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Colorado Springs, CO 80903
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November 11, 2026

El Paso County Planning and Community Development Department
2880 International Circle
Colorado Springs, CO 80910

SUBJECT: Walden Preserve 2 Filing No. 4 (SF-18-034)
Engineer's Certification Letter – Permanent Control Measures

Ladies and Gentlemen:

Drainage Permanent Control Measures (PCM's) for this project include upgrades to one private Detention Basin (Pond B) and construction of one private Rain Garden (RG-C2). The PCM(s) provide the required storage volume and meet the required release rates, storage areas, elevations, and outlet dimensions, as documented by the attached revised MHFD-Detention spreadsheet that shows the as-built conditions. The As-Built drawings accurately depict the installation of the PCM improvements and verify that adequate detention volume has been provided.

Based upon information gathered from periodic site visits to the project, JPS Engineering, Inc. is of the opinion that the Permanent Control Measures have been constructed in general compliance with the approved design plans as filed with El Paso County.

The site and adjacent properties (as affected by work performed under the County permit) appear to be stable with respect to settlement and subsidence, sloughing of cut and fill slopes, revegetation or other ground cover, and the improvements (public improvements, common development improvements, site grading and paving) meet or exceed the minimum design requirements.

Sincerely,
JPS Engineering, Inc.



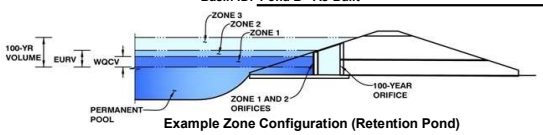
John P. Schwab, P.E.
Colorado P.E. No. 29891

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Walden Preserve

Basin ID: Pond B - As-Built



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	RP	
Watershed Area =	504.70	acres
Watershed Length =	6,870	ft
Watershed Slope =	0.029	ft/ft
Watershed Imperviousness =	10.40%	percent
Percentage Hydrologic Soil Group A =	82.5%	percent
Percentage Hydrologic Soil Group B =	17.5%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Desired WQCV Drain Time =	12.0	hours
Location for 1-hr Rainfall Depths =	User Input	
Water Quality Capture Volume (WQCV) =	2.331	acre-feet
Excess Urban Runoff Volume (EURV) =	4.083	acre-feet
2-yr Runoff Volume (P1 = 1.19 in.) =	2.688	acre-feet
5-yr Runoff Volume (P1 = 1.5 in.) =	3.790	acre-feet
10-yr Runoff Volume (P1 = 1.75 in.) =	5.852	acre-feet
25-yr Runoff Volume (P1 = 2 in.) =	10.973	acre-feet
50-yr Runoff Volume (P1 = 2.25 in.) =	17.533	acre-feet
100-yr Runoff Volume (P1 = 2.52 in.) =	29.086	acre-feet
500-yr Runoff Volume (P1 = 3.14 in.) =	55.540	acre-feet
Approximate 2-yr Detention Volume =	2.486	acre-feet
Approximate 5-yr Detention Volume =	3.515	acre-feet
Approximate 10-yr Detention Volume =	5.249	acre-feet
Approximate 25-yr Detention Volume =	7.155	acre-feet
Approximate 50-yr Detention Volume =	8.849	acre-feet
Approximate 100-yr Detention Volume =	13.388	acre-feet

Optional User Override 1-hr Precipitation	
1.19	inches
1.50	inches
1.75	inches
2.00	inches
2.25	inches
2.52	inches
3.14	inches

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	2.331 acre-feet
Zone 2 Volume (EURV - Zone 1) =	1.752 acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	9.305 acre-feet
Total Detention Basin Volume =	13.388 acre-feet

Depth Increment = ft

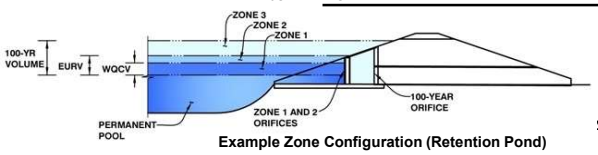
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Permanent Pool	--	0.00	--	--	--	76,766	1.762		
EL=7448.0	--	1.00	--	--	--	84,736	1.945	79,904	1.834
	--	3.00	--	--	--	91,954	2.111	257,441	5.910
	--	5.00	--	--	--	116,593	2.677	465,988	10.698
Spillway=7453.0	--	6.00	--	--	--	134,165	3.080	591,367	13.576
	--	7.00	--	--	--	151,736	3.483	734,317	16.858
Top EL=7456.0	--	9.00	--	--	--	199,982	4.591	1,086,035	24.932
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Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: WALDEN PRESERVE

Basin ID: POND B - As-Built



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.25	2.331	Orifice Plate
Zone 2 (EURV)	2.12	1.752	Orifice Plate
Zone 3 (100-year)	5.94	9.305	Weir&Pipe (Restrict)
		13.388	Total

