031	(0.191)	0.007	0.024
15	1.25	0.10	0.031	(0.190)	0.007	0.024
16	1.33	0.10	0.031	(0.189)	0.007	0.024
17	1.42	0.10	0.031	(0.188)	0.007	0.024
18	1.50	0.10	0.031	(0.187)	0.007	0.024
19	1.58	0.10	0.031	(0.187)	0.007	0.024
20	1.67	0.10	0.031	(0.186)	0.007	0.024
21	1.75	0.10	0.031	(0.185)	0.007	0.024
22	1.83	0.13	0.041	(0.185)	0.009	0.032
23	1.92	0.13	0.041	(0.184)	0.009	0.032
24	2.00	0.13	0.041	(0.183)	0.009	0.032
25	2.08	0.13	0.041	(0.182)	0.009	0.032
26	2.17	0.13	0.041	(0.182)	0.009	0.032
27	2.25	0.13	0.041	(0.181)	0.009	0.032
28	2.33	0.13	0.041	(0.180)	0.009	0.032
29	2.42	0.13	0.041	(0.179)	0.009	0.032
30	2.50	0.13	0.041	(0.179)	0.009	0.032
31	2.58	0.17	0.052	(0.178)	0.011	0.040
32	2.67	0.17	0.052	(0.177)	0.011	0.040
33	2.75	0.17	0.052	(0.176)	0.011	0.040
34	2.83	0.17	0.052	(0.176)	0.011	0.040

35	2.92	0.17	0.052	(0.175)	0.011	0.040
36	3.00	0.17	0.052	(0.174)	0.011	0.040
37	3.08	0.17	0.052	(0.174)	0.011	0.040
38	3.17	0.17	0.052	(0.173)	0.011	0.040
39	3.25	0.17	0.052	(0.172)	0.011	0.040
40	3.33	0.17	0.052	(0.171)	0.011	0.040
41	3.42	0.17	0.052	(0.171)	0.011	0.040
42	3.50	0.17	0.052	(0.170)	0.011	0.040
43	3.58	0.17	0.052	(0.169)	0.011	0.040
44	3.67	0.17	0.052	(0.169)	0.011	0.040
45	3.75	0.17	0.052	(0.168)	0.011	0.040
46	3.83	0.20	0.062	(0.167)	0.014	0.048
47	3.92	0.20	0.062	(0.166)	0.014	0.048
48	4.00	0.20	0.062	(0.166)	0.014	0.048
49	4.08	0.20	0.062	(0.165)	0.014	0.048
50	4.17	0.20	0.062	(0.164)	0.014	0.048
51	4.25	0.20	0.062	(0.164)	0.014	0.048
52	4.33	0.23	0.072	(0.163)	0.016	0.057
53	4.42	0.23	0.072	(0.162)	0.016	0.057
54	4.50	0.23	0.072	(0.161)	0.016	0.057
55	4.58	0.23	0.072	(0.161)	0.016	0.057
56	4.67	0.23	0.072	(0.160)	0.016	0.057
57	4.75	0.23	0.072	(0.159)	0.016	0.057
58	4.83	0.27	0.083	(0.159)	0.018	0.065
59	4.92	0.27	0.083	(0.158)	0.018	0.065
60	5.00	0.27	0.083	(0.157)	0.018	0.065
61	5.08	0.20	0.062	(0.157)	0.014	0.048
62	5.17	0.20	0.062	(0.156)	0.014	0.048
63	5.25	0.20	0.062	(0.155)	0.014	0.048
64	5.33	0.23	0.072	(0.155)	0.016	0.057
65	5.42	0.23	0.072	(0.154)	0.016	0.057
66	5.50	0.23	0.072	(0.153)	0.016	0.057
67	5.58	0.27	0.083	(0.153)	0.018	0.065
68	5.67	0.27	0.083	(0.152)	0.018	0.065
69	5.75	0.27	0.083	(0.151)	0.018	0.065
70	5.83	0.27	0.083	(0.151)	0.018	0.065
71	5.92	0.27	0.083	(0.150)	0.018	0.065
72	6.00	0.27	0.083	(0.149)	0.018	0.065
73	6.08	0.30	0.093	(0.149)	0.020	0.073
74	6.17	0.30	0.093	(0.148)	0.020	0.073
75	6.25	0.30	0.093	(0.147)	0.020	0.073
76	6.33	0.30	0.093	(0.147)	0.020	0.073
77	6.42	0.30	0.093	(0.146)	0.020	0.073
78	6.50	0.30	0.093	(0.145)	0.020	0.073
79	6.58	0.33	0.103	(0.145)	0.023	0.081
80	6.67	0.33	0.103	(0.144)	0.023	0.081
81	6.75	0.33	0.103	(0.143)	0.023	0.081
82	6.83	0.33	0.103	(0.143)	0.023	0.081
83	6.92	0.33	0.103	(0.142)	0.023	0.081
84	7.00	0.33	0.103	(0.141)	0.023	0.081
85	7.08	0.33	0.103	(0.141)	0.023	0.081
86	7.17	0.33	0.103	(0.140)	0.023	0.081
87	7.25	0.33	0.103	(0.140)	0.023	0.081
88	7.33	0.37	0.114	(0.139)	0.025	0.089
89	7.42	0.37	0.114	(0.138)	0.025	0.089
90	7.50	0.37	0.114	(0.138)	0.025	0.089
91	7.58	0.40	0.124	(0.137)	0.027	0.097
92	7.67	0.40	0.124	(0.136)	0.027	0.097
93	7.75	0.40	0.124	(0.136)	0.027	0.097
94	7.83	0.43	0.135	(0.135)	0.030	0.105
95	7.92	0.43	0.135	(0.134)	0.030	0.105
96	8.00	0.43	0.135	(0.134)	0.030	0.105
97	8.08	0.50	0.155	(0.133)	0.034	0.121
98	8.17	0.50	0.155	(0.133)	0.034	0.121
99	8.25	0.50	0.155	(0.132)	0.034	0.121
100	8.33	0.50	0.155	(0.131)	0.034	0.121
101	8.42	0.50	0.155	(0.131)	0.034	0.121
102	8.50	0.50	0.155	(0.130)	0.034	0.121
103	8.58	0.53	0.166	(0.130)	0.036	0.129
104	8.67	0.53	0.166	(0.129)	0.036	0.129
105	8.75	0.53	0.166	(0.128)	0.036	0.129
106	8.83	0.57	0.176	(0.128)	0.039	0.137
107	8.92	0.57	0.176	(0.127)	0.039	0.137

108	9.00	0.57	0.176	(0.126)	0.039	0.137
109	9.08	0.63	0.197	(0.126)	0.043	0.153
110	9.17	0.63	0.197	(0.125)	0.043	0.153
111	9.25	0.63	0.197	(0.125)	0.043	0.153
112	9.33	0.67	0.207	(0.124)	0.046	0.161
113	9.42	0.67	0.207	(0.124)	0.046	0.161
114	9.50	0.67	0.207	(0.123)	0.046	0.161
115	9.58	0.70	0.217	(0.122)	0.048	0.170
116	9.67	0.70	0.217	(0.122)	0.048	0.170
117	9.75	0.70	0.217	(0.121)	0.048	0.170
118	9.83	0.73	0.228	(0.121)	0.050	0.178
119	9.92	0.73	0.228	(0.120)	0.050	0.178
120	10.00	0.73	0.228	(0.119)	0.050	0.178
121	10.08	0.50	0.155	(0.119)	0.034	0.121
122	10.17	0.50	0.155	(0.118)	0.034	0.121
123	10.25	0.50	0.155	(0.118)	0.034	0.121
124	10.33	0.50	0.155	(0.117)	0.034	0.121
125	10.42	0.50	0.155	(0.117)	0.034	0.121
126	10.50	0.50	0.155	(0.116)	0.034	0.121
127	10.58	0.67	0.207	(0.115)	0.046	0.161
128	10.67	0.67	0.207	(0.115)	0.046	0.161
129	10.75	0.67	0.207	(0.114)	0.046	0.161
130	10.83	0.67	0.207	(0.114)	0.046	0.161
131	10.92	0.67	0.207	(0.113)	0.046	0.161
132	11.00	0.67	0.207	(0.113)	0.046	0.161
133	11.08	0.63	0.197	(0.112)	0.043	0.153
134	11.17	0.63	0.197	(0.112)	0.043	0.153
135	11.25	0.63	0.197	(0.111)	0.043	0.153
136	11.33	0.63	0.197	(0.110)	0.043	0.153
137	11.42	0.63	0.197	(0.110)	0.043	0.153
138	11.50	0.63	0.197	(0.109)	0.043	0.153
139	11.58	0.57	0.176	(0.109)	0.039	0.137
140	11.67	0.57	0.176	(0.108)	0.039	0.137
141	11.75	0.57	0.176	(0.108)	0.039	0.137
142	11.83	0.60	0.186	(0.107)	0.041	0.145
143	11.92	0.60	0.186	(0.107)	0.041	0.145
144	12.00	0.60	0.186	(0.106)	0.041	0.145
145	12.08	0.83	0.259	(0.106)	0.057	0.202
146	12.17	0.83	0.259	(0.105)	0.057	0.202
147	12.25	0.83	0.259	(0.105)	0.057	0.202
148	12.33	0.87	0.269	(0.104)	0.059	0.210
149	12.42	0.87	0.269	(0.103)	0.059	0.210
150	12.50	0.87	0.269	(0.103)	0.059	0.210
151	12.58	0.93	0.290	(0.102)	0.064	0.226
152	12.67	0.93	0.290	(0.102)	0.064	0.226
153	12.75	0.93	0.290	(0.101)	0.064	0.226
154	12.83	0.97	0.300	(0.101)	0.066	0.234
155	12.92	0.97	0.300	(0.100)	0.066	0.234
156	13.00	0.97	0.300	(0.100)	0.066	0.234
157	13.08	1.13	0.352	(0.099)	0.077	0.274
158	13.17	1.13	0.352	(0.099)	0.077	0.274
159	13.25	1.13	0.352	(0.098)	0.077	0.274
160	13.33	1.13	0.352	(0.098)	0.077	0.274
161	13.42	1.13	0.352	(0.097)	0.077	0.274
162	13.50	1.13	0.352	(0.097)	0.077	0.274
163	13.58	0.77	0.238	(0.096)	0.052	0.186
164	13.67	0.77	0.238	(0.096)	0.052	0.186
165	13.75	0.77	0.238	(0.095)	0.052	0.186
166	13.83	0.77	0.238	(0.095)	0.052	0.186
167	13.92	0.77	0.238	(0.094)	0.052	0.186
168	14.00	0.77	0.238	(0.094)	0.052	0.186
169	14.08	0.90	0.279	(0.093)	0.061	0.218
170	14.17	0.90	0.279	(0.093)	0.061	0.218
171	14.25	0.90	0.279	(0.093)	0.061	0.218
172	14.33	0.87	0.269	(0.092)	0.059	0.210
173	14.42	0.87	0.269	(0.092)	0.059	0.210
174	14.50	0.87	0.269	(0.091)	0.059	0.210
175	14.58	0.87	0.269	(0.091)	0.059	0.210
176	14.67	0.87	0.269	(0.090)	0.059	0.210
177	14.75	0.87	0.269	(0.090)	0.059	0.210
178	14.83	0.83	0.259	(0.089)	0.057	0.202
179	14.92	0.83	0.259	(0.089)	0.057	0.202
180	15.00	0.83	0.259	(0.088)	0.057	0.202

181	15.08	0.80	0.248	(0.088)	0.055	0.194
182	15.17	0.80	0.248	(0.087)	0.055	0.194
183	15.25	0.80	0.248	(0.087)	0.055	0.194
184	15.33	0.77	0.238	(0.087)	0.052	0.186
185	15.42	0.77	0.238	(0.086)	0.052	0.186
186	15.50	0.77	0.238	(0.086)	0.052	0.186
187	15.58	0.63	0.197	(0.085)	0.043	0.153
188	15.67	0.63	0.197	(0.085)	0.043	0.153
189	15.75	0.63	0.197	(0.084)	0.043	0.153
190	15.83	0.63	0.197	(0.084)	0.043	0.153
191	15.92	0.63	0.197	(0.083)	0.043	0.153
192	16.00	0.63	0.197	(0.083)	0.043	0.153
193	16.08	0.13	0.041	(0.083)	0.009	0.032
194	16.17	0.13	0.041	(0.082)	0.009	0.032
195	16.25	0.13	0.041	(0.082)	0.009	0.032
196	16.33	0.13	0.041	(0.081)	0.009	0.032
197	16.42	0.13	0.041	(0.081)	0.009	0.032
198	16.50	0.13	0.041	(0.081)	0.009	0.032
199	16.58	0.10	0.031	(0.080)	0.007	0.024
200	16.67	0.10	0.031	(0.080)	0.007	0.024
201	16.75	0.10	0.031	(0.079)	0.007	0.024
202	16.83	0.10	0.031	(0.079)	0.007	0.024
203	16.92	0.10	0.031	(0.079)	0.007	0.024
204	17.00	0.10	0.031	(0.078)	0.007	0.024
205	17.08	0.17	0.052	(0.078)	0.011	0.040
206	17.17	0.17	0.052	(0.077)	0.011	0.040
207	17.25	0.17	0.052	(0.077)	0.011	0.040
208	17.33	0.17	0.052	(0.077)	0.011	0.040
209	17.42	0.17	0.052	(0.076)	0.011	0.040
210	17.50	0.17	0.052	(0.076)	0.011	0.040
211	17.58	0.17	0.052	(0.075)	0.011	0.040
212	17.67	0.17	0.052	(0.075)	0.011	0.040
213	17.75	0.17	0.052	(0.075)	0.011	0.040
214	17.83	0.13	0.041	(0.074)	0.009	0.032
215	17.92	0.13	0.041	(0.074)	0.009	0.032
216	18.00	0.13	0.041	(0.074)	0.009	0.032
217	18.08	0.13	0.041	(0.073)	0.009	0.032
218	18.17	0.13	0.041	(0.073)	0.009	0.032
219	18.25	0.13	0.041	(0.072)	0.009	0.032
220	18.33	0.13	0.041	(0.072)	0.009	0.032
221	18.42	0.13	0.041	(0.072)	0.009	0.032
222	18.50	0.13	0.041	(0.071)	0.009	0.032
223	18.58	0.10	0.031	(0.071)	0.007	0.024
224	18.67	0.10	0.031	(0.071)	0.007	0.024
225	18.75	0.10	0.031	(0.070)	0.007	0.024
226	18.83	0.07	0.021	(0.070)	0.005	0.016
227	18.92	0.07	0.021	(0.070)	0.005	0.016
228	19.00	0.07	0.021	(0.069)	0.005	0.016
229	19.08	0.10	0.031	(0.069)	0.007	0.024
230	19.17	0.10	0.031	(0.069)	0.007	0.024
231	19.25	0.10	0.031	(0.068)	0.007	0.024
232	19.33	0.13	0.041	(0.068)	0.009	0.032
233	19.42	0.13	0.041	(0.068)	0.009	0.032
234	19.50	0.13	0.041	(0.067)	0.009	0.032
235	19.58	0.10	0.031	(0.067)	0.007	0.024
236	19.67	0.10	0.031	(0.067)	0.007	0.024
237	19.75	0.10	0.031	(0.067)	0.007	0.024
238	19.83	0.07	0.021	(0.066)	0.005	0.016
239	19.92	0.07	0.021	(0.066)	0.005	0.016
240	20.00	0.07	0.021	(0.066)	0.005	0.016
241	20.08	0.10	0.031	(0.065)	0.007	0.024
242	20.17	0.10	0.031	(0.065)	0.007	0.024
243	20.25	0.10	0.031	(0.065)	0.007	0.024
244	20.33	0.10	0.031	(0.065)	0.007	0.024
245	20.42	0.10	0.031	(0.064)	0.007	0.024
246	20.50	0.10	0.031	(0.064)	0.007	0.024
247	20.58	0.10	0.031	(0.064)	0.007	0.024
248	20.67	0.10	0.031	(0.063)	0.007	0.024
249	20.75	0.10	0.031	(0.063)	0.007	0.024
250	20.83	0.07	0.021	(0.063)	0.005	0.016
251	20.92	0.07	0.021	(0.063)	0.005	0.016
252	21.00	0.07	0.021	(0.062)	0.005	0.016
253	21.08	0.10	0.031	(0.062)	0.007	0.024

```
254  21.17     0.10      0.031       (  0.062)       0.007        0.024
255  21.25     0.10      0.031       (  0.062)       0.007        0.024
256  21.33     0.07      0.021       (  0.061)       0.005        0.016
257  21.42     0.07      0.021       (  0.061)       0.005        0.016
258  21.50     0.07      0.021       (  0.061)       0.005        0.016
259  21.58     0.10      0.031       (  0.061)       0.007        0.024
260  21.67     0.10      0.031       (  0.061)       0.007        0.024
261  21.75     0.10      0.031       (  0.060)       0.007        0.024
262  21.83     0.07      0.021       (  0.060)       0.005        0.016
263  21.92     0.07      0.021       (  0.060)       0.005        0.016
264  22.00     0.07      0.021       (  0.060)       0.005        0.016
265  22.08     0.10      0.031       (  0.060)       0.007        0.024
266  22.17     0.10      0.031       (  0.059)       0.007        0.024
267  22.25     0.10      0.031       (  0.059)       0.007        0.024
268  22.33     0.07      0.021       (  0.059)       0.005        0.016
269  22.42     0.07      0.021       (  0.059)       0.005        0.016
270  22.50     0.07      0.021       (  0.059)       0.005        0.016
271  22.58     0.07      0.021       (  0.058)       0.005        0.016
272  22.67     0.07      0.021       (  0.058)       0.005        0.016
273  22.75     0.07      0.021       (  0.058)       0.005        0.016
274  22.83     0.07      0.021       (  0.058)       0.005        0.016
275  22.92     0.07      0.021       (  0.058)       0.005        0.016
276  23.00     0.07      0.021       (  0.058)       0.005        0.016
277  23.08     0.07      0.021       (  0.058)       0.005        0.016
278  23.17     0.07      0.021       (  0.057)       0.005        0.016
279  23.25     0.07      0.021       (  0.057)       0.005        0.016
280  23.33     0.07      0.021       (  0.057)       0.005        0.016
281  23.42     0.07      0.021       (  0.057)       0.005        0.016
282  23.50     0.07      0.021       (  0.057)       0.005        0.016
283  23.58     0.07      0.021       (  0.057)       0.005        0.016
284  23.67     0.07      0.021       (  0.057)       0.005        0.016
285  23.75     0.07      0.021       (  0.057)       0.005        0.016
286  23.83     0.07      0.021       (  0.057)       0.005        0.016
287  23.92     0.07      0.021       (  0.057)       0.005        0.016
288  24.00     0.07      0.021       (  0.057)       0.005        0.016
               (Loss Rate Not Used)
    Sum =     100.0                                    Sum =    24.2
      Flood volume = Effective rainfall      2.02(In)
       times area      68.9(Ac.)/[(In)/(Ft.)] =      11.6(Ac.Ft)
      Total soil loss =      0.57(In)
      Total soil loss =     3.268(Ac.Ft)
      Total rainfall =      2.59(In)
      Flood volume =      504687.0 Cubic Feet
      Total soil loss =      142347.6 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     19.066(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       0.0026      0.38  Q         |         |         |         |
   0+10       0.0088      0.90  VQ        |         |         |         |
   0+15       0.0159      1.03  V Q       |         |         |         |
   0+20       0.0247      1.27  V Q       |         |         |         |
   0+25       0.0354      1.56  V  Q      |         |         |         |
   0+30       0.0467      1.64  V  Q      |         |         |         |
   0+35       0.0581      1.66  V  Q      |         |         |         |
   0+40       0.0697      1.68  V  Q      |         |         |         |
   0+45       0.0812      1.68  V  Q      |         |         |         |
   0+50       0.0941      1.87  V  Q      |         |         |         |
   0+55       0.1088      2.13  V   Q     |         |         |         |
   1+ 0       0.1240      2.20  V   Q     |         |         |         |
   1+ 5       0.1380      2.03  V   Q     |         |         |         |
   1+10       0.1503      1.78  V  Q      |         |         |         |
   1+15       0.1622      1.73  V  Q      |         |         |         |
   1+20       0.1739      1.70  V  Q      |         |         |         |
   1+25       0.1855      1.69  V  Q      |         |         |         |
```

```
1+30    0.1971    1.68  V  Q      |          |          |          |
1+35    0.2087    1.68  V  Q      |          |          |          |
1+40    0.2203    1.68  V  Q      |          |          |          |
1+45    0.2319    1.68  V  Q      |          |          |          |
1+50    0.2448    1.87  V  Q      |          |          |          |
1+55    0.2594    2.13  V   Q     |          |          |          |
2+ 0    0.2746    2.20  V   Q     |          |          |          |
2+ 5    0.2899    2.22  |V  Q     |          |          |          |
2+10    0.3053    2.24  |V  Q     |          |          |          |
2+15    0.3207    2.24  |V  Q     |          |          |          |
2+20    0.3362    2.24  |V  Q     |          |          |          |
2+25    0.3516    2.24  |V  Q     |          |          |          |
2+30    0.3671    2.24  |V  Q     |          |          |          |
2+35    0.3838    2.43  |V  Q     |          |          |          |
2+40    0.4024    2.69  |V   Q    |          |          |          |
2+45    0.4214    2.76  |V   Q    |          |          |          |
2+50    0.4406    2.78  |V   Q    |          |          |          |
2+55    0.4598    2.80  |V   Q    |          |          |          |
3+ 0    0.4791    2.80  |V   Q    |          |          |          |
3+ 5    0.4984    2.80  |V   Q    |          |          |          |
3+10    0.5177    2.80  |V   Q    |          |          |          |
3+15    0.5371    2.80  |V   Q    |          |          |          |
3+20    0.5564    2.80  |V   Q    |          |          |          |
3+25    0.5757    2.80  |V   Q    |          |          |          |
3+30    0.5950    2.80  | V  Q    |          |          |          |
3+35    0.6143    2.80  | V  Q    |          |          |          |
3+40    0.6336    2.80  | V  Q    |          |          |          |
3+45    0.6529    2.80  | V  Q    |          |          |          |
3+50    0.6735    2.99  | V  Q    |          |          |          |
3+55    0.6960    3.26  | V   Q   |          |          |          |
4+ 0    0.7188    3.32  | V   Q   |          |          |          |
4+ 5    0.7418    3.34  | V   Q   |          |          |          |
4+10    0.7650    3.36  | V   Q   |          |          |          |
4+15    0.7881    3.36  | V   Q   |          |          |          |
4+20    0.8126    3.55  | V    Q  |          |          |          |
4+25    0.8389    3.82  | V    Q  |          |          |          |
4+30    0.8656    3.88  | V    Q  |          |          |          |
4+35    0.8925    3.91  |  V   Q  |          |          |          |
4+40    0.9195    3.92  |  V   Q  |          |          |          |
4+45    0.9465    3.93  |  V   Q  |          |          |          |
4+50    0.9749    4.11  |  V    Q |          |          |          |
4+55    1.0050    4.38  |  V    Q |          |          |          |
5+ 0    1.0356    4.44  |  V    Q |          |          |          |
5+ 5    1.0637    4.09  |  V    Q |          |          |          |
5+10    1.0884    3.58  |  V   Q  |          |          |          |
5+15    1.1122    3.46  |  V  Q   |          |          |          |
5+20    1.1369    3.59  |  V   Q  |          |          |          |
5+25    1.1633    3.83  |   V  Q  |          |          |          |
5+30    1.1900    3.88  |   V  Q  |          |          |          |
5+35    1.2182    4.09  |   V   Q |          |          |          |
5+40    1.2483    4.37  |   V   Q |          |          |          |
5+45    1.2789    4.44  |   V   Q |          |          |          |
5+50    1.3096    4.47  |   V   Q |          |          |          |
5+55    1.3405    4.48  |   V   Q |          |          |          |
6+ 0    1.3714    4.49  |   V   Q |          |          |          |
6+ 5    1.4036    4.68  |   V    Q|          |          |          |
6+10    1.4376    4.94  |   V    Q|          |          |          |
6+15    1.4720    5.00  |    V   Q|          |          |          |
6+20    1.5067    5.03  |    V    Q          |          |          |
6+25    1.5414    5.04  |    V    Q          |          |          |
6+30    1.5761    5.05  |    V    Q          |          |          |
6+35    1.6122    5.24  |    V    Q          |          |          |
6+40    1.6501    5.50  |    V    Q          |          |          |
6+45    1.6884    5.56  |    V    |Q         |          |          |
6+50    1.7268    5.59  |    V    |Q         |          |          |
6+55    1.7654    5.60  |     V   |Q         |          |          |
7+ 0    1.8040    5.61  |     V   |Q         |          |          |
7+ 5    1.8426    5.61  |     V   |Q         |          |          |
7+10    1.8813    5.61  |     V   |Q         |          |          |
7+15    1.9199    5.61  |     V   |Q         |          |          |
7+20    1.9598    5.80  |     V   |Q         |          |          |
7+25    2.0015    6.06  |     V   | Q        |          |          |
7+30    2.0437    6.12  |      V  | Q        |          |          |
```

```
 7+35      2.0874      6.34  |      V   | Q        |          |          |
 7+40      2.1329      6.61  |      V   |  Q       |          |          |
 7+45      2.1789      6.68  |      V   |  Q       |          |          |
 7+50      2.2264      6.90  |      V   |  Q       |          |          |
 7+55      2.2758      7.17  |      V   |   Q      |          |          |
 8+ 0      2.3257      7.24  |       V  |   Q      |          |          |
 8+ 5      2.3784      7.65  |       V  |    Q     |          |          |
 8+10      2.4348      8.19  |       V  |     Q    |          |          |
 8+15      2.4921      8.32  |       V  |     Q    |          |          |
 8+20      2.5497      8.37  |       V  |     Q    |          |          |
 8+25      2.6076      8.40  |        V|     Q    |          |          |
 8+30      2.6655      8.41  |        V|     Q    |          |          |
 8+35      2.7247      8.60  |        V|      Q   |          |          |
 8+40      2.7858      8.86  |        V|      Q   |          |          |
 8+45      2.8472      8.93  |        V|      Q   |          |          |
 8+50      2.9102      9.14  |         V       Q |          |          |
 8+55      2.9751      9.42  |         V       Q |          |          |
 9+ 0      3.0404      9.49  |         V       Q |          |          |
 9+ 5      3.1085      9.89  |         V        Q|          |          |
 9+10      3.1803     10.43  |         V         Q          |          |
 9+15      3.2531     10.56  |         |V        |Q         |          |
 9+20      3.3275     10.80  |         |V        |Q         |          |
 9+25      3.4039     11.09  |         |V        | Q        |          |
 9+30      3.4808     11.17  |         | V       | Q        |          |
 9+35      3.5592     11.38  |         | V       | Q        |          |
 9+40      3.6395     11.66  |         | V       |  Q       |          |
 9+45      3.7203     11.73  |         | V       |  Q       |          |
 9+50      3.8026     11.95  |         |  V      |  Q       |          |
 9+55      3.8867     12.22  |         |  V      |   Q      |          |
10+ 0      3.9714     12.29  |         |  V      |   Q      |          |
10+ 5      4.0471     10.99  |         |  V      |Q         |          |
10+10      4.1102      9.17  |         |   V   Q |          |          |
10+15      4.1704      8.74  |         |   V  Q  |          |          |
10+20      4.2293      8.55  |         |   V  Q  |          |          |
10+25      4.2875      8.46  |         |   V Q   |          |          |
10+30      4.3455      8.41  |         |    VQ   |          |          |
10+35      4.4099      9.36  |         |    V  Q |          |          |
10+40      4.4834     10.67  |         |    V    |Q         |          |
10+45      4.5590     10.98  |         |    V    |Q         |          |
10+50      4.6356     11.12  |         |     V   | Q        |          |
10+55      4.7126     11.18  |         |     V   | Q        |          |
11+ 0      4.7898     11.22  |         |     V   | Q        |          |
11+ 5      4.8658     11.03  |         |     V   | Q        |          |
11+10      4.9399     10.76  |         |      V  |Q         |          |
11+15      5.0136     10.70  |         |      V  |Q         |          |
11+20      5.0871     10.67  |         |      V  |Q         |          |
11+25      5.1605     10.66  |         |      V  |Q         |          |
11+30      5.2339     10.65  |         |       V |Q         |          |
11+35      5.3047     10.28  |         |       V Q          |          |
11+40      5.3718      9.75  |         |       VQ|          |          |
11+45      5.4381      9.63  |         |       VQ|          |          |
11+50      5.5054      9.76  |         |        Q|          |          |
11+55      5.5742     10.00  |         |        Q|          |          |
12+ 0      5.6434     10.05  |         |        VQ          |          |
12+ 5      5.7219     11.40  |         |        V| Q        |          |
12+10      5.8132     13.25  |         |         V     Q    |          |
12+15      5.9075     13.69  |         |         V      Q   |          |
12+20      6.0044     14.07  |         |         V       Q  |          |
12+25      6.1037     14.43  |         |         |V      Q  |          |
12+30      6.2038     14.53  |         |         |V       Q|          |
12+35      6.3067     14.94  |         |         |V       Q|          |
12+40      6.4133     15.48  |         |         | V       Q          |
12+45      6.5208     15.61  |         |         | V       |Q         |
12+50      6.6299     15.85  |         |         | V       |Q         |
12+55      6.7411     16.14  |         |         |  V      | Q        |
13+ 0      6.8528     16.22  |         |         |  V      | Q        |
13+ 5      6.9711     17.19  |         |         |   V     |   Q      |
13+10      7.0986     18.51  |         |         |   V     |      Q   |
13+15      7.2283     18.83  |         |         |   V     |      Q   |
13+20      7.3590     18.97  |         |         |    V    |      Q   |
13+25      7.4900     19.03  |         |         |    V    |       Q  |
13+30      7.6213     19.07  |         |         |     V   |       Q  |
13+35      7.7383     16.98  |         |         |     V   |  Q       |
```

```
13+40      7.8354    14.10  |          |          |       VQ |          |
13+45      7.9278    13.41  |          |          |     QV   |          |
13+50      8.0181    13.12  |          |          |     QV   |          |
13+55      8.1074    12.97  |          |          |    Q V   |          |
14+ 0      8.1963    12.90  |          |          |    Q  V  |          |
14+ 5      8.2903    13.65  |          |          |      QV  |          |
14+10      8.3916    14.71  |          |          |       VQ|          |
14+15      8.4946    14.95  |          |          |        Q|          |
14+20      8.5970    14.87  |          |          |        Q|          |
14+25      8.6980    14.66  |          |          |        QV          |
14+30      8.7987    14.63  |          |          |        QV          |
14+35      8.8992    14.60  |          |          |        QV          |
14+40      8.9997    14.59  |          |          |        Q|V         |
14+45      9.1001    14.58  |          |          |        Q|V         |
14+50      9.1992    14.39  |          |          |       Q |V         |
14+55      9.2965    14.13  |          |          |       Q |  V       |
15+ 0      9.3934    14.07  |          |          |       Q |  V       |
15+ 5      9.4888    13.85  |          |          |      Q  |  V       |
15+10      9.5823    13.57  |          |          |      Q  |   V      |
15+15      9.6753    13.51  |          |          |      Q  |   V      |
15+20      9.7668    13.29  |          |          |     Q   |   V      |
15+25      9.8564    13.01  |          |          |     Q   |    V     |
15+30      9.9456    12.94  |          |          |    Q    |    V     |
15+35     10.0293    12.16  |          |          |   Q     |    V     |
15+40     10.1057    11.10  |          |          | Q       |    V     |
15+45     10.1804    10.84  |          |          |Q        |     V    |
15+50     10.2543    10.73  |          |          |Q        |     V    |
15+55     10.3279    10.68  |          |          |Q        |     V    |
16+ 0     10.4013    10.65  |          |          |Q        |     V    |
16+ 5     10.4551     7.82  |          |    Q     |         |      V   |
16+10     10.4818     3.88  |        Q |          |         |      V   |
16+15     10.5021     2.95  |     Q    |          |         |      V   |
16+20     10.5196     2.54  |     Q    |          |         |      V   |
16+25     10.5357     2.34  |    Q     |          |         |      V   |
16+30     10.5512     2.24  |    Q     |          |         |      V   |
16+35     10.5653     2.05  |    Q     |          |         |      V   |
16+40     10.5777     1.79  |   Q      |          |         |      V   |
16+45     10.5896     1.73  |   Q      |          |         |      V   |
16+50     10.6013     1.70  |   Q      |          |         |      V   |
16+55     10.6129     1.69  |   Q      |          |         |      V   |
17+ 0     10.6245     1.68  |   Q      |          |         |      V   |
17+ 5     10.6387     2.06  |    Q     |          |         |      V   |
17+10     10.6565     2.59  |     Q    |          |         |      V   |
17+15     10.6752     2.71  |     Q    |          |         |      V   |
17+20     10.6942     2.76  |     Q    |          |         |      V   |
17+25     10.7134     2.79  |     Q    |          |         |      V   |
17+30     10.7328     2.80  |     Q    |          |         |       V  |
17+35     10.7521     2.80  |     Q    |          |         |       V  |
17+40     10.7714     2.80  |     Q    |          |         |       V  |
17+45     10.7907     2.80  |     Q    |          |         |       V  |
17+50     10.8087     2.61  |     Q    |          |         |       V  |
17+55     10.8249     2.35  |    Q     |          |         |       V  |
18+ 0     10.8407     2.29  |    Q     |          |         |       V  |
18+ 5     10.8562     2.26  |    Q     |          |         |       V  |
18+10     10.8717     2.25  |    Q     |          |         |       V  |
18+15     10.8872     2.24  |    Q     |          |         |       V  |
18+20     10.9026     2.24  |    Q     |          |         |       V  |
18+25     10.9181     2.24  |    Q     |          |         |       V  |
18+30     10.9335     2.24  |    Q     |          |         |       V  |
18+35     10.9477     2.05  |    Q     |          |         |       V  |
18+40     10.9600     1.79  |   Q      |          |         |       V  |
18+45     10.9719     1.73  |   Q      |          |         |       V  |
18+50     10.9823     1.51  |   Q      |          |         |       V  |
18+55     10.9909     1.24  |  Q       |          |         |       V  |
19+ 0     10.9989     1.17  |  Q       |          |         |       V  |
19+ 5     11.0081     1.33  |  Q       |          |         |        V |
19+10     11.0190     1.58  |   Q      |          |         |        V |
19+15     11.0302     1.64  |   Q      |          |         |        V |
19+20     11.0430     1.85  |   Q      |          |         |        V |
19+25     11.0576     2.13  |    Q     |          |         |        V |
19+30     11.0727     2.20  |    Q     |          |         |        V |
19+35     11.0868     2.03  |    Q     |          |         |        V |
19+40     11.0990     1.78  |   Q      |          |         |        V |
```

```
   19+45      11.1110      1.73  |  Q       |          |          |        V |
   19+50      11.1214      1.51  |  Q       |          |          |        V |
   19+55      11.1299      1.24  | Q        |          |          |        V |
   20+ 0      11.1379      1.17  | Q        |          |          |        V |
   20+ 5      11.1471      1.33  | Q        |          |          |        V |
   20+10      11.1580      1.58  |  Q       |          |          |        V |
   20+15      11.1692      1.64  |  Q       |          |          |        V |
   20+20      11.1807      1.66  |  Q       |          |          |        V |
   20+25      11.1922      1.68  |  Q       |          |          |        V |
   20+30      11.2038      1.68  |  Q       |          |          |        V |
   20+35      11.2154      1.68  |  Q       |          |          |        V |
   20+40      11.2270      1.68  |  Q       |          |          |        V |
   20+45      11.2386      1.68  |  Q       |          |          |        V |
   20+50      11.2489      1.49  | Q        |          |          |        V |
   20+55      11.2573      1.23  | Q        |          |          |        V |
   21+ 0      11.2654      1.17  | Q        |          |          |        V |
   21+ 5      11.2745      1.33  | Q        |          |          |        V |
   21+10      11.2854      1.58  |  Q       |          |          |        V |
   21+15      11.2967      1.64  |  Q       |          |          |         V|
   21+20      11.3068      1.47  | Q        |          |          |         V|
   21+25      11.3153      1.22  | Q        |          |          |         V|
   21+30      11.3233      1.17  | Q        |          |          |         V|
   21+35      11.3325      1.33  | Q        |          |          |         V|
   21+40      11.3434      1.58  |  Q       |          |          |         V|
   21+45      11.3546      1.64  |  Q       |          |          |         V|
   21+50      11.3648      1.47  | Q        |          |          |         V|
   21+55      11.3732      1.22  | Q        |          |          |         V|
   22+ 0      11.3812      1.17  | Q        |          |          |         V|
   22+ 5      11.3904      1.33  | Q        |          |          |         V|
   22+10      11.4013      1.58  |  Q       |          |          |         V|
   22+15      11.4126      1.64  |  Q       |          |          |         V|
   22+20      11.4227      1.47  | Q        |          |          |         V|
   22+25      11.4311      1.22  | Q        |          |          |         V|
   22+30      11.4392      1.17  | Q        |          |          |         V|
   22+35      11.4470      1.14  | Q        |          |          |         V|
   22+40      11.4548      1.13  | Q        |          |          |         V|
   22+45      11.4625      1.12  | Q        |          |          |         V|
   22+50      11.4703      1.12  | Q        |          |          |         V|
   22+55      11.4780      1.12  | Q        |          |          |         V|
   23+ 0      11.4857      1.12  | Q        |          |          |         V|
   23+ 5      11.4934      1.12  | Q        |          |          |         V|
   23+10      11.5011      1.12  | Q        |          |          |         V|
   23+15      11.5089      1.12  | Q        |          |          |         V|
   23+20      11.5166      1.12  | Q        |          |          |         V|
   23+25      11.5243      1.12  | Q        |          |          |         V|
   23+30      11.5320      1.12  | Q        |          |          |         V|
   23+35      11.5398      1.12  | Q        |          |          |         V|
   23+40      11.5475      1.12  | Q        |          |          |         V|
   23+45      11.5552      1.12  | Q        |          |          |         V|
   23+50      11.5629      1.12  | Q        |          |          |         V|
   23+55      11.5707      1.12  | Q        |          |          |         V|
   24+ 0      11.5784      1.12  | Q        |          |          |         V|
   24+ 5      11.5835      0.74  |Q         |          |          |         V|
   24+10      11.5850      0.22  Q          |          |          |         V|
   24+15      11.5857      0.09  Q          |          |          |         V|
   24+20      11.5859      0.04  Q          |          |          |         V|
   24+25      11.5860      0.01  Q          |          |          |          V
--------------------------------------------------------------------------
```

Area 'C' – 100 Year 1 Hour Proposed Condition – Unit Hydrograph

```
        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  06/16/20 File: PRC1001100.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'C'
PROPOSED CONDITION UNIT HYDROGRAPH - 100 YEAR 1 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =      68.90(Ac.)  =      0.108 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      68.90(Ac.)  =      0.108 Sq. Mi.
Length along longest watercourse =    2643.00(Ft.)
Length along longest watercourse measured to centroid =    1184.00(Ft.)
Length along longest watercourse =      0.501 Mi.
Length along longest watercourse measured to centroid =      0.224 Mi.
Difference in elevation =     128.00(Ft.)
Slope along watercourse =    255.7094 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.055 Hr.
Lag time =     3.28 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]
       68.90            0.45                 31.01

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       68.90            1.20                 82.68

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    0.450(In)
Area Averaged 100-Year Rainfall =    1.200(In)

Point rain (area averaged) =    1.200(In)
Areal adjustment factor =   99.94 %
Adjusted average point rain =    1.199(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
```

```
          68.900           58.90         0.850
        Total Area Entered =     68.90(Ac.)


       RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
       AMC2 AMC-3     (In/Hr)    (Dec.%)     (In/Hr)       (Dec.)    (In/Hr)
       58.9  77.1      0.278     0.850        0.065        1.000      0.065
                                                          Sum (F) =    0.065
       Area averaged mean soil loss (F) (In/Hr) =  0.065
       Minimum soil loss rate ((In/Hr)) =  0.033
       (for 24 hour storm duration)
       Soil low loss rate (decimal) =   0.220
       ------------------------------------------------------------------------
       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        152.377         33.745            23.432
           2   0.167        304.754         46.835            32.521
           3   0.250        457.131         11.045             7.669
           4   0.333        609.508          4.812             3.341
           5   0.417        761.885          2.398             1.665
           6   0.500        914.262          1.165             0.809
                                   Sum = 100.000    Sum=      69.438
------------------------------------------------------------------------

 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      0.604          0.065    (  0.133)        0.539
    2   0.17     4.30      0.619          0.065    (  0.136)        0.553
    3   0.25     5.00      0.720          0.065    (  0.158)        0.654
    4   0.33     5.00      0.720          0.065    (  0.158)        0.654
    5   0.42     5.80      0.835          0.065    (  0.184)        0.769
    6   0.50     6.50      0.935          0.065    (  0.206)        0.870
    7   0.58     7.40      1.065          0.065    (  0.234)        1.000
    8   0.67     8.60      1.238          0.065    (  0.272)        1.172
    9   0.75    12.30      1.770          0.065    (  0.389)        1.705
   10   0.83    29.10      4.188          0.065    (  0.921)        4.122
   11   0.92     6.80      0.979          0.065    (  0.215)        0.913
   12   1.00     5.00      0.720          0.065    (  0.158)        0.654
              (Loss Rate Not Used)
      Sum =     100.0                                  Sum =    13.6
         Flood volume = Effective rainfall      1.13(In)
          times area      68.9(Ac.)/[(In)/(Ft.)] =       6.5(Ac.Ft)
         Total soil loss =      0.07(In)
         Total soil loss =     0.375(Ac.Ft)
         Total rainfall =      1.20(In)
         Flood volume =      283602.4 Cubic Feet
         Total soil loss =       16338.5 Cubic Feet
         ---------------------------------------------------------------------
          Peak flow rate of this hydrograph =    174.918(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       50.0     100.0     150.0     200.0
 ------------------------------------------------------------------------
   0+ 5       0.0870     12.64  V Q       |         |         |         |
```

```
    0+10       0.2972     30.52  |V    Q    |          |          |          |
    0+15       0.5554     37.48  |  V   Q   |          |          |          |
    0+20       0.8493     42.67  |    V  Q  |          |          |          |
    0+25       1.1736     47.09  |       V Q|          |          |          |
    0+30       1.5455     54.00  |         VQ          |          |          |
    0+35       1.9682     61.37  |          | Q        |          |          |
    0+40       2.4563     70.88  |          |   QV     |          |          |
    0+45       3.0796     90.50  |          |        Q |          |          |
    0+50       4.2265    166.53  |          |          |    V     |  Q       |
    0+55       5.4312    174.92  |          |          |          |  VQ      |
    1+ 0       6.0176     85.15  |          |       Q  |          |     V    |
    1+ 5       6.3335     45.87  |          Q|          |          |        V |
    1+10       6.4459     16.32  |  Q       |          |          |         V|
    1+15       6.4944      7.04  |Q         |          |          |         V|
    1+20       6.5070      1.83  Q          |          |          |         V|
    1+25       6.5106      0.53  Q          |          |          |          V
---------------------------------------------------------------------------
```

Area 'C' – 100 Year 3 Hour Proposed Condition – Unit Hydrograph

```
        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  06/16/20 File: PRC1003100.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'C'
PROPOSED CONDITION UNIT HYDROGRAPH - 100 YEAR 3 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =      68.90(Ac.)  =      0.108 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      68.90(Ac.)  =      0.108 Sq. Mi.
Length along longest watercourse =    2643.00(Ft.)
Length along longest watercourse measured to centroid =    1184.00(Ft.)
Length along longest watercourse =      0.501 Mi.
Length along longest watercourse measured to centroid =      0.224 Mi.
Difference in elevation =     128.00(Ft.)
Slope along watercourse =    255.7094 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.055 Hr.
Lag time =     3.28 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]
       68.90            0.80                 55.12

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       68.90            1.80                124.02

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    0.800(In)
Area Averaged 100-Year Rainfall =    1.800(In)

Point rain (area averaged) =    1.800(In)
Areal adjustment factor =   99.97 %
Adjusted average point rain =    1.799(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
```

```
          68.900           58.90         0.850
 Total Area Entered =     68.90(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-3     (In/Hr)    (Dec.%)     (In/Hr)       (Dec.)    (In/Hr)
58.9  77.1      0.278     0.850        0.065        1.000      0.065
                                                  Sum (F) =    0.065
Area averaged mean soil loss (F) (In/Hr) =  0.065
Minimum soil loss rate ((In/Hr)) =  0.033
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.220
------------------------------------------------------------------------

               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        152.377         33.745            23.432
    2   0.167        304.754         46.835            32.521
    3   0.250        457.131         11.045             7.669
    4   0.333        609.508          4.812             3.341
    5   0.417        761.885          2.398             1.665
    6   0.500        914.262          1.165             0.809
                              Sum = 100.000   Sum=      69.438
------------------------------------------------------------------------
```

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	0.281	(0.065)	0.062	0.219
2	0.17	1.30	0.281	(0.065)	0.062	0.219
3	0.25	1.10	0.238	(0.065)	0.052	0.185
4	0.33	1.50	0.324	0.065	(0.071)	0.259
5	0.42	1.50	0.324	0.065	(0.071)	0.259
6	0.50	1.80	0.389	0.065	(0.086)	0.323
7	0.58	1.50	0.324	0.065	(0.071)	0.259
8	0.67	1.80	0.389	0.065	(0.086)	0.323
9	0.75	1.80	0.389	0.065	(0.086)	0.323
10	0.83	1.50	0.324	0.065	(0.071)	0.259
11	0.92	1.60	0.345	0.065	(0.076)	0.280
12	1.00	1.80	0.389	0.065	(0.086)	0.323
13	1.08	2.20	0.475	0.065	(0.105)	0.410
14	1.17	2.20	0.475	0.065	(0.105)	0.410
15	1.25	2.20	0.475	0.065	(0.105)	0.410
16	1.33	2.00	0.432	0.065	(0.095)	0.367
17	1.42	2.60	0.561	0.065	(0.124)	0.496
18	1.50	2.70	0.583	0.065	(0.128)	0.518
19	1.58	2.40	0.518	0.065	(0.114)	0.453
20	1.67	2.70	0.583	0.065	(0.128)	0.518
21	1.75	3.30	0.713	0.065	(0.157)	0.647
22	1.83	3.10	0.669	0.065	(0.147)	0.604
23	1.92	2.90	0.626	0.065	(0.138)	0.561
24	2.00	3.00	0.648	0.065	(0.143)	0.582
25	2.08	3.10	0.669	0.065	(0.147)	0.604
26	2.17	4.20	0.907	0.065	(0.200)	0.842
27	2.25	5.00	1.080	0.065	(0.238)	1.014
28	2.33	3.50	0.756	0.065	(0.166)	0.690
29	2.42	6.80	1.468	0.065	(0.323)	1.403
30	2.50	7.30	1.576	0.065	(0.347)	1.511
31	2.58	8.20	1.771	0.065	(0.390)	1.705
32	2.67	5.90	1.274	0.065	(0.280)	1.209
33	2.75	2.00	0.432	0.065	(0.095)	0.367
34	2.83	1.80	0.389	0.065	(0.086)	0.323
35	2.92	1.80	0.389	0.065	(0.086)	0.323
36	3.00	0.60	0.130	(0.065)	0.029	0.101

```
              (Loss Rate Not Used)
    Sum =     100.0                                    Sum =    19.3
       Flood volume = Effective rainfall      1.61(In)
        times area      68.9(Ac.)/[(In)/(Ft.)] =       9.2(Ac.Ft)
       Total soil loss =      0.19(In)
       Total soil loss =     1.098(Ac.Ft)
       Total rainfall =      1.80(In)
       Flood volume =      402229.9 Cubic Feet
       Total soil loss =       47827.0 Cubic Feet
       ---------------------------------------------------------------------
        Peak flow rate of this hydrograph =    104.591(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       50.0     100.0     150.0     200.0
  ----------------------------------------------------------------------------
    0+ 5       0.0354      5.13  VQ        |         |         |         |
    0+10       0.1198     12.26  V Q       |         |         |         |
    0+15       0.2103     13.15  V Q       |         |         |         |
    0+20       0.3102     14.50  |VQ       |         |         |         |
    0+25       0.4272     16.99  |V Q      |         |         |         |
    0+30       0.5591     19.14  | VQ      |         |         |         |
    0+35       0.6962     19.92  |  Q      |         |         |         |
    0+40       0.8334     19.92  |  Q      |         |         |         |
    0+45       0.9836     21.81  |   Q     |         |         |         |
    0+50       1.1260     20.68  |   Q     |         |         |         |
    0+55       1.2585     19.24  |  Q V    |         |         |         |
    1+ 0       1.3998     20.51  |   Q V   |         |         |         |
    1+ 5       1.5647     23.94  |   Q V   |         |         |         |
    1+10       1.7509     27.05  |    Q V  |         |         |         |
    1+15       1.9427     27.84  |    Q  V |         |         |         |
    1+20       2.1300     27.20  |    Q   V|         |         |         |
    1+25       2.3299     29.02  |    Q    V         |         |         |
    1+30       2.5604     33.48  |     Q   |V        |         |         |
    1+35       2.7912     33.51  |     Q   | V       |         |         |
    1+40       3.0215     33.45  |     Q   |  V      |         |         |
    1+45       3.2857     38.35  |      Q  |   V     |         |         |
    1+50       3.5747     41.97  |       Q |    V    |         |         |
    1+55       3.8549     40.68  |       Q |     V   |         |         |
    2+ 0       4.1299     39.93  |      Q  |      V  |         |         |
    2+ 5       4.4118     40.94  |       Q |        V|         |         |
    2+10       4.7373     47.26  |        Q|         V         |         |
    2+15       5.1448     59.17  |         |Q        | V       |         |
    2+20       5.5518     59.09  |         |Q        |   V     |         |
    2+25       6.0162     67.43  |         |  Q      |     V   |         |
    2+30       6.6475     91.66  |         |       Q |       V |         |
    2+35       7.3678    104.59  |         |         Q         |V        |
    2+40       8.0708    102.08  |         |         Q         |   V     |
    2+45       8.5457     68.96  |         |  Q      |         |      V  |
    2+50       8.8084     38.14  |      Q  |         |         |       V |
    2+55       9.0082     29.02  |    Q    |         |         |        V|
    3+ 0       9.1459     19.99  |  Q      |         |         |        V|
    3+ 5       9.2040      8.44  |Q        |         |         |        V|
    3+10       9.2226      2.69  Q         |         |         |        V|
    3+15       9.2304      1.14  Q         |         |         |        V|
    3+20       9.2334      0.43  Q         |         |         |        V|
    3+25       9.2339      0.08  Q         |         |         |        V|
  ----------------------------------------------------------------------------
```

Area 'C' – 100 Year 6 Hour Proposed Condition – Unit Hydrograph

```
        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  06/16/20 File: PRC1006100.out

++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'C'
PROPOSED CONDITION UNIT HYDROGRAPH - 100 YEAR 6 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =      68.90(Ac.)  =      0.108 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      68.90(Ac.)  =      0.108 Sq. Mi.
Length along longest watercourse =    2643.00(Ft.)
Length along longest watercourse measured to centroid =    1184.00(Ft.)
Length along longest watercourse =      0.501 Mi.
Length along longest watercourse measured to centroid =      0.224 Mi.
Difference in elevation =     128.00(Ft.)
Slope along watercourse =    255.7094 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.055 Hr.
Lag time =     3.28 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]
       68.90           1.00                 68.90

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       68.90           2.50                172.25

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    1.000(In)
Area Averaged 100-Year Rainfall =    2.500(In)

Point rain (area averaged) =    2.500(In)
Areal adjustment factor =   99.98 %
Adjusted average point rain =    2.499(In)
```

```
Sub-Area Data:
Area(Ac.)          Runoff Index    Impervious %
    68.900            58.90          0.850
 Total Area Entered =     68.90(Ac.)


RI     RI    Infil. Rate Impervious   Adj. Infil. Rate  Area%      F
AMC2 AMC-3      (In/Hr)     (Dec.%)      (In/Hr)       (Dec.)     (In/Hr)
58.9  77.1       0.278      0.850         0.065        1.000       0.065
                                                    Sum (F) =     0.065
Area averaged mean soil loss (F) (In/Hr) =  0.065
Minimum soil loss rate ((In/Hr)) =  0.033
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.220
------------------------------------------------------------------------

               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        152.377         33.745            23.432
     2   0.167        304.754         46.835            32.521
     3   0.250        457.131         11.045             7.669
     4   0.333        609.508          4.812             3.341
     5   0.417        761.885          2.398             1.665
     6   0.500        914.262          1.165             0.809
                              Sum = 100.000    Sum=      69.438
------------------------------------------------------------------------
```

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	(0.065) 0.033	0.117
2	0.17	0.60	0.180	(0.065) 0.040	0.140
3	0.25	0.60	0.180	(0.065) 0.040	0.140
4	0.33	0.60	0.180	(0.065) 0.040	0.140
5	0.42	0.60	0.180	(0.065) 0.040	0.140
6	0.50	0.70	0.210	(0.065) 0.046	0.164
7	0.58	0.70	0.210	(0.065) 0.046	0.164
8	0.67	0.70	0.210	(0.065) 0.046	0.164
9	0.75	0.70	0.210	(0.065) 0.046	0.164
10	0.83	0.70	0.210	(0.065) 0.046	0.164
11	0.92	0.70	0.210	(0.065) 0.046	0.164
12	1.00	0.80	0.240	(0.065) 0.053	0.187
13	1.08	0.80	0.240	(0.065) 0.053	0.187
14	1.17	0.80	0.240	(0.065) 0.053	0.187
15	1.25	0.80	0.240	(0.065) 0.053	0.187
16	1.33	0.80	0.240	(0.065) 0.053	0.187
17	1.42	0.80	0.240	(0.065) 0.053	0.187
18	1.50	0.80	0.240	(0.065) 0.053	0.187
19	1.58	0.80	0.240	(0.065) 0.053	0.187
20	1.67	0.80	0.240	(0.065) 0.053	0.187
21	1.75	0.80	0.240	(0.065) 0.053	0.187
22	1.83	0.80	0.240	(0.065) 0.053	0.187
23	1.92	0.80	0.240	(0.065) 0.053	0.187
24	2.00	0.90	0.270	(0.065) 0.059	0.211
25	2.08	0.80	0.240	(0.065) 0.053	0.187
26	2.17	0.90	0.270	(0.065) 0.059	0.211
27	2.25	0.90	0.270	(0.065) 0.059	0.211
28	2.33	0.90	0.270	(0.065) 0.059	0.211
29	2.42	0.90	0.270	(0.065) 0.059	0.211
30	2.50	0.90	0.270	(0.065) 0.059	0.211
31	2.58	0.90	0.270	(0.065) 0.059	0.211
32	2.67	0.90	0.270	(0.065) 0.059	0.211
33	2.75	1.00	0.300	0.065 (0.066)	0.235
34	2.83	1.00	0.300	0.065 (0.066)	0.235

35	2.92	1.00	0.300	0.065	(0.066)		0.235
36	3.00	1.00	0.300	0.065	(0.066)		0.235
37	3.08	1.00	0.300	0.065	(0.066)		0.235
38	3.17	1.10	0.330	0.065	(0.073)		0.265
39	3.25	1.10	0.330	0.065	(0.073)		0.265
40	3.33	1.10	0.330	0.065	(0.073)		0.265
41	3.42	1.20	0.360	0.065	(0.079)		0.295
42	3.50	1.30	0.390	0.065	(0.086)		0.325
43	3.58	1.40	0.420	0.065	(0.092)		0.355
44	3.67	1.40	0.420	0.065	(0.092)		0.355
45	3.75	1.50	0.450	0.065	(0.099)		0.385
46	3.83	1.50	0.450	0.065	(0.099)		0.385
47	3.92	1.60	0.480	0.065	(0.106)		0.415
48	4.00	1.60	0.480	0.065	(0.106)		0.415
49	4.08	1.70	0.510	0.065	(0.112)		0.445
50	4.17	1.80	0.540	0.065	(0.119)		0.475
51	4.25	1.90	0.570	0.065	(0.125)		0.505
52	4.33	2.00	0.600	0.065	(0.132)		0.535
53	4.42	2.10	0.630	0.065	(0.139)		0.565
54	4.50	2.10	0.630	0.065	(0.139)		0.565
55	4.58	2.20	0.660	0.065	(0.145)		0.595
56	4.67	2.30	0.690	0.065	(0.152)		0.625
57	4.75	2.40	0.720	0.065	(0.158)		0.655
58	4.83	2.40	0.720	0.065	(0.158)		0.655
59	4.92	2.50	0.750	0.065	(0.165)		0.684
60	5.00	2.60	0.780	0.065	(0.172)		0.714
61	5.08	3.10	0.930	0.065	(0.205)		0.864
62	5.17	3.60	1.080	0.065	(0.238)		1.014
63	5.25	3.90	1.170	0.065	(0.257)		1.104
64	5.33	4.20	1.260	0.065	(0.277)		1.194
65	5.42	4.70	1.410	0.065	(0.310)		1.344
66	5.50	5.60	1.680	0.065	(0.370)		1.614
67	5.58	1.90	0.570	0.065	(0.125)		0.505
68	5.67	0.90	0.270	(0.065)	0.059		0.211
69	5.75	0.60	0.180	(0.065)	0.040		0.140
70	5.83	0.50	0.150	(0.065)	0.033		0.117
71	5.92	0.30	0.090	(0.065)	0.020		0.070
72	6.00	0.20	0.060	(0.065)	0.013		0.047

(Loss Rate Not Used)

Sum = 100.0 Sum = 25.9

Flood volume = Effective rainfall 2.16(In)
times area 68.9(Ac.)/[(In)/(Ft.)] = 12.4(Ac.Ft)
Total soil loss = 0.34(In)
Total soil loss = 1.953(Ac.Ft)
Total rainfall = 2.50(In)
Flood volume = 540058.2 Cubic Feet
Total soil loss = 85061.2 Cubic Feet

Peak flow rate of this hydrograph = 96.835(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	25.0	50.0	75.0	100.0
0+ 5	0.0189	2.74	VQ				
0+10	0.0678	7.10	V Q				
0+15	0.1281	8.76	V Q				
0+20	0.1923	9.33	V Q				
0+25	0.2584	9.60	V Q				
0+30	0.3292	10.28	|V Q				
0+35	0.4054	11.06	|V Q				
0+40	0.4828	11.24	|V Q				
0+45	0.5608	11.32	|V Q				
0+50	0.6390	11.36	| V Q				
0+55	0.7173	11.38	| V Q				
1+ 0	0.7995	11.93	| V Q				
1+ 5	0.8869	12.69	| V Q				
1+10	0.9755	12.87	| V Q				

```
    1+15       1.0646     12.94  |  V Q    |          |          |          |
    1+20       1.1540     12.98  |  V Q    |          |          |          |
    1+25       1.2436     13.00  |   VQ    |          |          |          |
    1+30       1.3331     13.00  |   VQ    |          |          |          |
    1+35       1.4227     13.00  |   VQ    |          |          |          |
    1+40       1.5122     13.00  |   VQ    |          |          |          |
    1+45       1.6018     13.00  |    Q    |          |          |          |
    1+50       1.6913     13.00  |    Q    |          |          |          |
    1+55       1.7809     13.00  |    Q    |          |          |          |
    2+ 0       1.8742     13.55  |    QV   |          |          |          |
    2+ 5       1.9690     13.76  |    QV   |          |          |          |
    2+10       2.0636     13.73  |    QV   |          |          |          |
    2+15       2.1627     14.39  |    QV   |          |          |          |
    2+20       2.2627     14.53  |    Q V  |          |          |          |
    2+25       2.3632     14.59  |    Q V  |          |          |          |
    2+30       2.4638     14.61  |    Q V  |          |          |          |
    2+35       2.5646     14.63  |    Q  V |          |          |          |
    2+40       2.6653     14.63  |    Q  V |          |          |          |
    2+45       2.7699     15.19  |     Q V |          |          |          |
    2+50       2.8800     15.97  |     Q  V|          |          |          |
    2+55       2.9912     16.16  |     Q  V|          |          |          |
    3+ 0       3.1031     16.24  |     Q   V          |          |          |
    3+ 5       3.2152     16.28  |     Q   V          |          |          |
    3+10       3.3323     17.00  |     Q   V          |          |          |
    3+15       3.4561     17.98  |      Q  |V         |          |          |
    3+20       3.5815     18.21  |      Q  |V         |          |          |
    3+25       3.7124     19.01  |      Q  |V         |          |          |
    3+30       3.8553     20.74  |       Q | V        |          |          |
    3+35       4.0114     22.67  |         Q| V       |          |          |
    3+40       4.1766     23.98  |         Q|  V      |          |          |
    3+45       4.3492     25.06  |          Q   V     |          |          |
    3+50       4.5297     26.21  |          Q   V     |          |          |
    3+55       4.7172     27.22  |          Q    V    |          |          |
    4+ 0       4.9123     28.32  |          |Q   V    |          |          |
    4+ 5       5.1141     29.31  |          |Q    V   |          |          |
    4+10       5.3284     31.11  |          | Q    V  |          |          |
    4+15       5.5561     33.07  |          |  Q   V  |          |          |
    4+20       5.7979     35.10  |          |   Q   V |          |          |
    4+25       6.0538     37.16  |          |   Q    V|          |          |
    4+30       6.3192     38.54  |          |    Q    V          |          |
    4+35       6.5923     39.65  |          |    Q    |V         |          |
    4+40       6.8781     41.50  |          |     Q   | V        |          |
    4+45       7.1776     43.49  |          |      Q  |  V       |          |
    4+50       7.4863     44.82  |          |      Q  |   V      |          |
    4+55       7.8024     45.90  |          |       Q |    V     |          |
    5+ 0       8.1313     47.75  |          |         Q|     V   |          |
    5+ 5       8.4932     52.55  |          |          |Q     V  |          |
    5+10       8.9154     61.30  |          |          |   Q   V |          |
    5+15       9.3947     69.59  |          |          |      Q  V          |
    5+20       9.9206     76.35  |          |          |         Q V        |
    5+25      10.5009     84.26  |          |          |          |  Q      |
    5+30      11.1678     96.83  |          |          |          |     V Q |
    5+35      11.7279     81.32  |          |          |          | Q    V  |
    5+40      12.0110     41.12  |          |     Q    |          |       V |
    5+45      12.1668     22.62  |         Q|          |          |         V|
    5+50      12.2659     14.39  |    Q     |          |          |         V|
    5+55      12.3305      9.38  |  Q       |          |          |         V|
    6+ 0      12.3684      5.51  | Q        |          |          |         V|
    6+ 5      12.3881      2.86  |Q         |          |          |         V|
    6+10      12.3943      0.90  Q          |          |          |         V|
    6+15      12.3968      0.37  Q          |          |          |         V|
    6+20      12.3978      0.13  Q          |          |          |         V|
    6+25      12.3980      0.04  Q          |          |          |         V|
-------------------------------------------------------------------------
```

Area 'C' – 100 Year 24 Hour Proposed Condition – Unit Hydrograph

```
        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  06/16/20 File: PRC10024100.out


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
------------------------------------------------------------------------------

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


Program License Serial Number 6406

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

 English Units used in output format



------------------------------------------------------------------------
TTM 32372 - 'STONERIDGE' PRELIMINARY HYDROLOGY STUDY - AREA 'C'
PROPOSED CONDITION UNIT HYDROGRAPH - 100 YEAR 24 HOUR STORM
HUNSAKER & ASSOCIATES, JUNE 2020
BY: BRIAN LOWELL, PE & ALEX ANDAYA
------------------------------------------------------------------------
Drainage Area =      68.90(Ac.)  =      0.108 Sq. Mi.
Drainage Area for Depth-Area Areal Adjustment =      68.90(Ac.)  =      0.108 Sq. Mi.
Length along longest watercourse =    2643.00(Ft.)
Length along longest watercourse measured to centroid =    1184.00(Ft.)
Length along longest watercourse =      0.501 Mi.
Length along longest watercourse measured to centroid =      0.224 Mi.
Difference in elevation =     128.00(Ft.)
Slope along watercourse =    255.7094 Ft./Mi.
Average Manning's 'N' = 0.015
Lag time =    0.055 Hr.
Lag time =     3.28 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]
       68.90            1.60                110.24

100 YEAR Area rainfall data:


Area(Ac.)[1]       Rainfall(In)[2]      Weighting[1*2]
       68.90            4.00                275.60

STORM EVENT (YEAR) =  100.00
Area Averaged 2-Year Rainfall =    1.600(In)
Area Averaged 100-Year Rainfall =    4.000(In)

Point rain (area averaged) =    4.000(In)
Areal adjustment factor =   99.99 %
Adjusted average point rain =    3.999(In)

Sub-Area Data:
Area(Ac.)         Runoff Index   Impervious %
```

```
          68.900           58.90         0.850
 Total Area Entered =     68.90(Ac.)


RI    RI   Infil. Rate Impervious   Adj. Infil. Rate  Area%     F
AMC2 AMC-3     (In/Hr)    (Dec.%)     (In/Hr)       (Dec.)    (In/Hr)
58.9  77.1      0.278     0.850        0.065        1.000      0.065
                                                  Sum (F) =    0.065
Area averaged mean soil loss (F) (In/Hr) =  0.065
Minimum soil loss rate ((In/Hr)) =  0.033
(for 24 hour storm duration)
Soil low loss rate (decimal) =   0.220
------------------------------------------------------------------------

               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        152.377         33.745             23.432
    2   0.167        304.754         46.835             32.521
    3   0.250        457.131         11.045              7.669
    4   0.333        609.508          4.812              3.341
    5   0.417        761.885          2.398              1.665
    6   0.500        914.262          1.165              0.809
                              Sum = 100.000   Sum=      69.438
------------------------------------------------------------------------
```

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	0.032	(0.116)	0.007	0.025
2	0.17	0.07	0.032	(0.115)	0.007	0.025
3	0.25	0.07	0.032	(0.115)	0.007	0.025
4	0.33	0.10	0.048	(0.114)	0.011	0.037
5	0.42	0.10	0.048	(0.114)	0.011	0.037
6	0.50	0.10	0.048	(0.114)	0.011	0.037
7	0.58	0.10	0.048	(0.113)	0.011	0.037
8	0.67	0.10	0.048	(0.113)	0.011	0.037
9	0.75	0.10	0.048	(0.112)	0.011	0.037
10	0.83	0.13	0.064	(0.112)	0.014	0.050
11	0.92	0.13	0.064	(0.111)	0.014	0.050
12	1.00	0.13	0.064	(0.111)	0.014	0.050
13	1.08	0.10	0.048	(0.110)	0.011	0.037
14	1.17	0.10	0.048	(0.110)	0.011	0.037
15	1.25	0.10	0.048	(0.110)	0.011	0.037
16	1.33	0.10	0.048	(0.109)	0.011	0.037
17	1.42	0.10	0.048	(0.109)	0.011	0.037
18	1.50	0.10	0.048	(0.108)	0.011	0.037
19	1.58	0.10	0.048	(0.108)	0.011	0.037
20	1.67	0.10	0.048	(0.107)	0.011	0.037
21	1.75	0.10	0.048	(0.107)	0.011	0.037
22	1.83	0.13	0.064	(0.107)	0.014	0.050
23	1.92	0.13	0.064	(0.106)	0.014	0.050
24	2.00	0.13	0.064	(0.106)	0.014	0.050
25	2.08	0.13	0.064	(0.105)	0.014	0.050
26	2.17	0.13	0.064	(0.105)	0.014	0.050
27	2.25	0.13	0.064	(0.104)	0.014	0.050
28	2.33	0.13	0.064	(0.104)	0.014	0.050
29	2.42	0.13	0.064	(0.104)	0.014	0.050
30	2.50	0.13	0.064	(0.103)	0.014	0.050
31	2.58	0.17	0.080	(0.103)	0.018	0.062
32	2.67	0.17	0.080	(0.102)	0.018	0.062
33	2.75	0.17	0.080	(0.102)	0.018	0.062
34	2.83	0.17	0.080	(0.101)	0.018	0.062
35	2.92	0.17	0.080	(0.101)	0.018	0.062
36	3.00	0.17	0.080	(0.101)	0.018	0.062

37	3.08	0.17	0.080	(0.100)	0.018	0.062
38	3.17	0.17	0.080	(0.100)	0.018	0.062
39	3.25	0.17	0.080	(0.099)	0.018	0.062
40	3.33	0.17	0.080	(0.099)	0.018	0.062
41	3.42	0.17	0.080	(0.099)	0.018	0.062
42	3.50	0.17	0.080	(0.098)	0.018	0.062
43	3.58	0.17	0.080	(0.098)	0.018	0.062
44	3.67	0.17	0.080	(0.097)	0.018	0.062
45	3.75	0.17	0.080	(0.097)	0.018	0.062
46	3.83	0.20	0.096	(0.097)	0.021	0.075
47	3.92	0.20	0.096	(0.096)	0.021	0.075
48	4.00	0.20	0.096	(0.096)	0.021	0.075
49	4.08	0.20	0.096	(0.095)	0.021	0.075
50	4.17	0.20	0.096	(0.095)	0.021	0.075
51	4.25	0.20	0.096	(0.094)	0.021	0.075
52	4.33	0.23	0.112	(0.094)	0.025	0.087
53	4.42	0.23	0.112	(0.094)	0.025	0.087
54	4.50	0.23	0.112	(0.093)	0.025	0.087
55	4.58	0.23	0.112	(0.093)	0.025	0.087
56	4.67	0.23	0.112	(0.092)	0.025	0.087
57	4.75	0.23	0.112	(0.092)	0.025	0.087
58	4.83	0.27	0.128	(0.092)	0.028	0.100
59	4.92	0.27	0.128	(0.091)	0.028	0.100
60	5.00	0.27	0.128	(0.091)	0.028	0.100
61	5.08	0.20	0.096	(0.091)	0.021	0.075
62	5.17	0.20	0.096	(0.090)	0.021	0.075
63	5.25	0.20	0.096	(0.090)	0.021	0.075
64	5.33	0.23	0.112	(0.089)	0.025	0.087
65	5.42	0.23	0.112	(0.089)	0.025	0.087
66	5.50	0.23	0.112	(0.089)	0.025	0.087
67	5.58	0.27	0.128	(0.088)	0.028	0.100
68	5.67	0.27	0.128	(0.088)	0.028	0.100
69	5.75	0.27	0.128	(0.087)	0.028	0.100
70	5.83	0.27	0.128	(0.087)	0.028	0.100
71	5.92	0.27	0.128	(0.087)	0.028	0.100
72	6.00	0.27	0.128	(0.086)	0.028	0.100
73	6.08	0.30	0.144	(0.086)	0.032	0.112
74	6.17	0.30	0.144	(0.085)	0.032	0.112
75	6.25	0.30	0.144	(0.085)	0.032	0.112
76	6.33	0.30	0.144	(0.085)	0.032	0.112
77	6.42	0.30	0.144	(0.084)	0.032	0.112
78	6.50	0.30	0.144	(0.084)	0.032	0.112
79	6.58	0.33	0.160	(0.084)	0.035	0.125
80	6.67	0.33	0.160	(0.083)	0.035	0.125
81	6.75	0.33	0.160	(0.083)	0.035	0.125
82	6.83	0.33	0.160	(0.082)	0.035	0.125
83	6.92	0.33	0.160	(0.082)	0.035	0.125
84	7.00	0.33	0.160	(0.082)	0.035	0.125
85	7.08	0.33	0.160	(0.081)	0.035	0.125
86	7.17	0.33	0.160	(0.081)	0.035	0.125
87	7.25	0.33	0.160	(0.081)	0.035	0.125
88	7.33	0.37	0.176	(0.080)	0.039	0.137
89	7.42	0.37	0.176	(0.080)	0.039	0.137
90	7.50	0.37	0.176	(0.079)	0.039	0.137
91	7.58	0.40	0.192	(0.079)	0.042	0.150
92	7.67	0.40	0.192	(0.079)	0.042	0.150
93	7.75	0.40	0.192	(0.078)	0.042	0.150
94	7.83	0.43	0.208	(0.078)	0.046	0.162
95	7.92	0.43	0.208	(0.078)	0.046	0.162
96	8.00	0.43	0.208	(0.077)	0.046	0.162
97	8.08	0.50	0.240	(0.077)	0.053	0.187
98	8.17	0.50	0.240	(0.077)	0.053	0.187
99	8.25	0.50	0.240	(0.076)	0.053	0.187
100	8.33	0.50	0.240	(0.076)	0.053	0.187
101	8.42	0.50	0.240	(0.076)	0.053	0.187
102	8.50	0.50	0.240	(0.075)	0.053	0.187
103	8.58	0.53	0.256	(0.075)	0.056	0.200
104	8.67	0.53	0.256	(0.074)	0.056	0.200
105	8.75	0.53	0.256	(0.074)	0.056	0.200
106	8.83	0.57	0.272	(0.074)	0.060	0.212
107	8.92	0.57	0.272	(0.073)	0.060	0.212
108	9.00	0.57	0.272	(0.073)	0.060	0.212
109	9.08	0.63	0.304	(0.073)	0.067	0.237

110	9.17	0.63	0.304	(0.072)	0.067	0.237
111	9.25	0.63	0.304	(0.072)	0.067	0.237
112	9.33	0.67	0.320	(0.072)	0.070	0.250
113	9.42	0.67	0.320	(0.071)	0.070	0.250
114	9.50	0.67	0.320	(0.071)	0.070	0.250
115	9.58	0.70	0.336	0.071	(0.074)	0.265
116	9.67	0.70	0.336	0.070	(0.074)	0.266
117	9.75	0.70	0.336	0.070	(0.074)	0.266
118	9.83	0.73	0.352	0.070	(0.077)	0.282
119	9.92	0.73	0.352	0.069	(0.077)	0.283
120	10.00	0.73	0.352	0.069	(0.077)	0.283
121	10.08	0.50	0.240	(0.069)	0.053	0.187
122	10.17	0.50	0.240	(0.068)	0.053	0.187
123	10.25	0.50	0.240	(0.068)	0.053	0.187
124	10.33	0.50	0.240	(0.068)	0.053	0.187
125	10.42	0.50	0.240	(0.067)	0.053	0.187
126	10.50	0.50	0.240	(0.067)	0.053	0.187
127	10.58	0.67	0.320	0.067	(0.070)	0.253
128	10.67	0.67	0.320	0.066	(0.070)	0.254
129	10.75	0.67	0.320	0.066	(0.070)	0.254
130	10.83	0.67	0.320	0.066	(0.070)	0.254
131	10.92	0.67	0.320	0.065	(0.070)	0.255
132	11.00	0.67	0.320	0.065	(0.070)	0.255
133	11.08	0.63	0.304	0.065	(0.067)	0.239
134	11.17	0.63	0.304	0.064	(0.067)	0.240
135	11.25	0.63	0.304	0.064	(0.067)	0.240
136	11.33	0.63	0.304	0.064	(0.067)	0.240
137	11.42	0.63	0.304	0.063	(0.067)	0.240
138	11.50	0.63	0.304	0.063	(0.067)	0.241
139	11.58	0.57	0.272	(0.063)	0.060	0.212
140	11.67	0.57	0.272	(0.063)	0.060	0.212
141	11.75	0.57	0.272	(0.062)	0.060	0.212
142	11.83	0.60	0.288	0.062	(0.063)	0.226
143	11.92	0.60	0.288	0.062	(0.063)	0.226
144	12.00	0.60	0.288	0.061	(0.063)	0.227
145	12.08	0.83	0.400	0.061	(0.088)	0.339
146	12.17	0.83	0.400	0.061	(0.088)	0.339
147	12.25	0.83	0.400	0.060	(0.088)	0.340
148	12.33	0.87	0.416	0.060	(0.092)	0.356
149	12.42	0.87	0.416	0.060	(0.092)	0.356
150	12.50	0.87	0.416	0.059	(0.092)	0.356
151	12.58	0.93	0.448	0.059	(0.099)	0.389
152	12.67	0.93	0.448	0.059	(0.099)	0.389
153	12.75	0.93	0.448	0.059	(0.099)	0.389
154	12.83	0.97	0.464	0.058	(0.102)	0.406
155	12.92	0.97	0.464	0.058	(0.102)	0.406
156	13.00	0.97	0.464	0.058	(0.102)	0.406
157	13.08	1.13	0.544	0.057	(0.120)	0.487
158	13.17	1.13	0.544	0.057	(0.120)	0.487
159	13.25	1.13	0.544	0.057	(0.120)	0.487
160	13.33	1.13	0.544	0.057	(0.120)	0.487
161	13.42	1.13	0.544	0.056	(0.120)	0.488
162	13.50	1.13	0.544	0.056	(0.120)	0.488
163	13.58	0.77	0.368	0.056	(0.081)	0.312
164	13.67	0.77	0.368	0.055	(0.081)	0.313
165	13.75	0.77	0.368	0.055	(0.081)	0.313
166	13.83	0.77	0.368	0.055	(0.081)	0.313
167	13.92	0.77	0.368	0.055	(0.081)	0.313
168	14.00	0.77	0.368	0.054	(0.081)	0.314
169	14.08	0.90	0.432	0.054	(0.095)	0.378
170	14.17	0.90	0.432	0.054	(0.095)	0.378
171	14.25	0.90	0.432	0.053	(0.095)	0.379
172	14.33	0.87	0.416	0.053	(0.092)	0.363
173	14.42	0.87	0.416	0.053	(0.092)	0.363
174	14.50	0.87	0.416	0.053	(0.092)	0.363
175	14.58	0.87	0.416	0.052	(0.092)	0.364
176	14.67	0.87	0.416	0.052	(0.092)	0.364
177	14.75	0.87	0.416	0.052	(0.092)	0.364
178	14.83	0.83	0.400	0.052	(0.088)	0.348
179	14.92	0.83	0.400	0.051	(0.088)	0.349
180	15.00	0.83	0.400	0.051	(0.088)	0.349
181	15.08	0.80	0.384	0.051	(0.084)	0.333
182	15.17	0.80	0.384	0.051	(0.084)	0.333

183	15.25	0.80	0.384	0.050	(0.084)	0.334
184	15.33	0.77	0.368	0.050	(0.081)	0.318
185	15.42	0.77	0.368	0.050	(0.081)	0.318
186	15.50	0.77	0.368	0.049	(0.081)	0.318
187	15.58	0.63	0.304	0.049	(0.067)	0.255
188	15.67	0.63	0.304	0.049	(0.067)	0.255
189	15.75	0.63	0.304	0.049	(0.067)	0.255
190	15.83	0.63	0.304	0.048	(0.067)	0.255
191	15.92	0.63	0.304	0.048	(0.067)	0.256
192	16.00	0.63	0.304	0.048	(0.067)	0.256
193	16.08	0.13	0.064	(0.048)	0.014	0.050
194	16.17	0.13	0.064	(0.047)	0.014	0.050
195	16.25	0.13	0.064	(0.047)	0.014	0.050
196	16.33	0.13	0.064	(0.047)	0.014	0.050
197	16.42	0.13	0.064	(0.047)	0.014	0.050
198	16.50	0.13	0.064	(0.047)	0.014	0.050
199	16.58	0.10	0.048	(0.046)	0.011	0.037
200	16.67	0.10	0.048	(0.046)	0.011	0.037
201	16.75	0.10	0.048	(0.046)	0.011	0.037
202	16.83	0.10	0.048	(0.046)	0.011	0.037
203	16.92	0.10	0.048	(0.045)	0.011	0.037
204	17.00	0.10	0.048	(0.045)	0.011	0.037
205	17.08	0.17	0.080	(0.045)	0.018	0.062
206	17.17	0.17	0.080	(0.045)	0.018	0.062
207	17.25	0.17	0.080	(0.044)	0.018	0.062
208	17.33	0.17	0.080	(0.044)	0.018	0.062
209	17.42	0.17	0.080	(0.044)	0.018	0.062
210	17.50	0.17	0.080	(0.044)	0.018	0.062
211	17.58	0.17	0.080	(0.044)	0.018	0.062
212	17.67	0.17	0.080	(0.043)	0.018	0.062
213	17.75	0.17	0.080	(0.043)	0.018	0.062
214	17.83	0.13	0.064	(0.043)	0.014	0.050
215	17.92	0.13	0.064	(0.043)	0.014	0.050
216	18.00	0.13	0.064	(0.042)	0.014	0.050
217	18.08	0.13	0.064	(0.042)	0.014	0.050
218	18.17	0.13	0.064	(0.042)	0.014	0.050
219	18.25	0.13	0.064	(0.042)	0.014	0.050
220	18.33	0.13	0.064	(0.042)	0.014	0.050
221	18.42	0.13	0.064	(0.041)	0.014	0.050
222	18.50	0.13	0.064	(0.041)	0.014	0.050
223	18.58	0.10	0.048	(0.041)	0.011	0.037
224	18.67	0.10	0.048	(0.041)	0.011	0.037
225	18.75	0.10	0.048	(0.041)	0.011	0.037
226	18.83	0.07	0.032	(0.040)	0.007	0.025
227	18.92	0.07	0.032	(0.040)	0.007	0.025
228	19.00	0.07	0.032	(0.040)	0.007	0.025
229	19.08	0.10	0.048	(0.040)	0.011	0.037
230	19.17	0.10	0.048	(0.040)	0.011	0.037
231	19.25	0.10	0.048	(0.040)	0.011	0.037
232	19.33	0.13	0.064	(0.039)	0.014	0.050
233	19.42	0.13	0.064	(0.039)	0.014	0.050
234	19.50	0.13	0.064	(0.039)	0.014	0.050
235	19.58	0.10	0.048	(0.039)	0.011	0.037
236	19.67	0.10	0.048	(0.039)	0.011	0.037
237	19.75	0.10	0.048	(0.038)	0.011	0.037
238	19.83	0.07	0.032	(0.038)	0.007	0.025
239	19.92	0.07	0.032	(0.038)	0.007	0.025
240	20.00	0.07	0.032	(0.038)	0.007	0.025
241	20.08	0.10	0.048	(0.038)	0.011	0.037
242	20.17	0.10	0.048	(0.038)	0.011	0.037
243	20.25	0.10	0.048	(0.037)	0.011	0.037
244	20.33	0.10	0.048	(0.037)	0.011	0.037
245	20.42	0.10	0.048	(0.037)	0.011	0.037
246	20.50	0.10	0.048	(0.037)	0.011	0.037
247	20.58	0.10	0.048	(0.037)	0.011	0.037
248	20.67	0.10	0.048	(0.037)	0.011	0.037
249	20.75	0.10	0.048	(0.036)	0.011	0.037
250	20.83	0.07	0.032	(0.036)	0.007	0.025
251	20.92	0.07	0.032	(0.036)	0.007	0.025
252	21.00	0.07	0.032	(0.036)	0.007	0.025
253	21.08	0.10	0.048	(0.036)	0.011	0.037
254	21.17	0.10	0.048	(0.036)	0.011	0.037
255	21.25	0.10	0.048	(0.036)	0.011	0.037

```
256  21.33     0.07      0.032       (  0.035)       0.007        0.025
257  21.42     0.07      0.032       (  0.035)       0.007        0.025
258  21.50     0.07      0.032       (  0.035)       0.007        0.025
259  21.58     0.10      0.048       (  0.035)       0.011        0.037
260  21.67     0.10      0.048       (  0.035)       0.011        0.037
261  21.75     0.10      0.048       (  0.035)       0.011        0.037
262  21.83     0.07      0.032       (  0.035)       0.007        0.025
263  21.92     0.07      0.032       (  0.035)       0.007        0.025
264  22.00     0.07      0.032       (  0.034)       0.007        0.025
265  22.08     0.10      0.048       (  0.034)       0.011        0.037
266  22.17     0.10      0.048       (  0.034)       0.011        0.037
267  22.25     0.10      0.048       (  0.034)       0.011        0.037
268  22.33     0.07      0.032       (  0.034)       0.007        0.025
269  22.42     0.07      0.032       (  0.034)       0.007        0.025
270  22.50     0.07      0.032       (  0.034)       0.007        0.025
271  22.58     0.07      0.032       (  0.034)       0.007        0.025
272  22.67     0.07      0.032       (  0.034)       0.007        0.025
273  22.75     0.07      0.032       (  0.034)       0.007        0.025
274  22.83     0.07      0.032       (  0.033)       0.007        0.025
275  22.92     0.07      0.032       (  0.033)       0.007        0.025
276  23.00     0.07      0.032       (  0.033)       0.007        0.025
277  23.08     0.07      0.032       (  0.033)       0.007        0.025
278  23.17     0.07      0.032       (  0.033)       0.007        0.025
279  23.25     0.07      0.032       (  0.033)       0.007        0.025
280  23.33     0.07      0.032       (  0.033)       0.007        0.025
281  23.42     0.07      0.032       (  0.033)       0.007        0.025
282  23.50     0.07      0.032       (  0.033)       0.007        0.025
283  23.58     0.07      0.032       (  0.033)       0.007        0.025
284  23.67     0.07      0.032       (  0.033)       0.007        0.025
285  23.75     0.07      0.032       (  0.033)       0.007        0.025
286  23.83     0.07      0.032       (  0.033)       0.007        0.025
287  23.92     0.07      0.032       (  0.033)       0.007        0.025
288  24.00     0.07      0.032       (  0.033)       0.007        0.025
              (Loss Rate Not Used)
    Sum =     100.0                                    Sum =    39.3
      Flood volume = Effective rainfall      3.27(In)
       times area      68.9(Ac.)/[(In)/(Ft.)] =      18.8(Ac.Ft)
      Total soil loss =      0.73(In)
      Total soil loss =     4.181(Ac.Ft)
      Total rainfall =      4.00(In)
      Flood volume =      818178.8 Cubic Feet
      Total soil loss =      182114.5 Cubic Feet
      ---------------------------------------------------------------------
       Peak flow rate of this hydrograph =     33.882(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       10.0      20.0      30.0      40.0
 ---------------------------------------------------------------------------
   0+ 5       0.0040      0.59  Q         |         |         |         |
   0+10       0.0137      1.40  VQ        |         |         |         |
   0+15       0.0246      1.59  VQ        |         |         |         |
   0+20       0.0381      1.96  VQ        |         |         |         |
   0+25       0.0547      2.41  V Q       |         |         |         |
   0+30       0.0721      2.53  V Q       |         |         |         |
   0+35       0.0898      2.57  V Q       |         |         |         |
   0+40       0.1077      2.59  V Q       |         |         |         |
   0+45       0.1256      2.60  V Q       |         |         |         |
   0+50       0.1455      2.89  V Q       |         |         |         |
   0+55       0.1682      3.30  V  Q      |         |         |         |
   1+ 0       0.1916      3.40  V  Q      |         |         |         |
   1+ 5       0.2133      3.14  V  Q      |         |         |         |
   1+10       0.2323      2.76  V Q       |         |         |         |
   1+15       0.2507      2.67  V Q       |         |         |         |
   1+20       0.2688      2.63  V Q       |         |         |         |
   1+25       0.2868      2.61  V Q       |         |         |         |
   1+30       0.3047      2.60  V Q       |         |         |         |
   1+35       0.3226      2.60  V Q       |         |         |         |
```

```
1+40      0.3405     2.60  V Q       |         |         |         |
1+45      0.3585     2.60  V Q       |         |         |         |
1+50      0.3784     2.89  V Q       |         |         |         |
1+55      0.4011     3.30  V  Q      |         |         |         |
2+ 0      0.4245     3.40  V  Q      |         |         |         |
2+ 5      0.4482     3.44  V  Q      |         |         |         |
2+10      0.4720     3.46  |V Q      |         |         |         |
2+15      0.4958     3.47  |V Q      |         |         |         |
2+20      0.5197     3.47  |V Q      |         |         |         |
2+25      0.5436     3.47  |V Q      |         |         |         |
2+30      0.5675     3.47  |V Q      |         |         |         |
2+35      0.5934     3.76  |V Q      |         |         |         |
2+40      0.6221     4.17  |V  Q     |         |         |         |
2+45      0.6514     4.26  |V  Q     |         |         |         |
2+50      0.6811     4.30  |V  Q     |         |         |         |
2+55      0.7109     4.32  |V  Q     |         |         |         |
3+ 0      0.7407     4.33  |V  Q     |         |         |         |
3+ 5      0.7706     4.33  |V  Q     |         |         |         |
3+10      0.8004     4.33  |V  Q     |         |         |         |
3+15      0.8303     4.33  |V  Q     |         |         |         |
3+20      0.8601     4.33  |V  Q     |         |         |         |
3+25      0.8900     4.33  |V  Q     |         |         |         |
3+30      0.9198     4.33  |V  Q     |         |         |         |
3+35      0.9497     4.33  | V Q     |         |         |         |
3+40      0.9795     4.33  | V Q     |         |         |         |
3+45      1.0094     4.33  | V Q     |         |         |         |
3+50      1.0413     4.63  | V Q     |         |         |         |
3+55      1.0759     5.03  | V  Q    |         |         |         |
4+ 0      1.1112     5.13  | V  Q    |         |         |         |
4+ 5      1.1468     5.17  | V  Q    |         |         |         |
4+10      1.1826     5.19  | V  Q    |         |         |         |
4+15      1.2184     5.20  | V  Q    |         |         |         |
4+20      1.2563     5.49  | V  Q    |         |         |         |
4+25      1.2969     5.90  | V  Q    |         |         |         |
4+30      1.3382     6.00  | V  Q    |         |         |         |
4+35      1.3798     6.04  | V   Q   |         |         |         |
4+40      1.4215     6.06  |  V  Q   |         |         |         |
4+45      1.4633     6.07  |  V  Q   |         |         |         |
4+50      1.5071     6.36  |  V  Q   |         |         |         |
4+55      1.5537     6.77  |  V  Q   |         |         |         |
5+ 0      1.6010     6.86  |  V  Q   |         |         |         |
5+ 5      1.6445     6.32  |  V  Q   |         |         |         |
5+10      1.6826     5.53  |  V Q    |         |         |         |
5+15      1.7194     5.35  |  V Q    |         |         |         |
5+20      1.7576     5.56  |  V Q    |         |         |         |
5+25      1.7984     5.92  |  V Q    |         |         |         |
5+30      1.8397     6.00  |  V Q    |         |         |         |
5+35      1.8833     6.33  |   V Q   |         |         |         |
5+40      1.9298     6.76  |   V Q   |         |         |         |
5+45      1.9771     6.86  |   V Q   |         |         |         |
5+50      2.0247     6.90  |   V Q   |         |         |         |
5+55      2.0724     6.93  |   V Q   |         |         |         |
6+ 0      2.1201     6.94  |   V Q   |         |         |         |
6+ 5      2.1699     7.23  |   V  Q  |         |         |         |
6+10      2.2225     7.63  |   V  Q  |         |         |         |
6+15      2.2757     7.73  |   V  Q  |         |         |         |
6+20      2.3292     7.77  |   V  Q  |         |         |         |
6+25      2.3829     7.79  |    V Q  |         |         |         |
6+30      2.4366     7.80  |    V Q  |         |         |         |
6+35      2.4924     8.09  |    V  Q |         |         |         |
6+40      2.5509     8.50  |    V  Q |         |         |         |
6+45      2.6101     8.60  |    V  Q |         |         |         |
6+50      2.6696     8.64  |    V  Q |         |         |         |
6+55      2.7293     8.66  |    V  Q |         |         |         |
7+ 0      2.7890     8.67  |    V  Q |         |         |         |
7+ 5      2.8487     8.67  |     V Q |         |         |         |
7+10      2.9084     8.67  |     V Q |         |         |         |
7+15      2.9681     8.67  |     V Q |         |         |         |
7+20      3.0298     8.96  |     V Q |         |         |         |
7+25      3.0943     9.37  |     V  Q|         |         |         |
7+30      3.1595     9.46  |     V  Q|         |         |         |
7+35      3.2270     9.80  |     V  Q|         |         |         |
7+40      3.2974    10.22  |      V  Q         |         |         |
```

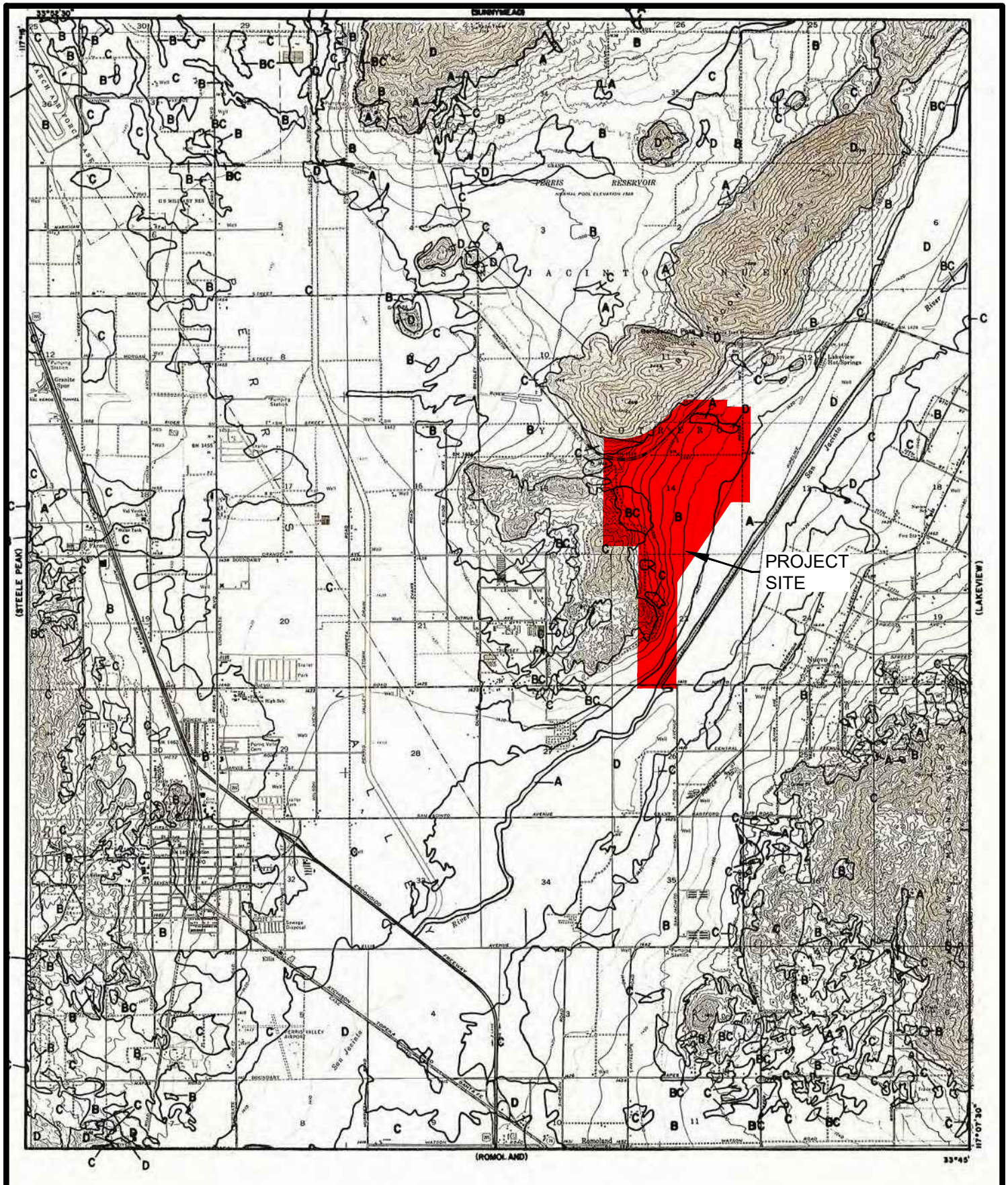
```
 7+45      3.3685     10.33  |      V  Q         |          |          |
 7+50      3.4420     10.66  |      V  Q         |          |          |
 7+55      3.5184     11.09  |      V  |Q        |          |          |
 8+ 0      3.5955     11.20  |      V  |Q        |          |          |
 8+ 5      3.6769     11.82  |      V  |Q        |          |          |
 8+10      3.7641     12.66  |       V | Q       |          |          |
 8+15      3.8527     12.86  |       V | Q       |          |          |
 8+20      3.9418     12.94  |       V | Q       |          |          |
 8+25      4.0312     12.98  |       V | Q       |          |          |
 8+30      4.1208     13.00  |       V |  Q      |          |          |
 8+35      4.2123     13.30  |       V |  Q      |          |          |
 8+40      4.3067     13.70  |        V|  Q      |          |          |
 8+45      4.4017     13.80  |        V|  Q      |          |          |
 8+50      4.4991     14.13  |        V|   Q     |          |          |
 8+55      4.5993     14.56  |        V|   Q     |          |          |
 9+ 0      4.7003     14.67  |         V   Q     |          |          |
 9+ 5      4.8056     15.29  |         V    Q    |          |          |
 9+10      4.9167     16.12  |         V     Q   |          |          |
 9+15      5.0291     16.33  |         V     Q   |          |          |
 9+20      5.1442     16.70  |         V     Q   |          |          |
 9+25      5.2623     17.15  |         |V     Q  |          |          |
 9+30      5.3812     17.27  |         |V     Q  |          |          |
 9+35      5.5029     17.68  |         |V     Q  |          |          |
 9+40      5.6284     18.22  |         |V      Q |          |          |
 9+45      5.7549     18.37  |         | V     Q |          |          |
 9+50      5.8845     18.82  |         | V     Q |          |          |
 9+55      6.0180     19.38  |         | V      Q|          |          |
10+ 0      6.1525     19.54  |         |  V     Q|          |          |
10+ 5      6.2721     17.37  |         |  V   Q  |          |          |
10+10      6.3705     14.28  |         |  VQ     |          |          |
10+15      6.4639     13.56  |         |  Q      |          |          |
10+20      6.5551     13.24  |         |  Q      |          |          |
10+25      6.6452     13.08  |         |  QV     |          |          |
10+30      6.7347     13.00  |         |  QV     |          |          |
10+35      6.8350     14.55  |         |   Q     |          |          |
10+40      6.9501     16.71  |         |   V Q   |          |          |
10+45      7.0688     17.24  |         |    V Q  |          |          |
10+50      7.1892     17.48  |         |    V Q  |          |          |
10+55      7.3104     17.61  |         |    V Q  |          |          |
11+ 0      7.4323     17.69  |         |    V Q  |          |          |
11+ 5      7.5516     17.33  |         |     VQ  |          |          |
11+10      7.6676     16.84  |         |     Q   |          |          |
11+15      7.7828     16.74  |         |     Q   |          |          |
11+20      7.8979     16.70  |         |     Q   |          |          |
11+25      8.0129     16.70  |         |     QV  |          |          |
11+30      8.1280     16.71  |         |     QV  |          |          |
11+35      8.2385     16.05  |         |     QV  |          |          |
11+40      8.3427     15.12  |         |    Q V  |          |          |
11+45      8.4453     14.90  |         |   Q  V  |          |          |
11+50      8.5495     15.13  |         |    Q  V |          |          |
11+55      8.6566     15.55  |         |    Q  V |          |          |
12+ 0      8.7644     15.65  |         |    Q  V |          |          |
12+ 5      8.8907     18.34  |         |       Q |          |          |
12+10      9.0424     22.03  |         |        V| Q        |          |
12+15      9.2002     22.92  |         |        V| Q        |          |
12+20      9.3634     23.69  |         |        V|  Q       |          |
12+25      9.5316     24.42  |         |         V   Q      |          |
12+30      9.7013     24.65  |         |         V   Q      |          |
12+35      9.8768     25.48  |         |         |V   Q     |          |
12+40     10.0598     26.57  |         |         |V    Q    |          |
12+45     10.2446     26.84  |         |         |V    Q    |          |
12+50     10.4330     27.35  |         |         | V    Q   |          |
12+55     10.6254     27.94  |         |         | V    Q   |          |
13+ 0     10.8190     28.11  |         |         |  V    Q  |          |
13+ 5     11.0260     30.06  |         |         |  V      Q|          |
13+10     11.2513     32.71  |         |         |  V      | Q        |
13+15     11.4810     33.36  |         |         |   V     |  Q       |
13+20     11.7127     33.64  |         |         |   V     |  Q       |
13+25     11.9455     33.80  |         |         |    V    |  Q       |
13+30     12.1789     33.88  |         |         |    V    |  Q       |
13+35     12.3839     29.78  |         |         |     V  Q|          |
13+40     12.5497     24.07  |         |         |   Q V   |          |
13+45     12.7063     22.74  |         |         | Q    V  |          |
```

```
13+50      12.8590     22.17  |          |          | Q    V  |          |
13+55      13.0098     21.90  |          |          |Q     V  |          |
14+ 0      13.1598     21.77  |          |          |Q      V |          |
14+ 5      13.3202     23.29  |          |          |  Q    V |          |
14+10      13.4951     25.39  |          |          |    Q  V |          |
14+15      13.6735     25.91  |          |          |    Q   V|          |
14+20      13.8509     25.76  |          |          |    Q   V|          |
14+25      14.0256     25.37  |          |          |    Q   V|          |
14+30      14.2000     25.32  |          |          |    Q    V          |
14+35      14.3741     25.28  |          |          |    Q    V          |
14+40      14.5482     25.27  |          |          |    Q    V          |
14+45      14.7223     25.28  |          |          |    Q    |V         |
14+50      14.8939     24.92  |          |          |   Q     |V         |
14+55      15.0621     24.42  |          |          |   Q     | V        |
15+ 0      15.2296     24.32  |          |          |   Q     | V        |
15+ 5      15.3942     23.91  |          |          |  Q      | V        |
15+10      15.5552     23.38  |          |          |  Q      |  V       |
15+15      15.7154     23.26  |          |          |  Q      |  V       |
15+20      15.8727     22.85  |          |          | Q       |  V       |
15+25      16.0265     22.32  |          |          | Q       |   V      |
15+30      16.1794     22.20  |          |          | Q       |   V      |
15+35      16.3217     20.67  |          |          Q         |   V      |
15+40      16.4496     18.57  |          |        Q |         |    V     |
15+45      16.5742     18.09  |          |        Q |         |    V     |
15+50      16.6974     17.89  |          |       Q  |         |    V     |
15+55      16.8200     17.80  |          |       Q  |         |    V     |
16+ 0      16.9424     17.77  |          |       Q  |         |     V    |
16+ 5      17.0315     12.95  |          | Q        |         |     V    |
16+10      17.0746      6.25  |      Q   |          |         |     V    |
16+15      17.1067      4.67  |    Q     |          |         |     V    |
16+20      17.1341      3.98  |  Q       |          |         |     V    |
16+25      17.1591      3.63  |  Q       |          |         |     V    |
16+30      17.1830      3.47  |  Q       |          |         |     V    |
16+35      17.2049      3.18  |  Q       |          |         |     V    |
16+40      17.2239      2.77  | Q        |          |         |     V    |
16+45      17.2423      2.67  | Q        |          |         |     V    |
16+50      17.2605      2.63  | Q        |          |         |     V    |
16+55      17.2784      2.61  | Q        |          |         |     V    |
17+ 0      17.2964      2.60  | Q        |          |         |     V    |
17+ 5      17.3183      3.19  |  Q       |          |         |     V    |
17+10      17.3458      4.00  |  Q       |          |         |     V    |
17+15      17.3747      4.19  |    Q     |          |         |      V   |
17+20      17.4041      4.27  |    Q     |          |         |      V   |
17+25      17.4338      4.31  |    Q     |          |         |      V   |
17+30      17.4637      4.33  |    Q     |          |         |      V   |
17+35      17.4935      4.33  |    Q     |          |         |      V   |
17+40      17.5234      4.33  |    Q     |          |         |      V   |
17+45      17.5532      4.33  |    Q     |          |         |      V   |
17+50      17.5811      4.04  |    Q     |          |         |      V   |
17+55      17.6061      3.64  |  Q       |          |         |      V   |
18+ 0      17.6305      3.54  |  Q       |          |         |      V   |
18+ 5      17.6546      3.50  |  Q       |          |         |      V   |
18+10      17.6785      3.48  |  Q       |          |         |      V   |
18+15      17.7024      3.47  |  Q       |          |         |      V   |
18+20      17.7263      3.47  |  Q       |          |         |      V   |
18+25      17.7502      3.47  |  Q       |          |         |      V   |
18+30      17.7741      3.47  |  Q       |          |         |      V   |
18+35      17.7959      3.18  |  Q       |          |         |      V   |
18+40      17.8150      2.77  | Q        |          |         |      V   |
18+45      17.8334      2.67  | Q        |          |         |      V   |
18+50      17.8495      2.34  | Q        |          |         |       V  |
18+55      17.8627      1.91  |Q         |          |         |       V  |
19+ 0      17.8751      1.81  |Q         |          |         |       V  |
19+ 5      17.8893      2.06  | Q        |          |         |       V  |
19+10      17.9061      2.44  | Q        |          |         |       V  |
19+15      17.9235      2.53  | Q        |          |         |       V  |
19+20      17.9433      2.86  | Q        |          |         |       V  |
19+25      17.9659      3.29  |  Q       |          |         |       V  |
19+30      17.9893      3.40  |  Q       |          |         |       V  |
19+35      18.0110      3.14  |  Q       |          |         |       V  |
19+40      18.0300      2.76  | Q        |          |         |       V  |
19+45      18.0484      2.67  | Q        |          |         |       V  |
19+50      18.0645      2.34  | Q        |          |         |       V  |
```

19+55	18.0776	1.91	|Q	|	|	|	V |
20+ 0	18.0901	1.81	|Q	|	|	|	V |
20+ 5	18.1043	2.06	| Q	|	|	|	V |
20+10	18.1211	2.44	| Q	|	|	|	V |
20+15	18.1385	2.53	| Q	|	|	|	V |
20+20	18.1562	2.57	| Q	|	|	|	V |
20+25	18.1740	2.59	| Q	|	|	|	V |
20+30	18.1919	2.60	| Q	|	|	|	V |
20+35	18.2099	2.60	| Q	|	|	|	V |
20+40	18.2278	2.60	| Q	|	|	|	V |
20+45	18.2457	2.60	| Q	|	|	|	V |
20+50	18.2616	2.31	| Q	|	|	|	V |
20+55	18.2747	1.90	|Q	|	|	|	V |
21+ 0	18.2871	1.81	|Q	|	|	|	V |
21+ 5	18.3013	2.06	| Q	|	|	|	V |
21+10	18.3181	2.44	| Q	|	|	|	V|
21+15	18.3355	2.53	| Q	|	|	|	V|
21+20	18.3512	2.28	| Q	|	|	|	V|
21+25	18.3642	1.89	|Q	|	|	|	V|
21+30	18.3767	1.81	|Q	|	|	|	V|
21+35	18.3908	2.06	| Q	|	|	|	V|
21+40	18.4077	2.44	| Q	|	|	|	V|
21+45	18.4251	2.53	| Q	|	|	|	V|
21+50	18.4408	2.28	| Q	|	|	|	V|
21+55	18.4538	1.89	|Q	|	|	|	V|
22+ 0	18.4662	1.81	|Q	|	|	|	V|
22+ 5	18.4804	2.06	| Q	|	|	|	V|
22+10	18.4972	2.44	| Q	|	|	|	V|
22+15	18.5146	2.53	| Q	|	|	|	V|
22+20	18.5303	2.28	| Q	|	|	|	V|
22+25	18.5433	1.89	|Q	|	|	|	V|
22+30	18.5558	1.81	|Q	|	|	|	V|
22+35	18.5679	1.76	|Q	|	|	|	V|
22+40	18.5799	1.74	|Q	|	|	|	V|
22+45	18.5919	1.73	|Q	|	|	|	V|
22+50	18.6038	1.73	|Q	|	|	|	V|
22+55	18.6158	1.73	|Q	|	|	|	V|
23+ 0	18.6277	1.73	|Q	|	|	|	V|
23+ 5	18.6397	1.73	|Q	|	|	|	V|
23+10	18.6516	1.73	|Q	|	|	|	V|
23+15	18.6635	1.73	|Q	|	|	|	V|
23+20	18.6755	1.73	|Q	|	|	|	V|
23+25	18.6874	1.73	|Q	|	|	|	V|
23+30	18.6994	1.73	|Q	|	|	|	V|
23+35	18.7113	1.73	|Q	|	|	|	V|
23+40	18.7232	1.73	|Q	|	|	|	V|
23+45	18.7352	1.73	|Q	|	|	|	V|
23+50	18.7471	1.73	|Q	|	|	|	V|
23+55	18.7591	1.73	|Q	|	|	|	V|
24+ 0	18.7710	1.73	|Q	|	|	|	V|
24+ 5	18.7789	1.15	|Q	|	|	|	V|
24+10	18.7812	0.34	Q	|	|	|	V|
24+15	18.7822	0.15	Q	|	|	|	V|
24+20	18.7827	0.06	Q	|	|	|	V|
24+25	18.7828	0.02	Q	|	|	|	V|

SECTION 5 - Soils Data

- Riverside County Soil Group Map – Perris Plate C1-30
- Web Soil Survey Data
- Geotechnical Investigation – LGC Geotechnical Inc. (September 2019)



LEGEND

—— SOILS GROUP BOUNDARY

A SOILS GROUP DESIGNATION

RCFC&WCD

HYDROLOGY MANUAL

0 FEET 5000

HYDROLOGIC SOILS GROUP MAP FOR PERRIS

PLATE C-I.30

LGC Geotechnical, Inc.

