GREAT BASIN ENGINEERING INC

RIVERBEND
APPROX. 900 S 3500 W
WEBER COUNTY, UTAH 84401
STORM WATER STUDY
Project No. 21N724
6-9-2021
Revised 8-4-2021
Revised 8-24-2021
Revised 11-18-2021

General Site Information:

The proposed residential site is located approximately at 900 South 3500 West. The site is situated about 1,000 ft to the west of the Weber River in Weber County, Utah. Construction will consist of a 95-lot residential subdivision prepared for development along with site grading, sidewalks, curb and gutter, underground utilities, and landscaped areas when completed.

Storm water from the site will be collected in inlet boxes and catch basins and will continue via storm drain to a proposed detention pond to the northeast of the study area. The site is divided into two phases with 47 lots on the west side (Phase 1) and 48 lots on the east side (Phase 2). Each phase is allowed a unit-release of 0.1 cfs per acre for the 100-yr storm. This post-restriction release will be discharged into the Weber River. The attached figure shows the project site and location of the storm water detention facility and outfall. Detention calculations have been provided for the site. (See attached figure and calculations).

The study area is broken up into 6 drainage areas (labeled A-1 through A-6). A runoff coefficient of 0.15 is used for natural ground and landscaped areas. A runoff coefficient of 0.90 is used for asphalt, concrete, buildings, and other hard surfaced areas. An average runoff coefficient was calculated for each of the drainage areas. The calculated coefficients are 0.52, 0.51, 0.46, 0.53, 0.51 and 0.51 for A-1 through A-6 respectively. This yields a coefficient of 0.50 for the overall study area.

Times of concentration are calculated using the FAA method assuming flow resistance coefficients of K=0.35 for landscape and K=0.91 for hardscape for each of the areas. The times of concentration are about 19, 21, 23, 19, 20 and 23 respectively for areas A-1 through A-6. These times are based on the hydraulically longest drainage path inside each respective drainage area over grass or other vegetation, asphalt, concrete, and/or through a pipeline as applicable. Times calculated to be less than 5 minutes are rounded to 5 minutes (as applicable) when using this method. Rainfall Intensities were taken from NOAA Atlas 14 for pipe sizing and detention requirements. The values obtained were interpolated as necessary. A copy of these data is attached.

Data showing area information, runoff coefficient, time of concentration, peak flows, and detention storage requirements for the site are also provided and can be found in the attached calculations.

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Design Requirements:

The design storms and allowable stormwater release rate were found at the weber county website and verified with the County Engineer on 5/28/2021. For storm drain piping, the requirement is listed as the "10-year frequency storm" for multiple initial collection points and conveyance (pipes) and "0.1 cfs/acre per 100-year frequency rainfall event" for major collection (detention pond) of multiple initial systems.

Pipe Sizes:

Storm water pipes in the project are proposed to be concrete pipe (CP), and/or reinforced concrete pipe (RCP). All pipes in the project are sloped to provide the design capacity while maintaining a minimum scour speed of at least 2 feet per second when the pipes are flowing at least half full. The pipes and inlet boxes have enough capacity to convey the 10-year storm without surcharging.

Orifice Plate:

An orifice plate will be used in the detention pond to control the rate that storm water flows from the project. It will be located on the downstream face of the outlet structure labeled as node 53 (See attached figure). The orifice opening is given designation of node 100 for convenience in modeling the reduced flow through the restriction. The orifice plate opening will be sized to allow a release rate of no more than 0.1 cfs/ac. The orifice plate will allow small flows to pass through without detention. As the rate of storm water into the pipes and detention facility increases, the orifice plate will restrict the flow. The maximum flow through the plate will occur when the detention basin reaches the maximum design depth. A detail for an orifice plate can be found in the construction documents for this project.

Required Detention:

The required detention storage for the 100-year storm with a release rate of 0.1 cfs/acre is 91,476 cf. There is capacity provided in the detention facility to meet or exceed this requirement. In the event the detention facility experiences a storm larger than the design storm water will then spill out through an overflow structure and into the Weber River and proceed downstream.

Great Basin Engineering, Inc.

