

El Paso County  
Engineering Development Review Team  
2880 International Circle  
Colorado Springs, CO 80910

September 2022

RE: MDG Project No. 19.886.008 – Trails at Aspen Ridge: Certification of West SF Pond

Dear Sir or Madam,

This letter certifies that the dimensions, elevations and volume of the Trails at Aspen Ridge - West SF Pond substantially comply with the plan documents and Final Drainage Report (FDR: Approved January 2020).

As-built survey of the West SF Pond by a third-party Professional Land Surveyor and a detention pond site walkthrough indicate that the pond volume, filter area, emergency spillway and outlet structure, as constructed and surveyed, are in substantial conformance with the construction plans.

The West Pond contours as surveyed for this certification and outlet structure provide the required storage volume and will meet the required release rates as documented by the attached UDFCD/MHFD Design Spreadsheets.

Caveats: Because the certifier was not involved with construction administration of the pond, the compaction of earthwork in the pond embankment, placement of buried rip rap in the emergency spillway, and/or any other items not specifically mentioned are not certified in this letter. Submittal reviews during the construction phase of the project indicate that the appropriate material submittals were made, but do not certify that these actual materials were placed or whether appropriate means of storage were utilized prior to installation.

Additionally, the West SF Pond will be upgraded to a Full Spectrum EDB as development of the Trails at Aspen Ridge proceeds. Depending on the speed of progress for the development, this means the pond may no longer match the contours surveyed for this certification. Another certification will be provided once the full buildout of the pond has been completed.

From the Colorado Springs Pond certification checklist (“Yes” indicates substantial compliance):

**Grading**

West Pond

- Grading and Slopes Completed per approved plans

Yes

**ACCEPTED for FILE**  
**Engineering Review**

11/30/2022 7:44:21 AM  
dsdlaforce

EPC Planning & Community  
Development Department



### **Soil Mixes**

- Proper storage of soil mix prior to placement (*see above*) N/A
- Soil Mix Correct per approved plans (*See above*) N/A

### **Forebay**

- Built per approved plans N/A
- Forebay Volume per approved plans N/A

### **Outlet Works**

- Built per approved plans Yes

### **Spillway structure**

- Built per approved plans (*Caveats for West Pond noted above*) Yes w/ *caveat*

### **WQCV and Elevations**

- WQCV per approved plans Yes
- All elevations per approved plans Yes

### **As built Plans for Permanent BMP**

- Built per approved plans (*see caveats above*) Yes

If there are any questions regarding this certification, please feel free to contact me by phone: 719-575-0100 or email: [jesse.sullivan@matrixdesigngroup.com](mailto:jesse.sullivan@matrixdesigngroup.com).

Thank you,

Jesse Sullivan, P.E.

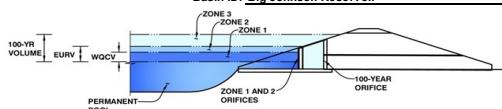


## **DETENTION BASIN STAGE-STORAGE TABLE BUILDER**

UD-Detention, Version 3.07 (February 2017)

