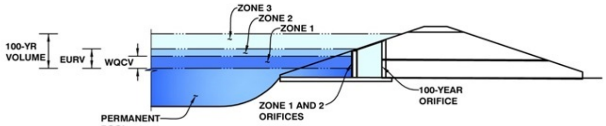
DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)

Project: **Haven Forest School**

Basin ID: **Rain Garden A2**



Example Zone Configuration (Retention Pond)

See comments in drainage report

Depth Increement = | ft

Watershed Information

Selected SCM Type =	**BR**	
Watershed Area =	6.20	acres
Watershed Length =	1,285	ft
Watershed Length to Centroid =	645	ft
Watershed Slope =	0.057	ft/ft
Watershed Imperviousness =	25.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	12.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.056	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.157	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	0.163	acre-feet	1.19	inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.279	acre-feet	1.50	inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.387	acre-feet	1.75	inches
25-yr Runoff Volume (P1 = 2 in.) =	0.556	acre-feet	2.00	inches
50-yr Runoff Volume (P1 = 2.25 in.) =	0.680	acre-feet	2.25	inches
100-yr Runoff Volume (P1 = 2.52 in.) =	0.850	acre-feet	2.52	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	1.173	acre-feet	3.14	inches
Approximate 2-yr Detention Volume =	0.110	acre-feet		
Approximate 5-yr Detention Volume =	0.160	acre-feet		
Approximate 10-yr Detention Volume =	0.243	acre-feet		
Approximate 25-yr Detention Volume =	0.290	acre-feet		
Approximate 50-yr Detention Volume =	0.306	acre-feet		
Approximate 100-yr Detention Volume =	0.369	acre-feet		

Define Zones and Basin Geometry

Zone 1 Volume (WQCV) =	0.056	acre-feet

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Media Surface	--	0.00	--	--	--	1,870	0.043		
RG WSL=7117.0	--	1.00	--	--	--	3,200	0.073	2,535	0.058
Top EL=7118.0	--	2.00	--	--	--	4,530	0.104	6,400	0.147
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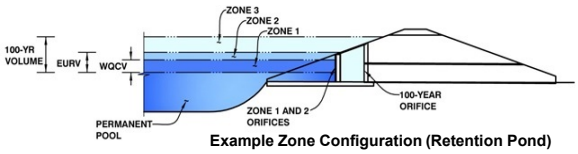
DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)

Project: **Haven Forest School**

Basin ID: **Rain Garden A2**



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	0.97	0.056	Filtration Media
Zone 2			
Zone 3			
Total (all zones)		0.056	

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

Underdrain Orifice Invert Depth =	1.90	ft (distance below the filtration media surface)	Underdrain Orifice Area =	0.0	ft^2
Underdrain Orifice Diameter =	1.18	inches	Underdrain Orifice Centroid =	0.05	feet

Calculated Parameters for Underdrain

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

Centroid of Lowest Orifice =		ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =		ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =		inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =		sq. inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (optional)	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)								
Orifice Area (sq. inches)								

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =			ft^2
Depth at top of Zone using Vertical Orifice =			ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =			feet
Vertical Orifice Diameter =			inches				

Calculated Parameters for Vertical Orifice

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

	Not Selected	Not Selected			Not Selected	Not Selected	
Overflow Weir Front Edge Height, Ho =	1.00		ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	1.00		feet
Overflow Weir Front Edge Length =	4.00		feet	Overflow Weir Slope Length =	2.50		feet
Overflow Weir Grate Slope =	0.00		H:V	Grate Open Area / 100-yr Orifice Area =	3.94		
Horiz. Length of Weir Sides =	2.50		feet	Overflow Grate Open Area w/o Debris =	6.96		ft^2
Overflow Grate Type =	Type C Grate			Overflow Grate Open Area w/ Debris =	3.48		ft^2
Debris Clogging % =	50%		%				

Calculated Parameters for Overflow Weir

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

	Not Selected	Not Selected			Not Selected	Not Selected	
Depth to Invert of Outlet Pipe =	2.00		ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	1.77		ft^2
Circular Orifice Diameter =	18.00		inches	Outlet Orifice Centroid =	0.75		feet
				Half-Central Angle of Restrictor Plate on Pipe =	N/A	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	1.10	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.60	feet
Spillway Crest Length =	4.00	feet	Stage at Top of Freeboard =	1.70	feet
Spillway End Slopes =	4.00	H:V	Basin Area at Top of Freeboard =	0.09	acres
Freeboard above Max Water Surface =	0.00	feet	Basin Volume at Top of Freeboard =	0.12	acre-ft

Calculated Parameters for Spillway

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).

Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
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) =	0.056	0.157	0.163	0.279	0.387	0.556	0.680	0.850	1.173
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.163	0.279	0.387	0.556	0.680	0.850	1.173
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.7	1.6	2.4	4.2	5.3	6.8	9.4
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.11	0.26	0.39	0.68	0.85	1.09	1.52
Peak Inflow Q (cfs) =	N/A	N/A	1.6	2.7	3.6	5.5	6.7	8.3	11.2
Peak Outflow Q (cfs) =	0.1	14.8	1.1	2.4	3.4	5.6	6.8	8.2	11.2
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.5	1.4	1.3	1.3	1.2	1.2
Structure Controlling Flow =	Filtration Media	Filtration Media	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	0.14	0.3	0.4	0.6	0.7	0.8	1.0
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) =	12	11	15	14	14	12	12	11	9
Time to Drain 99% of Inflow Volume (hours) =	**12**	12	16	16	15	15	15	14	14
Maximum Ponding Depth (ft) =	0.97	0.95	1.13	1.20	1.25	1.33	1.37	1.41	1.49
Area at Maximum Ponding Depth (acres) =	0.07	0.07	0.08	0.08	0.08	0.08	0.08	0.09	0.09
Maximum Volume Stored (acre-ft) =	0.056	0.055	0.068	0.073	0.077	0.083	0.087	0.091	0.098

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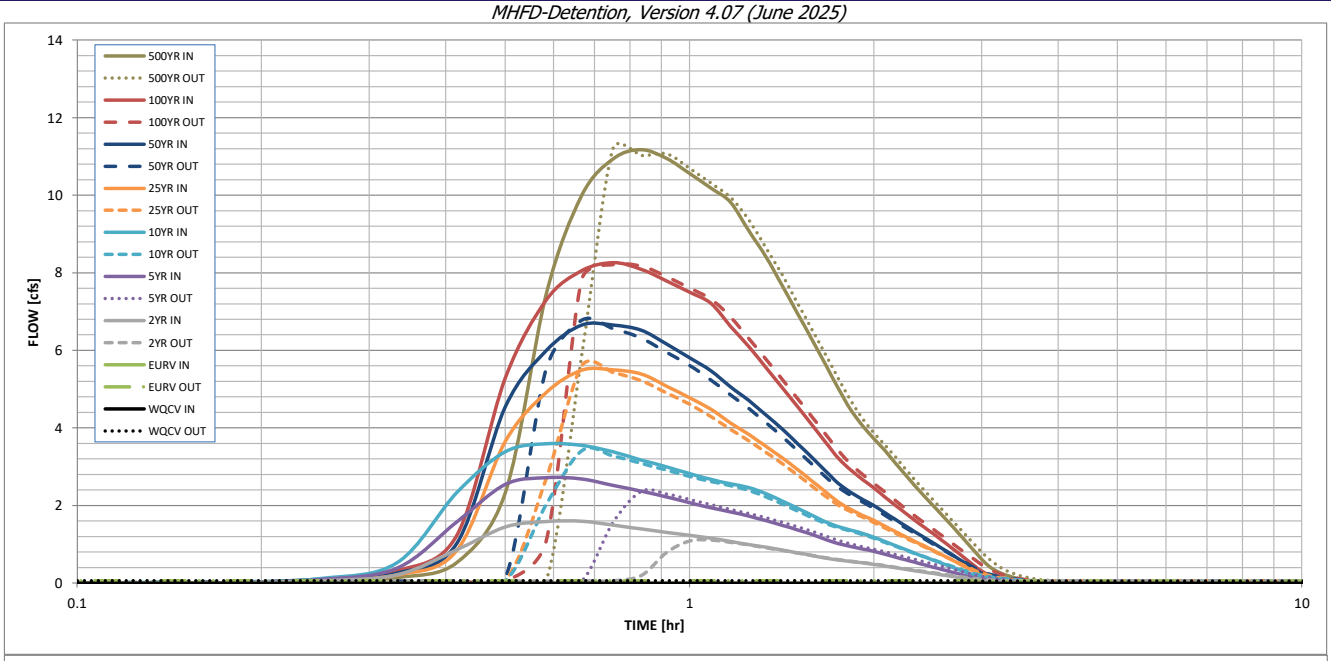