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

			Calculated Parameters for Underdrain		
Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft²
Underdrain Orifice Diameter =	N/A	inches	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)

			Calculated Parameters for Plate		
Invert of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft²
Depth at top of Zone using Orifice Plate =	2.12	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	8.30	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	inches	Elliptical Slot Area =	N/A	ft²

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	0.71	1.41					
Orifice Area (sq. inches)	100.00	1.23	1.23					

	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		**Calculated Parameters for Vertical Orifice**	Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft²
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

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

	Zone 3 Weir	Not Selected		**Calculated Parameters for Overflow Weir**	Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	4.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	4.00	N/A	feet
Overflow Weir Front Edge Length =	6.00	N/A	feet	Over Flow Weir Slope Length =	0.00	N/A	feet
Overflow Weir Slope =	0.00	N/A	H:V (enter zero for flat grate)	Grate Open Area / 100-yr Orifice Area =	0.00	N/A	should be ≥ 4
Horiz. Length of Weir Sides =	0.00	N/A	feet	Overflow Grate Open Area w/o Debris =	0.00	N/A	ft²
Overflow Grate Open Area % =	70%	N/A	%, grate open area/total area	Overflow Grate Open Area w/ Debris =	0.00	N/A	ft²
Debris Clogging % =	50%	N/A	%				

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**	Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	4.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	10.11	N/A	ft²
Outlet Pipe Diameter =	48.00	N/A	inches	Outlet Orifice Centroid =	1.66	N/A	feet
Restrictor Plate Height Above Pipe Invert =	36.00		inches	Half-Central Angle of Restrictor Plate on Pipe =	2.09	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

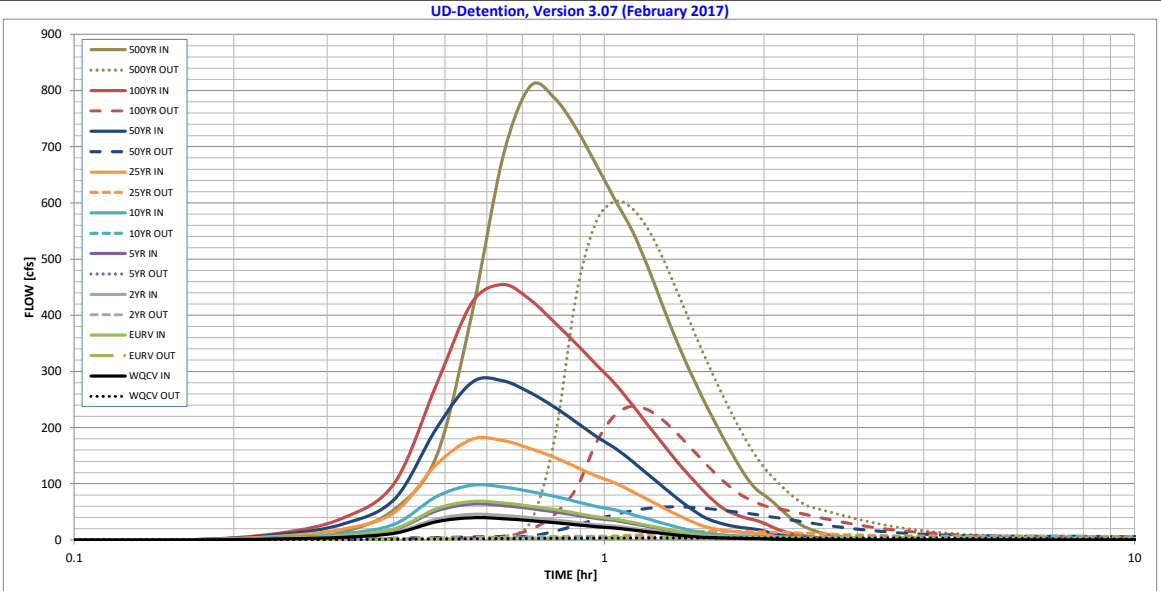
			Calculated Parameters for Spillway		
Spillway Invert Stage=	6.00	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	1.97	feet
Spillway Crest Length =	50.00	feet	Stage at Top of Freeboard =	8.97	feet
Spillway End Slopes =	3.00	H:V	Basin Area at Top of Freeboard =	4.57	acres
Freeboard above Max Water Surface =	1.00	feet			

