

October 31, 2023

El Paso County
Planning and Community Development
2880 International Circle, Suite 110
Colorado Springs, CO 80910



Attn.: Mr. Brad Walters, Inspection Supervisor
RE: Cloverleaf Filing No. 2 – Pond Certifications

To whom it may concern,

This letter is intended to provide documentation with County Inspection Staff that the Pond facilities in Cloverleaf Filing No. 2 have been constructed within reasonable conformance to the design. The District owned pond facilities for Cloverleaf Filing No. 2 are described by the following:

- Pond 1 above lots 88 -102 (Volume Attenuation Pond)
- Pond P-2 within Tract A (FSD)
- Pond P-3 within Tract I (FSD)
- Pond P-4 within Tract F (Water Quality)
- Sand Filter within Tract H (Sand Filter)

JR Engineering reviewed the final constructed facilities and recently gathered EJ Survey as-builts which confirm the appropriate size and design of the ponds.

The site and adjacent properties (as affected by work performed under the County permit) appear to be stable with respect to settlement and subsidence, sloughing of cut and fill slopes, revegetation or other ground cover, and the improvements (public improvements, common development improvements, site grading and paving) meet or exceed the minimum design requirements.

Based upon this information and information gathered during periodic site visits to the project under construction, JR Engineering is of the opinion that the stormwater BMPs have been constructed in general compliance with the approved Construction Plans, and Specifications as filed with El Paso County.

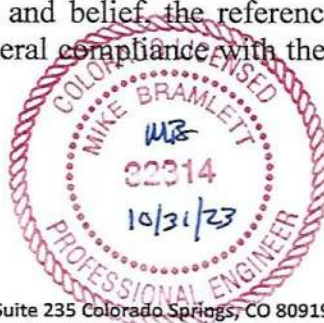
(See attached documents – UD Detention sheets and as-built drawings)

Statement Of Engineer In Responsible Charge:

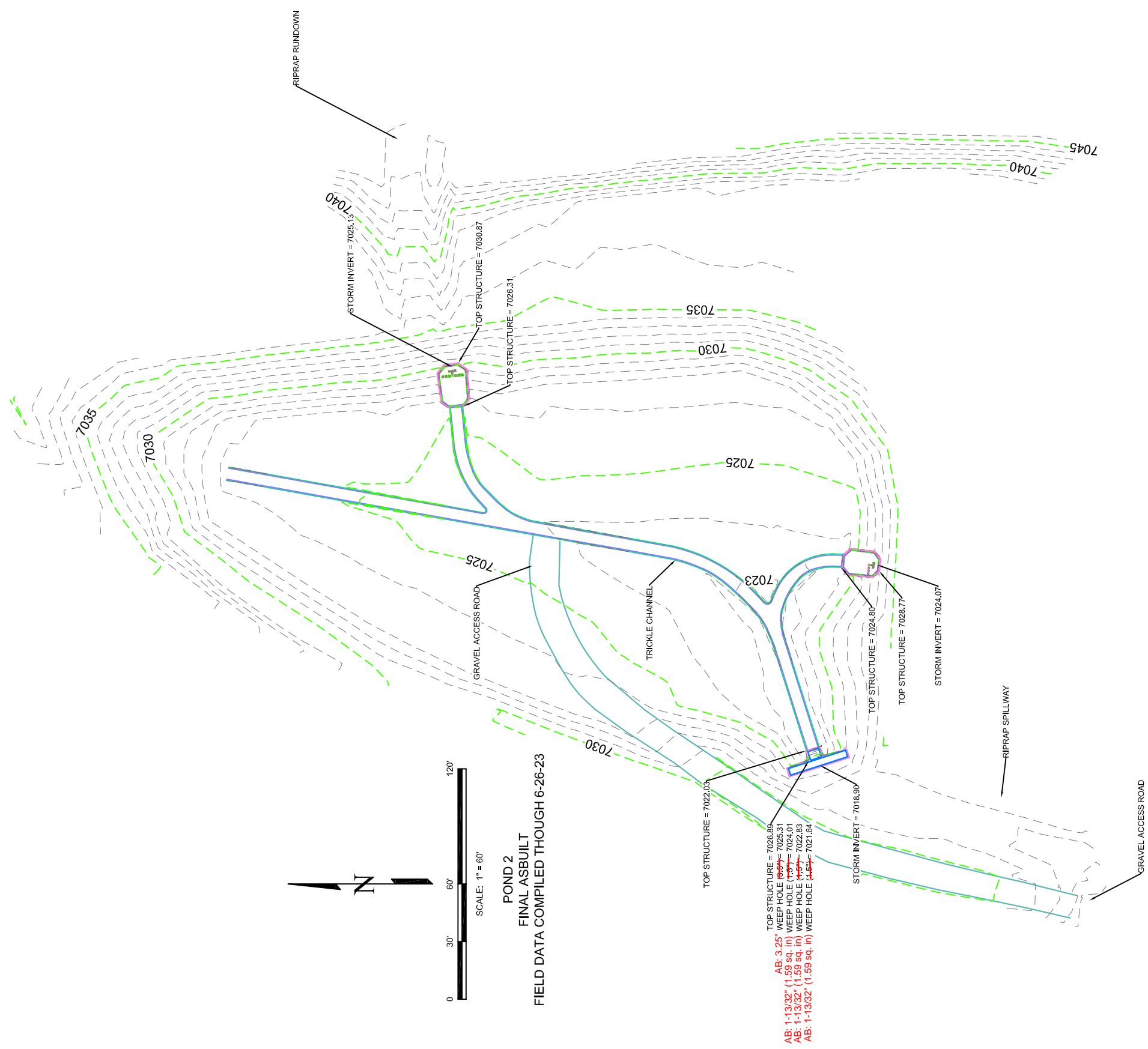
To the best of my knowledge, information and belief, the referenced Cloverleaf Filing No. 2 Pond facilities have been constructed in general compliance with the approved design plans and specifications as filed with El Paso County.

A handwritten signature in blue ink that reads "Mike Bramlett".

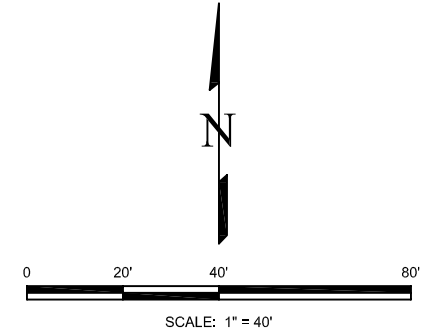
Mike Bramlett, P.E.
Colorado No. 32314



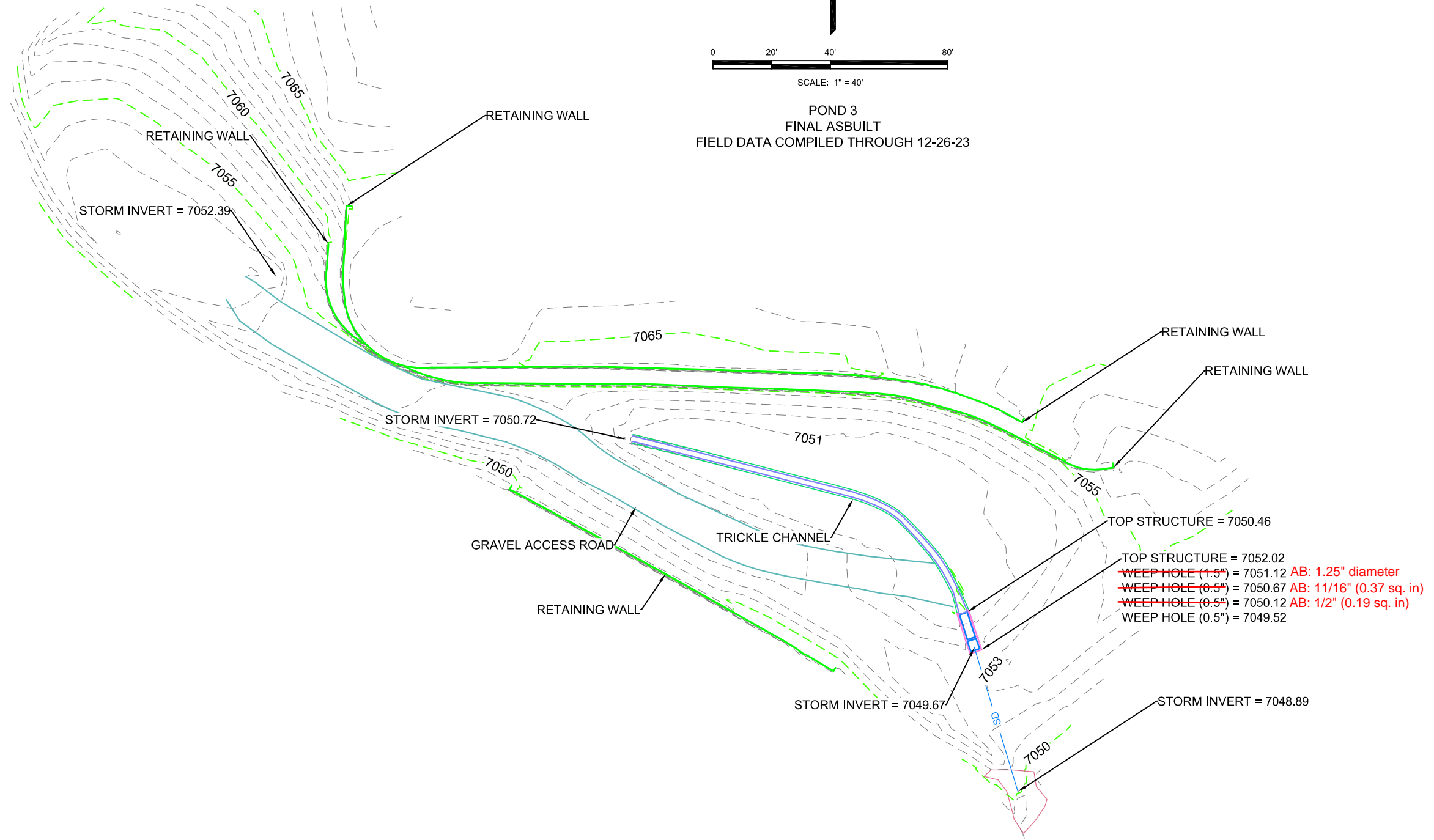
All info and linework shown on this plan is the As-Built Condition



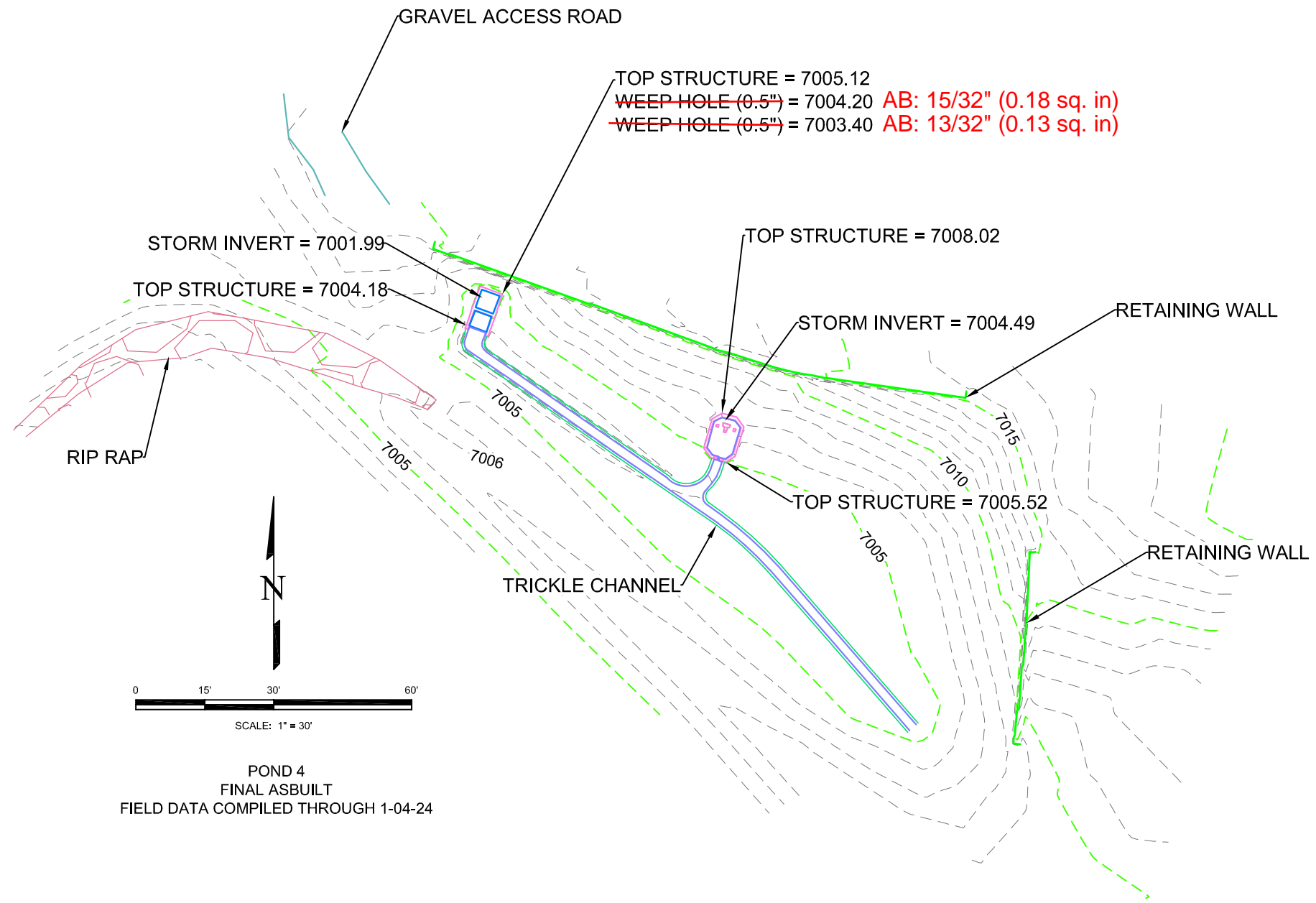
All info and linework shown on this plan is the As-Built Condition