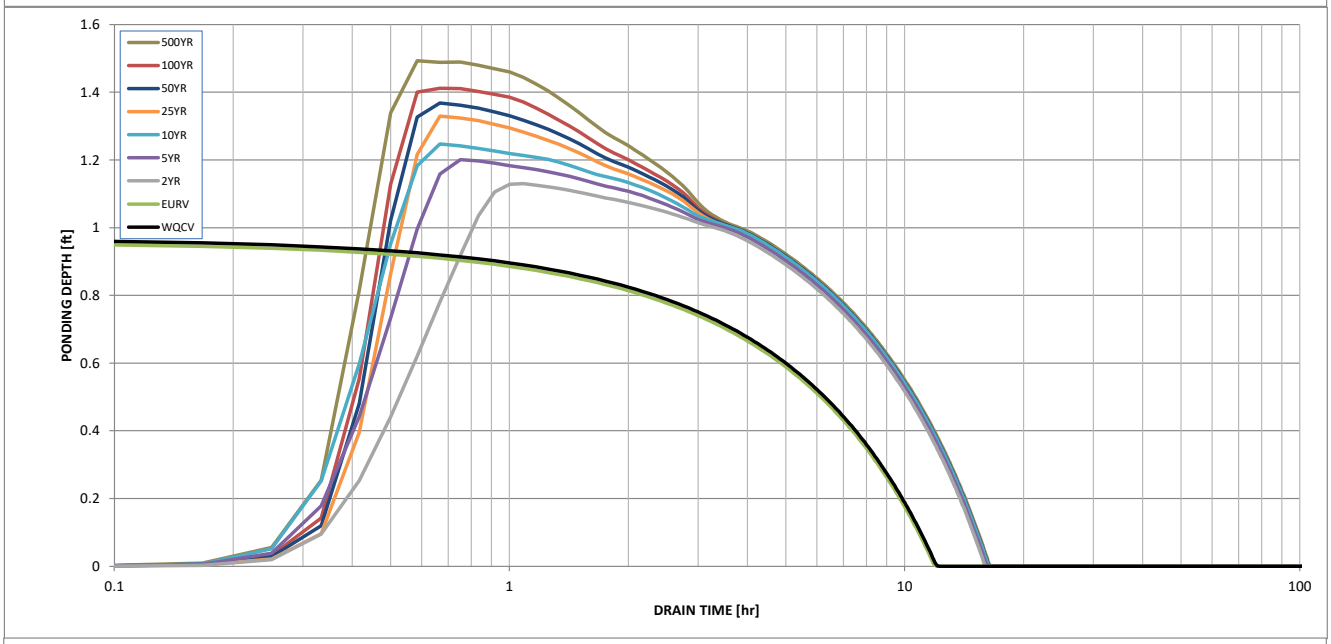

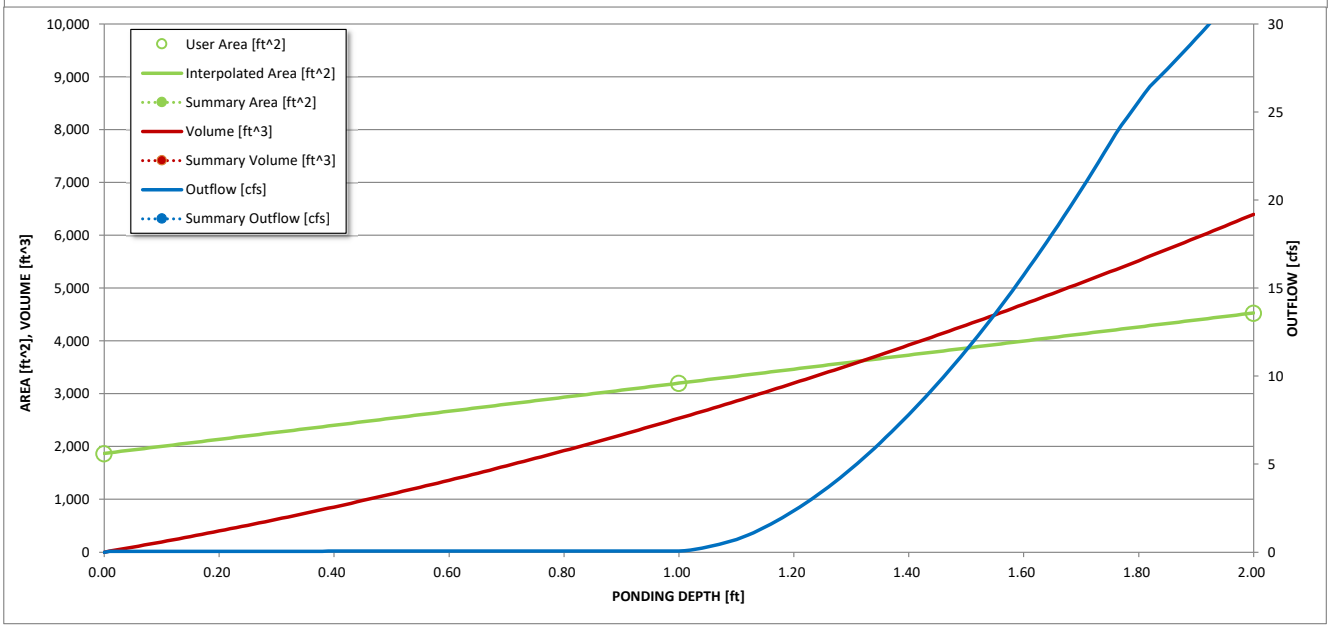

S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

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.

