

Courtyard I
7500 Jefferson St. NE
Albuquerque, NM
87109-4335

www.bhinc.com

voice: 505.823.1000

facsimile: 505.798.7988

toll free: 800.877.5332

MEMORANDUM

DATE: 19 January 2022

TO: Ernest Armijo, PE – COA Hydrology

FROM: Olin Brown, PE – BHI

SUBJECT: Inspiration Subdivision – Pond 1 Revisions (CN 651183)

The intent of this memorandum is to notify the City of Albuquerque Hydrology Section of an as-built condition within the Inspiration Subdivision that varies from the original design and approved drainage report. Bohannon Huston, Inc. received as-built survey information for the Pond 1 constructed within the Inspiration Subdivision as part of Phase 1A. Due to grading constraints on the north side of the pond, the as-built survey indicated that the pond volume was less than the volume required in the approved drainage report. BHI has re-evaluated the hydrologic and hydraulic models for the system and has recommended grading modifications to ensure the appropriate pond and downstream storm drain performance, per the City of Albuquerque Design Process Manual.

The original pond design provided 2.41 acre-feet of storage with a bottom elevation of 5550.00 feet and a top (spillway crest) elevation of 5556.00 feet. The pond outlet was designed to be 2.0' above the pond bottom to create a stormwater quality volume below the outlet (0.8 acre-feet). The as-built data indicated that the pond bottom and spillway elevations were constructed per plan, but the grading constraints along the north side of the pond results in a resultant volume of only 1.54 ac-ft. This grading information was incorporated into the HEC-HMS model for the project. Under these conditions, the pond failed by overtopping during the 100-year, 24-hour storm event. As such, BHI developed alternative solutions to ensure the pond functions as the original design intended.

BHI recommends excavating the pond bottom an additional 2.0 feet (proposed bottom elevation of 5548.00 feet), while leaving the outlet pipe and spillway unchanged. This will increase the total pond storage to approximately 1.80 acre-feet and increase the stormwater quality volume below the outlet pipe to be 0.93 acre-feet (see attached Grading Plan and Stage-Storage information). These changes will still allow the 100-year, 24-hour water surface elevation (WSEL) to be approximately 6 inches below the emergency spillway crest elevation. With the changes in the WSEL, the effective headwater increases, which increases the discharge out of the outlet pipe to the downstream storm drain system. As such, BHI backchecked the hydraulic grade line (HGL) analysis for the impacted storm drain system. Using the previously approved hydraulic model (Stormwater Studio) that applies the current HEC-22 methodology, the HGL was shown to still be below any of the top of grate elevations and the energy grade line (EGL) shown to be within the right-of-way. The following table summarizes the changes to the Pond 1.

Table 1 – Pond 1 Summary Table

Pond Bottom Elevation	5548.00 ft
Emergency Spillway Crest Elevation	5556.00 ft
Spillway Width	69.0 ft
Spillway Capacity	108.4 cfs
Top of Pond Elevation	5556.00 ft
Outlet Size	24 in RCP
Outlet Elevation	5552.00 ft
Maximum Pond Volume	1.80 ac-ft
Q100, Inflow (6hr)	63.9 cfs
Q100, Outflow (6hr)	13.2 cfs
V100 (6hr)	1.39 ac-ft
WSEL-100yr (6hr)	5554.32 ft
Q100, Inflow (24hr)	72.8 cfs
Q100, Outflow (24hr)	18.1 cfs
V100 (24hr)	1.65 ac-ft
WSEL-100yr (24hr)	5555.54 ft
SWQV	0.93 ac-ft

This data will be included in the as-built record drawings for the project. Attached is the 100-year HGL results (including the model plan and profile) from Stormwater Studio analysis software.

