THE POINT – SOUTH PKG 3

ROLESVILLE, NORTH CAROLINA

STORM DRAINAGE CALCULATIONS

PROJECT NUMBER:	AWH-20000.02
DESIGNED BY:	T. DABOLT, EI
CHECKED BY:	T. O'DANIEL, PE

DATE: MAY 1, 2024

NORTH CAROLINA PROFESSIONAL SEAL 22630 ENGINEER WILLIAM T. O'DANIEL

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NC LIC. # C-0293

THE POINT SOUTH – PKG 3

STORM DRAINAGE SYSTEM CALCULATIONS

GENERAL DESCRIPTION

The Point site is located along NC HWY 401 (Louisburg Road) and west of East Young Street in Rolesville, North Carolina. The proposed development at The Point is approximately 300 acres, divided into two sections with one to the north of NC HWY 401 (The Point – North) and another to the south of NC HWY 401 (The Point - South). This storm drainage analysis includes CD Package 2 of the "The Point – South" only. The total development will consist of approximately 804 lots, a mixture of townhomes and various types of single-family housing, thirteen stormwater control measures, sidewalks, roadways, greenway trail, and associated infrastructure and various amenities.

The Point South – Pkg 3 development is located within the Neuse River basin with the site's stormwater runoff draining into Harris Creek. The proposed development shall be subject to storm drainage requirements set forth in the Rolesville Unified Development Ordinance.

CALCULATION METHODOLOGY

- Rainfall data for the Rolesville, NC region was taken from NOAA Atlas 14. This data describes a depth-duration-frequency (DDF) table describing rainfall depth versus time for varying return periods in the Rolesville, NC area. These rainfall depths are entered into the "Stormwater Studio" application to determine design flows associated with the storm drainage system. Please reference the rainfall data section within this report for additional information.

- The time of concentration was calculated using the Kirpich Method.

- The existing on-site topography used in the analysis is from a field survey by The John R. McAdams Company, Inc. and local GIS data.

- For each individual storm drainage inlet, a drainage area was measured as well as assigning impervious surface percentage. From this impervious percentage, a rational c factor was calculated based on 0.95 for impervious areas. For drainage areas with a combination of both pervious (Open Space and Lawns, C=0.35) and impervious areas, a composite "c" factor was interpolated.

- The pipes were sized using "Stormwater Studio 2021 Ver. 3.0.0.25". This program accepts the input data from each inlet, as well as physical characteristics of the storm system to be designed, and calculates flow rates and pipe sizes throughout the system. The final results of this program as well as calculated pipe sizes and hydraulic grade lines may be found in the appropriate section of this report. The minimum pipe size was 15" unless otherwise shown on the plans. Pipe material is RCP or HDPE as indicated on the plans.

- The inlet types included for this project are primarily NCDOT type combination catch basins with curb inlets and grates. The calculations include an analysis to determine gutter spread at these inlets based on a 4-in per hour rainfall intensity.

- The storm water network was analyzed for the 10-year storm event using a starting time of concentration of 5 minutes.

- The various inlet types are shown on the stormwater detail sheets, within the plan set. Flared end sections or Endwalls are used at discharge points. Headwalls or structures are used at inlet points. Velocity dissipators are provided at discharge points to prevent erosion and scour in these areas. The dissipators have been sized using the NYDOT method.

- For Wall Drains, the pipes were sized using “Studio Express” by “Hydrology Studio Ver. 1.0.0.10”. This program accepts the input data from each inlet, as well as physical characteristics of the storm system to be designed, and calculates flow rates and pipe sizes throughout the system. The final results of this program as well as calculated pipe sizes may be found in the appropriate section of this report. The minimum pipe size was 8” unless otherwise shown on the plans. Pipe material is PVC as indicated on the plans.

PRECIPITATION FREQUENCY DATA TABLES

NOAA Atlas 14, Volume 2, Version 3
Location name: Wake Forest, North Carolina, USA*
Latitude: 35.9088°, Longitude: -78.4485°
Elevation: 405.98 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

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/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	4.84 (4.43-5.29)	5.62 (5.15-6.14)	6.41 (5.87-6.98)	7.19 (6.58-7.85)	7.98 (7.27-8.70)	8.62 (7.81-9.40)	9.18 (8.28-10.0)	9.68 (8.68-10.6)	10.2 (9.10-11.2)	10.7 (9.46-11.7)
10-min	3.86 (3.54-4.23)	4.49 (4.12-4.91)	5.13 (4.70-5.59)	5.75 (5.26-6.28)	6.36 (5.80-6.94)	6.86 (6.22-7.48)	7.29 (6.58-7.95)	7.67 (6.88-8.37)	8.09 (7.19-8.84)	8.45 (7.45-9.25)
15-min	3.22 (2.95-3.52)	3.77 (3.45-4.12)	4.32 (3.96-4.72)	4.85 (4.44-5.29)	5.38 (4.90-5.86)	5.79 (5.25-6.31)	6.14 (5.54-6.70)	6.45 (5.78-7.04)	6.79 (6.04-7.42)	7.07 (6.23-7.74)
30-min	2.21 (2.02-2.42)	2.60 (2.38-2.84)	3.07 (2.81-3.35)	3.51 (3.21-3.83)	3.98 (3.63-4.34)	4.36 (3.96-4.75)	4.71 (4.24-5.13)	5.02 (4.50-5.48)	5.40 (4.80-5.90)	5.73 (5.05-6.27)
60-min	1.38 (1.26-1.51)	1.63 (1.50-1.78)	1.97 (1.80-2.15)	2.29 (2.09-2.50)	2.65 (2.41-2.89)	2.96 (2.68-3.22)	3.24 (2.92-3.53)	3.52 (3.16-3.84)	3.88 (3.45-4.23)	4.18 (3.68-4.57)
2-hr	0.805 (0.732-0.888)	0.957 (0.874-1.05)	1.17 (1.06-1.28)	1.37 (1.25-1.50)	1.61 (1.46-1.77)	1.83 (1.64-2.00)	2.03 (1.81-2.22)	2.24 (1.99-2.45)	2.52 (2.21-2.75)	2.76 (2.40-3.02)
3-hr	0.568 (0.516-0.629)	0.676 (0.617-0.746)	0.828 (0.753-0.913)	0.980 (0.889-1.08)	1.16 (1.05-1.28)	1.33 (1.19-1.46)	1.49 (1.33-1.64)	1.66 (1.47-1.82)	1.89 (1.65-2.08)	2.10 (1.81-2.31)
6-hr	0.342 (0.312-0.378)	0.407 (0.372-0.448)	0.499 (0.455-0.548)	0.591 (0.537-0.648)	0.705 (0.637-0.772)	0.808 (0.726-0.884)	0.912 (0.811-0.996)	1.02 (0.900-1.11)	1.17 (1.02-1.27)	1.31 (1.12-1.43)
12-hr	0.200 (0.183-0.221)	0.238 (0.219-0.262)	0.293 (0.269-0.322)	0.350 (0.319-0.383)	0.420 (0.381-0.459)	0.485 (0.436-0.528)	0.551 (0.490-0.599)	0.622 (0.547-0.675)	0.719 (0.622-0.781)	0.809 (0.690-0.880)
24-hr	0.119 (0.111-0.128)	0.144 (0.134-0.155)	0.181 (0.168-0.195)	0.210 (0.195-0.227)	0.251 (0.232-0.270)	0.283 (0.261-0.304)	0.316 (0.290-0.340)	0.350 (0.321-0.378)	0.398 (0.362-0.429)	0.436 (0.395-0.471)
2-day	0.069 (0.064-0.074)	0.083 (0.078-0.090)	0.104 (0.097-0.112)	0.120 (0.111-0.129)	0.142 (0.132-0.153)	0.160 (0.147-0.172)	0.178 (0.164-0.192)	0.197 (0.180-0.212)	0.223 (0.203-0.241)	0.243 (0.220-0.263)
3-day	0.049 (0.046-0.052)	0.059 (0.055-0.063)	0.073 (0.068-0.078)	0.084 (0.078-0.090)	0.099 (0.092-0.107)	0.112 (0.103-0.120)	0.124 (0.114-0.133)	0.137 (0.126-0.147)	0.155 (0.141-0.167)	0.169 (0.154-0.183)
4-day	0.039 (0.036-0.041)	0.046 (0.043-0.050)	0.057 (0.054-0.061)	0.066 (0.062-0.071)	0.078 (0.072-0.083)	0.088 (0.081-0.094)	0.097 (0.090-0.104)	0.107 (0.099-0.115)	0.121 (0.111-0.130)	0.132 (0.120-0.142)
7-day	0.026 (0.024-0.027)	0.031 (0.029-0.033)	0.037 (0.035-0.040)	0.043 (0.040-0.046)	0.050 (0.047-0.054)	0.056 (0.052-0.060)	0.062 (0.057-0.066)	0.068 (0.063-0.073)	0.077 (0.070-0.082)	0.084 (0.076-0.090)
10-day	0.020 (0.019-0.022)	0.024 (0.023-0.026)	0.029 (0.027-0.031)	0.033 (0.031-0.035)	0.039 (0.036-0.041)	0.043 (0.040-0.046)	0.047 (0.044-0.050)	0.051 (0.047-0.055)	0.057 (0.053-0.061)	0.062 (0.057-0.066)
20-day	0.014 (0.013-0.015)	0.016 (0.015-0.017)	0.019 (0.018-0.020)	0.022 (0.020-0.023)	0.025 (0.023-0.026)	0.027 (0.025-0.029)	0.030 (0.028-0.032)	0.032 (0.030-0.035)	0.036 (0.033-0.038)	0.039 (0.036-0.041)
30-day	0.011 (0.011-0.012)	0.013 (0.013-0.014)	0.016 (0.015-0.017)	0.017 (0.016-0.018)	0.020 (0.018-0.021)	0.021 (0.020-0.023)	0.023 (0.022-0.025)	0.025 (0.023-0.026)	0.027 (0.025-0.029)	0.029 (0.027-0.031)
45-day	0.010 (0.009-0.010)	0.011 (0.011-0.012)	0.013 (0.012-0.014)	0.014 (0.013-0.015)	0.016 (0.015-0.017)	0.017 (0.016-0.018)	0.018 (0.017-0.019)	0.020 (0.018-0.021)	0.021 (0.020-0.023)	0.022 (0.021-0.024)
60-day	0.009 (0.008-0.009)	0.010 (0.010-0.011)	0.011 (0.011-0.012)	0.013 (0.012-0.013)	0.014 (0.013-0.015)	0.015 (0.014-0.016)	0.016 (0.015-0.017)	0.017 (0.016-0.018)	0.018 (0.017-0.019)	0.019 (0.018-0.020)

