



August 12, 2020

Ms. Elizabeth Nijkamp
El Paso County
325 Akers Drive
Colorado Springs, CO 80922

**RE: Amendment to the Preliminary Drainage Report
PCD File No. WSEO 20-1
Front Range Midway Solar Project
Fountain, CO**

Dear Ms. Kijkamp:

CORE is writing this Drainage letter in support of the Major Amendment application to the Wind/Solar Energy Generation Overlay (WSE-O) district approved on April 24, 2018 (WSEO-17-001) for the Front Range Midway Solar Project (Project). Since the WSEO-17-001 approval in 2018, the FRMW Project design has been optimized resulting in changes to the Project boundary, layout and infrastructure. Per WSEO-17-001, many of the FRMW Project details remain the same, including the Applicant's intent to construct, operate, and maintain a 100.2-megawatt (MW) photovoltaic solar energy generation facility. The facilities included in the approved WSEO-17-001 included proposed solar panels, a project substation, and meteorological monitoring devices. The Project now includes the details for an Operations & Management facility and energy storage facility utilizing battery technology that will be coupled to the solar facility. The developable ground has also been reduced thus the project footprint has been revised to fit within the new project limits.

The minor basins within the site largely remained the same. The revised project layout removed the majority of the solar panels within basin A5 from the original approved permit. For this amendment, the original basin A5 has been divided into basins A5A and A5B. Panel layouts in basins A1, A6, and A7 stayed relatively the same. Panels in A8 were reduced with basin A10 and A11 still containing the largest concentration of panels. Basin A9 was combined with basin 12 from the original approved permit and now extends to the northeast corner of the property. The original preliminary drainage report had detention facilities serving both basin A9 and A12 in the original report. With the combination of these two areas in this amendment, the pond location has been consolidated into one site. Other than the consolidation of this pond location, all other detention facilities remain generally in the same locations as shown in the original preliminary drainage report.

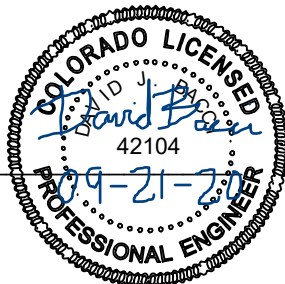
Basin 12 has been redefined as the southeastern tip of the project. Flows entering this basin from the detention pond in basin A10 will be reduced from predevelopment conditions due to the full spectrum detention facility. The basin itself will remain undeveloped and flows will remain historic.

The hydrology has been updated to represent the revised project footprint. Current rational method and Colorado Urban Hydrograph Procedure spreadsheets were used to determine the minor (5-yr) and major (100-yr) storm runoff. NOAA Atlas 14, volume 8, version 2, point precipitation frequency estimates from the Fountain station were used when calculating the hydrology. Extended Detention Basins have been recalculated utilizing the Mile High Flood District Detention spreadsheet version 4.03. The calculations are attached.

Design Engineer's Statement:

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by the County for drainage reports and said report is in conformity with the applicable master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omissions on my part in preparing this report.

David Bacci, P.E. #42104



Date

Owner/Developer's Statement:

I, the owner/developer have read and will comply with all of the requirements specified in this drainage report and plan.

Scott Zeimetz
Scott Zeimetz, authorized person
Front Range-Midway Solar Project, LLC
422 Admiral Blvd.
Kansas City, Missouri 64106

September 22, 2020 | 5:43 AM PDT

Date

El Paso County:

Filed in accordance with the requirements of the Drainage Criteria Manual, Volumes 1 and 2, El Paso County Engineering Criteria Manual and Land Development Code as amended.

Jennifer Irvine, P.E.
County Engineer / ECM Administrator

Date

Conditions:

NOAA Atlas 14, Volume 8, Version 2 FOUNTAIN

Station ID: 05-3063

Location name: Fountain, Colorado, USA*

Latitude: 38.6778°, Longitude: -104.7014°

Elevation:

Elevation (station metadata): 5560 ft**

* source: ESRI Maps

** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Deborah Martin, Sandra Pavlovic, Ishani Roy, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Michael Yekta, Geoffrey Bonnin

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps & aerals](#)

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	0.267 (0.215-0.337)	0.319 (0.257-0.403)	0.413 (0.331-0.524)	0.500 (0.398-0.637)	0.631 (0.489-0.852)	0.743 (0.558-1.01)	0.863 (0.623-1.21)	0.994 (0.684-1.44)	1.18 (0.777-1.76)	1.33 (0.847-2.00)
10-min	0.390 (0.315-0.493)	0.467 (0.376-0.590)	0.605 (0.485-0.767)	0.732 (0.583-0.933)	0.925 (0.716-1.25)	1.09 (0.817-1.49)	1.26 (0.912-1.77)	1.46 (1.00-2.10)	1.73 (1.14-2.57)	1.95 (1.24-2.93)
15-min	0.476 (0.384-0.601)	0.569 (0.458-0.720)	0.737 (0.591-0.936)	0.892 (0.711-1.14)	1.13 (0.874-1.52)	1.33 (0.997-1.81)	1.54 (1.11-2.16)	1.78 (1.22-2.56)	2.11 (1.39-3.14)	2.38 (1.51-3.57)
30-min	0.674 (0.543-0.851)	0.804 (0.648-1.02)	1.04 (0.835-1.32)	1.26 (1.00-1.61)	1.59 (1.23-2.15)	1.88 (1.41-2.56)	2.18 (1.57-3.06)	2.51 (1.73-3.63)	2.99 (1.96-4.44)	3.37 (2.14-5.06)
60-min	0.864 (0.696-1.09)	1.01 (0.815-1.28)	1.30 (1.04-1.65)	1.57 (1.25-2.01)	2.01 (1.57-2.74)	2.40 (1.81-3.29)	2.82 (2.04-3.98)	3.29 (2.27-4.78)	3.98 (2.63-5.95)	4.55 (2.89-6.83)
2-hr	1.05 (0.854-1.32)	1.22 (0.988-1.53)	1.56 (1.25-1.96)	1.89 (1.51-2.39)	2.43 (1.92-3.31)	2.92 (2.22-4.00)	3.46 (2.53-4.87)	4.08 (2.84-5.90)	4.98 (3.32-7.40)	5.73 (3.68-8.54)
3-hr	1.16 (0.939-1.45)	1.32 (1.07-1.65)	1.67 (1.35-2.10)	2.03 (1.63-2.56)	2.64 (2.09-3.59)	3.19 (2.44-4.37)	3.82 (2.81-5.37)	4.53 (3.18-6.56)	5.60 (3.76-8.31)	6.49 (4.19-9.65)
6-hr	1.33 (1.08-1.65)	1.50 (1.22-1.86)	1.87 (1.52-2.34)	2.28 (1.84-2.85)	2.97 (2.38-4.04)	3.61 (2.80-4.94)	4.35 (3.23-6.10)	5.20 (3.69-7.49)	6.47 (4.39-9.56)	7.54 (4.92-11.1)
12-hr	1.49 (1.22-1.83)	1.69 (1.39-2.09)	2.13 (1.74-2.64)	2.58 (2.09-3.21)	3.33 (2.68-4.47)	4.02 (3.12-5.43)	4.80 (3.58-6.65)	5.68 (4.06-8.10)	6.99 (4.78-10.2)	8.09 (5.33-11.9)
24-hr	1.66 (1.37-2.04)	1.94 (1.60-2.38)	2.46 (2.02-3.03)	2.98 (2.43-3.68)	3.79 (3.04-5.00)	4.50 (3.51-6.00)	5.30 (3.97-7.25)	6.17 (4.43-8.70)	7.46 (5.14-10.8)	8.52 (5.67-12.4)
2-day	1.86 (1.54-2.26)	2.22 (1.84-2.71)	2.87 (2.37-3.51)	3.46 (2.84-4.25)	4.36 (3.49-5.66)	5.11 (3.99-6.72)	5.92 (4.46-8.00)	6.80 (4.91-9.47)	8.05 (5.59-11.5)	9.07 (6.10-13.1)
3-day	2.01 (1.67-2.44)	2.37 (1.97-2.88)	3.03 (2.51-3.69)	3.64 (3.00-4.46)	4.58 (3.69-5.93)	5.37 (4.21-7.04)	6.23 (4.72-8.39)	7.17 (5.21-9.95)	8.51 (5.95-12.2)	9.61 (6.50-13.8)
4-day	2.16 (1.80-2.61)	2.51 (2.09-3.05)	3.17 (2.63-3.85)	3.79 (3.12-4.62)	4.74 (3.84-6.14)	5.57 (4.38-7.29)	6.47 (4.92-8.70)	7.45 (5.44-10.3)	8.88 (6.23-12.7)	10.0 (6.83-14.4)
7-day	2.61 (2.18-3.14)	2.98 (2.49-3.59)	3.66 (3.05-4.42)	4.31 (3.57-5.23)	5.32 (4.33-6.84)	6.19 (4.91-8.06)	7.15 (5.48-9.56)	8.20 (6.03-11.3)	9.73 (6.89-13.8)	11.0 (7.53-15.7)
10-day	3.00 (2.51-3.59)	3.41 (2.86-4.09)	4.15 (3.47-5.00)	4.85 (4.03-5.87)	5.93 (4.83-7.57)	6.84 (5.43-8.85)	7.84 (6.02-10.4)	8.92 (6.59-12.2)	10.5 (7.46-14.8)	11.8 (8.11-16.8)
20-day	3.98 (3.36-4.75)	4.57 (3.85-5.45)	5.59 (4.69-6.68)	6.47 (5.41-7.78)	7.77 (6.33-9.76)	8.82 (7.03-11.3)	9.93 (7.66-13.0)	11.1 (8.24-15.0)	12.7 (9.12-17.8)	14.0 (9.78-19.8)
30-day	4.78 (4.04-5.67)	5.51 (4.66-6.55)	6.75 (5.69-8.04)	7.79 (6.53-9.33)	9.27 (7.55-11.5)	10.4 (8.32-13.2)	11.6 (8.98-15.1)	12.8 (9.56-17.2)	14.5 (10.4-20.1)	15.8 (11.1-22.2)
45-day	5.78 (4.91-6.83)	6.69 (5.68-7.92)	8.18 (6.92-9.71)	9.40 (7.91-11.2)	11.1 (9.02-13.6)	12.4 (9.87-15.5)	13.6 (10.6-17.6)	14.9 (11.1-19.8)	16.6 (12.0-22.8)	17.8 (12.6-25.0)
60-day	6.65 (5.66-7.84)	7.70 (6.54-9.08)	9.37 (7.94-11.1)	10.7 (9.05-12.8)	12.5 (10.2-15.4)	13.9 (11.1-17.3)	15.2 (11.8-19.5)	16.5 (12.4-21.9)	18.2 (13.2-24.9)	19.4 (13.8-27.2)

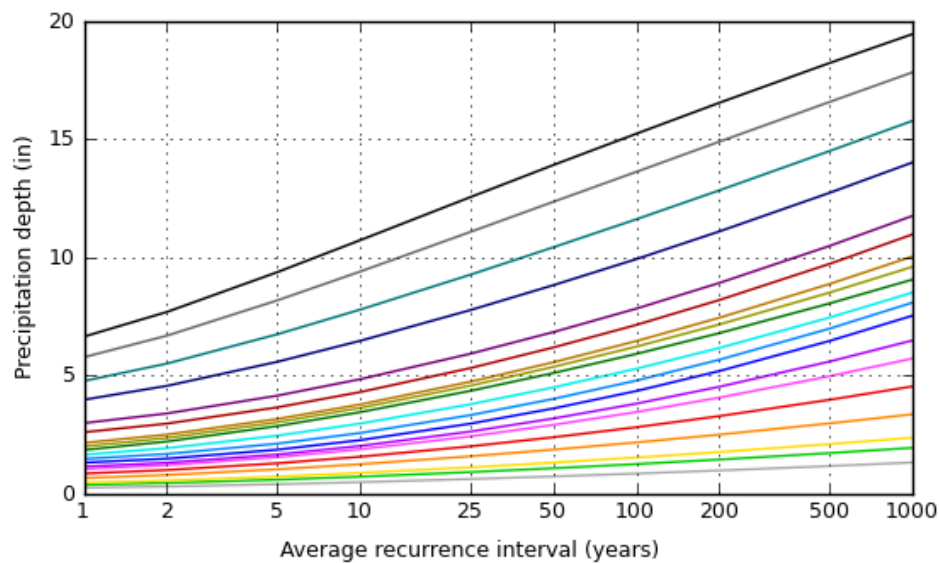
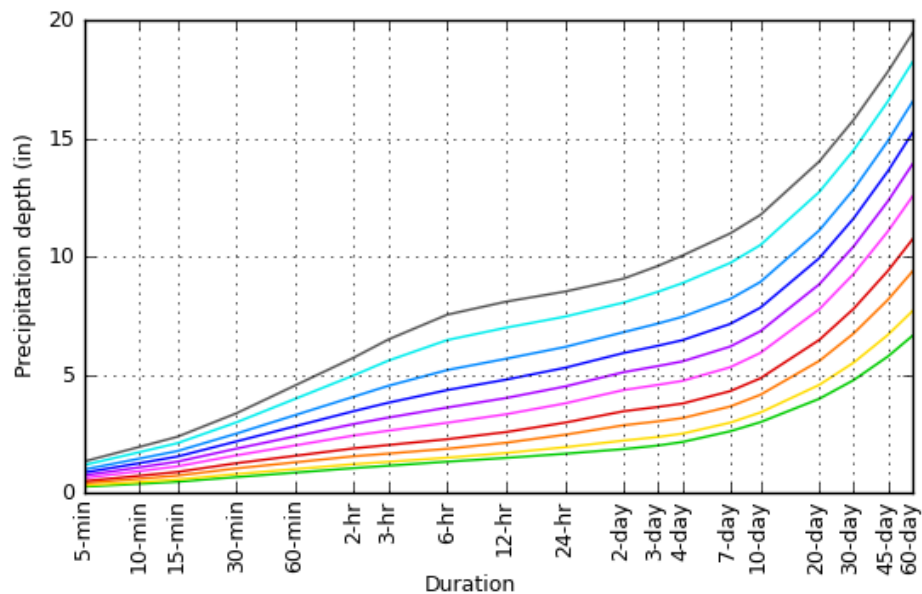
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average 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.

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PF graphical

PDS-based depth-duration-frequency (DDF) curves

Latitude: 38.6778°, Longitude: -104.7014°

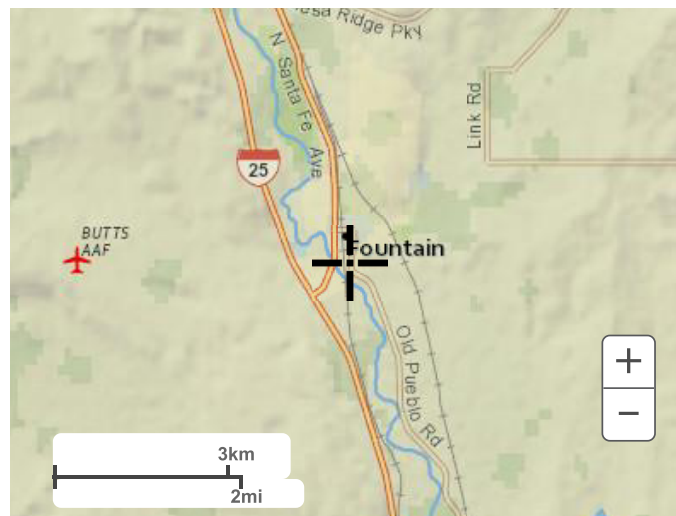


NOAA Atlas 14, Volume 8, Version 2

Created (GMT): Fri Jun 5 18:04:07 2020

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Small scale terrain



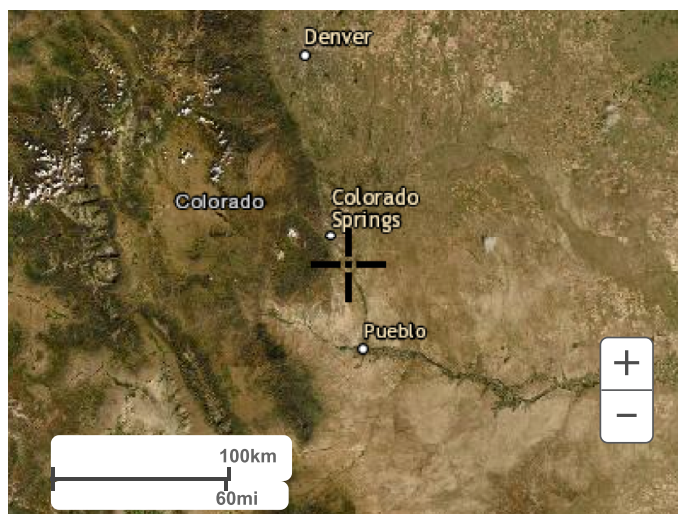
Large scale terrain



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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FRONT RANGE MIDWAY SOLAR PROJECT

CORE Project #: 19-177

Prepared By: DJB

COMPOSITE BASIN - WEIGHTED "C" CALCULATIONS

-REFERENCE UDFCD Vol.1 RUNOFF Table 6-3

				Lawns				
				Clay Soil				
		Streets: Gravel	Gravel	2-7% Slope	>7% Slope	Historic		
% Imperv.		80.00%	40.00%	2.00%	2.00%	2.00%		
	Design						Total	Percent
BASIN	Point	Area	Area	Area	Area	Area	Area	Impervious
A-1	1	-	-	-	-	31.30	31.30	2.0%
A-2	2	-	-	-	-	72.65	72.65	2.0%
A-3	3	-	-	-	-	107.81	107.81	2.0%
A-4	4	-	-	-	-	33.49	33.49	2.0%
A-5B	5B	-	-	-	-	10.24	10.24	2.0%
A-6	6	-	-	-	-	34.04	34.04	2.0%
A-7	7	-	-	-	-	55.40	55.40	2.0%
A-8	8	-	-	-	-	89.54	89.54	2.0%
A-9	9	-	-	-	-	48.32	48.32	2.0%
A-12	12	-	-	-	-	28.57	28.57	2.0%

FRONT RANGE MID

CORE Project #: 19-177

Prepared By: DJB

COMPOSITE EXISTING BASIN -WEIGHTED "C" CALCULATIONS

-REFERENCE UDFCD Vol.1 RUNOFF Table 6-4

i = % imperviousness/100 expressed as a decimal

C_A = Runoff coefficient for NRCS HSG A soils

C_B = Runoff coefficient for NRCS HSG B soils

C_{CD} = Runoff coefficient for NRCS HSG C and D soils.

Natural Resource Conservation Service (NRCS)

Table 6-4. Runoff coefficient equations based on NRCS soil group and storm return period

NRCS Soil Group	Storm Return Period						
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
A	$C_A = 0.84i^{1.302}$	$C_A = 0.86i^{1.276}$	$C_A = 0.87i^{1.232}$	$C_A = 0.84i^{1.124}$	$C_A = 0.85i+0.025$	$C_A = 0.78i+0.110$	$C_A = 0.65i+0.254$
B	$C_B = 0.84i^{1.169}$	$C_B = 0.86i^{1.088}$	$C_B = 0.81i+0.057$	$C_B = 0.63i+0.249$	$C_B = 0.56i+0.328$	$C_B = 0.47i+0.426$	$C_B = 0.37i+0.536$
C/D	$C_{CD} = 0.83i^{1.122}$	$C_{CD} = 0.82i+0.035$	$C_{CD} = 0.74i+0.132$	$C_{CD} = 0.56i+0.319$	$C_{CD} = 0.49i+0.393$	$C_{CD} = 0.41i+0.484$	$C_{CD} = 0.32i+0.588$

Basin ID	% Imperv.	i	Soil Type	Runoff Coefficients, C				Basin Area	Total Area	Weighted Runoff Coefficients, C			
				2-Year	5-Year	10-Year	100-Year			2-Year	5-Year	10-Year	100-Year
A-1	2.0%	0.02	A	0.01	0.01	0.01	0.13	31.30	31.30	0.01	0.05	0.15	0.49
			B	0.01	0.01	0.07	0.44						
			C or D	0.01	0.05	0.15	0.49						
A-2	2.0%	0.02	A	0.01	0.01	0.01	0.13	72.65	72.65	0.01	0.05	0.15	0.49
			B	0.01	0.01	0.07	0.44						
			C or D	0.01	0.05	0.15	0.49						
A-3	2.0%	0.02	A	0.01	0.01	0.01	0.13	107.81	107.81	0.01	0.05	0.15	0.49
			B	0.01	0.01	0.07	0.44						
			C or D	0.01	0.05	0.15	0.49						
A-4	2.0%	0.02	A	0.01	0.01	0.01	0.13	33.49	33.49	0.01	0.05	0.15	0.49
			B	0.01	0.01	0.07	0.44						
			C or D	0.01	0.05	0.15	0.49						
A-5B	2.0%	0.02	A	0.01	0.01	0.01	0.13	10.24	10.24	0.01	0.05	0.15	0.49
			B	0.01	0.01	0.07	0.44						
			C or D	0.01	0.05	0.15	0.49						
A-6	2.0%	0.02	A	0.01	0.01	0.01	0.13	34.04	34.04	0.01	0.05	0.15	0.49
			B	0.01	0.01	0.07	0.44						
			C or D	0.01	0.05	0.15	0.49						

Basin ID	% Imperv.	<i>i</i>	Soil Type	Runoff Coefficients, C				Basin Area	Total Area	Weighted Runoff Coefficients, C			
				2-Year	5-Year	10-Year	100-Year			2-Year	5-Year	10-Year	100-Year
A-7	2.0%	0.02	A	0.01	0.01	0.01	0.13	55.40	55.40	0.01	0.05	0.15	0.49
			B	0.01	0.01	0.07	0.44						
			C or D	0.01	0.05	0.15	0.49						
A-8	2.0%	0.02	A	0.01	0.01	0.01	0.13	89.54	89.54	0.01	0.05	0.15	0.49
			B	0.01	0.01	0.07	0.44						
			C or D	0.01	0.05	0.15	0.49						
A-9	2.0%	0.02	A	0.01	0.01	0.01	0.13	48.32	48.32	0.01	0.05	0.15	0.49
			B	0.01	0.01	0.07	0.44						
			C or D	0.01	0.05	0.15	0.49						
A-12	2.0%	0.02	A	0.01	0.01	0.01	0.13	28.57	28.57	0.01	0.05	0.15	0.49
			B	0.01	0.01	0.07	0.44						
			C or D	0.01	0.05	0.15	0.49						