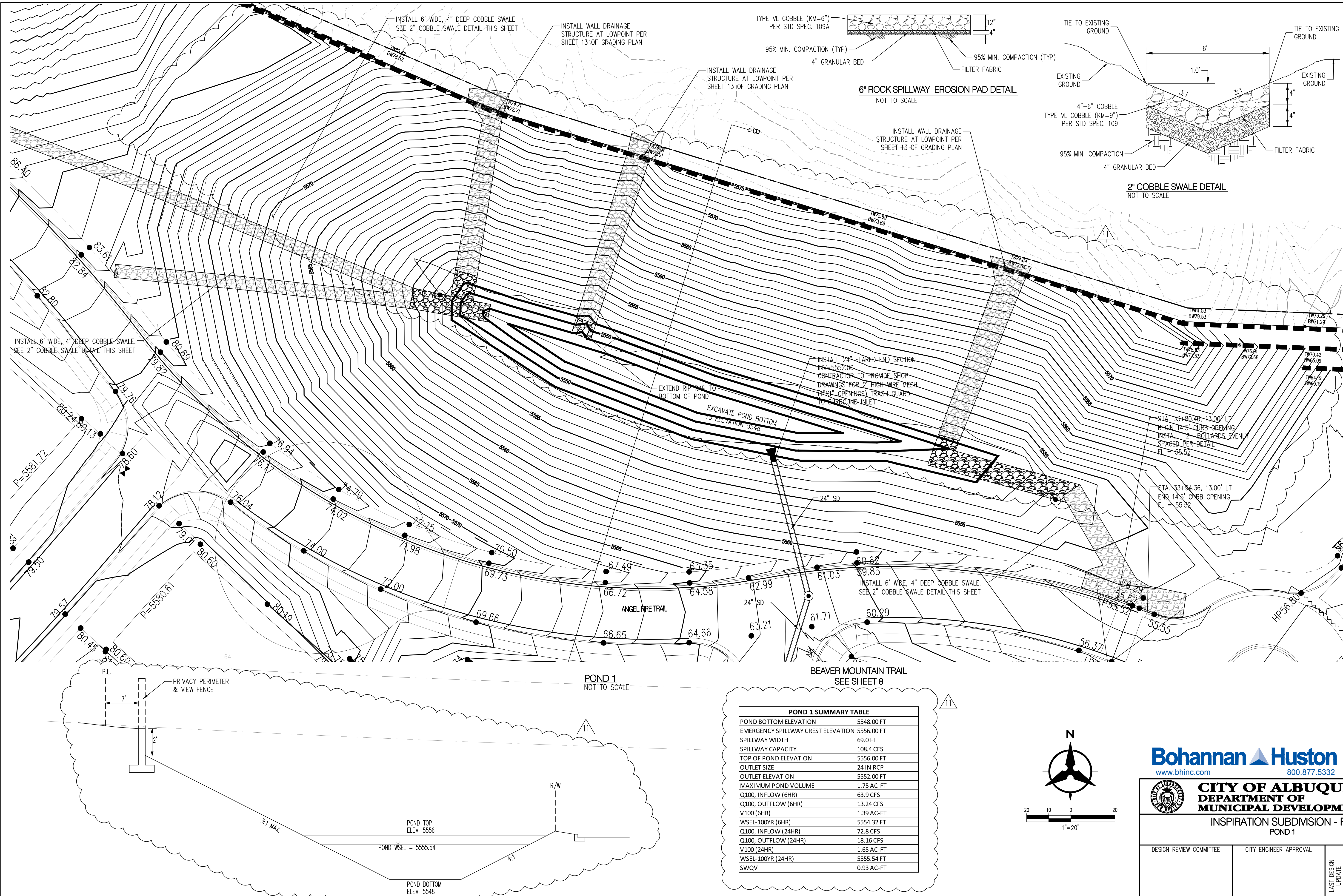
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Attachments