[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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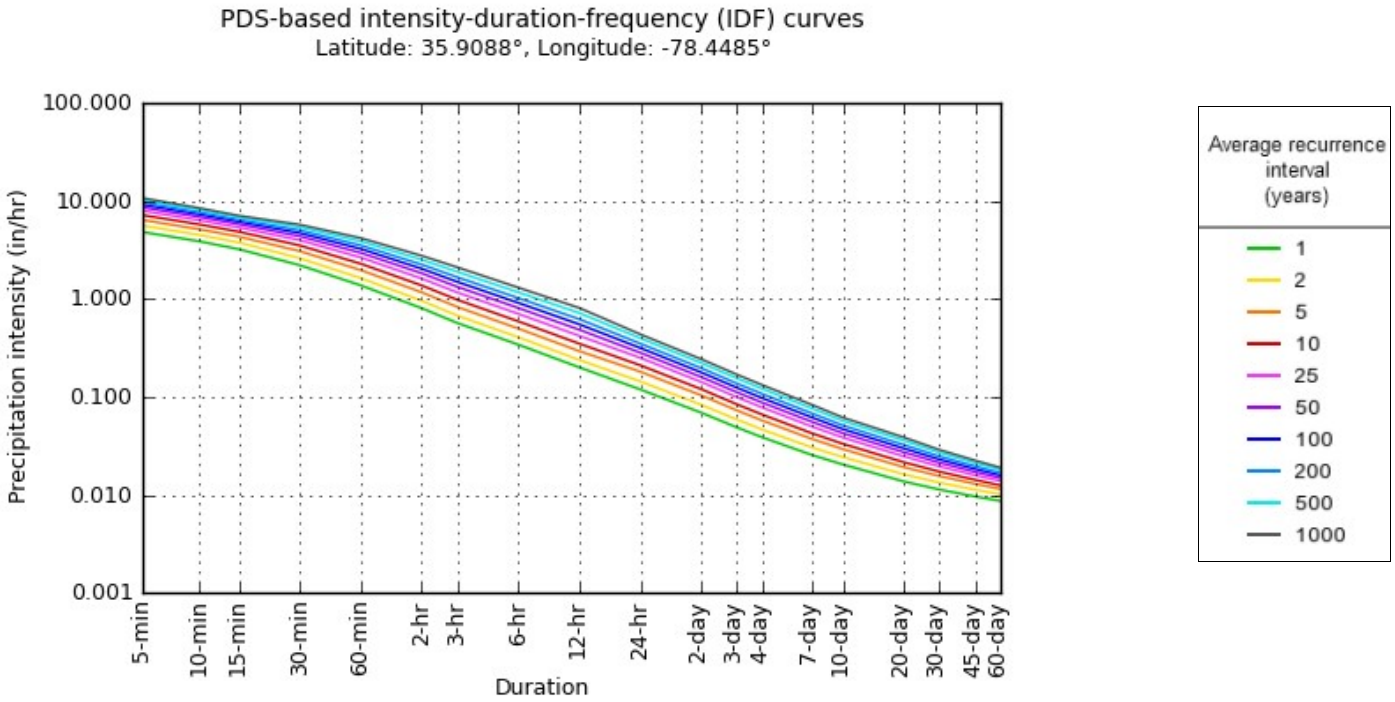
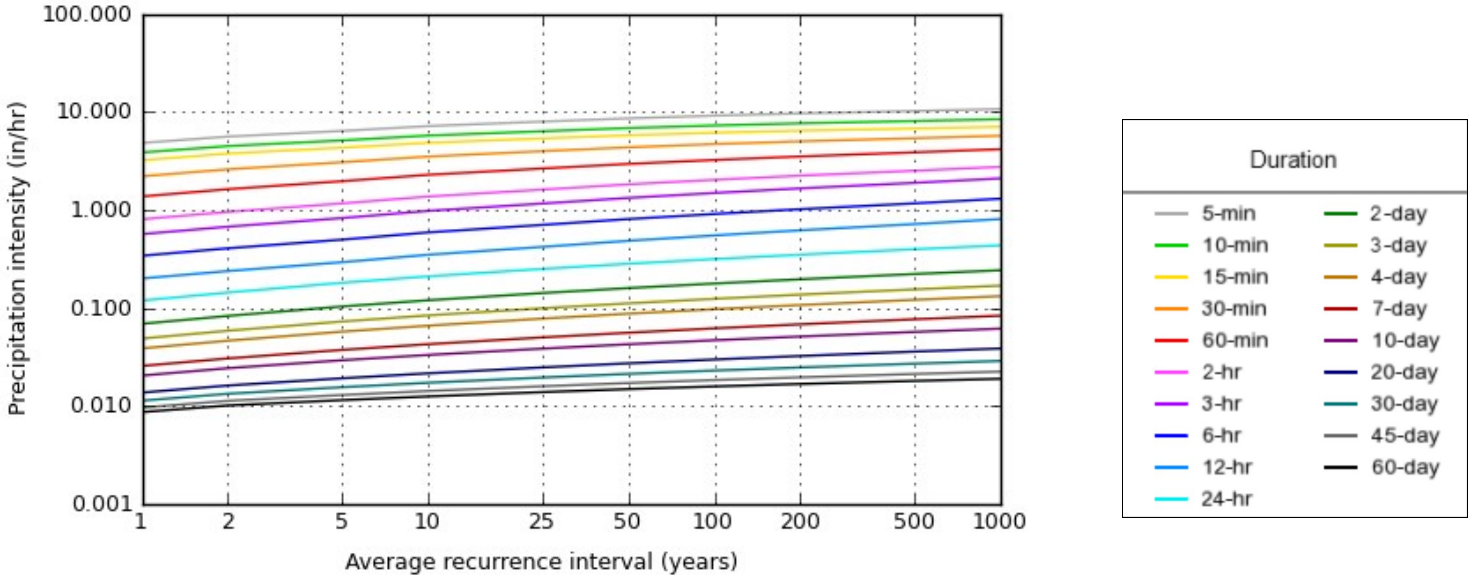
PF graphical





NOAA Atlas 14, Volume 2, Version 3 Created (GMT): Thu Oct 29 20:52:01 2020

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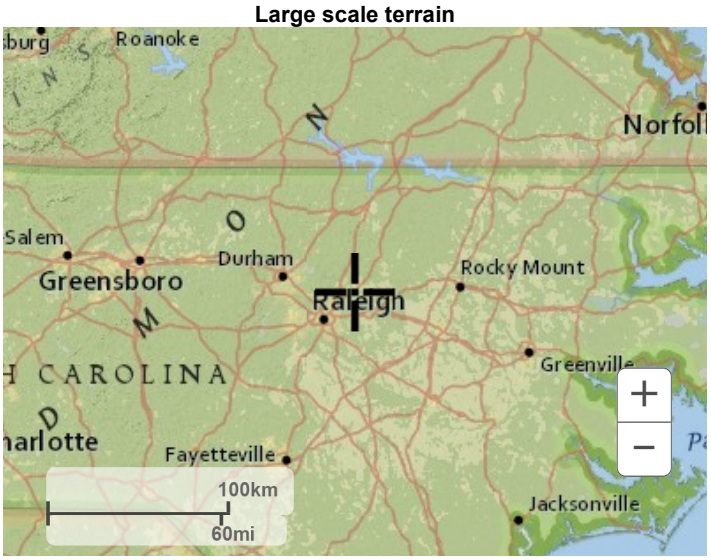
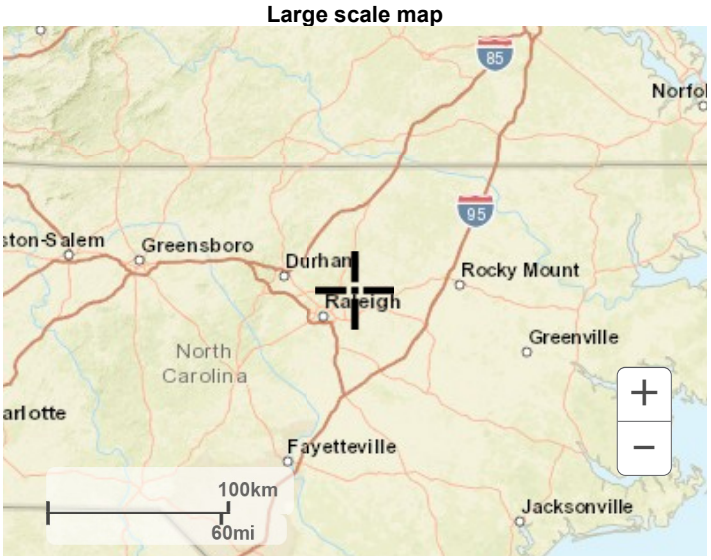
Maps & aerials

Small scale terrain

Large scale terrain



Large scale map



Large scale aerial

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National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

IDF Report

Stormwater Studio 2023 v 3.0.0.32

IDF filename: The Point.IDF

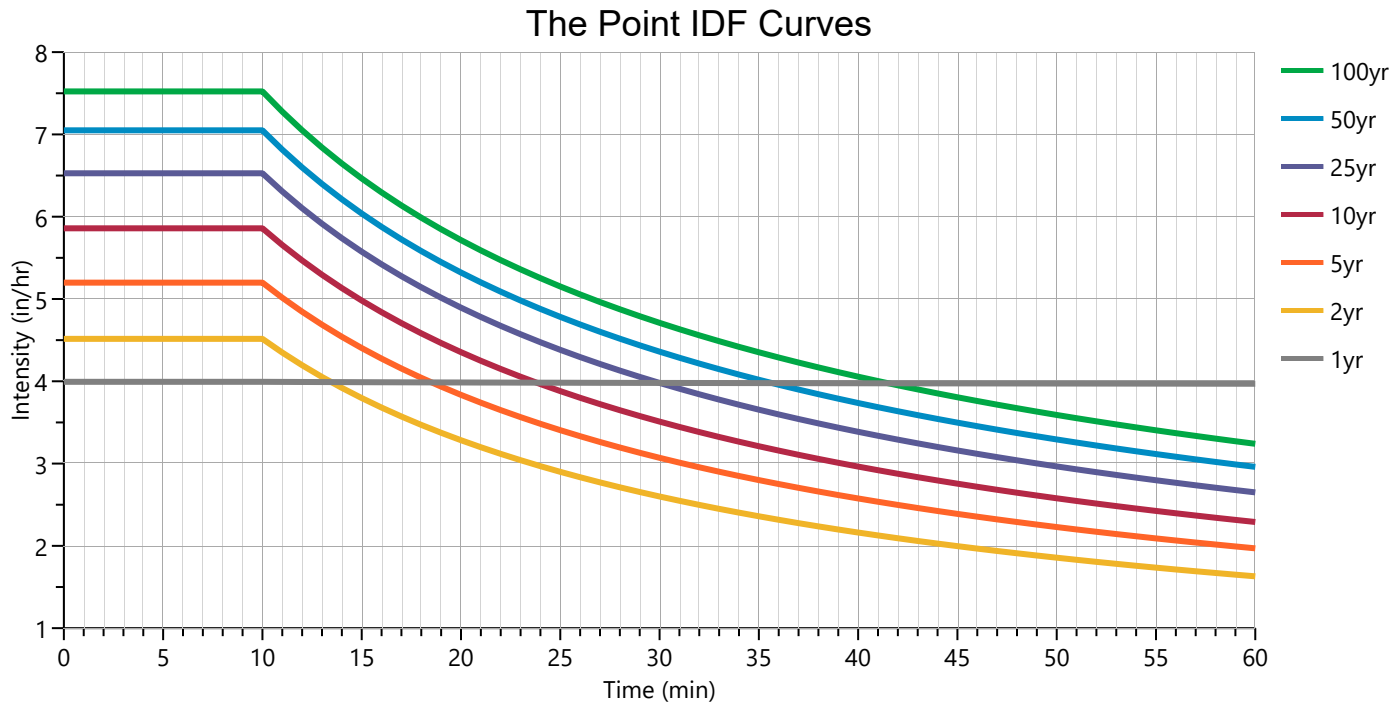
11-17-2023

Equation Coefficients	Intensity = B / (Tc + D)^E (in/hr)								
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
B	4.0388	71.7923	0.0000	70.2128	67.8360	62.7327	55.6315	53.3810	
D	5.5000	13.0000	0.0000	12.7000	12.0000	11.1000	9.9000	9.4000	
E	0.0041	0.8822	0.0000	0.8337	0.7923	0.7421	0.6907	0.6608	

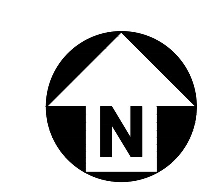
Minimum Tc = 10 minutes

Tc (min)	Intensity Values (in/hr)								
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
Cf	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
5	3.99	4.52	0	5.20	5.86	6.53	7.05	7.52	
10	3.99	4.52	0	5.20	5.86	6.53	7.05	7.52	
15	3.99	3.80	0	4.40	4.98	5.57	6.04	6.46	
20	3.99	3.28	0	3.83	4.35	4.89	5.32	5.72	
25	3.98	2.90	0	3.41	3.88	4.38	4.78	5.15	
30	3.98	2.60	0	3.07	3.51	3.98	4.36	4.71	
35	3.98	2.36	0	2.80	3.21	3.65	4.02	4.35	
40	3.98	2.16	0	2.58	2.96	3.39	3.74	4.06	
45	3.97	2.00	0	2.39	2.76	3.16	3.50	3.81	
50	3.97	1.86	0	2.23	2.58	2.97	3.29	3.59	
55	3.97	1.74	0	2.09	2.42	2.80	3.12	3.40	
60	3.97	1.63	0	1.97	2.29	2.65	2.96	3.24	

Cf = Correction Factor applied to Rational Method runoff coefficient.



DRAINAGE AREA MAP



GRAPHIC SCALE
0 50 100 200
1 inch = 100 ft.