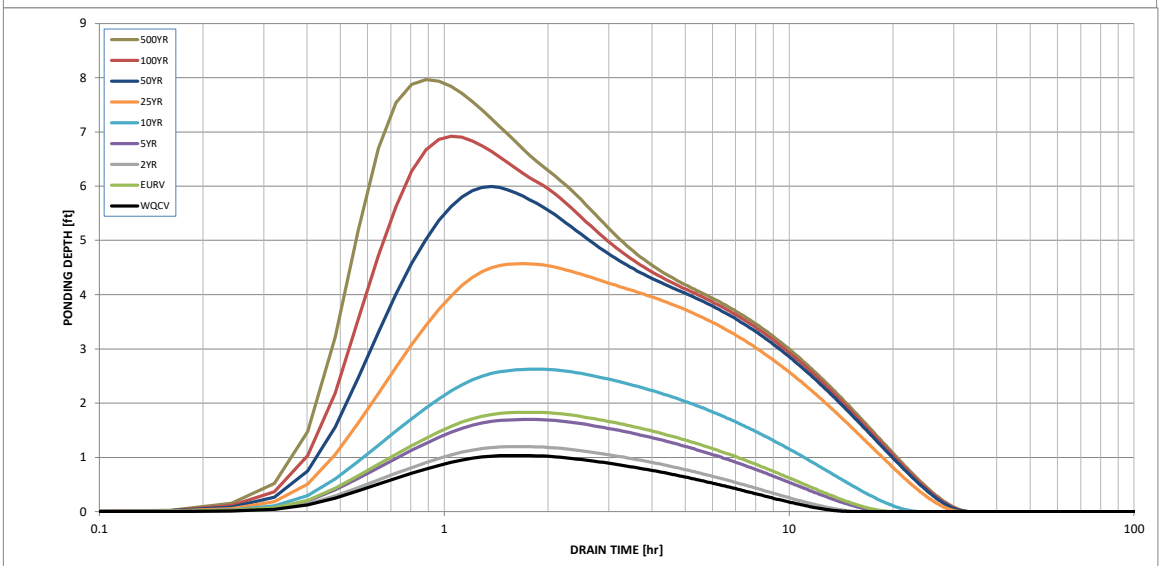
Routed Hydrograph Results

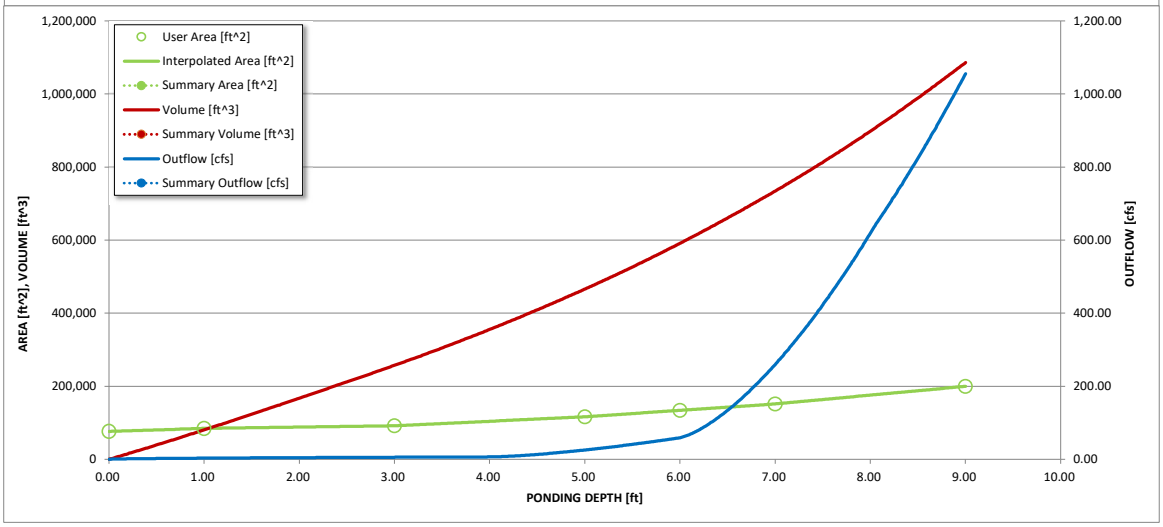
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.14
Calculated Runoff Volume (acre-ft) =	2.331	4.083	2.688	3.790	5.852	10.973	17.533	29.086	55.540
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	2.329	4.081	2.687	3.788	5.850	10.970	17.527	29.076	55.515
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.00	0.01	0.05	0.14	0.34	0.64	1.26
Predevelopment Peak Q (cfs) =	0.0	0.0	1.4	4.1	23.7	72.8	170.2	321.2	635.5
Peak Inflow Q (cfs) =	39.4	68.5	45.4	63.7	97.4	179.4	283.1	454.8	808.1
Peak Outflow Q (cfs) =	3.4	4.6	3.7	4.4	5.5	15.1	59.0	237.9	602.9
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	1.1	0.2	0.2	0.3	0.7	0.9
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Overflow Grate 1	Overflow Grate 1	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	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	N/A
Time to Drain 97% of Inflow Volume (hours) =	13	17	14	16	20	26	26	25	21
Time to Drain 99% of Inflow Volume (hours) =	**14**	18	15	18	22	29	29	28	27
Maximum Ponding Depth (ft) =	1.04	1.83	1.20	1.70	2.63	4.57	5.99	6.92	7.96
Area at Maximum Ponding Depth (acres) =	1.95	2.01	1.96	2.00	2.08	2.55	3.08	3.45	4.02
Maximum Volume Stored (acre-ft) =	1.912	3.497	2.225	3.216	5.114	9.573	13.545	16.580	20.457

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.