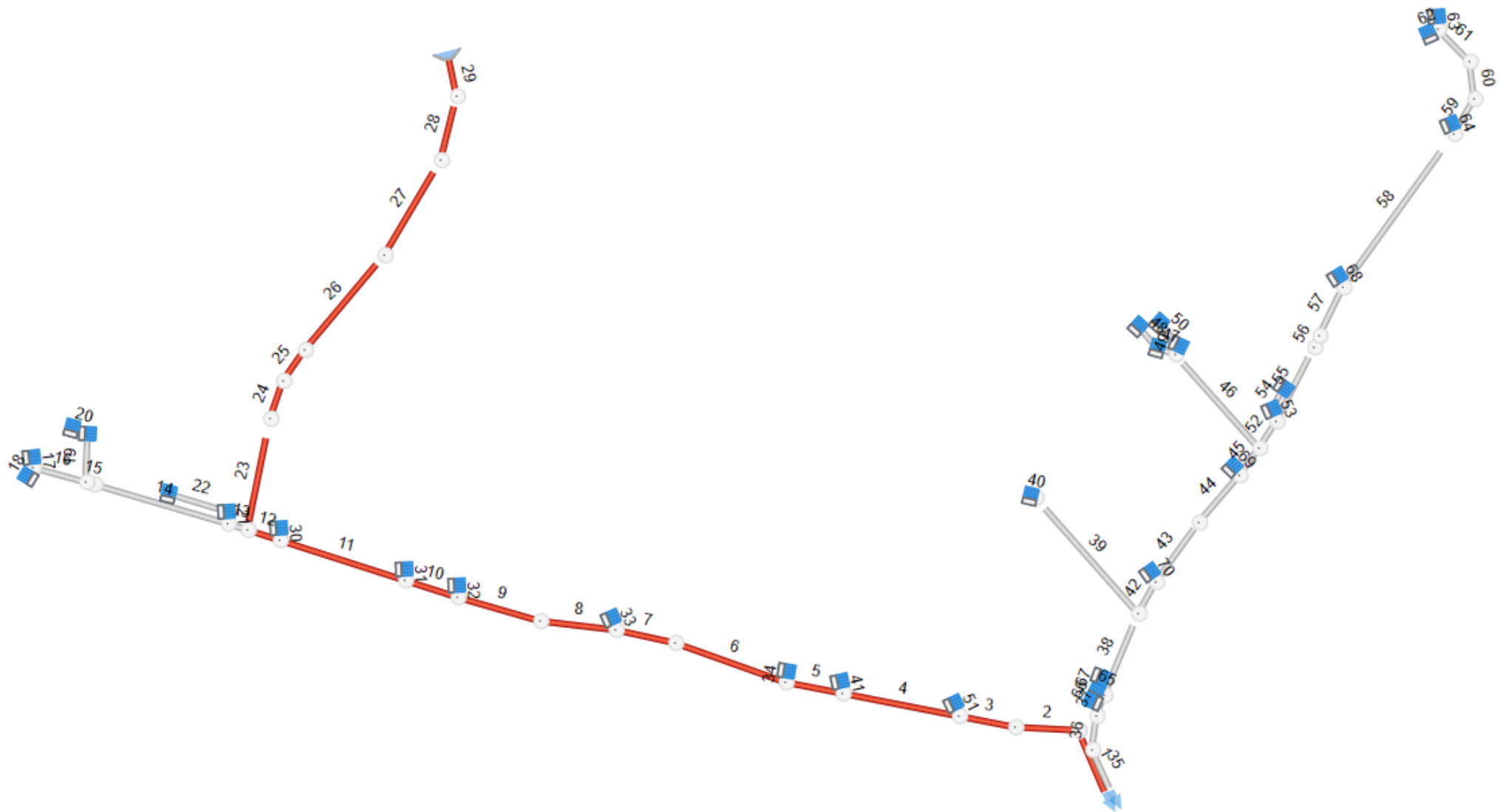
Pond 1 Stage-Storage Curve for Revised Grading

Project:

Basin Description:

Contour Elevation	Area	Contour (ft) (sq. ft)	Depth Volume	Incremental Volume Avg. End Avg. End (cu. ft) (cu. ft)	Cumulative Volume Conic (cu. ft)	Incremental Volume Conic (cu. ft)	Cumulative Volume
5,548.000		1,240.02	N/A	N/A	0.00	N/A	0.00
5,549.000		2,724.21	1.000	1982.12	1982.12		1934.06
	1934.06						
5,551.000		6,796.55	2.000	9520.76	11502.88	9215.80	11149.86
5,552.000		9,294.76	1.000	8045.66	19548.54	8013.14	19163.00
5,553.000		11,961.02	1.000	10627.89	30176.43	10599.91	29762.91
5,554.000		14,919.69	1.000	13440.36	43616.78	13413.14	43176.04
5,555.000		17,952.86	1.000	16436.28	60053.06	16412.90	59588.95
5,556.000		20,506.86	1.000	19229.86	79282.92	19215.71	78804.66=1.80acft
5,557.000		22,297.75	1.000	21402.31	100685.23	21396.06	100200.72
5,558.000		24,704.60	1.000	23501.17	124186.40	23490.90	123691.62
5,559.000		25,109.35	1.000	24906.98	149093.38	24906.70	148598.32
5,560.000		26,529.41	1.000	25819.38	174912.76	25816.13	174414.45
5,561.000		28,553.86	1.000	27541.64	202454.40	27535.43	201949.88
5,562.000		30,557.29	1.000	29555.57	232009.97	29549.91	231499.79
5,563.000		32,504.97	1.000	31531.13	263541.10	31526.11	263025.91
5,564.000		34,396.88	1.000	33450.92	296992.02	33446.46	296472.37