September 12, 2019 Project No: 13092-01

Mr. Brian Hardy
Richland Communities, Inc.
3161 Michelson Drive, Suite 425
Irvine, CA 92626

Subject: ***Updated Geotechnical Evaluation, Proposed "Stoneridge" Industrial and Mixed-Use Development, Tentative Tract Map No. 32372, Unincorporated Area of Riverside County, California***

In accordance with your request and authorization, LGC Geotechnical, Inc. has performed an updated geotechnical evaluation for the proposed "Stoneridge" industrial and mixed-use development, Tentative Tract Map No. 32372, located in an unincorporated area of Riverside County, California. The purpose of our study was to evaluate the existing onsite geotechnical conditions, confirm that the site can be developed from a geotechnical perspective, and provided updated recommendations regarding the proposed design.

Should you have any questions regarding this report, please do not hesitate to contact our office. We appreciate this opportunity to be of service.

Respectfully Submitted,

LGC Geotechnical, Inc.

Ryan Douglas, RCE 84840
Project Engineer

REGISTERED PROFESSIONAL ENGINEER
RYAN L. DOUGLAS
No. 84840
CIVIL
STATE OF CALIFORNIA

Kevin Dyekman, CEG 2595
Project Geologist

PROFESSIONAL GEOLOGIST
KEVIN DYEKMAN
No. 2595
CERTIFIED ENGINEERING GEOLOGIST
STATE OF CALIFORNIA

Dennis Boratynec, GE 2770
Vice President

REGISTERED PROFESSIONAL ENGINEER
DENNIS BORATYNEC
No. 2770
GEOTECHNICAL
STATE OF CALIFORNIA

DJB/KAD/RLD/CNJ/amm

Distribution: (4) Addressee (3 wet-signed copies & 1 electronic copy)

TABLE OF CONTENTS

Section ***Page***

1.0 INTRODUCTION 1
1.1 Purpose and Scope of Services 1
1.2 Existing Conditions 1
1.3 Background and Project Description 1
1.4 Subsurface Geotechnical Evaluation 2
1.5 Laboratory Testing 3

2.0 GEOTECHNICAL CONDITIONS 6
2.1 Regional Geology 6
2.2 Site-Specific Geology 6
2.2.1 Quarternary Very Old Fan Deposits (Map Symbol - Qvof) 6
2.2.2 Cretaceous Lakeview Mountain Tonalite (Map Symbol - Klmt) 6
2.3 Geologic Structure 7
2.4 Groundwater 7
2.5 Landslides, Debris Flows and Rock Falls 7
2.6 Seiche 8
2.7 Subsidence 8
2.8 Field Infiltration Testing 9
2.9 Preliminary Seismic Design Parameters 10
2.10 Faulting and Seismic Hazards 11
2.10.1 Liquefaction and Dynamic Settlement 11
2.10.2 Lateral Spreading 12
2.11 Seismic Refraction Lines 12
2.12 Rippability 12
2.13 Oversized Material 13
2.14 Settlement and Collapse/Swell Potential 13
2.15 Expansion Potential 14

3.0 CONCLUSIONS 15

4.0 PRELIMINARY RECOMMENDATIONS 17
4.1 Site Earthwork 17
4.1.1 Site Preparation 17
4.1.2 Removals and Recompaction 18
4.1.3 Geologic Mapping 19
4.1.4 Over-excavation 19
4.1.5 Removal and Overexcavation Bottom Preparation 19
4.1.6 Material for Fill 20
4.1.7 Fill Placement and Compaction 21
4.1.7.1 Oversized Placement and Compaction 21
4.1.8 Trench and Conventional Retaining Wall Backfill and Compaction 22
4.1.9 Shrinkage and Bulking 22

4.1.10 Temporary Excavations 23
4.2 Settlement Monitoring 24
4.3 Slope Stability 24
4.3.1 Cut Slopes 24
4.3.2 Fill Slopes 25
4.3.3 Slope Maintenance Guidelines 25
4.4 Subdrains 26
4.5 Preliminary Foundation Recommendations 26
4.5.1 Slab Design and Construction 26
4.5.2 Foundation Design Parameters 27
4.5.3 Foundation Construction 28
4.5.4 Lateral Load Resistance 28
4.6 Foundation Setback from Top-of-Slope and Bottom-of-Slope 29
4.7 Lateral Earth Pressures for Conventional Retaining Wall Design 29
4.8 Soil Corrosivity to Concrete and Metal 31
4.9 Subsurface Water Infiltration 31
4.10 Control of Surface Water and Drainage Control 32
4.11 Preliminary Asphalt Concrete Pavement Sections 32
4.12 Preliminary Portland Cement Concrete Pavement Sections 33
4.13 Nonstructural Concrete Flatwork 34
4.14 Grading, Foundation and Retaining Wall Plan Review 35
4.15 Geotechnical Observation and Testing During Construction 35

5.0 LIMITATIONS 36

LIST OF ILLUSTRATIONS, TABLES, AND APPENDICES

Figures

Figure 1 – Site Location Map (Page 5)
Figure 2 – Retaining Wall Backfill Criteria (Rear of Text)

Sheets

Sheet 1 through 3 – Geotechnical Map (In Pocket)

Tables

Table 1 – Summary of Infiltration Testing (Page 9)
Table 2 – Seismic Design Parameters (Page 10)
Table 3 – Estimated Shrinkage (Page 22)
Table 4 – Allowable Soil Bearing Pressures (Page 27)
Table 5 – Lateral Earth Pressures – Select Sandy Soils (Page 29)
Table 6 – Preliminary Asphalt Concrete Paving Section Options (Page 32)
Table 7 – Preliminary PCC Pavement Section Options (Page 33)
Table 8 – Minimum Guidelines for Nonstructural Concrete Flatwork for Very Low to Low Expansion Potential (Page 34)

Appendices

Appendix A – References
Appendix B – Logs of Exploratory Borings, Test Pits, & CPTs
Appendix C – Laboratory Test Results
Appendix D – Seismic Refraction Survey Report
Appendix E – Infiltration Test Results
Appendix F – Liquefaction Analysis
Appendix G – General Earthwork Specifications for Rough Grading

1.0 INTRODUCTION

1.1 Purpose and Scope of Services

This report presents the results of our updated geotechnical evaluation for the proposed "Stoneridge" industrial and mixed-use development, Tentative Tract Map No. 32372, located in an unincorporated area of Riverside County, California. The conclusions and recommendations included herein supersede those provided in our previous reports (LGC Geotechnical, 2017a & 2017b).

The purpose of our study was to evaluate the existing onsite geotechnical conditions, confirm that the site can be developed from a geotechnical perspective, and provided updated recommendations regarding the proposed design. Our services consisted of a limited subsurface geotechnical evaluation and review of previous geotechnical reports, preliminary site plans and readily available geotechnical information including in-house maps and reports.

1.2 Existing Conditions

The proposed "Stoneridge" industrial/mixed use development includes multiple undeveloped parcels equaling approximately 680-acres. The irregular-shaped site is located approximately 4 miles east of Interstate-215 and just south of Ramona Expressway (see Figure 1 – Site Location Map). In general, the site is bound to the north by Ramona Expressway, to the east by undeveloped land associated with the San Jacinto River floodplains, to the south by Nuevo Road, and to the west by undeveloped land. The site is generally situated along the eastern flank of some relatively small hills associated with plutonic rocks of the Peninsular Ranges geomorphic province. In general, the site gently slopes southeast toward the San Jacinto River. Topographically, the elevations on the site range from approximately 1420 feet above mean sea level (msl) in the east portion of the site to approximately 1630 feet above msl in the northwest portion of the site.

1.3 Background and Project Description

Previously the subject site was proposed for a mixed-use development, featuring commercial spaces, 781 single-family residential lots of medium/medium high density, a sports park, trails, open space, water quality basins and associated street improvements. A portion of the subject site was evaluated with regards to the first phase of the previously proposed development (LGC Geotechnical, 2017a) which would have included approximately 285 single-family residential lots, interior roadways, a detention basin and other associated improvements. The previous subsurface evaluation consisted of the excavation of thirteen hollow-stem auger borings (HS-1 through HS-13), ten backhoe test pits (T-1 through T-10), and eleven cone penetration tests (CPT-1 through CPT-11) to evaluate onsite geotechnical conditions.

The approximate locations of all the borings, test pits, and cone penetration tests are included on the Geotechnical Map (Sheets 1 through 3). Exploratory boring, test pit, and cone penetration test logs are presented in Appendix B and laboratory test results are included in Appendix C.

Based on our review of the updated site plan prepared by Architects Orange (2019), the proposed industrial and mixed-use development of the subject site includes the construction of approximately 20 industrial buildings with footprints up to approximately 1,700,000 square feet (sf) and several lots for mixed-use development including a hotel, retail buildings, multi-tenant commercial buildings, commercial buildings and retail/business park lots. In addition, it is our understanding that site development will include the construction of underground utilities, streets, parking areas, open space, conservation areas and water quality basins.

Maximum design cuts and fills are anticipated to be on the order of approximately 60 and 35 feet, respectively. Additionally, the maximum design cut and fill slope heights are both anticipated to be on the order of approximately 90 feet.

1.4 Subsurface Geotechnical Evaluation

LGC Geotechnical performed a subsurface geotechnical evaluation of the subject site consisting of the excavation of twelve hollow-stem auger borings, twelve backhoe test pits, thirteen cone penetration tests, and two infiltration tests to evaluate onsite geotechnical conditions of areas not previously evaluated. In addition, five seismic fraction lines were performed in the northwestern portion of the site to evaluate the potential for near surface hard rock.

Twelve hollow-stem borings (HS-14 through HS-25) were drilled by 2R Drilling under subcontract to LGC Geotechnical. The total depth drilled of the hollow-stem borings ranged from approximately 20 to 50 feet below existing grade. An LGC Geotechnical representative observed the drilling operations, logged the borings, and collected soil samples for laboratory testing. The borings were excavated using a truck mounted drill rig equipped with 8-inch-diameter hollow-stem augers. Driven soil samples were collected by means of the Standard Penetration Test (SPT) and Modified California Drive (MCD) sampler. Samples were generally obtained at 2.5-foot vertical increments in the upper ten feet and at 5-foot vertical increments below ten feet. The MCD is a split-barrel sampler with a tapered cutting tip and lined with a series of 1-inch-tall brass rings. The SPT sampler and MCD sampler were driven using a 140-pound automatic hammer falling 30 inches to advance the sampler a total depth of 18 inches or until refusal. The blow counts for each 6-inch increment of penetration were recorded on the boring logs. Bulk samples were also collected and logged at select depths for laboratory testing. At the completion of drilling the borings were backfilled with cuttings.

Twelve exploratory test pits (T-11 through T-22) were excavated, sampled, and logged to depths ranging from approximately 5 to 10 feet below the existing ground surface. The test pits were geotechnically logged and sampled by a representative of LGC Geotechnical, Inc. Soil descriptions are presented in the test pit logs, which are included in Appendix B. The test pit excavations were backfilled and compacted with the excavated materials to the ground surface. Please note that some settlement of the backfill may occur over time and the excavations should be topped off as needed.

Thirteen Cone Penetration Test (CPT) soundings (CPT-12 through CPT-24) were performed by Gregg Drilling & Testing, Inc. under subcontract with LGC Geotechnical. The CPT probe was pushed to target depths or refusal at each test location in general accordance with the current ASTM standards (ASTM D5778 and ASTM D3441). The CPT equipment consists of a cone penetrometer assembly mounted at the end of a series of hollow sounding rods. The interior of

the cone penetrometer is instrumented with strain gauges that allow the simultaneous measurement of cone tip and friction sleeve resistance during penetration. The cone penetration assembly is continuously pushed into the soil by a set of hydraulic rams at a standard rate of approximately 0.8-inch per second while the cone tip resistance and sleeve friction resistance are recorded at approximately every 2 inches and stored in digital form. A specially designed all-wheel drive 25-ton truck provides the required reaction weight for pushing the cone assembly.

Two additional borings (I-1 and I-2) were excavated to approximately 10 and 5 feet below the existing ground surface, respectively. Subsequent to excavation, the borings were converted into infiltration test wells. Test well installation consisted of placing a 3-inch diameter perforated PVC pipe in each excavated borehole and backfilling the annulus with crushed rock including the placement of approximately 2 inches of crushed rock at the bottom of each borehole. Infiltration testing was performed in accordance with guidelines set forth by the County of Riverside (2011). The PVC pipes were removed and the holes were subsequently backfilled with native soils at the completion of testing.

The five seismic refraction lines (S-1 through S-5) were performed by Terra Geosciences in order to assess the general seismic velocity characteristics of the underlying bedrock materials with regards to rippability during grading. The seismic refraction lines were performed in proposed cut areas with dense bedrock and line lengths were maximized based on access and topography in order to achieve anticipated maximum cut depths. The line lengths were on the order of approximately 150 feet which resulted in a maximum obtainable depth of approximately 60 feet below existing ground.

The approximate locations of borings, trenches, CPTs, infiltration tests, and seismic lines are presented on the Geotechnical Map (Sheets 1 through 3). Boring logs, test pit logs, and CPT outputs are presented in Appendix B. Laboratory test results are presented in Appendix C. A report summarizing the findings and conclusions of the seismic refraction lines is presented in Appendix D.

1.5 Laboratory Testing

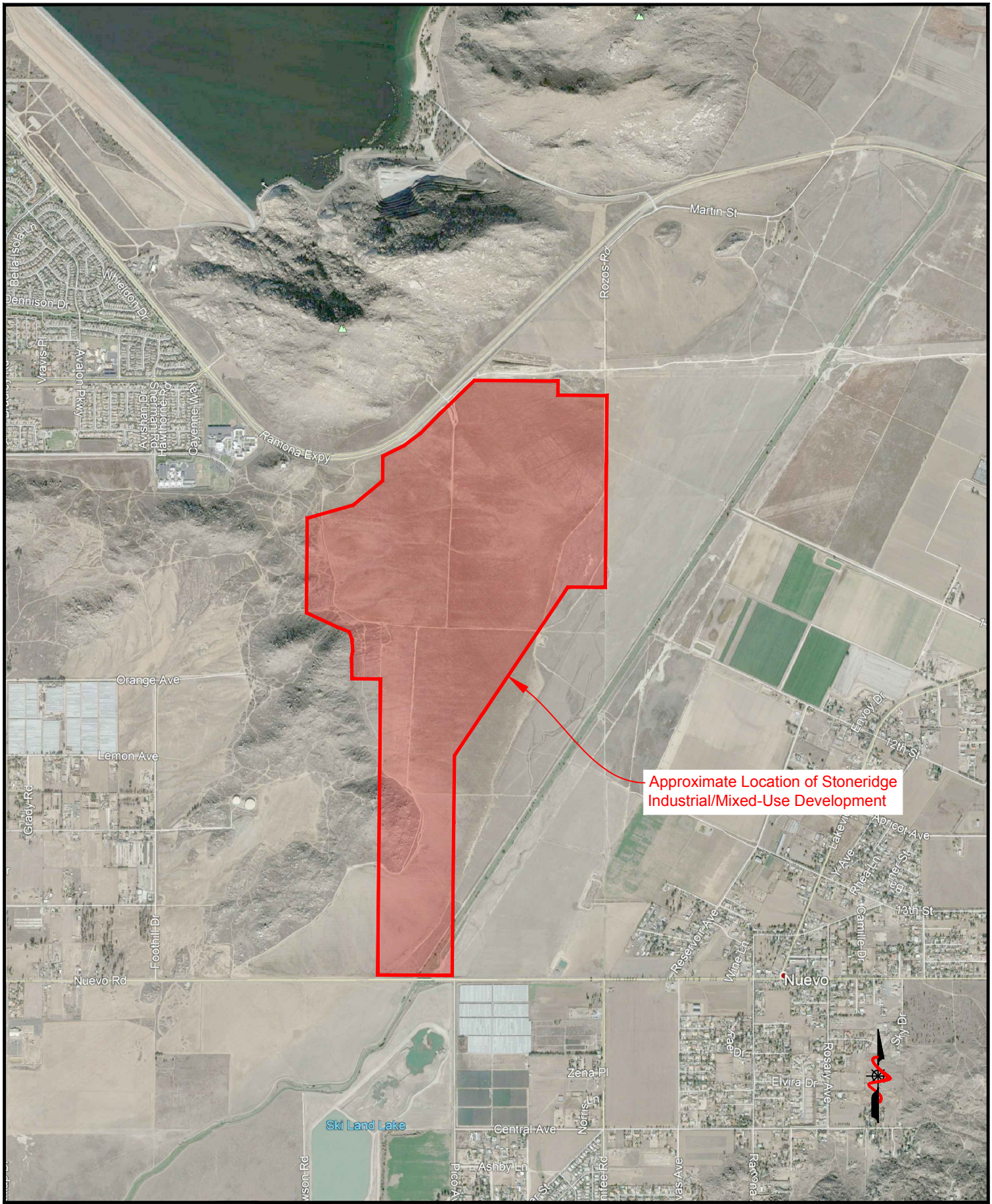
Representative samples were retained for laboratory testing during our field evaluation. Laboratory testing included in-situ moisture and density tests, fines content/sieve analysis, Atterberg Limits (liquid limit and plastic limits), consolidation, collapse/swell, direct shear, expansion index, laboratory compaction and corrosion (sulfate, chloride content, pH, and minimum resistivity).

The following is a brief summary of the laboratory test results:

- Dry density of the samples collected ranged from approximately 100 pounds per cubic foot (pcf) to 137 pcf, with an average of 124 pcf. Field moisture contents ranged from approximately 1 to 39 percent, with an average of 6 percent.
- Twelve fines content tests were performed and indicated fines contents (passing No. 200 sieve) ranging from 8 to 39 percent. Based on the Unified Soils Classification System (USCS), the tested samples range from “coarse-grained”.

- Three Atterberg Limit (liquid limit and plastic limit) tests were performed. Results indicated a Plasticity Index (PI) values of NP (not plastic), 4 and 14.
- Two consolidation tests were performed. The load versus deformation plots are provided in Appendix C.
- Four collapse/swell tests were performed. The load versus deformation plots are provided in Appendix C.
- Eight laboratory compaction test of near surface samples were performed. Results are presented in Appendix C.
- Expansion potential testing indicated expansion index values ranging from 0 to 33, corresponding to "Very Low" to "Low" expansion potential.
- Four direct shear tests were performed. Plots are presented in Appendix C.
- Corrosion testing indicated soluble sulfate content less than 0.02 percent, chloride contents ranging from approximately 31 to 104 parts per million (ppm), pH values ranging from approximately 5.78 to 7.90, and minimum resistivity values of approximately 1,146 to 15,000 ohm-cm.

A summary of the laboratory test results is presented in Appendix C. The moisture and dry density results are presented on the boring logs in Appendix B.



PROJECT NAME	Stoneridge
PROJECT NO.	13092-01
ENG. / GEOL.	RLD / KAD
SCALE	Not to Scale
DATE	September 2019

LGC Geotechnical, Inc.

FIGURE 1
Site Location Map

2.0 GEOTECHNICAL CONDITIONS

2.1 Regional Geology

The property is regionally located in the Peninsular Ranges geomorphic province which extends from the Los Angeles Basin south to Baja California. The province is characterized by numerous southwest trending mountain ranges and valleys that are geologically controlled by a series of paralleling major active faults. More specifically, the site is located in the northern portion of the Perris block which is bordered to the northeast by the San Jacinto Fault Zone and to the southwest by the Chino/Elsinore Fault Zone. The Peninsular Ranges batholith is comprised of Cretaceous aged plutonic rocks mainly of tonalitic composition. Near the site, the plutonic rocks are associated with the Lakeview Mountain Pluton which primarily consists of biotite-hornblende tonalite characterized by ubiquitous schlieren and the lack of potassium feldspar (CGS, 2003). The site is situated on the western margin of an alluvial flood plain associated with the San Jacinto River. Most of the alluvial areas west of the San Jacinto River consists of Pleistocene age fluvial deposits similar to those observed at the subject site. These alluvial materials generally form the large area flanking the Perris Valley and the west side of the San Jacinto River Valley.

2.2 Site-Specific Geology

Based on the Geologic Map of the 7.5-foot Perris Quadrangle (CGS, 2003) the subject site is underlain by Very Old Fan Deposits of the late Pleistocene. In addition, Lakeview Mountain plutonic bedrock is present along and adjacent to the western boundary of the subject site. The presence of some minor amounts of artificial fill (not mapped) associated with existing "dirt" roadway construction and past agricultural uses should be anticipated. The approximate lateral limits of the geologic units are depicted on the Geotechnical Map (Sheets 1 through 3).

2.2.1 Quaternary Very Old Fan Deposits (Map Symbol - Qvof)

Quaternary Very Old Fan deposits generally flank steep bedrock slopes and consist of reddish brown, well indurated sand deposits (CGS, 2003). During our subsurface field evaluation, these deposits were observed to generally consist of brown, gray brown, and reddish-brown sand, silty sand and clayey sand. The upper approximately 1-foot of the alluvial material was observed to be desiccated and contained rootlets.

2.2.2 Cretaceous Lakeview Mountain Tonalite (Map Symbol – Klmt)

The Lakeview Mountain Tonalite is descried as a medium to coarse grained biotite-hornblende tonalite with an absence of potassium (alkali) feldspar (CGS, 2003). During our subsurface field evaluation, these materials were observed to generally be gray to brown, medium to coarse grained rock with abundant hornblende and biotite. The bedrock ranged from moderately to slightly weathered.

2.3 Geologic Structure

Both the Quaternary Old Fan deposits and the Cretaceous Lake View Mountain Tonalite were observed to be massive and lacking any significant geologic structure during our subsurface exploration.

2.4 Groundwater

Groundwater was not encountered during our subsurface field evaluation to the maximum explored depth of approximately 50 feet below existing ground. Based on nearby available well data (CDWR, 2018), recent high groundwater for Well 337981N1171695W001 south of the subject site was measured at an elevation of approximately 1357 feet above mean sea level (msl) in March of 2013. This corresponds to depth of approximately 63 below existing grades in the southeastern (lowest) portion of the subject site.

Seasonal fluctuations of groundwater elevations should be expected over time. In general, groundwater levels fluctuate with the seasons and local zones of perched groundwater may be present within the near-surface deposits due to local seepage or during rainy seasons. Local perched groundwater conditions or surface seepage may develop once site development is completed and landscape irrigation commences.

2.5 Landslides, Debris Flows and Rock Falls

Review of readily available geologic resources and field observations of the surficial conditions do not indicate the presence of landslides on the site or in the immediate vicinity. In general, the site consists of relatively flat-lying very old fan deposits which are not considered susceptible to landslides, seismically-induced landslides, or other mass wasting processes (debris flows, rockfalls, etc.).

In general, the cause of debris flows is a combination of heavy rainfall, loose soil, and steep slope conditions. Based on reviewed documents (USGS, 1975 and Weber, 1979), debris flows have the potential to occur on slopes that have a gradient steeper than approximately 18 degrees which is approximately equivalent to a 3:1 (horizontal to vertical) slope ratio. Debris flows are most common and have higher flow velocity on slopes with gradients ranging from approximately 2:1 to 1:1 (horizontal to vertical). Generally, the steeper the slope, the more prone it is to developing a fast moving, violent debris flow. In addition, debris flows generally begin at drainage heads where there is a concentration of water during heavy rainfall. Approximately 2:1 (horizontal to vertical) cut and fill slopes are proposed for the "Stoneridge" industrial and mixed-use development. Cut and fill slopes will consist of either hard Lakeview Tonalite Bedrock or dense compacted fill soils, respectfully. These slopes are considered surficially stable as long as they are designed and constructed with proper surface drainage (purview of civil engineer) and are properly maintained after construction. Therefore, it is our opinion that the potential for the development of a rapid debris flow event on a slope associated with or adjacent to the proposed development is considered very low.

A rockfall is a fragment of rock, or block of rocks, that detaches from a vertical to sub-vertical cliff or bluff in a downward motion. Boulder outcrops are present within the subject site along

the western boundary. The natural slopes along the western boundary, where outcrops are observed, generally have a slope gradient of 3:1 (horizontal to vertical) or shallower. During grading a majority of the western boundary will be cut in order to produce an approximately 2:1 (vertical to horizontal) slope exposing dense Lakeview Tonalite Bedrock. Due to the shallow slope gradients of the existing slopes and proposed manufactured slopes, the potential for rockfalls to impact the proposed development is considered low. Loose boulders and/or "corestones" at or near design grade should be removed during slope grading in order to further mitigate potential rockfalls.

2.6 Seiche

A seiche is an underwater wave that oscillates through a body of water which may be triggered by earthquakes or landslides. In general, seiches are small (on the order of a few inches) and are present in larger lakes as a result of the depth, temperature, and contours of the body of water. Due to the lack of an onsite body of water the potential for the subject site to be impacted by seiches is considered low.

2.7 Subsidence

Per the County Interactive Geographic Information Services (RCIT, 2019), the proposed development is located within an area considered to be potentially susceptible to subsidence. A specific ground subsidence evaluation was previously performed by Western Technologies, Inc. (1990) due to the observation of well-defined fissures within and nearby the subject site. Based on the report prepared by Western Technologies (1990), the observed fissure was located in the eastern central portion of the proposed development and trended approximately north-south, near parallel with the San Jacinto River. Previous subsurface evaluations found that the observed fissure extended to a maximum depth of approximately 17 feet below the existing ground surface (Aragon, 1989). Aerial photograph review indicated that the fissure "daylighted" to the surface relatively rapidly between 1974 to 1976 and has been followed by a slower rate of modification since that time (Western, 1990). In addition, it was concluded that the observed fissuring is a result of localized subsidence from the horizontal shrinkage of fine-grained clayey floodplain sediments induced by historic groundwater withdrawal (Western, 1990). In general, potential constraints on the proposed development from the existing fissure may be mitigated utilizing specialized grading techniques, geotextile reinforcement, and requiring post-tension/stiffened building foundations within 25 feet of the existing fissure (Western, 1990).

Based on Figure No. 1 from the subsidence evaluation report (Western, 1990), at its closest the proposed industrial and mixed-use Stoneridge development is located approximately 700 feet northwest of the subject fissure (see Sheet 2 of 3 for approximate fissure location). Therefore, the observed fissure does not significantly impact the proposed development. However, if additional well-defined fissures are observed prior to or during grading operations, the geotechnical consultant of record should provide specific recommendations in order to mitigate any potential impact on the development. As mentioned above, recommendations for mitigation may consist of specialized grading techniques, geotextile reinforcement, and/or post-tension/stiffened foundations within the immediate area of an observed fissure. Recommendations should be provided on a case by case basis based on the subsurface conditions encountered during grading operations and proximity to proposed improvements.

As described on the county website, subsidence on a much larger regional scale is possible if groundwater resources are not managed properly. Mitigation against such a large-scale groundwater drawdown cannot be done by means of typical grading or construction methods within the limits of the proposed project, but instead "requires regional cooperation among all agencies" and, therefore, is not a site-specific geotechnical consideration. Based on our review, it appears that the majority of the areas located within the Lakeview Basin comprised of alluvial deposits are considered potentially susceptible to subsidence (RCIT, 2019). Surveys performed across the Lakeview Basin since 1967 indicate that regional subsidence is most likely continuing at a very slow and decreasing rate (Western, 1990). Thus, based on current conditions, the potential impact of regional subsidence on the proposed development is considered very low.

2.8 Field Infiltration Testing

Two field percolation tests were performed on Borings I-1 and I-2 to approximate depths of 10 and 5 feet below existing grade, respectively. Estimation of infiltration rates was performed in general accordance with guidelines set forth by the County of Riverside (2011). In general, a 3-inch diameter perforated PVC pipe was placed in each borehole to be tested and the annulus was backfilled with gravel, including placement of about 2 inches of gravel at the bottom of the borehole. The infiltration wells were pre-soaked prior to testing. Based on the County of Riverside methodology, the calculated (observed) infiltration rates are provided in Table 1. These infiltration rates do not include any factor of safety (to be determined by the project Civil Engineer); however, they have been normalized to correct the 3-D flow that occurs within the field test to 1-D flow out of the bottom of the boring only. The locations of the infiltration tests were coordinated with the civil engineer. The approximate infiltration test locations are shown on the Geotechnical Maps (Sheets 1 and 3) and the infiltration test data is included in Appendix E and summarized in Table 1 below.

TABLE 1

Summary of Infiltration Testing

Infiltration Test Location	Approximate Infiltration Test Depth Below Existing Grade (ft)	Observed Infiltration Rate* (Inch/Hr)
I-1	10	0.1
I-2	5	0.5

*Normalized to One-Dimensional Flow, does not include any Factor of Safety

It should be emphasized that infiltration test results are only representative of the location and depth where they are performed. Varying subsurface conditions may exist outside of the test locations which could alter the calculated infiltration rates indicated above. Infiltration tests are performed using relatively clean water free of particulates, silt, etc.

2.9 Preliminary Seismic Design Parameters

The site seismic characteristics were evaluated per the guidelines set forth in Chapter 16, Section 1613 of the 2016 California Building Code (CBC). Representative site coordinates of latitude 33.8297 degrees north and longitude -117.1570 degrees west were utilized in our analyses. Please note that these coordinates are generally considered representative of the site for preliminary planning purposes, however, their applicability must be verified with respect to a desired specific location within the site. The maximum considered earthquake (MCE) spectral response accelerations (S_{MS} and S_{M1}) and adjusted design spectral response acceleration parameters (S_{DS} and S_{D1}) for Site Class D are provided in Table 2 below.

TABLE 2

Seismic Design Parameters

Selected Parameters from 2016 CBC, Section 1613 - Earthquake Loads	**Seismic Design Values**
Site Class per Chapter 20 of ASCE 7	D
Risk-Targeted Spectral Acceleration for Short Periods (S_S)*	1.505g
Risk-Targeted Spectral Accelerations for 1-Second Periods (S_1)*	0.605g
Site Coefficient F_a per Table 1613.3.3(1)	1.000
Site Coefficient F_v per Table 1613.3.3(2)	1.500
Site Modified Spectral Acceleration for Short Periods (S_{MS}) for Site Class D [Note: $S_{MS} = F_aS_S$]	1.505g
Site Modified Spectral Acceleration for 1-Second Periods (S_{M1}) for Site Class D [Note: $S_{M1} = F_vS_1$]	0.907g
Design Spectral Acceleration for Short Periods (S_{DS}) for Site Class D [Note: $S_{DS} = (^2/_3)S_{MS}$]	1.003g
Design Spectral Acceleration for 1-Second Periods (S_{D1}) for Site Class D [Note: $S_{D1} = (^2/_3)S_{M1}$]	0.605g
Mapped Risk Coefficient at 0.2 sec Spectral Response Period, C_{RS} (per ASCE 7)	1.018
Mapped Risk Coefficient at 1 sec Spectral Response Period, C_{R1} (per ASCE 7)	0.988

* From SEAOC, 2019

Section 1803.5.12 of the 2016 CBC (per Section 11.8.3 of ASCE 7) states that the maximum considered earthquake geometric mean (MCE_G) Peak Ground Acceleration (PGA) should be used for liquefaction potential. The PGA_M for the site is equal to 0.575g (SEAOC, 2019).

A deaggregation of the PGA based on a 2,475-year average return period indicates that an

earthquake magnitude of 7.5 at a distance of approximately 8.5 km from the site would contribute the most to this ground motion (USGS, 2008).

2.10 Faulting and Seismic Hazards

The subject site is not located within a State of California Earthquake Fault Zone (i.e., Alquist-Priolo Earthquake Fault Act Zone) and no active faults are known to cross the site. A fault is considered "Holocene-active" if evidence of surface rupture in Holocene time (the last approximately 11,000 years) is present. The possibility of damage due to ground rupture is considered low since no active faults are known to cross the site. The closest known active fault is the Casa Loma Fault of the San Jacinto Fault Zone located approximately 5 miles northeast of the subject site.

Secondary effects of seismic shaking resulting from large earthquakes on the major faults in the Southern California region, which may affect the site, include ground lurching and shallow ground rupture, soil liquefaction, and dynamic settlement. These secondary effects of seismic shaking are a possibility throughout the Southern California region and are dependent on the distance between the site and causative fault, and the onsite geology. A discussion of these secondary effects is provided in the following sections.

2.10.1 Liquefaction and Dynamic Settlement

Liquefaction is a seismic phenomenon in which loose, saturated, granular soils behave similarly to a fluid when subject to high-intensity ground shaking. Liquefaction occurs when three general conditions coexist: 1) shallow groundwater; 2) low density non-cohesive (granular) soils; and 3) high-intensity ground motion. Studies indicate that loose, saturated, near surface cohesionless soils exhibit the highest liquefaction potential, while dry, dense, cohesionless soils and cohesive soils exhibit low to negligible liquefaction potential. In general, cohesive soils are not considered susceptible to liquefaction, depending on their plasticity and moisture content (Bray & Sancio, 2006). Effects of liquefaction on level ground include settlement, sand boils, and bearing capacity failures below structures. Dynamic settlement of dry sands can occur as the sand particles tend to settle and densify as a result of a seismic event.

The site is located within a zone with a low to moderate potential for liquefaction according to maps prepared by the County of Riverside (2019). Site soils are not generally susceptible to liquefaction due to a lack of groundwater in the upper 50 feet and generally dense to very dense sandy soils. However, isolated layers may be susceptible to dry sand seismic settlement. Seismically induced dry sand settlements were estimated by the procedures outlined by Pradel (Pradel, 1998) using the PGA_M per the 2016 CBC and a moment magnitude of 7.5 (USGS, 2008).

Based on the data obtained from our field evaluation, seismic settlement due to dry sands is estimated to be on the order of about ½-inch or less. Differential settlement may be estimated as half of the total settlement over a horizontal span of 40 feet.

Seismic settlement calculations were performed using the program CLiq (GeoLogismiki, 2017) and are provided in Appendix F.

2.10.2 Lateral Spreading

Lateral spreading is a type of liquefaction-induced ground failure associated with the lateral displacement of surficial blocks of sediment resulting from liquefaction in a subsurface layer. Once liquefaction transforms the subsurface layer into a fluid mass, gravity plus the earthquake inertial forces may cause the mass to move downslope towards a free face (such as a river channel or an embankment). Lateral spreading may cause large horizontal displacements and such movement typically damages pipelines, utilities, bridges, and structures.

Due to the low probability of liquefaction, the potential for lateral spreading is also considered low.

2.11 Seismic Refraction Lines

To aid in evaluation of the rippability of the materials to be encountered within the proposed deeper cuts on the site, five seismic refraction lines were performed (see Geotechnical Map for locations). The data gathered via the seismic lines, provides estimated seismic velocities of the onsite materials to depths up to approximately 60 feet below the surface for this study. A detailed discussion of the methodology and graphic representation of the results are presented in Appendix D.

2.12 Rippability

In general, undocumented artificial fill, colluvium, and very old fan deposits are anticipated to be easily to moderately rippable utilizing conventional heavy-duty earth moving equipment (Caterpillar D9 with single shank or equivalent).

In general, the upper portions of site bedrock (Lakeview Mountain Tonalite) are anticipated to have a moderate to very difficult rippability utilizing heavy duty conventional earth moving equipment. Based on seismic refraction lines, excavation difficulty of these materials increases with depth. Blasting should be anticipated as non-rippable bedrock materials have been identified within the depth of the design cut. In general, the subsurface data collected indicates that the bedrock materials can be generally classified into three zones of rippability (rippable, marginally rippable, and non-rippable). Seismic refraction data is summarized below and the locations of the seismic lines are depicted on the Geotechnical Map (Sheet 2).

The estimated depths to the different rippability classifications (rippable, marginally rippable, and non-rippable) are based on the onsite seismic refraction topographic models and the seismic velocities are summarized below. In general, the site bedrock may be considered:

- Rippable (seismic velocity < 4,000 ft/sec) to depths ranging from approximately 0 to 15 feet below existing ground surface.

- Marginally Rippable (seismic velocity 4,000 ft/sec to 7,000 ft/sec) to depths ranging from approximately 15 to 25 feet below existing ground surface.
- Non-Rippable or Blasting (seismic velocity >7,000 ft/sec) at depths greater than approximately 25 to 50 feet below existing ground surface, with the exception of shallow core stones.

Please note that the velocity ranges of these classifications are approximate and that rock characteristics, including jointing and fracturing spacing and orientation, are a major factor in determining rippability. Isolated core stones consisting of generally non-rippable rock may be encountered at depths shallower than approximately 25 feet below existing ground surface in the bedrock areas.

Localized zones of potentially non-rippable bedrock should be anticipated to be encountered above the estimated non-rippable bedrock depths. It is recommended that contractors review the provided subsurface data and independently determine the potential heavy ripping/blasting depths, lateral extents, quantities, etc. based on their experience. For further details regarding rippability please refer to the seismic refraction survey report (Appendix D).

2.13 Oversized Material

Oversized material (material larger than 8 inches in maximum dimension) may be generated during site grading. Recommendations are provided for appropriate handling of oversized materials in Appendix G. If feasible, crushing oversized materials onsite, incorporating them into "rock fills" (windrows, rock blankets or individual rock burial), or exporting oversized materials may be considered. Isolated core stones consisting of generally irreducible rock may be encountered in the bedrock areas. Special handling recommendations should be provided on a case-by-case basis, if encountered.

2.14 Settlement and Collapse/Swell Potential

Static settlement of the site will be induced by subjecting the existing grades to design grades (adding fill) and by the proposed structural building loads. The underlying very old fan deposits encountered were found to be medium dense to very dense and are generally not considered susceptible to long term consolidation settlement. Due to the primarily coarse-grained nature and apparent density of the site soils, static settlement should occur immediately during increasing grades; therefore, static settlement from increasing grades should not affect the proposed structural improvements. Static foundation settlement due to structural building loads is discussed in Section 4.4. Recommendations for settlement monitoring of deep fills, greater than approximately 40 feet, are provided in Section 4.2.

In addition to static settlement, recent and previous laboratory testing indicates the presence of potentially collapsible native alluvial soils within the upper approximately 10 feet. Four of the six samples tested for collapse/consolidation experienced hydro-collapse and the resulting two experienced soil swell or expansion. The collapse potential (or hydro-collapse) of the four samples ranged from approximately 0 to 0.9 percent, which is considered to be slightly susceptible to hydro-collapse. To reduce the potential for adverse settlements in the proposed

building areas, we recommend implementing our earthwork recommendations provided in Section 4.1.

2.15 Expansion Potential

Based on the results of laboratory testing, site soils are anticipated to have a "Very Low" to "Low" expansion potential. Final expansion potential of site soils should be determined at the completion of grading. Results of expansion testing at finish grades will be utilized to confirm final foundation design.

3.0 CONCLUSIONS

Based on the results of our subsurface evaluation and geotechnical review of the proposed plan, it is our opinion that the proposed improvements are feasible from a geotechnical standpoint, provided that the recommendations provided here and in future reports are incorporated during site grading and development. A summary of our geotechnical conclusions are as follows:

- The geologic units mapped on the site include Quaternary Very Old Fan deposits and Cretaceous Lakeview Mountain Tonalite. Localized zones of potentially compressible soils overlie portions of the site including undocumented artificial fill, topsoil and near-surface portions of the old fan deposits.
- Groundwater was not encountered during our subsurface field evaluation to the maximum explored depth of approximately 50 feet below existing ground and is not considered a significant issue with regards to future development.
- The subject study area is not located within a mapped State of California Earthquake Fault Zone, and based upon our review of published geologic mapping, no known active or potentially active faults are known to exist within or in the immediate vicinity of the site. Therefore, the potential for ground rupture as a result of faulting is considered very low. The closest known active fault is the Casa Loma Fault of the San Jacinto Fault Zone located approximately 5 miles northeast of the subject site.
- The main seismic hazard that may affect the site is from ground shaking from one of the active regional faults. The subject site will likely experience strong seismic ground shaking during its design life.
- According to the County of Riverside GIS website, portions of the site are located in mapped zones for low to moderate liquefaction susceptibility. Due to the generally dense to very dense nature of the soil and lack of groundwater in the upper 50 feet, site soils are generally not considered susceptible to liquefaction. However, isolated sandy layers may be susceptible to dry sand settlement. Total seismic settlement due to dry sand settlement is estimated to be on the order of about ½-inch or less. Differential seismic settlement may be estimated as half the total estimated seismic settlement over a horizontal span of 40 feet.
- Some of the site bedrock should be anticipated to be easily to very difficult to excavate (rippability) utilizing heavy-duty machinery. In general, the site bedrock is considered to be rippable to marginally rippable at depths shallower than approximately 25 feet below the existing ground surface and non-rippable (blasting) at depths greater than approximately 25 to 50 feet below existing ground surface, with the exception of shallow core stones.
- Oversize particles (larger than 8 inches in maximum dimension) will require reduction in size or placement in rock disposal areas. Rock disposal areas are generally located in areas that are deeper than 10 feet below finish design grades or approximately 2 feet below the deepest utility, whichever is deeper.
- Oversized core stones that will require special handling may be encountered throughout the bedrock.
- From a geotechnical perspective, the existing onsite soils are considered suitable material for use as general fill, provided that they are relatively free from oversize rocks (larger than 8 inches in maximum dimension), construction debris, and significant organic material.
- Design cut and fill slopes are anticipated to be both grossly and surficially stable, as long as they are constructed in accordance with our geotechnical recommendations and are properly landscaped and maintained throughout their design life.

- Total fill depths greater than approximately 40 feet require surface settlement monitoring be performed after grading is completed to ensure long-term fill settlement is within tolerable limits prior to commencement of building construction. The "total fill depth" refers to the depth of new fill or the cumulative depth of new fill placed over existing fill.
- Based on the results of laboratory testing, site soils have a "Very Low" to "Low" expansion potential. Mitigation measures will be required for any planned foundations and or site improvements to minimize the impacts of expansive soils. Final expansion potential of site soils should be determined at the completion of grading.
- Existing on-site soils are generally granular in nature and slope face compaction may be difficult to achieve. Additionally, erosion rills generally develop on slopes consisting of granular materials that are subject to heavy rain prior to establishment of properly designed and maintained landscaping. Completed cut and fill slopes should be immediately planted and irrigated, as vegetation has a positive effect on surficial stability.
- Existing native slopes surrounding the development are anticipated to be grossly stable; however, minor surficial failures may occur over time.

4.0 PRELIMINARY RECOMMENDATIONS

The following recommendations are to be considered preliminary, and should be confirmed upon completion of grading and earthwork operations. In addition, they should be considered minimal from a geotechnical viewpoint, as there may be more restrictive requirements from the architect, structural engineer, building codes, governing agencies, or the owner.

It should be noted that the following geotechnical recommendations are intended to provide sufficient information to develop the site in general accordance with the 2016 CBC requirements. With regard to the possible occurrence of potentially catastrophic geotechnical hazards such as seismic shaking, earthquake-induced landslides, liquefaction, etc. the following geotechnical recommendations should provide adequate protection for the proposed development to the extent required to reduce seismic risk to an "acceptable level." The "acceptable level" of risk is defined by the California Code of Regulations as "that level that provides reasonable protection of the public safety, though it does not necessarily ensure continued structural integrity and functionality of the project" [Section 3721(a)]. Therefore, repair and remedial work of the proposed improvements may be required after a significant seismic event. With regards to the potential for less significant geologic hazards to the proposed development such as expansive soils, fill settlement, groundwater seepage, etc, the recommendations contained herein are intended as a reasonable protection against potential damaging effects. It should be understood, however, that our recommendations are intended to maintain the structural integrity of the proposed development and structures given the site geotechnical conditions, but cannot preclude the potential for some cosmetic distress or nuisance issues to develop as a result of the site geotechnical conditions.

The geotechnical recommendations contained herein must be confirmed to be suitable or modified based on the actual as-graded conditions.

4.1 Site Earthwork

We anticipate that earthwork at the site will consist of rough grading followed by retaining wall construction, utility construction, foundation construction, and asphalt paving of the interior streets and drives. We recommend that earthwork onsite be performed in accordance with the following recommendations, the County of Riverside/2016 CBC requirements, and the General Earthwork and Grading Specifications for Rough Grading included in Appendix G. In case of conflict, the following recommendations shall supersede those included as part of Appendix G. The following recommendations should be considered preliminary and may be revised by the geotechnical consultant based on the actual conditions encountered during site grading.

4.1.1 Site Preparation

Prior to grading of areas to receive structural fill or engineered structures, the areas should be cleared of surface obstructions and unsuitable material (such as undocumented fill, colluvium, and topsoil). Vegetation and debris should be removed and properly disposed of offsite. Holes resulting from the removal of buried obstructions, which extend below proposed removal bottoms, should be replaced with suitable compacted fill material.

4.1.2 Removal and Recompaction

In order to provide a relatively uniform bearing condition for the planned building structures and improvements, we recommend the site soils be removed and recompacted. Unsuitable and potentially compressible materials not removed by design cuts should be excavated to competent very old fan deposit materials or bedrock and replaced with compacted fill soils. In general, this includes existing undocumented artificial fill, residual soil, and upper weathered/desiccated portions of the very old fan deposits. Subsurface site soils should be removed and recompacted according to the criteria outlined below. Updated recommendations may be required based on additional field evaluation, changes to building layouts and actual structural loads.

Industrial and Commercial Buildings: We recommend that soils within the proposed building pads be temporarily removed and recompacted to minimum depths of approximately 3 to 8 feet below existing grade or 2 feet beneath the base of the foundations, whichever is deeper. Estimated removal and recompaction depths are presented on the Geotechnical Maps (Sheets 1 through 3). Where adequate space is available, the base of removal and recompaction bottoms should extend laterally a minimum distance equal to the depth of removal and recompaction below finish grade or at a minimum distance of 5 feet beyond the edges of the proposed building foundations, whichever is larger.

Minor Site Structures: For minor site structures such as free-standing walls, screen walls, trash enclosures, etc., removal and recompaction should extend at least 5 feet beneath existing grade or 2 feet beneath the base of foundations, whichever is deeper. In general, the envelope for removal and recompaction should extend laterally a minimum distance of 5 feet beyond the edges of the proposed improvements mentioned above, where space permits.

Pavement: Within pavement areas, removal and recompaction should extend to a depth of at least 2 feet below the existing grade or 2 feet beneath the finished subgrade (i.e., beneath planned aggregate base/asphalt concrete or PCC), whichever is deeper. The envelope for removal and recompaction should extend laterally a minimum distance of 2 feet beyond the edges of pavement, where space permits.

Local conditions may be encountered during excavation that could require deep remedial grading beyond the above noted minimum in order to obtain an acceptable subgrade. The actual depths and lateral extents of grading will be determined by the geotechnical consultant, based on subsurface conditions encountered during grading. Removal and recompaction areas should be accurately staked in the field by the Project Surveyor.

Several methods will be utilized in determining the suitability of the material observed in the removal bottom excavations. Observation of material, proof rolling, probing, and occasional field density testing of the removal bottoms shall be performed by a field technician and/or field geologist. When field density test data is utilized for approval of material, an in-place relative compaction of 85 percent or greater and a degree of saturation of 85 percent or greater will be considered suitable.

4.1.3 Geologic Mapping

Removals, backcuts, and keyway excavations (where applicable) must be geologically mapped by the geotechnical consultant during earthwork construction to confirm the anticipated conditions. The grading contractor must trim the backcuts with a slope board to remove loose material to allow for confirmation mapping. Updated and/or revised geotechnical recommendations may be required based on observed conditions.

4.1.4 Over-excavation

In order to provide a uniform fill blanket beneath proposed structures, it is recommended that design cut and cut/fill transition pads be over-excavated a minimum of 3 feet below ultimate finish pad grade, or a minimum of 2 feet below planned footings, whichever is greater. A maximum 3:1 differential fill thickness, up to a maximum over-excavation depth of 10 feet, underneath individual building pads should be maintained in order to reduce the potential for future differential settlement. Over-excavation should extend laterally a minimum of 5 feet beyond proposed building footprints. The over-excavation bottoms should be graded with a minimum 2 percent tilt towards deeper fill areas in order to reduce the potential for ponding of water.

Minor site structure foundations (e.g., retaining wall footings, trash enclosure footings, etc.) located on cut or cut/fill transition areas should be over-excavated a minimum of 1-foot below and 2 feet beyond the edges of the proposed footings. In addition, streets in design cut areas should be over-excavated a minimum of 2 feet below design subgrade elevations. In order to avoid difficult excavation during utility installation, streets in bedrock cut areas may be over-excavated to a depth equivalent to 1-foot below the lowest utility, if desired. Extending the street over-excavation to 1-foot below deepest utility, in bedrock cut areas, will help mitigate potential excavation difficulties during underground utility installation.

Over-excavations/undercuts must be confirmed and mapped by the geotechnical consultant prior to subsequent fill placement. The actual depth and lateral extents of over-excavation should be determined by the geotechnical consultant, based on subsurface conditions encountered during grading. Over-excavation areas should be accurately staked in the field by the Project Surveyor. Please note that some estimated removals in the western portion of the site may extend deeper than the recommended over-excavation in order to remove unsuitable materials (see Removals Section).

4.1.5 Removal and Overexcavation Bottom Preparation

In general, removal bottoms, over-excavation/undercut bottoms, and areas to receive compacted fill should be scarified to a minimum depth of 6 to 8 inches, brought to a near-optimum moisture condition (generally within optimum and 2 percent above optimum moisture content) and re-compacted per project requirements.

Removal bottoms, over-excavation/undercut bottoms, and areas to receive fill should be observed and accepted by the geotechnical consultant prior to fill placement.

4.1.6 Material for Fill

From a geotechnical perspective, the onsite soils are generally considered suitable for use as general compacted fill, provided they are relatively free of organic materials and construction debris. Any encountered oversized material (material larger than 8 inches in maximum dimension) must be appropriately handled as outlined in Appendix G.

From a geotechnical perspective, any required import soils for general fill (i.e., not retaining wall backfill), should consist of clean, relatively granular soils of Very Low expansion potential (expansion index 20 or less based on ASTM D4829) and no particles larger than 3 inches in greatest dimension. Import for any required retaining wall backfill should meet the criteria outlined in the following paragraph. Source samples should be provided to the geotechnical consultant for laboratory testing a minimum of 3 working days prior to any planned importation.

Conventional (masonry) retaining wall backfill should consist of sandy soils with a maximum of 35 percent fines (passing the No. 200 sieve) per American Society for Testing and Materials (ASTM) Test Method D1140 (or ASTM D6913/D422) and a "Very Low" expansion potential (EI of 20 or less per ASTM D4829). Soils should also be screened of organic materials, construction debris, and any material greater than 3 inches in maximum dimension. Much of the site sandy soils should be suitable for retaining wall backfill once screened of material greater than 3 inches in maximum dimension; therefore, select grading and stockpiling of onsite soils meeting the criteria above will be required by the contractor for obtaining suitable retaining wall backfill soil. These preliminary findings should be confirmed during grading.

Aggregate base (crushed aggregate base or crushed miscellaneous base) should conform to the latest requirements of Section 200-2 of the Standard Specifications for Public Works Construction ("Greenbook") for untreated base materials (except processed miscellaneous base) or Caltrans Class 2 aggregate base.

The placement of demolition materials in compacted fill is acceptable from a geotechnical viewpoint provided the demolition material is broken up into pieces not larger than typically used for aggregate base (approximately 1-inch in maximum dimension) and well blended into fill soils with essentially no resulting voids. Demolition material placed in fills must be free of construction debris (wood, brick, etc.) and reinforcing steel. If asphalt concrete fragments will be incorporated into the demolition materials, approval from an environmental viewpoint may be required and is not the purview of the geotechnical consultant. From our previous experience, we recommend that asphalt concrete fragments be limited to fill areas within planned street areas below future utilities (i.e., not within building pad areas).

4.1.7 Fill Placement and Compaction

Material to be placed as fill should be brought to near optimum moisture content (generally at optimum to 2 percent above optimum moisture content) and recompacted to at least 90 percent relative compaction (per ASTM D1557). It is anticipated that moisture conditioning of site soils will be required in order to achieve adequate compaction. Some of the site soils will require additional moisture in order to achieve the required compaction. Very moist soils are also present that will require drying and or mixing prior to reusing the materials in compacted fills.

The optimum lift thickness to produce a uniformly compacted fill will depend on the type and size of compaction equipment used. In general, fill should be placed in uniform lifts not exceeding 8 inches in compacted thickness. Each lift should be thoroughly compacted and accepted prior to subsequent lifts. Generally, placement and compaction of fill should be performed in accordance with local grading ordinances and under observation and testing by LGC Geotechnical. Any encountered oversized material as previously defined must be appropriately handled (Appendix G).

Fill placed on any slopes greater than 5:1 (horizontal to vertical) should be properly keyed and benched into firm and competent soils as it is placed in lifts. During backfill of temporary excavations, fill should be properly benched into firm and competent soils as it is placed in lifts.

Fill slope faces should also be compacted to minimum project recommendations. This may require overbuilding of the slope face and trimming back to design grades. Placement of sand or gravel lacking cohesive soil for binder on the outer slope face should be avoided in order to reduce potential for surficial instability such as erosion rills. To improve surficial stability, vegetation specified by the landscape architect should be established on the slope face as soon as it is practical, refer to Section 4.3.1

Aggregate base material (crushed aggregate base and crushed miscellaneous base) should be compacted to a minimum of 95 percent relative compaction at or slightly above optimum moisture content per ASTM D1557. Subgrade below aggregate base should be compacted to a minimum of 90 percent relative compaction at near-optimum moisture content (generally within optimum and 2 percent above optimum moisture content) per ASTM D1557.

4.1.7.1 Oversized Placement and Compaction

Oversized material (material larger than 8 inches in maximum dimension) may be generated during site grading. Recommendations are provided for appropriate handling of oversized materials in General Earthwork & Grading Specifications, Appendix G. Oversize material should not be placed in deep fill areas where an increased minimum relative compaction is required. If feasible, crushing oversized materials or exporting to an offsite location may be considered.

4.1.8 Trench and Conventional Retaining Wall Backfill and Compaction

The onsite soils may generally be suitable as trench backfill, provided the soils are generally free of material greater than 6 inches in diameter and organic matter. If trenches are shallow or the use of conventional equipment may result in damage to the utilities, sand having a sand equivalent (SE) of 30 or greater (per CTM 217) may be used to bed and shade pipes. Sand backfill within the pipe bedding zone may be densified by jetting or flooding and then tamped to ensure adequate compaction. Subsequent trench backfill should be compacted in uniform lifts by mechanical means to at least the recommended minimum relative compaction (per ASTM D1557).

Conventional (masonry) retaining wall backfill should consist of sandy soils outlined in above Section 4.1.6. The limits of select sandy backfill should extend at minimum ½ the height of the retaining wall or the width of the heel (if applicable), whichever is greater, refer to Figure 2 (Rear of Text). Retaining wall backfill soils should be compacted in relatively uniform thin lifts to at least 90 percent relative compaction (per ASTM D1557). Jetting or flooding of retaining wall backfill materials should not be permitted.

In backfill areas where mechanical compaction of soil backfill is impractical due to space constraints, typically sand-cement slurry may be substituted for compacted backfill. The slurry should contain about one sack of cement per cubic yard. When set, such a mix typically has the consistency of compacted soil. Sand cement slurry placed near the surface within landscape areas should be evaluated for potential impacts on planned improvements.

A representative from LGC Geotechnical should observe, probe, and test the backfill to verify compliance with the project recommendations.

4.1.9 Shrinkage and Bulking

Volumetric changes in earth quantities will occur when excavated onsite earth materials are replaced as properly compacted fill. The following is an estimate of shrinkage factors for the various geologic units found onsite. These estimates are based on in-place densities of the various materials and on the estimated average degree of relative compaction that will be achieved during grading.

TABLE 3

Estimated Shrinkage

Soil Type	Allowance	Estimated Range
Qvof	Shrinkage/Bulking	-5 to 5 %
Klmt (within 5 feet from existing)	Bulking	5 to 10 %
Klmt (deeper than 5 feet from existing)	Bulking	15 to 20 %

Subsidence due to earthwork equipment is expected to be on the order of 0.1 feet. It

should be stressed that these values are only estimates and that actual shrinkage factors are extremely difficult to predict. The effective shrinkage of onsite soils will depend primarily on the type of compaction equipment and method of compaction used onsite by the contractor. Additionally, the geology onsite varies; the above estimates are generalized groupings of similar lithologies and should be expected to vary across the site laterally and with depth. The above shrinkage estimates are intended as an aid for others in determining preliminary earthwork quantities. However, these estimates should be used with some caution since they are not absolute values.

Due to the combined variability in topographic surveys, inability to precisely model the removals and variability in on-site near-surface conditions, it is our opinion that the site will not balance at the end of grading. If importing/exporting a large volume of soils is not considered feasible or economical, we recommend a balance area be designated onsite that can fluctuate up or down based on the actual volume of soil. We recommend a "balance" area that can accommodate on the order of 5 to 10 percent (plus or minus) of the total grading volume be considered.

4.1.10 Temporary Excavations

Temporary excavations should be performed in accordance with project plans, specifications, and all Occupational Safety and Health Administration (OSHA) requirements. Excavations should be laid back or shored in accordance with OSHA requirements before personnel or equipment are allowed to enter. We anticipate temporary slopes required for removals, over-excavations and haul roads to be grossly stable at 1:1 (horizontal to vertical) or flatter.

The contractor must request observation of temporary excavations by a representative of LGC Geotechnical, not only to confirm the geotechnical conditions, but to also help provide observation of early warning signs of potential failures. Based on our field evaluation, the majority of site soils are anticipated to be OSHA Type "C" soils (refer to the attached boring logs). Sandy soils are present and should be considered susceptible to caving. Soil conditions should be regularly evaluated during construction to verify conditions are as anticipated. The contractor shall be responsible for providing the "competent person" required by OSHA standards to evaluate soil conditions. Close coordination with the geotechnical consultant should be maintained to facilitate construction while providing safe excavations. Excavation safety is the sole responsibility of the contractor.

Surcharge loads (vehicular traffic, soil stockpiles, construction equipment, etc.) should be set back from the perimeter of excavations a minimum distance equivalent to a 1:1 projection from the bottom of the excavation or 5 feet, whichever is greater, unless the cut is properly shored and designed for the applicable surcharge load. Once an excavation has been initiated, it should be backfilled as soon as practical. Prolonged exposure of temporary excavations may result in some localized instability. Excavations should be planned so that they are not initiated without sufficient time to shore/fill them prior to weekends, holidays, or forecasted rain.

It should be noted that any excavation that extends below a 1:1 (horizontal to vertical) projection of an existing foundation will remove existing support of the structure foundation. If requested, temporary shoring parameters will be provided.

4.2 Settlement Monitoring

Fill soils are subject to post-grading settlement. This even occurs to properly compacted fill soils with properly constructed subdrains. Total fill depths greater than approximately 40 feet require surface settlement monitoring be performed after grading is completed to ensure long-term fill settlement is within tolerable limits prior to commencement of building construction. The total fill depth refers to the depth of new design fill or the cumulative depth of new design fill placed over older artificial fill.

Specific recommendations for installation of settlement monitoring equipment, settlement monitoring procedures, approximate number of settlement monitoring points, frequency of readings and estimated settlement monitoring period will be provided in a future report once actual grading plans are available.

4.3 Slope Stability

Based on the preliminary site plans, the findings of our limited geotechnical evaluation and previous experience with similar geotechnical conditions, design cut and fill slopes up to a maximum height of approximately 90 feet are anticipated to be both grossly and surficially stable as designed, as long as they are constructed in accordance with the recommendations provided in the Sections below and our General Earthwork and Grading Specifications for Rough Grading (Appendix G). Slope stability analysis should be performed once grading plans are available to confirm this.

4.3.1 Cut Slopes

Based on the preliminary grading plan (Hunsaker, 2019), cut slopes with a maximum inclination of approximately 2:1 (horizontal to vertical) are proposed in the site bedrock and very old fan deposits. Cut slopes within the site bedrock are considered grossly and surficially stable as designed. The owner may elect to construct stabilization fills for the proposed cut slopes in the very old fan deposits over 5 feet in height in accordance with the detail provided in Appendix G. Stabilization fills should be a minimum of 15 feet wide. They should be a minimum of 2 feet deep, determined from the lowest toe-of-slope elevation, and tilted back towards the heel a minimum 2 percent or 1-foot (whichever is greater).

Stabilization fill backcuts should be excavated so that at least a minimum 15-foot fill width is maintained for the entire height of the stability fill slope. In general, backcuts should be excavated at a maximum 1.5:1 (horizontal to vertical) inclination. Properly outletted back drains should be constructed along stabilization fill backcuts in accordance with the General Earthwork and Grading Specifications for Rough Grading included in

Appendix G. Flatter backcut inclinations may be required based on observed conditions during grading. The backcuts should not be initiated prior to forecasted rain or be left open for extended periods of time.

Backcuts and stabilization fill excavations must be geologically mapped by the geotechnical consultant during excavation to confirm the anticipated conditions. If adverse conditions are exposed, additional analysis and/or remediation measures may be required. The grading contractor must trim the backcuts with a slope board to remove loose material to allow for confirmational mapping. Updated and/or revised geotechnical recommendations may be required based on observed conditions.

4.3.2 Fill Slopes

Design fill slopes depicted on the preliminary grading plan (Hunsaker, 2019) are anticipated to be both grossly and surficially stable as designed provided they are constructed in accordance with the General Earthwork and Grading Specifications for Rough Grading included in Appendix G and properly maintained subsequent to construction (Section 4.3.3). Fill slopes should be constructed with a maximum slope ratio of 2:1 (horizontal to vertical). Slope faces should be compacted to project recommendations. To improve surficial stability, vegetation specified by the landscape architect should be established on the slope face as soon as it is practical.

4.3.3 Slope Maintenance Guidelines

It is recommended that any graded slopes be planted with groundcover vegetation as soon as practical to protect against erosion by reducing runoff velocity. Deep-rooted vegetation that requires little water and is able to survive local climate conditions should also be established to protect against surficial slumping. Under no circumstances should slopes be allowed to be bare of vegetation. Landscape vegetation must not be "trimmed" to root structures leaving no protection of the slopes. Irrigation levels should be kept to the minimum level necessary to establish healthy plant growth. Slopes must not be overwatered. If automatic sprinklers are used, they must be adjusted during periods of rainfall. A landscape professional must be consulted for landscape recommendations.

A program for the elimination of burrowing animals in both native and graded slope areas must be established to protect slope stability by reducing the potential for surface water to penetrate into the slope face. Continuous erosion control, rodent control, and maintenance are essential to the long-term stability of all slopes. Trenches excavated on a slope face for utility or irrigation lines and/or for any purpose must be properly backfilled and compacted to project recommendations to the slope face. Observation/testing and acceptance by the geotechnical consultant during trench backfill are recommended. V-ditches should be inspected and cleared of loose soil and/or debris on a routine basis, especially prior to and during the rainy season.

4.4 Subdrains

If unanticipated groundwater or areas of potential future groundwater seepage and/or accumulation are encountered during grading subdrain systems may be recommended by the geotechnical consultant. Subdrains are to be properly outletted and connected to a suitable discharge point.

A representative of the project civil engineer should survey the installed subdrains for alignment and grade prior to fill placement above the subdrains. The location and elevations of subdrains and subdrain outlets should be recorded on as-built plans and made available to future owners. It is the responsibility of the contractor to locate and protect subdrain outlets prior to the completion of work.

4.5 Preliminary Foundation Recommendations

The proposed structures may be supported on spread or continuous footings and conventional slabs, provided earthwork is performed in accordance with the recommendations presented in this report. All footings should be supported on properly compacted fill. Please note that the following foundation recommendations are preliminary and must be confirmed by LGC Geotechnical at the completion of grading.

Preliminary foundation recommendations are provided in the following sections. The foundation design must be performed by the structural engineer based on the following geotechnical parameters and minimum values provided.

4.5.1 Slab Design and Construction

Minimum slab thicknesses of 6 inches and 4 inches are recommended for new slabs in the truck bay/warehouse areas and office areas, respectively. Slabs are to be supported on compacted fill soils properly prepared in accordance with the recommendations provided in this report. Minimum slab reinforcement should be determined by the structural engineer based on the imposed loading, crack control, etc. Additional slab-on-grade recommendations can be provided for alternative building types upon request.

It is recommended that subgrade soils below slabs be moisture conditioned in order to maintain the recommended moisture content up to the time of concrete placement. The recommended moisture content of the slab subgrade soils should be approximately 2 percent above optimum moisture content to a minimum depth of 12 inches. The moisture content of the slab subgrade should be verified by the geotechnical engineer within 1 to 2 days prior to concrete placement. In addition, this moisture content should be maintained around the immediate perimeter of the slab during construction and up to occupancy of the building structures.

Some post-construction moisture migration should be expected below the foundation. The following recommendations should be applied for office areas and/or other portions of the proposed truck bays that may be sensitive to nuisance moisture migrating through the slab from the subgrade soils. The following recommendations are

for informational purposes only, as they are unrelated to the geotechnical performance of the foundation. The following recommendations may be superseded by the foundation engineer and/or owner.

In general, interior floor slabs with moisture sensitive floor coverings should be underlain by a minimum 15 mil thick vapor retarder, which has a water vapor transmission rate (permeance) of less than 0.3 perms, as determined by ASTM E 96, and meets the applicable code requirements (ASTM E 1745).

It is the responsibility of the contractor to ensure that the moisture/vapor retarder systems are properly installed in accordance with the project plans and manufacturers specifications, and that the moisture/vapor retarder materials are free of tears and punctures prior to and as a result of concrete placement. Additional moisture reduction and/or prevention measures may be needed, depending on the performance requirements of future interior floor coverings.

The foundation/structural engineer should determine whether the use of a capillary break (sand or gravel layer) in conjunction with the vapor retarder is necessary or required by code. Sand layer thickness and location (above and/or below vapor retarder) should also be determined by the foundation/structural engineer. Sand layers should be installed, where applicable, in accordance with ACI Publication 302 – "Guide for Concrete Floor and Slab Construction."

4.5.2 Foundation Design Parameters

Provided our earthwork recommendations are implemented, the proposed buildings may be supported on shallow foundation systems. Minimum continuous wall and column footing widths are to be 12 inches and 24 inches, respectively. Minimum foundation embedment is to extend a minimum of 24 inches below the adjacent exterior grade. Interior column footings may be placed 12 inches beneath the floor slab. The following allowable bearing pressures for both continuous and column spread footings presented in Table 4 below are recommended for corresponding footing widths and embedments.

TABLE 4

Allowable Soil Bearing Pressures

Allowable Static Bearing Pressure (psf)	Minimum Footing Width (feet)	Minimum Footing Embedment* (feet)
4,000	5	2
3,500	3	2
2,500	1	1

* Refers to minimum depth measured below lowest adjacent grade, or slab if internal footing.

These allowable bearing values indicated above (exclusive of the weight of the footings) are for total dead loads and frequently applied live loads and may be increased by ⅓ for short duration loading (i.e., wind or seismic loads). The allowable bearing pressures are applicable for level (ground slope equal to or flatter than 5H:1V) conditions only.

In addition, it is recommended that the perimeter building foundations be continuous across all exterior doorways to reduce moisture migration beneath the slab.

In utilizing the above-mentioned allowable bearing capacity and provided our earthwork recommendations are implemented, foundation settlement due to structural loads is anticipated to be on the order of 1-inch or less. Differential static settlement may be taken as half of the static settlement (i.e., ½-inch over a horizontal span of 40 feet). Furthermore, seismic dry sand settlement is anticipated to be on the order of ½-inch or less. Differential seismic settlement may be taken as half of the seismic settlement (i.e., ¼-inch over a horizontal span of 40 feet).

4.5.3 Foundation Construction

The foundation is to be excavated into competent compacted artificial fill placed during grading operations. It is recommended that the foundation subgrade soils be evaluated by the geotechnical engineer prior to steel and/or concrete placement.

The geotechnical parameters provided herein assume that if the areas adjacent to the foundation are planted and irrigated, these areas will be designed with proper drainage and adequately maintained so that ponding, which causes significant moisture changes below the foundation, does not occur. Our recommendations do not account for excessive irrigation and/or incorrect landscape design. Plants should only be provided with sufficient irrigation for life and not overwatered to saturate subgrade soils. Sunken planters placed adjacent to the foundation should either be designed with an efficient drainage system or liners to prevent moisture infiltration below the foundation.

4.5.4 Lateral Load Resistance

Resistance to lateral loads can be provided by friction acting at the base of foundations and by passive earth pressure. For concrete/soil frictional resistance, an allowable coefficient of friction of 0.35 may be assumed with dead-load forces. For slabs constructed over a moisture retarder, the allowable friction coefficient should be provided by the manufacturer. An allowable passive lateral earth pressure of 275 psf per foot of depth (or pcf) to a maximum of 2,750 psf may be used for the sides of footings poured against properly compacted fill. Allowable passive pressure may be increased to 375 pcf (maximum of 3,750 psf) for short duration seismic loading. This passive pressure is applicable for level (ground slope equal to or flatter than 5H:1V) conditions. Frictional resistance and passive pressure may be used in combination without reduction. We recommend that the upper foot of passive resistance be neglected if finished grade will not be covered with concrete or asphalt. The provided allowable passive pressures are based on a factor of safety of 1.5 and 1.1 for static and seismic loading conditions, respectively.

4.6 Foundation Setback from Top-of-Slope and Bottom-of-Slope

Foundations should have adequate setback from top and bottom of slopes. Per the 2016 CBC, the minimum top-of-slope setback is H/3, with a maximum required setback of 40 feet, where H is the total height of the slope. The minimum bottom-of-slope setback is H/2, with a maximum required setback of 15 feet. Refer to Chapter 18 of the 2016 CBC. Foundation setback criteria should be reviewed based on the precise grading plans.

4.7 Lateral Earth Pressures for Conventional Retaining Wall Design

New retaining walls are expected to be required in truck dock (court) areas. Additionally, the proposed development may require some small retaining walls to facilitate the new site grades. The following may be used for design of site retaining walls. Lateral earth pressures are provided as equivalent fluid unit weights, in psf per foot of depth (or pcf). These values do not contain an appreciable factor of safety, so the retaining wall designer should apply the applicable factors of safety and/or load factors during design. A soil unit weight of 120 pcf may be assumed for calculating the actual weight of soil over the wall footing.

The following lateral earth pressures are presented in Table 5 below for approved onsite select sandy soils with a maximum of 35 percent fines (passing the No. 200 sieve per ASTM D-421/422) and a "Very Low" expansion potential (EI of 20 or less per ASTM D4829). Much of the site sandy soils should be suitable for retaining wall backfill once screened of material greater than 3 inches in maximum dimension; therefore, select grading and stockpiling of onsite soils meeting the criteria above will be required by the contractor for obtaining suitable retaining wall backfill soil. The retaining wall designer should clearly indicate on the retaining wall plans the required sandy backfill.

TABLE 5

Lateral Earth Pressures – Select Sandy Soils

Conditions	**Equivalent Fluid Unit Weight (pcf)**	
	Level Backfill	**2:1 Sloped Backfill**
	Select Sandy Backfill	**Select Sandy Backfill**
Active	35	55
At-Rest	55	70

If the wall can yield enough to mobilize the full shear strength of the soil, it can be designed for "active" pressure. If the wall cannot yield under the applied load, the earth pressure will be higher. This would include 90-degree corners of retaining walls. Such walls should be designed

for “at-rest.” The equivalent fluid pressure values assume free-draining conditions and a drainage system will be installed and maintained to prevent the build-up of hydrostatic pressures. If conditions other than those assumed above are anticipated, the equivalent fluid pressure values should be provided on an individual-case basis by the geotechnical engineer.

Retaining wall structures should be provided with appropriate drainage and appropriately waterproofed. To reduce, but not eliminate, saturation of near-surface (upper approximate 1-foot) soils in front of the retaining walls, the perforated subdrain pipe should be located as low as possible behind the retaining wall. The outlet pipe should be sloped to drain to a suitable outlet. In general, we do not recommend retaining wall outlet pipes be connected to area drains. If subdrains are connected to area drains, special care should be taken to maintain these drains. Typical conventional retaining wall drainage is shown on Figure 3. It should be noted that the recommended subdrain does not provide protection against seepage through the face of the wall and/or efflorescence. Waterproofing and outlet systems are not the purview of the geotechnical consultant.

Surcharge loading effects from any adjacent structures should be evaluated by the retaining wall designer. In general, structural loads within a 1:1 (horizontal: vertical) upward projection from the bottom of the proposed retaining wall footing will surcharge the proposed retaining wall. In addition to the recommended earth pressure, retaining walls adjacent to streets should be designed to resist a uniform lateral pressure of 85 pounds per square foot (psf) due to normal street vehicle traffic, if applicable. Uniform lateral surcharges may be estimated using the applicable coefficient of lateral earth pressure using a rectangular distribution. A factor of 0.45 and 0.3 may be used for at-rest and active conditions, respectively. The retaining wall designer should contact the geotechnical consultant for any required geotechnical input in estimating surcharge loads.

If required, the retaining wall designer may use a seismic lateral earth pressure increment of 10 pcf for a level backfill condition. This increment should be applied in addition to the provided static lateral earth pressure using a triangular distribution with the resultant acting at H/3 in relation to the base of the retaining structure (where H is the retained height). Per Section 1803.5.12 of the 2016 CBC, the seismic lateral earth pressure is applicable to structures assigned to Seismic Design Category D through F for retaining wall structures supporting more than 6 feet of backfill height. The provided seismic lateral earth pressure should not be used for retaining walls exceeding 10 feet in height. If a retaining wall greater than 10 feet in height or a retaining wall with a sloping backfill condition is proposed, the retaining wall designer should contact the geotechnical engineer for specific seismic lateral earth pressure increments based on the configuration of the planned retaining wall structures. This seismic lateral earth pressure is estimated using the procedure outlined by the Structural Engineers Association of California (Lew, et al, 2010).

Soil bearing and lateral resistance (friction coefficient and passive resistance) are provided in Section 4.4. Earthwork considerations (temporary backcuts, backfill, compaction, etc.) for retaining walls are provided in Section 4.1 (Site Earthwork) and the subsequent earthwork related sub-sections.

4.8 Soil Corrosivity to Concrete and Metal

Although not corrosion engineers (LGC Geotechnical is not a corrosion consultant), several governing agencies in Southern California require the geotechnical consultant to determine the corrosion potential of soils on buried concrete and metal facilities. We therefore present the results of our testing with regard to corrosion for the use of the client and other consultants, as they determine necessary.

Preliminary corrosion testing of a near-surface bulk sample indicated a soluble sulfate content less than approximately 0.02 percent, chloride contents ranging from approximately 31 to 104 parts per million (ppm), pH values ranging from approximately 5.8 to 7.9, and minimum resistivities ranging from approximately 1,446 to 15,000 ohm-cm. Based on Caltrans Corrosion Guidelines (Caltrans, 2015), soils are considered corrosive to structural elements if the pH is 5.5 or less, or the chloride concentration is 500 ppm or greater, or the sulfate concentration is 2,000 ppm (0.2 percent) or greater. Based on the preliminary test results, soils are not considered corrosive using Caltrans criteria.

Based on preliminary laboratory test results of representative site soil samples, onsite soils are anticipated to have a designated sulfate exposure class of "S0" per ACI 318-14, Table 19.3.1.1. Concrete in direct contact with the onsite soils can be designed according to ACI 318, Table 19.3.2.1 using the "S0" sulfate classification.

Laboratory testing may need to be performed at the completion of grading by the project corrosion engineer to further evaluate the as-graded soil corrosivity characteristics. Accordingly, revision of the corrosion potential may be needed, should future test results differ substantially from the conditions reported herein. The client and/or other members of the development team should consider this during the design and planning phase of the project, and formulate an appropriate course of action.

4.9 Subsurface Water Infiltration

Recent regulatory changes have occurred that mandate that storm water be infiltrated below grade into subsurface soils rather than collected in a conventional storm drain system. Typically, a combination of methods are implemented to reduce surface water runoff and increase infiltration including; permeable pavements/pavers for roadways and walkways, directing surface water runoff to grass-lined swales, retention areas, drywells, etc.

It should be noted that collecting and concentrating surface water for the purpose of intentionally infiltrating below grade, conflicts with the geotechnical engineering objective of directing surface water away from slopes, structures and other improvements. The geotechnical stability and integrity of a site is reliant upon appropriately handling surface water. In general, we do not recommend that surface water be intentionally infiltrated into the subsurface soils.

Considering the low tested preliminary infiltration rates combined with the fact that the developed site will consist of compacted fill over dense native materials, we do not recommend that surface water be intentionally infiltrated into subsurface soils unless additional infiltration testing is performed in the proposed basin locations.

4.10 Control of Surface Water and Drainage Control

From a geotechnical perspective, we recommend that compacted finished grade soils adjacent to the proposed warehouse structures be sloped away from the proposed structures towards an approved drainage device or unobstructed swale. Drainage swales, wherever feasible, should not be constructed within 5 feet of buildings. Where lot and building geometry necessitates that the drainage swales be routed closer than 5 feet to structural foundations, we recommend the use of area drains together with drainage swales. Drainage swales used in conjunction with area drains should be designed by the project civil engineer so that a properly constructed and maintained system will prevent ponding within 5 feet of the foundation. Code compliance of grades is not the purview of the geotechnical consultant.

Planters with open bottoms adjacent to buildings should be avoided. Planters should not be designed adjacent to buildings unless provisions for drainage, such as catch basins, liners, and/or area drains, are made. Overwatering must be avoided.

4.11 Preliminary Asphalt Concrete Pavement Sections

Preliminary laboratory testing resulted in R-values of 67 and 43 for the onsite soils. Preliminary minimum street sections are provided in Table 6 below for Traffic Indices of 5.5, 6.0, 7.0 and 8.0 and a preliminary R-value of 40. Pavement sections are based on Caltrans Highway Design Manual (Caltrans, 2008) and the County of Riverside minimum pavement sections. These recommendations must be confirmed with additional R-value testing of representative near-surface soils at the completion of grading and after underground utilities have been installed and backfilled. Final street sections should be confirmed by the project civil engineer based upon the projected design Traffic Index. If requested, LGC Geotechnical will provide sections for alternate TI values.

TABLE 6

Preliminary Asphalt Concrete Paving Section Options

Assumed Traffic Index	5.0	6.0	7.0	8.0
R-Value Subgrade	40	40	40	40
AC Thickness	3.0 inches	4.0 inches	4.0 inches	5.0 feet
Aggregate Base Thickness	6.0 inches	6.0 inches	7.0 inches	8.0 feet

Aggregate base material (crushed aggregate base and crushed miscellaneous base) should be compacted to a minimum of 95 percent relative compaction at or slightly above optimum moisture content per ASTM D1557. Subgrade below aggregate base should be compacted to a minimum of 90 percent relative compaction at or slightly above optimum moisture content per ASTM D1557. Earthwork recommendations are provided in Section 4.1 "Site Earthwork" and the related sub-sections of this report.

The thicknesses shown are minimum thicknesses. Increasing the thickness of any or all of the above layers will reduce the likelihood of the pavement experiencing distress during its service

life. The above recommendations are based on the assumption that proper maintenance and irrigation of areas adjacent to the roadway will occur through the design life of the pavement. Failure to maintain a proper maintenance and/or irrigation program may jeopardize the integrity of the pavement.

4.12 Preliminary Portland Cement Concrete Pavement Sections

Preliminary laboratory testing resulted in R-values of 67 and 43 for the onsite soils. Preliminary minimum Portland Cement Concrete (PCC) pavement street sections are provided below in Table 7 for Traffic Indices of 6.0, 7.0, and 8.0 to be utilized in the design of the truck parking/circulation areas or loading docks. These sections are based on a preliminary assumed R-value of 40. These recommendations must be confirmed with R-value testing of representative near-surface soils at the completion of grading and after underground utilities have been installed and backfilled. Final street sections should be confirmed by the project civil engineer based upon the projected design Traffic Index. If requested, LGC Geotechnical will provide sections for alternate TI values. The appropriate paving section must be selected by the project civil engineer/client based on design traffic indexes.

TABLE 7

Preliminary PCC Pavement Section Options

Provided Traffic Index	6.0	7.0	8.0
PCC Thickness	6.0 inches	8.0 inches	9.5 inches
95% Compacted Subgrade	12.0 inches	12.0 inches	12.0 inches

We recommend a PCC pavement section consisting of thicknesses presented above over 12 inches of compacted subgrade. The concrete should have a minimum compressive strength of 3,250 psi at the time the pavement is subjected to traffic. To reduce the potential (but not eliminate) for cracking, paving should provide control joints at regular intervals not exceeding 14 feet in each direction, depth of ⅓ the concrete thickness. Contraction and construction joints should include a joint filler/sealer to prevent migration of water into the subgrade soils. The type of joint sealer and filler material should be specified by the pavement designer and should be maintained throughout the life of the pavement. Dowels are recommended at joints to reduce potential offsets. The above section does not include steel reinforcement. Steel reinforcement (typically No. 3 rebars at 24 inches on-center each way) may be added to reduce the potential for cracking.

Subgrade below the PCC pavement should be compacted to a minimum of 95 percent relative compaction per ASTM D1557 near optimum moisture content (generally within optimum and 2 percent above optimum moisture content). Earthwork recommendations are provided in Section 4.1 “Site Earthwork” and the related sub-sections of this report.

The thicknesses shown are minimum thicknesses. Increasing the thickness of any or all of the above layers will reduce the likelihood of the pavement experiencing distress during its service life. The above recommendations are based on the assumption that proper maintenance and

irrigation of the areas adjacent to the roadway will occur through the design life of the pavement. Failure to maintain a proper maintenance and/or irrigation program may jeopardize the integrity of the pavement.

4.13 Nonstructural Concrete Flatwork

Nonstructural concrete flatwork (such as walkways, patios, bicycle trails, etc.) has a high potential for cracking due to changes in soil volume related to soil-moisture fluctuations. To reduce the potential for excessive cracking and lifting, concrete should be designed in accordance with the minimum guidelines outlined in Table 8. These guidelines will reduce the potential for irregular cracking and promote cracking along construction joints, but will not eliminate all cracking or lifting. Thickening the concrete and/or adding additional reinforcement will further reduce cosmetic distress. Please note that these are preliminary recommendations that will need to be confirmed and/or modified based on as-graded conditions at the completion of grading.

TABLE 8

Minimum Guidelines for Nonstructural Concrete Flatwork for Very Low to Low Expansion Potential

	Private Drives	**Patios/ Entryways**	**City Sidewalk Curb and Gutters**
Minimum Thickness (in.)	4 (full)	4 (full)	City/Agency Standard
Presoaking	Wet down prior to placing	Wet down prior to placing	City/Agency Standard
Reinforcement	No. 3 at 24 inches on centers	No. 3 at 24 inches on centers	City/Agency Standard
Thickened Edge (in.)	8 x 8	—	City/Agency Standard
Crack Control Joints	Saw cut or deep open tool joint to a minimum of $^1/_3$ the concrete thickness	Saw cut or deep open tool joint to a minimum of $^1/_3$ the concrete thickness	City/Agency Standard
Maximum Joint Spacing	10 feet or quarter cut whichever is closer	6 feet	City/Agency Standard
Aggregate Base Thickness (in.)	—	—	City/Agency Standard

To reduce the potential for concrete flatwork to separate from the loading dock or building

slab, the builder may elect to install dowels to tie these two elements together.

4.14 Grading, Foundation and Retaining Wall Plan Review

When available, project plans (rough grading, precise grading, retaining wall, foundation, etc.) should be reviewed by LGC Geotechnical in order to verify our geotechnical recommendations are properly implemented. A 40-scale geotechnical grading plan review should be performed prior to construction of the proposed development. Updated recommendations and/or additional field work may be necessary in the future.

4.15 Geotechnical Observation and Testing During Construction

The recommendations provided in this report are based on limited subsurface observations and geotechnical analysis. The interpolated subsurface conditions should be checked in the field during construction by a representative of LGC Geotechnical. Geotechnical observation and testing are required per Section 1705 of the 2016 California Building Code (CBC).

Geotechnical observation and/or testing should be performed by LGC Geotechnical at the following stages:

- During rough grading (removal/over-excavation bottoms, fill placement, etc.);
- Geologic mapping of temporary backcuts;
- During retaining wall backfill and compaction;
- During utility trench backfill and compaction;
- During precise grading;
- After presoaking building pads and other concrete-flatwork subgrades, and prior to placement of aggregate base or concrete;
- After building and wall footing excavation and prior to placement of steel reinforcement and/or concrete;
- Preparation of pavement subgrade and placement of aggregate base; and
- When any unusual soil conditions are encountered during any construction operation subsequent to issuance of this report.

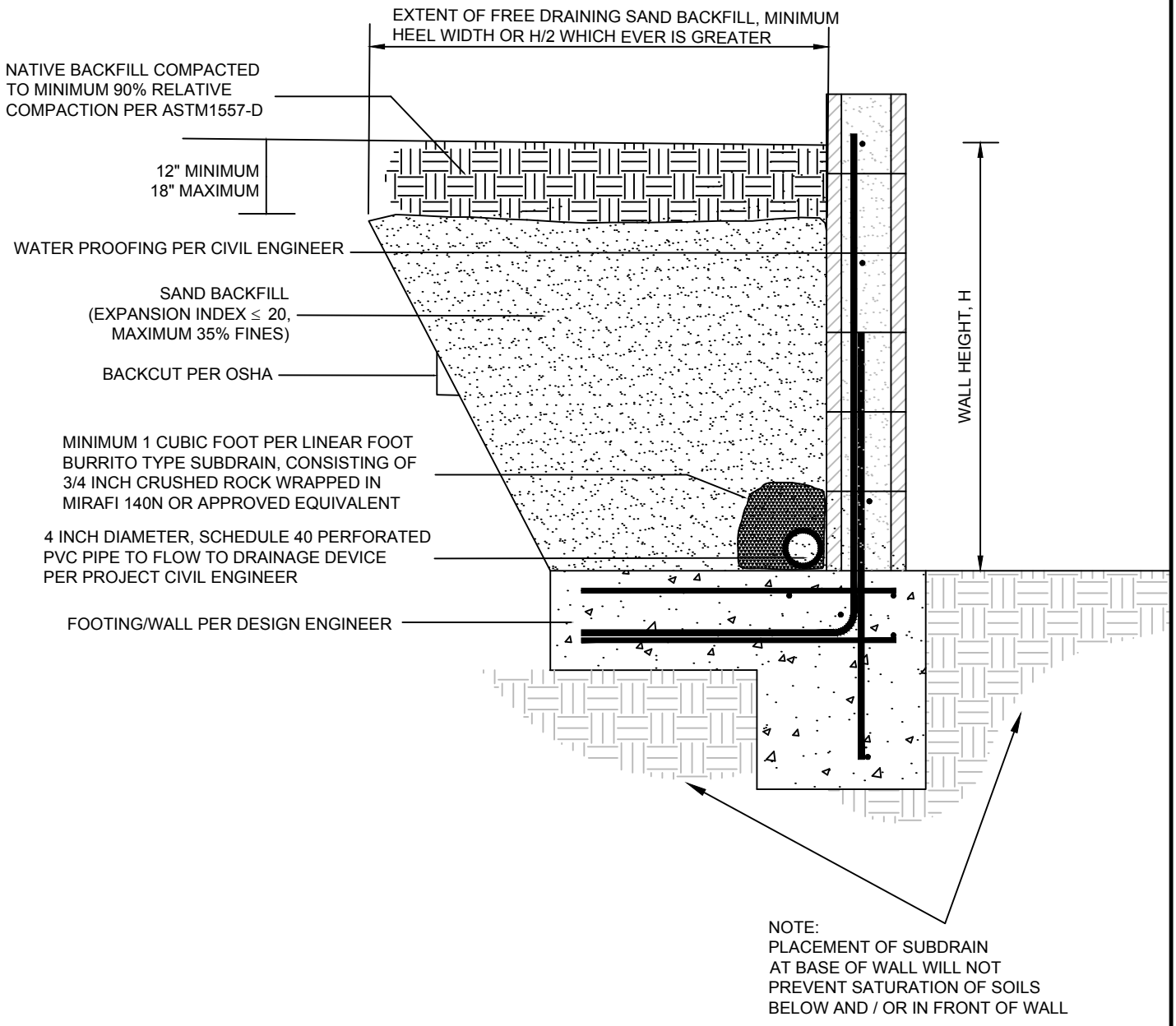
5.0 LIMITATIONS

Our services were performed using the degree of care and skill ordinarily exercised, under similar circumstances, by reputable soils engineers and geologists practicing in this or similar localities. No other warranty, expressed or implied, is made as to the conclusions and professional advice included in this report.

This report is based on data obtained from limited observations of the site, which have been extrapolated to characterize the site. While the scope of services performed is considered suitable to adequately characterize the site geotechnical conditions relative to the proposed development, no practical evaluation can completely eliminate uncertainty regarding the anticipated geotechnical conditions in connection with a subject site. Variations may exist and conditions not observed or described in this report may be encountered during grading and construction.

The findings of this report are valid as of the present date. However, changes in the conditions of a site can and do occur with the passage of time, whether they be due to natural processes or the works of man on this or adjacent properties. The findings and conclusions presented in this report can be relied upon only if LGC Geotechnical has the opportunity to observe the subsurface conditions during grading and construction of the project, in order to confirm that our preliminary findings are representative for the site. This report is intended exclusively for use by the client, any use of or reliance on this report by a third party shall be at such party's sole risk.

In addition, changes in applicable or appropriate standards may occur, whether they result from legislation or the broadening of knowledge. Accordingly, the findings of this report may be invalidated wholly or partially by changes outside our control. Therefore, this report is subject to review and modification.



LGC Geotechnical, Inc.

FIGURE 2
Retaining Wall Backfill Detail

PROJECT NAME	Stoneridge
PROJECT NO.	13092-01
ENG. / GEOL.	RLD / KAD
SCALE	Not to Scale
DATE	September 2019

Appendix A
References

APPENDIX A

References

American Concrete Institute, 2014, Building Code Requirements for Structural Concrete (ACI 318-14) and Commentary (ACI 318R-14).

American Society of Civil Engineers (ASCE), 2013, Minimum Design Loads for Buildings and Other Structures, ASCE/SEI 7-10, Third Printing, 2013.

American Society for Testing and Materials (ASTM), Volume 04.08 Soil and Rock (I): D420 – D5876.

Aragon Geotechnical Consultants, Inc., 1989, Preliminary Soil and Foundation Investigation for Proposed 750-Acre Master Planned Community, Stoneridge Project south of Ramona Expressway and North of Nuevo Road, Nuevo Area, Riverside, California, Project 3600SF, dated November 30, 1989.

Architects Orange, 2019, Conceptual Master Plan 2, Richland Stoneridge Industrial/Mixed-Use, County of Riverside, California, dated May 28, 2019

Bray, J.D., and Sancio, R. B., 2006, Assessment of Liquefaction Susceptibility of Fine-Grained Soils, Journal of Geotechnical and Geoenvironmental Engineering, ASCE, pp. 1165-1177, dated September 2006.

California Building Standards Commission, 2016, California Building Code, California Code of Regulations Title 24, Volumes 1 and 2, dated July 2016.

California Department of Transportation (Caltrans), 2015, Corrosion Guidelines, Version 2.1, dated January 2015.

California Department of Water Resources (CDWR), 2018, Water Data Library, Website Address: http://wdl.water.ca.gov/waterdatalibrary

California Geological Survey (CGS), 2002, Guidelines for Evaluating the Hazard of Surface Rupture, California Geological Survey Note No. 49, Revised May 2002

_____, 2003, Geologic Map of the Perris 7.5' Quadrangle, Riverside California, Scale 1:24,000, Open-File Report 03-270, dated 2003.

_____, 2018, Fault-Rupture Hazard Zones in California, Alquist-Priolo Earthquake Fault Zoning Act with Index to Earthquake Fault Zones Maps, Special Publication 42.

County of Riverside, 2015, County of Riverside Environmental Impact Report, No. 521, Section 4.11 Flood and Dam Inundation Hazards, dated 2015.

Hunsaker & Associates, 2019, Richland Stoneridge Industrial, Mass Grading Concept A, dated June 21, 2019.

Lew, et al, 2010, Seismic Earth Pressures on Deep Basements, Structural Engineers Association of California (SEAOC) Convention Proceedings.

LGC Geotechnical, Inc., 2017a, Preliminary Geotechnical Evaluation, Proposed "StoneRidge" Phase 1 Development, Tentative Tract Map No. 32372, Unincorporated Territory of Riverside County, California, dated February 23, 2017.

____, 2017b, Response to Geotechnical Review Comments, Riverside County Planning Department Review Sheet dated June 6, 2017, Proposed "StoneRidge" Phase 1 Development, Tentative Tract Map No. 32372, Unincorporated Territory of Riverside County, California, dated September 20, 2017.

NCEER, 1997, "Proceeding of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils", T. L. Youd and I. M. Idriss Editors, Technical Report NCEER-97-0022, NCEER, Buffalo, NY.

Riverside County Integrated Technologies (RCIT), 2017, Interactive Geographic Information Services, Website Address: http://gis.rivcoit.org/

Riverside County Planning Department, 2017, Review Comments, County Geologic Report No. 2556, "Preliminary Geotechnical Evaluation, Proposed "StoneRidge" Phase 1 Development, Tentative Tract Map No. 32372, Unincorporated Territory of Riverside County, California, dated February 23, 2017", dated June 6, 2017.

Pradel, Daniel, 1998, Procedure to evaluate earthquake-induced settlement in dry sandy soils, *Journal of Geotechnical and Geoenvironmental Engineering*, Volume 124(4), pp. 364-368, dated April and October 1998.

Southern California Earthquake Center (SCEC), 1999, "Recommended Procedure for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigation Liquefaction Hazards in California", Edited by Martin, G.R., and Lew, M., dated March 1999.

Tokimatsu, K., and Seed, H. B., 1987, "Evaluation of Settlements in Sands Due to Earthquake Shaking", Journal of Geotechnical Engineering, ASCE, Vol. 113, No. 8, pp. 861-878.

Structural Engineers Association of California (SEAOC), 2019, OSHPD Seismic Design Maps, Retrieved August 12, 2019, from: https://seismicmaps.org/

United States Geological Survey (USGS), 1975, Soil Slips, Debris Flows, and Rainstorms in the Santa Monica Mountains and Vicinity, Southern California, by Russell H. Campbell, U.S. Geologic Survey Professional Paper 851.

_____, 2008, Unified Hazard Tool, Dynamic: Conterminous U.S. 2008 (v3.3.1), Retrieved August 12, 2019, from: https://earthquake.usgs.gov/hazards/interactive/

Weber, F.H., Jr., and Treiman, J.A., 1979, Slope Instability and Debris Flows, Los Angeles Area: California Geology, v. 32, no. 1, p. 3-5.

Western Technologies, Inc., 1990, Ground Subsidence investigation Proposed 750-Acre Residnetial Development, Stoneridge Project, South of Ramona Expressway and North of Nuevo Road, Nuevo Area, Riverside County, California, Project 4560K006, dated July 20, 1990.