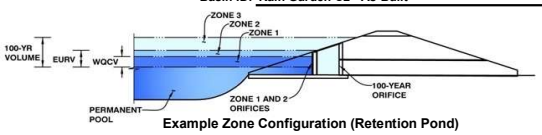
Time Interval	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
4.83 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:04:50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrograph	0:09:40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Constant	0:14:29	1.69	2.85	1.93	2.66	3.90	6.47	9.05	11.50	14.55
1.035	0:19:19	4.62	7.90	5.30	7.37	11.02	19.24	28.52	39.21	55.45
	0:24:09	11.86	20.29	13.61	18.92	28.31	49.44	73.44	102.91	151.20
	0:28:59	32.54	55.63	37.35	51.88	77.54	135.05	199.96	278.60	406.83
	0:33:49	39.42	68.47	45.38	63.65	97.39	179.37	281.21	423.69	683.82
	0:38:38	37.77	65.86	43.51	61.17	94.30	176.92	283.09	454.81	808.05
	0:43:28	34.38	59.98	39.60	55.67	86.12	162.68	262.06	427.10	787.16
	0:48:18	30.89	54.03	35.61	50.15	77.63	146.83	236.73	387.31	731.80
	0:53:08	26.89	47.26	31.04	43.84	68.08	129.40	209.40	348.62	666.38
	0:57:58	23.39	41.25	27.02	38.25	59.52	113.34	183.59	311.32	605.83
	1:02:47	21.19	37.24	24.46	34.55	53.59	101.45	163.47	278.16	551.10
	1:07:37	17.69	31.21	20.43	28.94	45.10	86.25	140.24	240.93	485.96
	1:12:27	14.60	25.86	16.88	23.96	37.44	71.79	116.95	204.86	416.24
	1:17:17	11.47	20.48	13.30	18.96	29.82	57.76	94.82	170.95	354.24
	1:22:07	8.77	15.82	10.19	14.63	23.14	45.15	74.50	140.10	300.93
	1:26:56	6.48	11.81	7.55	10.90	17.39	34.24	57.01	113.26	253.57
	1:31:46	4.90	8.86	5.70	8.19	12.97	25.27	42.31	89.37	212.56
	1:36:36	3.98	7.13	4.61	6.60	10.37	20.01	33.06	68.74	175.06
	1:41:26	3.36	6.00	3.89	5.55	8.71	16.75	27.47	53.83	141.07
	1:46:16	2.93	5.22	3.39	4.83	7.56	14.47	23.62	44.88	111.70
	1:51:05	2.63	4.67	3.04	4.32	6.75	12.88	20.95	38.96	90.85
	1:55:55	2.41	4.27	2.79	3.96	6.18	11.75	19.05	34.79	77.99
	2:00:45	1.78	3.19	2.06	2.95	4.65	9.07	15.06	28.44	65.15
	2:05:35	1.30	2.31	1.50	2.14	3.36	6.53	10.87	21.18	50.73
	2:10:25	0.95	1.71	1.11	1.58	2.49	4.85	8.04	15.39	37.80
	2:15:14	0.71	1.27	0.82	1.17	1.85	3.60	5.97	11.40	28.22
	2:20:04	0.51	0.93	0.60	0.86	1.36	2.66	4.42	8.64	20.97
	2:24:54	0.37	0.67	0.43	0.62	0.98	1.93	3.22	6.46	15.86
	2:29:44	0.27	0.48	0.31	0.45	0.71	1.39	2.32	4.80	12.05
	2:34:34	0.18	0.34	0.21	0.31	0.50	0.99	1.68	3.58	9.14
	2:39:23	0.12	0.22	0.14	0.20	0.33	0.66	1.13	2.63	7.01
	2:44:13	0.06	0.12	0.08	0.11	0.19	0.40	0.70	1.83	5.36
	2:49:03	0.03	0.06	0.03	0.05	0.09	0.20	0.36	1.18	3.93
	2:53:53	0.01	0.02	0.01	0.01	0.03	0.06	0.14	0.67	2.72
	2:58:43	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.30	1.73
	3:03:32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.97
	3:08:22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42
	3:13:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
	3:18:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:22:52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:27:41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:32:31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:37:21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:42:11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:47:01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:51:50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:56:40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:01:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:06:20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:11:10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:44:58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:49:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:54:38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:59:28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:04:17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:09:07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:13:57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:18:47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:23:37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:28:26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:33:16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:38:06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:42:56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:47:46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

