

- Pre-development release rate into East Tributary=141cfs/458cfs in the 5yr/100 yr storm at this pond outfall (Design Pt. 2, Table 6.2 in MDDP). See Design Point 46 for discussion on flows in creek from this pond
- Pond Bottom Elevation: 5706.00

Design: Composite, WQ/EURV by Full Spectrum Excel Worksheets, 5/100yr by Hydraflow

	WQ	EURV	5-yr	100-yr
Peak Inflow	63.1cfs	181.4cfs	167.5cfs	519.1cfs
Peak Outflow	1.4cfs	7.3cfs	126.3cfs	453.2cfs
Ponding Depth	3.92ft	6.27ft	7.49ft	8.42ft
Stored Volume	3.29ac-ft	9.52ac-ft	13.01ac-ft	15.86ac-ft
Spillway Stage	7.00ft, 52' wide			
Structure Type:	3'x30' flat top outlet structure (cdot type d) with top at stage 6.60ft			

Detention Pond D2 (Full Spectrum Design, Ultimate Conditions)

This is an on-site permanent full spectrum detention pond that includes water quality and discharges directly into the East Tributary. Pond D2 is a typical full spectrum pond is designed using the UDCF Full Spectrum spreadsheets. There are no ponds in series for the "D" basins. The outlet structure is a standard 4'x20' full spectrum sloped outlet structure and the overflow spillway is a weir set above the outlet structure designed by the full spectrum spreadsheets to match pre-developed rates. The full spectrum print outs are in the appendix of this report. See map in appendix for watershed areas.

- Watershed Ares: 89 acres (Ultimate Area)
- Watershed Imperviousness: 55%
- Hydrologic Soils Group C/D see calc. sheet redlines.
- Forebay: 1.635ac-ft (see spreadsheet in appendix) divided between two forebays
- Zone 1 WQCV: 1.53ac-ft, WSEL: 5697.72
- Zone 2 EURV: 3.93ac-ft, WSEL: 5699.13, Top EURV set at 5699.60, 4'x20' outlet with 10:1 slope, 9.2cfs
- (5-yr): 5.3ac-ft, WSEL: 5699.90, 14.2cfs
- Zone 3 (100-yr): 8.77ac-ft, WSEL: 5701.70, 145cfs
- Pipe Outlet: 54" RCP at 0.5% with no restrictor plate
- Overflow Spillway: 30' wide bottom, elevation=5702.00, 4:1 side slopes, flow depth=1.64' at 277.1cfs
- Pre-development release rate into creek compliance from full spectrum pond spreadsheets
- Pond Bottom Elevation: 5695.00
-

Design: Full Spectrum Excel Worksheets Only

	WQ	EURV	5-yr	100-yr
Peak Inflow	32.1cfs	90.1cfs	122.9cfs	288.3cfs
Peak Outflow	0.7cfs	9.2cfs	14.2cfs	145.0cfs
Ponding Depth	2.72ft	4.13ft	4.90ft	6.70ft
Stored Volume	1.53ac-ft	3.95ac-ft	5.29ac-ft	8.77ac-ft

Adjust impervious % for Filing
1 and overlot areas only?.

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Larson East MDDP (100.013)
Basin ID: Pond C5

Required Volume Calculation

Selected BMP Type =	EDB
Watershed Area =	171.00 acres
Watershed Length =	2.00 ft
Watershed Slope =	0.018 ft/ft
Percentage Hydrologic Soil Group A =	63.00% percent
Percentage Hydrologic Soil Group B =	0.00% percent
Percentage Hydrologic Soil Groups C/D =	100.00% percent
Desired WQCV Drain Time =	40.0 hours
Location for 1-hr Rainfall Depths =	User Input
Water Quality Capture Volume (WQCV) =	3.515 acre-feet
Excess Urban Runoff Volume (EURV) =	10.382 acre-feet
2-yr Runoff Volume ($P_1 = 1.9$ in.) =	9.890 acre-feet
5-yr Runoff Volume ($P_1 = 1.5$ in.) =	14.020 acre-feet
10-yr Runoff Volume ($P_1 = 1.75$ in.) =	17.354 acre-feet
25-yr Runoff Volume ($P_1 = 2.0$ in.) =	22.326 acre-feet
50-yr Runoff Volume ($P_1 = 2.25$ in.) =	26.255 acre-feet
100-yr Runoff Volume ($P_1 = 2.5$ in.) =	31.112 acre-feet
500-yr Runoff Volume ($P_1 = 0$ in.) =	0.000 acre-feet
Approximate 2-yr Detention Volume =	9.279 acre-feet
Approximate 5-yr Detention Volume =	13.206 acre-feet
Approximate 10-yr Detention Volume =	15.090 acre-feet
Approximate 25-yr Detention Volume =	16.122 acre-feet
Approximate 50-yr Detention Volume =	16.607 acre-feet
Approximate 100-yr Detention Volume =	18.232 acre-feet