FINAL DRAWING - NOT RELEASED FOR CONSTRUCTION

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ASHTON WOODS™

THE POINT
PHASES 8 AND 14
CONSTRUCTION DRAWINGS - PACKAGE 3
EAST YOUNG STREET
TOWN OF ROLESVILLE, WAKE FOREST TOWNSHIP,
WAKE COUNTY, NORTH CAROLINA

CID-24-01

REVISIONS

NO.	DATE	
1	03. 01. 2024	RESPOND TO MUNICIPAL COMMENTS
2	05. 01. 2024	RESPOND TO MUNICIPAL COMMENTS

PLAN INFORMATION

PROJECT NO.	AWH-20000
FILENAME	
CHECKED BY	.
DRAWN BY	.
SCALE	
DATE	12. 13. 2023

SHEET

M:\Projects\AWH\AWH-20000\04-Production\Engineering\Design Files\Storm Drainage\CD Package 3\Drainage Area\AWH20000x-DA1.dwg, 5/1/2024 3:07:29 PM, Tommy Dabolt

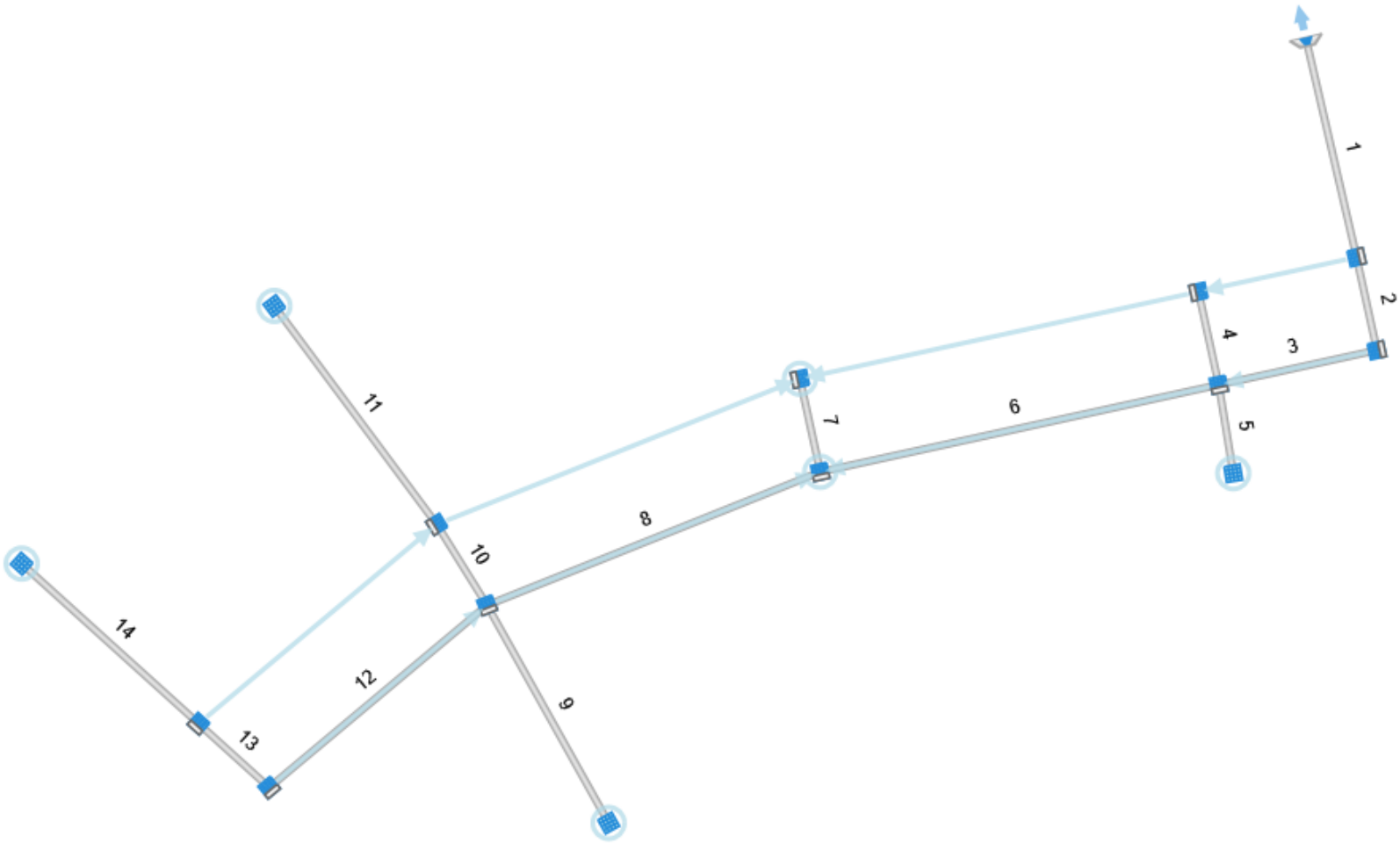
SYSTEM 1100 – REPORTS AND PROFILES

Plan View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1100

02-27-2024



Project File: Storm System 1100.sws

Storm Sewer Tabulation

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1100

02-27-2024

Line ID	Length	Drng Area		Rational	C x A		Tc		Intensity	Total Q	Capacity	Velocity	Line		Invert Elev		HGL Elev		Surface Elev		Line No
		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
	(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1100-1101	73.82	0.070	3.090	0.90	0.06	2.31	5.0	6.64	6.68	15.45	44.83	5.17	24	3.93	312.90	310.00	314.60	314.35	323.93	312.33	1
1101-1102	32.50	0.170	3.020	0.80	0.14	2.25	5.0	6.56	6.70	15.08	19.84	5.18	24	0.77	313.25	313.00	314.92	314.85	323.93	323.93	2
1102-1103	55.29	0.040	2.850	0.85	0.03	2.11	5.0	6.41	6.75	14.25	18.30	4.98	24	0.65	313.72	313.35	315.32	315.21	322.17	323.93	3
1103-1104	32.50	0.040	0.040	0.85	0.03	0.03	5.0	5.00	7.19	0.24	6.26	2.16	15	0.94	317.90	317.60	318.10	317.77	322.17	322.17	4
1103-1105	30.60	0.830	0.830	0.65	0.54	0.54	5.0	5.00	7.19	3.88	5.00	3.16	15	0.60	314.40	314.22	315.81	315.70	317.05	322.17	5
1103-1106	139.35	0.190	1.940	0.85	0.16	1.51	5.0	6.01	6.87	10.33	17.52	4.26	24	0.60	314.65	313.82	315.87	315.68	320.31	322.17	6
1106-1107	32.50	0.200	0.200	0.85	0.17	0.17	5.0	5.00	7.19	1.22	7.14	3.52	15	1.22	316.06	315.66	316.50	316.04	320.31	320.31	7
1106-1108	122.60	0.170	1.550	0.85	0.14	1.17	5.0	5.62	6.99	8.20	8.13	5.08	18	0.60	315.49	314.75	316.74	316.08	321.90	320.31	8
1108-1109	85.15	0.140	0.140	0.65	0.09	0.09	5.0	5.00	7.19	0.65	4.80	0.60	15	0.55	316.32	315.85	317.25	317.24	320.00	321.90	9
1108-1110	32.50	0.210	0.330	0.85	0.18	0.26	5.0	5.45	7.04	1.81	6.84	3.91	15	1.12	317.55	317.19	318.09	317.66	321.90	321.90	10
1110-1111	92.93	0.120	0.120	0.65	0.08	0.08	5.0	5.00	7.19	0.56	7.02	1.69	15	1.18	318.75	317.65	319.05	318.28	323.00	321.90	11
1108-1112	97.01	0.190	0.910	0.85	0.16	0.68	5.0	5.47	7.03	4.79	14.47	4.56	15	5.02	320.66	315.79	321.54	317.10	325.40	321.90	12
1112-1113	32.50	0.260	0.720	0.85	0.22	0.52	5.0	5.34	7.07	3.68	5.00	3.44	15	0.60	320.96	320.76	321.92	321.85	325.40	325.40	13
1113-1114	81.47	0.460	0.460	0.65	0.30	0.30	5.0	5.00	7.19	2.15	5.03	2.57	15	0.61	321.55	321.06	322.21	322.13	325.80	325.40	14

Notes: IDF File = The Point.IDF, Return Period = 10-yrs.

Project File: Storm System 1100.sws

Energy Grade Line Calculations

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024

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)
1	48	59.18	299.50	1.55‡	4.51	301.05	13.13	2.68	303.75	42.89	302.00	2.28²	7.38	304.28	8.02	1.00	305.28	0.013	1.526	304.28	305.28	0.00
2	48	59.32	302.10	1.24‡	3.31	303.34	17.91	4.99	305.46	82.56	310.00	2.28²	7.39	312.27	8.03	1.00	313.27	0.013	7.818	312.27	313.27	0.00
3	48	59.04	310.10	1.28‡	3.45	311.38	17.12	4.56	313.45	95.68	317.57	2.27²	7.37	319.85	8.01	1.00	320.84	0.013	7.391	319.85	320.84	0.00
4	48	58.13	317.69	2.67	8.92	320.36	6.52	0.66	321.02	24.50	317.83	2.46	8.11	320.30	7.16	0.80	321.09	0.013	0.074	320.35	321.15	0.06
5	42	51.98	318.30	2.16‡	6.22	320.46	8.36	1.09	321.58	66.48	318.74	2.21²	6.39	320.95	8.13	1.03	321.97	0.013	0.398	320.95	321.97	0.00
6	42	51.28	318.84	2.17‡	6.28	321.01	8.17	1.04	322.16	63.93	319.22	2.20	6.37	321.42	8.05	1.01	322.43	0.013	0.267	321.49	322.50	0.07
7	42	50.75	319.32	2.75	8.10	322.07	6.26	0.61	322.68	60.00	319.70	2.30	6.70	322.00	7.57	0.89	322.89	0.013	0.213	322.06	322.96	0.06
8	42	46.08	319.70	2.96	8.69	322.67	5.31	0.44	323.10	33.36	319.98	2.66	7.83	322.64	5.88	0.54	323.18	0.013	0.073	322.66	323.20	0.03
9	36	41.41	320.48	2.05‡	5.14	322.53	8.05	1.01	323.60	81.83	320.97	2.06	5.17	323.03	8.01	1.00	324.03	0.013	0.435	323.10	324.10	0.07
10	36	41.07	321.07	2.62	6.54	323.69	6.28	0.61	324.30	76.21	321.53	2.28	5.78	323.82	7.11	0.79	324.60	0.013	0.298	323.88	324.67	0.07
11	36	38.69	321.63	2.70	6.70	324.33	5.78	0.52	324.85	90.84	322.18	2.29	5.78	324.46	6.69	0.70	325.16	0.013	0.311	324.53	325.23	0.07
12	36	21.81	333.96	1.02‡	2.12	334.98	10.29	1.65	336.05	46.32	335.96	1.49²	3.50	337.45	6.23	0.60	338.05	0.013	1.998	337.45	338.05	0.00
13	30	20.18	336.70	1.29‡	2.56	337.99	7.88	0.96	338.87	33.27	337.26	1.50²	3.08	338.76	6.55	0.67	339.43	0.013	0.560	338.76	339.43	0.00
14	30	19.59	337.36	1.45‡	2.96	338.81	6.61	0.68	339.55	95.89	337.94	1.48²	3.02	339.41	6.48	0.65	340.07	0.013	0.520	339.41	340.07	0.00
15	30	18.83	338.04	1.01‡	1.85	339.05	10.18	1.61	340.18	42.50	339.80	1.45²	2.95	341.25	6.38	0.63	341.88	0.013	1.701	341.25	341.88	0.00
16	30	18.58	339.90	1.22‡	2.37	341.12	7.83	0.95	341.99	24.73	340.43	1.44²	2.93	341.87	6.34	0.63	342.50	0.013	0.510	341.87	342.50	0.00
17	15	4.13	341.38	0.75‡	0.77	342.13	5.38	0.45	342.57	75.01	342.13	0.81²	0.85	342.95	4.89	0.37	343.32	0.013	0.750	342.95	343.32	0.00
18	15	1.26	342.23	1.08	1.12	343.30	1.12	0.02	343.32	18.79	343.34	0.45²	0.40	343.79	3.18	0.16	343.95	0.013	0.624	343.79	343.95	0.00
19	15	1.59	342.23	1.06	1.11	343.30	1.42	0.03	343.33	24.50	342.38	0.92	0.97	343.30	1.63	0.04	343.35	0.013	0.017	343.33	343.37	0.03
20	15	0.33	342.48	0.89	0.94	343.37	0.35	0.00	343.38	45.04	342.75	0.62	0.61	343.37	0.53	0.00	343.38	0.013	0.003	343.38	343.38	0.00
21	30	14.30	340.53	1.82	3.83	342.35	3.73	0.22	342.57	46.26	341.04	1.26²	2.49	342.30	5.75	0.51	342.81	0.013	0.246	342.30	342.81	0.00
22	15	1.71	342.35	0.51‡	0.47	342.85	3.64	0.21	343.06	32.50	342.54	0.53	0.49	343.07	3.48	0.19	343.26	0.013	0.195	343.16	343.35	0.09

Notes: Return Period = 10-yrs. ² Critical depth. ‡ Supercritical.

