



El Paso County MS4 Post Construction Detention / Water Quality Facility Documentation Form

This document **must be completed and submitted** with required attachments to the County for projects requiring a detention and/or a water quality facility. A separate completed form must be submitted for each facility.

Project name: The Hills at Lorson Ranch– Pond C1

Owner name: Lorson Ranch Metropolitan District

Location Address: 212 N. Wahsatch Avenue, Suite 301

Latitude and Longitude:

Latitude: 38°44'13.50"N, Longitude: 104°37'16.90"W and 24

Assessor's Parcel #: 5500000279 Section: 13 Township: 15 South Range: 65 West

Expected Completion date: August, 2020

Project acreage: 123.167 acres **76 Ac. cont.** Design Ponding Acres: 1.93acres Design Storm: 100-year

Design Engineer Email Address: rich@ceg1.com

To ensure compliance with C.R.S. 37-92-602(8), the completed Stormwater Detention and Infiltration Design Data Sheet **must be attached**. The form can be found here: <https://maperture.digitaldataservices.com/gvh/?viewer=cswdif#> (click on Download SDI Design Data Sheet)

List all permanent water quality control measure(s) (EDBs, rain gardens, etc):
Pond C3 is an Extended Detention Basin with only existing undeveloped overland flows entering the pond. An outlet structure for Water quality capture volume will be added when upstream development occurs . The detention pond has been sized in accordance with future full spectrum designs requirements for fully developed tributary areas. The interim outlet structure is a RCP storm sewer.

For all projects for which the constrained redevelopment sites standard is applied, provide an explanation of why it is not practicable to meet the full design standards. Answer: full design standards will be achieved when tributary area is developed and a full spectrum outlet structure is constructed.

Attach Operations and Maintenance (O&M) Plan describing the operation and maintenance procedures that ensure the long-term observation, maintenance, and operation of control measure(s), including routine inspection frequencies and maintenance activities. If multiple, different water quality control measures are used at the same location, a separate O & M Plan must be provided for each facility.

Attach Private Detention Basin / Stormwater Quality Best Management Practice Maintenance Agreement and Easement addressing maintenance of BMPs that shall be binding on all subsequent owners of the permanent BMPs.

Attachments:

- Stormwater Detention and Infiltration Design Data Sheet
- O & M Plan
- Maintenance and Access Agreement

Review Engineer **JDR**
EPC Project File No. **PUDSP20003**

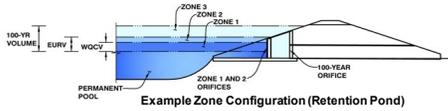
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.02 (February 2020)

Project: **The Hills at Lorson Ranch**

Basin ID: **Pond C1**

ACCEPTED FOR FILE
Engineering Review
11/25/20 12:46:50 PM
EPC Planning & Community
Development Department



pond bottom=5743.40

Watershed Information

Selected BMP Type =	EDB	
Watershed Area =	76.00	acres
Watershed Length =	4,800	ft
Watershed Length to Centroid =	2,100	ft
Watershed Slope =	0.040	ft/ft
Watershed Imperviousness =	55.00%	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 WQC 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) =	1.396	acre-feet	
Excess Urban Runoff Volume (EURV) =	4.503	acre-feet	
2-yr Runoff Volume (P1 = 1.19 in.) =	4.251	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	5.966	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	7.456	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	9.398	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	11.003	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	13.015	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	17.139	acre-feet	
Approximate 2-yr Detention Volume =	3.431	acre-feet	
Approximate 5-yr Detention Volume =	4.666	acre-feet	
Approximate 10-yr Detention Volume =	6.090	acre-feet	
Approximate 25-yr Detention Volume =	6.620	acre-feet	
Approximate 50-yr Detention Volume =	6.911	acre-feet	
Approximate 100-yr Detention Volume =	7.625	acre-feet	

Define Zones and Basin Geometry

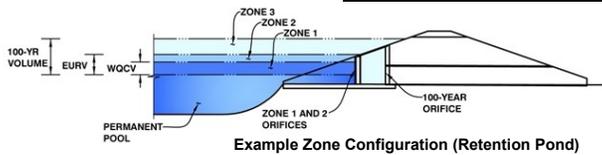
Zone 1 Volume (WQCV) =	1.396	acre-feet
Zone 2 Volume (EURV - Zone 1) =	3.107	acre-feet
Zone 3 (100yr + 1 / 2 WQCV - Zones 1 & 2) =	3.820	acre-feet
Total Detention Basin Volume =	8.323	acre-feet
Initial Surcharge Volume (ISV) =	user	ft ³
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention 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	
Initial Surcharge Area (A _{ISV}) =	user	ft ²
Surcharge Volume Length (L _{ISV}) =	user	ft
Surcharge Volume Width (W _{ISV}) =	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