Project: Trails at Aspen Ridge Filing No. 1 Buildout: West Pond

**Basin ID: Big Johnson Reservoir**



#### **Example Zone Configuration (Retention Pond)**

### Required Volume Calculation

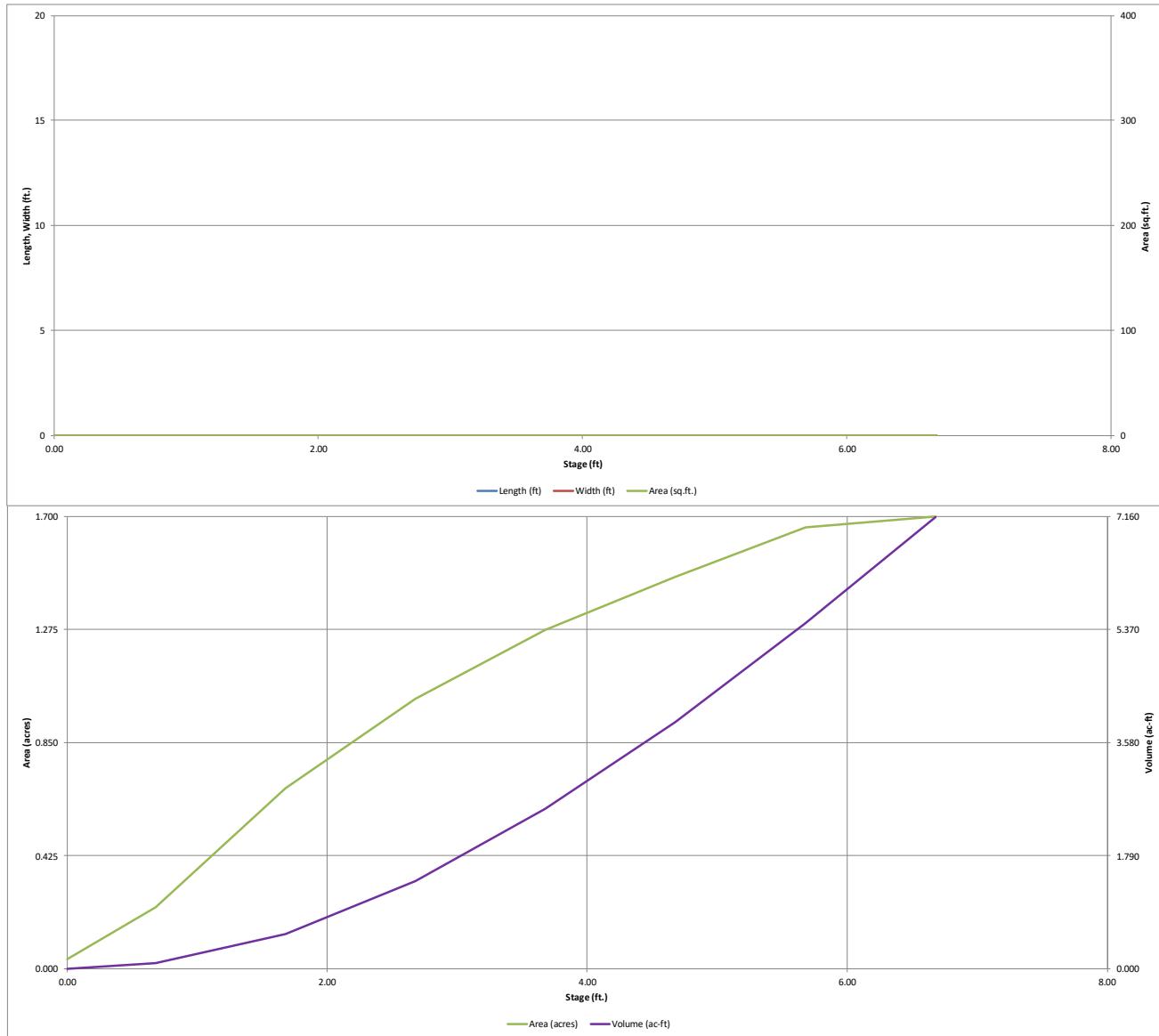
Selected BMP Type =	<b>SF</b>	
Watershed Area =	34.69	acres
Watershed Length =	2.691	ft
Watershed Slope =	0.020	ft/ft
Watershed Imperviousness =	3.83%	percent
Percentage Hydrologic Soil Group A =	8.6%	percent
Percentage Hydrologic Soil Group B =	81.2%	percent
Percentage Hydrologic Soil Groups C/D =	10.2%	percent
Desired WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	
Water Quality Capture Volume (WQCV) =	0.065	acre-feet
Excess Urban Runoff Volume (EURV) =	0.111	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.071	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	0.137	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	0.499	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	1.729	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	2.512	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	3.566	acre-feet
500-yr Runoff Volume (P1 = 3.55 in.) =	6.349	acre-feet
Approximate 2-yr Detention Volume =	0.066	acre-feet
Approximate 5-yr Detention Volume =	0.129	acre-feet
Approximate 10-yr Detention Volume =	0.383	acre-feet
Approximate 25-yr Detention Volume =	0.573	acre-feet
Approximate 50-yr Detention Volume =	0.582	acre-feet
Approximate 100-yr Detention Volume =	0.811	acre-feet
		<b>Drain Time Too Long</b>
		<b>Optional User Override 1-hr Precipitation</b>
		1.19 inches
		1.50 inches
		1.75 inches
		2.00 inches
		2.25 inches
		2.52 inches
		3.55 inches