Project File: SD-1800.sws

Energy Grade Line Calculations

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024

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	11.32	341.79	0.79‡	1.16	342.58	9.80	1.49	343.50	150.07	346.20	1.19²	1.95	347.39	5.80	0.52	347.91	0.013	4.410	347.39	347.91	0.00
24	15	1.28	347.80	0.33‡	0.26	348.13	4.94	0.38	348.41	36.89	348.72	0.45²	0.40	349.17	3.19	0.16	349.33	0.013	0.921	349.17	349.33	0.00
25	24	8.70	346.30	0.95‡	1.48	347.25	5.88	0.54	347.98	101.79	347.11	1.04²	1.66	348.16	5.24	0.43	348.58	0.013	0.607	348.16	348.58	0.00
26	15	3.49	336.02	0.44‡	0.39	336.46	8.97	1.25	337.09	101.52	341.12	0.75²	0.77	341.87	4.56	0.32	342.19	0.013	5.099	341.87	342.19	0.00
27	15	1.10	341.22	0.95	1.01	342.18	1.09	0.02	342.20	24.50	341.47	0.70	0.71	342.17	1.55	0.04	342.21	0.013	0.014	342.19	342.23	0.02
28	15	1.52	341.47	0.29‡	0.21	341.76	7.13	0.79	342.21	86.54	345.86	0.49²	0.45	346.35	3.37	0.18	346.53	0.013	4.318	346.35	346.53	0.00
29	15	0.98	345.96	0.38‡	0.31	346.34	3.12	0.15	346.54	24.50	346.11	0.40	0.34	346.51	2.90	0.13	346.64	0.013	0.096	346.59	346.72	0.08
30	15	2.36	326.18	0.61‡	0.59	326.78	4.00	0.25	327.03	24.49	326.32	0.62	0.60	326.94	3.90	0.24	327.18	0.013	0.147	327.03	327.27	0.09
31	15	1.94	326.42	0.54³	0.51	326.96	3.82	0.23	327.29	125.80	327.18	0.56²	0.53	327.74	3.66	0.21	327.95	0.013	0.654	327.74	327.95	0.00
32	15	1.56	327.28	0.53	0.49	327.81	3.15	0.15	327.96	61.82	327.65	0.50²	0.46	328.15	3.40	0.18	328.33	0.013	0.367	328.15	328.33	0.00
33	15	0.89	327.75	0.54	0.51	328.29	1.73	0.05	328.34	31.36	327.94	0.38	0.32	328.32	2.82	0.12	328.44	0.013	0.100	328.41	328.53	0.09
34	15	4.05	329.04	0.85³	0.89	329.89	4.54	0.32	330.21	24.50	329.19	0.85	0.89	330.04	4.54	0.32	330.36	0.013	0.147	330.24	330.56	0.20
35	15	2.00	329.29	1.25	1.23	330.53	1.63	0.04	330.58	43.96	329.55	1.01	1.07	330.56	1.87	0.05	330.62	0.013	0.042	330.58	330.64	0.02
36	15	0.70	329.65	0.98	1.03	330.63	0.68	0.01	330.64	90.31	330.18	0.47	0.43	330.66	1.64	0.04	330.70	0.013	0.062	330.68	330.73	0.03
37	24	16.85	323.18	1.63	2.75	324.81	6.13	0.58	325.40	24.50	323.32	1.61	2.71	324.93	6.22	0.60	325.53	0.013	0.139	324.97	325.58	0.04
38	24	16.88	323.42	1.84	3.03	325.27	5.58	0.48	325.75	48.76	323.72	1.76	2.92	325.47	5.78	0.52	325.99	0.013	0.241	325.51	326.03	0.04
39	24	16.70	323.82	1.28‡	2.12	325.10	7.86	0.96	326.21	32.51	324.31	1.45²	2.43	325.76	6.86	0.73	326.49	0.013	0.284	325.76	326.49	0.00
40	18	8.97	334.25	1.03‡	1.29	335.28	6.95	0.75	335.99	90.58	335.35	1.14²	1.44	336.50	6.21	0.60	337.10	0.013	1.104	336.50	337.10	0.00
41	24	7.45	324.51	1.92	3.10	326.43	2.40	0.09	326.52	66.41	324.91	1.56	2.63	326.47	2.83	0.12	326.60	0.013	0.072	326.49	326.61	0.01
42	15	0.67	326.41	0.31‡	0.24	326.72	2.78	0.12	326.84	39.01	326.64	0.33	0.26	326.97	2.59	0.10	327.07	0.013	0.230	327.11	327.21	0.14
43	18	6.31	325.01	1.48	1.76	326.49	3.58	0.20	326.69	91.90	325.56	1.18	1.49	326.74	4.24	0.28	327.02	0.013	0.331	326.79	327.07	0.05
44	15	4.06	325.91	0.58‡	0.56	326.49	7.28	0.82	327.13	94.80	328.24	0.81²	0.84	329.05	4.85	0.37	329.41	0.013	2.284	329.05	329.41	0.00

Notes: Return Period = 10-yrs. ² Critical depth. ³ Normal depth. ‡ Supercritical.

Project File: SD-1800.sws

Energy Grade Line Calculations

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024

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)
45	15	1.52	325.91	1.14	1.17	327.05	1.30	0.03	327.08	35.20	326.12	0.94	0.99	327.06	1.54	0.04	327.10	0.013	0.021	327.08	327.11	0.02
46	15	0.65	326.22	0.89	0.93	327.11	0.70	0.01	327.12	104.02	326.75	0.41	0.36	327.16	1.84	0.05	327.22	0.013	0.102	327.20	327.25	0.03
47	18	7.56	347.21	0.93‡	1.15	348.14	6.59	0.67	348.79	36.00	347.66	1.05²	1.32	348.71	5.73	0.51	349.22	0.012	0.428	348.71	349.22	0.00
48	18	5.96	347.76	0.86‡	1.05	348.62	5.68	0.50	349.29	147.13	348.86	0.93²	1.15	349.79	5.17	0.42	350.21	0.012	0.919	349.79	350.21	0.00
49	15	2.15	349.11	0.55‡	0.52	349.66	4.13	0.27	350.23	101.06	349.75	0.59²	0.57	350.34	3.80	0.22	350.56	0.012	0.332	350.34	350.56	0.00
50	18	4.67	328.20	0.61‡	0.67	328.81	6.96	0.75	329.37	99.21	330.00	0.82²	1.00	330.82	4.69	0.34	331.17	0.012	1.795	330.82	331.17	0.00
51	15	2.80	333.27	0.50‡	0.46	333.77	6.06	0.57	334.21	91.94	334.83	0.67²	0.67	335.50	4.18	0.27	335.77	0.012	1.562	335.50	335.77	0.00

Notes: Return Period = 10-yrs. ² Critical depth. ‡ Supercritical.

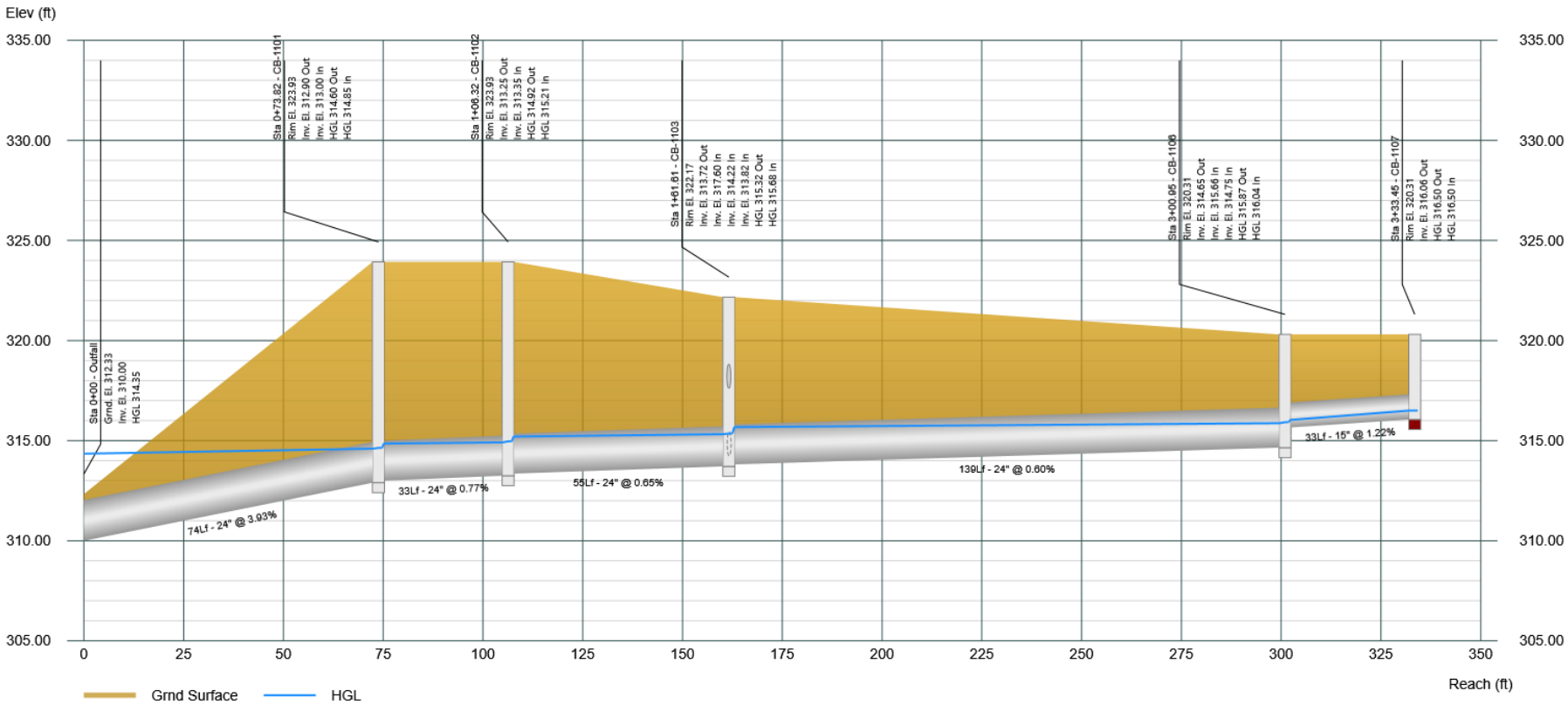
Project File: SD-1800.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1100

02-27-2024



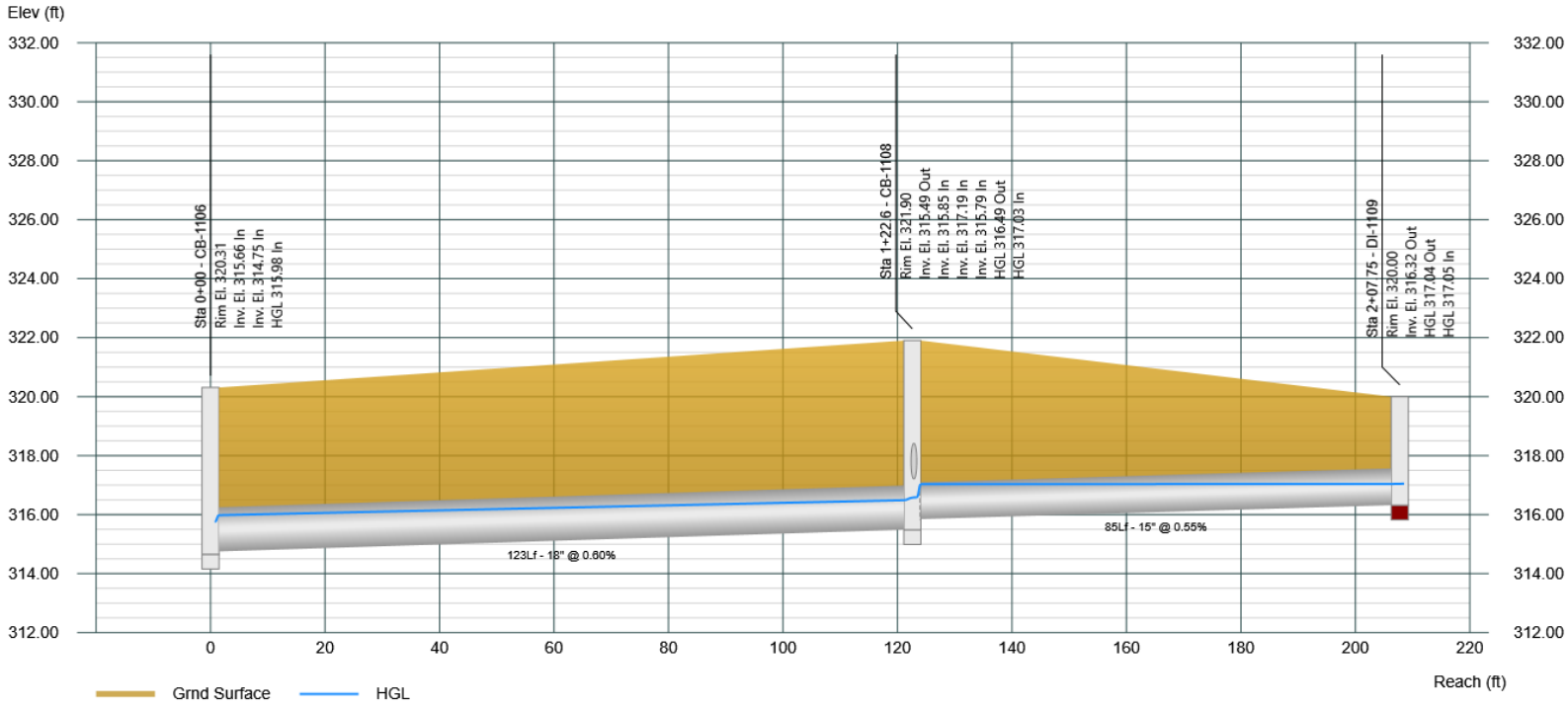
Project File: Storm System 1100-SPREAD.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1100