Optional User Override 1-hr Precipitation

Stage - Storage Description	Stage (ft)	ft	Optional Override Stage (ft)	ft	Length (ft)	Width (ft)	Area (ft ²)	Optional Override Area (ft ²)	ft ²	Area (acre)	Volume (ft ³)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	--	50	0.001	50	0.001	24	0.001
5706.33	--	0.33	--	--	--	--	100	0.002	100	0.002	383	0.009
5707	--	1.00	--	--	--	--	1,000	0.023	1,000	0.023	10,154	0.233
5708	--	2.00	--	--	--	--	18,898	0.434	18,898	0.434	506,690	11.632
5709	--	3.00	--	--	--	--	77,432	1.778	77,432	1.778	58,507	1.343
5710	--	4.00	--	--	--	--	110,270	2.531	110,270	2.531	152,358	3.498
5711	--	5.00	--	--	--	--	115,455	2.650	115,455	2.650	265,220	6.089
5712	--	6.00	--	--	--	--	120,720	2.771	120,720	2.771	383,308	8.800
5713	--	7.00	--	--	--	--	126,045	2.894	126,045	2.894	506,690	11.632
5714	--	8.00	--	--	--	--	131,696	3.023	131,696	3.023	635,561	14.590
5715	--	9.00	--	--	--	--	136,745	3.139	136,745	3.139	769,781	17.672
5716	--	10.00	--	--	--	--	141,857	3.257	141,857	3.257	909,082	20.870

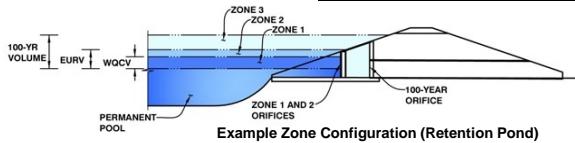
Stage-Storage Calculation

Zone 1 Volume (WQCV) =	3.515 acre-feet
Zone 2 Volume (EURV - Zone 1) =	6.868 acre-feet
Zone 3 Volume (User Defined - Zones 1 & 2) =	0.100 acre-feet
Total Detention Basin Volume =	10,482 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 ($H_{trickle}$) =	user ft
Slope of Trickle Channel ($S_{trickle}$) =	user ft/ft
Slopes of Main Basin Sides (S_{main}) =	user ft/V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user
Initial Surcharge Area (A_{ISU}) =	user ft ²
Surcharge Volume Length (L_{ISU}) =	user ft
Surcharge Volume Width (W_{ISU}) =	user ft
Depth of Basin Floor (H_{floor}) =	user ft
Length of Basin Floor (L_{floor}) =	user ft
Width of Basin Floor (W_{floor}) =	user ft
Area of Basin Floor (A_{floor}) =	user ft ²
Volume of Basin Floor (V_{floor}) =	user ft ³
Depth of Main Basin (H_{main}) =	user ft
Length of Main Basin (L_{main}) =	user ft
Width of Main Basin (W_{main}) =	user ft
Area of Main Basin (A_{main}) =	user ft ²
Volume of Main Basin (V_{main}) =	user ft ³
Calculated Total Basin Volume (V_{total}) =	user acre-feet

Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 [February 2017]

Project: Lorson East MDDP (100.013)
Basin ID: Pond C5 (only used for WQCV and EURV) Do not use for 2-100-yr Storm Event!!!!!!



Example Zone Configuration (Retention Pond)

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 Diameter =	N/A	inches

Calculated Parameters for Underdrain

Underdrain Orifice Area =	N/A	ft ²
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)
Depth at top of Zone using Orifice Plate =	4.01	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	16.00	inches
Orifice Plate: Orifice Area per Row =	9.21	sq. inches (use rectangular openings)

Calculated Parameters for Plate

WQ Orifice Area per Row =	6.396E-02	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	1.34	2.67				
Orifice Area (sq. inches)	9.21	9.21	9.21				
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)

Zone 2 Rectangular	Not Selected
Invert of Vertical Orifice =	4.01
Depth at top of Zone using Vertical Orifice =	6.57
Vertical Orifice Height =	6.00
Vertical Orifice Width =	18.68

Calculated Parameters for Vertical Orifice

Zone 2 Rectangular	Not Selected
Vertical Orifice Area =	0.78
Vertical Orifice Centroid =	0.25

User Input: Overflow Weir (Dropbox) and Grate (Flat or Sloped)

