



Drexel, Barrell & Co.

February 6, 2024

Engineers/Surveyors

**Colorado Springs
Lafayette**

101 Sahwatch St., Ste 100
Colorado Springs,
Colorado 80903

719 260-0887
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El Paso County
Department of Public Works
3275 Akers Drive
Colorado Springs, CO 80922

Attn: Jeff Rice, P.E.

RE: Windermere Filing No. 1
Certification Letter

Mr. Rice,

Based upon information gathered from periodic site visits during significant/key phases of the project development, Drexel, Barrell & Co., is of the opinion that the subdivision improvements have been constructed in general conformance with the approved design plans as filed with El Paso County.

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

Drainage improvements for the site consist of two Extended Detention Basins. The facilities have been constructed in general compliance with the approved Erosion Control and Stormwater Quality Plan. The facilities provide the required storage volume and meet the required release rates as documented by the attached MHFD design forms. The Engineering Record Drawings accurately depict the installation of the facilities and verify the detention volume provided.

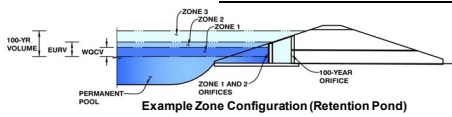
Tim D. McConnell, P.E.
Colorado No. 33797



DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.04 (February 2021)

Project: Windermere Filing No. 1
Basin ID: North Pond



NORTH POND DESIGN

Watershed Information

Selected BMP Type = **EDB**
 Watershed Area = **133.15** acres
 Watershed Length = **4,000** ft
 Watershed Length to Centroid = **600** ft
 Watershed Slope = **0.025** ft/ft
 Watershed Imperviousness = **40.70%** percent
 Percentage Hydrologic Soil Group A = **100.0%** percent
 Percentage Hydrologic Soil Group B = **0.0%** 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.

Water Quality Capture Volume (WQCV) =	2.016	acre-feet	Optional User Overrides		acre-feet
Excess Urban Runoff Volume (EURV) =	5.899	acre-feet			acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	4.477	acre-feet		1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	6.022	acre-feet		1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	7.245	acre-feet		1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	9.501	acre-feet		2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	11.710	acre-feet		2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	14.604	acre-feet		2.52	inches
500-yr Runoff Volume (P1 = 3.49 in.) =	24.649	acre-feet		3.49	inches
Approximate 2-yr Detention Volume =	3.759	acre-feet			
Approximate 5-yr Detention Volume =	4.975	acre-feet			
Approximate 10-yr Detention Volume =	6.130	acre-feet			
Approximate 25-yr Detention Volume =	7.597	acre-feet			
Approximate 50-yr Detention Volume =	8.584	acre-feet			
Approximate 100-yr Detention Volume =	9.941	acre-feet			

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) = **2.016** acre-feet
 Zone 2 Volume (EURV - Zone 1) = **3.883** acre-feet
 Zone 3 Volume (100-year - Zones 1 & 2) = **4.043** acre-feet
 Total Detention Basin Volume = **9.941** acre-feet
 Initial Surcharge Volume (ISV) = **user** ft³
 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** ft²
 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** ft²
 Volume of Basin Floor (V_{FLOOR}) = **user** ft³
 Depth of Main Basin (H_{MAN}) = **user** ft
 Length of Main Basin (L_{MAN}) = **user** ft
 Width of Main Basin (W_{MAN}) = **user** ft
 Area of Main Basin (A_{MAN}) = **user** ft²
 Volume of Main Basin (V_{MAN}) = **user** ft³
 Calculated Total Basin Volume (V_{total}) = **user** acre-feet

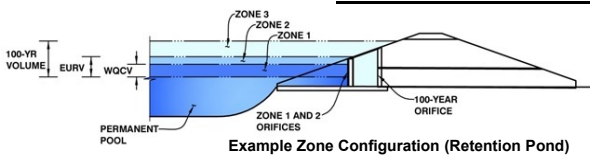
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft ²)	Optional Override Area (ft ²)	Area (acre)	Volume (ft ³)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	250	0.006		
6572	--	0.50	--	--	--	7,926	0.182	2,044	0.047
6576	--	4.50	--	--	--	135,531	3.111	288,957	6.634
6578	--	6.50	--	--	--	209,825	4.817	634,313	14.562
6579	--	7.50	--	--	--	220,020	5.051	849,236	19.496
6580	--	8.50	--	--	--	225,118	5.168	1,071,805	24.605