02-27-2024



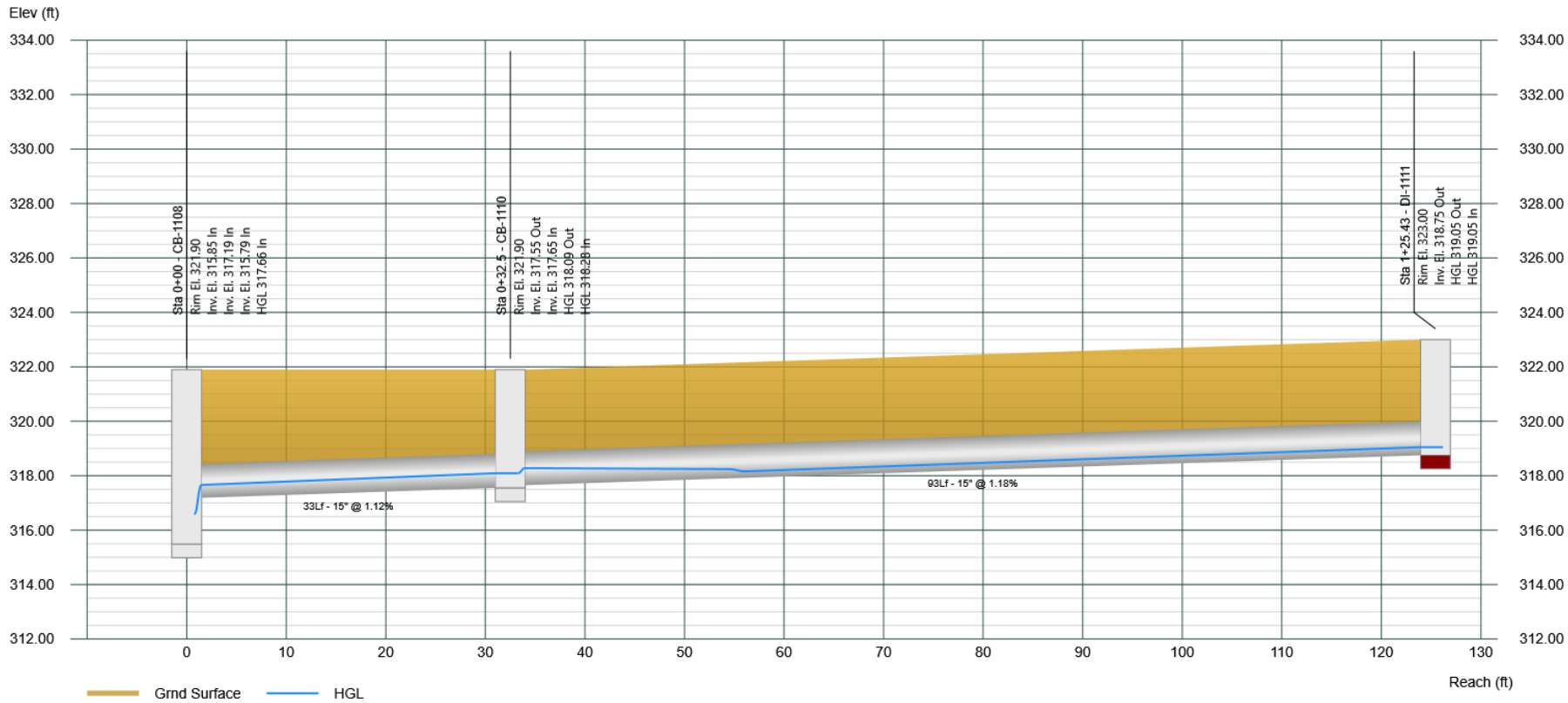
Project File: Storm System 1100-SPREAD.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1100

02-27-2024



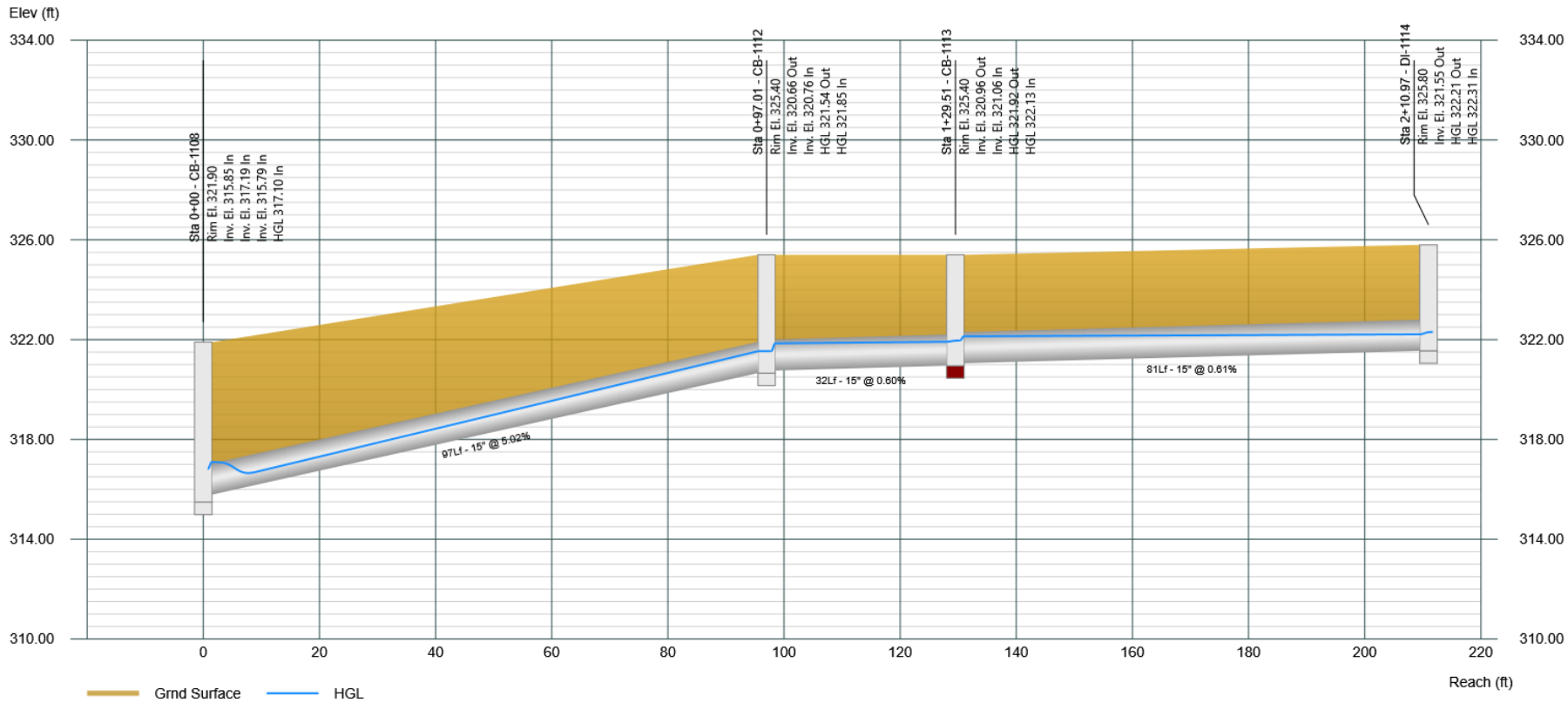
Project File: Storm System 1100-SPREAD.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1100