Zone 3 Weir	Not Selected
Overflow Weir Front Edge Height, Ho =	6.60
Overflow Weir Front Edge Length =	3.00
Overflow Weir Slope =	0.00
Horiz. Length of Weir Sides =	30.00
Overflow Grate Open Area % =	80%
Debris Clogging % =	50%

Calculated Parameters for Overflow Weir

Zone 3 Weir	Not Selected
Height of Grate Upper Edge, H _t =	6.60
Over Flow Weir Slope Length =	30.00
Grate Open Area / 100-yr Orifice Area =	5.73
Overflow Grate Open Area w/o Debris =	72.00
Overflow Grate Open Area w/ Debris =	36.00

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 =	0.00
Outlet Pipe Diameter =	48.00
Restrictor Plate Height Above Pipe Invert =	48.00

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

Zone 3 Restrictor	Not Selected
Outlet Orifice Area =	12.57
Outlet Orifice Centroid =	2.00
Half-Central Angle of Restrictor Plate on Pipe =	3.14

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	7.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	52.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	3.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth =	2.05	feet
Stage at Top of Freeboard =	12.05	feet
Basin Area at Top of Freeboard =	3.26	acres

Routed Hydrograph Results

	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) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	0.00
Calculated Runoff Volume (acre-ft) =	3.515	10.382	9.890	14.020	17.354	22.326	26.255	31.112	0.000
OPTIONAL Override Runoff Volume (acre-ft) =	3.517	10.386	6.877	8.575	17.689	26.716	34.728	37.807	#N/A
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.02	0.14	0.39	0.89	1.17	1.52	0.00
Predevelopment Peak Q (cfs) =	0.0	0.0	2.9	24.2	65.9	151.4	199.8	259.3	0.0
Peak Inflow Q (cfs) =	63.1	181.4	138.8	167.5	201.0	385.7	450.0	519.1	#N/A
Peak Outflow Q (cfs) =	2.5	7.3	5.1	6.2	108.7	107.6	313.1	326.0	#N/A
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.3	1.7	1.4	1.6	1.1	#N/A
Structure Controlling Flow =	User Defined	#N/A							
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	1.1	1.9	1.9	1.9	#N/A
Max Velocity through Grate 2 (fps) =	N/A	#N/A							
Time to Drain 97% of Inflow Volume (hours) =	38	54	49	52	53	50	48	47	#N/A
Time to Drain 99% of Inflow Volume (hours) =	40	58	52	55	59	58	58	57	#N/A
Maximum Ponding Depth (ft) =	3.92	6.27	5.05	5.58	7.23	7.55	8.00	8.04	#N/A
Area at Maximum Ponding Depth (acres) =	2.47	2.80	2.66	2.72	2.92	2.96	3.02	3.03	#N/A
Maximum Volume Stored (acre-ft) =	3.298	9.524	6.195	7.619	12.301	13.213	14.560	14.711	#N/A

Adjust to be
1 or less

Detention Basin Outlet Structure Design

Outflow Hydrograph Workbook Filename: _____

Storm Inflow Hydrographs

UD-Detention, Version 3.07 (February 2017)