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.04 (February 2021)

Project: Windermere Filing No. 1

Basin ID: North Pond



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.59	2.016	Orifice Plate
Zone 2 (EURV)	4.26	3.883	Orifice Plate
Zone 3 (100-year)	5.45	4.043	Weir&Pipe (Circular)
Total (all zones)		9.941	

NORTH POND DESIGN

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 =	4.26	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	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	1.42	2.83					
Orifice Area (sq. inches)	11.00	11.00	11.00					

	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 Gate and Outlet Pipe OR Rectangular/Trapezoidal Weir (and No Outlet Pipe))

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, H _o =	4.30	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	6.75	N/A	feet
Overflow Weir Gate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	6.75	N/A	feet
Overflow Gate Type =	Type C Gate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Gate Upper Edge, H _t =	4.30	N/A	feet
Overflow Weir Slope Length =	6.75	N/A	feet
Gate Open Area / 100-yr Orifice Area =	4.49	N/A	
Overflow Gate Open Area w/o Debris =	31.71	N/A	ft ²
Overflow Gate Open Area w/ Debris =	15.86	N/A	ft ²

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

	Zone 3 Circular	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =	36.00	N/A	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Circular	Not Selected	
Outlet Orifice Area =	7.07	N/A	ft ²
Outlet Orifice Centroid =	1.50	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	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 =	70.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

Spillway Design Flow Depth =	0.92	feet
Stage at Top of Freeboard =	7.92	feet
Basin Area at Top of Freeboard =	5.10	acres
Basin Volume at Top of Freeboard =	21.63	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).

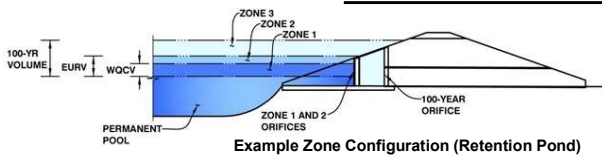
	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
One-Hour Rainfall Depth (in) =	2.016	5.899	4.477	6.022	7.245	9.501	11.710	14.604	24.649
CUHP Runoff Volume (acre-ft) =	N/A	N/A	4.477	6.022	7.245	9.501	11.710	14.604	24.649
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.4	2.7	3.8	35.3	69.5	113.7	257.4
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	0.01	0.02	0.03	0.26	0.52	0.85	1.93
Peak Inflow Q (cfs) =	N/A	N/A	76.6	105.2	127.2	182.0	232.6	297.1	501.8
Peak Outflow Q (cfs) =	1.0	1.8	1.6	1.8	6.7	20.3	38.5	67.6	189.1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.7	1.8	0.6	0.6	0.6	0.7
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Spillway
Max Velocity through Gate 1 (fps) =	N/A	N/A	N/A	N/A	0.2	0.6	1.2	2.06	2.4
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) =	38	66	59	68	71	69	68	65	59
Time to Drain 99% of Inflow Volume (hours) =	40	71	62	72	76	76	75	75	72
Maximum Ponding Depth (ft) =	2.59	4.26	3.64	4.20	4.53	4.86	5.19	5.61	6.64
Area at Maximum Ponding Depth (acres) =	1.71	2.94	2.48	2.88	3.13	3.42	3.69	4.06	4.85
Maximum Volume Stored (acre-ft) =	2.027	5.908	4.229	5.704	6.696	7.809	8.946	10.613	15.238

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

Project: Windermere Filing No. 1 - AS BUILT

Basin ID: North Pond



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.80	2.016	Orifice Plate
Zone 2 (EURV)	4.47	3.883	Orifice Plate
Zone 3 (100-year)	5.65	4.043	Weir&Pipe (Circular)
Total (all zones)		9.941	

NORTH POND AS-BUILT

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)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	4.30	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	N/A	sq. 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	1.43	2.84					
Orifice Area (sq. inches)	9.00	11.00	11.00					

	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 =	4.30	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	6.75	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	6.75	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H _u =	4.30	N/A	feet
Overflow Weir Slope Length =	6.75	N/A	feet
Grate Open Area / 100-yr Orifice Area =	4.49	N/A	
Overflow Grate Open Area w/o Debris =	31.71	N/A	ft ²
Overflow Grate Open Area w/ Debris =	15.86	N/A	ft ²