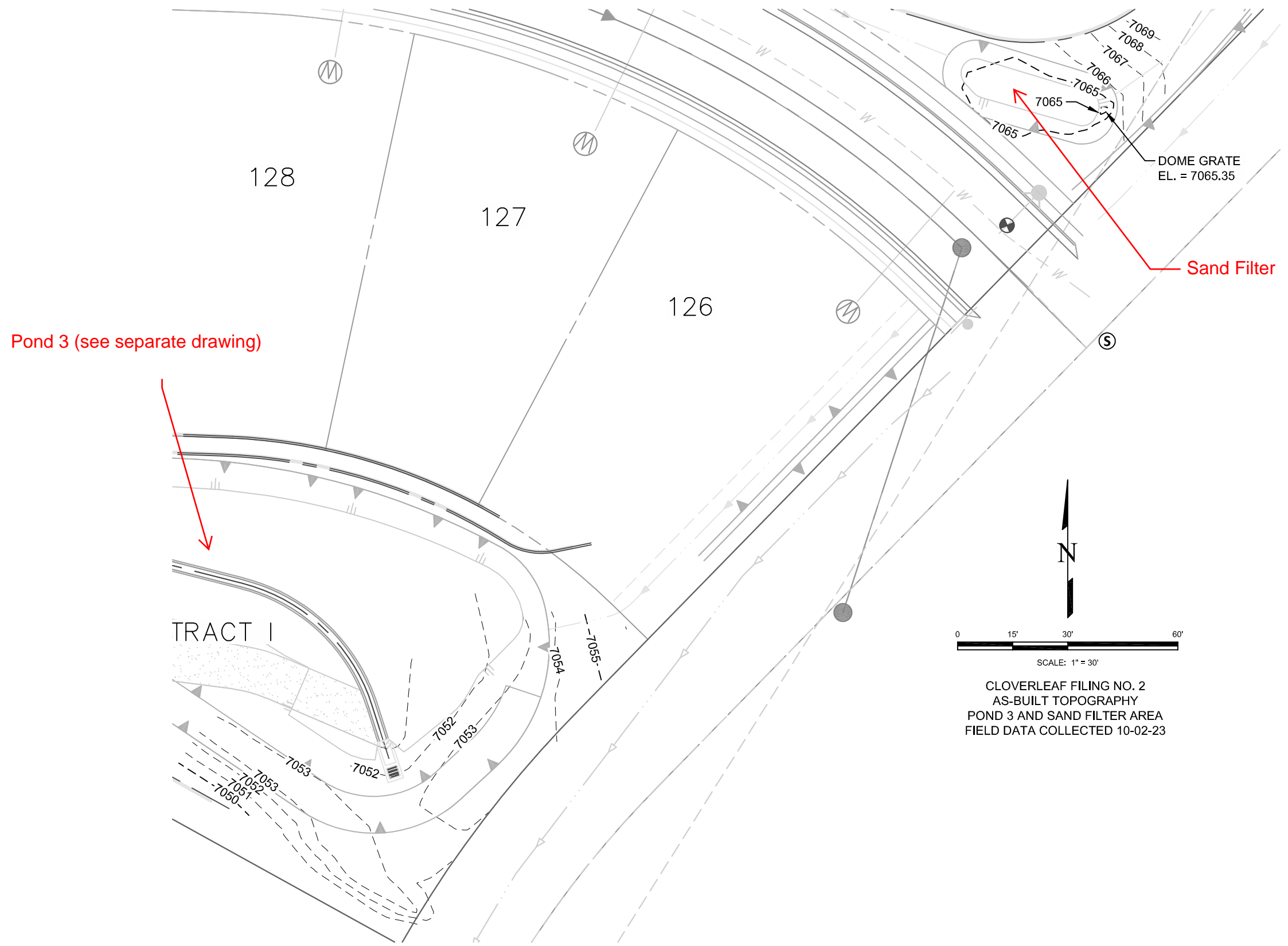


POND 3
FINAL ASBUILT
FIELD DATA COMPILED THROUGH 12-26-23



All info and linework shown on this plan is the As-Built Condition





Pond 3 (see separate drawing)

Sand Filter

DOME GRATE
EL. = 7065.35

N

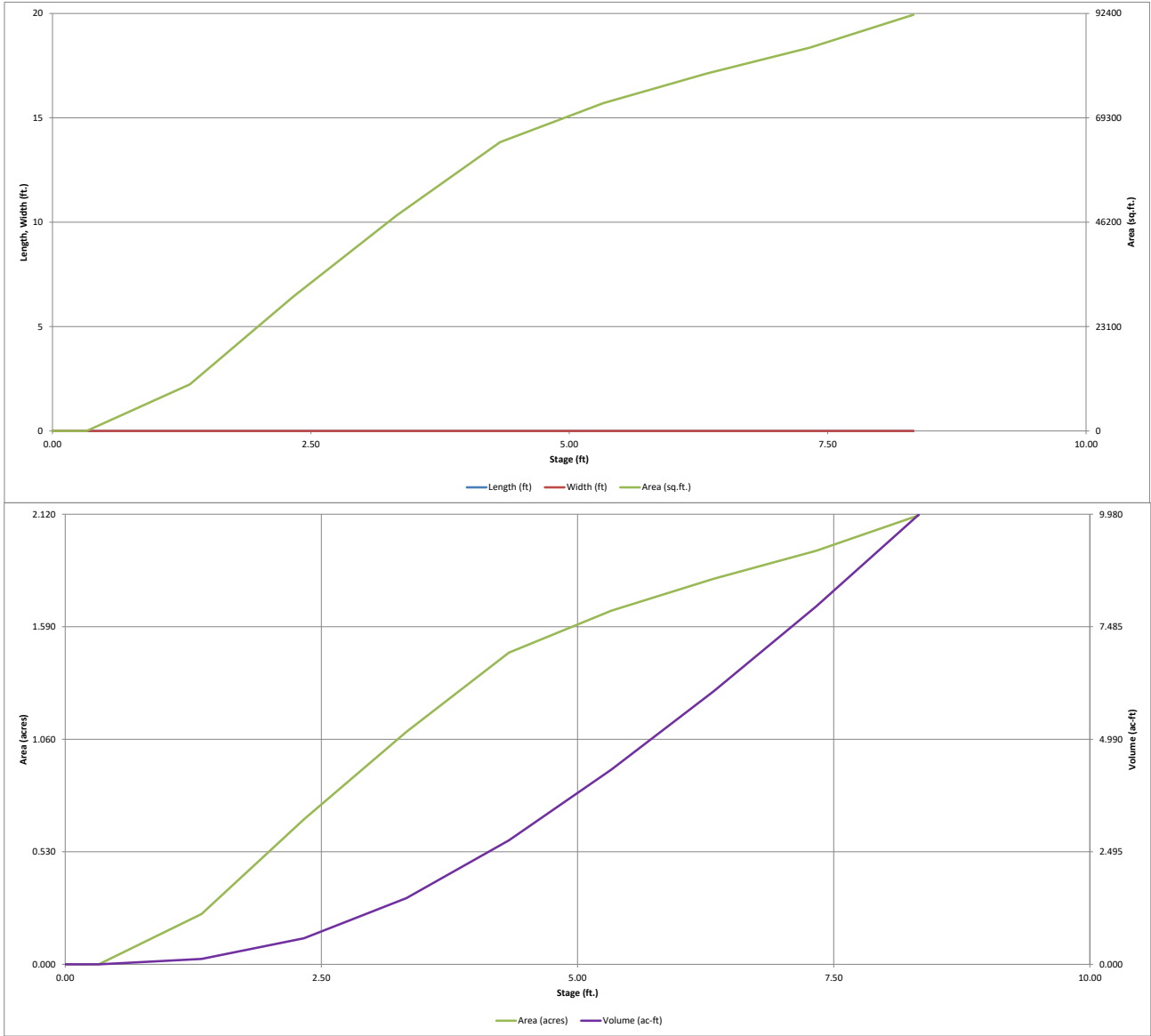
0 15' 30' 60'

SCALE: 1" = 30'

CLOVERLEAF FILING NO. 2
AS-BUILT TOPOGRAPHY
POND 3 AND SAND FILTER AREA
FIELD DATA COLLECTED 10-02-23

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

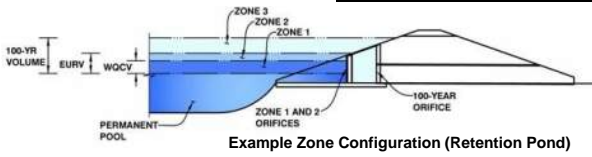


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: Cloverleaf Filing No. 1

Basin ID: Attenuation Pond P1



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (100-year)	7.12	7.514	Weir&Pipe (Restrict)
Zone 2			
Zone 3			
Total (all zones)		7.514	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Calculated Parameters for Underdrain

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft ²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Calculated Parameters for Plate

Invert of Lowest Orifice =	N/A	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft ²
Depth at top of Zone using Orifice Plate =	N/A	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft ²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (optional)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

Calculated Parameters for Vertical Orifice

Invert of Vertical Orifice =	Not Selected	Not Selected	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	Not Selected	Not Selected	ft ²
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =			feet
Vertical Orifice Diameter =			inches				

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

Calculated Parameters for Overflow Weir

	Zone 1 Weir	Not Selected		Zone 1 Weir	Not Selected	
Overflow Weir Front Edge Height, H _o =	0.00		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H _t =	3.33	feet
Overflow Weir Front Edge Length =	6.00		feet	Overflow Weir Slope Length =	10.54	feet
Overflow Weir Grate Slope =	3.00		H:V	Grate Open Area / 100-yr Orifice Area =	6.63	
Horiz. Length of Weir Sides =	10.00		feet	Overflow Grate Open Area w/o Debris =	44.27	ft ²
Overflow Grate Open Area % =	70%		% , grate open area/total area	Overflow Grate Open Area w/ Debris =	22.14	ft ²
Debris Clogging % =	50%		%			

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Depth to Invert of Outlet Pipe =	Zone 1 Restrictor	Not Selected	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	Zone 1 Restrictor	Not Selected	ft ²
Outlet Pipe Diameter =	42.00		inches	Outlet Orifice Centroid =	1.29		feet
Restrictor Plate Height Above Pipe Invert =	27.50		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.89	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

Spillway Invert Stage =	6.08	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth =	1.33	feet
Spillway Crest Length =	32.00	feet	Stage at Top of Freeboard =	8.41	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	2.11	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	9.97	acre-ft