UD-Detention, Version 3.07 (February 2017)

Project: Walden Preserve 2 - Filing No. 4

Basin ID: Rain Garden C2 - As-Built



Example Zone Configuration (Retention Pond)

Required Volume Calculation

Selected BMP Type =	RG		
Watershed Area =	22.77	acres	
Watershed Length =	1,670	ft	
Watershed Slope =	0.061	ft/ft	
Watershed Imperviousness =	16.15%	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	
Desired WQCV Drain Time =	12.0	hours	
Location for 1-hr Rainfall Depths =	User Input		
Water Quality Capture Volume (WQCV) =	0.150	acre-feet	Optional User Override 1-hr Precipitation
Excess Urban Runoff Volume (EURV) =	0.359	acre-feet	
2-yr Runoff Volume (P1 = 1.19 in.) =	0.259	acre-feet	1.19 inches
5-yr Runoff Volume (P1 = 1.5 in.) =	0.388	acre-feet	1.50 inches
10-yr Runoff Volume (P1 = 1.75 in.) =	0.721	acre-feet	1.75 inches
25-yr Runoff Volume (P1 = 2 in.) =	1.556	acre-feet	2.00 inches
50-yr Runoff Volume (P1 = 2.25 in.) =	2.086	acre-feet	2.25 inches
100-yr Runoff Volume (P1 = 2.52 in.) =	2.779	acre-feet	2.52 inches
500-yr Runoff Volume (P1 = 3.14 in.) =	4.134	acre-feet	3.14 inches
Approximate 2-yr Detention Volume =	0.241	acre-feet	
Approximate 5-yr Detention Volume =	0.363	acre-feet	
Approximate 10-yr Detention Volume =	0.627	acre-feet	
Approximate 25-yr Detention Volume =	0.806	acre-feet	
Approximate 50-yr Detention Volume =	0.851	acre-feet	
Approximate 100-yr Detention Volume =	1.065	acre-feet	

Stage-Storage Calculation

Zone 1 Volume (WQCV) =	0.150	acre-feet
Zone 2 Volume (User Defined - Zone 1) =	0.510	acre-feet
Select Zone 3 Storage Volume (Optional) =		acre-feet
Total Detention Basin Volume =	0.660	acre-feet

Total detention volume is less than 100-year volume.

Depth Increment = ft

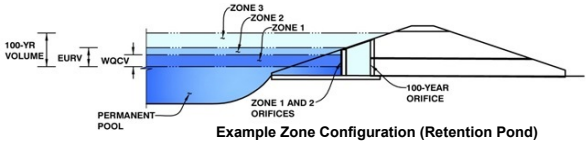
Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Media Surface	--	0.00	--	--	--	6,604	0.152		
WQCV EL=7441.0	--	1.00	--	--	--	8,334	0.191	7,386	0.170
	--	2.00	--	--	--	10,300	0.236	16,683	0.383
Top EL=7443.0	--	3.00	--	--	--	11,721	0.269	27,796	0.638
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Detention Basin Outlet Structure Design

UD-Detention, Version 3.07 (February 2017)

Project: Walden Preserve 2 - Filing No. 4

Basin ID: Rain Garden C2 - As-Built



Example Zone Configuration (Retention Pond)

	Stage (ft)	Zone Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	0.89	0.150	Filtration Media
Zone 2 (User)		0.510	Weir&Pipe (Restrict)
Zone 3			
		0.660	Total

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

Underdrain Orifice Invert Depth =	2.80	ft (distance below the filtration media surface)	
Underdrain Orifice Diameter =	1.88	inches	

Calculated Parameters for Underdrain

Underdrain Orifice Area =	0.0	ft^2
Underdrain Orifice Centroid =	0.08	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 =	N/A	ft (relative to basin bottom at Stage = 0 ft)
Depth at top of Zone using Orifice Plate =	N/A	ft (relative to basin bottom at Stage = 0 ft)
Orifice Plate: Orifice Vertical Spacing =	N/A	inches
Orifice Plate: Orifice Area per Row =	N/A	inches

Calculated Parameters for Plate

WQ Orifice Area per Row =	N/A	ft^2
Elliptical Half-Width =	N/A	feet
Elliptical Slot Centroid =	N/A	feet
Elliptical Slot Area =	N/A	ft^2

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)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

	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)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Orifice Area (sq. inches)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

User Input: Vertical Orifice (Circular or Rectangular)

