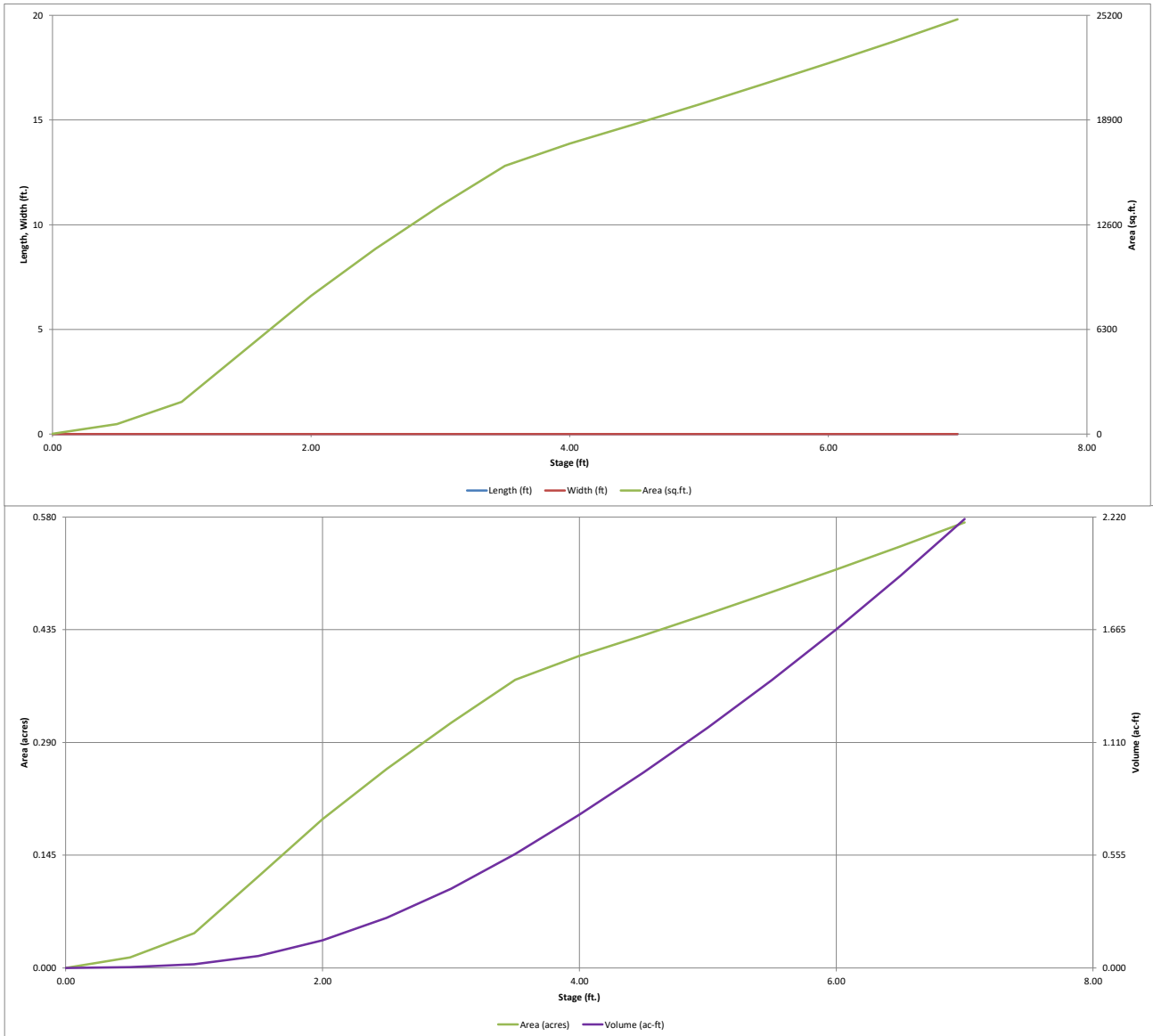




# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

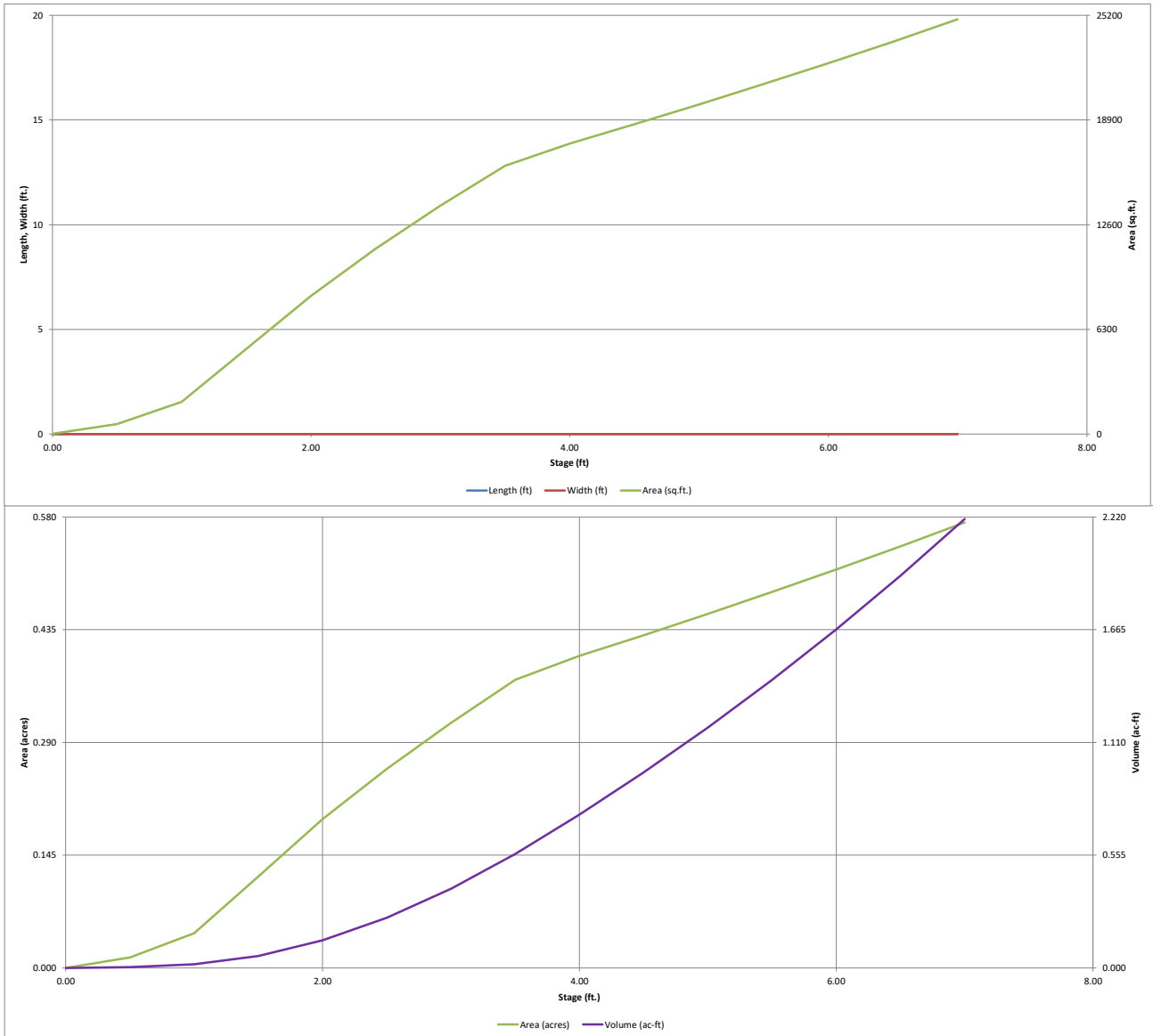
*MHFD-Detention, Version 4.06 (July 2022)*





# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

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

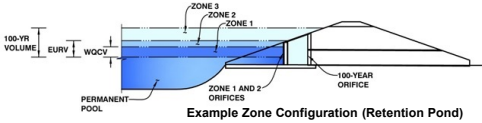


# DETENTION BASIN OUTLET STRUCTURE DESIGN

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

**Project: Life Church - FULL SPECTRUM DETENTION**

**Basin ID: Pond A**



	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	2.28	0.193	Orifice Plate
Zone 2 (EURV)	3.97	0.549	Rectangular Orifice
Zone 3 (100-year)	4.97	0.425	Weir&Pipe (Restrict)
<b>Total (all zones)</b>		<b>1.167</b>	

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

Underdrain Orifice Invert Depth =	<input type="text"/>	ft (distance below the filtration media surface)	Underdrain Orifice Area =	<input type="text"/>	ft <sup>2</sup>
Underdrain Orifice Diameter =	<input type="text"/>	inches	Underdrain Orifice Centroid =	<input type="text"/>	feet

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation BMP)