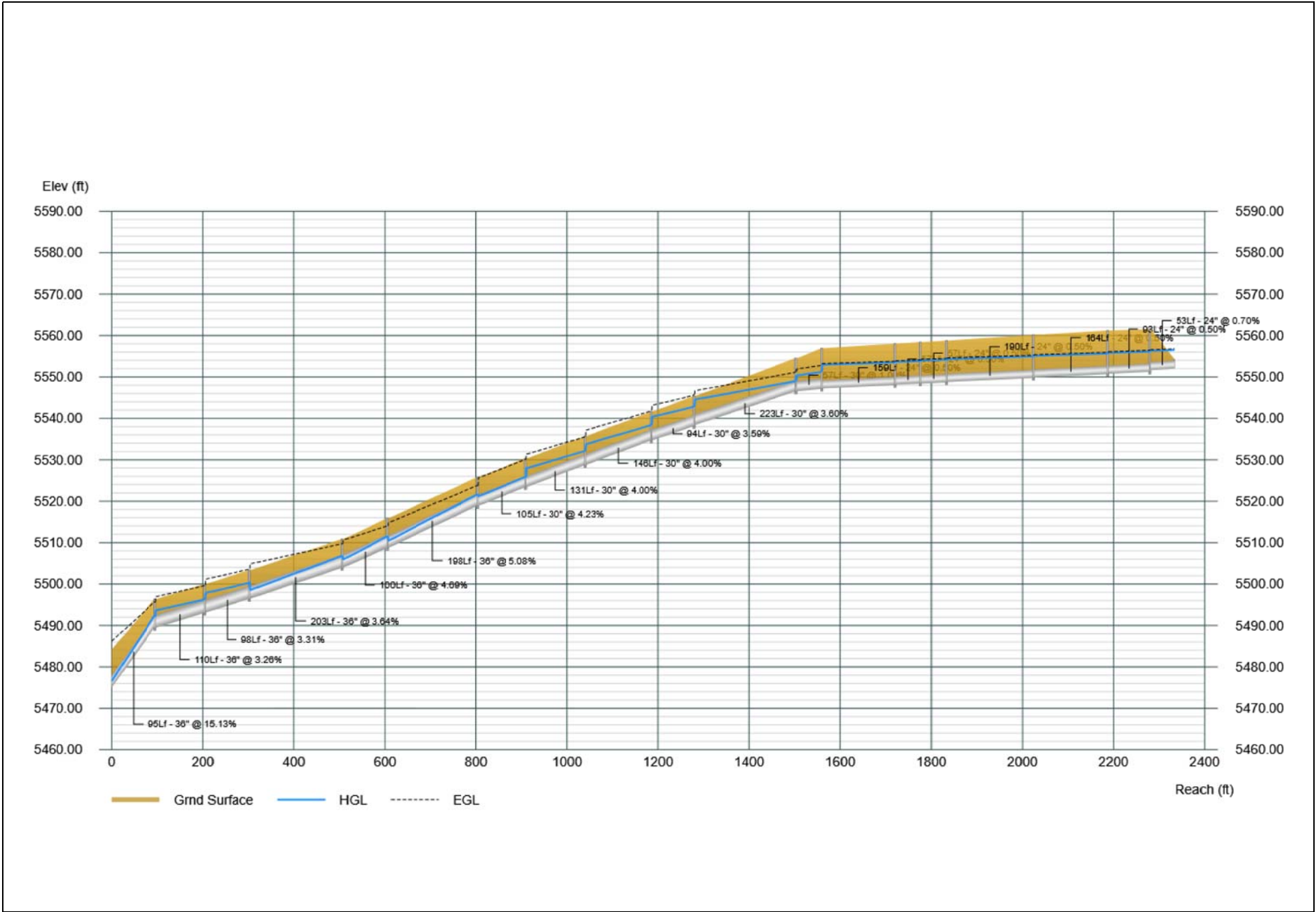


Profile View

Stormwater Studio 2021 v 3.0.0.25

Project Name: SD

01-17-2022



Energy Grade Line Calculations

Stormwater Studio 2021 v 3.0.0.25

Project Name: SD

01-17-2022

Line No	Line Size (in)	Q (cfs)	Downstream							Length (ft)	Upstream							Pipe		Junction		
			Invert Elev (ft)	Depth (ft)	Area (sqft)	HGL Elev (ft)	Vel (ft/s)	Vel Head (ft)	EGL Elev (ft)		Invert Elev (ft)	Depth (ft)	Area (sqft)	HGL Elev (ft)	Vel (ft/s)	Vel Head (ft)	EGL Elev (ft)	n Value	Enrgy Loss (ft)	HGLa Elev (ft)	EGLa Elev (ft)	Enrgy Loss (ft)
1	36	103.10	5475.00	1.57†	3.73	5476.57	27.62	11.86	5486.21	94.71	5489.33	2.91 ²	7.01	5492.24	14.71	3.37	5495.61	0.013	9.397	5492.24	5495.61	0.00
2	36	103.10	5489.43	3.00	7.07	5493.62	14.59	3.31	5496.93	109.51	5493.00	3.00	7.07	5496.24	14.59	3.31	5499.55	0.013	2.618	5496.51	5499.82	0.27
3	36	103.10	5493.10	3.00	7.07	5497.84	14.59	3.31	5501.15	98.37	5496.36	3.00	7.07	5500.19	14.59	3.31	5503.50	0.013	2.352	5500.39	5503.70	0.20
4	36	95.90	5496.46	2.10†	5.28	5498.56	18.18	5.14	5504.84	203.29	5503.85	2.88 ²	6.97	5506.73	13.75	2.94	5509.67	0.013	4.828	5506.73	5509.67	0.00
5	36	87.90	5503.95	1.96†	4.88	5505.91	18.00	5.04	5510.63	99.74	5508.63	2.84 ²	6.92	5511.47	12.71	2.51	5513.98	0.013	3.344	5511.47	5513.98	0.00
6	36	80.50	5508.73	1.71†	4.16	5510.44	19.37	5.83	5514.78	198.10	5518.80	2.78 ²	6.83	5521.58	11.78	2.16	5523.74	0.013	8.953	5521.58	5523.74	0.00
7	30	80.50	5518.90	2.33†	4.76	5521.23	16.91	4.45	5525.67	104.59	5523.32	2.47 ²	4.90	5525.79	16.44	4.20	5529.99	0.013	4.317	5525.79	5529.99	0.00
8	30	72.40	5523.42	2.50	4.91	5527.96	14.75	3.38	5531.34	130.79	5528.65	2.50	4.91	5532.04	14.75	3.38	5535.42	0.013	4.078	5532.35	5535.73	0.31
9	30	72.40	5528.75	2.50	4.91	5533.70	14.75	3.38	5537.08	146.34	5534.61	2.50	4.91	5538.26	14.75	3.38	5541.64	0.013	4.562	5538.59	5541.97	0.33