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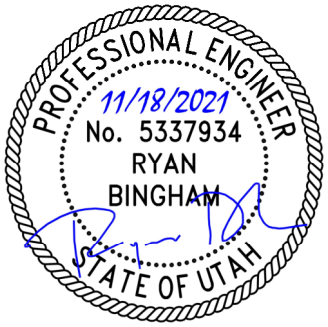
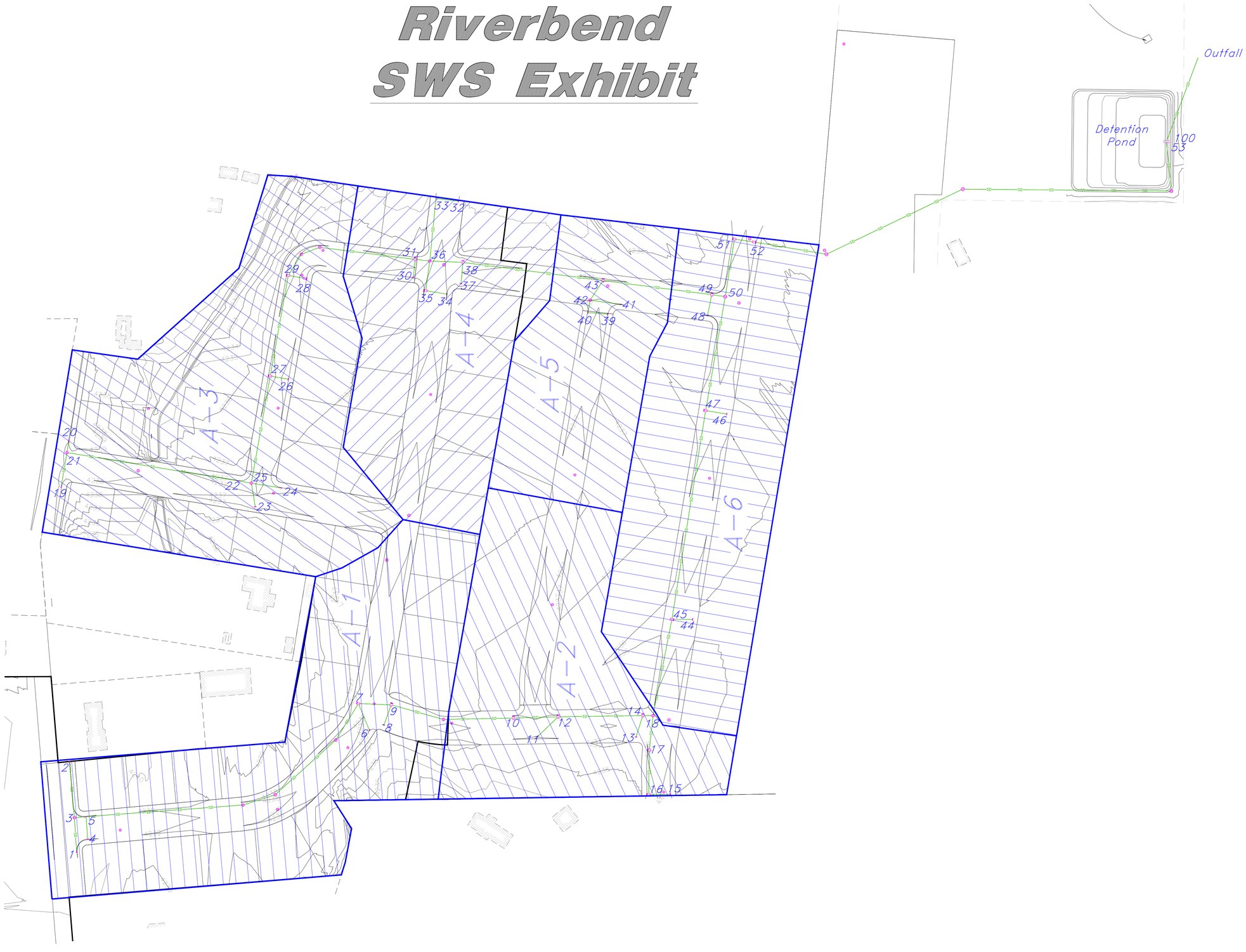


Riverbend
SWS Exhibit

Scale: NTS



Storm Water Calculations
Riverbend
Approx. 900 W 3500 W, Ogden, UT 84401
21N724 SWS Exhib.dwg

1/18/2021

6 Detained Areas

	Zone 1 (ft^2)
Avg. lot size	9794
Avg. home size	2000
Avg. patio/driveway size	1500
C =	0.418

Hardscape C =	0.90
Landscape C =	0.15

		Category Runoff Coefficients				
		0.763	0.775	0.200	0.418	
Drainage Areas	Total Area (acres)	60' Road Area (acres)	66' Road Area (acres)	Common Area (acres)	Zone 1 Area (acres)	**C**
∑ Det. Areas	33.285	2.152	7.281	2.493	21.360	0.502
∑ All Areas	33.285	2.152	7.281	2.493	21.360	0.502
A-1	6.878	0.000	2.140	0.340	4.398	0.518
A-2	4.857	0.600	0.787	0.290	3.181	0.505
A-3	7.508	0.750	1.225	1.746	3.786	0.460
A-4	4.668	0.236	1.212	0.000	3.219	0.528
A-5	3.246	0.565	0.324	0.000	2.357	0.514
A-6	6.128	0.000	1.594	0.117	4.417	0.507

Time of Concentration--use FAA Method

For FAA Method, use K's of..