FRONT RANGE MIDWAY SOLAR PROJECT

CORE Project #: 19-177

Prepared By: DJB

TIME OF CONCENTRATION CALCULATIONS

-REFERENCE UDFCD Vol.1 Section 2.4

NRCS Conveyance factors, K -REFERENCE UDFCD Vol.1 RUNOFF Table 6-2

SF-2

Heavy Meadow 2.50 Short Grass Pasture & Lawns 7.00 Grassed Waterway 15.00
Tillage/field 5.00 Nearly Bare Ground 10.00 Paved Area & Shallow Gutter 20.00

SUB-BASIN DATA			INITIAL / OVERLAND TIME				CHANNEL / TRAVEL TIME T(t)							T(c) CHECK (URBANIZED BASINS)		FINAL T(c)
DRAIN BASIN	AREA ac.	C(5)	Length ft.	Elev Change	Slope %	T(i) min	Length ft.	Elev Change	Slope %	Coeff.	Velocity fps	T(t) min.	COMP. T(c)	% IMPER-VIOUS	USDCM Eq . 6-5	min.
A-1	31.30	0.05	300	2.7	0.9	34.1	1170	34.9	3.0	7.0	1.2	16.1	50.2	2.0%	37.8	37.8
A-2	72.65	0.05	300	3.1	1.0	32.4	1665	22.1	1.3	7.0	0.8	34.4	66.8	2.0%	51.6	51.6
A-3	107.81	0.05	300	5.5	1.8	26.8	2883	45.3	1.6	7.0	0.9	54.8	81.6	2.0%	67.0	67.0
A-4	33.49	0.05	300	2.2	0.7	36.2	3635	44.7	1.2	7.0	0.8	78.0	114.2	2.0%	84.5	84.5
A-5B	10.24	0.05	300	6.0	2.0	26.1	908	33.7	3.7	7.0	1.3	11.2	37.3	2.0%	34.1	34.1
A-6	34.04	0.05	300	4.6	1.5	28.4	1318	24.3	1.8	7.0	1.0	23.1	51.5	2.0%	43.1	43.1
A-7	55.40	0.05	300	8.8	2.9	23.0	2169	50.2	2.3	7.0	1.1	33.9	56.9	2.0%	51.3	51.3
A-8	89.54	0.05	300	5.3	1.8	27.2	3108	77.7	2.5	7.0	1.1	46.8	74.0	2.0%	61.0	61.0
A-9	48.32	0.05	300	8.9	3.0	22.9	2163	70.0	3.2	7.0	1.3	28.6	51.5	2.0%	47.3	47.3
A-12	28.57	0.05	300	5.0	1.7	27.7	2235	49.0	2.2	7.0	1.0	35.9	63.6	2.0%	52.8	52.8

FRONT RANGE MIDWAY SOLAR PROJECT

CORE Project #: 19-177

Prepared By: DJB

RATIONAL METHOD PEAK RUNOFF

5-Year STORM

Rainfall Depth-Duration-Frequency (1-hr) = 1.3

SF-3

-REFERENCE UDFCD Vol.1 EQ 5-1 & EQ 6-1

BASIN INFORMATON				DIRECT RUNOFF			
DESIGN POINT	DRAIN BASIN	AREA ac.	5yr Runoff COEFF	T(c) min	C x A	I in/hr	Q cfs
1	A-1	31.30	0.05	37.8	1.61	1.77	2.9
2	A-2	72.65	0.05	51.6	3.73	1.45	5.4
3	A-3	107.81	0.05	67.0	5.54	1.22	6.8
4	A-4	33.49	0.05	84.5	1.72	1.04	1.8
5B	A-5B	10.24	0.05	34.1	0.53	1.89	1.0
6	A-6	34.04	0.05	43.1	1.75	1.63	2.9
7	A-7	55.40	0.05	51.3	2.85	1.46	4.2
8	A-8	89.54	0.05	61.0	4.60	1.30	6.0
9	A-9	48.32	0.05	47.3	2.48	1.54	3.8
12	A-12	28.57	0.05	52.8	1.47	1.43	2.1

FRONT RANGE MIDWAY SOLAR PROJECT

CORE Project #: 19-177

Prepared By: DJB

RATIONAL METHOD PEAK RUNOFF

100-YR STORM

SF-3 Rainfall Depth-Duration-Frequency (1-hr) = **2.82**

-REFERENCE UDFCD Vol.1 EQ 5-1 & EQ 6-1

BASIN INFORMATION				DIRECT RUNOFF			
DESIGN POINT	DRAIN BASIN	AREA ac.	100yr RUNOFF COEFF C	T(c) min	C x A	I in/hr	Q cfs
1	A-1	31.30	0.49	37.83	15.41	3.84	59.23
2	A-2	72.65	0.49	51.62	35.76	3.15	112.65
3	A-3	107.81	0.49	66.99	53.06	2.64	140.33
4	A-4	33.49	0.49	84.51	16.48	2.25	37.10
5B	A-5B	10.24	0.49	34.12	5.04	4.10	20.65
6	A-6	34.04	0.49	43.09	16.75	3.54	59.34
7	A-7	55.40	0.49	51.27	27.27	3.16	86.30
8	A-8	89.54	0.49	60.97	44.07	2.82	124.26
9	A-9	48.32	0.49	47.25	23.78	3.34	79.38
12	A-12	28.57	0.49	52.77	14.06	3.11	43.67

FRONT RANGE MIDWAY SOLAR PROJECT

CORE Project #: 19-177

Prepared By: DJB

COMPOSITE BASIN - WEIGHTED "C" CALCULATIONS

-REFERENCE UDFCD Vol.1 RUNOFF Table 6-3

				Lawns		Historic		
				Clay Soil				
		Streets: Gravel	Gravel	2-7% Slope	>7% Slope			
% Imperv.		80.00%	40.00%	2.00%	2.00%	2.00%		
	Design						Total	Percent
BASIN	Point	Area	Area	Area	Area	Area	Area	Impervious
A-1	1	1.48	-	-	-	29.82	31.30	5.7%
A-2	2	4.82	-	-	-	67.83	72.65	7.2%
A-3	3	-	-	-	-	107.81	107.81	2.0%
A-4	4	-	-	-	-	33.49	33.49	2.0%
A-5B	5B	1.20	-	-	-	9.54	10.74	10.7%
A-6	6	1.24	-	-	-	32.80	34.04	4.8%
A-7	7	1.87	-	-	-	53.53	55.40	4.6%
A-8	8	2.08	-	-	-	87.46	89.54	3.8%
A-9	9	1.55	-	-	-	46.77	48.32	4.5%
A-12	12	-	-	-	-	28.57	28.57	2.0%

FRONT RANGE MID

CORE Project #: 19-177

Prepared By: DJB

COMPOSITE DEVELOPED BASIN -WEIGHTED "C" CALCULATIONS

-REFERENCE UDFCD Vol.1 RUNOFF Table 6-4

i = % imperviousness/100 expressed as a decimal

C_A = Runoff coefficient for NRCS HSG A soils

C_B = Runoff coefficient for NRCS HSG B soils

$C_{C/D}$ = Runoff coefficient for NRCS HSG C and D soils.

Natural Resource Conservation Service (NRCS)

Table 6-4. Runoff coefficient equations based on NRCS soil group and storm return period

NRCS Soil Group	Storm Return Period						
	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
A	$C_A = 0.84i^{1.302}$	$C_A = 0.86i^{1.276}$	$C_A = 0.87i^{1.232}$	$C_A = 0.84i^{1.124}$	$C_A = 0.85i+0.025$	$C_A = 0.78i+0.110$	$C_A = 0.65i+0.254$
B	$C_B = 0.84i^{1.169}$	$C_B = 0.86i^{1.088}$	$C_B = 0.81i+0.057$	$C_B = 0.63i+0.249$	$C_B = 0.56i+0.328$	$C_B = 0.47i+0.426$	$C_B = 0.37i+0.536$
C/D	$C_{C/D} = 0.83i^{1.122}$	$C_{C/D} = 0.82i+0.035$	$C_{C/D} = 0.74i+0.132$	$C_{C/D} = 0.56i+0.319$	$C_{C/D} = 0.49i+0.393$	$C_{C/D} = 0.41i+0.484$	$C_{C/D} = 0.32i+0.588$

Basin ID	% Imperv.	i	Soil Type	Runoff Coefficients, C				Basin Area	Total Area	Weighted Runoff Coefficients, C			
				2-Year	5-Year	10-Year	100-Year			2-Year	5-Year	10-Year	100-Year
A-1	5.7%	0.06	A	0.02	0.02	0.03	0.15	31.30	31.30	0.03	0.08	0.17	0.51
			B	0.03	0.04	0.10	0.45						
			C or D	0.03	0.08	0.17	0.51						
A-2	7.2%	0.07	A	0.03	0.03	0.03	0.17	72.65	72.65	0.04	0.09	0.19	0.51
			B	0.04	0.05	0.12	0.46						
			C or D	0.04	0.09	0.19	0.51						
A-3	2.0%	0.02	A	0.01	0.01	0.01	0.13	107.81	107.81	0.01	0.05	0.15	0.49
			B	0.01	0.01	0.07	0.44						
			C or D	0.01	0.05	0.15	0.49						
A-4	2.0%	0.02	A	0.01	0.01	0.01	0.13	33.49	33.49	0.01	0.05	0.15	0.49
			B	0.01	0.01	0.07	0.44						
			C or D	0.01	0.05	0.15	0.49						
A-5B	10.7%	0.11	A	0.05	0.05	0.06	0.19	10.74	10.74	0.07	0.12	0.21	0.53
			B	0.06	0.08	0.14	0.48						
			C or D	0.07	0.12	0.21	0.53						
A-6	4.8%	0.05	A	0.02	0.02	0.02	0.15	34.04	34.04	0.03	0.07	0.17	0.50
			B	0.02	0.03	0.10	0.45						
			C or D	0.03	0.07	0.17	0.50						

Basin ID	% Imperv.	<i>i</i>	Soil Type	Runoff Coefficients, C				Basin Area	Total Area	Weighted Runoff Coefficients, C			
				2-Year	5-Year	10-Year	100-Year			2-Year	5-Year	10-Year	100-Year
A-7	4.6%	0.05	A	0.02	0.02	0.02	0.15	55.40	55.40	0.03	0.07	0.17	0.50
			B	0.02	0.03	0.09	0.45						
			C or D	0.03	0.07	0.17	0.50						
A-8	3.8%	0.04	A	0.01	0.01	0.02	0.14	89.54	89.54	0.02	0.07	0.16	0.50
			B	0.02	0.02	0.09	0.44						
			C or D	0.02	0.07	0.16	0.50						
A-9	4.5%	0.05	A	0.01	0.02	0.02	0.15	48.32	48.32	0.03	0.07	0.17	0.50
			B	0.02	0.03	0.09	0.45						
			C or D	0.03	0.07	0.17	0.50						
A-12	2.0%	0.02	A	0.01	0.01	0.01	0.13	28.57	28.57	0.01	0.05	0.15	0.49
			B	0.01	0.01	0.07	0.44						
			C or D	0.01	0.05	0.15	0.49						

FRONT RANGE MIDWAY SOLAR PROJECT

CORE Project #: 19-177

Prepared By: DJB

TIME OF CONCENTRATION CALCULATIONS

-REFERENCE UDFCD Vol.1 Section 2.4

NRCS Conveyance factors, K -REFERENCE UDFCD Vol.1 RUNOFF Table 6-2

SF-2

Heavy Meadow 2.50 Short Grass Pasture & Lawns 7.00 Grassed Waterway 15.00
Tillage/field 5.00 Nearly Bare Ground 10.00 Paved Area & Shallow Gutter 20.00

SUB-BASIN DATA			INITIAL / OVERLAND TIME				CHANNEL / TRAVEL TIME T(t)							T(c) CHECK (URBANIZED BASINS)		FINAL T(c)
DRAIN BASIN	AREA ac.	C(5)	Length ft.	Elev Change	Slope %	T(i) min	Length ft.	Elev Change	Slope %	Coeff.	Velocity fps	T(t) min.	COMP. T(c)	% IMPER-VIOUS	USDCM Eq . 6-5	min.
A-1	31.30	0.08	300	2.7	0.9	33.1	1170	34.9	3.0	7.0	1.2	16.1	49.3	5.7%	36.6	36.6
A-2	72.65	0.09	300	3.1	1.0	31.1	1665	22.1	1.3	7.0	0.8	34.4	65.5	7.2%	48.9	48.9
A-3	107.81	0.05	300	5.5	1.8	26.8	2883	45.3	1.6	7.0	0.9	54.8	81.6	2.0%	67.0	67.0
A-4	33.49	0.05	300	2.2	0.7	36.2	3635	44.7	1.2	7.0	0.8	78.0	114.2	2.0%	84.5	84.5
A-5B	10.74	0.12	300	6.0	2.0	24.3	908	33.7	3.7	7.0	1.3	11.2	35.5	10.7%	31.7	31.7
A-6	34.04	0.07	300	4.6	1.5	27.8	1318	24.3	1.8	7.0	1.0	23.1	50.9	4.8%	41.9	41.9
A-7	55.40	0.07	300	8.8	2.9	22.5	2169	50.2	2.3	7.0	1.1	33.9	56.4	4.6%	49.8	49.8
A-8	89.54	0.07	300	5.3	1.8	26.8	3108	77.7	2.5	7.0	1.1	46.8	73.6	3.8%	59.7	59.7
A-9	48.32	0.07	300	8.9	3.0	22.4	2163	70.0	3.2	7.0	1.3	28.6	51.1	4.5%	46.0	46.0
A-12	28.57	0.05	300	5.0	1.7	27.7	2235	49.0	2.2	7.0	1.0	35.9	63.6	2.0%	52.8	52.8

FRONT RANGE MIDWAY SOLAR PROJECT

CORE Project #: 19-177

Prepared By: DJB

RATIONAL METHOD PEAK RUNOFF

5-Year STORM

Rainfall Depth-Duration-Frequency (1-hr) = 1.3

SF-3

-REFERENCE UDFCD Vol.1 EQ 5-1 & EQ 6-1

BASIN INFORMATON				DIRECT RUNOFF			
DESIGN POINT	DRAIN BASIN	AREA ac.	5yr Runoff COEFF	T(c) min	C x A	I in/hr	Q cfs
1	A-1	31.30	0.08	36.6	2.56	1.81	4.6
2	A-2	72.65	0.09	48.9	6.82	1.51	10.3
3	A-3	107.81	0.05	67.0	5.54	1.22	6.8
4	A-4	33.49	0.05	84.5	1.72	1.04	1.8
5B	A-5B	10.74	0.12	31.7	1.32	1.98	2.6
6	A-6	34.04	0.07	41.9	2.54	1.66	4.2
7	A-7	55.40	0.07	49.8	4.04	1.49	6.0
8	A-8	89.54	0.07	59.7	5.93	1.32	7.8
9	A-9	48.32	0.07	46.0	3.48	1.56	5.4
12	A-12	28.57	0.05	52.8	1.47	1.43	2.1

FRONT RANGE MIDWAY SOLAR PROJECT

CORE Project #: 19-177

Prepared By: DJB

RATIONAL METHOD PEAK RUNOFF

100-YR STORM

SF-3 Rainfall Depth-Duration-Frequency (1-hr) = **2.82**

-REFERENCE UDFCD Vol.1 EQ 5-1 & EQ 6-1

BASIN INFORMATION				DIRECT RUNOFF			
DESIGN POINT	DRAIN BASIN	AREA ac.	100yr RUNOFF COEFF C	T(c) min	C x A	I in/hr	Q cfs
1	A-1	31.30	0.51	36.56	15.88	3.93	62.36
2	A-2	72.65	0.51	48.86	37.30	3.27	121.82
3	A-3	107.81	0.49	66.99	53.06	2.64	140.33
4	A-4	33.49	0.49	84.51	16.48	2.25	37.10
5B	A-5B	10.74	0.53	31.66	5.67	4.29	24.30
6	A-6	34.04	0.50	41.90	17.15	3.61	61.84
7	A-7	55.40	0.50	49.84	27.87	3.22	89.84
8	A-8	89.54	0.50	59.72	44.74	2.86	127.90
9	A-9	48.32	0.50	46.04	24.28	3.39	82.41
12	A-12	28.57	0.49	52.77	14.06	3.11	43.67

EXISTING 5-YR

Summary of CUHP Input Parameters (Version 2.0.0)

Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			Percent Eff. Imperv.
								Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	
A5A	A5A	5	0.316	0.479	1.072	0.014	2.0	0.35	0.05	3.00	0.50	0.0018	0.00	0.04	0.02	1.62
A10	A10	5	0.370	0.856	1.425	0.019	2.0	0.35	0.05	3.00	0.50	0.0018	0.00	0.04	0.02	1.62
A11	A11	5	0.345	0.785	1.525	0.019	2.0	0.35	0.05	3.00	0.50	0.0018	0.00	0.04	0.02	1.62

EXISTING 5-YR

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.0)

Catchment Name/ID	User Comment for Catchment	Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
		CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
A5A	Existing 5-yr Storm	0.157	0.256	58.1	12.91	30.2	9.12	21.5	163	733,623	0.24	173,242	50.0	36	173,257	0.18
A10	Existing 5-yr Storm	0.157	0.268	77.7	17.50	40.4	12.37	29.2	143	858,967	0.24	202,842	60.0	32	202,840	0.14
A11	Existing 5-yr Storm	0.157	0.262	79.0	17.42	41.1	12.31	29.0	131	800,560	0.24	189,049	60.0	30	189,031	0.13

EXISTING 100-YR

Summary of CUHP Input Parameters (Version 2.0.0)

Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			Percent Eff. Imperv.
								Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	
A5A	A5A	100	0.316	0.479	1.072	0.014	2.0	0.35	0.05	3.00	0.50	0.0018	0.00	0.04	0.02	1.81
A10	A10	100	0.370	0.856	1.425	0.019	2.0	0.35	0.05	3.00	0.50	0.0018	0.00	0.04	0.02	1.81
A11	A11	100	0.345	0.785	1.525	0.019	2.0	0.35	0.05	3.00	0.50	0.0018	0.00	0.04	0.02	1.81

EXISTING 100-YR

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.0)

Catchment Name/ID	User Comment for Catchment	Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
		CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
A5A	Existing 100-yr Storm	0.156	0.255	58.1	12.85	30.2	9.08	21.4	163	733,623	1.84	1,349,173	60.0	248	1,349,302	1.23
A10	Existing 100-yr Storm	0.156	0.267	77.7	17.43	40.4	12.31	29.0	143	858,967	1.84	1,579,688	70.0	233	1,579,673	0.99
A11	Existing 100-yr Storm	0.156	0.261	79.0	17.35	41.1	12.26	28.9	131	800,560	1.84	1,472,275	70.0	215	1,472,127	0.97

PROPOSED 5-YR

Summary of CUHP Input Parameters (Version 2.0.0)

Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			Percent Eff. Imperv.
								Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	
A5A	A5A	5	0.316	0.479	1.072	0.014	2.2	0.35	0.05	3.00	0.50	0.0018	0.00	0.04	0.02	1.78
A10	A10	5	0.370	0.856	1.425	0.019	4.3	0.35	0.05	3.00	0.50	0.0018	0.00	0.09	0.04	3.52
A11	A11	5	0.345	0.785	1.525	0.019	4.3	0.35	0.05	3.00	0.50	0.0018	0.00	0.09	0.04	3.52

PROPOSED 5-YR

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.0)

Catchment Name/ID	User Comment for Catchment	Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
		CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
A5A	Proposed 5-yr Storm	0.156	0.255	58.1	12.86	30.2	9.09	21.4	163	733,623	0.24	174,696	50.0	36	174,712	0.18
A10	Proposed 5-yr Storm	0.150	0.257	77.5	16.78	40.3	11.86	28.0	143	858,967	0.26	222,537	60.0	35	222,533	0.15
A11	Proposed 5-yr Storm	0.150	0.251	78.8	16.71	41.0	11.81	27.9	131	800,560	0.26	207,405	60.0	32	207,385	0.14

PROPOSED 100-YR

Summary of CUHP Input Parameters (Version 2.0.0)

Catchment Name/ID	SWMM Node/ID	Raingage Name/ID	Area (sq.mi.)	Dist. to Centroid (miles)	Length (miles)	Slope (ft./ft.)	Percent Imperv.	Depression Storage		Horton's Infiltration Parameters			DCIA Level and Fractions			Percent Eff. Imperv.
								Pervious (inches)	Imperv. (inches)	Initial Rate (in./hr.)	Final Rate (in.hr.)	Decay Coeff. (1/sec.)	DCIA Level	Dir. Con'ct Imperv. Fraction	Receiv. Perv. Fraction	
A5A	A5A	100	0.316	0.479	1.072	0.014	2.2	0.35	0.05	3.00	0.50	0.0018	0.00	0.04	0.02	2.00
A10	A10	100	0.370	0.856	1.425	0.019	4.3	0.35	0.05	3.00	0.50	0.0018	0.00	0.09	0.04	3.92
A11	A11	100	0.345	0.785	1.525	0.019	4.3	0.35	0.05	3.00	0.50	0.0018	0.00	0.09	0.04	3.92

PROPOSED 100-YR

Summary of Unit Hydrograph Parameters Used By Program and Calculated Results (Version 2.0.0)

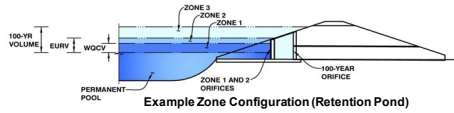
Catchment Name/ID	User Comment for Catchment	Unit Hydrograph Parameters and Results									Excess Precip.		Storm Hydrograph			
		CT	Cp	W50 (min.)	W50 Before Peak	W75 (min.)	W75 Before Peak	Time to Peak (min.)	Peak (cfs)	Volume (c.f)	Excess (inches)	Excess (c.f.)	Time to Peak (min.)	Peak Flow (cfs)	Total Volume (c.f.)	Runoff per Unit Area (cfs/acre)
A5A	Proposed 100-yr Storm	0.156	0.254	58.1	12.81	30.2	9.05	21.3	163	733,623	1.84	1,350,808	60.0	248	1,350,947	1.23
A10	Proposed 100-yr Storm	0.148	0.254	77.5	16.63	40.3	11.75	27.7	143	858,967	1.86	1,601,749	70.0	236	1,601,695	1.00
A11	Proposed 100-yr Storm	0.148	0.249	78.7	16.56	40.9	11.70	27.6	131	800,560	1.86	1,492,836	70.0	217	1,492,709	0.98

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: **Front Range - Midway Solar Project**