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

SOURCE	WORKBOOK	WORKBOOK	USER	USER	USER	USER	USER	USER	#N/A	
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]
	4.53 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
		0:04:32	0.00	0.00	29.00	36.00	51.00	62.00	64.00	65.00
Hydrograph Constant		0:09:04	0.00	0.00	66.00	81.00	120.00	139.00	173.00	175.00
		0:13:35	2.65	6.62	96.00	117.00	181.00	213.00	275.00	283.00
	1.105	0:18:07	7.32	19.57	124.00	151.00	248.00	313.00	391.00	461.00
		0:22:39	18.80	50.29	135.00	164.00	291.00	375.00	440.00	509.00
		0:27:11	51.57	137.40	138.80	167.50	301.00	385.70	450.00	519.10
		0:31:43	63.09	181.40	124.00	145.00	272.00	362.00	435.00	476.00
		0:36:14	60.59	178.56	93.00	112.00	224.00	306.00	415.00	396.00
		0:40:46	55.14	164.07	73.00	89.00	197.00	264.00	360.00	336.00
		0:45:18	49.64	148.07	53.00	65.00	163.00	210.00	297.00	264.00
		0:49:50	43.37	130.43	42.00	52.00	138.00	182.00	235.00	225.00
		0:54:22	37.83	114.23	29.00	36.00	96.00	151.00	202.00	183.00
		0:58:53	34.19	102.31	18.00	24.00	67.00	120.00	165.00	149.00
		1:03:25	28.61	86.89	8.00	17.00	39.00	85.00	136.00	119.00
		1:07:57	23.68	72.31	7.40	11.00	33.00	78.00	109.80	117.00
		1:12:29	18.72	58.12	6.90	10.00	29.00	72.00	98.00	113.00
		1:17:01	14.42	45.40	6.30	10.00	25.00	67.00	86.00	98.00
		1:21:32	10.74	34.41	5.70	8.40	24.00	64.00	79.00	91.00
		1:26:04	8.07	25.42	5.40	7.50	22.00	59.00	75.00	86.00
		1:30:36	6.51	20.14	4.70	6.80	21.00	50.00	71.00	83.00
		1:35:08	5.48	16.87	4.50	6.10	20.00	41.00	68.00	80.00
		1:39:40	4.77	14.58	4.00	5.60	20.00	37.00	64.00	78.00
		1:44:11	4.27	12.98	3.60	5.20	19.00	34.00	60.00	75.00
		1:48:43	3.92	11.84	3.10	4.80	19.00	33.00	50.00	72.00
		1:53:15	2.91	9.12	3.00	4.40	18.00	32.00	42.90	69.00
		1:57:47	2.11	6.57	2.50	4.10	18.00	31.00	38.00	66.00
		2:02:19	1.56	4.88	2.40	3.80	17.00	31.00	35.00	63.00
		2:06:50	1.16	3.62	2.30	3.50	17.00	30.00	34.00	58.00
		2:11:22	0.85	2.68	2.20	3.20	17.00	29.00	33.00	46.00
		2:15:54	0.61	1.94	1.90	3.00	17.00	29.00	32.00	40.00
		2:20:26	0.44	1.40	1.70	3.00	17.00	28.00	31.00	37.00
		2:24:58	0.31	1.00	1.50	3.00	16.00	28.00	30.00	35.00
		2:29:29	0.20	0.66	1.30	3.00	15.00	27.00	30.00	35.00
		2:34:01	0.11	0.40	1.00	2.30	15.00	27.00	29.00	33.00
		2:38:33	0.05	0.20	0.90	2.00	14.00	26.00	29.00	33.00
		2:43:05	0.01	0.06	0.80	1.80	14.00	26.00	28.00	32.00
		2:47:37	0.00	0.00	0.20	1.70	9.00	25.00	28.00	32.00
		2:52:08	0.00	0.00	0.00	1.60	5.00	25.00	27.00	31.00
		2:56:40	0.00	0.00	0.00	1.00	3.00	24.00	27.00	31.00
		3:01:12	0.00	0.00		0.90	2.00	24.00	27.00	31.00
		3:05:44	0.00	0.00		0.00	1.00	23.00	26.00	30.00
		3:10:16	0.00	0.00		0.00	0.00	23.00	26.00	30.00
		3:14:47	0.00	0.00		0.00	0.00	20.00	25.00	28.00
		3:19:19	0.00	0.00		0.00	0.00	20.00	25.00	28.00
		3:23:51	0.00	0.00		0.00	0.00	20.00	25.00	28.00
		3:28:23	0.00	0.00		0.00	0.00	15.00	20.00	25.00
		3:32:55	0.00	0.00			10.00	20.00	25.00	0.00
		3:37:26	0.00	0.00			5.00	20.00	25.00	0.00
		3:41:58	0.00	0.00			1.00	15.00	20.00	0.00
		3:46:30	0.00	0.00			0.00	15.00	20.00	0.00
		3:51:02	0.00	0.00			0.00	10.00	16.00	0.00
		3:55:34	0.00	0.00				10.00	16.00	0.00
		4:00:05	0.00	0.00				8.00	11.00	0.00
		4:04:37	0.00	0.00				8.00	11.00	0.00
		4:09:09	0.00	0.00				6.00	8.00	0.00
		4:13:41	0.00	0.00				4.00	6.00	0.00
		4:18:13	0.00	0.00				2.00	4.00	#N/A
		4:22:44	0.00	0.00				1.00	2.00	#N/A
		4:27:16	0.00	0.00				0.00	1.00	#N/A
		4:31:48	0.00	0.00				0.00	0.00	#N/A
		4:36:20	0.00	0.00					0.00	#N/A
		4:40:52	0.00	0.00					0.00	#N/A
		4:45:23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
		4:49:55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
		4:54:27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
		4:58:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
		5:03:31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
		5:08:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
		5:12:34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
		5:17:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
		5:21:38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A
		5:26:10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#N/A

Replace the SSD sheet.

Isn't this area mostly type B soils?

This is for the existing pre-development soils, not import.

DETENTION BASIN STAGE-STORAGE TABLE BUILDER																																																																																																																																																							
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