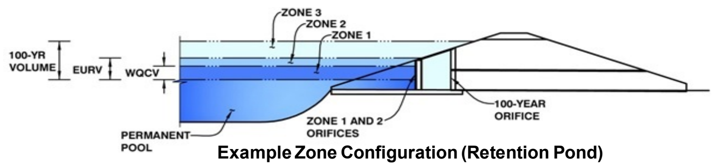
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: **DWIRE Storage Yard**

Basin ID: **FSD Pond 1**



Example Zone Configuration (Retention Pond)

Watershed Information

Selected BMP Type =	**EDB**	
Watershed Area =	19.36	acres
Watershed Length =	1,535	ft
Watershed Length to Centroid =	768	ft
Watershed Slope =	0.021	ft/ft
Watershed Imperviousness =	72.20%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	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.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.453	acre-feet	0.453	acre-feet
Excess Urban Runoff Volume (EURV) =	1.518	acre-feet	1.518	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	1.391	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	1.867	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	2.267	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	2.732	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	3.149	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	3.640	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	4.697	acre-feet		inches
Approximate 2-yr Detention Volume =	1.206	acre-feet		
Approximate 5-yr Detention Volume =	1.603	acre-feet		
Approximate 10-yr Detention Volume =	2.016	acre-feet		
Approximate 25-yr Detention Volume =	2.164	acre-feet		
Approximate 50-yr Detention Volume =	2.250	acre-feet		
Approximate 100-yr Detention Volume =	2.402	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.453	acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.065	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.884	acre-feet
Total Detention Basin Volume =	2.402	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Depth Increment = 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)
6527.17	**Top of Micropool**	--	0.00	--	--	--	102	0.002		
6527.5		--	0.33	--	--	--	102	0.002	33	0.001
		--	0.83	--	--	--	550	0.013	196	0.005
		--	1.83	--	--	--	6,231	0.143	3,587	0.082
		--	2.83	--	--	--	19,968	0.458	16,686	0.383
		--	3.83	--	--	--	24,562	0.564	38,951	0.894
6532.00		--	4.83	--	--	--	29,300	0.673	65,882	1.512
6533.00		--	5.83	--	--	--	34,177	0.785	97,621	2.241
6534.00		--	6.83	--	--	--	39,216	0.900	134,317	3.083
6535.00		--	7.83	--	--	--	44,188	1.014	176,019	4.041
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DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.03 (May 2020)

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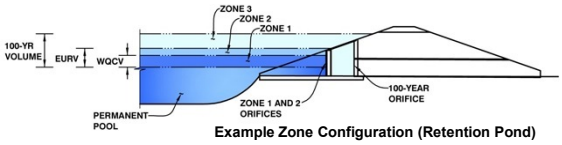
Basin ID: FSD Pond 1



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.98	0.453	Orifice Plate
Zone 2 (EURV)	4.84	1.065	Orifice Plate
Zone 3 (100-year)	6.04	0.884	Weir&Pipe (Restrict)
Total (all zones)		2.402	

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 = ft^2

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 = 0.00 ft (relative to basin bottom at Stage = 0 ft)

Depth at top of Zone using Orifice Plate = 4.84 ft (relative to basin bottom at Stage = 0 ft)

Orifice Plate: Orifice Vertical Spacing = 19.40 inches

Orifice Plate: Orifice Area per Row = N/A inches

Calculated Parameters for Plate

WQ Orifice Area per Row = N/A ft^2

Elliptical Half-Width = N/A feet

Elliptical Slot Centroid = N/A feet

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	1.61	3.23					
Orifice Area (sq. inches)	1.91	1.91	6.25					

	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)

	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Diameter =	N/A	N/A	inches

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft^2
Vertical Orifice Centroid =	N/A	N/A	feet

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

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.85	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	8.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	3.50	N/A	feet
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	4.85	N/A	feet
Overflow Weir Slope Length =	3.50	N/A	feet
Grate Open Area / 100-yr Orifice Area =	12.82	N/A	
Overflow Grate Open Area w/o Debris =	19.60	N/A	ft^2
Overflow Grate Open Area w/ Debris =	9.80	N/A	ft^2