### Stage-Storage Calculation

Zone 1 Volume (WOCV) =	0.065	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.046	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.700	acre-feet
Total Detention Basin Volume =	0.811	acre-feet
Initial Surcharge Volume (ISV) =	N/A	ft <sup>3</sup>
Initial Surcharge Depth (ISD) =	N/A	ft
Total Available Detention Depth (H <sub>total</sub> ) =	user	ft
Depth of Trickle Channel (H <sub>TG</sub> ) =	N/A	ft
Slope of Trickle Channel (S <sub>TG</sub> ) =	N/A	ft/ft
Slopes of Main Basin Sides (S <sub>main</sub> ) =	user	H:V
Basin Length-to-Width Ratio (R <sub>LW</sub> ) =	user	
Initial Surcharge Area (A <sub>ISV</sub> ) =	user	ft <sup>2</sup>
Surcharge Volume Length (L <sub>ISV</sub> ) =	user	ft
Surcharge Volume Width (W <sub>ISV</sub> ) =	user	ft
Depth of Basin Floor (H <sub>FLOOR</sub> ) =	user	ft
Length of Basin Floor (L <sub>FLOOR</sub> ) =	user	ft
Width of Basin Floor (W <sub>FLOOR</sub> ) =	user	ft
Area of Basin Floor (A <sub>FLOOR</sub> ) =	user	ft <sup>2</sup>
Volume of Basin Floor (V <sub>FLOOR</sub> ) =	user	ft <sup>3</sup>
Depth of Main Basin (H <sub>MAIN</sub> ) =	user	ft
Length of Main Basin (L <sub>MAIN</sub> ) =	user	ft
Width of Main Basin (W <sub>MAIN</sub> ) =	user	ft
Area of Main Basin (A <sub>MAIN</sub> ) =	user	ft <sup>2</sup>
Volume of Main Basin (V <sub>MAIN</sub> ) =	user	ft <sup>3</sup>
Calculated Total Basin Volume (V <sub>BASIN</sub> ) =	user	acre-feet

## DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

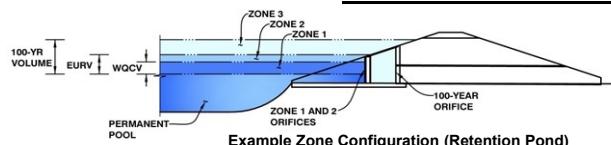


## Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Trails at Aspen Ridge Filing No. 1 Buildout: West Pond

Basin ID: Big Johnson Reservoir



	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	0.56	0.065	Filtration Media
Zone 2 (EURV)	0.76	0.046	Orifice Plate
Zone 3 (100-year)	2.04	0.700	Weir&Pipe (Restrict)
			0.811 Total

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration BMP)

Underdrain Orifice Invert Depth =	1.92	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	0.70	inches

Calculated Parameters for Underdrain	
Underdrain Orifice Area =	0.0 ft <sup>2</sup>
Underdrain Orifice Centroid =	0.03 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 =	0.56	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	3.50	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	0.80	inches
Orifice Plate: Orifice Area per Row =	2.66	sq. inches (diameter = 1-13/16 inches)