Appendix B
Logs of Exploratory Borings, CPTs and Trenches

Geotechnical Boring Log Borehole HS-1

Date: 3/29/2016	**Drilling Company:** Cal Pac
Project Name: Richland - Stoneridge	**Type of Rig:** Limited Access
Project Number: 13092-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1471' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 2

Logged By CAC
Sampled By CAC
Checked By DJB

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1470	0	B-1			119.4	8.0	SM	**@0'-T.D. - <u>Quaternary Very Old Fan Deposits</u>** @0'-2' Silty SAND; brown, moist, loose, wheat grass crops at surface.	CR
			R-1	6 5 4					-200
							SC	@2.5' - Clayey SAND; dark brown, moist, fine to coarse grains with approx. 5% gravel, loose.	
	5		R-2	8 21 50/5"	133.8	8.4			
1465								@5' - Clayey SAND; dark brown, slightly moist, very dense.	
			R-3	18 30 50/5"	129.7	9.5			-200
								@7.5' - Clayey SAND; dark brown, slightly moist, very dense.	
	10		R-4	19 31 41	133.1	10.0			
1460								@10' - Clayey SAND; dark brown, slightly moist, very dense.	
	15		SPT-1	7 9 9		8.9		@15' - Clayey SAND; dark brown, medium dense, top inch and bottom 2 inches of sample contained reddish brown layers.	
1455									
	20		R-5	50/5"	112.2	7.1		@20' - Clayey SAND; dark brown, moist, loose, transitions to reddish brown, very dense.	
1450									
	25		SPT-2	23 34 40		5.8		@25' - Clayey SAND; dark brown, moist, very dense.	
1445									
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 4/4/2016

Geotechnical Boring Log Borehole HS-1

Date: 3/29/2016	**Drilling Company:** Cal Pac
Project Name: Richland - Stoneridge	**Type of Rig:** Limited Access
Project Number: 13092-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1471' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 2 of 2

Logged By CAC
Sampled By CAC
Checked By DJB

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1440	30		R-6	12 33 34	121.5	4.4		@30' - Clayey SAND; dark brown, moist, very dense.	
1435	35		SPT-3	50/6"		5.2		@35' - Clayey SAND; dark brown, moist, very dense.	
1430	40		R-7	30 50/6"	123.8	5.2		@40' - Clayey SAND; dark brown, moist, very dense.	
1425	45		SPT-4	16 30 28		5.3		@45' - Clayey SAND; dark brown, moist, very dense.	
1420	50		R-8	25 50/6"	115.6	4.7		@50' - Clayey SAND; dark brown, moist, very dense.	
1415	55							Total Depth = 51.5' Groundwater Not Encountered Backfilled with Cuttings on 3/29/2016	
	60								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Geotechnical Boring Log Borehole HS-2

Date: 3/29/2016	**Drilling Company:** Cal Pac
Project Name: Richland - Stoneridge	**Type of Rig:** Limited Access
Project Number: 13092-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1471' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Logged By CAC
Sampled By CAC
Checked By DJB

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1470	0							**@0'-15.5' - <u>Quaternary Very Old Fan Deposits</u>**	
							SM	@0'-2' Silty SAND; brown, moist, loose, wheat grass crops at surface.	
			R-1	6 4 3	118.1	7.7			DS
							SC	@2.5' - Clayey SAND; dark brown, moist, mica flakes, loose.	
1465	5		R-2	5 9 13	125.3	9.9		@5' - Clayey SAND; dark brown, moist, mica flakes, medium dense.	
			R-3	9 16 21	127.5	10.5		@7.5' - Clayey SAND; dark brown, moist, mica flakes, medium dense.	
1460	10		SPT-1	8 9 14		10.3		@10' - Clayey SAND; dark brown, slightly moist, dense, traces of bedrock parent material.	
1455	15		R-4	50/5"	110.1	8.6		@15' - Clayey SAND; dark brown, slightly moist, very dense, transition to bedrock.	
								@15.5'-T.D. - <u>Cretaceous Lakeview Mountain Tonalite</u>	
1450	20		SPT-2	50/4"		1.8		@20' - Excavates to SAND; gray to brown, moist, very dense; medium to coarse grained; white/black/orange.	
1445	25		R-5	50/3"	114.8	5.8		No Recovery	
	30							Total Depth = 26.5' Groundwater Not Encountered Backfilled with Cuttings on 3/29/2016	

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 4/4/2016

Geotechnical Boring Log Borehole HS-3

Date: 3/29/2016	**Drilling Company:** Cal Pac
Project Name: Richland - Stoneridge	**Type of Rig:** Limited Access
Project Number: 13092-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1463' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Logged By CAC
Sampled By CAC
Checked By DJB

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1460	0	B-1	R-1	4 6 7	114.8	5.8	SM	**@0'-8' - <u>Quaternary Very Old Fan Deposits</u>** @0'-2' Silty SAND; brown, moist, loose, wheat grass crops at surface.	RV
							SC	@2.5' - Clayey SAND; dark brown, moist, medium dense, mica flakes.	
1455	5		R-2	7 9 50/6"	123.9	6.7		@5' - Clayey SAND; dark reddish brown, slightly moist, very dense, mica flakes.	
			R-3	30 50/3"	127.5	7.6		@7.5' - Clayey SAND; reddish brown with traces of bedrock parent material, very dense.	
1450	10		R-4	50\5"	117.5	3.8		**@8'-T.D. - <u>Cretaceous Lakeview Mountain Tonalite</u>** @10' - Excavates to SAND; gray to brown, moist, very dense, medium coarse grained; white/black/orange.	
1445	15		SPT-1	50/5"		2.3		@15' - Excavates to SAND; gray to brown, moist, very dense, medium coarse grained; white/black/orange.	
1440	20		R-5	50/3"				@20' - No Recovery	
1435	25							Total Depth = 21.5' Groundwater Not Encountered Backfilled with Cuttings on 3/29/2016	
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 4/4/2016

Geotechnical Boring Log Borehole HS-4

Date: 3/29/2016	**Drilling Company:** Cal Pac
Project Name: Richland - Stoneridge	**Type of Rig:** Limited Access
Project Number: 13092-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1549' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Logged By CAC
Sampled By CAC
Checked By DJB

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1545	0	B-1	R-1	29 50/5"			SM	**@0' - 5.5' - <u>Quaternary Very Old Fan Deposits</u>** @0'-2' Silty SAND; brown, moist, loose, wheat grass crops at surface.	CR, EI
	5		R-2	33 50/3"			SC	@2.5' - Clayey SAND; reddish brown, sligtly moist with approx 2% gravel, very dense, mica flakes. @5' - Clayey SAND; reddish brown, sligtly moist with approx 2% gravel, very dense, mica flakes, transitions to bedrock after 5".	
1540	10		SPT-1	50/6"				**@5.5' - T.D. - <u>Cretaceous Lakeview Mountain Tonalite</u>** @7.5' - No Recovery	
1535	15							Total Depth = 9' Groundwater Not Encountered Backfilled with Cuttings on 3/29/2016	
1530	20								
1525	25								
1520	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Geotechnical Boring Log Borehole HS-5

Date: 3/29/2016	**Drilling Company:** Cal Pac
Project Name: Richland - Stoneridge	**Type of Rig:** Limited Access
Project Number: 13092-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1489' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Logged By CAC
Sampled By CAC
Checked By DJB

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1485	0	B-1	R-1	15 32 48	125.9	9.1	SM	**@0'-10' - <u>Quaternary Very Old Fan Deposits</u>** @0'-2' Silty SAND; brown, moist, loose, wheat grass crops at surface.	MD
	5		R-2	3 50/6"	127.9	8.5	SC	@2.5' - Silty SAND; light brown, moist, very dense, mica flakes. @5' - Clayey SAND; brown, moist, very dense, mica flakes.	
1480			R-3	21 30 40	118.6	5.9		**@10'-T.D. - <u>Cretaceous Lakeview Mountain Tonalite</u>**	
	10		R-4	30 50/4"	120	3.9		@10' - Excavates to SAND; gray to brown, moist, very dense, medium coarse grained; white/black/orange, moderately to highly weathered.	
1475									
	15		SPT-1	35 50/4"		3.1		@15' - Excavates to SAND; gray to brown, moist, very dense, medium coarse grained; white/black/orange.	
1470	20							Total Depth = 16.5' Groundwater Not Encountered Backfilled with Cuttings on 3/29/2016	
1465	25								
1460	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 4/4/2016

Geotechnical Boring Log Borehole HS-6

Date: 3/29/2016	**Drilling Company:** Cal Pac
Project Name: Richland - Stoneridge	**Type of Rig:** Limited Access
Project Number: 13092-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1499' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Logged By CAC
Sampled By CAC
Checked By DJB

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1495	0						SM	**@0'-7.5' - <u>Quaternary Very Old Fan Deposits</u>** @0'-2' Silty SAND; brown, moist, loose, wheat grass crops at surface.	
			R-1	8 9 12	110.1	3.8			-200
							SC	@2.5' - Silty SAND; light brown, dry, medium dense, with approx 1% gravel.	
1490	5		R-2	22 19 30	132.3	8.2			DS
								@5' - Clayey SAND; dark brown, moist, dense, mica flakes.	
			R-3	12 17 19	115.9	11.6		**@7.5'-T.D. - <u>Cretaceous Lakeview Mountain Tonalite</u>**	-200
1485	10		R-4	17 30 30	134.8	4.0		@7.5' - Excavates to SAND; gray to brown, moist, dense, medium coarse grained; white/black/orange. @10' - Excavates to SAND; gray to brown, moist, dense, medium coarse grained; white/black/orange.	
1480	15							Total Depth = 11.5' Groundwater Not Encountered Backfilled with Cuttings on 3/29/2016	
1475	20								
1470	25								
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 4/4/2016

Geotechnical Boring Log Borehole HS-7

Date: 3/30/2016	**Drilling Company:** Cal Pac
Project Name: Richland - Stoneridge	**Type of Rig:** Limited Access
Project Number: 13092-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1578' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Logged By CAC
Sampled By CAC
Checked By DJB

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1575	0		R-1	25 50/5"	127.7	3.8	SM	**@0'-3' - <u>Quaternary Very Old Fan Deposits</u>** @0'-2' Silty SAND; brown, moist, loose, wheat grass crops at surface.	
1570	5		R-2	50/6"	122.5	2.6		**@3'-T.D. - <u>Cretaceous Lakeview Mountain Tonalite</u>** @2.5' - Silty SAND; transitions to parent bedrock material. @5' - Excavates to SAND; gray to brown, moist, very dense, medium coarse grained; white/black/orange.	
1565	10							Total Depth = 6.5' Groundwater Not Encountered Backfilled with Cuttings on 3/30/2016	
1560	15								
1555	20								
1550	25								
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 4/4/2016

Geotechnical Boring Log Borehole HS-8

Date: 3/30/2016	**Drilling Company:** Cal Pac
Project Name: Richland - Stoneridge	**Type of Rig:** Limited Access
Project Number: 13092-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1546' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Logged By CAC
Sampled By CAC
Checked By DJB

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1545	0							**@0'-8' - Quaternary Very Old Fan Deposits**	
							SM	@0'-2' Silty SAND; brown, moist, loose, wheat grass crops at surface.	
			R-1	10 19 19	130.2	10.3			
							SC	@2.5' - Clayey SAND; dark brown, slightly moist, medium dense, fine to coarse grain with approx 2% gravel.	
1540	5		R-2	10 21 24				@5' - increase to 5% gravel	
			R-3	11 50/5"				**@6'-T.D. - Cretaceous Lakeview Mountain Tonalite**	
								@7.5' - Excavates to SAND; gray to brown, moist, very dense, medium coarse grained; white/black/orange.	
1535	10		SPT-1	33 50/5"		4.1		@10' - Excavates to SAND; gray to brown, moist, very dense, medium coarse grained; white/black/orange.	
1530	15							Total Depth = 11.5' Groundwater Not Encountered Backfilled with Cuttings on 3/30/2016	
1525	20								
1520	25								
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 4/4/2016

Geotechnical Boring Log Borehole HS-9

Date: 3/30/2016	**Drilling Company:** Cal Pac
Project Name: Richland - Stoneridge	**Type of Rig:** Limited Access
Project Number: 13092-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1446' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Logged By CAC
Sampled By CAC
Checked By DJB

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1445	0	B-1	R-1	13 20 30	131.1	8.8	SM	**@0'-8' - <u>Quaternary Very Old Fan Deposits</u>** @0'-2' Silty SAND; brown, moist, loose, wheat grass crops at surface.	RV
							SC	@2.5' - Silty SAND; light brown, dry to slightly moist, mica flakes, dense.	
1440	5		R-2	10 11 13	121.8	5.2		@5' - Clayey SAND; dark brown, moist, medium dense.	
			R-3	13 50/5"	128.3	1.3		**@6'-T.D. - <u>Cretaceous Lakeview Mountain Tonalite</u>** @7.5' - Sandy CLAY; dark brown, moist, dense, transitions to highly weathered bedrock.	
1435	10		SPT-1	19 50/5"		1.3		@10' - Excavates to SAND; gray to brown, moist, very dense, medium coarse grained; white/black/orange.	
1430	15							Total Depth = 11.5' Groundwater Not Encountered Backfilled with Cuttings on 3/30/2016	
1425	20								
1420	25								
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 4/4/2016

Geotechnical Boring Log Borehole HS-10

Date: 3/30/2016	**Drilling Company:** Cal Pac
Project Name: Richland - Stoneridge	**Type of Rig:** Limited Access
Project Number: 13092-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1446' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 2

Logged By CAC
Sampled By CAC
Checked By DJB

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1445	0	B-1	R-1	3 3 3	109.2	3.8	SM	**@0'-8' - <u>Quaternary Very Old Fan Deposits</u>** @0'-2' Silty SAND; brown,slightly moist, loose, wheat grass crops at surface.	
								@2.5' - Silty SAND; brown, slightly moist, mica flakes, loose.	
	5		R-2	13 15 20	128.5	8.3		@5' - Clayey SAND; dark brown, moist, medium dense.	
1440							SC		
			R-3	7 10 10	120.7	7.5		@7.5' - Clayey SAND; dark brown, moist, medium dense.	-200, CO
	10		SPT-1	5 5 10		10.8		@10' - Clayey SAND; dark brown, moist, medium dense.	
1435									
	15		R-4	17 32 40				@15' - Clayey SAND; dark brown, moist, very dense, approximately 2% gravel,	
1430									
	20		SPT-2	11 12 12		4.3		@20' - SAND with Silty SAND; reddish brown, slightly moist, dense.	
1425							SP-SM		
	25		R-5	16 23 40			SC	@25' - Clayey SAND; dark brown, moist, dense, difficulty drilling.	
1420									
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 4/4/2016

Geotechnical Boring Log Borehole HS-10

Date: 3/30/2016	**Drilling Company:** Cal Pac
Project Name: Richland - Stoneridge	**Type of Rig:** Limited Access
Project Number: 13092-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1446' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 2 of 2

Logged By CAC
Sampled By CAC
Checked By DJB

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1415	30		SPT-3	17 22 44		6	SP-SM	@30' - SAND with SILTY SAND; dark brown, moist, very dense, difficulty drilling.	
								Total Depth = 31.5' Groundwater Not Encountered Backfilled with Cuttings on 3/30/2016	
1410	35								
1405	40								
1400	45								
1395	50								
1390	55								
	60								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Geotechnical Boring Log Borehole HS-11

Date: 3/30/2016	**Drilling Company:** Cal Pac
Project Name: Richland - Stoneridge	**Type of Rig:** Limited Access
Project Number: 13092-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1426' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Logged By CAC
Sampled By CAC
Checked By DJB

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1425	0							**@0'-T.D. - <u>Quaternary Very Old Fan Deposits</u>**	
							SM	@0'-2' Silty SAND; brown, moist, loose, wheat grass crops at surface.	
			R-1	6 8 8	113.8	5.4			
	5						SC	@3' - Clayey SAND; dark brown, moist, approx. 2% gravel, mica flakes, medium dense.	
1420								Total Depth = 5' Groundwater Not Encountered Backfilled with 3" perforated pipe with filter sock and gravel on 03/30/16 Backfilled with Cuttings on 3/31/2016	
	10								
1415									
	15								
1410									
	20								
1405									
	25								
1400									
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 4/4/2016

Geotechnical Boring Log Borehole HS-12

Date: 3/30/2016	**Drilling Company:** Cal Pac
Project Name: Richland - Stoneridge	**Type of Rig:** Limited Access
Project Number: 13092-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1430' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	Logged By CAC Sampled By CAC Checked By DJB DESCRIPTION	Type of Test
1425	0		R-1	5 12 22	125.3	6.8	SM	**@0'-T.D. - <u>Quaternary Very Old Fan Deposits</u>** @0'-2' Silty SAND; brown, moist, loose, wheat grass crops at surface.	
	5						SC	@3' - Clayey SAND; dark brown, moist, approximately 2% gravel, mica flakes, medium dense.	
1420	10							Total Depth = 5' Groundwater Not Encountered Backfilled with 3" perforated pipe with filter sock and gravel on 03/30/16 Backfilled with Cuttings on 3/31/2016	
1415	15								
1410	20								
1405	25								
1410	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 4/4/2016

Geotechnical Boring Log Borehole HS-13

Date: 3/30/2016	**Drilling Company:** Cal Pac
Project Name: Richland - Stoneridge	**Type of Rig:** Limited Access
Project Number: 13092-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1435' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Logged By CAC
Sampled By CAC
Checked By DJB

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1430	0						SM	**@0'-7.5' - <u>Quaternary Very Old Fan Deposits</u>** @0'-2' Silty SAND; brown, moist, loose, wheat grass crops at surface.	
	5		R-1	11 17 22	127.1	6.0	SC	@8' - Clayey SAND; dark brown, moist, mica flakes, dense.	
1425	10							Total Depth = 10' Groundwater Not Encountered Backfilled with 3" perforated pipe with filter sock and gravel on 03/30/16 Backfilled with Cuttings on 3/31/2016	
1420	15								
1415	20								
1410	25								
1405	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
⏚	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 4/4/2016

Geotechnical Boring Log Borehole HS-14

Date: 6/24/2019	**Drilling Company:** 2R
Project Name: Stoneridge	**Type of Rig:** CME 75
Project Number: 13092-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1436' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Logged By CNJ
Sampled By CNJ
Checked By KAD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1435	0							**@0' to T.D. - <u>Quaternary Very Old Fan Deposits (Qvof)</u>**	
			R-1	14 24 21	122.1	2.3	SM	@2.5' - Silty SAND with trace Gravel: light reddish brown, dry to slightly moist, dense; indurated, pinhole porosity	
1430	5		R-2	24 50/5"	125.9	5.0	SC	@5' - Clayey SAND: reddish brown, slightly moist, very dense; well indurated, pinhole porosity	
			R-3	36 50/5"	132.8	5.7	SP-SC	@7.5' - SAND with Clay: brown, slightly moist to moist, very dense	
1425	10		R-4	32 50/5"	131.6	8.4		@10' - SAND with Clay: brown, moist, very dense	
1420	15		SPT-1	8 9 10		5.2		@15' - SAND with Clay: brown, slightly moist, medium dense	
1415	20		R-5	15 18 24	130.8	5.4	SC	@20' - Clayey SAND: brown, moist, dense	
1410	25							Total Depth Drilled = 20' Groundwater Not Encountered Backfilled with Cuttings on 6/24/2019	
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 8/1/2019

Geotechnical Boring Log Borehole HS-15

Date: 6/24/2019 | **Drilling Company:** 2R

Project Name: Stoneridge | **Type of Rig:** CME 75

Project Number: 13092-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~1479' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map |

Logged By CNJ
Sampled By CNJ
Checked By KAD

Elevation (ft)	Depth (ft)	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0						**@0' to T.D. - <u>Quaternary Very Old Fan Deposits (Qvof)</u>**	
		R-1	8 9 9	117.1	2.9	SM	@2.5' - Silty SAND: light brown, dry to slightly moist, medium dense; rootlets; pores	
1475	5	R-2	5 6 7	118.1	3.2		@5' - Silty SAND: light brown, slightly moist, medium dense; pores, rootlets	
		R-3	10 14 17	125.3	3.3	SC	@7.5' - Clayey SAND: brown, moist, medium dense	AL CN
1470	10	R-4	11 19 20	117.8	1.9	SW-SM	@10' - SAND with Silt: very light brown, dry to slightly moist, dense; coarse sand to fine gravel	-#200 CO
1465	15	R-5	11 14 20	118.0	1.6	SP	@15' - Sand with Gravel: very light brown, dry, medium dense	
1460	20	SPT-1	3 6 9		6.7	SC	@20' - Clayey SAND: brown, moist, medium dense	
1455	25						Total Depth Drilled = 20' Groundwater Not Encountered Backfilled with Cuttings on 6/24/2019	
1450	30							

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 8/1/2019

Geotechnical Boring Log Borehole HS-16

Date: 6/24/2019 | **Drilling Company:** 2R

Project Name: Stoneridge | **Type of Rig:** CME 75

Project Number: 13092-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~1450' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By CNJ
Sampled By CNJ
Checked By KAD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0							**@0' to T.D. - <u>Quaternary Very Old Fan Deposits (Qvof)</u>**	
			R-1	15 13 13	122.2	1.3	SM	@2.5' - Silty SAND: brown, dry, medium dense; rootlets, pores, slightly indurated	
1445	5		R-2	14 17 24	119.0	3.0		@5' - Silty SAND: brown, dry to slightly moist, dense; roots, pores, indurated	
			R-3	17 20 24	127.0	3.4	SC	@7.5' - Clayey SAND: brown, slightly moist, dense	
1440	10		R-4	18 28 34	130.9	6.4		@10' - Clayey SAND: dark brown, slightly moist, dense, well indurated	
1435	15		SPT-1	10 13 16		10.2	CL	@15' - Sandy CLAY: brown, moist, hard	
1430	20		R-5	10 15 21	120.0	3.3	SP	@20' - SAND: dark brown, moist, medium dense	
1425	25		SPT-2	8 18 18		7.6	SC	@25' - Clayey SAND: reddish brown, slightly moist, dense	
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 8/1/2019

Geotechnical Boring Log Borehole HS-16

Date: 6/24/2019 | **Drilling Company:** 2R

Project Name: Stoneridge | **Type of Rig:** CME 75

Project Number: 13092-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~1450' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By CNJ
Sampled By CNJ
Checked By KAD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	30		R-6	10 17 20	121.8	5.8	SM	@30' - Silty SAND: brown, slightly moist to moist, medium dense	
1420	35		SPT-3	6 7 10		8.9		@35' - Silty SAND: brown, slightly moist, medium dense	
1415	40		R-7	16 22 31	125.2	5.7	SC	@40' - Clayey SAND: brown, moist, dense	
1410	45		SPT-4	9 12 13		6.8	SM	@45' - Silty SAND: brown, slightly moist, medium dense	
1405	50		R-8	20 27 36	123.2	4.8		@50' - Silty SAND: brown, slightly moist, dense	
1400	55							Total Depth Drilled = 50' Groundwater Not Encountered Backfilled with Cuttings on 6/24/2019	
	60								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Geotechnical Boring Log Borehole HS-17

Date: 6/24/2019 | **Drilling Company:** 2R

Project Name: Stoneridge | **Type of Rig:** CME 75

Project Number: 13092-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~1450' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By CNJ
Sampled By CNJ
Checked By KAD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0							**@0' to T.D. - <u>Quaternary Very Old Fan Deposits (Qvof)</u>**	
			R-1	15 25 25	125.8	4.0	SM	@2.5' - Silty SAND: brown, dry, slightly moist, dense; roots	
1445	5		R-2	17 43 50/5"	125.9	3.9		@5' - Silty SAND: brown, slightly moist, very dense	
			R-3	17 25 32	131.0	4.7		@7.5' - Silty SAND: dark brown, moist, dense	
1440	10		R-4	23 50/5"	131.4	9.0	SC	@10' - Clayey SAND: dark brown, moist, very dense	
1435	15		SPT-1	11 12 12		6.6		@15' - Clayey SAND: reddish brown, moist, dense	
1430	20		R-5	11 16 23	117.8	7.6	SM	@20' - Silty SAND: dark brown, moist, dense	
1425	25							Total DepthDrilled = 20' Groundwater Not Encountered Backfilled with Cuttings on 6/24/2019	
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 8/1/2019

Geotechnical Boring Log Borehole HS-18

Date: 6/24/2019 | **Drilling Company:** 2R

Project Name: Stoneridge | **Type of Rig:** CME 75

Project Number: 13092-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~1450' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map |

Logged By CNJ
Sampled By CNJ
Checked By KAD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0	B-1						**@0' to T.D. - <u>Quaternary Very Old Fan Deposits (Qvof)</u>**	
			R-1	12 24 48	125.5	5.5	SM	@2.5' - Silty SAND: brown, dry, very dense	CR -#200 MD EI
1445	5		R-2	30 32 32	109.4	14.7	ML	@5' - Sandy SILT: brown, dry, hard	
			R-3	10 18 19	106.9	20.0		@7.5' - Sandy SILT: gray brown mottled, slightly moist to moist, very stiff	
1440	10		R-4	15 17 28	126.3	8.8	SM	@10' - Silty SAND: dark brown, moist, dense	
1435	15		R-5	10 25 39	131.6	7.9	CL	@15' - Sandy CLAY: red brown, slightly moist, hard	
1430	20		SPT-1	3 4 7		8.0	SC	@20' - Clayey SAND: red brown, slightly moist, medium dense	
								Total Depth Drilled = 20' Groundwater Not Encountered Backfilled with Cuttings on 6/24/2019	
1425	25								
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 8/1/2019

Geotechnical Boring Log Borehole HS-19

Date: 6/24/2019 | **Drilling Company:** 2R

Project Name: Stoneridge | **Type of Rig:** CME 75

Project Number: 13092-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~1466' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map |

Logged By CNJ
Sampled By CNJ
Checked By KAD

Elevation (ft)	Depth (ft)	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1465	0						**@0' to 15' - <u>Quaternary Very Old Fan Deposits (Qvof)</u>**	
		R-1	27 50/5"	125.8	4.1	SC	@2.5' - Clayey SAND: red brown, slightly moist, very dense	
1460	5	R-2	27 43 50/5"	124.8	3.8		@5' - Clayey SAND: red brown, slightly moist, very dense	
		R-3	13 23 50/5"	131.9	3.5		@7.5' - Clayey SAND: reddish brown, slightly moist, very dense	
1455	10	R-4	11 21 50/5"	131.4	9.0		@10' - Clayey SAND: red brown, slightly moist, very dense	
							@15' to T.D. - <u>Cretaceous Lakeview Mountain Tonalite (Klmt)</u>	
1450	15	SPT-1	27 50/5"		6.2	SP	@15' - Tonalite excavates to SAND: light brown, dry, very dense	
	20	R-5	50/5"	119.1	3.1		@20' - Tonalite, excavates to SAND: light brown, dry, very dense, slightly disturbed sample	
1445							Total Depth Drilled = 20' Groundwater Not Encountered Backfilled with Cuttings on 6/24/2019	
1440	25							
	30							

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 8/2/2019

Geotechnical Boring Log Borehole HS-20

Date: 6/27/2019 | **Drilling Company:** 2R

Project Name: Stoneridge | **Type of Rig:** CME 75

Project Number: 13092-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~1439' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By KAD
Sampled By KAD
Checked By KAD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0	B-1						**@0' to T.D. - <u>Quaternary Very Old Fan Deposits (Qvof)</u>**	CR -#200 MD EI DS
			R-1	8 11 15	117.7	3.1	SM	@2.5' - Silty SAND: brown to reddish brown, dry, medium dense	
1435									
	5		R-2	9 15 18	118.6	4.6		@5' - Silty SAND: reddish brown, slightly moist, medium dense	
			R-3	15 21 25	129.5	9.6		@7.5' - Silty SAND: brown to gray brown, slightly moist, dense	
1430									
	10		R-4	15 24 36	125.7	9.0		@10' - Silty SAND: reddish brown, slightly moist, dense	
1425									
	15		SPT-1	4 4 13		4.6		@15' - Silty SAND: reddish brown, slightly moist, medium dense	
1420									
	20		R-5	34 50/5"	126.8	5.5		@20' - Silty SAND: reddish brown, slightly moist, very dense	
1415								Total Depth Drilled = 20' Groundwater Not Encountered Backfilled with Cuttings on 6/27/2019	
	25								
1410									
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
⏚	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 8/5/2019

Geotechnical Boring Log Borehole HS-21

Date: 6/27/2019 | **Drilling Company:** 2R

Project Name: Stoneridge | **Type of Rig:** CME 75

Project Number: 13092-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~1451' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map |

Logged By KAD
Sampled By KAD
Checked By KAD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1450	0							**@0' to 20' - <u>Quaternary Very Old Fan Deposits (Qvof)</u>**	
			R-1	11 13 14	111.5	3.7	SM	@2.5' - Silty SAND: Reddish brown, dry, medium dense; trace rootlets	
1445	5		R-2	22 30 50	131.0	5.2		@5' - Silty SAND: reddish brown, slightly moist, very dense	
			R-3	27 43 50	132.8	10.0	SP-SC	@7.5' - SAND with Clay: reddish brown, slightly moist, very dense	
1440	10		R-4	26 36 22	127.9	6.7	SP	@10' - SAND: reddish brown to dark reddish brown, slightly moist, dense	
1435	15		SPT-1	20 21 18		6.5		@15' - SAND: reddish brown to brown, slightly moist, dense	
								@20' to T.D. - <u>Cretaceous Lakeview Mountain Tonalite (Klmt)</u>	
1430	20		R-5	30 50/3"	130.0	8.3	SP	@20' - SAND: grayish yellow, dry, very dense; yellowish weathering @22' - Refusal	
								Total Depth Drilled = 22' Groundwater Not Encountered Backfilled with Cuttings on 6/27/2019	
1425	25								
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 8/5/2019

Geotechnical Boring Log Borehole HS-22

Date: 6/27/2019 | **Drilling Company:** 2R

Project Name: Stoneridge | **Type of Rig:** CME 75

Project Number: 13092-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~1442' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map

Logged By KAD
Sampled By KAD
Checked By KAD

Elevation (ft)	Depth (ft)	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0						**@0' to T.D. - <u>Quaternary Very Old Fan Deposits (Qvof)</u>**	
1440		R-1	13 20 24	99.8	5.7	SM	@2.5' - Silty SAND: brown to reddish brown, dry, dense; trace rootlets	
	5	R-2	42 50/5"	126.9	4.8		@5' - Silty SAND: reddish brown, slightly moist, very dense	
1435		R-3	7 6 6	118.8	1.1	SP-SM	@7.5' - SAND with Silt: gray brown, dry to slightly moist, loose	-#200 CO
	10	R-4	40 50/4"	124.2	6.5	SM	@10' - Silty SAND: dark reddish brown, slightly moist, very dense	
1430								
	15	SPT-1	10 15 9		7.2		@15' - Silty SAND: reddish brown, slightly moist, medium dense	
1425								
	20	R-5	15 50/6"	126.9	5.7	SP-SM	@20' - SAND with SILT: reddish brown, slightly moist, very dense	
1420								
	25	SPT-2	17 21 32		8.4	SP	@25' - SAND: reddish brown, slightly moist, very dense	
1415								
	30							

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 8/5/2019

Geotechnical Boring Log Borehole HS-22

Date: 6/27/2019	**Drilling Company:** 2R
Project Name: Stoneridge	**Type of Rig:** CME 75
Project Number: 13092-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1442' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 2 of 2

Logged By KAD
Sampled By KAD
Checked By KAD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1410	30		R-6	50/6"	125.9	7.6	SP-SM	@30' - SAND with Silt: dark reddish brown, slightly moist to moist, very dense	
1405	35		SPT-3	28 50/6"		6.1	SM	@35' - Silty SAND: reddish brown, slightly moist, very dense	
1400	40		R-7	25 50/4"		6.5		@40' -Silty SAND: reddish brown, moist, very dense	
1395	45		SPT-4	18 26 27		4.6	SP	@45' - SAND: reddish brown, slightly moist, very dense	
1390	50		R-8	20 50/5"	129.4	6.5		@50' - SAND: gray brown, slightly moist, very dense	
1385	55							Total Depth Drilled = 50' Groundwater Not Encountered Backfilled with Cuttings on 6/27/2019	
	60								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Geotechnical Boring Log Borehole HS-23

Date: 6/27/2019 | **Drilling Company:** 2R

Project Name: Stoneridge | **Type of Rig:** CME 75

Project Number: 13092-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~1438' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map |

Logged By KAD
Sampled By KAD
Checked By KAD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0							**@0' to T.D. - <u>Quaternary Very Old Fan Deposits (Qvof)</u>**	
1435			R-1	15 24 25	122.0	4.4	SP	@2.5' - SAND: brown, dry, dense; trace rootlets	
	5		R-2	27 50/6"	131.7	5.3	SM	@5' - Silty SAND: gray brown, dry, very dense	
1430			R-3	40 50/6"	124.4	5.2		@7.5' - Silty SAND: brown to yellowish brown, slightly moist, very dense	
	10		R-4	25 50/6"	132.7	9.0	SC-SM	@10' - Silty Clayey SAND: dark brown, moist, very dense	AL CN
1425									
	15		SPT-1	9 6 11		8.0	SM	@15' - Silty SAND: reddish brown, slightly moist, medium dense	
1420									
	20		R-5	35 50/5"	124.2	9.3		@20' - Silty SAND: reddish brown, yellowish brown, slightly moist, very dense	
1415								Total Depth Drilled = 20' Groundwater Not Encountered Backfilled with Cuttings on 6/27/2019	
	25								
1410									
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 8/6/2019

Geotechnical Boring Log Borehole HS-24

Date: 6/27/2019	**Drilling Company:** 2R
Project Name: Stoneridge	**Type of Rig:** CME 75
Project Number: 13092-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1540' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Logged By KAD
Sampled By KAD
Checked By KAD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0	B-1						**@0' to 10' - Quaternary Very Old Fan Deposits (Qvof)**	CR -#200 MD
			R-1	4 5 6	116.2	4.6	SP-SC	@2.5' - SAND with Clay: dark gray brown, slightly moist, loose	EI
1535	5		R-2	4 7 13	128.2	8.1	SC	@5' - Clayey SAND: dark gray brown, slightly moist, medium dense	-#200 CO
			R-3	20 30 42	136.5	5.5		@7.5' - Clayey SAND: gray brown, slightly moist, very dense	
1530	10		R-4	15 35 50/5"	104.2	12.6	SP	**@10' to T.D. - Cretaceous Lakeview Mountain Tonalite (Klmt)** @10' - SAND: dark gray with reddish weathering, slightly moist, very dense	DS
1525	15		SPT-1	50/4"		1.7		@15' - Same as Above (R-4); medium to coarse grained	
								Total Depth Drilled = 15' Groundwater Not Encountered Backfilled with Cuttings on 6/27/2019	
1520	20								
1515	25								
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 8/6/2019

Geotechnical Boring Log Borehole HS-25

Date: 6/27/2019 | **Drilling Company:** 2R

Project Name: Stoneridge | **Type of Rig:** CME 75

Project Number: 13092-01 | **Drop:** 30" | **Hole Diameter:** 8"

Elevation of Top of Hole: ~1525' MSL | **Drive Weight:** 140 pounds

Hole Location: See Geotechnical Map |

Logged By KAD
Sampled By KAD
Checked By KAD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
	0							**@0' to 10' - <u>Quaternary Very Old Fan Deposits (Qvof)</u>**	
			R-1	18 42 48	131.7	3.6	SM	@2.5' - Silty SAND: yellowish brown, dry, very dense; few rootlets	
1520	5		R-2	23 50/5"	122.2	3.3	SP-SM	@5' - SAND with Silt: light gray brown, dry to slightly moist, very dense	
			R-3	20 50/6"	125.5	4.2	SM	@7.5' - Silty SAND with Silt: yellowish brown, dry to slightly moist, very dense	
1515	10		R-4	50/5"	104.2	12.6	SP	**@10' to T.D. - <u>Cretaceous Lakeview Mountain Tonalite (Klmt)</u>** @10' - SAND: gray, dry, very dense	
1510	15		SPT-1	22 33 50/5"		6.1		@15' - Same as Above R-4; Coarse grained, less weathered	
								Total Depth Drilled = 15' Groundwater Not Encountered Backfilled with Cuttings on 6/27/2019	
1505	20								
1500	25								
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 8/6/2019

Geotechnical Boring Log Borehole I-1

Date: 6/24/2019	**Drilling Company:** 2R
Project Name: Stoneridge	**Type of Rig:** CME 75
Project Number: 13092-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1428' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Logged By CNJ
Sampled By CNJ
Checked By KAD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1425	0						SM	**@0' to T.D. - <u>Quaternary Very Old Fan Deposits (Qvof)</u>** @0' - Generally Silty SAND: brown, dry	
	5								
1420			SPT-1	1 2 2		38.9	CL	@8.5' - CLAY: very light brown, slightly moist, medium stiff; trace scattered gravel	
	10								
1415								Total Depth = 10' Groundwater Not Encountered Backfilled with Cuttings Subsequent to Infiltration Testing	
	15								
1410									
	20								
1405									
	25								
1400									
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
▽	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

Last Edited: 8/6/2019

Geotechnical Boring Log Borehole I-2

Date: 6/24/2019	**Drilling Company:** 2R
Project Name: Stoneridge	**Type of Rig:** CME 75
Project Number: 13092-01	**Drop:** 30" **Hole Diameter:** 8"
Elevation of Top of Hole: ~1429' MSL	**Drive Weight:** 140 pounds
Hole Location: See Geotechnical Map	Page 1 of 1

Logged By CNJ
Sampled By CNJ
Checked By KAD

Elevation (ft)	Depth (ft)	Graphic Log	Sample Number	Blow Count	Dry Density (pcf)	Moisture (%)	USCS Symbol	DESCRIPTION	Type of Test
1425	0						SP-SM	**@0' to T.D. - <u>Quaternary Very Old Fan Deposits (Qvof)</u>** @0' - SAND with Silt: brown, dry, loose	
1420	5							Total Depth = 5' Groundwater Not Encountered Backfilled with Cuttings Subsequent to Infiltration Testing	
1415	10								
1410	15								
1405	20								
1400	25								
	30								

LGC Geotechnical, Inc.

THIS SUMMARY APPLIES ONLY AT THE LOCATION OF THIS BORING AND AT THE TIME OF DRILLING. SUBSURFACE CONDITIONS MAY DIFFER AT OTHER LOCATIONS AND MAY CHANGE AT THIS LOCATION WITH THE PASSAGE OF TIME. THE DATA PRESENTED IS A SIMPLIFICATION OF THE ACTUAL CONDITIONS ENCOUNTERED. THE DESCRIPTIONS PROVIDED ARE QUALITATIVE FIELD DESCRIPTIONS AND ARE NOT BASED ON QUANTITATIVE ENGINEERING ANALYSIS.

SAMPLE TYPES:

B	BULK SAMPLE
R	RING SAMPLE (CA Modified Sampler)
G	GRAB SAMPLE
SPT	STANDARD PENETRATION TEST SAMPLE
⏚	GROUNDWATER TABLE

TEST TYPES:

DS	DIRECT SHEAR
MD	MAXIMUM DENSITY
SA	SIEVE ANALYSIS
S&H	SIEVE AND HYDROMETER
EI	EXPANSION INDEX
CN	CONSOLIDATION
CR	CORROSION
AL	ATTERBERG LIMITS
CO	COLLAPSE/SWELL
RV	R-VALUE
-#200	% PASSING # 200 SIEVE

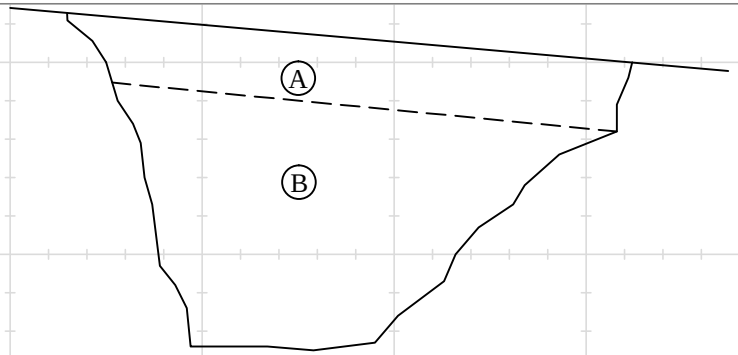
Last Edited: 8/6/2019

Project Name: Richland - Stoneridge	Logged By: KAD	Trench No: TP-1
Project Number : 13092-01	Date : 3/31/2016	**Engineering Properties:**
Equipment: Backhoe - John Deere 310SK	Location: See Geotechnical Map	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
		Quaternary Very Old Fan Deposits	Qvof	SP	B-1 4'-5'		
	A	@0'-1.8' SAND; brown, slightly moist, friable, upper 6" disturbed from agricultural use, roots + rootlets to ~4".					
	B	@1.8'-T.D. Silty SAND; brown to orange brown, moist, increased density, decomposed granitics, coarse to fine grained.		SM			

GRAPHICAL REPRESENTATION BELOW: Elevation : 1507 ' MSL Surface Slope: -5 deg. Trend: EW



Total Depth: 7.5'
Groundwater: None
Backfilled: 3/31/2016

scale : 1 in = 5 ft

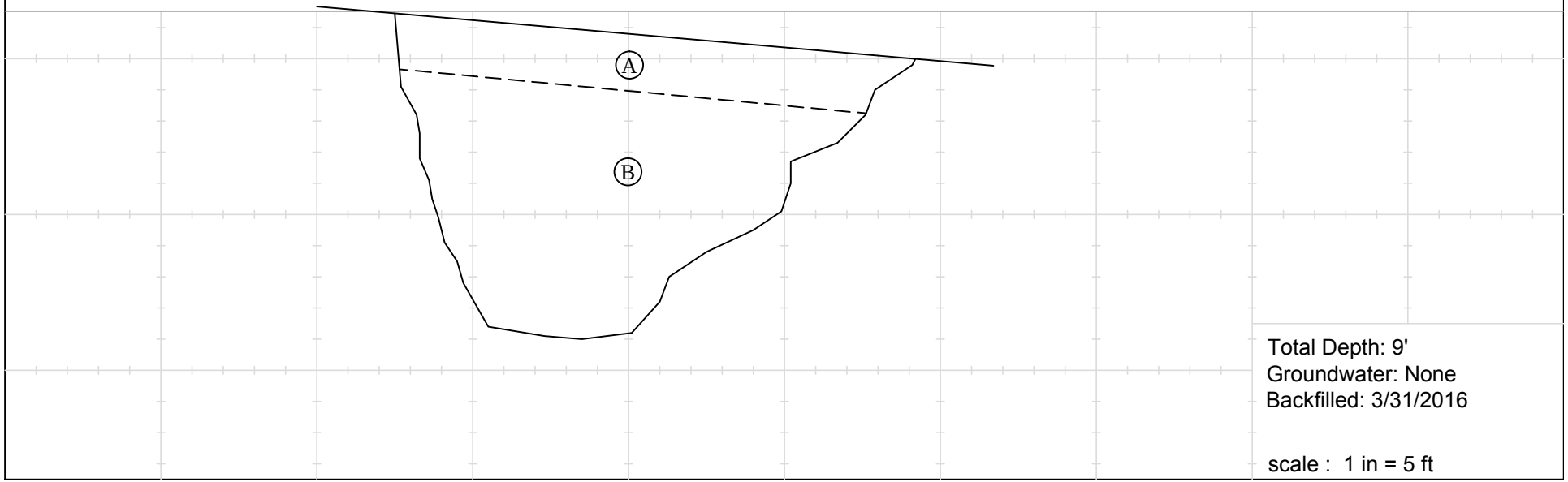
Last Edited: 4/5/2016

Project Name: Richland - Stoneridge	Logged By: KAD	Trench No: TP-2	
Project Number : 13092-01	Date : 3/31/2016	**Engineering Properties:**	
Equipment: Backhoe - John Deere 310SK	Location: See Geotechnical Map		

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
		Quaternary Very Old Fan Deposits	Qvof	SP			
	A	@0'-1.75' Silty SAND; brown, slightly moist, fine grained sand, upper 4"-6" disturbed by agricultural use, rootlets to approx. 5"-6".					
	B	@1.75'-T.D. Silty SAND to SAND; brown to orange brown, moist, dense, some caliche, very decomposed granitics, coarse to fine grained sand, some localized areas of increased fines, moderate hand excavation, becomes more sand with depth.		SM-SP			

GRAPHICAL REPRESENTATION BELOW: Elevation : 1512 ' MSL Surface Slope: -5 deg. Trend: EW



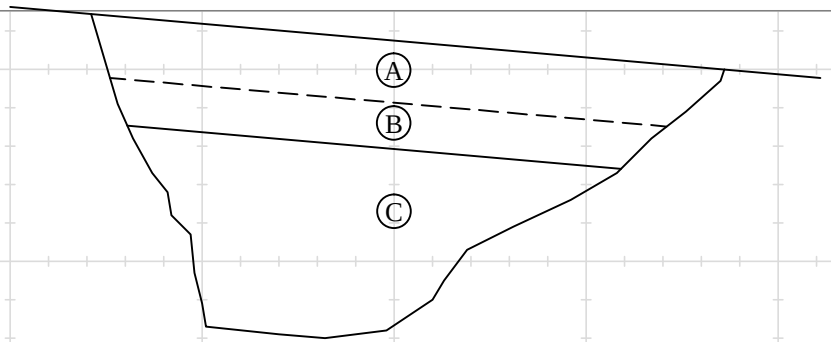
Last Edited: 4/5/2016

Project Name: Richland - Stoneridge	Logged By: KAD	Trench No: TP-3
Project Number : 13092-01	Date : 3/31/2016	**Engineering Properties:**
Equipment: Backhoe - John Deere 310SK	Location: See Geotechnical Map	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
		Quaternary Very Old Fan Deposits					
	A	0'-0.8' Silty SAND; brown, slightly moist, fine grained sand, upper 4"-6" disturbed by agriculture use, rootlets to approz 5"-6".	Qvof	SM	B-1 2'-3'		
	B	0.8'-2' Decomposed Granitics - Clayey SAND to Silty SAND; red brown to gray, moist.		SC-SM			
		Cretaceous Lakeview Mountain Tonalite					
	C	2'-T.D. Granitic Bedrock; yellow brown to gray, slightly moist, coarse grained, very weathered, decrease in weathering with depth.	Klmt				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1518 ' MSL Surface Slope: -5 deg. Trend: EW



Total Depth: 7'
Groundwater: None
Backfilled: 3/31/2016

scale : 1 in = 5 ft

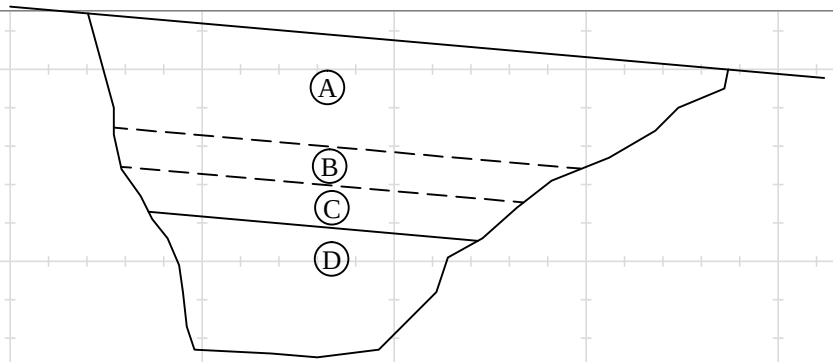
Last Edited: 4/5/2016

Project Name: Richland - Stoneridge	Logged By: KAD	Trench No: TP-4
Project Number : 13092-01	Date : 3/31/2016	**Engineering Properties:**
Equipment: Backhoe - John Deere 310SK	Location: See Geotechnical Map	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
		Quaternary Very Old Fan Deposits					
	A	@0'-2' Clayey SAND; brown to gray brown, moist, rootlets upper 6", fine sand with some larger coarse grains.	Qvof	SC	B-1 0'-2'		
	B	@2'-3' Silty SAND; brown to gray brown, moist, dense.		SM			
	C	@3'-4.1' SAND; brown, moist, friable, fine to medium grained.		SP			
		Cretaceous Lakeview Mountain Tonalite					
	D	@4.1'-T.D. Granitic bedrock; orange to gray, slightly moist, moderately weathered, coarse grained.	Klmt				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1558 ' MSL Surface Slope: -5 deg. Trend: EW



Total Depth: 7.5'
Groundwater: None
Backfilled: 3/31/2016

scale : 1 in = 5 ft

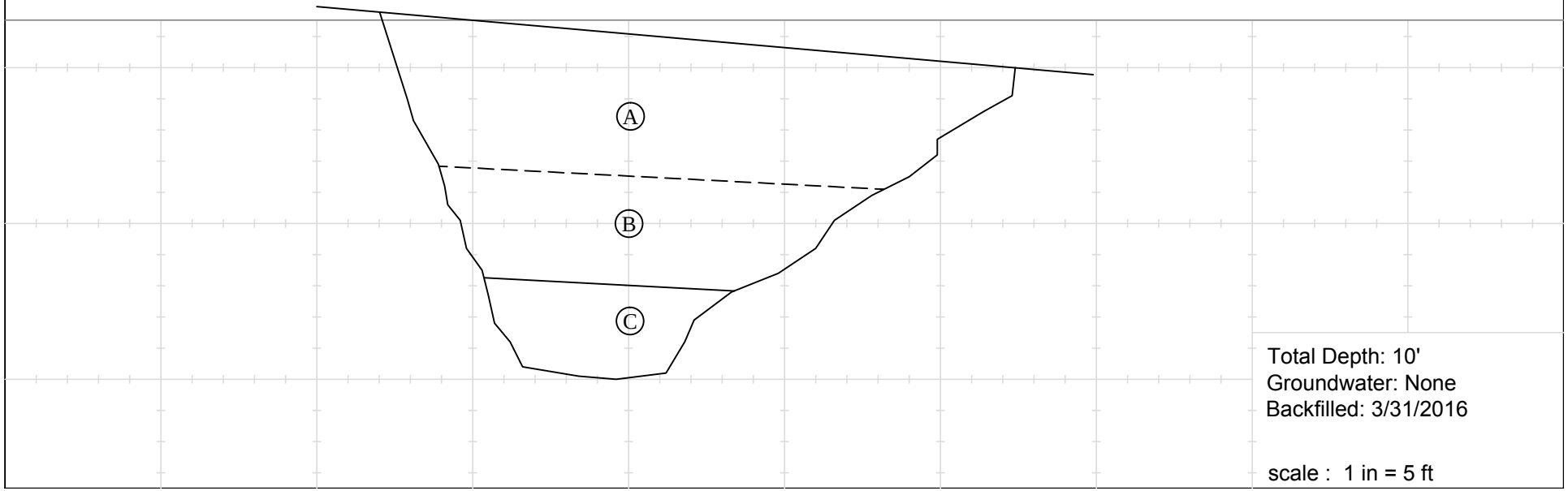
Last Edited: 4/5/2016

Project Name: Richland - Stoneridge	Logged By: KAD	Trench No: TP-5
Project Number : 13092-01	Date : 3/31/2016	**Engineering Properties:**
Equipment: Backhoe - John Deere 310SK	Location: See Geotechnical Map	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
		Quaternary Very Old Fan Deposits					
	A	@0'-3.5' Clayey SAND to Silty SAND; brown to gray brown, moist, upper 1' disturbed by agricultural use, abundant rootlets to approx. 7".	Qvof	SC			
	B	@3.5'-7' SAND; gray brown to orange brown, moist, predominately fine grained with some coarse grained sand.		SP			
		Cretaceous Lakeview Mountain Tonalite					
	C	@7'-T.D. Granitic Bedrock; gray to yellow brown, slightly moist, moderately weathered.	Klmt				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1543 ' MSL Surface Slope: -5 deg. Trend: EW



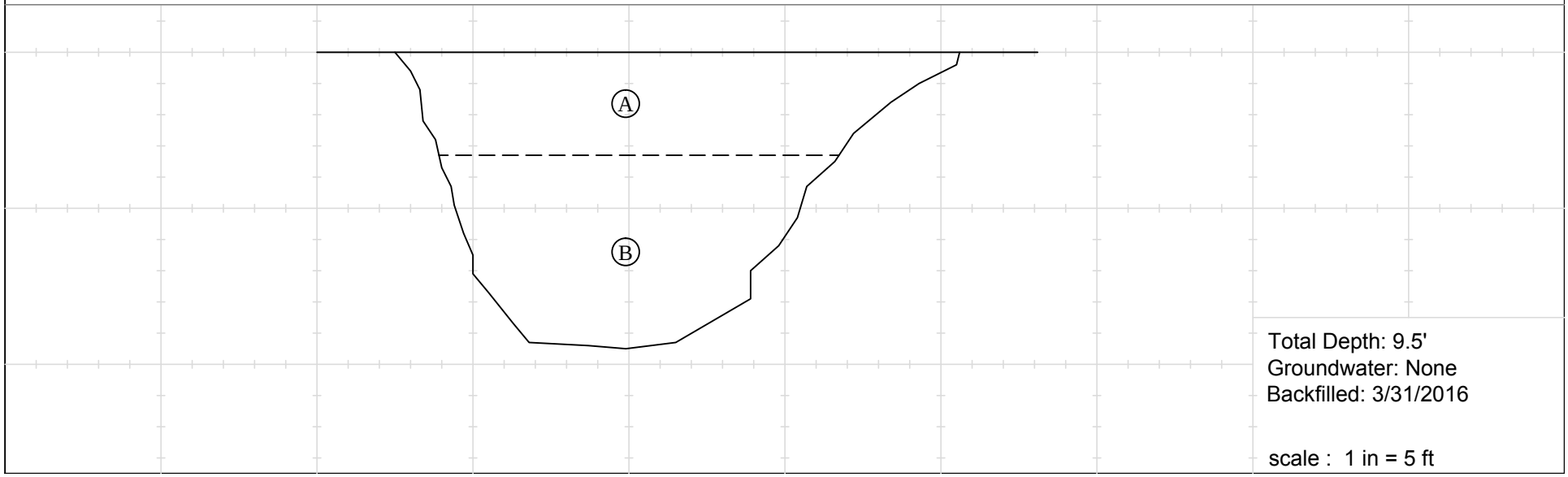
Last Edited: 4/5/2016

Project Name: Richland - Stoneridge	Logged By: KAD	Trench No: TP-6
Project Number : 13092-01	Date : 3/31/2016	**Engineering Properties:**
Equipment: Backhoe - John Deere 310SK	Location: See Geotechnical Map	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
		Quaternary Very Old Fan Deposits					
	A	@0'-3.3' Clayey SAND; dark brown to brown, moist, upper 1.5' disturbed by agricultural use, abundant rootlets to 1', predominately fine grained sand with some coarse grains.	Qvof	SC	B-1 2'-3'		
	B	@3.3'-T.D. Silty SAND; brown to gray brown, moist, fine grained sand.		SM			

GRAPHICAL REPRESENTATION BELOW: Elevation : 1450 ' MSL Surface Slope: 0 deg. Trend: EW



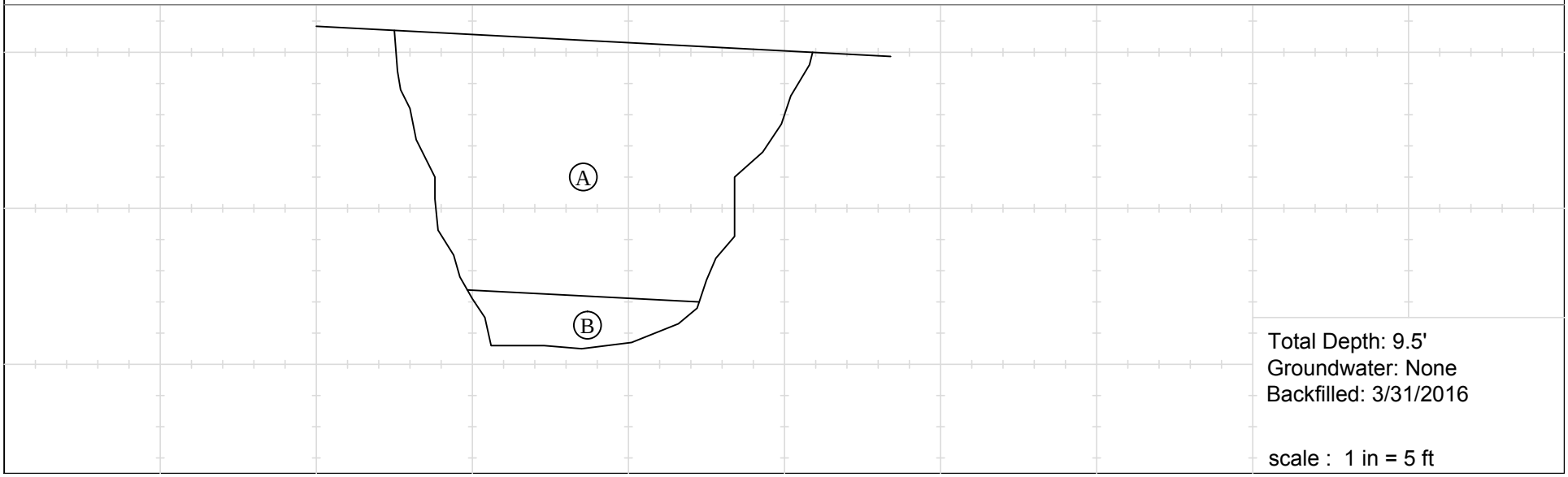
Last Edited: 4/5/2016

Project Name: Richland - Stoneridge	Logged By: KAD	Trench No: TP-7
Project Number : 13092-01	Date : 3/31/2016	**Engineering Properties:**
Equipment: Backhoe - John Deere 310SK	Location: See Geotechnical Map	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
		Quaternary Very Old Fan Deposits					
	A	@0'-8' SAND; dark brown to reddish brown, moist, loose, very friable, micaceous, upper 10" disturbed by agricultural use with abundant rootlets, fine to medium grained.	Qvof	SP			
		Cretaceous Lakeview Mountain Tonalite					
	B	@8'-T.D. Granitic Bedrock; highly weathered	Klmt				

GRAPHICAL REPRESENTATION BELOW: Elevation : 1485 ' MSL Surface Slope: -3 deg. Trend: EW



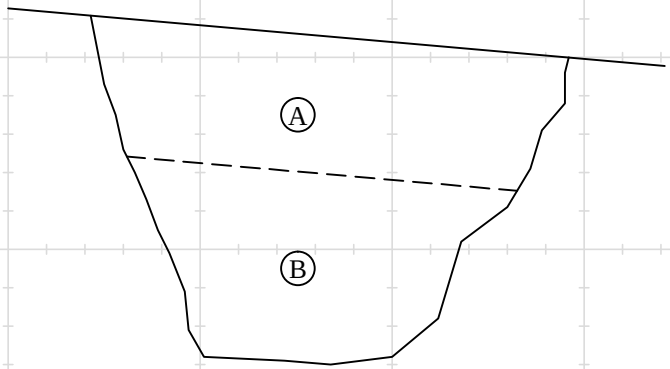
Last Edited: 4/5/2016

Project Name: Richland - Stoneridge	Logged By: KAD	Trench No: TP-8
Project Number : 13092-01	Date : 3/31/2016	**Engineering Properties:**
Equipment: Backhoe - John Deere 310SK	Location: See Geotechnical Map	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
		Quaternary Very Old Fan Deposits					
	A	@0'-3' SAND with CLAY; dark brown to reddish brown, moist, medium dense, fine grained with some coarser grains, upper 9" disturbed by agricultural use, rootlets to approx 6".	Qvof	SP-SC			
	B	@3'-T.D. Silty SAND; reddish brown, moist, dense, fine grained sand. @6.5 ' increase density, moderately hard to excavate.		SM			

GRAPHICAL REPRESENTATION BELOW: Elevation : 1484 ' MSL Surface Slope: -5 deg. Trend: EW



Total Depth: 8'
Groundwater: None
Backfilled: 3/31/2016

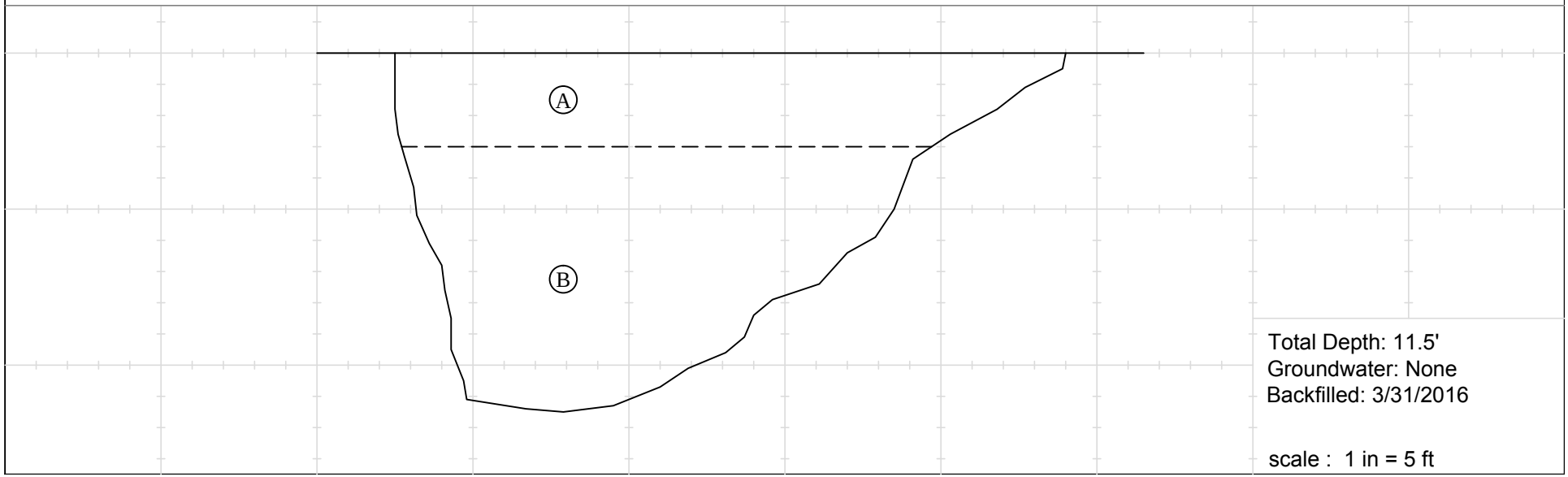
scale : 1 in = 5 ft

Last Edited: 4/5/2016

Project Name: Richland - Stoneridge	Logged By: KAD	Trench No: TP-9	LGC Geotechnical, Inc.
Project Number : 13092-01	Date : 3/31/2016	**Engineering Properties:**	
Equipment: Backhoe - John Deere 310SK	Location: See Geotechnical Map		

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
		Quaternary Very Old Fan Deposits					
	A	@0'-3' Clayey SAND to SAND with CLAY; brown to dark brown, moist, medium dense, upper 1' disturbed by agricultural use with abundant rootlets.	Qvof	SC	B-1 3'-4'		
	B	@3'-T.D. SAND to Silty SAND; reddish brown, moist, dense, predominately fine sand.		SP-SM			

GRAPHICAL REPRESENTATION BELOW: Elevation : 1454 ' MSL Surface Slope: 0 deg. Trend: EW

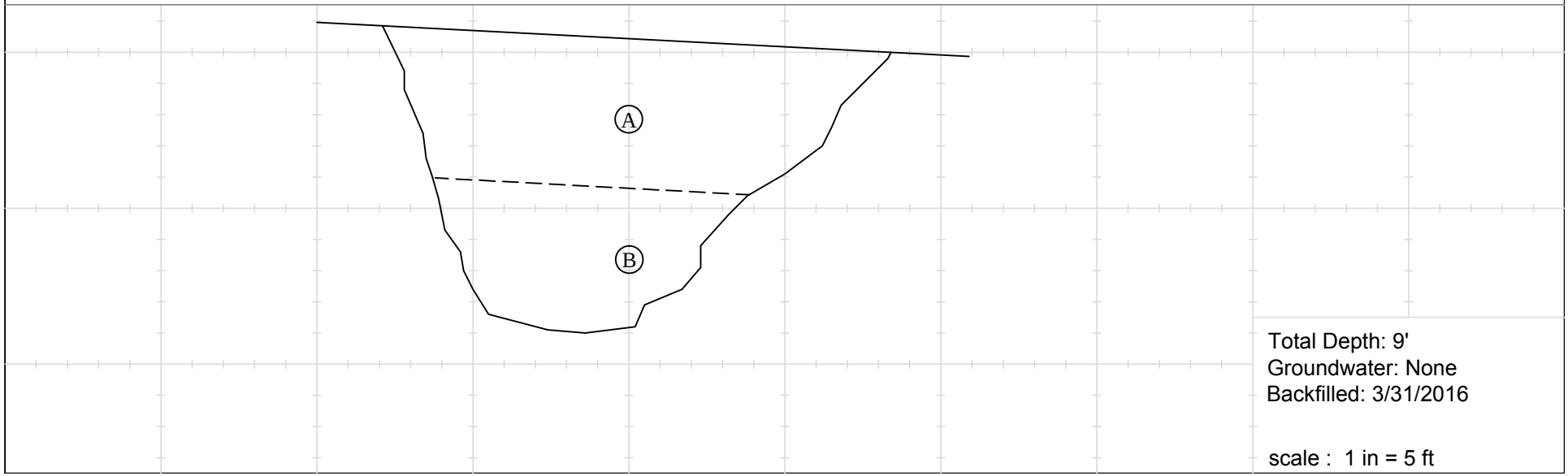


Last Edited: 4/5/2016

Project Name: Richland - Stoneridge	Logged By: KAD	Trench No: TP-10	LGC Geotechnical, Inc.
Project Number : 13092-01	Date : 3/31/2016	**Engineering Properties:**	
Equipment: Backhoe - John Deere 310SK	Location: See Geotechnical Map		

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
		Quaternary Very Old Fan Deposits					
	A	@0'-4.3' Clayey SAND to SAND with CLAY; dark reddish brown, moist, medium dense, upper 10" disturbed by agricultural use, rootlets to depth of approx. 6"	Qvof	SC			
	B	@4.3'-T.D. SAND to Silty SAND; brown, moist, dense, fine grained sand. @6' becomes harder to excavate.		SP-SM			

GRAPHICAL REPRESENTATION BELOW: Elevation : 1481 ' MSL Surface Slope: -3 deg. Trend: EW



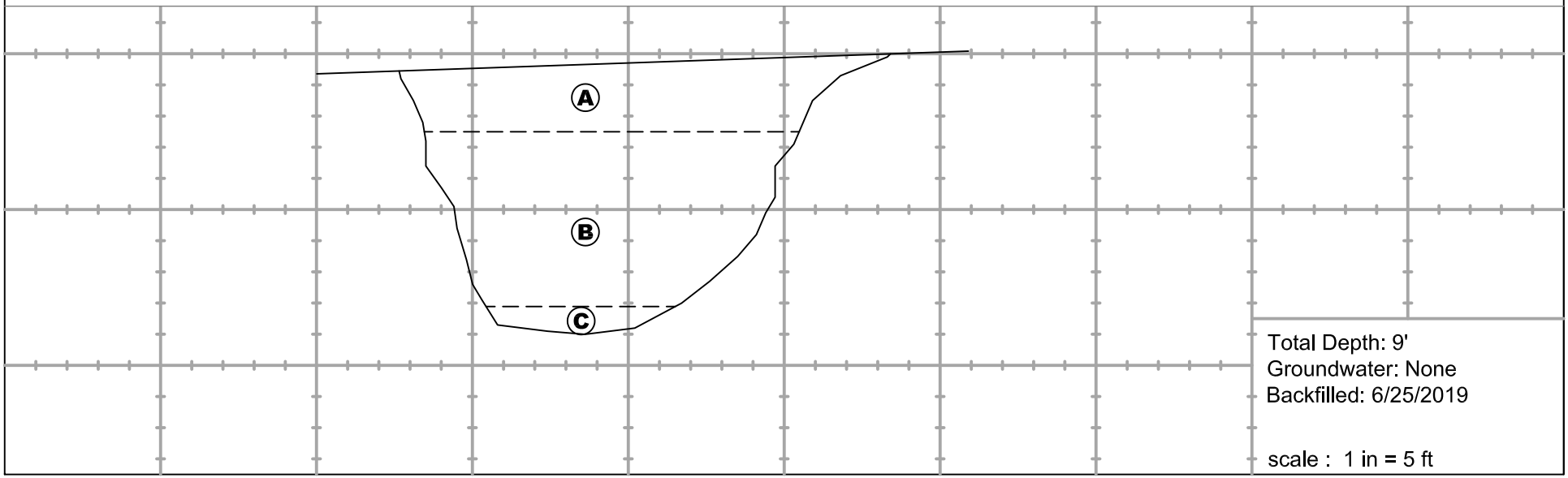
Last Edited: 4/5/2016

Project Name: Richland - Stoneridge	**Logged By: KAD**	**Trench No: TP-11**
Project Number : 13092-01	**Date : 6/25/2019**	**Engineering Properties:**
Equipment: Deere 310J	**Location: See Geotechnical Map**	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
		Quaternary Very Old Fan Deposits	Qvof				
	A	@ 0 to 2.5' Sand with Silt: light brown to brown, slightly moist, slightly indurated; upper 4"-6" dry and desiccated with abundant rootlets		SP-SM			
	B	@ 2.5' to 8' Sand: medium brown, slightly moist to moist, friable, trace rootlets		SP	B-1 @ 4'-5'		
	C	@8' to T.D. Sand: gray brown, slightly moist to moist; extremely weathered bedrock (?) T.D.= 9'					

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1444 ' MSL** **Surface Slope: 2 deg.** **Trend: N15W**



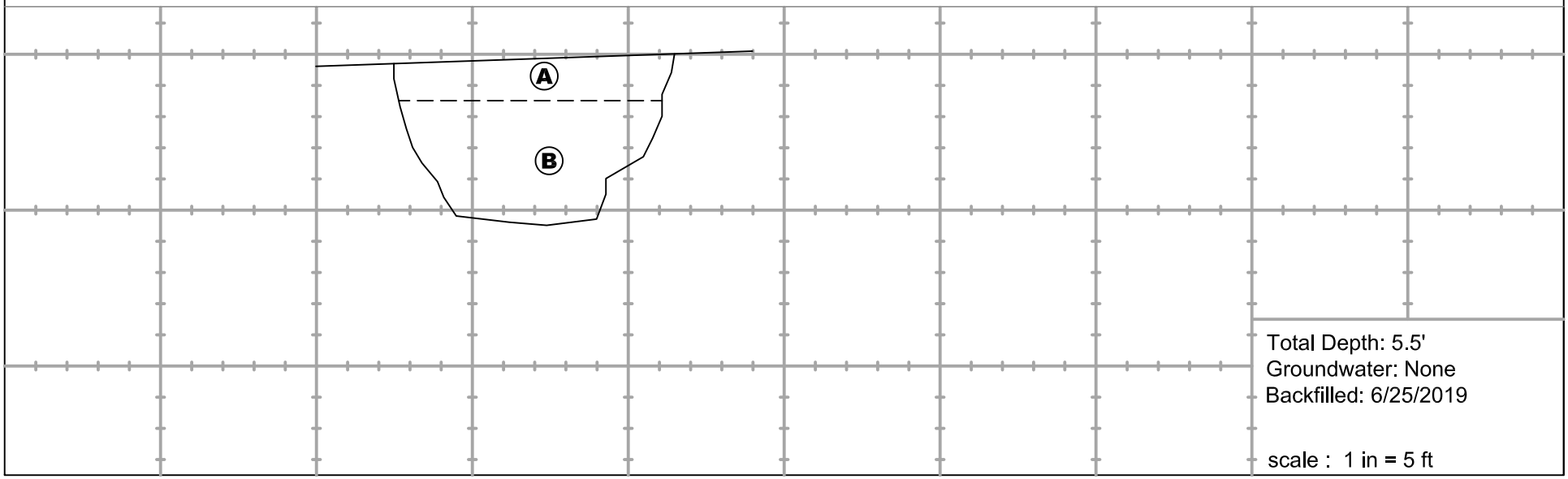
Last Edited: 8/5/2019

Project Name: Richland - Stoneridge	Logged By: KAD	Trench No: TP-12
Project Number : 13092-01	Date : 6/25/2019	Engineering Properties:
Equipment: Deere 310J	Location: See Geotechnical Map	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
		Quaternary Very Old Fan Deposits	Qvof				
	A	@ 0 to 1.5' Sand with Silt: light to medium brown, dry, slightly indurated; upper 6" desiccated with abundant rootlets		SP-SM			
	B	@ 1.5' to T.D. Sand: dark red brown to gray dark brown, slightly moist to moist, moderately indurated, pinhole to pencil hole porosity T.D.=5.5'		SP	B-1 @ 3.5'-4'		

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1437 ' MSL** **Surface Slope: 2 deg.** **Trend: NS**



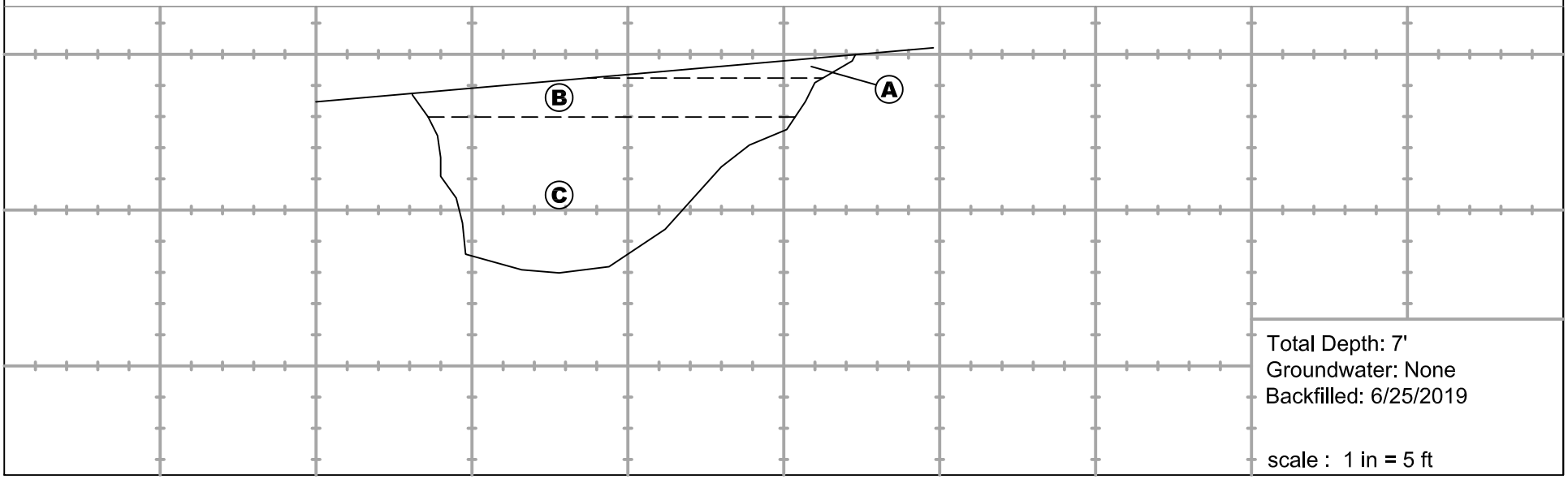
Last Edited: 8/5/2019

Project Name: Richland - Stoneridge	Logged By: KAD	Trench No: TP-13
Project Number : 13092-01	Date : 6/25/2019	Engineering Properties:
Equipment: Deere 310J	Location: See Geotechnical Map	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
		Quaternary Very Old Fan Deposits	Qvof				
	A	@ 0 to 0.75' Sand: light gray to light brown, dry, loose; very friable, abundant rootlets		SP			
	B	@ 0.75' to 2' Sand with Silt to Silty Sand: light to medium brown, slightly moist, slightly indurated; pinhole porosity; some rootlets		SP to SM			
	C	@ 2' to T.D. Sand: dark reddish brown, slightly moist to moist; friable; pinhole porosity T.D.=7'		SP			

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1455 ' MSL** **Surface Slope: 5 deg.** **Trend: EW**



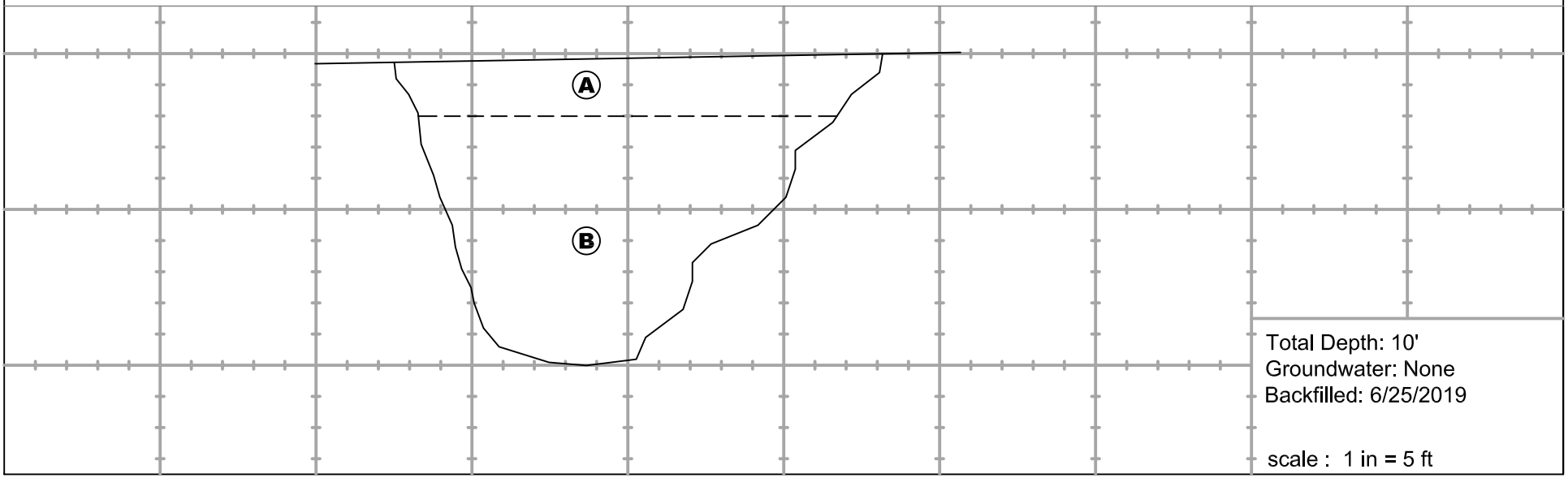
Last Edited: 8/5/2019

Project Name: Richland - Stoneridge	**Logged By: KAD**	**Trench No: TP-14**
Project Number : 13092-01	**Date : 6/25/2019**	**Engineering Properties:**
Equipment: Deere 310J	**Location: See Geotechnical Map**	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
		Quaternary Very Old Fan Deposits	Qvof				
	A	@ 0 to 2' Sand with Silt: medium brown to red brown, dry to slightly moist; some rootlets; slightly to moderately indurated; upper 6"-8" desiccated with abundant roots		SP-SM	B-1 @ 1'-2'		
	B	@ 2' to T.D. Sand: reddish brown, slightly moist to moist; friable; fine to medium grained; trace rootlets T.D.=10'		SP			

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1469 ' MSL** **Surface Slope: 1 deg.** **Trend: EW**



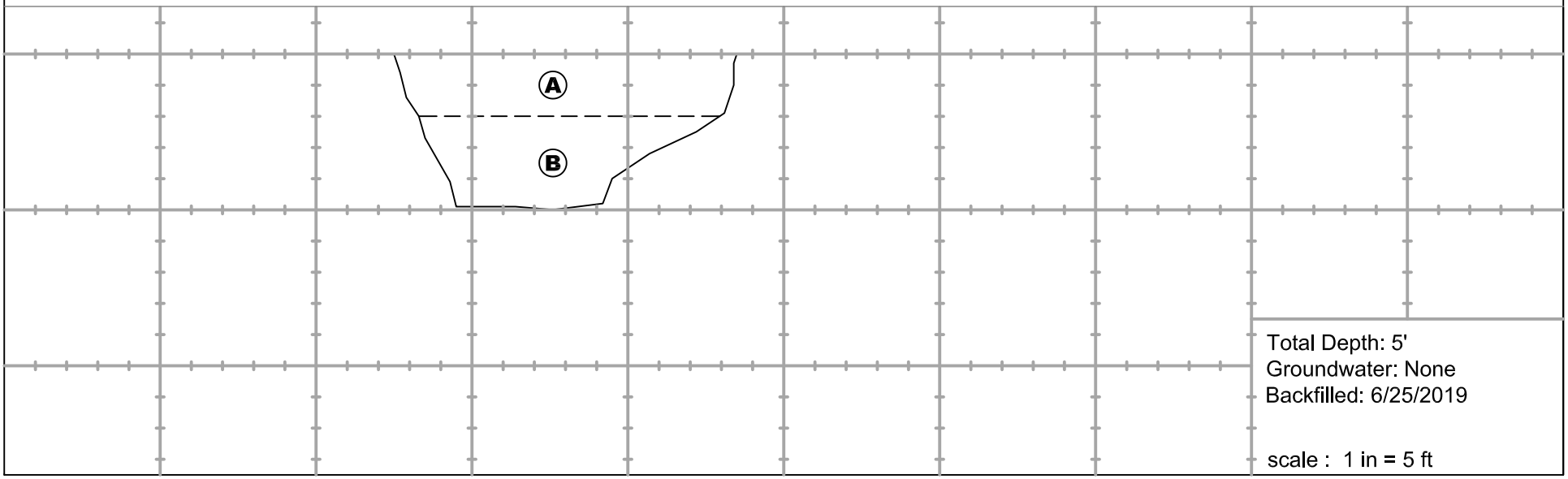
Last Edited: 8/5/2019

Project Name: Richland - Stoneridge	Logged By: KAD	Trench No: TP-15
Project Number : 13092-01	Date : 6/25/2019	Engineering Properties:
Equipment: Deere 310J	Location: See Geotechnical Map	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
		Quaternary Very Old Fan Deposits	Qvof				
	A	@ 0 to 1.5' Silty Sand: light brown, dry; friable; abundant rootlets and desiccated		SM			
	B	@ 1.5' to T.D. Sand: reddish dark brown, slightly moist; very well indurated; very difficult digging; pinhole porosity		SP			
		T.D.=5'					

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1430 ' MSL** **Surface Slope: 0 deg.** **Trend: NS**

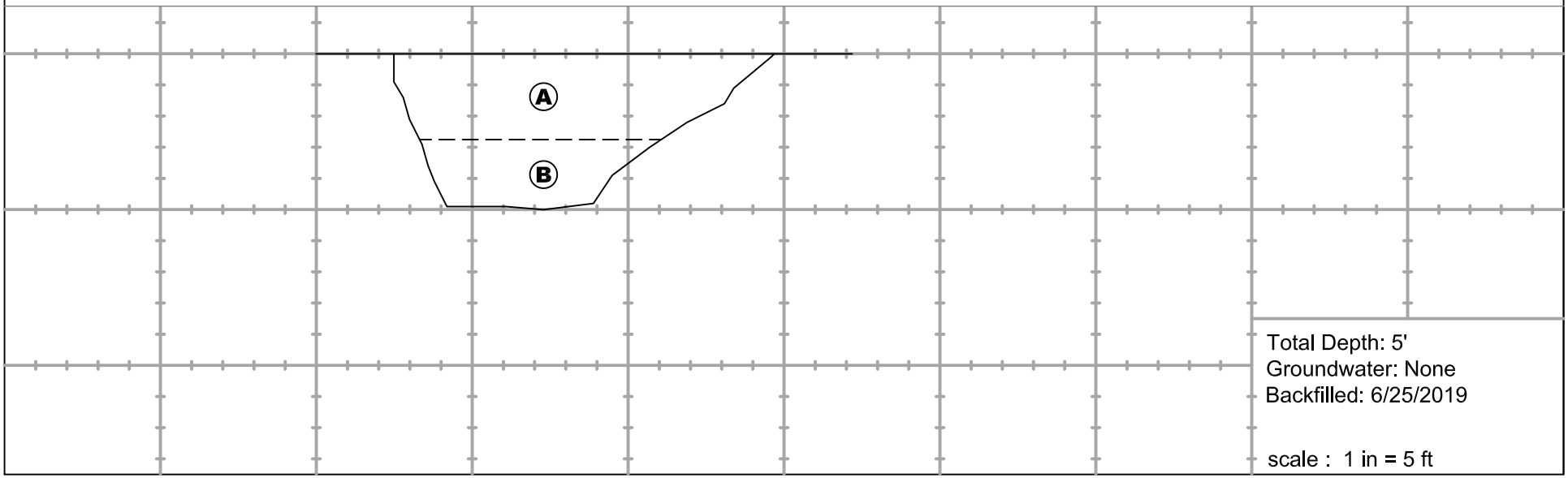


Last Edited: 8/5/2019

Project Name: Richland - Stoneridge	**Logged By: KAD**	**Trench No: TP-16**	LGC Geotechnical, Inc.
Project Number : 13092-01	**Date : 6/25/2019**	**Engineering Properties:**	
Equipment: Deere 310J	**Location: See Geotechnical Map**		

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
		Quaternary Very Old Fan Deposits	Qvof				
	A	@ 0 to 2.75' Silty Sand: light to medium brown, dry to slightly moist; slightly indurated; upper 8"-12" desiccated with abundant rootlets		SM			
	B	@ 2.75' to T.D. Sand: dark reddish brown, slightly moist to moist; well indurated; difficult digging; pinhole porosity T.D.=5'		SP			

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1430 ' MSL** **Surface Slope: 0 deg.** **Trend: EW**



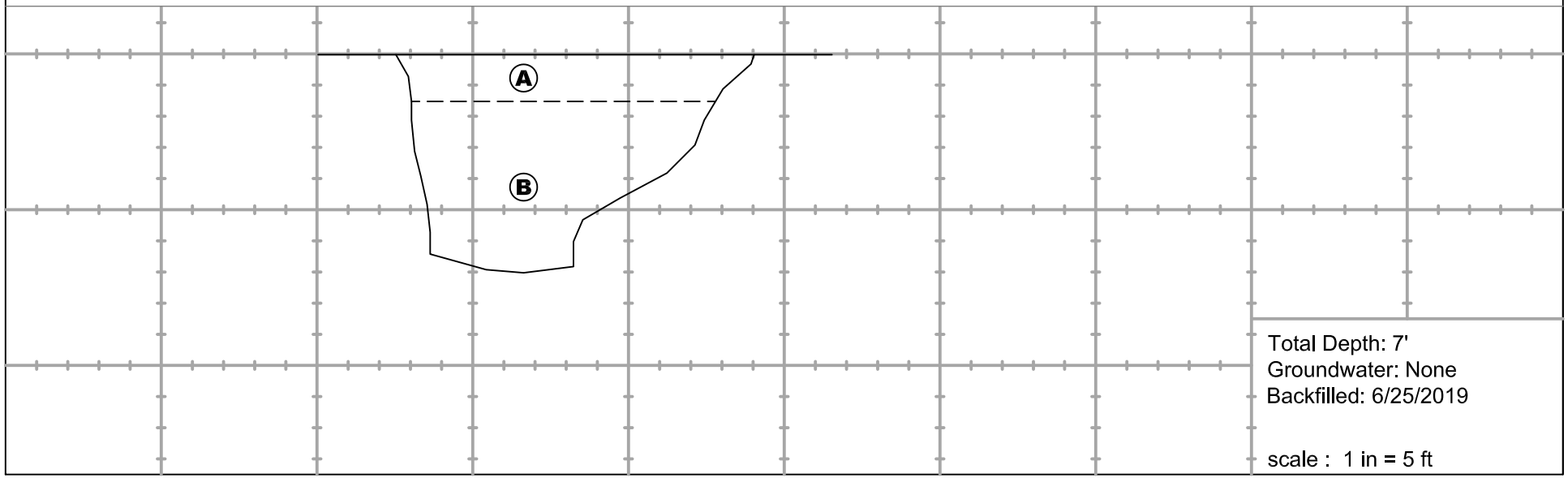
Last Edited: 8/5/2019

Project Name: Richland - Stoneridge	Logged By: KAD	Trench No: TP-17
Project Number : 13092-01	Date : 6/25/2019	Engineering Properties:
Equipment: Deere 310J	Location: See Geotechnical Map	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
		Quaternary Very Old Fan Deposits	Qvof				
	A	@ 0 to 1.5' Silty Sand: light brown to light gray, dry; abundant roots and rootlets; desiccated		SM			
	B	@ 1.5' to T.D. Sand to Sand with Silt: medium brown to gray brown, slightly moist, slightly indurated; trace rootlets T.D.=7'		SP			

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1433 ' MSL** **Surface Slope: 0 deg.** **Trend: EW**



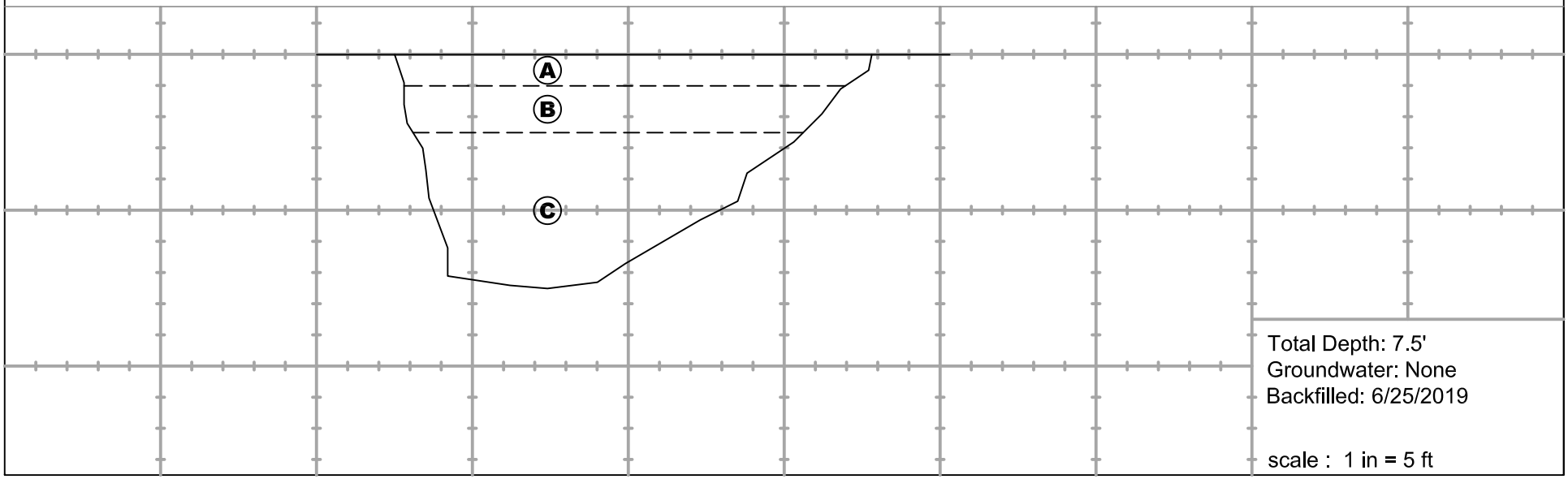
Last Edited: 8/5/2019

Project Name: Richland - Stoneridge	Logged By: KAD	Trench No: TP-18
Project Number : 13092-01	Date : 6/25/2019	Engineering Properties:
Equipment: Deere 310J	Location: See Geotechnical Map	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
		Quaternary Very Old Fan Deposits	Qvof				
	A	@ 0 to 1' Silty Sand to Sand: light brown to light gray, dry; abundant rootlets and desiccated; fine grained sand		SM to SP			
	B	@ 1' to 2.5' Sand: medium brown to gray brown, dry to slightly moist, slightly indurated; pinhole porosity; trace rootlets		SP			
	C	@ 2.5' to T.D. Sand to Sand with Silt: dark reddish brown to brown, slightly moist to moist; slightly friable; abundant pinhole porosity @5' increase in density; decrease porosity T.D.=7.5'		SP			

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1460 ' MSL** **Surface Slope: 0 deg.** **Trend: EW**



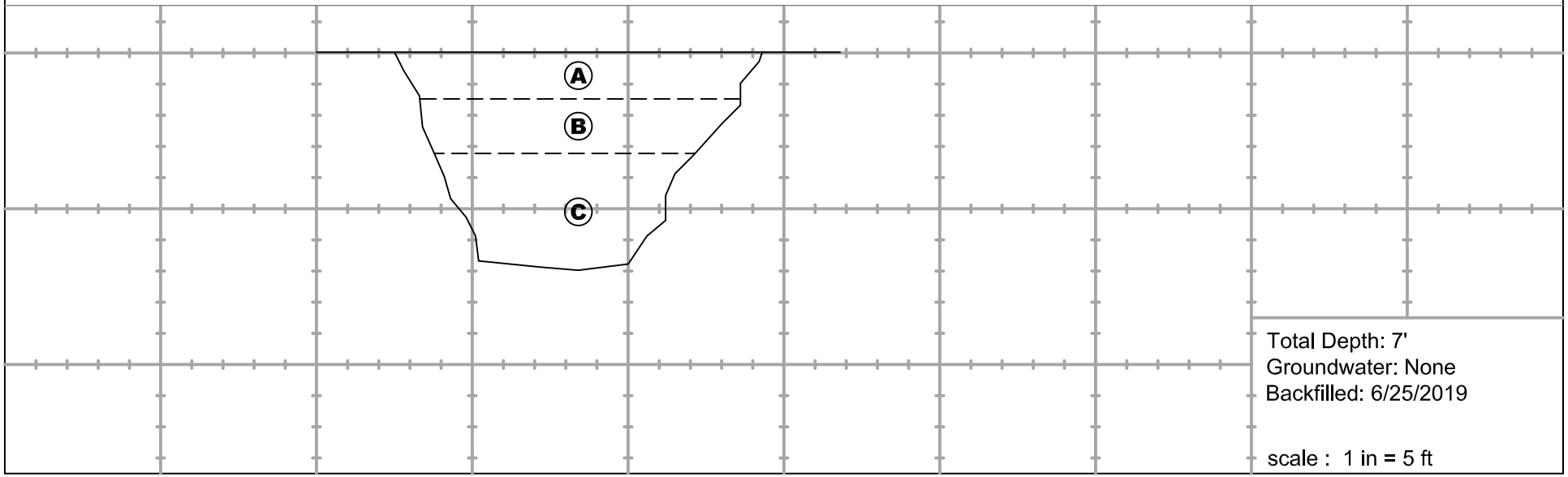
Last Edited: 8/5/2019

Project Name: Richland - Stoneridge	Logged By: KAD	Trench No: TP-19
Project Number : 13092-01	Date : 6/25/2019	Engineering Properties:
Equipment: Deere 310J	Location: See Geotechnical Map	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
		Quaternary Very Old Fan Deposits	Qvof				
	A	@ 0 to 1.5' Silty Sand: light brown to light gray, dry; abundant rootlets; desiccated; friable; fine grained sand		SM			
	B	@ 1.5' to 3.25' Sand to Sand with Silt: brown to gray brown, slightly moist, slightly indurated; trace rootlets		SP			
	C	@ 3.25' to T.D. Sand: brown to reddish brown, slightly moist to moist; slightly friable; pinhole porosity @5.5' darker coloration; increase in density T.D.=7'		SP	B-1 @ 3.5'-4.5'		

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1480 ' MSL** **Surface Slope: 0 deg.** **Trend: N60W**



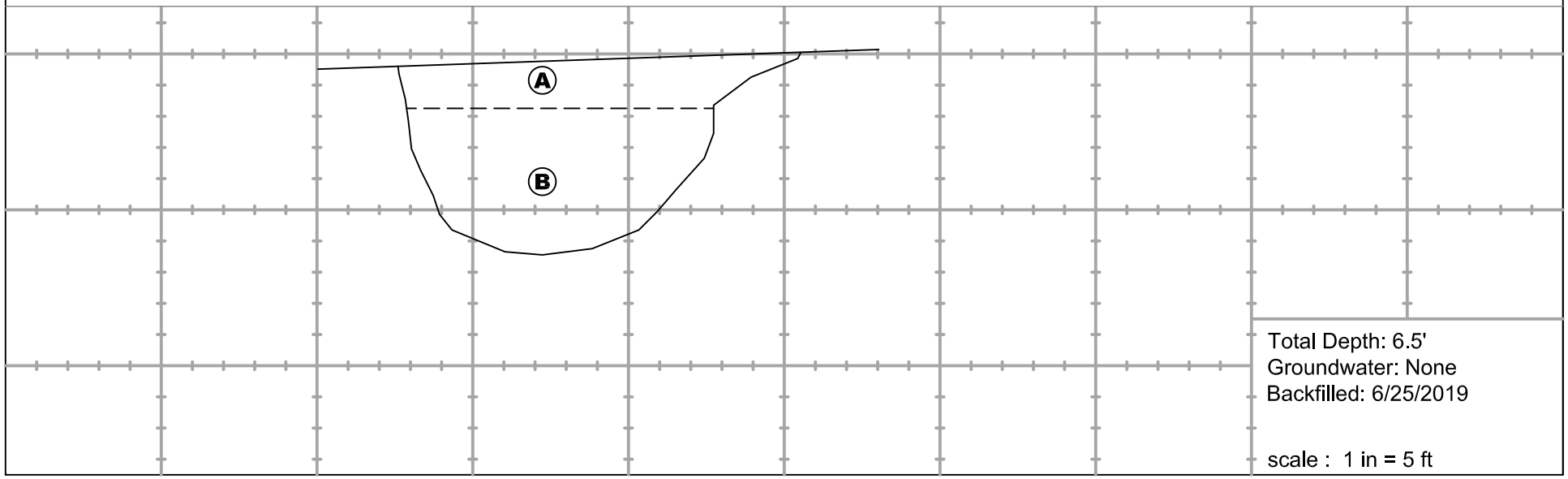
Last Edited: 8/5/2019

Project Name: Richland - Stoneridge	Logged By: KAD	Trench No: TP-20
Project Number : 13092-01	Date : 6/25/2019	Engineering Properties:
Equipment: Deere 310J	Location: See Geotechnical Map	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
		Quaternary Very Old Fan Deposits	Qvof				
	A	@ 0 to 1.8' Silty Sand: light brown to light reddish brown, dry to slightly moist; upper 6" to 8" desiccated with abundant rootlets; slightly indurated		SM			
	B	@ 1.8' to T.D. Sand to Sand with Silt: dark brown to dark reddish brown, moist; well indurated; difficult digging; prominent white grains (Quartz) T.D.=6.5'		SP	B-1 @ 3'-4'		

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1507 ' MSL** **Surface Slope: 2 deg.** **Trend: EW**



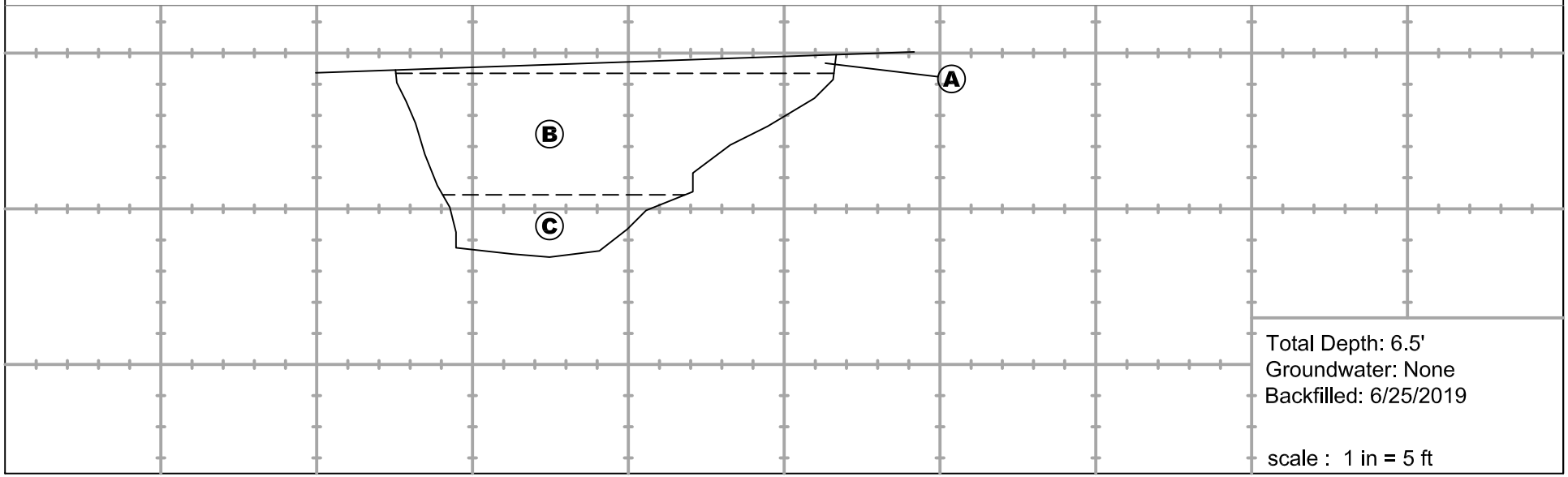
Last Edited: 8/5/2019

Project Name: Richland - Stoneridge	Logged By: KAD	Trench No: TP-21
Project Number : 13092-01	Date : 6/25/2019	Engineering Properties:
Equipment: Deere 310J	Location: See Geotechnical Map	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
		Quaternary Very Old Fan Deposits	Qvof				
	A	@ 0 to 0.6' Sand: light gray, dry, loose; abundant rootlets; desiccated; fine grained		SP			
	B	@ 0.6' to 4.5' Sand: dark brown, slightly moist; micaceous; friable; fine to medium grained		SP	B-1 @ 2'-3'		
	C	***Lakeview Mountain Tonalite***	Klmt		B-2 @ 5'-6'		
		@ 4.5' to T.D. Excavates to Sand: gray and dark brown, slightly moist to moist; friable; decomposed tonalite		SP			
		@6.5' Practical Refusal					
		T.D.=6.5'					

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1527 ' MSL** **Surface Slope: 2 deg.** **Trend: N50E**



Total Depth: 6.5'
Groundwater: None
Backfilled: 6/25/2019

scale : 1 in = 5 ft

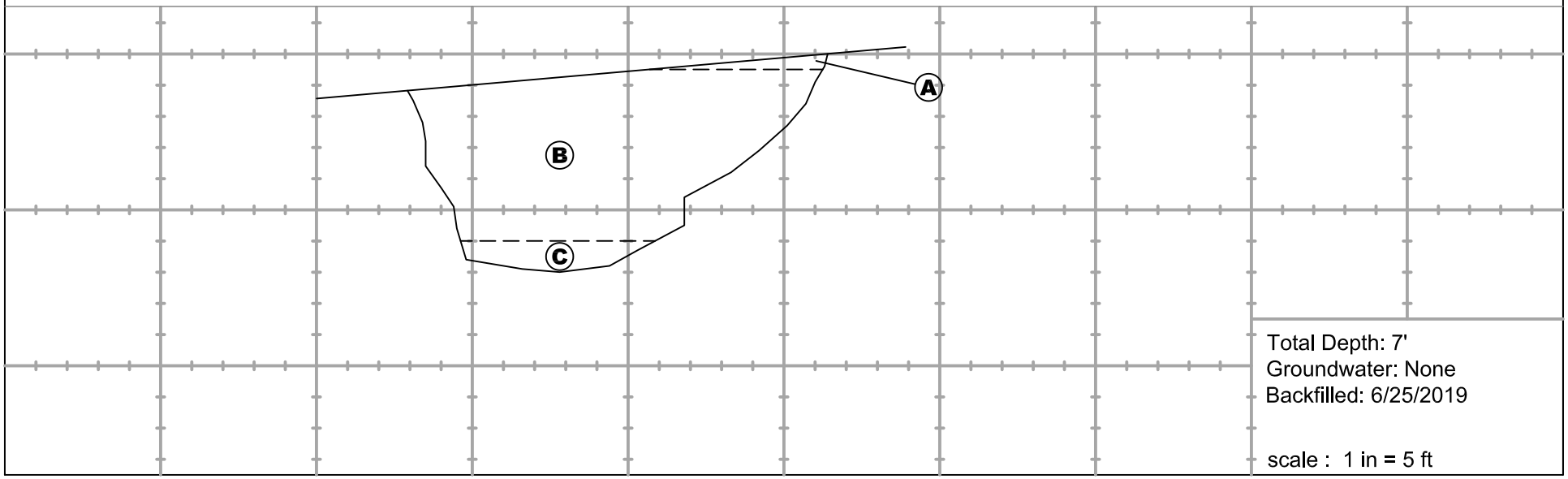
Last Edited: 8/5/2019

Project Name: Richland - Stoneridge	Logged By: KAD	Trench No: TP-22
Project Number : 13092-01	Date : 6/25/2019	Engineering Properties:
Equipment: Deere 310J	Location: See Geotechnical Map	

LGC Geotechnical, Inc.

