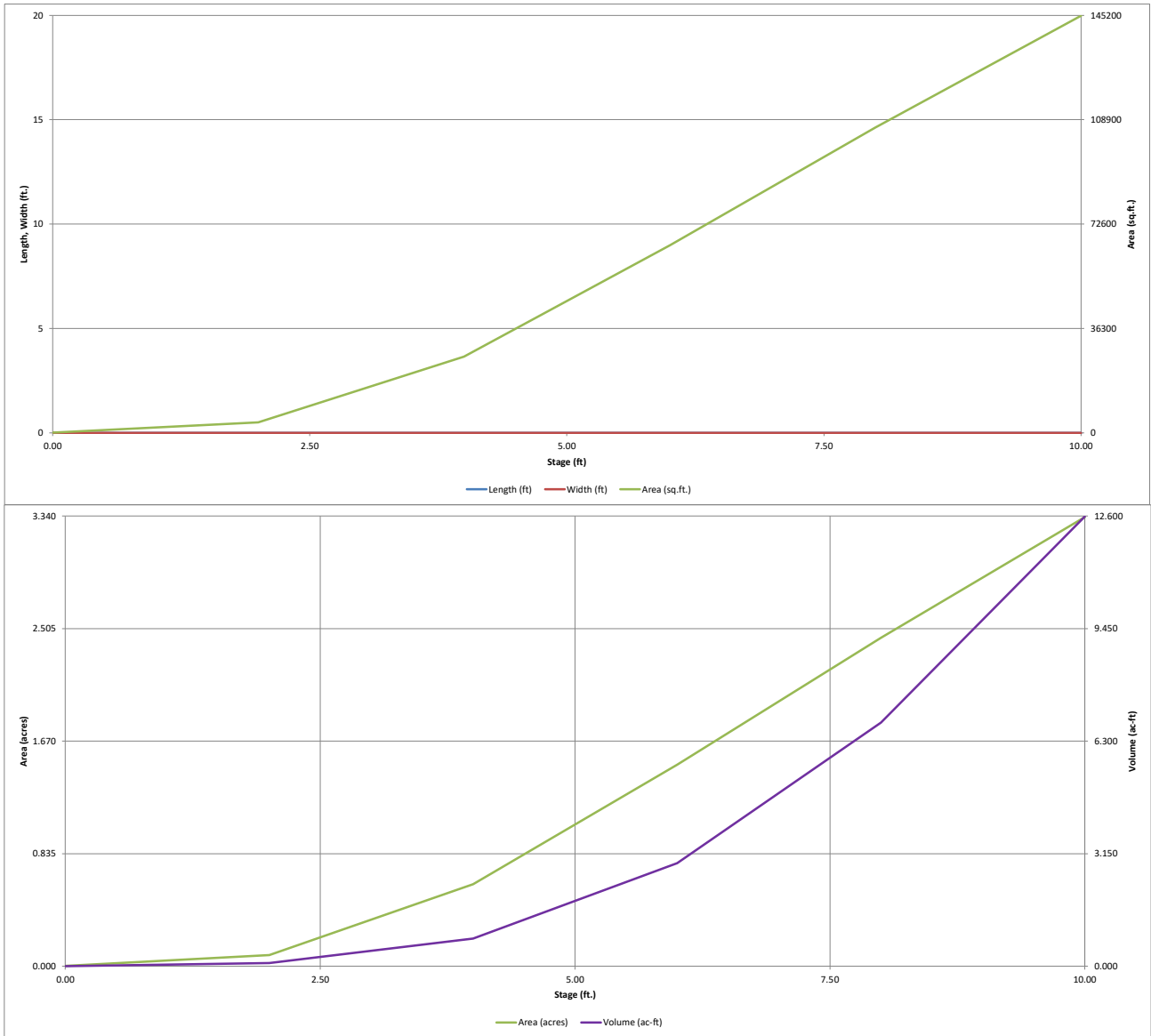




# DETENTION BASIN STAGE-STORAGE TABLE BUILDER

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

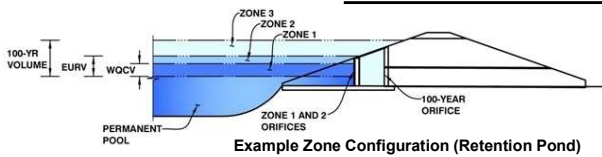


# DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.06 (July 2022)

**Project:** STERLING RANCH EAST FILING NO. 3

**Basin ID:** POND FSD-11B



**Example Zone Configuration (Retention Pond)**

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	4.59	1.207	Orifice Plate
Zone 2 (EURV)	6.73	2.894	Orifice Plate
Zone 3 (100-year)	7.91	2.492	Weir&Pipe (Restrict)
<b>Total (all zones)</b>		<b>6.594</b>	