10	30	65.40	5534.71	2.50	4.91	5540.31	13.33	2.76	5543.07	93.75	5538.08	2.50	4.91	5542.70	13.32	2.76	5545.46	0.013	2.385	5542.98	5545.74	0.28
11	30	57.30	5538.41	1.70†	3.54	5540.10	16.17	4.07	5546.59	223.36	5546.45	2.38 ²	4.82	5548.83	11.89	2.20	5551.02	0.013	4.438	5548.83	5551.02	0.00
12	30	49.20	5546.55	2.50 ³	4.91	5550.09	10.02	1.56	5551.65	57.15	5547.12	2.50	4.91	5550.91	10.02	1.56	5552.47	0.013	0.823	5551.25	5552.81	0.34
13	24	36.20	5547.22	1.20†	1.97	5548.42	18.34	5.23	5553.64	35.85	5551.33	1.93 ²	3.11	5553.26	11.65	2.11	5555.37	0.013	1.735	5553.26	5555.37	0.00
14	24	22.20	5551.43	2.00	3.14	5554.90	7.07	0.78	5555.68	236.58	5560.89	1.67 ²	2.80	5562.56	7.93	0.98	5563.54	0.013	7.855	5562.56	5563.54	0.00
15	24	22.20	5560.89	1.34†	2.24	5562.23	9.90	1.53	5563.85	14.67	5561.48	1.67 ²	2.80	5563.15	7.93	0.98	5564.12	0.013	0.276	5563.15	5564.12	0.00
16	24	10.20	5561.58	2.00	3.14	5564.02	3.25	0.16	5564.19	93.66	5565.53	1.13 ²	1.83	5566.66	5.57	0.48	5567.14	0.013	2.955	5566.66	5567.14	0.00
17	18	5.10	5565.63	1.43	1.74	5567.06	2.94	0.13	5567.19	14.65	5565.96	1.04	1.30	5567.00	3.92	0.24	5567.23	0.013	0.041	5567.25	5567.49	0.26
18	18	5.10	5565.63	0.46†	0.46	5566.09	11.18	1.94	5567.19	14.79	5568.48	0.86 ²	1.05	5569.34	4.85	0.37	5569.71	0.013	2.515	5569.34	5569.71	0.00
19	18	12.00	5561.58	1.50	1.65	5563.69	6.79	0.72	5564.41	67.31	5563.55	1.32 ²	1.65	5564.87	7.29	0.83	5565.70	0.013	1.285	5564.87	5565.70	0.00
20	18	6.00	5563.55	1.50	1.77	5565.59	3.40	0.18	5565.77	28.01	5563.83	1.50	1.77	5565.68	3.40	0.18	5565.86	0.013	0.091	5565.82	5566.00	0.14
21	18	14.00	5551.43	1.50 ³	1.77	5554.79	7.92	0.98	5555.76	16.80	5551.63	1.50	1.77	5555.08	7.92	0.98	5556.06	0.013	0.298	5555.40	5556.38	0.32
22	18	7.00	5553.28	1.50	1.77	5556.23	3.96	0.24	5556.47	102.90	5558.31	1.01 ²	1.27	5559.32	5.53	0.48	5559.80	0.013	3.321	5559.32	5559.80	0.00