K =	0.35	for landscape
K =	0.91	for hardscape

$$t_c = \frac{1.8(1.1 - K)\sqrt{L}}{\sqrt[3]{S}}$$

Assume Pipe Flow is at 2 ft/s Scour Speed

**Note: S is in percent, 5 min is smallest allowed Tc

Area	Length on Landscape (ft)	Slope of Landscape (%)	Time on Landscape (min.)	Length on Hardscape (ft)	Slope of Hardscape (%)	Time on Hardscape (min.)	Length in Pipe (ft)	Time in Pipe (min.)	TC for entire Area (min.)
A-1	69.00	2.00	8.90	604.00	1.00	8.41	177.00	1.48	18.78
A-2	123.00	2.00	11.88	359.00	1.00	6.48	285.00	2.38	20.74
A-3	128.00	2.00	12.12	302.00	1.00	5.94	575.00	4.79	22.86
A-4	86.00	2.00	9.94	428.00	1.00	7.08	286.00	2.38	19.40
A-5	120.00	2.00	11.74	311.00	1.00	6.03	208.00	1.73	19.50
A-6	97.00	2.00	10.55	165.00	1.00	4.39	968.00	8.07	23.01

Rainfall Intensities
Data From NOAA

10-Year and 100-Year Intensities

The equations used for the 10-Year and 100-Year Intensities were found using the attached Rainfall data as well as Interpolated data where applicable.

Storm Intensities

AREA	Tc (minutes)	I (10-yr.) (in./hr.)	I (100-yr.) (in./hr.)
A-1	18.8	1.82	3.65
A-2	20.7	1.71	3.44
A-3	22.9	1.63	3.26
A-4	19.4	1.78	3.57
A-5	19.5	1.78	3.56
A-6	23.0	1.62	3.25

Peak Flow Information
Use Rational Method
10-Year and 100-Year Intensities

Q=CIA

					Peak Flows	
				∑ detained =	28.69	57.56
AREA	C	I10 (in./hr.)	I100 (in./hr.)	A (acres)	Q (10-yr.) (cfs)	Q (100-yr.) (cfs)
A-1	0.518	1.820	3.649	6.88	6.49	13.01
A-2	0.505	1.714	3.439	4.86	4.21	8.44
A-3	0.460	1.626	3.262	7.51	5.62	11.27
A-4	0.528	1.782	3.574	4.67	4.39	8.81
A-5	0.514	1.776	3.561	3.25	2.96	5.94
A-6	0.507	1.620	3.249	6.13	5.03	10.09

Node Inlet Requirements

Size pipes for 10 year storm

Area	Node #	% of Total	Q (cfs)
A-1	1	5.0%	0.32
A-1	2	5.0%	0.32
A-1	3	0.0%	0.00
A-1	4	2.0%	0.13
A-1	5	2.0%	0.13
A-1	6	25.0%	1.62
A-1	7	35.0%	2.27
A-1	8	20.0%	1.30
A-1	9	6.0%	0.39
A-2	10	30.0%	1.26
A-2	11	30.0%	1.26
A-2	12	20.0%	0.84
A-2	13	5.0%	0.21
A-2	14	5.0%	0.21
A-2	15	5.0%	0.21
A-2	16	3.0%	0.13
A-2	17	2.0%	0.08
A-2	18	0.0%	0.00
A-3	19	8.0%	0.45
A-3	20	8.0%	0.45
A-3	21	0.0%	0.00
A-3	22	10.0%	0.56
A-3	23	15.0%	0.84
A-3	24	5.0%	0.28
A-3	25	0.0%	0.00
A-3	26	15.0%	0.84
A-3	27	15.0%	0.84
A-3	28	12.0%	0.67
A-3	29	12.0%	0.67
A-4	30	5.0%	0.22
A-4	31	5.0%	0.22
A-4	32	5.0%	0.22
A-4	33	5.0%	0.22
A-4	34	35.0%	1.54
A-4	35	35.0%	1.54
A-4	36	0.0%	0.00
A-4	37	5.0%	0.22
A-4	38	5.0%	0.22
A-5	39	40.0%	1.18
A-5	40	40.0%	1.18
A-5	41	5.0%	0.15
A-5	42	0.0%	0.00
A-5	43	15.0%	0.44
A-6	44	20.0%	1.01
A-6	45	20.0%	1.01
A-6	46	20.0%	1.01
A-6	47	20.0%	1.01
A-6	48	5.0%	0.25
A-6	49	5.0%	0.25
A-6	50	0.0%	0.00
A-6	51	5.0%	0.25
A-6	52	5.0%	0.25
A-6	53	0.0%	0.00
A-6	100	-504.5%	(25.37)