Centroid of Lowest Orifice =	<input type="text"/> 0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	<input type="text"/> 7.708E-03	ft <sup>2</sup>
Depth at top of Zone using Orifice Plate =	<input type="text"/> 4.15	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	<input type="text"/> N/A	feet
Orifice Plate: Orifice Vertical Spacing =	<input type="text"/> 18.00	inches	Elliptical Slot Centroid =	<input type="text"/> N/A	feet
Orifice Plate: Orifice Area per Row =	<input type="text"/> 1.11	sq. inches (diameter = 1-3/16 inches)	Elliptical Slot Area =	<input type="text"/> 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)	<input type="text"/> 0.00	<input type="text"/> 1.50	<input type="text"/> 3.00					
Orifice Area (sq. inches)	<input type="text"/> 1.11	<input type="text"/> 1.11	<input type="text"/> 1.11					

	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)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>
Orifice Area (sq. inches)	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

User Input: Vertical Orifice (Circular or Rectangular)

	Zone 2 Rectangular	Not Selected		Calculated Parameters for Vertical Orifice
Invert of Vertical Orifice =	<input type="text"/> 2.28	<input type="text"/> N/A	ft (relative to basin bottom at Stage = 0 ft)	Zone 2 Rectangular
Depth at top of Zone using Vertical Orifice =	<input type="text"/> 3.97	<input type="text"/> N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =
Vertical Orifice Height =	<input type="text"/> 2.00	<input type="text"/> N/A	inches	Vertical Orifice Centroid =
Vertical Orifice Width =	<input type="text"/> 1.76	<input type="text"/> N/A	inches	<input type="text"/> 0.02
				<input type="text"/> 0.08
				ft <sup>2</sup>

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected		Calculated Parameters for Overflow Weir
Overflow Weir Front Edge Height, H <sub>o</sub> =	<input type="text"/> 4.16	<input type="text"/> N/A	ft (relative to basin bottom at Stage = 0 ft)	Zone 3 Weir
Overflow Weir Front Edge Length =	<input type="text"/> 3.00	<input type="text"/> N/A	feet	Height of Grate Upper Edge, H <sub>g</sub> =
Overflow Weir Grate Slope =	<input type="text"/> 0.00	<input type="text"/> N/A	H:V	Overflow Weir Slope Length =
Horiz. Length of Weir Sides =	<input type="text"/> 3.00	<input type="text"/> N/A	feet	<input type="text"/> 3.00
Overflow Grate Type =	<input type="text"/> Type C Grate	<input type="text"/> N/A		Grate Open Area / 100-yr Orifice Area =
Debris Clogging % =	<input type="text"/> 0%	<input type="text"/> N/A	%	<input type="text"/> 11.49
				Overflow Grate Open Area w/o Debris =
				<input type="text"/> 6.26
				Overflow Grate Open Area w/ Debris =
				<input type="text"/> 6.26
				ft <sup>2</sup>

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

	Zone 3 Restrictor	Not Selected		Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate
Depth to Invert of Outlet Pipe =	<input type="text"/> 0.25	<input type="text"/> N/A	ft (distance below basin bottom at Stage = 0 ft)	Zone 3 Restrictor
Outlet Pipe Diameter =	<input type="text"/> 18.00	<input type="text"/> N/A	inches	Outlet Orifice Area =
Restrictor Plate Height Above Pipe Invert =	<input type="text"/> 6.25	<input type="text"/> N/A	inches	Outlet Orifice Centroid =
				<input type="text"/> 0.55
				<input type="text"/> 0.30
				Half-Central Angle of Restrictor Plate on Pipe =
				<input type="text"/> 1.26
				N/A
				radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

				Calculated Parameters for Spillway
Spillway Invert Stage =	<input type="text"/> 4.75	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth =	<input type="text"/> 0.84
Spillway Crest Length =	<input type="text"/> 9.00	feet	Stage at Top of Freeboard =	<input type="text"/> 6.59
Spillway End Slopes =	<input type="text"/> 4.00	H:V	Basin Area at Top of Freeboard =	<input type="text"/> 0.55
Freeboard above Max Water Surface =	<input type="text"/> 1.00	feet	Basin Volume at Top of Freeboard =	<input type="text"/> 1.98
				acre-ft