	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.02
	0:15:00	0	0.00	0.06	0.10	0.12	0.08	0.10	0.10	0.14
	0:20:00	0	0.00	0.22	0.40	0.54	0.21	0.26	0.32	0.54
	0:25:00	0	0.00	0.86	1.58	2.34	0.84	1.03	1.24	2.32
	0:30:00	0	0.00	1.45	2.54	3.39	3.65	4.54	5.28	7.45
	0:35:00	0	0.00	1.59	2.72	3.59	4.91	5.99	7.30	10.00
	0:40:00	0	0.00	1.60	2.69	3.55	5.49	6.66	8.06	10.94
	0:45:00	0	0.00	1.50	2.52	3.38	5.50	6.66	8.26	11.18
	0:50:00	0	0.00	1.40	2.38	3.18	5.40	6.53	8.09	10.95
	0:55:00	0	0.00	1.31	2.22	3.00	5.08	6.17	7.79	10.57
	1:00:00	0	0.00	1.23	2.08	2.83	4.78	5.82	7.50	10.19
	1:05:00	0	0.00	1.16	1.94	2.68	4.49	5.48	7.22	9.82
	1:10:00	0	0.00	1.08	1.84	2.56	4.13	5.06	6.62	9.08
	1:15:00	0	0.00	1.00	1.73	2.46	3.83	4.71	6.10	8.41
	1:20:00	0	0.00	0.93	1.61	2.31	3.52	4.33	5.56	7.67
	1:25:00	0	0.00	0.85	1.49	2.12	3.23	3.97	5.04	6.96
	1:30:00	0	0.00	0.78	1.37	1.93	2.93	3.60	4.56	6.29
	1:35:00	0	0.00	0.71	1.26	1.75	2.64	3.25	4.09	5.64
	1:40:00	0	0.00	0.65	1.13	1.58	2.36	2.90	3.64	5.02
	1:45:00	0	0.00	0.60	1.02	1.46	2.09	2.57	3.22	4.47
	1:50:00	0	0.00	0.56	0.95	1.37	1.90	2.34	2.92	4.06
	1:55:00	0	0.00	0.52	0.88	1.28	1.75	2.16	2.67	3.72
	2:00:00	0	0.00	0.49	0.82	1.19	1.62	2.00	2.46	3.43
	2:05:00	0	0.00	0.44	0.75	1.08	1.47	1.82	2.23	3.10
	2:10:00	0	0.00	0.40	0.67	0.97	1.33	1.65	2.01	2.80
	2:15:00	0	0.00	0.36	0.60	0.87	1.20	1.48	1.81	2.51
	2:20:00	0	0.00	0.32	0.54	0.77	1.08	1.33	1.62	2.25
	2:25:00	0	0.00	0.28	0.47	0.68	0.96	1.18	1.44	2.00
	2:30:00	0	0.00	0.25	0.41	0.59	0.84	1.04	1.27	1.76
	2:35:00	0	0.00	0.22	0.35	0.51	0.73	0.90	1.10	1.52
	2:40:00	0	0.00	0.18	0.30	0.43	0.62	0.76	0.94	1.29
	2:45:00	0	0.00	0.15	0.24	0.35	0.51	0.63	0.77	1.06
	2:50:00	0	0.00	0.12	0.19	0.28	0.40	0.50	0.61	0.83
	2:55:00	0	0.00	0.09	0.14	0.21	0.30	0.37	0.45	0.61
	3:00:00	0	0.00	0.06	0.10	0.16	0.21	0.25	0.31	0.43
	3:05:00	0	0.00	0.05	0.08	0.13	0.15	0.18	0.22	0.32
	3:10:00	0	0.00	0.04	0.07	0.11	0.11	0.14	0.16	0.24
	3:15:00	0	0.00	0.03	0.06	0.09	0.08	0.11	0.12	0.17
	3:20:00	0	0.00	0.03	0.05	0.07	0.06	0.08	0.09	0.13
	3:25:00	0	0.00	0.02	0.04	0.06	0.05	0.06	0.06	0.10
	3:30:00	0	0.00	0.02	0.03	0.05	0.04	0.05	0.04	0.07
	3:35:00	0	0.00	0.02	0.02	0.04	0.03	0.04	0.03	0.05
	3:40:00	0	0.00	0.01	0.02	0.03	0.02	0.03	0.03	0.04
	3:45:00	0	0.00	0.01	0.01	0.02	0.02	0.02	0.02	0.03
	3:50:00	0	0.00	0.01	0.01	0.02	0.01	0.02	0.02	0.03
	3:55:00	0	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02
	4:00:00	0	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01
	4:05:00	0	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01
	4:10:00	0	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
	4:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00