02-27-2024



Project File: Storm System 1100-SPREAD.sws

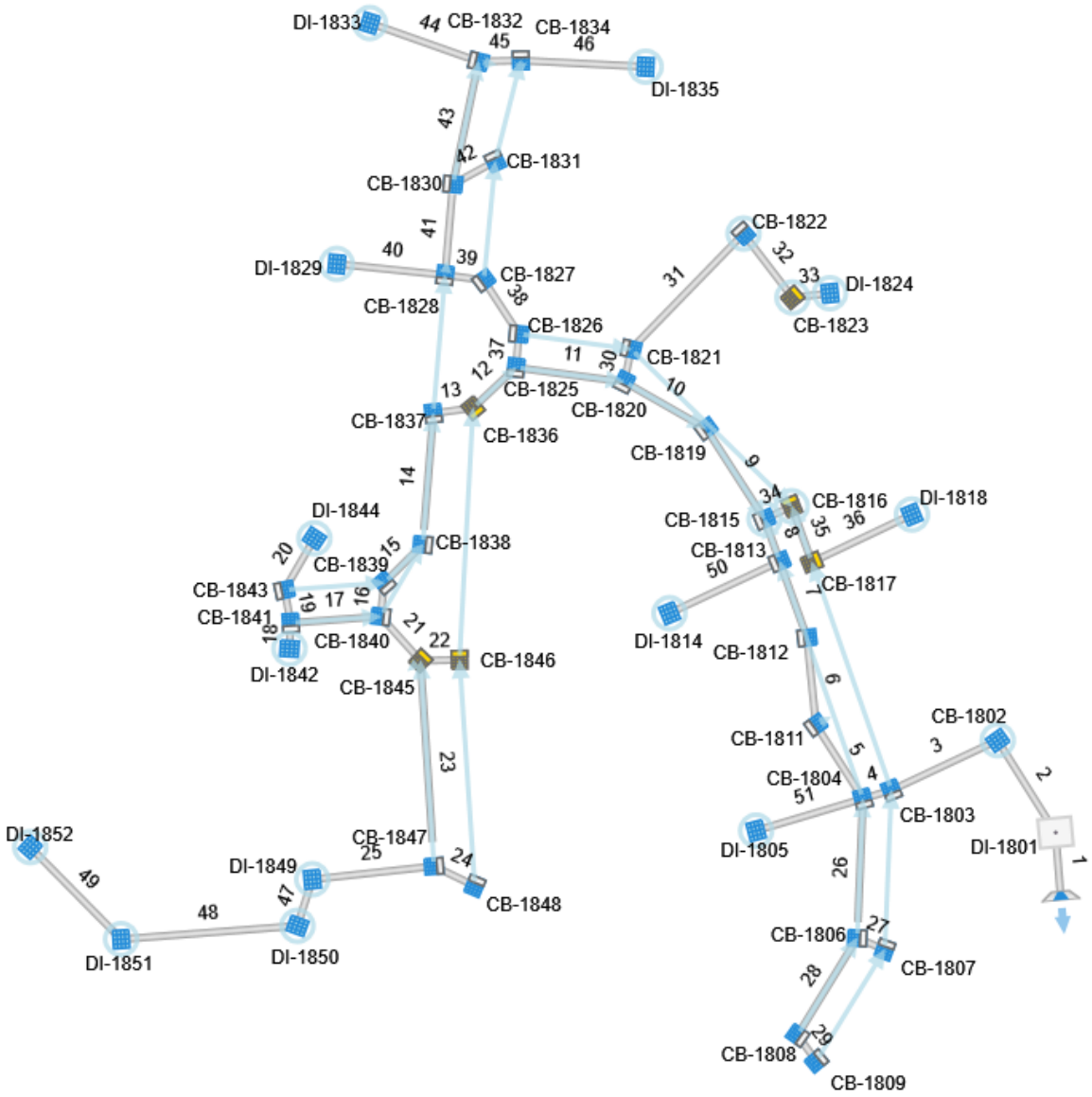
SYSTEM 1800 – REPORTS AND PROFILES

Plan View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024



Project File: SD-1800.sws

Storm Sewer Tabulation

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024

Line ID	Length	Drng Area		Rational	C x A		Tc		Intensity	Total Q	Capacity	Velocity	Line		Invert Elev		HGL Elev		Surface Elev		Line No
		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
	(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1800-1801	42.89	0.000	12.730	0.00	0.00	9.40	5.0	8.09	6.30	59.18	346.85	10.57	48	5.83	302.00	299.50	304.28	301.05	311.00	304.00	1
1801-1802	82.56	0.110	12.730	0.65	0.07	9.40	5.0	8.03	6.31	59.32	444.22	12.97	48	9.56	310.00	302.10	312.27	303.34	324.00	311.00	2
1802-1803	95.68	0.190	12.620	0.85	0.16	9.33	5.0	7.96	6.33	59.04	401.49	12.56	48	7.81	317.57	310.10	319.85	311.38	340.27	324.00	3
1803-1804	24.50	0.150	12.430	0.85	0.13	9.17	5.0	7.91	6.34	58.13	111.27	6.84	48	0.60	317.83	317.69	320.30	320.36	340.27	340.27	4
1810-1811	66.48	0.160	11.100	0.95	0.15	8.16	5.0	7.78	6.37	51.98	81.38	8.24	42	0.65	318.74	318.30	320.95	320.46	337.97	337.61	5
1811-1812	63.93	0.140	10.940	0.85	0.12	8.01	5.0	7.66	6.41	51.28	77.93	8.11	42	0.60	319.22	318.84	321.42	321.01	334.87	337.97	6
1812-1813	60.00	0.110	10.800	0.85	0.09	7.89	5.0	7.54	6.44	50.75	80.08	6.92	42	0.63	319.70	319.32	322.00	322.07	333.78	334.87	7
1813-1815	33.36	0.220	9.690	0.85	0.19	7.14	5.0	7.48	6.45	46.08	92.18	5.59	42	0.84	319.98	319.70	322.64	322.67	333.62	333.78	8
1815-1819	81.83	0.110	8.750	0.85	0.09	6.37	5.0	7.31	6.50	41.41	51.66	8.03	36	0.60	320.97	320.48	323.03	322.53	334.74	333.62	9
1819-1820	76.21	0.080	8.640	0.85	0.07	6.28	5.0	7.15	6.54	41.07	51.66	6.69	36	0.60	321.53	321.07	323.82	323.69	337.50	334.74	10
1820-1825	90.84	0.070	8.130	0.85	0.06	5.87	5.0	6.95	6.59	38.69	51.66	6.23	36	0.60	322.18	321.63	324.46	324.33	340.36	337.50	11
1825-1836	46.32	0.300	4.420	0.85	0.26	3.30	5.0	6.90	6.61	21.81	138.52	8.26	36	4.31	335.96	333.96	337.45	334.98	342.67	340.36	12
1836-1837	33.27	0.140	4.120	0.85	0.12	3.05	5.0	6.84	6.62	20.18	53.20	7.22	30	1.68	337.26	336.70	338.76	337.99	342.86	342.67	13
1837-1838	95.89	0.140	3.980	0.85	0.12	2.93	5.0	6.60	6.69	19.59	31.77	6.54	30	0.60	337.94	337.36	339.41	338.81	344.96	342.86	14
1838-1839	42.50	0.050	3.840	0.85	0.04	2.81	5.0	6.55	6.71	18.83	83.34	8.28	30	4.13	339.80	338.04	341.25	339.05	346.18	344.96	15
1839-1840	24.73	0.070	3.790	0.85	0.06	2.77	5.0	6.51	6.72	18.58	59.95	7.08	30	2.14	340.43	339.90	341.87	341.12	346.26	346.18	16
1840-1841	75.01	0.220	0.770	0.85	0.19	0.59	5.0	5.44	7.04	4.13	6.46	5.13	15	1.00	342.13	341.38	342.95	342.13	349.16	346.26	17
1841-1842	18.79	0.270	0.270	0.65	0.18	0.18	5.0	5.00	7.19	1.26	15.72	2.15	15	5.92	343.34	342.23	343.79	343.30	350.00	349.16	18
1841-1843	24.50	0.210	0.280	0.85	0.18	0.22	5.0	5.33	7.08	1.59	5.00	1.53	15	0.60	342.38	342.23	343.30	343.30	349.16	349.16	19
1843-1844	45.04	0.070	0.070	0.65	0.05	0.05	5.0	5.00	7.19	0.33	5.00	0.44	15	0.60	342.75	342.48	343.37	343.37	347.00	349.16	20
1836-1841	46.26	0.260	2.950	0.85	0.22	2.12	5.0	6.41	6.75	14.30	42.96	4.74	30	1.10	341.04	340.53	342.30	342.35	346.79	346.26	21
1845-1846	32.50	0.280	0.280	0.85	0.24	0.24	5.0	5.00	7.19	1.71	5.00	3.56	15	0.60	342.54	342.35	343.07	342.85	346.79	346.79	22

Notes: IDF File = The Point.IDF, Return Period = 10-yrs.

Project File: SD-1800.sws

Storm Sewer Tabulation

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024

Line ID	Length	Drng Area		Rational	C x A		Tc		Intensity	Total Q	Capacity	Velocity	Line		Invert Elev		HGL Elev		Surface Elev		Line No
		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
	(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1845-1847	150.07	0.260	2.410	0.85	0.22	1.66	5.0	6.18	6.82	11.32	38.77	7.80	24	2.94	346.20	341.79	347.39	342.58	352.13	346.79	23
1847-1848	36.89	0.210	0.210	0.85	0.18	0.18	5.0	5.00	7.19	1.28	10.20	4.07	15	2.50	348.72	347.80	349.17	348.13	352.97	352.13	24
1847-1849	101.79	0.260	1.940	0.65	0.17	1.26	5.0	5.90	6.90	8.70	20.19	5.56	24	0.80	347.11	346.30	348.16	347.25	354.00	352.13	25
1804-1806	101.52	0.150	0.580	0.85	0.13	0.49	5.0	5.32	7.08	3.49	14.47	6.77	15	5.02	341.12	336.02	341.87	336.46	345.72	340.27	26
1806-1807	24.50	0.180	0.180	0.85	0.15	0.15	5.0	5.00	7.19	1.10	6.48	1.32	15	1.01	341.47	341.22	342.17	342.18	345.72	345.72	27
1806-1808	86.54	0.090	0.250	0.85	0.08	0.21	5.0	5.13	7.14	1.52	14.54	5.25	15	5.07	345.86	341.47	346.35	341.76	350.36	345.72	28
1808-1809	24.50	0.160	0.160	0.85	0.14	0.14	5.0	5.00	7.19	0.98	5.00	3.01	15	0.60	346.11	345.96	346.51	346.34	350.36	350.36	29
1820-1821	24.49	0.080	0.430	0.85	0.07	0.34	5.0	6.01	6.87	2.36	5.00	3.95	15	0.60	326.32	326.18	326.94	326.78	337.50	337.50	30
1821-1822	125.80	0.060	0.350	0.95	0.06	0.28	5.0	5.46	7.04	1.94	5.00	3.74	15	0.60	327.18	326.42	327.74	326.96	332.20	337.50	31
1822-1823	61.82	0.100	0.290	0.95	0.10	0.22	5.0	5.17	7.13	1.56	5.00	3.28	15	0.60	327.65	327.28	328.15	327.81	332.00	332.20	32
1823-1824	31.36	0.190	0.190	0.65	0.12	0.12	5.0	5.00	7.19	0.89	5.00	2.27	15	0.60	327.94	327.75	328.32	328.29	333.00	332.00	33
1815-1816	24.50	0.350	0.720	0.85	0.30	0.58	5.0	5.72	6.96	4.05	5.00	4.54	15	0.60	329.19	329.04	330.04	329.89	333.62	333.62	34
1816-1817	43.96	0.220	0.370	0.85	0.19	0.28	5.0	5.53	7.01	2.00	5.00	1.75	15	0.60	329.55	329.29	330.56	330.53	333.90	333.62	35
1817-1818	90.31	0.150	0.150	0.65	0.10	0.10	5.0	5.00	7.19	0.70	4.96	1.16	15	0.59	330.18	329.65	330.66	330.63	334.38	333.90	36
1825-1826	24.50	0.010	3.640	0.85	0.01	2.51	5.0	6.51	6.72	16.85	17.52	6.17	24	0.60	323.32	323.18	324.93	324.81	340.36	340.36	37
1826-1827	48.76	0.040	3.630	0.85	0.03	2.50	5.0	6.38	6.75	16.88	17.52	5.68	24	0.60	323.72	323.42	325.47	325.27	339.34	340.36	38
1827-1828	32.51	0.150	3.590	0.85	0.13	2.47	5.0	6.33	6.77	16.70	27.91	7.36	24	1.52	324.31	323.82	325.76	325.10	339.31	339.34	39
1828-1829	90.58	1.920	1.920	0.65	1.25	1.25	5.0	5.00	7.19	8.97	11.59	6.58	18	1.22	335.35	334.25	336.50	335.28	342.00	339.31	40
1828-1830	66.41	0.100	1.520	0.85	0.09	1.09	5.0	6.12	6.83	7.45	17.52	2.62	24	0.60	324.91	324.51	326.47	326.43	336.19	339.31	41
1830-1831	39.01	0.110	0.110	0.85	0.09	0.09	5.0	5.00	7.19	0.67	4.96	2.68	15	0.59	326.64	326.41	326.97	326.72	335.16	336.19	42
1830-1832	91.90	0.150	1.310	0.85	0.13	0.91	5.0	5.82	6.92	6.31	8.13	3.91	18	0.60	325.56	325.01	326.74	326.49	331.98	336.19	43
1832-1833	94.80	0.870	0.870	0.65	0.57	0.57	5.0	5.00	7.19	4.06	10.12	6.07	15	2.46	328.24	325.91	329.05	326.49	332.70	331.98	44

Notes: IDF File = The Point.IDF, Return Period = 10-yrs.

Project File: SD-1800.sws

Storm Sewer Tabulation

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024

Line ID	Length	Drng Area		Rational	C x A		Tc		Intensity	Total Q	Capacity	Velocity	Line		Invert Elev		HGL Elev		Surface Elev		Line No
		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
	(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1832-1834	35.20	0.150	0.290	0.85	0.13	0.22	5.0	5.65	6.98	1.52	5.00	1.42	15	0.60	326.12	325.91	327.06	327.05	331.33	331.98	45
1834-1835	104.02	0.140	0.140	0.65	0.09	0.09	5.0	5.00	7.19	0.65	4.60	1.27	15	0.51	326.75	326.22	327.16	327.11	331.00	331.33	46
1849-1850	36.00	0.380	1.680	0.65	0.25	1.09	5.0	5.82	6.92	7.56	12.73	6.16	18	1.25	347.66	347.21	348.71	348.14	353.01	354.00	47
1850-1851	147.13	0.840	1.300	0.65	0.55	0.84	5.0	5.40	7.06	5.96	9.84	5.42	18	0.75	348.86	347.76	349.79	348.62	354.37	353.01	48
1851-1852	101.06	0.460	0.460	0.65	0.30	0.30	5.0	5.00	7.19	2.15	5.56	3.97	15	0.63	349.75	349.11	350.34	349.66	353.50	354.37	49
1813-1814	99.21	1.000	1.000	0.65	0.65	0.65	5.0	5.00	7.19	4.67	15.30	5.82	18	1.81	330.00	328.20	330.82	328.81	334.50	333.78	50
1804-1805	91.94	0.600	0.600	0.65	0.39	0.39	5.0	5.00	7.19	2.80	9.12	5.12	15	1.70	334.83	333.27	335.50	333.77	339.08	340.27	51

Notes: IDF File = The Point.IDF, Return Period = 10-yrs.

Project File: SD-1800.sws

Energy Grade Line Calculations

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024

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)
1	48	59.18	299.50	1.55‡	4.51	301.05	13.13	2.68	303.75	42.89	302.00	2.28²	7.38	304.28	8.02	1.00	305.28	0.013	1.526	304.28	305.28	0.00
2	48	59.32	302.10	1.24‡	3.31	303.34	17.91	4.99	305.46	82.56	310.00	2.28²	7.39	312.27	8.03	1.00	313.27	0.013	7.818	312.27	313.27	0.00
3	48	59.04	310.10	1.28‡	3.45	311.38	17.12	4.56	313.45	95.68	317.57	2.27²	7.37	319.85	8.01	1.00	320.84	0.013	7.391	319.85	320.84	0.00
4	48	58.13	317.69	2.67	8.92	320.36	6.52	0.66	321.02	24.50	317.83	2.46	8.11	320.30	7.16	0.80	321.09	0.013	0.074	320.35	321.15	0.06
5	42	51.98	318.30	2.16‡	6.22	320.46	8.36	1.09	321.58	66.48	318.74	2.21²	6.39	320.95	8.13	1.03	321.97	0.013	0.398	320.95	321.97	0.00
6	42	51.28	318.84	2.17‡	6.28	321.01	8.17	1.04	322.16	63.93	319.22	2.20	6.37	321.42	8.05	1.01	322.43	0.013	0.267	321.49	322.50	0.07
7	42	50.75	319.32	2.75	8.10	322.07	6.26	0.61	322.68	60.00	319.70	2.30	6.70	322.00	7.57	0.89	322.89	0.013	0.213	322.06	322.96	0.06
8	42	46.08	319.70	2.96	8.69	322.67	5.31	0.44	323.10	33.36	319.98	2.66	7.83	322.64	5.88	0.54	323.18	0.013	0.073	322.66	323.20	0.03
9	36	41.41	320.48	2.05‡	5.14	322.53	8.05	1.01	323.60	81.83	320.97	2.06	5.17	323.03	8.01	1.00	324.03	0.013	0.435	323.10	324.10	0.07
10	36	41.07	321.07	2.62	6.54	323.69	6.28	0.61	324.30	76.21	321.53	2.28	5.78	323.82	7.11	0.79	324.60	0.013	0.298	323.88	324.67	0.07
11	36	38.69	321.63	2.70	6.70	324.33	5.78	0.52	324.85	90.84	322.18	2.29	5.78	324.46	6.69	0.70	325.16	0.013	0.311	324.53	325.23	0.07
12	36	21.81	333.96	1.02‡	2.12	334.98	10.29	1.65	336.05	46.32	335.96	1.49²	3.50	337.45	6.23	0.60	338.05	0.013	1.998	337.45	338.05	0.00
13	30	20.18	336.70	1.29‡	2.56	337.99	7.88	0.96	338.87	33.27	337.26	1.50²	3.08	338.76	6.55	0.67	339.43	0.013	0.560	338.76	339.43	0.00
14	30	19.59	337.36	1.45‡	2.96	338.81	6.61	0.68	339.55	95.89	337.94	1.48²	3.02	339.41	6.48	0.65	340.07	0.013	0.520	339.41	340.07	0.00
15	30	18.83	338.04	1.01‡	1.85	339.05	10.18	1.61	340.18	42.50	339.80	1.45²	2.95	341.25	6.38	0.63	341.88	0.013	1.701	341.25	341.88	0.00
16	30	18.58	339.90	1.22‡	2.37	341.12	7.83	0.95	341.99	24.73	340.43	1.44²	2.93	341.87	6.34	0.63	342.50	0.013	0.510	341.87	342.50	0.00
17	15	4.13	341.38	0.75‡	0.77	342.13	5.38	0.45	342.57	75.01	342.13	0.81²	0.85	342.95	4.89	0.37	343.32	0.013	0.750	342.95	343.32	0.00
18	15	1.26	342.23	1.08	1.12	343.30	1.12	0.02	343.32	18.79	343.34	0.45²	0.40	343.79	3.18	0.16	343.95	0.013	0.624	343.79	343.95	0.00
19	15	1.59	342.23	1.06	1.11	343.30	1.42	0.03	343.33	24.50	342.38	0.92	0.97	343.30	1.63	0.04	343.35	0.013	0.017	343.33	343.37	0.03
20	15	0.33	342.48	0.89	0.94	343.37	0.35	0.00	343.38	45.04	342.75	0.62	0.61	343.37	0.53	0.00	343.38	0.013	0.003	343.38	343.38	0.00
21	30	14.30	340.53	1.82	3.83	342.35	3.73	0.22	342.57	46.26	341.04	1.26²	2.49	342.30	5.75	0.51	342.81	0.013	0.246	342.30	342.81	0.00
22	15	1.71	342.35	0.51‡	0.47	342.85	3.64	0.21	343.06	32.50	342.54	0.53	0.49	343.07	3.48	0.19	343.26	0.013	0.195	343.16	343.35	0.09

Notes: Return Period = 10-yrs. ² Critical depth. ‡ Supercritical.