Geologic Attitudes	Unit	SOIL DESCRIPTION:	GEOLOGIC UNIT	USCS	SAMPLE No	MOISTURE (%)	DRY DENSITY (PCF)
		Quaternary Very Old Fan Deposits	Qvof				
	A	@ 0 to 0.5' Sand: light gray, dry, loose; abundant rootlets and desiccated; fine grained		SP			
	B	@ 0.5' to 6' Sand to Sand with Silt: dark brown, moist; friable; fine grained		SP			
	C	***Lakeview Mountain Tonalite***	Klmt				
		@ 6' to T.D. Excavates to Sand: gray and red brown, slightly moist; medium to coarse grained		SP			

GRAPHICAL REPRESENTATION BELOW: **Elevation : 1555 ' MSL** **Surface Slope: 5 deg.** **Trend: EW**



Total Depth: 7'
Groundwater: None
Backfilled: 6/25/2019

scale : 1 in = 5 ft

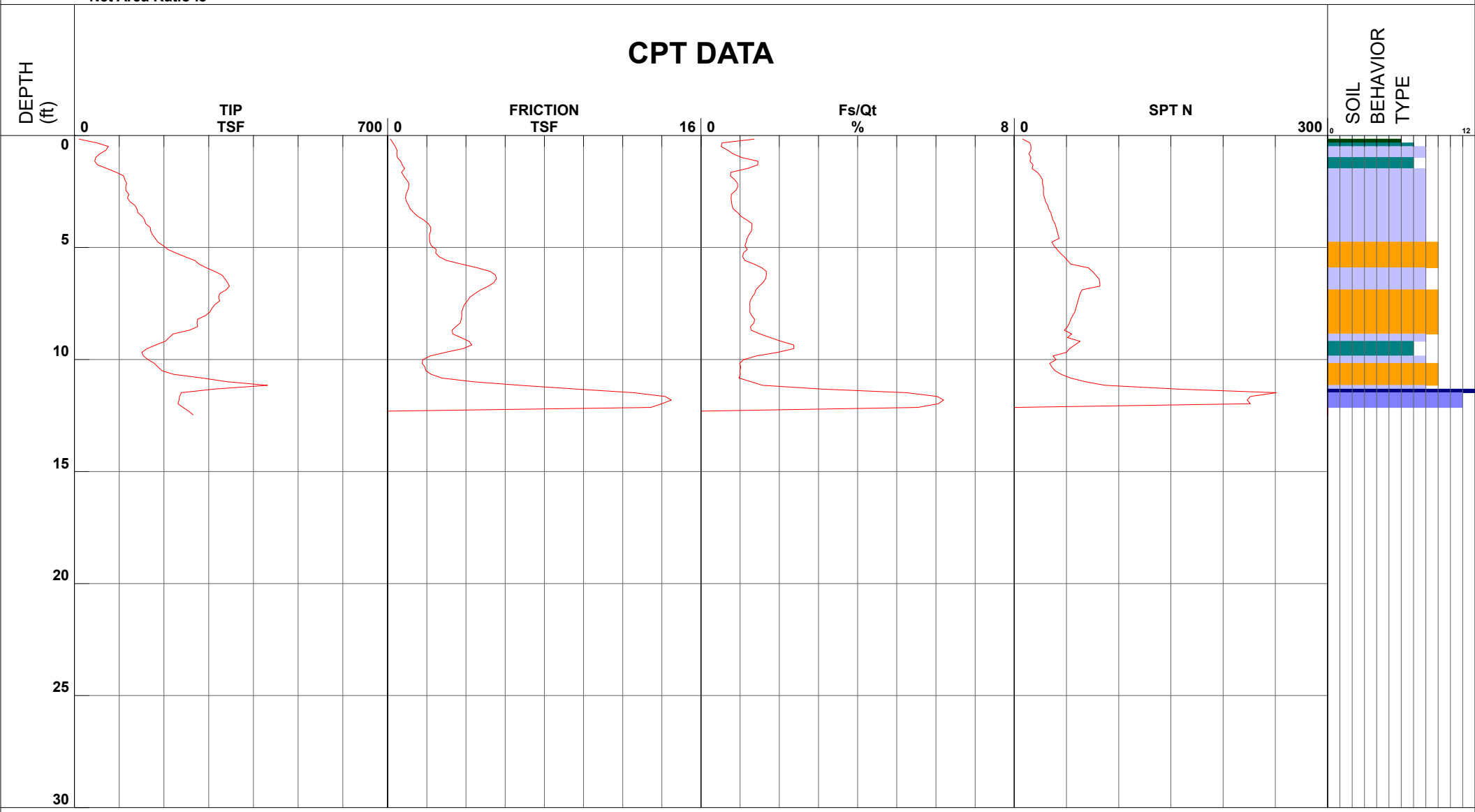
Last Edited: 8/5/2019

LGC Geotechnical Inc

Project	Richland-Stonebridge	Operator	DG-RC	Filename	SDF(300).cpt
Job Number	13092-01	Cone Number	DDG1366	GPS	
Hole Number	CPT-01	Date and Time	3/29/2016 9:42:05 AM	Maximum Depth	12.47 ft
EST GW Depth During Test		12.47 ft			

Net Area Ratio .8

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Cone Size 10cm squared

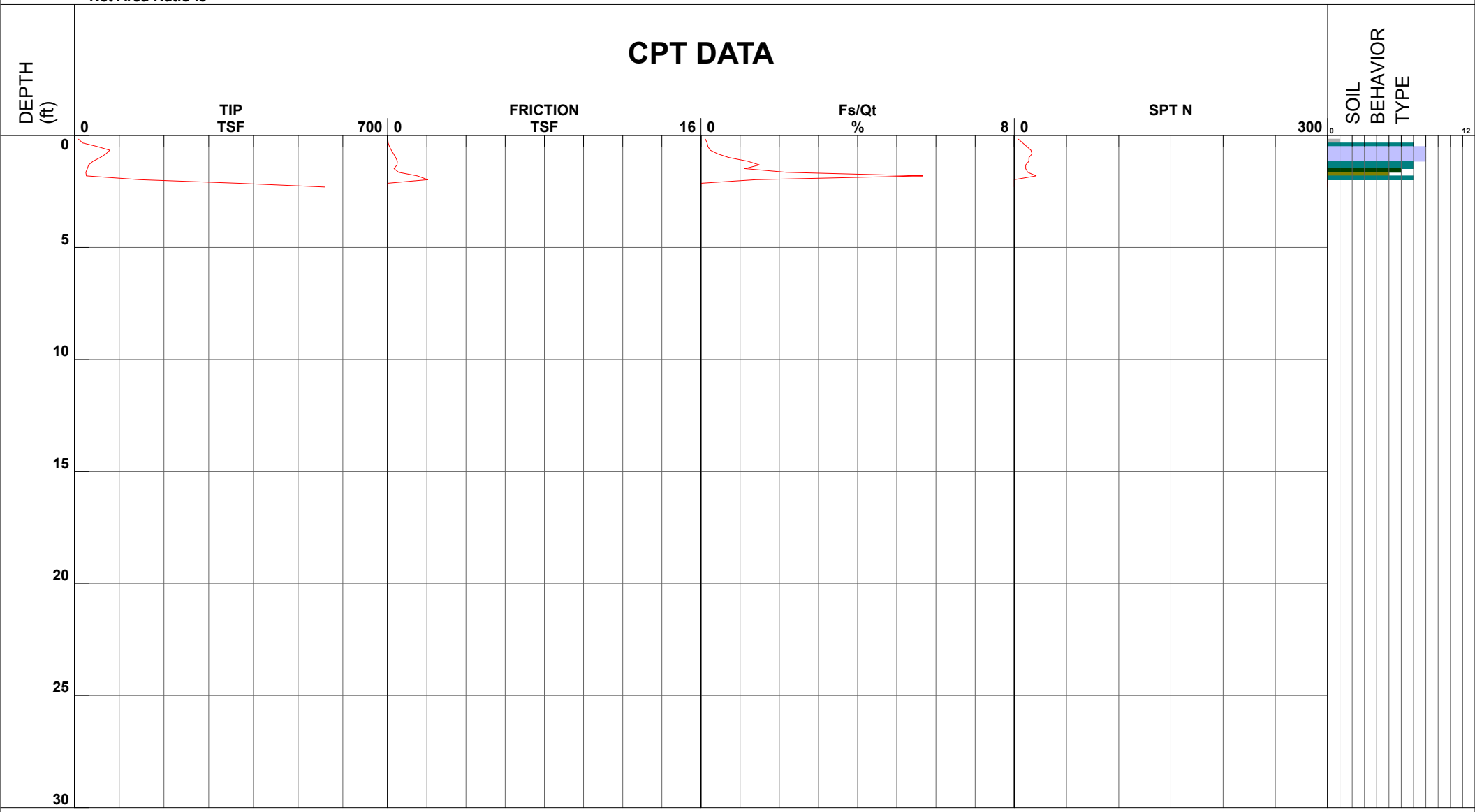
S*Soil behavior type and SPT based on data from UBC-1983

LGC Geotechnical Inc

Project	Richland-Stonebridge	Operator	DG-RC	Filename	SDF(301).cpt
Job Number	13092-01	Cone Number	DDG1366	GPS	
Hole Number	CPT-02	Date and Time	3/29/2016 10:15:30 AM	Maximum Depth	2.30 ft
EST GW Depth During Test		2.30 ft			

Net Area Ratio .8

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Cone Size 10cm squared

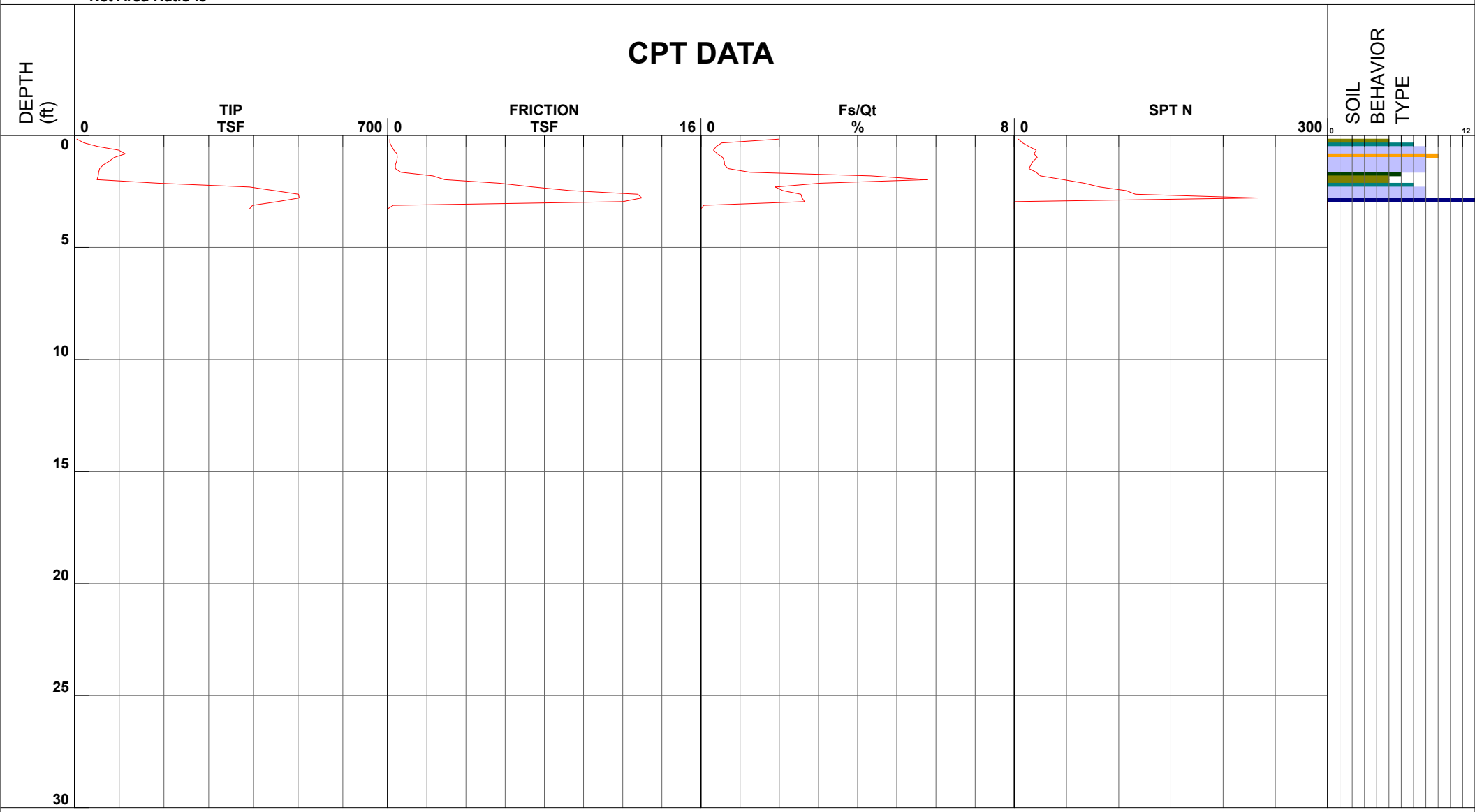
S*Soil behavior type and SPT based on data from UBC-1983

LGC Geotechnical Inc

Project	Richland-Stonebridge	Operator	DG-RC	Filename	SDF(302).cpt
Job Number	13092-01	Cone Number	DDG1366	GPS	
Hole Number	CPT-02A	Date and Time	3/29/2016 10:23:16 AM	Maximum Depth	3.28 ft
EST GW Depth During Test	3.28 ft				

Net Area Ratio .8

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Cone Size 10cm squared

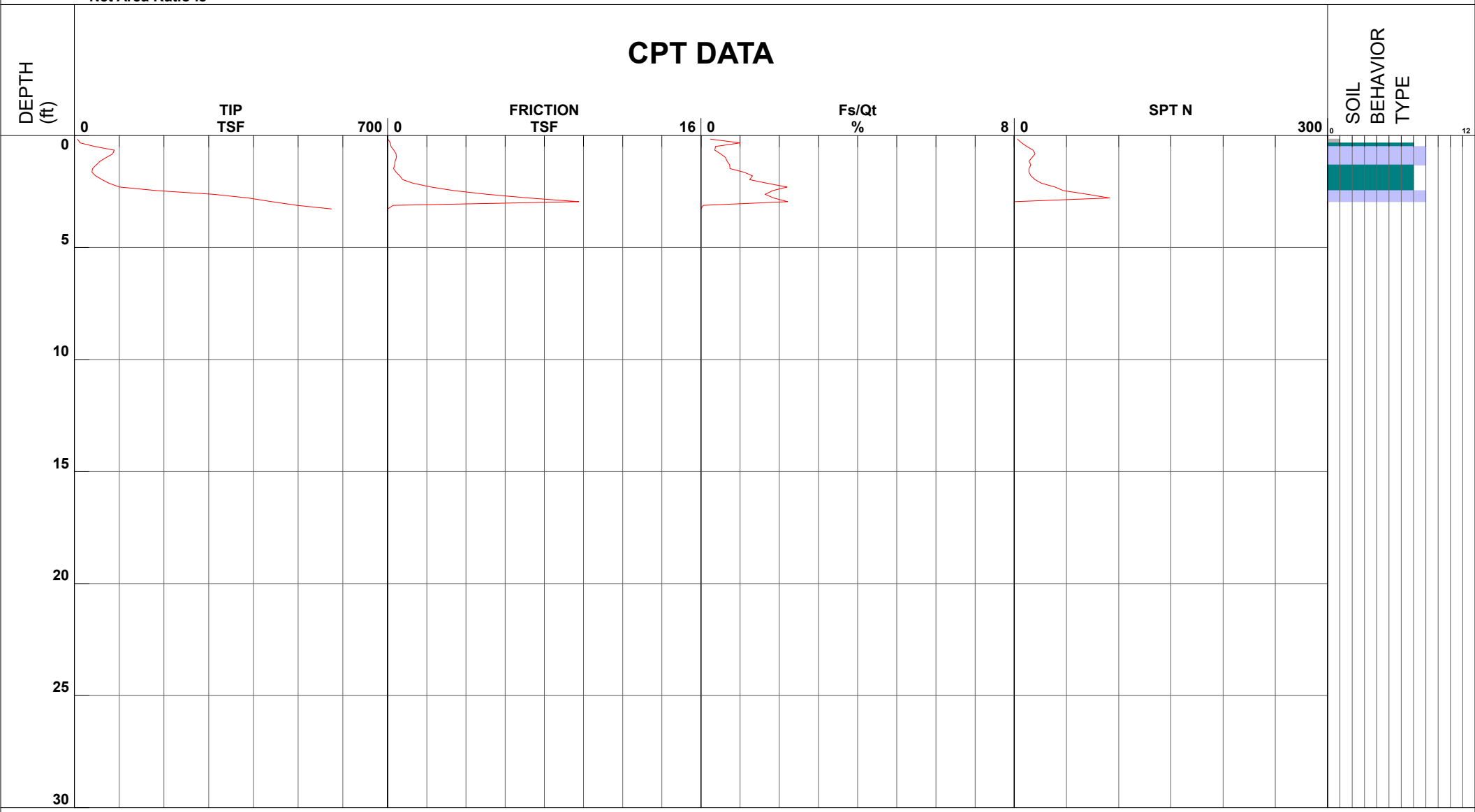
S*Soil behavior type and SPT based on data from UBC-1983

LGC Geotechnical Inc

Project	Richland-Stonebridge	Operator	DG-RC	Filename	SDF(303).cpt
Job Number	13092-01	Cone Number	DDG1366	GPS	
Hole Number	CPT-03	Date and Time	3/29/2016 10:38:10 AM	Maximum Depth	3.28 ft
EST GW Depth During Test		3.28 ft			

Net Area Ratio .8

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Cone Size 10cm squared

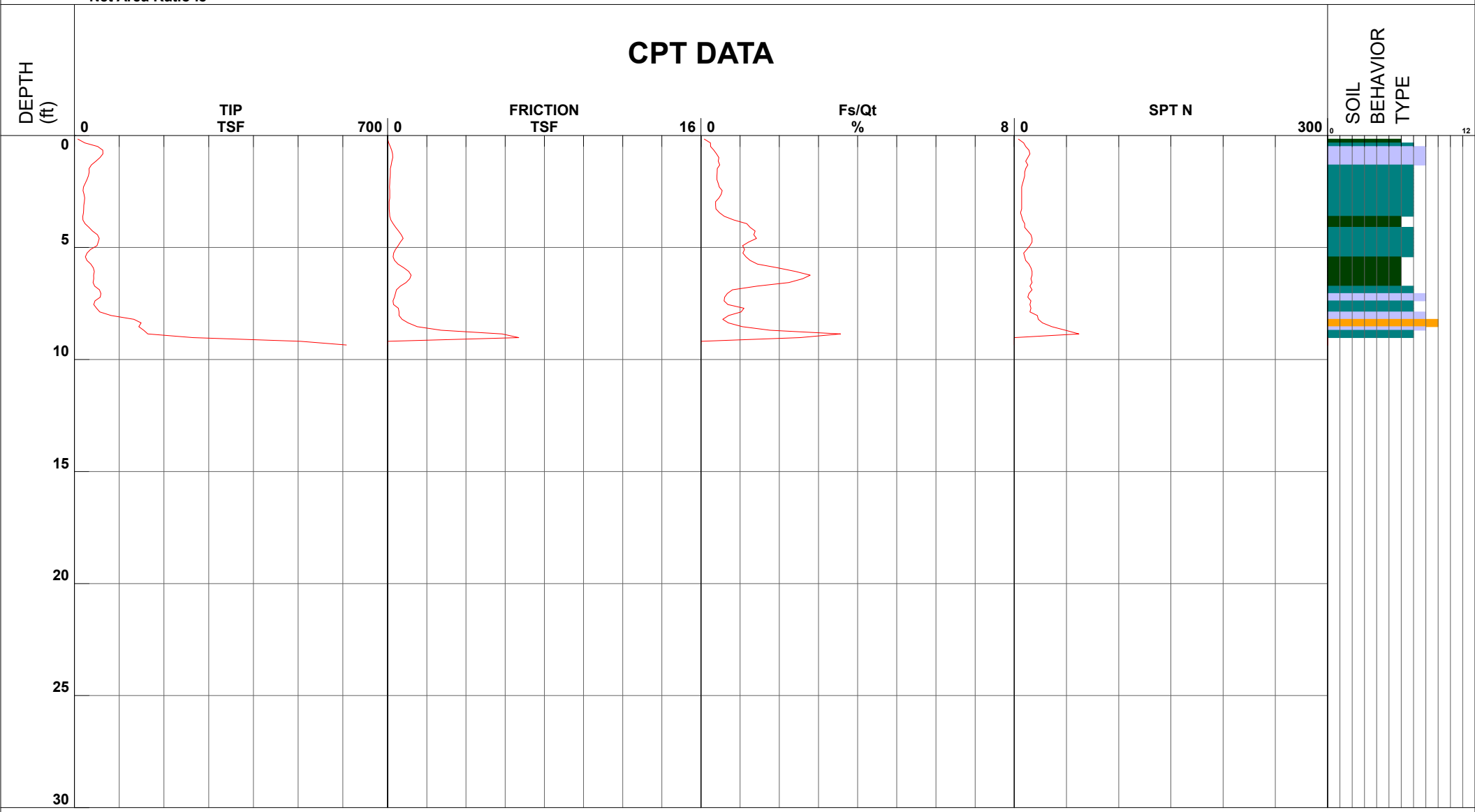
S*Soil behavior type and SPT based on data from UBC-1983

LGC Geotechnical Inc

Project	Richland-Stonebridge	Operator	DG-RC	Filename	SDF(304).cpt
Job Number	13092-01	Cone Number	DDG1366	GPS	
Hole Number	CPT-04	Date and Time	3/29/2016 10:54:59 AM	Maximum Depth	9.35 ft
EST GW Depth During Test		9.35 ft			

Net Area Ratio .8

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Cone Size 10cm squared

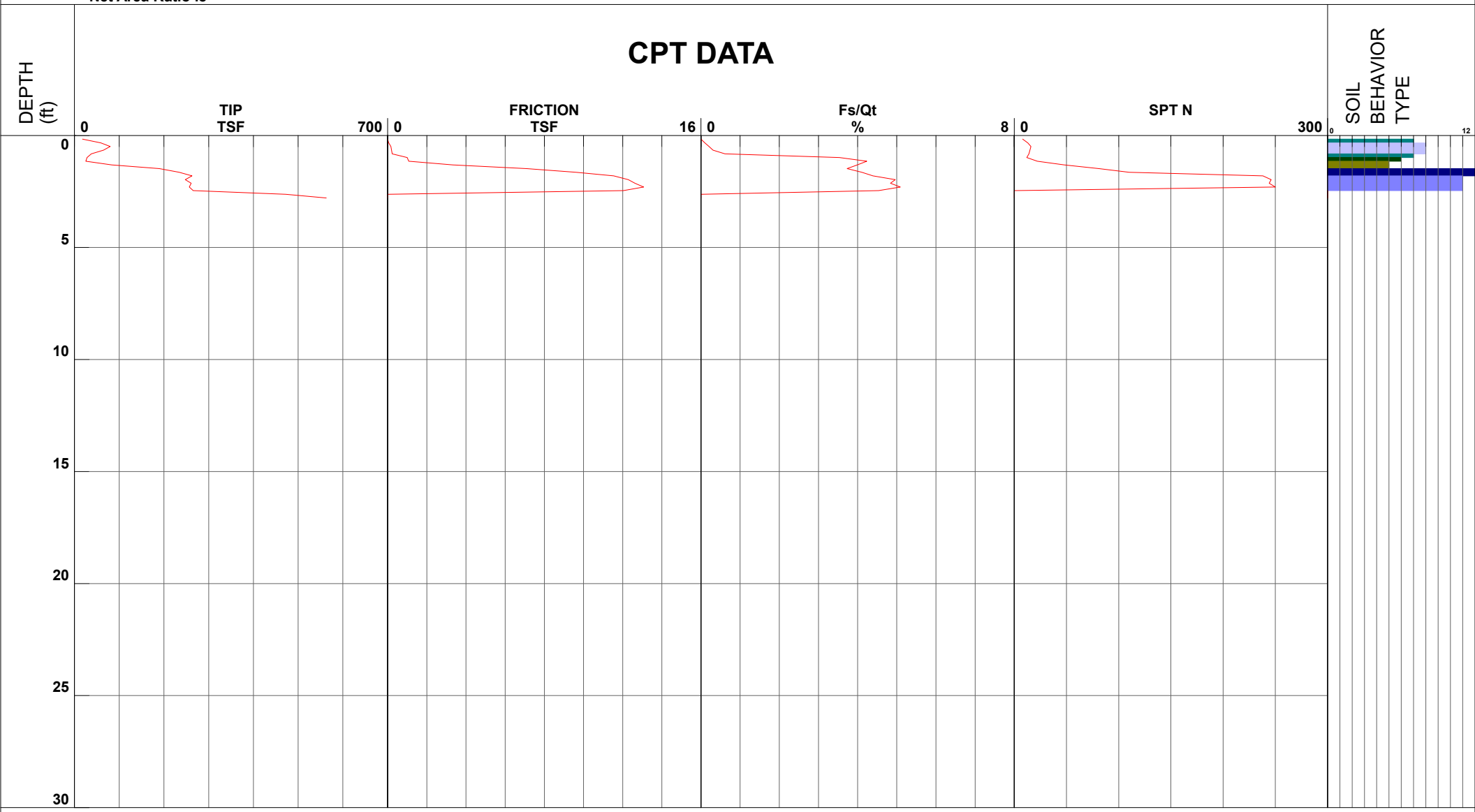
S*Soil behavior type and SPT based on data from UBC-1983

LGC Geotechnical Inc

Project	Richland-Stonebridge	Operator	DG-RC	Filename	SDF(305).cpt
Job Number	13092-01	Cone Number	DDG1366	GPS	
Hole Number	CPT-05	Date and Time	3/29/2016 11:10:58 AM	Maximum Depth	2.79 ft
EST GW Depth During Test		2.79 ft			

Net Area Ratio .8

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Cone Size 10cm squared

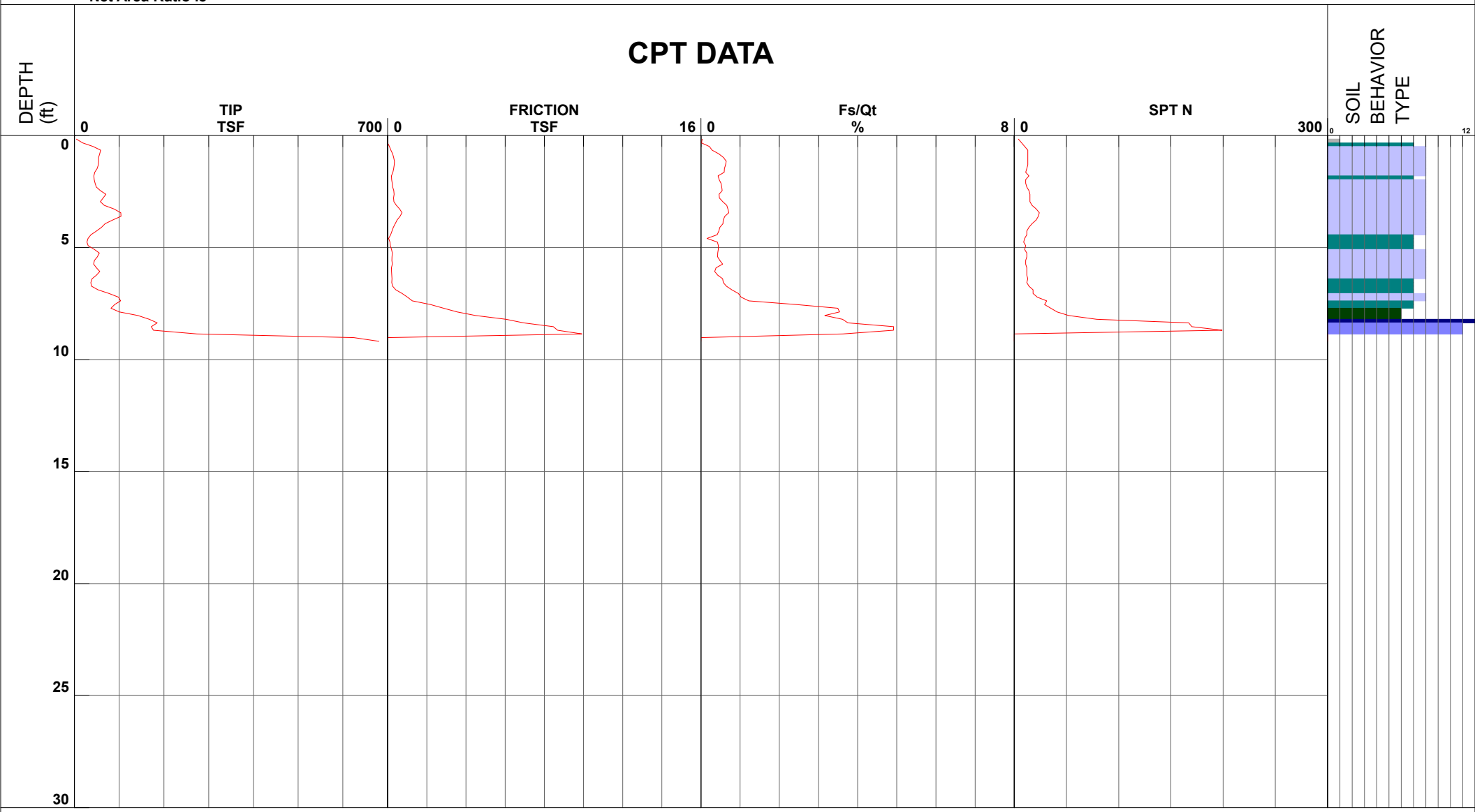
S*Soil behavior type and SPT based on data from UBC-1983

LGC Geotechnical Inc

Project	Richland-Stonebridge	Operator	DG-RC	Filename	SDF(306).cpt
Job Number	13092-01	Cone Number	DDG1366	GPS	
Hole Number	CPT-06	Date and Time	3/29/2016 11:25:18 AM	Maximum Depth	9.19 ft
EST GW Depth During Test		9.19 ft			

Net Area Ratio .8

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Cone Size 10cm squared

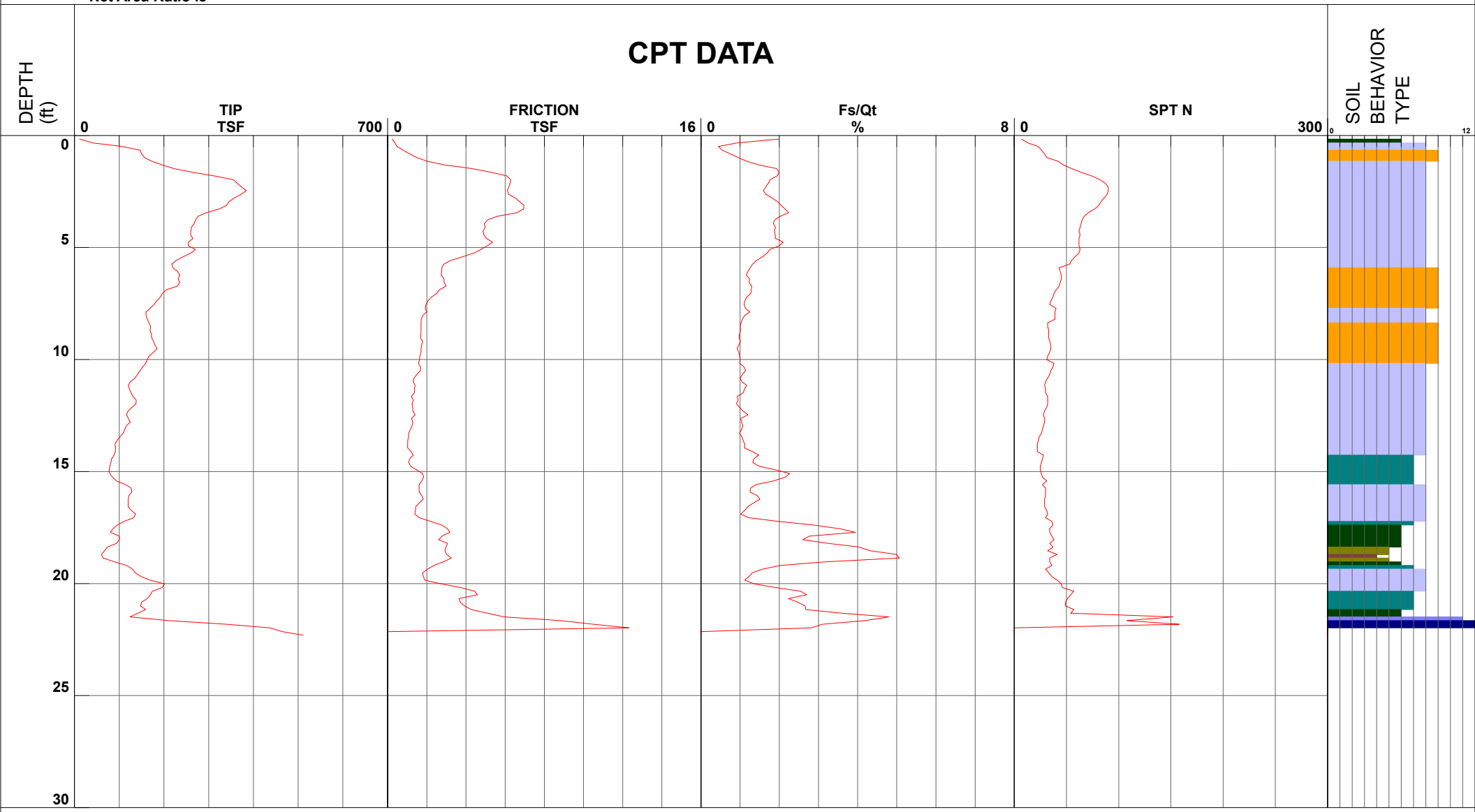
S*Soil behavior type and SPT based on data from UBC-1983

LGC Geotechnical Inc

Project	Richland-Stonebridge	Operator	DG-RC	Filename	SDF(307).cpt
Job Number	13092-01	Cone Number	DDG1366	GPS	
Hole Number	CPT-07	Date and Time	3/29/2016 11:46:18 AM	Maximum Depth	22.31 ft
EST GW Depth During Test	22.31 ft				

Net Area Ratio .8

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Cone Size 10cm squared

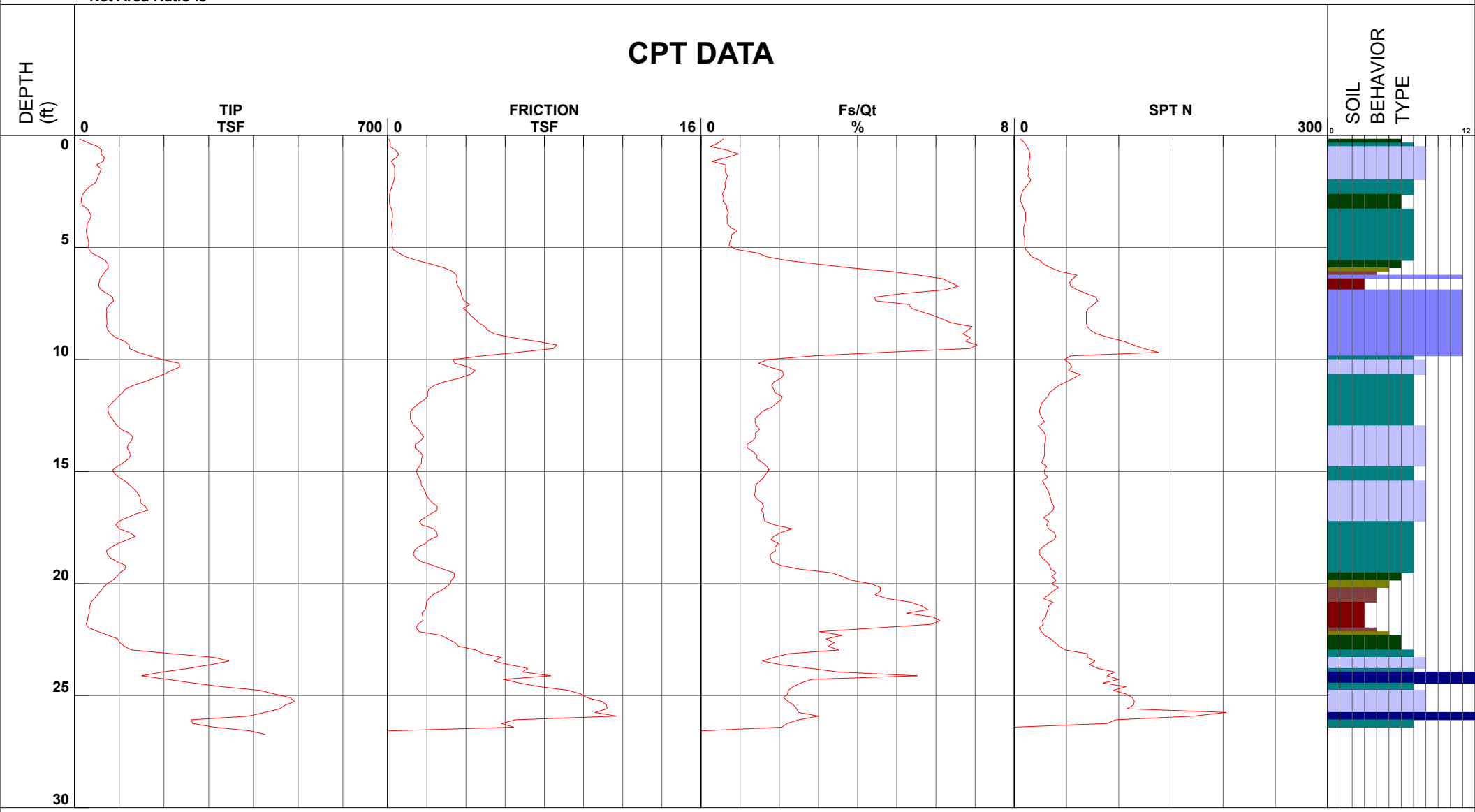
S*Soil behavior type and SPT based on data from UBC-1983

LGC Geotechnical Inc

Project	Richland-Stonebridge	Operator	DG-RC	Filename	SDF(308).cpt
Job Number	13092-01	Cone Number	DDG1366	GPS	
Hole Number	CPT-08	Date and Time	3/29/2016 12:17:43 PM	Maximum Depth	26.74 ft
EST GW Depth During Test		26.74 ft			

Net Area Ratio .8

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Cone Size 10cm squared

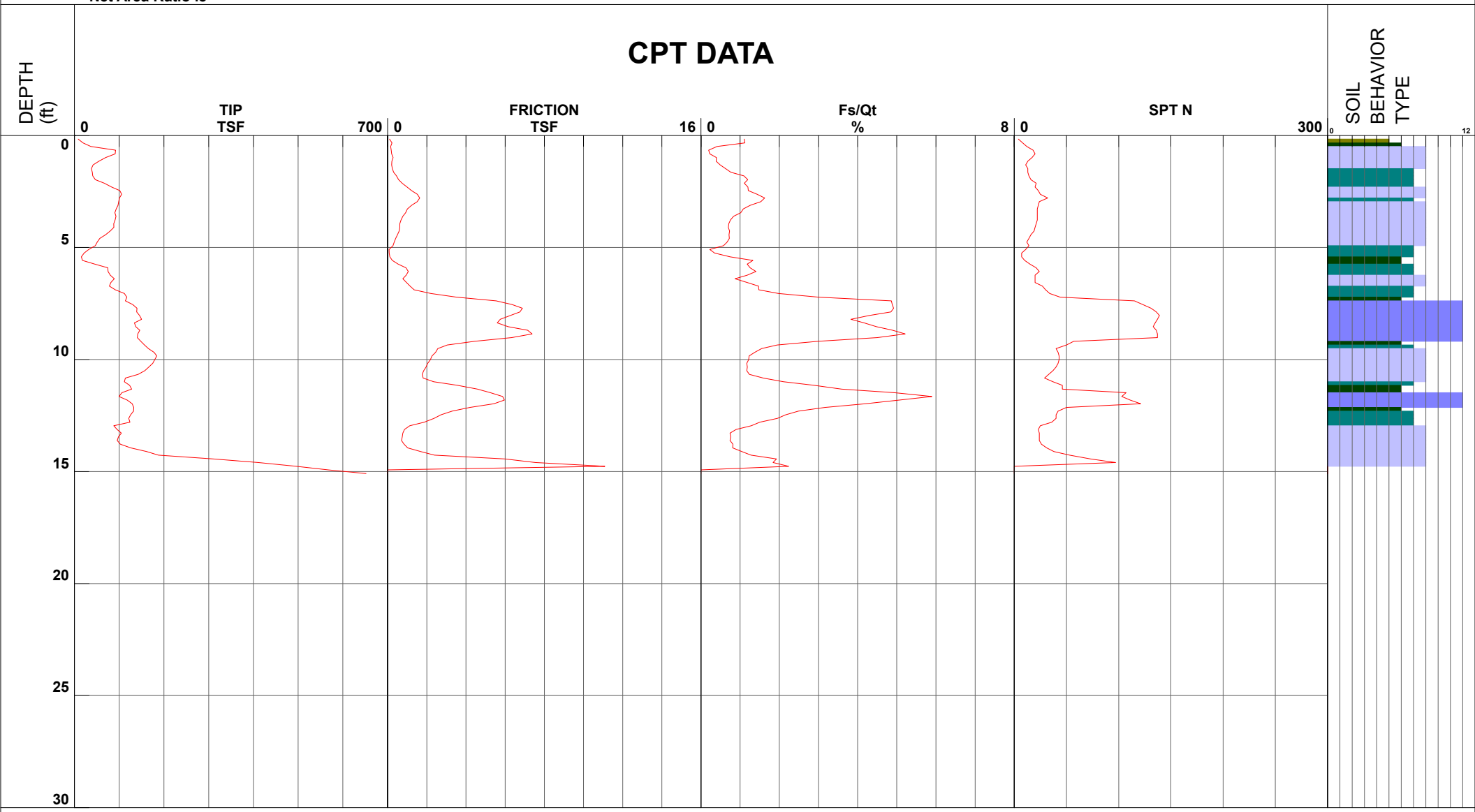
S*Soil behavior type and SPT based on data from UBC-1983

LGC Geotechnical Inc

Project	Richland-Stonebridge	Operator	DG-RC	Filename	SDF(309).cpt
Job Number	13092-01	Cone Number	DDG1366	GPS	
Hole Number	CPT-09	Date and Time	3/29/2016 12:49:30 PM	Maximum Depth	15.09 ft
EST GW Depth During Test		15.09 ft			

Net Area Ratio .8

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Cone Size 10cm squared

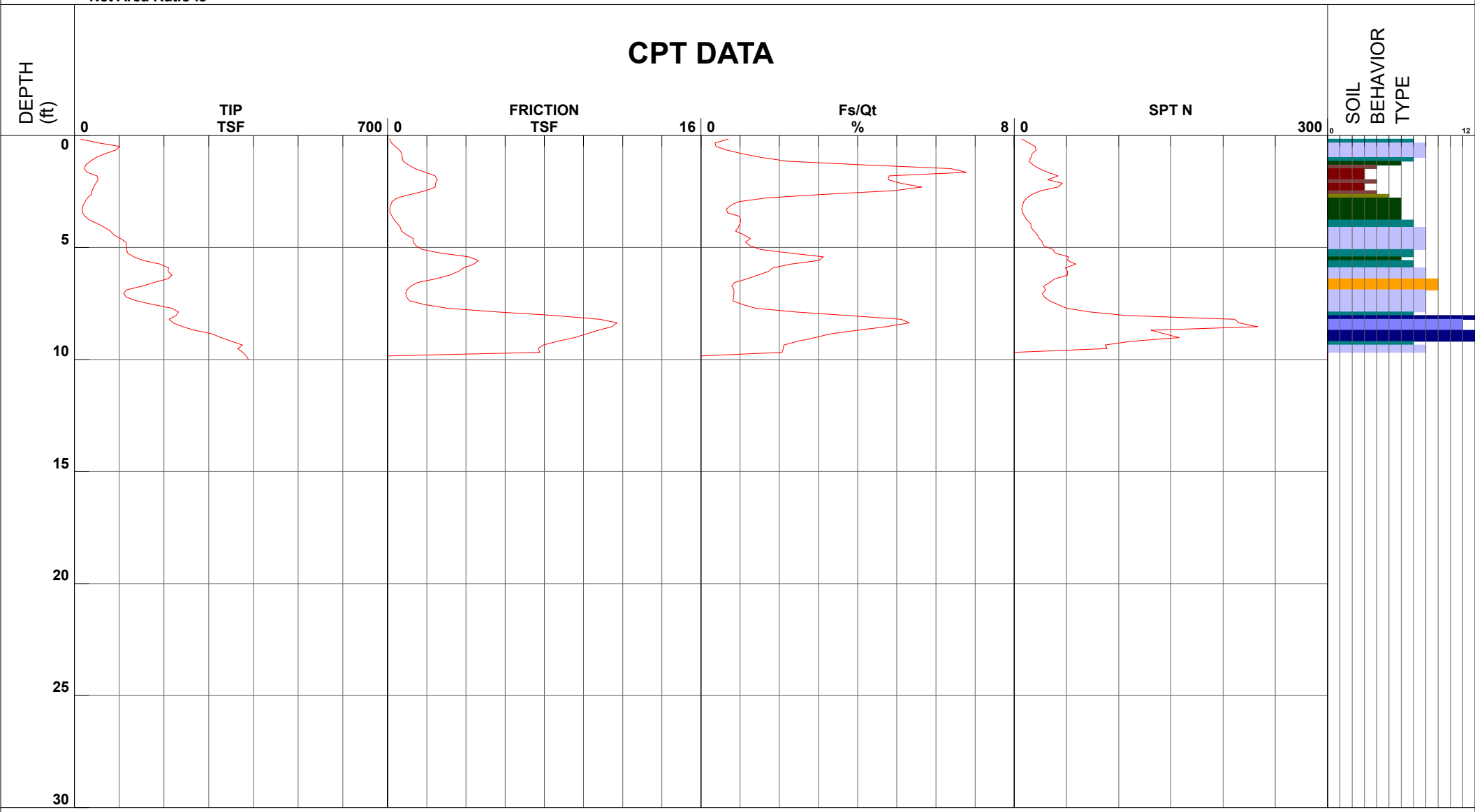
S*Soil behavior type and SPT based on data from UBC-1983

LGC Geotechnical Inc

Project	Richland-Stonebridge	Operator	DG-RC	Filename	SDF(310).cpt
Job Number	13092-01	Cone Number	DDG1366	GPS	
Hole Number	CPT-10	Date and Time	3/29/2016 1:10:41 PM	Maximum Depth	10.01 ft
EST GW Depth During Test		10.01 ft			

Net Area Ratio .8

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Cone Size 10cm squared

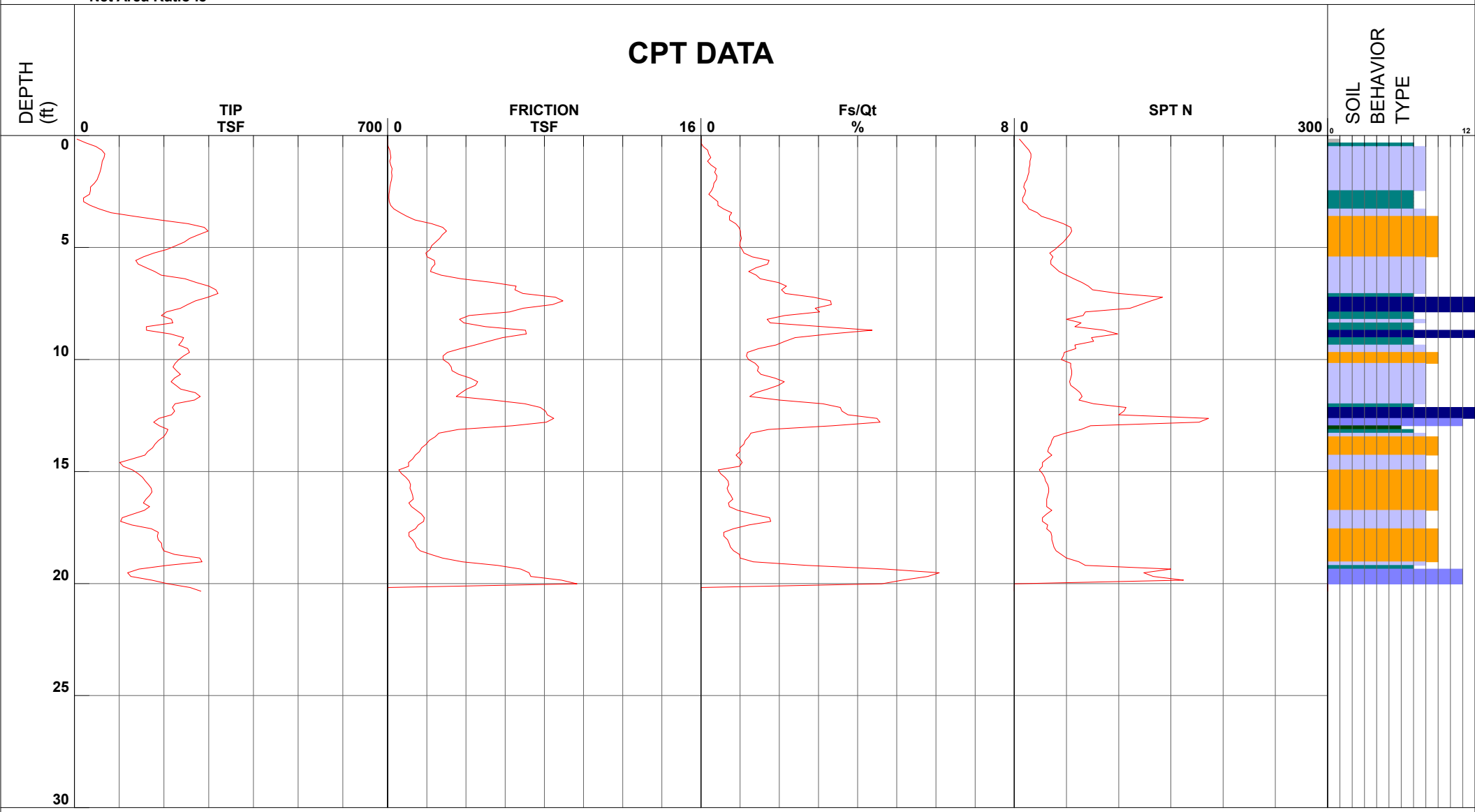
S*Soil behavior type and SPT based on data from UBC-1983

LGC Geotechnical Inc

Project	Richland-Stonebridge	Operator	DG-RC	Filename	SDF(311).cpt
Job Number	13092-01	Cone Number	DDG1366	GPS	
Hole Number	CPT-11	Date and Time	3/29/2016 1:52:16 PM	Maximum Depth	20.34 ft
EST GW Depth During Test		20.34 ft			

Net Area Ratio .8

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Cone Size 10cm squared

S*Soil behavior type and SPT based on data from UBC-1983

GREGG DRILLING, INC.
www.greggdrilling.com

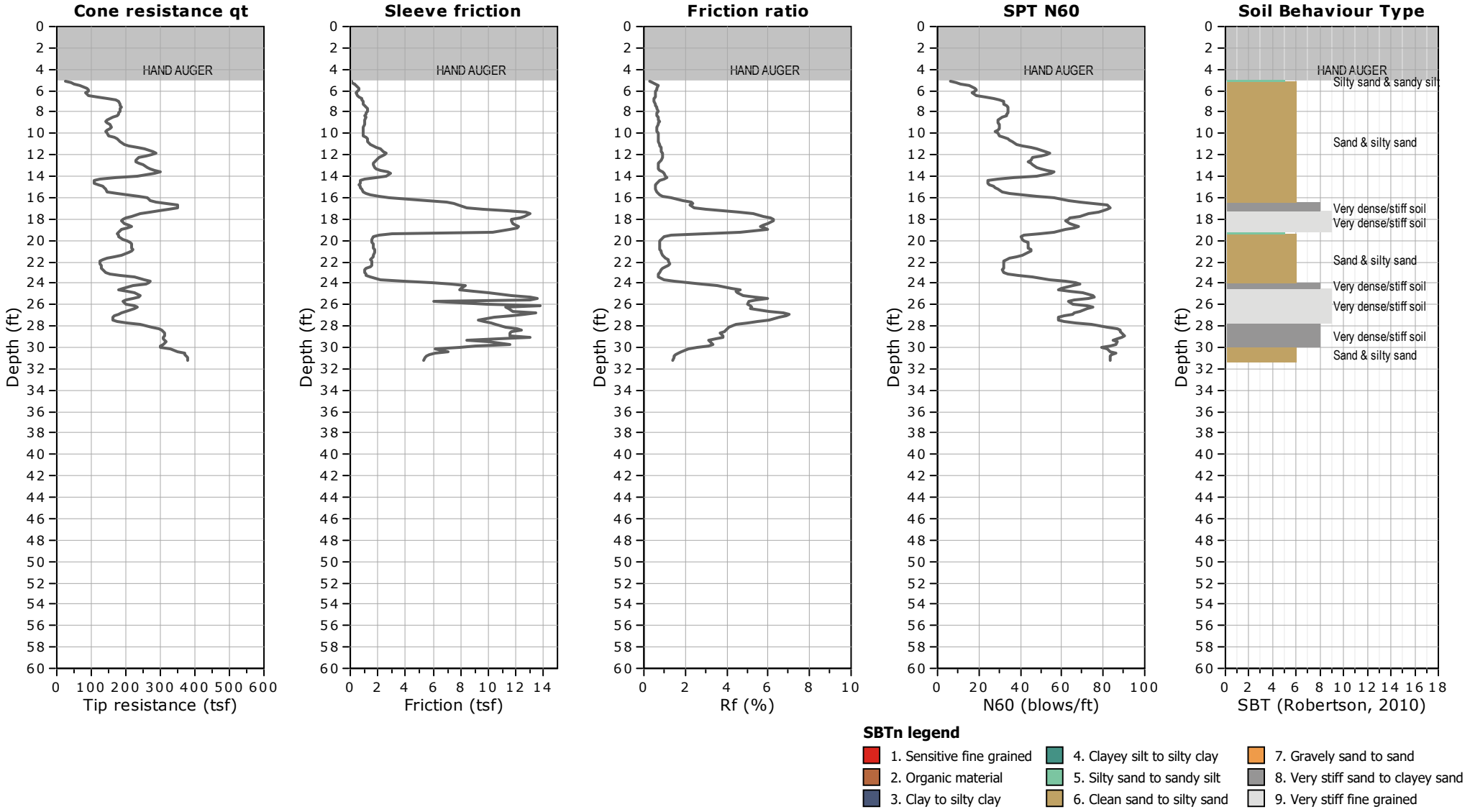
CPT: CPT-12

CLIENT: LGC GEOTECHNICAL INC.

FIELD REP: BRANDON

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

Total depth: 31.17 ft, Date: 6/25/2019



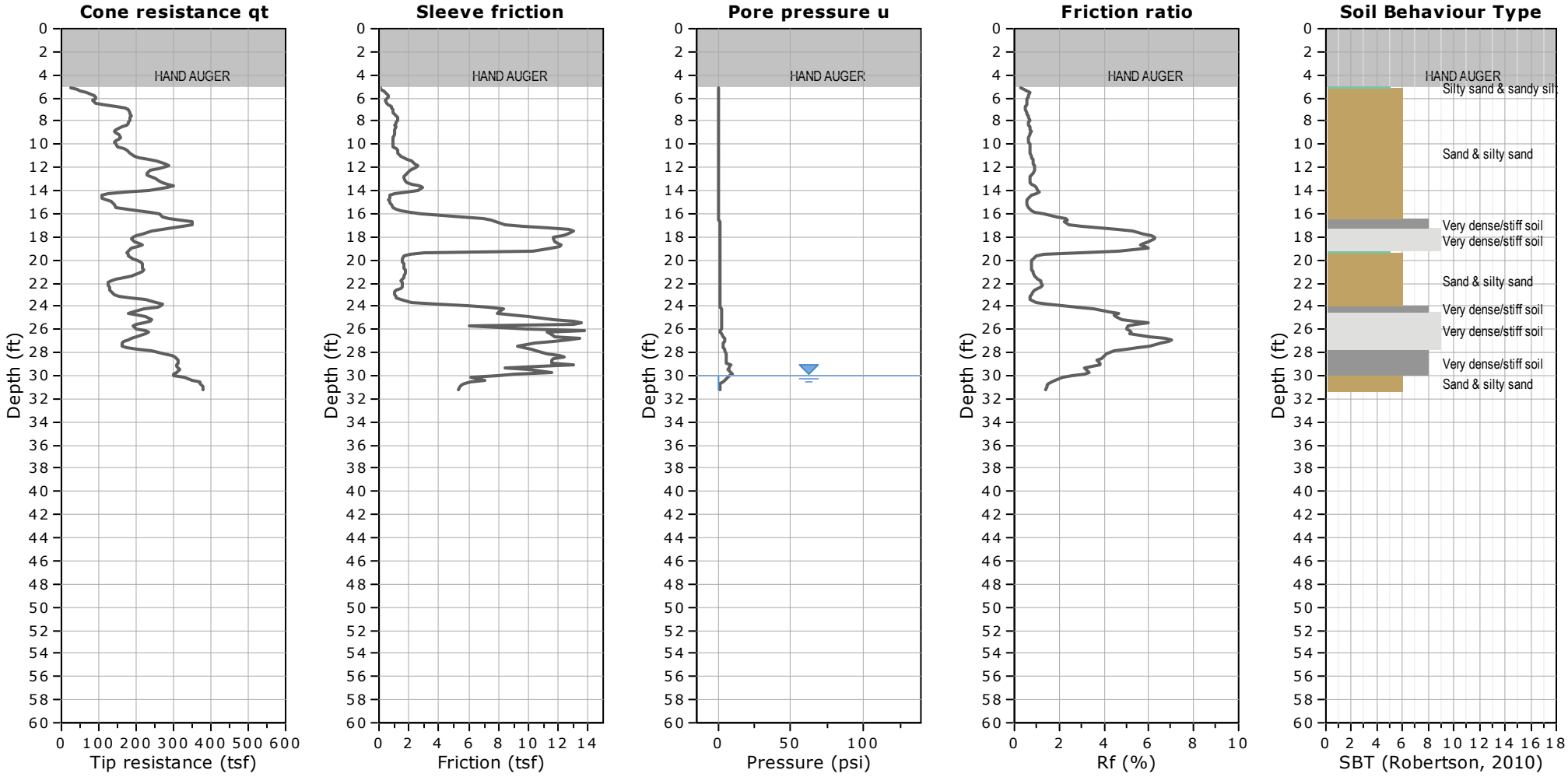
CPT: CPT-12

CLIENT: LGC GEOTECHNICAL INC.

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

Field Rep: BRANDON

Total depth: 31.17 ft, Date: 6/25/2019



WATER TABLE FOR ESTIMATING PURPOSES ONLY

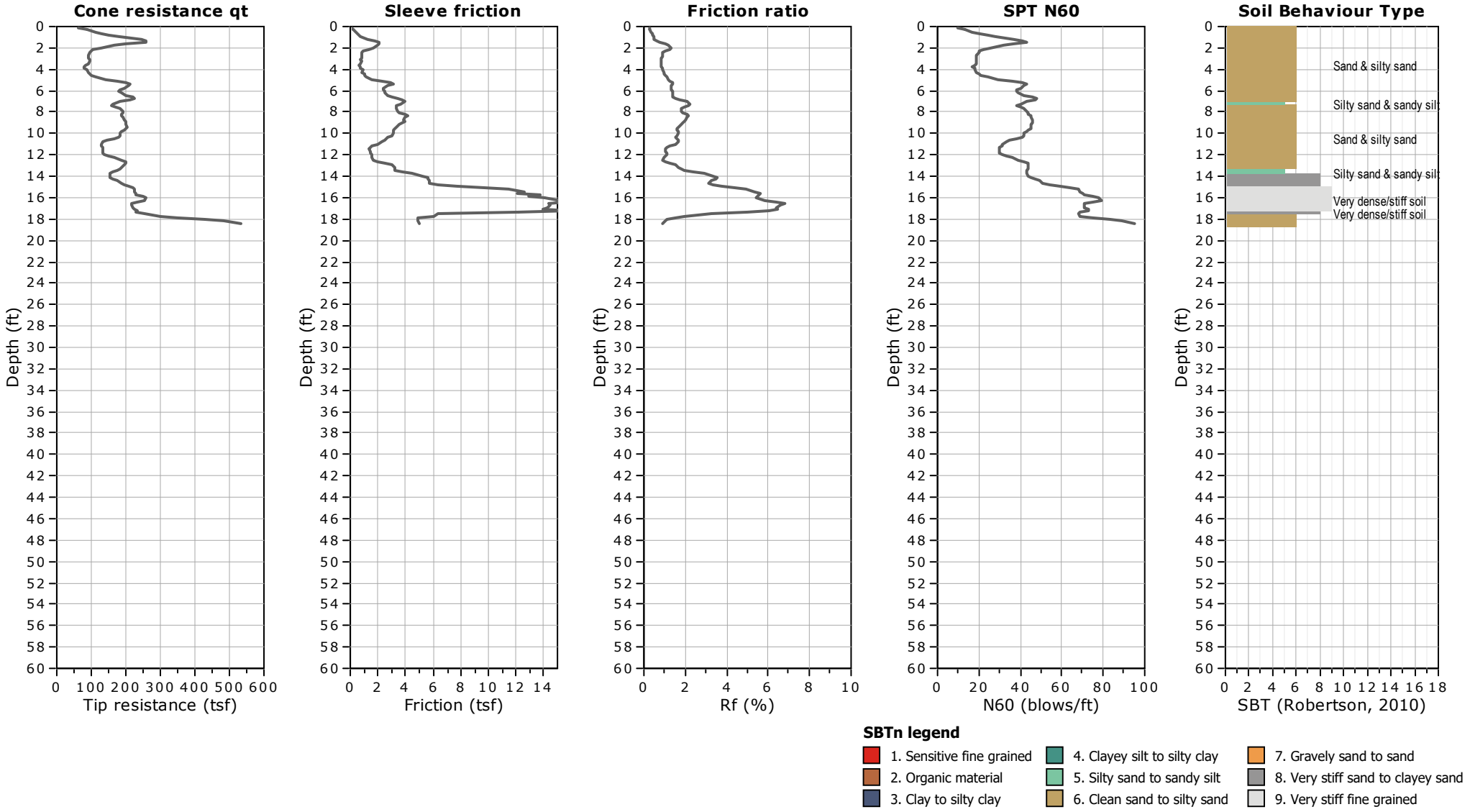
CPT: CPT-13

CLIENT: LGC GEOTECHNICAL INC.

FIELD REP: BRANDON

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

Total depth: 18.37 ft, Date: 6/25/2019



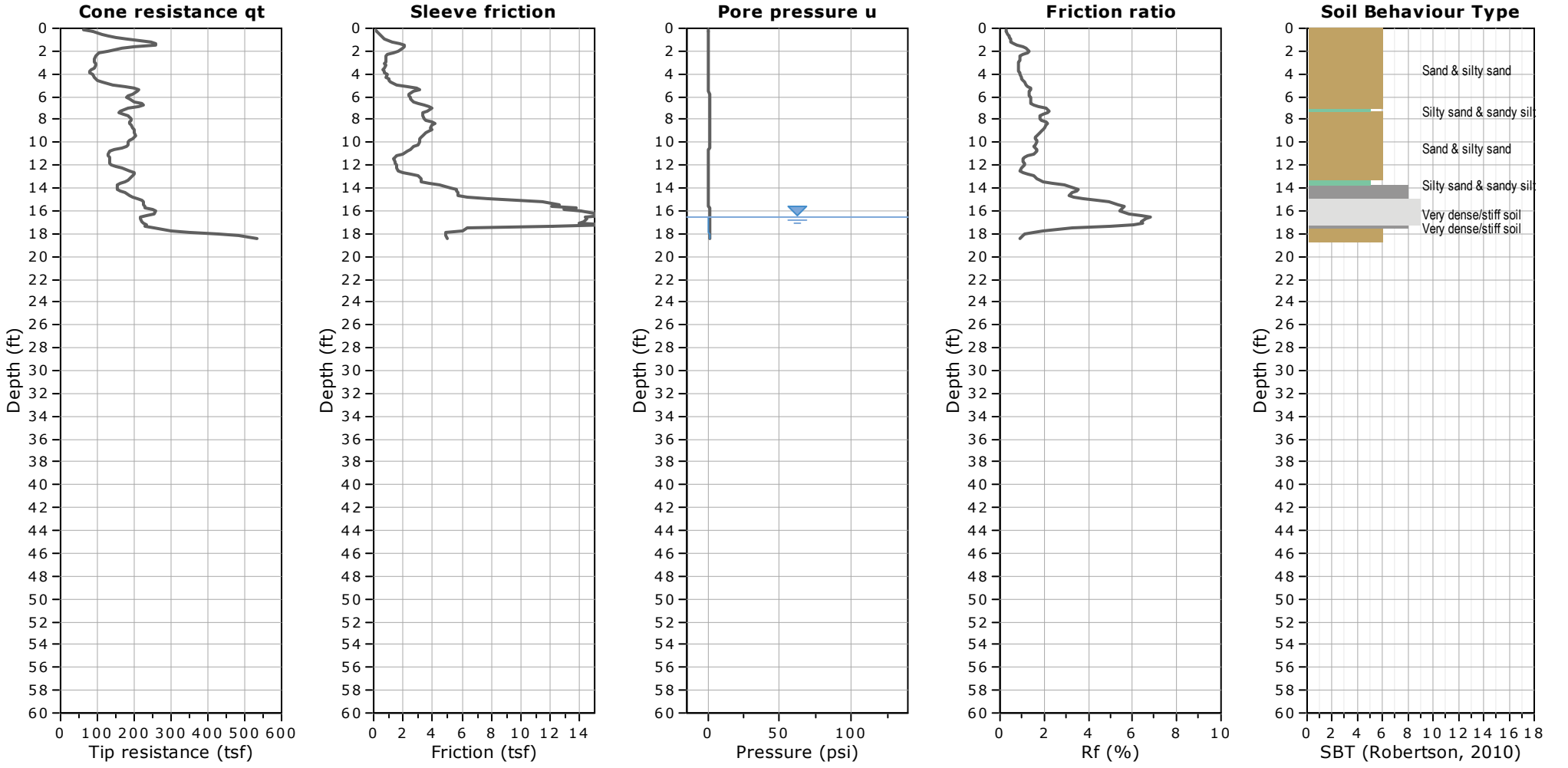
CPT: CPT-13

CLIENT: LGC GEOTECHNICAL INC.

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

Field Rep: BRANDON

Total depth: 18.37 ft, Date: 6/25/2019



WATER TABLE FOR ESTIMATING PURPOSES ONLY

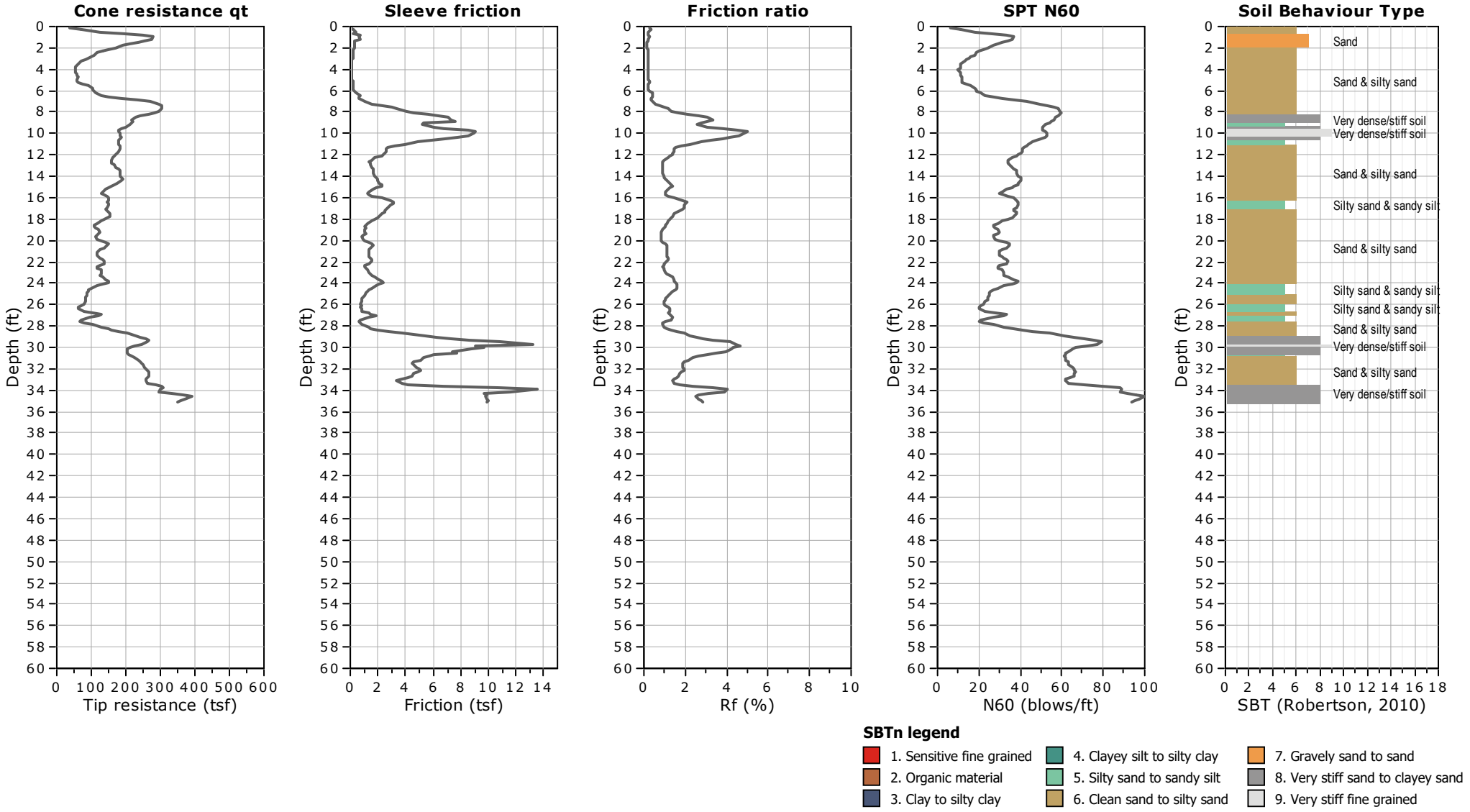
CPT: CPT-14

CLIENT: LGC GEOTECHNICAL INC.

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

FIELD REP: BRANDON

Total depth: 35.10 ft, Date: 6/25/2019



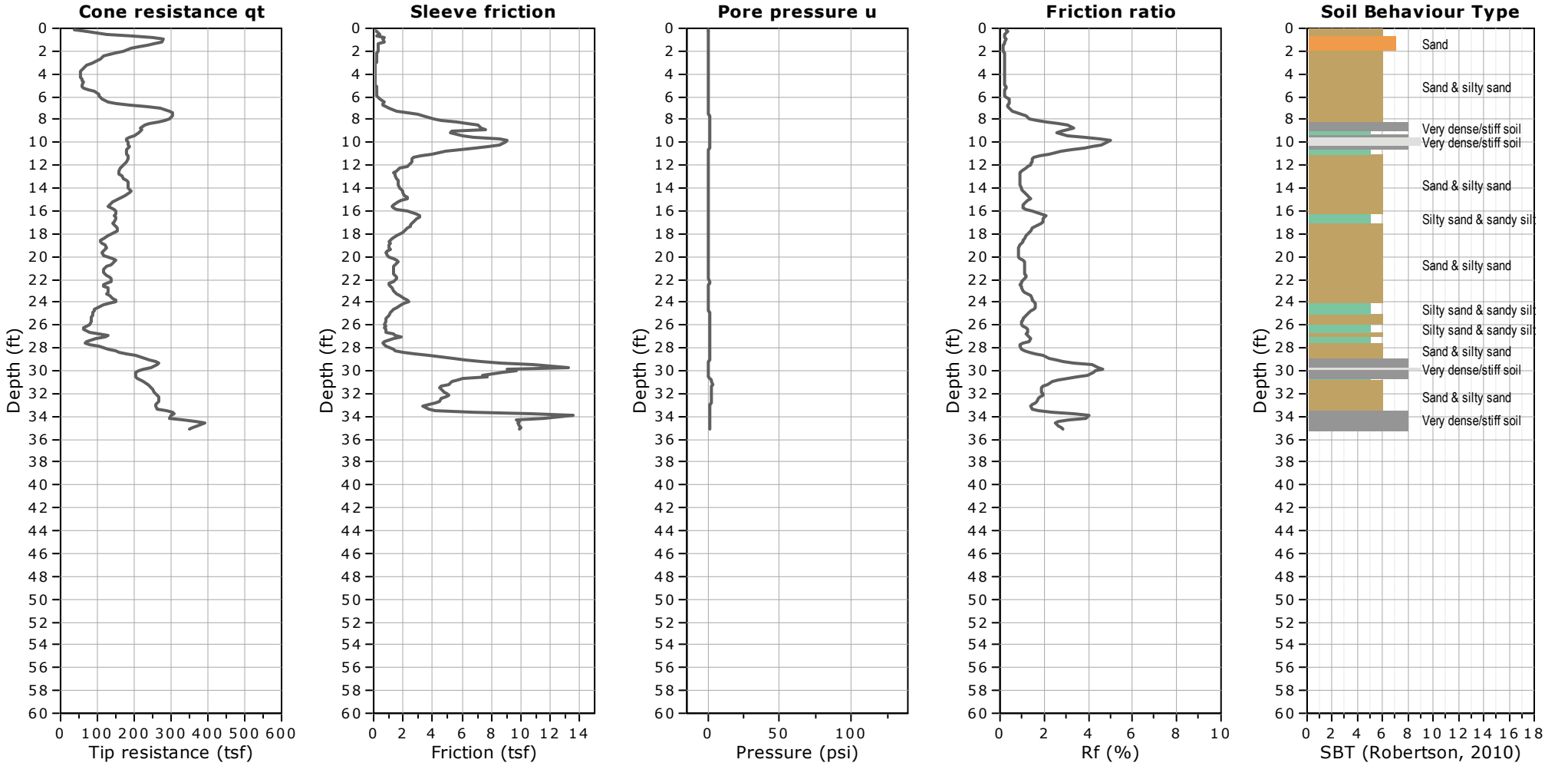
CPT: CPT-14

CLIENT: LGC GEOTECHNICAL INC.

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

Field Rep: BRANDON

Total depth: 35.10 ft, Date: 6/25/2019



WATER TABLE FOR ESTIMATING PURPOSES ONLY

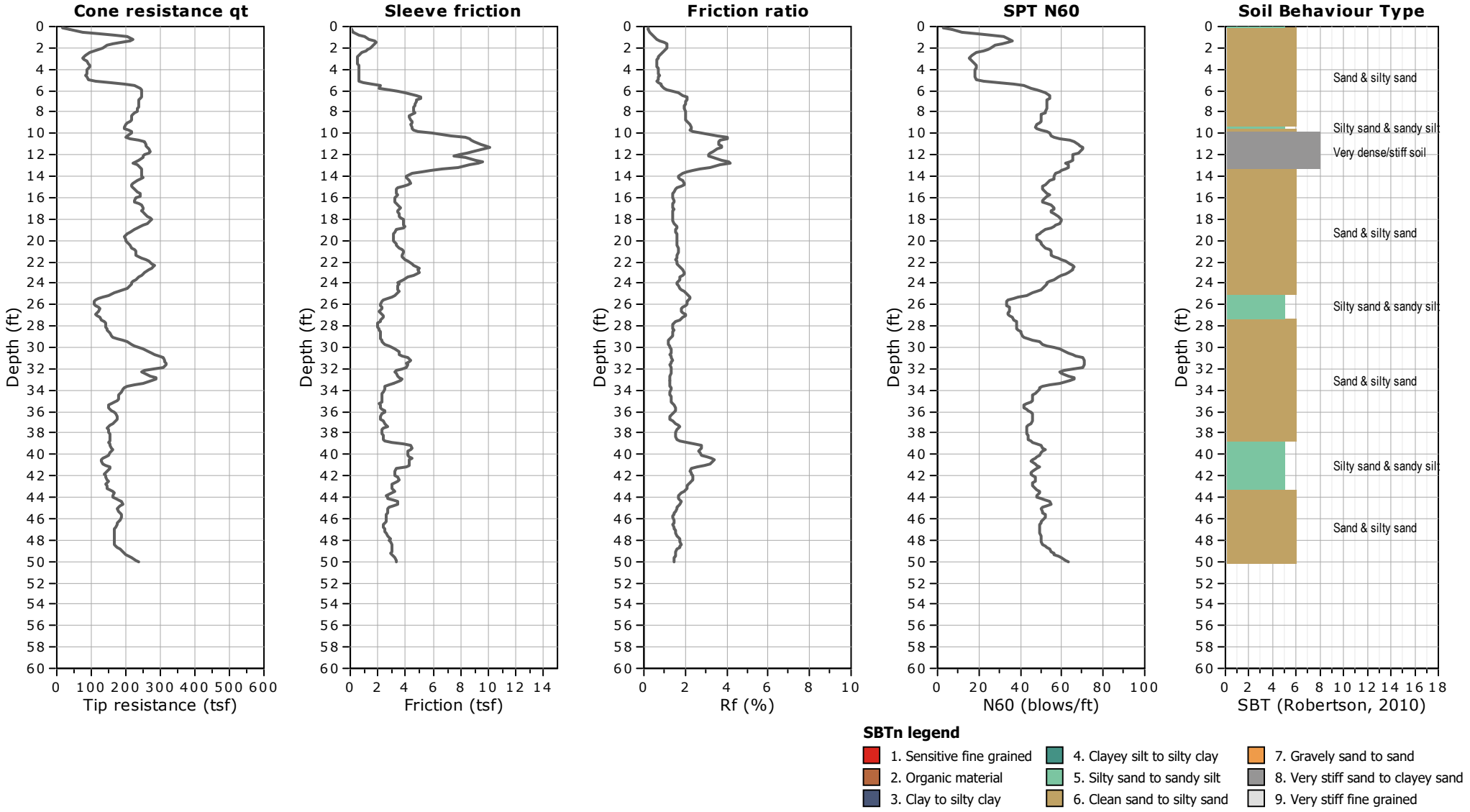
CPT: CPT-15

CLIENT: LGC GEOTECHNICAL INC.

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

FIELD REP: BRANDON

Total depth: 50.03 ft, Date: 6/25/2019



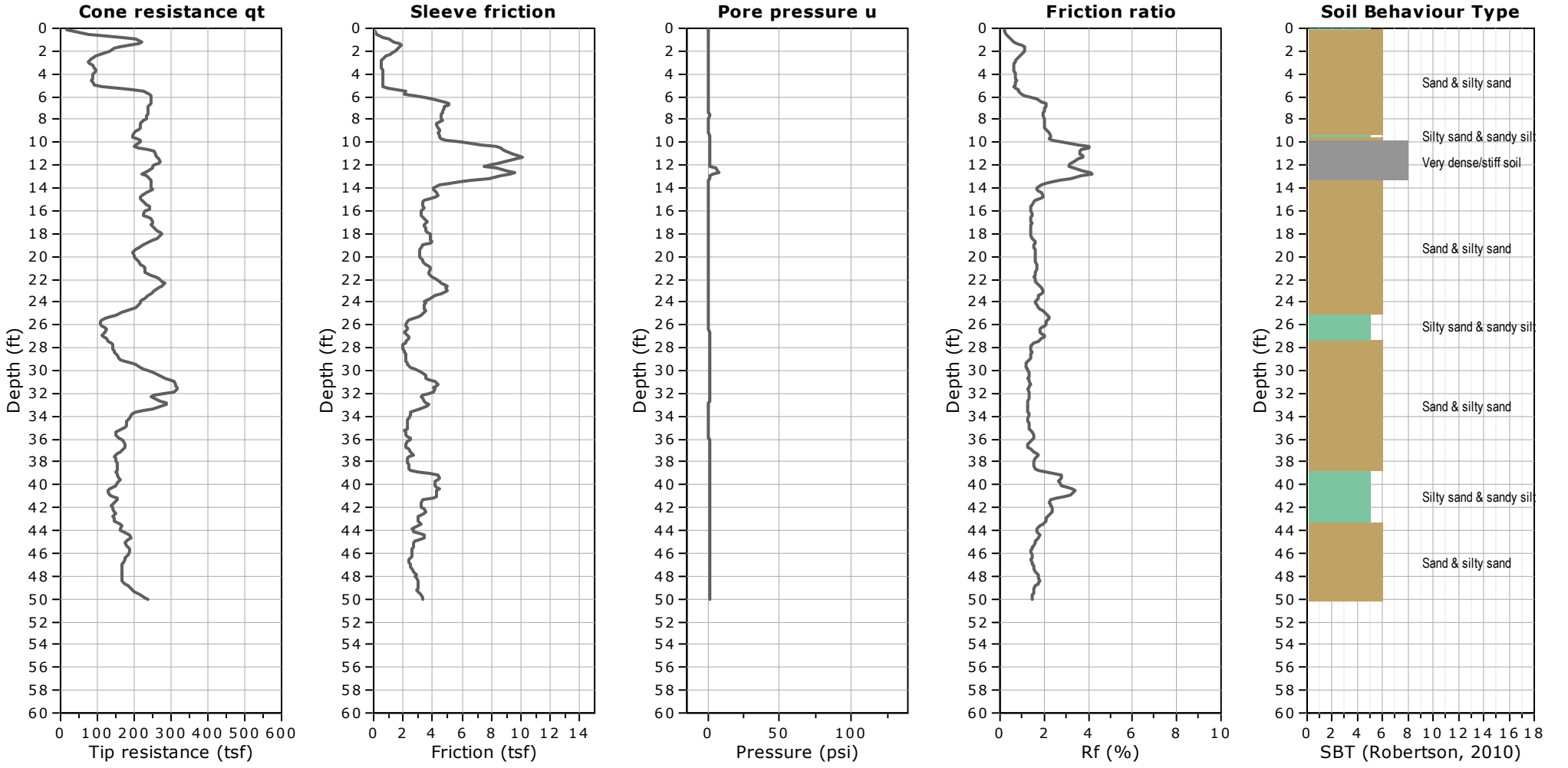
CPT: CPT-15

CLIENT: LGC GEOTECHNICAL INC.

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

Field Rep: BRANDON

Total depth: 50.03 ft, Date: 6/25/2019



WATER TABLE FOR ESTIMATING PURPOSES ONLY

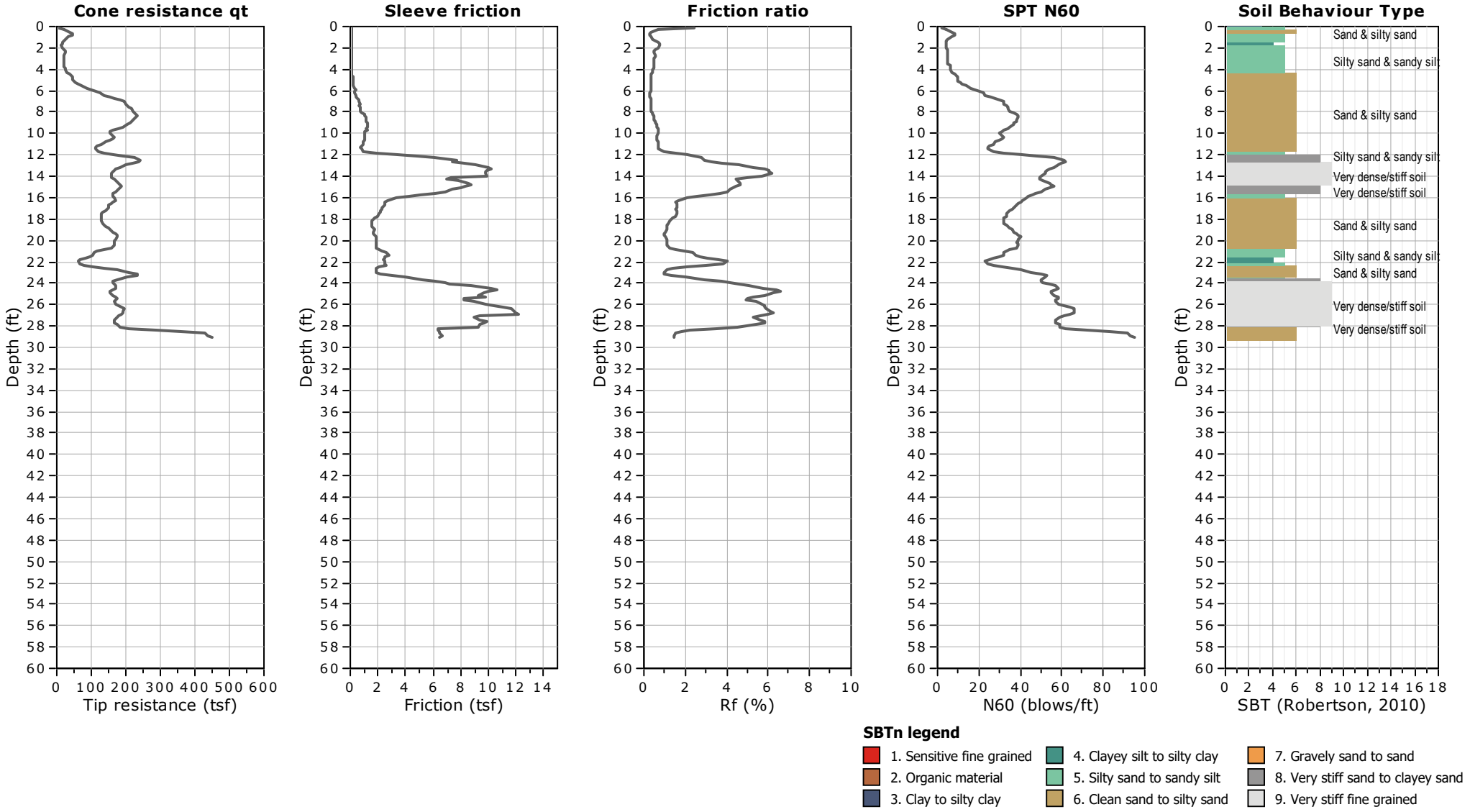
CPT: CPT-16

CLIENT: LGC GEOTECHNICAL INC.

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

FIELD REP: BRANDON

Total depth: 29.04 ft, Date: 6/25/2019



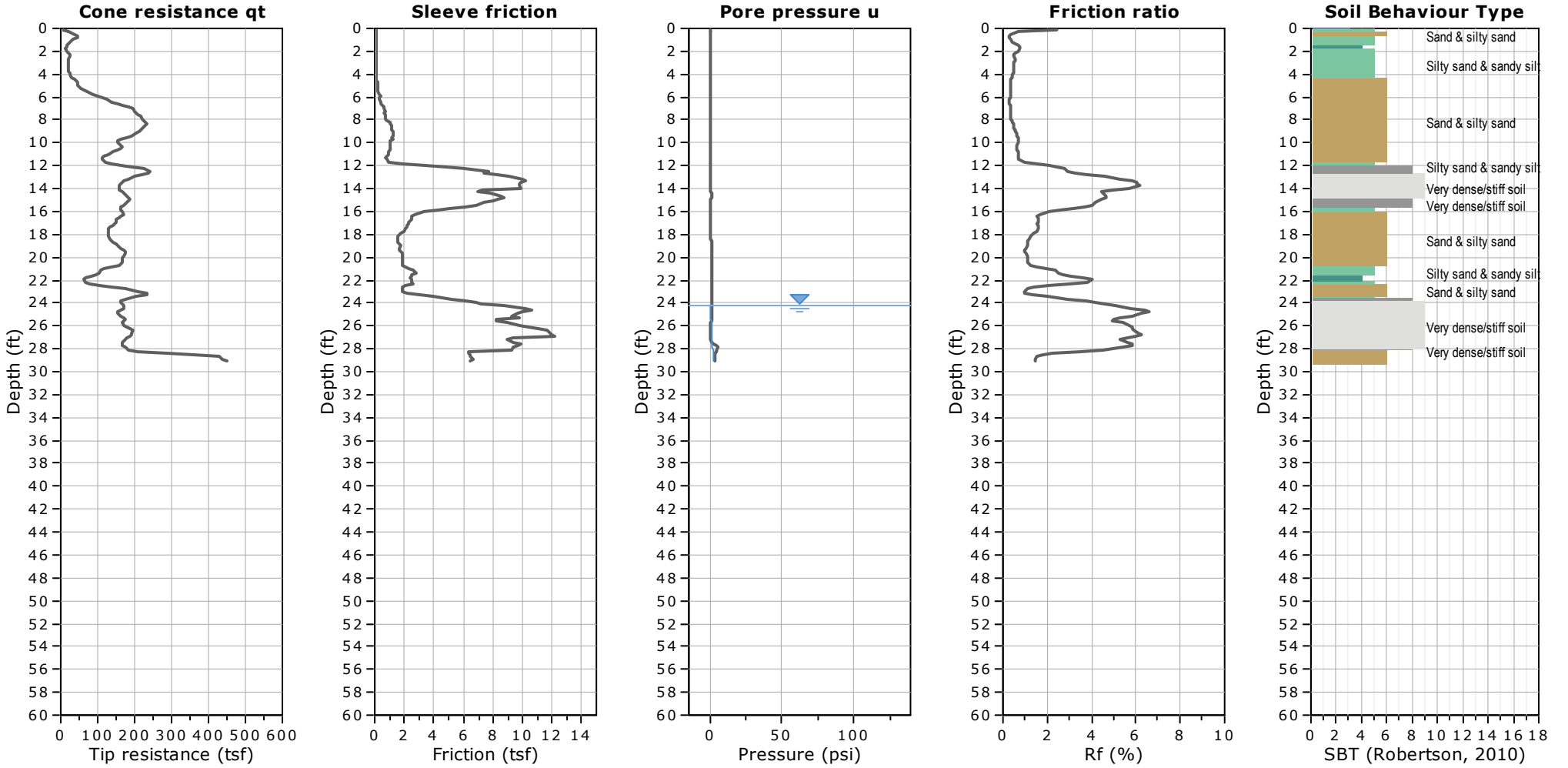
CPT: CPT-16

CLIENT: LGC GEOTECHNICAL INC.

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

Field Rep: BRANDON

Total depth: 29.04 ft, Date: 6/25/2019



SBTn legend

1. Sensitive fine grained	4. Clayey silt to silty clay	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

WATER TABLE FOR ESTIMATING PURPOSES ONLY

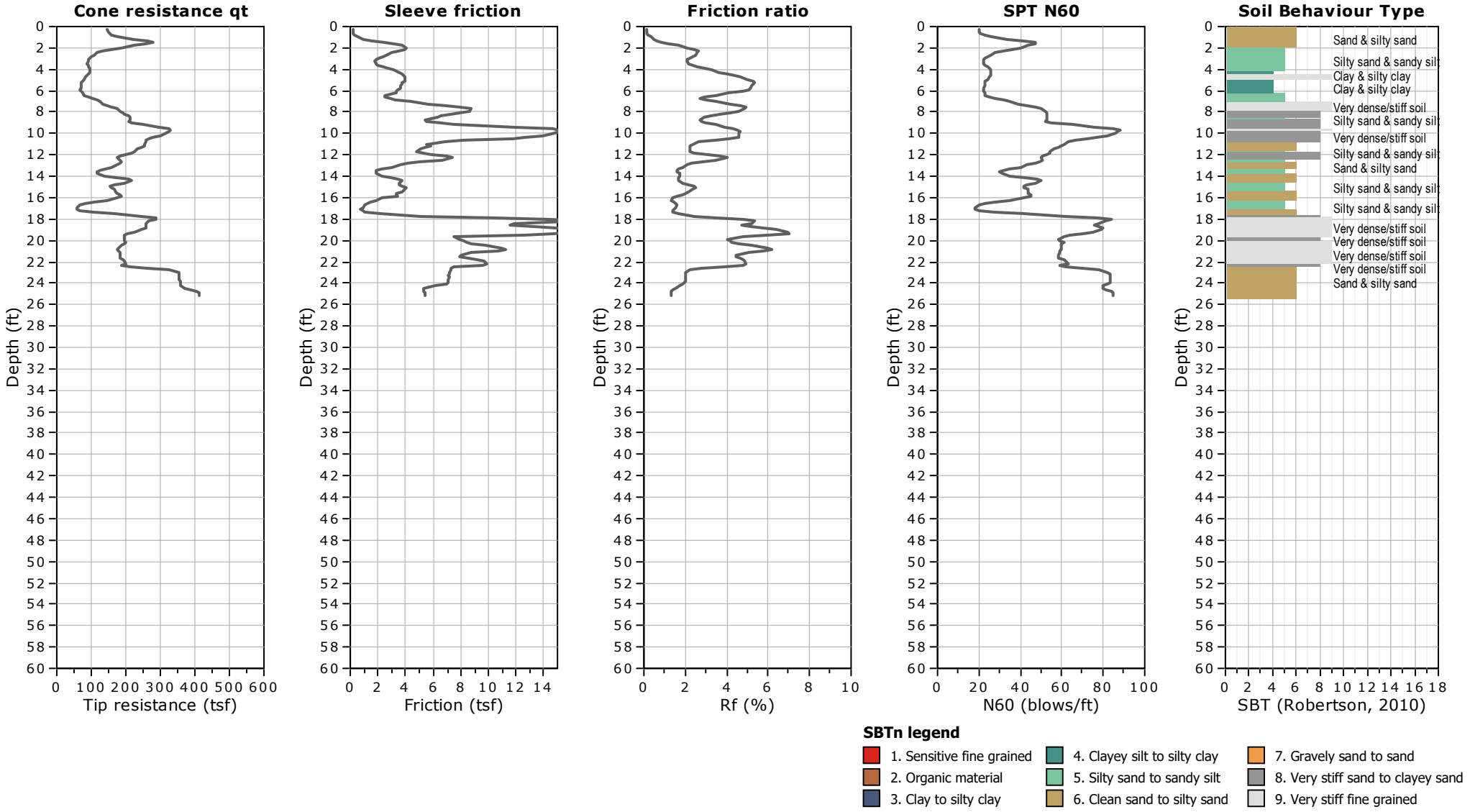
CPT: CPT-17

CLIENT: LGC GEOTECHNICAL INC.

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

FIELD REP: BRANDON

Total depth: 25.10 ft, Date: 6/25/2019



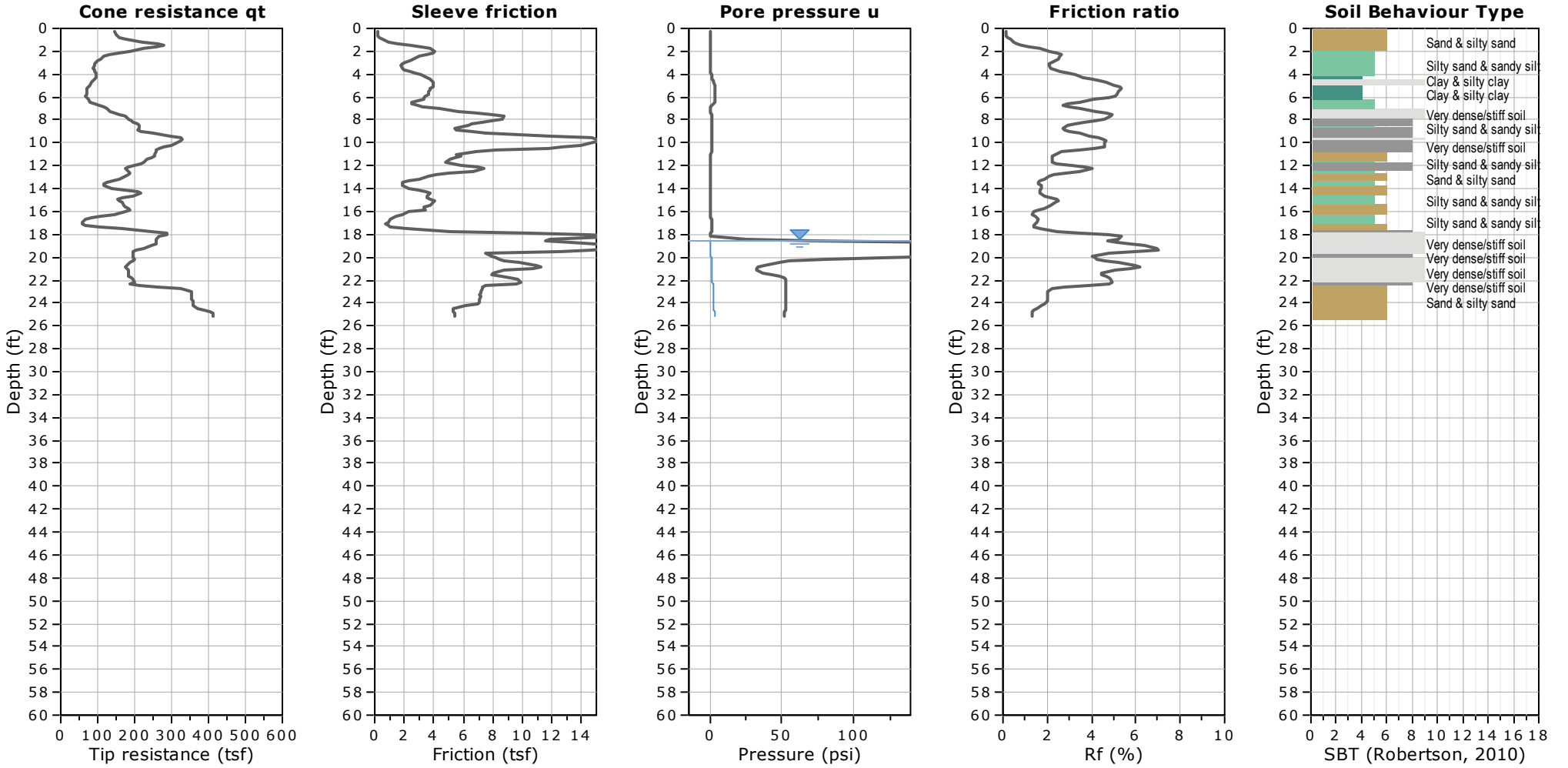
CPT: CPT-17

CLIENT: LGC GEOTECHNICAL INC.

