



## 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: 1.93 acres 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

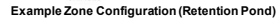
EPC Project File No.

PUDSP20003

## MHFD-Detention, Version 4.02 (February 2020)

**Basin ID: Pond C1**

11/25/2020 12:40:50 PM  
dsdnijkamp  
EPC Planning & Community  
Development Department



Depth Increment =	0.20	ft
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[illegible]

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 WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths = User Input		

### Optional User Overrides

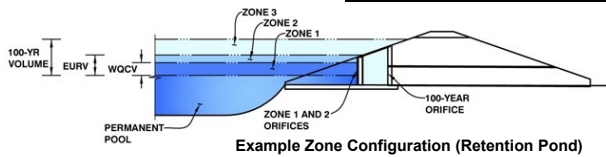
	acre-feet
	acre-feet
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
	inches

Zone 1 Volume ( $V_{QVOC}$ )	=	1.996	acre-feet
Zone 2 Volume ( $EURV - Zone 1$ )	=	3.107	acre-feet
Zone 3 ( $100yr + 1/2$ WQVOC - Zones 1 & 2)	=	3.820	acre-feet
Total Detention Basin Volume	=	8.923	acre-feet
Initial Surcharge Volume ( $ISV$ )	=	user	ft <sup>3</sup>
Initial Surcharge Depth ( $ISD$ )	=	user	ft
Total Available Detention Depth ( $H_{TAA}$ )	=	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 ( $A_{SV}$ )	=	user	ft <sup>2</sup>
Surcharge Volume Length ( $L_{SV}$ )	=	user	ft
Surcharge Volume Width ( $W_{SV}$ )	=	user	ft
Depth of Basin Floor ( $H_{BFloor}$ )	=	user	ft
Length of Basin Floor ( $L_{BFloor}$ )	=	user	ft
Width of Basin Floor ( $W_{BFloor}$ )	=	user	ft
Area of Basin Floor ( $A_{BFloor}$ )	=	user	ft <sup>2</sup>
Volume of Basin Floor ( $V_{BFloor}$ )	=	user	ft <sup>3</sup>
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 <sup>2</sup>
Volume of Main Basin ( $V_{Main}$ )	=	user	ft <sup>3</sup>
Calculated Total Basin Volume ( $V_{Total}$ )	=	user	acre-feet

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

Calculated Parameters for Underdrain  
Underdrain Orifice Area =  ft<sup>2</sup>  
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 =  sq. inches (use rectangular openings)

Calculated Parameters for Plate  
WQ Orifice Area per Row =  ft<sup>2</sup>  
Elliptical Half-Width =  feet  
Elliptical Slot Centroid =  feet  
Elliptical Slot Area =  ft<sup>2</sup>

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)

Invert of Vertical Orifice =  ft (relative to basin bottom at Stage = 0 ft)  
Depth at top of Zone using Vertical Orifice =  ft (relative to basin bottom at Stage = 0 ft)  
Vertical Orifice Height =  inches  
Vertical Orifice Width =  inches

Calculated Parameters for Vertical Orif  
Zone 2 Rectangular =  ft<sup>2</sup>  
Zone 2 Rectangular =  ft<sup>2</sup>  
Not Selected =  ft<sup>2</sup>  
Not Selected =  ft<sup>2</sup>

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, Ho =  ft (relative to basin bottom at Stage = 0 ft)  
Overflow Weir Front Edge Length =  feet  
Overflow Weir Grate Slope =  H:V  
Horiz. Length of Weir Sides =  feet  
Overflow Grate Open Area % =  %  
Debris Clogging % =  %

Calculated Parameters for Overflow We  
Height of Grate Upper Edge, H<sub>u</sub> =  ft  
Overflow Weir Slope Length =  feet  
Grate Open Area / 100-yr Orifice Area =  ft<sup>2</sup>  
Overflow Grate Open Area w/o Debris =  ft<sup>2</sup>  
Overflow Grate Open Area w/ Debris =  ft<sup>2</sup>

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

Depth to Invert of Outlet Pipe =  ft (distance below basin bottom at Stage = 0 ft)  
Outlet Pipe Diameter =  inches  
Restrictor Plate Height Above Pipe Invert =  inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Pl  
Outlet Orifice Area =  ft<sup>2</sup>  
Outlet Orifice Centroid =  feet  
Half-Central Angle of Restrictor Plate on Pipe =  degrees

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

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
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.08	0.21	0.33	0.60	0.76	0.98
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	53.5	75.6	91.9	123.5	144.7	170.4
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	5.3	7.1	15.0	16.2	17.0	18.1
Peak Inflow Q (cfs) =	0.6	6.3	5.3	7.1	15.0	16.2	17.0	18.1
Peak Outflow Q (cfs) =	N/A	N/A	N/A	0.4	0.6	0.4	0.3	0.2
Ratio Peak Outflow to Predevelopment Q =	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1	Outlet Plate 1
Structure Controlling Flow =	N/A	N/A	N/A	0.0	0.6	0.6	0.6	0.6
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	38	48	49	50	49	48	47	46
Time to Drain 97% of Inflow Volume (hours) =	40	52	53	55	55	55	55	56
Time to Drain 99% of Inflow Volume (hours) =	3.64	5.81	5.19	6.14	6.66	7.63	8.41	9.40
Maximum Ponding Depth (ft) =	1.29	1.55	1.49	1.58	1.64	1.74	1.82	1.93
Area at Maximum Ponding Depth (acres) =	1.397	4.505	3.548	5.006	5.858	7.493	8.862	10.736
Maximum Volume Stored (acre-ft) =								

# Stormwater Detention and Infiltration Design Data Sheet

Worksheet Protected

### User Input: Watershed Characteristics

Watershed Slope = 0.040 ft/ft

Watershed Length = 4800 ft

Watershed Area =	76.00	acres
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Watershed Imperviousness = 55.0% percent

Percentage Hydrologic Soil Group A =  percent

Percentage Hydrologic Soil Group B = 100.0% percent

Percentage Hydrologic Soil Groups C/D =  percent

Location for 1-hr Rainfall Depths (use dropdown):

Denver - Capitol Building

WQCV Treatment Method = Extended Detention

[illegible]

**After completing and printing this worksheet to a pdf, go to:**

<https://maperture.digitaldataservices.com/gvh/?viewer=cswdif>

**create a new stormwater facility, and**

**attach the pdf of this worksheet to that record.**

### Routed Hydrograph Results

Design Storm Return Period =		WQCV	2 Year	5 Year	10 Year	50 Year	100 Year	
One-Hour Rainfall Depth =	0.53	0.83	1.09	1.33	1.99	2.31		in
Calculated Runoff Volume =	1.396	2.541	3.609	5.009	9.332	11.640		acre-ft
OPTIONAL Override Runoff Volume =								acre-ft
Inflow Hydrograph Volume =	1.395	2.540	3.609	5.000	9.323	11.638		acre-ft
Time to Drain 97% of Inflow Volume =	38.2	44.9	46.2	47.2	45.5	44.9		hours
Time to Drain 99% of Inflow Volume =	39.9	47.4	49.5	51.5	52.5	52.9		hours
Maximum Ponding Depth =	3.55	4.24	4.83	5.60	7.52	8.60		ft
Maximum Poned Area =	1.25	1.38	1.45	1.53	1.72	1.84		acres
Maximum Volume Stored =	1.271	2.184	3.020	4.166	7.281	9.221		acre-ft

## Stormwater Detention and Infiltration Design Data Sheet