PIPE FLOWS

Upstream Node	Downstream node	Pipe Flow (cfs)
1	3	0.32
2	3	0.32
3	5	0.65
4	5	0.13
5	7	0.91
6	7	1.62
7	9	4.80
8	9	1.30
9	10	6.49
10	12	7.75
11	12	1.26
12	14	9.85
13	14	0.21
14	18	10.28
15	16	0.21
16	17	0.34
17	18	0.42
18	45	10.70
19	21	0.45
20	21	0.45
21	22	0.90
22	25	1.46
23	25	0.84
24	25	0.28
25	27	2.58
26	27	0.84
27	29	4.27
28	29	0.67
29	31	5.62
30	31	0.22
31	36	6.06
32	33	0.22
33	36	0.44
34	35	1.54
35	36	3.08
36	38	9.57
37	38	0.22
38	43	10.01
39	40	1.18
40	42	2.37
41	42	0.15
42	43	2.52
43	49	12.97
44	45	1.01
45	47	12.71
46	47	1.01
47	50	14.72
48	49	0.25
49	50	13.47
50	51	28.19
51	52	28.44
52	53	28.69
53	100	28.69
100	Outfall	3.33

Options for Pipe Sizes Between the Specified Nodes

Up Stream Node	Dn Stream Node	Q (cfs)	Pipe Size (in)	Design Min Slope (%)	Area (ft^2)	Rh (ft)	Manning's n	Scour Min. Slope (%)	First Trial Pipe Size
1	3	0.32	15	0.003%	1.227	0.313	0.013	0.000%	**15**
		0.32	18	0.001%	1.767	0.375	0.013	0.000%	
		0.32	24	0.000%	3.142	0.500	0.013	0.000%	
2	3	0.32	15	0.003%	1.227	0.313	0.013	0.000%	**15**
		0.32	18	0.001%	1.767	0.375	0.013	0.000%	
		0.32	24	0.000%	3.142	0.500	0.013	0.000%	
3	5	0.65	15	0.010%	1.227	0.313	0.013	0.000%	**15**
		0.65	18	0.004%	1.767	0.375	0.013	0.000%	
		0.65	24	0.001%	3.142	0.500	0.013	0.000%	
4	5	0.13	15	0.000%	1.227	0.313	0.013	0.000%	**15**
		0.13	18	0.000%	1.767	0.375	0.013	0.000%	
		0.13	24	0.000%	3.142	0.500	0.013	0.000%	
5	7	0.91	15	0.020%	1.227	0.313	0.013	0.000%	**15**
		0.91	18	0.007%	1.767	0.375	0.013	0.000%	
		0.91	24	0.002%	3.142	0.500	0.013	0.000%	
6	7	1.62	15	0.063%	1.227	0.313	0.013	0.000%	**15**
		1.62	18	0.024%	1.767	0.375	0.013	0.000%	
		1.62	24	0.005%	3.142	0.500	0.013	0.000%	
7	9	4.80	15	0.552%	1.227	0.313	0.013	0.000%	**18**
		4.80	18	0.209%	1.767	0.375	0.013	0.000%	
		4.80	24	0.045%	3.142	0.500	0.013	0.000%	
8	9	1.30	15	0.040%	1.227	0.313	0.013	0.000%	**15**
		1.30	18	0.015%	1.767	0.375	0.013	0.000%	
		1.30	24	0.003%	3.142	0.500	0.013	0.000%	
9	10	6.49	15	1.008%	1.227	0.313	0.013	0.000%	**18**
		6.49	18	0.381%	1.767	0.375	0.013	0.000%	
		6.49	24	0.082%	3.142	0.500	0.013	0.000%	
10	12	7.75	15	1.439%	1.227	0.313	0.013	0.000%	**24**
		7.75	18	0.544%	1.767	0.375	0.013	0.000%	
		7.75	24	0.117%	3.142	0.500	0.013	0.000%	
11	12	1.26	15	0.038%	1.227	0.313	0.013	0.000%	**15**
		1.26	18	0.014%	1.767	0.375	0.013	0.000%	
		1.26	24	0.003%	3.142	0.500	0.013	0.000%	
12	14	9.85	15	2.327%	1.227	0.313	0.013	0.000%	**24**
		9.85	18	0.880%	1.767	0.375	0.013	0.000%	
		9.85	24	0.190%	3.142	0.500	0.013	0.000%	
13	14	0.21	15	0.001%	1.227	0.313	0.013	0.000%	**15**
		0.21	18	0.000%	1.767	0.375	0.013	0.000%	
		0.21	24	0.000%	3.142	0.500	0.013	0.000%	