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

	Zone 3 Circular	Not Selected	
Depth to Invert of Outlet Pipe =	0.00	N/A	ft (distance below basin bottom at Stage = 0 ft)
Circular Orifice Diameter =	36.00	N/A	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Circular	Not Selected	
Outlet Orifice Area =	7.07	N/A	ft ²
Outlet Orifice Centroid =	1.50	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	6.20	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	70.00	feet
Spillway End Slopes =	40.00	H:V
Freeboard above Max Water Surface =	1.00	feet

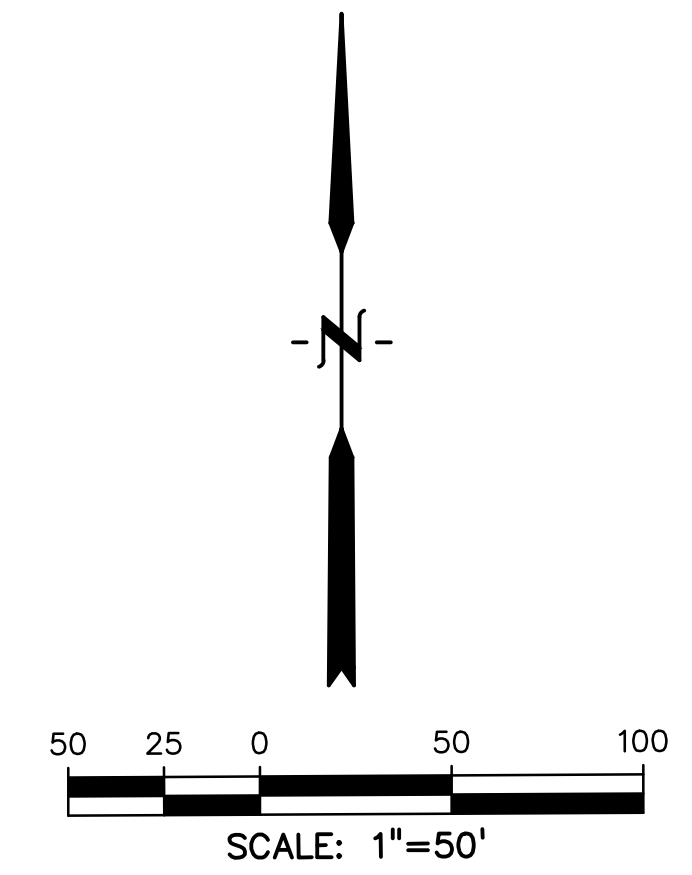
Calculated Parameters for Spillway

Spillway Design Flow Depth =	0.98	feet
Stage at Top of Freeboard =	8.18	feet
Basin Area at Top of Freeboard =	5.20	acres
Basin Volume at Top of Freeboard =	21.75	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	3.49
One-Hour Rainfall Depth (in) =	2.016	5.899	4.477	6.022	7.245	9.501	11.710	14.604	24.649
CUHP Runoff Volume (acre-ft) =	N/A	N/A	4.477	6.022	7.245	9.501	11.710	14.604	24.649
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	1.4	2.7	3.8	35.3	69.5	113.7	257.4
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.01	0.02	0.03	0.26	0.52	0.85	1.93
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	76.6	105.2	127.2	182.0	232.6	297.1	501.8
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	1.5	3.1	10.7	25.9	45.3	70.0	200.0
Peak Inflow Q (cfs) =	N/A	N/A	N/A	1.1	2.8	0.7	0.7	0.6	0.8
Peak Outflow Q (cfs) =	N/A	N/A	N/A	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1
Structure Controlling Flow =	N/A	0.10	N/A	0.0	0.3	0.8	1.4	2.1	2.4
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	39	66	59	68	68	66	64	61	56
Time to Drain 97% of Inflow Volume (hours) =	40	71	63	72	73	73	72	71	68
Time to Drain 99% of Inflow Volume (hours) =	2.80	4.47	3.85	4.40	4.65	4.97	5.30	5.73	6.79
Maximum Ponding Depth (ft) =	1.72	2.94	2.49	2.89	3.08	3.35	3.61	3.96	4.68
Area at Maximum Ponding Depth (acres) =	2.017	5.910	4.226	5.677	6.422	7.483	8.595	10.261	14.896
Maximum Volume Stored (acre-ft) =									