Routed Hydrograph Results

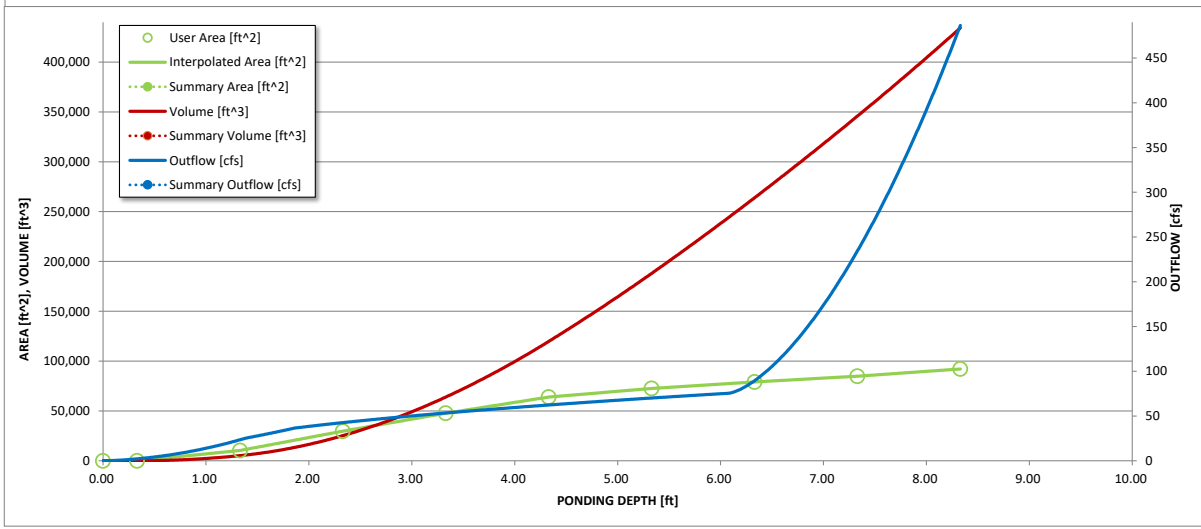
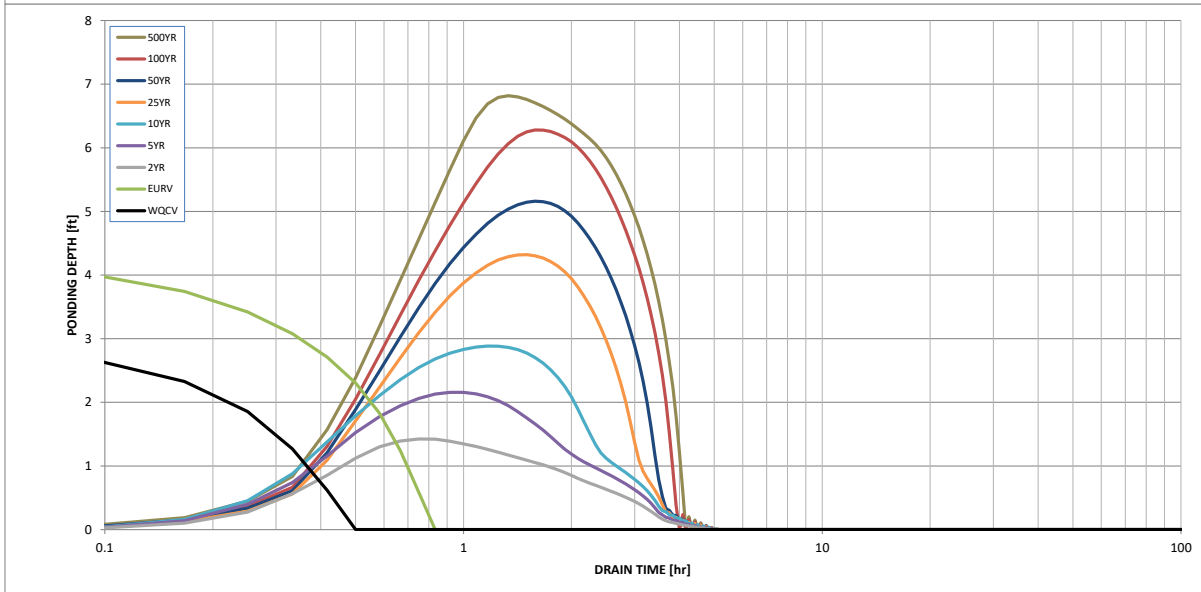
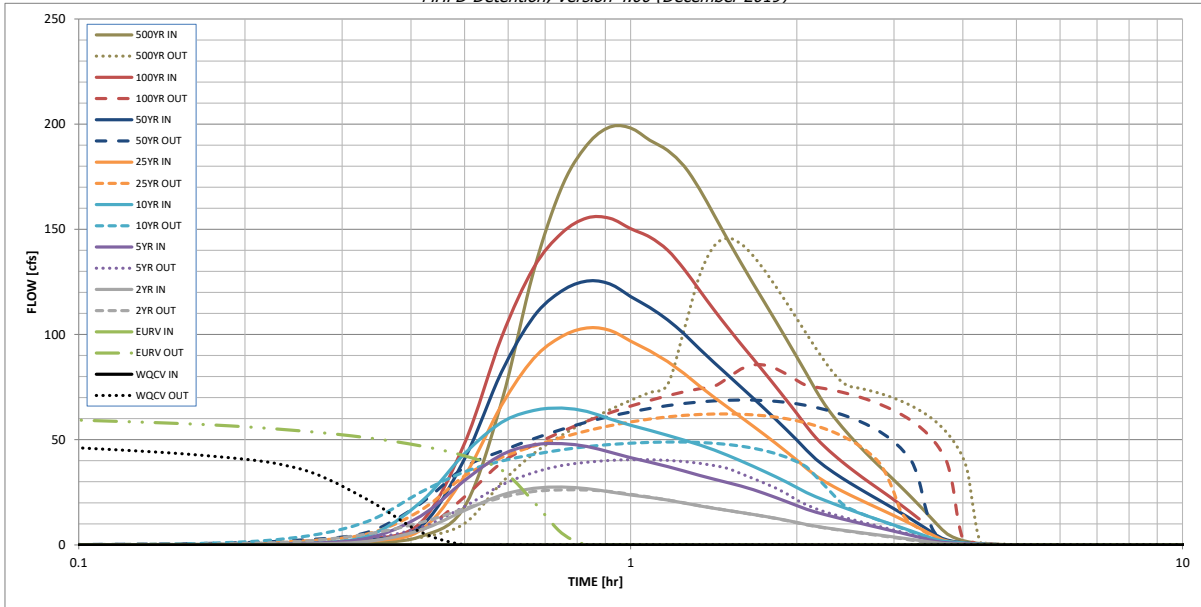
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.00
CUHP Runoff Volume (acre-ft) =	1.401	2.993	3.226	5.717	8.074	11.847	14.582	18.346	23.804
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.226	5.717	8.074	11.847	14.582	18.346	23.804
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	9.9	27.9	43.4	80.3	101.1	129.9	170.2
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.07	0.21	0.32	0.59	0.74	0.96	1.25
Peak Inflow Q (cfs) =	N/A	N/A	27.5	48.1	65.1	103.1	125.4	155.4	198.7
Peak Outflow Q (cfs) =	51.1	62.5	26.1	40.5	48.9	62.2	68.9	85.6	145.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.5	1.1	0.8	0.7	0.7	0.9
Structure Controlling Flow =	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	1.19	1.44	0.59	0.9	1.1	1.4	1.6	1.7	1.8
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	0	1	1	2	2	3	3	4	4
Time to Drain 99% of Inflow Volume (hours) =	0	1	2	2	3	3	3	4	4
Maximum Ponding Depth (ft) =	3.27	4.50	1.43	2.16	2.88	4.32	5.16	6.28	6.82
Area at Maximum Ponding Depth (acres) =	1.07	1.50	0.28	0.60	0.91	1.46	1.63	1.81	1.88
Maximum Volume Stored (acre-ft) =	1.403	3.001	0.142	0.463	1.017	2.734	4.019	5.948	6.944

yellow cells are as-built/changes from approved design.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)



S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

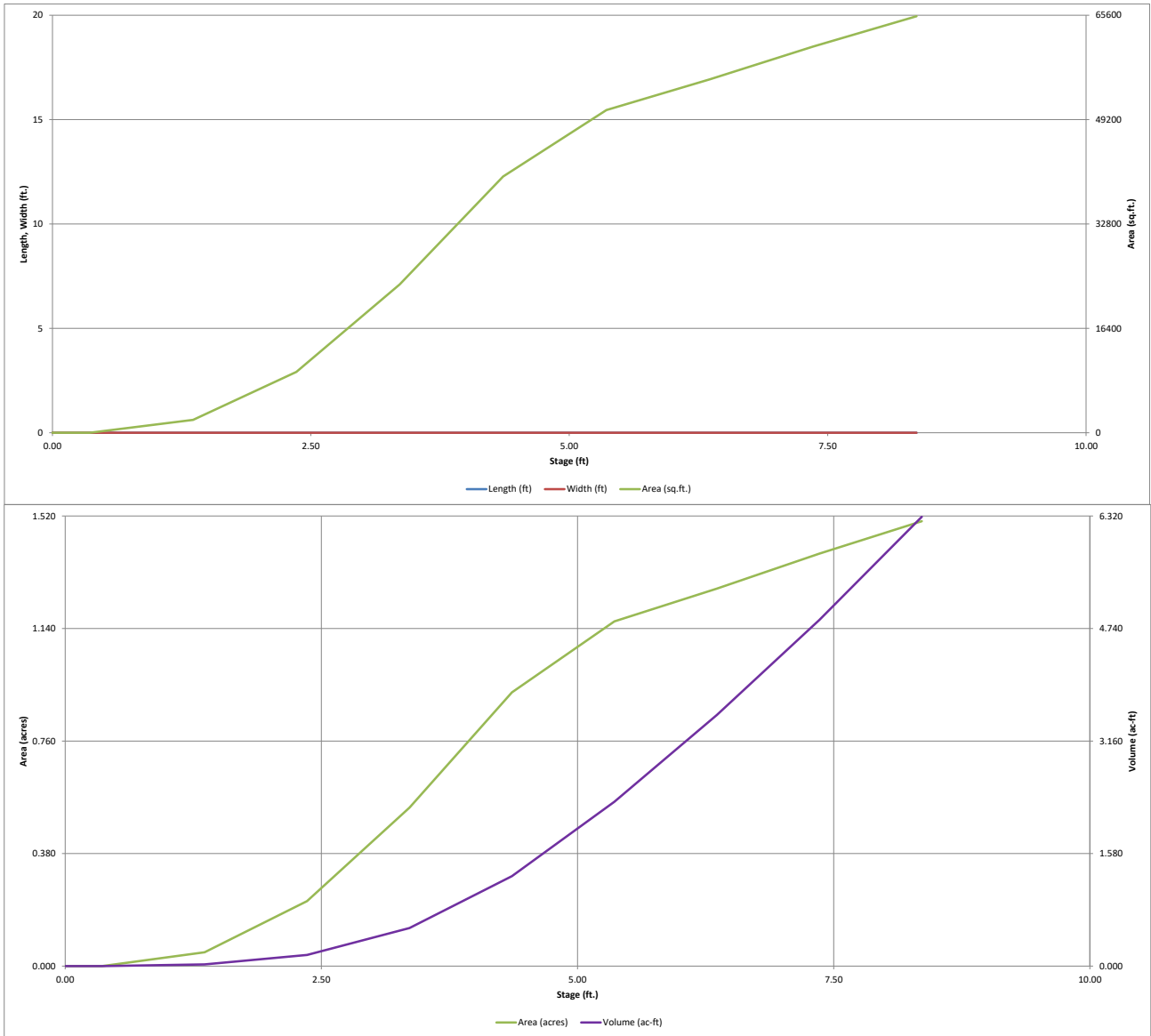
Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.10
	0:15:00	0.00	0.00	0.34	0.56	0.69	0.47	0.63	0.58	0.88
	0:20:00	0.00	0.00	1.61	3.09	4.17	1.75	2.24	2.60	3.98
	0:25:00	0.00	0.00	7.03	13.68	20.35	7.00	8.68	10.63	18.02
	0:30:00	0.00	0.00	16.33	30.59	43.34	32.65	40.82	48.21	67.71
	0:35:00	0.00	0.00	23.65	42.79	58.20	66.30	82.08	98.53	129.76
	0:40:00	0.00	0.00	26.87	47.50	63.86	88.51	108.37	131.60	169.95
	0:45:00	0.00	0.00	27.50	48.14	65.05	99.07	120.69	148.20	190.10
	0:50:00	0.00	0.00	26.72	46.78	63.42	103.12	125.42	155.40	198.66
	0:55:00	0.00	0.00	25.20	44.10	59.87	101.98	124.06	155.26	198.18
	1:00:00	0.00	0.00	23.72	41.44	56.86	96.85	118.04	150.33	192.34
	1:05:00	0.00	0.00	22.57	39.29	54.43	92.22	112.81	146.32	187.54
	1:10:00	0.00	0.00	21.30	37.22	52.06	87.16	106.97	140.12	180.06
	1:15:00	0.00	0.00	19.88	35.09	49.78	81.47	100.30	131.04	169.11
	1:20:00	0.00	0.00	18.52	33.01	47.52	75.46	93.11	120.99	156.78
	1:25:00	0.00	0.00	17.36	31.21	45.10	70.14	86.63	111.65	145.01
	1:30:00	0.00	0.00	16.35	29.58	42.53	65.32	80.72	103.27	134.24
	1:35:00	0.00	0.00	15.39	27.99	39.93	60.77	75.11	95.57	124.28
	1:40:00	0.00	0.00	14.47	26.26	37.35	56.45	69.77	88.51	115.08
	1:45:00	0.00	0.00	13.55	24.38	34.81	52.27	64.61	81.72	106.23
	1:50:00	0.00	0.00	12.63	22.46	32.33	48.20	59.60	75.14	97.69
	1:55:00	0.00	0.00	11.66	20.55	29.84	44.20	54.67	68.72	89.36
	2:00:00	0.00	0.00	10.65	18.68	27.27	40.28	49.86	62.51	81.31
	2:05:00	0.00	0.00	9.66	16.94	24.84	36.33	44.99	56.33	73.40
	2:10:00	0.00	0.00	8.83	15.53	22.84	32.79	40.68	50.90	66.51
	2:15:00	0.00	0.00	8.16	14.38	21.12	30.01	37.27	46.56	60.90
	2:20:00	0.00	0.00	7.56	13.32	19.52	27.66	34.35	42.84	56.02
	2:25:00	0.00	0.00	7.00	12.33	18.03	25.56	31.72	39.48	51.60
	2:30:00	0.00	0.00	6.47	11.39	16.62	23.63	29.30	36.41	47.54
	2:35:00	0.00	0.00	5.97	10.50	15.28	21.85	27.07	33.57	43.79
	2:40:00	0.00	0.00	5.49	9.64	14.00	20.14	24.93	30.91	40.28
	2:45:00	0.00	0.00	5.03	8.81	12.78	18.51	22.90	28.43	37.00
	2:50:00	0.00	0.00	4.59	8.01	11.61	16.94	20.94	26.06	33.86
	2:55:00	0.00	0.00	4.16	7.23	10.49	15.40	19.03	23.72	30.80
	3:00:00	0.00	0.00	3.74	6.48	9.42	13.89	17.16	21.41	27.77
	3:05:00	0.00	0.00	3.32	5.74	8.36	12.39	15.30	19.11	24.76
	3:10:00	0.00	0.00	2.91	5.01	7.32	10.91	13.47	16.82	21.77
	3:15:00	0.00	0.00	2.50	4.30	6.29	9.44	11.65	14.54	18.79
	3:20:00	0.00	0.00	2.10	3.59	5.27	7.98	9.83	12.27	15.83
	3:25:00	0.00	0.00	1.71	2.90	4.27	6.52	8.04	10.02	12.89
	3:30:00	0.00	0.00	1.33	2.22	3.30	5.10	6.28	7.81	10.01
	3:35:00	0.00	0.00	0.97	1.59	2.43	3.71	4.57	5.67	7.28
	3:40:00	0.00	0.00	0.70	1.17	1.89	2.49	3.12	3.88	5.11
	3:45:00	0.00	0.00	0.54	0.95	1.56	1.78	2.28	2.77	3.72
	3:50:00	0.00	0.00	0.45	0.78	1.30	1.32	1.71	2.02	2.75
	3:55:00	0.00	0.00	0.37	0.65	1.08	1.00	1.31	1.46	2.03
	4:00:00	0.00	0.00	0.31	0.54	0.89	0.76	1.00	1.05	1.48
	4:05:00	0.00	0.00	0.26	0.44	0.73	0.59	0.78	0.75	1.06
	4:10:00	0.00	0.00	0.21	0.35	0.58	0.46	0.60	0.52	0.75
	4:15:00	0.00	0.00	0.17	0.28	0.45	0.35	0.46	0.38	0.56
	4:20:00	0.00	0.00	0.14	0.22	0.35	0.28	0.36	0.31	0.44
	4:25:00	0.00	0.00	0.11	0.17	0.27	0.22	0.28	0.24	0.34
	4:30:00	0.00	0.00	0.09	0.12	0.20	0.17	0.22	0.19	0.27
	4:35:00	0.00	0.00	0.07	0.09	0.15	0.13	0.17	0.15	0.21
	4:40:00	0.00	0.00	0.05	0.06	0.11	0.10	0.12	0.11	0.16
	4:45:00	0.00	0.00	0.03	0.04	0.08	0.07	0.09	0.08	0.11
	4:50:00	0.00	0.00	0.02	0.03	0.05	0.04	0.06	0.05	0.07
	4:55:00	0.00	0.00	0.01	0.02	0.03	0.03	0.03	0.03	0.04
	5:00:00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.01	0.02
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