14	18	10.28	15	2.530%	1.227	0.313	0.013	0.000%	**24**
		10.28	18	0.957%	1.767	0.375	0.013	0.000%	
		10.28	24	0.206%	3.142	0.500	0.013	0.000%	
15	16	0.21	15	0.001%	1.227	0.313	0.013	0.000%	**15**
		0.21	18	0.000%	1.767	0.375	0.013	0.000%	
		0.21	24	0.000%	3.142	0.500	0.013	0.000%	
16	17	0.34	15	0.003%	1.227	0.313	0.013	0.000%	**15**
		0.34	18	0.001%	1.767	0.375	0.013	0.000%	
		0.34	24	0.000%	3.142	0.500	0.013	0.000%	
17	18	0.42	15	0.004%	1.227	0.313	0.013	0.000%	**15**
		0.42	18	0.002%	1.767	0.375	0.013	0.000%	
		0.42	24	0.000%	3.142	0.500	0.013	0.000%	
18	45	10.70	15	2.741%	1.227	0.313	0.013	0.000%	**24**
		10.70	18	1.037%	1.767	0.375	0.013	0.000%	
		10.70	24	0.224%	3.142	0.500	0.013	0.000%	
19	21	0.45	15	0.005%	1.227	0.313	0.013	0.000%	**15**
		0.45	18	0.002%	1.767	0.375	0.013	0.000%	
		0.45	24	0.000%	3.142	0.500	0.013	0.000%	
20	21	0.45	15	0.005%	1.227	0.313	0.013	0.000%	**15**
		0.45	18	0.002%	1.767	0.375	0.013	0.000%	
		0.45	24	0.000%	3.142	0.500	0.013	0.000%	
21	22	0.90	15	0.019%	1.227	0.313	0.013	0.000%	**15**
		0.90	18	0.007%	1.767	0.375	0.013	0.000%	
		0.90	24	0.002%	3.142	0.500	0.013	0.000%	
22	25	1.46	15	0.051%	1.227	0.313	0.013	0.000%	**15**
		1.46	18	0.019%	1.767	0.375	0.013	0.000%	
		1.46	24	0.004%	3.142	0.500	0.013	0.000%	
23	25	0.84	15	0.017%	1.227	0.313	0.013	0.000%	**15**
		0.84	18	0.006%	1.767	0.375	0.013	0.000%	
		0.84	24	0.001%	3.142	0.500	0.013	0.000%	
24	25	0.28	15	0.002%	1.227	0.313	0.013	0.000%	**15**
		0.28	18	0.001%	1.767	0.375	0.013	0.000%	
		0.28	24	0.000%	3.142	0.500	0.013	0.000%	
25	27	2.58	15	0.160%	1.227	0.313	0.013	0.000%	**15**
		2.58	18	0.060%	1.767	0.375	0.013	0.000%	
		2.58	24	0.013%	3.142	0.500	0.013	0.000%	
26	27	0.84	15	0.017%	1.227	0.313	0.013	0.000%	**15**
		0.84	18	0.006%	1.767	0.375	0.013	0.000%	
		0.84	24	0.001%	3.142	0.500	0.013	0.000%	
27	29	4.27	15	0.436%	1.227	0.313	0.013	0.000%	**15**
		4.27	18	0.165%	1.767	0.375	0.013	0.000%	
		4.27	24	0.036%	3.142	0.500	0.013	0.000%	