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

Field Rep: BRANDON

Total depth: 25.10 ft, Date: 6/25/2019



SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

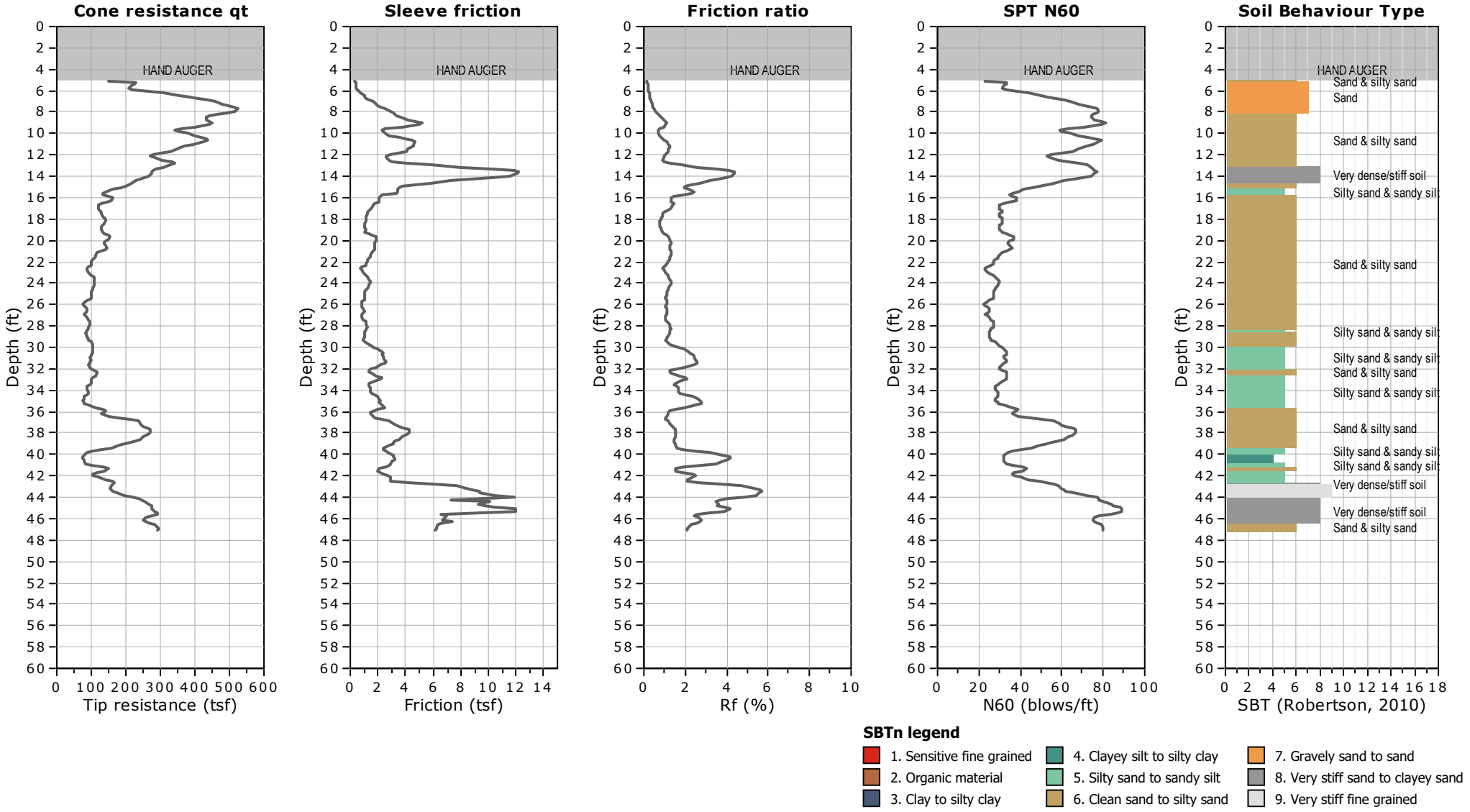
WATER TABLE FOR ESTIMATING PURPOSES ONLY

CLIENT: LGC GEOTECHNICAL INC.

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

FIELD REP: BRANDON

Total depth: 47.08 ft, Date: 6/25/2019

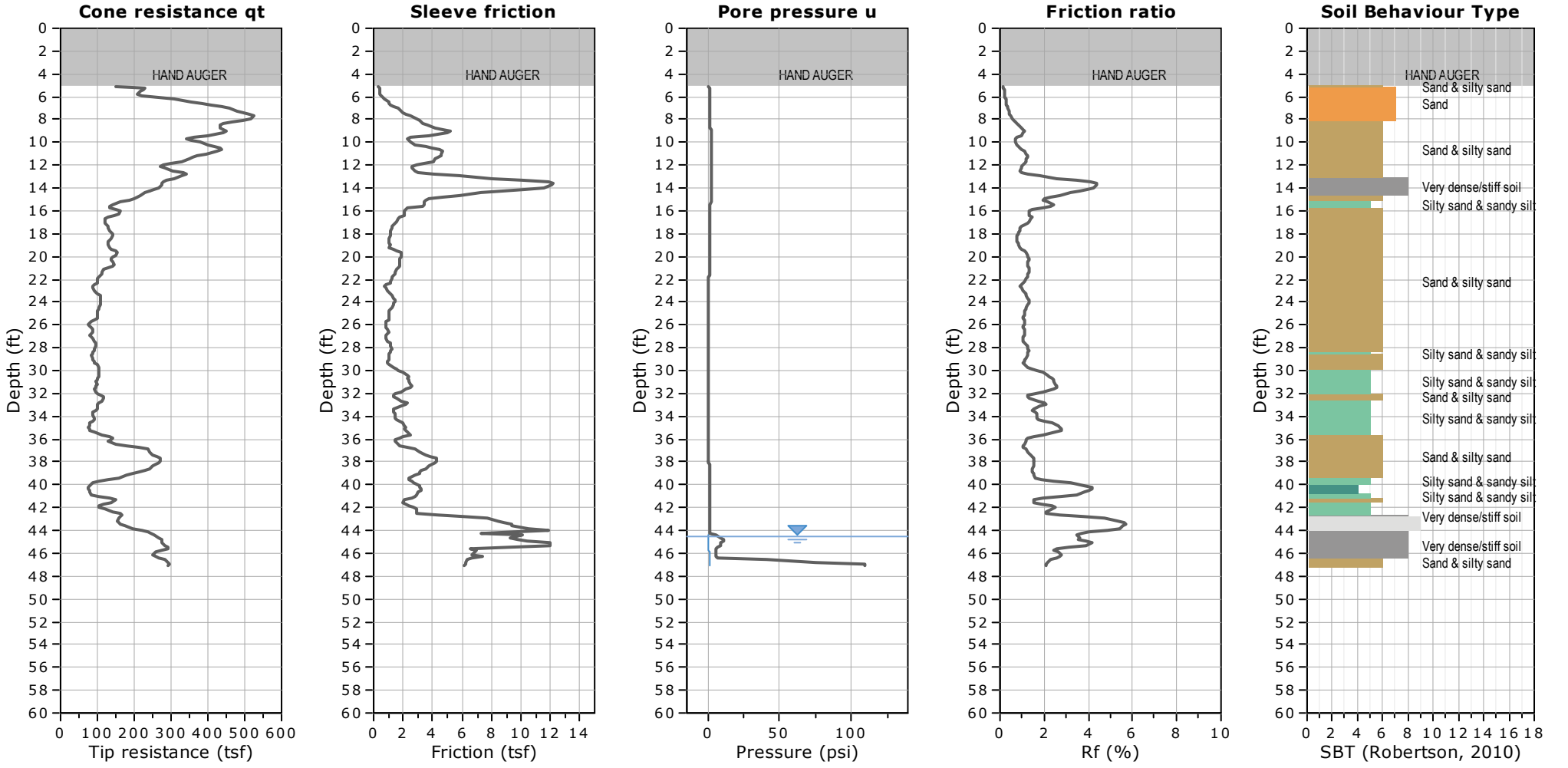


CLIENT: LGC GEOTECHNICAL INC.

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

Field Rep: BRANDON

Total depth: 47.08 ft, Date: 6/25/2019



SBTn legend

1. Sensitive fine grained	4. Clayey silt to silty clay	7. Gravely sand to sand
2. Organic material	5. Silty sand to sandy silt	8. Very stiff sand to clayey sand
3. Clay to silty clay	6. Clean sand to silty sand	9. Very stiff fine grained

WATER TABLE FOR ESTIMATING PURPOSES ONLY

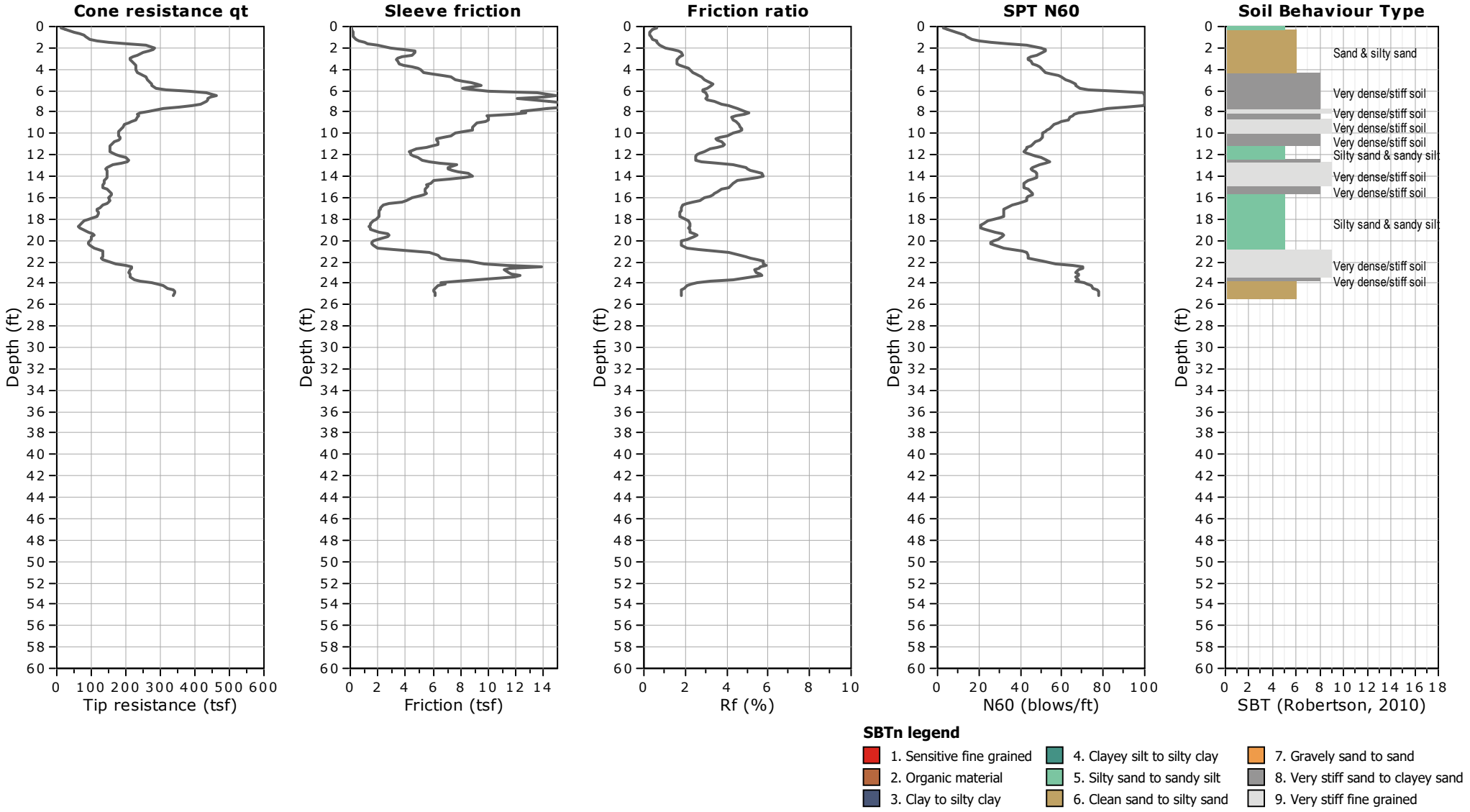
CPT: CPT-19

CLIENT: LGC GEOTECHNICAL INC.

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

FIELD REP: BRANDON

Total depth: 25.10 ft, Date: 6/25/2019



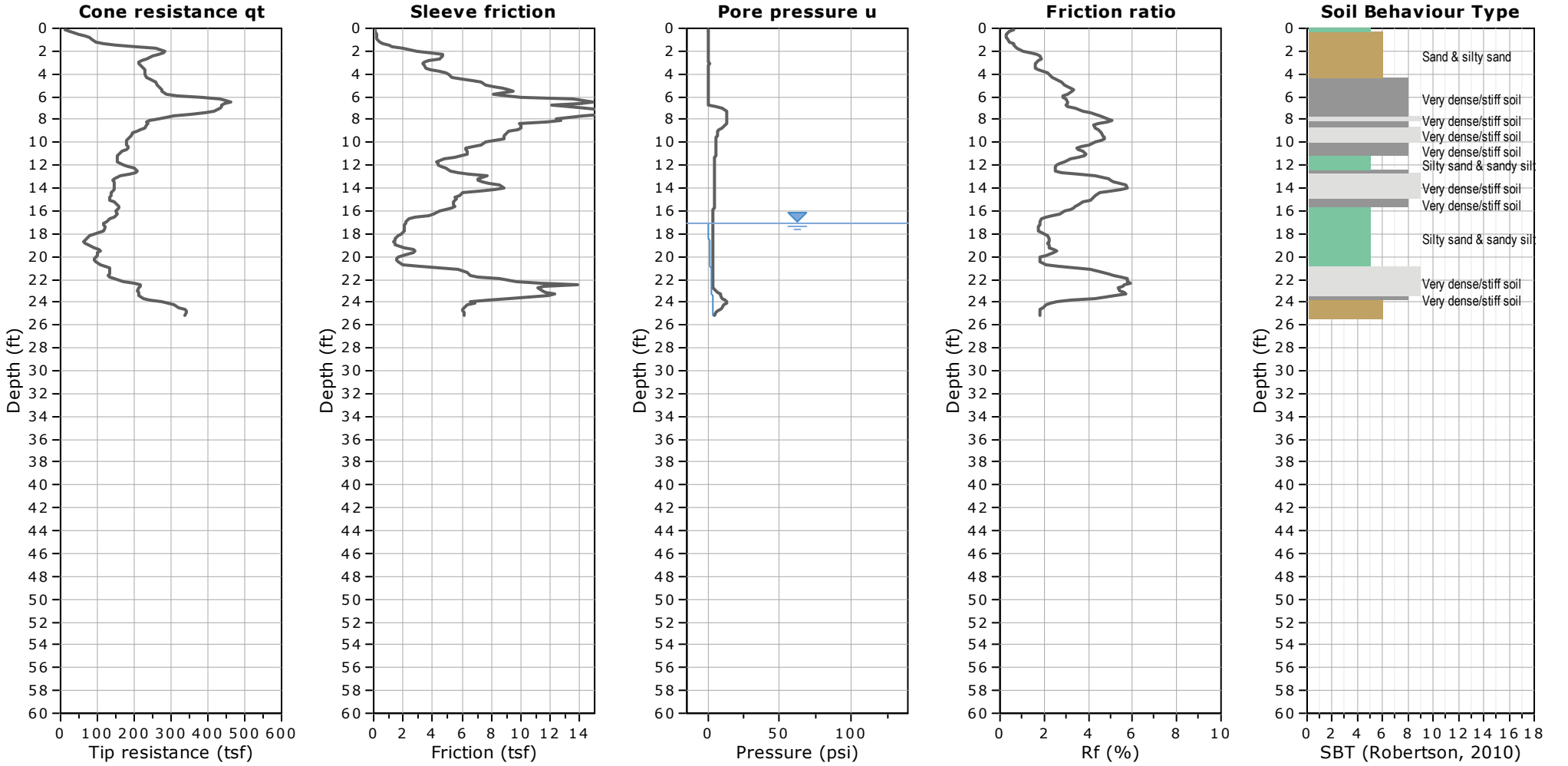
CPT: CPT-19

CLIENT: LGC GEOTECHNICAL INC.

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

Field Rep: BRANDON

Total depth: 25.10 ft, Date: 6/25/2019



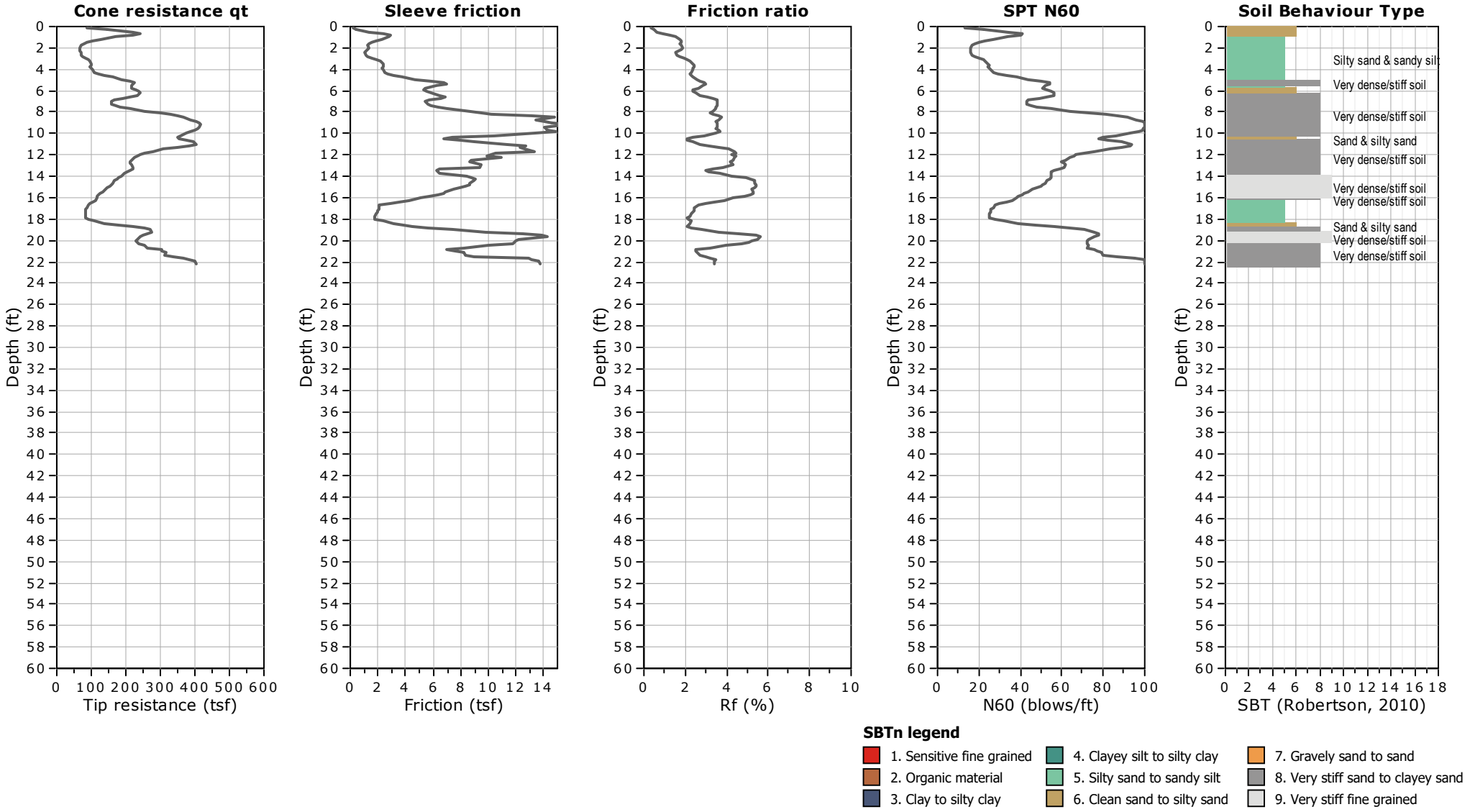
WATER TABLE FOR ESTIMATING PURPOSES ONLY

CLIENT: LGC GEOTECHNICAL INC.

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

FIELD REP: BRANDON

Total depth: 22.15 ft, Date: 6/25/2019



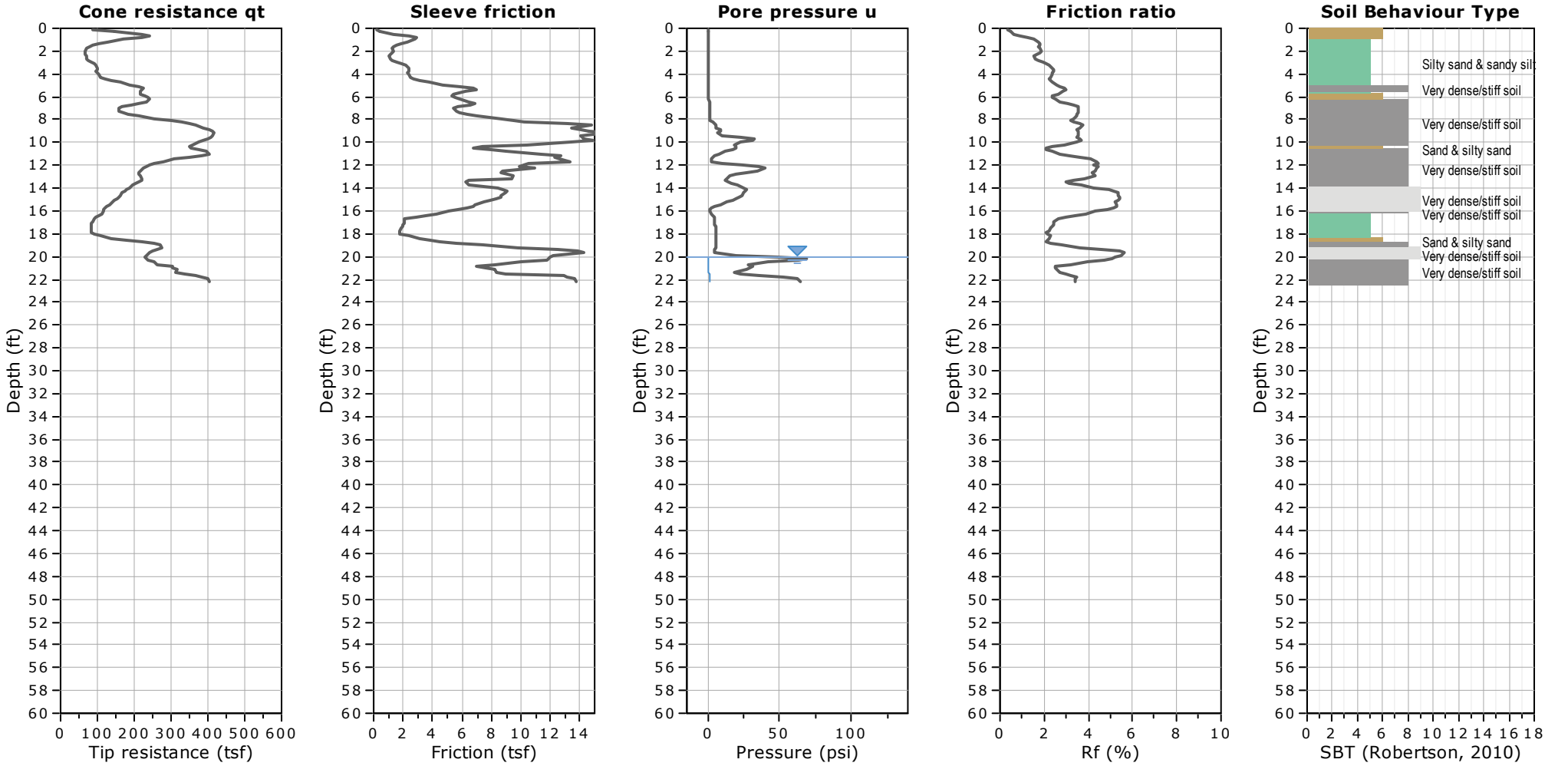
CPT: CPT-20

CLIENT: LGC GEOTECHNICAL INC.

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

Field Rep: BRANDON

Total depth: 22.15 ft, Date: 6/25/2019



WATER TABLE FOR ESTIMATING PURPOSES ONLY

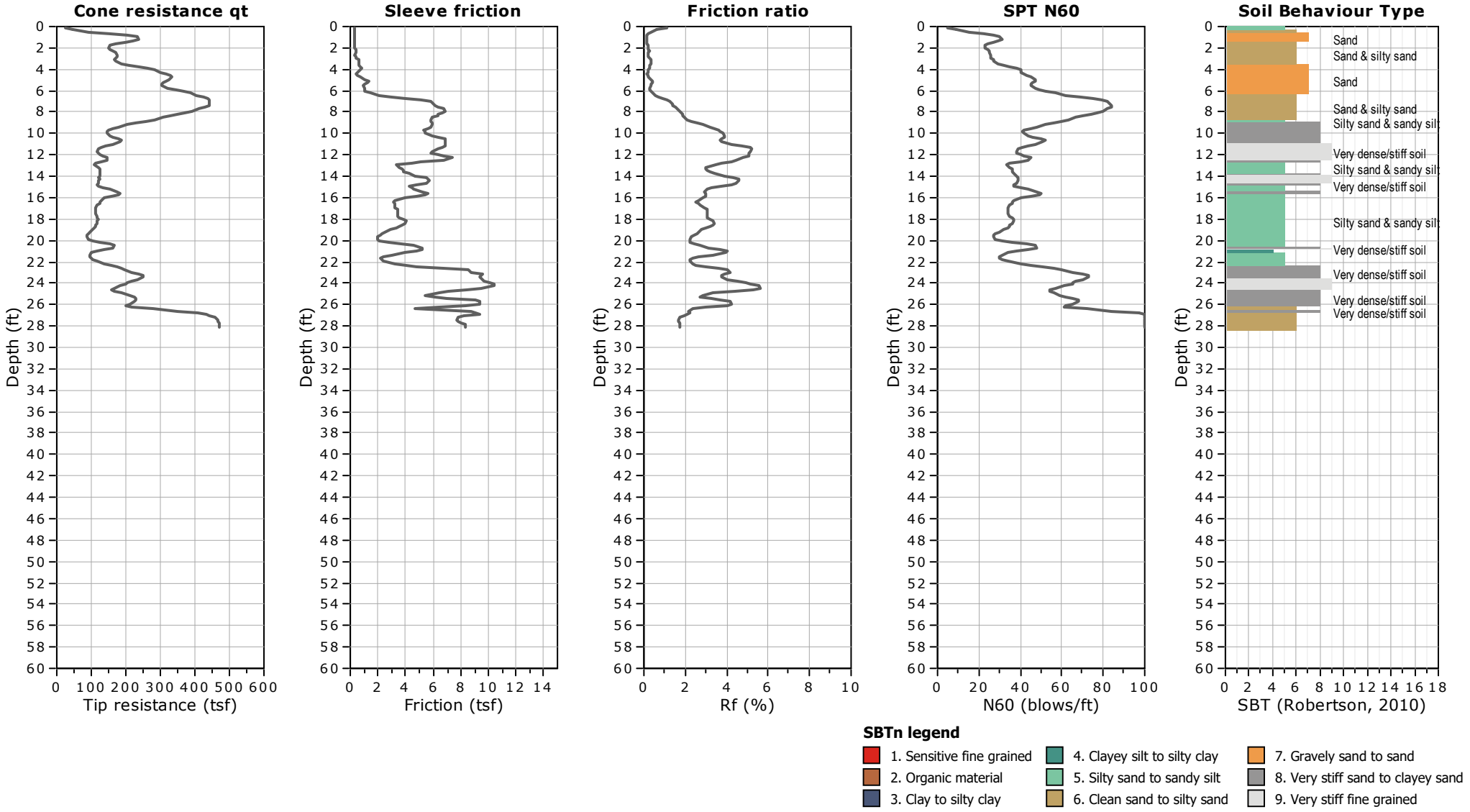
CPT: CPT-21

CLIENT: LGC GEOTECHNICAL INC.

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

FIELD REP: BRANDON

Total depth: 28.05 ft, Date: 6/26/2019



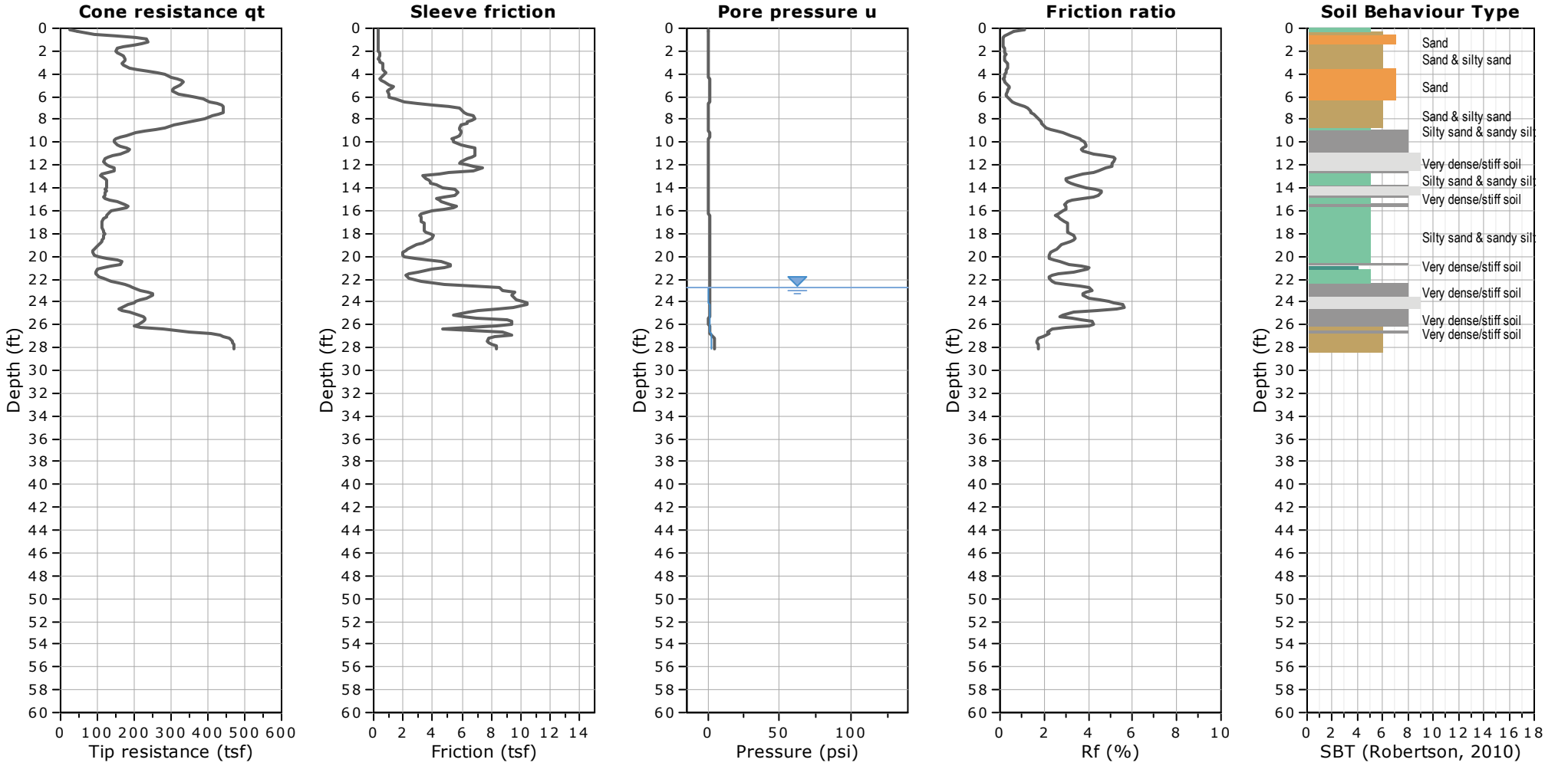
CPT: CPT-21

CLIENT: LGC GEOTECHNICAL INC.

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

Field Rep: BRANDON

Total depth: 28.05 ft, Date: 6/26/2019



SBTn legend

1. Sensitive fine grained
2. Organic material
3. Clay to silty clay
4. Clayey silt to silty clay
5. Silty sand to sandy silt
6. Clean sand to silty sand
7. Gravely sand to sand
8. Very stiff sand to clayey sand
9. Very stiff fine grained

WATER TABLE FOR ESTIMATING PURPOSES ONLY

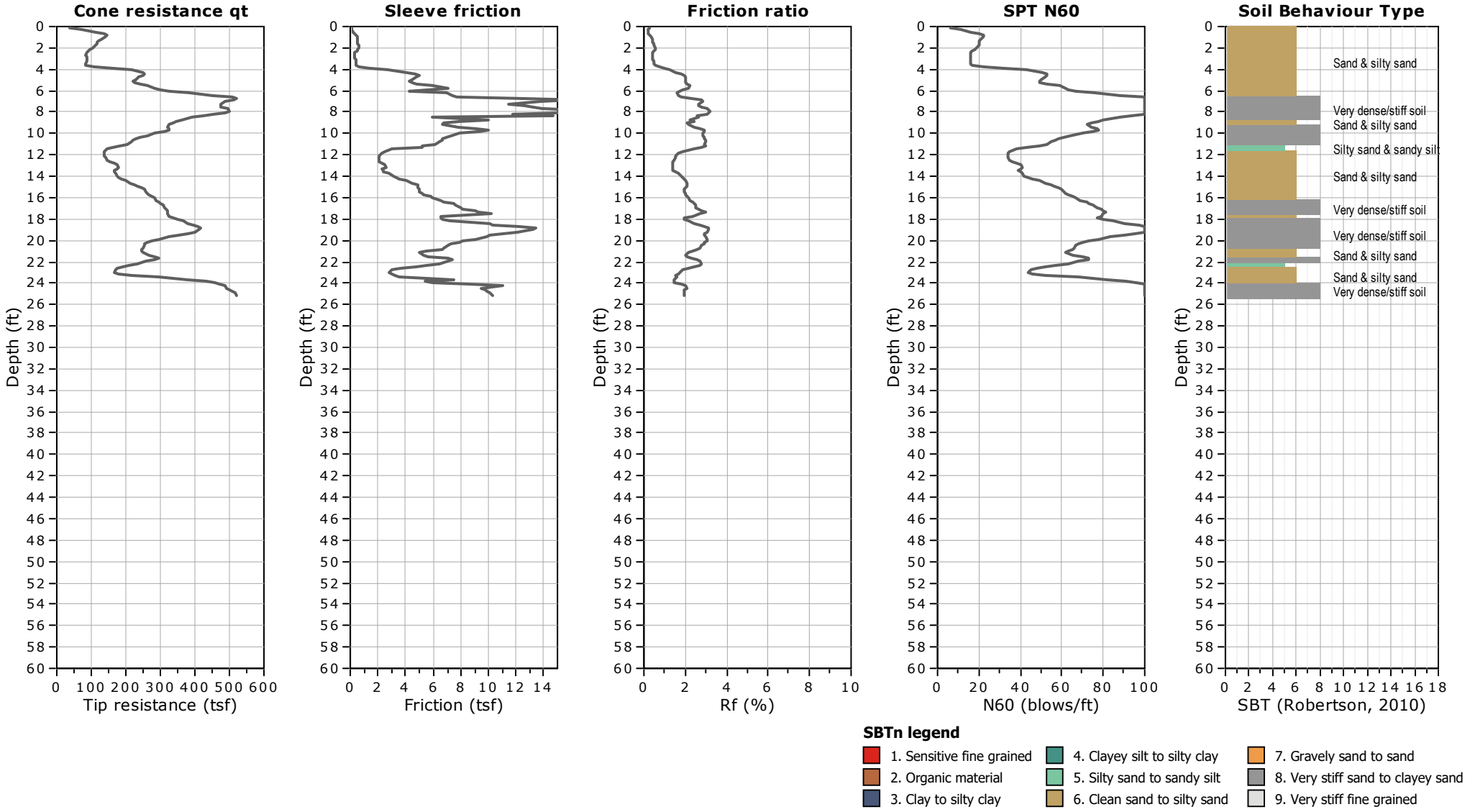
CPT: CPT-22

CLIENT: LGC GEOTECHNICAL INC.

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

FIELD REP: BRANDON

Total depth: 25.10 ft, Date: 6/26/2019



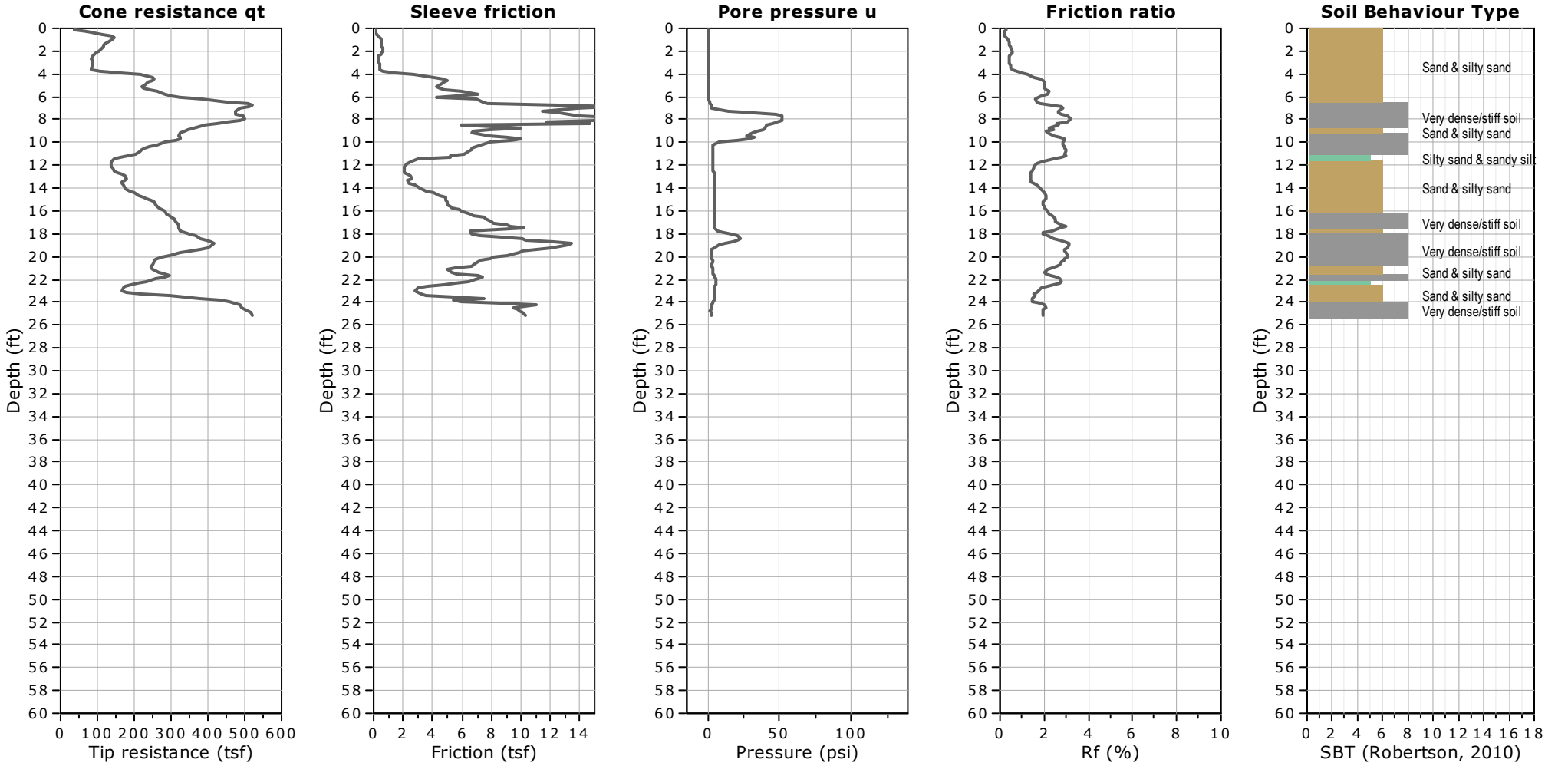
CPT: CPT-22

CLIENT: LGC GEOTECHNICAL INC.

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

Field Rep: BRANDON

Total depth: 25.10 ft, Date: 6/26/2019



WATER TABLE FOR ESTIMATING PURPOSES ONLY

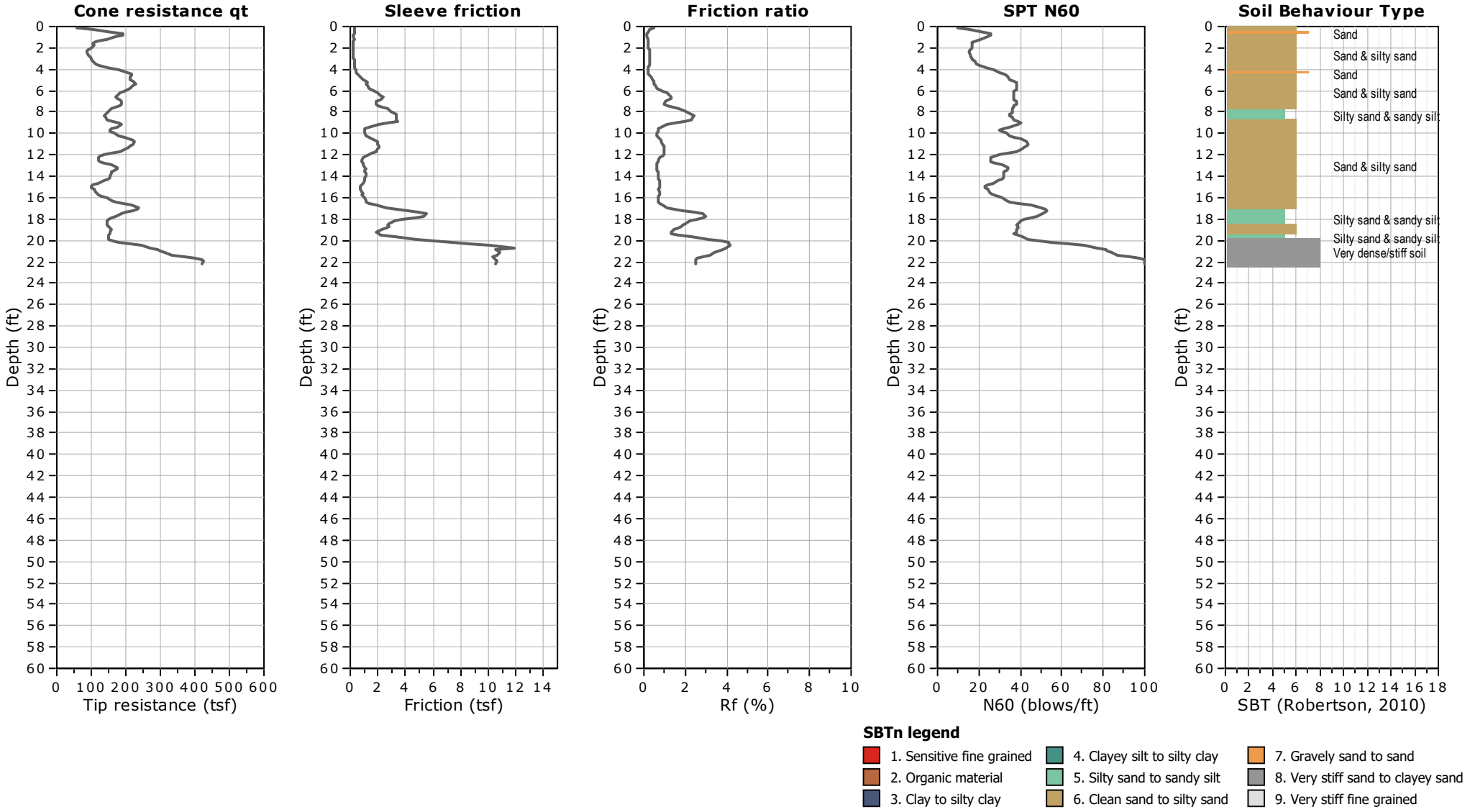
CPT: CPT-23

CLIENT: LGC GEOTECHNICAL INC.

FIELD REP: BRANDON

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

Total depth: 22.15 ft, Date: 6/26/2019



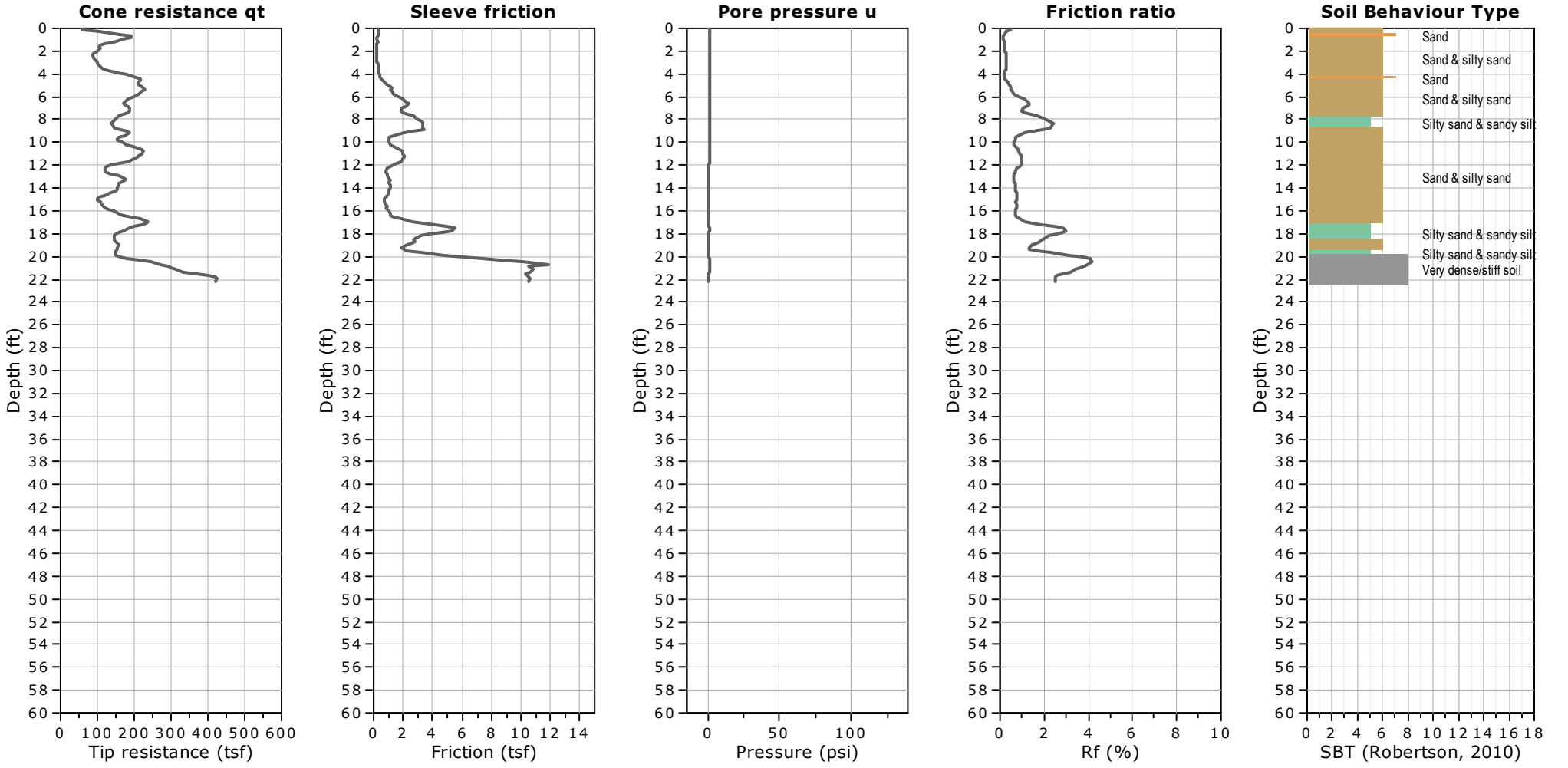
CPT: CPT-23

CLIENT: LGC GEOTECHNICAL INC.

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

Field Rep: BRANDON

Total depth: 22.15 ft, Date: 6/26/2019



WATER TABLE FOR ESTIMATING PURPOSES ONLY

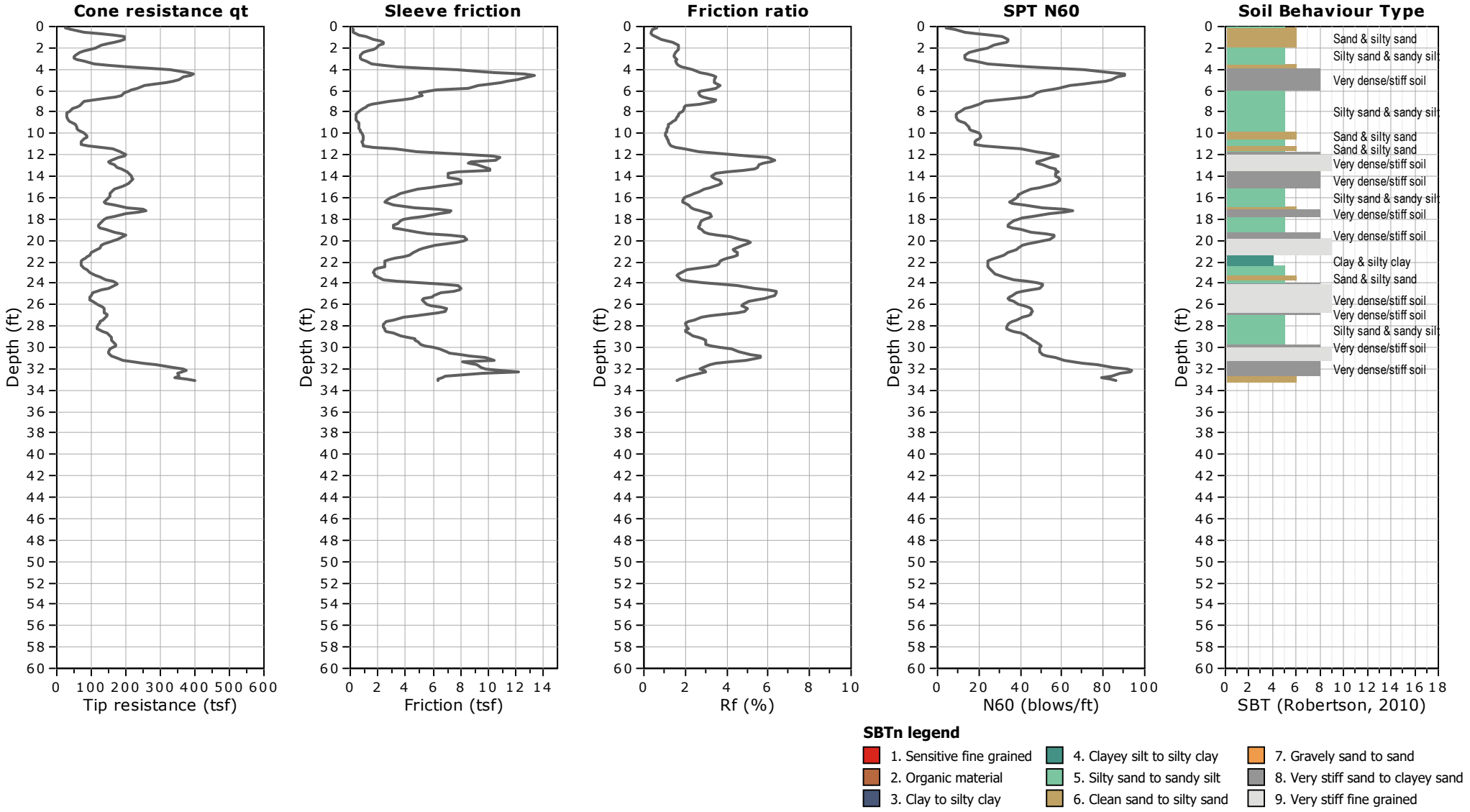
CPT: CPT-24

CLIENT: LGC GEOTECHNICAL INC.

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

FIELD REP: BRANDON

Total depth: 33.14 ft, Date: 6/26/2019

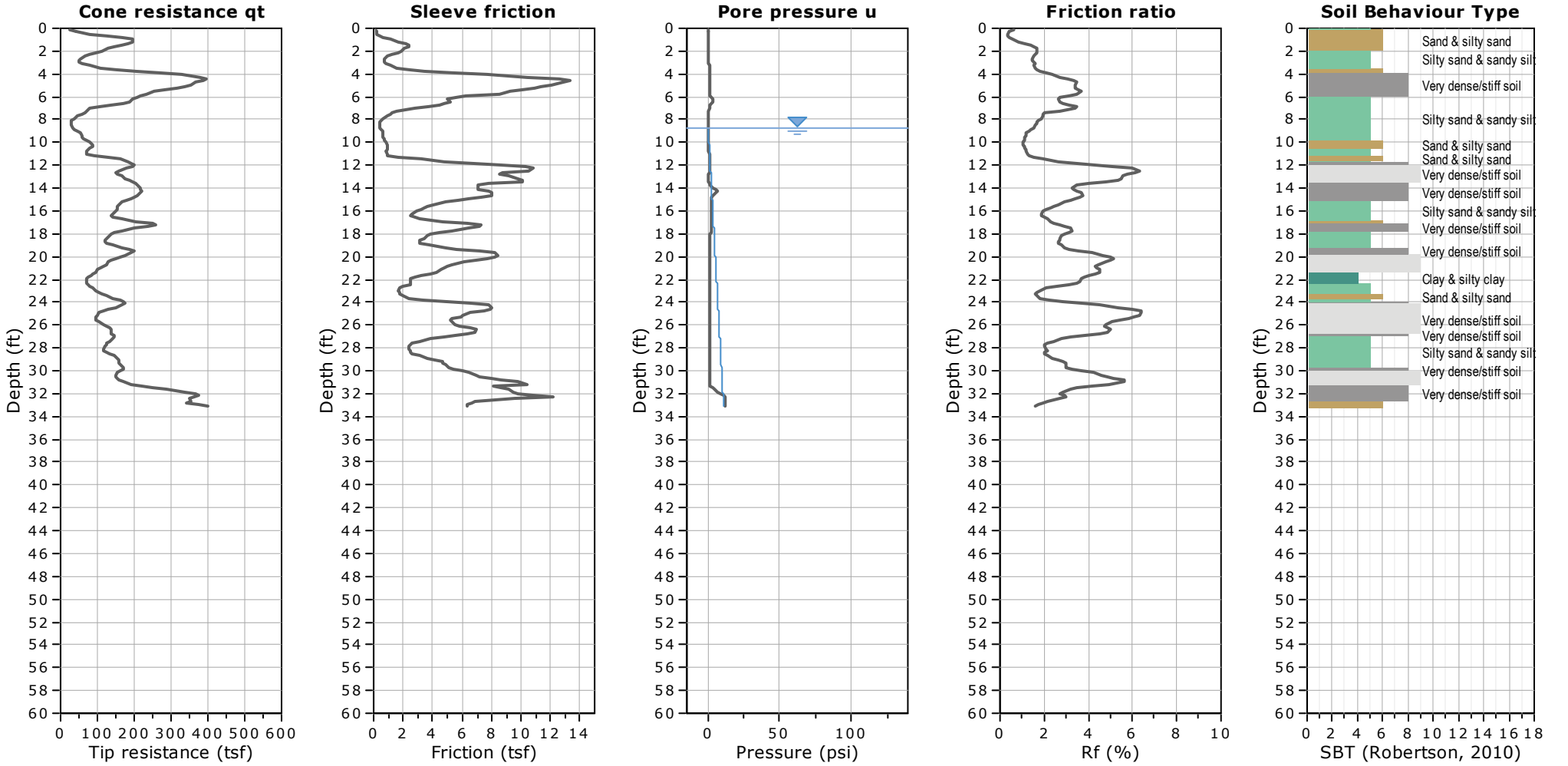


CLIENT: LGC GEOTECHNICAL INC.

SITE: STONERIDGE - RAMONA EXPRESSWAY, PERRIS, CA

Field Rep: BRANDON

Total depth: 33.14 ft, Date: 6/26/2019



WATER TABLE FOR ESTIMATING PURPOSES ONLY

Appendix C
Laboratory Test Results

APPENDIX C

Laboratory Testing Procedures and Test Results

The laboratory testing program was formulated towards providing data relating to the relevant engineering properties of the soils with respect to residential construction. Samples considered representative of site conditions were tested in general accordance with American Society for Testing and Materials (ASTM) procedure and/or California Test Methods (CTM), where applicable. The following summary is a brief outline of the test type and a table summarizing the test results.

Moisture and Density Determination Tests: Moisture content (ASTM D2216) and dry density determinations (ASTM D2937) were performed on relatively undisturbed samples obtained from the test borings and/or trenches. The results of these tests are presented in the boring and/or trench logs. Where applicable, only moisture content was determined from undisturbed or disturbed samples.

Grain Size Distribution: Representative samples were dried, weighed, and soaked in water until individual soil particles were separated (per ASTM D421) and then washed on a No. 200 sieve. The portion retained on the No. 200 sieve was dried and then sieved on a U.S. Standard brass sieve set in accordance with ASTM D422 (CTM 202). Where an appreciable number of fines were encountered (greater than 20 percent passing the No. 200 sieve) a hydrometer analysis was done to determine the distribution of soil particles passing the No. 200 sieve.

Sample Location	Description	% Passing # 200 Sieve
HS-1 @ 2.5 ft	Brown Clayey Sand	22
HS-1 @ 7.5 ft	Brown Clayey Sand	33
HS-6 @ 2.5 ft	Brown Silty Sand	20
HS-6 @ 7.5 ft	Brown Silty Sand w/ Gravel, Decomposed Granite	21
HS-10 @ 7.5 ft	Dark Brown Silty Clayey Sand	24
TP-4 @ 0 to 2 ft	Reddish Brown Clayey Sand	38
HS-15 @ 10 ft	Light Olive Brown Sand with Silt	8
HS-18 @ 2 to 5 ft	Light Brown Sandy Silt	33
HS-20 @ 0 to 2.5 ft	Brown Silty Sand	18
HS-22 @ 7.5 ft	Light Olive Brown Sand with Silt	10
HS-24 @ 0 to 5 ft	Brown Sand	12
HS-24 @ 5 ft	Yellowish Brown Silty Clayey Sand	39

Laboratory Testing Procedures and Test Results

Atterberg Limits: The liquid and plastic limits ("Atterberg Limits") were determined in accordance with ASTM Test Method D4318 for engineering classification of fine-grained material and presented in the table below. Plots are included in this appendix.

Sample Location	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	USCS Soil Classification
TP-4 @ 0 to 2 ft	28	14	14	CL
HS-15 @ 7.5 ft	NP	NP	NP	NP
HS-23 @ 10 ft	20	16	4	CL-ML

Maximum Density Tests: The maximum dry density and optimum moisture content of typical materials were determined in accordance with ASTM D1557. The results of these tests are presented in the table below:

Sample Location	Sample Description	Maximum Dry Density (pcf)	Optimum Moisture Content (%)
HS-1 @ 0 to 3 ft	Yellowish Brown Silty Sand	135.0	7.5
HS-5 @ 0 to 4 ft	Dark Yellowish Brown Silty Clayey Sand	137.5	7.5
HS-9 & TP-4	Dark Yellowish Brown Silty Clayey Sand	134.5	8.5
TP-6 @ 2 to 3 ft	Dark Yellowish Brown Silty Clayey Sand	135.0	8.0
TP-9 @ 3 to 4 ft	Dark Yellowish Brown Silty, Clayey Sand	138.0	7.0
HS-18 @ 2 to 5 ft	Light Brown Sandy Silt	127.5	7.5
HS-20 @ 2 to 2.5 ft	Brown Silty Sand	135.0	7.0
HS-24 @ 0 to 5 ft	Brown Sand	128.5	7.5

Laboratory Testing Procedures and Test Results

Expansion Index: The expansion potential of selected samples was evaluated by the Expansion Index Test, Standard ASTM D4829. Specimens are molded under a given compactive energy to approximately the optimum moisture content and approximately 50 percent saturation or approximately 90 percent relative compaction. The prepared 1-inch-thick by 4-inch-diameter specimens are loaded to an equivalent 144 psf surcharge and are inundated with tap water until volumetric equilibrium is reached. The results of these tests are presented in the table below.

Sample Location	Expansion Index	Expansion Potential*
HS-4 @ 0 to 4 ft	33	Low
TP-1 @ 4 to 5 ft	0	Very Low
TP-4 @ 0 to 2 ft	21	Low
HS-18 @ 2 to 5 ft	6	Very Low
HS-20 @ 0 to 2.5 ft	1	Very Low
HS-24 @ 0 to 5 ft	0	Very Low

* ASTM D4829

Direct Shear: Direct shear tests were performed on selected driven samples, which were soaked for a minimum of 24 hours prior to testing. The samples were tested under various normal loads using a motor-driven, strain-controlled, direct-shear testing apparatus (ASTM D3080). The plot is provided in this Appendix.

Collapse/Swell Potential: Collapse tests were performed per ASTM D4546. Samples (2.4 inches in diameter and 1 inch in height) were placed in a consolidometer and loaded to their approximate in-situ effective stress. The curves are presented in this Appendix.

Consolidation: Consolidation tests were performed per ASTM D2435. Samples (2.4 inches in diameter and 1 inch in height) were placed in a consolidometer and increasing loads were applied. The samples were allowed to consolidate under "double drainage" and total deformation for each loading step was recorded. The percent consolidation for each load step was recorded as the ratio of the amount of vertical compression to the original sample height. The consolidation pressure curves are provided in this Appendix.

Laboratory Testing Procedures and Test Results

Chloride Content: Chloride content was tested in accordance with Caltrans Test Method (CTM) 422. The results are presented below.

Sample Location	Chloride Content, ppm
HS-1 @ 0 to 3 ft	81
HS-4 @ 0 to 4 ft	103
TP-1 @ 4 to 5 ft	51
HS-18 @ 2 to 5 ft	104
HS-20 @ 0 to 2.5 ft	41
HS-24 @ 0 to 5 ft	31

Minimum Resistivity and pH Tests: Minimum resistivity and pH tests were performed in general accordance with CTM 643 and standard geochemical methods. The electrical resistivity of a soil is a measure of its resistance to the flow of electrical current. As a result of a decrease in resistivity, the potential for corrosion increases. The results are presented in the table below.

Sample Location	pH	Minimum Resistivity (ohms-cm)
HS-1 @ 0 to 3 ft	5.78	2,960
HS-4 @ 0 to 4 ft	7.88	1,146
TP-1 @ 4 to 5 ft	7.90	3,300
HS-18 @ 2 to 5 ft	7.67	1,450
HS-20 @ 0 to 2.5 ft	7.74	5,290
HS-24 @ 0 to 5 ft	7.71	15,000

Laboratory Testing Procedures and Test Results

Soluble Sulfates: The soluble sulfate contents of selected samples were determined by standard geochemical methods (CTM 417). The soluble sulfate content is used to determine the appropriate cement type and maximum water-cement ratios. The test results are presented in the table below.

Sample Location	Sulfate Content (ppm)
HS-1 @ 0 to 3 ft	29
HS-4 @ 0 to 4 ft	34
TP-1 @ 4 to 5 ft	42
HS-18 @ 2 to 5 ft	196
HS-20 @ 0 to 2.5 ft	148
HS-24 @ 0 to 5 ft	168

*Based on ACI 318, Table 19.3.1.1 (ACI 318R-14).

R-Value: The resistance R-value was determined by the ASTM D2844 for base, subbase, and basement soils. The samples were prepared and exudation pressure and R-value were determined. The graphically determined R-values at exudation pressure of 300 psi are reported in this appendix. These results were used for pavement design purposes. The R-value plots are presented in this appendix.

Sample Location	R-Value
HS-3 @ 0 to 3 ft	67
HS-9 @ 0 to 4 ft	43

PARTICLE-SIZE ANALYSIS OF SOILS

ASTM D 422

Project Name: Richland – Stoneridge | Tested By: A. Santos | Date: 04/20/16

Project No.: 13092-01 | Data Input By: J. Ward | Date: 04/27/16

Boring No.: TP-4

Sample No.: B-1 | Depth (feet): 0-2

Soil Identification: Reddish brown clayey sand (SC)

% Gravel	**N/A**	**Soil Type**
% Sand	**N/A**	**SC**
% Fines	**38**	

			Moisture Content of Total Air-Dry Soil	Moisture Content of Air-Dry Soil Passing #10	After Hydrometer & Wet Sieve ret. in #200 Sieve
Specific Gravity (Assumed)	2.70	Wt.of Air-Dry Soil + Cont.(g)	0.00	72.52	
Correction for Specific Gravity	0.99	Dry Wt. of Soil + Cont. (g)	0.00	72.50	135.87
Wt.of Air-Dry Soil + Cont. (g)	1133.00	Wt. of Container No.___ (g)	1.00	57.25	75.31
Wt. of Container	108.80	Moisture Content (%)	0.00	0.13	
Dry Wt. of Soil (g)	1024.20	Wt. of Dry Soil (g)			60.56

Coarse Sieve

U.S. Sieve	Cumulative Wt. Of Dry Soil Retained (g)	% Passing
3"		
1½"		
3/4"		
3/8"		
No. 4		
No. 10	75.08	92.7
Pan		

Sieve after Hydrometer & Wet Sieve

U.S. Sieve Size	Cumulative Wt. Of Dry Soil Retained (g)	% Passing	% Total Sample
No. 10	0.00	100.0	92.7
No. 16			
No. 30			
No. 50			
No. 100			
No. 200	59.24	41.0	38.0
Pan			

Hydrometer Wt. of Air-Dry Soil (g): 100.50 Wt. of Dry Soil (g): 100.37

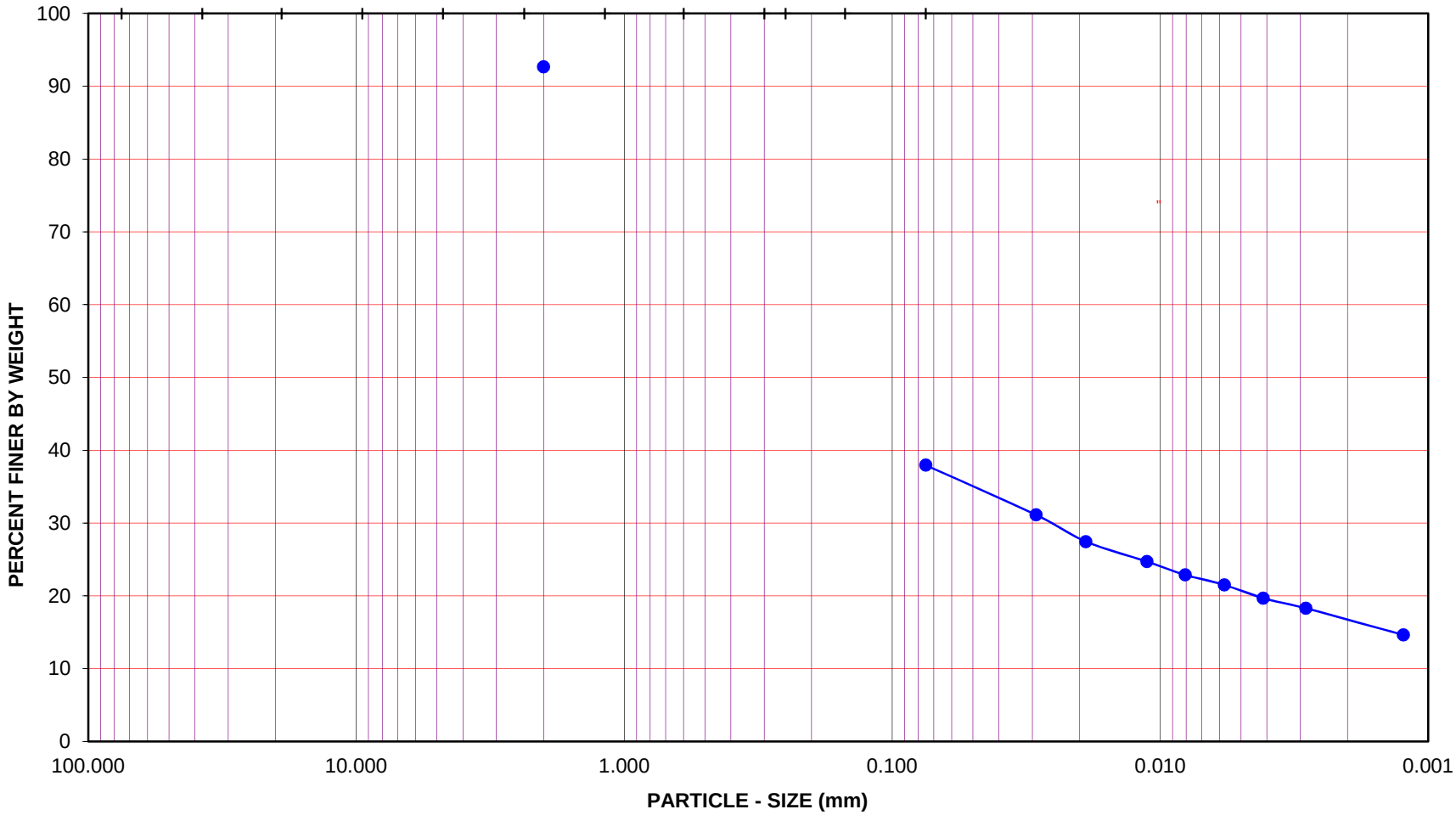
Deflocculant 125 cc of 4% Solution

Date	Time	Elapsed Time (min)	Water Temperature (°C)	Composite Correction 152H	Actual Hydrometer Readings	% Total Sample (%)	Soil Particle Diameter (mm)
22-Apr-16	9:06	0		7.0			
	9:08	2	21.9	7.0	41.0	31.1	0.0291
	9:11	5	21.9	8.0	37.0	27.5	0.0190
	9:21	15	21.9	8.0	34.0	24.7	0.0112
	9:36	30	21.8	8.0	32.0	22.9	0.0081
	10:06	60	21.9	8.0	30.5	21.5	0.0058
	11:06	120	21.9	8.0	28.5	19.7	0.0041
	13:16	250	22.4	8.0	27.0	18.3	0.0029
23-Apr-16	9:06	1440	21.0	8.0	23.0	14.7	0.0012

GRAVEL		SAND			FINES	
COARSE	FINE	CRSE	MEDIUM	FINE	SILT	CLAY

U.S. STANDARD SIEVE OPENING — U.S. STANDARD SIEVE NUMBER — HYDROMETER

3.0" 1 1/2" 3/4" 3/8" #4 #8 #16 #30 #50 #100 #200



Project Name: Richland – Stoneridge

Project No.: 13092-01

Boring No.: TP-4 Sample No.: B-1

Depth (feet): 0-2 Soil Type : SC

Soil Identification: Reddish brown clayey sand (SC)

PARTICLE - SIZE DISTRIBUTION ASTM D 422

GR:SA:FI : (%) N/A : N/A : 38

04/27/16

Hydrometer TP-4, B-1 @ 0-2

ATTERBERG LIMITS

ASTM D 4318

Project Name:	Richland – Stoneridge	Tested By:	A. Santos	Date:	04/25/16
Project No. :	13092-01	Input By:	J. Ward	Date:	04/27/16
Boring No.:	TP-4	Checked By:	J. Ward		
Sample No.:	B-1	Depth (ft.)	0-2		
Soil Identification:	Reddish brown clayey sand (SC)				

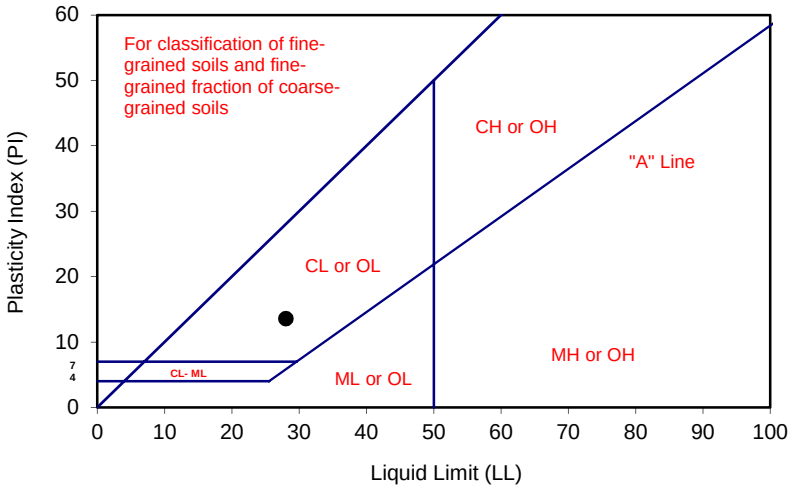
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			33	25	17	
Wet Wt. of Soil + Cont. (g)	9.90	10.59	22.37	26.70	22.82	
Dry Wt. of Soil + Cont. (g)	8.80	9.39	17.86	21.13	17.98	
Wt. of Container (g)	1.06	1.18	1.12	1.10	1.11	
Moisture Content (%) [Wn]	14.21	14.62	26.94	27.81	28.69	

Liquid Limit	**28**
Plastic Limit	**14**
Plasticity Index	**14**
Classification	**CL**

PI at "A" - Line = 0.73(LL-20) 5.84

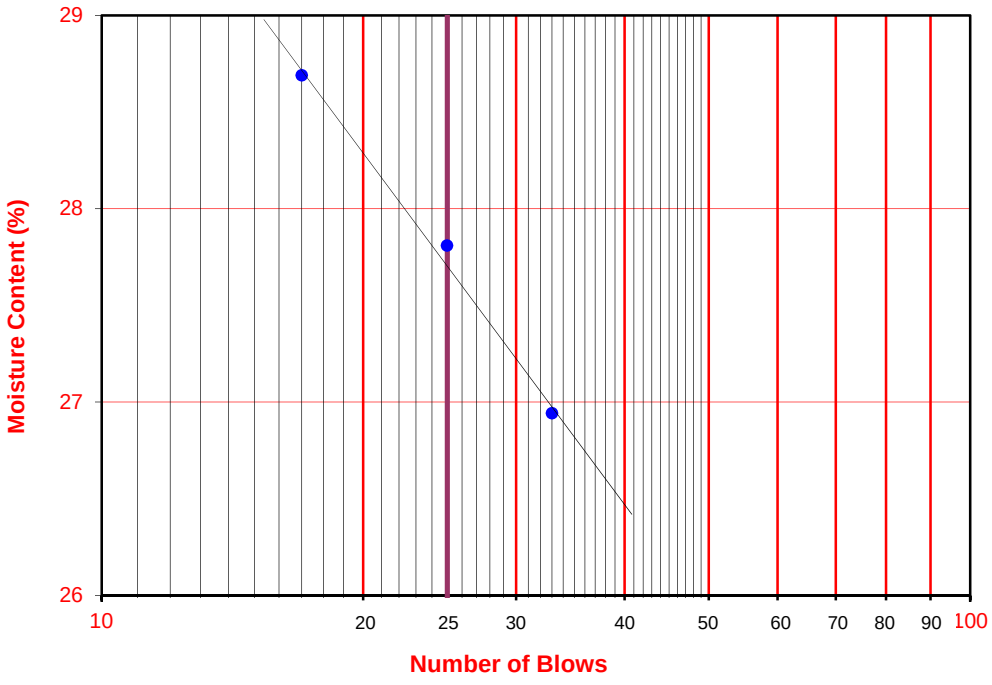
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

	Wet Preparation
	Multipoint - Wet
X	Dry Preparation
	Multipoint - Dry
X	Procedure A
	Multipoint Test
	Procedure B
	One-point Test



ATTERBERG LIMITS

ASTM D 4318

Project Name:	Stoneridge	Tested By:	A. Santos	Date:	07/23/19
Project No. :	13092-01	Input By:	G. Bathala	Date:	07/24/19
Boring No.:	HS-15	Checked By:	J. Ward		
Sample No.:	R-3	Depth (ft.)	7.5		
Soil Identification:	Olive brown silty sand (SM)				

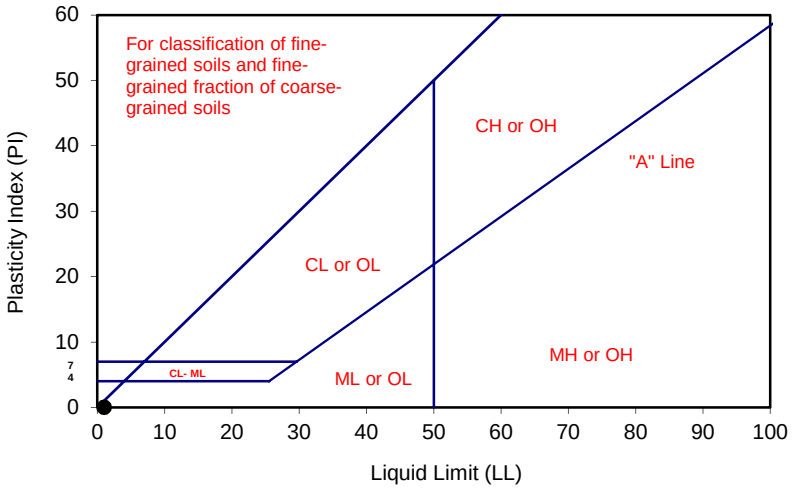
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			5			
Wet Wt. of Soil + Cont. (g)	**Cannot be rolled:**		18.85	**Cannot get more than 5 blows:**		
Dry Wt. of Soil + Cont. (g)	**NonPlastic**		15.58	**NonPlastic**		
Wt. of Container (g)			1.05			
Moisture Content (%) [Wn]			22.51			

Liquid Limit	**NP**
Plastic Limit	**NP**
Plasticity Index	**NP**
Classification	**NP**

PI at "A" - Line = 0.73(LL-20) =

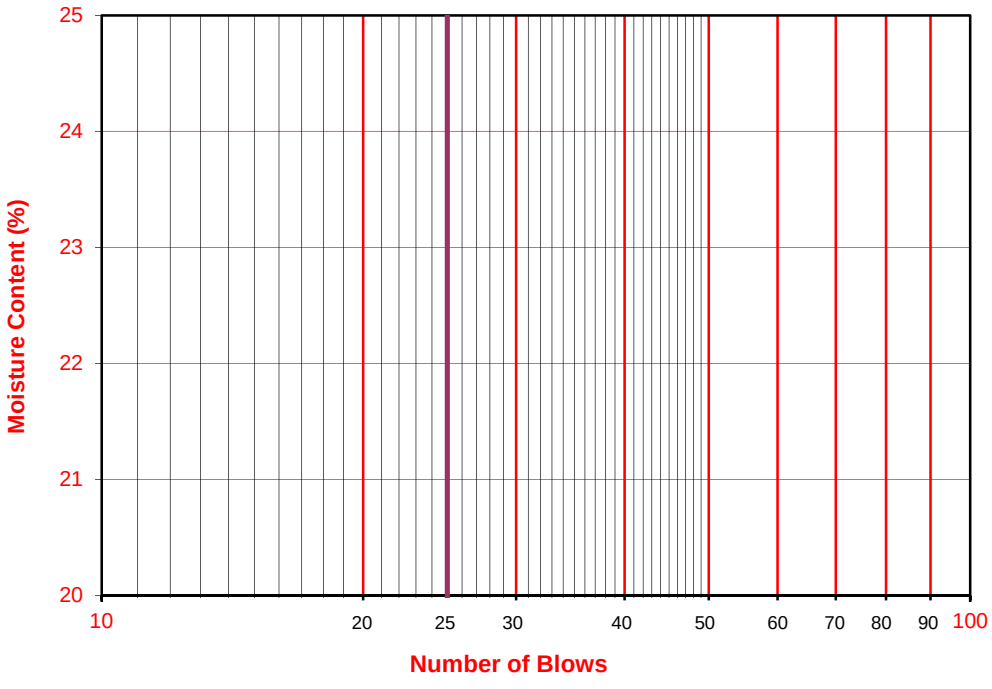
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

	Wet Preparation
	Multipoint - Wet
X	Dry Preparation
	Multipoint - Dry
X	Procedure A
	Multipoint Test
	Procedure B
	One-point Test



ATTERBERG LIMITS

ASTM D 4318

Project Name:	Stoneridge	Tested By:	R. Manning	Date:	07/18/19
Project No. :	13092-01	Input By:	G. Bathala	Date:	07/22/19
Boring No.:	HS-23	Checked By:	J. Ward		
Sample No.:	R-4	Depth (ft.)	10.0		
Soil Identification:	Olive brown silty, clayey sand (SC-SM)				

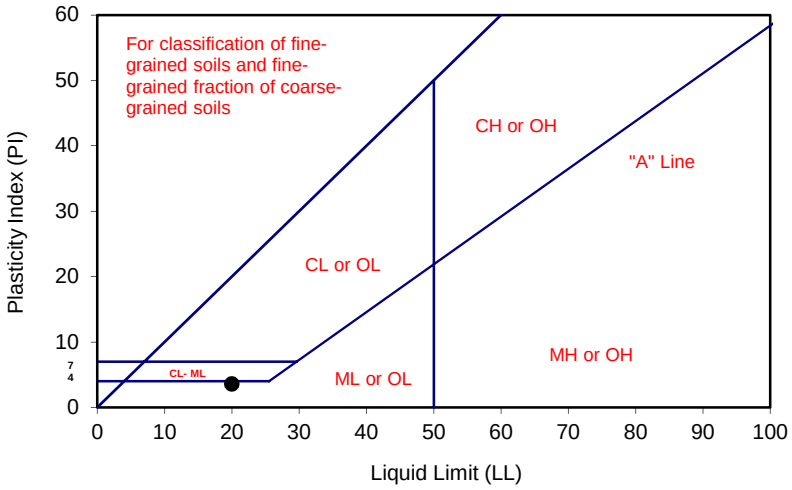
TEST	PLASTIC LIMIT		LIQUID LIMIT			
NO.	1	2	1	2	3	4
Number of Blows [N]			35	23	16	
Wet Wt. of Soil + Cont. (g)	19.41	19.47	26.87	26.31	24.80	
Dry Wt. of Soil + Cont. (g)	18.24	18.29	24.75	24.15	22.80	
Wt. of Container (g)	11.11	11.11	13.55	13.39	13.41	
Moisture Content (%) [Wn]	16.41	16.43	18.93	20.07	21.30	

Liquid Limit	**20**
Plastic Limit	**16**
Plasticity Index	**4**
Classification	**CL-ML**

PI at "A" - Line = 0.73(LL-20) 0

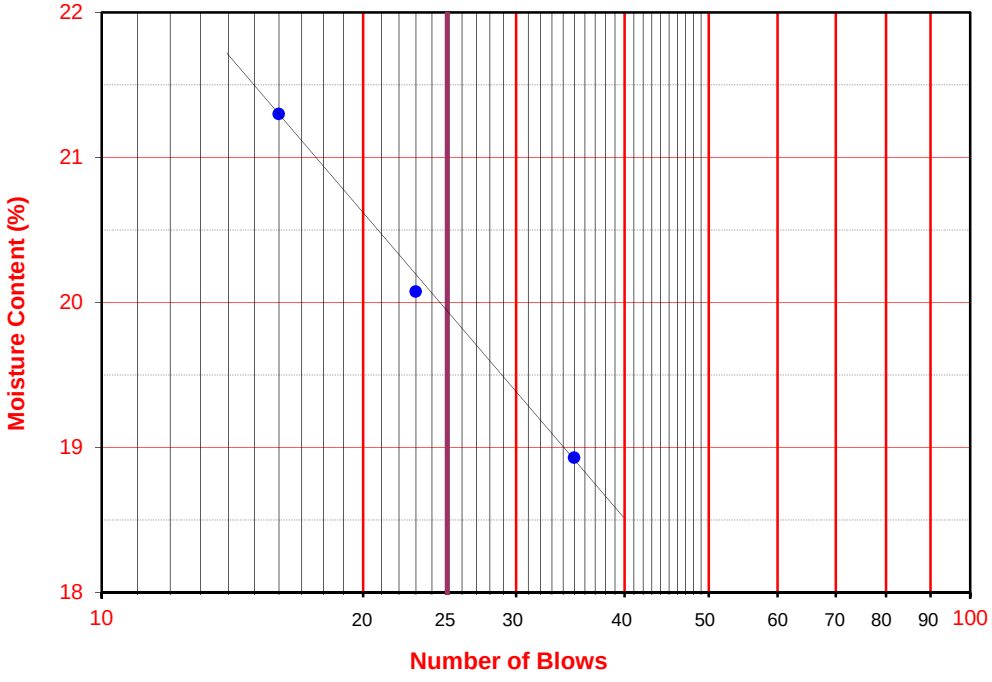
One - Point Liquid Limit Calculation

$LL = Wn(N/25)^{0.121}$



PROCEDURES USED

	Wet Preparation
	Multipoint - Wet
X	Dry Preparation
	Multipoint - Dry
X	Procedure A
	Multipoint Test
	Procedure B
	One-point Test

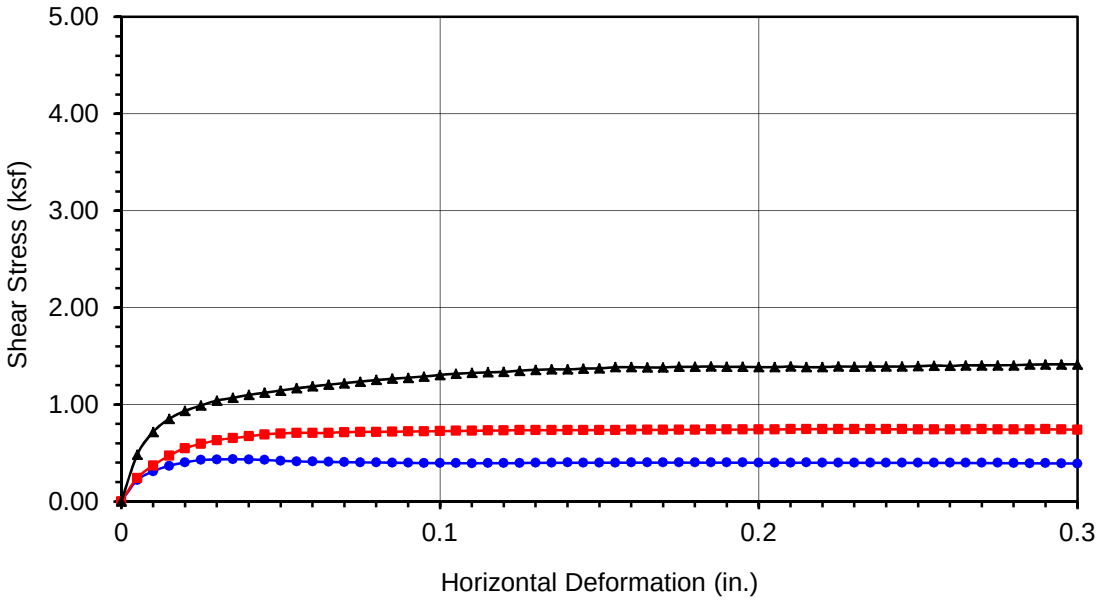


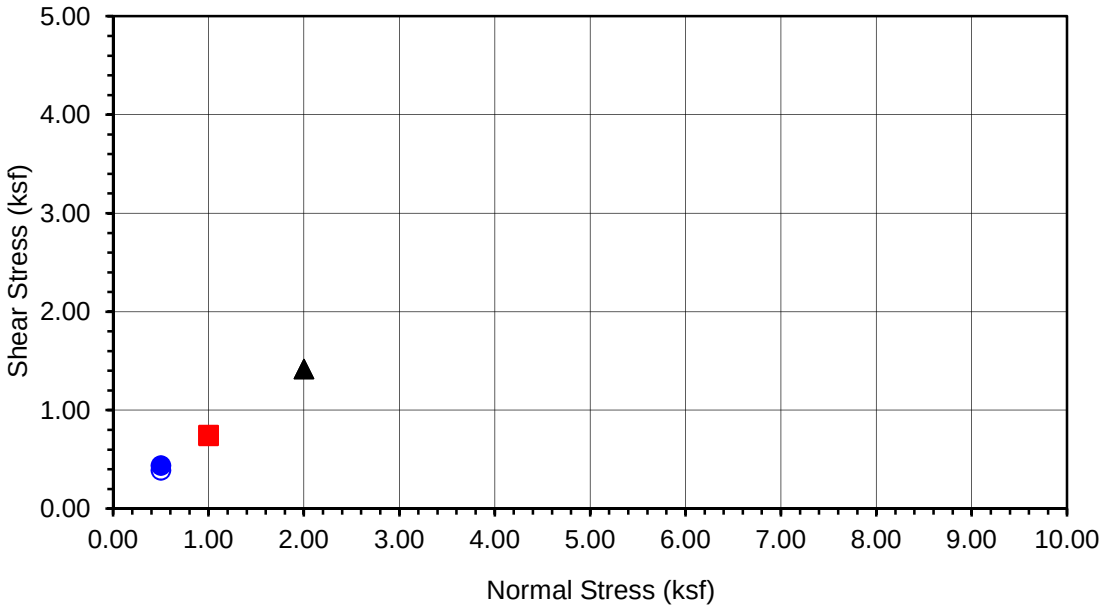
DIRECT SHEAR TEST

Consolidated Drained - ASTM D 3080

Project Name:	Richland – Stoneridge	Tested By:	G. Bathala	Date:	04/20/16
Project No.:	13092-01	Checked By:	J. Ward	Date:	04/27/16
Boring No.:	HS-2	Sample Type:	Ring		
Sample No.:	R-1	Depth (ft.):	2.5		
Soil Identification:	Brown clayey sand (SC)				

Sample Diameter(in):	2.415	2.415	2.415
Sample Thickness(in.):	1.000	1.000	1.000
Weight of Sample + ring(gm):	196.20	198.05	202.46
Weight of Ring(gm):	45.31	45.16	45.73
Before Shearing			
Weight of Wet Sample+Cont.(gm):	202.91	202.91	202.91
Weight of Dry Sample+Cont.(gm):	193.08	193.08	193.08
Weight of Container(gm):	64.62	64.62	64.62
Vertical Rdg.(in): Initial	0.0000	0.2461	0.2583
Vertical Rdg.(in): Final	-0.0052	0.2531	0.2721
After Shearing			
Weight of Wet Sample+Cont.(gm):	221.23	233.99	218.56
Weight of Dry Sample+Cont.(gm):	202.23	216.08	200.81
Weight of Container(gm):	66.16	76.26	57.73
Specific Gravity (Assumed):	2.70	2.70	2.70
Water Density(pcf):	62.43	62.43	62.43





Boring No.	**HS-2**
Sample No.	**R-1**
Depth (ft)	**2.5**
Sample Type: Ring	
Soil Identification: Brown clayey sand (SC)	

Normal Stress (kip/ft²)	0.500	1.000	2.000
Peak Shear Stress (kip/ft²)	● 0.437	■ 0.748	▲ 1.415
Shear Stress @ End of Test (ksf)	○ 0.390	□ 0.739	△ 1.415
Deformation Rate (in./min.)	0.0050	0.0050	0.0050
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	7.65	7.65	7.65
Dry Density (pcf)	116.6	118.1	121.1
Saturation (%)	46.3	48.4	52.7
Soil Height Before Shearing (in.)	0.9948	0.9930	0.9862
Final Moisture Content (%)	14.0	12.8	12.4

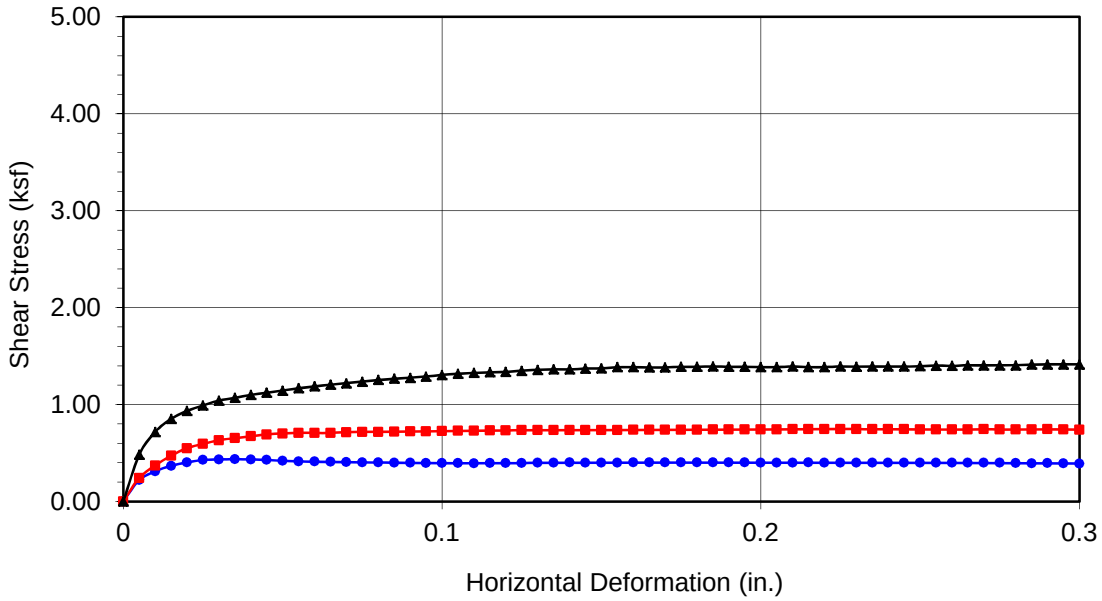
DIRECT SHEAR TEST RESULTS

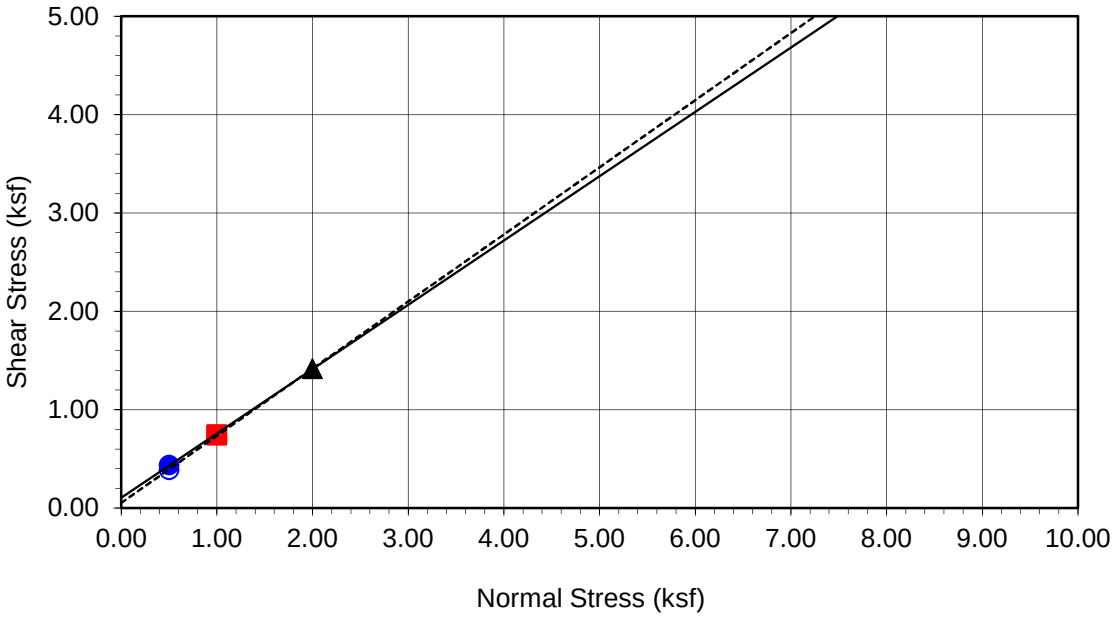
Consolidated Drained - ASTM D 3080

Project No.: 13092-01

Richland – Stoneridge

04-16





Boring No.	**HS-2**
Sample No.	**R-1**
Depth (ft)	**2.5**
Sample Type:	Ring
Soil Identification:	Brown clayey sand (SC)

Strength Parameters

	C (psf)	ϕ (^{o})
Peak	104	33
Ultimate	52	34

Normal Stress (kip/ft²)	0.500	1.000	2.000
Peak Shear Stress (kip/ft²)	● 0.437	■ 0.748	▲ 1.415
Shear Stress @ End of Test (ksf)	○ 0.390	□ 0.739	△ 1.415
Deformation Rate (in./min.)	0.0050	0.0050	0.0050
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	7.65	7.65	7.65
Dry Density (pcf)	116.6	118.1	121.1
Saturation (%)	46.3	48.4	52.7
Soil Height Before Shearing (in.)	0.9948	0.9930	0.9862
Final Moisture Content (%)	14.0	12.8	12.4

DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

Project No.: 13092-01

Richland – Stoneridge

04-16

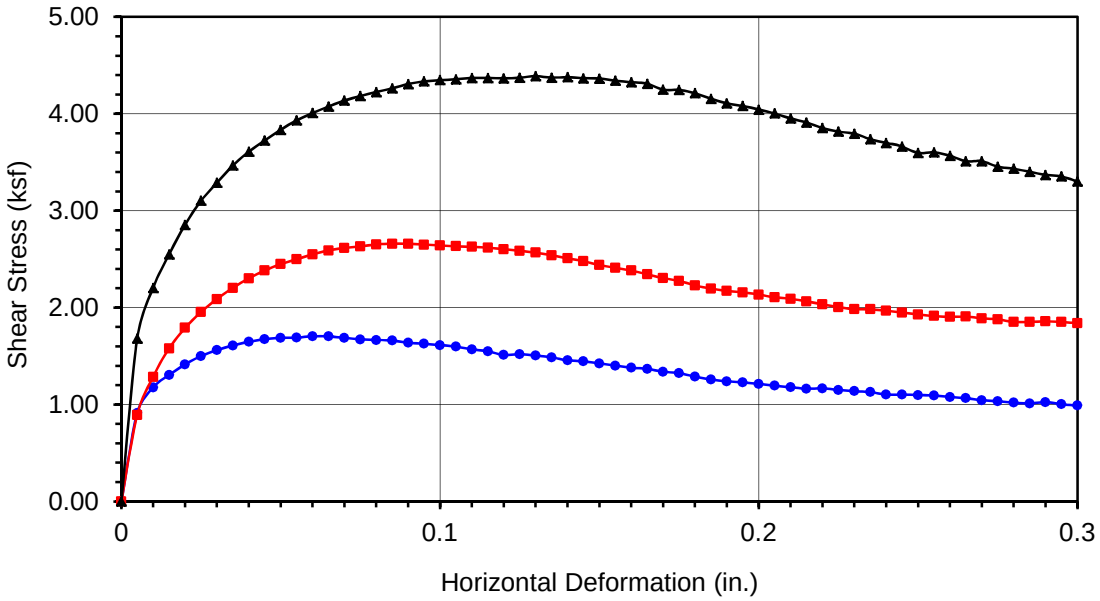
DIRECT SHEAR TEST

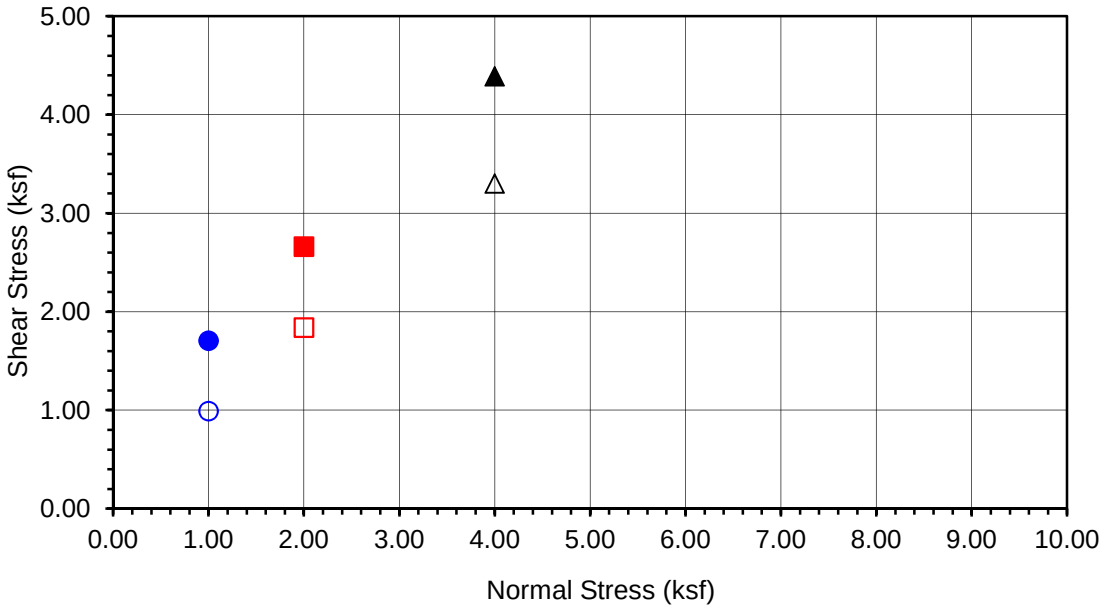
Consolidated Drained - ASTM D 3080

Project Name:	Richland – Stoneridge	Tested By:	G. Bathala	Date:	04/20/16
Project No.:	13092-01	Checked By:	J. Ward	Date:	04/27/16
Boring No.:	HS-6	Sample Type:	Ring		
Sample No.:	R-2	Depth (ft.):	5.0		

Soil Identification: Olive gray clayey sand (SC)

Sample Diameter(in):	2.415	2.415	2.415
Sample Thickness(in.):	1.000	1.000	1.000
Weight of Sample + ring(gm):	209.75	212.49	212.51
Weight of Ring(gm):	45.08	45.69	45.31
Before Shearing			
Weight of Wet Sample+Cont.(gm):	232.84	232.84	232.84
Weight of Dry Sample+Cont.(gm):	220.68	220.68	220.68
Weight of Container(gm):	71.79	71.79	71.79
Vertical Rdg.(in): Initial	0.2353	0.2783	0.0000
Vertical Rdg.(in): Final	0.2265	0.2752	-0.0056
After Shearing			
Weight of Wet Sample+Cont.(gm):	208.36	239.44	227.46
Weight of Dry Sample+Cont.(gm):	182.92	217.77	206.20
Weight of Container(gm):	39.05	65.67	57.44
Specific Gravity (Assumed):	2.70	2.70	2.70
Water Density(pcf):	62.43	62.43	62.43





Boring No.	**HS-6**
Sample No.	**R-2**
Depth (ft)	**5**
Sample Type: Ring	
Soil Identification: Olive gray clayey sand (SC)	

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 1.704	■ 2.660	▲ 4.389
Shear Stress @ End of Test (ksf)	○ 0.990	□ 1.839	△ 3.301
Deformation Rate (in./min.)	0.0050	0.0050	0.0050
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	8.17	8.17	8.17
Dry Density (pcf)	126.6	128.2	128.6
Saturation (%)	66.5	70.1	70.9
Soil Height Before Shearing (in.)	1.0088	1.0031	0.9944
Final Moisture Content (%)	17.7	14.2	14.3

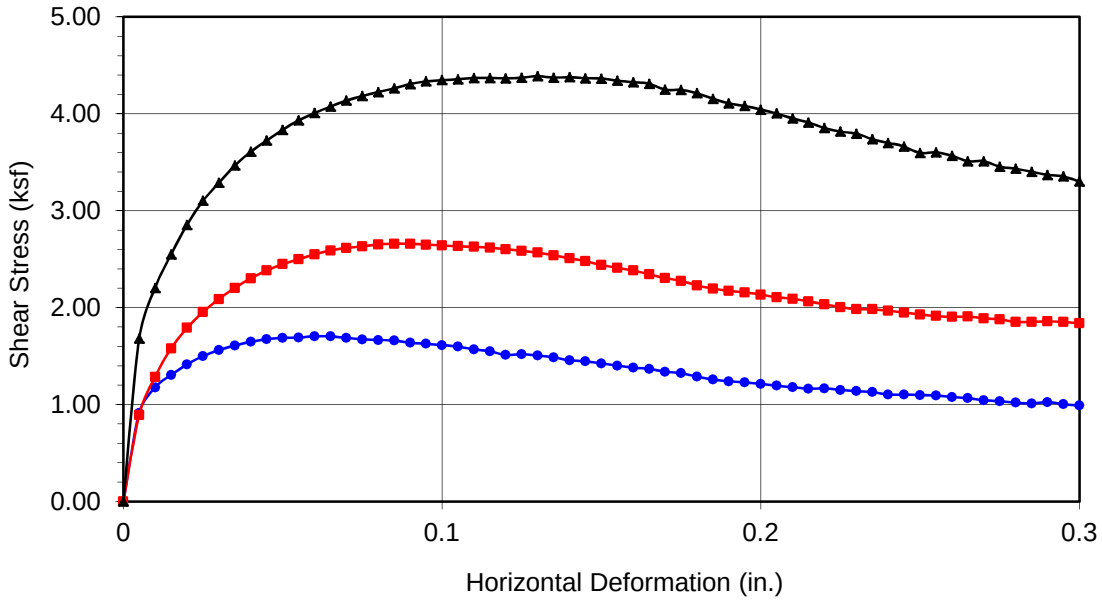
DIRECT SHEAR TEST RESULTS

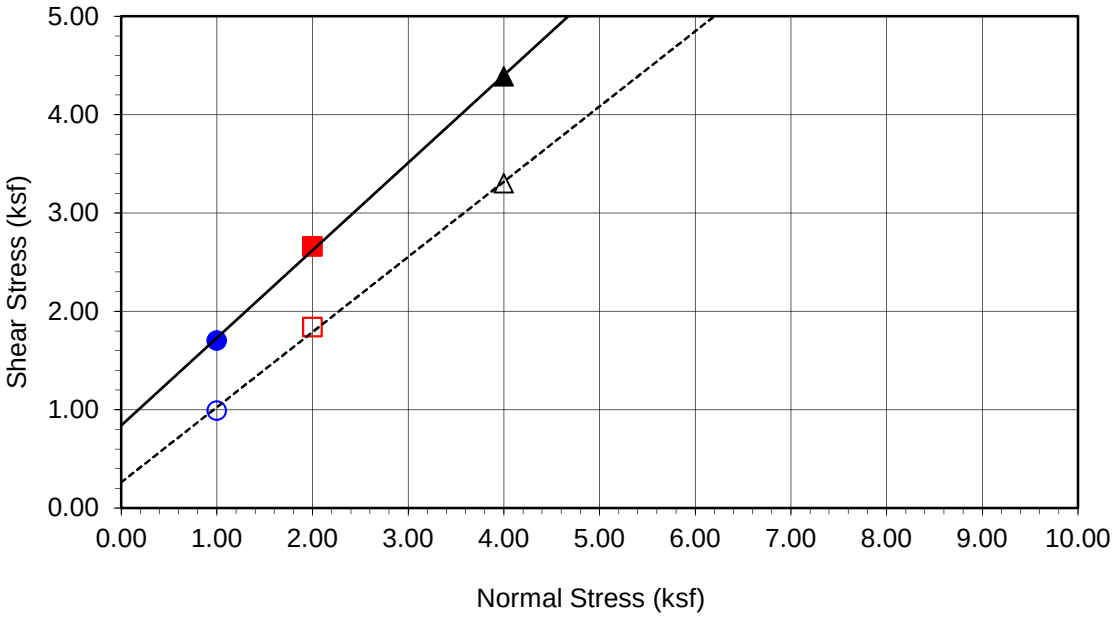
Consolidated Drained - ASTM D 3080

Project No.: 13092-01

Richland – Stoneridge

04-16





Boring No.	**HS-6**
Sample No.	**R-2**
Depth (ft)	**5**
Sample Type:	Ring
Soil Identification:	Olive gray clayey sand (SC)

Strength Parameters

	C (psf)	ϕ (^{o})
Peak	840	42
Ultimate	259	37

Normal Stress (kip/ft²)	1.000	2.000	4.000
Peak Shear Stress (kip/ft²)	● 1.704	■ 2.660	▲ 4.389
Shear Stress @ End of Test (ksf)	○ 0.990	□ 1.839	△ 3.301
Deformation Rate (in./min.)	0.0050	0.0050	0.0050
Initial Sample Height (in.)	1.000	1.000	1.000
Diameter (in.)	2.415	2.415	2.415
Initial Moisture Content (%)	8.17	8.17	8.17
Dry Density (pcf)	126.6	128.2	128.6
Saturation (%)	66.5	70.1	70.9
Soil Height Before Shearing (in.)	1.0088	1.0031	0.9944
Final Moisture Content (%)	17.7	14.2	14.3

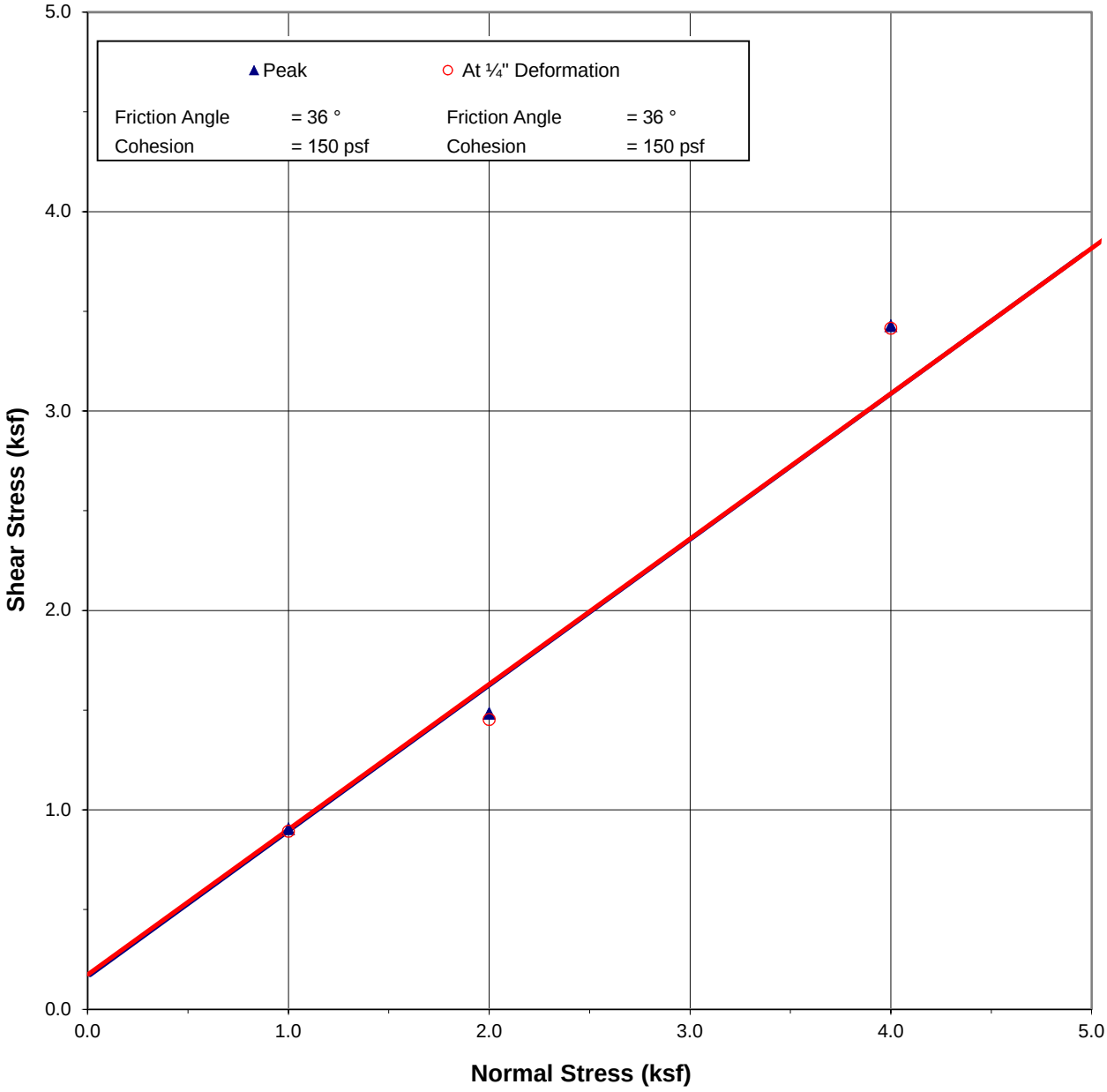
DIRECT SHEAR TEST RESULTS

Consolidated Drained - ASTM D 3080

Project No.: 13092-01

Richland – Stoneridge

04-16



Location:	Sample No.:	Depth (ft)	Sample Type	Shear Rate (inch/min)	Dry Density (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)
HS-20	**B-1**	**2.5'**	**Remolded**	**0.004**	**135.0**	**7.0**	**16.4**

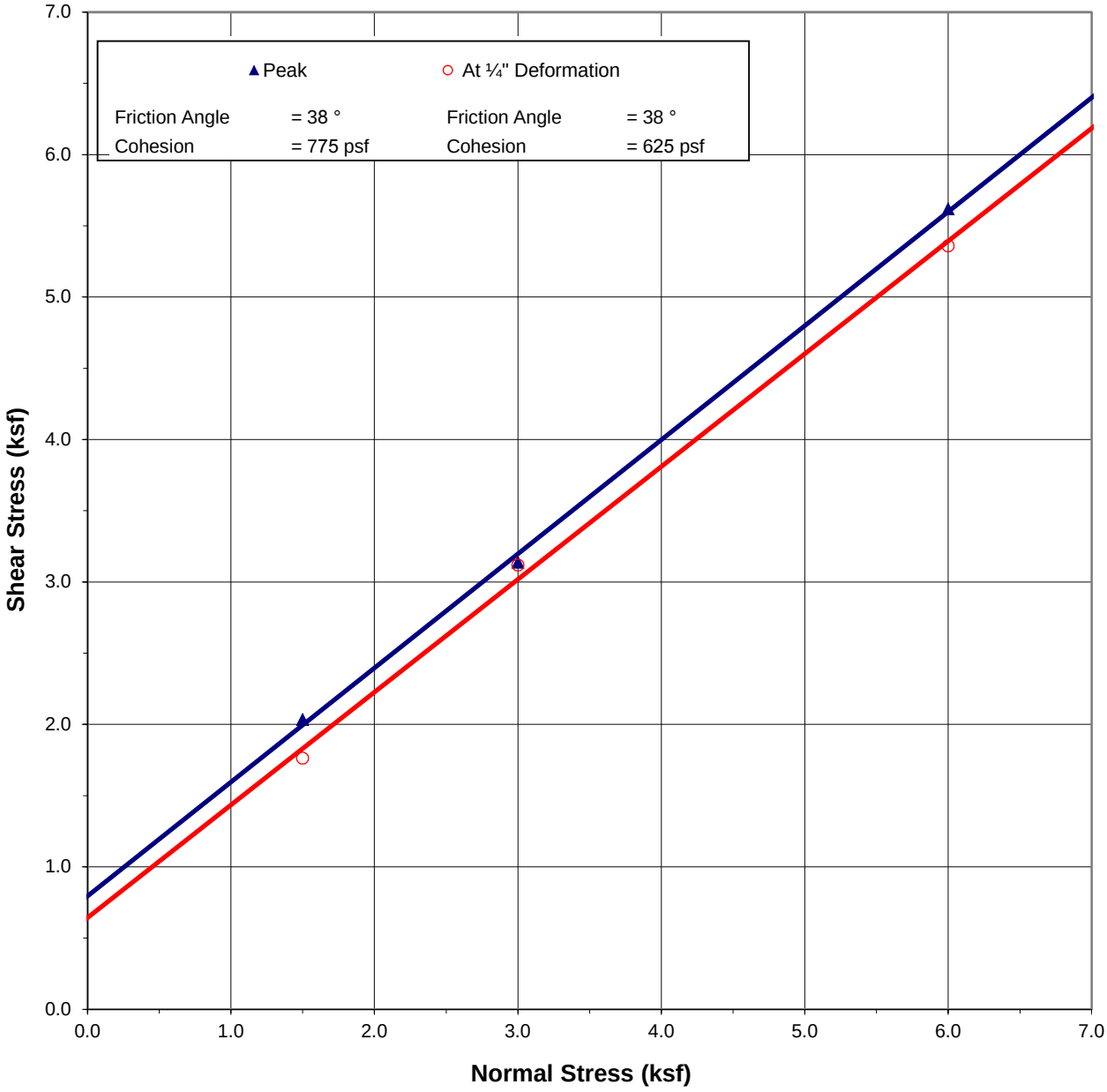
Sample Description: SM

LGC Geotechnical, Inc.

