

Appendix 8

Preliminary Drainage Study

PRELIMINARY DRAINAGE STUDY FOR
CHIKUITO BATTERY ENERGY STORAGE
SYSTEMS (BESS)

North of Clinton Keith Avenue
East of Grand Avenue
City of Wildomar
Riverside County, CA



Prepared For:

Chiquito Grid LLC

Prepared By:

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June 20, 2023

TABLE OF CONTENTS

<u>I PROJECT UNDERSTANDING</u>	1
<u>II GENERAL SITE INFORMATION</u>	2
<u>III METHODOLOGY</u>	3
<u>IV RESULTS SUMMARY</u>	4

APPENDICES

APPENDIX I – HYDROLOGY MAPS

HYDROLOGY MAP - EXISTING CONDITIONS
HYDROLOGY MAP - PROPOSED CONDITIONS

APPENDIX II – RAINFALL INTENSITY DATA

APPENDIX III – SOIL GROUP MAP

APPENDIX IV – FLOOD INSURANCE RATE MAP (FIRM)

APPENDIX V – HYDROLOGY CALCULATIONS

EXISTING CONDITIONS 10 YEAR FLOW CALCULATIONS
EXISTING CONDITIONS 100 YEAR FLOW CALCULATIONS
PROPOSED CONDITIONS 10 YEAR FLOW CALCULATIONS
PROPOSED CONDITIONS 100 YEAR FLOW CALCULATIONS

APPENDIX VI – HYDROGRAPH CALCULATIONS

APPENDIX VII – HYDRAULICS CALCULATIONS

I. Project Understanding

Chiquito Grid LLC proposes to develop an 80-megawatt Battery Energy Storage System (BESS) project. The project is on two, separately owned parcels (APN 380150019 and 380150020). Combined, they are 2.98 acres. The site is located near the southwestern edge of the City of Wildomar limits.

The project will consist of battery storage containers series. Each series would consist of inverters, a transformer and a battery enclosure or an interconnected series of containers. Each container would be self-enclosed, housing batteries, fire detection and suppression systems, controls and cooling units. The project site is 200 feet northeast of Tenaja Substation and is in an area which has an existing 115kV transmission line corridor that extends across adjacent southwestern parcels (APN 380150020 and APN 380150021) to connect to the Substation.

The report presents the design considerations, methodology, and results of drainage analyses performed for the Chiquito BESS Project.



Figure 1.0 – *Project Location*

II. GENERAL SITE INFORMATION

The project is on two, separately owned parcels (APN 380150019 and 380150020). Combined, they are 2.98 acres. The property is in the City of Wildomar and is bounded by Clinton Keith Road to the south, Southern California Edison (SCE) Tenaja Substation to the west, undeveloped vacant land to the north, and a landscape supply business to the east.

The property is currently undeveloped and vacant land covered by vegetation. The project proposes to construct and operate a Battery Energy Storage System (BESS) site on the property. The development involves installation of outdoor, enclosed battery storage containers and associated equipment that would connect to Tenaja Substation. The site will have gravel surface cover and the equipment would be placed on concrete. The site proposes to have two entrances with concrete driveways and all weather access road. The perimeter of the site will be vegetated.

Under pre-development conditions, there is a mound located in the middle of the project site with a ridge extending to the north. The site generally surface flows at approximately 5% grade to the northwest corner, to the east at approximately 5% grade to a drainage course and approximately 5% grade to the south. The stormwater that drains to the east and south discharges to the street gutter along Clinton Keith Road to a curb inlet located approximately 450 feet east of the project site. The curb inlet outlets to a rock lined ditch via a 24-inch RCP and ultimately discharges to Murrieta Creek to the west. The stormwater that drains to the northwest corner of the property drains to the street gutter on Grand Avenue and is captured by a curb inlet on the north side of Clinton Keith Road, approximately 100 feet west of the project site. The stormwater is conveyed to a 36-inch RCP via double 24-inch RCPs to the south side of Clinton Keith Road and ultimately discharges to the Murrieta Creek to the east.

Under post-development conditions, the proposed grading will range between 1% and 2.5%. The site will surface flow to a detention basin in the northwest corner as well as to a detention basin in the southeast corner. The proposed detention basins attenuate post-development flows so as not to exceed the pre-development volume. Once the sufficient volume is detained, the runoff will outlet through raised inlets. The upstream end of the onsite storm drain system will connect to the northwest basin with 12" PVC pipe and follow the access road alignment prior to connecting to a 15" RCP servicing the southeast basin near the easterly entrance. The runoff then outlets via an 18" RCP and connects to the existing 36" RCP on the south side of Clinton Keith Road.

III. METHODOLOGY

A. HYDROLOGY

Hydrology calculations performed for the project are in conformance with the method outlined in the Riverside County Hydrology Manual dated April, 1978. This study was prepared using the method outlined in the Riverside County Hydrology Manual dated April, 1978, last updated August 2018 to determine the 10-year and 100-year storm peak discharges. The soils type was based on Plate C-1.51 of the manual. Rainfall Intensity-inches per hour data is obtained from plate NOAA Atlas 14, see Appendix II.

Hydrologic analyses were prepared for the proposed developed condition to calculate the 10-year and 100-year peak runoff using the Rational Method procedure. The existing soil type (Type C) was determined with the use of the soils map provided in the Riverside County Hydrology Manual. AES HydroWin Rational Method software, by Advanced Engineering Software (AES), was utilized for these calculations.

Project Site Soil: Type C per Riverside County Hydrology Manual. See Appendix III for a copy of the Soils Map.

Runoff Coefficient: Plate D-5.6 from RCFC&WCD Hydrology Manual was referenced. The project site has 15% impervious cover and is better represented by the impervious cover for Single Family Residential, 40,000 S.F. (1 ac) Lots. Based on data from NOAA Atlas 14, the rainfall intensity is 0.884 in/hr for 10-year storm and 1.46 in/hr for 100-year storm. D-5.3 from RCFC&WCD was then referenced to determine the coefficient using 0.883 in/hr and single family – 1 acre lot. The runoff coefficient yielded was 0.60. Plates D-5.3 and D-5.6 can be referenced in Appendix V.

The project site lies within Zone X designated as area determined to be outside the 0.2% annual chance floodplain based on the Flood Insurance Rate Map (Map No. 06065C2684G, effective August 28, 2008). See Appendix IV for a copy of the Flood Insurance Rate Map.

B. CONDUIT HYDRAULICS

Bentley FlowMaster V8i program was used to calculate the flow conditions in the proposed storm drain systems.

IV. RESULT SUMMARY

The total project site drainage within the development site was analyzed and estimated to be 2.98 acres. The tributary area, subareas, and flow path are shown on the Existing Condition and Proposed Condition Hydrology Maps in Appendix I.

The results of the existing and proposed conditions hydrology study are presented in Table 1. Refer to Appendix V for hydrology calculations.

The results of the existing and proposed conditions hydrograph study are presented in Table 2. Refer to Appendix VI for hydrograph calculations.

Table 1 – Hydrology Study Results for Existing and Proposed Conditions

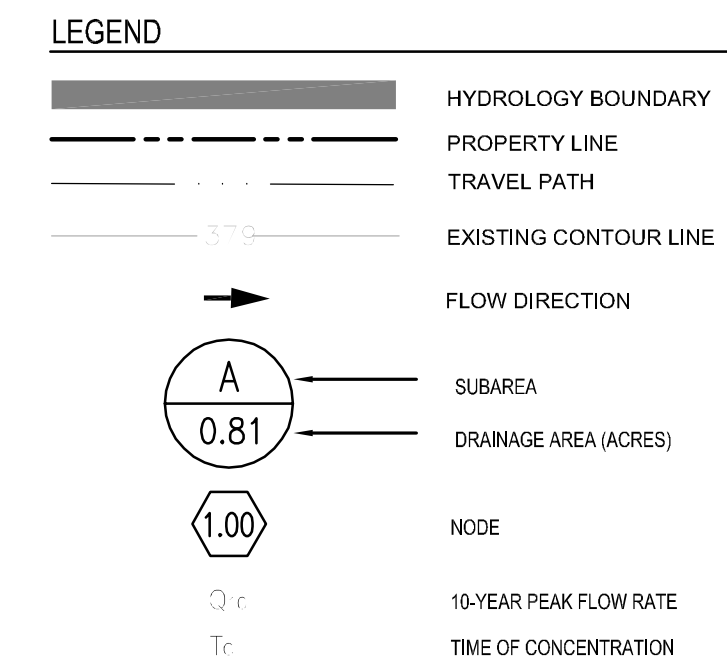
Drainage Area	Existing Condition				Drainage Area	Proposed Condition			
	Area (ac)	Q10 (cfs)	Q100 (cfs)	Tc (min)		Area (ac)	Q10 (cfs)	Q100 (cfs)	Tc (min)
A	0.81	1.02	1.76	15.1	A	0.85	1.67	2.77	7.8
B	2.01	1.98	3.48	22.1	B1	0.50	0.81	1.35	-
C	0.16	0.26	0.44	9.9	B2	1.45	2.34	3.92	11.0
					C	0.18	0.31	0.62	7.1

Table 2 – Hydrograph Results for Existing and Proposed Conditions

Drainage Area	Existing Condition Volume (ac-ft)	Existing Condition Volume (ac-ft)
A	0.08	0.10
B	0.19	0.22
C	0.02	0.02
TOTAL	0.29	0.34