Notes: Return Period = 2-yrs. ² Critical depth. ³ Normal depth. † Supercritical.

Project File: InspirationOnsiteRevised Pond 1.sws

Energy Grade Line Calculations

Stormwater Studio 2021 v 3.0.0.25

Project Name: SD

01-17-2022

Line No	Line Size	Q	Downstream							Length	Upstream							Pipe		Junction		
			Invert Elev	Depth	Area	HGL Elev	Vel	Vel Head	EGL Elev		Invert Elev	Depth	Area	HGL Elev	Vel	Vel Head	EGL Elev	n Value	Enrgy Loss	HGLa Elev	EGLa Elev	Enrgy Loss
	(in)	(cfs)	(ft)	(ft)	(sqft)	(ft)	(ft/s)	(ft)	(ft)	(ft)	(ft)	(ft)	(sqft)	(ft)	(ft/s)	(ft)	(ft)		(ft)	(ft)	(ft)	(ft)
23	24	13.00	5547.22	2.00	3.14	5552.65	4.14	0.27	5552.92	159.39	5548.02	2.00	3.14	5553.18	4.14	0.27	5553.44	0.013	0.527	5553.20	5553.47	0.03
24	24	13.00	5548.12	2.00	3.14	5553.31	4.14	0.27	5553.58	57.02	5548.40	2.00	3.14	5553.50	4.14	0.27	5553.76	0.013	0.188	5553.54	5553.81	0.05
25	24	13.00	5548.40	2.00	3.14	5553.65	4.14	0.27	5553.92	57.09	5548.69	2.00	3.14	5553.84	4.14	0.27	5554.11	0.013	0.189	5553.86	5554.12	0.02
26	24	13.00	5548.79	2.00	3.14	5553.96	4.14	0.27	5554.23	190.38	5549.74	2.00	3.14	5554.59	4.14	0.27	5554.86	0.013	0.629	5554.62	5554.89	0.03
27	24	13.00	5549.84	2.00	3.14	5554.73	4.14	0.27	5555.00	164.07	5550.66	2.00	3.14	5555.27	4.14	0.27	5555.54	0.013	0.542	5555.32	5555.59	0.05
28	24	13.00	5550.76	2.00	3.14	5555.43	4.14	0.27	5555.69	93.20	5551.23	2.00	3.14	5555.73	4.14	0.27	5556.00	0.013	0.308	5555.81	5556.07	0.07
29	24	13.00	5551.63	2.00	3.14	5555.91	4.14	0.27	5556.18	52.97	5552.00	2.00	3.14	5556.09	4.14	0.27	5556.35	0.013	0.175	5556.22	5556.49	0.13
30	18	8.10	5547.60	1.50	1.77	5550.83	4.58	0.33	5551.15	16.83	5547.84	1.50	1.77	5550.93	4.58	0.33	5551.25	0.013	0.100	5551.13	5551.45	0.20
31	18	8.10	5538.08	1.50	1.77	5545.54	4.58	0.33	5545.87	15.65	5538.72	1.50	1.77	5545.64	4.58	0.33	5545.96	0.013	0.093	5545.67	5545.99	0.03
32	18	7.00	5534.71	1.50	1.77	5541.82	3.96	0.24	5542.07	16.62	5534.90	1.50	1.77	5541.90	3.96	0.24	5542.14	0.013	0.074	5541.92	5542.16	0.02
33	18	8.10	5523.42	1.50	1.77	5529.79	4.58	0.33	5530.12	17.87	5523.69	1.50	1.77	5529.90	4.58	0.33	5530.23	0.013	0.106	5529.96	5530.29	0.06
34	18	7.40	5508.73	1.50	1.77	5513.81	4.19	0.27	5514.09	15.96	5508.99	1.50	1.77	5513.89	4.19	0.27	5514.17	0.013	0.079	5513.99	5514.27	0.10
35	60	147.75	5472.00	5.00	19.63	5482.90	7.53	0.88	5483.78	59.29	5473.71	5.00	19.63	5483.09	7.52	0.88	5483.97	0.013	0.190	5483.53	5484.41	0.44
36	54	147.75	5474.00	4.50	15.90	5483.61	9.29	1.34	5484.95	47.74	5475.00	4.50	15.90	5483.88	9.29	1.34	5485.22	0.013	0.270	5484.31	5485.65	0.44
37	54	147.75	5475.00	4.50	15.90	5484.85	9.29	1.34	5486.19	31.94	5478.05	4.50	15.90	5485.03	9.29	1.34	5486.37	0.013	0.180	5485.34	5486.68	0.31
38	54	99.00	5478.15	4.50	15.90	5486.32	6.23	0.60	5486.92	127.78	5479.94	4.50	15.90	5486.65	6.22	0.60	5487.25	0.013	0.324	5486.82	5487.42	0.17
39	18	5.90	5482.54	1.50	1.77	5487.32	3.34	0.17	5487.49	239.78	5504.20	0.93 ²	1.15	5505.13	5.14	0.41	5505.54	0.013	18.047	5505.13	5505.54	0.00
40	18	5.90	5504.30	0.49†	0.49	5504.79	11.92	2.21	5505.64	8.28	5506.97	0.93 ²	1.15	5507.90	5.14	0.41	5508.31	0.013	2.670	5507.90	5508.31	0.00
41	18	8.00	5503.95	1.50	1.77	5509.48	4.53	0.32	5509.80	17.27	5504.27	1.50	1.77	5509.58	4.53	0.32	5509.90	0.013	0.101	5509.68	5510.00	0.10
42	48	93.10	5480.04	4.00	12.56	5486.91	7.41	0.85	5487.76	53.15	5480.78	4.00	12.57	5487.13	7.41	0.85	5487.99	0.013	0.224	5487.39	5488.24	0.25
43	48	86.10	5480.87	4.00	12.56	5487.80	6.85	0.73	5488.53	111.24	5482.38	4.00	12.57	5488.20	6.85	0.73	5488.93	0.013	0.400	5488.37	5489.10	0.17
44	42	86.10	5482.48	3.50	9.62	5488.36	8.95	1.25	5489.60	96.00	5483.30	3.50	9.62	5489.06	8.95	1.25	5490.31	0.013	0.703	5489.43	5490.68	0.37