DIRECT SHEAR PLOT

Project Number: 13092-01
Date: Jun-19

Stoneridge



Location:	Sample No.:	Depth (ft)	Sample Type	Shear Rate (inch/min)	Dry Density (pcf)	Initial Moisture Content (%)	Final Moisture Content (%)
HS-24	**R-4**	**10'**	**Ring**	**0.004**	**132.4**	**7.6**	**14.4**

Sample Description: DG

LGC Geotechnical, Inc.

DIRECT SHEAR PLOT

Project Number: 13092-01
Date: Jun-19

Stoneridge

ONE-DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS

ASTM D 4546

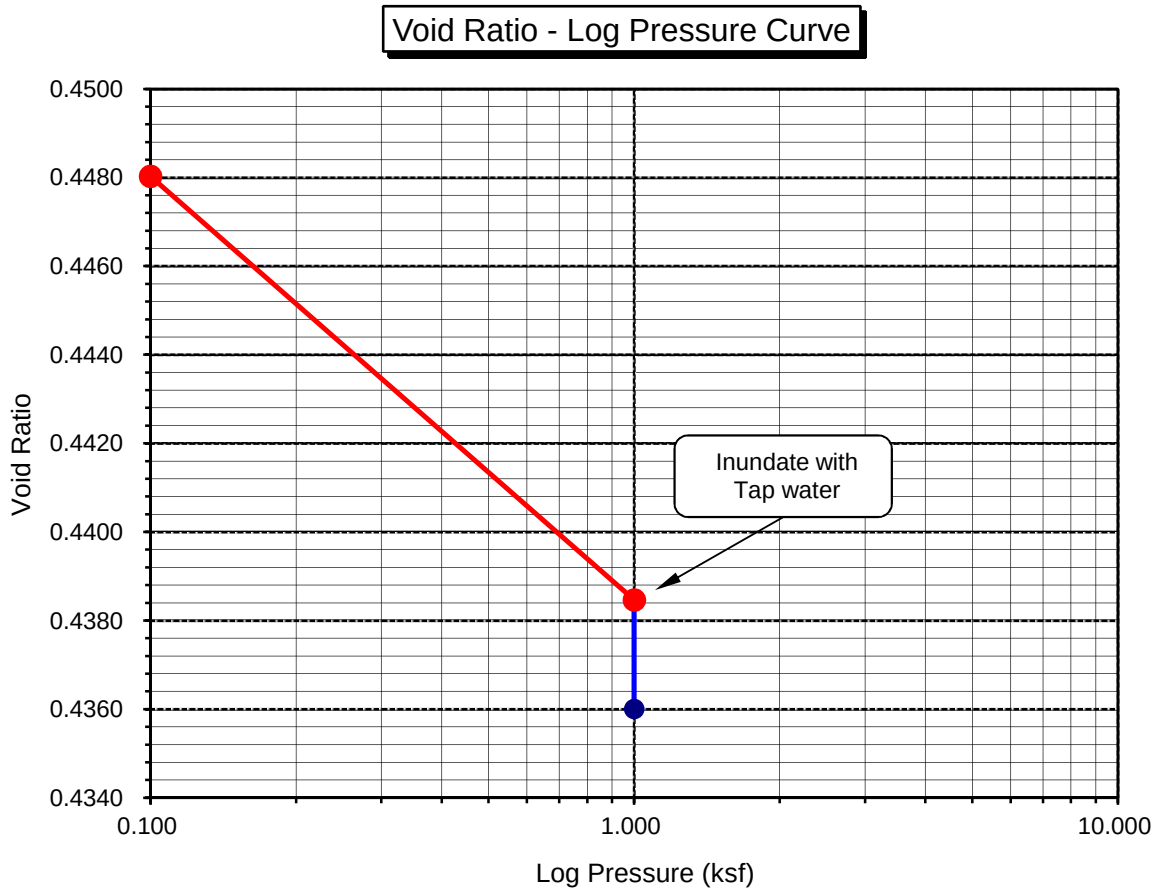
Project Name:	Richland – Stoneridge	Tested By:	G. Bathala	Date:	04/20/16
Project No.:	13092-01	Checked By:	J. Ward	Date:	04/27/16
Boring No.:	HS-10	Sample Type:	Ring		
Sample No.:	R-3	Depth (ft.)	7.5		
Sample Description:	Dark brown silty, clayey sand (SC-SM)				

Initial Dry Density (pcf):	116.4
Initial Moisture (%):	7.49
Initial Length (in.):	1.0000
Initial Dial Reading:	0.2653
Diameter(in):	2.415

Final Dry Density (pcf):	117.4
Final Moisture (%) :	13.9
Initial Void Ratio:	0.4485
Specific Gravity(assumed):	2.70
Initial Saturation (%)	45.1

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.100	0.2650	0.9997	0.00	-0.03	0.4480	-0.03
1.000	0.2567	0.9914	0.17	-0.86	0.4385	-0.69
H2O	0.2550	0.9897	0.17	-1.03	0.4360	-0.86

Percent Swell (+) / Settlement (-) After Inundation = -0.17



ONE-DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS

ASTM D 4546

Project Name:	Stoneridge	Tested By:	G. Bathala	Date:	07/18/19
Project No.:	13092-01	Checked By:	J. Ward	Date:	07/24/19
Boring No.:	HS-15	Sample Type:	Ring		
Sample No.:	R-4	Depth (ft.)	10.0		

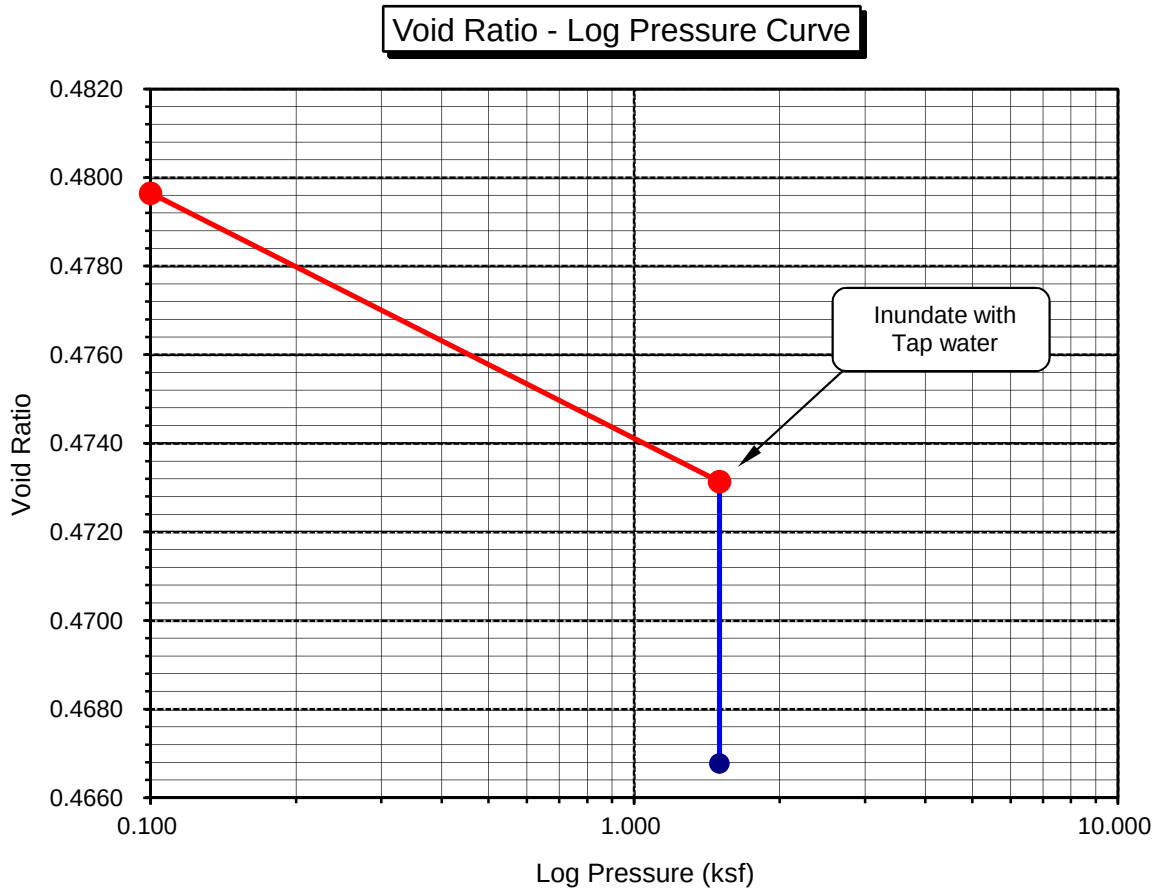
Sample Description: Light olive brown well-graded sand with silt (SW-SM)

Initial Dry Density (pcf):	113.9
Initial Moisture (%):	1.91
Initial Length (in.):	1.0000
Initial Dial Reading:	0.2809
Diameter(in):	2.415

Final Dry Density (pcf):	114.9
Final Moisture (%) :	14.2
Initial Void Ratio:	0.4796
Specific Gravity(assumed):	2.70
Initial Saturation (%)	10.7

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.100	0.2809	1.0000	0.00	0.00	0.4796	0.00
1.500	0.2739	0.9930	0.26	-0.70	0.4731	-0.44
H2O	0.2696	0.9887	0.26	-1.13	0.4668	-0.87

Percent Swell (+) / Settlement (-) After Inundation = -0.43



ONE-DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS

ASTM D 4546

Project Name:	Stoneridge	Tested By:	G. Bathala	Date:	07/19/19
Project No.:	13092-01	Checked By:	J. Ward	Date:	07/24/19
Boring No.:	HS-22	Sample Type:	Ring		
Sample No.:	R-3	Depth (ft.)	7.5		

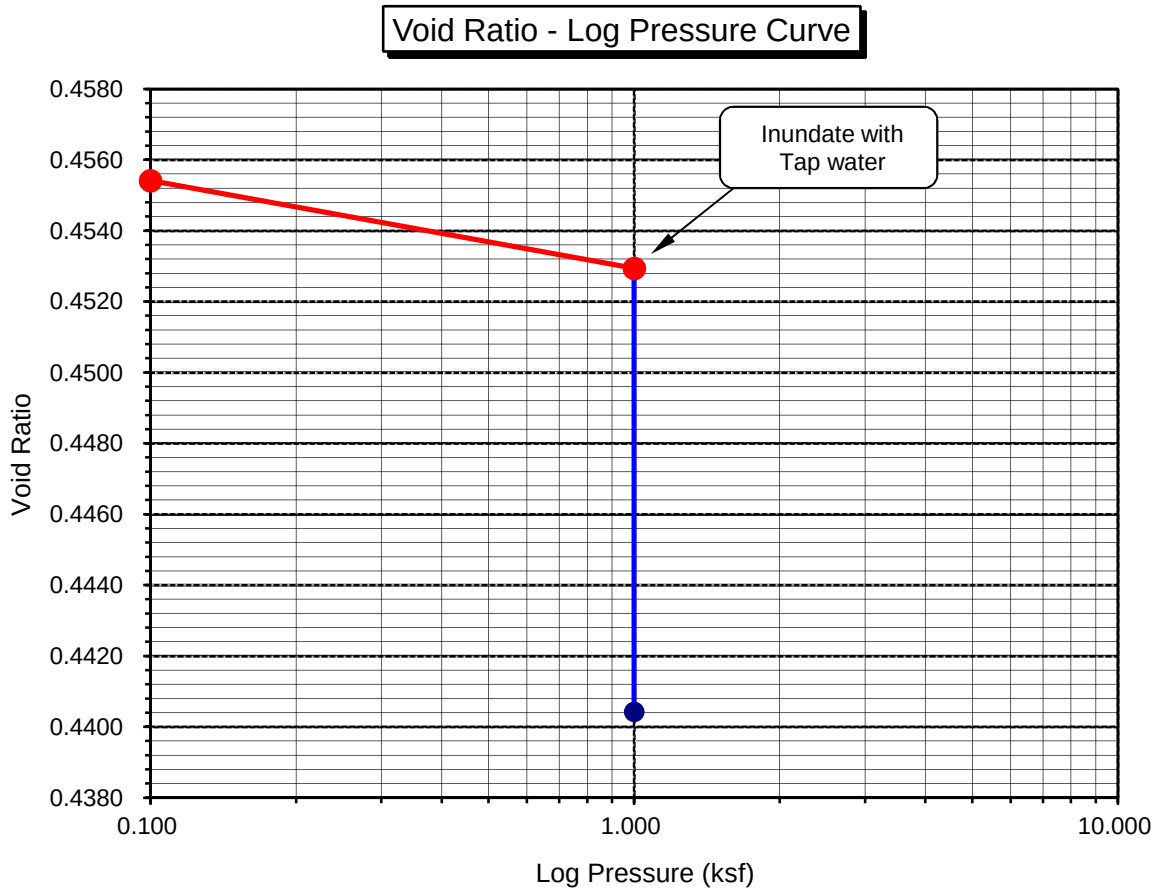
Sample Description: Light olive brown well-graded sand with silt (SW-SM)

Initial Dry Density (pcf):	115.8
Initial Moisture (%):	1.10
Initial Length (in.):	1.0000
Initial Dial Reading:	0.2798
Diameter(in):	2.415

Final Dry Density (pcf):	117.0
Final Moisture (%) :	13.7
Initial Void Ratio:	0.4554
Specific Gravity(assumed):	2.70
Initial Saturation (%)	6.5

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.100	0.2798	1.0000	0.00	0.00	0.4554	0.00
1.000	0.2761	0.9963	0.20	-0.37	0.4529	-0.17
H2O	0.2675	0.9877	0.20	-1.23	0.4404	-1.03

Percent Swell (+) / Settlement (-) After Inundation = -0.86



ONE-DIMENSIONAL SWELL OR SETTLEMENT POTENTIAL OF COHESIVE SOILS

ASTM D 4546

Project Name:	Stoneridge	Tested By:	G. Bathala	Date:	07/19/19
Project No.:	13092-01	Checked By:	J. Ward	Date:	07/24/19
Boring No.:	HS-24	Sample Type:	Ring		
Sample No.:	R-2	Depth (ft.)	5.0		

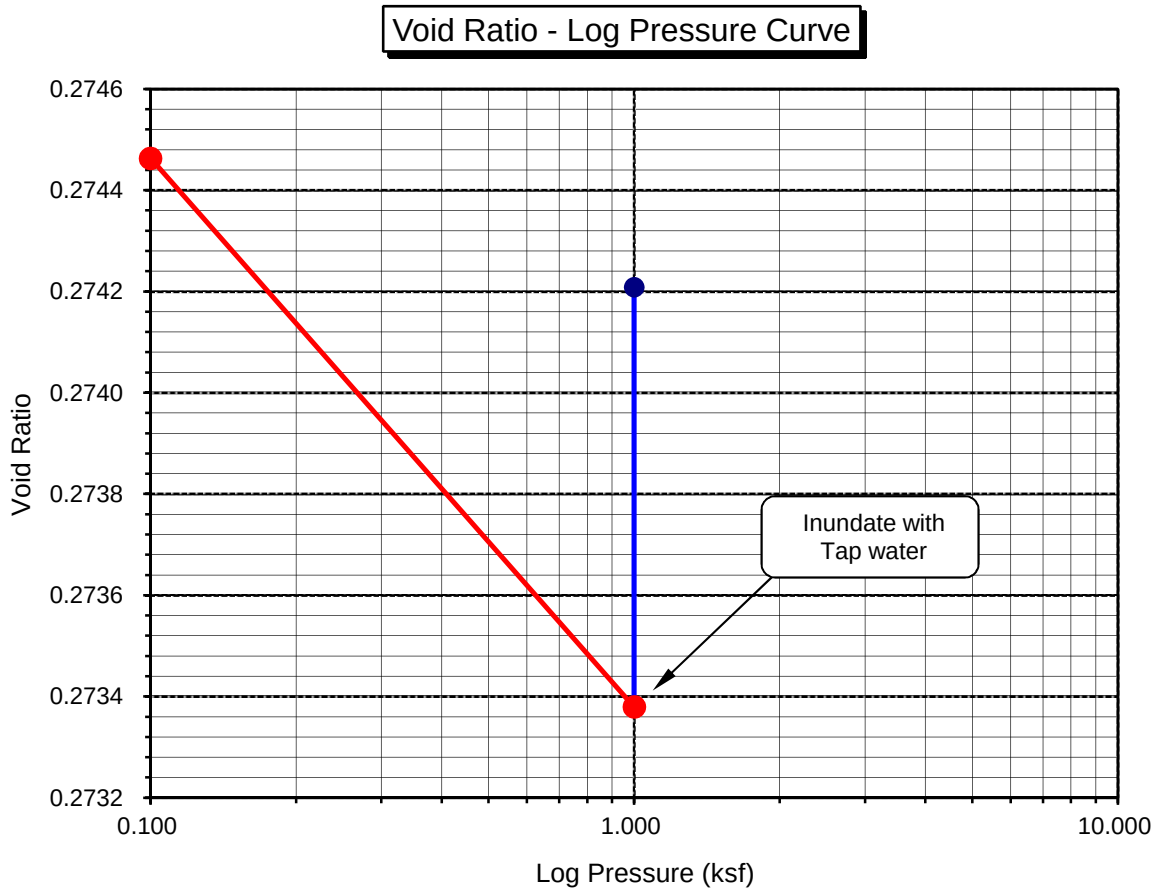
Sample Description: Yellowish brown silty, clayey sand (SC-SM)

Initial Dry Density (pcf):	132.2
Initial Moisture (%):	8.11
Initial Length (in.):	1.0000
Initial Dial Reading:	0.3215
Diameter(in):	2.415

Final Dry Density (pcf):	132.3
Final Moisture (%) :	11.1
Initial Void Ratio:	0.2748
Specific Gravity(assumed):	2.70
Initial Saturation (%)	79.6

Pressure (p) (ksf)	Final Reading (in)	Apparent Thickness (in)	Load Compliance (%)	Swell (+) Settlement (-) % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.100	0.32120	0.9997	0.00	-0.03	0.2745	-0.03
1.000	0.31765	0.9962	0.27	-0.39	0.2734	-0.12
H2O	0.31830	0.9968	0.27	-0.32	0.2742	-0.05

Percent Swell (+) / Settlement (-) After Inundation = 0.07



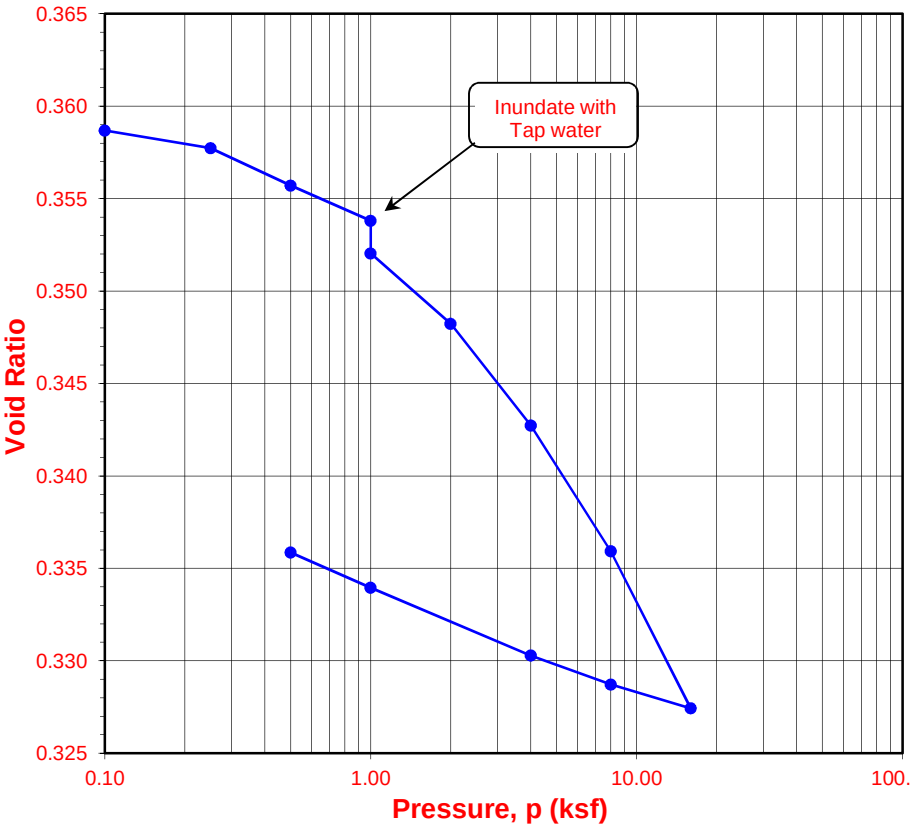
ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

ASTM D 2435

Project Name: Stoneridge
Project No.: 13092-01
Boring No.: HS-15
Sample No.: R-3
Soil Identification: Olive brown silty sand (SM)

Tested By: G. Bathala Date: 07/15/19
Checked By: J. Ward Date: 07/24/19
Depth (ft.): 7.5
Sample Type: Ring

Sample Diameter (in.)	2.415
Sample Thickness (in.)	1.000
Wt. of Sample + Ring (g)	199.67
Weight of Ring (g)	45.65
Height after consol. (in.)	0.9829
Before Test	
Wt.Wet Sample+Cont. (g)	335.83
Wt.of Dry Sample+Cont. (g)	326.41
Weight of Container (g)	39.23
Initial Moisture Content (%)	3.3
Initial Dry Density (pcf)	124.0
Initial Saturation (%)	25
Initial Vertical Reading (in.)	0.3017
After Test	
Wt.of Wet Sample+Cont. (g)	280.67
Wt. of Dry Sample+Cont. (g)	263.36
Weight of Container (g)	69.53
Final Moisture Content (%)	11.68
Final Dry Density (pcf)	125.4
Final Saturation (%)	92
Final Vertical Reading (in.)	0.2818
Specific Gravity (assumed)	2.70
Water Density (pcf)	62.43

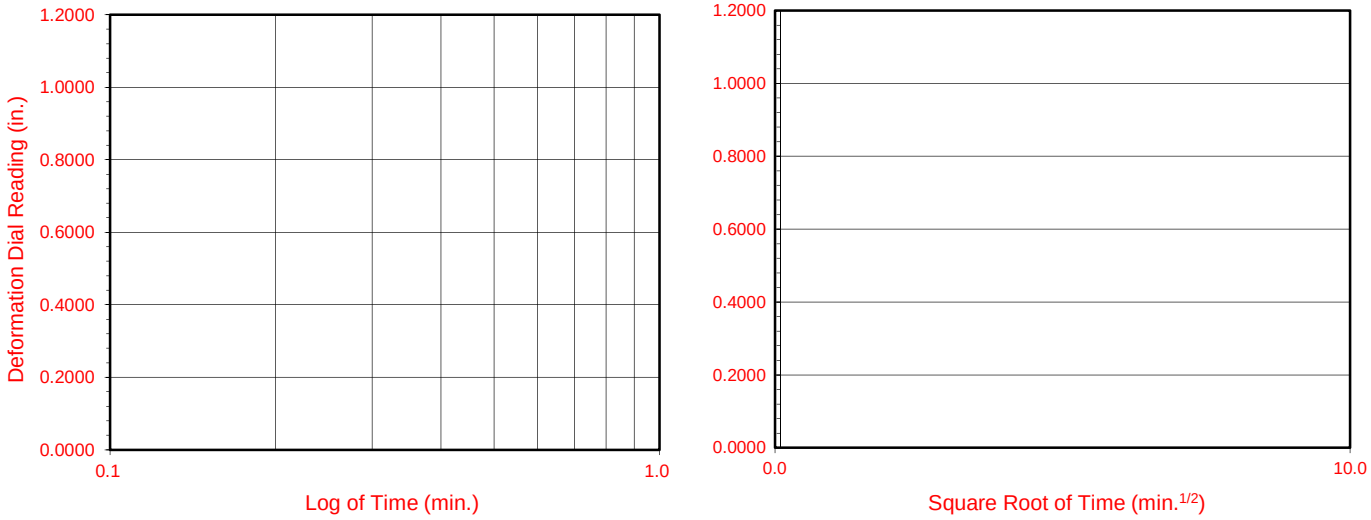


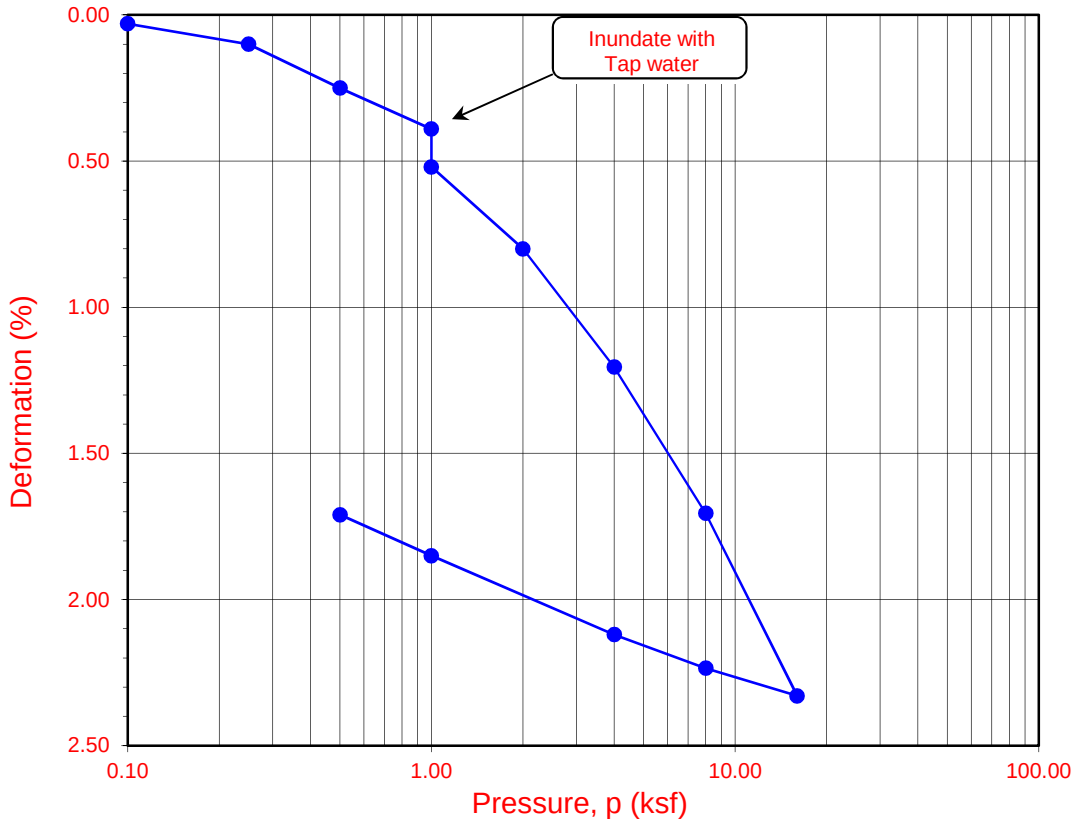
Pressure (p) (ksf)	Final Reading (in.)	Apparent Thickness (in.)	Load Compliance (%)	Deformation % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.10	0.3014	0.9997	0.00	0.03	0.359	0.03
0.25	0.3002	0.9985	0.05	0.15	0.358	0.10
0.50	0.2982	0.9965	0.10	0.35	0.356	0.25
1.00	0.2960	0.9943	0.18	0.57	0.354	0.39
1.00	0.2947	0.9930	0.18	0.70	0.352	0.52
2.00	0.2910	0.9893	0.27	1.07	0.348	0.80
4.00	0.2857	0.9840	0.40	1.61	0.343	1.21
8.00	0.2791	0.9774	0.56	2.27	0.336	1.71
16.00	0.2707	0.9690	0.77	3.10	0.327	2.33
8.00	0.2729	0.9712	0.65	2.89	0.329	2.24
4.00	0.2751	0.9734	0.54	2.66	0.330	2.12
1.00	0.2796	0.9779	0.36	2.21	0.334	1.85
0.50	0.2818	0.9801	0.28	1.99	0.336	1.71

Time Readings

Date	Time	Elapsed Time (min)	Square Root of Time	Dial Rdgs. (in.)

Time Readings





Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
HS-15	**R-3**	**7.5**	**3.3**	**11.7**	**124.0**	**125.4**	**0.359**	**0.336**	**25**	**92**

Soil Identification: Olive brown silty sand (SM)

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

Project No.: 13092-01

Stoneridge

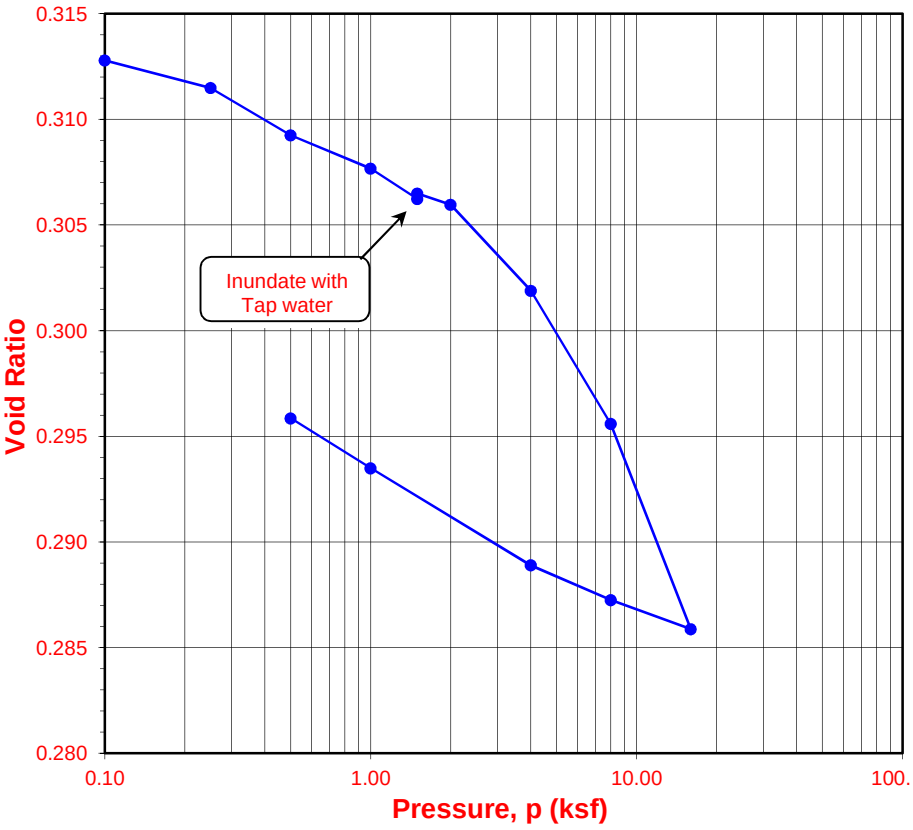
07-19

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS

ASTM D 2435

Project Name:	Stoneridge	Tested By: G. Bathala	Date: 07/15/19
Project No.:	13092-01	Checked By: J. Ward	Date: 07/24/19
Boring No.:	HS-23	Depth (ft.): 10.0	
Sample No.:	R-4	Sample Type: Ring	
Soil Identification:	Olive brown silty, clayey sand (SC-SM)		

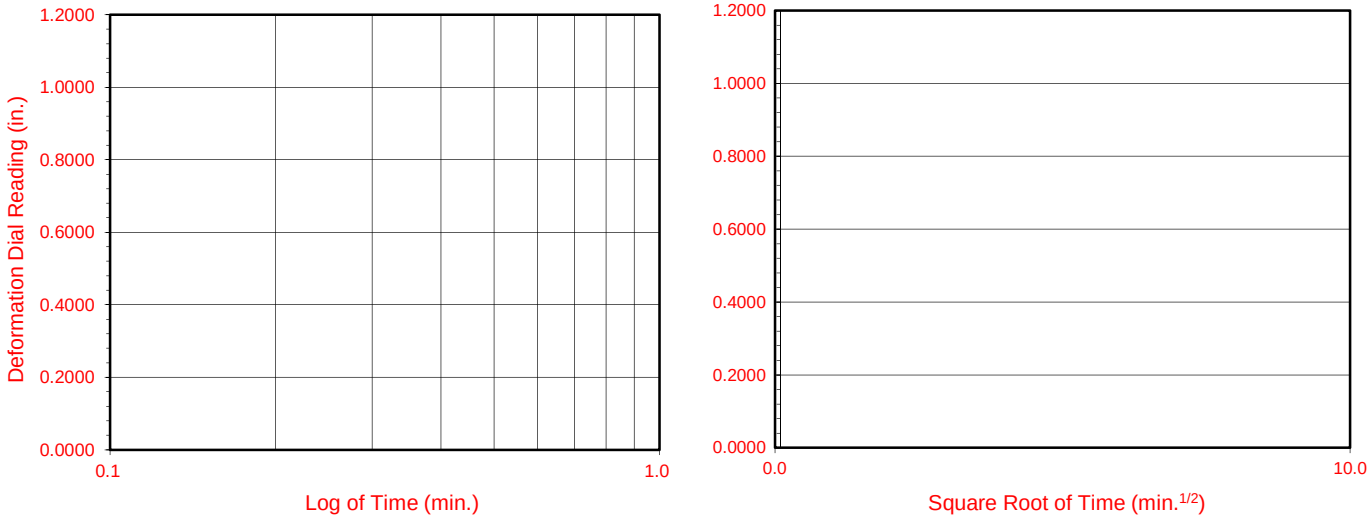
Sample Diameter (in.)	2.415
Sample Thickness (in.)	1.000
Wt. of Sample + Ring (g)	215.12
Weight of Ring (g)	42.58
Height after consol. (in.)	0.9868
Before Test	
Wt.Wet Sample+Cont. (g)	390.82
Wt.of Dry Sample+Cont. (g)	361.89
Weight of Container (g)	39.21
Initial Moisture Content (%)	9.0
Initial Dry Density (pcf)	131.7
Initial Saturation (%)	79
Initial Vertical Reading (in.)	0.3051
After Test	
Wt.of Wet Sample+Cont. (g)	278.57
Wt. of Dry Sample+Cont. (g)	261.60
Weight of Container (g)	60.64
Final Moisture Content (%)	10.71
Final Dry Density (pcf)	133.5
Final Saturation (%)	100
Final Vertical Reading (in.)	0.2904
Specific Gravity (assumed)	2.77
Water Density (pcf)	62.43

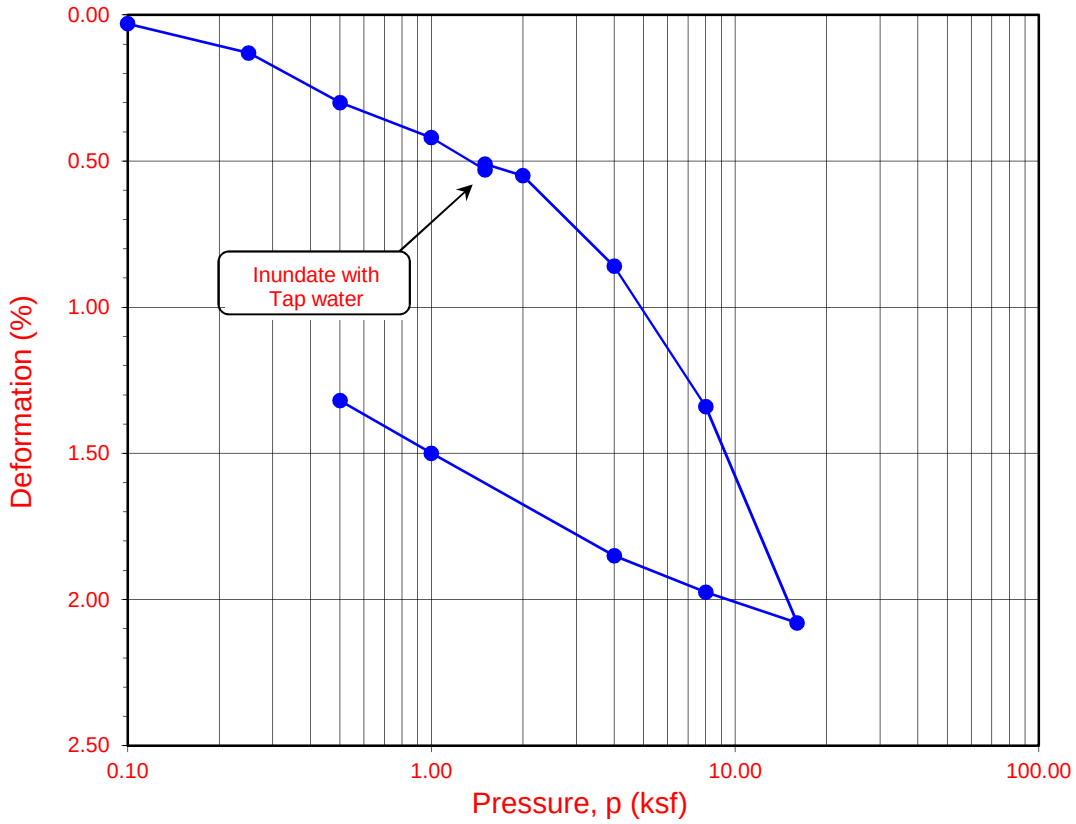


Pressure (p) (ksf)	Final Reading (in.)	Apparent Thickness (in.)	Load Compliance (%)	Deformation % of Sample Thickness	Void Ratio	Corrected Deformation (%)
0.10	0.3048	0.9997	0.00	0.03	0.313	0.03
0.25	0.3036	0.9985	0.02	0.15	0.311	0.13
0.50	0.3017	0.9966	0.04	0.34	0.309	0.30
1.00	0.3002	0.9951	0.07	0.49	0.308	0.42
1.50	0.2989	0.9938	0.09	0.62	0.306	0.53
1.50	0.2991	0.9940	0.09	0.60	0.306	0.51
2.00	0.2985	0.9934	0.11	0.66	0.306	0.55
4.00	0.2947	0.9896	0.18	1.04	0.302	0.86
8.00	0.2889	0.9838	0.28	1.62	0.296	1.34
16.00	0.2802	0.9751	0.41	2.49	0.286	2.08
8.00	0.2818	0.9767	0.36	2.34	0.287	1.98
4.00	0.2836	0.9785	0.30	2.15	0.289	1.85
1.00	0.2882	0.9831	0.19	1.69	0.293	1.50
0.50	0.2904	0.9853	0.15	1.47	0.296	1.32

Time Readings				
Date	Time	Elapsed Time (min)	Square Root of Time	Dial Rdgs. (in.)

Time Readings





Boring No.	Sample No.	Depth (ft.)	Moisture Content (%)		Dry Density (pcf)		Void Ratio		Degree of Saturation (%)	
			Initial	Final	Initial	Final	Initial	Final	Initial	Final
HS-23	**R-4**	**10.0**	**9.0**	**10.7**	**131.7**	**133.5**	**0.313**	**0.296**	**79**	**100**

Soil Identification: Olive brown silty, clayey sand (SC-SM)

ONE-DIMENSIONAL CONSOLIDATION PROPERTIES of SOILS
ASTM D 2435

Project No.: 13092-01

Stoneridge

07-19

R-VALUE TEST RESULTS

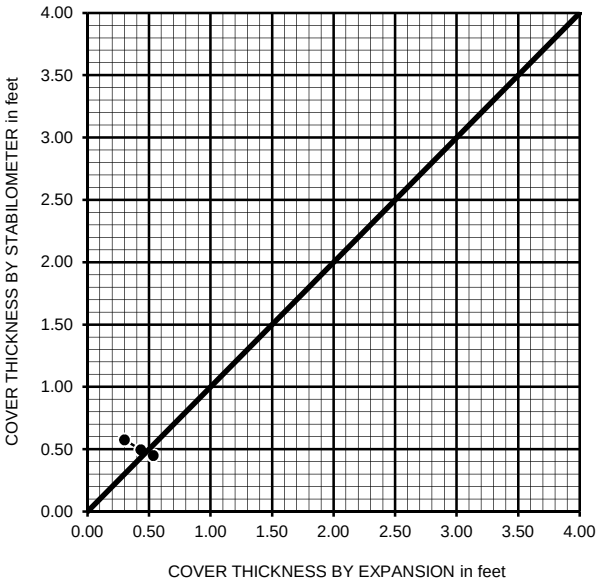
DOT CA Test 301

PROJECT NAME:	Richland – Stoneridge	PROJECT NUMBER:	13092-01
BORING NUMBER:	HS-3	DEPTH (FT.):	0-3
SAMPLE NUMBER:	B-1	TECHNICIAN:	S. Felter
SAMPLE DESCRIPTION:	Brown silty sand (SM)	DATE COMPLETED:	4/21/2016

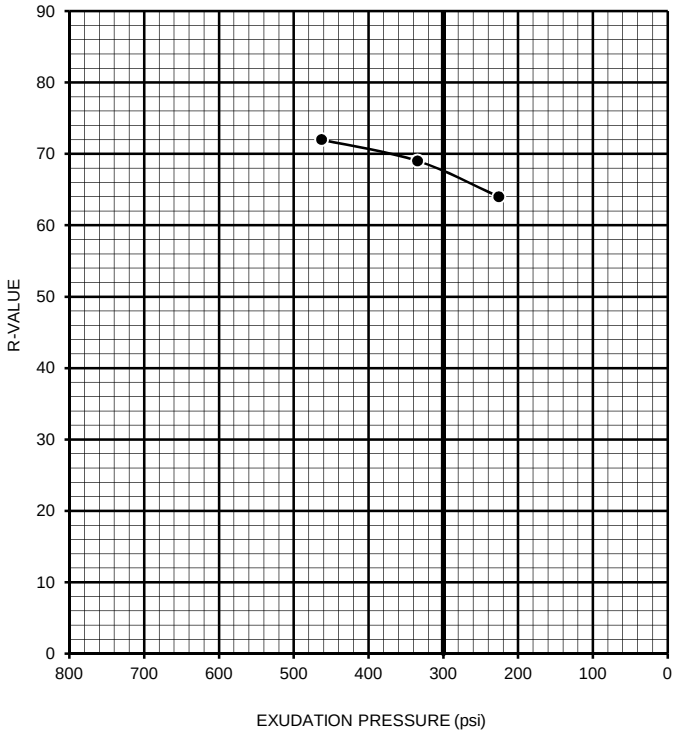
TEST SPECIMEN	**a**	**b**	**c**
MOISTURE AT COMPACTION %	9.2	9.7	10.2
HEIGHT OF SAMPLE, Inches	2.46	2.48	2.53
DRY DENSITY, pcf	129.5	131.8	130.1
COMPACTOR PRESSURE, psi	350	240	175
EXUDATION PRESSURE, psi	463	334	225
EXPANSION, Inches x 10exp-4	16	13	9
STABILITY Ph 2,000 lbs (160 psi)	30	32	36
TURNS DISPLACEMENT	4.19	4.50	4.88
R-VALUE UNCORRECTED	72	69	64
R-VALUE CORRECTED	72	69	64

DESIGN CALCULATION DATA	**a**	**b**	**c**
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.45	0.50	0.58
EXPANSION PRESSURE THICKNESS, ft.	0.53	0.43	0.30

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	70
R-VALUE BY EXUDATION:	67
EQUILIBRIUM R-VALUE:	67

R-VALUE TEST RESULTS

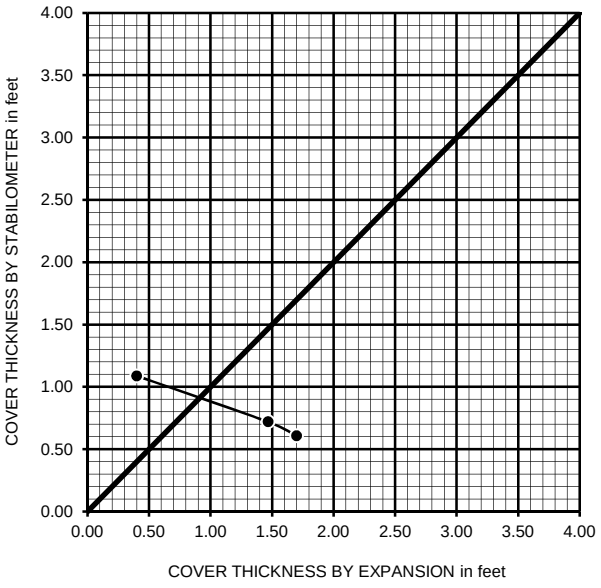
DOT CA Test 301

PROJECT NAME:	Richland – Stoneridge	PROJECT NUMBER:	13092-01
BORING NUMBER:	HS-9	DEPTH (FT.):	0-4
SAMPLE NUMBER:	B-1	TECHNICIAN:	S. Felter
SAMPLE DESCRIPTION:	Brown silty, clayey sand (SC-SM)	DATE COMPLETED:	4/21/2016

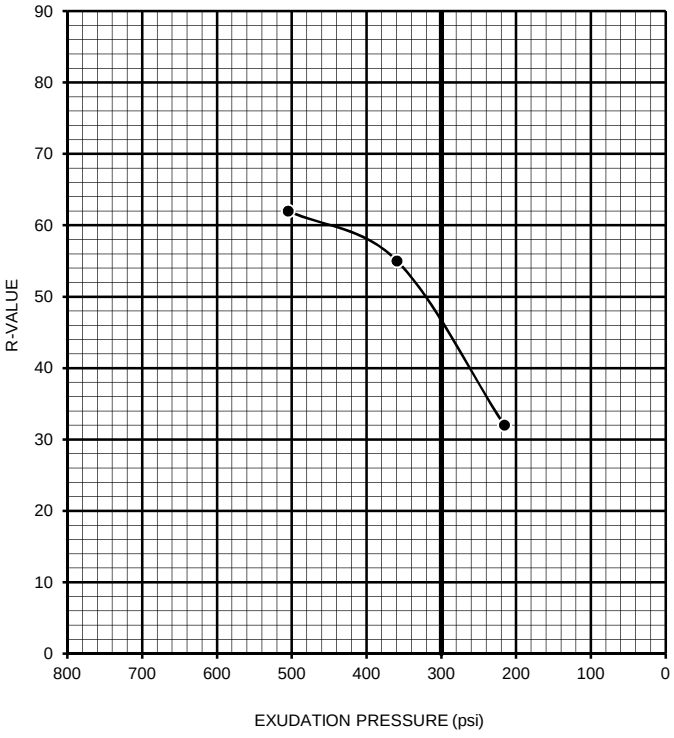
TEST SPECIMEN	**a**	**b**	**c**
MOISTURE AT COMPACTION %	10.2	10.7	11.6
HEIGHT OF SAMPLE, Inches	2.43	2.42	2.46
DRY DENSITY, pcf	133.3	131.2	129.4
COMPACTOR PRESSURE, psi	250	200	125
EXUDATION PRESSURE, psi	504	359	216
EXPANSION, Inches x 10exp-4	51	44	12
STABILITY Ph 2,000 lbs (160 psi)	40	50	88
TURNS DISPLACEMENT	4.20	4.09	4.37
R-VALUE UNCORRECTED	64	57	32
R-VALUE CORRECTED	62	55	32

DESIGN CALCULATION DATA	**a**	**b**	**c**
GRAVEL EQUIVALENT FACTOR	1.0	1.0	1.0
TRAFFIC INDEX	5.0	5.0	5.0
STABILOMETER THICKNESS, ft.	0.61	0.72	1.09
EXPANSION PRESSURE THICKNESS, ft.	1.70	1.47	0.40

EXPANSION PRESSURE CHART



EXUDATION PRESSURE CHART



R-VALUE BY EXPANSION:	43
R-VALUE BY EXUDATION:	46
EQUILIBRIUM R-VALUE:	43

Appendix D
Seismic Refraction Survey Report

TERRA GEOSCIENCES

SEISMIC REFRACTION SURVEY

RICHLAND STONERIDGE PROJECT

SOUTHEAST OF RAMONA EXPRESSWAY AND RIDER STREET

PERRIS AREA, RIVERSIDE COUNTY, CALIFORNIA

Project No. 193235-1

July 1, 2019

Prepared for:

LGC Geotechnical, Inc.
131 Calle Iglesia, Suite 200
San Clemente, CA 92672

Consulting Engineering Geology & Geophysics

P.O. Box 1090, Loma Linda, CA 92354 • 909 796-4667

LGC Geotechnical, Inc.
131 Calle Iglesia, Suite 200
San Clemente, CA 92672

July 1, 2019
Project No. 193235-1

Attention: Mr. Kevin Dyekman, Project Geologist

Regarding: Seismic Refraction Survey
Richland Stoneridge Project
Southeast of Ramona Expressway and Rider Street
Perris Area, Riverside County, California
LGC Project No. 13092-01

EXECUTIVE SUMMARY

As requested, this firm has performed a geophysical survey using the seismic refraction method for the above-referenced site. The purpose of this investigation was to assess the general seismic velocity characteristics of the underlying earth materials and to evaluate whether high velocity bedrock materials (non-rippable) may be present. Additionally, the structure and seismic velocity distribution of the subsurface earth materials was also assessed. This report will describe in further detail the procedures used and the results of our findings, along with presentation of representative seismic models for the survey traverse.

For this study, five survey traverses were performed across the subject property, as selected by your office. The traverses were located in the field by use of Google™ Earth imagery (2019) and GPS coordinates. The approximate locations of these traverses are shown on the Seismic Line Location Map, Plate 1, of which the base map is a captured Google™ Earth image (2019).

This opportunity to be of service is sincerely appreciated. If you should have questions regarding this report or do not understand the limitations of this study or the data and results that are presented, please do not hesitate to contact our office.

Respectfully submitted,
TERRA GEOSCIENCES

Donn C. Schwartzkopf
Principal Geophysicist
PGP 1002

TABLE OF CONTENTS

	Page No.
INTRODUCTION	**1**
SEISMIC REFRACTION SURVEY	**2**
Methodology	2
Field Procedures	2
Data Processing	3
SUMMARY OF GEOPHYSICAL INTERPRETATION	**4**
Velocity Layer V1	5
Velocity Layer V2	5
Velocity Layer V3	5
GENERALIZED RIPPABILITY CHARACTERISTICS OF BEDROCK	**6**
Rippable Condition (0 - 4,000 ft/sec)	9
Marginally Rippable Condition (4,000 - 7,000 ft/sec)	9
Non-Rippable Condition (7,000 ft/sec or greater)	9
GEOLOGIC & EARTHWORK CONSIDERATIONS	**10**
SUMMARY OF FINDINGS AND CONCLUSIONS	**10**
Velocity Layer V1	10
Velocity Layer V2	11
Velocity Layer V3	11
CLOSURE	**11**
ILLUSTRATIONS	
Figure 1- Geologic Map	1
Table 1- Velocity Summary of Seismic Survey Lines	6
Table 2- Caterpillar Rippability Chart (D9 Ripper)	7
Table 3- Standard Caltrans Rippability chart	7
Table 4- Summary of Rock Engineering Properties	7
Figure 2- Caterpillar D9R Ripper Performance Chart	8
Seismic Line Location Map	Plate 1
APPENDICES	
Layer Velocity Models	Appendix A
Refraction Tomographic Models	Appendix B
Excavation Considerations	Appendix C
References	Appendix D

INTRODUCTION

The subject study area is located southeast of Ramona Expressway and Rider Street, in the Perris area of Riverside County, California. Topographically, the subject study area is situated along the northwestern flank of some low-lying unnamed hills just south of the Bernasconi Hills, which is covered with dense shrub brush and annual weeds and grasses, with scattered numerous large boulder outcrops.

Geomorphically, the subject study area is located within the northwestern portion of the Perris Block, which is an eroded mass of Cretaceous and older crystalline rock forming generally flat-lying erosion surfaces now present at various elevations. More specifically, the subject property is located within the western transition zone of the southern Peninsular Ranges batholith, along the northwestern portion of the Cretaceous age Lakeview Mountains Valley pluton. Locally, as shown on Figure 1 below, surficial mapping by Morton (2003) indicates the subject study area to be underlain by Cretaceous age granitic rocks generally described as being a gray, medium- to coarse-grained, massive to foliated, biotite hornblende tonalite (map symbol Klmt). For reference, the approximate locations of the seismic traverses are indicated as the red lines in Figure 1 below.

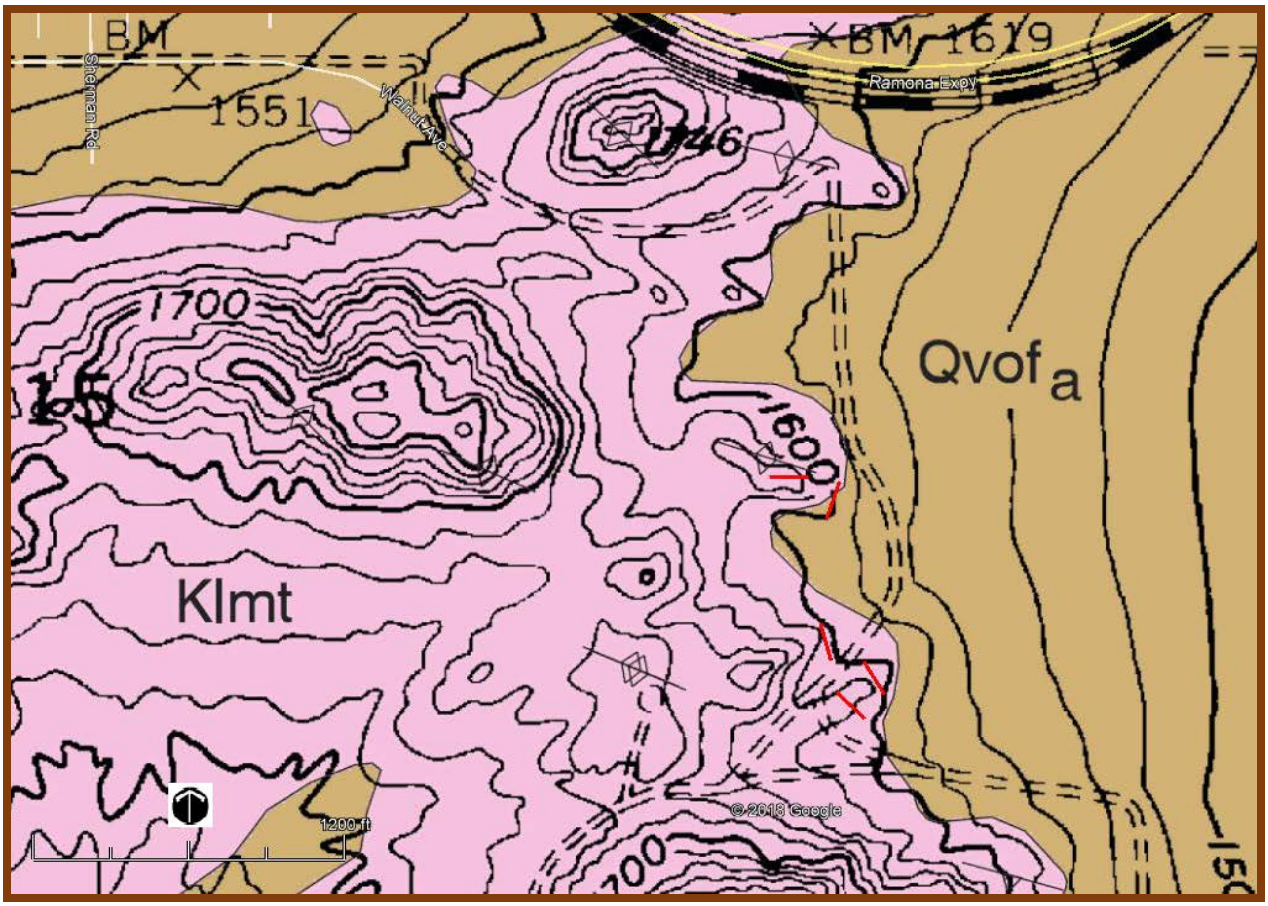


FIGURE 1- Geologic Map (Morton, 2003), Seismic traverses shown as red lines.

SEISMIC REFRACTION SURVEY

Methodology

The seismic refraction method consists of measuring (at known points along the surface of the ground) the travel times of compressional waves generated by an impulsive energy source and can be used to estimate the layering, structure, and seismic acoustic velocities of subsurface horizons. Seismic waves travel down and through the soils and rocks, and when the wave encounters a contact between two earth materials having different velocities, some of the wave's energy travels along the contact at the velocity of the lower layer. The fundamental assumption is that each successively deeper layer has a velocity greater than the layer immediately above it. As the wave travels along the contact, some of the wave's energy is refracted toward the surface where it is detected by a series of motion-sensitive transducers (geophones). The arrival time of the seismic wave at the geophone locations can be related to the relative seismic velocities of the subsurface layers in feet per second (fps), which can then be used to aid in interpreting both the depth and type of materials encountered.

Field Procedures

Five seismic refraction survey lines (Seismic Lines S-1 through S-5) have been performed along representative areas across the subject study area as selected by you. The traverses were located in the field by use of Google™ Earth imagery (2019) and GPS coordinates and have been delineated on the Seismic Line Location Map, as presented on Plate 1. The survey traverses were each 150 feet in length, which consisted of a total of twenty-four 14-Hertz geophones, spaced at regular six-foot intervals, in order to detect both the direct and refracted waves. A 16-pound sledge-hammer was used as the energy source to produce the seismic waves. Multiple hammer impacts were utilized at each shot point in order to increase the signal to noise ratio, which enhanced the primary seismic “P”-waves.

The seismic wave arrivals were digitally recorded in SEG-2 format on a Geometrics StrataVisor™ NZXP model signal enhancement refraction seismograph. Seven shot points were utilized along each spread using forward, reverse, and several intermediate locations in order to obtain high resolution survey data for velocity analysis and depth modeling purposes. The data was acquired using a sampling rate of 0.0625 milliseconds having a record length of 0.064 seconds. No acquisition filters were used during data collection.

During acquisition, the seismograph displays the seismic wave arrivals on the computer screen which were used to analyze the arrival time of the primary seismic “P”-waves at each geophone station, in the form of a wiggle trace for quality control purposes in the field. If spurious “noise” was observed, the shot location was resampled during relatively quieter periods. Each geophone and seismic shot location were surveyed using a hand level and ruler for topographic correction, with “0” being the lowest point along each survey line.

Data Processing

The recorded seismic data was subsequently transferred to our office computer for processing and analyzing purposes, using the computer programs **SIPwin** (**S**eismic Refraction **I**nterpretation **P**rogram for **Win**dows) developed by Rimrock Geophysics, Inc. (2004); **Refractor** (Geogiga, 2001-2018); and **Rayfract™** (Intelligent Resources, Inc., 1996-2019). All of the computer programs perform their individual analyses using exactly the same input data, which includes the first-arrival times of the "P"-waves and the survey line geometry.

- **SIPwin** is a ray-trace modeling program that evaluates the subsurface using layer assignments based on time-distance curves and is better suited for layered media, using the "Seismic Refraction Modeling by Computer" method (Scott, 1973). The first step in the modeling procedure is to compute layer velocities by least-squares techniques. Then the program uses the delay-time method to estimate depths to the top of layer-2. A forward modeling routine traces rays from the shot points to each geophone that received a first-arrival ray refracted along the top of layer-2. The travel time of each such ray is compared with the travel time recorded in the field by the seismic system. The program then adjusts the layer-2 depths so as to minimize discrepancies between the computed ray-trace travel times and the first arrival times picked from the seismic waveform record. The process of ray tracing and model adjustment is repeated a total of six times to improve the accuracy of depths to the top of layer-2. This first-arrival picks were then used to generate the Layer Velocity Models using the **SIPwin** computer program, which presents the subsurface velocities as individual layers and are presented within Appendix A for reference. In addition, the associated Time-Distance Plot for each survey line, which shows the individual data picks of the first "P-wave" arrival times, also appears in Appendix A.

- **Refractor** is seismic refraction software that also evaluates the subsurface using layer assignments utilizing interactive and interchangeable analytical methods that include the Delay-Time method, the ABC method, and the Generalized Reciprocal Method (GRM). These methods are used for defining irregular non-planar refractors and are briefly described below. The Delay-Time method will measure the delay time depth to a refractor beneath each geophone rather than at shot points. Delay-time is the time spent by a wave to travel up or down through the layer (slant path) compared to the time the wave would spend if traveling along the projection of the slant path on the refractor. The ABC (intercept time) method makes use of critically refracted rays converging on a common surface position. This method involves using three surface to surface travel times between three geophones and the velocity of the first layer in an equation to calculate depth under the central geophone and is applied to all other geophones on the survey line. The GRM method is a technique for delineating undulating refractors at any depth from in-line seismic refraction data consisting of forward and reverse travel-times and is capable of resolving dips of up to 20% and does not over-smooth or average the subsurface refracting layers. In addition, the technique provides an approach for recognizing and compensating for hidden layer conditions.

- **Rayfract™** is seismic refraction tomography software that models subsurface refraction, transmission, and diffraction of acoustic waves which generally indicates the relative structure and velocity distribution of the subsurface using first break energy propagation modeling. An initial 1D gradient model is created using the DeltatV method (Gebrande and Miller, 1985) which gives a good initial fit between modeled and picked first breaks. The DeltatV method is a turning-ray inversion method which delivers continuous depth vs. velocity profiles for all profile stations. These profiles consist of horizontal inline offset, depth, and velocity triples. The method handles real-life geological conditions such as velocity gradients, linear increasing of velocity with depth, velocity inversions, pinched-out layers and outcrops, and faults and local velocity anomalies. This initial model is then refined automatically with a true 2D WET (Wavepath Eikonal Traveltime) tomographic inversion (Schuster and Quintus-Bosz, 1993).

  WET tomography models multiple signal propagation paths contributing to one first break, whereas conventional ray tracing tomography is limited to the modeling of just one ray per first break. This computer program performs the analysis by using the same first-arrival P-wave times and survey line geometry that were generated during the layer velocity model analyses. The associated Refraction Tomographic Models which display the subsurface earth material velocity structure, is represented by the velocity contours (isolines displayed in feet/second), supplemented with the color-coded velocity shading for visual reference, and are presented within Appendix B.

The combined use of these computer programs provided a more thorough and comprehensive analysis of the subsurface structure and velocity characteristics. Each computer program has a specific purpose based on the objective of the analysis being performed. **SIPwin** and **Refractor** were primarily used for detecting generalized subsurface velocity layers providing “weighted average velocities.” The processed seismic data of these two programs were compared and averaged to provide a final composite layer velocity model which provided a more thorough representation of the subsurface. **Rayfract™** provided tomographic velocity and structural imaging that is very conducive to detecting strong lateral velocity characteristics such as imaging corestones, dikes, and other subsurface structural characteristics.

SUMMARY OF GEOPHYSICAL INTERPRETATION

To begin our discussion, it is important to consider that the seismic velocities obtained within bedrock materials are influenced by the nature and character of the localized major structural discontinuities (foliation, fracturing, relic bedding, etc.), creating anisotropic conditions. Anisotropy (direction-dependent properties of materials) can be caused by “micro-cracks,” jointing, foliation, layered or inter-bedded rocks with unequal layer stiffness, small-scale lithologic changes, etc. (Barton, 2007). Velocity anisotropy complicates interpretation and it should be noted that the seismic velocities obtained during this survey may have been influenced by the nature and character of any localized structural discontinuities within the bedrock underlying the subject site.

Generally, it is expected that higher (truer) velocities will be obtained when the seismic waves propagate along direction (strike) of the dominant structure, with a damping effect when the seismic waves travel in a perpendicular direction. Such variable directions can result in velocity differentials of between 2% to 40% depending upon the degree of the structural fabric (i.e., weakly-moderately-strongly foliated, respectively). Therefore, the seismic velocities obtained during our field study and as discussed below, should be considered minimum velocities at this time.

The first computer method described below used for data analysis is the traditional layer method (**SIPwin** and **Refractor**). Using this method, it should be understood that the data obtained represents an average of seismic velocities within any given layer. For example, high seismic velocity boulders, dikes, or other local lithologic inconsistencies, may be isolated within a low velocity matrix, thus yielding an average medium velocity for that layer. Therefore, in any given layer, a range of velocities could be anticipated, which can also result in a wide range of excavation characteristics. In general, the site where locally surveyed, was noted to be characterized by three major subsurface layers (Layers V1, V2, and V3) with respect to seismic velocities.

The following velocity layer summaries have been prepared using the **SIPwin** and **Refractor** analysis, with the representative Layer Velocity Model presented within Appendix A along with the respective Time-Distance Plot.

- ***Velocity Layer V1***:

  This uppermost velocity layer (V1) is most likely comprised of colluvium, topsoil, wind-blown sands, and/or completely-weathered and fractured bedrock materials. This layer has an average weighted velocity of 1,336 to 1,659 fps, which is typical for these types of unconsolidated surficial earth materials.

- ***Velocity Layer V2***:

  The second layer (V2) yielded a seismic velocity range of 3,330 to 4,763 fps, which is typical for highly-weathered granitic bedrock materials. This velocity range may indicate the presence of homogeneous weathered bedrock with a relatively wide spaced joint/fracture system and/or the possibility of buried relatively-fresher boulders within a very highly-weathered bedrock matrix.

- ***Velocity Layer V3***:

  The third layer (V3) indicates the presence of slightly-weathered bedrock, having a seismic velocity range of 8,279 to 11,260 fps. These higher velocities signify the decreasing effect of weathering as a function of depth and could indicate a slightly-weathered bedrock matrix that has a wide-spaced fracture system, or possibly the presence of abundant widely-scattered buried fresh large crystalline boulders in a moderately-weathered matrix, which based on the abundant large surface rock outcrops exposed across the site, appears likely.

The following table summarizes the results of the survey lines with respect to the "weighted average" seismic velocities for each layer, as indicated on the Layer Velocity Models, presented within Appendix A.

TABLE 1- VELOCITY SUMMARY OF SEISMIC SURVEY LINES

Seismic Line	V1 Layer (fps)	V2 Layer (fps)	V3 Layer (fps)
S-1	**1,371**	**3,657**	**11,260**
S-2	**1,389**	**3,330**	**8,279**
S-3	**1,336**	**4,058**	**-----**
S-4	**1,373**	**3,498**	**10,169**
S-5	**1,659**	**4,763**	**10,717**

Using **Rayfract™**, tomographic models were also prepared for comparative purposes to better illustrate the general structure and velocity distribution of the subsurface, using velocity contour isolines, as presented within Appendix B. Although no discrete velocity layers or boundaries are created, these models generally resemble the corresponding overall average layer velocities as presented within Appendix A.

In general, the seismic velocity of the bedrock gradually increases with depth, with occasional lateral velocity differentials suggesting the local presence of buried corestones and/or dike structures. These corestones are expected as numerous bedrock outcrops are scattered across the hillside in the study area. The colors representing the velocity gradients have been standardized on all of the models for comparative purposes.

GENERALIZED RIPPABILITY CHARACTERISTICS OF BEDROCK

A summary of the generalized rippability characteristics of bedrock based on a compilation of rippability performance charts prepared by Caterpillar, Inc. (2018; see Figure 2, Page 8), Caltrans (Stephens, 1978), and Santi (2006), has been provided to aid in evaluating potential excavation difficulties with respect to the seismic velocities obtained along the local areas surveyed. These seismic velocity ranges and rippability potentials have been tabulated below for reference.

TABLE 2- CATERPILLAR RIPPABILITY CHART (D9 Ripper)

Granitic Rock Velocity	Rippability
< 6,800	Rippable
6,800 – 8,000	Moderately Rippable
> 8,000	Non-Rippable

Additionally, we have provided the Caltrans Rippability Chart as presented below within Table 2 for comparison. These values are from published Caltrans studies (Stephens, 1978) that are based on their experience and which appear to be more conservative than Caterpillar's rippability chart. It should be noted that the type of bedrock was not indicated.

TABLE 3- STANDARD CALTRANS RIPPABILITY CHART

Velocity (feet/sec ±)	Rippability
< 3,500	Easily Ripped
3,500 – 5,000	Moderately Difficult
5,000 – 6,600	Difficult Ripping / Light Blasting
> 6,600	Blasting Required

Table 3 is partially modified from the "Engineering Behavior from Weathering Grade" as presented by Santi (2006), which also provides velocity ranges with respect to rippability potentials, along with other rock engineering properties that may be pertinent.

TABLE 4- SUMMARY OF ROCK ENGINEERING PROPERTIES

ENGINEERING PROPERTY:	Slightly Weathered	Moderately Weathered	Highly Weathered	Completely Weathered
Excavatability	Blasting necessary	Blasting to rippable	Generally rippable	Rippable
Slope Stability	½ :1 to 1:1 (H:V)	1:1 (H:V)	1:1 to 1.5:1 (H:V)	1.5:1 to 2:1 (H:V)
Schmidt Hammer Value	51 – 56	37 – 48	12 – 21	5 – 20
Seismic Velocity (fps)	8,200 – 13,125	5,000 – 10,000	3,300 – 6,600	1,650 – 3,300

The Caterpillar D9R Ripper Performance Chart (Caterpillar, 2018) has been provided on Figure 2 below for reference.

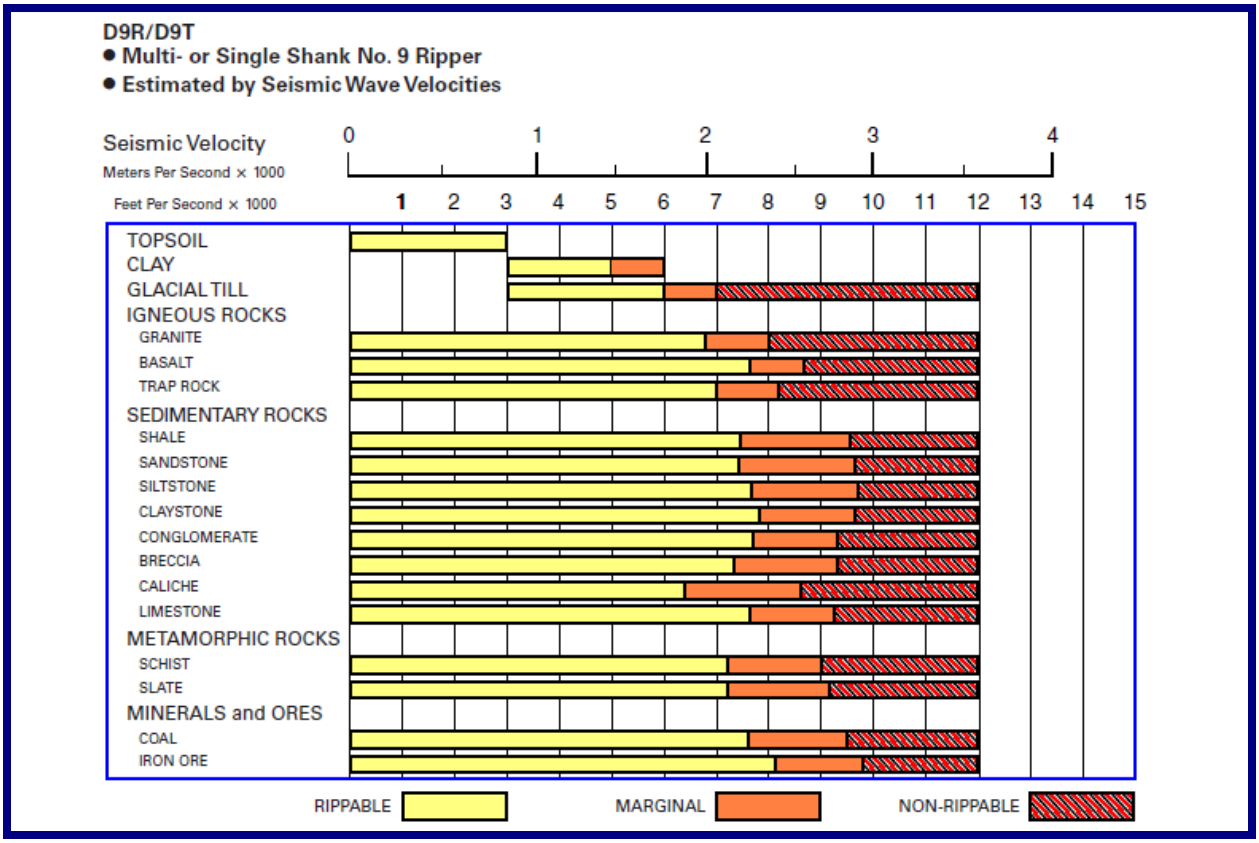


FIGURE 2- Caterpillar D9R Ripper Performance Chart (2018).

For purposes of the discussion in this report with respect to the expected bedrock rippability characteristics, we are assuming that a D9R/D9T dozer will be used as a minimum, such as discussed further below and as shown in Figure 2 above. Smaller excavating equipment will most likely result in slower production rates and possible refusal within relatively lower velocity bedrock materials. It should be noted that the decision for blasting of bedrock materials for facilitating the excavation process is sometimes made based upon economic production reasons and not solely on the rippability (velocity/hardness) characteristics of the bedrock.

A summary of the generalized rippability characteristics of granitic bedrock (such as present within the subject study area) has been provided below to aid in evaluating potential excavation difficulties with respect to the seismic velocities obtained along the local areas that were surveyed. The velocity ranges described below are general averages of Tables 2 and 3 presented in this report (see Page 7) and assume typical, good-working, heavy excavation equipment, such as D9R dozer using a single shank, as described by Caterpillar, Inc. (2000 and 2018).

However, different excavating equipment (i.e., trenching equipment) may not correlate well with these velocity ranges as the rippability performance charts are tailored for conventional bulldozer equipment and cannot be directly correlated. Trenching operations which utilize large excavator-type equipment within granitic bedrock materials, typically encounter very difficult to non-productable conditions where seismic velocities are generally greater than 4,000± fps, and less for smaller backhoe-type equipment.

These average seismic velocity ranges are summarized below:

- ***Rippable Condition (0 - 4,000 ft/sec)***:

  This velocity range indicates rippable materials which may consist of alluvial-type deposits and decomposed granitic bedrock, with random hardrock floaters. These materials typically break down into silty sands (depending on parent lithologic materials), whereas floaters will require special disposal. Some areas containing numerous hardrock floaters may present utility trench problems. Large floaters exposed at or near finished grade may present problems for footing or infrastructure trenching.

  Marginally Rippable Condition (4,000 - 7,000 ft/sec):

  This range of seismic velocities indicates materials which may consist of moderately weathered bedrock and/or large areas of fresh bedrock materials separated by weathered fractured zones. These bedrock materials are generally rippable with difficulty by a Caterpillar D9R or equivalent. Excavations may produce material that will partially break down into a coarse, silty to clean sand, with a high percentage of very coarse sand to pebble-sized material depending on the parent bedrock lithology. Less fractured or weathered materials will probably require blasting to facilitate removal.

- ***Non-Rippable Condition (7,000 ft/sec or greater)***:

  This velocity range includes non-rippable material consisting primarily of moderately fractured bedrock at lower velocities and only slightly fractured or unfractured rock at higher velocities. Materials in this velocity range may be marginally rippable, depending upon the degree of fracturing and the skill and experience of the operator. Tooth penetration is often the key to ripping success, regardless of seismic velocity. If the fractures and joints do not allow tooth penetration, the material may not be ripped effectively; however, pre-blasting or "popping" may induce sufficient fracturing to permit tooth entry. In their natural state, materials with these velocities are generally not desirable for building pad grade, due to difficulty in footing and utility trench excavation. Blasting will most likely produce oversized material, requiring special disposal.

GEOLOGIC & EARTHWORK CONSIDERATIONS

To evaluate whether a particular bedrock material can be ripped or excavated, this geophysical survey should be used in conjunction with the geologic and/or geotechnical report and/or information gathered for the subject project which may describe the physical properties of the bedrock. The physical characteristics of bedrock materials that favor ripping generally include the presence of fractures, faults, and other structural discontinuities, weathering effects, brittleness or crystalline structure, stratification or lamination, large grain size, moisture permeated clay, and low compressive strength. If the bedrock is foliated and/or fractured at depth, this structure could aid in excavation production.

Unfavorable bedrock conditions can include such characteristics as massive and homogeneous formations, non-crystalline structure, absence of planes of weakness, fine-grained materials, and formations of clay origin where moisture makes the material plastic. Use of these physical bedrock conditions along with the subsurface velocity characteristics as presented within this report should aid in properly evaluating the type of equipment that will be necessary and the production levels that can be anticipated for this project. A summary of excavation considerations is included within Appendix C in order to provide you and your grading contractor with a better understanding of the complexities of excavation in bedrock materials, so that proper planning and excavation techniques can be employed.

SUMMARY OF FINDINGS AND CONCLUSIONS

The raw field data was considered to be of good quality with minor amounts of ambient "noise" that was introduced during our survey, originating from vehicular traffic along Domenigoni Parkway to the north and wind sources. Analysis of the data and picking of the primary "P"-wave arrivals was therefore performed with little difficulty, with only minor interpolation of some data points being necessary.

Based on the results of our comparative seismic analyses of the computer programs **SIPwin**, **Refractor**, and **Rayfract™**, the seismic refraction survey line models appear to generally coincide with one another, with some minor variances due to the methods that these programs process, integrate, and display the input data. The anticipated excavation potentials of the velocity layers encountered locally during our survey are as follows:

- ***Velocity Layer V1***:

  No excavating difficulties are expected to be encountered within the uppermost, low-velocity V1 layer (average weighted velocity of 1,336 to 1,659 fps) and should excavate with conventional ripping. This surficial velocity layer is expected to be comprised of colluvium, topsoil, wind-blown sands, and/or completely-weathered and fractured bedrock materials.

- ***Velocity Layer V2***:

  The second V2 layer (average weighted velocity of 3,330 to 4,763 fps) is believed to consist of highly-weathered granitic bedrock. Using the rock classifications as presented within Tables 2 through 4 and Figure 2, seismic wave velocities of less than 6,800± fps are generally noted to be within the threshold for conventional ripping. Isolated floaters (i.e., boulders, corestones, etc.) may be locally present within this layer, based on nearby surficial bedrock outcrops, and could produce somewhat difficult conditions locally. Placement of infrastructure within this velocity layer using excavator equipment may require some breaking and/or light blasting to obtain desired grade.

- ***Velocity Layer V3***:

  The third V3 layer is believed to consist of slightly-weathered bedrock. Hard excavation difficulties within this velocity layer (average weighted velocity range of 8,279 to 11,260 fps) should be anticipated if encountered during grading. This layer may consist of relatively homogeneous bedrock with wide-spaced fracturing, or may contain higher velocity scattered corestones, dikes, and other lithologic variables, within a relatively lower velocity bedrock matrix. Significant blasting should be anticipated throughout this layer to achieve desired grade, including any infrastructure. Caterpillar (2018; see Figure 2) indicates this velocity range to be "non-rippable" using a D9R dozer or equivalent. Larger equipment may facilitate excavation potentials within this higher velocity layer. The absence of the V3 layer within Seismic Line S-3 indicates that the depth to this contact boundary is greater than 35± feet locally, based on the length of the seismic traverse performed.

The ray sampling coverage of the subsurface seismic waves that were acquired during the processing of the refraction tomographic models using **Rayfract™**, appeared to be of good quality. Based on the tomographic modeling and typical excavation characteristics observed within bedrock materials of the southern California region, anticipation of gradual increasing hardness with depth should be anticipated during grading. Some lateral velocity variations should be expected to be encountered across the site generally due to the presence of buried corestones, dikes, and/or lithologic variabilities.

CLOSURE

The field geophysical survey was performed on June 25, 2019 by the undersigned using "state of the art" geophysical equipment and techniques along the selected traverse location. The seismic data was further evaluated using recently developed computerized tomographic inversion techniques to provide a more thorough analysis and understanding of the subsurface velocity and structural conditions. It should be noted that our data presented within this report was obtained along five specific locations therefore other areas in the local may contain different velocity layers and

depths not encountered during our field survey. Additional survey traverses may be necessary to further evaluate the excavation characteristics across other portions of the site where cut grading will be proposed, if warranted. Estimates of layer velocity boundaries as presented in this report are generally considered to be within 10± percent of the total depth of the contact.

It is important to understand that the fundamental limitation for seismic refraction surveys is known as nonuniqueness, wherein a specific seismic refraction data set does not provide sufficient information to determine a single “true” earth model. Therefore, the interpretation of any seismic data set uses “best-fit” approximations along with the geologic models that appear to be most reasonable for the local area being surveyed. Client should also understand that when using the theoretical geophysical principles and techniques discussed in this report, sources of error are possible in both the data obtained, and in the interpretation, and that the results of this survey may not represent actual subsurface conditions. These are all factors beyond **Terra Geosciences** control and no guarantees as to the results of this survey can be made. We make no warranty, either expressed or implied.

In summary, the results of this seismic refraction survey are to be considered as an aid to assessing the rippability and excavation potentials of the bedrock locally. This information should be carefully reviewed by the grading contractor and representative “test” excavations with the proposed type of excavation equipment for the proposed construction should be considered, so that they may be correlated with the data presented within this report.

SEISMIC LINE LOCATION MAP

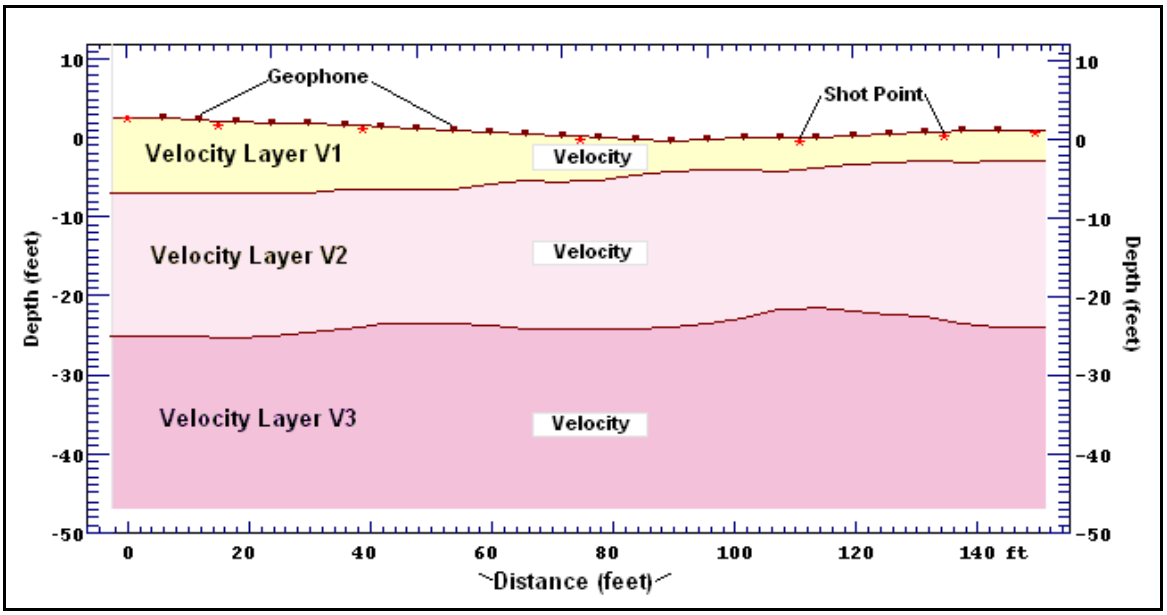
Base Map: Google™ Earth imagery (2019); Seismic traverses shown as yellow lines.

