

**PRELIMINARY DRAINAGE REPORT**  
for  
**WINDERMERE FILING NO. 2**

Colorado Springs, CO

**June 2025**

Prepared for:

**Colo Windermere #2, LLC**  
4164 Austin Bluffs Parkway, #361  
Colorado Springs, CO 80918  
Contact: James Todd Stephens

Prepared by:

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## **TABLE OF CONTENTS**

<b>1.0</b>	<b>CERTIFICATION STATEMENTS .....</b>	<b>1</b>
<b>2.0</b>	<b>PURPOSE .....</b>	<b>2</b>
<b>3.0</b>	<b>GENERAL SITE DESCRIPTION .....</b>	<b>2</b>
<b>4.0</b>	<b>HISTORIC HYDROLOGY .....</b>	<b>3</b>
<b>5.0</b>	<b>EXISTING HYDROLOGY .....</b>	<b>3</b>
<b>6.0</b>	<b>PROPOSED HYDROLOGY .....</b>	<b>5</b>
<b>7.0</b>	<b>EXISTING/DEVELOPED COMPARISON .....</b>	<b>7</b>
<b>8.0</b>	<b>EXISTING DETENTION/WATER QUALITY FACILITY .....</b>	<b>7</b>
<b>9.0</b>	<b>FOUR-STEP PROCESS .....</b>	<b>9</b>
<b>10.0</b>	<b>GEOTECHNICAL HAZARDS .....</b>	<b>9</b>
<b>11.0</b>	<b>FACILITY MAINTENANCE .....</b>	<b>9</b>
<b>12.0</b>	<b>CONSTRUCTION COST ESTIMATE .....</b>	<b>9</b>
<b>13.0</b>	<b>DRAINAGE/BRIDGE FEES .....</b>	<b>10</b>
<b>14.0</b>	<b>CONCLUSIONS .....</b>	<b>10</b>
<b>15.0</b>	<b>REFERENCES .....</b>	<b>10</b>

## **APPENDICES**

VICINITY MAP  
SOILS MAP  
FLOODPLAIN MAP  
APPROVED DRAINAGE REPORT EXCERPTS  
DRAINAGE CALCULATIONS  
DRAINAGE MAP

## PRELIMINARY DRAINAGE REPORT

for

### WINDERMERE FILING NO. 2

Colorado Springs, Colorado

## 1.0 CERTIFICATION STATEMENTS

### ENGINEER'S STATEMENT

The attached drainage plan and report were prepared under my direction and supervision and are correct to the best of my knowledge and belief. Said drainage report has been prepared according to the criteria established by El Paso County for drainage reports, and said report is in conformity with the master plan of the drainage basin. I accept responsibility for any liability caused by any negligent acts, errors or omission on my part in preparing this report.

Tim D. McConnell, P.E.  
Colorado P.E. License No. 33797  
For and on Behalf of Drexel, Barrell & Co.



6/27/25

Date

### DEVELOPER'S STATEMENT

I, the developer have read and will comply with all the requirements specified in this drainage report and plan.

Business Name: Colo Windermere #2, LLC

By:

A handwritten signature of James Todd Stephens.

6/27/25

James Todd Stephens

Date

Title:

Owner

Address:

4164 Austin Bluffs Parkway, #361  
Colorado Springs, CO 80918

### EL PASO COUNTY

Filed in accordance with the requirements of the El Paso County Land Development Code, Drainage Criteria Manual Volumes 1 and 2, and the Engineering Criteria Manual, as amended.

7/2/2025

County Engineer/ECM Administrator

Date

CONDITIONS

## **PRELIMINARY DRAINAGE REPORT**

for

### **WINDERMERE FILING NO. 2**

Colorado Springs, Colorado

## **2.0 PURPOSE**

This report is prepared by Drexel, Barrel & Co in support of the Windermere Filing No. 2 subdivision. This preliminary drainage report is presented in order to determine the adequacy of the existing drainage facilities based upon the anticipated development. This report is associated with a preliminary plan amendment, which triggered the need for this drainage analysis. This development is in the concept stage and as such no site work, grading or drainage and utility installation is to occur at this time. The drainage report will be required to be updated upon final layout, grading and drainage design.

## **3.0 GENERAL SITE DESCRIPTION**

### Location

The site is located at the northwest corner of N. Carefree Cir. and Marksheffel Rd. - the E 1/2 of Section 29, Township 13 S, Range 65 W of the 6th P.M., El Paso County, Colorado.

The site is bound on the west by Antelope Ridge Dr., on the north by the Windermere Filing No. 1 subdivision (Pronghorn Meadows Circle), on the east by Marksheffel Rd., and on the south by N. Carefree Cir.

### Site Conditions

The site is approximately 9.26 acres in size and is proposed as a multi-family home subdivision. The proposed site development includes approximately 200 multi-family units. The site has recently been overlot graded, seeded and mulched as part of the Windermere Filing No. 1 development to the north. The site is located within the Sand Creek Drainage Basin. Historically, this site drains to the southeast towards the intersection of N. Carefree Circle and Marksheffel Road.

This site was studied as part of the approved Preliminary Drainage Report for Windermere & Final Drainage Report for Windermere Filing No. 1, by Classic Consulting (October 2014) and the more recently approved Final Drainage Report for Windermere Filing No. 1, by Drexel, Barrell & Co. (April 2022).

### Soils

According to the Soil Survey of El Paso County Area, Colorado, prepared by the U.S. Department of Agriculture Soil Conservation Service, the site is underlain by Truckton sandy loam, a type 'A' hydrologic soil. See appendix for map.

### Climate

This area of El Paso County can be described as the foothills, with total precipitation amounts typical of a semi-arid region. Winters are generally cold and dry, and summers

relatively warm and dry. Precipitation ranges from 12 to 14 inches per year, with the majority of this moisture occurring in the spring and summer in the form of rainfall. Thunderstorms are common during the summer months.

#### Floodplain Statement

According to the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) Panel #08041C0543 G (December 7, 2018) the project site is within a designated Zone X area described as "area of minimal hazard". A firmette map is included in the appendix.

## **4.0 HISTORIC HYDROLOGY**

The existing condition described in the previously approved *Preliminary Drainage Report for Windermere & Final Drainage Report for Windermere Filing No. 1*, by Classic Consulting (October 2014) of the project area is presented here for reference, specifically for the offsite basins that have not changed from the time of the Classic Consulting report.

A copy of the existing conditions map from the Classic Consulting report is provided in the appendix and presented as the historic condition. Reference Section 5.0 below for the existing condition analysis.

## **5.0 EXISTING HYDROLOGY**

As described above, the Windermere Filing No. 2 site was overlaid graded as part of the Windermere Filing No. 1 development and studied as part of the previously approved *Final Drainage Report for Windermere Filing No. 1*, by Drexel, Barrell & Co. (April 2022). A full-spectrum detention facility was designed as part of Filing No.1 and in order to minimize future grading within the detention facility area, the volume was based on assumed final build-out watershed imperviousness of 68% and an interim outlet plate installed to control the release rate for the undeveloped condition.

The Rational Method was used to determine runoff quantities for the 5- and 100-year storm recurrence intervals. See below for a summary runoff table and description of each design point.

**Design Point 1** represents the flows generated by offsite basin OS1, and onsite basin E1. Flows of  $Q_5=7.1$  cfs and  $Q_{100}=15.7$  cfs travel via the existing private 24" RCP storm sewer to the east and discharge into the north end of the existing detention facility.

**Design Point 2** represents the flows generated by onsite basin E2 ( $Q_5=2.9$  cfs and  $Q_{100}=16.1$  cfs). These flows sheet flow across the site, from northwest to southeast, before being discharged into the existing detention facility.

**Design Point 3** represents all flows reaching the existing detention facility (DP1, DP2, OS2 and Basin E3) for a total flow of  $Q_5=9.5$  cfs and  $Q_{100}=32.3$  cfs. Flows exiting the facility were determined by the interim pond design completed with the Windermere Filing 1 Final Drainage Report.

### Rational Method Existing Runoff Summary

BASIN	DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
OS1		3.82	7.0	15.5
OS2		0.16	0.3	0.6
E1		0.03	0.2	0.3
	1	3.85	7.1	15.7
E2	2	5.70	2.9	16.1
E3		1.10	0.8	4.5
	3	10.81	9.5	32.3
D16	4	2.73	4.7	10.3
E4		1.86	0.9	5.3
	4A	4.59	4.8	13.6
E5	5	0.63	0.4	2.4
EXR		0.53	2.4	4.4
	S	5.75	6.7	18.1
NC2	19	1.61	6.4	12.2
	J1	7.36	10.5	25.5
NC1		0.43	1.9	3.4
	20	7.79	11.7	27.6

**Design Point 4** is identical to DP-4-EX in the historic condition and represents flows ( $Q_5=4.7\text{cfs}$  and  $Q_{100}=10.3\text{cfs}$ ) from offsite basin D16 which discharge on to the southwest corner of the Windermere property.

**Design Point 4A** represents flows from offsite DP4 and onsite basin E4 ( $Q_5=0.9\text{cfs}$  and  $Q_{100}=5.3\text{cfs}$ ) reaching the intersection of N. Carefree Circle and Marksheffel Road.

**Design Point S** is located at the same existing public area inlet as DP-6-EX in the historic condition. In the existing condition flows reaching this point, from DP4A, DP5 and Basin EXR in addition to the interim design pond release rate will equal  $Q_5=6.7\text{ cfs}$  and  $Q_{100}=18.1\text{ cfs}$ . Flows exit this existing public area inlet by existing public 24" RCP to the south.

**Design Point 19** consists of runoff from off-site basin NC-2 with a flow of  $Q_5= 6.4\text{cfs}$  and  $Q_{100}=12.2\text{ cfs}$ ). An existing public 15' Type R at-grade curb inlet just west of the intersection of N. Carefree Circle and Marksheffel Road intercepts a portion of this runoff ( $Q_5=4.8\text{ cfs}$  and  $Q_{100}=8.1\text{ cfs}$ ) and discharges to the east via existing public 18" RCP storm sewer.

**Design Point J1** is located at the existing public manhole on the north side of N. Carefree Circle and represents the combining of flows from DP-19 and DP-S. Flows of  $Q_5=10.5\text{ cfs}$  and  $Q_{100}=25.5\text{ cfs}$  continue to the south via the existing public 30" RCP towards DP-20.

**Design Point 20** consists of surface runoff from basin NC-1, flowby from the at-grade inlet at DP-19 and pipe flow from DP-J1. An existing public 10' Type R sump inlet intercepts all the surface runoff and combines it with the upstream flows from DP-J1 and DP-19 existing at-grade inlet capture. Total developed runoff at this location is  $Q_5=11.7$  cfs and  $Q_{100}=27.6$  cfs. This runoff continues within the existing Marksheffel Road storm system to the south. Should the inlet be clogged, the resulting runoff will continue east via the neighboring curb and gutter.

## **6.0 PROPOSED HYDROLOGY**

**This preliminary drainage report is presented in order to determine the adequacy of the existing drainage facilities based upon the anticipated development. This report is associated with a preliminary plan amendment, which triggered the need for this drainage analysis. This development is in the concept stage and as such no site work, grading or drainage and utility installation is to occur at this time. The drainage report will be required to be updated upon final layout, grading and drainage design.**

The Rational Method was used to determine runoff quantities for the 5- and 100-year storm recurrence intervals, and Mile High Flood District design software (MHFD-Detention v.4.03) for pond analysis. See below for a summary runoff table and description of each design point.

**The basins and design points described below are based on a preliminary concept site design. Grading and subsequent areas tributary to the detention facility are subject to change and any areas not tributary to the detention facility will be assessed for water quality treatment in adherence to County drainage criteria at the final drainage report stage.**

**Design Point 1** represents the flows generated by offsite basin OS1, and onsite basin E1. Flows of  $Q_5=7.1$  cfs and  $Q_{100}=15.7$  cfs travel via the existing private 24" RCP storm sewer to the east and discharge into the north end of the existing detention facility.

**Design Point 2** represents the flows generated by onsite basin B2 ( $Q_5=11.8$  cfs and  $Q_{100}=26.0$  cfs). These flows sheet flow across the site, from northwest to southeast, before being discharged into the existing detention facility. No early grading is proposed with this concept design, and it is acknowledged that prior to any grading an adequate method will need to be provided for flows to discharge into the existing detention facility

**Design Point 3** represents all flows reaching the existing detention facility (Basins B4, P1, DP1, and DP2) for a total flow of  $Q_5=19.8$  cfs and  $Q_{100}=45.8$  cfs. The existing detention facility and necessary modifications for this developed condition are described further below.

**Design Point 4** is identical to DP-4 in the existing condition and represents flows ( $Q_5=4.7$  cfs and  $Q_{100}=10.3$  cfs) from offsite basin D16 which discharge on to the southwest corner of the Windermere property.

**Design Point 4A** represents flows from offsite DP4 and onsite basin B4 ( $Q_5=5.0$  cfs and

Q<sub>100</sub>=11.7cfs) reaching the intersection of N. Carefree Circle and Marksheffel Road. In the developed condition, it is proposed that the roadside ditch be continued to capture flows that are not able to be captured by the detention facility due to grading restraints. This swale would allow flows to continue to the east to be captured by the existing Type D area inlet at the intersection of N. Carefree Cir. and Marksheffel Road. As the grading for the site is refined, the area tributary to the detention facility will be maximized to the extent possible given the site grading constraints. Appropriate erosion control measures will be provided at the terminus of the swale to aid in erosion and scour mitigation.

#### Rational Method Developed Runoff Summary

BASIN	DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
OS1		3.82	7.0	15.5
OS2		0.16	0.3	0.6
E1		0.03	0.2	0.3
	1	3.85	7.1	15.7
B2	2	6.63	11.8	26.0
E3		1.10	0.8	4.5
	3	11.74	19.4	44.8
D16	4	2.73	4.7	10.3
B4		0.93	1.2	3.4
	4A	3.66	5.0	11.7
E5	5	0.63	0.4	2.4
EXR		0.53	2.4	4.4
	S	4.82	7.7	25.3
NC2	19	1.61	6.4	12.2
	J1	6.43	10.7	23.6
NC1		0.43	1.9	3.4
	20	6.86	11.8	25.7

**Design Point S** is located at the same existing public area inlet as DPS in the existing condition. In the developed condition flows reaching this point, from DP4A, DP5 and Basin EXR in addition to the pond release rate will equal Q<sub>5</sub>=7.7 cfs and Q<sub>100</sub>=25.3 cfs. Flows exit this existing public area inlet by existing public 24" RCP to the south.

**Design Point 19** consists of runoff from off-site basin NC-2 with a flow of Q<sub>5</sub>= 6.4cfs and Q<sub>100</sub>=12.2 cfs). An existing public 15' Type R at-grade curb inlet just west of the intersection of N. Carefree Circle and Marksheffel Road intercepts a portion of this runoff (Q<sub>5</sub>=4.8 cfs and Q<sub>100</sub>=8.1 cfs) and discharges to the east via existing public 18" RCP storm sewer.

**Design Point J1** is located at the existing public manhole on the north side of N. Carefree Circle and represents the combining of flows from DP-19 and DP-S. Flows of Q<sub>5</sub>=10.7 cfs



and  $Q_{100}=23.6$  cfs continue to the south via the existing public 30" RCP towards DP-20.