NORTH POND
 WQC: DESIGN: 2.02 ac-ft
 AS-BUILT: 2.03 ac-ft

100 YEAR: DESIGN: 10.61 ac-ft
 AS-BUILT: 10.53 ac-ft

AS-BUILT
 1/15/2024

PREPARED BY:



DREXEL, BARRELL & CO.
 Engineers & Surveyors
 3 SOUTH 7TH STREET
 COLORADO SPGS, COLORADO 80905
 CONTACT: TIM D. MCCONNELL, P.E.
 (719) 260-0887
 BOULDER • COLORADO SPRINGS • GREELEY

CLIENT:



THE LANDHUIS COMPANY
 212 N. WAHSATCH AVE., #301
 COLORADO SPRINGS, CO 80903
 (719) 635-3200
 CONTACT: JEFF MARK

**WINDERMERE
 POND AS-BUILTS**
 N. MARKSHEFFEL ROAD
 EL PASO COUNTY, COLORADO

ISSUE	DATE
INITIAL ISSUE	6/15/23
RESUBMITTAL	2/6/24

DESIGNED BY: KGV
 DRAWN BY: CGH
 CHECKED BY: TDM
 FILE NAME: 21187-01PND AB2

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
 HORIZONTAL: 1"=50'
 VERTICAL: N/A

**NORTH POND
 AS-BUILT**

PROJECT NO. 21187-01CSCV
 DRAWING NO.

PD-AB

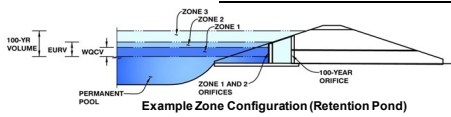
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.03 (May 2020)

Project: Windermere Filing No. 1

Basin ID: South Pond - Interim Condition

SOUTH POND INTERIM DESIGN



Watershed Information

Selected BMP Type =	EDB
Watershed Area =	10.89 acres
Watershed Length =	700 ft
Watershed Length to Centroid =	400 ft
Watershed Slope =	0.040 ft/ft
Watershed Imperviousness =	23.80% percent
Percentage Hydrologic Soil Group A =	100.0% percent
Percentage Hydrologic Soil Group B =	0.0% 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.

Water Quality Capture Volume (WQCV) =	0.118	acre-feet	Optional User Overrides	acre-feet
Excess Urban Runoff Volume (EURV) =	0.243	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.156	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.221	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.279	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	0.448	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	0.608	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	0.825	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.49 in.) =	1.590	acre-feet	3.49	inches
Approximate 2-yr Detention Volume =	0.151	acre-feet		
Approximate 5-yr Detention Volume =	0.203	acre-feet		
Approximate 10-yr Detention Volume =	0.256	acre-feet		
Approximate 25-yr Detention Volume =	0.328	acre-feet		
Approximate 50-yr Detention Volume =	0.388	acre-feet		
Approximate 100-yr Detention Volume =	0.496	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.118	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.124	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.253	acre-feet
Total Detention Basin Volume =	0.496	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 _t) =	user	ft
Slope of Trickle Channel (S _t) =	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 _{LSV}) =	user	ft
Surcharge Volume Width (W _{LSV}) =	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 _{MAN}) =	user	ft
Length of Main Basin (L _{MAN}) =	user	ft
Width of Main Basin (W _{MAN}) =	user	ft
Area of Main Basin (A _{MAN}) =	user	ft ²
Volume of Main Basin (V _{MAN}) =	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		
6574	--	1.00	--	--	--	1,801	0.041	920	0.021
6575	--	2.00	--	--	--	3,008	0.069	3,325	0.076
6576	--	3.00	--	--	--	5,232	0.120	7,445	0.171
6577	--	4.00	--	--	--	7,923	0.182	14,022	0.322
6578	--	5.00	--	--	--	11,161	0.256	23,564	0.541
6579	--	6.00	--	--	--	13,425	0.308	35,857	0.823
6580	--	7.00	--	--	--	15,853	0.364	50,496	1.159
6581	--	8.00	--	--	--	18,293	0.420	67,569	1.551
6581.5	--	8.50	--	--	--	25,208	0.579	78,445	1.801

THIS POND AND OUTLET WERE SIZED FOR DEVELOPMENT OF THE ADJACENT PARCEL IN THE CURRENT OVERLOT GRADED - INTERIM CONDITION. THE ORIFICE PLATE INSTALLED IS SUFFICIENT TO TREAT THE CURRENT WQCV CONDITION. ANALYSIS OF THE POND AND ITS FEATURES WILL BE COMPLETED AT TIME OF FURTHER DEVELOPMENT AND ADJUSTED ACCORDINGLY.