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	0.25	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	24.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	11.75		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	1.53	N/A	ft^2
Outlet Orifice Centroid =	0.56	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.55	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage= 6.00 ft (relative to basin bottom at Stage = 0 ft)

Spillway Crest Length = 25.00 feet

Spillway End Slopes = 4.00 H:V

Freeboard above Max Water Surface = 1.00 feet

Calculated Parameters for Spillway

Spillway Design Flow Depth= 0.78 feet

Stage at Top of Freeboard = 7.78 feet

Basin Area at Top of Freeboard = 1.01 acres

Basin Volume at Top of Freeboard = 3.99 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).

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft) =	0.453	1.518	1.391	1.867	2.267	2.732	3.149	3.640	4.697
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.391	1.867	2.267	2.732	3.149	3.640	4.697
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	1.8	5.1	7.8	14.1	17.7	22.6	31.6
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.10	0.27	0.40	0.73	0.91	1.17	1.63
Peak Inflow Q (cfs) =	N/A	N/A	22.9	30.6	36.1	44.8	51.6	60.4	77.4
Peak Outflow Q (cfs) =	0.2	0.5	0.5	3.6	7.7	15.9	16.8	17.5	36.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.7	1.0	1.1	1.0	0.8	1.2
Structure Controlling Flow =	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	0.2	0.4	0.8	0.8	0.9	0.9
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	70	68	72	70	69	68	66	63
Time to Drain 99% of Inflow Volume (hours) =	**40**	75	73	78	77	76	76	75	73
Maximum Ponding Depth (ft) =	2.98	4.84	4.53	5.01	5.12	5.31	5.53	5.97	6.38
Area at Maximum Ponding Depth (acres) =	0.47	0.67	0.64	0.69	0.71	0.73	0.75	0.80	0.85
Maximum Volume Stored (acre-ft) =	0.453	1.519	1.316	1.628	1.712	1.841	2.011	2.352	2.682