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

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)
Underdrain Orifice Diameter =	N/A	inches

**Calculated Parameters for Underdrain**

Underdrain Orifice Area =	N/A	ft <sup>2</sup>
Underdrain Orifice Centroid =	N/A	feet

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

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	6.83	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	27.32	inches
Orifice Plate: Orifice Area per Row =	N/A	sq. 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	2.30	4.60					
Orifice Area (sq. inches)	3.14	4.91	15.90					

**User Input:** Vertical Orifice (Circular or Rectangular)

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

**Calculated Parameters for Vertical Orifice**

	Not Selected	Not Selected	
Vertical Orifice Area =	N/A	N/A	ft <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)

	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	6.83	N/A	ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	7.00	N/A	feet
Overflow Weir Grate Slope =	0.00	N/A	H:V
Horiz. Length of Weir Sides =	4.00	N/A	feet
Overflow Grate Type =	Close Mesh Grate	N/A	
Debris Clogging % =	50%	N/A	%

**Calculated Parameters for Overflow Weir**

	Zone 3 Weir	Not Selected	
Height of Grate Upper Edge, H <sub>u</sub> =	6.83	N/A	feet
Overflow Weir Slope Length =	4.00	N/A	feet
Grate Open Area / 100-yr Orifice Area =	7.92	N/A	
Overflow Grate Open Area w/o Debris =	22.15	N/A	ft <sup>2</sup>
Overflow Grate Open Area w/ Debris =	11.07	N/A	ft <sup>2</sup>

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

	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.50	N/A	ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	24.00	N/A	inches
Restrictor Plate Height Above Pipe Invert =	20.00		inches

**Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate**

	Zone 3 Restrictor	Not Selected	
Outlet Orifice Area =	2.80	N/A	ft <sup>2</sup>
Outlet Orifice Centroid =	0.90	N/A	feet
Half-Central Angle of Restrictor Plate on Pipe =	2.30	N/A	radians

**User Input:** Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage =	8.25	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	90.00	feet
Spillway End Slopes =	3.00	H:V
Freeboard above Max Water Surface =	1.00	feet

**Calculated Parameters for Spillway**

Spillway Design Flow Depth =	0.75	feet
Stage at Top of Freeboard =	10.00	feet
Basin Area at Top of Freeboard =	3.33	acres
Basin Volume at Top of Freeboard =	12.59	acre-ft