28	29	0.67	15	0.011%	1.227	0.313	0.013	0.000%	**15**
		0.67	18	0.004%	1.767	0.375	0.013	0.000%	
		0.67	24	0.001%	3.142	0.500	0.013	0.000%	
29	31	5.62	15	0.756%	1.227	0.313	0.013	0.000%	**18**
		5.62	18	0.286%	1.767	0.375	0.013	0.000%	
		5.62	24	0.062%	3.142	0.500	0.013	0.000%	
30	31	0.22	15	0.001%	1.227	0.313	0.013	0.000%	**15**
		0.22	18	0.000%	1.767	0.375	0.013	0.000%	
		0.22	24	0.000%	3.142	0.500	0.013	0.000%	
31	36	6.06	15	0.878%	1.227	0.313	0.013	0.000%	**18**
		6.06	18	0.332%	1.767	0.375	0.013	0.000%	
		6.06	24	0.072%	3.142	0.500	0.013	0.000%	
32	33	0.22	15	0.001%	1.227	0.313	0.013	0.000%	**15**
		0.22	18	0.000%	1.767	0.375	0.013	0.000%	
		0.22	24	0.000%	3.142	0.500	0.013	0.000%	
33	36	0.44	15	0.005%	1.227	0.313	0.013	0.000%	**15**
		0.44	18	0.002%	1.767	0.375	0.013	0.000%	
		0.44	24	0.000%	3.142	0.500	0.013	0.000%	
34	35	1.54	15	0.057%	1.227	0.313	0.013	0.000%	**15**
		1.54	18	0.021%	1.767	0.375	0.013	0.000%	
		1.54	24	0.005%	3.142	0.500	0.013	0.000%	
35	36	3.08	15	0.227%	1.227	0.313	0.013	0.000%	**15**
		3.08	18	0.086%	1.767	0.375	0.013	0.000%	
		3.08	24	0.018%	3.142	0.500	0.013	0.000%	
36	38	9.57	15	2.194%	1.227	0.313	0.013	0.000%	**24**
		9.57	18	0.830%	1.767	0.375	0.013	0.000%	
		9.57	24	0.179%	3.142	0.500	0.013	0.000%	
37	38	0.22	15	0.001%	1.227	0.313	0.013	0.000%	**15**
		0.22	18	0.000%	1.767	0.375	0.013	0.000%	
		0.22	24	0.000%	3.142	0.500	0.013	0.000%	
38	43	10.01	15	2.401%	1.227	0.313	0.013	0.000%	**24**
		10.01	18	0.908%	1.767	0.375	0.013	0.000%	
		10.01	24	0.196%	3.142	0.500	0.013	0.000%	
39	40	1.18	15	0.034%	1.227	0.313	0.013	0.000%	**15**
		1.18	18	0.013%	1.767	0.375	0.013	0.000%	
		1.18	24	0.003%	3.142	0.500	0.013	0.000%	
40	42	2.37	15	0.134%	1.227	0.313	0.013	0.000%	**15**
		2.37	18	0.051%	1.767	0.375	0.013	0.000%	
		2.37	24	0.011%	3.142	0.500	0.013	0.000%	
41	42	0.15	15	0.001%	1.227	0.313	0.013	0.000%	**15**
		0.15	18	0.000%	1.767	0.375	0.013	0.000%	
		0.15	24	0.000%	3.142	0.500	0.013	0.000%	

42	43	2.52	15	0.152%	1.227	0.313	0.013	0.000%	**15**
		2.52	18	0.057%	1.767	0.375	0.013	0.000%	
		2.52	24	0.012%	3.142	0.500	0.013	0.000%	
43	49	12.97	15	4.030%	1.227	0.313	0.013	0.000%	**24**
		12.97	18	1.524%	1.767	0.375	0.013	0.000%	
		12.97	24	0.329%	3.142	0.500	0.013	0.000%	
44	45	1.01	15	0.024%	1.227	0.313	0.013	0.000%	**15**
		1.01	18	0.009%	1.767	0.375	0.013	0.000%	
		1.01	24	0.002%	3.142	0.500	0.013	0.000%	
45	47	12.71	15	3.869%	1.227	0.313	0.013	0.000%	**24**
		12.71	18	1.463%	1.767	0.375	0.013	0.000%	
		12.71	24	0.315%	3.142	0.500	0.013	0.000%	
46	47	1.01	15	0.024%	1.227	0.313	0.013	0.000%	**15**
		1.01	18	0.009%	1.767	0.375	0.013	0.000%	
		1.01	24	0.002%	3.142	0.500	0.013	0.000%	
47	50	14.72	18	1.963%	1.767	0.375	0.013	0.000%	**24**
		14.72	24	0.423%	3.142	0.500	0.013	0.000%	
		14.72	30	0.129%	4.909	0.625	0.013	0.000%	
48	49	0.25	15	0.002%	1.227	0.313	0.013	0.000%	**15**
		0.25	18	0.001%	1.767	0.375	0.013	0.000%	
		0.25	24	0.000%	3.142	0.500	0.013	0.000%	
49	50	13.47	15	4.349%	1.227	0.313	0.013	0.000%	**24**
		13.47	18	1.645%	1.767	0.375	0.013	0.000%	
		13.47	24	0.355%	3.142	0.500	0.013	0.000%	
50	51	28.19	24	1.553%	3.142	0.500	0.013	0.000%	**30**
		28.19	30	0.472%	4.909	0.625	0.013	0.000%	
		28.19	36	0.179%	7.069	0.750	0.013	0.000%	
51	52	28.44	24	1.581%	3.142	0.500	0.013	0.000%	**30**
		28.44	30	0.481%	4.909	0.625	0.013	0.000%	
		28.44	36	0.182%	7.069	0.750	0.013	0.000%	
52	53	28.69	24	1.609%	3.142	0.500	0.013	0.000%	**30**
		28.69	30	0.489%	4.909	0.625	0.013	0.000%	
		28.69	36	0.185%	7.069	0.750	0.013	0.000%	
53	100	28.69	24	1.609%	3.142	0.500	0.013	0.000%	**30**
		28.69	30	0.489%	4.909	0.625	0.013	0.000%	
		28.69	36	0.185%	7.069	0.750	0.013	0.000%	
100	Outfall	3.33	15	0.265%	1.227	0.313	0.013	0.000%	**15**
		3.33	18	0.100%	1.767	0.375	0.013	0.000%	
		3.33	24	0.022%	3.142	0.500	0.013	0.000%	