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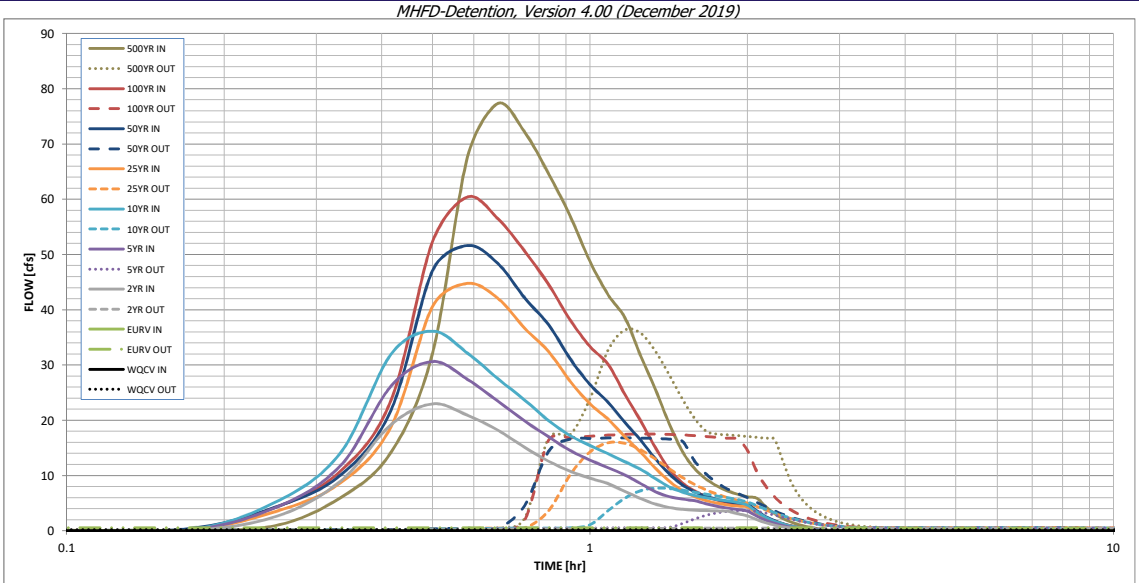
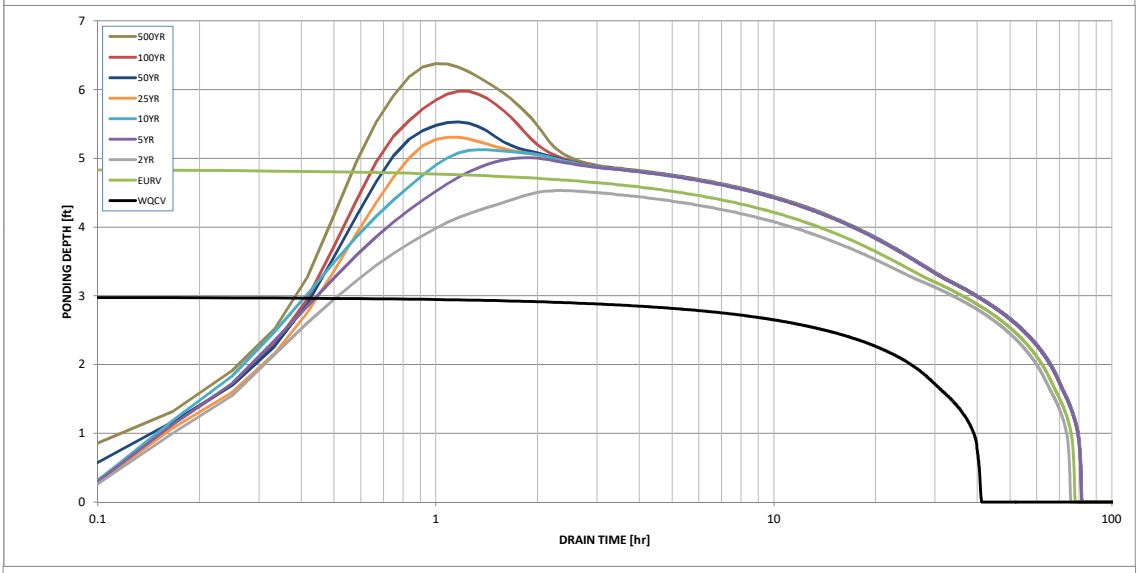
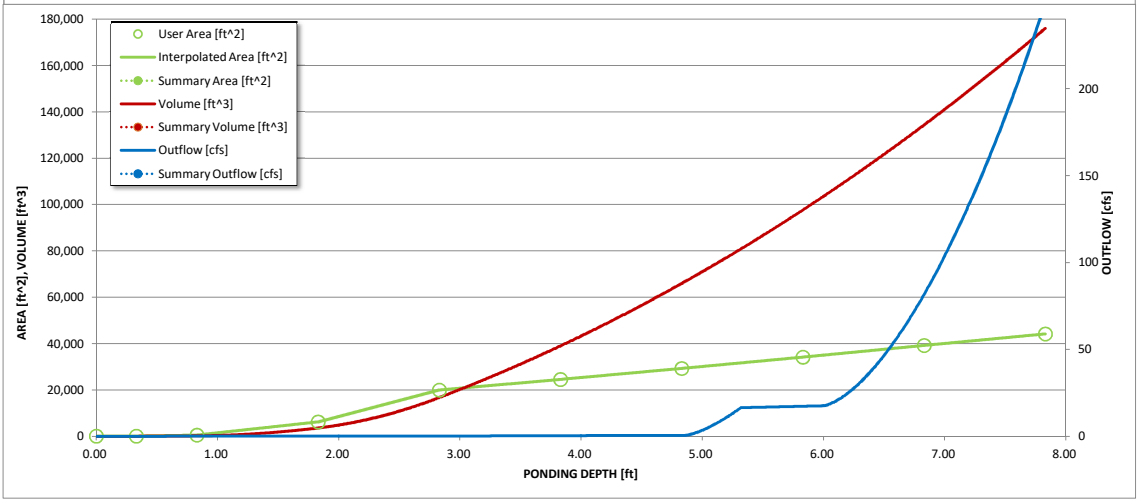
MHFD-Detention, Version 4.00 (December 2019)







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