Calculated Parameters for Plate	
WQ Orifice Area per Row =	1.847E-02 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)

Stage of Orifice Centroid (ft)	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Orifice Area (sq. inches)	0.56	0.64	0.70	1.50				
Orifice Area (sq. inches)	2.66	2.66	2.66	648.00				
Stage of Orifice Centroid (ft)	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice	
Not Selected	Not Selected
Vertical Orifice Area =	N/A
Vertical Orifice Centroid =	N/A

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

Overflow Weir Front Edge Height, Ho =	3.32	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	6.00	N/A	feet
Overflow Weir Slope =	4.00	N/A	H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Open Area % =	70%	N/A	% grate open area/total area
Debris Clogging % =	50%	N/A	%

Calculated Parameters for Overflow Weir	
Zone 3 Weir	Not Selected
Height of Grate Upper Edge, H <sub>t</sub> =	4.32
Over Flow Weir Slope Length =	4.12
Grate Open Area / 100-yr Orifice Area =	5.51
Overflow Grate Open Area w/o Debris =	17.32
Overflow Grate Open Area w/ Debris =	8.66

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 =	2.37	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	24.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	24.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate	
Zone 3 Restrictor	Not Selected
Outlet Orifice Area =	3.14
Outlet Orifice Centroid =	1.00
Half-Central Angle of Restrictor Plate on Pipe =	3.14

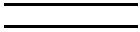
User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	4.70	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	40.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway		
Spillway Design Flow Depth=	0.50	feet
Stage at Top of Freeboard =	6.20	feet
Basin Area at Top of Freeboard =	1.68	acres

### Routed Hydrograph Results

	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Design Storm Return Period =								
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52
Calculated Runoff Volume (acre-ft) =	0.065	0.111	0.071	0.137	0.499	1.729	2.512	3.566
OPTIONAL Override Runoff Volume (acre-ft) =								
Inflow Hydrograph Volume (acre-ft) =	0.065	0.110	0.071	0.137	0.499	1.729	2.512	3.567
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.14	0.45	0.63	0.87
Predevelopment Peak Q (cfs) =	0.0	0.0	0.3	0.7	4.7	15.6	21.8	30.1
Peak Inflow Q (cfs) =	0.8	1.4	0.9	1.8	6.3	21.7	31.3	44.2
Peak Outflow Q (cfs) =	0.0	0.1	0.0	0.1	0.9	13.4	18.4	23.8
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.2	0.2	0.9	0.8	0.8
Structure Controlling Flow =	Filtration Media	Plate	Filtration Media	Plate	Plate	Plate	Plate	Plate
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	40	51	43	52	63	41	29	23
Time to Drain 99% of Inflow Volume (hours) =	41	52	44	54	70	62	57	51
Maximum Pending Depth (ft) =	0.53	0.71	0.56	0.79	1.50	1.87	2.19	2.67
Area at Maximum Pending Depth (acres) =	0.19	0.24	0.20	0.28	0.60	0.74	0.85	1.01
Maximum Volume Stored (acre-ft) =	0.060	0.096	0.066	0.119	0.431	0.673	0.935	1.371