Basin ID: **Basin A1**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB
Watershed Area =	31.30 acres
Watershed Length =	1,470 ft
Watershed Length to Centroid =	530 ft
Watershed Slope =	0.026 ft/ft
Watershed Imperviousness =	5.70% percent
Percentage Hydrologic Soil Group A =	0.0% percent
Percentage Hydrologic Soil Group B =	0.0% percent
Percentage Hydrologic Soil Groups C/D =	100.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Water Quality Capture Volume (WQCV) =	0.106 acre-feet
Excess Urban Runoff Volume (EURV) =	0.142 acre-feet
2-yr Runoff Volume (P1 = 1.01 in.) =	0.209 acre-feet
5-yr Runoff Volume (P1 = 1.3 in.) =	0.706 acre-feet
10-yr Runoff Volume (P1 = 1.57 in.) =	1.295 acre-feet
25-yr Runoff Volume (P1 = 2.01 in.) =	2.582 acre-feet
50-yr Runoff Volume (P1 = 2.4 in.) =	3.589 acre-feet
100-yr Runoff Volume (P1 = 2.82 in.) =	4.886 acre-feet
500-yr Runoff Volume (P1 = 3.98 in.) =	8.083 acre-feet
Approximate 2-yr Detention Volume =	0.095 acre-feet
Approximate 5-yr Detention Volume =	0.300 acre-feet
Approximate 10-yr Detention Volume =	0.455 acre-feet
Approximate 25-yr Detention Volume =	0.605 acre-feet
Approximate 50-yr Detention Volume =	0.651 acre-feet
Approximate 100-yr Detention Volume =	1.002 acre-feet

Optional User Overrides

	acre-feet
1.01	inches
1.30	inches
1.57	inches
2.01	inches
2.40	inches
2.82	inches
3.98	inches

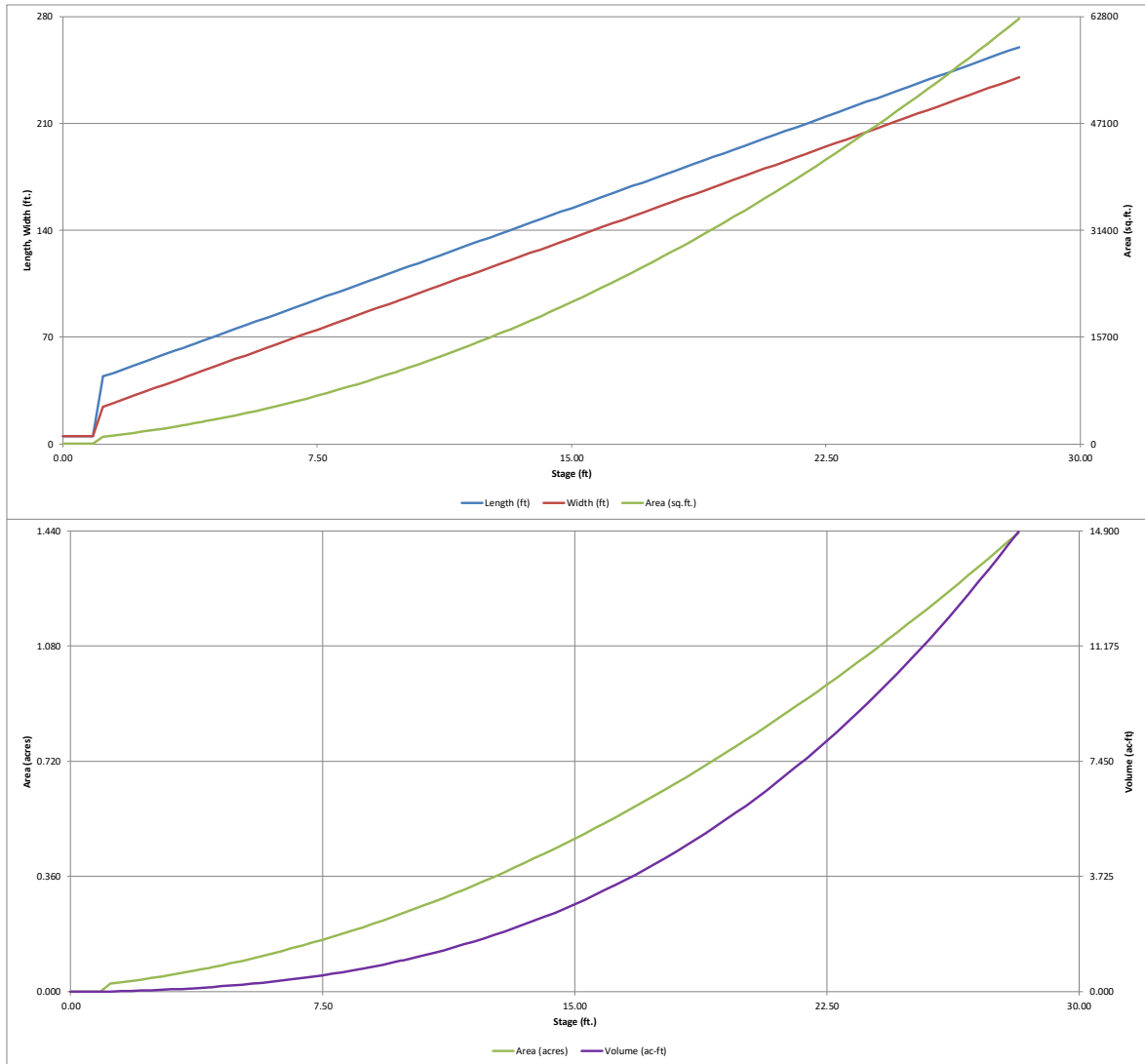
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.106 acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.036 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.860 acre-feet
Total Detention Basin Volume =	1.002 acre-feet
Initial Surge Volume (ISV) =	14 ft ³
Initial Surge Depth (ISD) =	0.50 ft
Total Available Detention Depth (H _{total}) =	9.90 ft
Depth of Trickle Channel (H _{TC}) =	0.50 ft
Slope of Trickle Channel (S _{TC}) =	0.005 ft/ft
Slopes of Main Basin Sides (S _{main}) =	4 ft/V
Basin Length-to-Width Ratio (L _W) =	2
Initial Surge Area (A _{ISV}) =	28 ft ²
Surcharge Volume Length (L _{SV}) =	5.3 ft
Surcharge Volume Width (W _{SV}) =	5.3 ft
Depth of Basin Floor (H _{floor}) =	0.19 ft
Length of Basin Floor (L _{floor}) =	44.0 ft
Width of Basin Floor (W _{floor}) =	24.3 ft
Area of Basin Floor (A _{floor}) =	1,069 ft ²
Volume of Basin Floor (V _{floor}) =	80 ft ³
Depth of Main Basin (H _{main}) =	8.71 ft
Length of Main Basin (L _{main}) =	113.7 ft
Width of Main Basin (W _{main}) =	94.0 ft
Area of Main Basin (A _{main}) =	10,683 ft ²
Volume of Main Basin (V _{main}) =	43,930 ft ³
Calculated Total Basin Volume (V _{total}) =	1.011 acre-feet

Depth Increment =	0.30								
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft ²)	Optional Override Area (ft ²)	Area (acre)	Volume (ft ³)	Volume (ac-ft)
Top of Micropool	0.00		5.3	5.3	28		0.001		
ISV	0.50		5.3	5.3	28		0.001	14	0.000
	0.60		5.3	5.3	28		0.001	17	0.000
	0.90		5.3	5.3	28		0.001	25	0.001
Floor	1.19		44.0	24.3	1,069		0.025	109	0.002
	1.20		44.1	24.4	1,074		0.025	119	0.003
	1.50		46.5	26.8	1,244		0.029	467	0.011
	1.80		48.9	29.2	1,426		0.033	867	0.020
	2.10		51.3	31.6	1,619		0.037	1,323	0.030
	2.40		53.7	34.0	1,824		0.042	1,840	0.042
	2.70		56.1	36.4	2,040		0.047	2,419	0.056
	3.00		58.5	38.8	2,267		0.052	3,065	0.070
	3.30		60.9	41.2	2,507		0.058	3,780	0.087
	3.60		63.3	43.6	2,757		0.063	4,570	0.105
Zone 1 (WQCV)	3.63		63.6	43.8	2,783		0.064	4,653	0.107
	3.90		65.7	46.0	3,020		0.069	5,436	0.125
Zone 2 (EURV)	4.14		67.6	47.9	3,238		0.074	6,187	0.142
	4.20		68.1	48.4	3,293		0.076	6,383	0.147
	4.50		70.5	50.8	3,579		0.082	7,413	0.170
	4.80		72.9	53.2	3,875		0.089	8,531	0.196
	5.10		75.3	55.6	4,184		0.096	9,739	0.224
	5.40		77.7	58.0	4,503		0.103	11,042	0.253
	5.70		80.1	60.4	4,835		0.111	12,443	0.286
	6.00		82.5	62.8	5,178		0.119	13,944	0.320
	6.30		84.9	65.2	5,532		0.127	15,550	0.357
	6.60		87.3	67.6	5,898		0.135	17,265	0.396
	6.90		89.7	70.0	6,275		0.144	19,090	0.438
	7.20		92.1	72.4	6,664		0.153	21,031	0.483
	7.50		94.5	74.8	7,065		0.162	23,090	0.530
	7.80		96.9	77.2	7,477		0.172	25,271	0.580
	8.10		99.3	79.6	7,900		0.181	27,577	0.633
	8.40		101.7	82.0	8,335		0.191	30,013	0.689
	8.70		104.1	84.4	8,782		0.202	32,580	0.748
	9.00		106.5	86.8	9,240		0.212	35,283	0.810
	9.30		108.9	89.2	9,710		0.223	38,125	0.875
	9.60		111.3	91.6	10,191		0.234	41,110	0.944
Zone 3 (100-year)	9.85		113.3	93.6	10,600		0.243	43,708	1.003
	9.90		113.7	94.0	10,683		0.245	44,241	1.016
	10.20		116.1	96.4	11,188		0.257	47,521	1.091
	10.50		118.5	98.8	11,703		0.269	50,954	1.170
	10.80		120.9	101.2	12,230		0.281	54,544	1.252
	11.10		123.3	103.6	12,769		0.293	58,294	1.338
	11.40		125.7	106.0	13,319		0.306	62,207	1.428
	11.70		128.1	108.4	13,881		0.319	66,286	1.522
	12.00		130.5	110.8	14,454		0.332	70,536	1.619
	12.30		132.9	113.2	15,039		0.345	74,960	1.721
	12.60		135.3	115.6	15,635		0.359	79,561	1.826
	12.90		137.7	118.0	16,243		0.373	84,343	1.936
	13.20		140.1	120.4	16,863		0.387	89,308	2.050
	13.50		142.5	122.8	17,493		0.402	94,461	2.169
	13.80		144.9	125.2	18,136		0.416	99,805	2.291
	14.10		147.3	127.6	18,790		0.431	105,344	2.418
	14.40		149.7	130.0	19,455		0.447	111,080	2.550
	14.70		152.1	132.4	20,132		0.462	117,018	2.686
	15.00		154.5	134.8	20,821		0.478	123,161	2.827
	15.30		156.9	137.2	21,521		0.494	129,512	2.973
	15.60		159.3	139.6	22,232		0.510	136,074	3.124
	15.90		161.7	142.0	22,955		0.527	142,852	3.279
	16.20		164.1	144.4	23,690		0.544	149,849	3.440
	16.50		166.5	146.8	24,436		0.561	157,067	3.606
	16.80		168.9	149.2	25,193		0.578	164,511	3.777
	17.10		171.3	151.6	25,962		0.596	172,184	3.953
	17.40		173.7	154.0	26,743		0.614	180,090	4.134
	17.70		176.1	156.4	27,535		0.632	188,231	4.321
	18.00		178.5	158.8	28,339		0.651	196,612	4.514
	18.30		180.9	161.2	29,154		0.669	205,236	4.712
	18.60		183.3	163.6	29,981		0.688	214,106	4.915
	18.90		185.7	166.0	30,819		0.708	223,226	5.125
	19.20		188.1	168.4	31,669		0.727	232,598	5.340
	19.50		190.5	170.8	32,530		0.747	242,228	5.561
	19.80		192.9	173.2	33,403		0.767	252,118	5.788
	20.10		195.3	175.6	34,287		0.787	262,271	6.021
	20.40		197.7	178.0	35,183		0.808	272,691	6.260
	20.70		200.1	180.4	36,090		0.829	283,382	6.506
	21.00		202.5	182.8	37,009		0.850	294,347	6.757
	21.30		204.9	185.2	37,940		0.871	305,589	7.015
	21.60		207.3	187.6	38,882		0.893	317,111	7.280
	21.90		209.7	190.0	39,835		0.914	328,919	7.551
	22.20		212.1	192.4	40,800		0.937	341,014	7.829
	22.50		214.5	194.8	41,776		0.959	353,400	8.113
	22.80		216.9	197.2	42,764		0.982	366,081	8.404
	23.10		219.3	199.6	43,764		1.005	379,060	8.702
	23.40		221.7	202.0	44,775		1.028	392,340	9.007
	23.70		224.1	204.4	45,797		1.051	405,926	9.319
	24.00		226.5	206.8	46,832		1.075	419,820	9.638
	24.30		228.9	209.2	47,877		1.099	434,026	9.964
	24.60		231.3	211.6	48,934		1.123	448,547	10.297
	24.90		233.7	214.0	50,003		1.148	463,388	10.638
	25.20		236.1	216.4	51,083		1.173	478,550	10.986
	25.50		238.5	218.8	52,175		1.198	494,039	11.342
	25.80		240.9	221.2	53,278		1.223	509,856	11.705
	26.10		243.3	223.6	54,393		1.249	526,006	12.075
	26.40		245.7	226.0	55,519		1.275	542,493	12.454
	26.70		248.1	228.4	56,657		1.301	559,319	12.840
	27.00		250.5	230.8	57,806		1.327	576,488	13.234
	27.30		252.9	233.2	58,967		1.354	594,004	13.636
	27.60		255.3	235.6	60,139		1.381	611,869	14.047
	27.90		257.7	238.0	61,323		1.408	630,088	14.465
	28.20		260.1	240.4	62,518		1.435	648,664	14.891

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

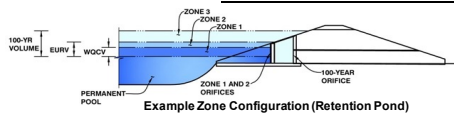


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: **Front Range - Midway Solar Project**

Basin ID: **Basin A2**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB
Watershed Area =	72.65 acres
Watershed Length =	1,964 ft
Watershed Length to Centroid =	927 ft
Watershed Slope =	0.011 ft/ft
Watershed Imperviousness =	7.20% percent
Percentage Hydrologic Soil Group A =	0.0% percent
Percentage Hydrologic Soil Group B =	0.0% percent
Percentage Hydrologic Soil Groups C/D =	100.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Water Quality Capture Volume (WQCV) =	0.305 acre-feet
Excess Urban Runoff Volume (EURV) =	0.424 acre-feet
2-yr Runoff Volume (P1 = 1.01 in.) =	0.556 acre-feet
5-yr Runoff Volume (P1 = 1.3 in.) =	1.732 acre-feet
10-yr Runoff Volume (P1 = 1.57 in.) =	3.114 acre-feet
25-yr Runoff Volume (P1 = 2.01 in.) =	6.107 acre-feet
50-yr Runoff Volume (P1 = 2.4 in.) =	8.456 acre-feet
100-yr Runoff Volume (P1 = 2.82 in.) =	11.469 acre-feet
500-yr Runoff Volume (P1 = 3.98 in.) =	18.917 acre-feet
Approximate 2-yr Detention Volume =	0.286 acre-feet
Approximate 5-yr Detention Volume =	0.805 acre-feet
Approximate 10-yr Detention Volume =	1.174 acre-feet
Approximate 25-yr Detention Volume =	1.574 acre-feet
Approximate 50-yr Detention Volume =	1.711 acre-feet
Approximate 100-yr Detention Volume =	2.578 acre-feet

Optional User Overrides

	acre-feet
	acre-feet
1.01	inches
1.30	inches
1.57	inches
2.01	inches
2.40	inches
2.82	inches
3.98	inches

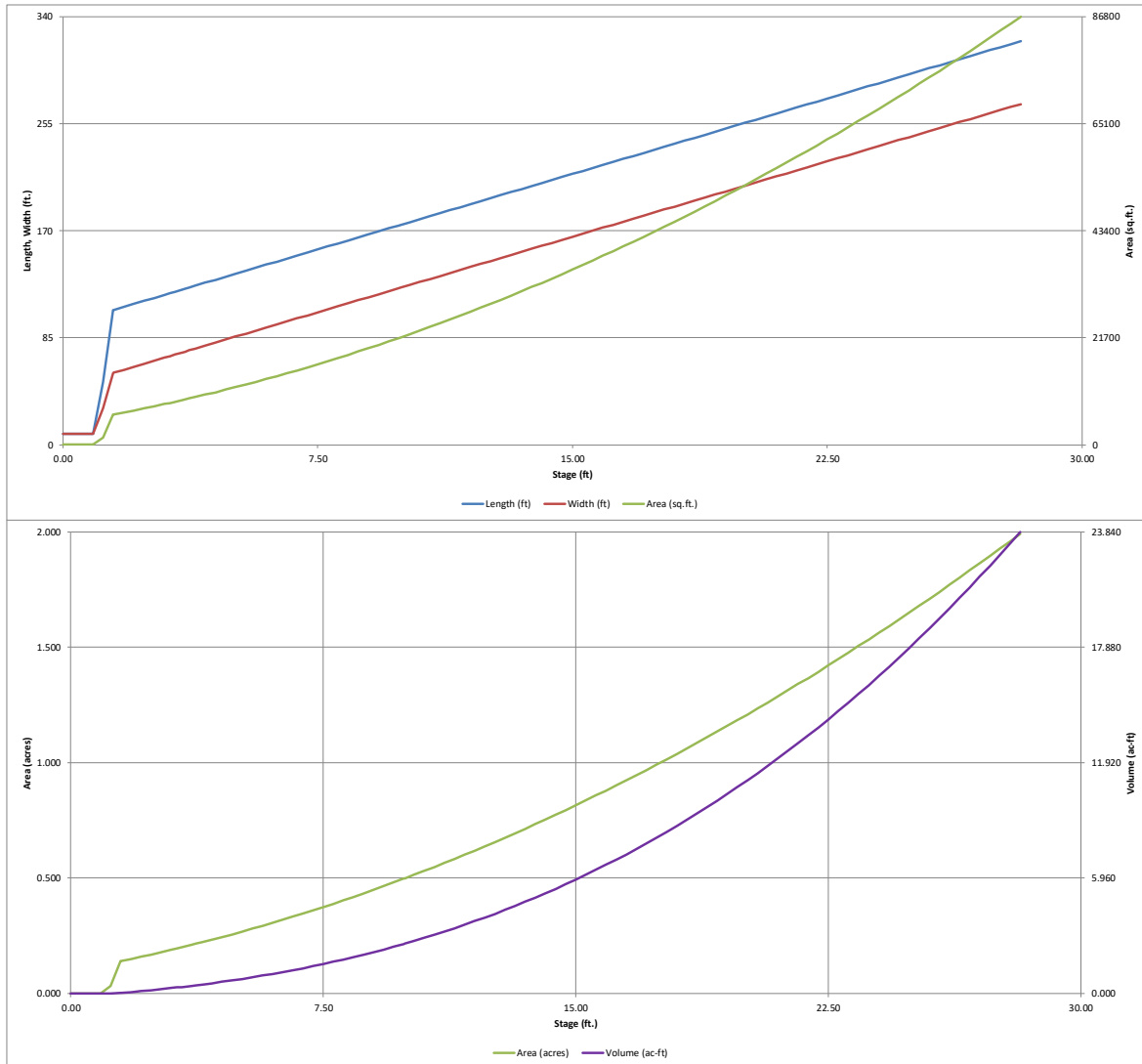
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.305 acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.119 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	2.154 acre-feet
Total Detention Basin Volume =	2.578 acre-feet
Initial Surge Volume (ISV) =	40 ft ³
Initial Surge Depth (ISD) =	0.50 ft
Total Available Detention Depth (H _{total}) =	9.90 ft
Depth of Trickle Channel (H _{TC}) =	0.50 ft
Slope of Trickle Channel (S _{TC}) =	0.005 ft/ft
Slopes of Main Basin Sides (S _{main}) =	4 ft/V
Basin Length-to-Width Ratio (L _W) =	2
Initial Surge Area (A _{ISV}) =	80 ft ²
Surge Volume Length (L _{SV}) =	8.9 ft
Surge Volume Width (W _{SV}) =	8.9 ft
Depth of Basin Floor (H _{FLOOR}) =	0.48 ft
Length of Basin Floor (L _{FLOOR}) =	106.8 ft
Width of Basin Floor (W _{FLOOR}) =	56.9 ft
Area of Basin Floor (A _{FLOOR}) =	6,082 ft ²
Volume of Basin Floor (V _{FLOOR}) =	1,097 ft ³
Depth of Main Basin (H _{MAIN}) =	8.42 ft
Length of Main Basin (L _{MAIN}) =	174.2 ft
Width of Main Basin (W _{MAIN}) =	124.3 ft
Area of Main Basin (A _{MAIN}) =	21,651 ft ²
Volume of Main Basin (V _{MAIN}) =	110,044 ft ³
Calculated Total Basin Volume (V _{total}) =	2.553 acre-feet