Notes: Return Period = 2-yrs. ² Critical depth. † Supercritical.

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Energy Grade Line Calculations

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			Invert Elev (ft)	Depth (ft)	Area (sqft)	HGL Elev (ft)	Vel (ft/s)	Vel Head (ft)	EGL Elev (ft)		Invert Elev (ft)	Depth (ft)	Area (sqft)	HGL Elev (ft)	Vel (ft/s)	Vel Head (ft)	EGL Elev (ft)	n Value	Enrgy Loss (ft)	HGLa Elev (ft)	EGLa Elev (ft)	Enrgy Loss (ft)
45	42	78.50	5483.40	3.50	9.62	5490.06	8.16	1.04	5491.09	50.84	5483.83	3.50	9.62	5490.37	8.16	1.04	5491.40	0.013	0.310	5490.81	5491.85	0.45
46	24	23.80	5485.43	2.00	2.89	5491.31	7.58	0.89	5492.21	194.68	5499.86	1.73	2.89	5501.59	8.23	1.05	5502.65	0.013	10.441	5501.59	5502.65	0.00
47	18	11.90	5499.96	1.50	1.64	5502.22	6.74	0.71	5502.93	31.51	5502.75	1.31	1.64	5504.06	7.26	0.82	5504.88	0.013	1.954	5504.06	5504.88	0.00
48	18	7.00	5502.75	1.50	1.77	5504.74	3.96	0.24	5504.98	45.00	5504.53	1.01 ²	1.27	5505.54	5.53	0.48	5506.02	0.013	1.036	5505.54	5506.02	0.00
49	18	11.90	5499.96	1.50	1.64	5502.22	6.74	0.71	5502.93	14.64	5501.80	1.31	1.64	5503.11	7.26	0.82	5503.93	0.013	1.003	5503.11	5503.93	0.00
50	18	7.00	5501.80	1.50	1.77	5503.79	3.96	0.24	5504.03	45.00	5503.59	1.01 ²	1.27	5504.60	5.53	0.48	5505.08	0.013	1.046	5504.60	5505.08	0.00
51	18	7.20	5496.46	1.50	1.77	5503.54	4.08	0.26	5503.80	19.40	5496.85	1.50	1.77	5503.63	4.07	0.26	5503.89	0.013	0.091	5503.66	5503.92	0.03
52	42	54.70	5483.93	3.50	9.62	5491.55	5.69	0.50	5492.05	47.46	5484.33	3.50	9.62	5491.69	5.69	0.50	5492.19	0.013	0.140	5491.87	5492.37	0.19
53	18	14.90	5490.50	1.06 [‡]	1.33	5491.56	11.18	1.94	5493.07	18.28	5491.45	1.41 ²	1.72	5492.86	8.66	1.17	5494.02	0.013	0.950	5492.86	5494.02	0.00
54	18	8.40	5491.45	1.50	1.77	5493.81	4.75	0.35	5494.16	36.97	5494.19	1.11 ²	1.40	5495.30	6.01	0.56	5495.86	0.013	1.696	5495.30	5495.86	0.00
55	36	39.80	5484.43	3.00	7.07	5492.08	5.63	0.49	5492.57	121.99	5485.47	3.00	7.07	5492.51	5.63	0.49	5493.01	0.013	0.434	5492.63	5493.12	0.11