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	--	--	--	40	0.001		
5743.73	--	0.33	--	--	--	52	0.001	15	0.000
5744	--	0.60	--	--	--	300	0.007	63	0.001
5745	--	1.60	--	--	--	4,017	0.092	2,221	0.051
5746	--	2.60	--	--	--	26,320	0.604	17,389	0.399
5747	--	3.60	--	--	--	56,078	1.287	58,588	1.345
5748	--	4.60	--	--	--	62,238	1.429	117,746	2.703
5749	--	5.60	--	--	--	66,563	1.528	182,147	4.182
5750	--	6.60	--	--	--	70,969	1.629	250,913	5.760
5751	--	7.60	--	--	--	75,495	1.733	324,145	7.441
5752	--	8.60	--	--	--	80,136	1.840	401,960	9.228
5753	--	9.60	--	--	--	85,057	1.953	484,557	11.124
5754	--	10.60	--	--	--	90,000	2.066	572,085	13.133
5755	--	11.60	--	--	--	95,000	2.181	664,585	15.257
5756	--	12.60	--	--	--	100,000	2.296	762,085	17.495

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.02 (February 2020)

Project: The Hills at Lorson Ranch
Basin ID: Pond C1



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.64	1.396	Orifice Plate
Zone 2 (EURV)	5.81	3.107	Rectangular Orifice
Zone 3 (100+1/2WQCV)	8.11	3.820	Weir&Pipe (Restrict)
Total (all zones)		8.323	

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 =	3.64	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	14.60	inches
Orifice Plate: Orifice Area per Row =	3.74	sq. inches (use rectangular openings)

Calculated Parameters for Plate	
WQ Orifice Area per Row =	2.597E-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	1.21	2.43					
Orifice Area (sq. inches)	3.74	3.74	3.74					

	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 =	3.64	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Vertical Orifice =	5.81	N/A	ft (relative to basin bottom at Stage = 0 ft)
Vertical Orifice Height =	6.00	N/A	inches
Vertical Orifice Width =	19.74	N/A	inches

Calculated Parameters for Vertical Orific	
Vertical Orifice Area =	0.82 N/A
Vertical Orifice Centroid =	0.25 N/A

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 =	6.10	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	5.66	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	3.00	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	
Height of Grate Upper Edge, H ₁ =	6.10 N/A
Overflow Weir Slope Length =	3.00 N/A
Grate Open Area / 100-yr Orifice Area =	9.41 N/A
Overflow Grate Open Area w/o Debris =	11.89 N/A
Overflow Grate Open Area w/ Debris =	5.94 N/A

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	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	18.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	12.10	N/A	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	
Outlet Orifice Area =	1.26 N/A
Outlet Orifice Centroid =	0.57 N/A
Half-Central Angle of Restrictor Plate on Pipe =	1.92 N/A

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	10.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	28.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.16	feet

Calculated Parameters for Spillway	
Spillway Design Flow Depth =	1.44 feet
Stage at Top of Freeboard =	12.60 feet
Basin Area at Top of Freeboard =	2.30 acres
Basin Volume at Top of Freeboard =	17.50 acre-ft

pond bottom = 0 = 5743.40

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
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52
One-Hour Rainfall Depth (in) =	1.396	4.503	4.251	5.966	7.456	9.398	11.003	13.015
CUHP Runoff Volume (acre-ft) =	N/A	N/A	4.251	5.966	7.456	9.398	11.003	13.015
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	5.7	16.2	25.0	45.9	57.7	74.5
OPTIONAL CUHP Predevelopment Peak Q (cfs) =	N/A	N/A						
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.08	0.21	0.33	0.60	0.76	0.98
Peak Inflow Q (cfs) =	N/A	N/A	53.5	75.6	91.9	123.5	144.7	170.4
Peak Outflow Q (cfs) =	0.6	6.3	5.3	7.1	15.0	16.2	17.0	18.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.4	0.6	0.4	0.3	0.2
Structure Controlling Flow =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	0.0	0.6	0.6	0.6	0.6
Max Velocity through Gate 2 (fps) =	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	48	49	50	49	48	47	46
Time to Drain 99% of Inflow Volume (hours) =	40	52	53	55	55	55	55	56
Maximum Ponding Depth (ft) =	3.64	5.81	5.19	6.14	6.66	7.63	8.41	9.40
Area at Maximum Ponding Depth (acres) =	1.29	1.55	1.49	1.58	1.64	1.74	1.82	1.93
Maximum Volume Stored (acre-ft) =	1.397	4.505	3.548	5.006	5.858	7.493	8.862	10.736

Stormwater Detention and Infiltration Design Data Sheet