Depth Increment =	0.30	ft								
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft ²)	Optional Override Area (ft ²)	Area (acre)	Volume (ft ³)	Volume (ac-ft)	
Top of Micropool	0.00		8.9	8.9	80		0.002			
ISV	0.50		8.9	8.9	80		0.002	40	0.001	
	0.60		8.9	8.9	80		0.002	48	0.001	
	0.90		8.9	8.9	80		0.002	72	0.002	
	1.20		49.7	28.9	1,438		0.033	204	0.005	
Floor	1.48		106.8	56.9	6,082		0.140	1,182	0.027	
	1.50		107.0	57.1	6,108		0.140	1,304	0.030	
	1.80		109.4	59.5	6,508		0.149	3,196	0.073	
	2.10		111.8	61.9	6,919		0.159	5,210	0.120	
	2.40		114.2	64.3	7,342		0.169	7,349	0.169	
	2.70		116.6	66.7	7,776		0.179	9,616	0.221	
	3.00		119.0	69.1	8,221		0.189	12,015	0.276	
	3.16		120.3	70.4	8,464		0.194	13,350	0.306	
Zone 1 (WQCV)	3.30		121.4	71.5	8,678		0.199	14,550	0.334	
	3.60		123.8	73.9	9,147		0.210	17,224	0.395	
Zone 2 (EURV)	3.74		124.9	75.0	9,370		0.215	18,520	0.425	
	3.90		126.2	76.3	9,627		0.221	20,040	0.460	
	4.20		128.6	78.7	10,119		0.232	23,001	0.528	
	4.50		131.0	81.1	10,622		0.244	26,112	0.599	
	4.80		133.4	83.5	11,137		0.256	29,376	0.674	
	5.10		135.8	85.9	11,663		0.268	32,796	0.753	
	5.40		138.2	88.3	12,201		0.280	36,375	0.835	
	5.70		140.6	90.7	12,751		0.293	40,117	0.921	
	6.00		143.0	93.1	13,311		0.306	44,026	1.011	
	6.30		145.4	95.5	13,884		0.319	48,105	1.104	
	6.60		147.8	97.9	14,468		0.332	52,358	1.202	
	6.90		150.2	100.3	15,063		0.346	56,787	1.304	
	7.20		152.6	102.7	15,670		0.360	61,397	1.409	
	7.50		155.0	105.1	16,288		0.374	66,190	1.520	
	7.80		157.4	107.5	16,918		0.388	71,171	1.634	
	8.10		159.8	109.9	17,560		0.403	76,343	1.753	
	8.40		162.2	112.3	18,213		0.418	81,708	1.876	
	8.70		164.6	114.7	18,877		0.433	87,272	2.003	
	9.00		167.0	117.1	19,554		0.449	93,036	2.136	
	9.30		169.4	119.5	20,241		0.465	99,005	2.273	
	9.60		171.8	121.9	20,940		0.481	105,182	2.415	
	9.90		174.2	124.3	21,651		0.497	111,570	2.561	
Zone 3 (100-year)	9.94		174.5	124.6	21,746		0.499	112,438	2.581	
	10.20		176.6	126.7	22,373		0.514	118,173	2.713	
	10.50		179.0	129.1	23,107		0.530	124,995	2.869	
	10.80		181.4	131.5	23,852		0.548	132,038	3.031	
	11.10		183.8	133.9	24,608		0.565	139,307	3.198	
	11.40		186.2	136.3	25,377		0.583	146,805	3.370	
	11.70		188.6	138.7	26,156		0.600	154,534	3.548	
	12.00		191.0	141.1	26,948		0.619	162,500	3.730	
	12.30		193.4	143.5	27,750		0.637	170,704	3.919	
	12.60		195.8	145.9	28,565		0.656	179,151	4.113	
	12.90		198.2	148.3	29,391		0.675	187,844	4.312	
	13.20		200.6	150.7	30,228		0.694	196,786	4.518	
	13.50		203.0	153.1	31,077		0.713	205,982	4.729	
	13.80		205.4	155.5	31,937		0.733	215,434	4.946	
	14.10		207.8	157.9	32,809		0.753	225,145	5.169	
	14.40		210.2	160.3	33,692		0.773	235,120	5.398	
	14.70		212.6	162.7	34,587		0.794	245,362	5.633	
	15.00		215.0	165.1	35,494		0.815	255,874	5.874	
	15.30		217.4	167.5	36,412		0.836	266,659	6.122	
	15.60		219.8	169.9	37,341		0.857	277,722	6.376	
	15.90		222.2	172.3	38,282		0.879	289,065	6.636	
	16.20		224.6	174.7	39,235		0.901	300,692	6.903	
	16.50		227.0	177.1	40,199		0.923	312,607	7.176	
	16.80		229.4	179.5	41,174		0.945	324,813	7.457	
	17.10		231.8	181.9	42,161		0.968	337,313	7.744	
	17.40		234.2	184.3	43,160		0.991	350,111	8.037	
	17.70		236.6	186.7	44,170		1.014	363,210	8.338	
	18.00		239.0	189.1	45,192		1.037	376,614	8.646	
	18.30		241.4	191.5	46,225		1.061	390,326	8.961	
	18.60		243.8	193.9	47,270		1.085	404,350	9.283	
	18.90		246.2	196.3	48,326		1.109	418,689	9.612	
	19.20		248.6	198.7	49,394		1.134	433,347	9.948	
	19.50		251.0	201.1	50,473		1.159	448,327	10.292	
	19.80		253.4	203.5	51,564		1.184	463,632	10.644	
	20.10		255.8	205.9	52,666		1.209	479,266	11.002	
	20.40		258.2	208.3	53,780		1.235	495,233	11.369	
	20.70		260.6	210.7	54,905		1.260	511,535	11.743	
	21.00		263.0	213.1	56,042		1.287	528,177	12.125	
	21.30		265.4	215.5	57,190		1.313	545,161	12.515	
	21.60		267.8	217.9	58,350		1.340	562,492	12.913	
	21.90		270.2	220.3	59,522		1.366	580,173	13.319	
	22.20		272.6	222.7	60,705		1.394	598,206	13.733	
	22.50		275.0	225.1	61,899		1.421	616,597	14.155	
	22.80		277.4	227.5	63,105		1.449	635,347	14.586	
	23.10		279.8	229.9	64,323		1.477	654,461	15.024	
	23.40		282.2	232.3	65,552		1.505	673,942	15.472	
	23.70		284.6	234.7	66,792		1.533	693,793	15.927	
	24.00		287.0	237.1	68,044		1.562	714,018	16.392	
	24.30		289.4	239.5	69,308		1.591	734,620	16.865	
	24.60		291.8	241.9	70,583		1.620	755,604	17.346	
	24.90		294.2	244.3	71,869		1.650	776,971	17.837	
	25.20		296.6	246.7	73,168		1.680	798,726	18.336	
	25.50		299.0	249.1	74,477		1.710	820,873	18.845	
	25.80		301.4	251.5	75,798		1.740	843,414	19.362	
	26.10		303.8	253.9	77,131		1.771	866,353	19.889	
	26.40		306.2	256.3	78,475		1.802	889,694	20.425	
	26.70		308.6	258.7	79,831		1.833	913,439	20.970	
	27.00		311.0	261.1	81,198		1.864	937,593	21.524	
	27.30		313.4	263.5	82,577		1.896	962,159	22.088	
	27.60		315.8	265.9	83,967		1.928	987,141	22.662	
	27.90		318.2	268.3	85,369		1.960	1,012,541	23.245	
	28.20		320.6	270.7	86,782		1.992	1,038,363	23.838	

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

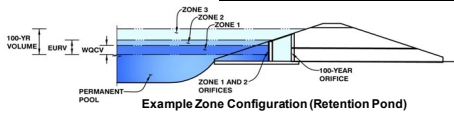


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: **Front Range - Midway Solar Project**

Basin ID: **Basin ASB**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB
Watershed Area =	10.74 acres
Watershed Length =	1,208 ft
Watershed Length to Centroid =	514 ft
Watershed Slope =	0.033 ft/ft
Watershed Imperviousness =	10.70% percent
Percentage Hydrologic Soil Group A =	0.0% percent
Percentage Hydrologic Soil Group B =	0.0% percent
Percentage Hydrologic Soil Groups C/D =	100.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

After providing required inputs above including 1-hour rainfall depths, click "Run CUHP" to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Water Quality Capture Volume (WQCV) =	0.064 acre-feet
Excess Urban Runoff Volume (EURV) =	0.096 acre-feet
2-yr Runoff Volume (P1 = 1.01 in.) =	0.107 acre-feet
5-yr Runoff Volume (P1 = 1.3 in.) =	0.286 acre-feet
10-yr Runoff Volume (P1 = 1.57 in.) =	0.493 acre-feet
25-yr Runoff Volume (P1 = 2.01 in.) =	0.933 acre-feet
50-yr Runoff Volume (P1 = 2.4 in.) =	1.280 acre-feet
100-yr Runoff Volume (P1 = 2.82 in.) =	1.722 acre-feet
500-yr Runoff Volume (P1 = 3.98 in.) =	2.820 acre-feet
Approximate 2-yr Detention Volume =	0.066 acre-feet
Approximate 5-yr Detention Volume =	0.157 acre-feet
Approximate 10-yr Detention Volume =	0.213 acre-feet
Approximate 25-yr Detention Volume =	0.286 acre-feet
Approximate 50-yr Detention Volume =	0.315 acre-feet
Approximate 100-yr Detention Volume =	0.457 acre-feet

Optional User Overrides

	acre-feet
	acre-feet
	inches
	inches
	inches
	inches
	inches
	inches

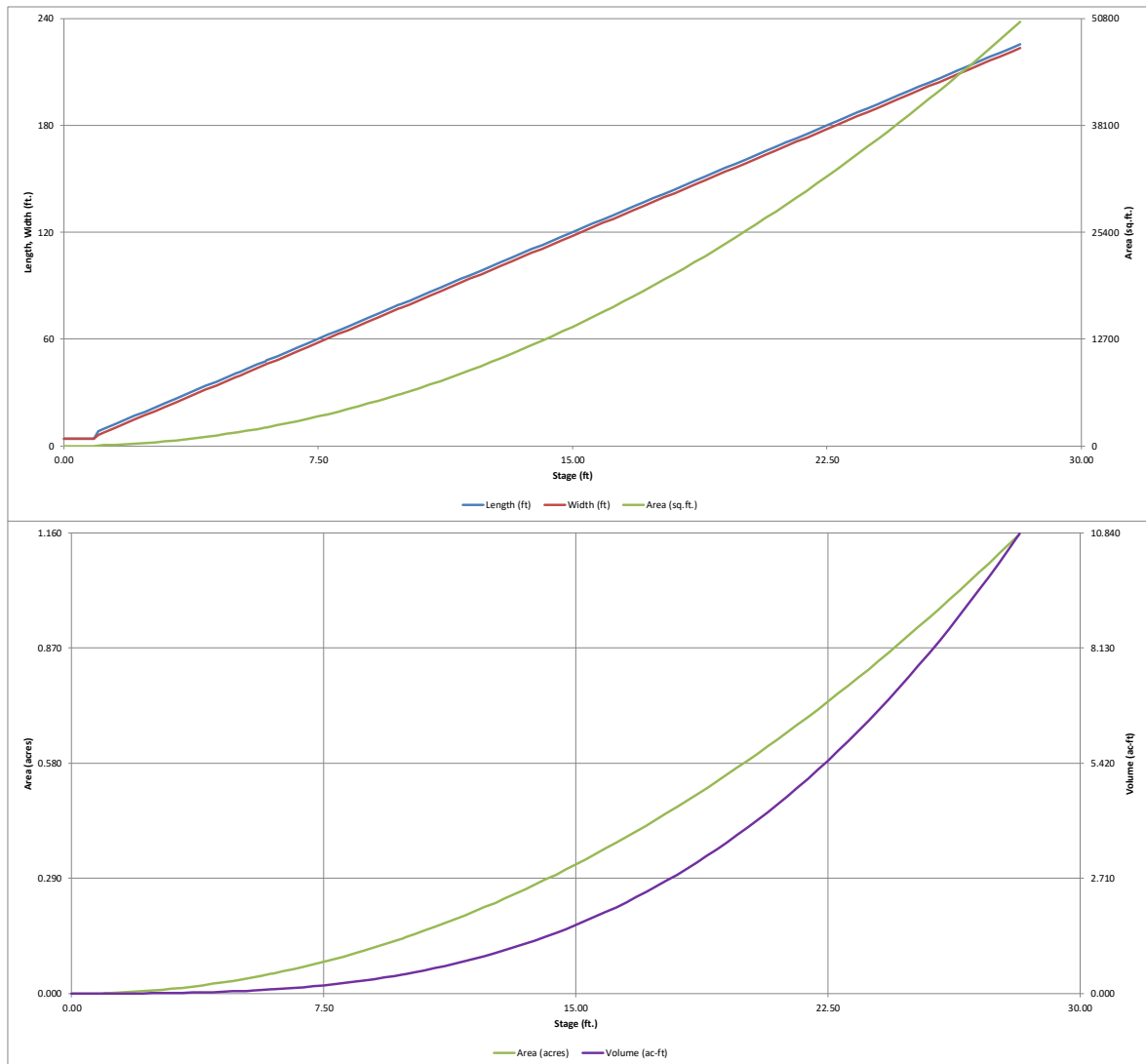
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.064 acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.033 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.361 acre-feet
Total Detention Basin Volume =	0.457 acre-feet
Initial Surcharge Volume (ISV) =	8 ft ³
Initial Surcharge Depth (ISD) =	0.50 ft
Total Available Detention Depth (H _{total}) =	9.90 ft
Depth of Trickle Channel (H _{TC}) =	0.50 ft
Slope of Trickle Channel (S _{TC}) =	0.005 ft/ft
Slopes of Main Basin Sides (S _{main}) =	4 ft/V
Basin Length-to-Width Ratio (L _{LW}) =	2
Initial Surcharge Area (A _{ISV}) =	17 ft ²
Surcharge Volume Length (L _{SV}) =	4.1 ft
Surcharge Volume Width (W _{SV}) =	4.1 ft
Depth of Basin Floor (H _{FLOOR}) =	0.02 ft
Length of Basin Floor (L _{FLOOR}) =	8.2 ft
Width of Basin Floor (W _{FLOOR}) =	6.1 ft
Area of Basin Floor (A _{FLOOR}) =	50 ft ²
Volume of Basin Floor (V _{FLOOR}) =	1 ft ³
Depth of Main Basin (H _{MAIN}) =	8.88 ft
Length of Main Basin (L _{MAIN}) =	79.2 ft
Width of Main Basin (W _{MAIN}) =	77.1 ft
Area of Main Basin (A _{MAIN}) =	6,107 ft ²
Volume of Main Basin (V _{MAIN}) =	19,851 ft ³
Calculated Total Basin Volume (V _{total}) =	0.456 acre-feet

Depth Increment =	0.30	ft							
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft ²)	Optional Override Area (ft ²)	Area (acre)	Volume (ft ³)	Volume (ac-ft)
Top of Micropool	0.00		4.1	4.1	17		0.000		
ISV	0.50		4.1	4.1	17		0.000	8	0.000
	0.60		4.1	4.1	17		0.000	10	0.000
Floor	0.90		4.1	4.1	17		0.000	15	0.000
	1.02		8.2	6.1	50		0.001	17	0.000
	1.20		9.6	7.5	72		0.002	28	0.001
	1.50		12.0	9.9	119		0.003	56	0.001
	1.80		14.4	12.3	177		0.004	101	0.002
	2.10		16.8	14.7	247		0.006	164	0.004
	2.40		19.2	17.1	328		0.008	250	0.006
	2.70		21.6	19.5	421		0.010	362	0.008
	3.00		24.0	21.9	526		0.012	504	0.012
	3.30		26.4	24.3	642		0.015	679	0.016
Zone 1 (WQCV)	3.60		28.8	26.7	769		0.018	890	0.020
	3.90		31.2	29.1	908		0.021	1,142	0.026
	4.20		33.6	31.5	1,059		0.024	1,436	0.033
	4.50		36.0	33.9	1,221		0.028	1,778	0.041
	4.80		38.4	36.3	1,394		0.032	2,170	0.050
	5.10		40.8	38.7	1,579		0.036	2,616	0.060
	5.20		41.6	39.5	1,644		0.038	2,777	0.064
	5.40		43.2	41.1	1,776		0.041	3,119	0.072
	5.70		45.6	43.5	1,984		0.046	3,682	0.085
	5.95		47.6	45.5	2,166		0.050	4,201	0.096
Zone 2 (EURV)	6.00		48.0	45.9	2,204		0.051	4,310	0.099
	6.30		50.4	48.3	2,435		0.056	5,006	0.115
	6.60		52.8	50.7	2,677		0.061	5,772	0.133
	6.90		55.2	53.1	2,932		0.067	6,613	0.152
	7.20		57.6	55.5	3,197		0.073	7,532	0.173
	7.50		60.0	57.9	3,474		0.080	8,533	0.196
	7.80		62.4	60.3	3,763		0.086	9,618	0.221
	8.10		64.8	62.7	4,063		0.093	10,792	0.248
	8.40		67.2	65.1	4,375		0.100	12,057	0.277
	8.70		69.6	67.5	4,699		0.108	13,418	0.308
Zone 3 (100-year)	9.00		72.0	69.9	5,033		0.116	14,878	0.342
	9.30		74.4	72.3	5,380		0.124	16,439	0.377
	9.60		76.8	74.7	5,738		0.132	18,106	0.416
	9.90		79.2	77.1	6,107		0.140	19,883	0.456
	9.91		79.3	77.2	6,119		0.140	19,944	0.458
	10.20		81.6	79.5	6,488		0.149	21,772	0.500
	10.50		84.0	81.9	6,880		0.158	23,777	0.546
	10.80		86.4	84.3	7,284		0.167	25,901	0.595
	11.10		88.8	86.7	7,700		0.177	28,148	0.646
	11.40		91.2	89.1	8,127		0.187	30,522	0.701
	11.70		93.6	91.5	8,565		0.197	33,026	0.758
	12.00		96.0	93.9	9,015		0.207	35,662	0.819
	12.30		98.4	96.3	9,477		0.218	38,436	0.882
	12.60		100.8	98.7	9,950		0.228	41,349	0.949
	12.90		103.2	101.1	10,434		0.240	44,407	1.019
	13.20		105.6	103.5	10,930		0.251	47,611	1.093
	13.50		108.0	105.9	11,438		0.263	50,966	1.170
	13.80		110.4	108.3	11,957		0.274	54,475	1.251
	14.10		112.8	110.7	12,488		0.287	58,142	1.335
	14.40		115.2	113.1	13,030		0.299	61,969	1.423
	14.70		117.6	115.5	13,584		0.312	65,961	1.514
	15.00		120.0	117.9	14,149		0.325	70,120	1.610
	15.30		122.4	120.3	14,726		0.338	74,451	1.709
	15.60		124.8	122.7	15,314		0.352	78,957	1.813
	15.90		127.2	125.1	15,914		0.365	83,641	1.920
	16.20		129.6	127.5	16,525		0.379	88,506	2.032
	16.50		132.0	129.9	17,148		0.394	93,557	2.148
	16.80		134.4	132.3	17,782		0.408	98,796	2.268
	17.10		136.8	134.7	18,428		0.423	104,228	2.393
	17.40		139.2	137.1	19,085		0.438	109,854	2.522
	17.70		141.6	139.5	19,754		0.453	115,680	2.656
	18.00		144.0	141.9	20,435		0.469	121,708	2.794
	18.30		146.4	144.3	21,127		0.485	127,942	2.937
	18.60		148.8	146.7	21,830		0.501	134,385	3.085
	18.90		151.2	149.1	22,545		0.518	141,041	3.238
	19.20		153.6	151.5	23,272		0.534	147,913	3.396
	19.50		156.0	153.9	24,010		0.551	155,005	3.558
	19.80		158.4	156.3	24,759		0.568	162,320	3.726
	20.10		160.8	158.7	25,520		0.586	169,862	3.899
	20.40		163.2	161.1	26,293		0.604	177,634	4.078
	20.70		165.6	163.5	27,077		0.622	185,639	4.262
	21.00		168.0	165.9	27,873		0.640	193,881	4.451
	21.30		170.4	168.3	28,680		0.658	202,363	4.646
	21.60		172.8	170.7	29,498		0.677	211,090	4.846
	21.90		175.2	173.1	30,328		0.696	220,064	5.052
	22.20		177.6	175.5	31,170		0.716	229,288	5.264
	22.50		180.0	177.9	32,023		0.735	238,767	5.481
	22.80		182.4	180.3	32,888		0.755	248,503	5.705
	23.10		184.8	182.7	33,764		0.775	258,501	5.934
	23.40		187.2	185.1	34,652		0.796	268,763	6.170
	23.70		189.6	187.5	35,551		0.816	279,293	6.412
	24.00		192.0	189.9	36,462		0.837	290,095	6.660
	24.30		194.4	192.3	37,385		0.858	301,172	6.914
	24.60		196.8	194.7	38,319		0.880	312,527	7.175
	24.90		199.2	197.1	39,264		0.901	324,164	7.442
	25.20		201.6	199.5	40,221		0.923	336,087	7.715
	25.50		204.0	201.9	41,189		0.946	348,298	7.996
	25.80		206.4	204.3	42,169		0.968	360,801	8.283
	26.10		208.8	206.7	43,161		0.991	373,600	8.577
	26.40		211.2	209.1	44,164		1.014	386,699	8.877
	26.70		213.6	211.5	45,178		1.037	400,100	9.185
	27.00		216.0	213.9	46,204		1.061	413,807	9.500
	27.30		218.4	216.3	47,242		1.085	427,823	9.821
	27.60		220.8	218.7	48,291		1.109	442,153	10.150
	27.90		223.2	221.1	49,351		1.133	456,799	10.487
	28.20		225.6	223.5	50,423		1.158	471,765	10.830

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

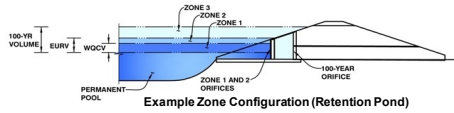


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: **Front Range - Midway Solar Project**

Basin ID: **Basin A6**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB
Watershed Area =	34.04 acres
Watershed Length =	1,618 ft
Watershed Length to Centroid =	625 ft
Watershed Slope =	0.018 ft/ft
Watershed Imperviousness =	4.80% percent
Percentage Hydrologic Soil Group A =	0.0% percent
Percentage Hydrologic Soil Group B =	0.0% percent
Percentage Hydrologic Soil Groups C/D =	100.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Water Quality Capture Volume (WQCV) =	0.099 acre-feet
Excess Urban Runoff Volume (EURV) =	0.128 acre-feet
2-yr Runoff Volume (P1 = 1.01 in.) =	0.208 acre-feet
5-yr Runoff Volume (P1 = 1.3 in.) =	0.743 acre-feet
10-yr Runoff Volume (P1 = 1.57 in.) =	1.381 acre-feet
25-yr Runoff Volume (P1 = 2.01 in.) =	2.781 acre-feet
50-yr Runoff Volume (P1 = 2.4 in.) =	3.874 acre-feet
100-yr Runoff Volume (P1 = 2.82 in.) =	5.286 acre-feet
500-yr Runoff Volume (P1 = 3.98 in.) =	8.761 acre-feet
Approximate 2-yr Detention Volume =	0.085 acre-feet
Approximate 5-yr Detention Volume =	0.295 acre-feet
Approximate 10-yr Detention Volume =	0.461 acre-feet
Approximate 25-yr Detention Volume =	0.607 acre-feet
Approximate 50-yr Detention Volume =	0.648 acre-feet
Approximate 100-yr Detention Volume =	1.012 acre-feet

Optional User Overrides

	acre-feet
1.01	inches
1.30	inches
1.57	inches
2.01	inches
2.40	inches
2.82	inches
3.98	inches