56	36	39.80	5485.57	3.00	7.07	5492.83	5.63	0.49	5493.32	18.29	5485.73	3.00	7.07	5492.89	5.63	0.49	5493.38	0.013	0.065	5493.00	5493.49	0.11
57	36	39.80	5485.73	3.00	7.07	5493.20	5.63	0.49	5493.69	79.08	5486.40	3.00	7.07	5493.48	5.63	0.49	5493.97	0.013	0.281	5493.66	5494.15	0.18
58	36	31.40	5486.50	3.00	7.07	5493.97	4.44	0.31	5494.28	286.23	5488.94	3.00	7.07	5494.60	4.44	0.31	5494.91	0.013	0.634	5494.78	5495.08	0.17
59	24	10.00	5489.04	2.00	3.14	5494.99	3.18	0.16	5495.15	60.16	5489.34	2.00	3.14	5495.10	3.18	0.16	5495.26	0.013	0.118	5495.19	5495.35	0.09
60	24	10.00	5489.44	2.00	3.14	5495.25	3.18	0.16	5495.41	52.43	5489.76	2.00	3.14	5495.36	3.18	0.16	5495.51	0.013	0.103	5495.44	5495.60	0.08
61	24	10.00	5489.76	2.00	3.14	5495.50	3.18	0.16	5495.66	70.91	5491.24	2.00	3.14	5495.64	3.18	0.16	5495.80	0.013	0.139	5495.74	5495.90	0.10
62	18	5.00	5491.34	1.50	1.77	5495.82	2.83	0.12	5495.95	16.88	5491.97	1.50	1.77	5495.86	2.83	0.12	5495.98	0.013	0.038	5495.92	5496.04	0.06
63	18	5.00	5491.34	1.50	1.77	5495.82	2.83	0.12	5495.95	17.83	5493.97	1.50	1.77	5495.86	2.83	0.12	5495.99	0.013	0.041	5495.92	5496.04	0.06
64	18	21.40	5489.14	1.50	1.77	5493.71	12.11	2.28	5496.00	14.68	5491.29	1.50	1.77	5494.33	12.11	2.28	5496.60	0.013	0.610	5494.33	5496.60	0.00
65	30	48.75	5488.00	1.94 [‡]	4.10	5489.95	11.90	2.20	5491.96	14.25	5488.50	2.29 ²	4.71	5490.79	10.36	1.67	5492.46	0.013	0.500	5490.79	5492.46	0.00
66	18	16.25	5488.50	0.88 [‡]	1.07	5489.38	15.16	3.57	5492.98	16.00	5491.10	1.43 ²	1.74	5492.53	9.35	1.36	5493.89	0.013	0.909	5492.53	5493.89	0.00

Notes: Return Period = 2-yrs. ² Critical depth. [‡] Supercritical.

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Energy Grade Line Calculations

Project Name: SD

Stormwater Studio 2021 v 3.0.0.25

01-17-2022

[illegible]

Notes: Return Period = 2-yrs. ² Critical depth. \pm Supercritical.

Project File: InspirationOnsiteRevised Pond 1.sws