ft<sup>2</sup>  
feet

feet  
feet  
should be  $\geq 4$   
ft<sup>2</sup>  
ft<sup>2</sup>

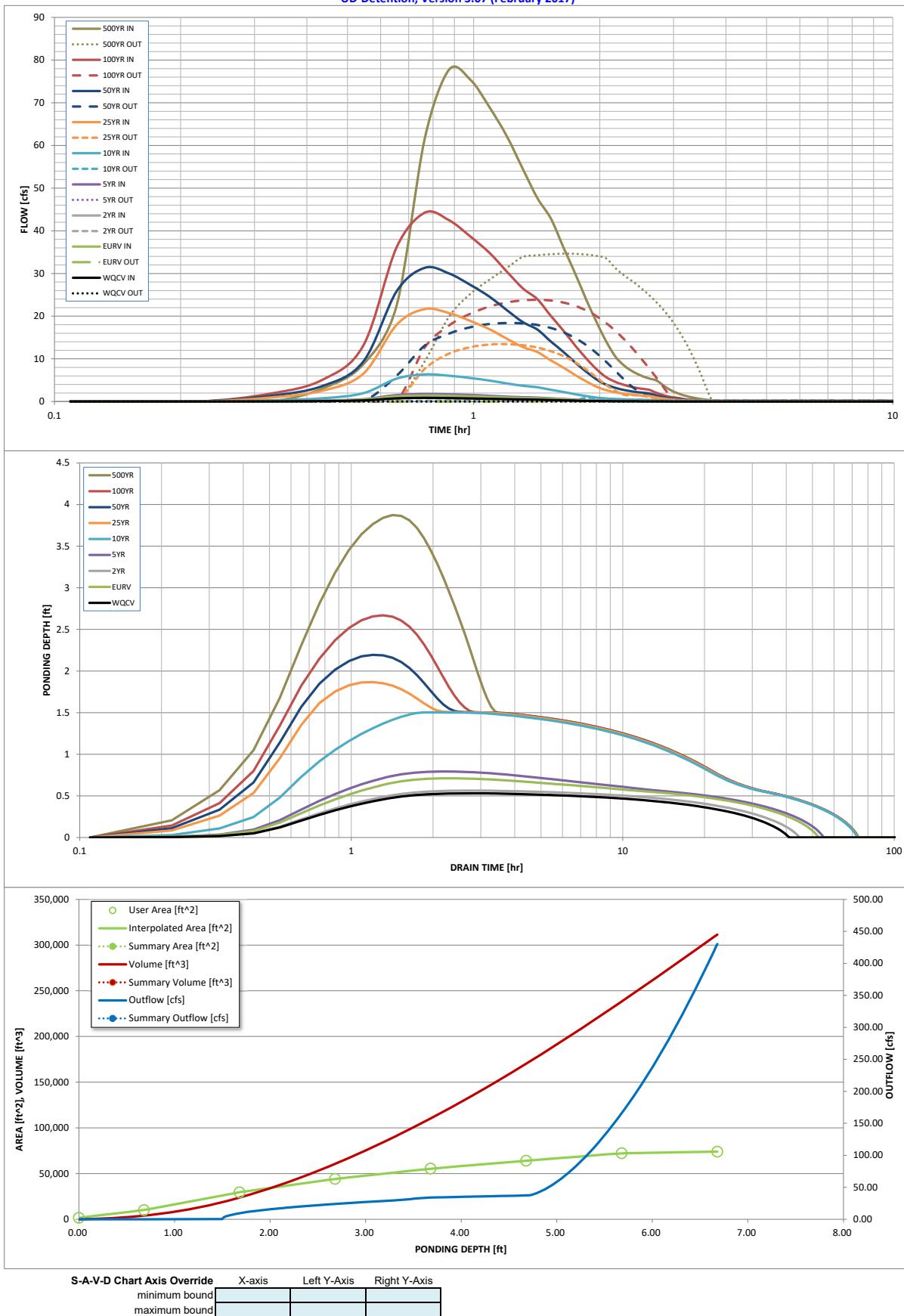
e

ft<sup>2</sup>  
feet  
radians

500 Year
3.55
6.349
6.344
1.48
51.4
77.7
34.6
0.7
Outlet Plate 1
0.0
N/A
16
34
3.87
1.31
2.780

## Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)



S-A-V-D Chart Axis Override      X-axis      Left Y-axis      Right Y-axis

minimum bound			
maximum bound			

## Detention Basin Outlet Structure Design

Outflow Hydrograph Workbook Filename:

## Storm Inflow Hydrographs

UD-Detention, Version 3.07 (February 2017)

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

## **Detention Basin Outlet Structure Design**

UD-Detention, Version 3.07 (February 2017)

## Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.

The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.