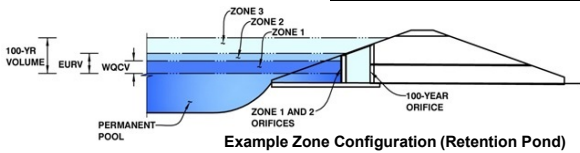
DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-*Detention*, Version 4.03 (May 2020)

Project: Windermere Filing No. 1

Basin ID: South Pond - Interim Condition

SOUTH POND INTERIM DESIGN



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.52	0.118	Orifice Plate
Zone 2 (EURV)	3.53	0.124	Orifice Plate
Zone 3 (100-year)	4.82	0.253	Weir&Pipe (Restrict)
Total (all zones)		0.496	

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 (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	1.18	2.35					
Orifice Area (sq. inches)	0.67	0.67	0.67					

	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 Diameter = inches

Calculated Parameters for Vertical Orifice
 Vertical Orifice Area = ft²
 Vertical Orifice Centroid = 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, H _o =	6.40	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	3.92	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	3.92	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_t = feet
 Overflow Weir Slope Length = feet
 Grate Open Area / 100-yr Orifice Area = ft²
 Overflow Grate Open Area w/o Debris = ft²
 Overflow Grate Open Area w/ Debris = ft²

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 =	2.50	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 =	7.00	N/A	inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
 Outlet Orifice Area = ft²
 Outlet Orifice Centroid = feet
 Half-Central Angle of Restrictor Plate on Pipe = 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).

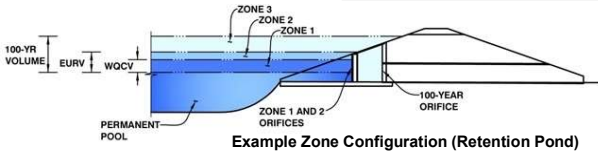
	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
Design Storm Return Period =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
CUHP Runoff Volume (acre-ft) =	0.118	0.243	0.156	0.221	0.279	0.448	0.608	0.825	1.590
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.156	0.221	0.279	0.448	0.608	0.825	1.590
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.2	0.3	2.9	5.6	9.1	20.5
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.01	0.02	0.03	0.27	0.52	0.84	1.89
Peak Inflow Q (cfs) =	N/A	N/A	2.5	3.6	4.5	7.7	10.6	14.5	27.0
Peak Outflow Q (cfs) =	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.4	0.3	0.0	0.0	0.0	0.4
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Plate	Outlet Plate 1
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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	53	44	51	57	71	83	99	103
Time to Drain 99% of Inflow Volume (hours) =	40	57	47	55	61	77	91	108	116
Maximum Ponding Depth (ft) =	2.51	3.53	2.76	3.27	3.64	4.53	5.17	5.93	6.91
Area at Maximum Ponding Depth (acres) =	0.10	0.15	0.11	0.14	0.16	0.22	0.27	0.30	0.36
Maximum Volume Stored (acre-ft) =	0.118	0.243	0.144	0.204	0.260	0.427	0.585	0.799	1.127

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-*Detention*, Version 4.06 (July 2022)

Project: Windermere Filing No. 1 - AS BUILT
Basin ID: South Pond - Interim Condition

SOUTH POND INTERIM AS-BUILT



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.89	0.118	Orifice Plate
Zone 2 (EURV)	3.91	0.124	Orifice Plate
Zone 3 (100-year)	5.23	0.253	Weir&Pipe (Restrict)
Total (all zones)		0.496	

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)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	3.91	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	0.56	sq. inches (diameter = 13/16 inch)

Calculated Parameters for Plate

WQ Orifice Area per Row =	3.889E-03	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	1.30	2.60					
Orifice Area (sq. inches)	0.56	0.56	0.56					

	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 =	6.22	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	3.92	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	3.92	N/A	feet
Overflow Grate Type =	Type C Grate	N/A	
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H _u =	6.22	N/A	feet
Overflow Weir Slope Length =	3.92	N/A	feet
Grate Open Area / 100-yr Orifice Area =	16.83	N/A	
Overflow Grate Open Area w/o Debris =	10.70	N/A	ft ²
Overflow Grate Open Area w/ Debris =	5.35	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 =	2.50	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 =	7.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	0.64	N/A	ft ²
Outlet Orifice Centroid =	0.34	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	1.35	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	6.94	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	27.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