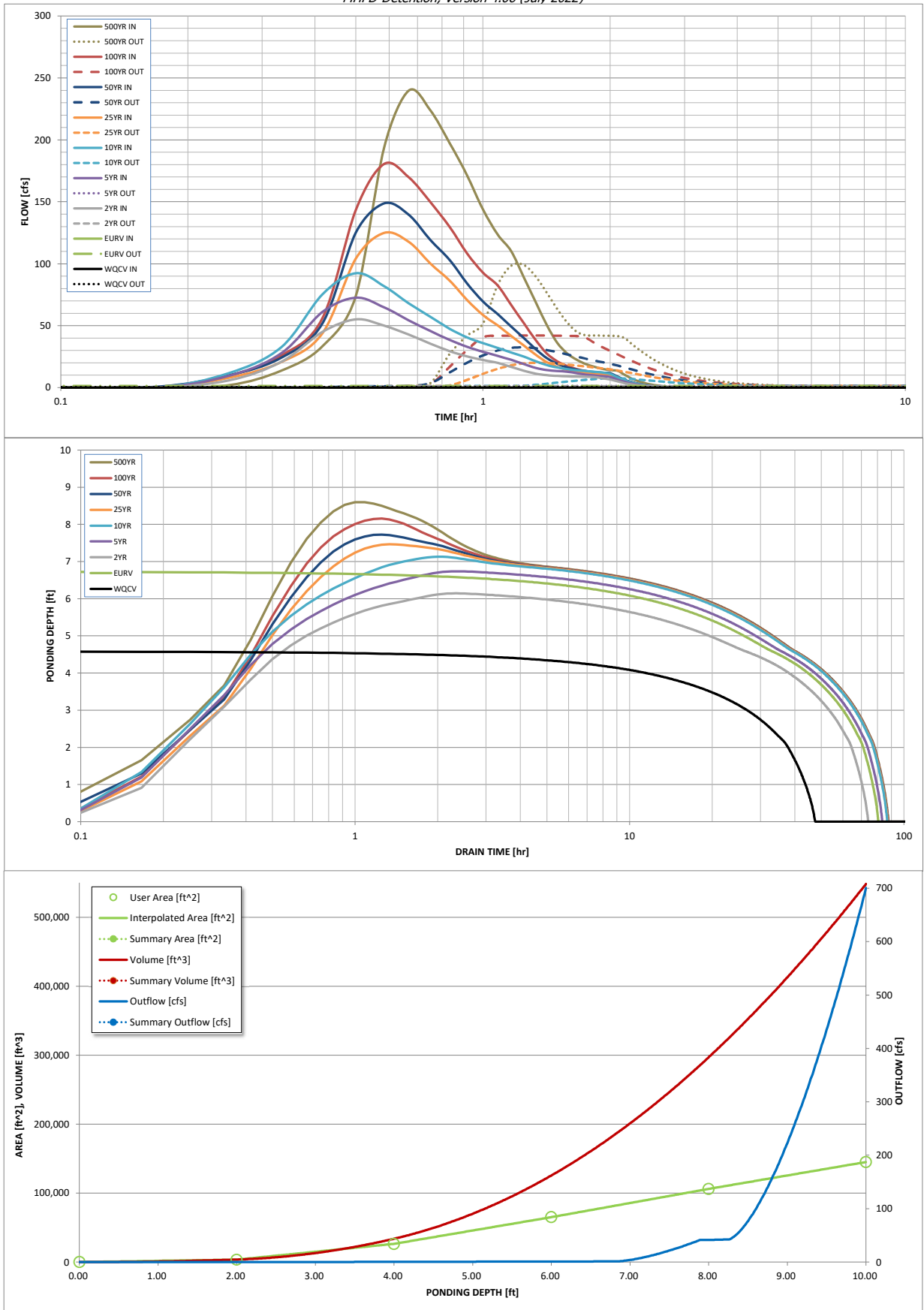
**Routed Hydrograph Results**

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	3.10
One-Hour Rainfall Depth (in) =	N/A	N/A	1.19	1.50	1.75	2.00	2.25	2.52	3.10
CUHP Runoff Volume (acre-ft) =	1.207	4.101	3.296	4.338	5.433	7.032	8.315	10.065	13.312
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	3.296	4.338	5.433	7.032	8.315	10.065	13.312
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.9	1.5	11.4	33.1	46.6	67.2	102.9
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	0.17	0.50	0.70	1.01	1.54
Peak Inflow Q (cfs) =	N/A	N/A	55.1	72.6	92.4	124.8	148.7	180.5	239.7
Peak Outflow Q (cfs) =	0.5	1.4	1.2	1.4	7.6	20.1	32.5	42.1	99.0
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.9	0.7	0.6	0.7	0.6	1.0
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	0.3	0.8	1.4	1.8	1.9
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) =	42	68	64	70	72	70	69	67	64
Time to Drain 99% of Inflow Volume (hours) =	<b>45</b>	75	69	78	80	79	78	77	75
Maximum Ponding Depth (ft) =	4.59	6.73	6.14	6.74	7.13	7.47	7.72	8.15	8.60
Area at Maximum Ponding Depth (acres) =	0.87	1.84	1.56	1.84	2.03	2.18	2.31	2.50	2.70
Maximum Volume Stored (acre-ft) =	1.215	4.102	3.098	4.102	4.876	5.571	6.154	7.189	8.334