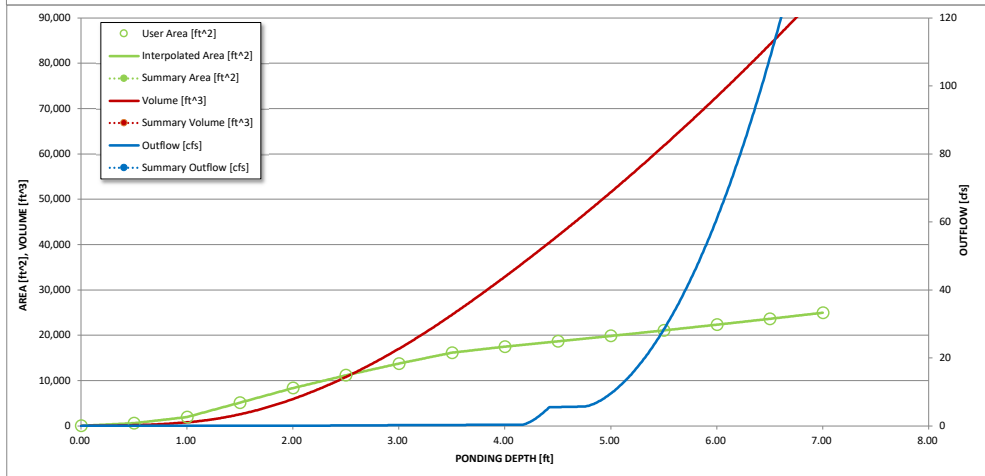
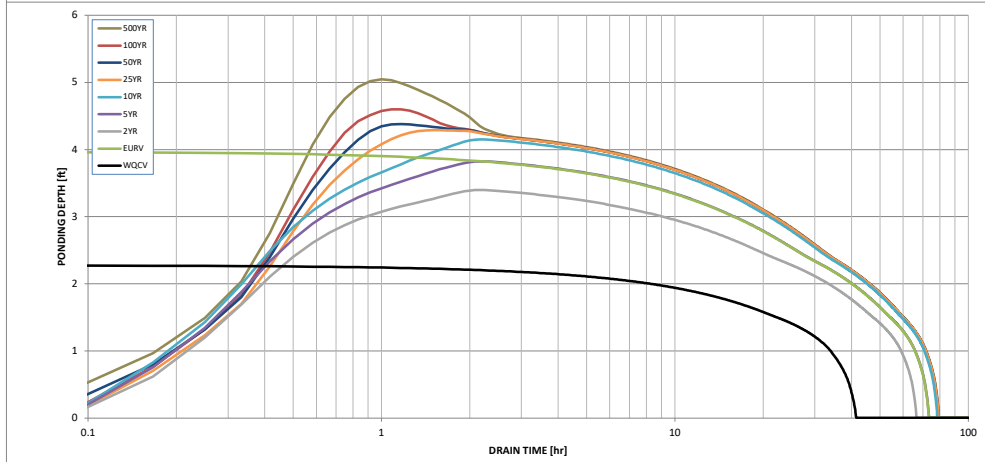
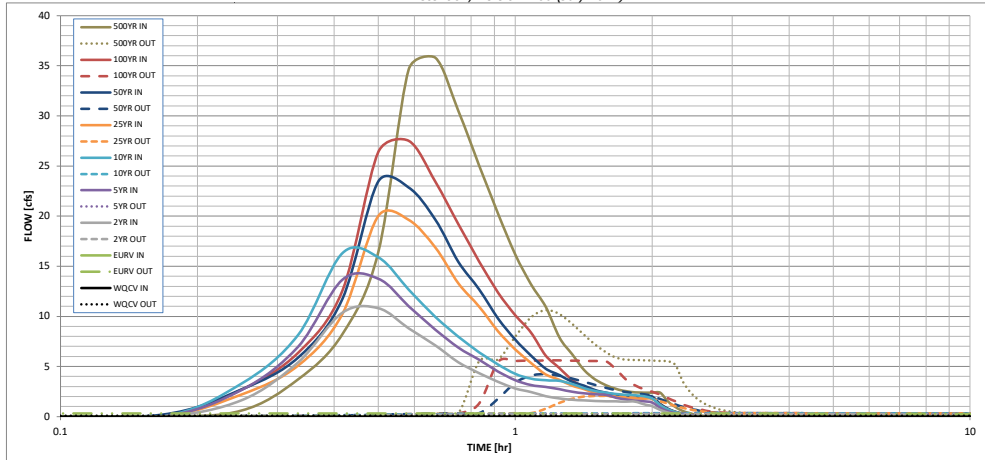
## Routed Hydrograph Results