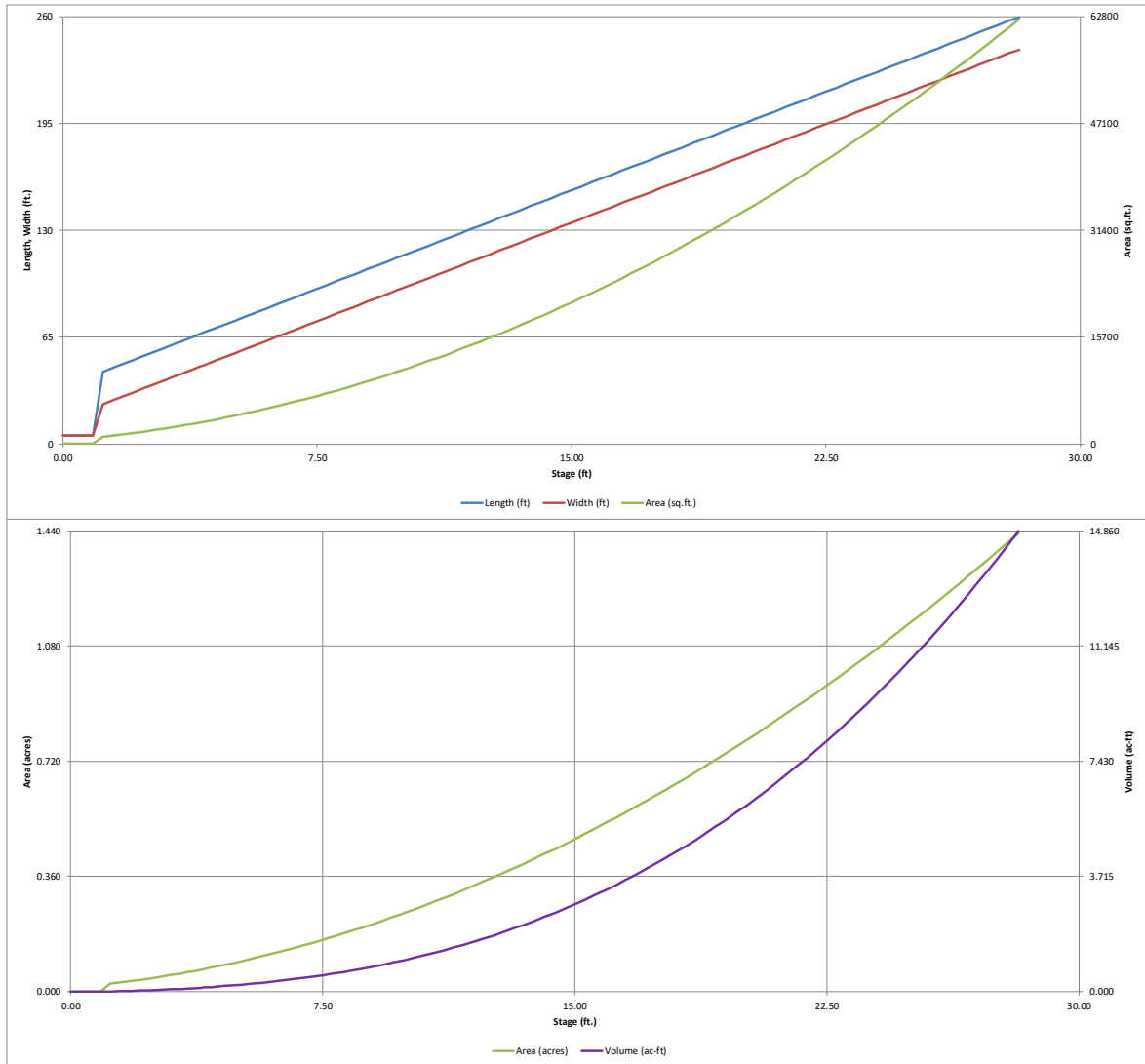
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.099 acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.029 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.884 acre-feet
Total Detention Basin Volume =	1.012 acre-feet
Initial Surge Volume (ISV) =	13 ft ³
Initial Surge Depth (ISD) =	0.50 ft
Total Available Detention Depth (H _{total}) =	9.90 ft
Depth of Trickle Channel (H _{TC}) =	0.50 ft
Slope of Trickle Channel (S _{TC}) =	0.005 ft/ft
Slopes of Main Basin Sides (S _{main}) =	4 ft/V
Basin Length-to-Width Ratio (L _W) =	2
Initial Surge Area (A _{ISV}) =	26 ft ²
Surge Volume Length (L _{SV}) =	5.1 ft
Surge Volume Width (W _{SV}) =	5.1 ft
Depth of Basin Floor (H _{floor}) =	0.19 ft
Length of Basin Floor (L _{floor}) =	43.8 ft
Width of Basin Floor (W _{floor}) =	24.1 ft
Area of Basin Floor (A _{floor}) =	1,056 ft ²
Volume of Basin Floor (V _{floor}) =	79 ft ³
Depth of Main Basin (H _{main}) =	8.71 ft
Length of Main Basin (L _{main}) =	113.5 ft
Width of Main Basin (W _{main}) =	93.8 ft
Area of Main Basin (A _{main}) =	10,643 ft ²
Volume of Main Basin (V _{main}) =	43,698 ft ³
Calculated Total Basin Volume (V _{total}) =	1,006 acre-feet

Depth Increment =	0.30								
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft ²)	Optional Override Area (ft ²)	Area (acre)	Volume (ft ³)	Volume (ac-ft)
Top of Micropool	0.00		5.1	5.1	26		0.001		
ISV	0.50		5.1	5.1	26		0.001	13	0.000
	0.60		5.1	5.1	26		0.001	15	0.000
	0.90		5.1	5.1	26		0.001	23	0.001
Floor	1.19		43.8	24.1	1,056		0.024	105	0.002
	1.20		43.9	24.2	1,061		0.024	116	0.003
	1.50		46.3	26.6	1,230		0.028	459	0.011
	1.80		48.7	29.0	1,411		0.032	855	0.020
	2.10		51.1	31.4	1,603		0.037	1,307	0.030
	2.40		53.5	33.8	1,807		0.041	1,818	0.042
	2.70		55.9	36.2	2,022		0.046	2,392	0.055
	3.00		58.3	38.6	2,249		0.052	3,032	0.070
	3.30		60.7	41.0	2,487		0.057	3,743	0.086
Zone 1 (WQCV)	3.52		62.5	42.7	2,669		0.061	4,310	0.099
	3.60		63.1	43.4	2,737		0.063	4,526	0.104
	3.90		65.5	45.8	2,998		0.069	5,386	0.124
Zone 2 (EURV)	3.97		66.1	46.3	3,061		0.070	5,598	0.129
	4.20		67.9	48.2	3,271		0.075	6,326	0.145
	4.50		70.3	50.6	3,555		0.082	7,349	0.169
	4.80		72.7	53.0	3,851		0.088	8,460	0.194
	5.10		75.1	55.4	4,159		0.095	9,661	0.222
	5.40		77.5	57.8	4,477		0.103	10,956	0.252
	5.70		79.9	60.2	4,808		0.110	12,349	0.283
	6.00		82.3	62.6	5,150		0.118	13,842	0.318
	6.30		84.7	65.0	5,503		0.126	15,440	0.354
	6.60		87.1	67.4	5,868		0.135	17,145	0.394
	6.90		89.5	69.8	6,245		0.143	18,962	0.435
	7.20		91.9	72.2	6,633		0.152	20,893	0.480
	7.50		94.3	74.6	7,032		0.161	22,943	0.527
	7.80		96.7	77.0	7,443		0.171	25,114	0.577
	8.10		99.1	79.4	7,866		0.181	27,410	0.629
	8.40		101.5	81.8	8,300		0.191	29,835	0.685
	8.70		103.9	84.2	8,746		0.201	32,391	0.744
	9.00		106.3	86.6	9,203		0.211	35,083	0.805
	9.30		108.7	89.0	9,672		0.222	37,914	0.870
	9.60		111.1	91.4	10,152		0.233	40,888	0.939
	9.90		113.5	93.8	10,643		0.244	44,007	1.010
Zone 3 (100-year)	9.91		113.6	93.8	10,660		0.245	44,113	1.013
	10.20		115.9	96.2	11,147		0.256	47,275	1.085
	10.50		118.3	98.6	11,661		0.268	50,696	1.164
	10.80		120.7	101.0	12,188		0.280	54,273	1.246
	11.10		123.1	103.4	12,726		0.292	58,010	1.332
	11.40		125.5	105.8	13,275		0.305	61,909	1.421
	11.70		127.9	108.2	13,836		0.318	65,976	1.515
	12.00		130.3	110.6	14,408		0.331	70,212	1.612
	12.30		132.7	113.0	14,992		0.344	74,622	1.713
	12.60		135.1	115.4	15,587		0.358	79,208	1.818
	12.90		137.5	117.8	16,194		0.372	83,975	1.928
	13.20		139.9	120.2	16,813		0.386	88,926	2.041
	13.50		142.3	122.6	17,443		0.400	94,064	2.159
	13.80		144.7	125.0	18,084		0.415	99,393	2.282
	14.10		147.1	127.4	18,737		0.430	104,915	2.409
	14.40		149.5	129.8	19,402		0.445	110,636	2.540
	14.70		151.9	132.2	20,078		0.461	116,557	2.676
	15.00		154.3	134.6	20,765		0.477	122,684	2.816
	15.30		156.7	137.0	21,464		0.493	129,018	2.962
	15.60		159.1	139.4	22,175		0.509	135,563	3.112
	15.90		161.5	141.8	22,897		0.526	142,324	3.267
	16.20		163.9	144.2	23,631		0.542	149,303	3.428
	16.50		166.3	146.6	24,376		0.560	156,503	3.593
	16.80		168.7	149.0	25,132		0.577	163,929	3.763
	17.10		171.1	151.4	25,901		0.595	171,584	3.939
	17.40		173.5	153.8	26,680		0.612	179,471	4.120
	17.70		175.9	156.2	27,471		0.631	187,593	4.307
	18.00		178.3	158.6	28,274		0.649	195,955	4.498
	18.30		180.7	161.0	29,088		0.668	204,559	4.696
	18.60		183.1	163.4	29,914		0.687	213,409	4.899
	18.90		185.5	165.8	30,752		0.706	222,508	5.108
	19.20		187.9	168.2	31,600		0.725	231,861	5.323
	19.50		190.3	170.6	32,461		0.745	241,470	5.543
	19.80		192.7	173.0	33,333		0.765	251,338	5.770
	20.10		195.1	175.4	34,216		0.785	261,470	6.003
	20.40		197.5	177.8	35,111		0.806	271,869	6.241
	20.70		199.9	180.2	36,017		0.827	282,538	6.486
	21.00		202.3	182.6	36,935		0.848	293,481	6.737
	21.30		204.7	185.0	37,865		0.869	304,700	6.995
	21.60		207.1	187.4	38,806		0.891	316,201	7.259
	21.90		209.5	189.8	39,758		0.913	327,985	7.530
	22.20		211.9	192.2	40,722		0.935	340,057	7.807
	22.50		214.3	194.6	41,698		0.957	352,420	8.090
	22.80		216.7	197.0	42,685		0.980	365,077	8.381
	23.10		219.1	199.4	43,683		1.003	378,032	8.678
	23.40		221.5	201.8	44,694		1.026	391,288	8.983
	23.70		223.9	204.2	45,715		1.049	404,849	9.294
	24.00		226.3	206.6	46,748		1.073	418,718	9.612
	24.30		228.7	209.0	47,793		1.097	432,899	9.938
	24.60		231.1	211.4	48,849		1.121	447,395	10.271
	24.90		233.5	213.8	49,917		1.146	462,210	10.611
	25.20		235.9	216.2	50,996		1.171	477,346	10.958
	25.50		238.3	218.6	52,087		1.196	492,809	11.313
	25.80		240.7	221.0	53,189		1.221	508,600	11.676
	26.10		243.1	223.4	54,303		1.245	524,723	12.046
	26.40		245.5	225.8	55,428		1.272	541,183	12.427
	26.70		247.9	228.2	56,565		1.299	557,981	12.809
	27.00		250.3	230.6	57,713		1.325	575,123	13.203
	27.30		252.7	233.0	58,873		1.352	592,611	13.604
	27.60		255.1	235.4	60,045		1.378	610,448	14.014
	27.90		257.5	237.8	61,228		1.406	628,639	14.432
	28.20		259.9	240.2	62,422		1.433	647,183	14.857

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

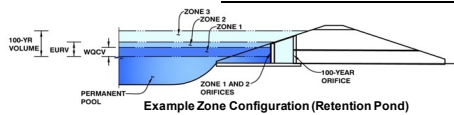


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: **Front Range - Midway Solar Project**

Basin ID: **Basin A7**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	55.40	acres
Watershed Length =	2,469	ft
Watershed Length to Centroid =	966	ft
Watershed Slope =	0.024	ft/ft
Watershed Imperviousness =	4.60%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Water Quality Capture Volume (WQCV) =	0.154	acre-feet
Excess Urban Runoff Volume (EURV) =	0.199	acre-feet
2-yr Runoff Volume (P1 = 1.01 in.) =	0.332	acre-feet
5-yr Runoff Volume (P1 = 1.3 in.) =	1.203	acre-feet
10-yr Runoff Volume (P1 = 1.57 in.) =	2.241	acre-feet
25-yr Runoff Volume (P1 = 2.01 in.) =	4.525	acre-feet
50-yr Runoff Volume (P1 = 2.4 in.) =	6.307	acre-feet
100-yr Runoff Volume (P1 = 2.82 in.) =	8.610	acre-feet
500-yr Runoff Volume (P1 = 3.98 in.) =	14.276	acre-feet
Approximate 2-yr Detention Volume =	0.131	acre-feet
Approximate 5-yr Detention Volume =	0.470	acre-feet
Approximate 10-yr Detention Volume =	0.737	acre-feet
Approximate 25-yr Detention Volume =	0.969	acre-feet
Approximate 50-yr Detention Volume =	1.032	acre-feet
Approximate 100-yr Detention Volume =	1.617	acre-feet

Optional User Overrides

		acre-feet
		acre-feet
1.01		inches
1.30		inches
1.57		inches
2.01		inches
2.40		inches
2.82		inches
3.98		inches

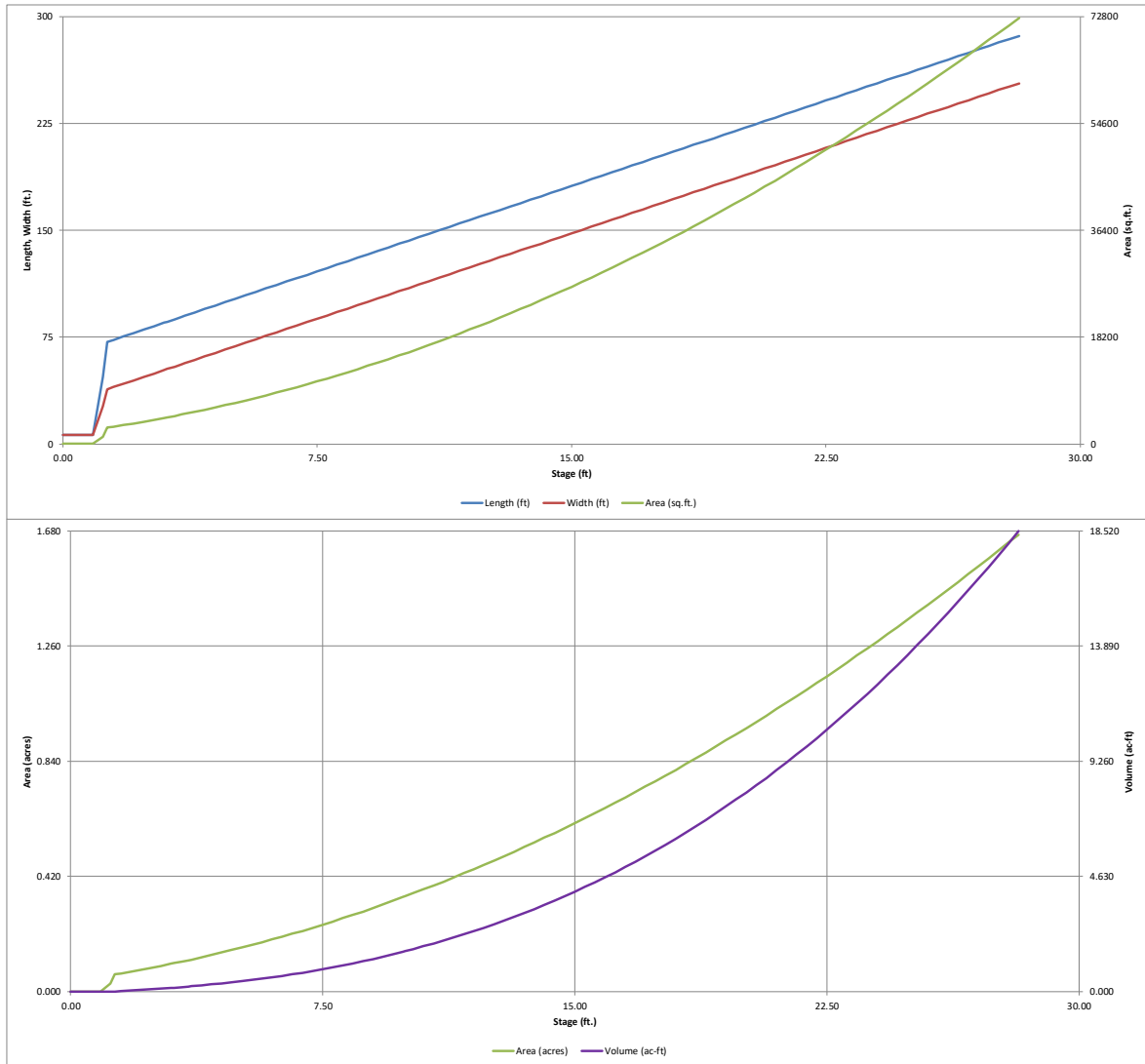
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.154	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.045	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.418	acre-feet
Total Detention Basin Volume =	1.617	acre-feet
Initial Surge Volume (ISV) =	20	ft ³
Initial Surge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H _{total}) =	9.90	ft
Depth of Trickle Channel (H _{TC}) =	0.50	ft
Slope of Trickle Channel (S _{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S _{main}) =	4	H:V
Basin Length-to-Width Ratio (L _W) =	2	
Initial Surge Area (A _{ISV}) =	40	ft ²
Surge Volume Length (L _{SV}) =	6.4	ft
Surge Volume Width (W _{SV}) =	6.4	ft
Depth of Basin Floor (H _{FLOOR}) =	0.32	ft
Length of Basin Floor (L _{FLOOR}) =	71.6	ft
Width of Basin Floor (W _{FLOOR}) =	38.4	ft
Area of Basin Floor (A _{FLOOR}) =	2,747	ft ²
Volume of Basin Floor (V _{FLOOR}) =	333	ft ³
Depth of Main Basin (H _{MAIN}) =	8.58	ft
Length of Main Basin (L _{MAIN}) =	140.3	ft
Width of Main Basin (W _{MAIN}) =	107.0	ft
Area of Main Basin (A _{MAIN}) =	15,008	ft ²
Volume of Main Basin (V _{MAIN}) =	69,146	ft ³
Calculated Total Basin Volume (V _{total}) =	1,596	acre-feet

Depth Increment =	0.30									
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft ²)	Optional Override Area (ft ²)	Area (acre)	Volume (ft ³)	Volume (ac-ft)	
Top of Micropool	0.00		6.4	6.4	40		0.001			
ISV	0.50		6.4	6.4	40		0.001	20	0.000	
	0.60		6.4	6.4	40		0.001	24	0.001	
	0.90		6.4	6.4	40		0.001	36	0.001	
	1.20		47.2	26.4	1,243		0.029	141	0.003	
	1.32		71.6	38.4	2,747		0.063	375	0.009	
Floor	1.50		73.1	39.8	2,908		0.067	884	0.020	
	1.80		75.5	42.2	3,184		0.073	1,797	0.041	
	2.10		77.9	44.6	3,473		0.080	2,796	0.064	
	2.40		80.3	47.0	3,772		0.087	3,882	0.089	
	2.70		82.7	49.4	4,083		0.094	5,060	0.116	
Zone 1 (WQCV)	3.00		85.1	51.8	4,406		0.101	6,333	0.145	
	3.09		85.8	52.5	4,505		0.103	6,734	0.155	
	3.30		87.5	54.2	4,740		0.109	7,705	0.177	
Zone 2 (EURV)	3.51		89.2	55.9	4,981		0.114	8,726	0.200	
	3.60		89.9	56.6	5,086		0.117	9,179	0.211	
	3.90		92.3	59.0	5,443		0.125	10,758	0.247	
	4.20		94.7	61.4	5,812		0.133	12,446	0.286	
	4.50		97.1	63.8	6,193		0.142	14,246	0.327	
	4.80		99.5	66.2	6,584		0.151	16,163	0.371	
	5.10		101.9	68.6	6,988		0.160	18,198	0.418	
	5.40		104.3	71.0	7,403		0.170	20,357	0.467	
	5.70		106.7	73.4	7,829		0.180	22,641	0.520	
	6.00		109.1	75.8	8,267		0.190	25,055	0.575	
	6.30		111.5	78.2	8,716		0.200	27,602	0.634	
	6.60		113.9	80.6	9,177		0.211	30,286	0.695	
	6.90		116.3	83.0	9,650		0.222	33,110	0.760	
	7.20		118.7	85.4	10,134		0.233	36,077	0.828	
	7.50		121.1	87.8	10,629		0.244	39,191	0.900	
	7.80		123.5	90.2	11,136		0.256	42,456	0.975	
	8.10		125.9	92.6	11,655		0.268	45,874	1.053	
	8.40		128.3	95.0	12,185		0.280	49,450	1.135	
	8.70		130.7	97.4	12,727		0.292	53,187	1.221	
	9.00		133.1	99.8	13,280		0.305	57,087	1.311	
	9.30		135.5	102.2	13,844		0.318	61,156	1.404	
	9.60		137.9	104.6	14,421		0.331	65,395	1.501	
	Zone 3 (100-year)	9.90		140.3	107.0	15,008		0.345	69,809	1.603
		9.95		140.7	107.4	15,107		0.347	70,562	1.620
		10.20		142.7	109.4	15,607		0.358	74,401	1.708
		10.50		145.1	111.8	16,218		0.372	79,175	1.818
		10.80		147.5	114.2	16,840		0.387	84,133	1.931
11.10			149.9	116.6	17,474		0.401	89,280	2.050	
11.40			152.3	119.0	18,119		0.416	94,619	2.172	
11.70			154.7	121.4	18,776		0.431	100,153	2.299	
12.00			157.1	123.8	19,445		0.446	105,886	2.431	
12.30			159.5	126.2	20,124		0.462	111,821	2.567	
12.60			161.9	128.6	20,816		0.478	117,962	2.708	
12.90			164.3	131.0	21,519		0.494	124,311	2.854	
13.20			166.7	133.4	22,233		0.510	130,874	3.004	
13.50			169.1	135.8	22,959		0.527	137,652	3.160	
13.80			171.5	138.2	23,696		0.544	144,650	3.321	
14.10			173.9	140.6	24,445		0.561	151,871	3.486	
14.40			176.3	143.0	25,206		0.579	159,319	3.657	
14.70			178.7	145.4	25,978		0.596	166,996	3.834	
15.00			181.1	147.8	26,761		0.614	174,907	4.015	
15.30			183.5	150.2	27,556		0.633	183,054	4.202	
15.60			185.9	152.6	28,363		0.651	191,442	4.395	
15.90			188.3	155.0	29,181		0.670	200,073	4.593	
16.20			190.7	157.4	30,011		0.689	208,951	4.797	
16.50			193.1	159.8	30,852		0.708	218,081	5.006	
16.80			195.5	162.2	31,704		0.728	227,464	5.222	
17.10			197.9	164.6	32,569		0.748	237,104	5.443	
17.40			200.3	167.0	33,444		0.768	247,006	5.670	
17.70			202.7	169.4	34,331		0.788	257,172	5.904	
18.00			205.1	171.8	35,230		0.809	267,606	6.143	
18.30			207.5	174.2	36,140		0.830	278,311	6.389	
18.60			209.9	176.6	37,062		0.851	289,291	6.641	
18.90			212.3	179.0	37,995		0.872	300,550	6.900	
19.20			214.7	181.4	38,940		0.894	312,090	7.165	
19.50			217.1	183.8	39,897		0.916	323,915	7.436	
19.80			219.5	186.2	40,864		0.938	336,029	7.714	
20.10		221.9	188.6	41,844		0.961	348,435	7.999		
20.40		224.3	191.0	42,835		0.983	361,136	8.291		
20.70		226.7	193.4	43,837		1.006	374,137	8.589		
21.00		229.1	195.8	44,851		1.030	387,440	8.894		
21.30		231.5	198.2	45,876		1.053	401,048	9.207		
21.60		233.9	200.6	46,913		1.077	414,967	9.526		
21.90		236.3	203.0	47,962		1.101	429,198	9.853		
22.20		238.7	205.4	49,022		1.125	443,745	10.187		
22.50		241.1	207.8	50,093		1.150	458,612	10.528		
22.80		243.5	210.2	51,176		1.175	473,802	10.877		
23.10		245.9	212.6	52,271		1.200	489,319	11.233		
23.40		248.3	215.0	53,377		1.225	505,166	11.597		
23.70		250.7	217.4	54,495		1.251	521,346	11.968		
24.00		253.1	219.8	55,624		1.277	537,864	12.348		
24.30		255.5	222.2	56,764		1.303	554,721	12.735		
24.60		257.9	224.6	57,917		1.330	571,923	13.130		
24.90		260.3	227.0	59,080		1.356	589,473	13.532		
25.20		262.7	229.4	60,255		1.383	607,373	13.943		
25.50		265.1	231.8	61,442		1.411	625,627	14.362		
25.80		267.5	234.2	62,640		1.438	644,239	14.790		
26.10		269.9	236.6	63,850		1.466	663,212	15.225		
26.40		272.3	239.0	65,071		1.494	682,550	15.669		
26.70		274.7	241.4	66,304		1.522	702,256	16.122		
27.00		277.1	243.8	67,549		1.551	722,334	16.583		
27.30		279.5	246.2	68,804		1.580	742,787	17.052		
27.60		281.9	248.6	70,072		1.609	763,618	17.530		
27.90		284.3	251.0	71,351		1.638	784,831	18.017		
28.20		286.7	253.4	72,641		1.668	806,429	18.513		