# 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	0.00	0.66	0.07	1.99
	0:15:00	0.00	0.00	0.00	5.75	9.45	11.73	7.89	9.91	9.64	13.75
	0:20:00	0.00	0.00	0.00	20.95	27.87	32.86	20.78	24.24	25.95	33.31
	0:25:00	0.00	0.00	0.00	44.93	61.06	75.33	43.86	51.82	56.04	73.80
	0:30:00	0.00	0.00	0.00	55.12	72.62	92.39	104.10	125.01	143.41	193.70
	0:35:00	0.00	0.00	0.00	50.01	64.71	81.84	124.83	148.67	180.50	239.73
	0:40:00	0.00	0.00	0.00	42.81	54.39	68.08	117.66	139.56	169.81	223.91
	0:45:00	0.00	0.00	0.00	35.57	45.69	57.30	100.29	119.31	149.82	197.56
	0:50:00	0.00	0.00	0.00	29.54	38.66	47.58	86.50	103.20	129.84	171.50
	0:55:00	0.00	0.00	0.00	25.20	32.95	40.47	70.78	84.19	108.46	143.66
	1:00:00	0.00	0.00	0.00	22.29	28.93	35.85	58.58	69.47	92.79	123.55
	1:05:00	0.00	0.00	0.00	19.91	25.61	32.05	50.21	59.35	82.44	110.18
	1:10:00	0.00	0.00	0.00	16.67	22.43	28.33	41.68	49.18	66.62	88.91
	1:15:00	0.00	0.00	0.00	13.61	18.98	25.05	33.99	40.01	51.92	69.06
	1:20:00	0.00	0.00	0.00	11.30	15.87	21.24	26.54	31.00	38.33	50.57
	1:25:00	0.00	0.00	0.00	10.04	14.22	18.13	20.62	23.90	27.59	36.14
	1:30:00	0.00	0.00	0.00	9.43	13.39	16.21	16.73	19.29	21.19	27.58
	1:35:00	0.00	0.00	0.00	9.08	12.84	14.90	14.28	16.37	17.44	22.49
	1:40:00	0.00	0.00	0.00	8.89	11.63	13.97	12.78	14.55	14.98	19.10
	1:45:00	0.00	0.00	0.00	8.74	10.55	13.32	11.76	13.33	13.33	16.81
	1:50:00	0.00	0.00	0.00	8.62	9.80	12.86	11.12	12.57	12.20	15.22
	1:55:00	0.00	0.00	0.00	7.59	9.25	12.21	10.66	12.03	11.42	14.14
	2:00:00	0.00	0.00	0.00	6.61	8.58	11.08	10.36	11.67	10.99	13.55
	2:05:00	0.00	0.00	0.00	4.99	6.48	8.27	7.89	8.87	8.37	10.29
	2:10:00	0.00	0.00	0.00	3.57	4.59	5.83	5.55	6.23	5.90	7.24
	2:15:00	0.00	0.00	0.00	2.53	3.25	4.13	3.94	4.42	4.21	5.16
	2:20:00	0.00	0.00	0.00	1.78	2.26	2.90	2.77	3.11	2.97	3.64
	2:25:00	0.00	0.00	0.00	1.22	1.51	1.99	1.90	2.12	2.03	2.48
	2:30:00	0.00	0.00	0.00	0.81	1.01	1.34	1.30	1.45	1.38	1.69
	2:35:00	0.00	0.00	0.00	0.50	0.66	0.86	0.85	0.95	0.91	1.11
	2:40:00	0.00	0.00	0.00	0.27	0.39	0.49	0.50	0.56	0.53	0.64
	2:45:00	0.00	0.00	0.00	0.12	0.19	0.22	0.24	0.27	0.26	0.31
	2:50:00	0.00	0.00	0.00	0.04	0.06	0.06	0.08	0.08	0.08	0.09
	2:55:00	0.00	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	0.00
	3:05:00	0.00	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	0.00
	3:15:00	0.00	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	0.00
	3:25:00	0.00	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	0.00
	3:35:00	0.00	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	0.00
	3:45:00	0.00	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	0.00
	3:55:00	0.00	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	0.00
	4:05:00	0.00	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	0.00
	4:15:00	0.00	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	0.00
	4:25:00	0.00	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	0.00
	4:35:00	0.00	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	0.00
	4:45:00	0.00	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	0.00
	4:55:00	0.00	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	0.00	
5:05:00	0.00	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	0.00	
5:15:00	0.00	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	0.00	
5:25:00	0.00	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	0.00	
5:35:00	0.00	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	0.00	
5:45:00	0.00	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	0.00	
5:55:00	0.00	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	0.00	