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

Calculated Parameters for Vertical Orifice

	Not Selected	Not Selected	
Vertical Orifice Area =			ft^2
Vertical Orifice Centroid =			feet

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

	Zone 2 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	0.08		ft (relative to basin bottom at Stage = 0 ft)
Overflow Weir Front Edge Length =	4.00		feet
Overflow Weir Slope =	0.00		H:V (enter zero for flat grate)
Horiz. Length of Weir Sides =	2.50		feet
Overflow Grate Open Area % =	70%		%, grate open area/total area
Debris Clogging % =	50%		%

Calculated Parameters for Overflow Weir

	Zone 2 Weir	Not Selected	
Height of Grate Upper Edge, H_t =	0.08		feet
Over Flow Weir Slope Length =	2.50		feet
Grate Open Area / 100-yr Orifice Area =	821.39		should be ≥ 4
Overflow Grate Open Area w/o Debris =	7.00		ft^2
Overflow Grate Open Area w/ Debris =	3.50		ft^2

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

	Zone 2 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	2.90		ft (distance below basin bottom at Stage = 0 ft)
Outlet Pipe Diameter =	1.25		inches
Restrictor Plate Height Above Pipe Invert =	6.00		inches

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

	Zone 2 Restrictor	Not Selected	
Outlet Orifice Area =	0.01		ft^2
Outlet Orifice Centroid =	0.05		feet
Half-Central Angle of Restrictor Plate on Pipe =	3.14	N/A	radians

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	1.00	ft (relative to basin bottom at Stage = 0 ft)
Spillway Crest Length =	15.00	feet
Spillway End Slopes =	4.00	H:V
Freeboard above Max Water Surface =	1.00	feet

Calculated Parameters for Spillway

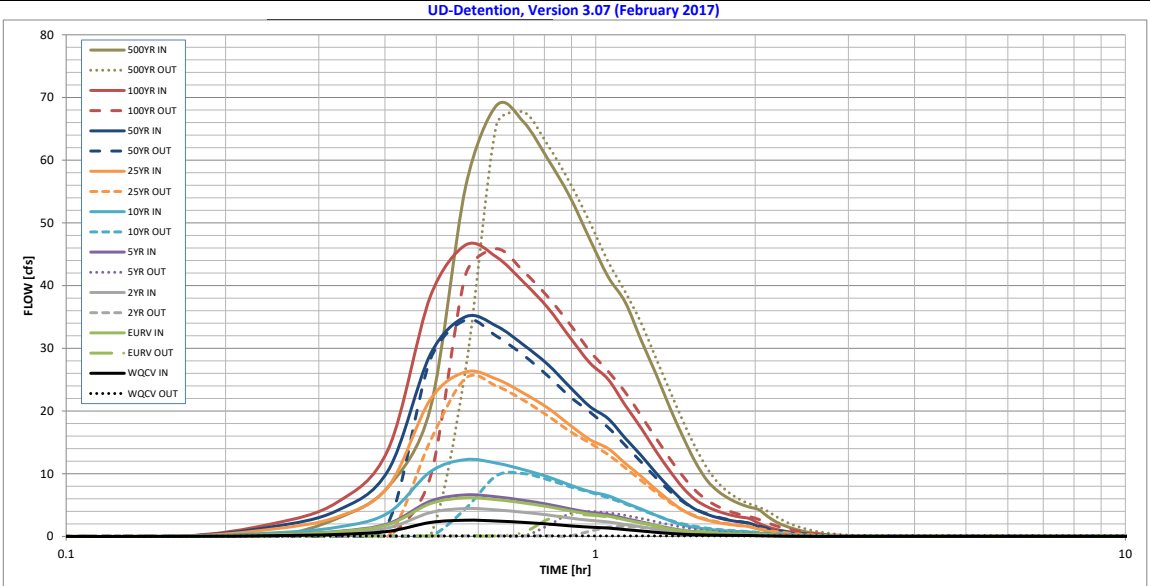
Spillway Design Flow Depth=	0.90	feet
Stage at Top of Freeboard =	2.90	feet
Basin Area at Top of Freeboard =	0.27	acres