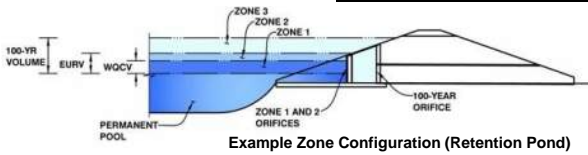


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: Cloverleaf Filing No. 2

Basin ID: Pond P2



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.47	0.590	Orifice Plate
Zone 2 (EURV)	5.04	1.348	Circular Orifice
Zone 3 (100-year)	6.12	1.279	Weir&Pipe (Restrict)
Total (all zones)		3.216	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Calculated Parameters for Underdrain

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft ²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Calculated Parameters for Plate

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft ²
Depth at top of Zone using Orifice Plate =	3.68	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft ²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	1.19	2.37					
Orifice Area (sq. inches)	1.59	1.59	1.59					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

Calculated Parameters for Vertical Orifice

	Zone 2 Circular	Not Selected		Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	3.67	N/A	ft (relative to basin bottom at Stage = 0 ft)	0.06	N/A	ft ²
Depth at top of Zone using Vertical Orifice =	5.25	N/A	ft (relative to basin bottom at Stage = 0 ft)	0.14	N/A	feet
Vertical Orifice Diameter =	3.25	N/A	inches			

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected		Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	5.25	N/A	ft (relative to basin bottom at Stage = 0 ft)	5.25	N/A	feet
Overflow Weir Front Edge Length =	31.06	N/A	feet	3.46	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	6.44	N/A	
Horiz. Length of Weir Sides =	3.46	N/A	feet	53.73	N/A	ft ²
Overflow Grate Open Area % =	50%	N/A	% , grate open area/total area	53.73	N/A	ft ²
Debris Clogging % =	0%	N/A	%			

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected		Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.77	N/A	ft (distance below basin bottom at Stage = 0 ft)	8.34	N/A	ft ²
Outlet Pipe Diameter =	42.00	N/A	inches	1.54	N/A	feet
Restrictor Plate Height Above Pipe Invert =	34.00		inches	2.24	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

Spillway Invert Stage =	7.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth =	0.79	feet
Spillway Crest Length =	45.00	feet	Stage at Top of Freeboard =	8.79	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	1.50	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	6.31	acre-ft

Routed Hydrograph Results

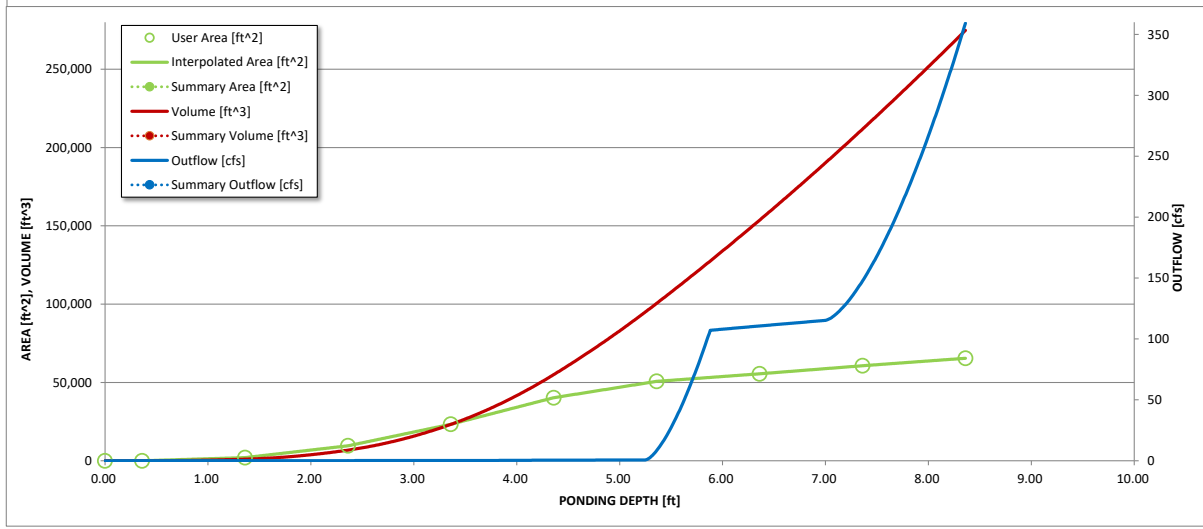
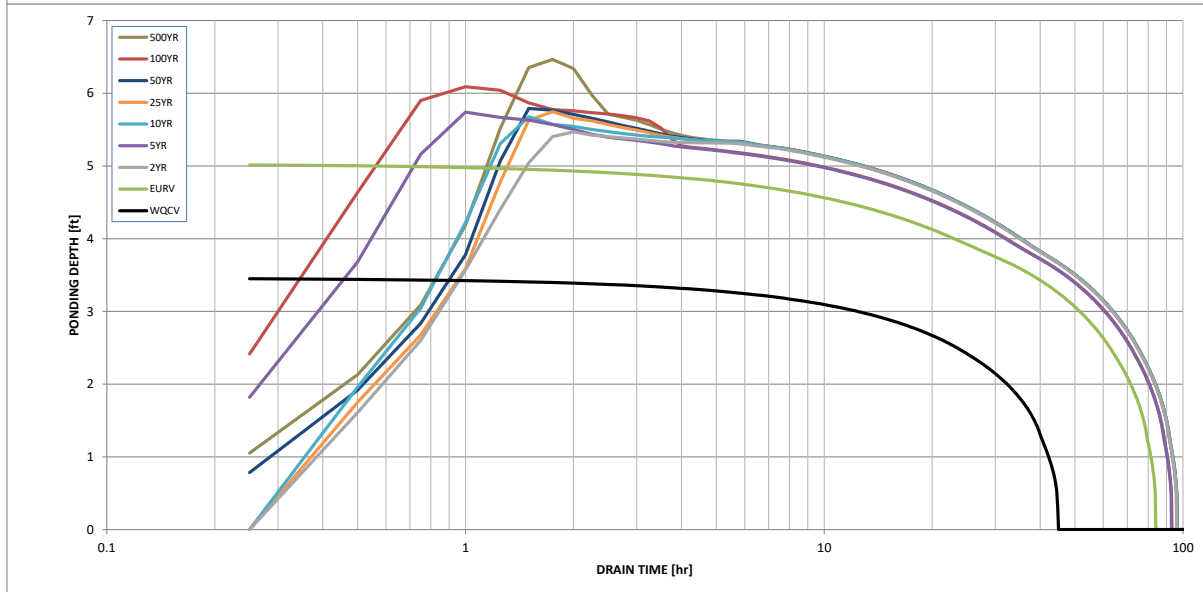
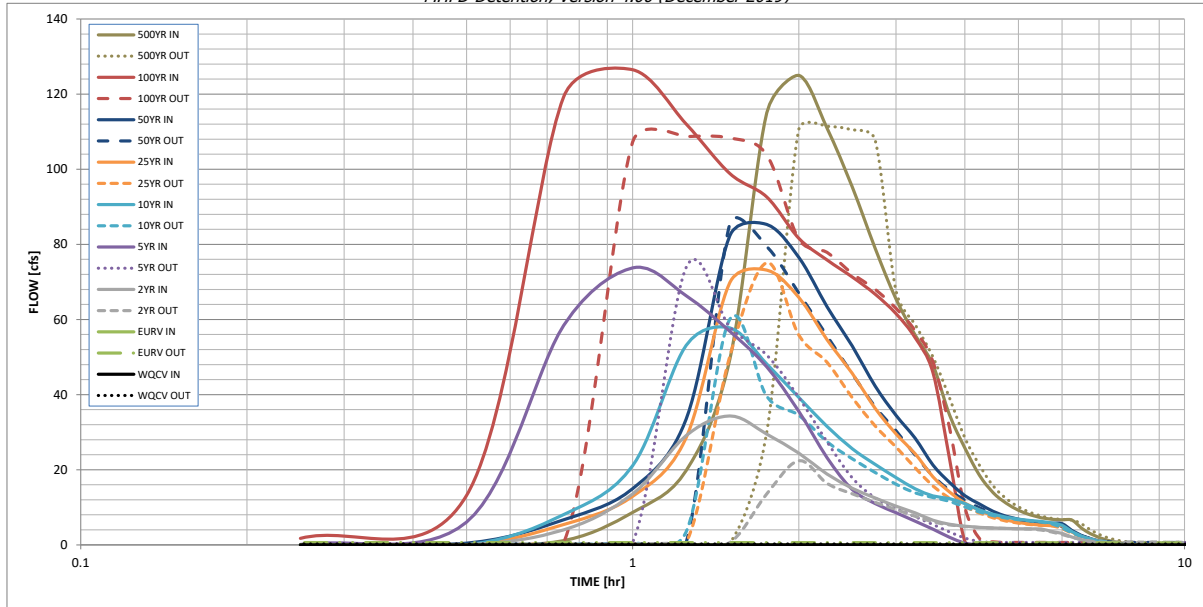
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.00
CUHP Runoff Volume (acre-ft) =	0.590	1.938	1.760	2.442	3.030	3.781	4.411	5.191	6.432
User Override Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	5.280	8.575	9.090	11.343	13.233	21.621	19.297
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	4.0	11.4	17.1	30.1	37.8	47.3	61.5
OPTIONAL User Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.13	0.37	0.56	0.98	1.24	1.55	2.01
Peak Inflow Q (cfs) =	N/A	N/A	34.3	73.7	57.8	73.1	85.3	126.5	125.0
Peak Outflow Q (cfs) =	0.2	0.6	22.4	73.8	60.1	75.1	85.5	108.7	111.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	6.5	3.5	2.5	2.3	2.3	1.8
Structure Controlling Flow =	Plate	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	0.41	1.4	1.1	1.4	1.6	2.0	2.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	41	75	77	67	70	65	62	45	52
Time to Drain 99% of Inflow Volume (hours) =	43	80	87	81	84	82	80	70	75
Maximum Ponding Depth (ft) =	3.47	5.04	5.47	5.74	5.68	5.75	5.79	6.09	6.47
Area at Maximum Ponding Depth (acres) =	0.58	1.09	1.18	1.21	1.20	1.21	1.21	1.24	1.29
Maximum Volume Stored (acre-ft) =	0.595	1.948	2.425	2.758	2.674	2.758	2.819	3.187	3.655

yellow cells are as-built/changes from approved design.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)