**Design Point 20** consists of surface runoff from basin NC-1, flowby from the at-grade inlet at DP-19 and pipe flow from DP-J1. An existing public 10' Type R sump inlet intercepts all the surface runoff and combines it with the upstream flows from DP-J1 and DP-19 existing at-grade inlet capture. Total developed runoff at this location is  $Q_5=11.8$  cfs and  $Q_{100}=25.7$  cfs. This runoff continues within the existing Marksheffel Road storm system to the south. Should the inlet be clogged, the resulting runoff will continue east via the neighboring curb and gutter.

## 7.0 EXISTING/DEVELOPED COMPARISON

A comparison of flows between the existing and developed conditions indicates that developed flows exiting the site vary slightly from the existing condition, but release less at the ultimate outfall - Design Point 20.

	Existing		Developed	
DP	Q5 (cfs)	Q100 (cfs)	Q5 (cfs)	Q100 (cfs)
4A	4.8	13.6	5.0	11.7
S	6.7	18.1	7.7	25.3
19	6.4	12.2	6.4	12.2
J1	10.5	25.5	10.7	23.6
20	11.7	27.6	11.8	25.7

## 8.0 EXISTING DETENTION/WATER QUALITY FACILITY

As part of the overlot design for Windermere Filing No. 1, the detention pond located in the southeast corner of the property was designed as a full-spectrum detention facility to capture flows from the Windermere Filing No. 2 basins.

In order to minimize future grading within the detention facility area, the volume was based on an assumed final build-out watershed imperviousness of 68.0%, which considered Windermere Filing No. 2 (Windermere Filing No. 1 – Tract B) as potentially higher density than single-family residential. As part of the Windermere Filing 1 overlot grading, the pond was excavated to full volume and the outlet structure and associated piping installed. An interim orifice plate (assuming full developed condition within the street right-of-way, but no further development) was installed to allow for appropriate WQCV drain time. Once the design is finalized at the final drainage report stage, the orifice plate will need to be switched out to allow for discharge of the developed flows. It is anticipated based on this preliminary design that the restrictor plate will need to be raised to 7.80" above the invert of the 18" outfall pipe. No other portion of the detention facility will need to be modified.

Based on the analysis in this preliminary report, the developed condition encompasses a total of 11.74 acres that is tributary to this existing facility, with a composite imperviousness of 59% for the final fully developed condition. Required volumes are listed below.

		<i>Required Volume</i>		
	<b>Imperviousness</b>	<b>WQCV</b>	<b>EURV</b>	<b>100-YR</b>
<b>FINAL</b>	59%	0.23	0.84	1.28

The actual pond volume at the proposed spillway stage is 1.15 acre-feet. A concrete forebay with an energy dissipater has been installed where the flows enter the pond. The volume of the forebay was designed for 3% of the WQCV volume for the pond, as is still within that limit for this concept design condition. The flows exit the forebay through a notch, discharging into the concrete trickle channel at the bottom of the pond. The trickle channel conveys the flows to the micropool. The outlet structure then releases the flows at a reduced flow rate with the use of a plate with orifice holes, into a proposed 18" pipe with restrictor plate, discharging into an existing storm inlet at the corner of N. Carefree Circle and Marksheffel Rd, after which the flows continue to the south via the existing storm sewer system.

In accordance with El Paso County criteria, the modified Type C outlet structure with a permanent micropool will release the WQCV over a 40-hour period. Switching out of the orifice plate will ensure that the WQCV release rate remains within criteria for the final developed condition. The outlet structure will remain in place and in this preliminary stage will result in release rates of  $Q_5=0.9$  cfs and  $Q_{100}=9.2$  cfs. For comparison, the existing basin EX-A released flow rates of  $Q_5=11.3$  cfs and  $Q_{100}=28.2$  cfs.

A 27-ft wide riprap emergency spillway is located on the south side of the pond. In the event that water overtops the spillway, flow will discharge into existing area inlet at the intersection of N. Carefree Cir and Marksheffel Rd, where it is then picked up by the existing storm system.

All detention facility calculations, including excerpts for forebay volumes, micropool surface areas, outlet structures, discharge pipes and spillway design are provided in the appendix.

The pond has a 15' wide maintenance access that provides access to the pond bottom, forebay and outlet structure per ECM 3.3.3.K. A private maintenance agreement and O&M manual has been established for this pond as required by the County. Necessary modifications to this maintenance access will be provided with the final drainage report.

## 9.0 FOUR-STEP PROCESS

This project conforms to the City of Colorado Springs/El Paso County Four Step Process. The process focuses on reducing runoff volumes, treating the water quality capture volume (WQCV), stabilizing drainage ways, and implementing long-term source controls.

1. **Employ Runoff Reduction Practices:** Proposed impervious areas on this site (roofs, asphalt/sidewalk) will sheet flow across landscaped ground as much as possible to slow runoff and increase time of concentration prior to being conveyed to the proposed public streets and storm sewer system. This will minimize directly connected impervious areas within the project site.
2. **Implement BMP's that provide a Water Quality Capture Volume with slow release:** Runoff from this project will be treated through capture and slow release of the WQCV in a permanent Extended Detention Basin designed per current City of El Paso County drainage criteria.
3. **Stabilize Drainage Ways:** Flows from the detention facility are released directly into the existing storm sewer system and no stabilization will be necessary.
4. **Implement Site Specific and Other Source Control BMP's:** The site is proposed as a residential development, and as such standard household source control will be utilized in order to minimize potential pollutants entering the storm system. Example source control measures consist of: garages for storage of household chemicals, trash receptacles for individual households and in common areas for pet waste. The need for Industrial and Commercial BMP's was considered, however per ECM 1.7.2.A the need for industrial and commercial BMPs are not applicable for this project.

## 10.0 GEOTECHNICAL HAZARDS

In accordance with geotechnical recommendations, the project design is intended to direct runoff away from structures, and into the receiving storm sewer system and water quality/detention basins. This will be accomplished by a variety of means, i.e. curb and gutter and storm sewer. Per "Soils and Geology Study, Windermere Subdivision" by RMG, October 26, 2020 (Revised January 18, 2021), and updated with an addendum for Tract B (March 30, 2022)

## 11.0 FACILITY MAINTENANCE

Ownership and maintenance of all public facilities, generally located within the public right-of-way will be by El Paso County. Ownership and maintenance of all tracts and private facilities will be by the Sands Metropolitan District #4.

## 12.0 CONSTRUCTION COST ESTIMATE

Construction cost estimate will be provided with the Final Drainage Report.

### **13.0 DRAINAGE/BRIDGE FEES**

Tract B was considered as an open space tract for the drainage fee calculation for Windermere Filing No. 1. Development of this tract will require payment of drainage and bridge fees associated with the proposed impervious acreage. This will be determined with the Final Drainage Report for this development as site imperviousness is confirmed.

### **14.0 CONCLUSIONS**

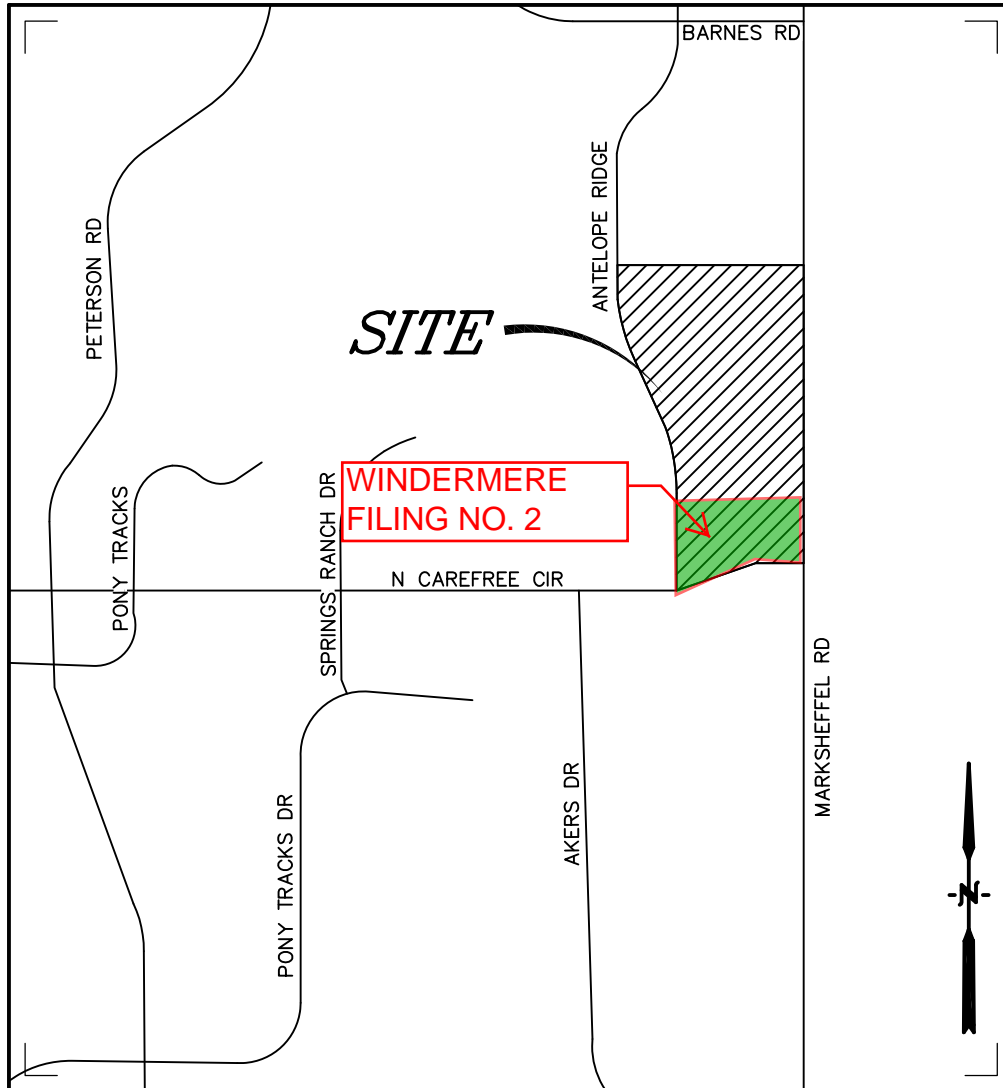
The Windermere Filing No. 2 project has been designed in accordance with El Paso County criteria. The detention facility has been designed to limit the release of storm runoff to historic conditions. This development will not negatively impact or increase flows in the downstream facilities.

### **15.0 REFERENCES**

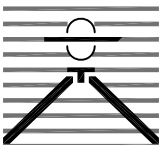
The sources of information used in the development of this study are listed below:

1. City of Colorado Springs "Drainage Criteria Manual", 2016.
2. Urban Storm Drainage Criteria Manuals, Urban Drainage and Flood Control District. June 2001, Revised October 2019.
3. Soil Survey for Colorado Springs and El Paso County, Colorado, U.S. Department of Agriculture, Soil Conservation Service, June 1980.
4. "Flood Insurance Studies for Colorado Springs and El Paso County, Colorado", prepared by the Federal Emergency Management Agency (FEMA), 2018.
5. "Soils and Geology Study, Windermere Subdivision", prepared by RMG, October 26, 2020, Revised January 18, 2021.
6. "Preliminary Drainage Report for Windermere & Final Drainage Report for Windermere Filing No. 1," prepared by Classic Consulting Engineers & Surveyors, October 2014.
7. "Final Drainage Report Marksheffel Road from Constitution Ave. to Dublin Rd.," by CH2M Hill, dated May 2008 and Marksheffel Road Construction Drawings by Wilson & Company.
8. "Final Drainage Report for Windermere Filing No. 1" prepared by Drexel, Barrell & Co., March 8, 2022.

## APPENDIX



*Vicinity Map*  
Not to scale



**WINDERMERE  
COLORADO SPRINGS, CO  
VICINITY MAP**

**Drexel, Barrell & Co.**  
Engineers • Surveyors

DATE:

DWG. NO.

JOB NO:

**21187-00CSCV**

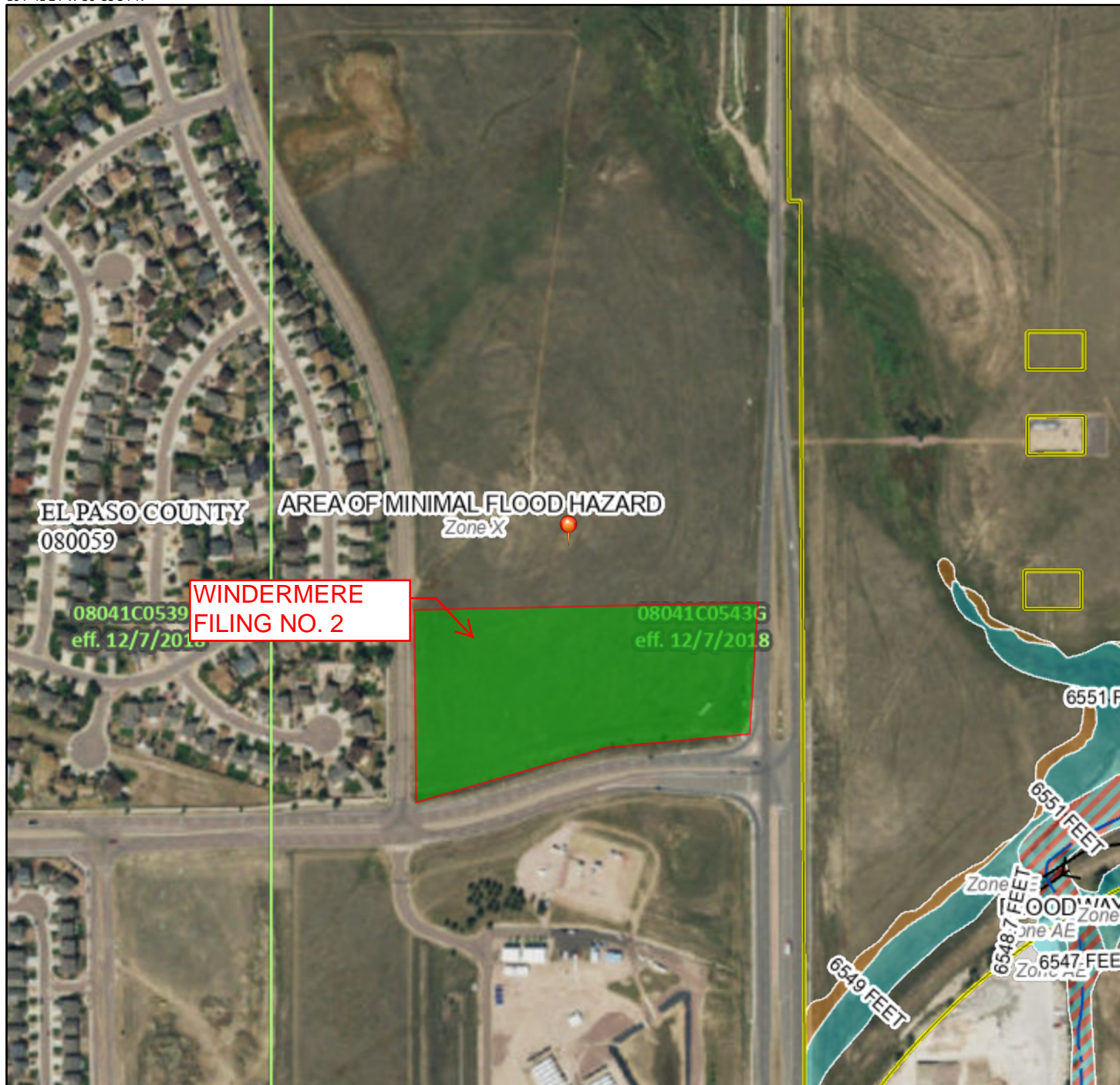
**VMAP**

SHEET 1 OF 1

# National Flood Hazard Layer FIRMette



104°41'24"W 38°53'34"N



0 250 500 1,000 1,500 2,000 Feet 1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

## Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
		Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
OTHER FEATURES		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 9/8/2021 at 3:46 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



# Hydrologic Soil Group—El Paso County Area, Colorado




Natural Resources  
Conservation Service

Web Soil Survey  
National Cooperative Soil Survey



## MAP LEGEND

### Area of Interest (AOI)









 Area of Interest (AOI)

### Soils

#### Soil Rating Polygons





 A  
 A/D  
 B  
 B/D  
 C  
 C/D  
 D  
 Not rated or not available

#### Soil Rating Lines


 A  
 A/D  
 B  
 B/D  
 C  
 C/D  
 D  
 Not rated or not available

#### Soil Rating Points






 A  
 A/D  
 B  
 B/D

 C  
 C/D  
 D  
 Not rated or not available


### Water Features

 Streams and Canals

### Transportation

 Rails  
 Interstate Highways  
 US Routes  
 Major Roads  
 Local Roads

### Background

 Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service  
 Web Soil Survey URL:  
 Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: El Paso County Area, Colorado  
 Survey Area Data: Version 15, Oct 10, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 15, 2011—Jun 17, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.



## Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
97	Truckton sandy loam, 3 to 9 percent slopes	A	56.4	100.0%
<b>Totals for Area of Interest</b>			<b>56.4</b>	<b>100.0%</b>

## Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified



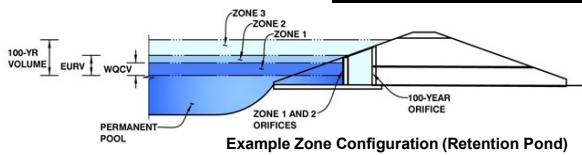
**APPROVED DRAINAGE REPORT EXCERPTS**

# **DETENTION BASIN OUTLET STRUCTURE DESIGN**

MHFD-Detention, Version 4.03 (May 2020)

**Project: Windermere Filing No. 1**

**Basin ID: South Pond - Interim Condition**



**Example Zone Configuration (Retention Pond)**

	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 =  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 =  0.00 ft (relative to basin bottom at Stage = 0 ft)  
Depth at top of Zone using Orifice Plate =  3.53 ft (relative to basin bottom at Stage = 0 ft)  
Orifice Plate: Orifice Vertical Spacing =  25.40 inches  
Orifice Plate: Orifice Area per Row =  N/A inches

Calculated Parameters for Plate  
WQ Orifice Area per Row =  N/A ft<sup>2</sup>  
Elliptical Half-Width =  N/A feet  
Elliptical Slot Centroid =  N/A feet  
Elliptical Slot Area =  N/A 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	1.18	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 =  Not Selected  Not Selected 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  
Vertical Orifice Area =  Not Selected  Not Selected ft<sup>2</sup>  
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))**

Overflow Weir Front Edge Height, H<sub>o</sub> =  Zone 3 Weir  Not Selected 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<sub>u</sub> =  Zone 3 Weir  Not Selected feet  
Overflow Weir Slope Length =  3.92  N/A feet  
Grate Open Area / 100-yr Orifice Area =  16.92  N/A  
Overflow Grate Open Area w/o Debris =  10.76  N/A ft<sup>2</sup>  
Overflow Grate Open Area w/ Debris =  5.38  N/A 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 =  Zone 3 Restrictor  Not Selected 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 =  Zone 3 Restrictor  Not Selected ft<sup>2</sup>  
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)**

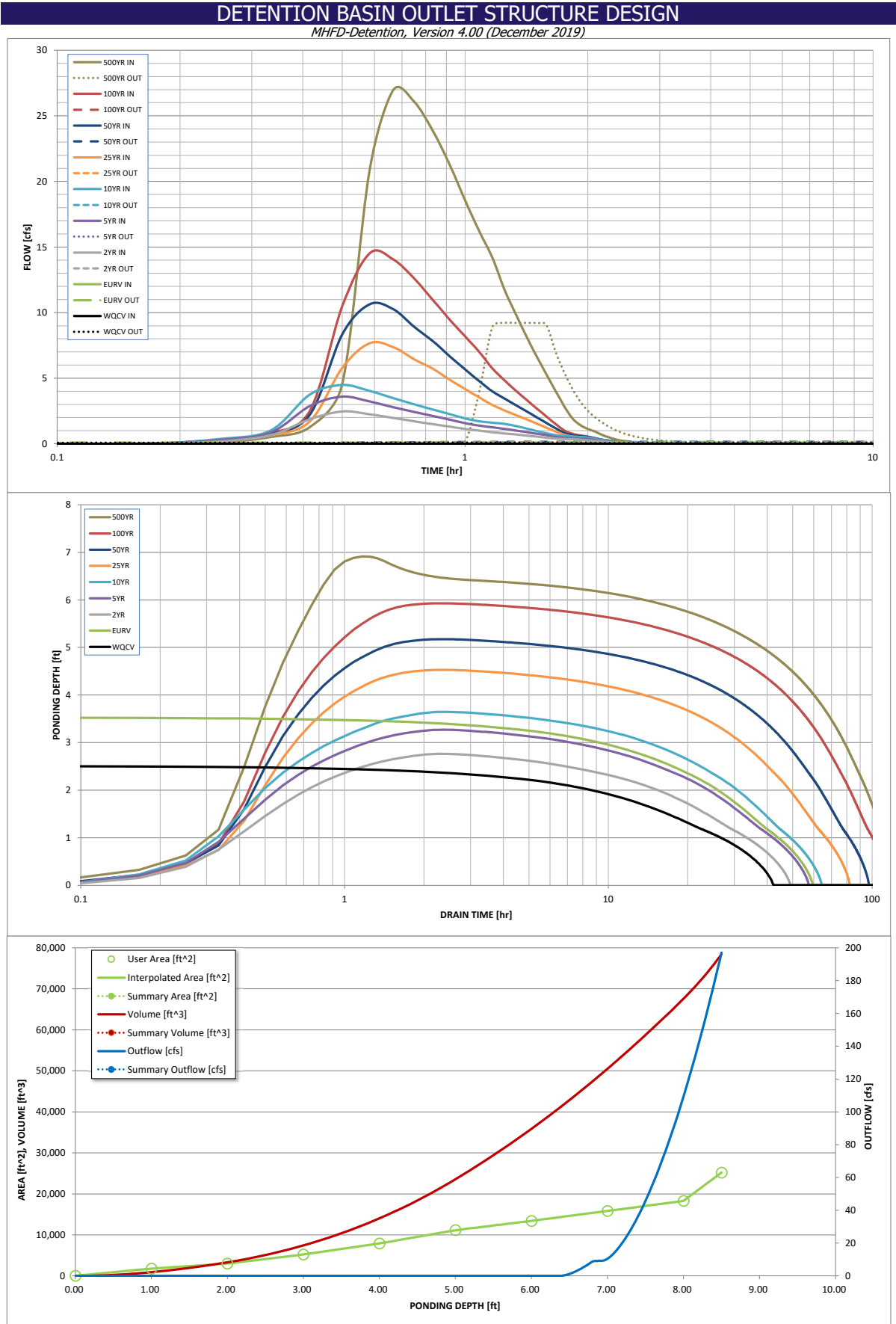
Spillway Invert Stage =  6.94 ft (relative to basin bottom at Stage = 0 ft)  
Spillway Crest Length =  27.00 feet  
Spillway End Slopes =  4.00 H:V  
Freeboard above Max Water Surface =  1.00 feet

Calculated Parameters for Spillway  
Spillway Design Flow Depth =  0.55 feet  
Stage at Top of Freeboard =  8.49 feet  
Basin Area at Top of Freeboard =  0.58 acres  
Basin Volume at Top of Freeboard =  1.80 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	9.2
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	0.8
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

Outflow Hydrograph Workbook Filename: \_\_\_\_\_

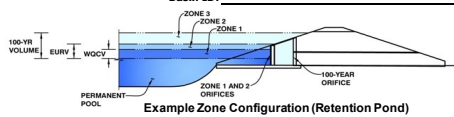
## Inflow Hydrographs

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

Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	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]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.10
	0:15:00	0.00	0.00	0.18	0.30	0.37	0.25	0.31	0.30	0.52
	0:20:00	0.00	0.00	0.66	0.86	1.01	0.64	0.75	0.80	1.28
	0:25:00	0.00	0.00	1.87	2.88	3.75	1.72	2.23	2.52	4.55
	0:30:00	0.00	0.00	2.47	3.59	4.48	5.79	8.34	10.48	20.89
	0:35:00	0.00	0.00	2.25	3.22	4.03	7.67	10.63	14.52	26.95
	0:40:00	0.00	0.00	1.98	2.79	3.48	7.36	10.26	14.06	26.08
	0:45:00	0.00	0.00	1.71	2.42	3.01	6.45	8.92	12.61	23.86
	0:50:00	0.00	0.00	1.50	2.13	2.62	5.72	7.82	10.97	21.29
	0:55:00	0.00	0.00	1.31	1.84	2.26	4.89	6.68	9.47	18.56
	1:00:00	0.00	0.00	1.13	1.57	1.94	4.17	5.67	8.18	16.22
	1:05:00	0.00	0.00	1.00	1.38	1.72	3.54	4.78	7.01	14.18
	1:10:00	0.00	0.00	0.89	1.26	1.61	2.96	3.99	5.75	11.72
	1:15:00	0.00	0.00	0.79	1.14	1.52	2.54	3.44	4.83	9.85
	1:20:00	0.00	0.00	0.71	1.01	1.35	2.18	2.93	4.04	8.14
	1:25:00	0.00	0.00	0.62	0.89	1.16	1.86	2.47	3.34	6.64
	1:30:00	0.00	0.00	0.54	0.77	0.97	1.53	2.02	2.69	5.30
	1:35:00	0.00	0.00	0.46	0.65	0.81	1.23	1.59	2.08	4.03
	1:40:00	0.00	0.00	0.40	0.53	0.66	0.94	1.18	1.51	2.87
	1:45:00	0.00	0.00	0.36	0.45	0.59	0.69	0.84	1.03	1.94
	1:50:00	0.00	0.00	0.35	0.42	0.55	0.56	0.66	0.76	1.43
	1:55:00	0.00	0.00	0.31	0.39	0.52	0.49	0.58	0.63	1.13
	2:00:00	0.00	0.00	0.28	0.36	0.48	0.46	0.53	0.55	0.93
	2:05:00	0.00	0.00	0.22	0.29	0.38	0.36	0.41	0.42	0.68
	2:10:00	0.00	0.00	0.18	0.23	0.30	0.28	0.32	0.31	0.49
	2:15:00	0.00	0.00	0.14	0.18	0.23	0.21	0.24	0.23	0.34
	2:20:00	0.00	0.00	0.11	0.14	0.18	0.16	0.18	0.17	0.24
	2:25:00	0.00	0.00	0.08	0.11	0.14	0.13	0.14	0.13	0.18
	2:30:00	0.00	0.00	0.06	0.08	0.10	0.09	0.11	0.10	0.14
	2:35:00	0.00	0.00	0.05	0.06	0.08	0.07	0.08	0.07	0.10
	2:40:00	0.00	0.00	0.04	0.05	0.06	0.05	0.06	0.06	0.08
	2:45:00	0.00	0.00	0.03	0.03	0.04	0.04	0.04	0.04	0.06
	2:50:00	0.00	0.00	0.02	0.02	0.03	0.03	0.03	0.03	0.04
	2:55:00	0.00	0.00	0.01	0.02	0.02	0.02	0.02	0.02	0.03
	3:00:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	3:05:00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

MHFD-Detention, Version 4.03 (May 2020)

**Basin ID:**



### Watershed Information

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

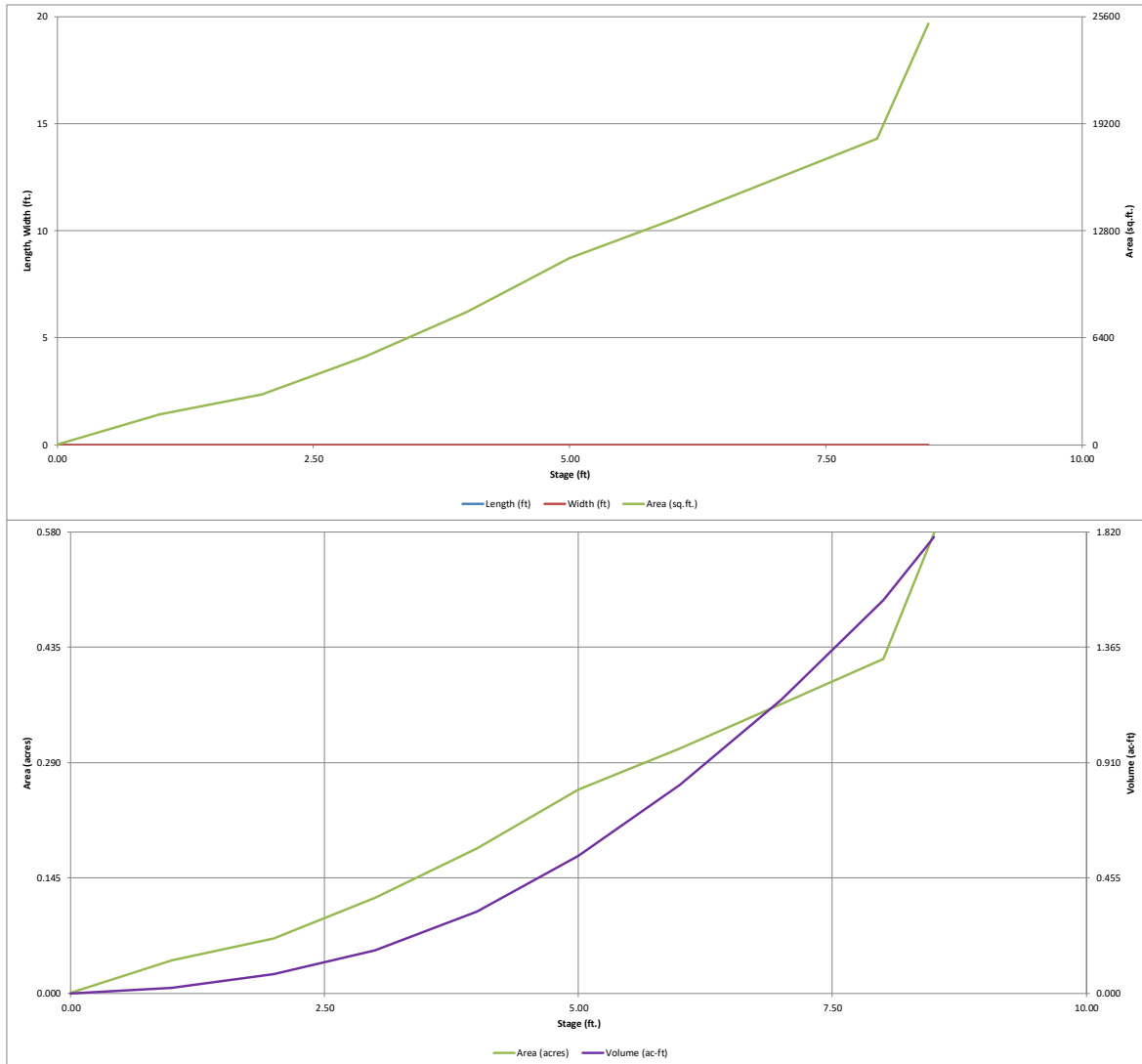
	acre-feet
	acre-feet
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
3.49	inches