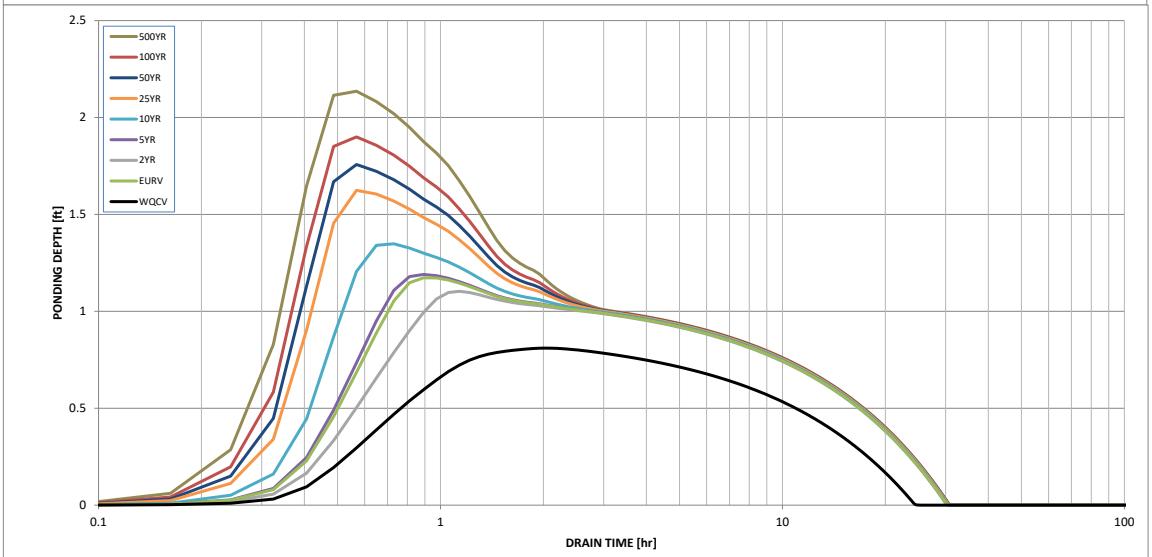
Routed Hydrograph Results

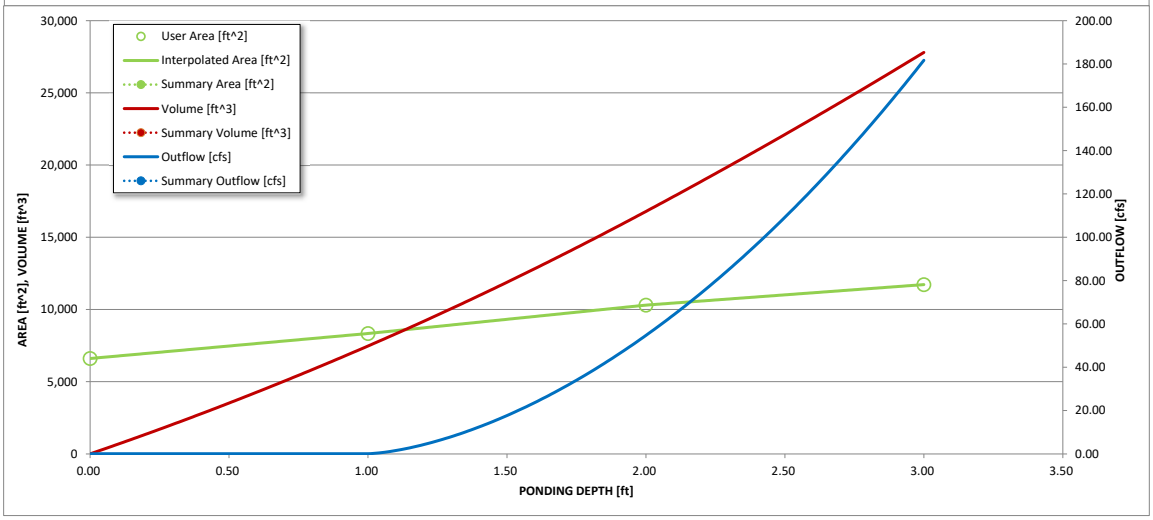
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	0.53	1.07	1.19	1.50	1.75	2.00	2.25	2.52	3.14
Calculated Runoff Volume (acre-ft) =	0.150	0.359	0.259	0.388	0.721	1.556	2.086	2.779	4.134
OPTIONAL Override Runoff Volume (acre-ft) =									
Inflow Hydrograph Volume (acre-ft) =	0.149	0.359	0.258	0.387	0.719	1.555	2.084	2.776	4.130
Predevelopment Unit Peak Flow, q (cfs/acre) =	0.00	0.00	0.01	0.02	0.20	0.66	0.91	1.23	1.82
Predevelopment Peak Q (cfs) =	0.0	0.0	0.3	0.5	4.5	15.1	20.8	28.0	41.4
Peak Inflow Q (cfs) =	2.6	6.2	4.4	6.6	12.2	26.2	35.0	46.5	68.7
Peak Outflow Q (cfs) =	0.1	3.4	1.6	4.0	10.0	25.2	34.5	45.9	67.7
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	8.4	2.2	1.7	1.7	1.6	1.6
Structure Controlling Flow =	Outlet Plate 1	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	-0.01	-0.01	-0.01	0.0	0.0	0.0	0.0	0.0	0.0
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) =	24	29	29	28	27	23	20	17	11
Time to Drain 99% of Inflow Volume (hours) =	**24**	30	30	30	29	28	27	26	24
Maximum Ponding Depth (ft) =	0.81	1.17	1.10	1.19	1.35	1.62	1.76	1.90	2.14
Area at Maximum Ponding Depth (acres) =	0.18	0.20	0.20	0.20	0.21	0.22	0.23	0.23	0.24
Maximum Volume Stored (acre-ft) =	0.136	0.205	0.191	0.209	0.239	0.299	0.328	0.360	0.416

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.