APPENDIX A

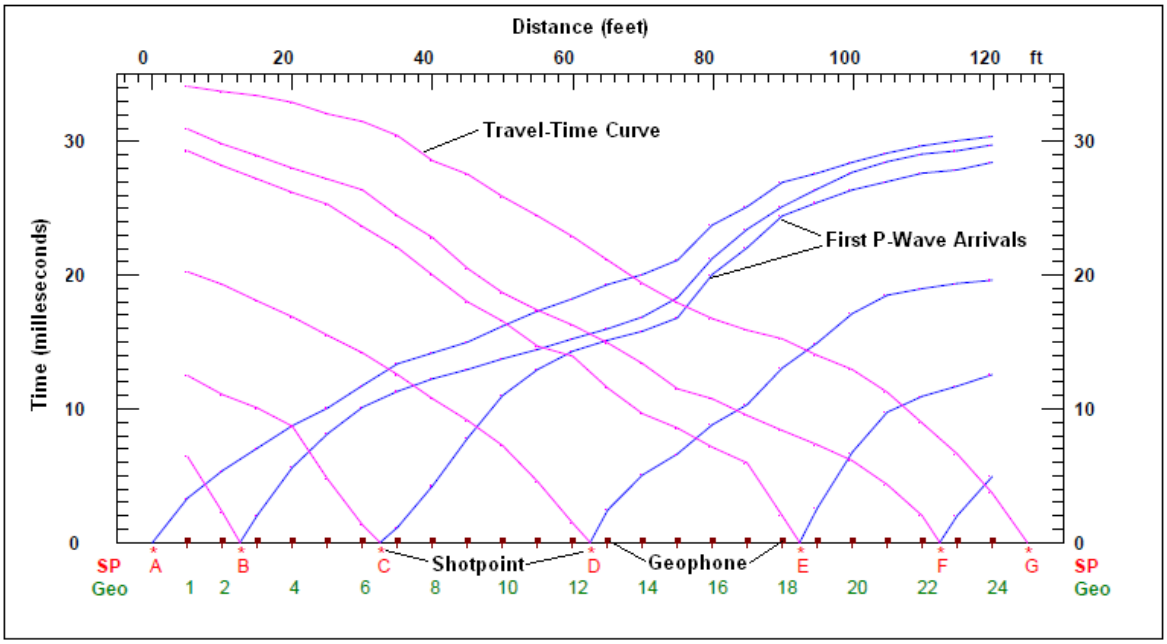
LAYER VELOCITY MODELS

LAYER VELOCITY MODEL LEGEND

LAYER VELOCITY MODEL



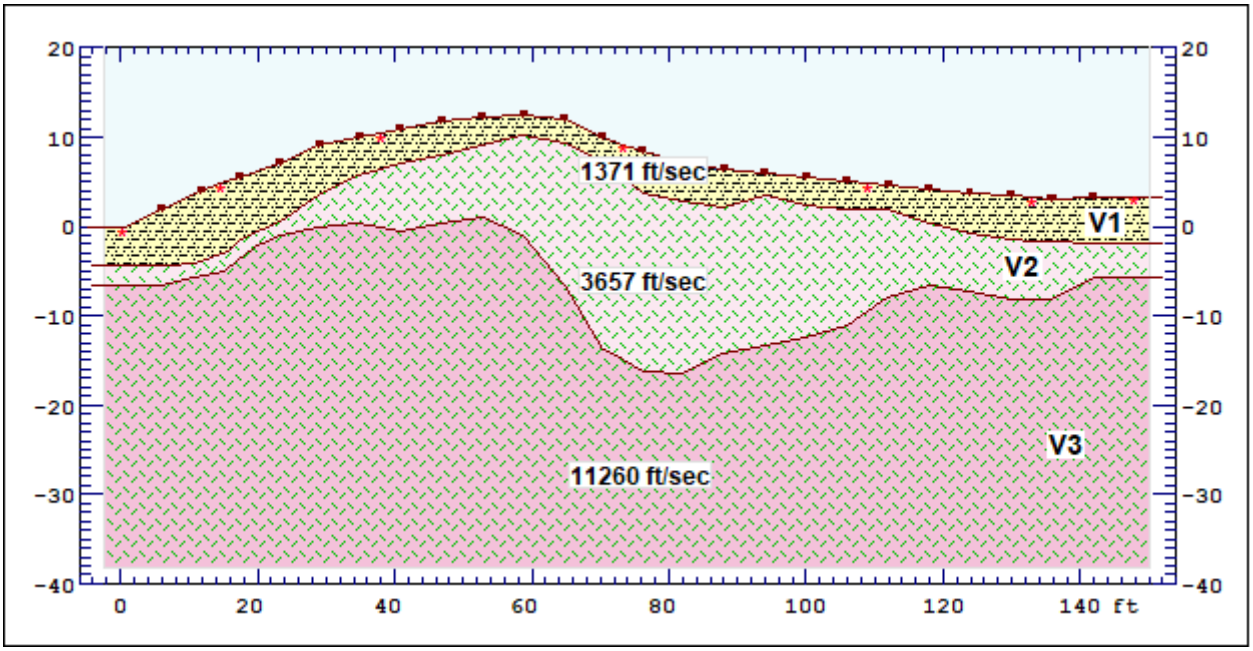
TIME-DISTANCE PLOT



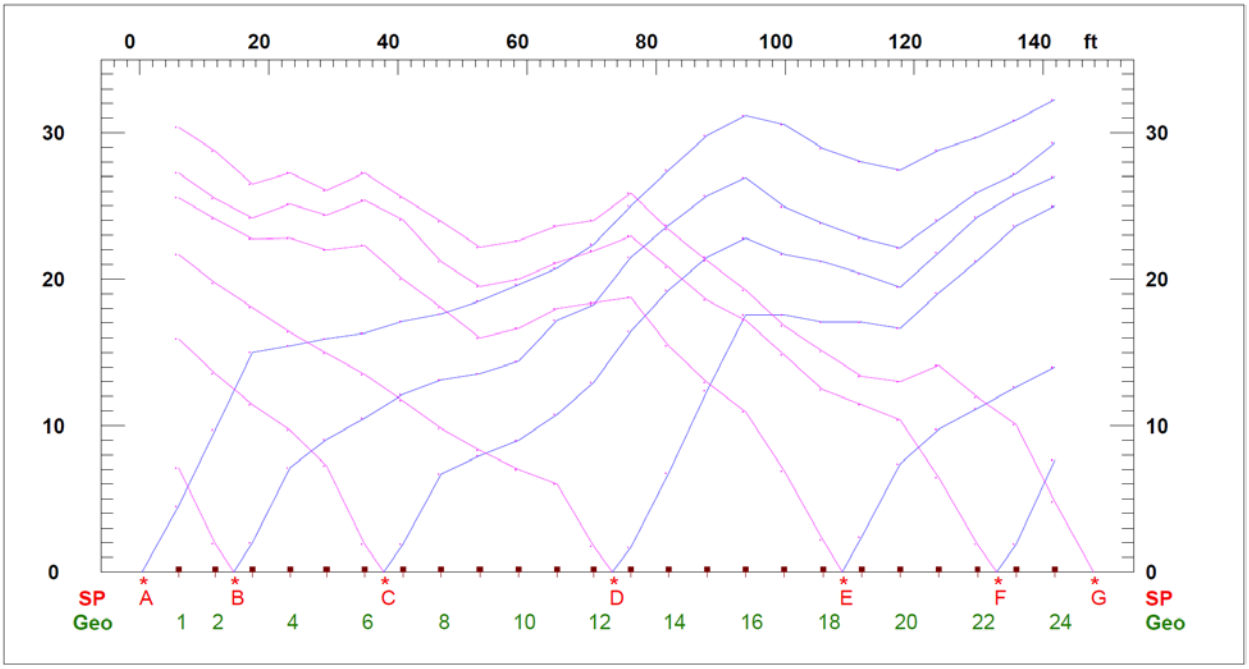
SEISMIC LINE S-1

North 19° East >

LAYER VELOCITY MODEL



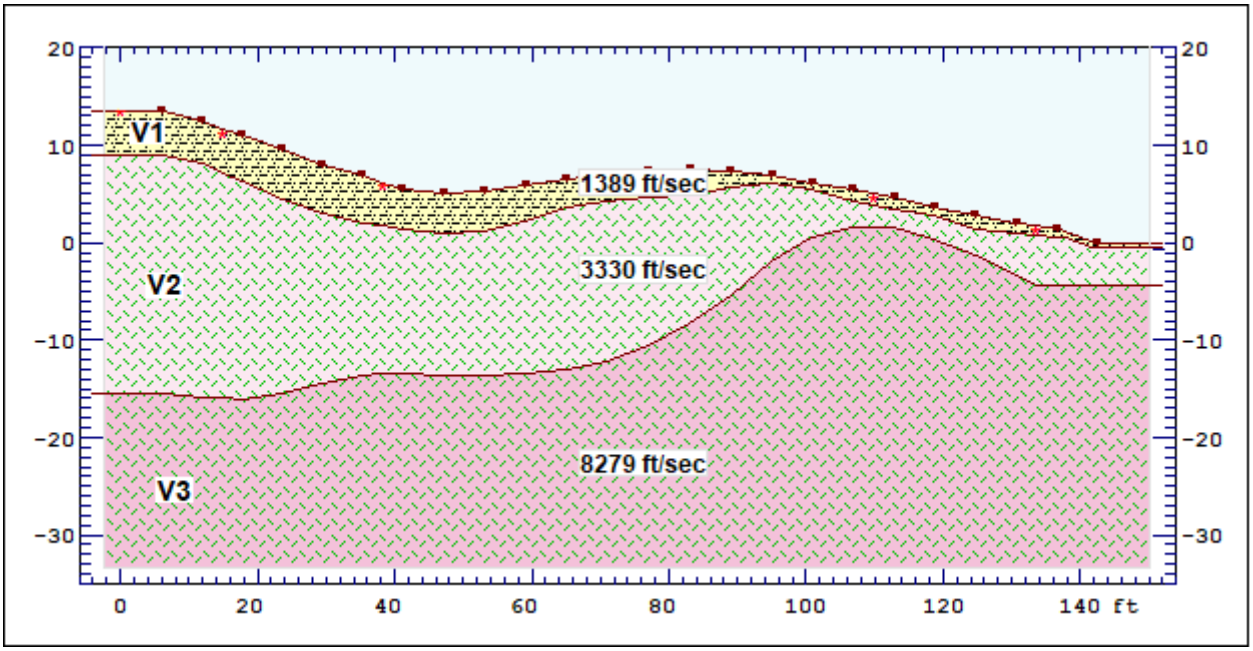
TIME-DISTANCE PLOT



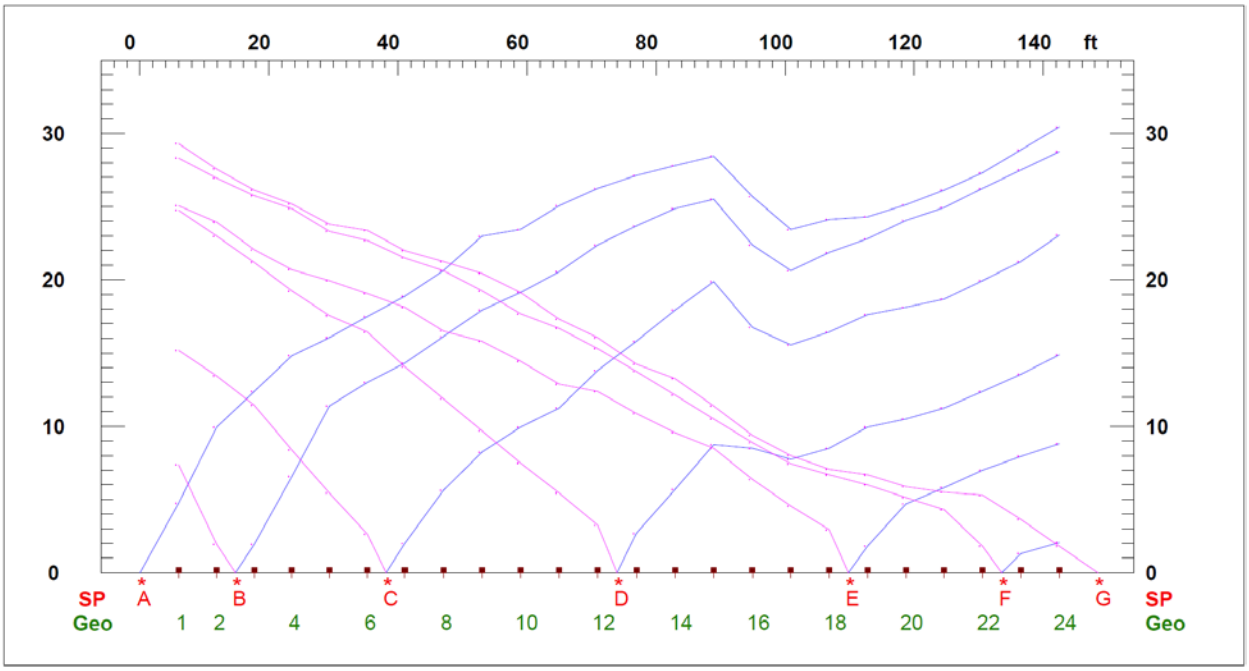
SEISMIC LINE S-2

< West - East >

LAYER VELOCITY MODEL



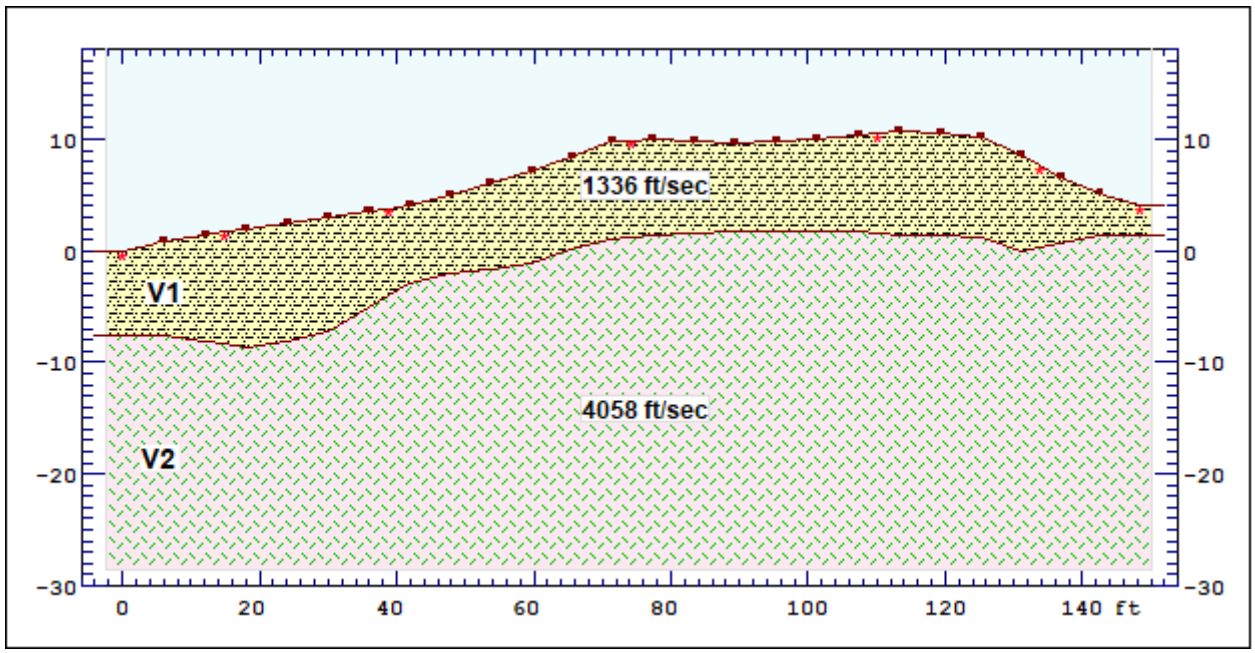
TIME-DISTANCE PLOT



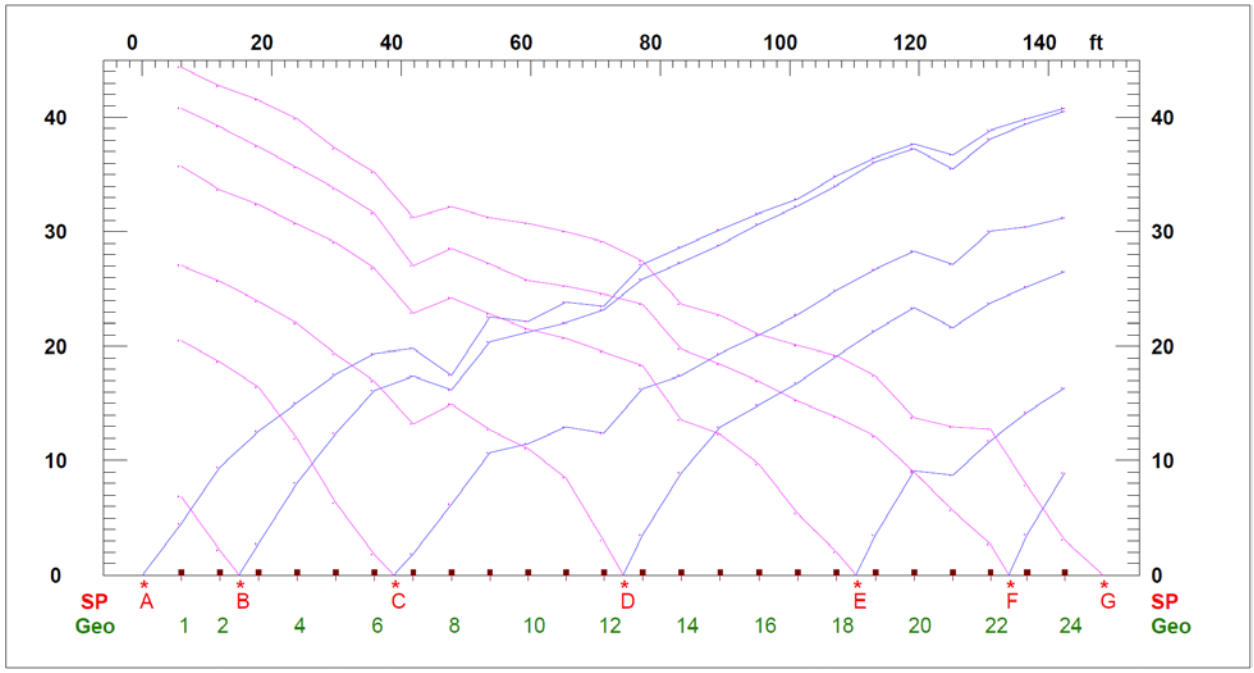
SEISMIC LINE S-3

North 16° West >

LAYER VELOCITY MODEL



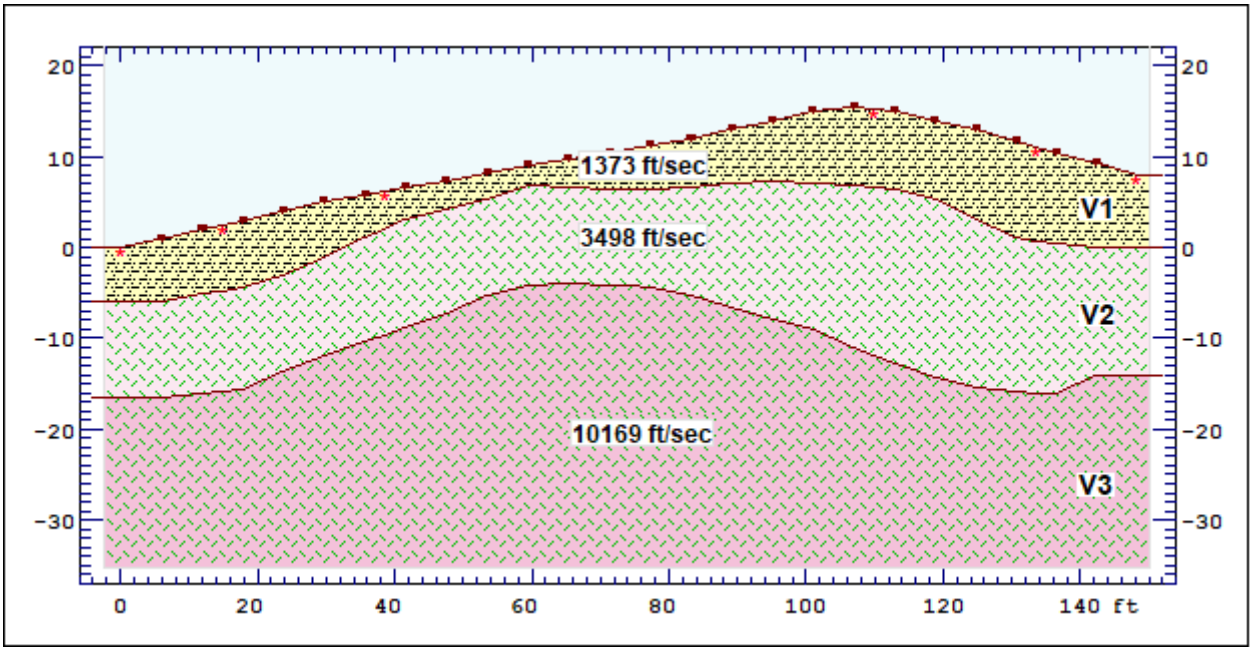
TIME-DISTANCE PLOT



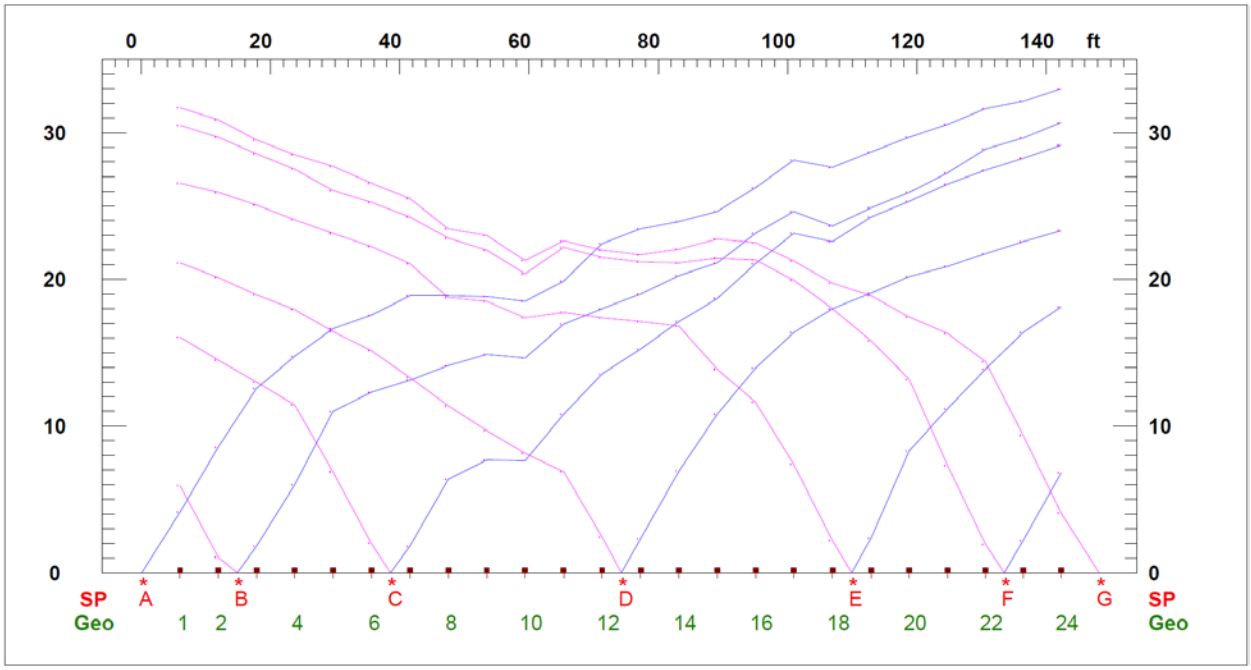
SEISMIC LINE S-4

North 33° West >

LAYER VELOCITY MODEL



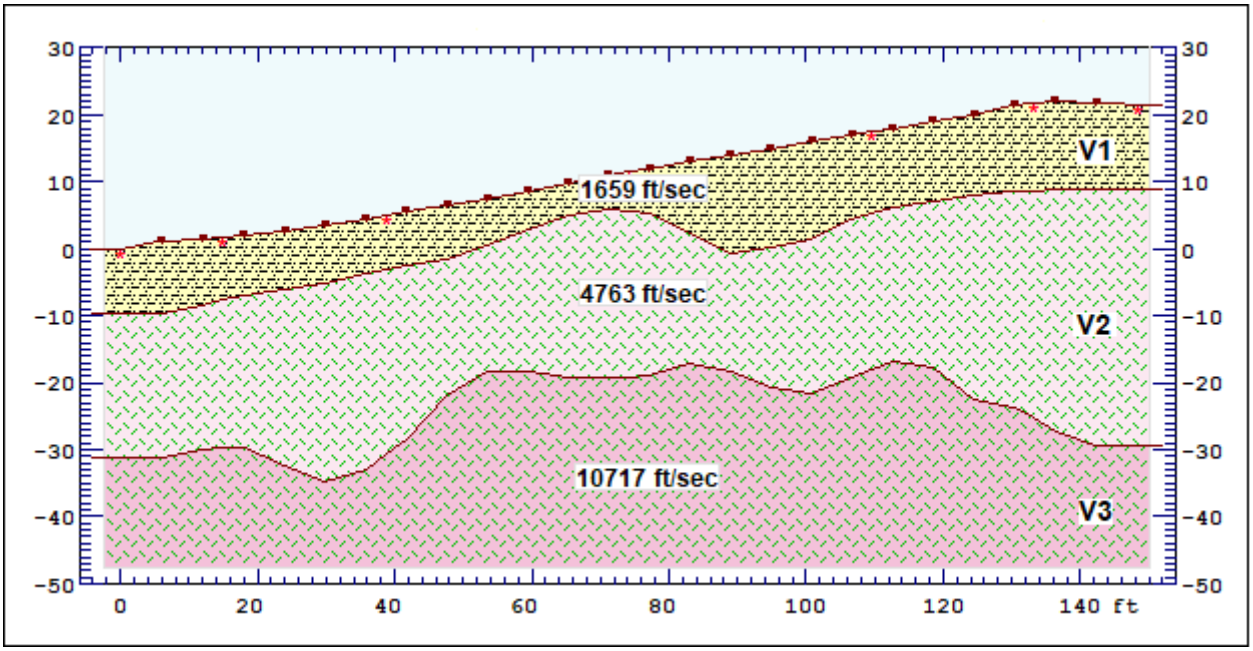
TIME-DISTANCE PLOT



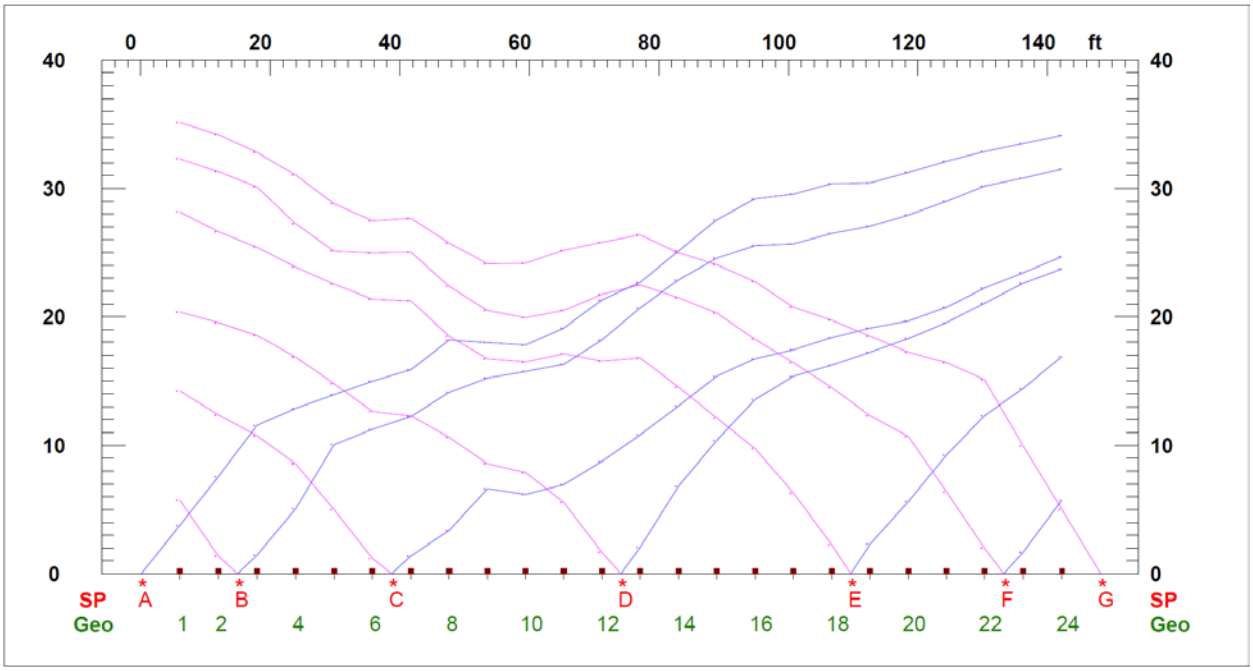
SEISMIC LINE S-5

North 47° West >

LAYER VELOCITY MODEL



TIME-DISTANCE PLOT



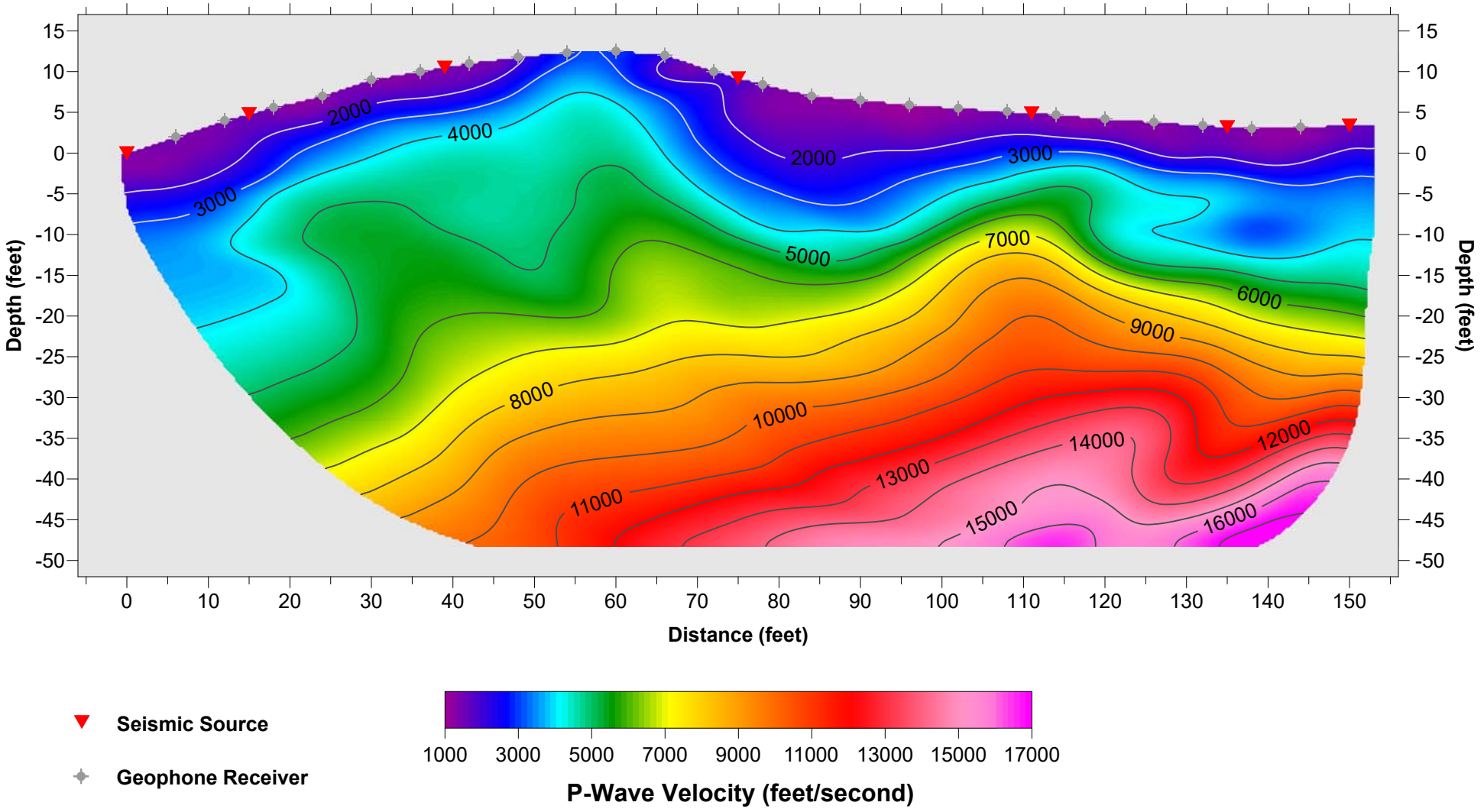
APPENDIX B

REFRACTION TOMOGRAPHIC MODELS

SEISMIC LINE S-1

North 19° East →

REFRACTION TOMOGRAPHIC MODEL

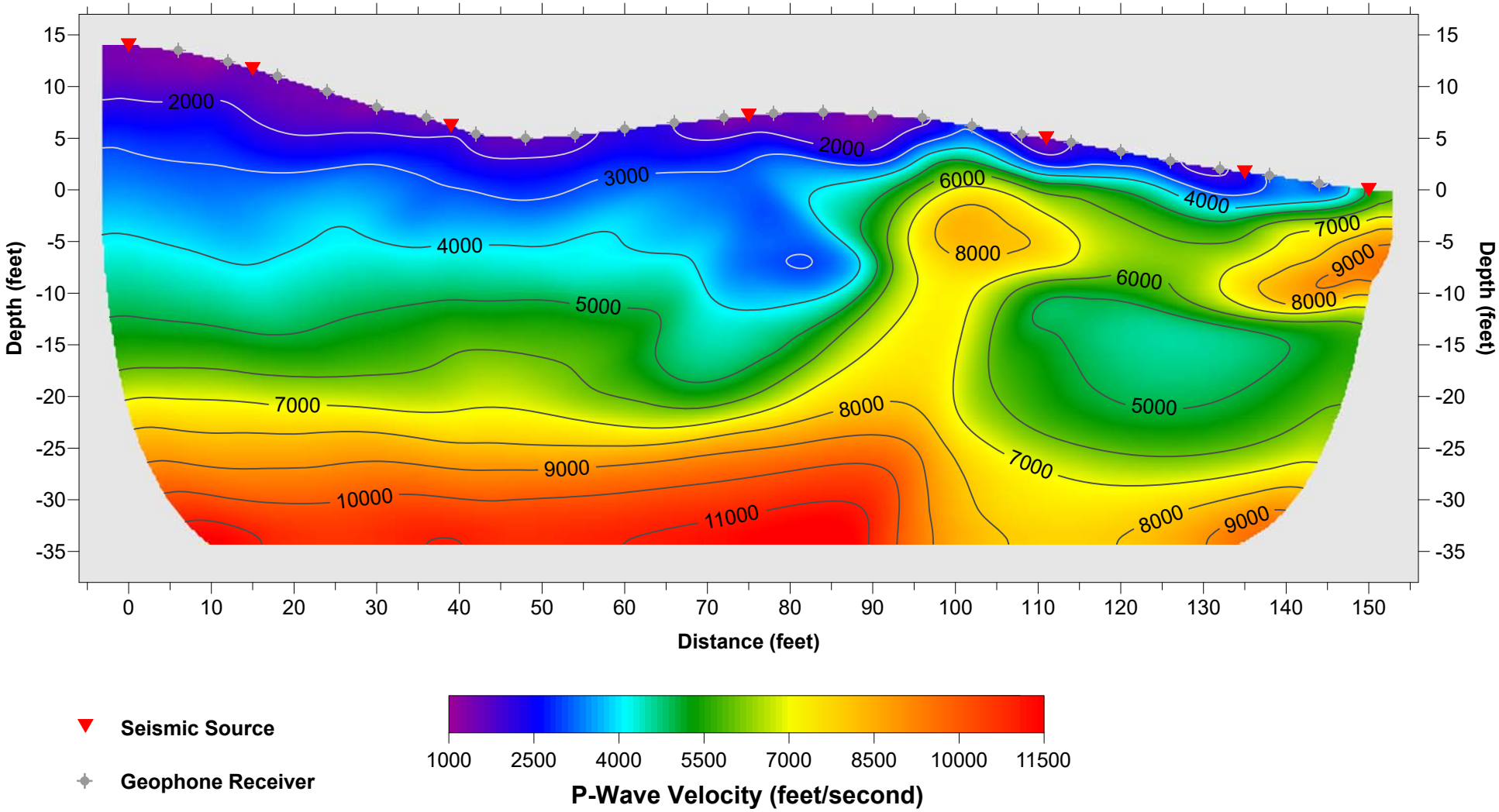


SCALE: 1:1 (Horizontal = Vertical)

SEISMIC LINE S-2

< West - East >

REFRACTION TOMOGRAPHIC MODEL

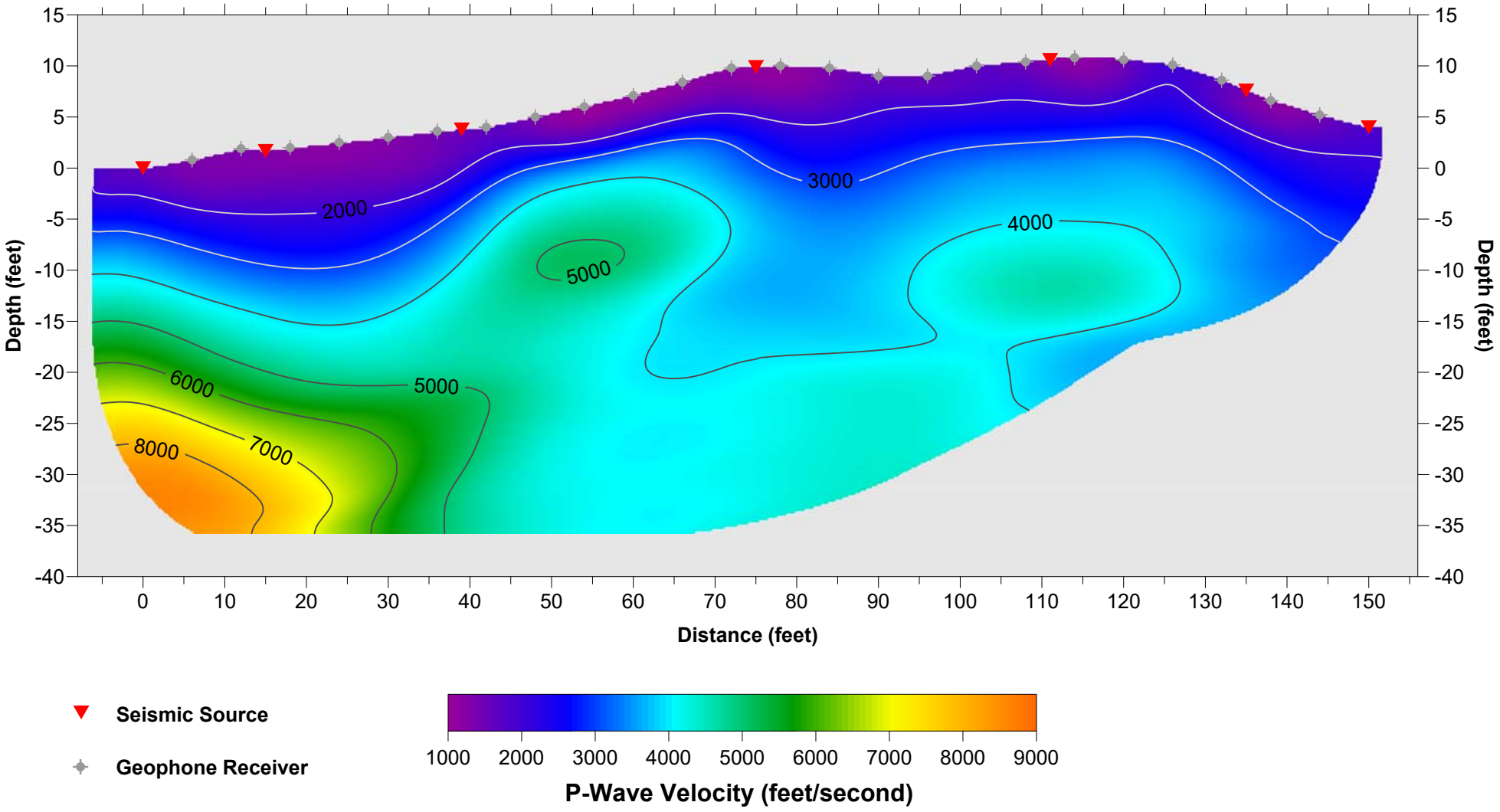


SCALE: Vertical Exaggeration 1.25X

SEISMIC LINE S-3

North 16° West →

REFRACTION TOMOGRAPHIC MODEL

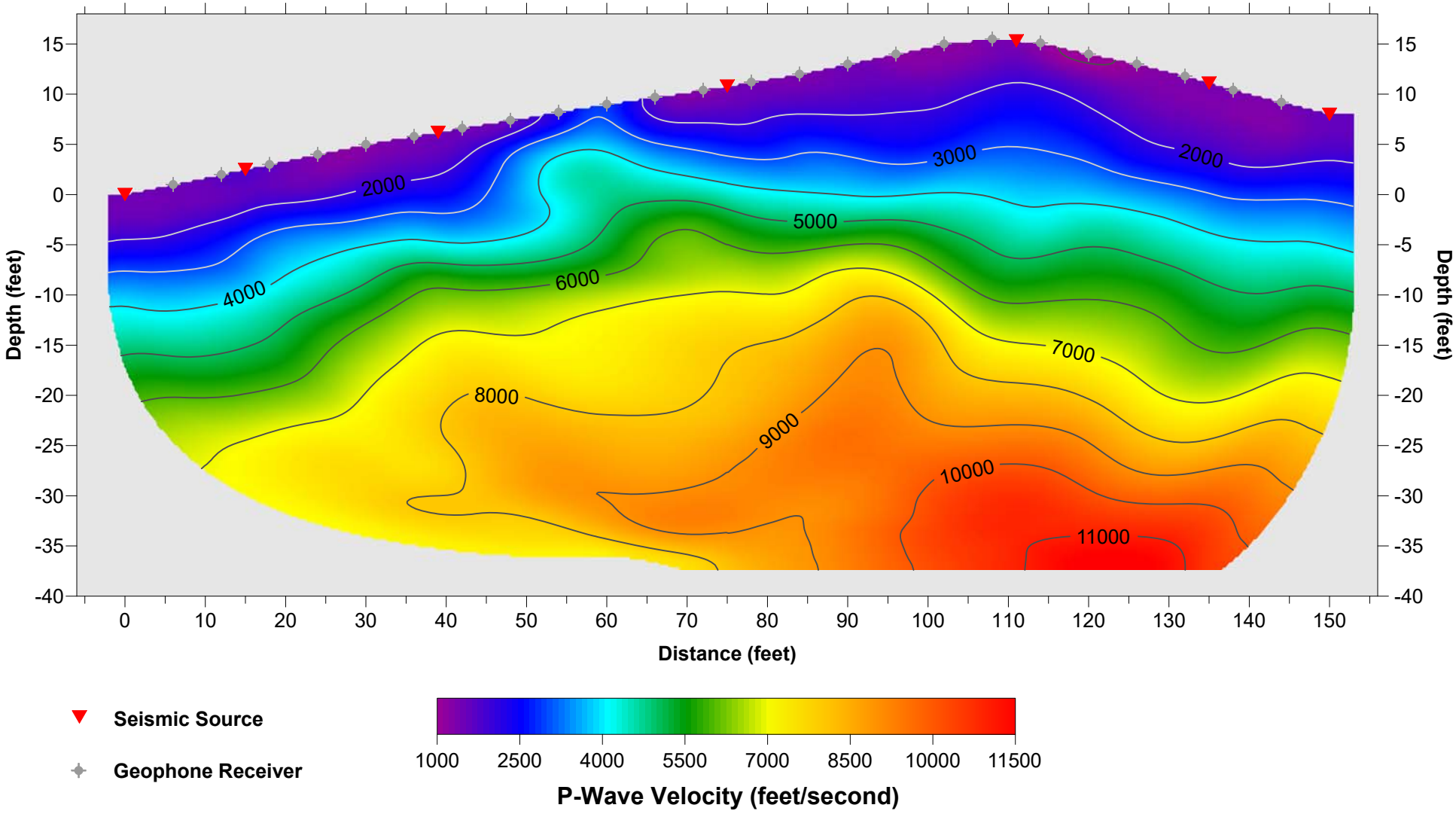


SCALE: Vertical Exaggeration 1.25X

SEISMIC LINE S-4

North 33° West →

REFRACTION TOMOGRAPHIC MODEL

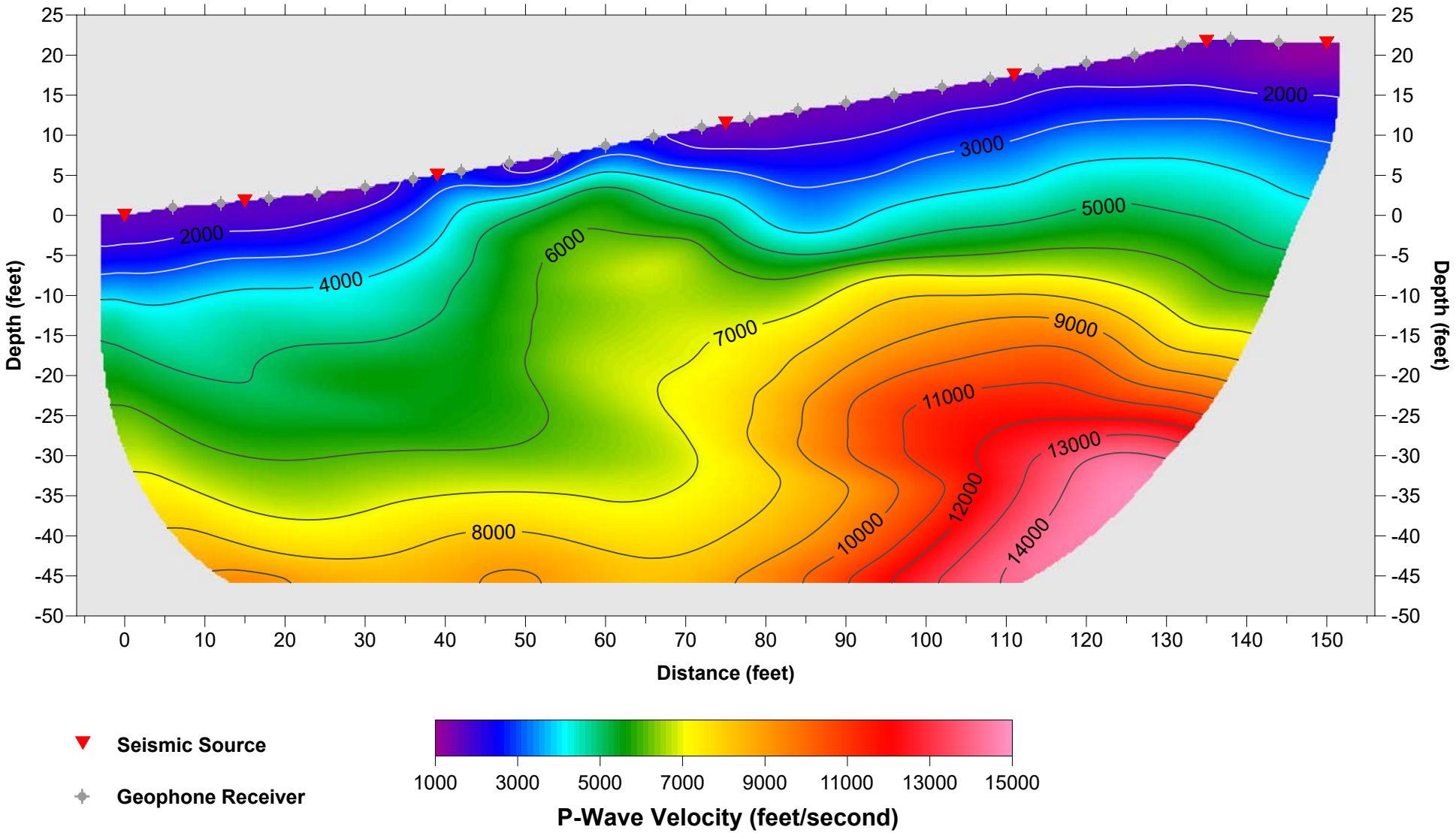


SCALE: Vertical Exaggeration 1.25X

SEISMIC LINE S-5

North 47° West →

REFRACTION TOMOGRAPHIC MODEL



SCALE: 1:1 (Horizontal = Vertical)

APPENDIX C

EXCAVATION CONSIDERATIONS

EXCAVATION CONSIDERATIONS

These excavation considerations have been included to provide the client with a brief overall summary of the general complexity of hard bedrock excavation. It is considered the client's responsibility to ensure that the grading contractor they select is both properly licensed and qualified, with experience in hard-bedrock ripping processes. To evaluate whether a particular bedrock material can be ripped, this geophysical survey should be used in conjunction with the geologic or geotechnical report prepared for the project which describes the physical properties of the bedrock. The physical characteristics of bedrock materials that favor ripping generally include the presence of fractures, faults and other structural discontinuities, weathering effects, brittleness or crystalline structure, stratification of lamination, large grain size, moisture permeated clay, and low compressive strength. Unfavorable conditions can include such characteristics as massive and homogeneous formations, non-crystalline structure, absence of planes of weakness, fine-grained materials, and formations of clay origin where moisture makes the material plastic.

When assessing the potential rippability of the underlying bedrock of a given site, the above geologic characteristics along with the estimated seismic velocities can then be used to evaluate what type of equipment may be appropriate for the proposed grading. When selecting the proper ripping equipment there are three primary factors to consider, which are:

- ***Down Pressure available at the tip, which determines the ripper penetration that can be attained and maintained,***
- ***Tractor flywheel horsepower, which determines whether the tractor can advance the tip, and,***
- ***Tractor gross-weight, which determines whether the tractor will have sufficient traction to use the horsepower.***

In addition to selecting the appropriate tractor, selection of the proper ripper design is also important. There are basically three designs, being radial, parallelogram, and adjustable parallelogram, of which the contractor should be aware of when selecting the appropriate design to be used for the project. The penetration depth will depend upon the down-pressure and penetration angle, as well as the length of the shank tips (short, intermediate, and long).

Also, important in the excavation process is the ripping technique used as well as the skill of the individual tractor operator. These techniques include the use of one or more ripping teeth, up- and down-hill ripping, and the direction of ripping with respect to the geologic structure of the bedrock locally. The use of two tractors (one to push the first tractor-ripper) can extend the range of materials that can be ripped. The second tractor can also be used to supply additional down-pressure on the ripper. Consideration of light blasting can also facilitate the ripper penetration and reduce the cost of moving highly consolidated rock formations.

All of the combined factors above should be considered by both the client and the grading contractor, to ensure that the proper selection of equipment and ripping techniques are used for the proposed grading.

APPENDIX D

REFERENCES

REFERENCES

American Society for Testing and Materials, Intl. (ASTM), 2000, Standard Guide for Using the Seismic Refraction Method for Subsurface Investigation, Designation D 5777-00, 13 pp.

Barton, N., 2007, Rock Quality, Seismic Velocity, Attenuation and Anisotropy, Taylor & Francis Group Publishers, 729 pp.

California State Board for Geologists and Geophysicists, Department of Consumer Affairs, 1998, Guidelines for Geophysical Reports for Environmental and Engineering Geology, 5 pp.

Caterpillar, Inc., 2000, Handbook of Ripping, Twelfth Edition, Caterpillar, Inc., Peoria, Illinois, 31 pp.

Caterpillar, Inc., 2018, Caterpillar Performance Handbook, Edition 48, Caterpillar, Inc., Peoria, Illinois, 2,442 pp.

Geometrics, Inc., 2004, StrataVisor™ NZXP Operation Manual, Revision B, San Jose, California, 234 pp.

Geogiga Technology Corp., 2001-2018, Geogiga Seismic Pro Refractor Software Program, Version 9.0, http://www.geogiga.com/.

Google™ Earth, 2019, Version Build 7.3.2.5776 (64-bit), (http://earth.google.com/).

Intelligent Resources, Inc., 1991-2019, Rayfract™ Seismic Refraction Tomography Software, Version 3.36, (http://rayfract.com/).

Morton, D.M., 2003, Geologic Map of the Perris 7.5' Quadrangle, Riverside County, California, U.S.G.S. Open-File Report 03-270, Scale 1: 24,000.

Rimrock Geophysics, Inc., 2004, **SIPwin**, **S**eismic **R**efraction **I**nterpretation **P**rogram for **Win**dows, Version 2.78, User Manual 78 pp.

Santi, P.M., 2006, Field Methods for Characterizing Weak Rock for Engineering, *in*, Environmental & Engineering Geoscience, Volume XII, No. 1, February 2006, pp. 1-11.

Scott, James H., 1973, Seismic Refraction Modeling by Computer, *in* Geophysics, Volume 38, No. 2, pp. 271-284.

Schuster, G. T. and Quintus-Bosz, A., (1993), Wavepath Eikonal Traveltime Inversion: Theory, *in*, *Geophysics*, Vol. 58, No. 9, September, pp. 1314-1323.

Stephens, E., 1978, Calculating Earthwork Factors Using Seismic Velocities, California Department of Transportation Report No. FHWA-CA-TL-78-23, 63 pp.

Appendix E
Infiltration Test Results

Infiltration Test Data Sheet

LGC Geotechnical, Inc

131 Calle Iglesia Suite 200, San Clemente, CA 92672 tel. (949) 369-6141

Project Name: Stoneridge

Project Number: 13092-01

Date: 6/25/2019

Boring Number: I-1

Test hole dimensions (if circular)	
Boring Depth (feet)*:	10
Boring Diameter (inches):	8
Pipe Diameter (inches):	3

*measured at time of test

Test pit dimensions (if rectangular)	
Pit Depth (feet):	
Pit Length (feet):	
Pit Breadth (feet):	

Minimum test Head (D_o):

(What the sounder tape should read) Boring Depth - (5 x Boring Radius) 8.4 ft

(Shallow) The value on the sounder tape should be close to this value during testing for **DEEP** testing fill to 4 feet below top of hole

*Pre-Test (Sandy Soil Criteria)**

Trial No.	Start Time (24:HR)	Stop Time (24:HR)	Time Interval (min)	Initial Depth to Water (feet)	Final Depth to Water (feet)	Total Change in Water Level (feet)	Greater Than or Equal to 0.5 feet (yes/no)
1	7:59	8:24	25.0	7.26	7.26	0.00	No
2	8:24	8:49	25.0	7.26	7.31	0.05	No

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight, and then obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25 inches

Main Test Data

Trial No.	Start Time (24:HR)	Stop Time (24:HR)	Time Interval, Δt (min)	Initial Depth to Water, D_o (feet)	Final Depth to Water, D_f (feet)	Change in Water Level, ΔD (feet)	Calculated Infiltration Rate(in/hr)
1	8:49	9:19	30.0	7.31	7.40	0.09	0.13
2	9:19	9:49	30.0	7.24	7.31	0.07	0.10
3	9:49	10:19	30.0	7.31	7.39	0.08	0.11
4	10:19	10:49	30.0	7.19	7.23	0.04	0.05
5	10:49	11:19	30.0	7.23	7.30	0.07	0.10
6	11:19	11:49	30.0	7.30	7.37	0.07	0.10
7	11:49	12:19	30.0	7.20	7.26	0.06	0.08
8	12:19	12:49	30.0	7.26	7.31	0.05	0.07
9	12:49	13:19	30.0	7.31	7.38	0.07	0.10
10	13:19	13:49	30.0	7.25	7.32	0.07	0.10
11	13:49	14:19	30.0	7.10	7.15	0.05	0.07
12	14:19	14:49	30.0	7.15	7.22	0.07	0.09

Calculated Infiltration Rate (No factors of safety)	**0.1**
Factor of Safety	**2.0**
Calculated Infiltration Rate (With Factor of Safety)	**0.0**

Sketch:

Notes:

Based on Guidelines from: Riverside County (9/1/2011)

Spreadsheet Revised on: 10/26/2016

LGC Geotechnical, Inc.

Infiltration Test Data Sheet

LGC Geotechnical, Inc

131 Calle Iglesia Suite 200, San Clemente, CA 92672 tel. (949) 369-6141

Project Name: Stoneridge

Project Number: 13092-01

Date: 6/25/2019

Boring Number: I-2

Test hole dimensions (if circular)	
Boring Depth (feet)*:	5
Boring Diameter (inches):	8
Pipe Diameter (inches):	3

*measured at time of test

Test pit dimensions (if rectangular)	
Pit Depth (feet):	
Pit Length (feet):	
Pit Breadth (feet):	

Minimum test Head (D_o):

(What the sounder tape should read) Boring Depth - (5 x Boring Radius) 3.4 ft

(Shallow) The value on the sounder tape should be close to this value during testing for **DEEP** testing fill to 4 feet below top of hole

*Pre-Test (Sandy Soil Criteria)**

Trial No.	Start Time (24:HR)	Stop Time (24:HR)	Time Interval (min)	Initial Depth to Water (feet)	Final Depth to Water (feet)	Total Change in Water Level (feet)	Greater Than or Equal to 0.5 feet (yes/no)
1	8:46	9:11	25.0	3.09	3.35	0.26	No
2	9:11	9:36	25.0	3.16	3.35	0.19	No

*If two consecutive measurements show that six inches of water seeps away in less than 25 minutes, the test shall be run for an additional hour with measurements taken every 10 minutes. Otherwise, pre-soak (fill) overnight, and then obtain at least twelve measurements per hole over at least six hours (approximately 30 minute intervals) with a precision of at least 0.25 inches

Main Test Data

Trial No.	Start Time (24:HR)	Stop Time (24:HR)	Time Interval, Δt (min)	Initial Depth to Water, D_o (feet)	Final Depth to Water, D_f (feet)	Change in Water Level, ΔD (feet)	Calculated Infiltration Rate(in/hr)
1	9:36	10:06	30.0	3.17	3.39	0.22	0.47
2	10:06	10:36	30.0	3.00	3.27	0.27	0.53
3	10:36	11:06	30.0	3.01	3.28	0.27	0.53
4	11:06	11:36	30.0	3.03	3.29	0.26	0.52
5	11:36	12:06	30.0	3.03	3.29	0.26	0.52
6	12:06	12:36	30.0	3.07	3.32	0.25	0.51
7	12:36	13:06	30.0	3.12	3.35	0.23	0.48
8	13:06	13:36	30.0	3.14	3.37	0.23	0.48
9	13:36	14:06	30.0	3.06	3.30	0.24	0.48
10	14:06	14:36	30.0	2.92	3.21	0.29	0.55
11	14:36	15:06	30.0	2.99	3.24	0.25	0.49
12	15:06	15:36	30.0	3.06	3.30	0.24	0.48

Calculated Infiltration Rate (No factors of safety)	**0.5**
Factor of Safety	**2.0**
Calculated Infiltration Rate (With Factor of Safety)	**0.2**

Sketch:

Notes:

Based on Guidelines from: Riverside County (9/1/2011)

Spreadsheet Revised on: 10/26/2016

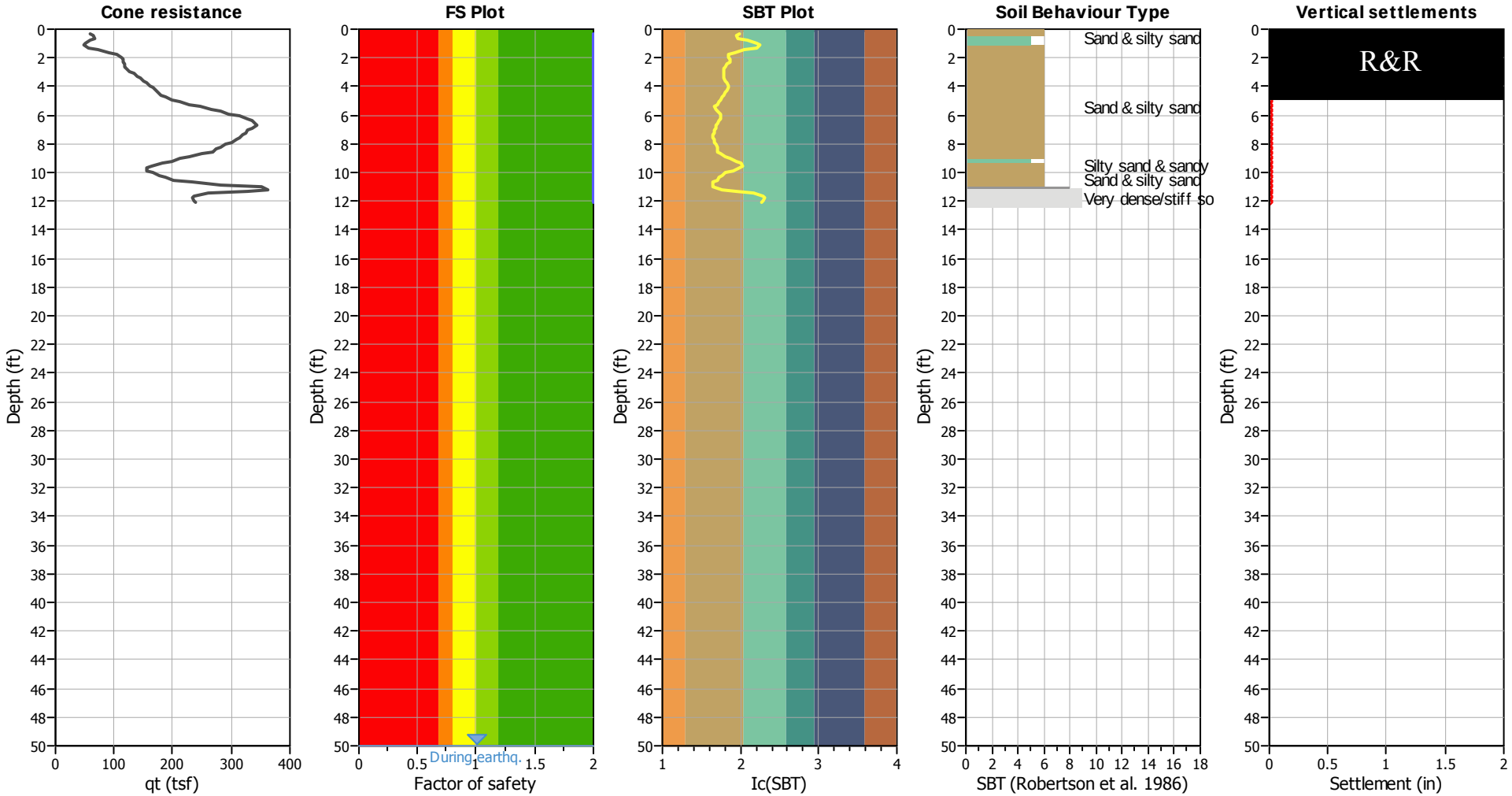
LGC Geotechnical, Inc.