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

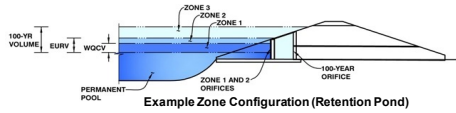


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: **Front Range - Midway Solar Project**

Basin ID: **Basin A8**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	89.54	acres
Watershed Length =	3,408	ft
Watershed Length to Centroid =	1,713	ft
Watershed Slope =	0.024	ft/ft
Watershed Imperviousness =	3.80%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	0.0%	percent
Percentage Hydrologic Soil Groups C/D =	100.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click "Run CUHP" to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Water Quality Capture Volume (WQCV) =	0.209	acre-feet
Excess Urban Runoff Volume (EURV) =	0.262	acre-feet
2-yr Runoff Volume (P1 = 1.01 in.) =	0.492	acre-feet
5-yr Runoff Volume (P1 = 1.3 in.) =	1.886	acre-feet
10-yr Runoff Volume (P1 = 1.57 in.) =	3.559	acre-feet
25-yr Runoff Volume (P1 = 2.01 in.) =	7.253	acre-feet
50-yr Runoff Volume (P1 = 2.4 in.) =	10.129	acre-feet
100-yr Runoff Volume (P1 = 2.82 in.) =	13.856	acre-feet
500-yr Runoff Volume (P1 = 3.98 in.) =	23.011	acre-feet
Approximate 2-yr Detention Volume =	0.171	acre-feet
Approximate 5-yr Detention Volume =	0.688	acre-feet
Approximate 10-yr Detention Volume =	1.109	acre-feet
Approximate 25-yr Detention Volume =	1.436	acre-feet
Approximate 50-yr Detention Volume =	1.514	acre-feet
Approximate 100-yr Detention Volume =	2.410	acre-feet

Optional User Overrides

		acre-feet
		acre-feet
1.01		inches
1.30		inches
1.57		inches
2.01		inches
2.40		inches
2.82		inches
3.98		inches

Define Zones and Basin Geometry

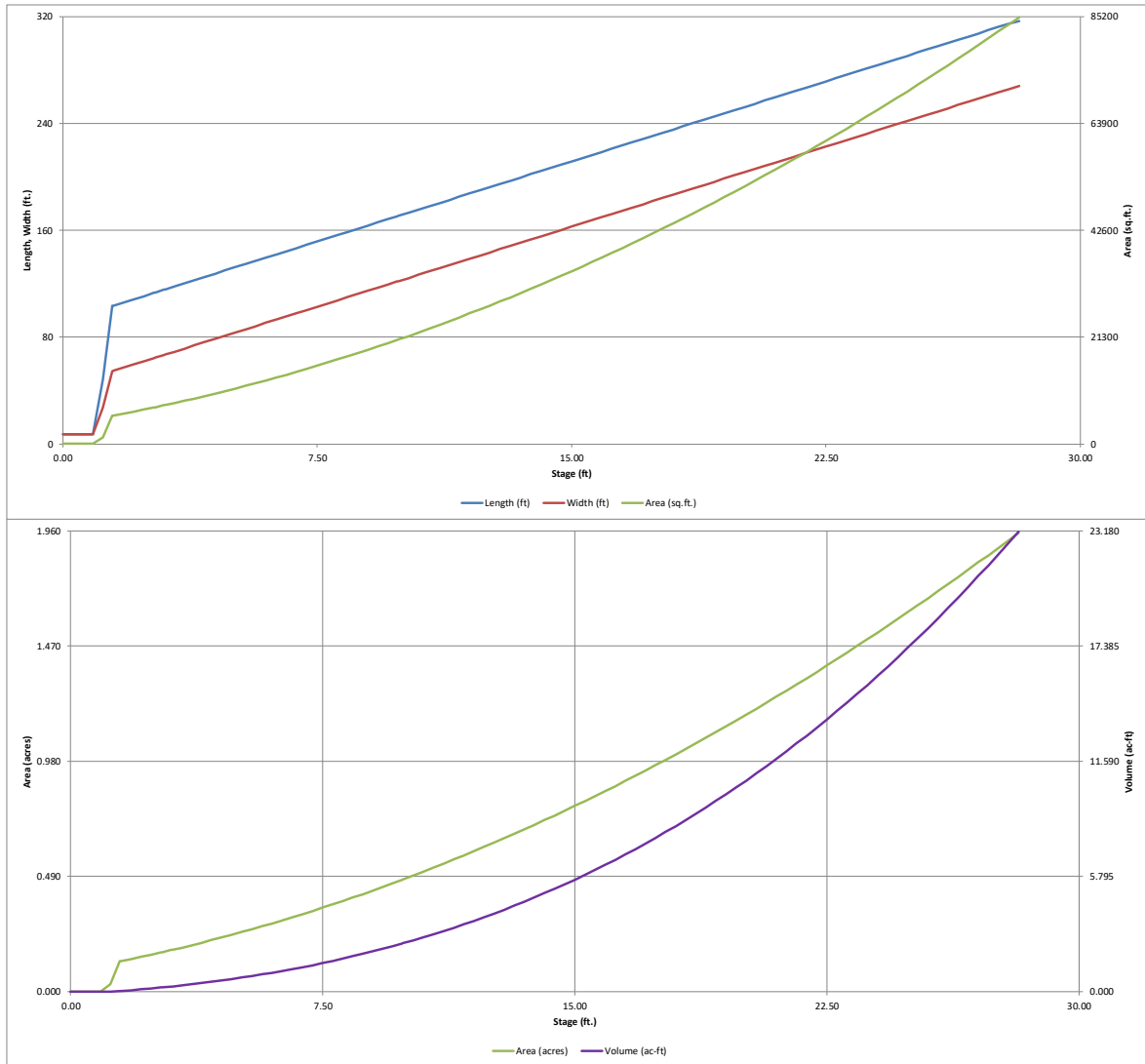
Zone 1 Volume (WQCV) =	0.209	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.053	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	2.149	acre-feet
Total Detention Basin Volume =	2.410	acre-feet
Initial Surge Volume (ISV) =	27	ft ³
Initial Surge Depth (ISD) =	0.50	ft
Total Available Detention Depth (H _{total}) =	9.90	ft
Depth of Trickle Channel (H _{TC}) =	0.50	ft
Slope of Trickle Channel (S _{TC}) =	0.005	ft/ft
Slopes of Main Basin Sides (S _{main}) =	4	H:V
Basin Length-to-Width Ratio (L _W) =	2	

Initial Surge Area (A _{ISV}) =	55	ft ²
Surge Volume Length (L _{SV}) =	7.4	ft
Surge Volume Width (W _{SV}) =	7.4	ft
Depth of Basin Floor (H _{FLOOR}) =	0.47	ft
Length of Basin Floor (L _{FLOOR}) =	103.3	ft
Width of Basin Floor (W _{FLOOR}) =	54.4	ft
Area of Basin Floor (A _{FLOOR}) =	5,616	ft ²
Volume of Basin Floor (V _{FLOOR}) =	975	ft ³
Depth of Main Basin (H _{MAIN}) =	8.43	ft
Length of Main Basin (L _{MAIN}) =	170.7	ft
Width of Main Basin (W _{MAIN}) =	121.8	ft
Area of Main Basin (A _{MAIN}) =	20,796	ft ²
Volume of Main Basin (V _{MAIN}) =	104,588	ft ³
Calculated Total Basin Volume (V _{total}) =	2.425	acre-feet

Depth Increment =	0.30								
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft ²)	Optional Override Area (ft ²)	Area (acre)	Volume (ft ³)	Volume (ac-ft)
Top of Micropool	0.00		7.4	7.4	55		0.001		
ISV	0.50		7.4	7.4	55		0.001	27	0.001
	0.60		7.4	7.4	55		0.001	33	0.001
	0.90		7.4	7.4	55		0.001	49	0.001
	1.20		48.2	27.4	1,320		0.030	165	0.004
Floor	1.47		103.3	54.4	5,616		0.129	1,034	0.024
	1.50		103.5	54.6	5,654		0.130	1,203	0.028
	1.80		105.9	57.0	6,039		0.139	2,957	0.068
	2.10		108.3	59.4	6,436		0.148	4,828	0.111
Zone 1 (WQCV)	2.40		110.7	61.8	6,844		0.157	6,820	0.157
	2.70		113.1	64.2	7,264		0.167	8,936	0.205
	2.73		113.3	64.5	7,307		0.168	9,154	0.210
	3.00		115.5	66.6	7,696		0.177	11,180	0.257
Zone 2 (EURV)	3.03		115.7	66.9	7,739		0.178	11,411	0.262
	3.30		117.9	69.0	8,139		0.187	13,554	0.311
	3.60		120.3	71.4	8,593		0.197	16,064	0.369
	3.90		122.7	73.8	9,059		0.208	18,711	0.430
	4.20		125.1	76.2	9,536		0.219	21,500	0.494
	4.50		127.5	78.6	10,025		0.230	24,434	0.561
	4.80		129.9	81.0	10,526		0.242	27,517	0.632
	5.10		132.3	83.4	11,038		0.253	30,751	0.706
	5.40		134.7	85.8	11,561		0.265	34,140	0.784
	5.70		137.1	88.2	12,096		0.278	37,689	0.865
	6.00		139.5	90.6	12,643		0.290	41,399	0.950
	6.30		141.9	93.0	13,201		0.303	45,276	1.039
	6.60		144.3	95.4	13,770		0.316	49,321	1.132
	6.90		146.7	97.8	14,352		0.329	53,539	1.229
	7.20		149.1	100.2	14,944		0.343	57,933	1.330
	7.50		151.5	102.6	15,548		0.357	62,507	1.435
	7.80		153.9	105.0	16,164		0.371	67,263	1.544
	8.10		156.3	107.4	16,791		0.385	72,206	1.658
	8.40		158.7	109.8	17,430		0.400	77,339	1.775
	8.70		161.1	112.2	18,080		0.415	82,665	1.898
	9.00		163.5	114.6	18,742		0.430	88,188	2.025
	9.30		165.9	117.0	19,415		0.446	93,912	2.156
	9.60		168.3	119.4	20,100		0.461	99,839	2.292
	Zone 3 (100-year)	9.86		170.4	121.5	20,703		0.475	105,143
9.90			170.7	121.8	20,796		0.477	105,973	2.433
10.20			173.1	124.2	21,504		0.494	112,318	2.578
10.50			175.5	126.6	22,224		0.510	118,877	2.729
10.80			177.9	129.0	22,954		0.527	125,653	2.885
11.10			180.3	131.4	23,697		0.544	132,650	3.045
11.40			182.7	133.8	24,451		0.561	139,872	3.211
11.70			185.1	136.2	25,216		0.579	147,322	3.382
12.00			187.5	138.6	25,993		0.597	155,003	3.558
12.30			189.9	141.0	26,782		0.615	162,919	3.740
12.60			192.3	143.4	27,582		0.633	171,073	3.927
12.90			194.7	145.8	28,393		0.652	179,469	4.120
13.20			197.1	148.2	29,216		0.671	188,110	4.318
13.50			199.5	150.6	30,051		0.690	197,000	4.522
13.80			201.9	153.0	30,897		0.709	206,142	4.732
14.10			204.3	155.4	31,754		0.729	215,539	4.948
14.40			206.7	157.8	32,623		0.749	225,196	5.170
14.70			209.1	160.2	33,504		0.769	235,114	5.397
15.00			211.5	162.6	34,396		0.790	245,299	5.631
15.30			213.9	165.0	35,300		0.810	255,753	5.871
15.60		216.3	167.4	36,215		0.831	266,480	6.118	
15.90		218.7	169.8	37,142		0.853	277,484	6.370	
16.20		221.1	172.2	38,080		0.874	288,767	6.629	
16.50		223.5	174.6	39,030		0.896	300,333	6.895	
16.80		225.9	177.0	39,991		0.918	312,186	7.167	
17.10		228.3	179.4	40,964		0.940	324,329	7.446	
17.40		230.7	181.8	41,948		0.963	336,765	7.731	
17.70		233.1	184.2	42,944		0.986	349,499	8.023	
18.00		235.5	186.6	43,951		1.009	362,533	8.323	
18.30		237.9	189.0	44,970		1.032	375,871	8.629	
18.60		240.3	191.4	46,001		1.056	389,516	8.942	
18.90		242.7	193.8	47,043		1.080	403,472	9.262	
19.20		245.1	196.2	48,096		1.104	417,743	9.590	
19.50		247.5	198.6	49,161		1.129	432,331	9.925	
19.80		249.9	201.0	50,238		1.153	447,241	10.267	
20.10		252.3	203.4	51,325		1.178	462,475	10.617	
20.40		254.7	205.8	52,425		1.204	478,037	10.974	
20.70		257.1	208.2	53,536		1.229	493,931	11.339	
21.00		259.5	210.6	54,659		1.255	510,163	11.713	
21.30		261.9	213.0	55,793		1.281	526,727	12.092	
21.60		264.3	215.4	56,938		1.307	543,637	12.480	
21.90		266.7	217.8	58,095		1.334	560,891	12.876	
22.20		269.1	220.2	59,264		1.361	578,495	13.280	
22.50		271.5	222.6	60,444		1.388	596,451	13.693	
22.80		273.9	225.0	61,636		1.415	614,763	14.113	
23.10		276.3	227.4	62,839		1.443	633,434	14.542	
23.40		278.7	229.8	64,054		1.470	652,467	14.979	
23.70		281.1	232.2	65,280		1.499	671,867	15.424	
24.00		283.5	234.6	66,518		1.527	691,636	15.878	
24.30		285.9	237.0	67,767		1.556	711,779	16.340	
24.60		288.3	239.4	69,028		1.585	732,298	16.811	
24.90		290.7	241.8	70,300		1.614	753,197	17.291	
25.20		293.1	244.2	71,584		1.643	774,479	17.780	
25.50		295.5	246.6	72,879		1.673	796,148	18.277	
25.80		297.9	249.0	74,186		1.703	818,208	18.783	
26.10		300.3	251.4	75,505		1.733	840,661	19.290	
26.40		302.7	253.8	76,835		1.764	863,512	19.824	
26.70		305.1	256.2	78,176		1.795	886,763	20.357	
27.00		307.5	258.6	79,529		1.826	910,418	20.900	
27.30		309.9	261.0	80,893		1.857	934,482	21.453	
27.60		312.3	263.4	82,269		1.889	958,956	22.015	
27.90		314.7	265.8	83,657		1.920	983,844	22.586	
28.20		317.1	268.2	85,056		1.953	1,009,151	23.167	

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Depotion, Version 4.03 (May 2020)

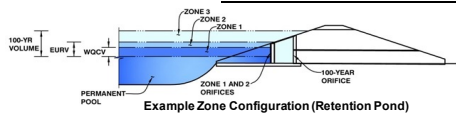


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: **Front Range - Midway Solar Project**

Basin ID: **Basin A9**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB
Watershed Area =	48.32 acres
Watershed Length =	2,463 ft
Watershed Length to Centroid =	1,017 ft
Watershed Slope =	0.032 ft/ft
Watershed Imperviousness =	4.50% percent
Percentage Hydrologic Soil Group A =	0.0% percent
Percentage Hydrologic Soil Group B =	0.0% percent
Percentage Hydrologic Soil Groups C/D =	100.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Water Quality Capture Volume (WQCV) =	0.132 acre-feet
Excess Urban Runoff Volume (EURV) =	0.170 acre-feet
2-yr Runoff Volume (P1 = 1.01 in.) =	0.286 acre-feet
5-yr Runoff Volume (P1 = 1.3 in.) =	1.045 acre-feet
10-yr Runoff Volume (P1 = 1.57 in.) =	1.950 acre-feet
25-yr Runoff Volume (P1 = 2.01 in.) =	3.941 acre-feet
50-yr Runoff Volume (P1 = 2.4 in.) =	5.494 acre-feet
100-yr Runoff Volume (P1 = 2.82 in.) =	7.503 acre-feet
500-yr Runoff Volume (P1 = 3.98 in.) =	12.442 acre-feet
Approximate 2-yr Detention Volume =	0.112 acre-feet
Approximate 5-yr Detention Volume =	0.405 acre-feet
Approximate 10-yr Detention Volume =	0.638 acre-feet
Approximate 25-yr Detention Volume =	0.837 acre-feet
Approximate 50-yr Detention Volume =	0.890 acre-feet
Approximate 100-yr Detention Volume =	1.397 acre-feet

Optional User Overrides

	acre-feet
	acre-feet
1.01	inches
1.30	inches
1.57	inches
2.01	inches
2.40	inches
2.82	inches
3.98	inches