	SOURCE	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK	WORKBOOK
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]
4.87 min	0:00:00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:04:52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Hydrograph	0:09:44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Constant	0:14:37	0.12	0.28	0.20	0.30	0.54	1.14	1.50	1.97	2.85
1.026	0:19:29	0.31	0.74	0.54	0.80	1.46	3.09	4.11	5.43	7.93
	0:24:21	0.81	1.90	1.38	2.05	3.75	7.94	10.56	13.93	20.35
	0:29:13	2.22	5.23	3.79	5.62	10.30	21.81	28.98	38.23	55.79
	0:34:05	2.59	6.16	4.45	6.63	12.25	26.23	35.04	46.48	68.70
	0:38:58	2.46	5.87	4.23	6.32	11.69	25.10	33.56	44.56	66.10
	0:43:50	2.23	5.34	3.85	5.75	10.65	22.85	30.55	40.56	60.20
	0:48:42	1.98	4.75	3.42	5.12	9.51	20.49	27.43	36.47	54.23
	0:53:34	1.69	4.09	2.93	4.41	8.22	17.79	23.86	31.80	47.44
	0:58:26	1.48	3.57	2.56	3.85	7.16	15.46	20.74	27.70	41.41
	1:03:19	1.34	3.23	2.32	3.48	6.49	14.02	18.80	25.07	37.38
	1:08:11	1.09	2.65	1.90	2.86	5.36	11.66	15.68	20.94	31.33
	1:13:03	0.87	2.15	1.54	2.32	4.38	9.60	12.93	17.31	25.96
	1:17:55	0.66	1.64	1.16	1.77	3.38	7.50	10.15	13.64	20.57
	1:22:47	0.47	1.21	0.85	1.31	2.52	5.69	7.74	10.46	15.89
	1:27:40	0.35	0.88	0.62	0.95	1.82	4.16	5.70	7.75	11.86
	1:32:32	0.28	0.69	0.49	0.74	1.41	3.17	4.32	5.85	8.90
	1:37:24	0.23	0.57	0.40	0.61	1.16	2.59	3.51	4.73	7.16
	1:42:16	0.19	0.48	0.34	0.52	0.99	2.19	2.97	3.99	6.02
	1:47:08	0.17	0.42	0.30	0.46	0.86	1.91	2.59	3.48	5.24
	1:52:01	0.16	0.38	0.27	0.41	0.78	1.72	2.32	3.12	4.69
	1:56:53	0.14	0.35	0.25	0.38	0.72	1.58	2.13	2.86	4.29
	2:01:45	0.11	0.26	0.19	0.28	0.53	1.16	1.57	2.12	3.20
	2:06:37	0.08	0.19	0.14	0.21	0.39	0.85	1.15	1.54	2.32
	2:11:29	0.06	0.14	0.10	0.15	0.28	0.62	0.84	1.13	1.71
	2:16:22	0.04	0.10	0.07	0.11	0.21	0.46	0.63	0.84	1.27
	2:21:14	0.03	0.07	0.05	0.08	0.15	0.33	0.45	0.61	0.93
	2:26:06	0.02	0.05	0.04	0.06	0.11	0.24	0.32	0.44	0.67
	2:30:58	0.01	0.04	0.03	0.04	0.08	0.17	0.24	0.32	0.49
	2:35:50	0.01	0.02	0.02	0.03	0.05	0.12	0.16	0.22	0.34
	2:40:43	0.00	0.01	0.01	0.01	0.03	0.07	0.10	0.14	0.22
	2:45:35	0.00	0.01	0.00	0.01	0.01	0.04	0.06	0.08	0.12
	2:50:27	0.00	0.00	0.00	0.00	0.00	0.02	0.02	0.03	0.06
	2:55:19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.02
	3:00:11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:05:04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:09:56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:14:48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:19:40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:24:32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:29:25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:34:17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:39:09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:44:01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:48:53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:53:46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:58:38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:03:30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:08:22	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:13:14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:18:07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:22:59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:27:51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:32:43	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:37:35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:42:28	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:47:20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:52:12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:57:04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:01:56	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:06:49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:11:41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:16:33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:21:25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:26:17	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:31:10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:36:02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00