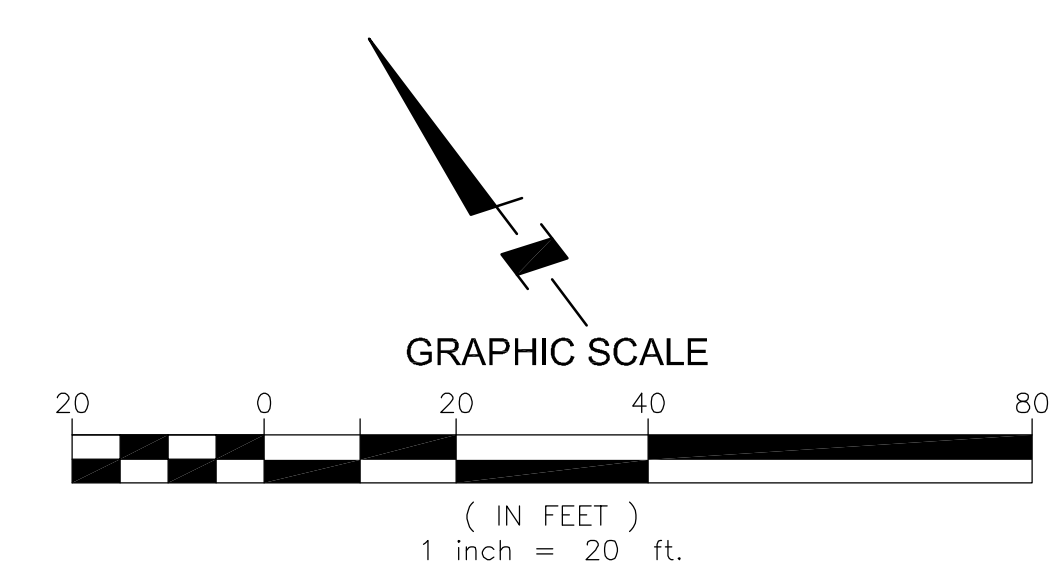
APPENDIX I

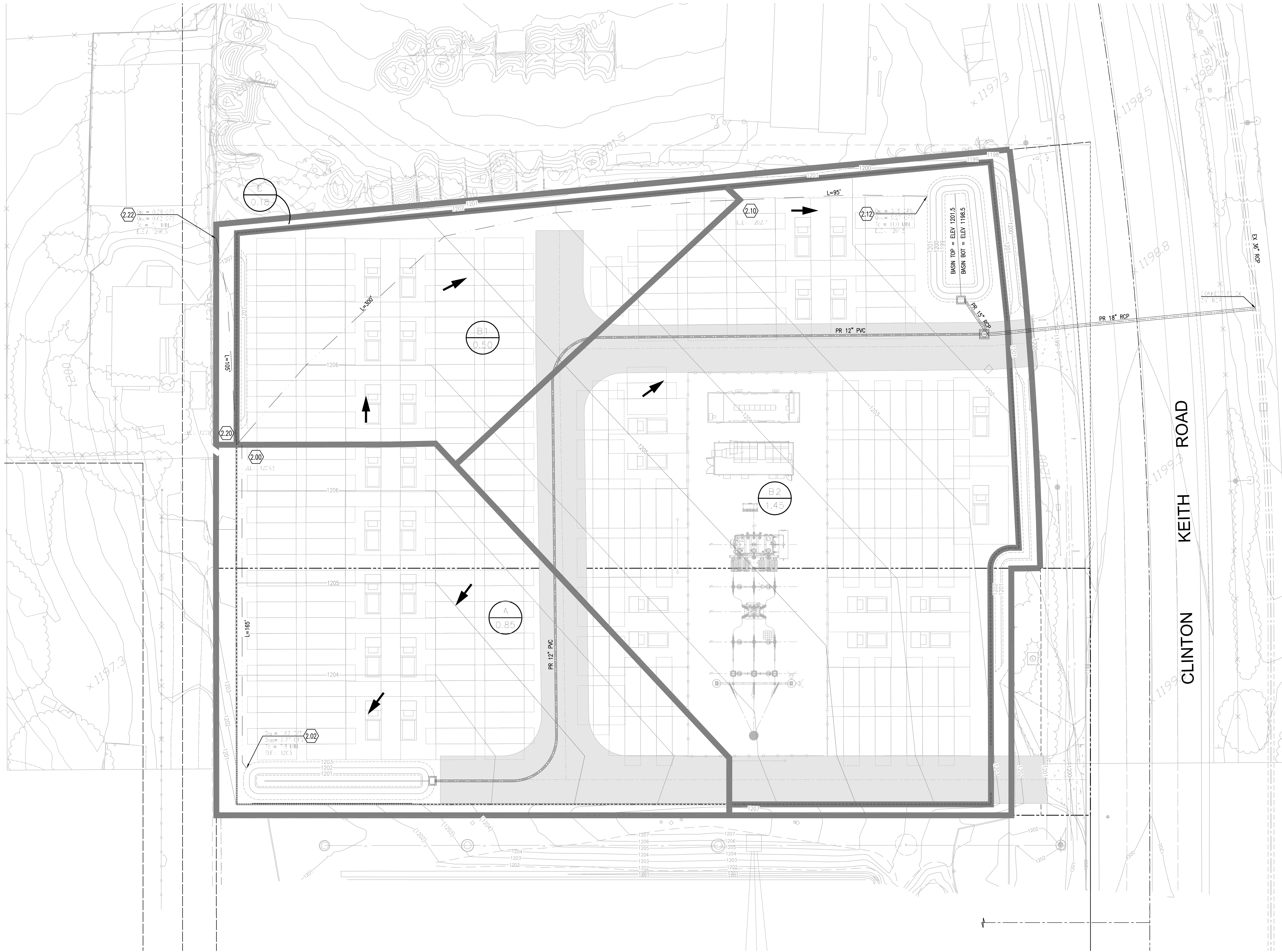
HYDROLOGY MAP - EXISTING CONDITION
HYDROLOGY MAP - PROPOSED CONDITION



NOTES

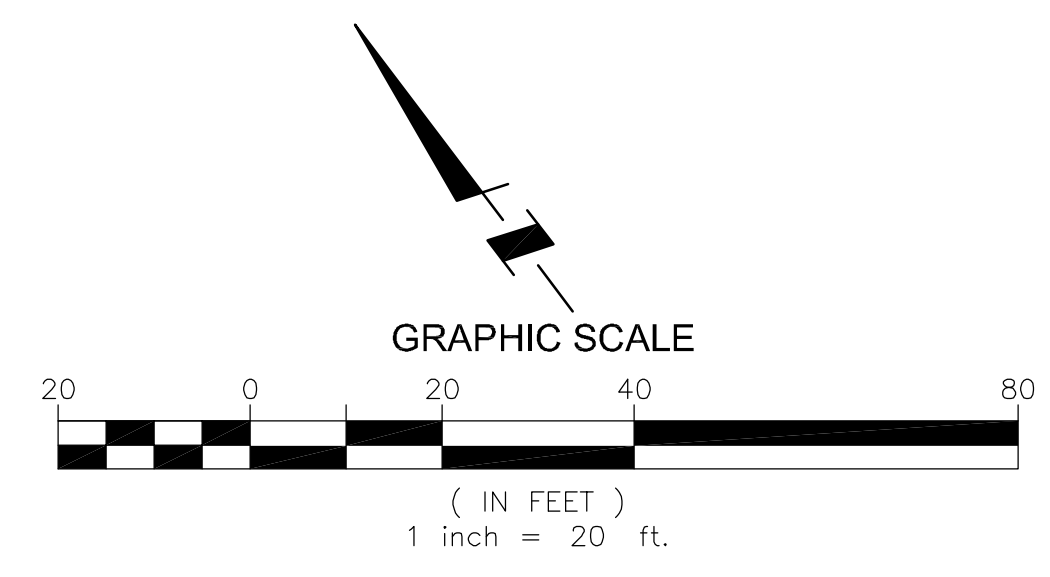
1. AREAS ROUNDED TO NEAREST 0.01 ACRE
2. BASED ON THE RIVERSIDE COUNTY SOILS MAP (PLATE C-1.51), THE PROJECT SITE IS COMPOSED OF TYPE C SOIL.





- LEGEND**
- HYDROLOGY BOUNDARY
 - PROPERTY LINE
 - TRAVEL PATH
 - EXISTING CONTOUR LINE
 - FLOW DIRECTION
 - SUBAREA
 - DRAINAGE AREA (ACRES)
 - NODE
 - 10-YEAR PEAK FLOW RATE
 - TIME OF CONCENTRATION

- NOTES**
- AREAS ROUNDED TO NEAREST 0.01 ACRE
 - BASED ON THE RIVERSIDE COUNTY SOILS MAP (PLATE C-1.51), THE PROJECT SITE IS COMPOSED OF TYPE C SOIL.



PREPARED BY: Stantec 38 TECHNOLOGY DRIVE, SUITE 200 IRVINE, CA 92618 949.923.6000 stantec.com	PREPARED FOR: CHIQUITO GRID, LLC 1435 CANYON BLVD, SUITE 218 BOULDER, CO 80502	BATTERY ENERGY STORAGE SYSTEM FOR CHIQUITO WILLOWAR, RIVERSIDE COUNTY, CA		SHEET <u>1</u> OF <u>1</u> JOB NO. 155805178
		HYDROLOGY MAP - EXISTING CONDITION		

APPENDIX II

RAINFALL INTENSITY DATA



NOAA Atlas 14, Volume 6, Version 2
Location name: Wildomar, California, USA*
Latitude: 33.5845°, Longitude: -117.2548°
Elevation: 1204 ft**
* source: ESRI Maps
** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

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

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[PF_tabular](#) | [PF_graphical](#) | [Maps_&_aerials](#)

PF tabular

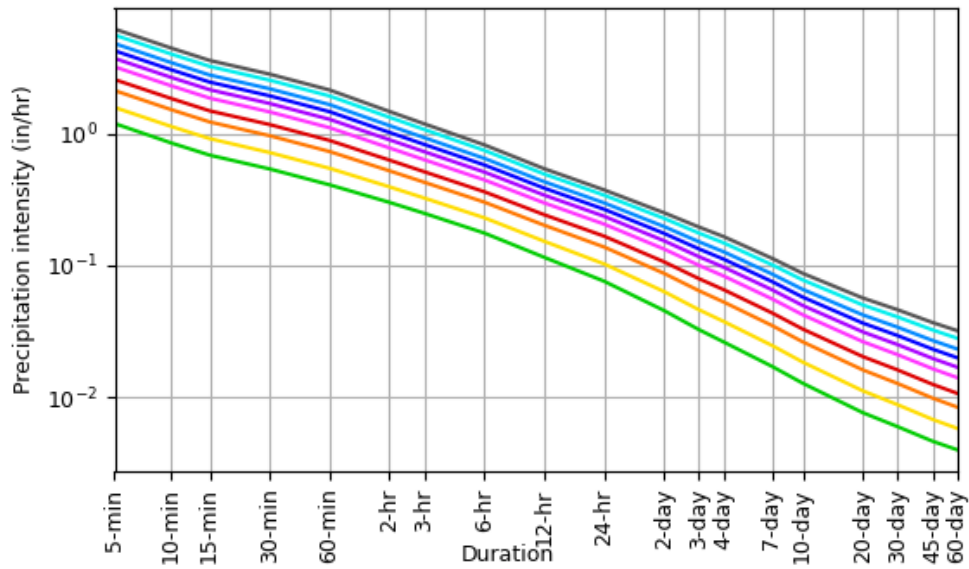
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	1.19 (0.996-1.43)	1.57 (1.32-1.90)	2.11 (1.76-2.56)	2.56 (2.12-3.12)	3.19 (2.56-4.04)	3.70 (2.89-4.79)	4.22 (3.22-5.60)	4.79 (3.54-6.54)	5.56 (3.94-7.93)	6.17 (4.21-9.13)
10-min	0.846 (0.714-1.02)	1.13 (0.948-1.36)	1.51 (1.27-1.83)	1.84 (1.52-2.24)	2.29 (1.83-2.89)	2.65 (2.08-3.43)	3.03 (2.31-4.02)	3.43 (2.54-4.69)	3.98 (2.82-5.69)	4.42 (3.02-6.55)
15-min	0.684 (0.572-0.824)	0.912 (0.764-1.10)	1.22 (1.02-1.48)	1.48 (1.23-1.80)	1.85 (1.48-2.33)	2.14 (1.67-2.76)	2.44 (1.86-3.24)	2.76 (2.04-3.78)	3.21 (2.27-4.58)	3.56 (2.43-5.28)
30-min	0.538 (0.452-0.648)	0.716 (0.600-0.864)	0.960 (0.802-1.16)	1.17 (0.966-1.42)	1.45 (1.16-1.84)	1.68 (1.32-2.18)	1.92 (1.47-2.55)	2.18 (1.61-2.97)	2.53 (1.79-3.61)	2.81 (1.92-4.16)
60-min	0.408 (0.343-0.492)	0.544 (0.456-0.656)	0.729 (0.609-0.881)	0.884 (0.733-1.08)	1.10 (0.882-1.39)	1.28 (0.999-1.65)	1.46 (1.11-1.94)	1.65 (1.22-2.26)	1.92 (1.36-2.74)	2.13 (1.45-3.15)
2-hr	0.300 (0.252-0.361)	0.394 (0.330-0.475)	0.521 (0.435-0.630)	0.627 (0.519-0.765)	0.776 (0.620-0.981)	0.894 (0.699-1.16)	1.02 (0.775-1.35)	1.15 (0.847-1.56)	1.32 (0.937-1.89)	1.46 (0.999-2.17)
3-hr	0.248 (0.208-0.298)	0.323 (0.271-0.390)	0.426 (0.355-0.515)	0.511 (0.423-0.624)	0.631 (0.504-0.797)	0.726 (0.567-0.938)	0.824 (0.628-1.09)	0.927 (0.685-1.27)	1.07 (0.756-1.52)	1.18 (0.805-1.75)
6-hr	0.176 (0.147-0.211)	0.229 (0.192-0.276)	0.301 (0.252-0.364)	0.361 (0.299-0.440)	0.444 (0.355-0.561)	0.509 (0.398-0.658)	0.576 (0.439-0.765)	0.647 (0.478-0.883)	0.743 (0.526-1.06)	0.819 (0.558-1.21)
12-hr	0.115 (0.096-0.138)	0.152 (0.127-0.183)	0.201 (0.168-0.244)	0.242 (0.200-0.295)	0.297 (0.238-0.376)	0.341 (0.266-0.440)	0.385 (0.293-0.510)	0.430 (0.318-0.588)	0.492 (0.348-0.702)	0.540 (0.368-0.800)
24-hr	0.076 (0.067-0.087)	0.102 (0.090-0.118)	0.138 (0.121-0.160)	0.166 (0.145-0.194)	0.205 (0.174-0.248)	0.235 (0.195-0.290)	0.266 (0.215-0.335)	0.297 (0.235-0.385)	0.340 (0.258-0.458)	0.373 (0.273-0.520)
2-day	0.045 (0.040-0.052)	0.063 (0.056-0.073)	0.087 (0.076-0.101)	0.106 (0.093-0.124)	0.133 (0.112-0.160)	0.154 (0.127-0.189)	0.175 (0.141-0.220)	0.197 (0.155-0.255)	0.227 (0.172-0.306)	0.251 (0.184-0.349)
3-day	0.032 (0.028-0.037)	0.046 (0.040-0.053)	0.064 (0.056-0.074)	0.079 (0.069-0.092)	0.100 (0.084-0.120)	0.116 (0.096-0.143)	0.133 (0.108-0.168)	0.151 (0.119-0.195)	0.175 (0.133-0.236)	0.195 (0.143-0.272)
4-day	0.026 (0.023-0.030)	0.037 (0.033-0.043)	0.052 (0.046-0.061)	0.065 (0.057-0.076)	0.083 (0.070-0.100)	0.097 (0.080-0.119)	0.111 (0.090-0.140)	0.126 (0.100-0.164)	0.148 (0.112-0.199)	0.165 (0.121-0.230)
7-day	0.017 (0.015-0.019)	0.024 (0.021-0.028)	0.035 (0.030-0.040)	0.043 (0.038-0.051)	0.055 (0.047-0.067)	0.065 (0.054-0.080)	0.075 (0.061-0.095)	0.086 (0.067-0.111)	0.101 (0.076-0.136)	0.113 (0.083-0.157)
10-day	0.012 (0.011-0.014)	0.018 (0.016-0.021)	0.026 (0.023-0.030)	0.032 (0.028-0.038)	0.042 (0.035-0.051)	0.049 (0.041-0.061)	0.057 (0.046-0.072)	0.065 (0.051-0.085)	0.077 (0.058-0.104)	0.087 (0.063-0.121)
20-day	0.007 (0.006-0.008)	0.011 (0.009-0.013)	0.016 (0.014-0.018)	0.020 (0.017-0.023)	0.026 (0.022-0.031)	0.031 (0.026-0.038)	0.036 (0.029-0.046)	0.042 (0.033-0.054)	0.050 (0.038-0.067)	0.056 (0.041-0.079)
30-day	0.006 (0.005-0.006)	0.008 (0.007-0.010)	0.012 (0.011-0.014)	0.016 (0.014-0.018)	0.021 (0.017-0.025)	0.025 (0.020-0.030)	0.029 (0.023-0.037)	0.034 (0.026-0.044)	0.040 (0.030-0.054)	0.046 (0.033-0.064)
45-day	0.004 (0.004-0.005)	0.006 (0.006-0.007)	0.009 (0.008-0.011)	0.012 (0.010-0.014)	0.016 (0.013-0.019)	0.019 (0.016-0.024)	0.023 (0.018-0.029)	0.027 (0.021-0.034)	0.032 (0.024-0.043)	0.036 (0.027-0.051)
60-day	0.004 (0.003-0.004)	0.005 (0.005-0.006)	0.008 (0.007-0.009)	0.010 (0.009-0.012)	0.014 (0.011-0.017)	0.016 (0.014-0.020)	0.019 (0.016-0.025)	0.023 (0.018-0.030)	0.028 (0.021-0.037)	0.032 (0.023-0.044)
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values. Please refer to NOAA Atlas 14 document for more information.										