S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

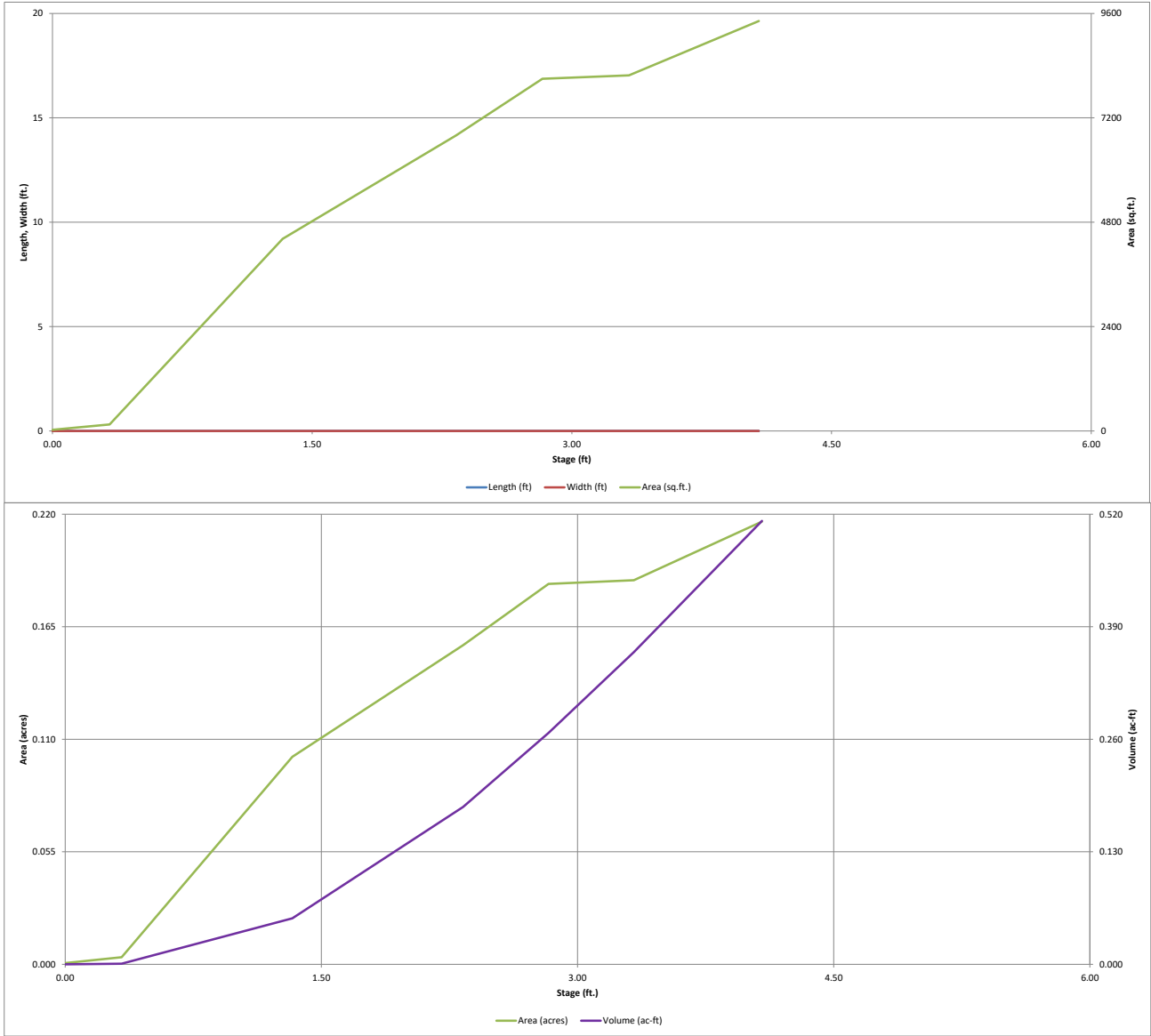
Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

User-Defined	SOURCE	CUHP	CUHP	CUHP	USER	CUHP	CUHP	CUHP	USER	CUHP
Time Interval	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
15.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:15:00	0.00	0.00	0.00	0.11	0.00	0.00	0.00	1.73	0.00
	0:30:00	0.00	0.00	0.00	6.05	0.00	0.00	0.45	13.14	1.13
	0:45:00	0.00	0.00	3.99	58.42	8.07	5.42	6.68	119.28	8.64
	1:00:00	0.00	0.00	13.54	73.74	21.08	12.93	14.96	126.49	19.77
	1:15:00	0.00	0.00	29.09	66.33	53.09	28.50	33.46	112.06	49.39
	1:30:00	0.00	0.00	34.32	56.86	57.77	69.83	82.32	98.86	115.02
	1:45:00	0.00	0.00	29.47	47.39	48.16	73.15	85.31	92.61	125.01
	2:00:00	0.00	0.00	24.43	35.56	39.27	65.91	76.55	81.62	110.96
	2:15:00	0.00	0.00	18.86	23.22	31.54	54.62	63.42	75.86	95.29
	2:30:00	0.00	0.00	15.06	14.72	25.59	45.66	52.94	71.31	78.98
	2:45:00	0.00	0.00	12.49	11.00	21.44	36.35	42.30	66.75	65.47
	3:00:00	0.00	0.00	10.31	8.57	17.92	29.55	34.50	61.57	55.86
	3:15:00	0.00	0.00	8.53	6.31	14.93	24.27	28.40	55.14	47.93
	3:30:00	0.00	0.00	6.57	4.19	13.03	18.13	21.27	45.91	34.67
	3:45:00	0.00	0.00	5.49	2.03	12.32	14.10	16.64	23.07	25.75
	4:00:00	0.00	0.00	4.97	0.45	10.97	11.10	13.08	0.90	18.54
	4:15:00	0.00	0.00	4.66	0.03	9.28	9.25	10.88	0.12	13.89
	4:30:00	0.00	0.00	4.50	0.02	8.14	7.65	8.93	0.02	11.11
	4:45:00	0.00	0.00	4.38	0.01	7.36	6.60	7.62	0.02	9.22
	5:00:00	0.00	0.00	4.30	0.00	6.84	5.95	6.82	0.00	8.00
	5:15:00	0.00	0.00	4.25	0.00	6.49	5.51	6.27	0.00	7.20
	5:30:00	0.00	0.00	4.23	0.00	6.23	5.25	5.94	0.00	6.81
	5:45:00	0.00	0.00	3.56	0.00	5.85	5.10	5.76	0.00	6.66
	6:00:00	0.00	0.00	3.08	0.00	5.21	5.02	5.65	0.00	6.61
	6:15:00	0.00	0.00	2.09	0.00	3.52	3.40	3.83	0.00	4.50
	6:30:00	0.00	0.00	1.37	0.00	2.33	2.25	2.53	0.00	2.98
	6:45:00	0.00	0.00	0.89	0.00	1.52	1.48	1.66	0.00	1.96
	7:00:00	0.00	0.00	0.55	0.00	0.95	0.93	1.04	0.00	1.22
	7:15:00	0.00	0.00	0.32	0.00	0.58	0.58	0.65	0.00	0.77
	7:30:00	0.00	0.00	0.16	0.00	0.31	0.33	0.37	0.00	0.43
	7:45:00	0.00	0.00	0.07	0.00	0.13	0.15	0.17	0.00	0.19
	8:00:00	0.00	0.00	0.02	0.00	0.03	0.04	0.04	0.00	0.05
	8:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	9:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	9:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	9:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	9:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	10:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	11:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	11:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	12:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	13:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	13:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	13:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	13:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	14:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	14:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	14:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	15:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	15:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	16:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	16:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	16:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	17:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	17:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	17:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	17:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	18:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

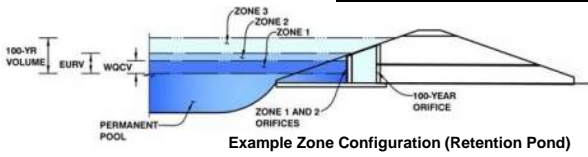


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: Cloverleaf Subdivision

Basin ID: P3 (Private FSD EDB for Basin L)



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.08	0.031	Orifice Plate
Zone 2 (EURV)	1.65	0.057	Circular Orifice
Zone 3 (100-year)	2.22	0.076	Weir&Pipe (Restrict)
Total (all zones)		0.164	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Calculated Parameters for Underdrain

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft ²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Calculated Parameters for Plate

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft ²
Depth at top of Zone using Orifice Plate =	1.69	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft ²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.45	1.00					
Orifice Area (sq. inches)	0.20	0.19	0.37					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

Calculated Parameters for Vertical Orifice

	Zone 2 Circular	Not Selected		Zone 2 Circular	Not Selected	
Invert of Vertical Orifice =	1.45	N/A	ft (relative to basin bottom at Stage = 0 ft)	0.01	N/A	ft ²
Depth at top of Zone using Vertical Orifice =	1.65	N/A	ft (relative to basin bottom at Stage = 0 ft)	0.05	N/A	feet
Vertical Orifice Diameter =	1.25	N/A	inches			

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected		Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, H _o =	2.35	N/A	ft (relative to basin bottom at Stage = 0 ft)	2.35	N/A	feet
Overflow Weir Front Edge Length =	3.00	N/A	feet	3.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V	9.46	N/A	
Horiz. Length of Weir Sides =	3.00	N/A	feet	6.30	N/A	ft ²
Overflow Grate Open Area % =	70%	N/A	% , grate open area/total area	6.30	N/A	ft ²
Debris Clogging % =	0%	N/A	%			

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected		Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	0.67	N/A	ft ²
Outlet Pipe Diameter =	18.00	N/A	inches	0.35	N/A	feet
Restrictor Plate Height Above Pipe Invert =	7.25		inches	1.38	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Calculated Parameters for Spillway

Spillway Invert Stage =	2.83	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth =	0.25	feet
Spillway Crest Length =	14.00	feet	Stage at Top of Freeboard =	4.08	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.22	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	0.51	acre-ft

Routed Hydrograph Results

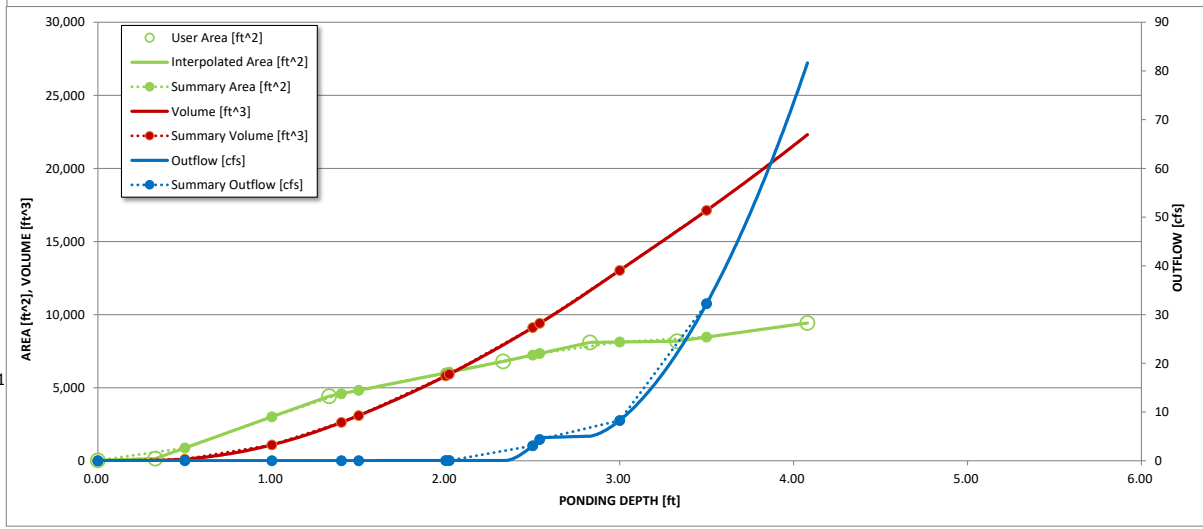
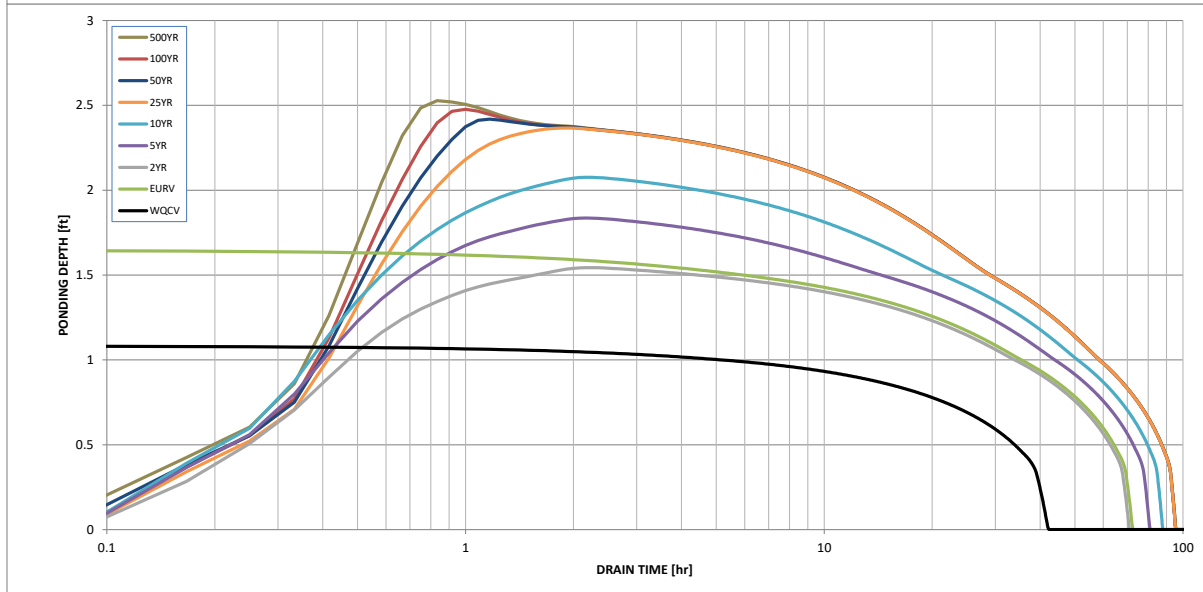
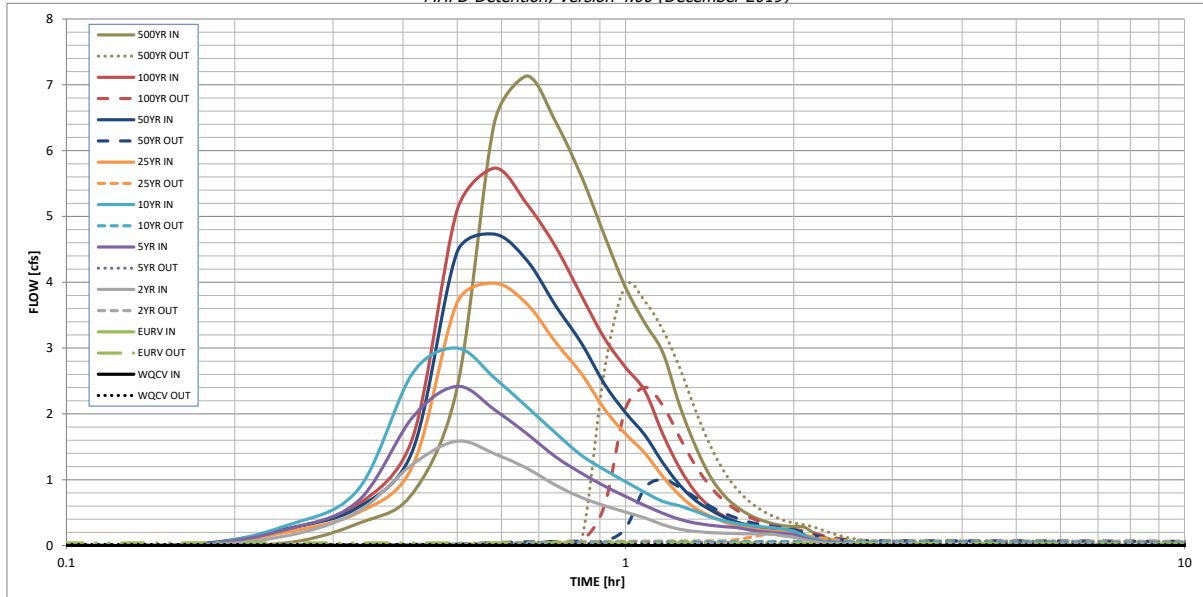
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.00
CUHP Runoff Volume (acre-ft) =	0.031	0.088	0.080	0.118	0.153	0.201	0.239	0.288	0.364
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.080	0.118	0.153	0.201	0.239	0.288	0.364
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.3	0.8	1.2	2.1	2.7	3.3	4.3
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.15	0.42	0.63	1.08	1.35	1.69	2.20
Peak Inflow Q (cfs) =	N/A	N/A	1.6	2.4	3.0	4.0	4.7	5.7	7.1
Peak Outflow Q (cfs) =	0.0	0.0	0.0	0.1	0.1	0.2	1.0	2.4	3.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.1	0.0	0.1	0.4	0.7	0.9
Structure Controlling Flow =	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.0	0.2	0.4	0.6
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	38	64	63	71	76	82	80	78	75
Time to Drain 99% of Inflow Volume (hours) =	40	69	68	76	82	89	88	87	86
Maximum Ponding Depth (ft) =	1.09	1.65	1.54	1.84	2.08	2.37	2.42	2.48	2.53
Area at Maximum Ponding Depth (acres) =	0.08	0.12	0.11	0.13	0.14	0.16	0.16	0.16	0.17
Maximum Volume Stored (acre-ft) =	0.032	0.088	0.076	0.111	0.143	0.187	0.194	0.204	0.213