*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	3.14
One-Hour Rainfall Depth (in)	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.14
CUHP Runoff Volume (acre-ft)	0.193	0.742	0.559	0.728	0.863	1.026	1.186	1.374	1.788
Inflow Hydrograph Volume (acre-ft)	N/A	N/A	0.559	0.728	0.863	1.026	1.186	1.374	1.788
CUHP Predevelopment Peak Q (cfs)	N/A	N/A	0.1	0.1	0.2	1.8	3.6	5.9	10.5
OPTIONAL Override Predevelopment Peak Q (cfs)	N/A	N/A	2.0	2.5	2.9	3.3	4.1		
Predevelopment Unit Peak Flow, q (cfs/acre)	N/A	N/A	0.24	0.30	0.35	0.40	0.50	0.71	1.26
Peak Inflow Q (cfs)	N/A	N/A	10.8	13.8	16.3	20.0	23.5	27.5	35.8
Peak Outflow Q (cfs)	0.1	0.3	0.3	0.30	0.3	2.1	4.2	5.60	10.6
Ratio Peak Outflow to Predevelopment Q	N/A	N/A	N/A	0.1	0.1	0.6	1.0	0.9	1.0
Structure Controlling Flow	Plate	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Vertical Orifice 1	Overflow Weir 1	Overflow Weir 1	Outlet Plate 1	Spillway
Max Velocity through Gate 1 (fps)	N/A	N/A	N/A	N/A	N/A	0.3	0.6	0.8	0.9
Max Velocity through Gate 2 (fps)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours)	38	65	60	65	69	68	67	65	62
Time to Drain 99% of Inflow Volume (hours)	40	70	64	70	74	74	74	73	72
Maximum Ponding Depth (ft)	2.28	3.97	3.39	3.82	4.15	4.29	4.38	4.60	5.04
Area at Maximum Ponding Depth (acres)	0.23	0.40	0.36	0.39	0.41	0.42	0.42	0.43	0.46
Maximum Volume Stored (acre-ft)	0.194	0.743	0.522	0.684	0.812	0.870	0.907	1.001	1.202

# DETENTION BASIN OUTLET STRUCTURE DESIGN

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



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:

### 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	0.18	0.02	0.59
	0:15:00	0.00	0.00	1.63	2.66	3.29	2.21	2.71	2.68	3.72
	0:20:00	0.00	0.00	5.42	6.99	8.16	5.11	5.90	6.39	8.21
	0:25:00	0.00	0.00	10.37	13.66	16.30	10.24	11.73	12.57	16.39
	0:30:00	0.00	0.00	10.81	13.76	15.90	20.02	23.47	26.38	34.64
	0:35:00	0.00	0.00	8.80	11.01	12.66	19.61	22.86	27.52	35.82
	0:40:00	0.00	0.00	7.10	8.69	9.97	16.88	19.67	23.44	30.51
	0:45:00	0.00	0.00	5.43	6.88	7.99	13.31	15.45	19.22	25.06
	0:50:00	0.00	0.00	4.33	5.67	6.42	10.97	12.69	15.48	20.26
	0:55:00	0.00	0.00	3.47	4.51	5.20	8.51	9.79	12.39	16.17
	1:00:00	0.00	0.00	2.81	3.63	4.27	6.70	7.68	10.13	13.21
	1:05:00	0.00	0.00	2.45	3.14	3.78	5.34	6.10	8.39	10.96
	1:10:00	0.00	0.00	2.04	2.96	3.62	4.22	4.79	6.10	7.91
	1:15:00	0.00	0.00	1.82	2.72	3.56	3.66	4.14	4.84	6.23
	1:20:00	0.00	0.00	1.69	2.47	3.26	3.08	3.48	3.65	4.66
	1:25:00	0.00	0.00	1.61	2.32	2.83	2.74	3.08	2.93	3.71
	1:30:00	0.00	0.00	1.56	2.22	2.55	2.35	2.65	2.49	3.13
	1:35:00	0.00	0.00	1.53	2.16	2.37	2.11	2.37	2.20	2.76
	1:40:00	0.00	0.00	1.51	1.88	2.25	1.96	2.20	2.03	2.53
	1:45:00	0.00	0.00	1.50	1.70	2.18	1.86	2.10	1.95	2.43
	1:50:00	0.00	0.00	1.50	1.58	2.13	1.81	2.04	1.92	2.39
	1:55:00	0.00	0.00	1.23	1.52	2.02	1.78	2.01	1.91	2.38
	2:00:00	0.00	0.00	1.05	1.40	1.81	1.77	1.99	1.91	2.38
	2:05:00	0.00	0.00	0.66	0.88	1.15	1.12	1.26	1.21	1.51
	2:10:00	0.00	0.00	0.41	0.55	0.71	0.71	0.79	0.76	0.94
	2:15:00	0.00	0.00	0.24	0.33	0.43	0.43	0.48	0.46	0.57
	2:20:00	0.00	0.00	0.13	0.19	0.25	0.25	0.28	0.27	0.33
	2:25:00	0.00	0.00	0.06	0.10	0.13	0.14	0.15	0.15	0.18
	2:30:00	0.00	0.00	0.03	0.04	0.05	0.06	0.06	0.06	0.07
	2:35:00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	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