Project File: SD-1800.sws

Energy Grade Line Calculations

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024

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	11.32	341.79	0.79‡	1.16	342.58	9.80	1.49	343.50	150.07	346.20	1.19²	1.95	347.39	5.80	0.52	347.91	0.013	4.410	347.39	347.91	0.00
24	15	1.28	347.80	0.33‡	0.26	348.13	4.94	0.38	348.41	36.89	348.72	0.45²	0.40	349.17	3.19	0.16	349.33	0.013	0.921	349.17	349.33	0.00
25	24	8.70	346.30	0.95‡	1.48	347.25	5.88	0.54	347.98	101.79	347.11	1.04²	1.66	348.16	5.24	0.43	348.58	0.013	0.607	348.16	348.58	0.00
26	15	3.49	336.02	0.44‡	0.39	336.46	8.97	1.25	337.09	101.52	341.12	0.75²	0.77	341.87	4.56	0.32	342.19	0.013	5.099	341.87	342.19	0.00
27	15	1.10	341.22	0.95	1.01	342.18	1.09	0.02	342.20	24.50	341.47	0.70	0.71	342.17	1.55	0.04	342.21	0.013	0.014	342.19	342.23	0.02
28	15	1.52	341.47	0.29‡	0.21	341.76	7.13	0.79	342.21	86.54	345.86	0.49²	0.45	346.35	3.37	0.18	346.53	0.013	4.318	346.35	346.53	0.00
29	15	0.98	345.96	0.38‡	0.31	346.34	3.12	0.15	346.54	24.50	346.11	0.40	0.34	346.51	2.90	0.13	346.64	0.013	0.096	346.59	346.72	0.08
30	15	2.36	326.18	0.61‡	0.59	326.78	4.00	0.25	327.03	24.49	326.32	0.62	0.60	326.94	3.90	0.24	327.18	0.013	0.147	327.03	327.27	0.09
31	15	1.94	326.42	0.54³	0.51	326.96	3.82	0.23	327.29	125.80	327.18	0.56²	0.53	327.74	3.66	0.21	327.95	0.013	0.654	327.74	327.95	0.00
32	15	1.56	327.28	0.53	0.49	327.81	3.15	0.15	327.96	61.82	327.65	0.50²	0.46	328.15	3.40	0.18	328.33	0.013	0.367	328.15	328.33	0.00
33	15	0.89	327.75	0.54	0.51	328.29	1.73	0.05	328.34	31.36	327.94	0.38	0.32	328.32	2.82	0.12	328.44	0.013	0.100	328.41	328.53	0.09
34	15	4.05	329.04	0.85³	0.89	329.89	4.54	0.32	330.21	24.50	329.19	0.85	0.89	330.04	4.54	0.32	330.36	0.013	0.147	330.24	330.56	0.20
35	15	2.00	329.29	1.25	1.23	330.53	1.63	0.04	330.58	43.96	329.55	1.01	1.07	330.56	1.87	0.05	330.62	0.013	0.042	330.58	330.64	0.02
36	15	0.70	329.65	0.98	1.03	330.63	0.68	0.01	330.64	90.31	330.18	0.47	0.43	330.66	1.64	0.04	330.70	0.013	0.062	330.68	330.73	0.03
37	24	16.85	323.18	1.63	2.75	324.81	6.13	0.58	325.40	24.50	323.32	1.61	2.71	324.93	6.22	0.60	325.53	0.013	0.139	324.97	325.58	0.04
38	24	16.88	323.42	1.84	3.03	325.27	5.58	0.48	325.75	48.76	323.72	1.76	2.92	325.47	5.78	0.52	325.99	0.013	0.241	325.51	326.03	0.04
39	24	16.70	323.82	1.28‡	2.12	325.10	7.86	0.96	326.21	32.51	324.31	1.45²	2.43	325.76	6.86	0.73	326.49	0.013	0.284	325.76	326.49	0.00
40	18	8.97	334.25	1.03‡	1.29	335.28	6.95	0.75	335.99	90.58	335.35	1.14²	1.44	336.50	6.21	0.60	337.10	0.013	1.104	336.50	337.10	0.00
41	24	7.45	324.51	1.92	3.10	326.43	2.40	0.09	326.52	66.41	324.91	1.56	2.63	326.47	2.83	0.12	326.60	0.013	0.072	326.49	326.61	0.01
42	15	0.67	326.41	0.31‡	0.24	326.72	2.78	0.12	326.84	39.01	326.64	0.33	0.26	326.97	2.59	0.10	327.07	0.013	0.230	327.11	327.21	0.14
43	18	6.31	325.01	1.48	1.76	326.49	3.58	0.20	326.69	91.90	325.56	1.18	1.49	326.74	4.24	0.28	327.02	0.013	0.331	326.79	327.07	0.05
44	15	4.06	325.91	0.58‡	0.56	326.49	7.28	0.82	327.13	94.80	328.24	0.81²	0.84	329.05	4.85	0.37	329.41	0.013	2.284	329.05	329.41	0.00

Notes: Return Period = 10-yrs. ² Critical depth. ³ Normal depth. ‡ Supercritical.

Project File: SD-1800.sws

Energy Grade Line Calculations

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024

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)
45	15	1.52	325.91	1.14	1.17	327.05	1.30	0.03	327.08	35.20	326.12	0.94	0.99	327.06	1.54	0.04	327.10	0.013	0.021	327.08	327.11	0.02
46	15	0.65	326.22	0.89	0.93	327.11	0.70	0.01	327.12	104.02	326.75	0.41	0.36	327.16	1.84	0.05	327.22	0.013	0.102	327.20	327.25	0.03
47	18	7.56	347.21	0.93‡	1.15	348.14	6.59	0.67	348.79	36.00	347.66	1.05²	1.32	348.71	5.73	0.51	349.22	0.012	0.428	348.71	349.22	0.00
48	18	5.96	347.76	0.86‡	1.05	348.62	5.68	0.50	349.29	147.13	348.86	0.93²	1.15	349.79	5.17	0.42	350.21	0.012	0.919	349.79	350.21	0.00
49	15	2.15	349.11	0.55‡	0.52	349.66	4.13	0.27	350.23	101.06	349.75	0.59²	0.57	350.34	3.80	0.22	350.56	0.012	0.332	350.34	350.56	0.00
50	18	4.67	328.20	0.61‡	0.67	328.81	6.96	0.75	329.37	99.21	330.00	0.82²	1.00	330.82	4.69	0.34	331.17	0.012	1.795	330.82	331.17	0.00
51	15	2.80	333.27	0.50‡	0.46	333.77	6.06	0.57	334.21	91.94	334.83	0.67²	0.67	335.50	4.18	0.27	335.77	0.012	1.562	335.50	335.77	0.00

Notes: Return Period = 10-yrs. ² Critical depth. ‡ Supercritical.

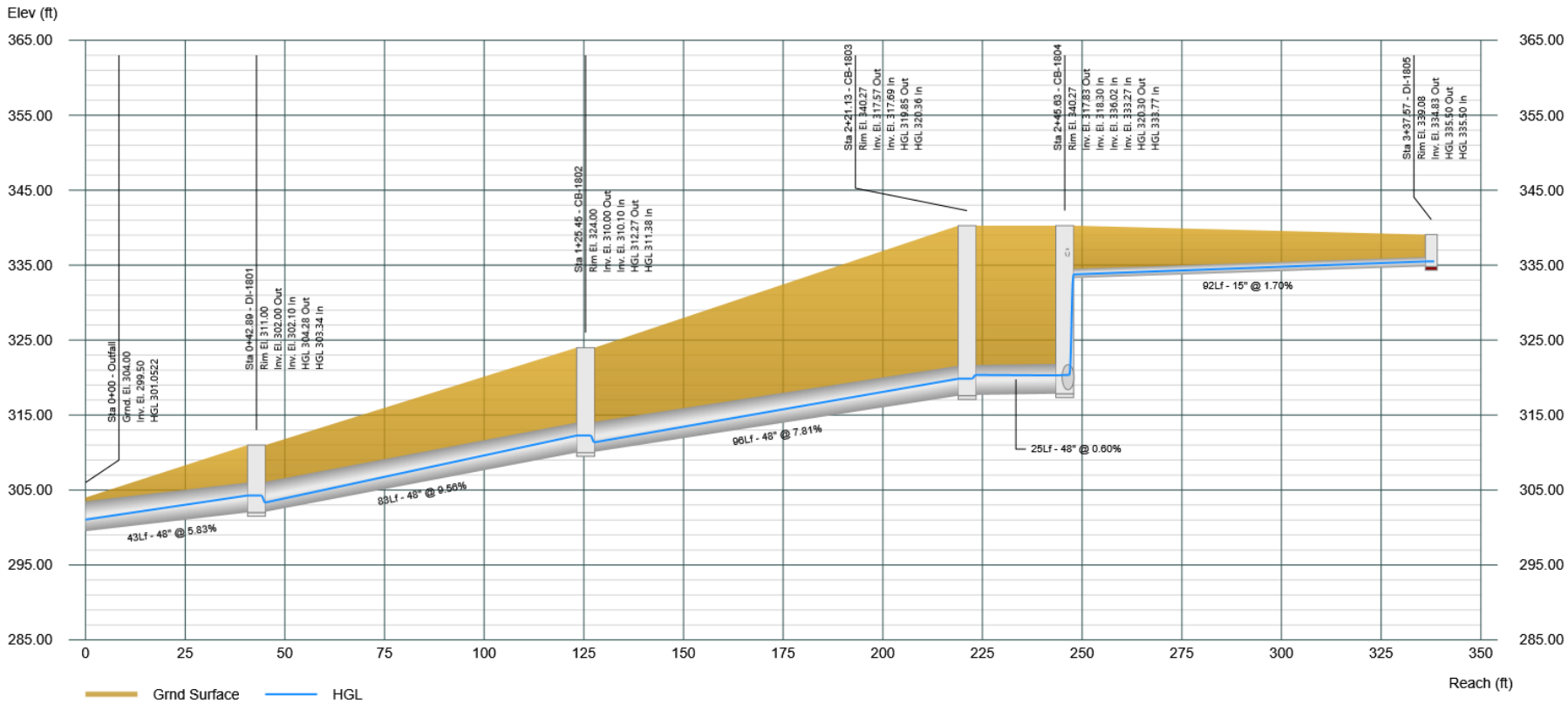
Project File: SD-1800.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024