Zone 1 Volume (WQCV) =	0.242	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.689	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.442	acre-feet
Total Detention Basin Volume =	1.373	acre-feet
Initial Surge Volume (ISV) =	user	ft <sup>3</sup>
Initial Surge 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 ( $A_{SV}$ )	=	user	ft <sup>2</sup>
Surcharge Volume Length ( $L_{SV}$ )	=	user	ft
Surcharge Volume Width ( $W_{SV}$ )	=	user	ft
Depth of Basin Floor ( $H_{FLOOR}$ )	=	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 <sup>2</sup>
Volume of Basin Floor ( $V_{FLOOR}$ )	=	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

[illegible]

WINDERMERE FILING NO. 1 FDR EXCERPT  
SOUTH POND FINAL DESIGN



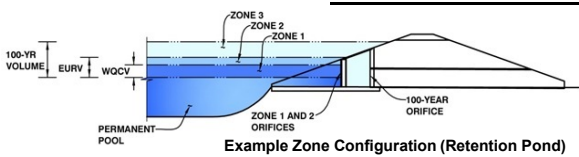


# **DETENTION BASIN OUTLET STRUCTURE DESIGN**

MHFD-Detention, Version 4.03 (May 2020)

**Project: Windermere South - FINAL**

**Basin ID:**



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.52	0.242	Orifice Plate
Zone 2 (EURV)	6.34	0.689	Orifice Plate
Zone 3 (100-year)	7.57	0.442	Weir&Pipe (Restrict)
Total (all zones)		1.373	

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 =  0.00 ft (relative to basin bottom at Stage = 0 ft)  
Depth at top of Zone using Orifice Plate =  6.34 ft (relative to basin bottom at Stage = 0 ft)  
Orifice Plate: Orifice Vertical Spacing =  25.40 inches  
Orifice Plate: Orifice Area per Row =  N/A inches

Calculated Parameters for Plate  
WQ Orifice Area per Row =  N/A ft<sup>2</sup>  
Elliptical Half-Width =  N/A feet  
Elliptical Slot Centroid =  N/A feet  
Elliptical Slot Area =  N/A 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	2.11	4.23					
Orifice Area (sq. inches)	1.24	1.24	1.24					

	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 =  Not Selected  Not Selected 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  
Vertical Orifice Area =  Not Selected  Not Selected ft<sup>2</sup>  
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))

Overflow Weir Front Edge Height, H<sub>o</sub> =  Zone 3 Weir  Not Selected 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<sub>u</sub> =  Zone 3 Weir  Not Selected feet  
Overflow Weir Slope Length =  3.92  N/A feet  
Grate Open Area / 100-yr Orifice Area =  16.92  N/A  
Overflow Grate Open Area w/o Debris =  10.76  N/A ft<sup>2</sup>  
Overflow Grate Open Area w/ Debris =  5.38  N/A 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 =  Zone 3 Restrictor  Not Selected 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  
Outlet Orifice Area =  Zone 3 Restrictor  Not Selected ft<sup>2</sup>  
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 =  0.55 feet  
Stage at Top of Freeboard =  8.49 feet  
Basin Area at Top of Freeboard =  0.58 acres  
Basin Volume at Top of Freeboard =  1.80 acre-ft

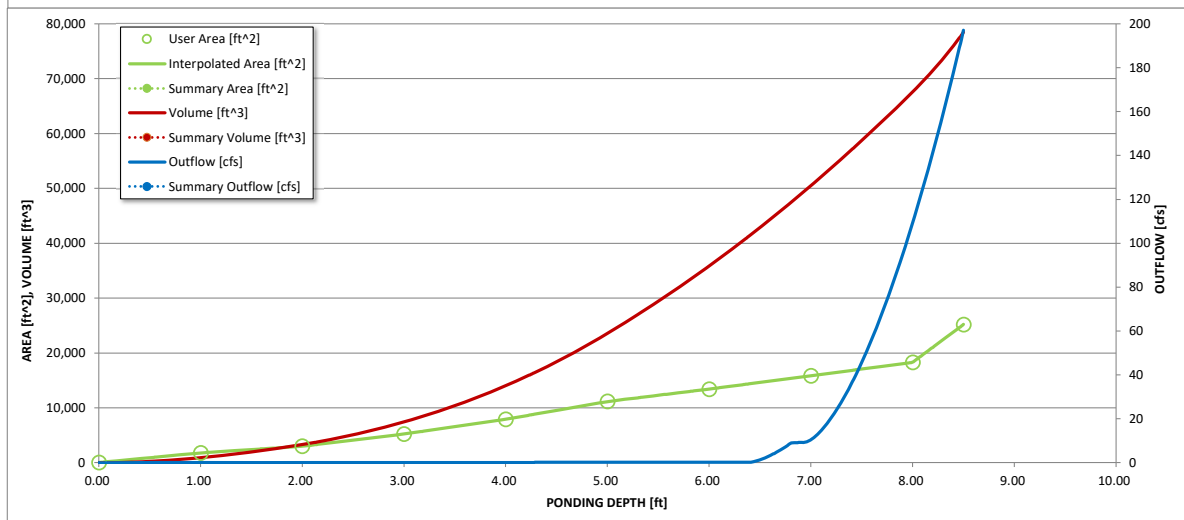
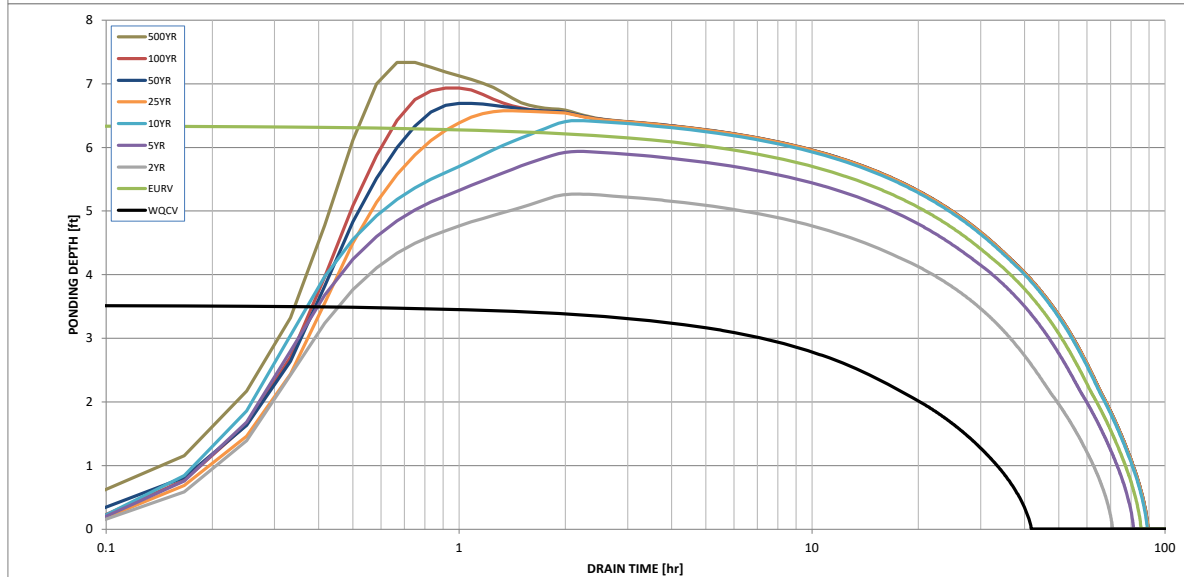
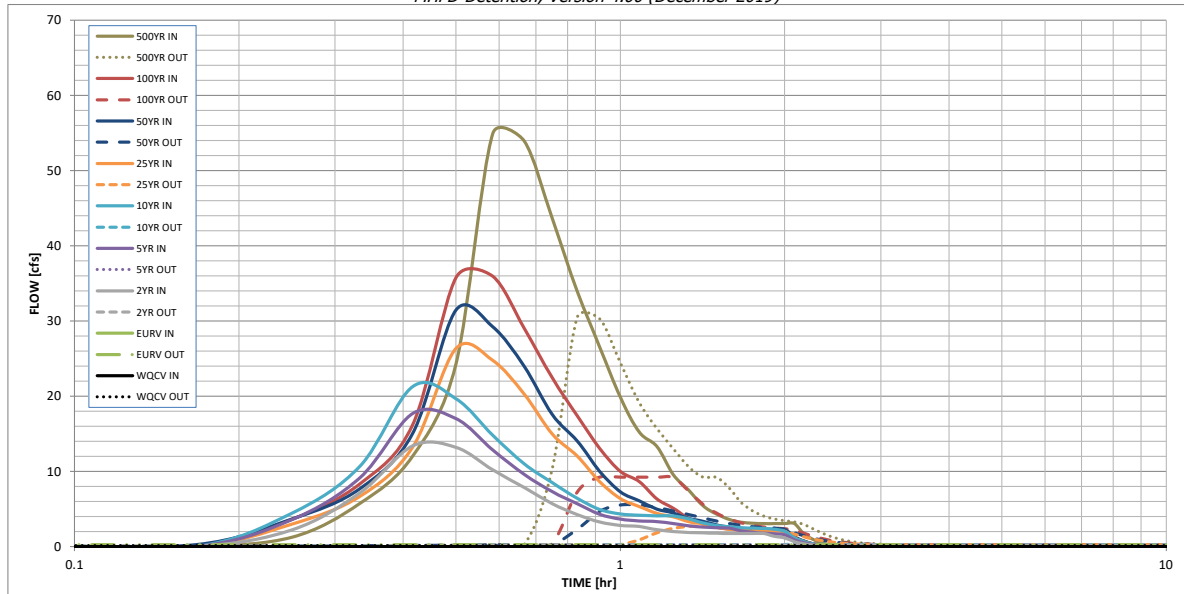
## **Routed Hydrograph Results**

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) =	0.242	0.931	0.641	0.838	0.996	1.198	1.395	1.633	2.459
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.641	0.838	0.996	1.198	1.395	1.633	2.459
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	13.4	17.7	21.3	26.3	31.4	35.9	54.9
Peak Outflow Q (cfs) =	0.1	0.2	0.2	0.2	0.3	2.7	5.5	9.2	30.5
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.0	1.1	0.9	1.0	1.0	1.5
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	0.0	0.2	0.5	0.8	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	75	63	72	78	77	76	74	69
Time to Drain 99% of Inflow Volume (hours) =	40	81	68	77	84	84	83	83	80
Maximum Ponding Depth (ft) =	3.53	6.34	5.26	5.94	6.42	6.57	6.69	6.93	7.33
Area at Maximum Ponding Depth (acres) =	0.15	0.33	0.27	0.30	0.33	0.34	0.35	0.36	0.38
Maximum Volume Stored (acre-ft) =	0.243	0.931	0.609	0.802	0.954	1.008	1.046	1.134	1.282

# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.00 (December 2019)



# DETENTION BASIN OUTLET STRUCTURE

Outflow Hydrograph Workbook Filename: \_\_\_\_\_

WINDERMERE FILING NO. 1 FDR EXCERPT  
SOUTH POND FINAL DESIGN

## Inflow Hydrographs

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

	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
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]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.02	1.24
	0:15:00	0.00	0.00	2.20	3.58	4.43	2.98	3.64	3.62	5.72
	0:20:00	0.00	0.00	7.15	9.15	10.68	6.68	7.69	8.35	12.02
	0:25:00	0.00	0.00	13.38	17.69	21.29	13.23	15.05	16.20	24.26
	0:30:00	0.00	0.00	13.20	16.99	19.67	26.35	31.45	35.75	54.89
	0:35:00	0.00	0.00	10.18	12.85	14.80	24.76	29.25	35.94	53.97
	0:40:00	0.00	0.00	7.86	9.61	11.02	20.31	24.00	29.05	43.65
	0:45:00	0.00	0.00	5.71	7.29	8.49	14.97	17.57	22.45	33.95
	0:50:00	0.00	0.00	4.27	5.70	6.40	12.02	14.05	17.39	26.56
	0:55:00	0.00	0.00	3.25	4.28	4.93	8.64	9.99	13.05	19.85
	1:00:00	0.00	0.00	2.81	3.64	4.33	6.38	7.27	9.99	15.21
	1:05:00	0.00	0.00	2.65	3.41	4.15	5.32	6.06	8.64	13.31
	1:10:00	0.00	0.00	2.23	3.33	4.09	4.41	4.99	6.33	9.55
	1:15:00	0.00	0.00	2.01	3.06	4.06	3.95	4.46	5.08	7.52
	1:20:00	0.00	0.00	1.88	2.76	3.68	3.31	3.73	3.74	5.42
	1:25:00	0.00	0.00	1.80	2.60	3.14	3.00	3.37	3.03	4.32
	1:30:00	0.00	0.00	1.76	2.50	2.81	2.55	2.87	2.57	3.60
	1:35:00	0.00	0.00	1.73	2.44	2.62	2.30	2.58	2.32	3.22
	1:40:00	0.00	0.00	1.73	2.08	2.51	2.16	2.42	2.24	3.10
	1:45:00	0.00	0.00	1.73	1.88	2.44	2.08	2.34	2.19	3.03
	1:50:00	0.00	0.00	1.73	1.76	2.41	2.05	2.30	2.19	3.03
	1:55:00	0.00	0.00	1.36	1.70	2.30	2.03	2.28	2.19	3.03
	2:00:00	0.00	0.00	1.15	1.57	2.02	2.03	2.28	2.19	3.03
	2:05:00	0.00	0.00	0.65	0.89	1.16	1.16	1.30	1.25	1.73
	2:10:00	0.00	0.00	0.36	0.50	0.65	0.66	0.74	0.71	0.98
	2:15:00	0.00	0.00	0.18	0.27	0.34	0.35	0.39	0.37	0.51
	2:20:00	0.00	0.00	0.08	0.13	0.16	0.18	0.20	0.19	0.26
	2:25:00	0.00	0.00	0.03	0.05	0.05	0.06	0.07	0.07	0.09
	2:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

North Pond (North Forebay)

**FOREBAY VOLUME**

Req'd V=3% x WQCV

**Ex DP 24** Impervious Area  
0.34 79.05

WQCV= 1.0826 ac-ft

V= 0.0325 ac-ft

Actual V 0.0409 ac-ft

**FOREBAY RELEASE NOTCH WIDTH**

5-YR NOTCH

$Q=CLH^{3/2}$

$Q_{100}= 111.3$  cfs

2% of Q= 2.23 cfs

C= 2.6

H (height of forebay wall)= 1 ft

L= 10 in  
3 in min.