yellow cells are as-built/changes from approved design.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)



S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

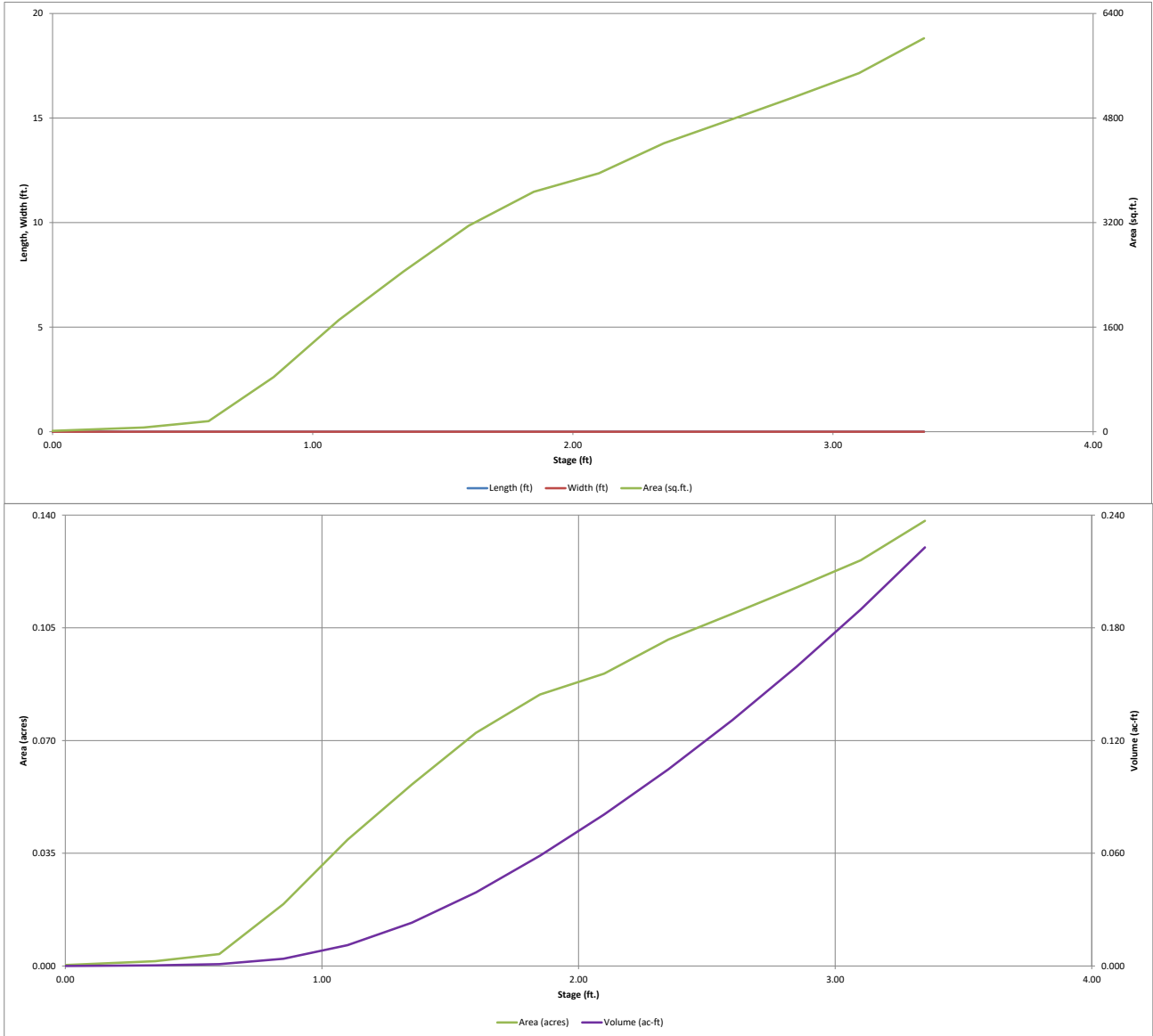
Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.04
	0:15:00	0.00	0.00	0.15	0.25	0.31	0.21	0.26	0.26	0.34
	0:20:00	0.00	0.00	0.52	0.68	0.86	0.50	0.58	0.63	0.80
	0:25:00	0.00	0.00	1.24	1.95	2.63	1.22	1.45	1.65	2.40
	0:30:00	0.00	0.00	1.59	2.42	3.00	3.69	4.46	5.10	6.44
	0:35:00	0.00	0.00	1.39	2.06	2.55	3.99	4.73	5.73	7.14
	0:40:00	0.00	0.00	1.17	1.70	2.11	3.67	4.33	5.19	6.44
	0:45:00	0.00	0.00	0.92	1.35	1.71	3.09	3.64	4.54	5.62
	0:50:00	0.00	0.00	0.73	1.10	1.37	2.62	3.08	3.80	4.71
	0:55:00	0.00	0.00	0.61	0.90	1.15	2.07	2.46	3.15	3.92
	1:00:00	0.00	0.00	0.51	0.75	0.97	1.70	2.02	2.71	3.38
	1:05:00	0.00	0.00	0.42	0.61	0.81	1.40	1.68	2.35	2.93
	1:10:00	0.00	0.00	0.32	0.49	0.67	1.05	1.25	1.69	2.13
	1:15:00	0.00	0.00	0.25	0.40	0.60	0.76	0.92	1.18	1.51
	1:20:00	0.00	0.00	0.21	0.34	0.52	0.57	0.69	0.81	1.05
	1:25:00	0.00	0.00	0.20	0.31	0.43	0.45	0.55	0.59	0.76
	1:30:00	0.00	0.00	0.19	0.29	0.37	0.36	0.43	0.45	0.58
	1:35:00	0.00	0.00	0.18	0.27	0.33	0.30	0.35	0.36	0.46
	1:40:00	0.00	0.00	0.18	0.24	0.31	0.26	0.31	0.29	0.39
	1:45:00	0.00	0.00	0.17	0.21	0.29	0.24	0.27	0.25	0.33
	1:50:00	0.00	0.00	0.17	0.19	0.27	0.22	0.25	0.23	0.30
	1:55:00	0.00	0.00	0.15	0.18	0.25	0.21	0.24	0.22	0.29
	2:00:00	0.00	0.00	0.13	0.17	0.22	0.21	0.24	0.22	0.28
	2:05:00	0.00	0.00	0.09	0.12	0.15	0.14	0.16	0.15	0.20
	2:10:00	0.00	0.00	0.06	0.08	0.10	0.10	0.11	0.10	0.13
	2:15:00	0.00	0.00	0.04	0.05	0.07	0.07	0.07	0.07	0.09
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	2:25:00	0.00	0.00	0.02	0.02	0.03	0.03	0.03	0.03	0.04
	2:30:00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.02
	2:35:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	2:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
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4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
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4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

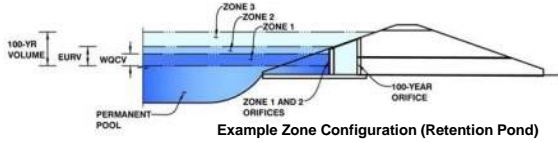
MHFD-Detention, Version 4.03 (May 2020)



DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: Cloverleaf Subdivision
Basin ID: P4 (Private Water Quality Only Pond)



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.45	0.029	Orifice Plate
Zone 2			Weir&Pipe (Circular)
Zone 3			
Total (all zones)		0.029	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft ²
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft ²
Depth at top of Zone using Orifice Plate =	1.71	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft ²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.80						
Orifice Area (sq. inches)	0.13	0.18						

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

Invert of Vertical Orifice =	Not Selected	Not Selected	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	Not Selected	ft ²
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =		feet
Vertical Orifice Diameter =			inches			

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

Overflow Weir Front Edge Height, H _o =	Zone 2 Weir: 1.72	Not Selected	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H _g =	Zone 2 Weir: 1.72	Not Selected	feet
Overflow Weir Front Edge Length =	4.00		feet	Overflow Weir Slope Length =	4.00		feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	6.34		acres
Horiz. Length of Weir Sides =	4.00		feet	Overflow Grate Open Area w/o Debris =	11.20		ft ²
Overflow Grate Open Area % =	70%		%, grate open area/total area	Overflow Grate Open Area w/ Debris =	11.20		ft ²
Debris Clogging % =	0%		%				

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

Depth to Invert of Outlet Pipe =	Zone 2 Circular: 1.41	Not Selected	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	Zone 2 Circular: 1.77	Not Selected	ft ²
Circular Orifice Diameter =	18.00		inches	Outlet Orifice Centroid =	0.75		feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	2.13	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth =	0.19	feet
Spillway Crest Length =	22.00	feet	Stage at Top of Freeboard =	3.32	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.14	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	0.22	acre-ft