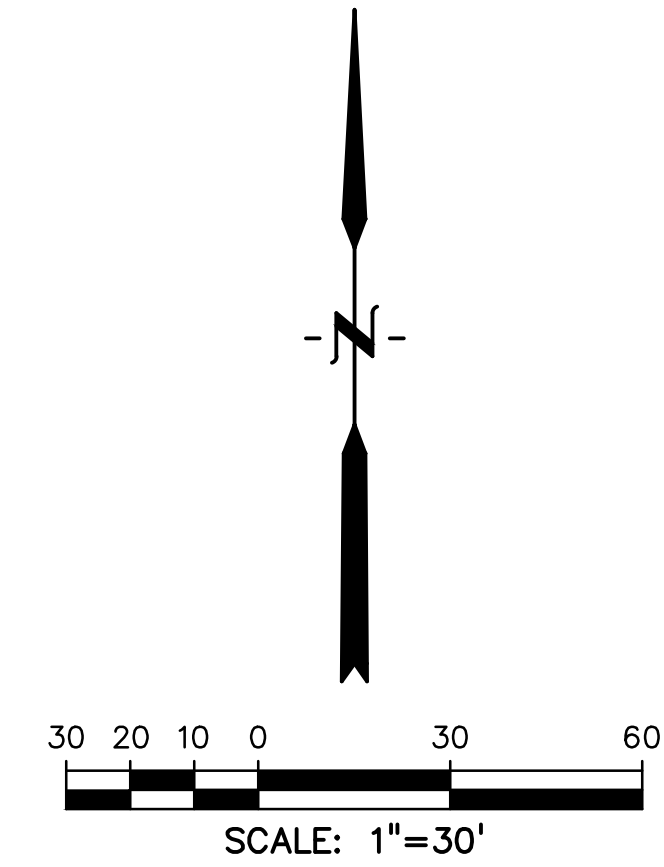
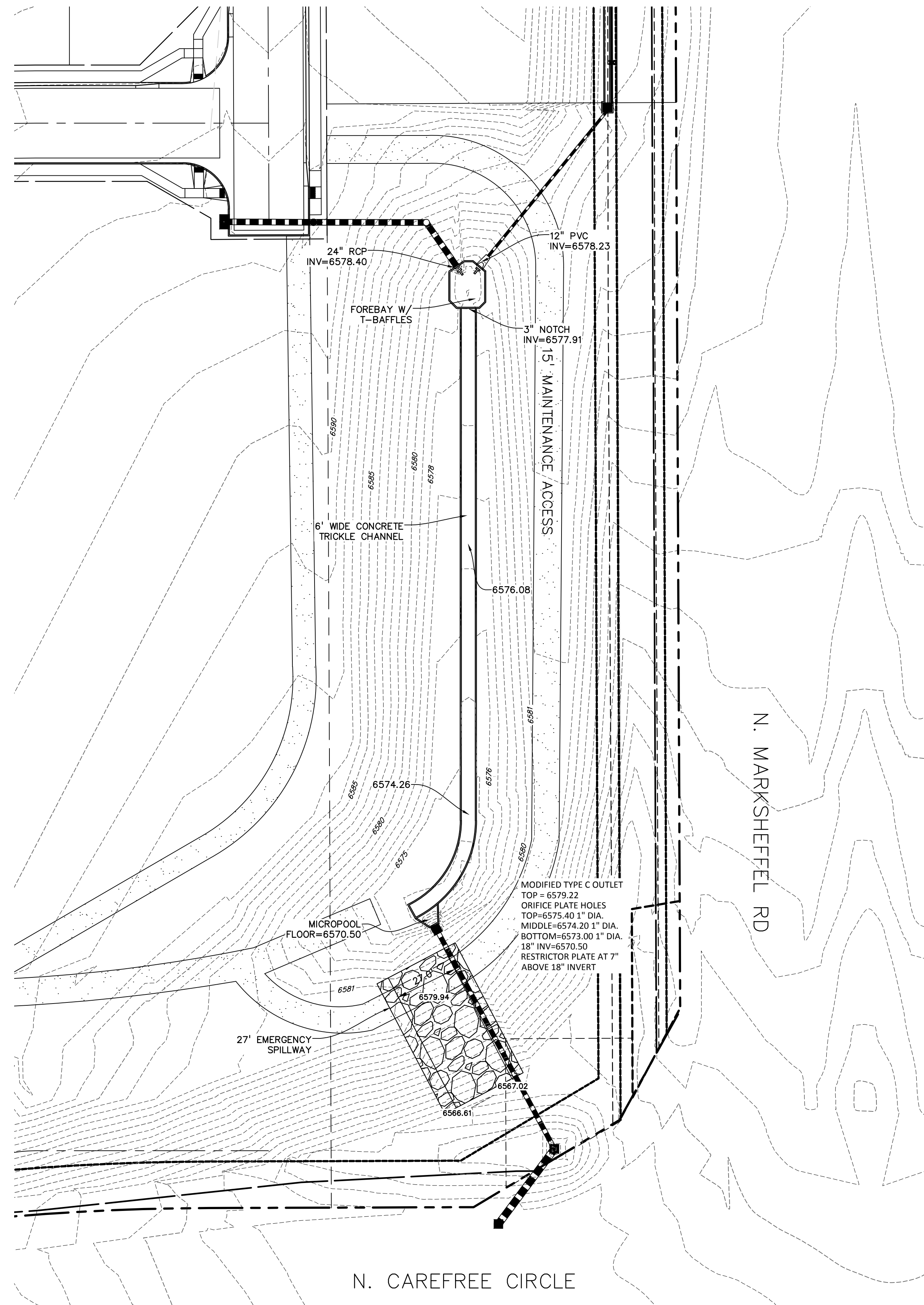
Calculated Parameters for Spillway