**FOREBAY RELEASE NOTCH WIDTH**

100-YR NOTCH

$Q=CLH^{3/2}$

$Q_{100}= 199.7$  cfs

2% of Q= 3.99 cfs

C= 2.6

H (height of forebay wall)= 1 ft

L= 18 in  
3 in min.

North Pond (South Forebay)

**FOREBAY VOLUME**

Req'd V=3% x WQCV

**DPM1** Impervious Area  
0.65 40.15

WQCV= 0.8503 ac-ft

V= 0.0255 ac-ft

Actual V 0.0310 ac-ft

**FOREBAY RELEASE NOTCH WIDTH**

5-YR NOTCH

$Q=CLH^{3/2}$

$Q_{100}= 54.8$  cfs

2% of Q= 1.10 cfs

C= 2.6

H (height of forebay wall)= 1 ft

L= 5 in  
3 in min.

**FOREBAY RELEASE NOTCH WIDTH**

100-YR NOTCH

$Q=CLH^{3/2}$

$Q_{100}= 119.4$  cfs

2% of Q= 2.39 cfs

C= 2.6

H (height of forebay wall)= 1 ft

L= 11 in  
3 in min.

South Pond (Forebay)

**FOREBAY VOLUME**

Req'd V=3% x WQCV

From Detention spreadsheet

WQCV= 0.052 ac-ft

V= 0.0016 ac-ft

Actual V 0.0040 ac-ft

**FOREBAY RELEASE NOTCH WIDTH**

$Q=CLH^{3/2}$

$Q_{100}= 17.9$  cfs

2% of Q= 0.36 cfs

C= 2.6

H (height of forebay wall)= 1 ft

L= 2 in  
3 in min.

Figure 13-12c. Emergency Spillway Protection

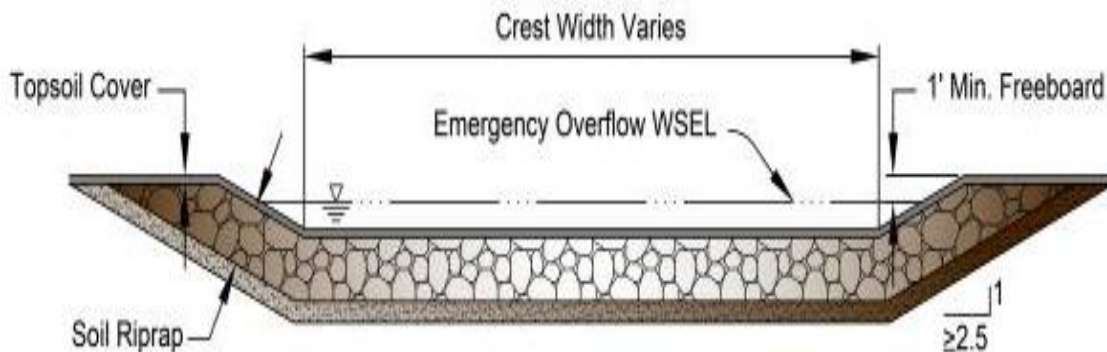
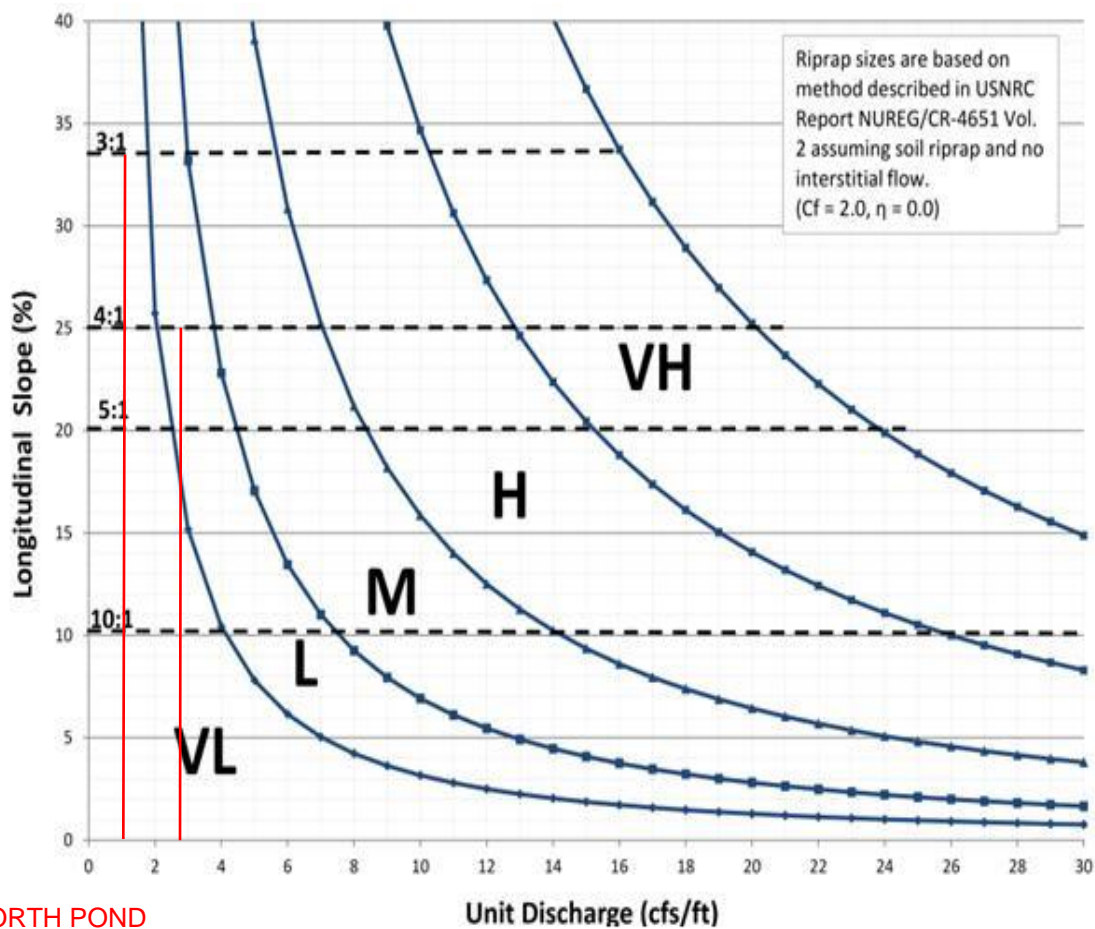


Figure 13-12d. Riprap Types for Emergency Spillway Protection



NORTH POND

UNIT DISCHARGE=  $194.1/70=2.7\text{cfs}$ 

SOUTH POND

UNIT DISCHARGE=  $35.9/27= 1.3\text{cfs}$

## HYDROLOGIC ANALYSIS

PROJECT INFORMATION									
PROJECT:	Windermere 2								
PROJECT NO:	21187-03								
DESIGN BY:	CGH								
REV. BY:	KGV								
AGENCY:	El Paso County								
REPORT TYPE:	Final								
DATE:	9/5/2024								
Soil Type: A									
					C2*	C5*	C10*	C100*	% IMPERV
Open Space						0.15		0.50	0
Residential (<1/8 acre)						0.45		0.59	65
Asphalt/Sidewalk						0.90		0.96	100
EXISTING									
SUB-BASIN	SURFACE DESIGNATION		AREA	COMPOSITE RUNOFF COEFFICIENTS				% IMPERV	
			ACRE	C2	C5	C10	C100		
OS1	Open Space		0.00		0.15		0.50	0	
	Residential (<1/8 acre)		3.82		0.45		0.59	65	
	Asphalt/Sidewalk		0.00		0.90		0.96	100	
	WEIGHTED AVERAGE				0.45		0.59	65%	
TOTAL OS1			3.82						
OS2	Open Space		0.00		0.15		0.50	0	
	Residential (<1/8 acre)		0.16		0.45		0.59	65	
	Asphalt/Sidewalk		0.00		0.90		0.96	100	
	WEIGHTED AVERAGE				0.45		0.59	65%	
TOTAL OS2			0.16						
E1	Open Space		0.00		0.15		0.50	0	
	Residential (<1/8 acre)		0.00		0.45		0.59	65	
	Asphalt/Sidewalk		0.03		0.90		0.96	100	
	WEIGHTED AVERAGE				0.90		0.96	100%	
TOTAL E1			0.03						
E2	Open Space		5.70		0.15		0.50	0	
	Residential (<1/8 acre)		0.00		0.45		0.59	65	
	Asphalt/Sidewalk		0.00		0.90		0.96	100	
	WEIGHTED AVERAGE				0.15		0.50	0%	
TOTAL E2			5.70						
E3	Open Space		1.10		0.15		0.50	0	
	Residential (<1/8 acre)		0.00		0.45		0.59	65	
	Asphalt/Sidewalk		0.00		0.90		0.96	100	
	WEIGHTED AVERAGE				0.15		0.50	0%	
TOTAL E3			1.10						
E4	Open Space		1.86		0.15		0.50	0	
	Residential (<1/8 acre)		0.00		0.45		0.59	65	
	Asphalt/Sidewalk		0.00		0.90		0.96	100	
	WEIGHTED AVERAGE				0.15		0.50	0%	
TOTAL E4			1.86						
E5	Open Space		0.63		0.15		0.50	0	
	Residential (<1/8 acre)		0.00		0.45		0.59	65	
	Asphalt/Sidewalk		0.00		0.90		0.96	100	
	WEIGHTED AVERAGE				0.15		0.50	0%	
TOTAL E5			0.63						
NC2	Open Space		0.27		0.15		0.50	0	
	Residential (<1/8 acre)		0.00		0.45		0.59	65	

	Asphalt/Sidewalk	1.34		0.90		0.96	100
	WEIGHTED AVERAGE			0.77		0.88	83%
<b>TOTAL NC2</b>		1.61					
<b>NC1</b>	Open Space	0.03		0.15		0.50	0
	Residential (<1/8 acre)	0.00		0.45		0.59	65
	Asphalt/Sidewalk	0.40		0.90		0.96	100
	WEIGHTED AVERAGE			0.85		0.93	93%
<b>TOTAL NC1</b>		0.43					
<b>D16</b>	Open Space	0.00		0.15		0.50	0
	Residential (<1/8 acre)	2.73		0.45		0.59	65
	Asphalt/Sidewalk	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.45		0.59	65%
<b>TOTAL D16</b>		2.73					
<b>EXR</b>	Open Space	0.00		0.15		0.50	0
	Residential (<1/8 acre)	0.00		0.45		0.59	65
	Asphalt/Sidewalk	0.53		0.90		0.96	100
	WEIGHTED AVERAGE			0.90		0.96	100%
<b>TOTAL EXR</b>		0.53					



## PROJECT INFORMATION

PROJECT: Windermere 2  
 PROJECT NO: 21187-03  
 DESIGN BY: CGH  
 REV. BY: KGV  
 AGENCY: El Paso County  
 REPORT TYPE: Final  
 DATE: 9/5/2024



## RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING TIME OF CONCENTRATION STANDARD FORM SF-2

SUB-BASIN DATA					INITIAL/OVERLAND TIME (t <sub>i</sub> )					TRAVEL TIME (t <sub>t</sub> )					PIPE TRAVEL TIME (t <sub>p</sub> )				TIME OF CONC. t <sub>c</sub>		FINAL t <sub>c</sub>
BASIN	DESIGN PT:	C <sub>s</sub>	C <sub>100</sub>	AREA		LENGTH	HT	SLOPE	t <sub>i</sub>	LENGTH	HT	SLOPE	VEL.	t <sub>t</sub>	LENGTH	SLOPE	VEL.	t <sub>t</sub>	COMP.	MINIMUM	
				Ac		Ft	FT	%	Min	Ft	FT	%	FPS	Min	Ft	%	FPS	Min	t <sub>c</sub>	t <sub>c</sub>	Min
OS1		0.45	0.59	3.82	1.72	2.25	35	1	3.5	4.7	885	30	3.4	2.8	5.3				10.1	5	10.1
OS2		0.45	0.59	0.16	0.07	0.10	50	2	4.0	5.4	725	20	2.8	2.5	4.8				10.2	5	10.2
E1		0.90	0.96	0.03	0.03	0.03	20	0	2.0	1.3					30	2.0	8.3	0.1	1.4	5	5.0
OS1+E1	1	0.45	0.59	3.85	1.75	2.29	From OS1			10.1					30	2.0	8.3	0.1	10.1	5	10.1
E2	2	0.15	0.50	5.70	0.85	2.85	100	5	5.3	10.2	825	21	2.5	2.4	5.8				15.9	5	15.9
E3		0.15	0.50	1.10	0.16	0.55	85	24	28.5	5.4	75	4	5.3	3.5	0.4				5.7	5	5.7
DP1+DP2+OS2+E3	3	0.26	0.53	10.81	2.84	5.78	From DP2			15.9	75	4	5.3	3.5	0.4				16.3	5	16.3
D16	4	0.45	0.59	2.73	1.23	1.61	200	10	5.0	10.1	350	12	3.5	2.8	2.1				12.1	5	12.1
E4		0.15	0.50	1.86	0.28	0.93	100	5	5.5	10.1	775	18	2.3	2.3	5.7				15.7	5	15.7
DP4+E4	4A	0.33	0.55	4.59	1.51	2.54	From DP4			12.1	775	18	2.3	2.3	5.7				17.8	5	17.8
E5	5	0.15	0.50	0.63	0.09	0.32	60	12	20.0	5.1	455	15	3.3	2.7	2.8				7.9	5	7.9
EXR		0.90	0.96	0.53	0.48	0.51	20	2	10.0	0.8	320	6	2.0	2.1	2.5				3.3	5	5.0
DP4A+DP5+EXR	S	0.36	0.59	5.75	2.08	3.36	From DP4A			17.8	20	0.2	1.0	1.5	0.2				18.0	5	18.0
NC2	19	0.77	0.88	1.61	1.25	1.42					625	25	4.0	3.0	3.5				3.5	5	5.0
DPS+DP19	J1	0.45	0.65	7.36	3.33	4.79	From DPS			18.0					30	2	9.6	0.1	18.1	5	18.1
NC1		0.85	0.93	0.43	0.36	0.40	45	1	2.2	2.4	185	4	2.2	2.2	1.4				3.8	5	5.0
DPJ1+NC1	20	0.47	0.67	7.79	3.69	5.18	From DPJ1			18.1					45	2	9.6	0.1	18.1	5	18.1

## PROJECT INFORMATION

PROJECT: Windermere 2  
 PROJECT NO: 21187-03  
 DESIGN BY: CGH  
 REV. BY: KGV  
 AGENCY: El Paso County  
 REPORT TYPE: Final  
 DATE: 9/5/2024



Drexel, Barrell & Co.

## RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING	RUNOFF		5 YR STORM		P1= 1.50		
			DIRECT RUNOFF				
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t <sub>c</sub> (MIN)	C * A	I (IN/HR)	Q (CFS)
OS1		3.82	0.45	10.1	1.72	4.09	7.0
OS2		0.16	0.45	10.2	0.07	4.06	0.3
E1		0.03	0.90	5.0	0.03	5.10	0.2
	1	3.85	0.45	10.1	1.75	4.08	7.1
E2	2	5.70	0.15	15.9	0.85	3.37	2.9
E3		1.10	0.15	5.7	0.16	4.92	0.8
	3	10.81	0.26	16.3	2.84	3.33	9.5
Interim Design Pond Outfall							0.1
D16	4	2.73	0.45	12.1	1.23	3.80	4.7
E4		1.86	0.15	15.7	0.28	3.39	0.9
	4A	4.59	0.33	17.8	1.51	3.20	4.8
E5	5	0.63	0.15	7.9	0.09	4.47	0.4
EXR		0.53	0.90	5.0	0.48	5.10	2.4
	S	5.75	0.36	18.0	2.08	3.18	6.7
NC2	19	1.61	0.77	5.0	1.25	5.10	6.4
	J1	7.36	0.45	18.1	3.33	3.17	10.5
NC1		0.43	0.85	5.0	0.36	5.10	1.9
	20	7.79	0.47	18.1	3.69	3.16	11.7

## PROJECT INFORMATION

PROJECT: Windermere 2  
 PROJECT NO: 21187-03  
 DESIGN BY: CGH  
 REV. BY: KGV  
 AGENCY: El Paso County  
 REPORT TYPE: Final  
 DATE: 9/5/2024



## RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

EXISTING RUNOFF 100 YR STORM P1= 2.52

BASIN (S)	DESIGN POINT	AREA (AC)	DIRECT RUNOFF		C * A	I (IN/HR)	Q (CFS)
			RUNOFF COEFF	t <sub>c</sub> (MIN)			
OS1		3.82	0.59	10.1	2.25	6.87	15.5
OS2		0.16	0.59	10.2	0.10	6.83	0.6
E1		0.03	0.96	5.0	0.03	8.58	0.3
	1	3.85	0.59	10.1	2.29	6.86	15.7
E2	2	5.70	0.50	15.9	2.85	5.66	16.1
E3		1.10	0.50	5.7	0.55	8.27	4.5
	3	10.81	0.53	16.3	5.78	5.60	32.3
Interim Design Pond Outfall							0.1
D16	4	2.73	0.59	12.1	1.61	6.38	10.3
E4		1.86	0.50	15.7	0.93	5.69	5.3
	4A	4.59	0.55	17.8	2.54	5.37	13.6
E5	5	0.63	0.50	7.9	0.32	7.51	2.4
EXR		0.53	0.96	5.0	0.51	8.58	4.4
	S	5.75	0.59	18.0	3.36	5.34	18.1
NC2	19	1.61	0.88	5.0	1.42	8.58	12.2
	J1	7.36	0.65	18.1	4.79	5.33	25.5
NC1		0.43	0.93	5.0	0.40	8.58	3.4
	20	7.79	0.67	18.1	5.18	5.32	27.6

PROJECT INFORMATION									
PROJECT:	Windermere 2								
PROJECT NO:	21187-03								
DESIGN BY:	CGH								
REV. BY:	KGV								
AGENCY:	El Paso County								
REPORT TYPE:	Final								
DATE:	9/5/2024								
Soil Type: A									
					C2*	C5*	C10*	C100*	% IMPERV
Open Space						0.15		0.50	0
Residential (<1/8 acre)						0.45		0.59	65
Asphalt/Sidewalk						0.90		0.96	100
DEVELOPED									
SUB-BASIN	SURFACE DESIGNATION	AREA	COMPOSITE RUNOFF COEFFICIENTS				% IMPERV		
		ACRE		C2	C5	C10	C100		
OS1	Open Space	0.00			0.15		0.50		0
	Residential (<1/8 acre)	3.82			0.45		0.59		65
	Asphalt/Sidewalk	0.00			0.90		0.96		100
	WEIGHTED AVERAGE				0.45		0.59		65%
TOTAL OS1		3.82							
OS2	Open Space	0.00			0.15		0.50		0
	Residential (<1/8 acre)	0.16			0.45		0.59		65
	Asphalt/Sidewalk	0.00			0.90		0.96		100
	WEIGHTED AVERAGE				0.45		0.59		65%
TOTAL OS2		0.16							
E1	Open Space	0.00			0.15		0.50		0
	Residential (<1/8 acre)	0.00			0.45		0.59		65
	Asphalt/Sidewalk	0.03			0.90		0.96		100
	WEIGHTED AVERAGE				0.90		0.96		100%
TOTAL E1		0.03							
B2	Open Space	0.00			0.15		0.50		0
	Residential (<1/8 acre)	6.63			0.45		0.59		65
	Asphalt/Sidewalk	0.00			0.90		0.96		100
	WEIGHTED AVERAGE				0.45		0.59		65%
TOTAL B2		6.63							
E3	Open Space	1.10			0.15		0.50		0
	Residential (<1/8 acre)	0.00			0.45		0.59		65
	Asphalt/Sidewalk	0.00			0.90		0.96		100
	WEIGHTED AVERAGE				0.15		0.50		0%
TOTAL E3		1.10							
B4	Open Space	0.68			0.15		0.50		0
	Residential (<1/8 acre)	0.00			0.45		0.59		65
	Asphalt/Sidewalk	0.25			0.90		0.96		100
	WEIGHTED AVERAGE				0.35		0.62		27%
TOTAL B4		0.93							
E5	Open Space	0.63			0.15		0.50		0
	Residential (<1/8 acre)	0.00			0.45		0.59		65
	Asphalt/Sidewalk	0.00			0.90		0.96		100
	WEIGHTED AVERAGE				0.15		0.50		0%
TOTAL E5		0.63							
NC2	Open Space	0.27			0.15		0.50		0
	Residential (<1/8 acre)	0.00			0.45		0.59		65

	Asphalt/Sidewalk	1.34		0.90		0.96	100
	WEIGHTED AVERAGE			0.77		0.88	83%
<b>TOTAL NC2</b>		1.61					
<b>NC1</b>	Open Space	0.03		0.15		0.50	0
	Residential (<1/8 acre)	0.00		0.45		0.59	65
	Asphalt/Sidewalk	0.40		0.90		0.96	100
	WEIGHTED AVERAGE			0.85		0.93	93%
<b>TOTAL NC1</b>		0.43					
<b>D16</b>	Open Space	0.00		0.15		0.50	0
	Residential (<1/8 acre)	2.73		0.45		0.59	65
	Asphalt/Sidewalk	0.00		0.90		0.96	100
	WEIGHTED AVERAGE			0.45		0.59	65%
<b>TOTAL D16</b>		2.73					
<b>EXR</b>	Open Space	0.00		0.15		0.50	0
	Residential (<1/8 acre)	0.00		0.45		0.59	65
	Asphalt/Sidewalk	0.53		0.90		0.96	100
	WEIGHTED AVERAGE			0.90		0.96	100%
<b>TOTAL EXR</b>		0.53					
<b>Pond Tributary (OS1, OS2, E1, B2, E3)</b>		11.74		0.42		0.58	59%

## PROJECT INFORMATION

PROJECT: Windermere 2  
 PROJECT NO: 21187-03  
 DESIGN BY: CGH  
 REV. BY: KGV  
 AGENCY: El Paso County  
 REPORT TYPE: Final  
 DATE: 9/5/2024



## RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED TIME OF CONCENTRATION STANDARD FORM SF-2

SUB-BASIN DATA					INITIAL/OVERLAND TIME (t <sub>i</sub> )					TRAVEL TIME (t <sub>t</sub> )					PIPE TRAVEL TIME (t <sub>p</sub> )				TIME OF CONC. t <sub>c</sub>		FINAL t <sub>c</sub>
BASIN	DESIGN PT:	C <sub>s</sub>	C <sub>100</sub>	AREA		LENGTH	HT	SLOPE	t <sub>i</sub>	LENGTH	HT	SLOPE	VEL.	t <sub>t</sub>	LENGTH	SLOPE	VEL.	t <sub>t</sub>	COMP.	MINIMUM	
				Ac		Ft	FT	%	Min	Ft	FT	%	FPS	Min	Ft	%	FPS	Min	t <sub>c</sub>	t <sub>c</sub>	Min
OS1		0.45	0.59	3.82	1.72	2.25	35	1	3.5	4.7	885	30	3.4	2.8	5.3				10.1	5	10.1
OS2		0.45	0.59	0.16	0.07	0.10	50	2	4.0	5.4	725	20	2.8	2.5	4.8				10.2	5	10.2
E1		0.90	0.96	0.03	0.03	0.03	20	0	2.0	1.3					30	2.0	8.3	0.1	1.4	5	5.0
OS1+E1	1	0.45	0.59	3.85	1.75	2.29	From OS1			10.1					30	2.0	8.3	0.1	10.1	5	10.1
B2	2	0.45	0.59	6.63	2.98	3.91	100	5	5.3	7.0	650	21	3.2	2.7	4.0				11.0	5	11.0
E3		0.15	0.50	1.10	0.16	0.55	85	24	28.5	5.4	75	4	5.3	3.5	0.4				5.7	5	5.7
DP1+DP2+OS2+E3	3	0.42	0.58	11.74	4.97	6.84	From DP2			11.0	75	4	5.3	3.5	0.4				11.4	5	11.4
D16	4	0.45	0.59	2.73	1.23	1.61	200	10	5.0	10.1	350	12	3.5	2.8	2.1				12.1	5	12.1
B4		0.35	0.62	0.93	0.33	0.58	100	5	5.5	7.9	830	18	2.2	2.2	6.3				14.2	5	14.2
DP4+E4	4A	0.43	0.60	3.66	1.55	2.19	From DP4			12.1	775	18	2.3	2.3	5.7				17.8	5	17.8
E5	5	0.15	0.50	0.63	0.09	0.32	60	12	20.0	5.1	455	15	3.3	2.7	2.8				7.9	5	7.9
EXR		0.90	0.96	0.53	0.48	0.51	20	2	10.0	0.8	320	6	2.0	2.1	2.5				3.3	5	5.0
DP4A+DP5+EXR	S	0.44	0.63	4.82	2.13	3.01	From DP4A			17.8	20	0.2	1.0	1.5	0.2				18.0	5	18.0
NC2	19	0.77	0.88	1.61	1.25	1.42					625	25	4.0	3.0	3.5				3.5	5	5.0
DPS+DP19	J1	0.52	0.69	6.43	3.37	4.44	From DPS			18.0					30	2	9.6	0.1	18.1	5	18.1
NC1		0.85	0.93	0.43	0.36	0.40	45	1	2.2	2.4	185	4	2.2	2.2	1.4				3.8	5	5.0
DPJ1+NC1	20	0.54	0.70	6.86	3.74	4.83	From DPJ1			18.1					45	2	9.6	0.1	18.1	5	18.1

## PROJECT INFORMATION

PROJECT: Windermere 2  
 PROJECT NO: 21187-03  
 DESIGN BY: CGH  
 REV. BY: KGV  
 AGENCY: El Paso County  
 REPORT TYPE: Final  
 DATE: 9/5/2024



Drexel, Barrell & Co.

## RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED	RUNOFF		5 YR STORM		P1= 1.50		
BASIN (S)	DESIGN POINT	AREA (AC)	DIRECT RUNOFF		C * A	I (IN/HR)	Q (CFS)
			RUNOFF COEFF	t <sub>c</sub> (MIN)			
OS1		3.82	0.45	10.1	1.72	4.09	7.0
OS2		0.16	0.45	10.2	0.07	4.06	0.3
E1		0.03	0.90	5.0	0.03	5.10	0.2
	1	3.85	0.45	10.1	1.75	4.08	7.1
B2	2	6.63	0.45	11.0	2.98	3.95	11.8
E3		1.10	0.15	5.7	0.16	4.92	0.8
	3	11.74	0.42	11.4	4.97	3.90	19.4
Pond Outfall							0.9
D16	4	2.73	0.45	12.1	1.23	3.80	4.7
B4		0.93	0.35	14.2	0.33	3.55	1.2
	4A	3.66	0.43	17.8	1.55	3.20	5.0
E5	5	0.63	0.15	7.9	0.09	4.47	0.4
EXR		0.53	0.90	5.0	0.48	5.10	2.4
	S	4.82	0.44	18.0	2.13	3.18	7.7
NC2	19	1.61	0.77	5.0	1.25	5.10	6.4
	J1	6.43	0.52	18.1	3.37	3.17	10.7
NC1		0.43	0.85	5.0	0.36	5.10	1.9
	20	6.86	0.54	18.1	3.74	3.16	11.8

## PROJECT INFORMATION

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Drexel, Barrell & Co.

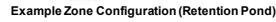
## RATIONAL METHOD CALCULATIONS FOR STORM WATER RUNOFF

DEVELOPED	RUNOFF		100 YR STORM		P1=		
			DIRECT RUNOFF				2.52
BASIN (S)	DESIGN POINT	AREA (AC)	RUNOFF COEFF	t <sub>c</sub> (MIN)	C * A	I (IN/HR)	Q (CFS)
OS1		3.82	0.59	10.1	2.25	6.87	15.5
OS2		0.16	0.59	10.2	0.10	6.83	0.6
E1		0.03	0.96	5.0	0.03	8.58	0.3
	1	3.85	0.59	10.1	2.29	6.86	15.7
B2	2	6.63	0.59	11.0	3.91	6.64	26.0
E3		1.10	0.50	5.7	0.55	8.27	4.5
	3	11.74	0.58	11.4	6.84	6.56	44.8
Pond Outfall							9.2
D16	4	2.73	0.59	12.1	1.61	6.38	10.3
B4		0.93	0.62	14.2	0.58	5.96	3.4
	4A	3.66	0.60	17.8	2.19	5.37	11.7
E5	5	0.63	0.50	7.9	0.32	7.51	2.4
EXR		0.53	0.96	5.0	0.51	8.58	4.4
	S	4.82	0.63	18.0	3.01	5.34	25.3
NC2	19	1.61	0.88	5.0	1.42	8.58	12.2
	J1	6.43	0.69	18.1	4.44	5.33	23.6
NC1		0.43	0.93	5.0	0.40	8.58	3.4
	20	6.86	0.70	18.1	4.83	5.32	25.7