[Back to Top](#)

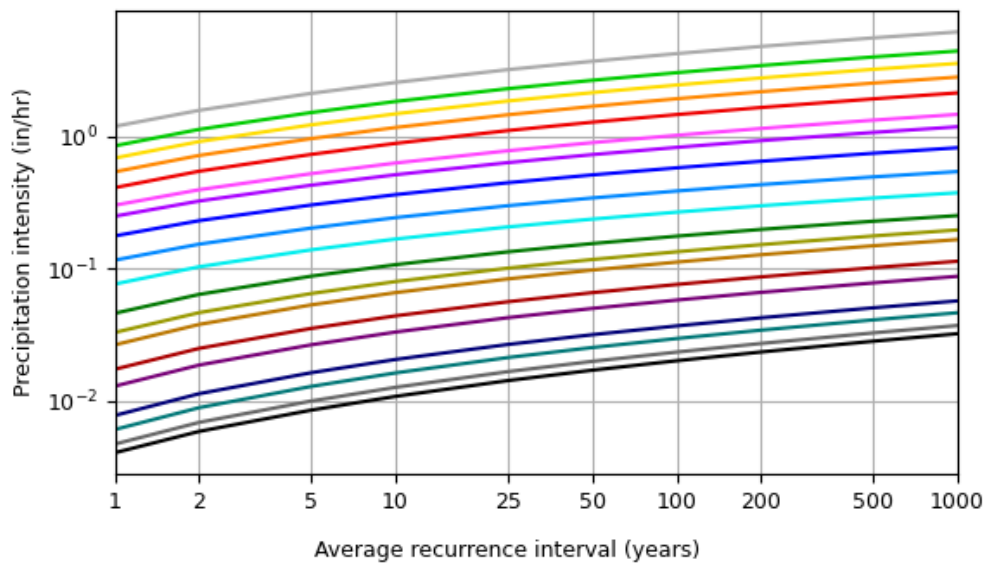
PF graphical

PDS-based intensity-duration-frequency (IDF) curves

Latitude: 33.5845°, Longitude: -117.2548°



Average recurrence interval (years)
1
2
5
10
25
50
100
200
500
1000



Duration	
5-min	2-day
10-min	3-day
15-min	4-day
30-min	7-day
60-min	10-day
2-hr	20-day
3-hr	30-day
6-hr	45-day
12-hr	60-day
24-hr	

[Back to Top](#)

Maps & aerials

Small scale terrain



NOAA Atlas 14, Volume 6, Version 2
Location name: Wildomar, California, USA*
Latitude: 33.5845°, Longitude: -117.2548°
Elevation: 1204 ft**
* source: ESRI Maps
** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

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NOAA, National Weather Service, Silver Spring, Maryland

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PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches) ¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.099 (0.083-0.119)	0.131 (0.110-0.158)	0.176 (0.147-0.213)	0.213 (0.177-0.260)	0.266 (0.213-0.337)	0.308 (0.241-0.399)	0.352 (0.268-0.467)	0.399 (0.295-0.545)	0.463 (0.328-0.661)	0.514 (0.351-0.761)
10-min	0.141 (0.119-0.170)	0.188 (0.158-0.227)	0.252 (0.211-0.305)	0.306 (0.253-0.373)	0.382 (0.305-0.482)	0.442 (0.346-0.571)	0.505 (0.385-0.670)	0.572 (0.423-0.781)	0.664 (0.470-0.948)	0.737 (0.503-1.09)
15-min	0.171 (0.143-0.206)	0.228 (0.191-0.274)	0.305 (0.255-0.369)	0.370 (0.307-0.451)	0.462 (0.369-0.583)	0.535 (0.418-0.691)	0.611 (0.465-0.810)	0.691 (0.511-0.944)	0.803 (0.568-1.15)	0.891 (0.608-1.32)
30-min	0.269 (0.226-0.324)	0.358 (0.300-0.432)	0.480 (0.401-0.581)	0.583 (0.483-0.710)	0.727 (0.581-0.919)	0.842 (0.658-1.09)	0.962 (0.733-1.28)	1.09 (0.805-1.49)	1.26 (0.895-1.80)	1.40 (0.958-2.08)
60-min	0.408 (0.343-0.492)	0.544 (0.456-0.656)	0.729 (0.609-0.881)	0.884 (0.733-1.08)	1.10 (0.882-1.39)	1.28 (0.999-1.65)	1.46 (1.11-1.94)	1.65 (1.22-2.26)	1.92 (1.36-2.74)	2.13 (1.45-3.15)
2-hr	0.601 (0.504-0.723)	0.788 (0.661-0.950)	1.04 (0.871-1.26)	1.26 (1.04-1.53)	1.55 (1.24-1.96)	1.79 (1.40-2.31)	2.03 (1.55-2.70)	2.29 (1.70-3.13)	2.65 (1.87-3.78)	2.93 (2.00-4.34)
3-hr	0.745 (0.625-0.896)	0.972 (0.815-1.17)	1.28 (1.07-1.55)	1.54 (1.27-1.87)	1.90 (1.52-2.40)	2.18 (1.70-2.82)	2.48 (1.89-3.28)	2.78 (2.06-3.80)	3.21 (2.27-4.58)	3.54 (2.42-5.25)
6-hr	1.05 (0.885-1.27)	1.38 (1.15-1.66)	1.81 (1.51-2.18)	2.16 (1.79-2.64)	2.66 (2.13-3.36)	3.05 (2.39-3.94)	3.46 (2.63-4.58)	3.88 (2.87-5.29)	4.45 (3.15-6.36)	4.90 (3.35-7.26)
12-hr	1.39 (1.17-1.67)	1.84 (1.54-2.22)	2.43 (2.03-2.94)	2.92 (2.42-3.56)	3.59 (2.87-4.54)	4.11 (3.21-5.31)	4.64 (3.54-6.15)	5.19 (3.84-7.09)	5.93 (4.20-8.47)	6.51 (4.44-9.64)
24-hr	1.82 (1.61-2.11)	2.47 (2.18-2.85)	3.31 (2.92-3.84)	4.00 (3.50-4.68)	4.94 (4.18-5.96)	5.66 (4.70-6.97)	6.40 (5.18-8.06)	7.15 (5.64-9.25)	8.18 (6.20-11.0)	8.97 (6.57-12.5)
2-day	2.19 (1.94-2.53)	3.05 (2.69-3.53)	4.19 (3.69-4.86)	5.12 (4.48-5.98)	6.40 (5.42-7.72)	7.40 (6.13-9.10)	8.42 (6.82-10.6)	9.47 (7.47-12.3)	10.9 (8.28-14.7)	12.1 (8.84-16.8)
3-day	2.35 (2.08-2.72)	3.33 (2.94-3.85)	4.64 (4.09-5.38)	5.72 (5.00-6.69)	7.22 (6.11-8.71)	8.40 (6.97-10.3)	9.62 (7.79-12.1)	10.9 (8.59-14.1)	12.7 (9.60-17.1)	14.1 (10.3-19.6)
4-day	2.53 (2.24-2.92)	3.62 (3.19-4.18)	5.08 (4.47-5.89)	6.29 (5.50-7.35)	7.99 (6.76-9.63)	9.32 (7.73-11.5)	10.7 (8.68-13.5)	12.2 (9.60-15.8)	14.2 (10.8-19.2)	15.9 (11.6-22.1)
7-day	2.89 (2.56-3.34)	4.17 (3.68-4.82)	5.90 (5.19-6.84)	7.35 (6.42-8.58)	9.38 (7.94-11.3)	11.0 (9.12-13.5)	12.7 (10.3-16.0)	14.5 (11.4-18.7)	17.0 (12.9-22.9)	19.0 (14.0-26.5)
10-day	3.08 (2.72-3.55)	4.45 (3.93-5.15)	6.33 (5.57-7.34)	7.91 (6.91-9.24)	10.2 (8.59-12.2)	11.9 (9.90-14.7)	13.8 (11.2-17.4)	15.8 (12.5-20.4)	18.6 (14.1-25.1)	20.9 (15.3-29.1)
20-day	3.69 (3.26-4.26)	5.40 (4.77-6.25)	7.78 (6.85-9.02)	9.82 (8.57-11.5)	12.7 (10.8-15.4)	15.1 (12.5-18.6)	17.6 (14.3-22.2)	20.3 (16.0-26.3)	24.1 (18.3-32.5)	27.2 (20.0-37.9)
30-day	4.34 (3.83-5.01)	6.36 (5.61-7.35)	9.20 (8.10-10.7)	11.7 (10.2-13.6)	15.2 (12.9-18.3)	18.1 (15.0-22.3)	21.2 (17.2-26.7)	24.6 (19.4-31.8)	29.4 (22.2-39.5)	33.3 (24.4-46.3)
45-day	5.04 (4.46-5.82)	7.38 (6.51-8.52)	10.7 (9.41-12.4)	13.6 (11.9-15.9)	17.8 (15.1-21.5)	21.3 (17.7-26.3)	25.1 (20.3-31.6)	29.2 (23.0-37.8)	35.1 (26.6-47.2)	39.9 (29.3-55.5)
60-day	5.78 (5.11-6.68)	8.40 (7.42-9.71)	12.2 (10.7-14.1)	15.5 (13.5-18.1)	20.3 (17.2-24.5)	24.4 (20.2-30.0)	28.8 (23.3-36.3)	33.5 (26.5-43.4)	40.4 (30.6-54.5)	46.1 (33.8-64.2)