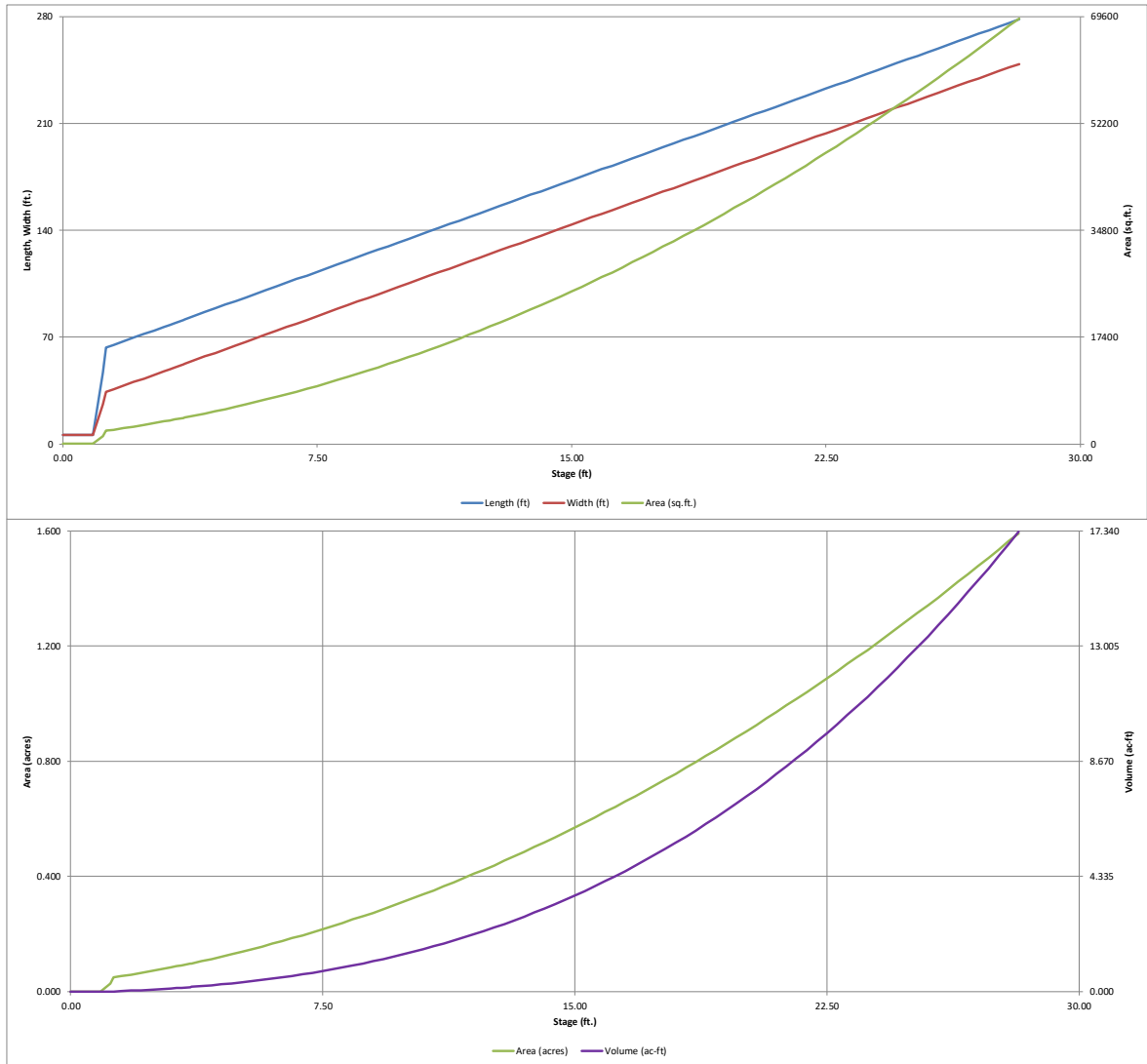
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.132 acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.038 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	1.228 acre-feet
Total Detention Basin Volume =	1.397 acre-feet
Initial Surge Volume (ISV) =	17 ft ³
Initial Surge Depth (ISD) =	0.50 ft
Total Available Detention Depth (H _{total}) =	9.90 ft
Depth of Trickle Channel (H _{TC}) =	0.50 ft
Slope of Trickle Channel (S _{TC}) =	0.005 ft/ft
Slopes of Main Basin Sides (S _{main}) =	4 ft/V
Basin Length-to-Width Ratio (L _W) =	2
Initial Surge Area (A _{ISV}) =	34 ft ²
Surge Volume Length (L _{SV}) =	5.9 ft
Surge Volume Width (W _{SV}) =	5.9 ft
Depth of Basin Floor (H _{FLOOR}) =	0.28 ft
Length of Basin Floor (L _{FLOOR}) =	63.0 ft
Width of Basin Floor (W _{FLOOR}) =	33.9 ft
Area of Basin Floor (A _{FLOOR}) =	2,134 ft ²
Volume of Basin Floor (V _{FLOOR}) =	228 ft ³
Depth of Main Basin (H _{MAIN}) =	8.62 ft
Length of Main Basin (L _{MAIN}) =	132.0 ft
Width of Main Basin (W _{MAIN}) =	102.8 ft
Area of Main Basin (A _{MAIN}) =	13,569 ft ²
Volume of Main Basin (V _{MAIN}) =	60,580 ft ³
Calculated Total Basin Volume (V _{total}) =	1.397 acre-feet

Depth Increment =	0.30	ft.								
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft ²)	Optional Override Area (ft ²)	Area (acre)	Volume (ft ³)	Volume (ac-ft)	
Top of Micropool	0.00		5.9	5.9	34		0.001			
ISV	0.50		5.9	5.9	34		0.001	17	0.000	
	0.60		5.9	5.9	34		0.001	21	0.000	
	0.90		5.9	5.9	34		0.001	31	0.001	
	1.20		46.7	25.9	1,208		0.028	131	0.003	
	1.28		63.0	33.9	2,134		0.049	263	0.006	
Floor	1.50		64.8	35.6	2,307		0.053	752	0.017	
	1.80		67.2	38.0	2,554		0.059	1,481	0.034	
	2.10		69.6	40.4	2,812		0.065	2,285	0.052	
	2.40		72.0	42.8	3,082		0.071	3,169	0.073	
	2.70		74.4	45.2	3,363		0.077	4,136	0.095	
Zone 1 (WQCV)	3.00		76.8	47.6	3,656		0.084	5,188	0.119	
	3.16		78.0	48.9	3,817		0.088	5,786	0.133	
	3.30		79.2	50.0	3,960		0.091	6,330	0.145	
	3.56		81.2	52.1	4,233		0.097	7,395	0.170	
	3.60		81.6	52.4	4,276		0.098	7,566	0.174	
Zone 2 (EURV)	3.90		84.0	54.8	4,603		0.106	8,897	0.204	
	4.20		86.4	57.2	4,942		0.113	10,329	0.237	
	4.50		88.8	59.6	5,293		0.122	11,864	0.272	
	4.80		91.2	62.0	5,654		0.130	13,505	0.310	
	5.10		93.6	64.4	6,028		0.138	15,258	0.350	
	5.40		96.0	66.8	6,413		0.147	17,123	0.393	
	5.70		98.4	69.2	6,809		0.156	19,106	0.439	
	6.00		100.8	71.6	7,217		0.166	21,210	0.487	
	6.30		103.2	74.0	7,637		0.175	23,438	0.538	
	6.60		105.6	76.4	8,068		0.185	25,793	0.592	
	6.90		108.0	78.8	8,510		0.195	28,280	0.649	
	7.20		110.4	81.2	8,964		0.206	30,901	0.709	
	7.50		112.8	83.6	9,430		0.216	33,659	0.773	
	7.80		115.2	86.0	9,907		0.227	36,560	0.839	
	8.10		117.6	88.4	10,396		0.239	39,605	0.909	
	8.40		120.0	90.8	10,896		0.250	42,798	0.983	
	8.70		122.4	93.2	11,407		0.262	46,143	1.059	
	9.00		124.8	95.6	11,930		0.274	49,644	1.140	
	9.30		127.2	98.0	12,465		0.286	53,303	1.224	
	9.60		129.6	100.4	13,011		0.299	57,124	1.311	
	Zone 3 (100-year)	9.89		131.9	102.8	13,550		0.311	60,975	1.400
		9.90		132.0	102.8	13,569		0.312	61,111	1.403
		10.20		134.4	105.2	14,138		0.325	65,266	1.498
		10.50		136.8	107.6	14,719		0.338	69,595	1.598
		10.80		139.2	110.0	15,311		0.352	74,099	1.701
11.10			141.6	112.4	15,915		0.365	78,783	1.809	
11.40			144.0	114.8	16,531		0.379	83,649	1.920	
11.70			146.4	117.2	17,157		0.394	88,702	2.036	
12.00			148.8	119.6	17,796		0.409	93,945	2.157	
12.30			151.2	122.0	18,446		0.423	99,381	2.281	
12.60			153.6	124.4	19,107		0.439	105,013	2.411	
12.90			156.0	126.8	19,780		0.454	110,846	2.545	
13.20			158.4	129.2	20,464		0.470	116,883	2.683	
13.50			160.8	131.6	21,160		0.486	123,126	2.827	
13.80			163.2	134.0	21,868		0.502	129,580	2.975	
14.10			165.6	136.4	22,587		0.519	136,248	3.128	
14.40			168.0	138.8	23,317		0.535	143,133	3.286	
14.70			170.4	141.2	24,059		0.552	150,239	3.449	
15.00			172.8	143.6	24,813		0.570	157,570	3.617	
15.30			175.2	146.0	25,578		0.587	165,128	3.791	
15.60			177.6	148.4	26,355		0.605	172,918	3.970	
15.90			180.0	150.8	27,143		0.623	180,942	4.154	
16.20			182.4	153.2	27,942		0.641	189,205	4.344	
16.50			184.8	155.6	28,754		0.660	197,709	4.539	
16.80			187.2	158.0	29,576		0.679	206,458	4.740	
17.10			189.6	160.4	30,411		0.698	215,456	4.946	
17.40			192.0	162.8	31,256		0.718	224,706	5.159	
17.70			194.4	165.2	32,113		0.737	234,211	5.377	
18.00			196.8	167.6	32,982		0.757	243,975	5.601	
18.30			199.2	170.0	33,863		0.777	254,001	5.831	
18.60			201.6	172.4	34,754		0.798	264,294	6.067	
18.90			204.0	174.8	35,658		0.819	274,855	6.310	
19.20			206.4	177.2	36,573		0.840	285,689	6.559	
19.50			208.8	179.6	37,499		0.861	296,800	6.814	
19.80			211.2	182.0	38,437		0.882	308,190	7.075	
20.10			213.6	184.4	39,386		0.904	319,863	7.343	
20.40			216.0	186.8	40,347		0.926	331,823	7.618	
20.70			218.4	189.2	41,320		0.949	344,072	7.899	
21.00			220.8	191.6	42,304		0.971	356,616	8.187	
21.30			223.2	194.0	43,299		0.994	369,456	8.482	
21.60		225.6	196.4	44,306		1.017	382,596	8.783		
21.90		228.0	198.8	45,325		1.041	396,040	9.092		
22.20		230.4	201.2	46,355		1.064	409,792	9.408		
22.50		232.8	203.6	47,396		1.088	423,854	9.730		
22.80		235.2	206.0	48,449		1.112	438,231	10.060		
23.10		237.6	208.4	49,514		1.137	452,925	10.398		
23.40		240.0	210.8	50,590		1.161	467,940	10.742		
23.70		242.4	213.2	51,678		1.186	483,280	11.095		
24.00		244.8	215.6	52,777		1.212	498,948	11.454		
24.30		247.2	218.0	53,887		1.237	514,947	11.822		
24.60		249.6	220.4	55,010		1.263	531,282	12.197		
24.90		252.0	222.8	56,143		1.289	547,954	12.579		
25.20		254.4	225.2	57,289		1.315	564,969	12.970		
25.50		256.8	227.6	58,445		1.342	582,329	13.368		
25.80		259.2	230.0	59,614		1.369	600,037	13.775		
26.10		261.6	232.4	60,793		1.396	618,088	14.180		
26.40		264.0	234.8	61,985		1.423	636,514	14.612		
26.70		266.4	237.2	63,188		1.451	655,290	15.043		
27.00		268.8	239.6	64,402		1.478	674,428	15.483		
27.30		271.2	242.0	65,628		1.507	693,932	15.930		
27.60		273.6	244.4	66,865		1.535	713,806	16.387		
27.90		276.0	246.8	68,114		1.564	734,053	16.852		
28.20		278.4	249.2	69,375		1.593	754,676	17.325		

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

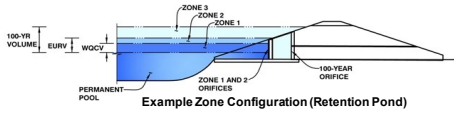


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: **Front Range - Midway Solar Project**

Basin ID: **Basin A10**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB
Watershed Area =	236.63 acres
Watershed Length =	7,526 ft
Watershed Length to Centroid =	4,519 ft
Watershed Slope =	0.019 ft/ft
Watershed Imperviousness =	4.30% percent
Percentage Hydrologic Soil Group A =	0.0% percent
Percentage Hydrologic Soil Group B =	0.0% percent
Percentage Hydrologic Soil Groups C/D =	100.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Water Quality Capture Volume (WQCV) =	0.619 acre-feet
Excess Urban Runoff Volume (EURV) =	0.791 acre-feet
2-yr Runoff Volume (P1 = 1.01 in.) =	1.375 acre-feet
5-yr Runoff Volume (P1 = 1.3 in.) =	5.086 acre-feet
10-yr Runoff Volume (P1 = 1.57 in.) =	9.522 acre-feet
25-yr Runoff Volume (P1 = 2.01 in.) =	19.293 acre-feet
50-yr Runoff Volume (P1 = 2.4 in.) =	26.909 acre-feet
100-yr Runoff Volume (P1 = 2.82 in.) =	36.763 acre-feet
500-yr Runoff Volume (P1 = 3.98 in.) =	60.991 acre-feet
Approximate 2-yr Detention Volume =	0.519 acre-feet
Approximate 5-yr Detention Volume =	1.935 acre-feet
Approximate 10-yr Detention Volume =	3.068 acre-feet
Approximate 25-yr Detention Volume =	4.012 acre-feet
Approximate 50-yr Detention Volume =	4.259 acre-feet
Approximate 100-yr Detention Volume =	6.711 acre-feet

Optional User Overrides

	acre-feet
	acre-feet
1.01	inches
1.30	inches
1.57	inches
2.01	inches
2.40	inches
2.82	inches
3.98	inches

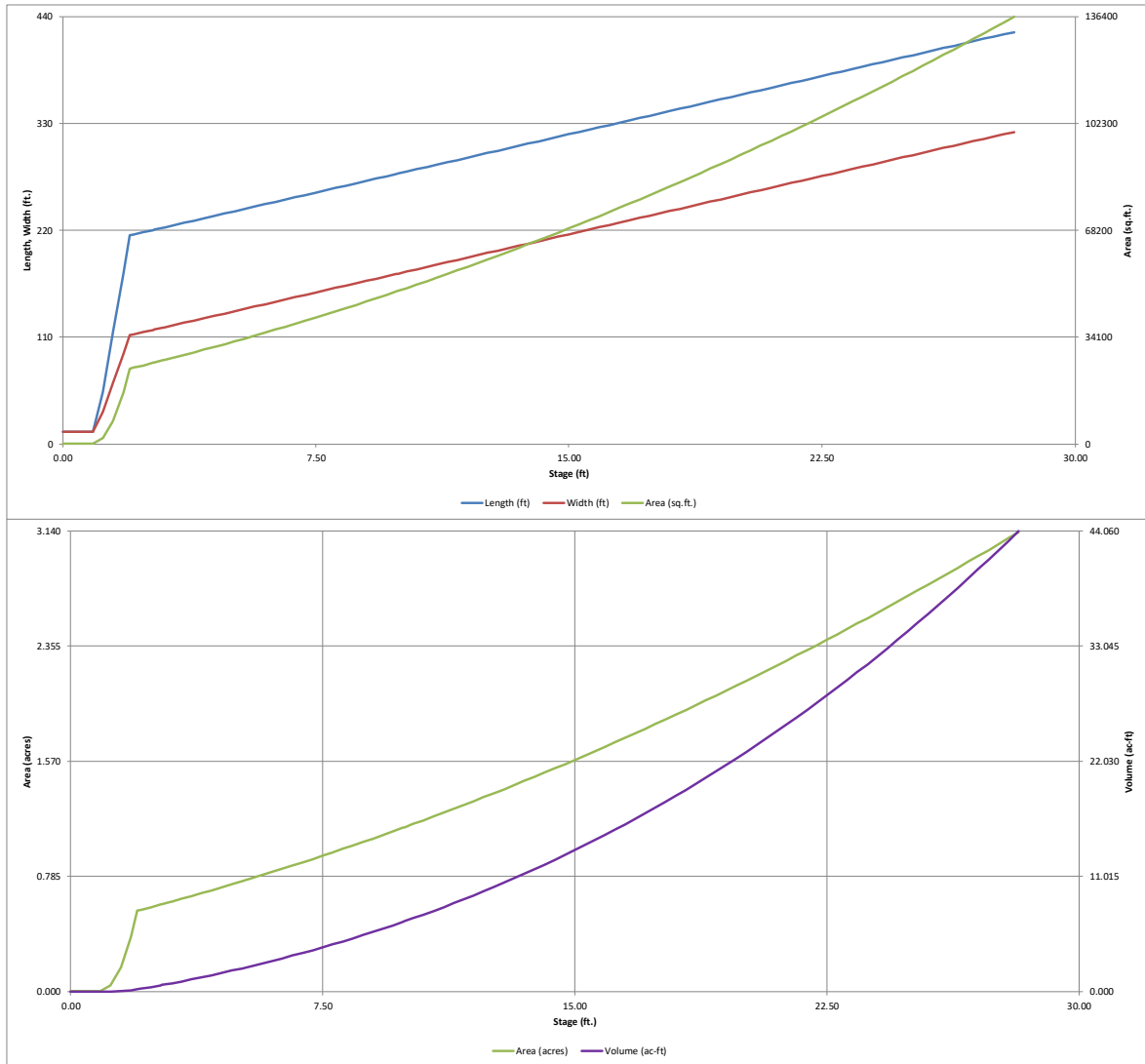
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.619 acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.172 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	5.920 acre-feet
Total Detention Basin Volume =	6.711 acre-feet
Initial Surcharge Volume (ISV) =	81 ft ³
Initial Surcharge Depth (ISD) =	0.50 ft
Total Available Detention Depth (H _{total}) =	9.90 ft
Depth of Trickle Channel (H _{TC}) =	0.50 ft
Slope of Trickle Channel (S _{TC}) =	0.005 ft/ft
Slopes of Main Basin Sides (S _{main}) =	4 ft/V
Basin Length-to-Width Ratio (R _{L/W}) =	2
Initial Surcharge Area (A _{ISV}) =	162 ft ²
Surcharge Volume Length (L _{SV}) =	12.7 ft
Surcharge Volume Width (W _{SV}) =	12.7 ft
Depth of Basin Floor (H _{FLOOR}) =	0.99 ft
Length of Basin Floor (L _{FLOOR}) =	214.7 ft
Width of Basin Floor (W _{FLOOR}) =	111.7 ft
Area of Basin Floor (A _{FLOOR}) =	23,985 ft ²
Volume of Basin Floor (V _{FLOOR}) =	8,619 ft ³
Depth of Main Basin (H _{MAIN}) =	7.91 ft
Length of Main Basin (L _{MAIN}) =	278.0 ft
Width of Main Basin (W _{MAIN}) =	175.0 ft
Area of Main Basin (A _{MAIN}) =	48,645 ft ²
Volume of Main Basin (V _{MAIN}) =	281,564 ft ³
Calculated Total Basin Volume (V _{total}) =	6.665 acre-feet

Depth Increment =	0.30	ft							
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft ²)	Optional Override Area (ft ²)	Area (acre)	Volume (ft ³)	Volume (ac-ft)
Top of Micropool	0.00		12.7	12.7	162		0.004		
ISV	0.50		12.7	12.7	162		0.004	81	0.002
	0.60		12.7	12.7	162		0.004	97	0.002
	0.90		12.7	12.7	162		0.004	146	0.003
	1.20		53.5	32.7	1,751		0.040	326	0.007
Floor	1.50		114.7	62.7	7,196		0.165	1,576	0.036
	1.80		175.9	92.7	16,312		0.374	5,011	0.115
	1.99		214.7	111.7	23,985		0.551	8,816	0.202
	2.10		215.6	112.6	24,273		0.557	11,470	0.263
Zone 1 (WQCV)	2.40		218.0	115.0	25,067		0.575	18,871	0.433
	2.70		220.4	117.4	25,871		0.594	26,511	0.609
	2.72		220.5	117.6	25,926		0.595	27,029	0.621
	3.00		222.8	119.8	26,688		0.613	34,395	0.790
Zone 2 (EURV)	3.01		222.8	119.9	26,715		0.613	34,662	0.796
	3.30		225.2	122.2	27,516		0.632	42,525	0.976
	3.60		227.6	124.6	28,355		0.651	50,905	1.169
	3.90		230.0	127.0	29,206		0.670	59,539	1.367
Zone 3 (100-year)	4.20		232.4	129.4	30,069		0.690	68,430	1.571
	4.50		234.8	131.8	30,943		0.710	77,582	1.781
	4.80		237.2	134.2	31,828		0.731	86,997	1.997
	5.10		239.6	136.6	32,725		0.751	96,680	2.219
	5.40		242.0	139.0	33,634		0.772	106,633	2.448
	5.70		244.4	141.4	34,554		0.793	116,861	2.683
	6.00		246.8	143.8	35,486		0.815	127,367	2.924
	6.30		249.2	146.2	36,429		0.836	138,154	3.172
	6.60		251.6	148.6	37,383		0.858	149,225	3.426
	6.90		254.0	151.0	38,349		0.880	160,585	3.687
	7.20		256.4	153.4	39,327		0.903	172,236	3.954
	7.50		258.8	155.8	40,316		0.926	184,182	4.228
	7.80		261.2	158.2	41,317		0.949	196,427	4.509
	8.10		263.6	160.6	42,329		0.972	208,974	4.797
	8.40		266.0	163.0	43,353		0.995	221,826	5.092
	8.70		268.4	165.4	44,388		1.019	234,987	5.395
	9.00		270.8	167.8	45,435		1.043	248,460	5.704
	9.30		273.2	170.2	46,493		1.067	262,249	6.020
	9.60		275.6	172.6	47,563		1.092	276,357	6.344
	9.90		278.0	175.0	48,645		1.117	290,788	6.676
	9.94		278.3	175.3	48,790		1.120	292,737	6.720
	10.20		280.4	177.4	49,738		1.142	305,545	7.014
	10.50		282.8	179.8	50,842		1.167	320,632	7.361
	10.80		285.2	182.2	51,958		1.193	336,051	7.715
	11.10		287.6	184.6	53,085		1.219	351,807	8.076
	11.40		290.0	187.0	54,224		1.245	367,904	8.446
	11.70		292.4	189.4	55,375		1.271	384,343	8.823
	12.00		294.8	191.8	56,537		1.298	401,130	9.209
	12.30		297.2	194.2	57,710		1.325	418,266	9.602
	12.60		299.6	196.6	58,895		1.352	435,757	10.004
	12.90		302.0	199.0	60,092		1.380	453,605	10.413
	13.20		304.4	201.4	61,300		1.407	471,813	10.831
	13.50		306.8	203.8	62,520		1.435	490,386	11.258
	13.80		309.2	206.2	63,751		1.464	509,326	11.693
	14.10		311.6	208.6	64,993		1.492	528,637	12.136
	14.40		314.0	211.0	66,247		1.521	548,323	12.588
	14.70		316.4	213.4	67,513		1.550	568,387	13.048
	15.00		318.8	215.8	68,790		1.579	588,832	13.518
	15.30		321.2	218.2	70,079		1.609	609,662	13.996
	15.60		323.6	220.6	71,379		1.639	630,881	14.483
15.90		326.0	223.0	72,691		1.669	652,491	14.979	
16.20		328.4	225.4	74,014		1.699	674,497	15.484	
16.50		330.8	227.8	75,349		1.730	696,901	15.999	
16.80		333.2	230.2	76,695		1.761	719,707	16.522	
17.10		335.6	232.6	78,053		1.792	742,919	17.055	
17.40		338.0	235.0	79,423		1.823	766,540	17.597	
17.70		340.4	237.4	80,804		1.855	790,574	18.149	
18.00		342.8	239.8	82,196		1.887	815,024	18.710	
18.30		345.2	242.2	83,600		1.919	839,893	19.281	
18.60		347.6	244.6	85,015		1.952	865,185	19.862	
18.90		350.0	247.0	86,442		1.984	890,903	20.452	
19.20		352.4	249.4	87,881		2.017	917,051	21.053	
19.50		354.8	251.8	89,331		2.051	943,633	21.663	
19.80		357.2	254.2	90,792		2.084	970,651	22.283	
20.10		359.6	256.6	92,265		2.118	998,109	22.913	
20.40		362.0	259.0	93,750		2.152	1,026,011	23.554	
20.70		364.4	261.4	95,246		2.187	1,054,360	24.205	
21.00		366.8	263.8	96,754		2.221	1,083,160	24.866	
21.30		369.2	266.2	98,273		2.256	1,112,414	25.538	
21.60		371.6	268.6	99,803		2.291	1,142,125	26.220	
21.90		374.0	271.0	101,346		2.327	1,172,297	26.912	
22.20		376.4	273.4	102,899		2.362	1,202,933	27.616	
22.50		378.8	275.8	104,464		2.398	1,234,038	28.330	
22.80		381.2	278.2	106,041		2.434	1,265,613	29.054	
23.10		383.6	280.6	107,629		2.471	1,297,663	29.790	
23.40		386.0	283.0	109,229		2.508	1,330,192	30.537	
23.70		388.4	285.4	110,840		2.545	1,363,202	31.295	
24.00		390.8	287.8	112,463		2.582	1,396,697	32.064	
24.30		393.2	290.2	114,098		2.619	1,430,681	32.844	
24.60		395.6	292.6	115,743		2.657	1,465,157	33.635	
24.90		398.0	295.0	117,401		2.695	1,500,128	34.438	
25.20		400.4	297.4	119,070		2.733	1,535,599	35.252	
25.50		402.8	299.8	120,750		2.772	1,571,571	36.078	
25.80		405.2	302.2	122,442		2.811	1,608,050	36.916	
26.10		407.6	304.6	124,145		2.850	1,645,038	37.765	
26.40		410.0	307.0	125,860		2.889	1,682,538	38.626	
26.70		412.4	309.4	127,587		2.929	1,720,555	39.499	
27.00		414.8	311.8	129,325		2.969	1,759,091	40.383	
27.30		417.2	314.2	131,074		3.009	1,798,151	41.280	
27.60		419.6	316.6	132,835		3.049	1,837,737	42.189	
27.90		422.0	319.0	134,608		3.090	1,877,853	43.110	
28.20		424.4	321.4	136,392		3.131	1,918,503	44.043	