## HYDRAULIC ANALYSIS

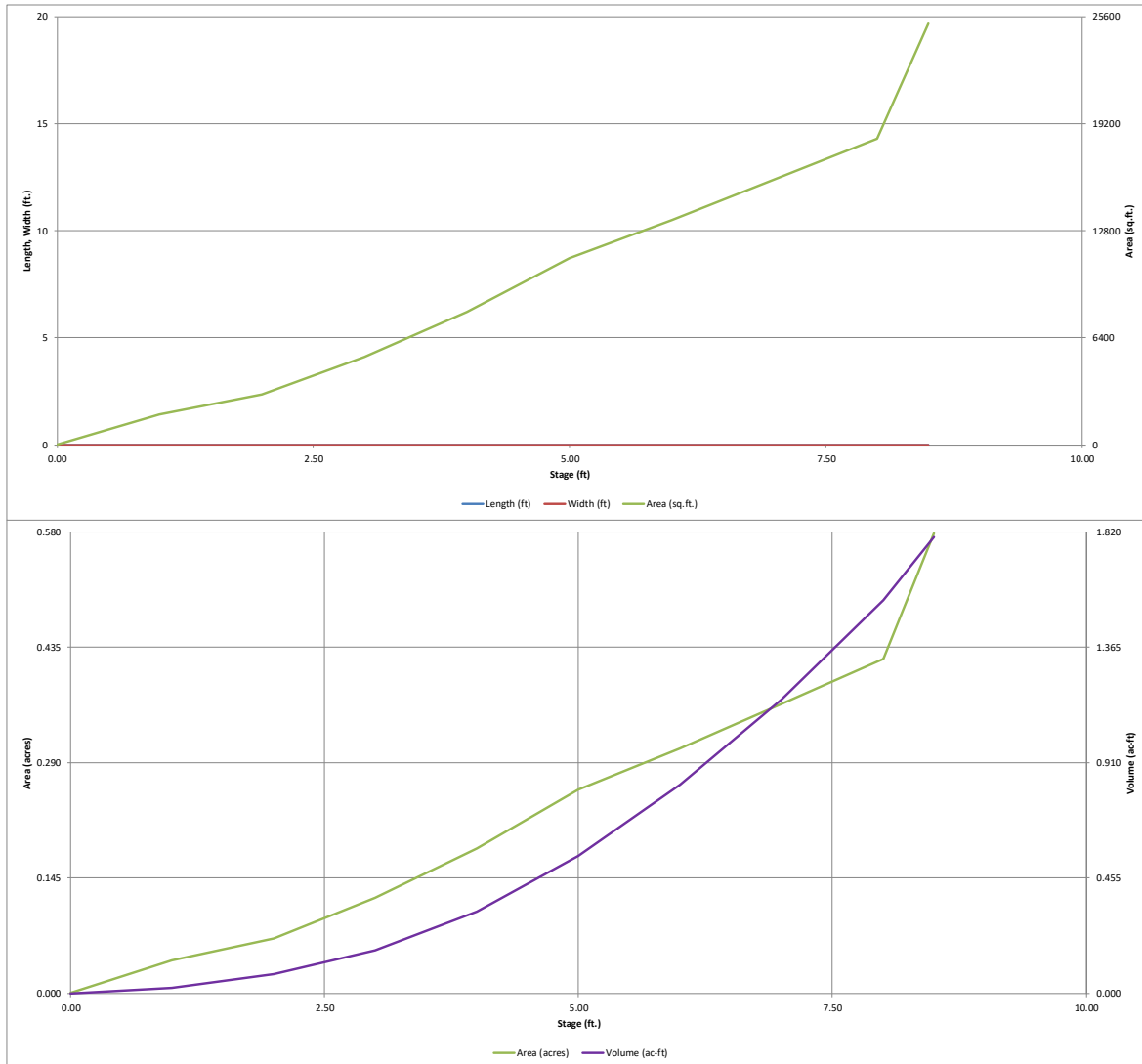
*MHFD-Detention, Version 4.03 (May 2020)*

Basin ID: Pond - Final

WINDERMERE FILING NO. 2 SOUTH POND  
FINAL DESIGN DEVELOPED CONDITION

[illegible]

WINDERMERE FILING NO. 2 SOUTH POND  
FINAL DESIGN DEVELOPED CONDITION



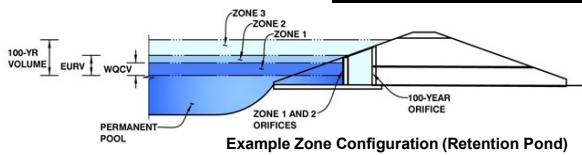
# DETENTION BASIN OUTLET STRUCTURE

MHFD-Detention, Version 4.03 (M)

**WINDERMERE FILING NO. 2 SOUTH POND**  
**FINAL DESIGN DEVELOPED CONDITION**

Project: Windermere Filing No. 2

Basin ID: Pond - Final



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	3.43	0.228	Orifice Plate
Zone 2 (EURV)	6.05	0.609	Orifice Plate
Zone 3 (100-year)	7.32	0.438	Weir&Pipe (Restrict)
Total (all zones)		1.275	

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 =  0.00 ft (relative to basin bottom at Stage = 0 ft)  
Depth at top of Zone using Orifice Plate =  6.05 ft (relative to basin bottom at Stage = 0 ft)  
Orifice Plate: Orifice Vertical Spacing =  24.20 inches  
Orifice Plate: Orifice Area per Row =  N/A inches

Calculated Parameters for Plate  
WQ Orifice Area per Row =  N/A ft<sup>2</sup>  
Elliptical Half-Width =  N/A feet  
Elliptical Slot Centroid =  N/A feet  
Elliptical Slot Area =  N/A 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	2.02	4.03					
Orifice Area (sq. inches)	1.17	1.18	1.18					

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

Calculated Parameters for Vertical Orifice  
Vertical Orifice Area =  Not Selected ft<sup>2</sup>  
Vertical Orifice Centroid =  Not Selected feet

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, H<sub>o</sub> =  6.40 ft (relative to basin bottom at Stage = 0 ft)  
Overflow Weir Front Edge Length =  3.92 feet  
Overflow Weir Grate Slope =  0.00 H:V  
Horiz. Length of Weir Sides =  3.93 feet  
Overflow Grate Open Area % =  70%  
Debris Clogging % =  50%

Calculated Parameters for Overflow Weir  
Height of Grate Upper Edge, H<sub>u</sub> =  6.40 feet  
Overflow Weir Slope Length =  3.93 feet  
Grate Open Area / 100-yr Orifice Area =  16.94  
Overflow Grate Open Area w/o Debris =  10.77 ft<sup>2</sup>  
Overflow Grate Open Area w/ Debris =  5.39 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 =  2.50 ft (distance below basin bottom at Stage = 0 ft)  
Outlet Pipe Diameter =  18.00 inches  
Restrictor Plate Height Above Pipe Invert =  7.00 inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate  
Outlet Orifice Area =  0.64 ft<sup>2</sup>  
Outlet Orifice Centroid =  0.34 feet  
Half-Central Angle of Restrictor Plate on Pipe =  1.35 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 =  0.53 feet  
Stage at Top of Freeboard =  8.47 feet  
Basin Area at Top of Freeboard =  0.57 acres  
Basin Volume at Top of Freeboard =  1.78 acre-ft

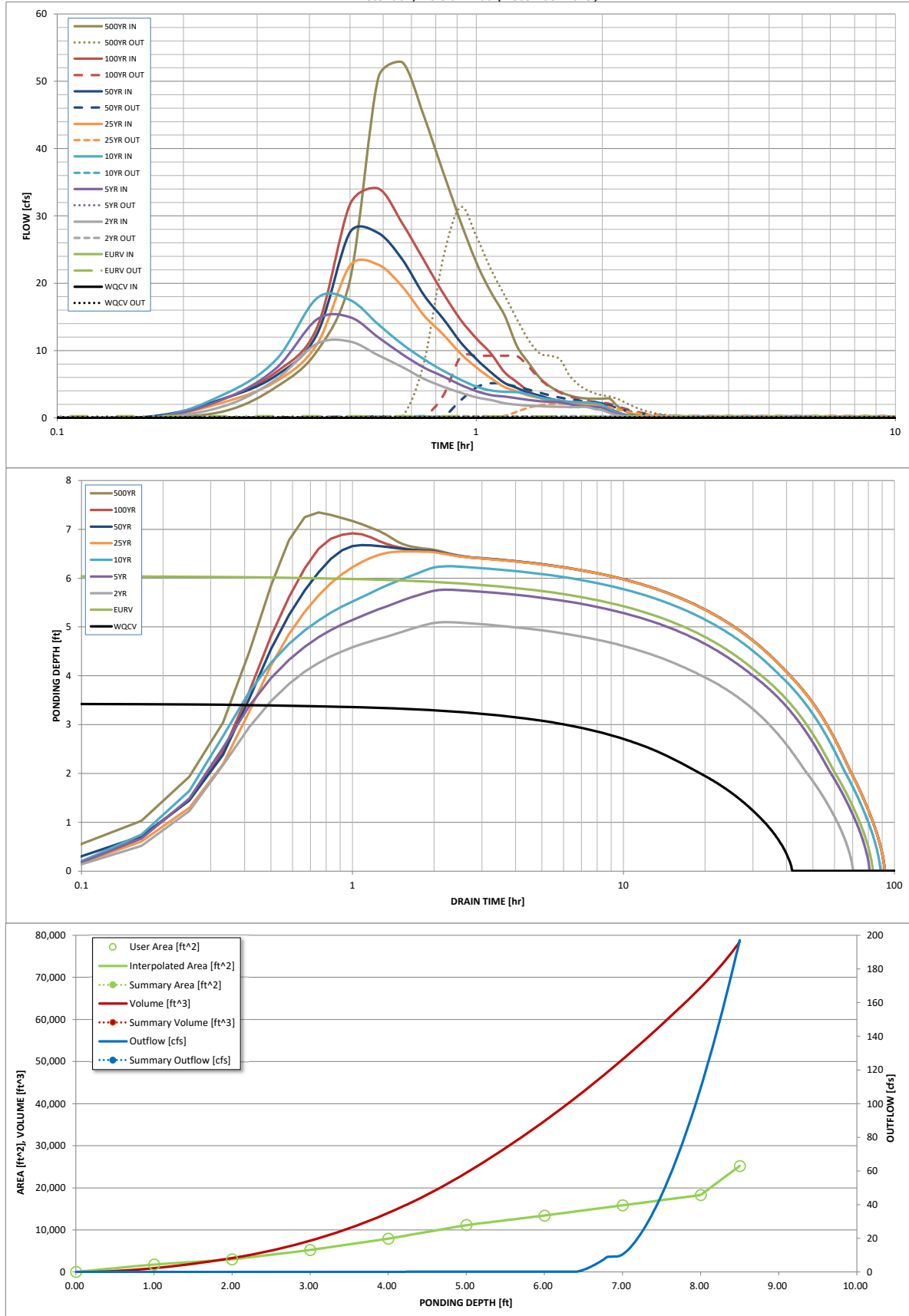
## Routed Hydrograph Results

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) =	0.228	0.837	0.595	0.784	0.936	1.146	1.353	1.608	2.495
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.595	0.784	0.936	1.146	1.353	1.608	2.495
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.1	0.2	0.3	2.9	5.7	9.3	21.0
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	0.25	0.48	0.79	1.79
Peak Inflow Q (cfs) =	N/A	N/A	11.3	14.9	17.8	22.8	27.6	34.1	52.8
Peak Outflow Q (cfs) =	0.1	0.2	0.2	0.2	0.2	2.1	5.1	9.2	31.3
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.9	0.7	0.7	0.9	1.0	1.5
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	0.2	0.5	0.8	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	73	63	72	78	80	78	76	70
Time to Drain 99% of Inflow Volume (hours) =	40	79	67	77	84	87	86	85	82
Maximum Ponding Depth (ft) =	3.43	6.05	5.10	5.76	6.24	6.54	6.68	6.91	7.34
Area at Maximum Ponding Depth (acres) =	0.15	0.31	0.26	0.30	0.32	0.34	0.35	0.36	0.38
Maximum Volume Stored (acre-ft) =	0.228	0.839	0.564	0.748	0.899	0.998	1.042	1.127	1.286

DETENTION BASIN OUTLET STRUCTURE

MHFD-Detention, Version 4.00 (December 2019)