Routed Hydrograph Results

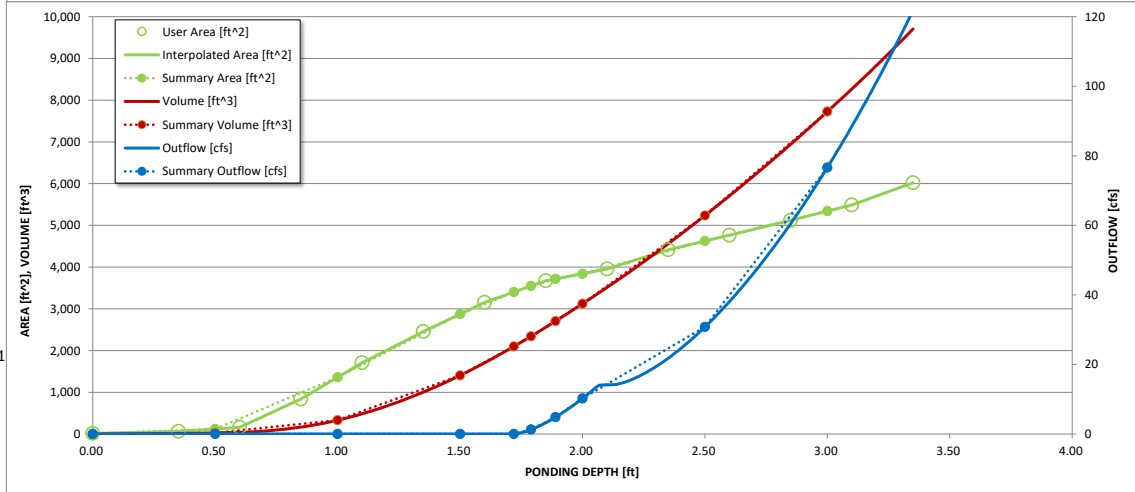
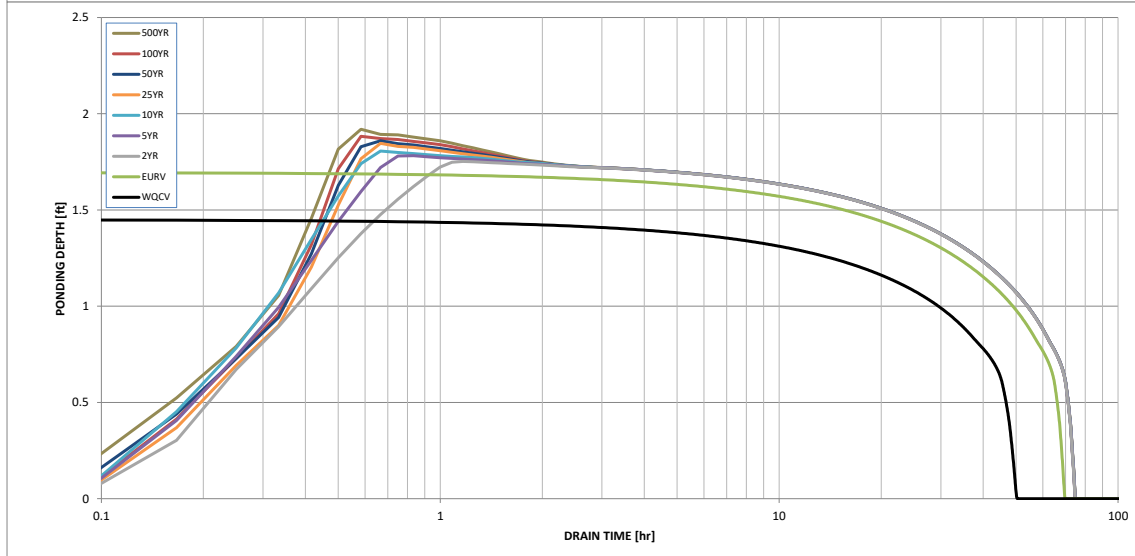
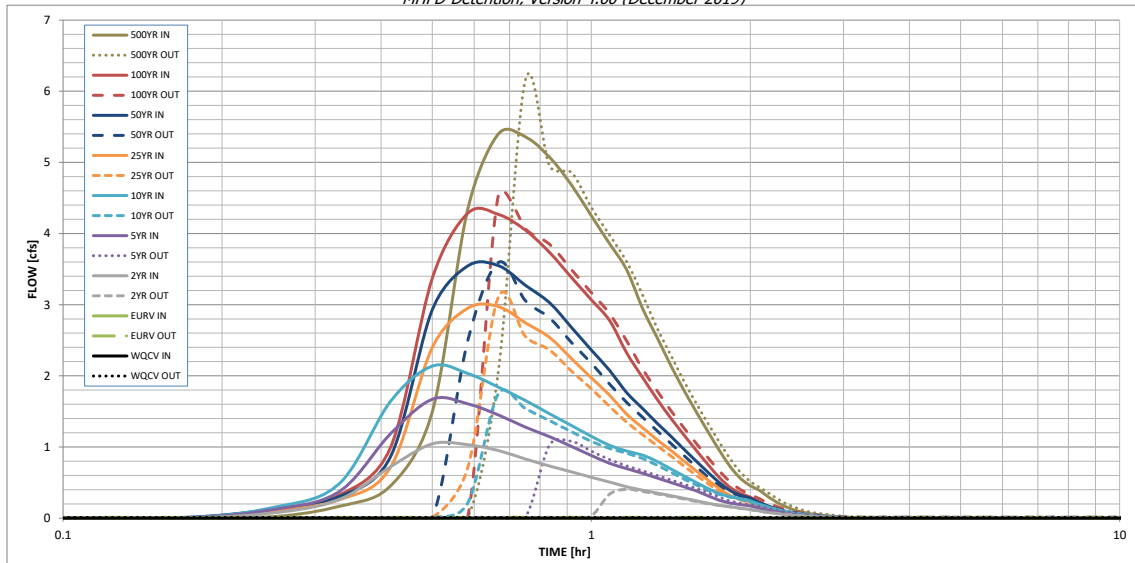
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.00
One-Hour Rainfall Depth (in)	N/A	N/A	0.073	0.113	0.149	0.202	0.243	0.297	0.378
CUHP Runoff Volume (acre-ft)	N/A	N/A	0.073	0.113	0.149	0.202	0.243	0.297	0.378
Inflow Hydrograph Volume (acre-ft)	N/A	N/A	0.2	0.7	1.0	1.7	2.2	2.7	3.5
CUHP Predevelopment Peak Q (cfs)	N/A	N/A							
OPTIONAL Override Predevelopment Peak Q (cfs)	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre)	N/A	N/A	0.11	0.32	0.48	0.85	1.06	1.33	1.73
Peak Inflow Q (cfs)	N/A	N/A	1.0	1.7	2.1	3.0	3.5	4.3	5.4
Peak Outflow Q (cfs)	0.0	4.3	0.4	1.1	1.7	3.1	3.6	4.5	6.2
Ratio Peak Outflow to Predevelopment Q	N/A	N/A	N/A	1.7	1.8	1.8	1.6	1.7	1.7
Structure Controlling Flow	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Max Velocity through Gate 1 (fps)	N/A	1.17	0.03	0.1	0.2	0.3	0.3	0.4	0.6
Max Velocity through Gate 2 (fps)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours)	46	62	66	62	60	57	55	52	48
Time to Drain 99% of Inflow Volume (hours)	48	66	71	69	68	67	65	64	62
Maximum Ponding Depth (ft)	1.45	2.05	1.75	1.78	1.81	1.85	1.86	1.88	1.92
Area at Maximum Ponding Depth (acres)	0.06	0.09	0.08	0.08	0.08	0.08	0.08	0.09	0.09
Maximum Volume Stored (acre-ft)	0.029	0.076	0.051	0.053	0.055	0.058	0.059	0.061	0.064

yellow cells are as-built/changes from approved design.

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)



S-A-V-D Chart Axis Override

	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

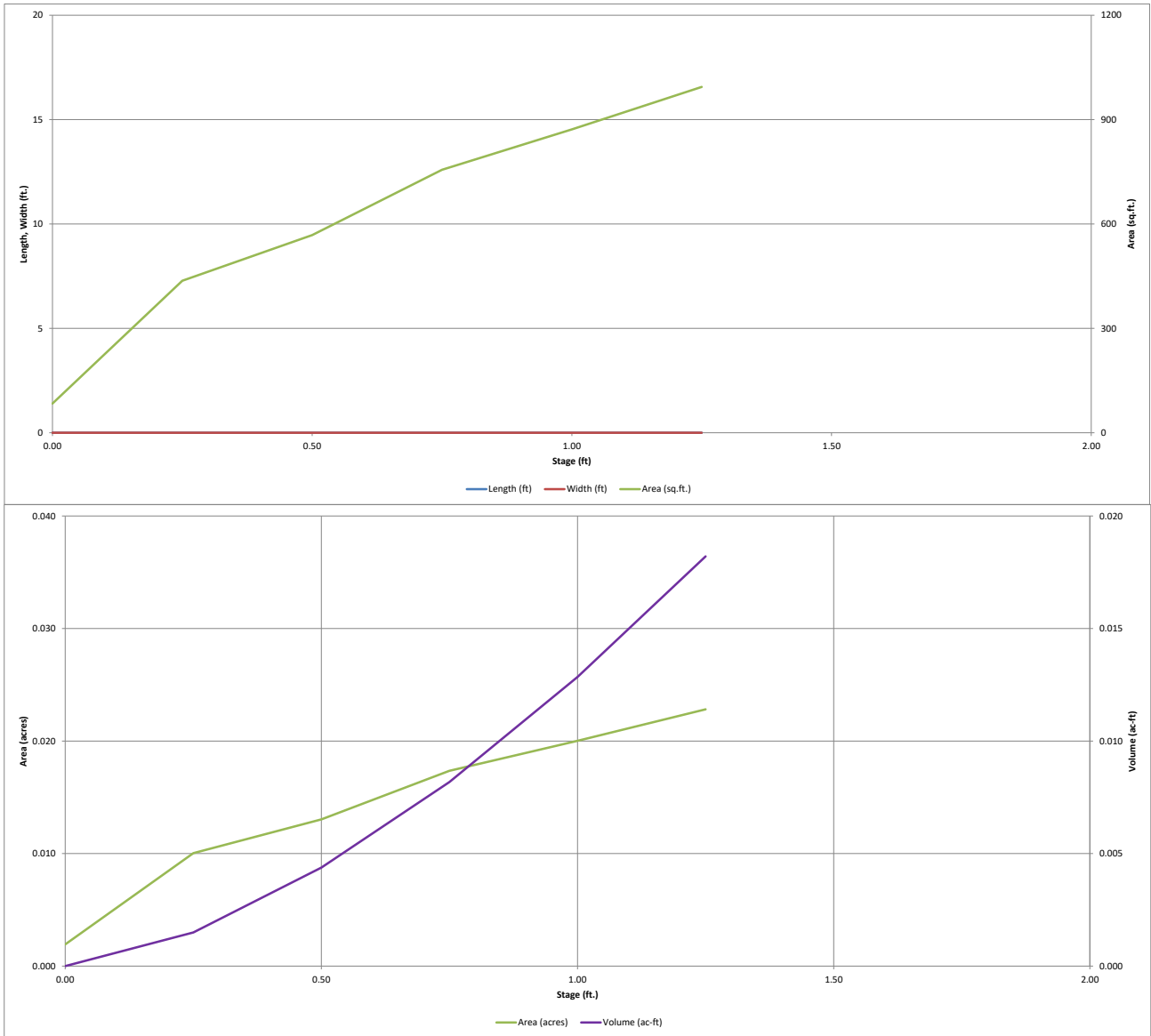
Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02
	0:15:00	0.00	0.00	0.07	0.12	0.15	0.10	0.13	0.12	0.17
	0:20:00	0.00	0.00	0.26	0.37	0.48	0.26	0.30	0.32	0.45
	0:25:00	0.00	0.00	0.72	1.19	1.64	0.72	0.86	0.99	1.49
	0:30:00	0.00	0.00	1.05	1.67	2.14	2.40	2.93	3.37	4.34
	0:35:00	0.00	0.00	1.03	1.61	2.03	2.95	3.54	4.28	5.40
	0:40:00	0.00	0.00	0.95	1.45	1.84	2.97	3.55	4.27	5.36
	0:45:00	0.00	0.00	0.83	1.28	1.65	2.74	3.27	4.05	5.07
	0:50:00	0.00	0.00	0.73	1.15	1.47	2.54	3.03	3.73	4.68
	0:55:00	0.00	0.00	0.65	1.01	1.30	2.24	2.68	3.38	4.25
	1:00:00	0.00	0.00	0.57	0.88	1.15	1.97	2.36	3.07	3.85
	1:05:00	0.00	0.00	0.51	0.77	1.02	1.73	2.08	2.77	3.49
	1:10:00	0.00	0.00	0.44	0.70	0.94	1.46	1.76	2.32	2.95
	1:15:00	0.00	0.00	0.39	0.63	0.89	1.27	1.54	1.98	2.53
	1:20:00	0.00	0.00	0.35	0.56	0.80	1.10	1.33	1.67	2.13
	1:25:00	0.00	0.00	0.31	0.50	0.69	0.95	1.15	1.40	1.79
	1:30:00	0.00	0.00	0.28	0.44	0.59	0.80	0.96	1.16	1.48
	1:35:00	0.00	0.00	0.24	0.38	0.50	0.66	0.79	0.94	1.20
	1:40:00	0.00	0.00	0.21	0.31	0.41	0.53	0.64	0.74	0.94
	1:45:00	0.00	0.00	0.18	0.25	0.34	0.41	0.49	0.57	0.72
	1:50:00	0.00	0.00	0.16	0.21	0.30	0.32	0.38	0.43	0.56
	1:55:00	0.00	0.00	0.14	0.19	0.27	0.26	0.32	0.35	0.46
	2:00:00	0.00	0.00	0.12	0.17	0.24	0.23	0.28	0.29	0.39
	2:05:00	0.00	0.00	0.10	0.14	0.19	0.18	0.22	0.22	0.29
	2:10:00	0.00	0.00	0.08	0.11	0.15	0.13	0.17	0.16	0.22
	2:15:00	0.00	0.00	0.06	0.09	0.12	0.10	0.13	0.12	0.16
	2:20:00	0.00	0.00	0.05	0.07	0.09	0.08	0.10	0.09	0.12
	2:25:00	0.00	0.00	0.04	0.05	0.07	0.06	0.07	0.06	0.09
	2:30:00	0.00	0.00	0.03	0.04	0.05	0.05	0.06	0.05	0.07
	2:35:00	0.00	0.00	0.02	0.03	0.04	0.03	0.04	0.04	0.05
	2:40:00	0.00	0.00	0.02	0.02	0.03	0.03	0.03	0.03	0.04
	2:45:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	2:50:00	0.00	0.00	0.01	0.01	0.02	0.01	0.02	0.02	0.02
	2:55:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	3:00:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

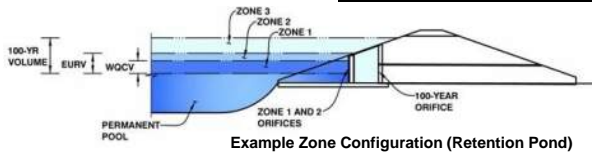


DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

Project: Cloverleaf Subdivision

Basin ID: OS4 (Sand Filter)



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	0.84	0.010	Filtration Media
Zone 2			Weir&Pipe (Circular)
Zone 3			
Total (all zones)		0.010	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth = ft (distance below the filtration media surface)
 Underdrain Orifice Diameter = inches