Riverbend

Combined Detention Facility

C = 0.50

Area = 33.29 acres

Remaining Unit Discharge = 0.100 cfs/acre

Release through Restriction = 3.329 cfs

Detention Pond Sized For The 100 Year Storm

Time	Rainfall Intensity	Accumulated Volume	Allowable Release	Needed Detention	
min	in./hr.	(CF)	(CF)	(CF)	
5	6.54	32787	999	31788	
10	4.97	49832	1997	47835	
15	4.11	61814	2996	58818	
20	3.50	70200	3994	66205	
25	3.08	77289	4993	72296	
30	2.77	83321	5991	77330	
35	2.54	89082	6990	82092	
40	2.31	92639	7988	84650	
45	2.12	95645	8987	86658	
50	1.96	98085	9986	88099	
55	1.82	100360	10984	89376	
60	1.71	102873	11983	90890	
90	1.21	109450	17974	91476	<- Req. Det.
120	0.93	112378	23965	88413	
180	0.64	114965	35948	79017	
360	0.36	128140	71896	56244	
720	0.22	156656	143793	12863	
1440	0.12	173260	287585	-114325	

Required Storage Volume = **91476** ft^3

NOAA Atlas 14, Volume 1, Version 5
Location name: Ogden, Utah, USA*
Latitude: 41.2558°, Longitude: -112.0612°
Elevation: 4232.68 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.126** (0.110-0.146)	**0.158** (0.140-0.184)	**0.217** (0.190-0.251)	**0.272** (0.236-0.315)	**0.361** (0.306-0.421)	**0.445** (0.365-0.526)	**0.545** (0.432-0.651)	**0.664** (0.506-0.810)	**0.856** (0.616-1.08)	**1.04** (0.708-1.33)
10-min	**0.192** (0.167-0.222)	**0.241** (0.213-0.280)	**0.330** (0.289-0.382)	**0.413** (0.359-0.479)	**0.550** (0.466-0.641)	**0.677** (0.555-0.800)	**0.829** (0.657-0.991)	**1.01** (0.770-1.23)	**1.30** (0.937-1.64)	**1.58** (1.08-2.03)
15-min	**0.238** (0.207-0.275)	**0.299** (0.264-0.347)	**0.409** (0.358-0.473)	**0.512** (0.445-0.594)	**0.682** (0.578-0.795)	**0.839** (0.688-0.992)	**1.03** (0.814-1.23)	**1.25** (0.955-1.53)	**1.62** (1.16-2.04)	**1.95** (1.34-2.52)
30-min	**0.321** (0.279-0.370)	**0.402** (0.355-0.466)	**0.550** (0.482-0.637)	**0.690** (0.600-0.800)	**0.918** (0.778-1.07)	**1.13** (0.927-1.34)	**1.38** (1.10-1.65)	**1.69** (1.29-2.06)	**2.17** (1.57-2.74)	**2.63** (1.80-3.39)
60-min	**0.397** (0.345-0.458)	**0.498** (0.440-0.577)	**0.681** (0.597-0.788)	**0.854** (0.742-0.990)	**1.14** (0.963-1.32)	**1.40** (1.15-1.65)	**1.71** (1.36-2.05)	**2.09** (1.59-2.55)	**2.69** (1.94-3.39)	**3.26** (2.23-4.19)
2-hr	**0.499** (0.442-0.572)	**0.625** (0.554-0.715)	**0.807** (0.712-0.924)	**0.984** (0.855-1.13)	**1.28** (1.09-1.48)	**1.55** (1.28-1.82)	**1.87** (1.50-2.23)	**2.25** (1.74-2.75)	**2.87** (2.09-3.61)	**3.44** (2.38-4.43)
3-hr	**0.585** (0.526-0.657)	**0.720** (0.646-0.812)	**0.901** (0.806-1.01)	**1.07** (0.950-1.21)	**1.34** (1.17-1.53)	**1.60** (1.36-1.84)	**1.91** (1.59-2.24)	**2.29** (1.84-2.75)	**2.91** (2.22-3.65)	**3.48** (2.54-4.47)