# DETENTION BASIN OUTLET STRUCTURE

Outflow Hydrograph Workbook Filename: \_\_\_\_\_

WINDERMERE FILING NO. 2 SOUTH POND  
FINAL DESIGN DEVELOPED CONDITION

## Inflow Hydrographs

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

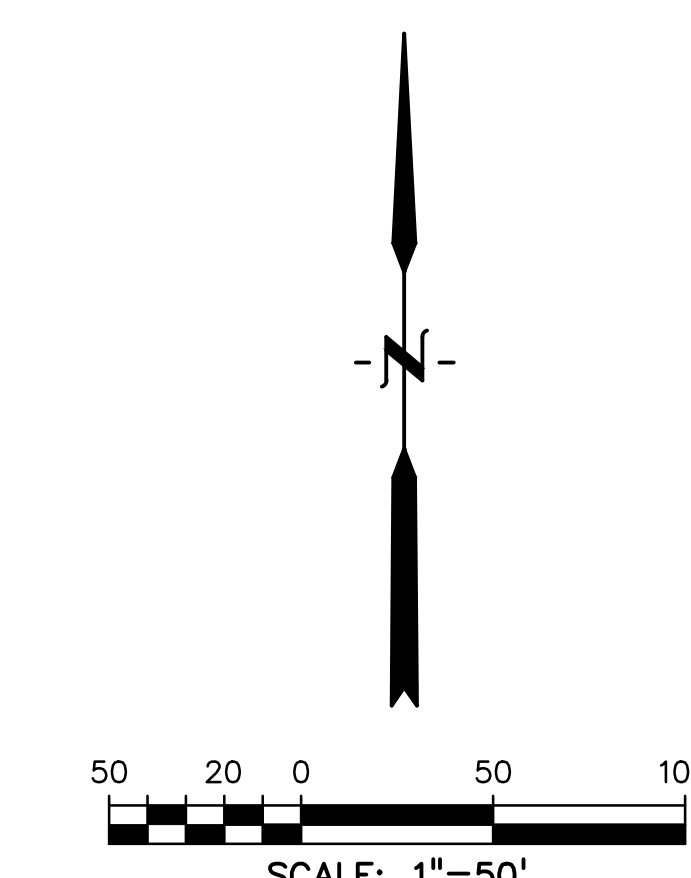
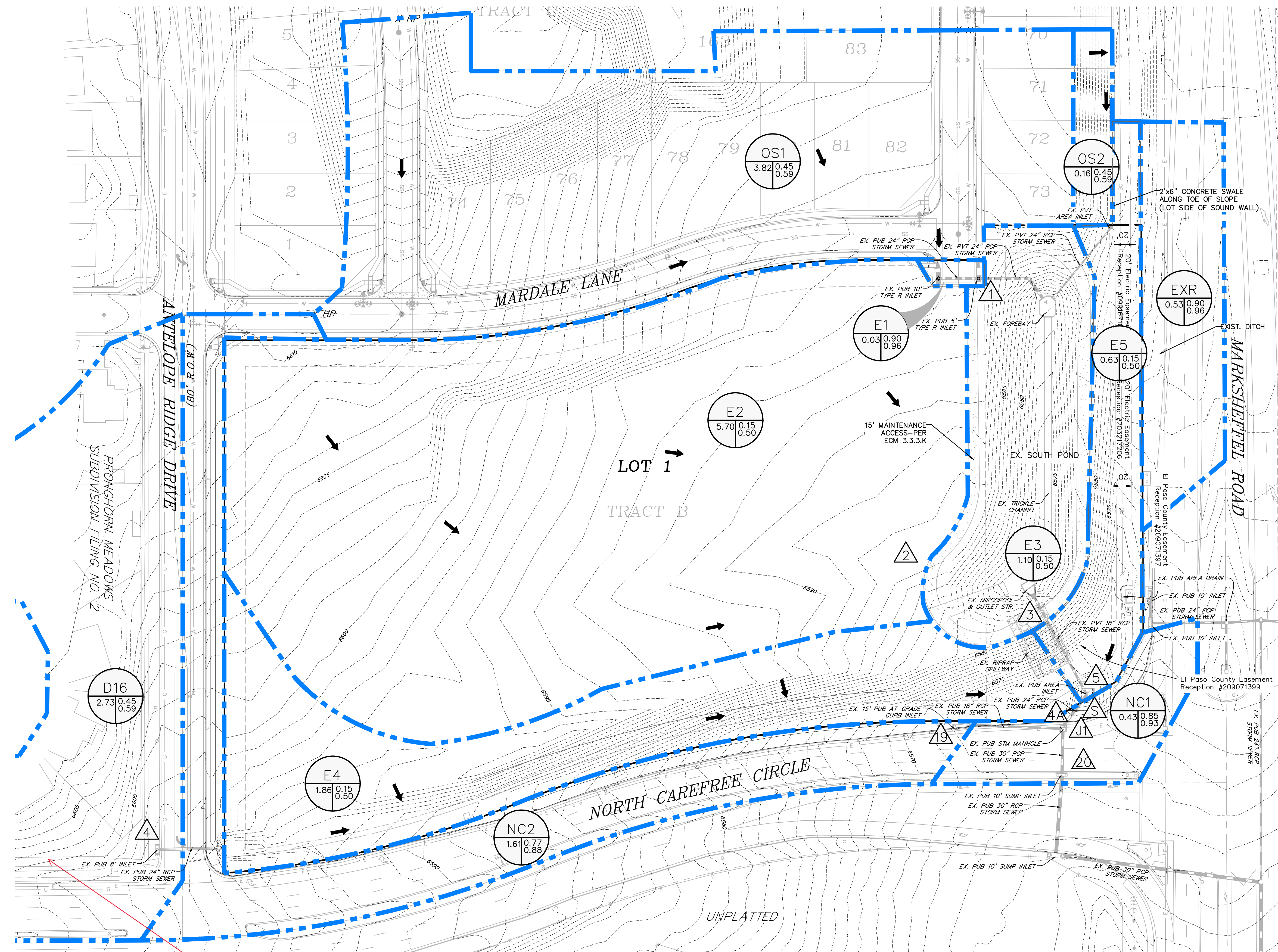
Time Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.02	0.98
	0:15:00	0.00	0.00	1.73	2.81	3.48	2.34	2.88	2.85	4.59
	0:20:00	0.00	0.00	5.74	7.40	8.66	5.44	6.29	6.80	9.87
	0:25:00	0.00	0.00	10.99	14.61	17.77	10.89	12.38	13.35	20.48
	0:30:00	0.00	0.00	11.35	14.94	17.50	22.59	27.57	31.72	50.53
	0:35:00	0.00	0.00	9.29	11.96	13.90	22.77	27.44	34.08	52.82
	0:40:00	0.00	0.00	7.53	9.44	10.92	19.49	23.51	28.87	44.82
	0:45:00	0.00	0.00	5.79	7.46	8.72	15.22	18.22	23.40	36.52
	0:50:00	0.00	0.00	4.63	6.16	7.01	12.40	14.73	18.52	29.23
	0:55:00	0.00	0.00	3.73	4.91	5.68	9.57	11.28	14.63	23.11
	1:00:00	0.00	0.00	3.04	3.95	4.64	7.49	8.73	11.81	18.69
	1:05:00	0.00	0.00	2.64	3.39	4.06	5.91	6.79	9.60	15.30
	1:10:00	0.00	0.00	2.19	3.17	3.87	4.58	5.22	6.81	10.67
	1:15:00	0.00	0.00	1.95	2.91	3.81	3.93	4.45	5.32	8.17
	1:20:00	0.00	0.00	1.81	2.65	3.49	3.31	3.73	3.98	5.97
	1:25:00	0.00	0.00	1.73	2.48	3.03	2.93	3.30	3.17	4.65
	1:30:00	0.00	0.00	1.67	2.38	2.74	2.52	2.83	2.69	3.86
	1:35:00	0.00	0.00	1.64	2.31	2.54	2.26	2.54	2.37	3.34
	1:40:00	0.00	0.00	1.61	2.02	2.41	2.10	2.36	2.18	3.02
	1:45:00	0.00	0.00	1.61	1.82	2.33	2.00	2.24	2.09	2.89
	1:50:00	0.00	0.00	1.61	1.70	2.28	1.94	2.18	2.05	2.84
	1:55:00	0.00	0.00	1.32	1.62	2.17	1.91	2.15	2.04	2.83
	2:00:00	0.00	0.00	1.13	1.51	1.93	1.89	2.13	2.04	2.83
	2:05:00	0.00	0.00	0.72	0.95	1.23	1.21	1.36	1.30	1.79
	2:10:00	0.00	0.00	0.44	0.59	0.77	0.76	0.85	0.82	1.12
	2:15:00	0.00	0.00	0.27	0.36	0.47	0.46	0.52	0.49	0.68
	2:20:00	0.00	0.00	0.15	0.21	0.27	0.27	0.30	0.29	0.40
	2:25:00	0.00	0.00	0.07	0.12	0.14	0.15	0.17	0.16	0.22
	2:30:00	0.00	0.00	0.03	0.05	0.06	0.06	0.07	0.07	0.09
	2:35:00	0.00	0.00	0.01	0.01	0.01	0.01	0.02	0.01	0.02
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	3:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	4:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	5:15:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
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	6:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

## **DRAINAGE MAPS**









LEGEND

- EX. INTERMEDIATE CONTOUR
- EX. INDEX CONTOUR
- EX. MANHOLE
- EX. STORM SEWER
- BASIN BOUNDARY
- FLOW DIRECTION
- DESIGN POINT
- BASIN
- AREA (ACRE)
- C5
- C100

BASIN	DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
OS1		3.82	7.0	15.5
OS2		0.16	0.3	0.6
E1		0.03	0.2	0.3
E2	1	3.85	7.1	15.7
E3	2	5.70	2.9	16.1
E4	3	1.10	0.8	4.5
E5	4	10.81	9.5	32.3
EXR	5	2.73	4.7	10.3
D16	6	1.86	0.9	5.3
NC1	7	4.59	4.8	13.6
NC2	8	0.63	0.4	2.4
J1	9	5.75	6.7	18.1
S1	10	1.61	6.4	12.2
S2	11	7.36	10.5	25.5
S3	12	0.43	1.9	3.4
S4	13	7.79	11.7	27.6

REFERENCE HISTORIC MAP FOR BASIN D16 EXTENTS

PREPARED BY:  
  
DREXEL, BARRELL & CO.  
Engineers-Surveyors  
101 SAWATCH ST. STE 100  
COLORADO SPGS, COLORADO 80903  
CONTACT: TIM D. McCONNELL, P.E.  
(719) 260-0887  
COLORADO SPRINGS • LAFAYETTE

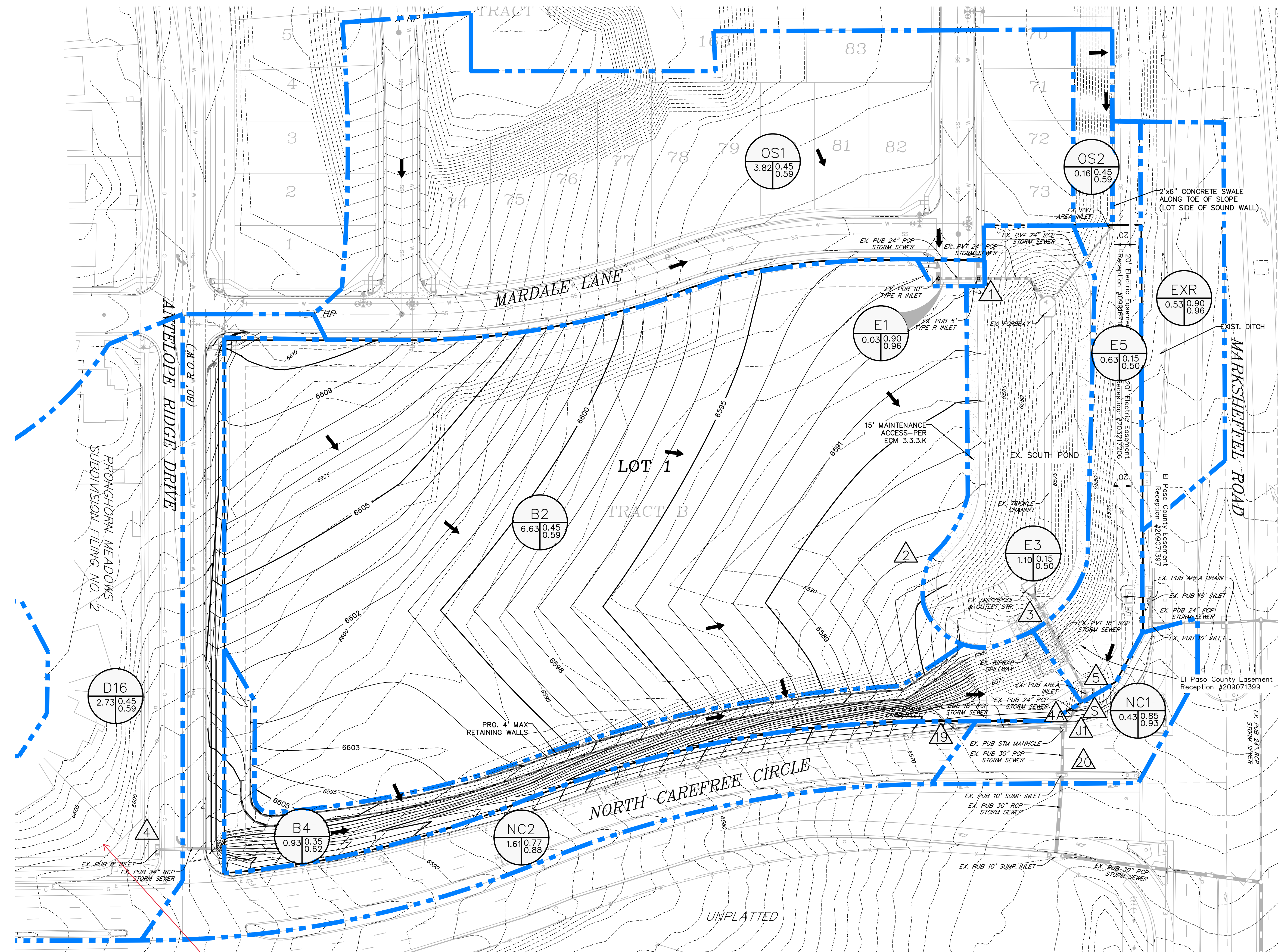
CLIENT:  
  
COLO WINDERMERE #2, LLC  
4164 AUSTIN BLUFFS FWY, #361  
COLORADO SPRINGS, CO 80918  
(719) 200-9594  
CONTACT: JAMES TODD STEPHENS

DRAINAGE PLANS FOR  
**WINDERMERE FILING 2**  
N. MARKSHEFFEL ROAD  
EL PASO COUNTY, COLORADO

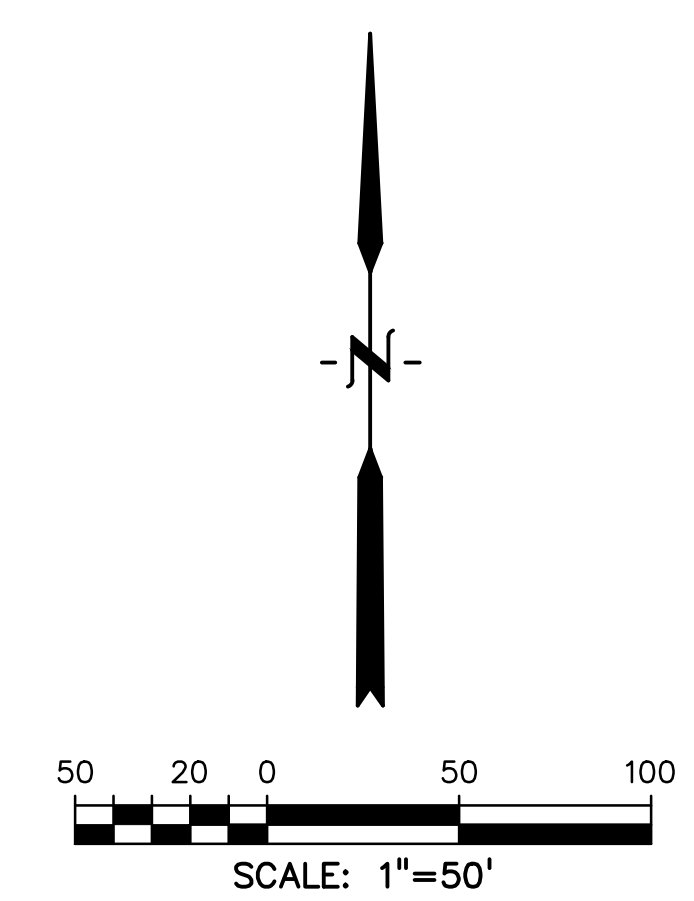
ISSUE	DATE
INITIAL ISSUE	4/1/22
REVISED	8/26/24
DESIGNED BY:	KGV
DRAWN BY:	CGH
CHECKED BY:	TDM
FILE NAME:	
PREPARED UNDER MY DIRECT SUPERVISION FOR AND ON BEHALF OF DREXEL, BARRELL & CO.	
DRAWING SCALE: HORIZONTAL: 1" = 50' VERTICAL: N/A	
EXISTING DRAINAGE MAP	
PROJECT NO. 21187-03CSCV DRAWING NO.	
<b>EDR</b>	
SHEET: 1 OF 2	

COUNTY FILE NO.: SP223





REFERENCE HISTORIC MAP  
FOR BASIN D16 EXTENTS



**LEGEND**

PROPOSED INTERMEDIATE CONTOUR  
PROPOSED INDEX CONTOUR  
EX. INTERMEDIATE CONTOUR  
EX. INDEX CONTOUR  
PROPOSED STORM SEWER  
PROPOSED INLET  
PROPOSED FLARED END SECTION  
EX. MANHOLE  
EX. STORM SEWER  
BASIN BOUNDARY  
FLOW DIRECTION  
DESIGN POINT

AREA (ACRE)  
A1  
C5  
C100

BASIN	DP	AREA (AC)	Q5 (cfs)	Q100 (cfs)
OS1		3.82	7.0	15.5
OS2		0.16	0.3	0.6
E1		0.03	0.2	0.3
B2	1	3.85	7.1	15.7
E3	2	6.63	11.8	26.0
E5	3	1.10	0.8	4.5
D16	4	2.73	4.7	10.3
B4		0.93	1.2	3.4
EXR	4A	3.66	5.0	11.7
NC1	5	0.63	0.4	2.4
NC2	5	0.53	2.4	4.4
J1	S	4.82	7.7	25.3
J1	19	1.61	6.4	12.2
J1	20	6.43	10.7	23.6
J1	20	0.43	1.9	3.4
J1	20	6.86	11.8	25.7

PREPARED BY:

DREXEL, BARRELL & CO.  
Engineers-Surveyors  
101 SAWATCH ST. STE 100  
COLORADO SPRINGS, COLORADO 80903  
CONTACT: TIM D. McCONNELL, P.E.  
(719) 260-0887  
COLORADO SPRINGS • LAFAYETTE

CLIENT:

DRAINAGE PLANS FOR  
**WINDERMERE FILING 2**  
N. MARKSHEFFEL ROAD  
EL PASO COUNTY, COLORADO

ISSUE	DATE
INITIAL ISSUE	4/1/22
REVISED	8/26/24

DESIGNED BY: KGV  
DRAWN BY: CGH  
CHECKED BY: TDM  
FILE NAME:

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

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

PROPOSED  
DRAINAGE MAP

PROJECT NO. 21187-03CSCV  
DRAWING NO.

**PDR**

SHEET: 2 OF 2

COUNTY FILE NO.: SP223