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

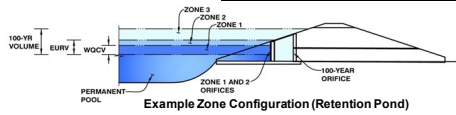


DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: **Front Range - Midway Solar Project**

Basin ID: **Basin A11**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	EDB
Watershed Area =	220.54 acres
Watershed Length =	8,124 ft
Watershed Length to Centroid =	4,145 ft
Watershed Slope =	0.019 ft/ft
Watershed Imperviousness =	4.30% percent
Percentage Hydrologic Soil Group A =	0.0% percent
Percentage Hydrologic Soil Group B =	0.0% percent
Percentage Hydrologic Soil Groups C/D =	100.0% percent
Target WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

Water Quality Capture Volume (WQCV) =	0.577 acre-feet
Excess Urban Runoff Volume (EURV) =	0.737 acre-feet
2-yr Runoff Volume (P1 = 1.01 in.) =	1.282 acre-feet
5-yr Runoff Volume (P1 = 1.3 in.) =	4.740 acre-feet
10-yr Runoff Volume (P1 = 1.57 in.) =	8.874 acre-feet
25-yr Runoff Volume (P1 = 2.01 in.) =	17.979 acre-feet
50-yr Runoff Volume (P1 = 2.4 in.) =	25.077 acre-feet
100-yr Runoff Volume (P1 = 2.82 in.) =	34.260 acre-feet
500-yr Runoff Volume (P1 = 3.98 in.) =	56.839 acre-feet
Approximate 2-yr Detention Volume =	0.484 acre-feet
Approximate 5-yr Detention Volume =	1.804 acre-feet
Approximate 10-yr Detention Volume =	2.859 acre-feet
Approximate 25-yr Detention Volume =	3.740 acre-feet
Approximate 50-yr Detention Volume =	3.970 acre-feet
Approximate 100-yr Detention Volume =	6.255 acre-feet

Optional User Overrides

	acre-feet
	acre-feet
1.01	inches
1.30	inches
1.57	inches
2.01	inches
2.40	inches
2.82	inches
3.98	inches

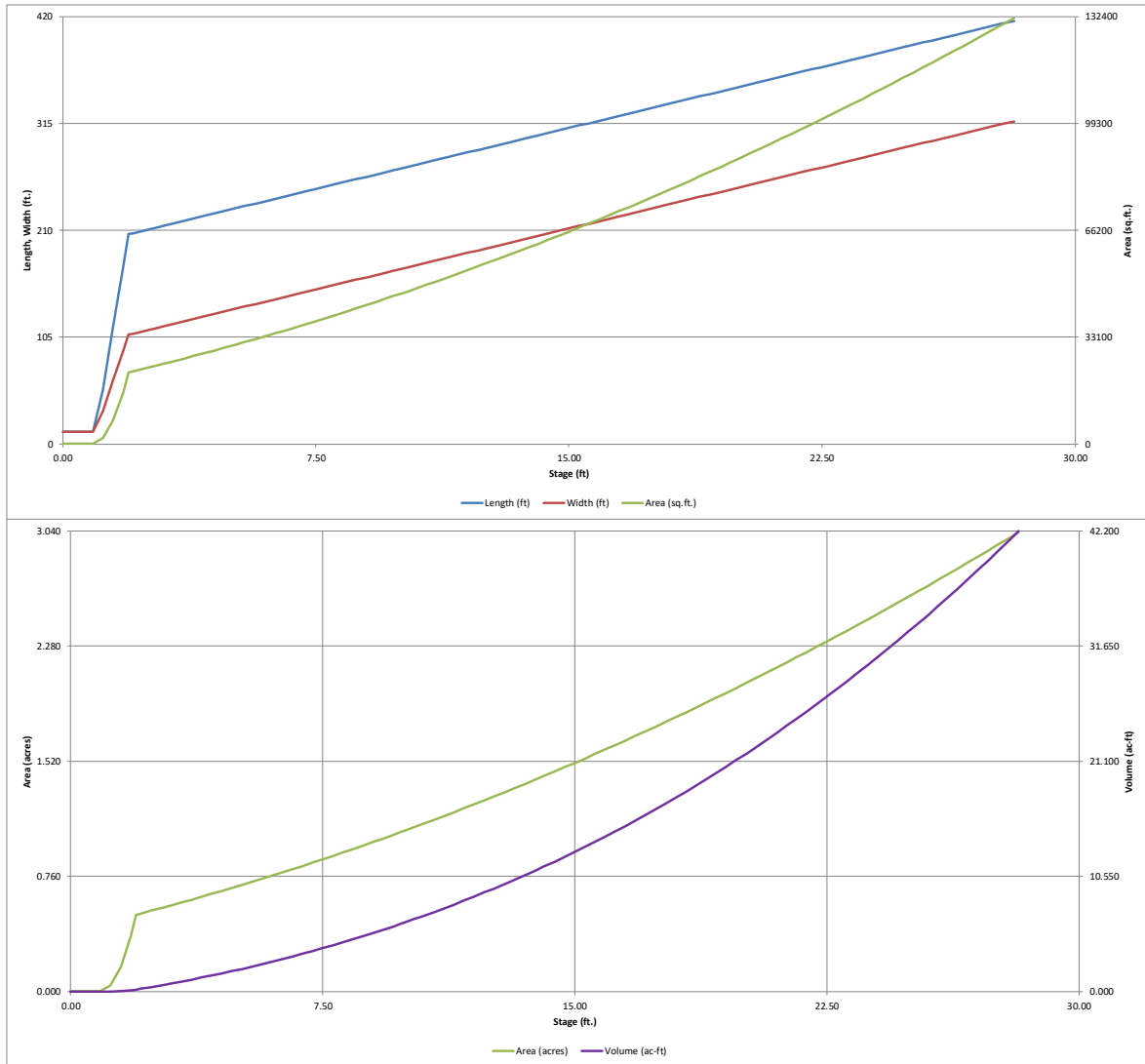
Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.577 acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.160 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	5.518 acre-feet
Total Detention Basin Volume =	6.255 acre-feet
Initial Surge Volume (ISV) =	75 ft ³
Initial Surge Depth (ISD) =	0.50 ft
Total Available Detention Depth (H _{total}) =	9.90 ft
Depth of Trickle Channel (H _{TC}) =	0.50 ft
Slope of Trickle Channel (S _{TC}) =	0.005 ft/ft
Slopes of Main Basin Sides (S _{main}) =	4 ft/V
Basin Length-to-Width Ratio (R _{L/W}) =	2
Initial Surge Area (A _{ISV}) =	151 ft ²
Surge Volume Length (L _{SV}) =	12.3 ft
Surge Volume Width (W _{SV}) =	12.3 ft
Depth of Basin Floor (H _{FLOOR}) =	0.95 ft
Length of Basin Floor (L _{FLOOR}) =	206.1 ft
Width of Basin Floor (W _{FLOOR}) =	107.3 ft
Area of Basin Floor (A _{FLOOR}) =	22,109 ft ²
Volume of Basin Floor (V _{FLOOR}) =	7,627 ft ³
Depth of Main Basin (H _{MAIN}) =	7.95 ft
Length of Main Basin (L _{MAIN}) =	269.7 ft
Width of Main Basin (W _{MAIN}) =	170.9 ft
Area of Main Basin (A _{MAIN}) =	46,084 ft ²
Volume of Main Basin (V _{MAIN}) =	265,302 ft ³
Calculated Total Basin Volume (V _{total}) =	6.269 acre-feet

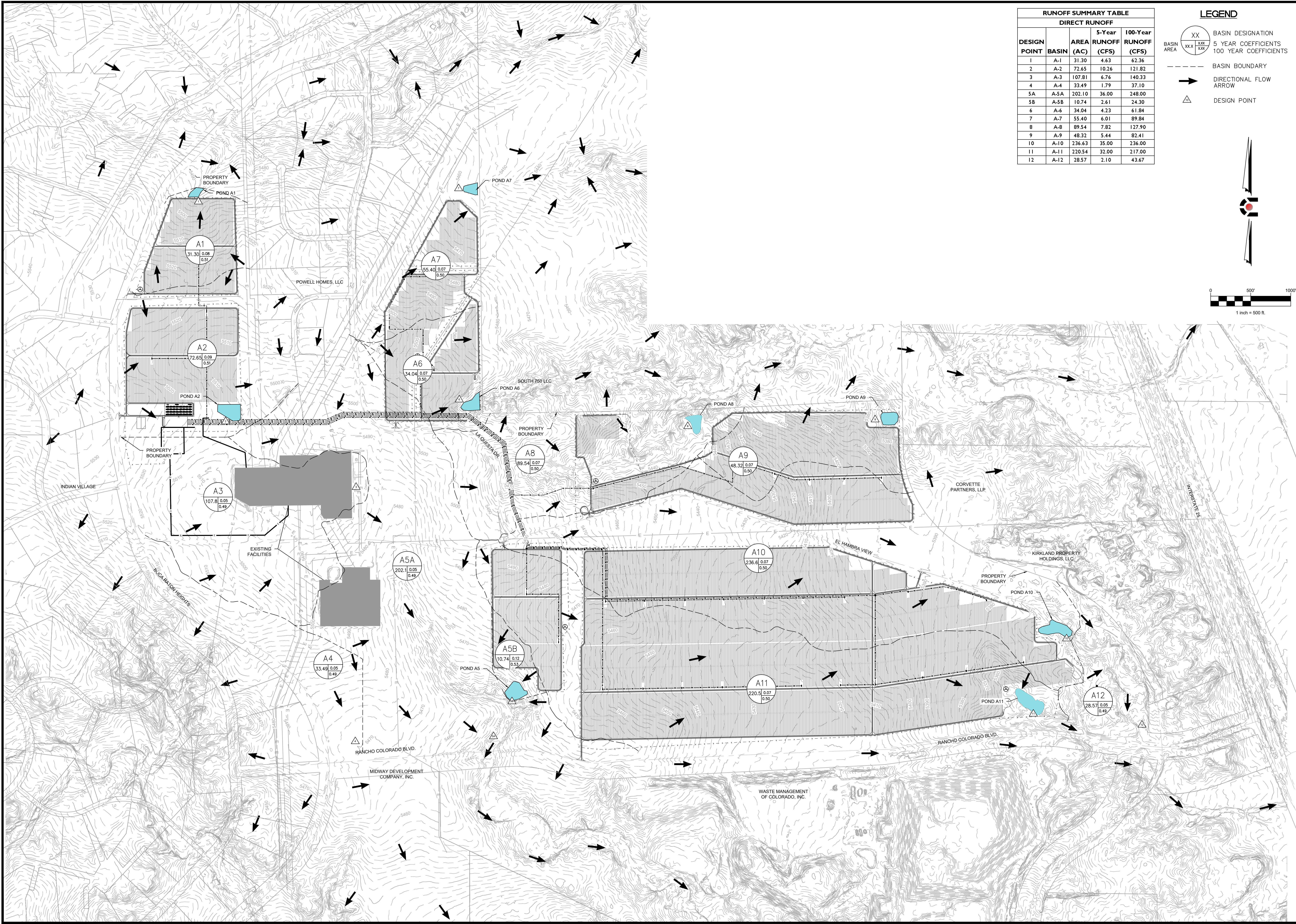
Depth Increment =	0.30									
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft ²)	Optional Override Area (ft ²)	Area (acre)	Volume (ft ³)	Volume (ac-ft)	
Top of Micropool	0.00		12.3	12.3	151		0.003			
ISV	0.50		12.3	12.3	151		0.003	75	0.002	
	0.60		12.3	12.3	151		0.003	91	0.002	
	0.90		12.3	12.3	151		0.003	136	0.003	
	1.20		53.1	32.3	1,714		0.039	310	0.007	
	1.50		114.3	62.3	7,118		0.163	1,543	0.035	
Floor	1.80		175.5	92.3	16,194		0.372	4,948	0.114	
	1.95		206.1	107.3	22,109		0.508	7,809	0.179	
	2.10		207.3	108.5	22,487		0.516	11,154	0.256	
	2.40		209.7	110.9	23,250		0.534	18,014	0.414	
	2.70		212.1	113.3	24,026		0.552	25,105	0.576	
Zone 1 (WQCV)	2.71		212.2	113.4	24,052		0.552	25,346	0.582	
Zone 2 (EURV)	2.99		214.4	115.6	24,786		0.569	32,183	0.739	
	3.00		214.5	115.7	24,812		0.570	32,431	0.745	
	3.30		216.9	118.1	25,610		0.588	39,994	0.918	
	3.60		219.3	120.5	26,420		0.607	47,798	1.097	
	3.90		221.7	122.9	27,241		0.625	55,847	1.282	
	4.20		224.1	125.3	28,074		0.644	64,144	1.473	
	4.50		226.5	127.7	28,918		0.664	72,693	1.669	
	4.80		228.9	130.1	29,774		0.684	81,496	1.871	
	5.10		231.3	132.5	30,641		0.703	90,558	2.079	
	5.40		233.7	134.9	31,520		0.724	99,882	2.293	
	5.70		236.1	137.3	32,410		0.744	109,471	2.513	
	6.00		238.5	139.7	33,312		0.765	119,329	2.739	
	6.30		240.9	142.1	34,226		0.786	129,460	2.972	
	6.60		243.3	144.5	35,150		0.807	139,866	3.211	
	6.90		245.7	146.9	36,087		0.828	150,551	3.456	
	7.20		248.1	149.3	37,035		0.850	161,519	3.708	
	7.50		250.5	151.7	37,994		0.872	172,773	3.966	
	7.80		252.9	154.1	38,965		0.895	184,317	4.231	
	8.10		255.3	156.5	39,948		0.917	196,153	4.503	
	8.40		257.7	158.9	40,942		0.940	208,287	4.782	
	8.70		260.1	161.3	41,947		0.963	220,720	5.067	
	9.00		262.5	163.7	42,964		0.986	233,456	5.359	
	9.30		264.9	166.1	43,993		1.010	246,499	5.659	
	9.60		267.3	168.5	45,033		1.034	259,853	5.965	
	Zone 3 (100-year)	9.88		269.5	170.7	46,014		1.056	272,599	6.258
		9.90		269.7	170.9	46,084		1.058	273,520	6.279
		10.20		272.1	173.3	47,148		1.082	287,505	6.600
10.50			274.5	175.7	48,222		1.107	301,810	6.929	
10.80			276.9	178.1	49,308		1.132	316,439	7.264	
11.10			279.3	180.5	50,406		1.157	331,396	7.608	
11.40			281.7	182.9	51,515		1.183	346,684	7.959	
11.70			284.1	185.3	52,636		1.208	362,306	8.317	
12.00			286.5	187.7	53,768		1.234	378,267	8.684	
12.30			288.9	190.1	54,912		1.261	394,568	9.058	
12.60			291.3	192.5	56,067		1.287	411,215	9.440	
12.90			293.7	194.9	57,234		1.314	428,210	9.830	
13.20			296.1	197.3	58,412		1.341	445,557	10.229	
13.50			298.5	199.7	59,602		1.368	463,258	10.635	
13.80			300.9	202.1	60,804		1.396	481,319	11.050	
14.10			303.3	204.5	62,016		1.424	499,742	11.472	
14.40			305.7	206.9	63,241		1.452	518,530	11.904	
14.70			308.1	209.3	64,477		1.480	537,687	12.344	
15.00			310.5	211.7	65,724		1.509	557,217	12.792	
15.30			312.9	214.1	66,983		1.538	577,123	13.249	
15.60			315.3	216.5	68,254		1.567	597,408	13.715	
15.90			317.7	218.9	69,536		1.596	618,076	14.189	
16.20			320.1	221.3	70,829		1.626	639,131	14.672	
16.50			322.5	223.7	72,134		1.656	660,575	15.165	
16.80			324.9	226.1	73,451		1.686	682,413	15.666	
17.10		327.3	228.5	74,779		1.717	704,647	16.176		
17.40		329.7	230.9	76,118		1.747	727,281	16.696		
17.70		332.1	233.3	77,470		1.778	750,319	17.225		
18.00		334.5	235.7	78,832		1.810	773,764	17.763		
18.30		336.9	238.1	80,206		1.841	797,619	18.311		
18.60		339.3	240.5	81,592		1.873	821,889	18.868		
18.90		341.7	242.9	82,989		1.905	846,576	19.435		
19.20		344.1	245.3	84,398		1.938	871,684	20.011		
19.50		346.5	247.7	85,818		1.970	897,216	20.597		
19.80		348.9	250.1	87,250		2.003	923,176	21.193		
20.10		351.3	252.5	88,693		2.036	949,567	21.799		
20.40		353.7	254.9	90,148		2.070	976,393	22.415		
20.70		356.1	257.3	91,614		2.103	1,003,657	23.041		
21.00		358.5	259.7	93,092		2.137	1,031,363	23.677		
21.30		360.9	262.1	94,582		2.171	1,059,513	24.323		
21.60		363.3	264.5	96,082		2.206	1,088,113	24.980		
21.90		365.7	266.9	97,595		2.240	1,117,164	25.647		
22.20		368.1	269.3	99,119		2.275	1,146,671	26.324		
22.50		370.5	271.7	100,654		2.311	1,176,636	27.012		
22.80		372.9	274.1	102,201		2.346	1,207,064	27.710		
23.10		375.3	276.5	103,760		2.382	1,237,958	28.420		
23.40		377.7	278.9	105,330		2.418	1,269,321	29.140		
23.70		380.1	281.3	106,911		2.454	1,301,157	29.870		
24.00		382.5	283.7	108,504		2.491	1,333,469	30.612		
24.30		384.9	286.1	110,109		2.528	1,366,261	31.365		
24.60		387.3	288.5	111,725		2.565	1,399,536	32.129		
24.90		389.7	290.9	113,352		2.602	1,433,297	32.904		
25.20		392.1	293.3	114,992		2.640	1,467,548	33.690		
25.50		394.5	295.7	116,642		2.678	1,502,293	34.488		
25.80		396.9	298.1	118,304		2.716	1,537,535	35.297		
26.10		399.3	300.5	119,978		2.754	1,573,077	36.117		
26.40		401.7	302.9	121,663		2.793	1,609,523	36.950		
26.70		404.1	305.3	123,360		2.832	1,646,276	37.793		
27.00		406.5	307.7	125,068		2.871	1,683,540	38.649		
27.30		408.9	310.1	126,788		2.911	1,721,318	39.516		
27.60		411.3	312.5	128,519		2.950	1,759,614	40.395		
27.90		413.7	314.9	130,262		2.990	1,798,431	41.286		
28.20		416.1	317.3	132,016		3.031	1,837,772	42.189		

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)



8/10/2020 2:26 PM, X:\10-477 FRANK SOLAR, EARLY ASSISTANCE\DRAWINGS\DRAINAGE LETTERS\DRAIN MAP.DWG,



RUNOFF SUMMARY TABLE				
DIRECT RUNOFF				
DESIGN POINT	BASIN	AREA (AC)	5-Year RUNOFF (CFS)	100-Year RUNOFF (CFS)
1	A-1	31.30	4.63	62.36
2	A-2	72.65	10.26	121.82
3	A-3	107.81	6.76	140.33
4	A-4	33.49	1.79	37.10
5A	A-5A	202.10	36.00	248.00
5B	A-5B	10.74	2.61	24.30
6	A-6	34.04	4.23	61.84
7	A-7	55.40	6.01	89.84
8	A-8	89.54	7.82	127.90
9	A-9	48.32	5.44	82.41
10	A-10	236.63	35.00	236.00
11	A-11	220.54	32.00	217.00
12	A-12	28.57	2.10	43.67

XX

BASIN DESIGNATION

XXX

5 YEAR COEFFICIENTS

XXX

100 YEAR COEFFICIENTS

BASIN BOUNDARY

→

DIRECTIONAL FLOW ARROW

△

DESIGN POINT

0 500' 1000'

1 inch = 500 ft.

CALL 2 BUSINESS DAYS IN ADVANCE BEFORE YOU DIG, GRADE, OR EXCAVATE FOR THE MARKING OF UNDERGROUND UTILITY LINES.

811

Know what's below. Call before you dig.

DESIGNED BY: DJB

DRAWN BY: DJB

CHECKED BY: DJB

DATE BY

06/12/20 DB

08/12/20 DB

#

REVISION DESCRIPTION

1 SUBMITTAL #1

2 SUBMITTAL #2

FRONT RANGE MIDWAY SOLAR PROJECT

EL PASO COUNTY, FOUNTAIN, CO

EXHIBIT

OVERALL DRAINAGE MAP

CIVIL ENGINEERING

DEVELOPMENT CONSULTING

NATURAL RESOURCES CONSULTING

LAND SURVEYING

303.703.4444

1950 W. Litchton Blvd., Ste. 109

Litchton, CO 80120

CORE CONSULTANTS