Calculated Parameters for Underdrain

Underdrain Orifice Area = ft²
 Underdrain Orifice Centroid = feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Invert of Lowest Orifice = ft (relative to basin bottom at Stage = 0 ft)
 Depth at top of Zone using Orifice Plate = ft (relative to basin bottom at Stage = 0 ft)
 Orifice Plate: Orifice Vertical Spacing = inches
 Orifice Plate: Orifice Area per Row = inches

Calculated Parameters for Plate

WQ Orifice Area per Row = ft²
 Elliptical Half-Width = feet
 Elliptical Slot Centroid = feet
 Elliptical Slot Area = ft²

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (optional)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	<input type="text"/>	<input type="text"/>	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	<input type="text"/>	<input type="text"/>	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	<input type="text"/>	<input type="text"/>	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	<input type="text"/>	<input type="text"/>	ft ²
Vertical Orifice Centroid =	<input type="text"/>	<input type="text"/>	feet

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, H _o =	<input type="text" value="0.86"/>	<input type="text"/>	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	<input type="text" value="3.00"/>	<input type="text"/>	feet
Overflow Weir Grate Slope =	<input type="text" value="0.00"/>	<input type="text"/>	H:V
Horiz. Length of Weir Sides =	<input type="text" value="3.00"/>	<input type="text"/>	feet
Overflow Grate Open Area % =	<input type="text" value="70%"/>	<input type="text"/>	% , grate open area/total area
Debris Clogging % =	<input type="text" value="50%"/>	<input type="text"/>	%

Calculated Parameters for Overflow Weir

	Zone 2 Weir	Not Selected	
Height of Grate Upper Edge, H _t =	<input type="text" value="0.86"/>	<input type="text"/>	feet
Overflow Weir Slope Length =	<input type="text" value="3.00"/>	<input type="text"/>	feet
Grate Open Area / 100-yr Orifice Area =	<input type="text" value="3.57"/>	<input type="text"/>	
Overflow Grate Open Area w/o Debris =	<input type="text" value="6.30"/>	<input type="text"/>	ft ²
Overflow Grate Open Area w/ Debris =	<input type="text" value="3.15"/>	<input type="text"/>	ft ²

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 2 Circular	Not Selected	
Depth to Invert of Outlet Pipe =	<input type="text" value="2.00"/>	<input type="text"/>	ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =	<input type="text" value="18.00"/>	<input type="text"/>	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 2 Circular	Not Selected	
Outlet Orifice Area =	<input type="text" value="1.77"/>	<input type="text"/>	ft ²
Outlet Orifice Centroid =	<input type="text" value="0.75"/>	<input type="text"/>	feet
Half-Central Angle of Restrictor Plate on Pipe =	<input type="text" value="N/A"/>	<input type="text" value="N/A"/>	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage = ft (relative to basin bottom at Stage = 0 ft)
 Spillway Crest Length = feet
 Spillway End Slopes = H:V
 Freeboard above Max Water Surface = feet

Calculated Parameters for Spillway

Spillway Design Flow Depth = feet
 Stage at Top of Freeboard = feet
 Basin Area at Top of Freeboard = acres
 Basin Volume at Top of Freeboard = acre-ft

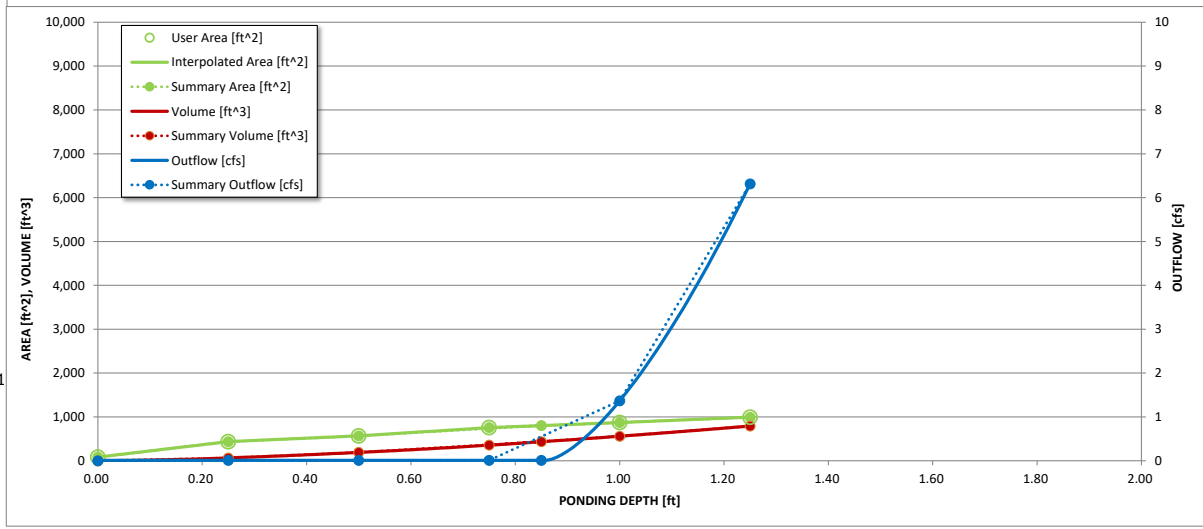
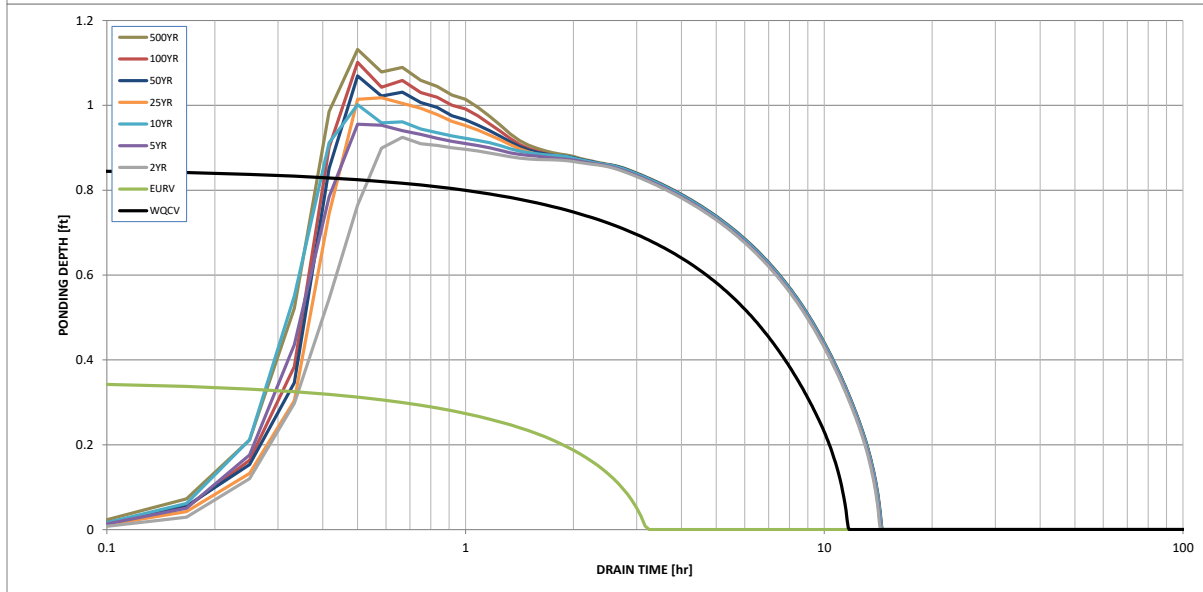
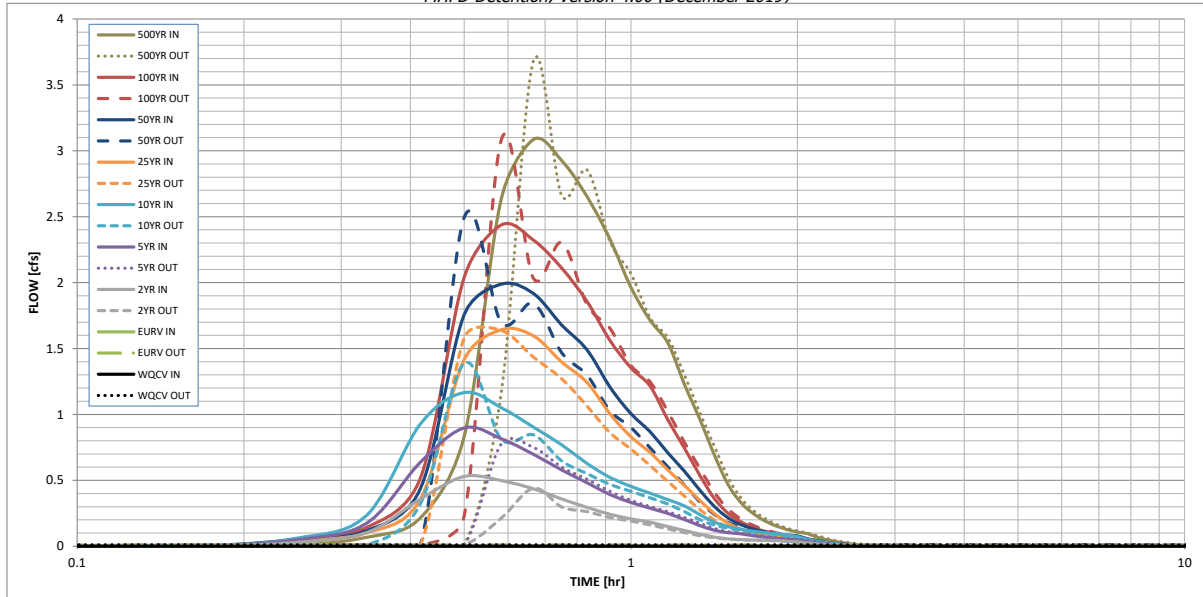
Routed Hydrograph Results

The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =									
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.00
CUHP Runoff Volume (acre-ft) =	0.010	0.029	0.028	0.046	0.063	0.088	0.107	0.133	0.171
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.028	0.046	0.063	0.088	0.107	0.133	0.171
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.2	0.5	0.7	1.2	1.5	1.9	2.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.17	0.47	0.72	1.20	1.50	1.88	2.45
Peak Inflow Q (cfs) =	N/A	N/A	0.5	0.9	1.2	1.6	2.0	2.4	3.1
Peak Outflow Q (cfs) =	0.0	3.8	0.4	0.8	1.4	1.6	2.5	3.1	3.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.6	1.9	1.4	1.7	1.6	1.5
Structure Controlling Flow =	Overflow Weir 1	Filtration Media	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	0.06	0.1	0.2	0.3	0.4	0.5	0.6
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	11	3	13	13	12	11	11	10	8
Time to Drain 99% of Inflow Volume (hours) =	12	3	14	14	14	13	13	13	12
Maximum Ponding Depth (ft) =	0.86	0.34	0.92	0.96	1.00	1.02	1.07	1.10	1.13
Area at Maximum Ponding Depth (acres) =	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Maximum Volume Stored (acre-ft) =	0.010	0.002	0.011	0.012	0.013	0.013	0.014	0.015	0.016

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)



S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename: _____

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	0:15:00	0.00	0.00	0.03	0.05	0.06	0.04	0.05	0.05	0.07
	0:20:00	0.00	0.00	0.10	0.17	0.23	0.10	0.12	0.14	0.21
	0:25:00	0.00	0.00	0.36	0.64	0.93	0.36	0.44	0.52	0.83
	0:30:00	0.00	0.00	0.53	0.90	1.17	1.42	1.76	2.04	2.63
	0:35:00	0.00	0.00	0.50	0.82	1.05	1.64	1.99	2.44	3.09
	0:40:00	0.00	0.00	0.44	0.70	0.90	1.60	1.92	2.32	2.93
	0:45:00	0.00	0.00	0.36	0.58	0.77	1.40	1.68	2.11	2.65
	0:50:00	0.00	0.00	0.29	0.48	0.63	1.24	1.49	1.86	2.33
	0:55:00	0.00	0.00	0.24	0.39	0.52	1.00	1.21	1.56	1.97
	1:00:00	0.00	0.00	0.21	0.33	0.45	0.83	1.01	1.35	1.71
	1:05:00	0.00	0.00	0.18	0.29	0.40	0.71	0.87	1.21	1.54
	1:10:00	0.00	0.00	0.15	0.25	0.35	0.58	0.71	0.96	1.23
	1:15:00	0.00	0.00	0.12	0.20	0.31	0.46	0.57	0.74	0.96
	1:20:00	0.00	0.00	0.09	0.16	0.24	0.35	0.42	0.54	0.69
	1:25:00	0.00	0.00	0.07	0.12	0.18	0.25	0.30	0.36	0.46
	1:30:00	0.00	0.00	0.06	0.10	0.15	0.17	0.21	0.25	0.33
	1:35:00	0.00	0.00	0.05	0.09	0.13	0.13	0.16	0.18	0.25
	1:40:00	0.00	0.00	0.05	0.08	0.11	0.10	0.13	0.14	0.19
	1:45:00	0.00	0.00	0.05	0.07	0.10	0.09	0.11	0.11	0.15
	1:50:00	0.00	0.00	0.04	0.06	0.10	0.07	0.09	0.09	0.13
	1:55:00	0.00	0.00	0.04	0.05	0.09	0.07	0.09	0.08	0.11
	2:00:00	0.00	0.00	0.03	0.05	0.07	0.06	0.08	0.07	0.10
	2:05:00	0.00	0.00	0.02	0.04	0.05	0.05	0.06	0.05	0.07
	2:10:00	0.00	0.00	0.02	0.03	0.04	0.03	0.04	0.04	0.05
	2:15:00	0.00	0.00	0.01	0.02	0.03	0.02	0.03	0.03	0.04
	2:20:00	0.00	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.03
	2:25:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	2:30:00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	2:35:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
	2:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