6-hr	**0.792** (0.725-0.871)	**0.965** (0.880-1.07)	**1.17** (1.06-1.29)	**1.35** (1.22-1.50)	**1.63** (1.45-1.82)	**1.86** (1.63-2.10)	**2.13** (1.84-2.43)	**2.42** (2.04-2.82)	**3.04** (2.47-3.68)	**3.60** (2.84-4.51)
12-hr	**1.01** (0.932-1.10)	**1.23** (1.14-1.35)	**1.49** (1.37-1.63)	**1.71** (1.56-1.87)	**2.05** (1.85-2.26)	**2.32** (2.07-2.58)	**2.62** (2.29-2.95)	**2.94** (2.51-3.37)	**3.42** (2.84-4.02)	**3.83** (3.09-4.59)
24-hr	**1.23** (1.13-1.33)	**1.50** (1.39-1.63)	**1.80** (1.66-1.95)	**2.04** (1.88-2.21)	**2.37** (2.18-2.57)	**2.63** (2.41-2.84)	**2.89** (2.64-3.13)	**3.15** (2.86-3.42)	**3.51** (3.16-4.06)	**3.87** (3.38-4.63)
2-day	**1.42** (1.32-1.54)	**1.74** (1.62-1.89)	**2.07** (1.92-2.23)	**2.34** (2.17-2.52)	**2.70** (2.50-2.90)	**2.97** (2.74-3.20)	**3.25** (2.99-3.50)	**3.52** (3.23-3.80)	**3.88** (3.53-4.20)	**4.15** (3.75-4.68)
3-day	**1.55** (1.44-1.67)	**1.90** (1.76-2.05)	**2.26** (2.09-2.43)	**2.55** (2.37-2.75)	**2.95** (2.73-3.17)	**3.26** (3.01-3.51)	**3.57** (3.28-3.85)	**3.89** (3.55-4.20)	**4.30** (3.90-4.66)	**4.61** (4.15-5.11)
4-day	**1.68** (1.55-1.81)	**2.05** (1.90-2.21)	**2.44** (2.27-2.63)	**2.77** (2.56-2.98)	**3.21** (2.96-3.45)	**3.55** (3.27-3.82)	**3.90** (3.58-4.20)	**4.25** (3.88-4.60)	**4.72** (4.26-5.13)	**5.07** (4.55-5.55)
7-day	**1.97** (1.83-2.14)	**2.42** (2.24-2.62)	**2.87** (2.67-3.10)	**3.25** (3.01-3.50)	**3.75** (3.47-4.03)	**4.13** (3.82-4.45)	**4.51** (4.16-4.86)	**4.89** (4.49-5.30)	**5.39** (4.91-5.86)	**5.76** (5.21-6.29)
10-day	**2.23** (2.07-2.41)	**2.73** (2.53-2.95)	**3.24** (3.01-3.48)	**3.64** (3.38-3.91)	**4.16** (3.87-4.47)	**4.55** (4.21-4.88)	**4.92** (4.55-5.29)	**5.28** (4.87-5.69)	**5.74** (5.27-6.20)	**6.06** (5.54-6.58)
20-day	**2.87** (2.67-3.09)	**3.52** (3.27-3.79)	**4.15** (3.86-4.46)	**4.63** (4.31-4.97)	**5.24** (4.88-5.61)	**5.67** (5.28-6.07)	**6.08** (5.65-6.52)	**6.46** (5.99-6.94)	**6.92** (6.40-7.45)	**7.23** (6.68-7.80)
30-day	**3.44** (3.21-3.69)	**4.21** (3.93-4.52)	**4.94** (4.61-5.28)	**5.49** (5.13-5.87)	**6.19** (5.78-6.61)	**6.68** (6.23-7.14)	**7.16** (6.66-7.65)	**7.59** (7.05-8.13)	**8.12** (7.51-8.71)	**8.47** (7.82-9.12)
45-day	**4.24** (3.95-4.54)	**5.17** (4.83-5.54)	**6.04** (5.66-6.45)	**6.71** (6.30-7.16)	**7.55** (7.08-8.04)	**8.14** (7.62-8.67)	**8.69** (8.13-9.26)	**9.19** (8.58-9.79)	**9.76** (9.11-10.4)	**10.1** (9.45-10.8)
60-day	**5.00** (4.68-5.35)	**6.11** (5.71-6.54)	**7.13** (6.68-7.62)	**7.91** (7.42-8.44)	**8.89** (8.33-9.47)	**9.58** (8.97-10.2)	**10.2** (9.56-10.9)	**10.8** (10.1-11.5)	**11.5** (10.7-12.3)	**11.9** (11.1-12.7)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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