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

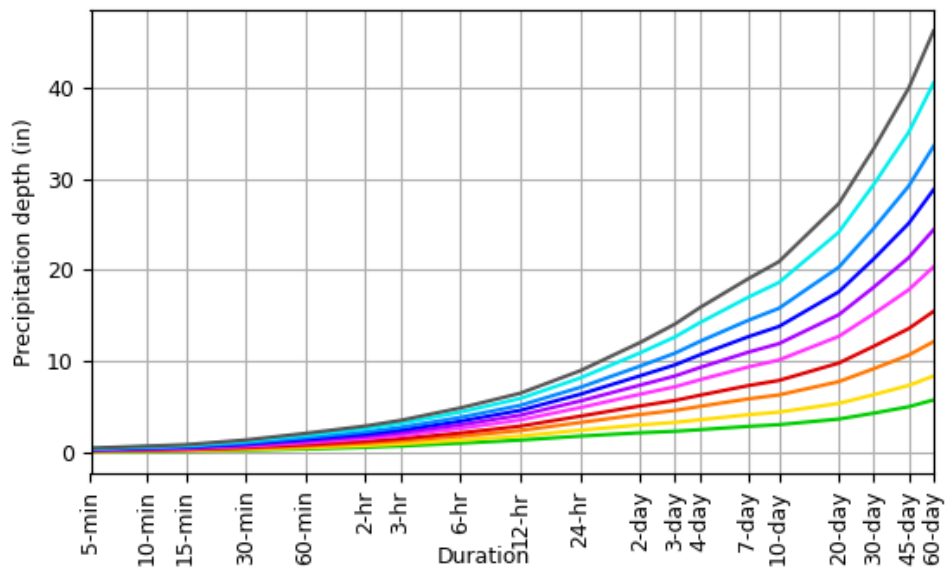
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper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

Please refer to NOAA Atlas 14 document for more information.

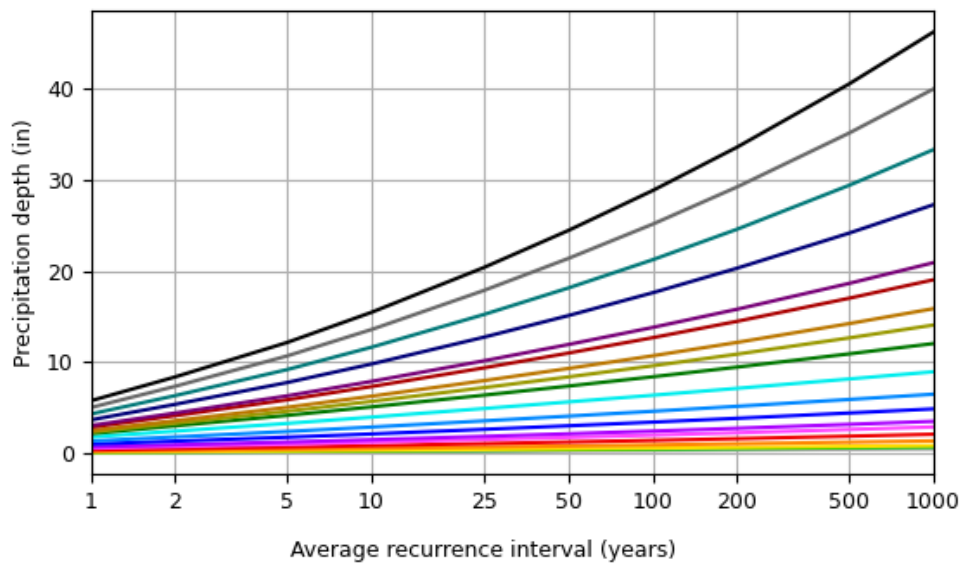
[Back to Top](#)

PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 33.5845°, Longitude: -117.2548°



Average recurrence interval (years)
1
2
5
10
25
50
100
200
500
1000

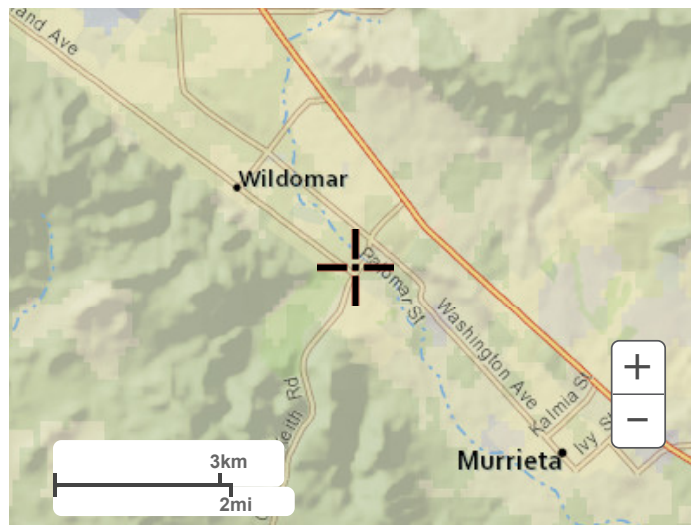


Duration	
5-min	2-day
10-min	3-day
15-min	4-day
30-min	7-day
60-min	10-day
2-hr	20-day
3-hr	30-day
6-hr	45-day
12-hr	60-day
24-hr	

[Back to Top](#)

Maps & aerials

Small scale terrain



Large scale terrain



Large scale map



Large scale aerial



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1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

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APPENDIX III

SOIL GROUP MAP

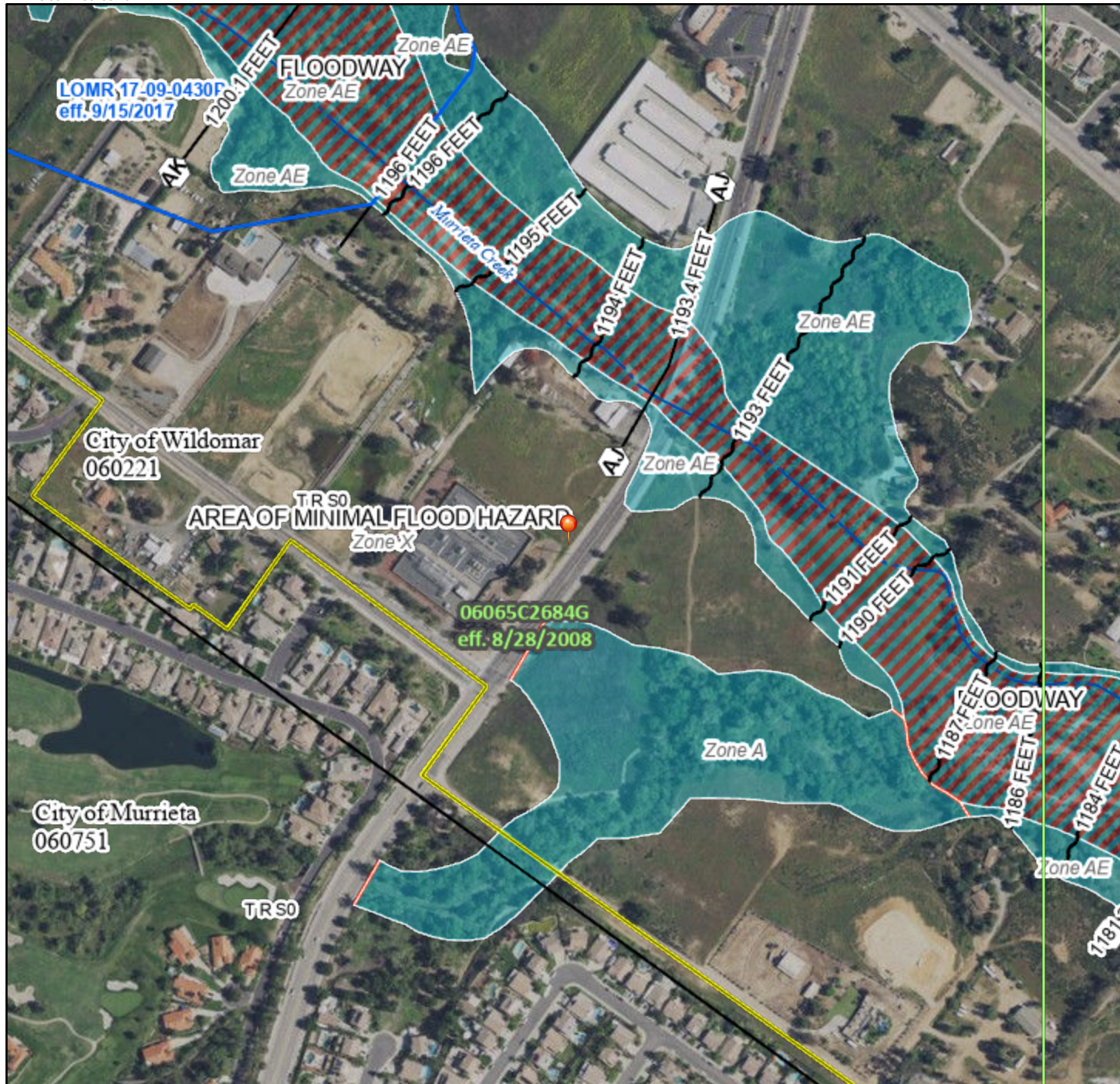
APPENDIX IV

FLOOD INSURANCE RATE MAP (FIRM)

National Flood Hazard Layer FIRMette



117°15'35"W 33°35'20"N



0 250 500 1,000 1,500 2,000 Feet

1:6,000

117°14'57"W 33°34'50"N

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard Zone D
		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
MAP PANELS		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
		Digital Data Available
		No Digital Data Available
		Unmapped



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 6/14/2023 at 9:26 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX V

HYDROLOGY CALCULATIONS

EXISTING CONDITIONS – 10 YEAR

EXISTING CONDITIONS – 100 YEAR

PROPOSED CONDITIONS – 10 YEAR

PROPOSED CONDITIONS – 100 YEAR

EXISTING CONDITIONS 10 YEAR

```

*****
RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM BASED ON
RIVERSIDE COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT
(RCFC&WCD) 1978 HYDROLOGY MANUAL
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(Rational Tabling Version 23.0)
Release Date: 07/01/2016 License ID 1535

```

Analysis prepared by:

Stantec

```

***** DESCRIPTION OF STUDY *****
* CHIQUITO BESS
* EXISTING CONDITION
* 10-YR
*****

```

FILE NAME: EX-10.DAT
TIME/DATE OF STUDY: 15:36 06/06/2023

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 4.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
2-YEAR, 1-HOUR PRECIPITATION(INCH) = 0.540
100-YEAR, 1-HOUR PRECIPITATION(INCH) = 1.460

COMPUTED RAINFALL INTENSITY DATA:

STORM EVENT = 10.00 1-HOUR INTENSITY(INCH/HOUR) = 0.928
SLOPE OF INTENSITY DURATION CURVE = 0.5000

RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD

NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN
UPSTREAM TRIBUTARY PIPE.*

```

*****
FLOW PROCESS FROM NODE      1.00 TO NODE      1.02 IS CODE = 21

```

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

```

=====
      ASSUMED INITIAL SUBAREA UNIFORM
      DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
INITIAL SUBAREA FLOW-LENGTH(FEET) = 216.00
UPSTREAM ELEVATION(FEET) = 1209.90
DOWNSTREAM ELEVATION(FEET) = 1200.50
ELEVATION DIFFERENCE(FEET) = 9.40
TC = 0.937*[( 216.00**3)/(( 9.40)]**.2 = 15.065
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.851