Appendix F
Liquefaction Analysis

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-01
Total depth: 12.14 ft

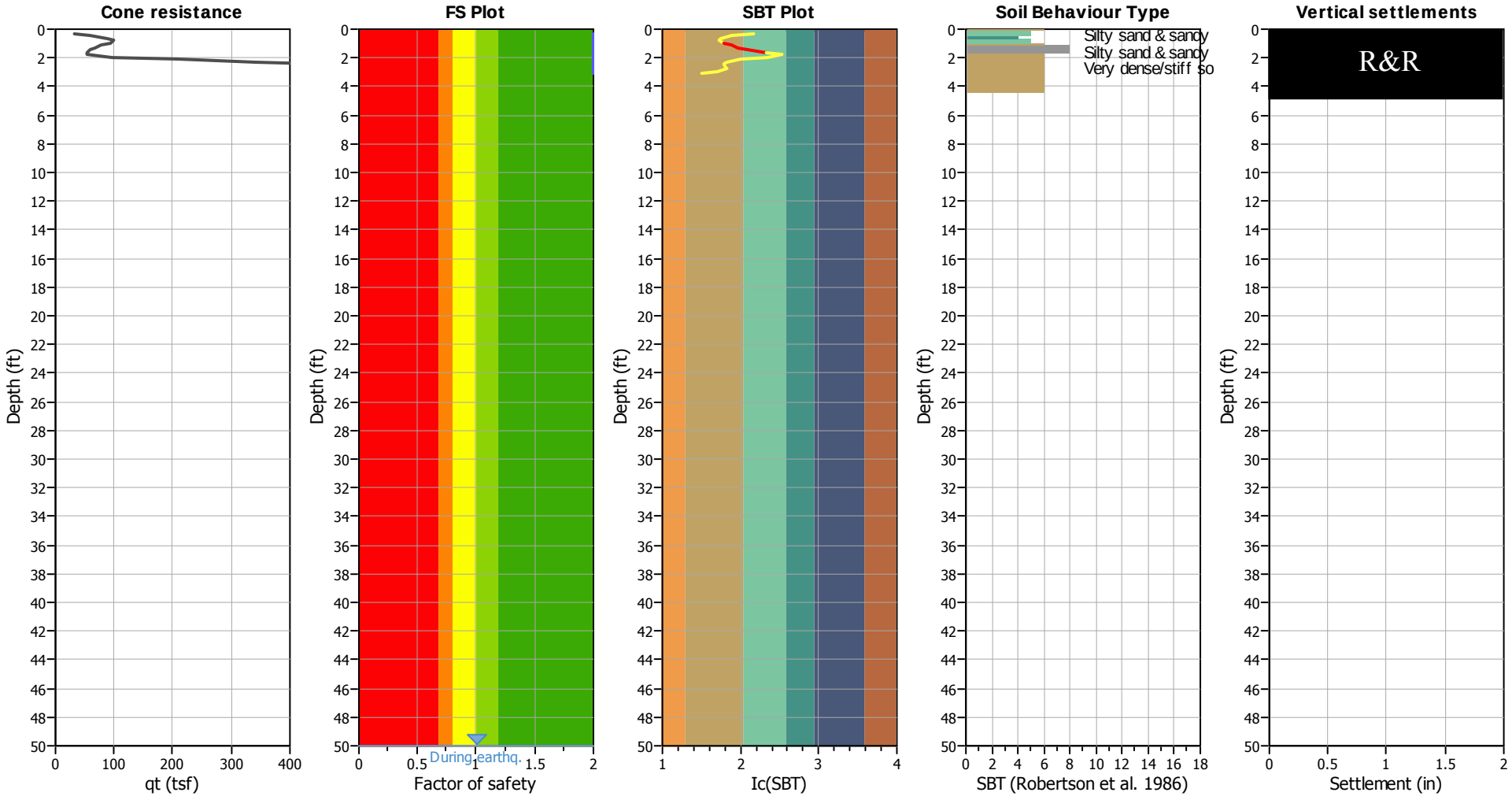


Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-02
Total depth: 3.12 ft

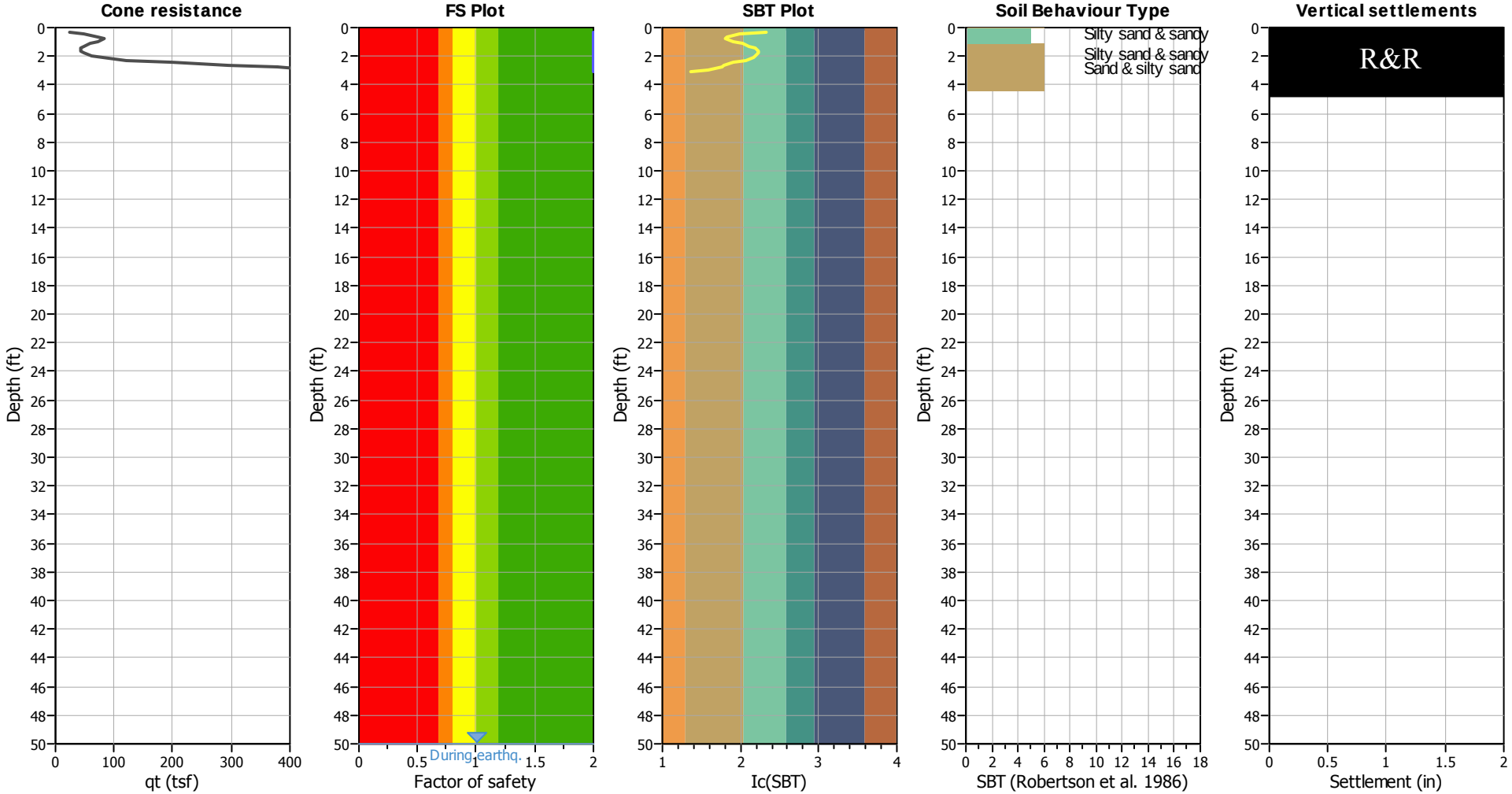


Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-03
Total depth: 3.12 ft

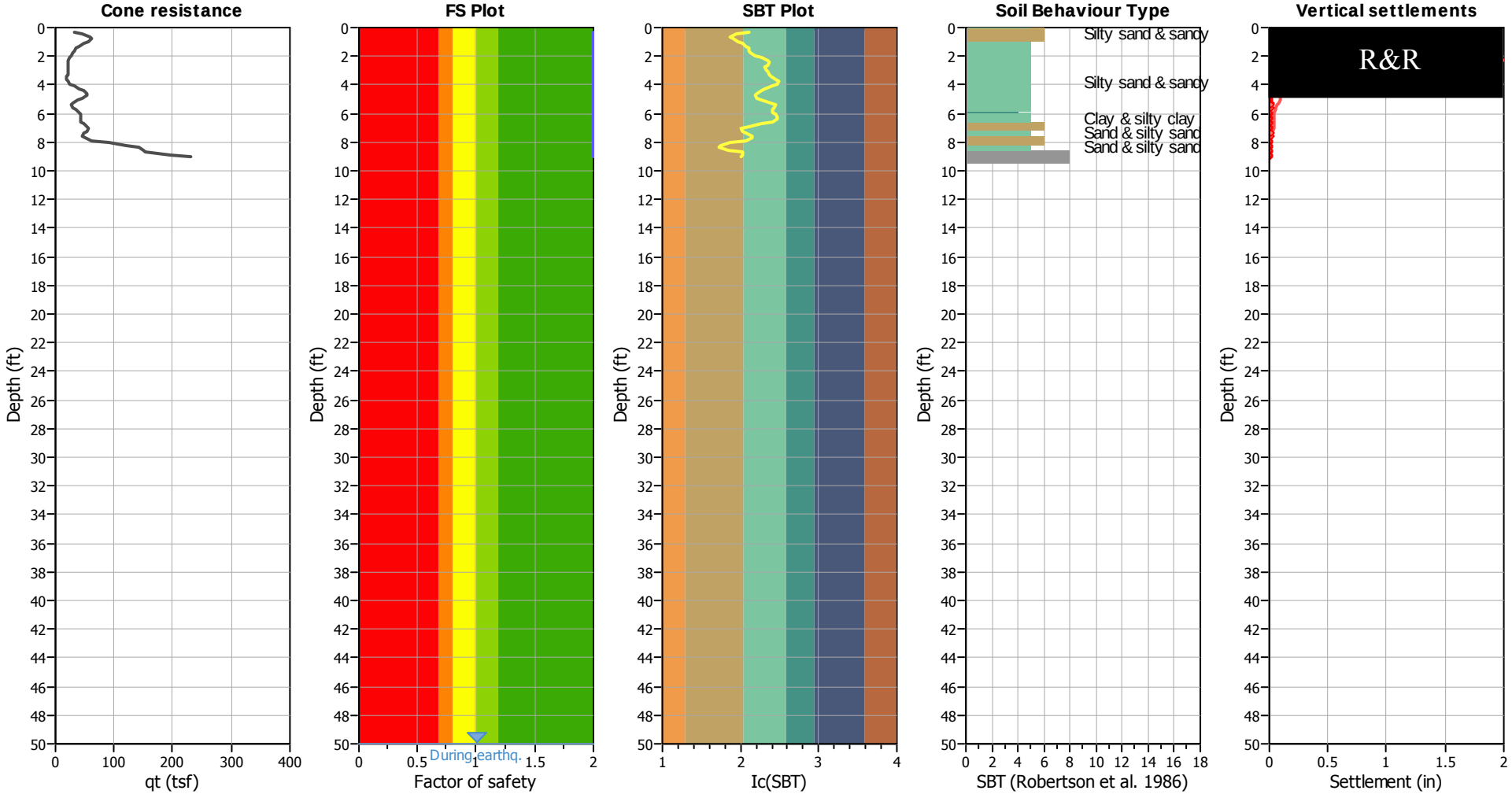


Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-04
Total depth: 9.02 ft

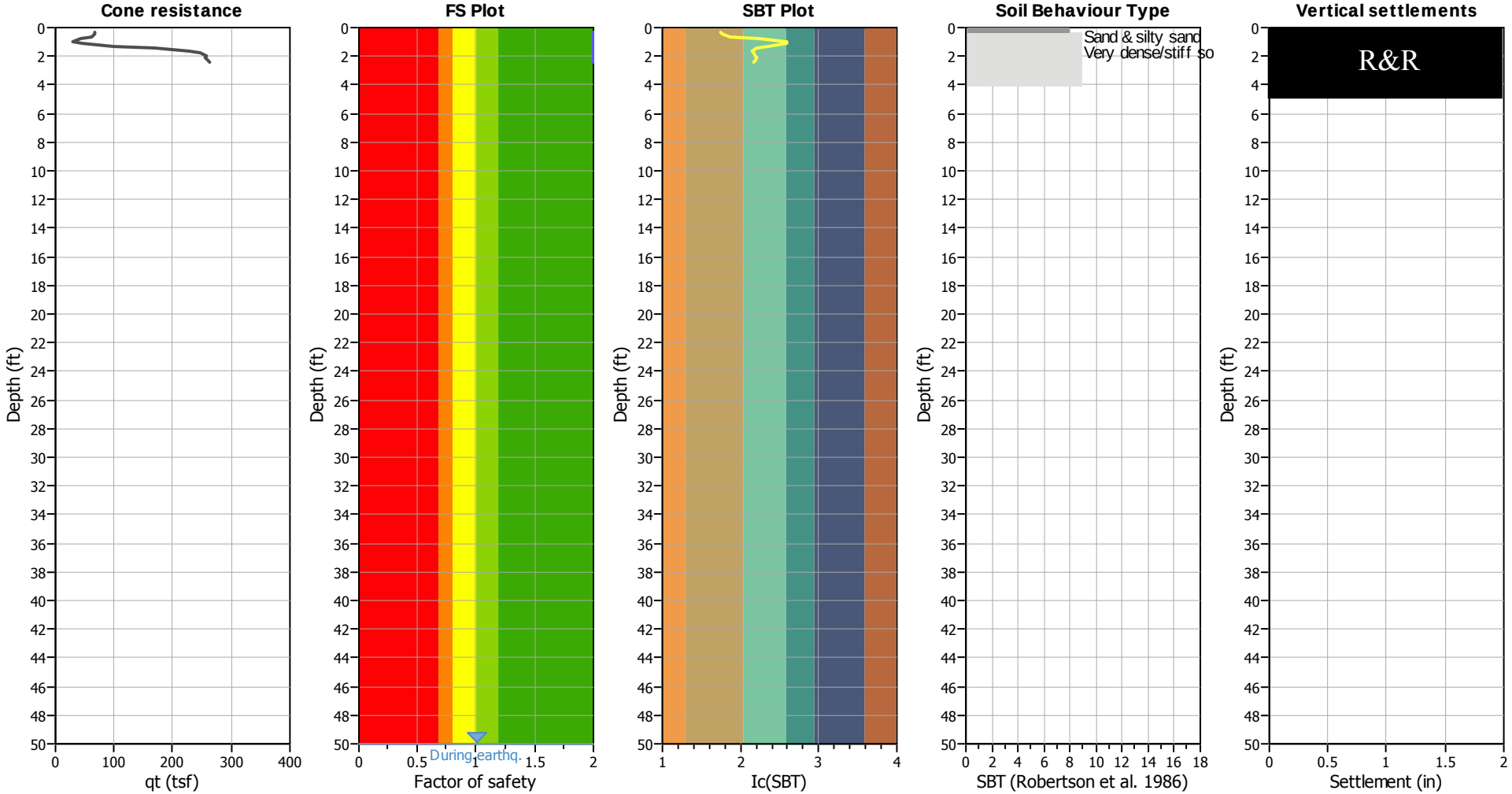


Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-05
Total depth: 2.46 ft

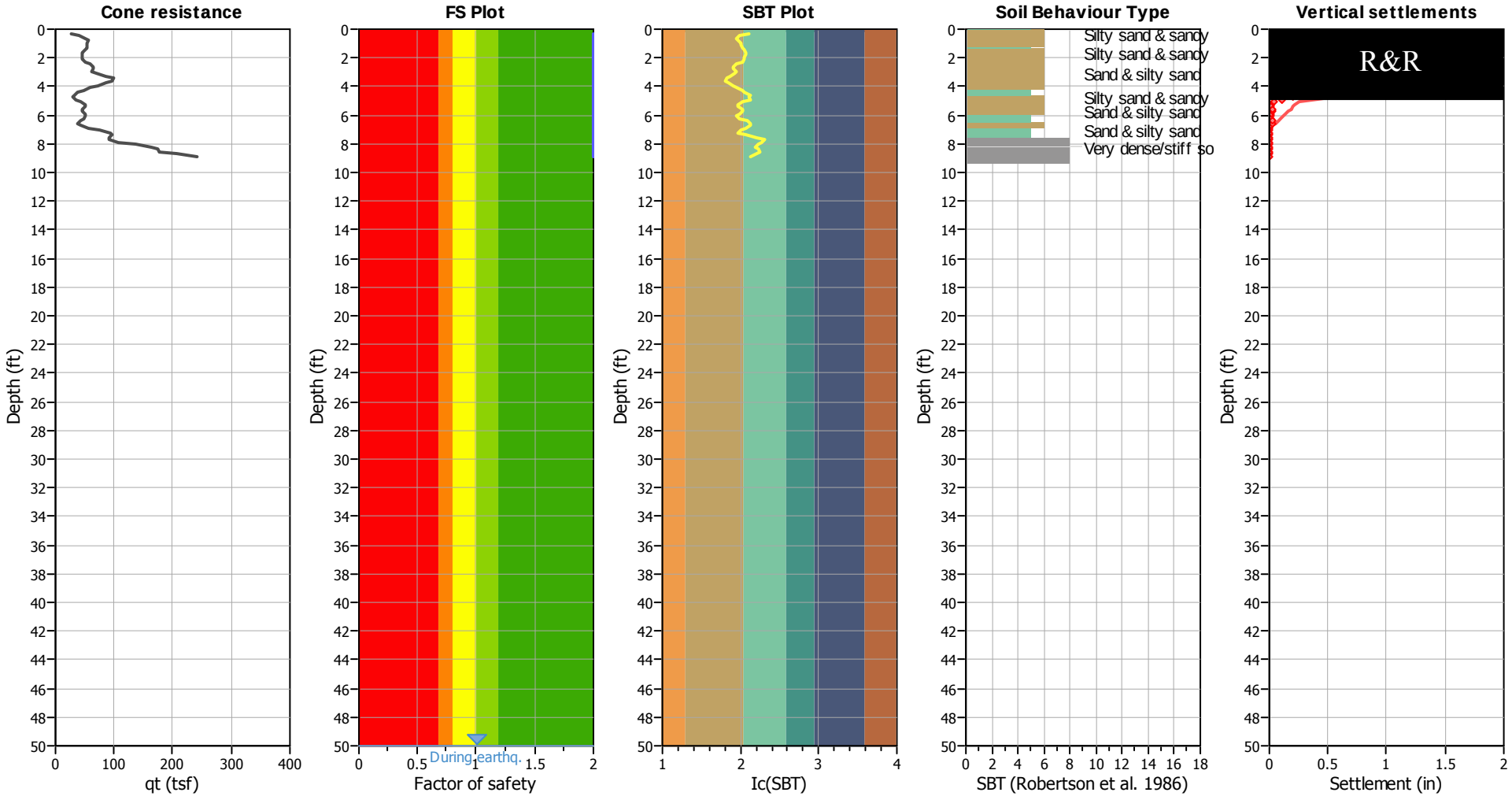


Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-06
Total depth: 8.86 ft

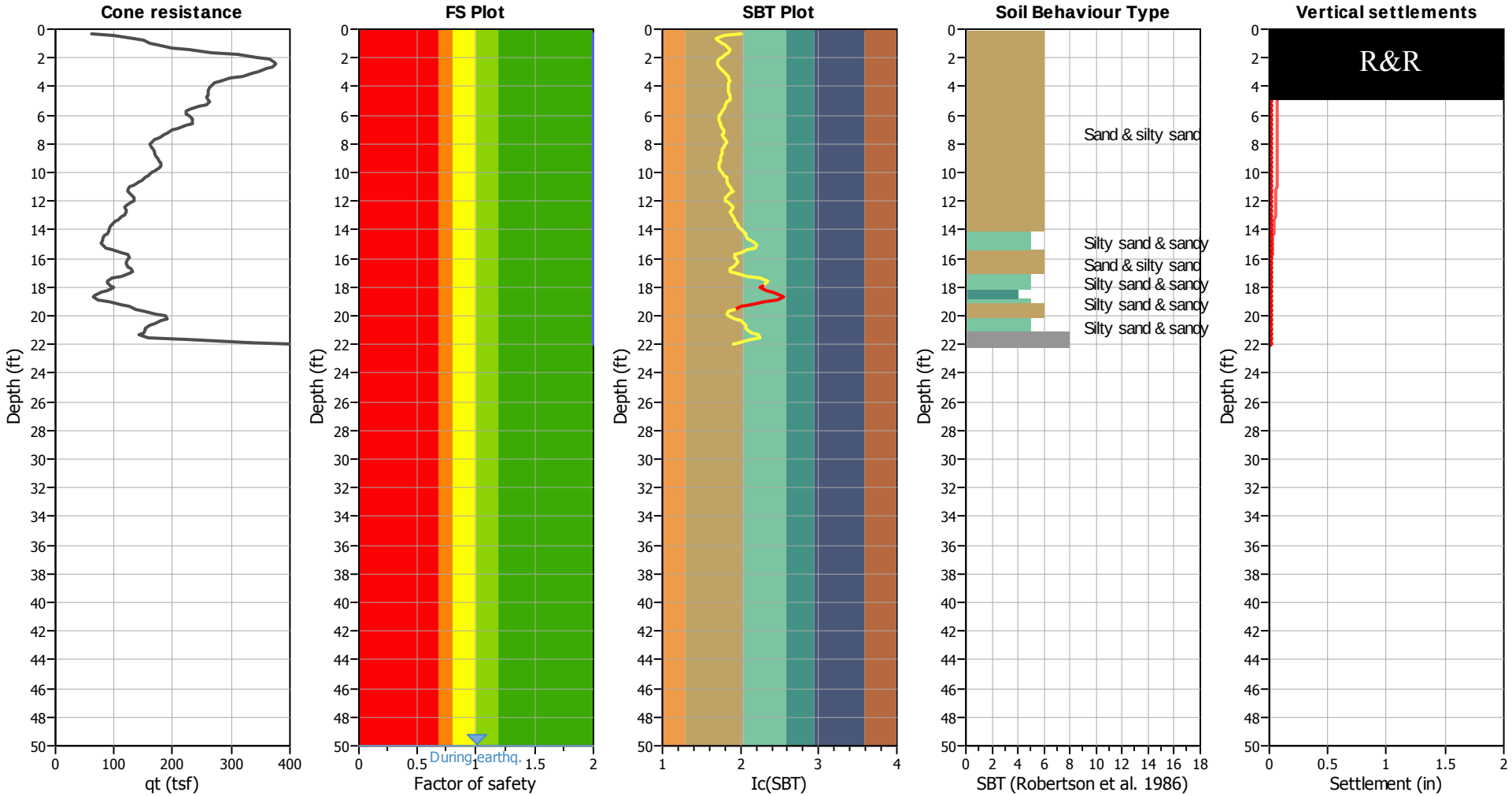


Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-07
Total depth: 21.98 ft

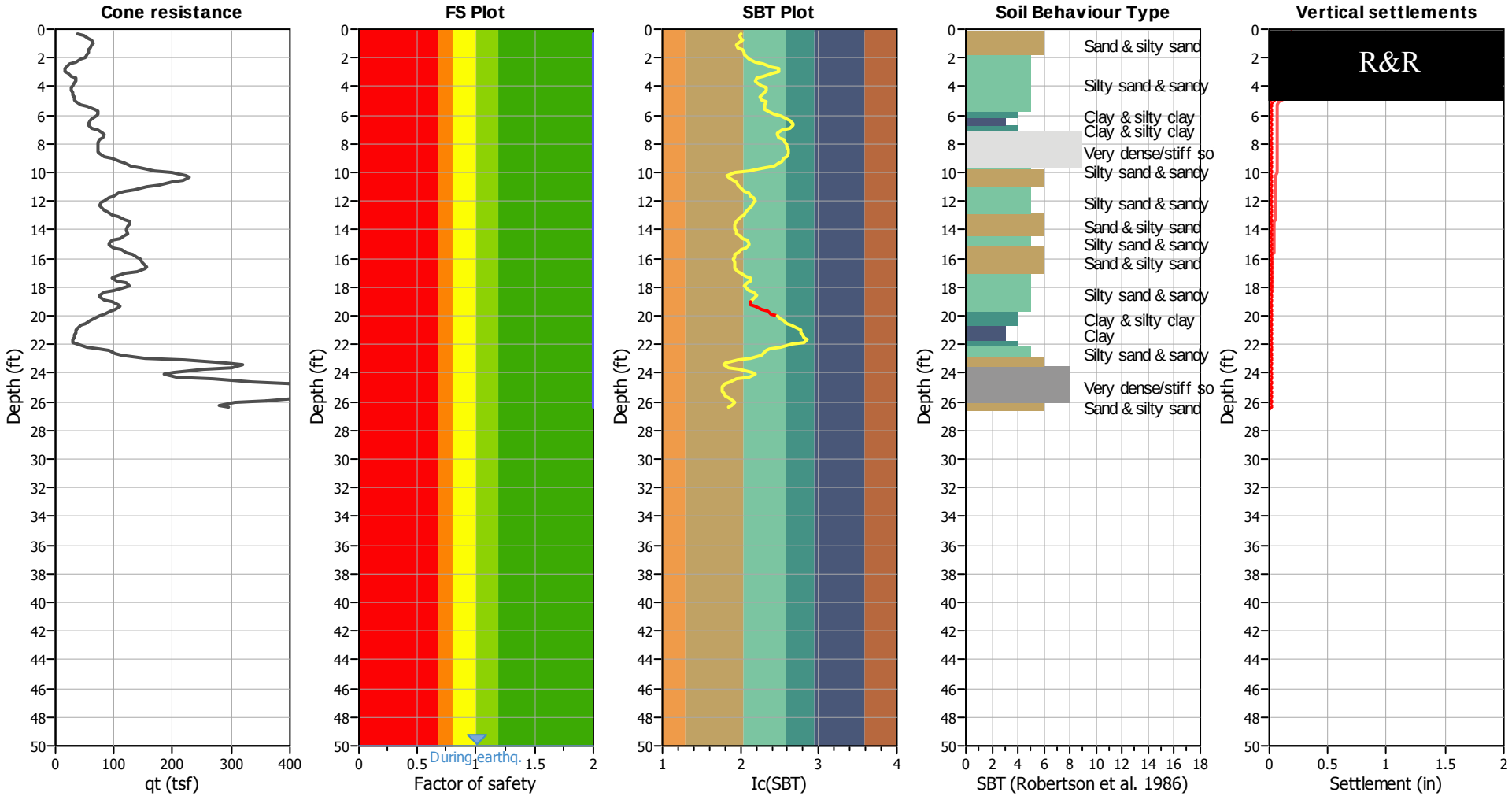


Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-08
Total depth: 26.41 ft

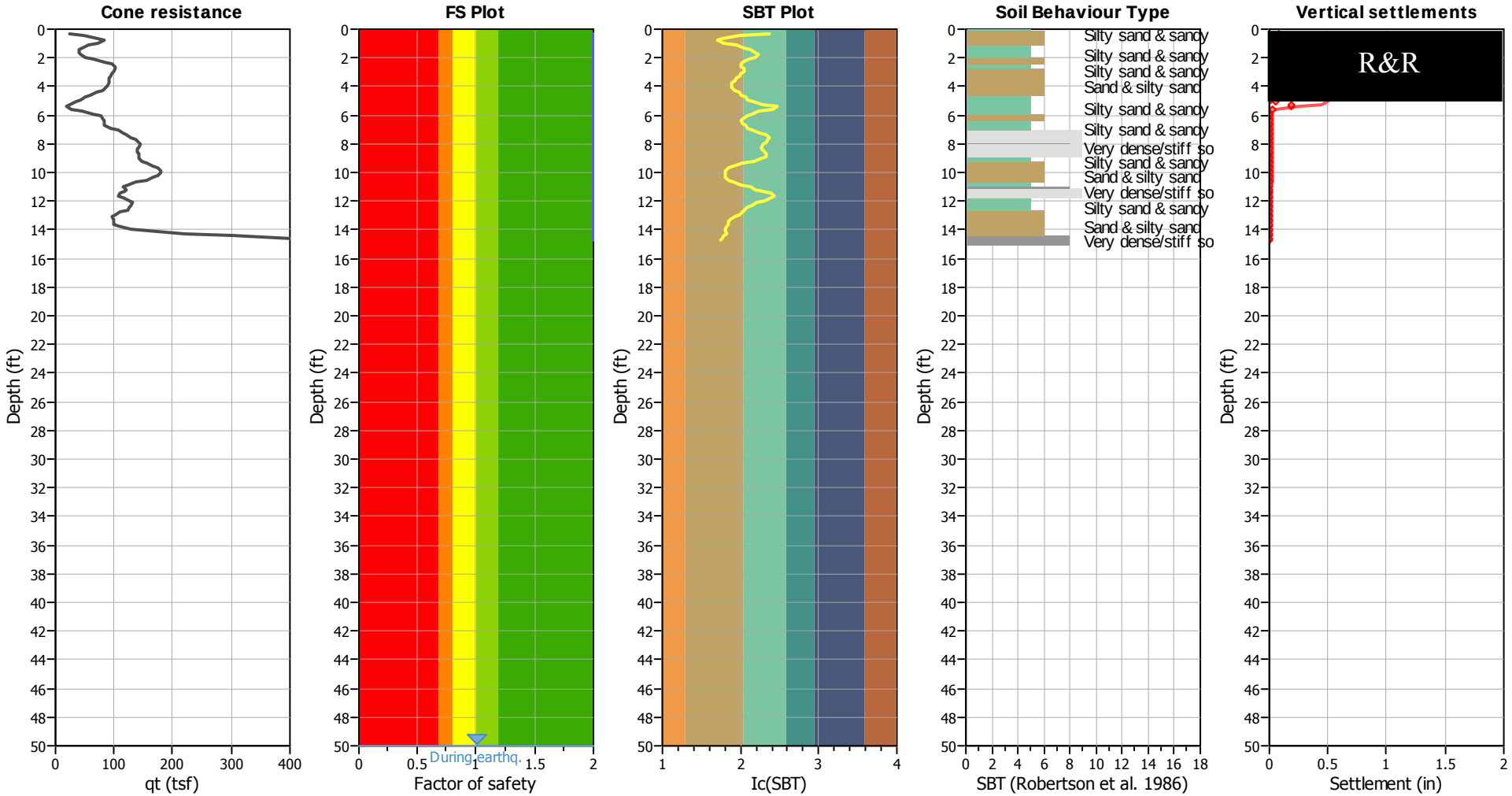


Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-09
Total depth: 14.76 ft

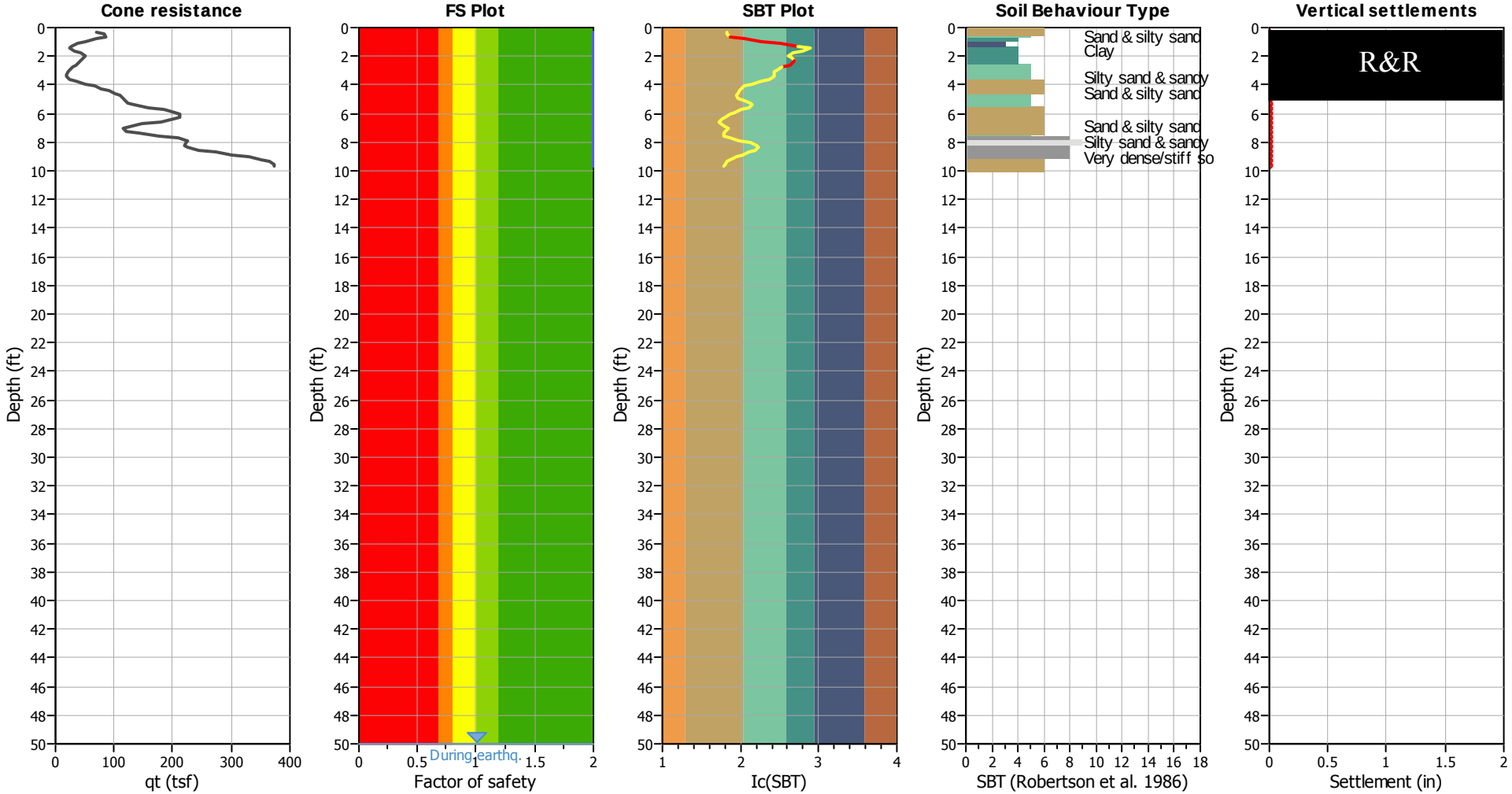


Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-10
Total depth: 9.68 ft

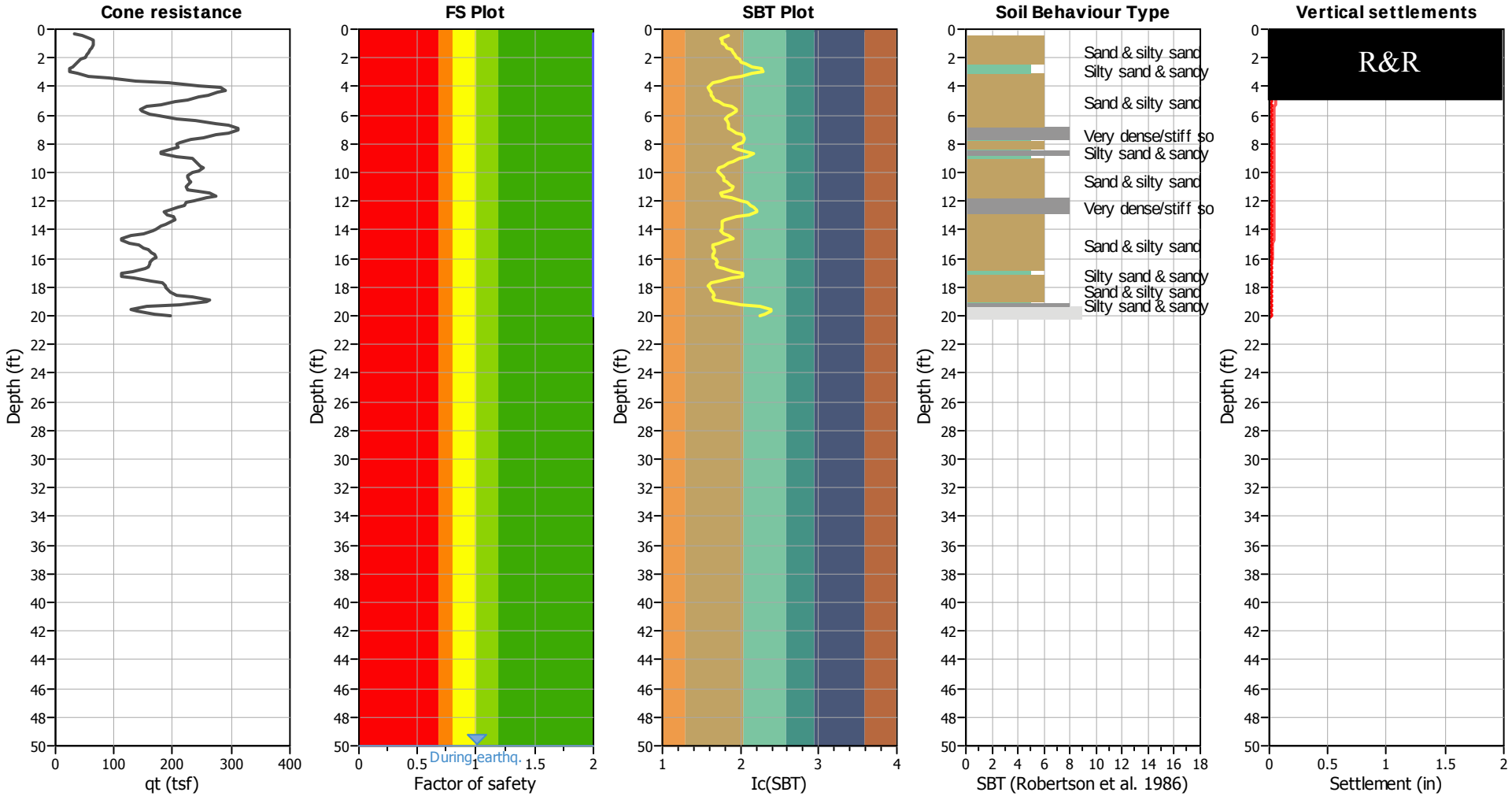


Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-11
Total depth: 20.01 ft

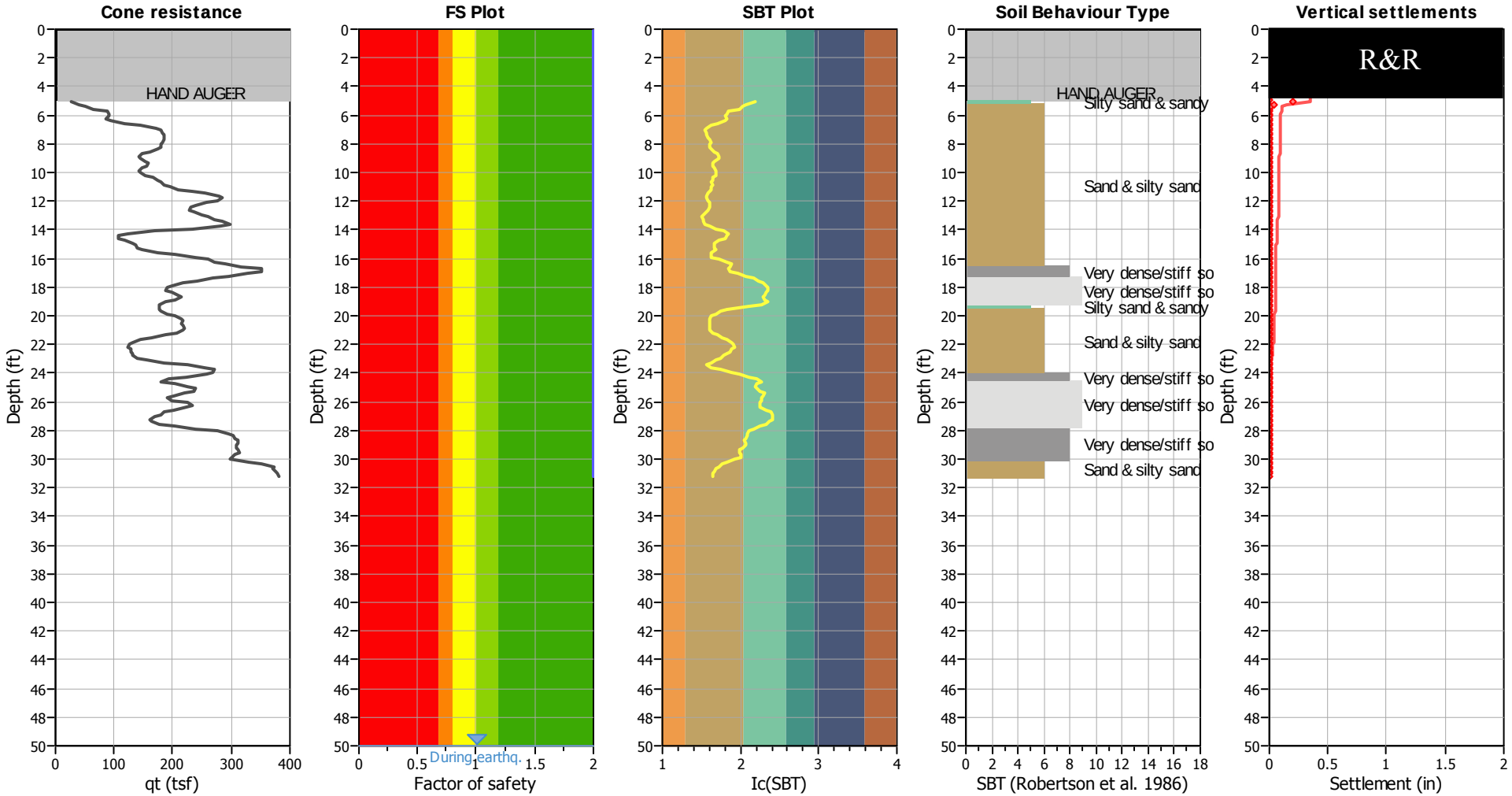


Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-12
Total depth: 31.17 ft

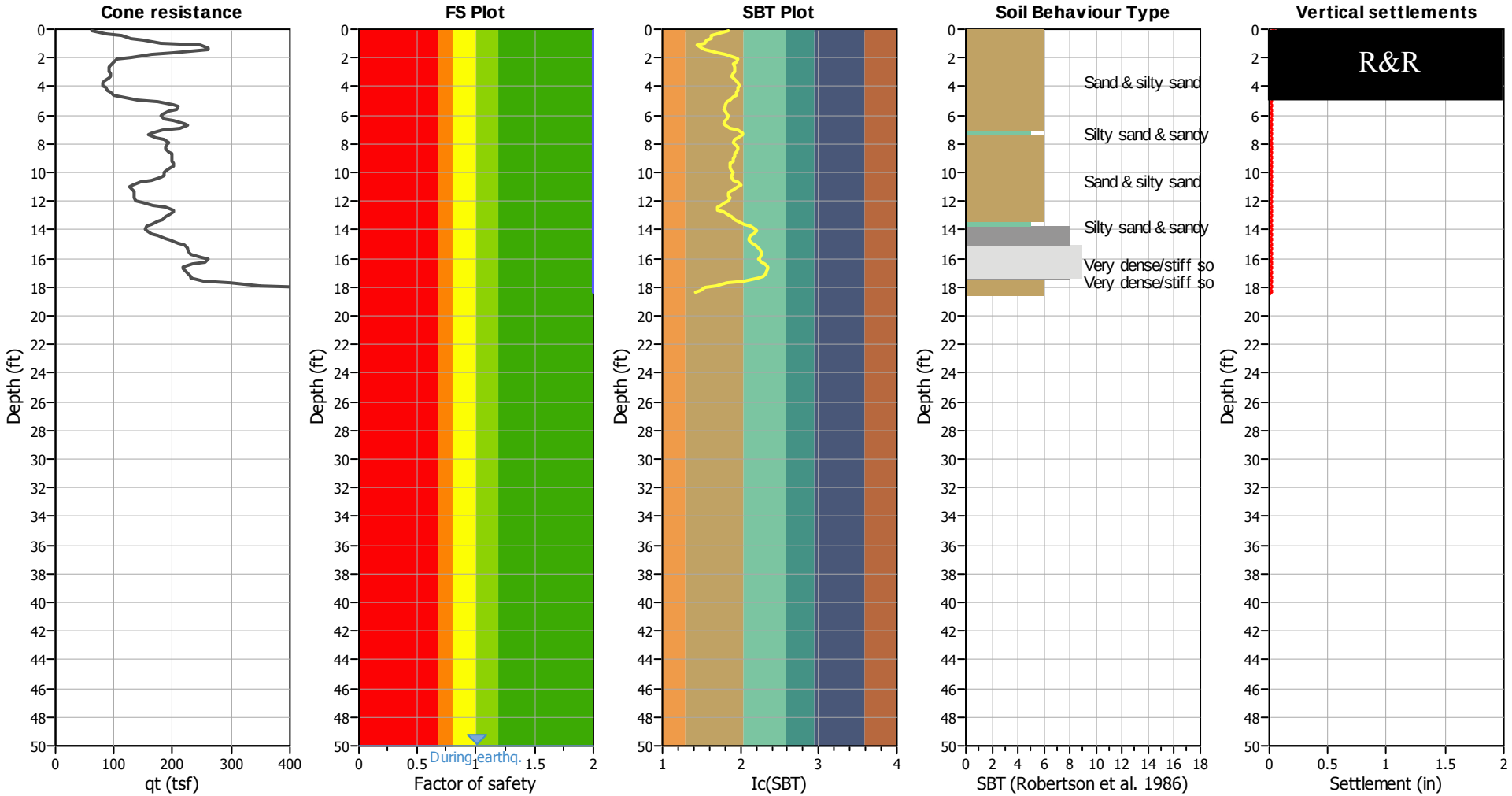


Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-13
Total depth: 18.37 ft

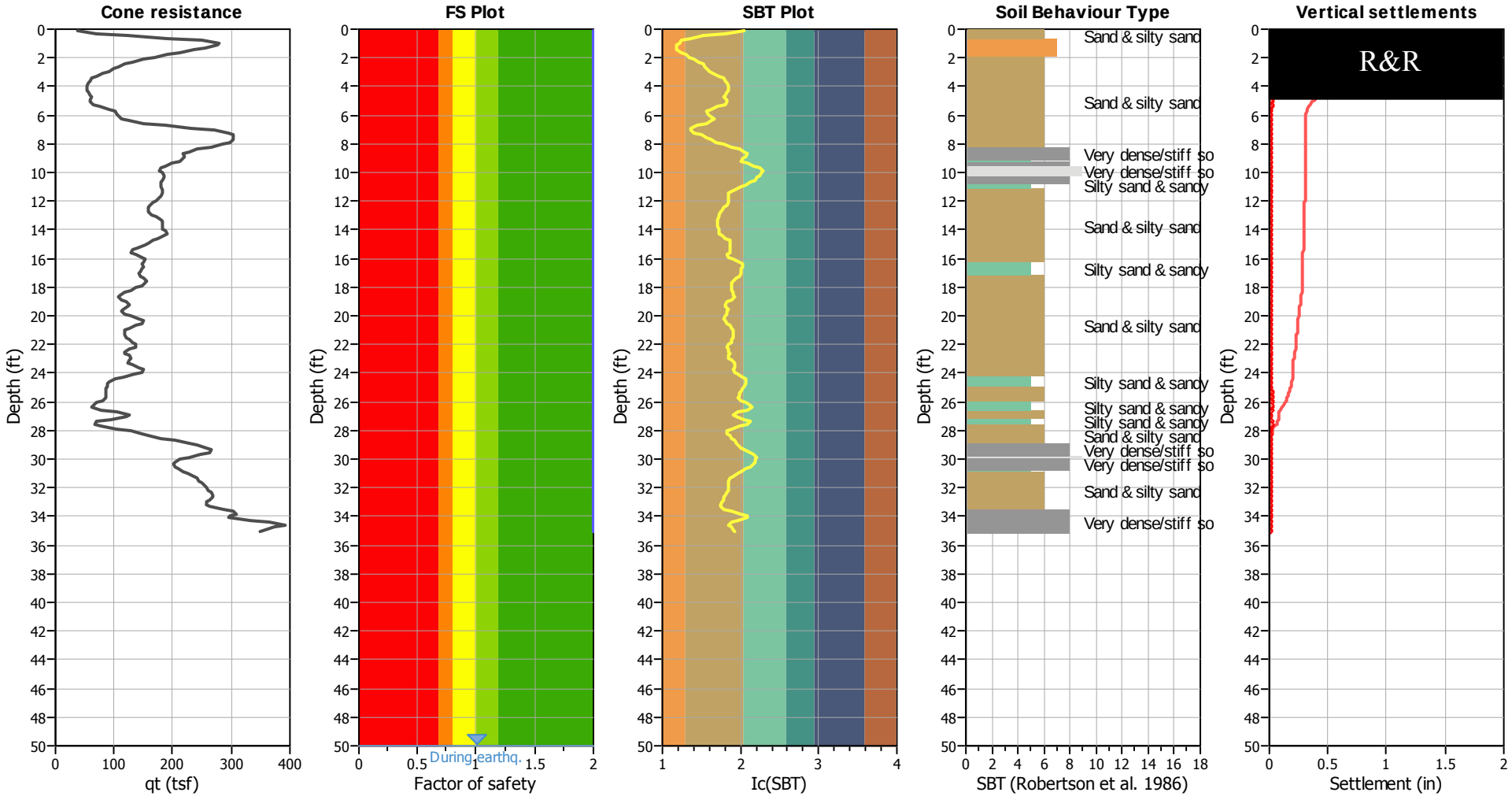


Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-14
Total depth: 35.10 ft

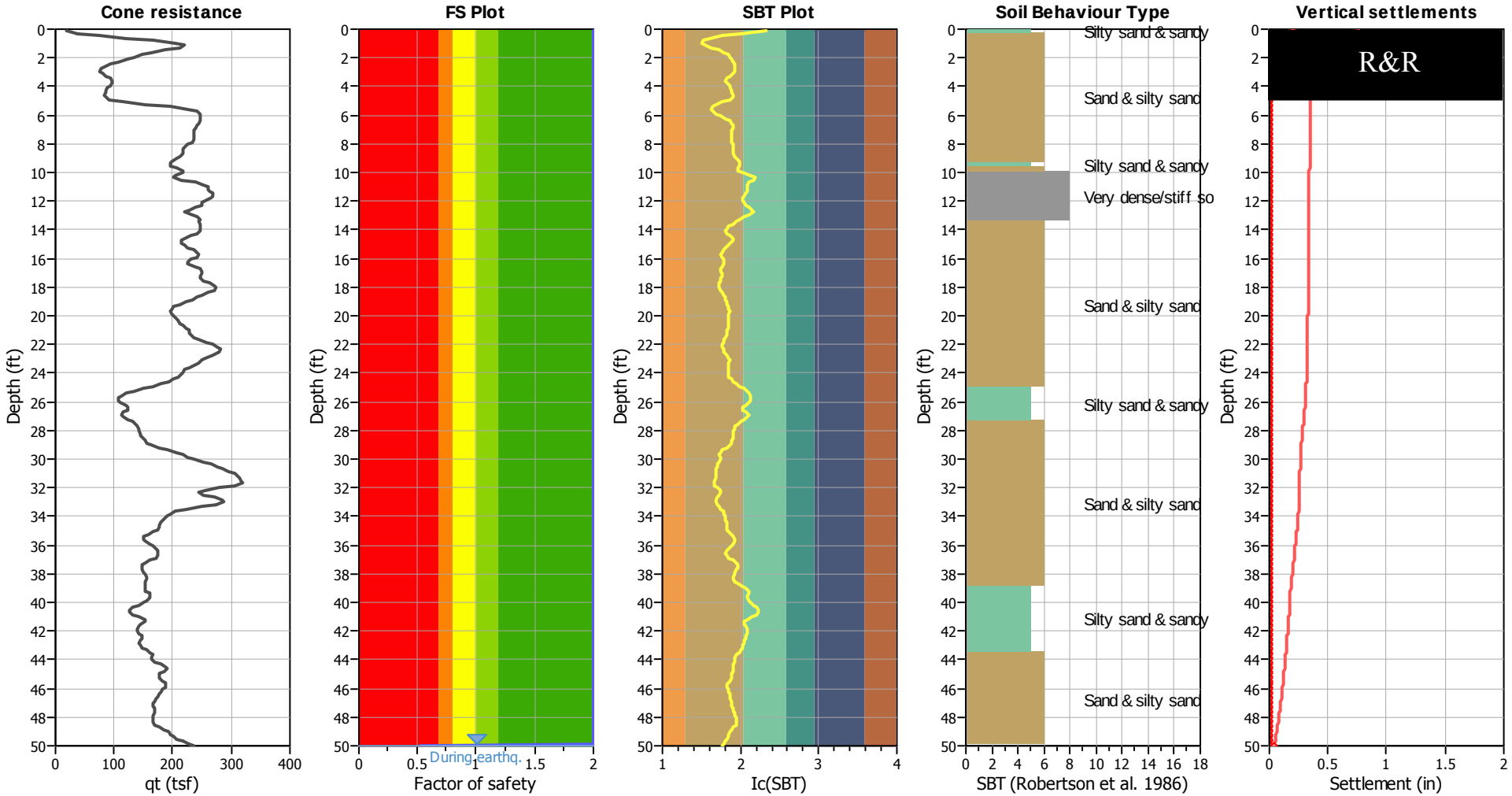


Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-15
Total depth: 50.03 ft

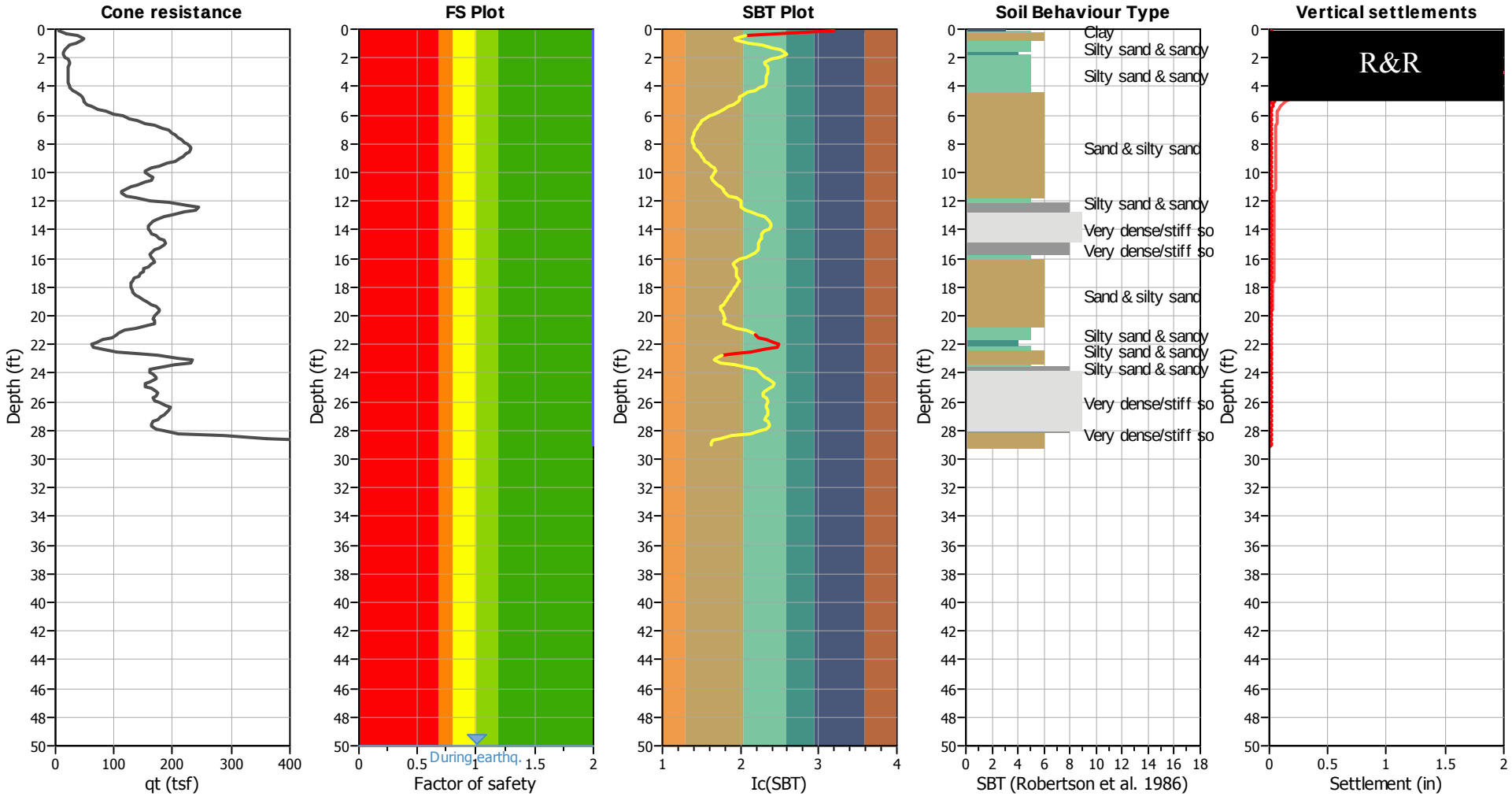


Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-16
Total depth: 29.04 ft

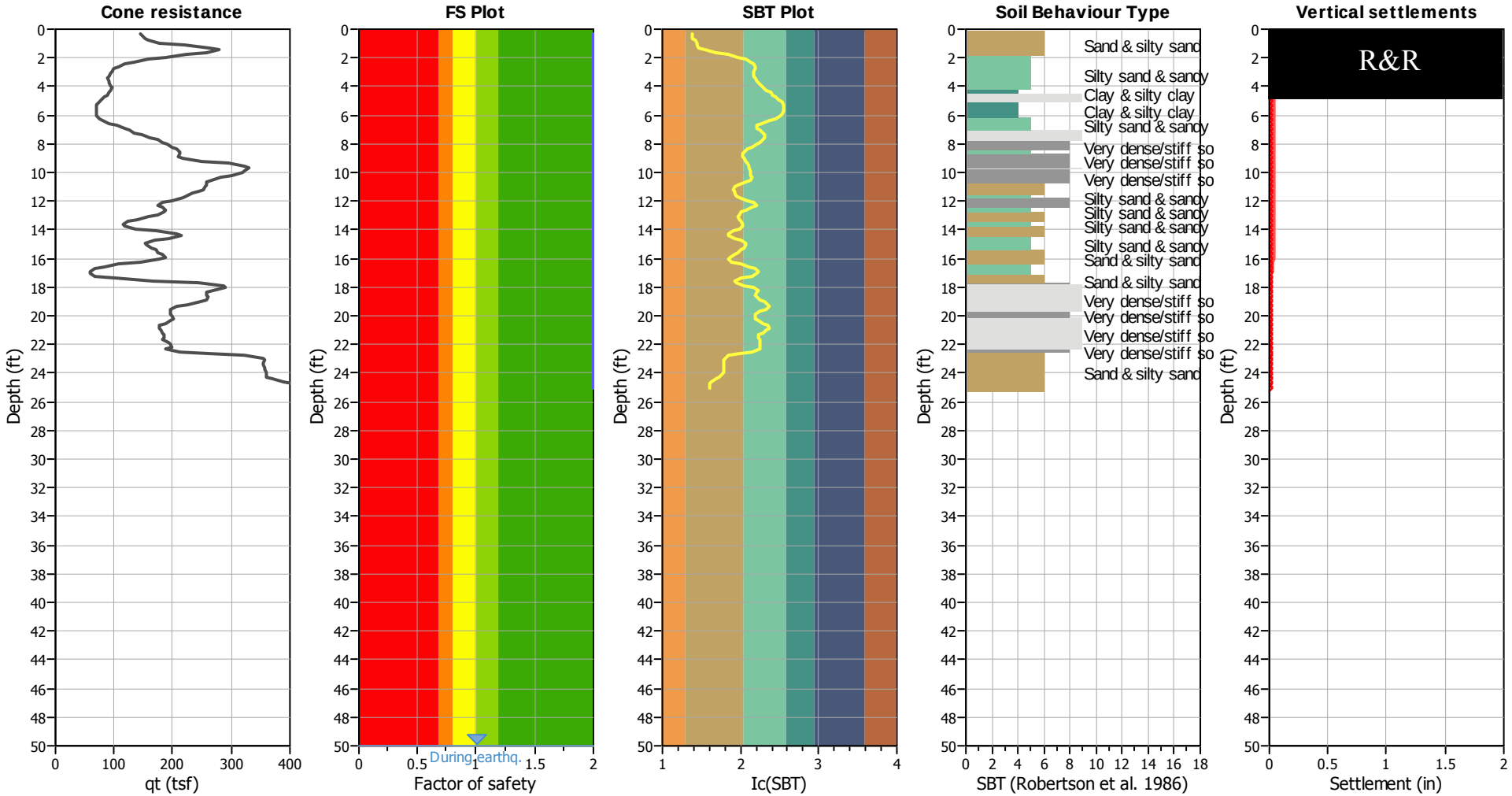


Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-17
Total depth: 25.10 ft

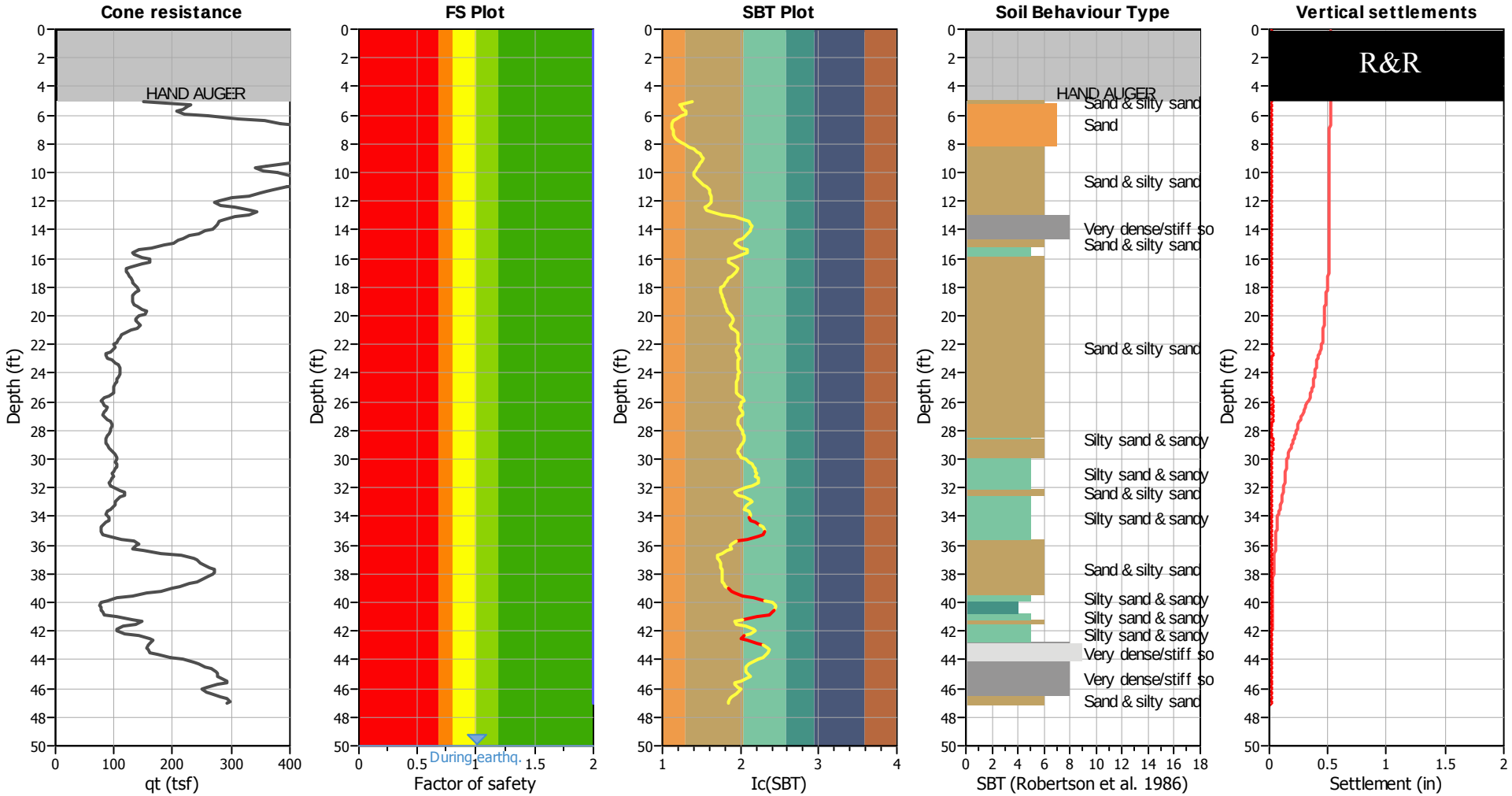


Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-18
Total depth: 47.08 ft

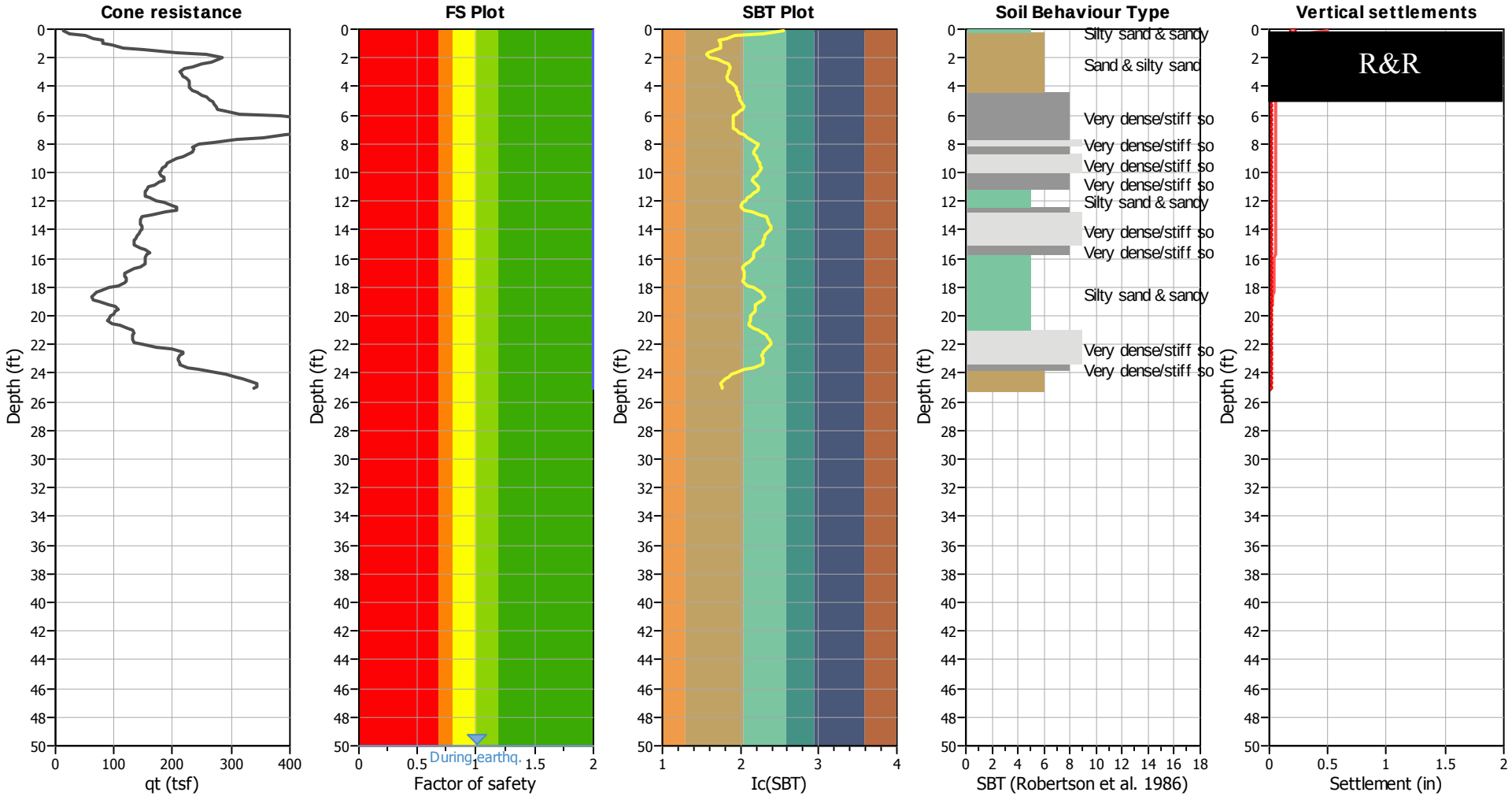


Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-19
Total depth: 25.10 ft

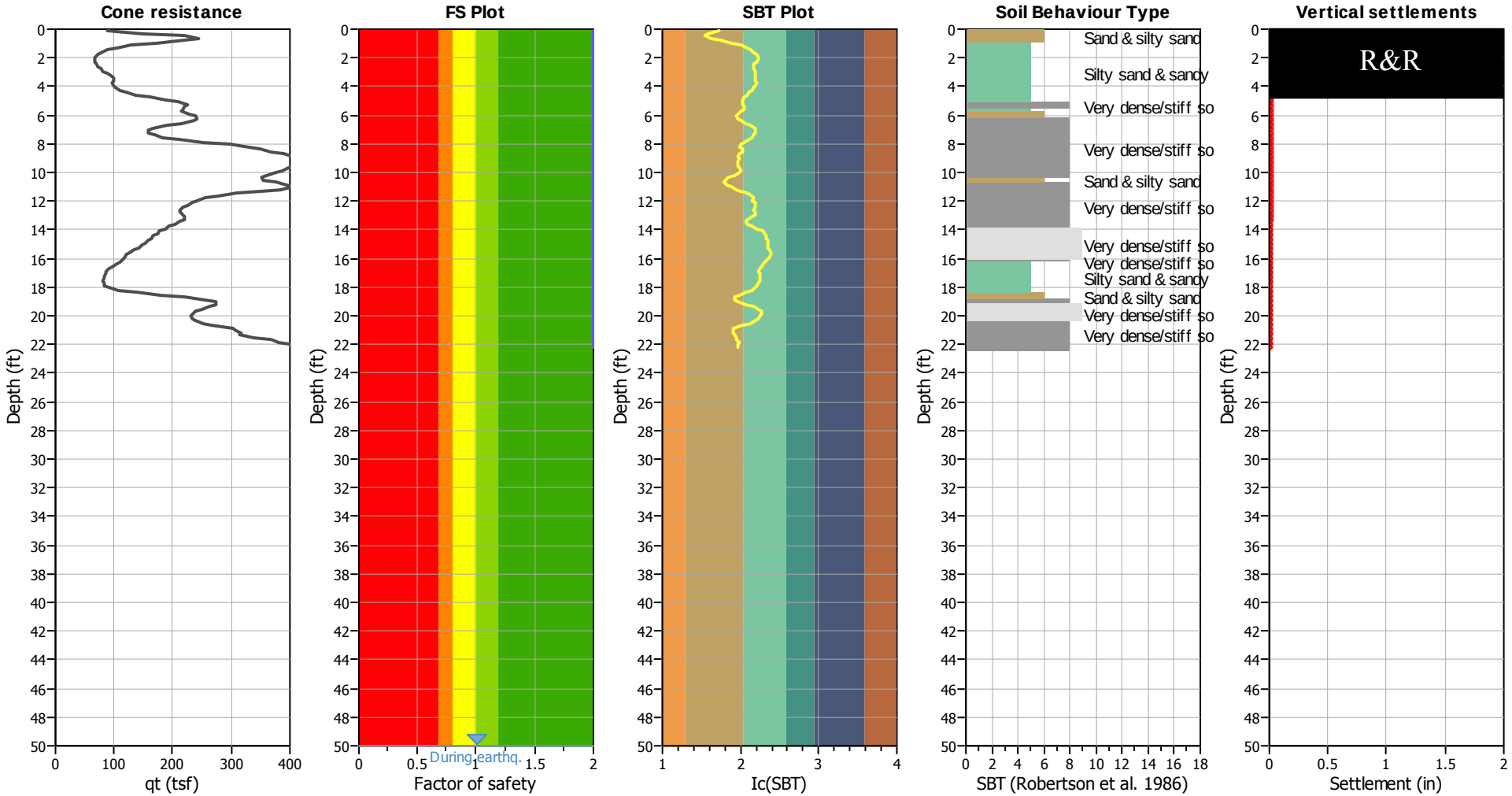


Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-20
Total depth: 22.15 ft

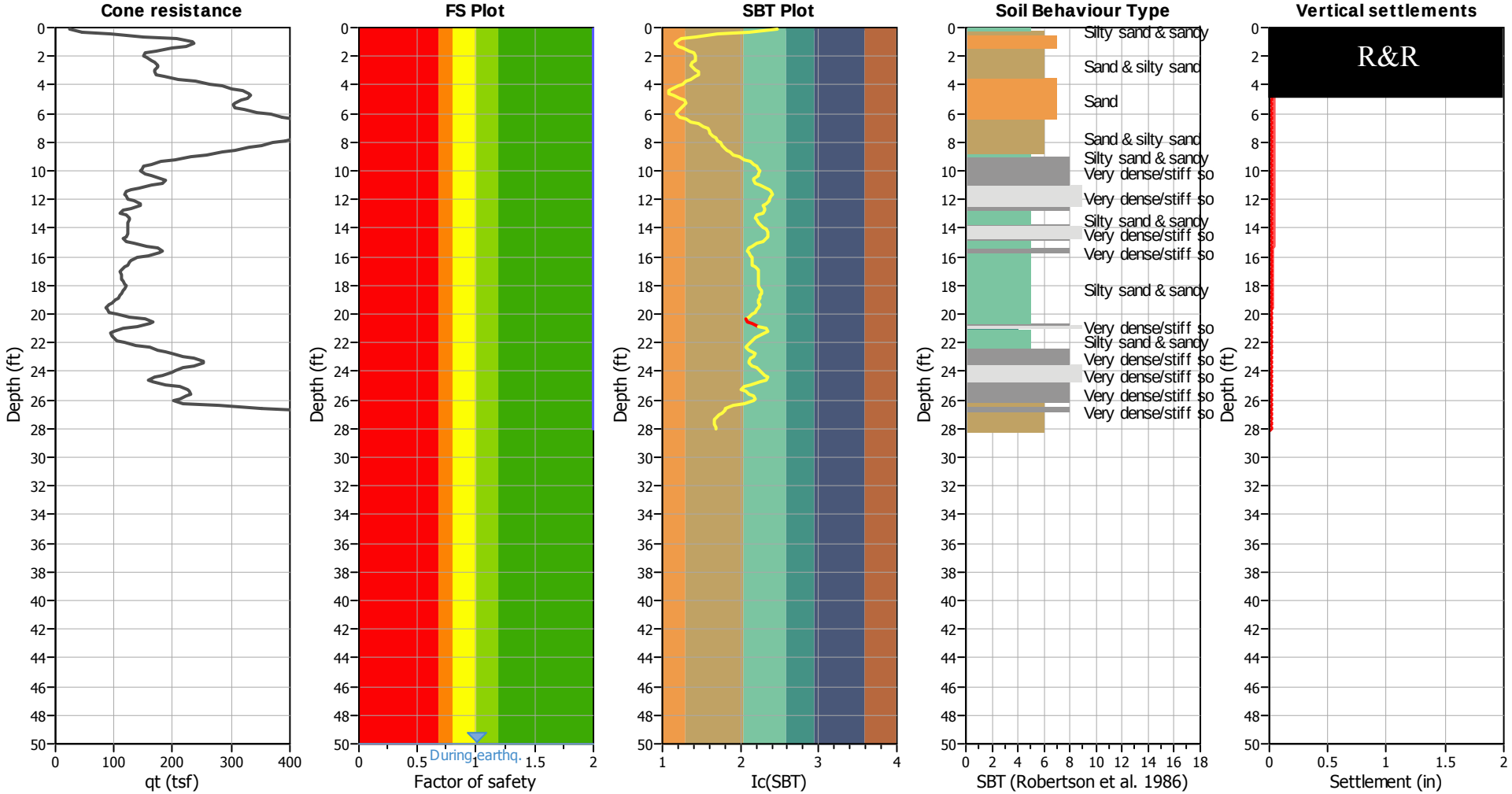


Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-21
Total depth: 28.05 ft

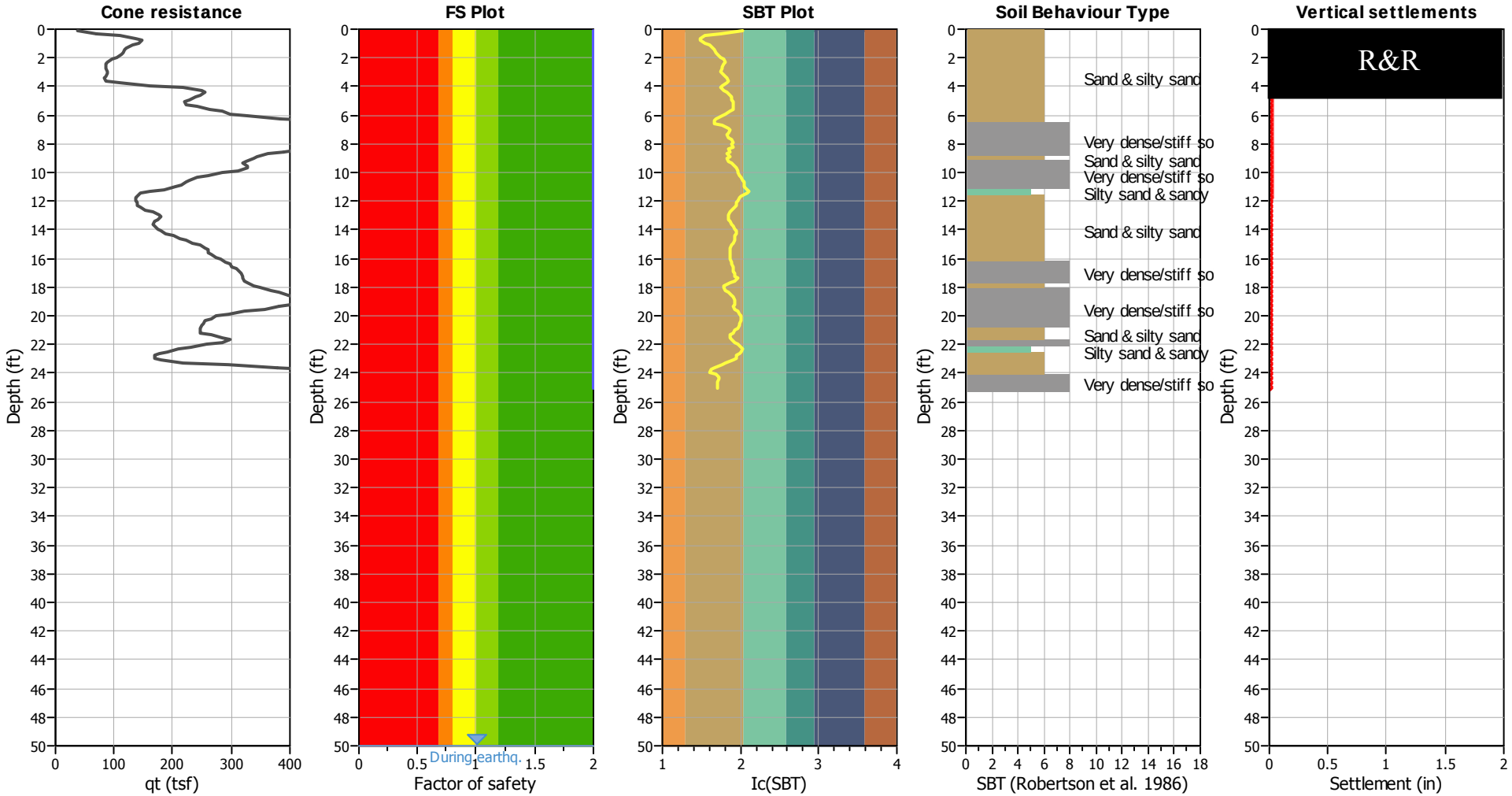


Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-22
Total depth: 25.10 ft

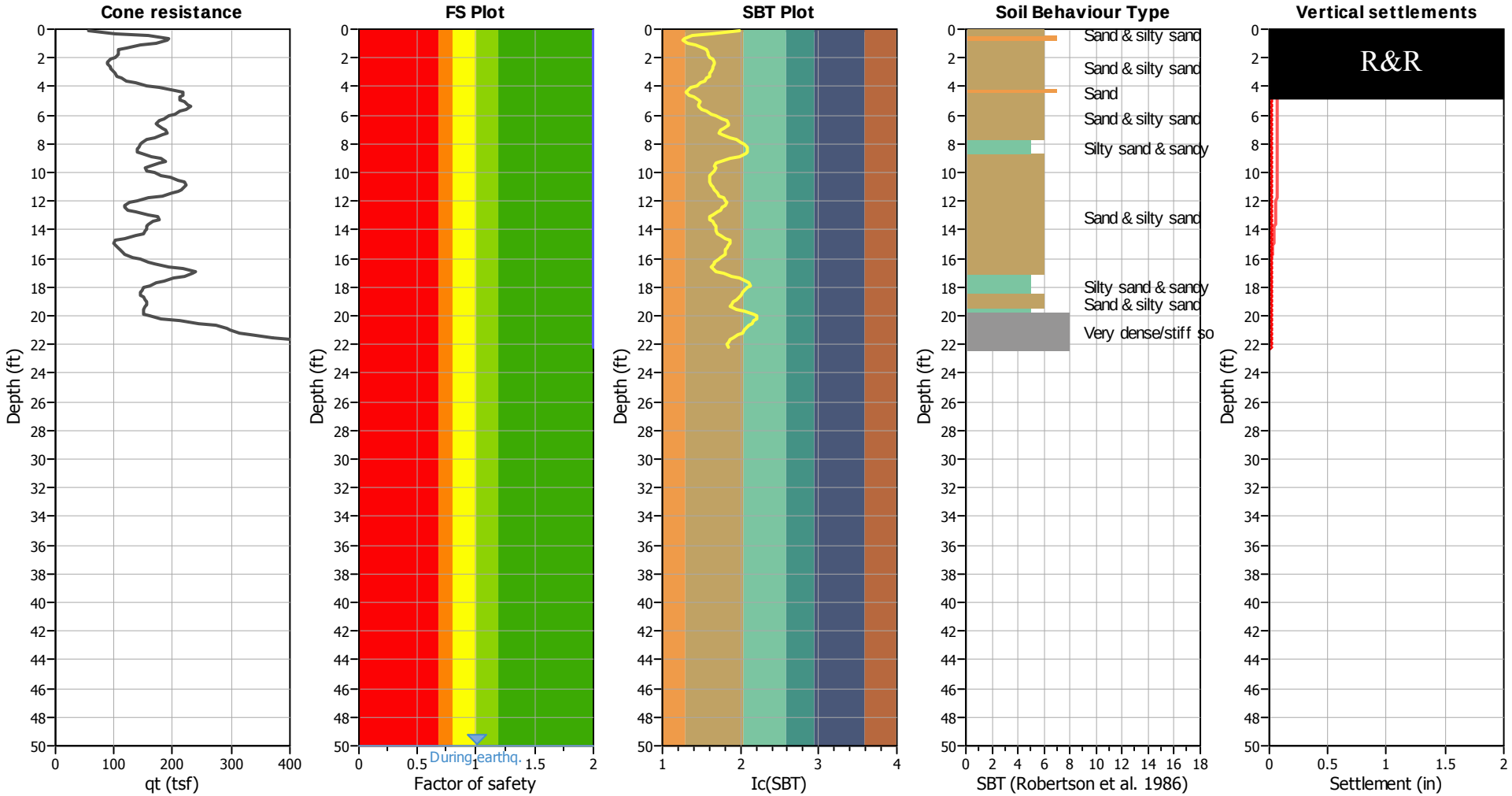


Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-23
Total depth: 22.15 ft

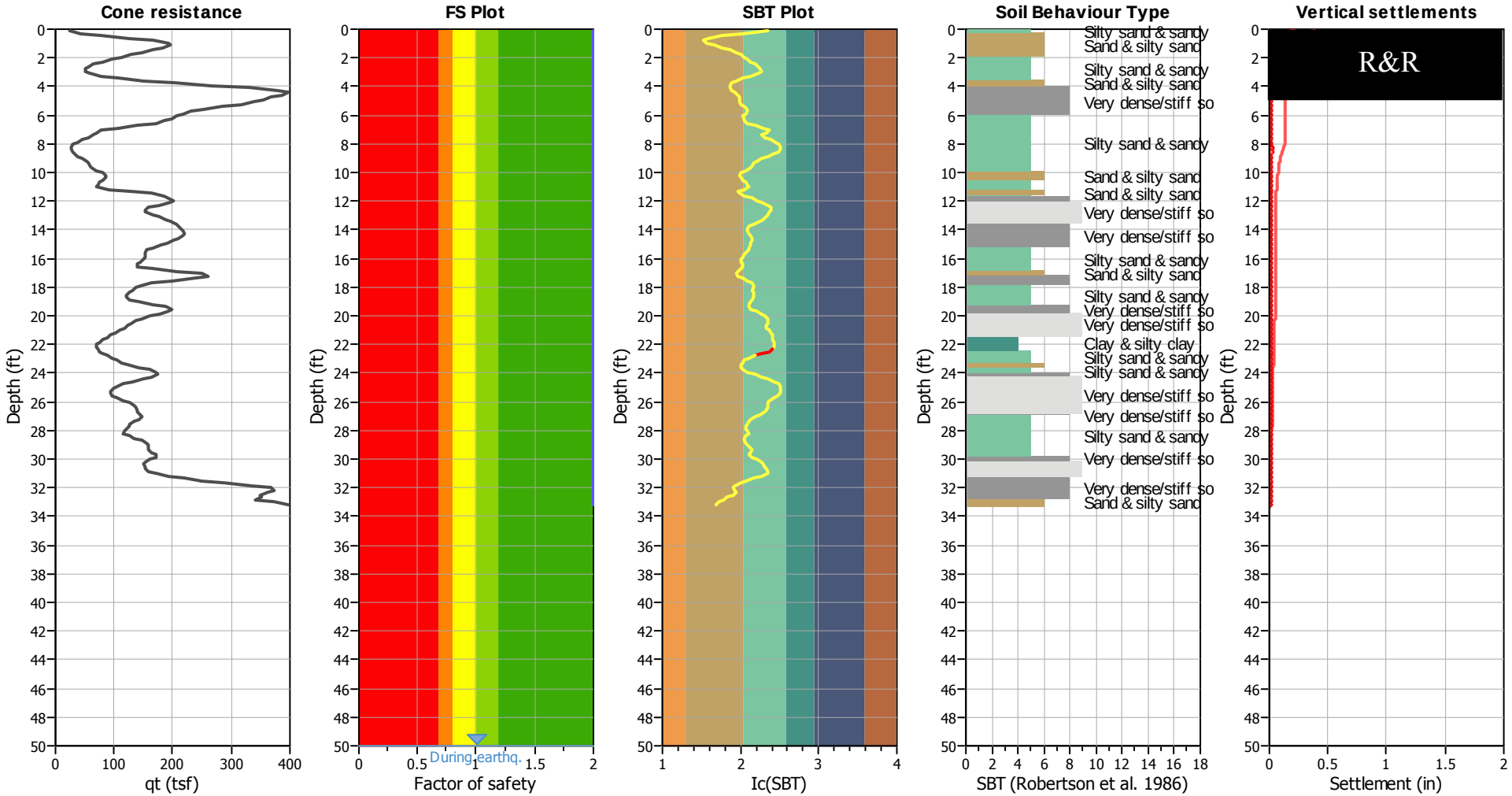


Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

LGC Geotechnical, Inc.
Geotechnical Engineers

Project: Stoneridge
Location: Riverside County

CPT: CPT-24
Total depth: 33.14 ft



Analysis method:	NCEER (1998)	G.W.T. (in-situ):	50.00 ft	Use fill:	No	Clay like behavior applied:	Sands only
Fines correction method:	NCEER (1998)	G.W.T. (earthq.):	50.00 ft	Fill height:	N/A	Limit depth applied:	No
Points to test:	Based on Ic value	Average results interval:	3	Fill weight:	N/A	Limit depth:	N/A
Earthquake magnitude M_w:	7.50	Ic cut-off value:	2.60	Trans. detect. applied:	Yes	MSF method:	Method based
Peak ground acceleration:	0.58	Unit weight calculation:	Based on SBT	K_σ applied:	Yes		

Appendix G
General Earthwork Specifications for Rough Grading

General Earthwork and Grading Specifications for Rough Grading

1.0 General

1.1 Intent

These General Earthwork and Grading Specifications are for the grading and earthwork shown on the approved grading plan(s) and/or indicated in the geotechnical report(s). These Specifications are a part of the recommendations contained in the geotechnical report(s). In case of conflict, the specific recommendations in the geotechnical report shall supersede these more general Specifications. Observations of the earthwork by the project Geotechnical Consultant during the course of grading may result in new or revised recommendations that could supersede these specifications or the recommendations in the geotechnical report(s).

1.2 The Geotechnical Consultant of Record

Prior to commencement of work, the owner shall employ a qualified Geotechnical Consultant of Record (Geotechnical Consultant). The Geotechnical Consultant shall be responsible for reviewing the approved geotechnical report(s) and accepting the adequacy of the preliminary geotechnical findings, conclusions, and recommendations prior to the commencement of the grading.

Prior to commencement of grading, the Geotechnical Consultant shall review the "work plan" prepared by the Earthwork Contractor (Contractor) and schedule sufficient personnel to perform the appropriate level of observation, mapping, and compaction testing.

During the grading and earthwork operations, the Geotechnical Consultant shall observe, map, and document the subsurface exposures to verify the geotechnical design assumptions. If the observed conditions are found to be significantly different than the interpreted assumptions during the design phase, the Geotechnical Consultant shall inform the owner, recommend appropriate changes in design to accommodate the observed conditions, and notify the review agency where required.

The Geotechnical Consultant shall observe the moisture-conditioning and processing of the subgrade and fill materials and perform relative compaction testing of fill to confirm that the attained level of compaction is being accomplished as specified. The Geotechnical Consultant shall provide the test results to the owner and the Contractor on a routine and frequent basis.

1.3 The Earthwork Contractor

The Earthwork Contractor (Contractor) shall be qualified, experienced, and knowledgeable in earthwork logistics, preparation and processing of ground to receive fill, moisture-conditioning and processing of fill, and compacting fill. The Contractor shall review and accept the plans, geotechnical report(s), and these Specifications prior to commencement of grading. The Contractor shall be solely responsible for performing the grading in accordance with the project plans and specifications. The Contractor shall prepare and submit to the owner and the Geotechnical Consultant a work plan that indicates the sequence of earthwork grading, the number of “equipment” of work and the estimated quantities of daily earthwork

contemplated for the site prior to commencement of grading. The Contractor shall inform the owner and the
Geotechnical Consultant of changes in work schedules and updates to the work plan at least 24 hours in advance of such changes so that appropriate personnel will be available for observation and testing. The Contractor shall not assume that the Geotechnical Consultant is aware of all grading operations.

The Contractor shall have the sole responsibility to provide adequate equipment and methods to accomplish the earthwork in accordance with the applicable grading codes and agency ordinances, these Specifications, and the recommendations in the approved geotechnical report(s) and grading plan(s). If, in the opinion of the Geotechnical Consultant, unsatisfactory conditions, such as unsuitable soil, improper moisture condition, inadequate compaction, insufficient buttress key size, adverse weather, etc., are resulting in a quality of work less than required in these specifications, the Geotechnical Consultant shall reject the work and may recommend to the owner that construction be stopped until the conditions are rectified. It is the contractor's sole responsibility to provide proper fill compaction.

2.0 Preparation of Areas to be Filled

2.1 Clearing and Grubbing

Vegetation, such as brush, grass, roots, and other deleterious material shall be sufficiently removed and properly disposed of in a method acceptable to the owner, governing agencies, and the Geotechnical Consultant.

The Geotechnical Consultant shall evaluate the extent of these removals depending on specific site conditions. Earth fill material shall not contain more than 1 percent of organic materials (by volume). Nesting of the organic materials shall not be allowed.

If potentially hazardous materials are encountered, the Contractor shall stop work in the affected area, and a hazardous material specialist shall be informed immediately for proper evaluation and handling of these materials prior to continuing to work in that area.

As presently defined by the State of California, most refined petroleum products (gasoline, diesel fuel, motor oil, grease, coolant, etc.) have chemical constituents that are considered to be hazardous waste. As such, the indiscriminate dumping or spillage of these fluids onto the ground may constitute a misdemeanor, punishable by fines and/or imprisonment, and shall not be allowed. The contractor is responsible for all hazardous waste relating to his work. The Geotechnical Consultant does not have expertise in this area. If hazardous waste is a concern, then the Client should acquire the services of a qualified environmental assessor.

2.2 Processing

Existing ground that has been declared satisfactory for support of fill by the Geotechnical Consultant shall be scarified to a minimum depth of 6 inches. Existing ground that is not satisfactory shall be over-excavated as specified in the following section. Scarification shall continue until soils are broken down and free of oversize material and the working surface is reasonably uniform, flat, and free of uneven features that would inhibit uniform compaction.

2.3 Over-excavation

In addition to removals and over-excavations recommended in the approved geotechnical report(s) and the grading plan, soft, loose, dry, saturated, spongy, organic-rich, highly fractured or otherwise unsuitable ground shall be over-excavated to competent ground as evaluated by the Geotechnical Consultant during grading.

2.4 Benching

Where fills are to be placed on ground with slopes steeper than 5:1 (horizontal to vertical units), the ground shall be stepped or benched. Please see the Standard Details for a graphic illustration. The lowest bench or key shall be a minimum of 15 feet wide and at least 2 feet deep, into competent material as evaluated by the Geotechnical Consultant. Other benches shall be excavated a minimum height of 4 feet into competent material or as otherwise recommended by the Geotechnical Consultant. Fill placed on ground sloping flatter than 5:1 shall also be benched or otherwise over-excavated to provide a flat subgrade for the fill.

2.5 Evaluation/Acceptance of Fill Areas

All areas to receive fill, including removal and processed areas, key bottoms, and benches, shall be observed, mapped, elevations recorded, and/or tested prior to being accepted by the Geotechnical Consultant as suitable to receive fill. The Contractor shall obtain a written acceptance from the Geotechnical Consultant prior to fill placement. A licensed surveyor shall provide the survey control for determining elevations of processed areas, keys, and benches.

3.0 Fill Material

3.1 General

Material to be used as fill shall be essentially free of organic matter and other deleterious substances evaluated and accepted by the Geotechnical Consultant prior to placement. Soils of poor quality, such as those with unacceptable gradation, high expansion potential, or low strength shall be placed in areas acceptable to the Geotechnical Consultant or mixed with other soils to achieve satisfactory fill material.

3.2 Oversize

Oversize material defined as rock, or other irreducible material with a maximum dimension greater than 8 inches, shall not be buried or placed in fill unless location, materials, and placement methods are specifically accepted by the Geotechnical Consultant. Placement operations shall be such that nesting of oversized material does not occur and such that oversize material is completely surrounded by compacted or densified fill. Oversize material shall not be placed within 10 vertical feet of finish grade or within 2 feet of future utilities or underground construction.

3.3 Import

If importing of fill material is required for grading, proposed import material shall meet the requirements of the geotechnical consultant. The potential import source shall be given to the Geotechnical Consultant at least 48 hours (2 working days) before importing begins so that its suitability can be determined and appropriate tests performed.

4.0 Fill Placement and Compaction

4.1 Fill Layers

Approved fill material shall be placed in areas prepared to receive fill (per Section 3.0) in near-horizontal layers not exceeding 8 inches in loose thickness. The Geotechnical Consultant may accept thicker layers if testing indicates the grading procedures can adequately compact the thicker layers. Each layer shall be spread evenly and mixed thoroughly to attain relative uniformity of material and moisture throughout.

4.2 Fill Moisture Conditioning

Fill soils shall be watered, dried back, blended, and/or mixed, as necessary to attain a relatively uniform moisture content at or slightly over optimum. Maximum density and optimum soil moisture content tests shall be performed in accordance with the American Society of Testing and Materials (ASTM Test Method D1557).

4.3 Compaction of Fill

After each layer has been moisture-conditioned, mixed, and evenly spread, it shall be uniformly compacted to not less than 90 percent of maximum dry density (ASTM Test Method D1557). Compaction equipment shall be adequately sized and be either specifically designed for soil compaction or of proven reliability to efficiently achieve the specified level of compaction with uniformity.

4.4 Compaction of Fill Slopes

In addition to normal compaction procedures specified above, compaction of slopes shall be accomplished by backrolling of slopes with sheepsfoot rollers at increments of 3 to 4 feet in fill elevation, or by other methods producing satisfactory results acceptable to the Geotechnical Consultant. Upon completion of grading, relative compaction of the fill, out to the slope face, shall be at least 90 percent of maximum density per ASTM Test Method D1557.

4.5 Compaction Testing

Field tests for moisture content and relative compaction of the fill soils shall be performed by the Geotechnical Consultant. Location and frequency of tests shall be at the Consultant's discretion based on field conditions encountered. Compaction test locations will not necessarily be selected on a random basis. Test locations shall be selected to verify adequacy of compaction levels in areas that are judged to be prone to inadequate compaction (such as close to slope faces and at the fill/bedrock benches).

4.6 Frequency of Compaction Testing

Tests shall be taken at intervals not exceeding 2 feet in vertical rise and/or 1,000 cubic yards of compacted fill soils embankment. In addition, as a guideline, at least one test shall be taken on slope faces for each 5,000 square feet of slope face and/or each 10 feet of vertical height of slope. The Contractor shall assure that fill construction is such that the testing schedule can be accomplished by the Geotechnical Consultant. The Contractor shall stop or slow down the earthwork construction if these minimum standards are not met.

4.7 Compaction Test Locations

The Geotechnical Consultant shall document the approximate elevation and horizontal coordinates of each test location. The Contractor shall coordinate with the project surveyor to assure that sufficient grade stakes are established so that the Geotechnical Consultant can determine the test locations with sufficient accuracy. At a minimum, two grade stakes within a horizontal distance of 100 feet and vertically less than
5 feet apart from potential test locations shall be provided.

5.0 Subdrain Installation

Subdrain systems shall be installed in accordance with the approved geotechnical report(s), the grading plan, and the Standard Details. The Geotechnical Consultant may recommend additional subdrains and/or changes in subdrain extent, location, grade, or material depending on conditions encountered during grading. All subdrains shall be surveyed by a land surveyor/civil engineer for line and grade after installation and prior to burial. Sufficient time should be allowed by the Contractor for these surveys.

6.0 Excavation

Excavations, as well as over-excavation for remedial purposes, shall be evaluated by the Geotechnical Consultant during grading. Remedial removal depths shown on geotechnical plans are estimates only. The actual extent of removal shall be determined by the Geotechnical Consultant based on the field evaluation of exposed conditions during grading. Where fill-over-cut slopes are to be graded, the cut portion of the slope shall be made, evaluated, and accepted by the Geotechnical Consultant prior to placement of materials for construction of the fill portion of the slope, unless otherwise recommended by the Geotechnical Consultant.

7.0 Trench Backfills

7.1 The Contractor shall follow all OHSA and Cal/OSHA requirements for safety of trench excavations.

7.2 All bedding and backfill of utility trenches shall be done in accordance with the applicable provisions of Standard Specifications of Public Works Construction. Bedding material shall have a Sand Equivalent greater than 30 (SE>30). The bedding shall be placed to 1 foot over

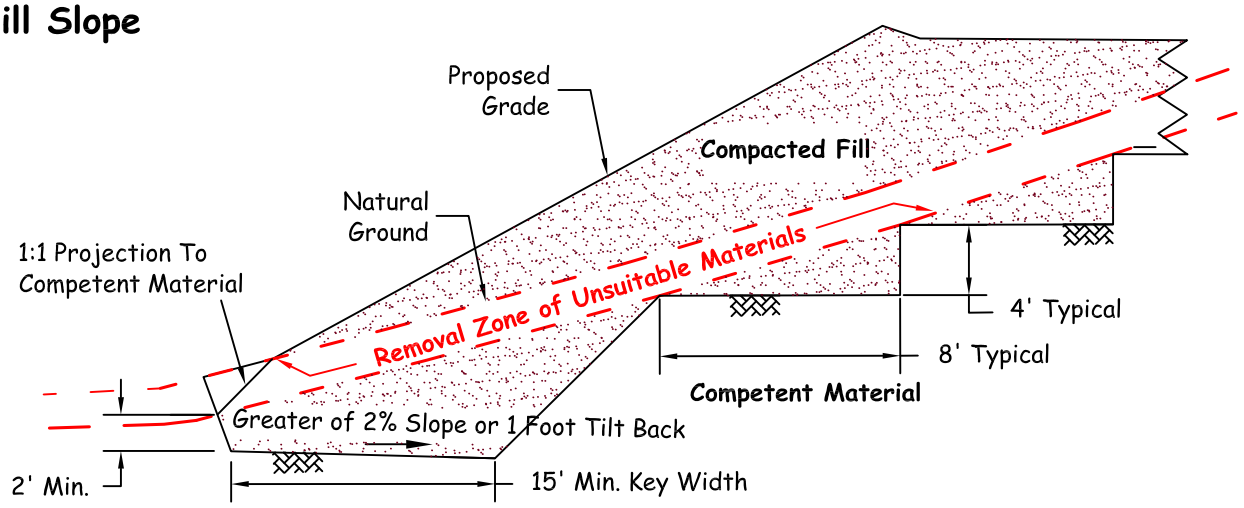
the top of the conduit and densified by jetting. Backfill shall be placed and densified to a minimum of 90 percent of maximum from 1 foot above the top of the conduit to the surface.

7.3 The jetting of the bedding around the conduits shall be observed by the Geotechnical Consultant.

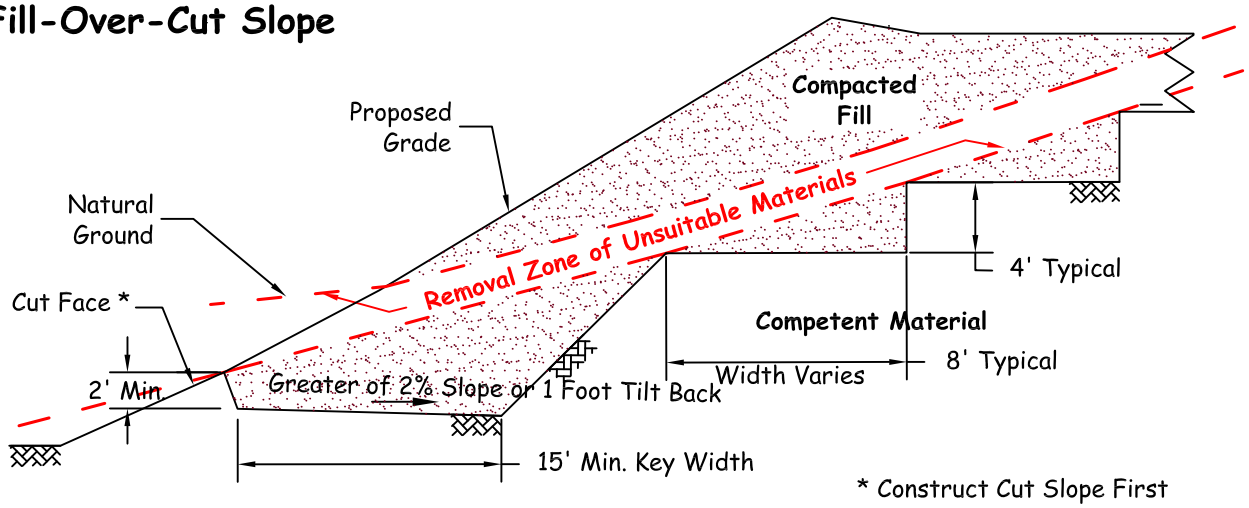
7.4 The Geotechnical Consultant shall test the trench backfill for relative compaction. At least one test should be made for every 300 feet of trench and 2 feet of fill.

7.5 Lift thickness of trench backfill shall not exceed those allowed in the Standard Specifications of Public Works Construction unless the Contractor can demonstrate to the Geotechnical Consultant that the fill lift can be compacted to the minimum relative compaction by his alternative equipment and method.

Fill Slope

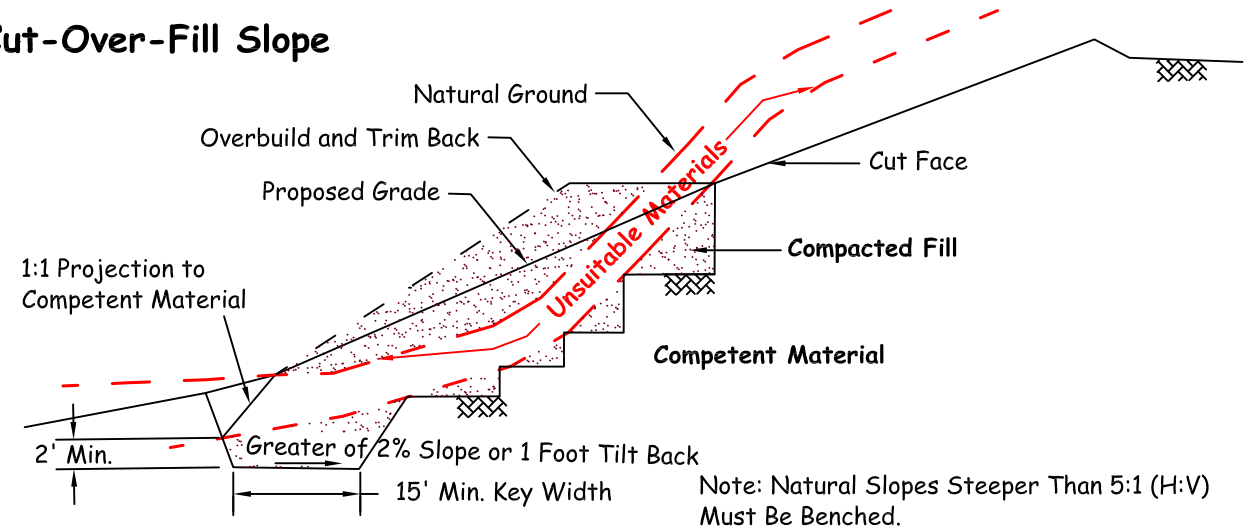


Fill-Over-Cut Slope



* Construct Cut Slope First

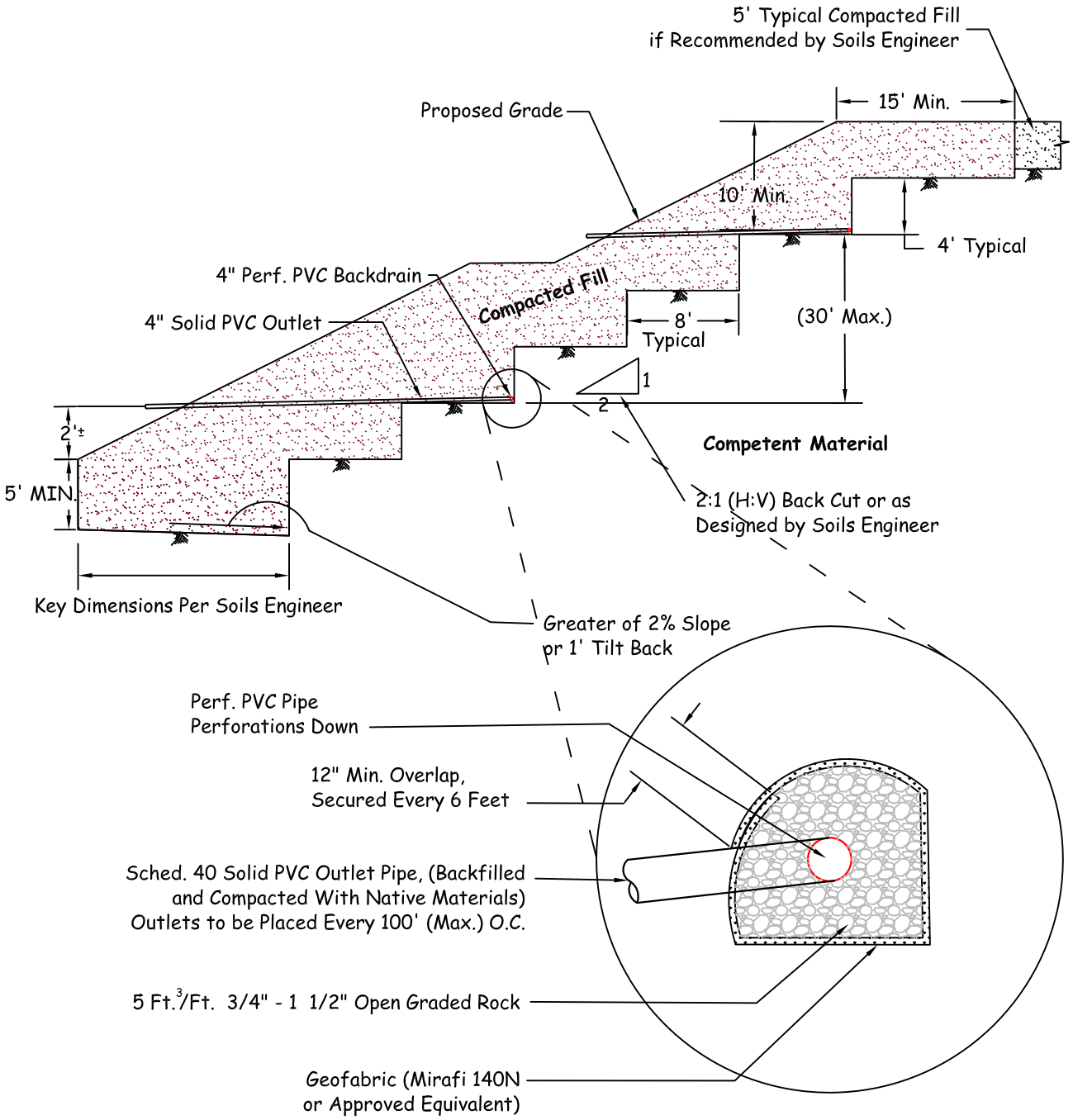
Cut-Over-Fill Slope



Note: Natural Slopes Steeper Than 5:1 (H:V) Must Be Benched.

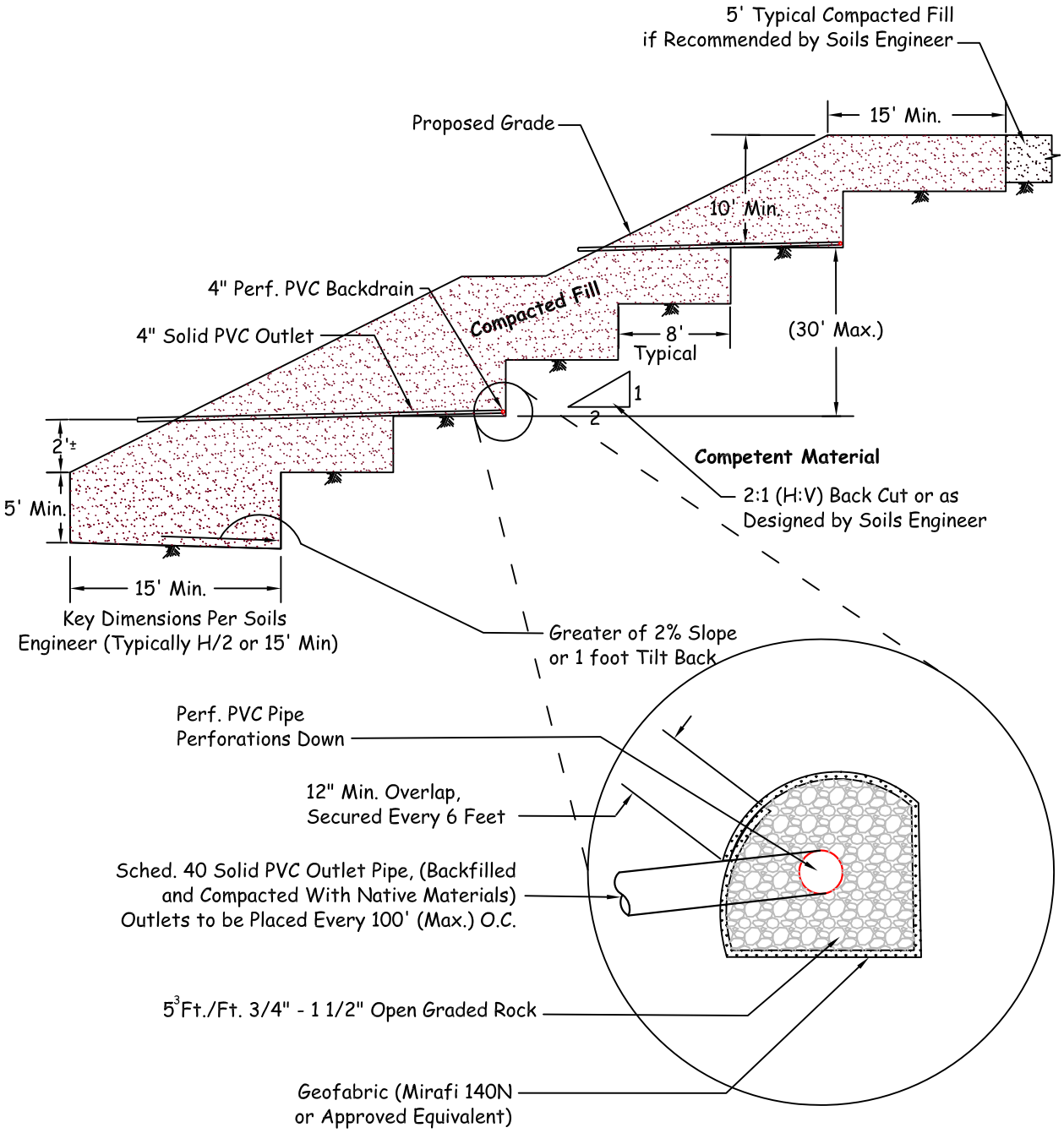
LGC Geotechnical, Inc.

KEYING AND BENCHING



LGC Geotechnical, Inc.

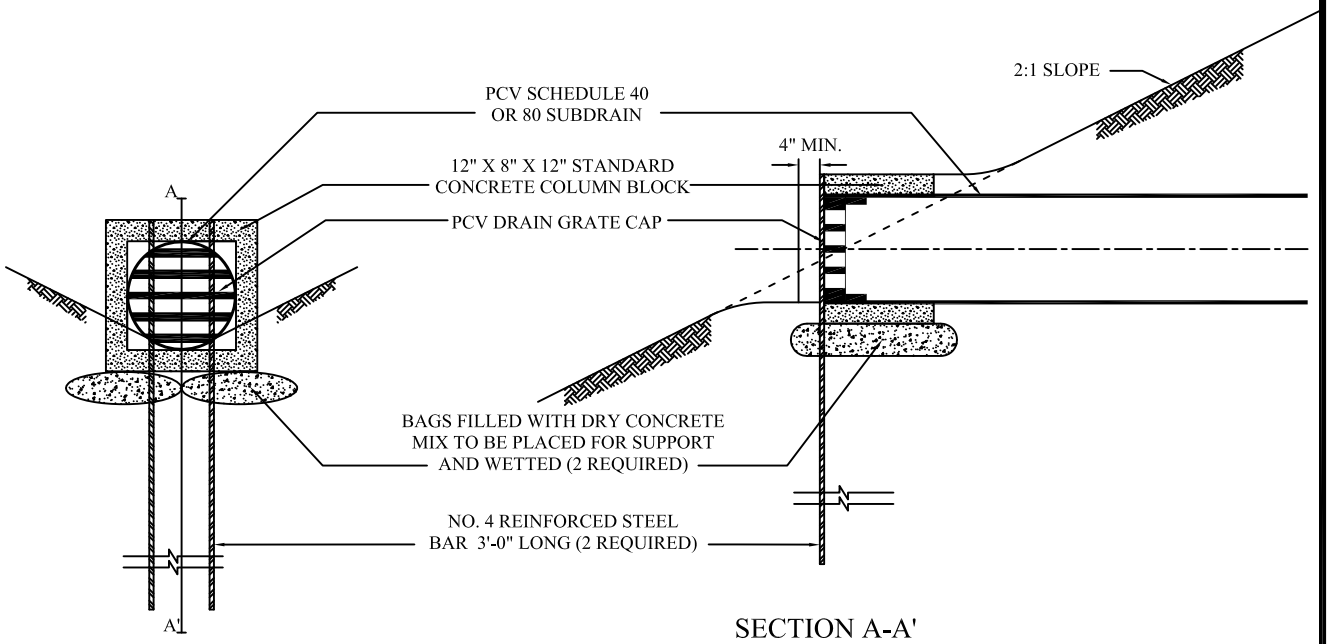
TYPICAL BUTTRESS DETAIL



LGC Geotechnical, Inc.

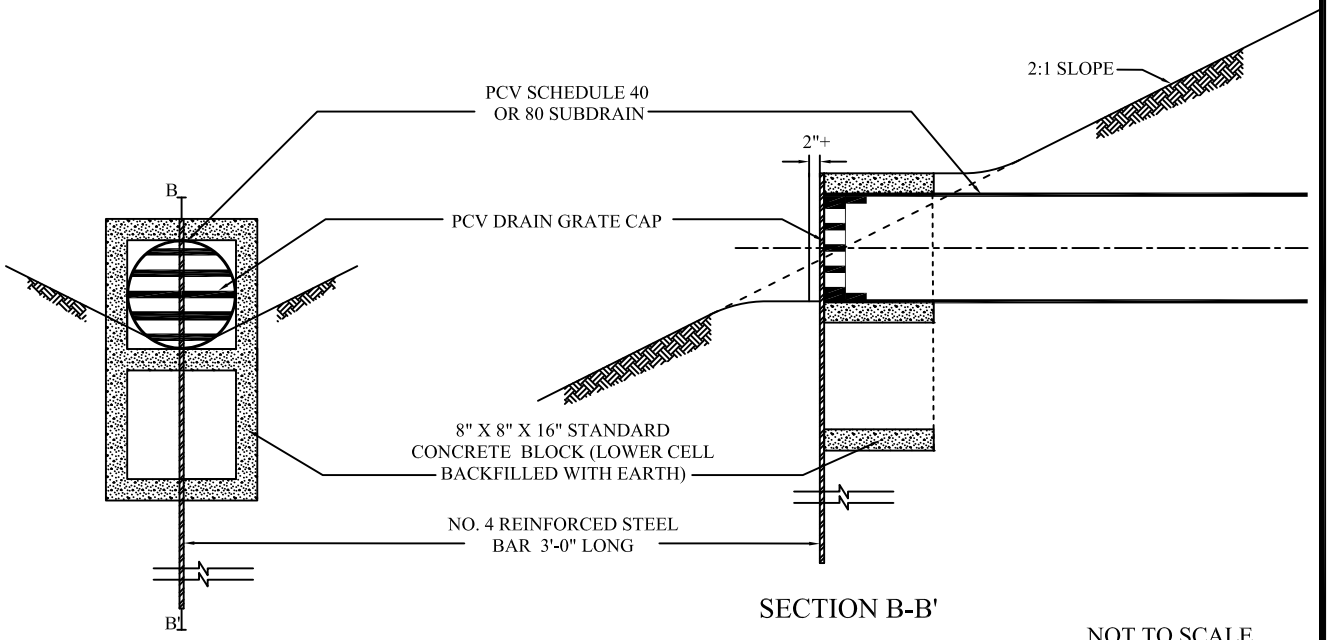
TYPICAL STABILIZATION FILL DETAIL

SUBDRAIN OUTLET MARKER -6" & 8" PIPE



SECTION A-A'

SUBDRAIN OUTLET MARKER -4" PIPE



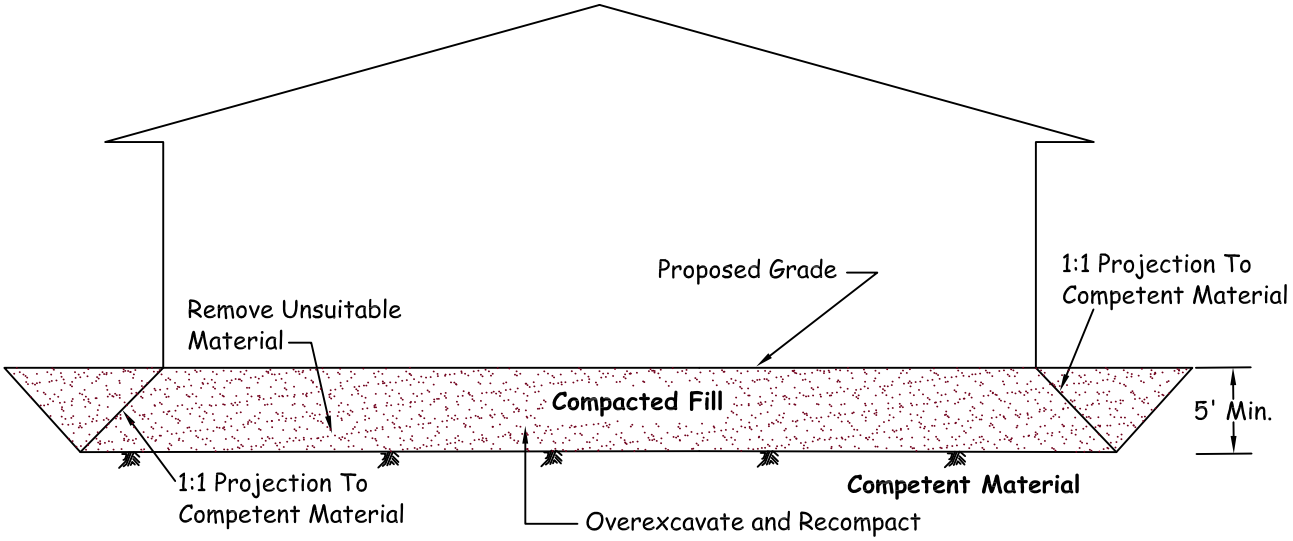
SECTION B-B'

NOT TO SCALE

LGC Geotechnical, Inc.

SUBDRAIN OUTLET MARKER DETAIL

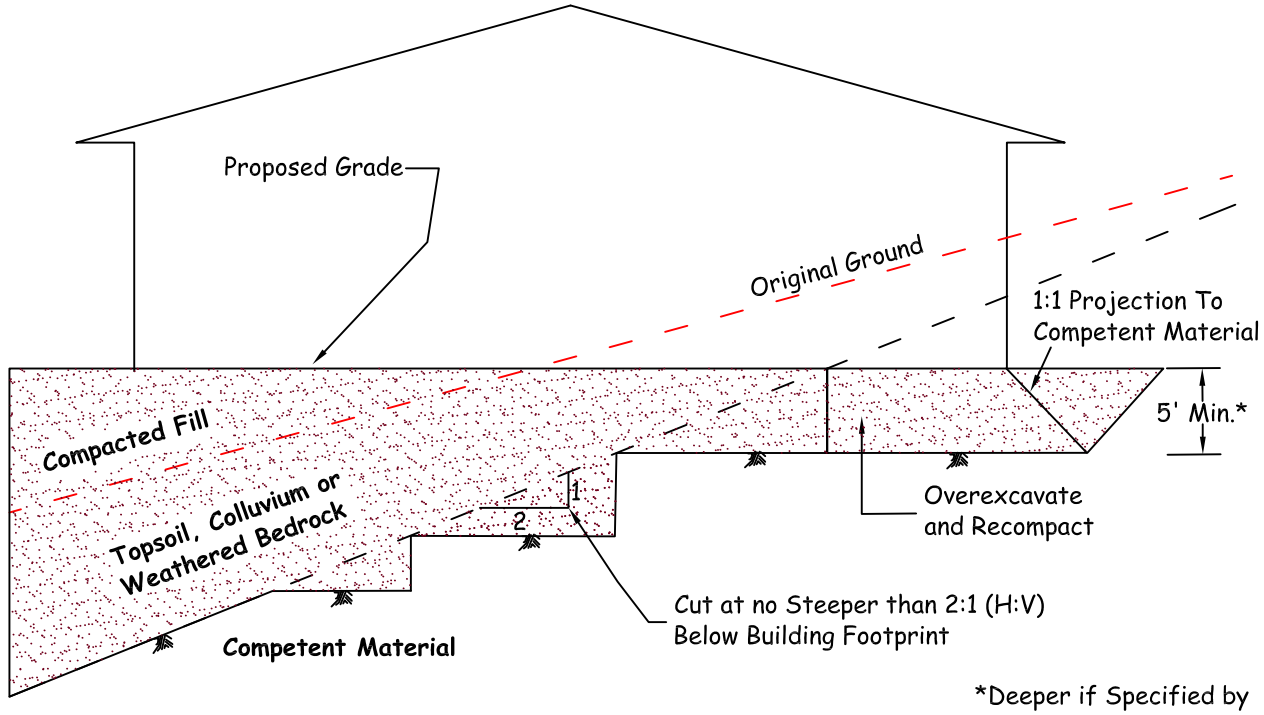
Cut Lot
(Exposing Unsuitable Soils at Design Grade)



Note 1: Removal Bottom Should be Graded With Minimum 2% Fall Towards Street or Other Suitable Area (as Determined by Soils Engineer) to Avoid Ponding Below Building

Note 2: Where Design Cut Lots are Excavated Entirely Into Competent Material, Overexcavation May Still be Required for Hard-Rock Conditions or for Materials With Variable Expansion Characteristics.

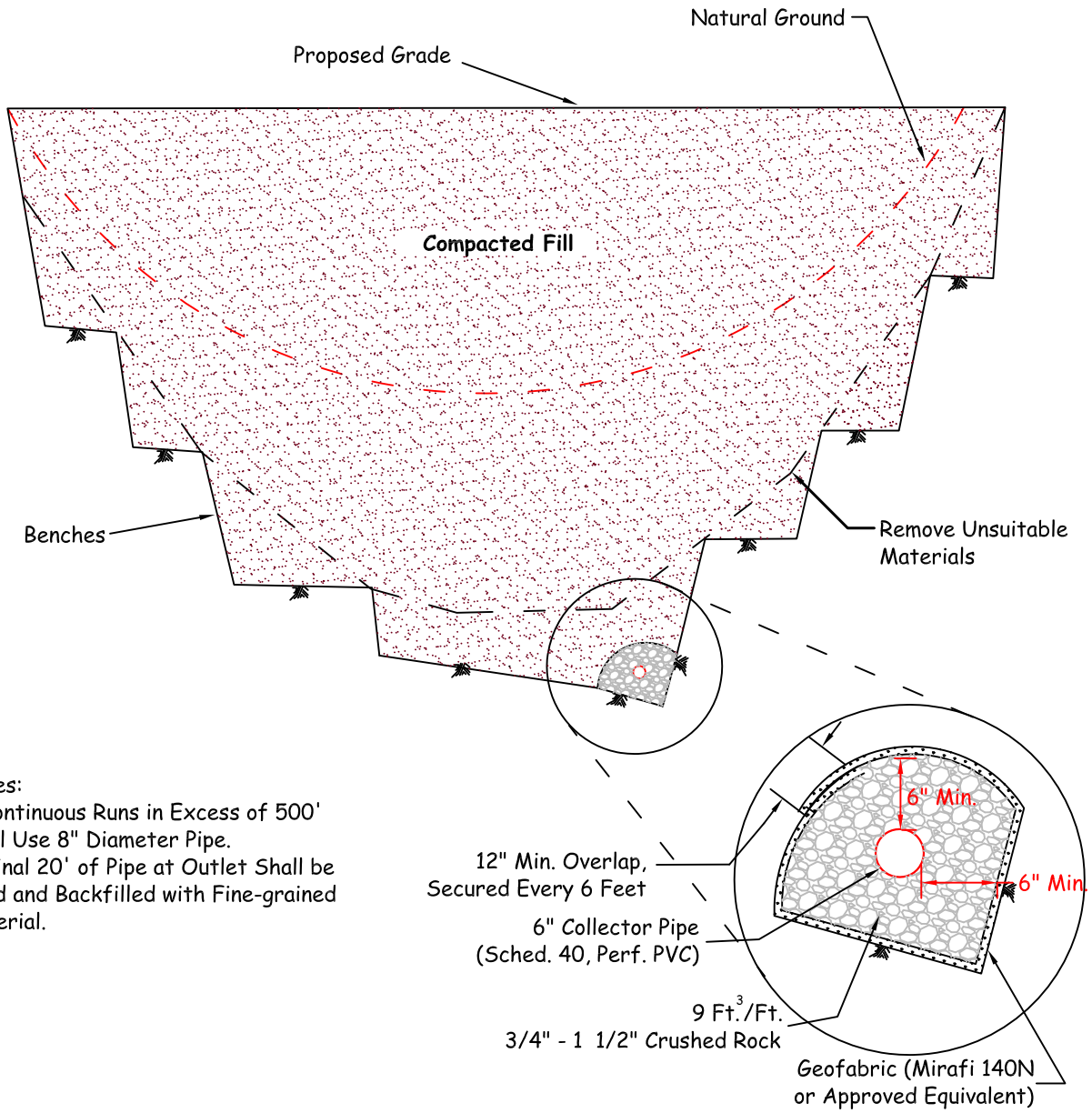
Cut/Fill Transition Lot



*Deeper if Specified by Soils Engineer

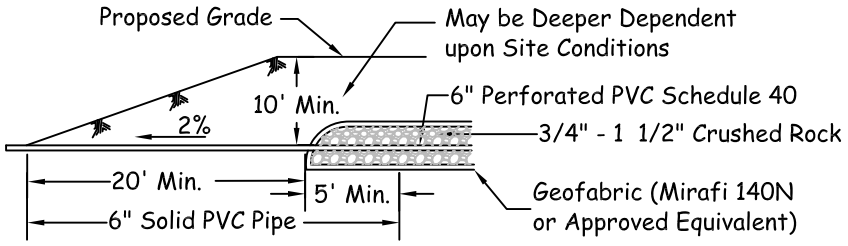
LGC Geotechnical, Inc.

CUT AND TRANSITION LOT OVEREXCAVATION DETAIL



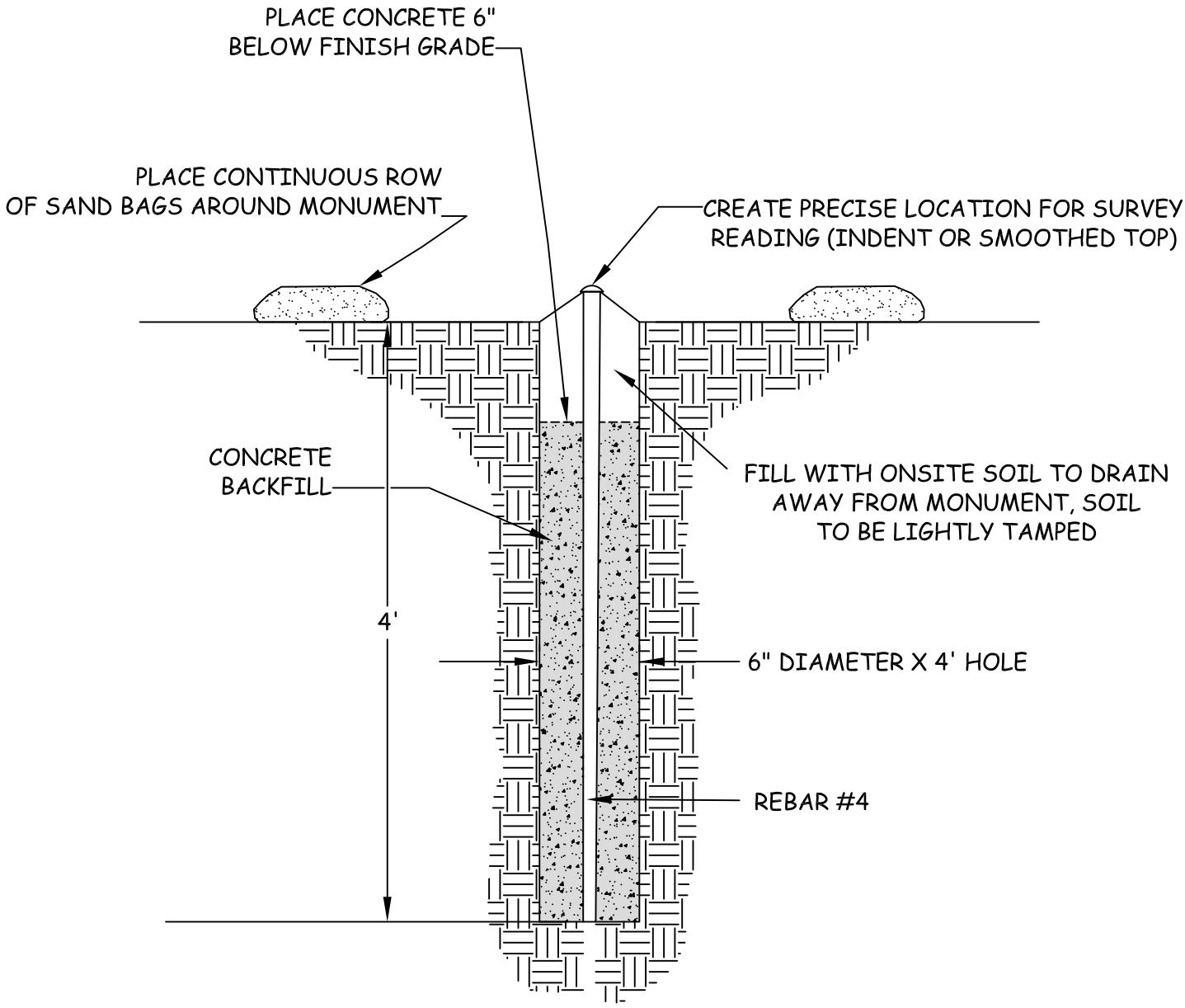
Notes:
1) Continuous Runs in Excess of 500' Shall Use 8" Diameter Pipe.
2) Final 20' of Pipe at Outlet Shall be Solid and Backfilled with Fine-grained Material.

Proposed Outlet Detail



LGC Geotechnical, Inc.

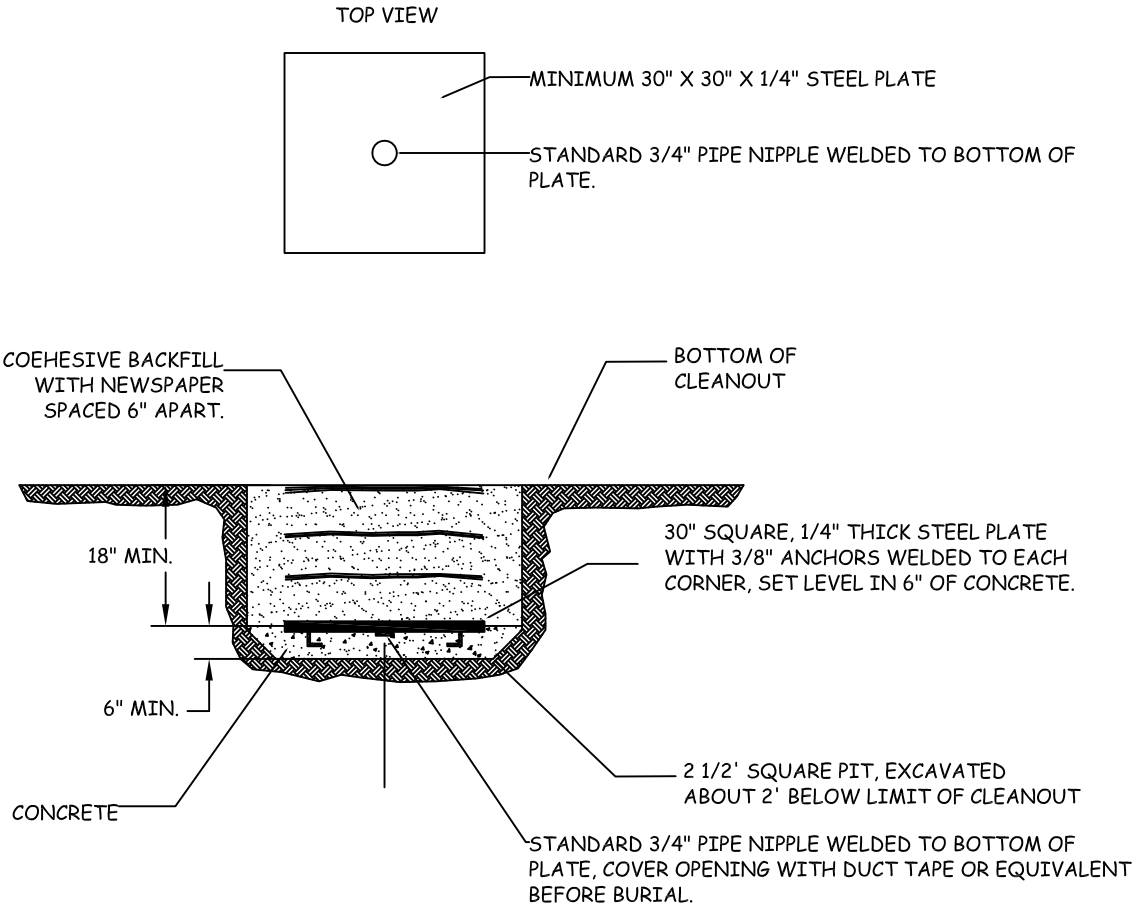
CANYON SUBDRAINS



NO CONSTRUCTION EQUIPMENT WITHIN 25 FEET
OF ANY INSTALLED SETTLEMENT MONUMENTS

LGC Geotechnical, Inc.

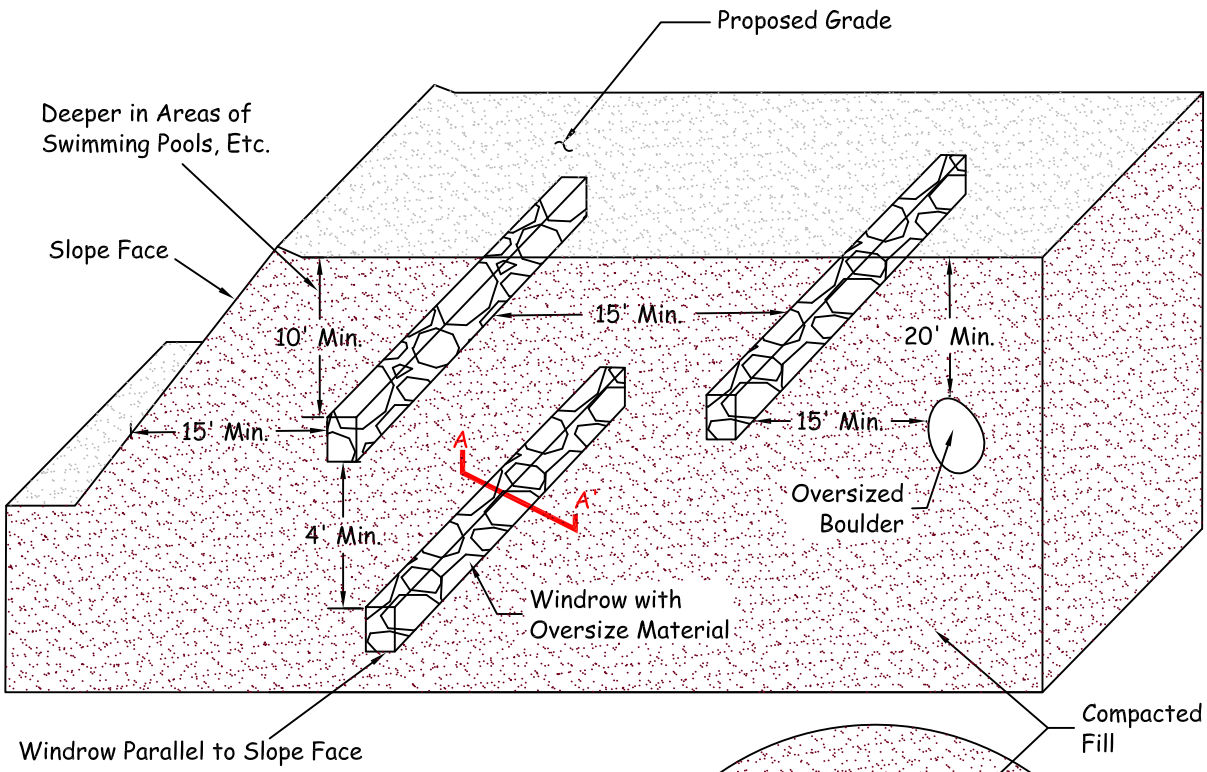
TYPICAL SURFACE SETTLEMENT MONUMENT

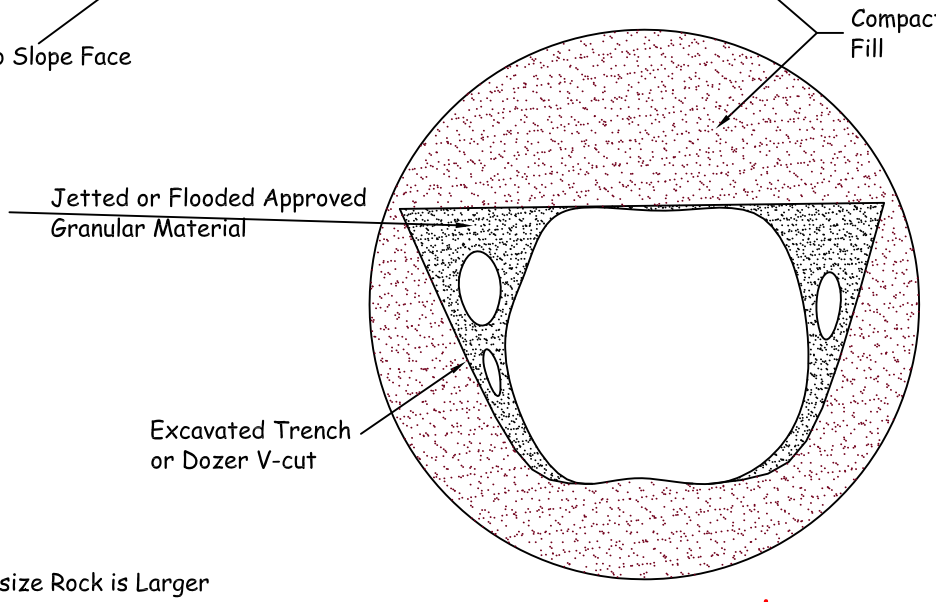


1. SURVEY FOR HORIZONTAL AND VERTICAL LOCATION TO NEAREST .01 INCH PRIOR TO BACKFILL USING KNOW LOCATIONS THAT WILL REMAIN INTACT DURING THE DURATION OF THE MONITORING PROGRAM. KNOW POINTS EXPLICITELY NOT ALLOWED ARE THOSE LOCATED ON FILL OR THAT WILL BE DESTROYED DURING GRADING.
2. IN THE EVENT OF DAMAGE TO SETTLEMENT PLATE DURING GRADING, CONTRACTOR SHALL IMMEDIATELY NOTIFY THE GEOTECHNICAL ENGINEER AND SHALL BE RESPONSIBLE FOR RESTORING THE SETTLEMENT PLATES TO WORKING ORDER.
3. DRILL TO RECOVER AND ATTACH RISER PIPE.

LGC Geotechnical, Inc.

TYPICAL SETTLEMENT PLATE AND RISER





Note: Oversize Rock is Larger
than 8" in Maximum Dimension.

Section A-A'

LGC Geotechnical, Inc.

OVERSIZE ROCK DISPOSAL DETAIL

LEGEND

Qvof	Quaternary Very Old Fan Deposits
Klmt	Cretaceous Lakeview Mountain Tonalite
	Approximate Location of Geologic Contact; Dotted Where Buried, Queried Where Uncertain
HS-25 T.D. = 15'	Approximate Location of Hollow Stem Auger Boring by LGC Geotechnical with Total Depth in Feet
CPT-24 T.D. = 33'	Approximate Location of Cone Penetration Test (CPT) by LGC Geotechnical with Total Depth in Feet
I-2 T.D. = 5'	Approximate Location of Infiltration Test by LGC Geotechnical with Total Depth in Feet
T-25	Approximate Location of Exploratory Test Pit by LGC Geotechnical
S-5	Approximate Location of Seismic Refraction Traverse
8	Estimated Depth of Removals in Feet from Existing Ground Surface
	Approximate Building Location per Conceptual Master Plan 2 (AO, 2019)
	Approximate Limit of Report

SCALE: 1"=100'
100' 0 100' 200'

Ramona Expressway

Orange Avenue

HS-15 T.D. = 20'
CPT-14 TD=35'
HS-14 T.D. = 20'
CPT-13 TD=18'
CPT-12 TD=31
CPT-15 TD=50'
TP-18
CPT-16 TD=29'
TP-19
TP-17
HS-16 T.D. = 5'
HS-13 TD=7.5'
HS-25 T.D. = 15'
CPT-10 TD=15'
HS-17 T.D. = 20'
CPT-11 TD=20.5
HS-12 TD=4.5'
HS-11 TD=4.5'
CPT-17 TD=25'
HS-1 TD=50'
TP-20
TP-10
HS-24 T.D. = 15'
TP-21
TP-22
J-1

Qvof
Klmt

MATCHLINE SEE SHEET 2

MATCHLINE SEE SHEET 2

LGC Geotechnical, Inc.

LGC Geotechnical, Inc.
131 Calle Iglesia, Ste. 200
San Clemente, CA 92672
TEL (949) 369-6141 FAX (949) 369-6142

Geotechnical Map

Stoneridge Industrial/Mixed-Use Development

CLIENT:
Richland Communities, Inc.
3161 Michelson Drive, Suite 425
Irvine, CA 92626

PROJECT NAME	Stoneridge
PROJECT NO.	13092-01
ENG. / GEOL.	RLD / KAD
SCALE	1" = 100'
DATE	September 2019

SHEET 1 of 3