Spillway Design Flow Depth =	0.31	feet
Stage at Top of Freeboard =	8.25	feet
Basin Area at Top of Freeboard =	0.50	acres
Basin Volume at Top of Freeboard =	1.51	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 =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.49
One-Hour Rainfall Depth (in) =	N/A	N/A	0.156	0.221	0.279	0.448	0.608	0.825	1.590
CUHP Runoff Volume (acre-ft) =	N/A	N/A	0.156	0.221	0.279	0.448	0.608	0.825	1.590
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.1	0.2	0.3	2.9	5.6	9.1	20.5
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.01	0.02	0.03	0.27	0.52	0.84	1.89
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A	0.01	0.02	0.03	0.27	0.52	0.84	1.89
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	2.5	3.6	4.5	7.7	10.6	14.5	27.0
Peak Inflow Q (cfs) =	N/A	N/A	0.1	0.1	0.1	0.1	0.1	0.7	11.0
Peak Outflow Q (cfs) =	N/A	N/A	N/A	0.4	0.3	0.0	0.0	0.1	0.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Spillway
Structure Controlling Flow =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.1	0.9
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
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	54	44	52	59	76	90	105	97
Time to Drain 99% of Inflow Volume (hours) =	40	58	47	56	63	82	98	115	110
Maximum Ponding Depth (ft) =	2.89	3.91	3.14	3.65	4.03	4.93	5.60	6.30	7.02
Area at Maximum Ponding Depth (acres) =	0.10	0.15	0.11	0.14	0.16	0.21	0.26	0.30	0.35
Maximum Volume Stored (acre-ft) =	0.119	0.244	0.143	0.206	0.262	0.429	0.587	0.780	1.014



SOUTH POND (INTERIM CONDITION)

WQCV: DESIGN: 0.12 ac-ft
AS-BUILT: 0.12 ac-ft

100 YEAR: DESIGN: 0.25 ac-ft
AS-BUILT: 0.76 ac-ft

AS-BUILT
1/16/24

PREPARED BY:



CLIENT:



WINDERMERE
POND AS-BUILTS
N. MARKSHEFFEL ROAD
EL PASO COUNTY, COLORADO

ISSUE	DATE
INITIAL ISSUE	6/15/23
RESUBMITTAL	2/6/24

DESIGNED BY: KGV
DRAWN BY: CGH
CHECKED BY: TDM
FILE NAME: 21187-01PND AB2

PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.

DRAWING SCALE:
HORIZONTAL: 1"=30'
VERTICAL: N/A

SOUTH POND
AS-BUILT

PROJECT NO. 21187-01CSCV
DRAWING NO.

PD-AB