```

```

UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6800
SOIL CLASSIFICATION IS "C"
SUBAREA RUNOFF(CFS) = 1.02
TOTAL AREA(ACRES) = 0.81 TOTAL RUNOFF(CFS) = 1.02

*****
FLOW PROCESS FROM NODE 1.00 TO NODE 1.10 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
      ASSUMED INITIAL SUBAREA UNIFORM
      DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
      TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
      INITIAL SUBAREA FLOW-LENGTH(FEET) = 427.00
      UPSTREAM ELEVATION(FEET) = 1209.90
      DOWNSTREAM ELEVATION(FEET) = 1199.30
      ELEVATION DIFFERENCE(FEET) = 10.60
      TC = 0.937*[( 427.00**3)/( 10.60)]**.2 = 22.137
      10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 1.527
      UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .6464
      SOIL CLASSIFICATION IS "C"
      SUBAREA RUNOFF(CFS) = 1.98
      TOTAL AREA(ACRES) = 2.01 TOTAL RUNOFF(CFS) = 1.98

*****
FLOW PROCESS FROM NODE 1.20 TO NODE 1.22 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
      ASSUMED INITIAL SUBAREA UNIFORM
      DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
      TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
      INITIAL SUBAREA FLOW-LENGTH(FEET) = 86.00
      UPSTREAM ELEVATION(FEET) = 1208.80
      DOWNSTREAM ELEVATION(FEET) = 1204.00
      ELEVATION DIFFERENCE(FEET) = 4.80
      TC = 0.937*[( 86.00**3)/( 4.80)]**.2 = 9.917
      10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.282
      UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7129
      SOIL CLASSIFICATION IS "C"
      SUBAREA RUNOFF(CFS) = 0.26
      TOTAL AREA(ACRES) = 0.16 TOTAL RUNOFF(CFS) = 0.26
=====
      END OF STUDY SUMMARY:
      TOTAL AREA(ACRES) = 0.2 TC(MIN.) = 9.92
      PEAK FLOW RATE(CFS) = 0.26
=====
      END OF RATIONAL METHOD ANALYSIS

```

EXISTING CONDITIONS
100 YEAR

```

*****
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(RCFC&WCD) 1978 HYDROLOGY MANUAL
(c) Copyright 1982-2016 Advanced Engineering Software (aes)
(Rational Tabling Version 23.0)
Release Date: 07/01/2016 License ID 1535

```

Analysis prepared by:

Stantec

```

***** DESCRIPTION OF STUDY *****
* CHIQUITO BESS
* EXISTING CONDITION
* 100-YR
*****

```

FILE NAME: EX-100.DAT
TIME/DATE OF STUDY: 15:40 06/06/2023

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 4.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
2-YEAR, 1-HOUR PRECIPITATION(INCH) = 0.544
100-YEAR, 1-HOUR PRECIPITATION(INCH) = 1.460

COMPUTED RAINFALL INTENSITY DATA:

STORM EVENT = 100.00 1-HOUR INTENSITY(INCH/HOUR) = 1.460
SLOPE OF INTENSITY DURATION CURVE = 0.5000

RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD

NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN
UPSTREAM TRIBUTARY PIPE.*

```

*****
FLOW PROCESS FROM NODE      1.00 TO NODE      1.02 IS CODE = 21

```

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

```

=====
      ASSUMED INITIAL SUBAREA UNIFORM
      DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
INITIAL SUBAREA FLOW-LENGTH(FEET) = 216.00
UPSTREAM ELEVATION(FEET) = 1209.90
DOWNSTREAM ELEVATION(FEET) = 1200.50
ELEVATION DIFFERENCE(FEET) = 9.40
TC = 0.937*[( 216.00**3)/(( 9.40)]**.2 = 15.065
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.914

```

```

UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7465
SOIL CLASSIFICATION IS "C"
SUBAREA RUNOFF(CFS) = 1.76
TOTAL AREA(ACRES) = 0.81 TOTAL RUNOFF(CFS) = 1.76

*****
FLOW PROCESS FROM NODE 1.00 TO NODE 1.10 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
      ASSUMED INITIAL SUBAREA UNIFORM
      DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
      TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
      INITIAL SUBAREA FLOW-LENGTH(FEET) = 427.00
      UPSTREAM ELEVATION(FEET) = 1209.90
      DOWNSTREAM ELEVATION(FEET) = 1199.30
      ELEVATION DIFFERENCE(FEET) = 10.60
      TC = 0.937*[( 427.00**3)/( 10.60)]**.2 = 22.137
      100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.404
      UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7204
      SOIL CLASSIFICATION IS "C"
      SUBAREA RUNOFF(CFS) = 3.48
      TOTAL AREA(ACRES) = 2.01 TOTAL RUNOFF(CFS) = 3.48

*****
FLOW PROCESS FROM NODE 1.20 TO NODE 1.22 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
      ASSUMED INITIAL SUBAREA UNIFORM
      DEVELOPMENT IS: UNDEVELOPED WITH GOOD COVER
      TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
      INITIAL SUBAREA FLOW-LENGTH(FEET) = 86.00
      UPSTREAM ELEVATION(FEET) = 1208.80
      DOWNSTREAM ELEVATION(FEET) = 1204.00
      ELEVATION DIFFERENCE(FEET) = 4.80
      TC = 0.937*[( 86.00**3)/( 4.80)]**.2 = 9.917
      100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.591
      UNDEVELOPED WATERSHED RUNOFF COEFFICIENT = .7713
      SOIL CLASSIFICATION IS "C"
      SUBAREA RUNOFF(CFS) = 0.44
      TOTAL AREA(ACRES) = 0.16 TOTAL RUNOFF(CFS) = 0.44
=====
      END OF STUDY SUMMARY:
      TOTAL AREA(ACRES) = 0.2 TC(MIN.) = 9.92
      PEAK FLOW RATE(CFS) = 0.44
=====
      END OF RATIONAL METHOD ANALYSIS

```

PROPOSED CONDITIONS 10 YEAR

```

*****
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(Rational Tabling Version 23.0)
Release Date: 07/01/2016 License ID 1535

```

Analysis prepared by:

Stantec

```

***** DESCRIPTION OF STUDY *****
* CHIQUITO BESS
* PROPOSED CONDITION
* 10-YR
*****

```

FILE NAME: PR-10.DAT
TIME/DATE OF STUDY: 13:15 06/15/2023

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

USER SPECIFIED STORM EVENT(YEAR) = 10.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 4.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
2-YEAR, 1-HOUR PRECIPITATION(INCH) = 0.544
100-YEAR, 1-HOUR PRECIPITATION(INCH) = 1.460

COMPUTED RAINFALL INTENSITY DATA:

STORM EVENT = 10.00 1-HOUR INTENSITY(INCH/HOUR) = 0.930
SLOPE OF INTENSITY DURATION CURVE = 0.5000

RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD

NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN
UPSTREAM TRIBUTARY PIPE.*

```

*****
FLOW PROCESS FROM NODE      2.00 TO NODE      2.02 IS CODE = 21

```

>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

```

=====
ASSUMED INITIAL SUBAREA UNIFORM
DEVELOPMENT IS SINGLE FAMILY(1-ACRE LOTS)
TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
INITIAL SUBAREA FLOW-LENGTH(FEET) = 165.00
UPSTREAM ELEVATION(FEET) = 1206.50
DOWNSTREAM ELEVATION(FEET) = 1203.00
ELEVATION DIFFERENCE(FEET) = 3.50
TC = 0.469*[( 165.00**3)/(( 3.50)]**.2 = 7.819
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.576

```

```

SINGLE-FAMILY(1-ACRE LOT) RUNOFF COEFFICIENT = .7642
SOIL CLASSIFICATION IS "C"
SUBAREA RUNOFF(CFS) = 1.67
TOTAL AREA(ACRES) = 0.85 TOTAL RUNOFF(CFS) = 1.67
*****
FLOW PROCESS FROM NODE 2.00 TO NODE 2.10 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
ASSUMED INITIAL SUBAREA UNIFORM
DEVELOPMENT IS SINGLE FAMILY(1-ACRE LOTS)
TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
INITIAL SUBAREA FLOW-LENGTH(FEET) = 300.00
UPSTREAM ELEVATION(FEET) = 1206.50
DOWNSTREAM ELEVATION(FEET) = 1202.70
ELEVATION DIFFERENCE(FEET) = 3.80
TC = 0.469*[( 300.00**3)/( 3.80)]**.2 = 11.009
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.171
SINGLE-FAMILY(1-ACRE LOT) RUNOFF COEFFICIENT = .7443
SOIL CLASSIFICATION IS "C"
SUBAREA RUNOFF(CFS) = 0.81
TOTAL AREA(ACRES) = 0.50 TOTAL RUNOFF(CFS) = 0.81
*****
FLOW PROCESS FROM NODE 2.10 TO NODE 2.12 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.171
SINGLE-FAMILY(1-ACRE LOT) RUNOFF COEFFICIENT = .7443
SOIL CLASSIFICATION IS "C"
SUBAREA AREA(ACRES) = 1.45 SUBAREA RUNOFF(CFS) = 2.34
TOTAL AREA(ACRES) = 2.0 TOTAL RUNOFF(CFS) = 3.15
TC(MIN.) = 11.01
*****
FLOW PROCESS FROM NODE 2.20 TO NODE 2.22 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
ASSUMED INITIAL SUBAREA UNIFORM
DEVELOPMENT IS SINGLE FAMILY(1-ACRE LOTS)
TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
INITIAL SUBAREA FLOW-LENGTH(FEET) = 105.00
UPSTREAM ELEVATION(FEET) = 1208.00
DOWNSTREAM ELEVATION(FEET) = 1206.50
ELEVATION DIFFERENCE(FEET) = 1.50
TC = 0.469*[( 105.00**3)/( 1.50)]**.2 = 7.062
10 YEAR RAINFALL INTENSITY(INCH/HOUR) = 2.711
SINGLE-FAMILY(1-ACRE LOT) RUNOFF COEFFICIENT = .7697
SOIL CLASSIFICATION IS "C"
SUBAREA RUNOFF(CFS) = 0.38
TOTAL AREA(ACRES) = 0.18 TOTAL RUNOFF(CFS) = 0.38
=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 0.2 TC(MIN.) = 7.06
PEAK FLOW RATE(CFS) = 0.38
=====
END OF RATIONAL METHOD ANALYSIS

```

PROPOSED CONDITIONS 100 YEAR

```

*****
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Release Date: 07/01/2016 License ID 1535

```

Analysis prepared by:

Stantec

```

***** DESCRIPTION OF STUDY *****
* CHIQUITO BESS
* PROPOSED CONDITION
* 100-YR
*****

```

FILE NAME: PR-100.DAT
TIME/DATE OF STUDY: 13:23 06/15/2023

USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:

USER SPECIFIED STORM EVENT(YEAR) = 100.00
SPECIFIED MINIMUM PIPE SIZE(INCH) = 4.00
SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
2-YEAR, 1-HOUR PRECIPITATION(INCH) = 0.544
100-YEAR, 1-HOUR PRECIPITATION(INCH) = 1.460

COMPUTED RAINFALL INTENSITY DATA:

STORM EVENT = 100.00 1-HOUR INTENSITY(INCH/HOUR) = 1.460
SLOPE OF INTENSITY DURATION CURVE = 0.5000

RCFC&WCD HYDROLOGY MANUAL "C"-VALUES USED FOR RATIONAL METHOD

NOTE: COMPUTE CONFLUENCE VALUES ACCORDING TO RCFC&WCD HYDROLOGY MANUAL
AND IGNORE OTHER CONFLUENCE COMBINATIONS FOR DOWNSTREAM ANALYSES

USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL

NO.	HALF- WIDTH (FT)	CROWN TO CROSSFALL (FT)	STREET-CROSSFALL: IN- / OUT-/PARK- SIDE / SIDE/ WAY	CURB HEIGHT (FT)	GUTTER-GEOMETRIES: WIDTH (FT)	LIP (FT)	HIKE (FT)	MANNING FACTOR (n)
1	30.0	20.0	0.018/0.018/0.020	0.67	2.00	0.0313	0.167	0.0150

GLOBAL STREET FLOW-DEPTH CONSTRAINTS:

1. Relative Flow-Depth = 0.00 FEET
as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
2. (Depth)*(Velocity) Constraint = 6.0 (FT*FT/S)

*PIPE MAY BE SIZED TO HAVE A FLOW CAPACITY LESS THAN
UPSTREAM TRIBUTARY PIPE.*

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*****
FLOW PROCESS FROM NODE      2.00 TO NODE      2.02 IS CODE = 21

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>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<

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=====
ASSUMED INITIAL SUBAREA UNIFORM
DEVELOPMENT IS SINGLE FAMILY(1-ACRE LOTS)
TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
INITIAL SUBAREA FLOW-LENGTH(FEET) = 165.00
UPSTREAM ELEVATION(FEET) = 1206.50
DOWNSTREAM ELEVATION(FEET) = 1203.00
ELEVATION DIFFERENCE(FEET) = 3.50
TC = 0.469*[( 165.00**3)/(( 3.50)]**.2 = 7.819
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.045

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SINGLE-FAMILY(1-ACRE LOT) RUNOFF COEFFICIENT = .8071
SOIL CLASSIFICATION IS "C"
SUBAREA RUNOFF(CFS) = 2.77
TOTAL AREA(ACRES) = 0.85 TOTAL RUNOFF(CFS) = 2.77
*****
FLOW PROCESS FROM NODE 2.00 TO NODE 2.10 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
ASSUMED INITIAL SUBAREA UNIFORM
DEVELOPMENT IS SINGLE FAMILY(1-ACRE LOTS)
TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
INITIAL SUBAREA FLOW-LENGTH(FEET) = 300.00
UPSTREAM ELEVATION(FEET) = 1206.50
DOWNSTREAM ELEVATION(FEET) = 1202.70
ELEVATION DIFFERENCE(FEET) = 3.80
TC = 0.469*[( 300.00**3)/( 3.80)]**.2 = 11.009
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.408
SINGLE-FAMILY(1-ACRE LOT) RUNOFF COEFFICIENT = .7924
SOIL CLASSIFICATION IS "C"
SUBAREA RUNOFF(CFS) = 1.35
TOTAL AREA(ACRES) = 0.50 TOTAL RUNOFF(CFS) = 1.35
*****
FLOW PROCESS FROM NODE 2.10 TO NODE 2.12 IS CODE = 81
-----
>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<
=====
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 3.408
SINGLE-FAMILY(1-ACRE LOT) RUNOFF COEFFICIENT = .7924
SOIL CLASSIFICATION IS "C"
SUBAREA AREA(ACRES) = 1.45 SUBAREA RUNOFF(CFS) = 3.92
TOTAL AREA(ACRES) = 2.0 TOTAL RUNOFF(CFS) = 5.27
TC(MIN.) = 11.01
*****
FLOW PROCESS FROM NODE 2.20 TO NODE 2.22 IS CODE = 21
-----
>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<
=====
ASSUMED INITIAL SUBAREA UNIFORM
DEVELOPMENT IS SINGLE FAMILY(1-ACRE LOTS)
TC = K*[(LENGTH**3)/(ELEVATION CHANGE)]**.2
INITIAL SUBAREA FLOW-LENGTH(FEET) = 105.00
UPSTREAM ELEVATION(FEET) = 1208.00
DOWNSTREAM ELEVATION(FEET) = 1206.50
ELEVATION DIFFERENCE(FEET) = 1.50
TC = 0.469*[( 105.00**3)/( 1.50)]**.2 = 7.062
100 YEAR RAINFALL INTENSITY(INCH/HOUR) = 4.256
SINGLE-FAMILY(1-ACRE LOT) RUNOFF COEFFICIENT = .8112
SOIL CLASSIFICATION IS "C"
SUBAREA RUNOFF(CFS) = 0.62
TOTAL AREA(ACRES) = 0.18 TOTAL RUNOFF(CFS) = 0.62
=====
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 0.2 TC(MIN.) = 7.06
PEAK FLOW RATE(CFS) = 0.62
=====
END OF RATIONAL METHOD ANALYSIS

```

RUNOFF COEFFICIENT

ACTUAL IMPERVIOUS COVER

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

Proposed BESS site
has 15% impervious
cover.
Use "40,000 S.F. (1
acre) lots" instead of
"Commercial,
Downtown Business
or Industrial Land
Use"

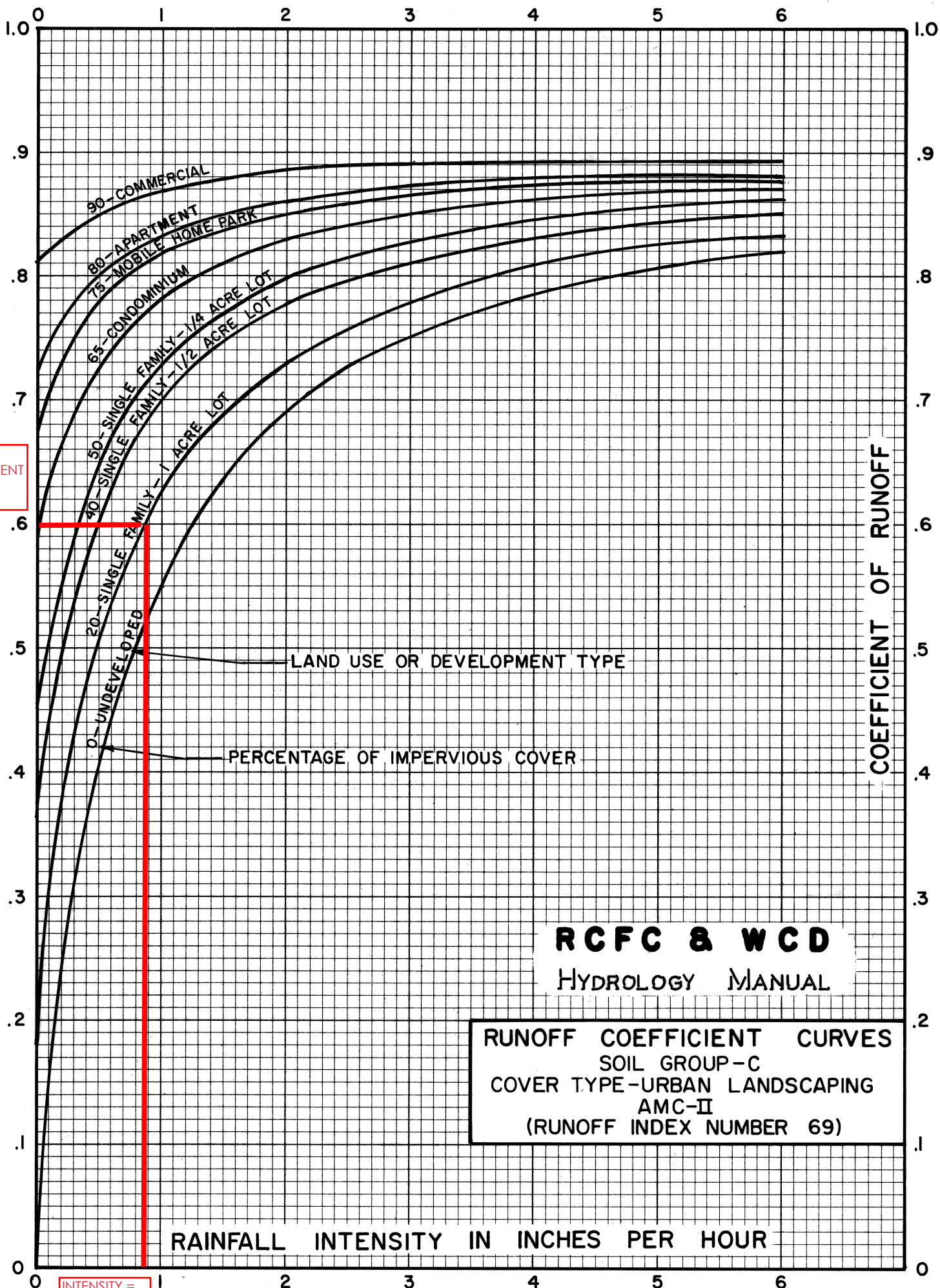
Notes:

1. Land use should be based on ultimate development of the watershed. Long range master plans for the County and incorporated cities should be reviewed to insure reasonable land use assumptions.
2. Recommended values are based on average conditions which may not apply to a particular study area. The percentage impervious may vary greatly even on comparable sized lots due to differences in dwelling size, improvements, etc. Landscape practices should also be considered as it is common in some areas to use ornamental gravels underlain by impervious plastic materials in place of lawns and shrubs. A field investigation of a study area should always be made, and a review of aerial photos, where available may assist in estimating the percentage of impervious cover in developed areas.
3. For typical horse ranch subdivisions increase impervious area 5 percent over the values recommended in the table above.

RCFC & WCD
HYDROLOGY MANUAL

**IMPERVIOUS COVER
FOR
DEVELOPED AREAS**

RUNOFF
COEFFICIENT
= 0.6



APPENDIX VI

HYDROGRAPH CALCULATIONS

Chiquito BESS

Basin Sizing Calculations

6/15/2023

Low Loss Rate - PERCENT

$$(0.90) - (0.80 * A_i)$$

$$A_i =$$

0 Existing Condition
0.148 Proposed Condition

$$\text{Existing Condition} = (0.90) - (0.80 * 0) = 0.9 * 100 = \mathbf{90}$$

$$\text{Proposed Condition} = (0.90) - (0.80 * 0.148) = 0.7816 * 100 = \mathbf{78}$$

Constant Loss Rate - Inches / Hour

$$F = F_p (1.0 - (0.9 * A_i))$$

$$A_i =$$

0 Existing Condition
0.148 Proposed Condition

Existing Condition

$$RI = 79$$

for Grass, Annual or Perennial Cover type, AMC II, Soil Group C
(Based on Plate E-6.1)

$$\text{Infiltration Rate} = 0.32 \text{ in/hr} \quad \text{for } RI=79 \quad (\text{Based on Plate E-6.2})$$

$$F = 0.32 (1.0 - 0.9 * 0) = \mathbf{0.32 \text{ in/hr}}$$

Proposed Condition

$$RI = 91$$

for graded land
(Based on Plate E-6.1)

$$\text{Infiltration Rate} = 0.12 \text{ in/hr} \quad \text{for } RI=91 \quad (\text{Based on Plate E-6.2})$$

$$F = 0.12 (1.0 - (0.9 * 0.148)) = \mathbf{0.104 \text{ in/hr}}$$

Basin Sizing

Pre-development Volume (Drainage Areas A, B and C) = 0.29 ac-ft

Post-development Volume (Drainage Areas A, B and C) = 0.34 ac-ft

$$\text{Volume required to be detained} = 0.34 \text{ ac-ft} - 0.29 \text{ ac-ft} = 0.05 \text{ ac-ft} =$$

2,178 cf

Northwest Detention Pond with ponding @ 1-ft = 888 cf

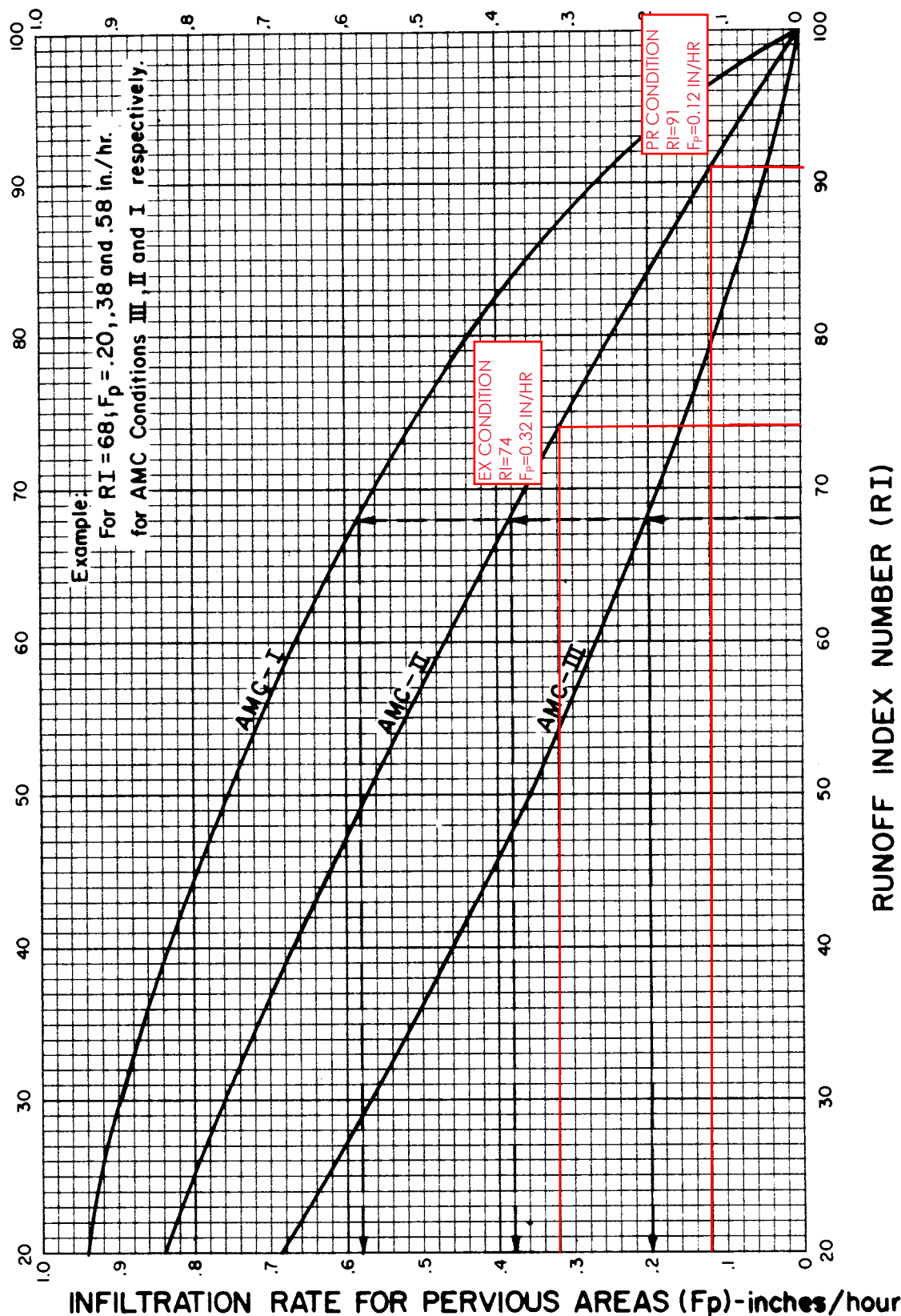
Southeast Detention Pond with ponding @ 1.50 ft = 1,600 cf

$$\text{Total Detention Volume Provided} = 1,600 \text{ cf} + 888 \text{ cf} =$$

2,488 cf

NOTES:

I. R.I. Number-Infiltration relationships are derived from rainfall-runoff relationships in Bibliography Item No. 36.



RCFC & WCD
HYDROLOGY MANUAL

INFILTRATION RATE FOR
PERVIOUS AREAS VERSUS
RUNOFF INDEX NUMBERS

RCFC & WCD		SYNTHETIC UNIT HYDROGRAPH METHOD				Project:		Date: 06/06/2023		Sheet	
		Unit Hydrograph and Effective Rain				Chiquito BESS				1 of	
		Calculation Form				Wildomar, CA				1	
[1] Concentration Point					1.02	[2] Area Designation					PreProject A
[3] Drainage Area Sq Miles (THIS WORKSHEET in ACRES)					0.81	[4] Ultimate Discharge-CFS-HRS/IN (645*[3])					n/a
[5] Unit Time Minutes (SAMPLE 100% -200% of LAG)					5	[6] LAG Time Minutes (0.8*Tc)					12.1
[7] Unit Time-Percent of Lag (100*[5]/[6])					n/a	[8] S-Curve					n/a
[9] Storm Frequency & Duration (SAMPLE 100 year 3 Hour)					100yr-1hr	[10] Total Adjusted Storm Rain- INCHES					1.46
[11] Variable Loss Rate(AVG) - INCHES/HOUR					n/a	[12] Minimum Loss Rate (for VAR. LOSS) - IN/HR					n/a
[13] Constant Loss Rate - INCHES/HOUR (see note 1)					0.32	[14] Low Loss Rate- PERCENT					90
	[15]	[16]	[17]	[18]	[19]	[20]	[21]	[22]		[23]	[24]
	Unit time period	Time percent of LAG	Cumulative average percent of ultimate discharge	Distrib Graph percent	Unit Hydrograph CFS-HRS/IN	Pattern Percent	Storm Rain IN/HR	LOSS RATE IN/HR		Effective Rain IN/HR	FLOW CFS
		[7] * [15]	(S-Graph)	[17]m-[17]m-1	(([4]*[18])/100	(PL E-5.9)	60*[10]*[20]/100*[5]	Max	Low	[21]-[22]	[3]*[23]
							0.1752*[20]		[21]- (((21)*([14]/100))		[3]*[23]
1		n/a	n/a	n/a	n/a	4.7	0.823	0.32		0.50	0.4
2						4.5	0.788	0.32		0.47	0.4
3						5.1	0.894	0.32		0.57	0.5
4						5.1	0.894	0.32		0.57	0.5
5						6.2	1.086	0.32		0.77	0.6
6						6.6	1.156	0.32		0.84	0.7
7						7.3	1.279	0.32		0.96	0.8
8						9.1	1.594	0.32		1.27	1.0
9						12.5	2.190	0.32		1.87	1.5
10						26.8	4.695	0.32		4.38	3.5
11						7.3	1.279	0.32		0.96	0.8
12						4.8	0.841	0.32		0.52	0.4
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						100			SUM	13.68	
Notes:											
1. Fp obtained from Plate E-6.2; Loss Rate (F) from page E-8						Effective Rain= Sum[23] * Unit Time (HRS)					
where F=Fp if 100 percent pervious cover						= 13.68*(5/60)= 13.68*0.0833					
						= 1.14 INCHES					
						Flood Volume = Effective Rain * Area					
						= 1.14*(1/12)*0.81 ACRES					
						0.08 ACRE-FEET					
						Plate E-2.2					

RCFC & WCD		SYNTHETIC UNIT HYDROGRAPH METHOD				Project:		Date: 06/06/2023		Sheet	
		Unit Hydrograph and Effective Rain				Chiquito BESS				1 of	
		Calculation Form				Wildomar, CA				1	
[1] Concentration Point					1.1	[2] Area Designation					PreProject B
[3] Drainage Area Sq Miles (THIS WORKSHEET in ACRES)					2.01	[4] Ultimate Discharge-CFS-HRS/IN (645*[3])					n/a
[5] Unit Time Minutes (SAMPLE 100% -200% of LAG)					5	[6] LAG Time Minutes (0.8*Tc)					17.7
[7] Unit Time-Percent of Lag (100*[5]/[6])					n/a	[8] S-Curve					n/a
[9] Storm Frequency & Duration (SAMPLE 100 year 3 Hour)					100yr-1hr	[10] Total Adjusted Storm Rain- INCHES					1.46
[11] Variable Loss Rate(AVG) - INCHES/HOUR					n/a	[12] Minimum Loss Rate (for VAR. LOSS) - IN/HR					n/a
[13] Constant Loss Rate - INCHES/HOUR (see note 1)					0.32	[14] Low Loss Rate- PERCENT					90
	[15]	[16]	[17]	[18]	[19]	[20]	[21]	[22]		[23]	[24]
	Unit time period	Time percent of LAG	Cumulative average percent of ultimate discharge	Distrib Graph percent	Unit Hydrograph CFS-HRS/IN	Pattern Percent	Storm Rain IN/HR	LOSS RATE IN/HR		Effective Rain IN/HR	FLOW CFS
		[7] * [15]	(S-Graph)	[17]m-[17]m-1	(([4]*[18])/100	(PL E-5.9)	60*[10]*[20]/100*[5]	Max	Low	[21]-[22]	[3]*[23]
							0.1752*[20]		[21]- (((21)*([14]/100))		[3]*[23]
1		n/a	n/a	n/a	n/a	4.7	0.823	0.32		0.50	1.0
2						4.5	0.788	0.32		0.47	0.9
3						5.1	0.894	0.32		0.57	1.2
4						5.1	0.894	0.32		0.57	1.2
5						6.2	1.086	0.32		0.77	1.5
6						6.6	1.156	0.32		0.84	1.7
7						7.3	1.279	0.32		0.96	1.9
8						9.1	1.594	0.32		1.27	2.6
9						12.5	2.190	0.32		1.87	3.8
10						26.8	4.695	0.32		4.38	8.8
11						7.3	1.279	0.32		0.96	1.9
12						4.8	0.841	0.32		0.52	1.0
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36											
						100			SUM	13.68	
Notes:											
1. Fp obtained from Plate E-6.2; Loss Rate (F) from page E-8						Effective Rain= Sum[23] * Unit Time (HRS)					
where F=Fp if 100 percent pervious cover						= 13.68*(5/60)= 13.68*0.0833					
						= 1.14 INCHES					
						Flood Volume = Effective Rain * Area					
						= 1.14*(1/12)*2.01 ACRES					
						0.19 ACRE-FEET					
						Plate E-2.2					

RCFC & WCD		SYNTHETIC UNIT HYDROGRAPH METHOD				Project:		Date: 06/06/2023		Sheet	
		Unit Hydrograph and Effective Rain				Chiquito BESS				1 of	
		Calculation Form				Wildomar, CA				1	
[1] Concentration Point					1.22	[2] Area Designation					PreProject C
[3] Drainage Area Sq Miles (THIS WORKSHEET in ACRES)					0.16	[4] Ultimate Discharge-CFS-HRS/IN (645*[3])					n/a
[5] Unit Time Minutes (SAMPLE 100% -200% of LAG)					5	[6] LAG Time Minutes (0.8*Tc)					7.9
[7] Unit Time-Percent of Lag (100*[5]/[6])					n/a	[8] S-Curve					n/a
[9] Storm Frequency & Duration (SAMPLE 100 year 3 Hour)					100yr-1hr	[10] Total Adjusted Storm Rain- INCHES					1.46
[11] Variable Loss Rate(AVG) - INCHES/HOUR					n/a	[12] Minimum Loss Rate (for VAR. LOSS) - IN/HR					n/a
[13] Constant Loss Rate - INCHES/HOUR (see note 1)					0.32	[14] Low Loss Rate- PERCENT					90
	[15]	[16]	[17]	[18]	[19]	[20]	[21]	[22]		[23]	[24]
	Unit time period	Time percent of LAG	Cumulative average percent of ultimate discharge	Distrib Graph percent	Unit Hydrograph CFS-HRS/IN	Pattern Percent	Storm Rain IN/HR	LOSS RATE IN/HR		Effective Rain IN/HR	FLOW CFS
		[7] * [15]	(S-Graph)	[17]m-[17]m-1	(([4]*[18])/100	(PL E-5.9)	60*[10]*[20]/100*[5]	Max	Low	[21]-[22]	[3]*[23]
							0.1752*[20]		[21]- (((21)*([14]/100))		[3]*[23]
1		n/a	n/a	n/a	n/a	4.7	0.823	0.32		0.50	0.1
2						4.5	0.788	0.32		0.47	0.1
3						5.1	0.894	0.32		0.57	0.1
4						5.1	0.894	0.32		0.57	0.1
5						6.2	1.086	0.32		0.77	0.1
6						6.6	1.156	0.32		0.84	0.1
7						7.3	1.279	0.32		0.96	0.2
8						9.1	1.594	0.32		1.27	0.2
9						12.5	2.190	0.32		1.87	0.3
10						26.8	4.695	0.32		4.38	0.7
11						7.3	1.279	0.32		0.96	0.2
12						4.8	0.841	0.32		0.52	0.1
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						100			SUM	13.68	
Notes:											
1. Fp obtained from Plate E-6.2; Loss Rate (F) from page E-8						Effective Rain= Sum[23] * Unit Time (HRS)					
where F=Fp if 100 percent pervious cover						= 13.68*(5/60)= 13.68*0.0833					
						= 1.14 INCHES					
						Flood Volume = Effective Rain * Area					
						= 1.14*(1/12)*0.16 ACRES					
						0.02 ACRE-FEET					
						Plate E-2.2					

RCFC & WCD		SYNTHETIC UNIT HYDROGRAPH METHOD				Project:		Date: 06/06/2023		Sheet	
		Unit Hydrograph and Effective Rain				Chiquito BESS				1 of	
		Calculation Form				Wildomar, CA				1	
[1] Concentration Point					2.02	[2] Area Designation					PostProject A
[3] Drainage Area Sq Miles (THIS WORKSHEET in ACRES)					0.85	[4] Ultimate Discharge-CFS-HRS/IN (645*[3])					n/a
[5] Unit Time Minutes (SAMPLE 100% -200% of LAG)					5	[6] LAG Time Minutes (0.8*Tc)					6.2
[7] Unit Time-Percent of Lag (100*[5]/[6])					n/a	[8] S-Curve					n/a
[9] Storm Frequency & Duration (SAMPLE 100 year 3 Hour)					100yr-1hr	[10] Total Adjusted Storm Rain- INCHES					1.46
[11] Variable Loss Rate(AVG) - INCHES/HOUR					n/a	[12] Minimum Loss Rate (for VAR. LOSS) - IN/HR					n/a
[13] Constant Loss Rate - INCHES/HOUR (see note 1)					0.104	[14] Low Loss Rate- PERCENT					78
	[15]	[16]	[17]	[18]	[19]	[20]	[21]	[22]		[23]	[24]
	Unit time period	Time percent of LAG	Cumulative average percent of ultimate discharge	Distrib Graph percent	Unit Hydrograph CFS-HRS/IN	Pattern Percent	Storm Rain IN/HR	LOSS RATE IN/HR		Effective Rain IN/HR	FLOW CFS
		[7] * [15]	(S-Graph)	[17]m-[17]m-1	(([4]*[18])/100	(PL E-5.9)	60*[10]*[20]/100*[5]	Max	Low	[21]-[22]	[3]*[23]
							0.1752*[20]		[21]- (((21)*([14]/100))		[3]*[23]
1		n/a	n/a	n/a	n/a	4.7	0.823	0.104		0.72	0.6
2						4.5	0.788	0.104		0.68	0.6
3						5.1	0.894	0.104		0.79	0.7
4						5.1	0.894	0.104		0.79	0.7
5						6.2	1.086	0.104		0.98	0.8
6						6.6	1.156	0.104		1.05	0.9
7						7.3	1.279	0.104		1.17	1.0
8						9.1	1.594	0.104		1.49	1.3
9						12.5	2.190	0.104		2.09	1.8
10						26.8	4.695	0.104		4.59	3.9
11						7.3	1.279	0.104		1.17	1.0
12						4.8	0.841	0.104		0.74	0.6
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						100			SUM	16.26	
Notes:											
1. Fp obtained from Plate E-6.2; Loss Rate (F) from page E-8						Effective Rain= Sum[23] * Unit Time (HRS)					
where F=Fp if 100 percent pervious cover						= 16.26*(5/60)= 16.26*0.0833					
						= 1.36 INCHES					
						Flood Volume = Effective Rain * Area					
						= 1.36*(1/12)*0.85 ACRES					
						0.10 ACRE-FEET					
						Plate E-2.2					

RCFC & WCD		SYNTHETIC UNIT HYDROGRAPH METHOD				Project:		Date: 06/06/2023		Sheet		
		Unit Hydrograph and Effective Rain				Chiquito BESS				1 of		
		Calculation Form				Wildomar, CA				1		
[1] Concentration Point					2.12	[2] Area Designation					PostProject B	
[3] Drainage Area Sq Miles (THIS WORKSHEET in ACRES)					1.95	[4] Ultimate Discharge-CFS-HRS/IN (645*[3])					n/a	
[5] Unit Time Minutes (SAMPLE 100% -200% of LAG)					5	[6] LAG Time Minutes (0.8*Tc)					8.8	
[7] Unit Time-Percent of Lag (100*[5]/[6])					n/a	[8] S-Curve					n/a	
[9] Storm Frequency & Duration (SAMPLE 100 year 3 Hour)					100yr-1hr	[10] Total Adjusted Storm Rain- INCHES					1.46	
[11] Variable Loss Rate(AVG) - INCHES/HOUR					n/a	[12] Minimum Loss Rate (for VAR. LOSS) - IN/HR					n/a	
[13] Constant Loss Rate - INCHES/HOUR (see note 1)					0.104	[14] Low Loss Rate- PERCENT					78	
	[15]	[16]	[17]	[18]	[19]	[20]	[21]	[22]		[23]	[24]	
	Unit time period	Time percent of LAG	Cumulative average percent of ultimate discharge	Distrib Graph percent	Unit Hydrograph CFS-HRS/IN	Pattern Percent	Storm Rain IN/HR	LOSS RATE IN/HR		Effective Rain IN/HR	FLOW CFS	
		[7] * [15]	(S-Graph)	[17]m-[17]m-1	(([4]*[18])/100	(PL E-5.9)	60*[10]*[20]/100*[5]	Max	Low	[21]-[22]	[3]*[23]	
							0.1752*[20]		[21]- (((21)*([14]/100))		[3]*[23]	
1		n/a	n/a	n/a	n/a	4.7	0.823	0.104		0.72	1.4	
2						4.5	0.788	0.104		0.68	1.3	
3						5.1	0.894	0.104		0.79	1.5	
4						5.1	0.894	0.104		0.79	1.5	
5						6.2	1.086	0.104		0.98	1.9	
6						6.6	1.156	0.104		1.05	2.1	
7						7.3	1.279	0.104		1.17	2.3	
8						9.1	1.594	0.104		1.49	2.9	
9						12.5	2.190	0.104		2.09	4.1	
10						26.8	4.695	0.104		4.59	9.0	
11						7.3	1.279	0.104		1.17	2.3	
12						4.8	0.841	0.104		0.74	1.4	
13												
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32												
33												
34												
35												
36												
						100			SUM	16.26		
Notes:												
1. Fp obtained from Plate E-6.2; Loss Rate (F) from page E-8						Effective Rain= Sum[23] * Unit Time (HRS)						
where F=Fp if 100 percent pervious cover						= 16.26*(5/60)= 16.26*0.0833						
						= 1.36 INCHES						
						Flood Volume = Effective Rain * Area						
						= 1.36*(1/12)*1.95 ACRES						
						0.22 ACRE-FEET						
												Plate E-2.2

RCFC & WCD		SYNTHETIC UNIT HYDROGRAPH METHOD				Project:		Date: 06/06/2023		Sheet	
		Unit Hydrograph and Effective Rain				Chiquito BESS				1 of	
		Calculation Form				Wildomar, CA				1	
[1] Concentration Point					2.22	[2] Area Designation					PostProject C
[3] Drainage Area Sq Miles (THIS WORKSHEET in ACRES)					0.18	[4] Ultimate Discharge-CFS-HRS/IN (645*[3])					n/a
[5] Unit Time Minutes (SAMPLE 100% -200% of LAG)					5	[6] LAG Time Minutes (0.8*Tc)					5.6
[7] Unit Time-Percent of Lag (100*[5]/[6])					n/a	[8] S-Curve					n/a
[9] Storm Frequency & Duration (SAMPLE 100 year 3 Hour)					100yr-1hr	[10] Total Adjusted Storm Rain- INCHES					1.46
[11] Variable Loss Rate(AVG) - INCHES/HOUR					n/a	[12] Minimum Loss Rate (for VAR. LOSS) - IN/HR					n/a
[13] Constant Loss Rate - INCHES/HOUR (see note 1)					0.104	[14] Low Loss Rate- PERCENT					78
	[15]	[16]	[17]	[18]	[19]	[20]	[21]	[22]		[23]	[24]
	Unit time period	Time percent of LAG	Cumulative average percent of ultimate discharge	Distrib Graph percent	Unit Hydrograph CFS-HRS/IN	Pattern Percent	Storm Rain IN/HR	LOSS RATE IN/HR		Effective Rain IN/HR	FLOW CFS
		[7] * [15]	(S-Graph)	[17]m-[17]m-1	(([4]*[18])/100	(PL E-5.9)	60*[10]*[20]/100*[5]	Max	Low	[21]-[22]	[3]*[23]
							0.1752*[20]		[21]- (((21)*([14]/100))		[3]*[23]
1		n/a	n/a	n/a	n/a	4.7	0.823	0.104		0.72	0.1
2						4.5	0.788	0.104		0.68	0.1
3						5.1	0.894	0.104		0.79	0.1
4						5.1	0.894	0.104		0.79	0.1
5						6.2	1.086	0.104		0.98	0.2
6						6.6	1.156	0.104		1.05	0.2
7						7.3	1.279	0.104		1.17	0.2
8						9.1	1.594	0.104		1.49	0.3
9						12.5	2.190	0.104		2.09	0.4
10						26.8	4.695	0.104		4.59	0.8
11						7.3	1.279	0.104		1.17	0.2
12						4.8	0.841	0.104		0.74	0.1
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						100			SUM	16.26	
Notes:											
1. Fp obtained from Plate E-6.2; Loss Rate (F) from page E-8						Effective Rain= Sum[23] * Unit Time (HRS)					
where F=Fp if 100 percent pervious cover						= 16.26*(5/60)= 16.26*0.0833					
						= 1.36 INCHES					
						Flood Volume = Effective Rain * Area					
						= 1.36*(1/12)*0.18 ACRES					
						0.02 ACRE-FEET					
						Plate E-2.2					

APPENDIX VII

HYRAULICS CALCULATIONS

Northwest Basin - 12-in PVC

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.00500	ft/ft
Diameter	1.00	ft
Discharge	2.77	ft ³ /s

Results

Normal Depth	0.76	ft
Flow Area	0.64	ft ²
Wetted Perimeter	2.13	ft
Hydraulic Radius	0.30	ft
Top Width	0.85	ft
Critical Depth	0.71	ft
Percent Full	76.3	%
Critical Slope	0.00587	ft/ft
Velocity	4.31	ft/s
Velocity Head	0.29	ft
Specific Energy	1.05	ft
Froude Number	0.87	
Maximum Discharge	3.20	ft ³ /s
Discharge Full	2.98	ft ³ /s
Slope Full	0.00433	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	76.34	%
Downstream Velocity	Infinity	ft/s

Northwest Basin - 12-in PVC

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.76	ft
Critical Depth	0.71	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.00587	ft/ft

Southeast Basin - 15-in RCP

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Diameter	1.25	ft
Discharge	5.27	ft³/s

Results

Normal Depth	0.86	ft
Flow Area	0.90	ft²
Wetted Perimeter	2.44	ft
Hydraulic Radius	0.37	ft
Top Width	1.16	ft
Critical Depth	0.93	ft
Percent Full	68.6	%
Critical Slope	0.00814	ft/ft
Velocity	5.87	ft/s
Velocity Head	0.54	ft
Specific Energy	1.39	ft
Froude Number	1.18	
Maximum Discharge	6.95	ft³/s
Discharge Full	6.46	ft³/s
Slope Full	0.00666	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	68.64	%
Downstream Velocity	Infinity	ft/s

Southeast Basin - 15-in RCP

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.86	ft
Critical Depth	0.93	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.00814	ft/ft

Downstream Pipe - 18-in RCP

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.01000	ft/ft
Diameter	1.50	ft
Discharge	8.04	ft ³ /s

Results

Normal Depth	0.98	ft
Flow Area	1.23	ft ²
Wetted Perimeter	2.83	ft
Hydraulic Radius	0.43	ft
Top Width	1.43	ft
Critical Depth	1.10	ft
Percent Full	65.5	%
Critical Slope	0.00745	ft/ft
Velocity	6.55	ft/s
Velocity Head	0.67	ft
Specific Energy	1.65	ft
Froude Number	1.24	
Maximum Discharge	11.30	ft ³ /s
Discharge Full	10.50	ft ³ /s
Slope Full	0.00586	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	65.55	%
Downstream Velocity	Infinity	ft/s

Downstream Pipe - 18-in RCP

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	0.98	ft
Critical Depth	1.10	ft
Channel Slope	0.01000	ft/ft
Critical Slope	0.00745	ft/ft