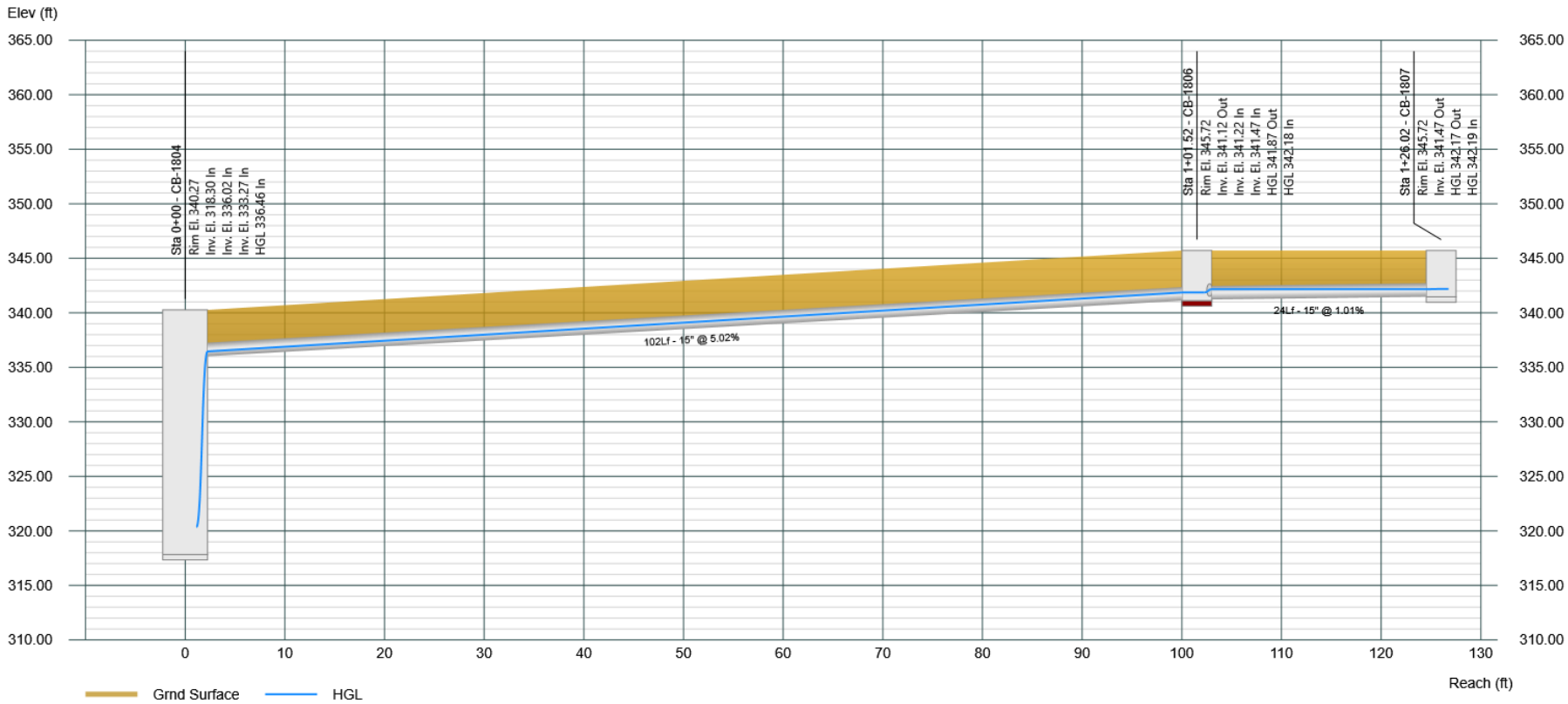
Project File: SD-1800.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024



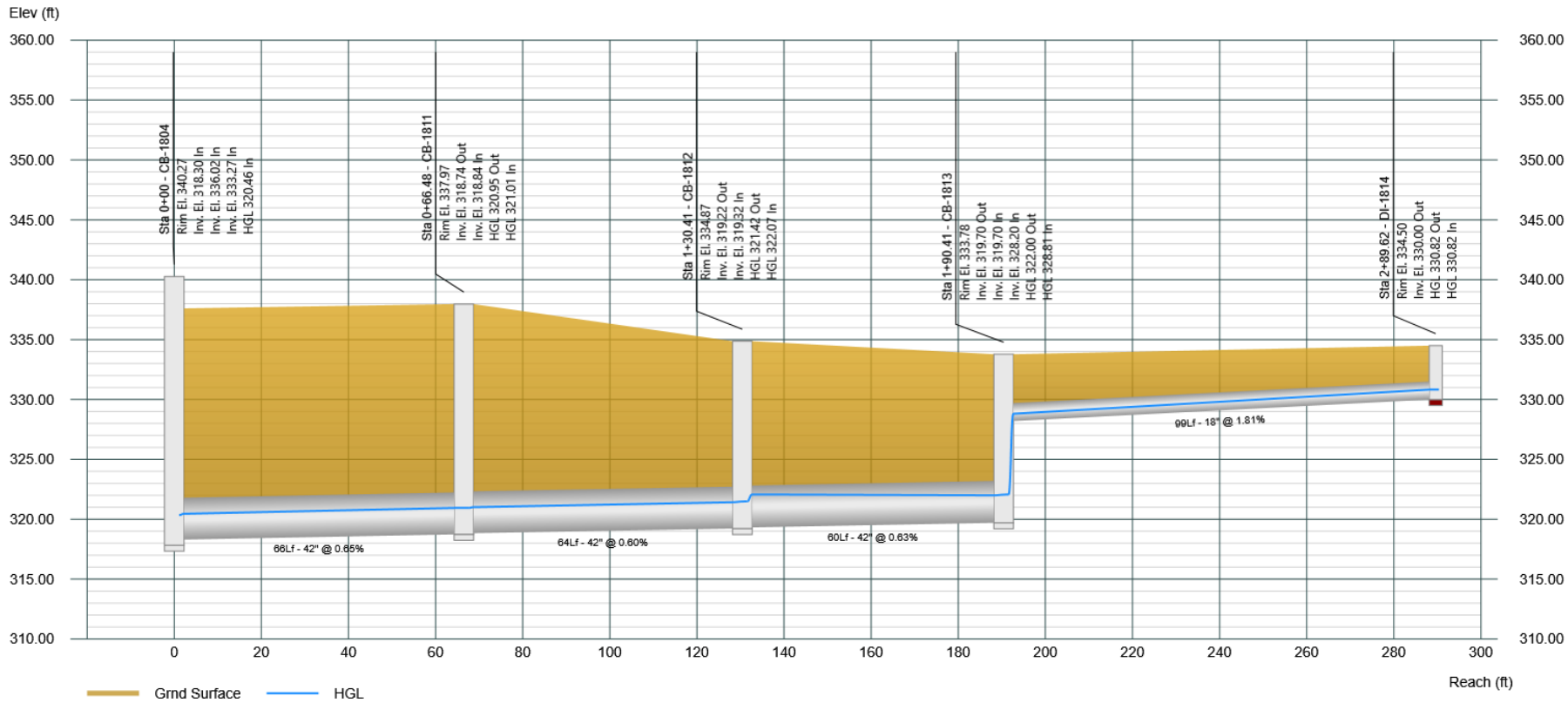
Project File: SD-1800.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024



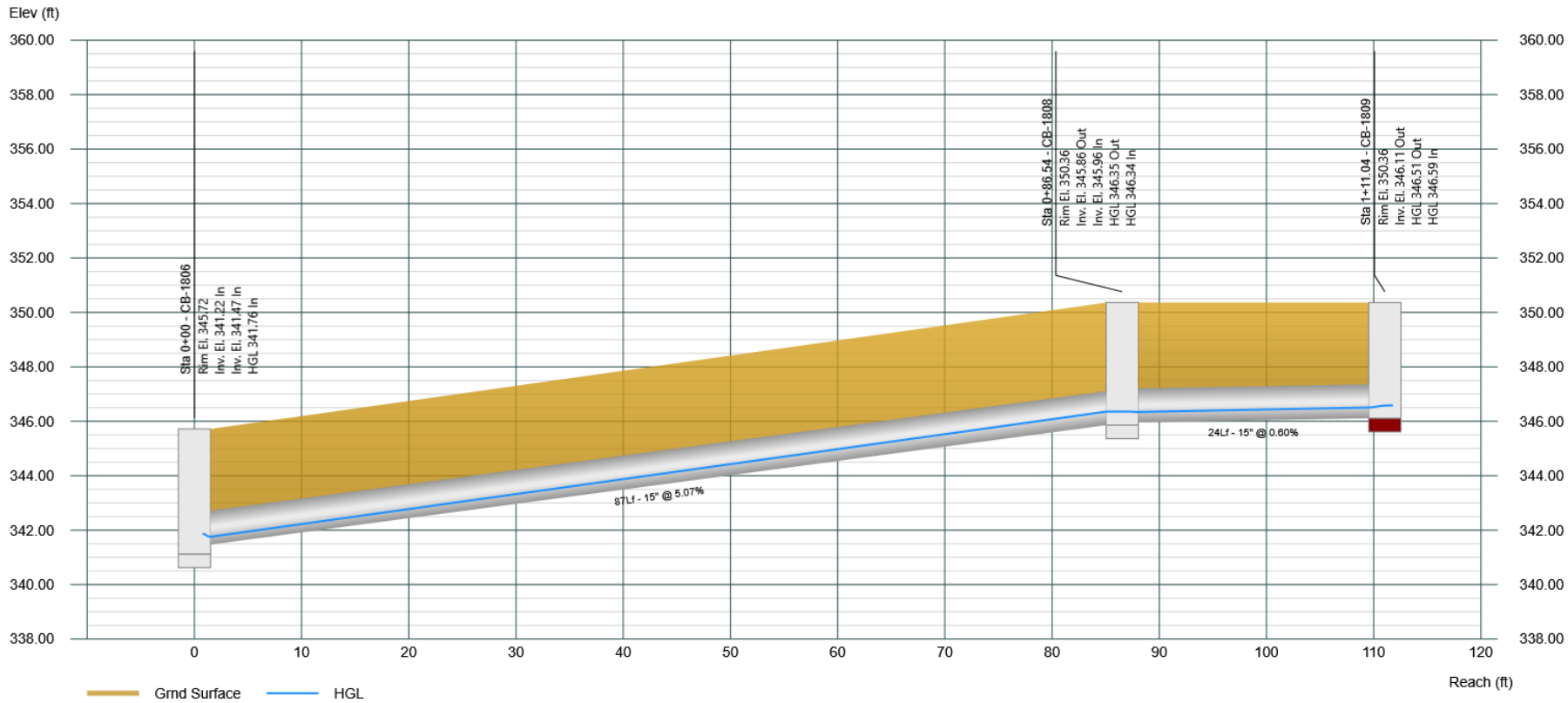
Project File: SD-1800.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024



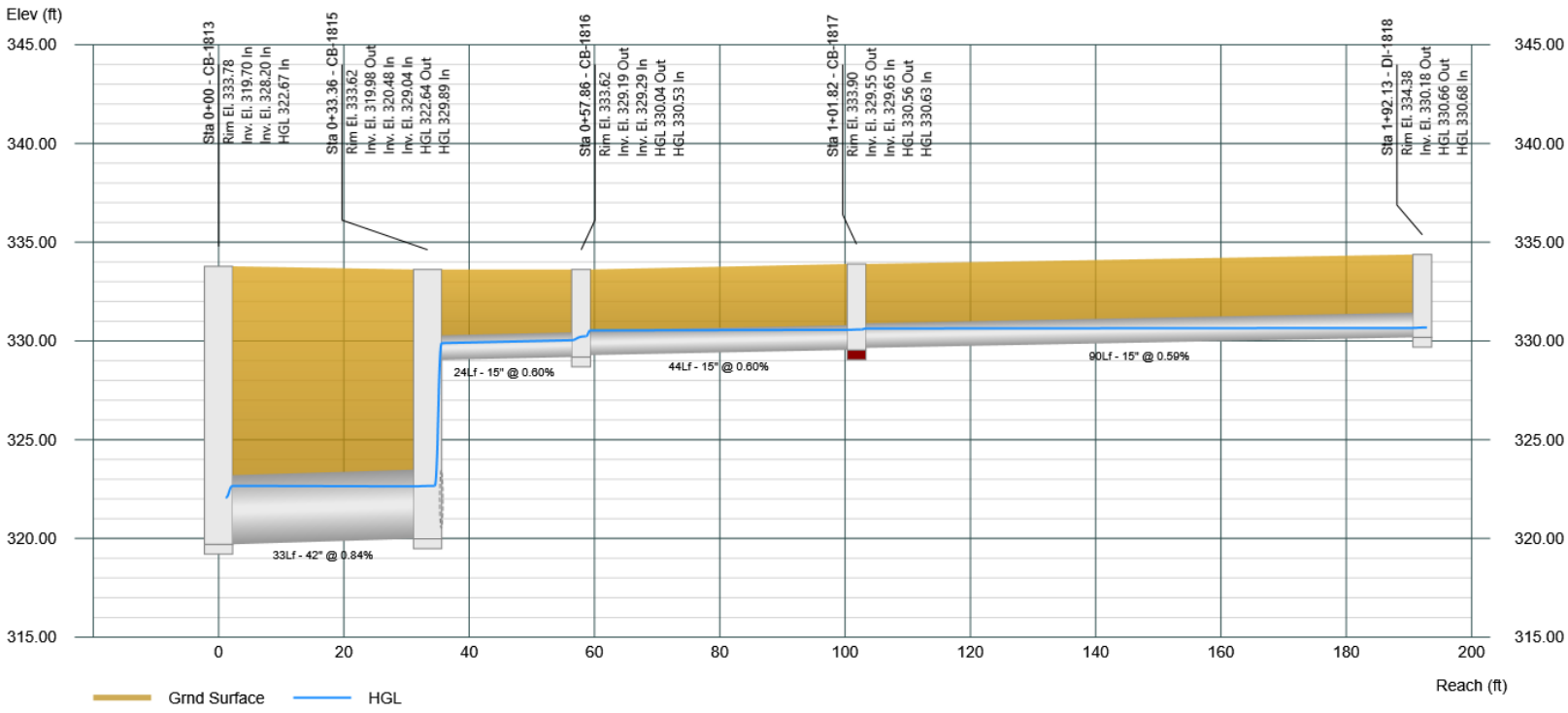
Project File: SD-1800.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024



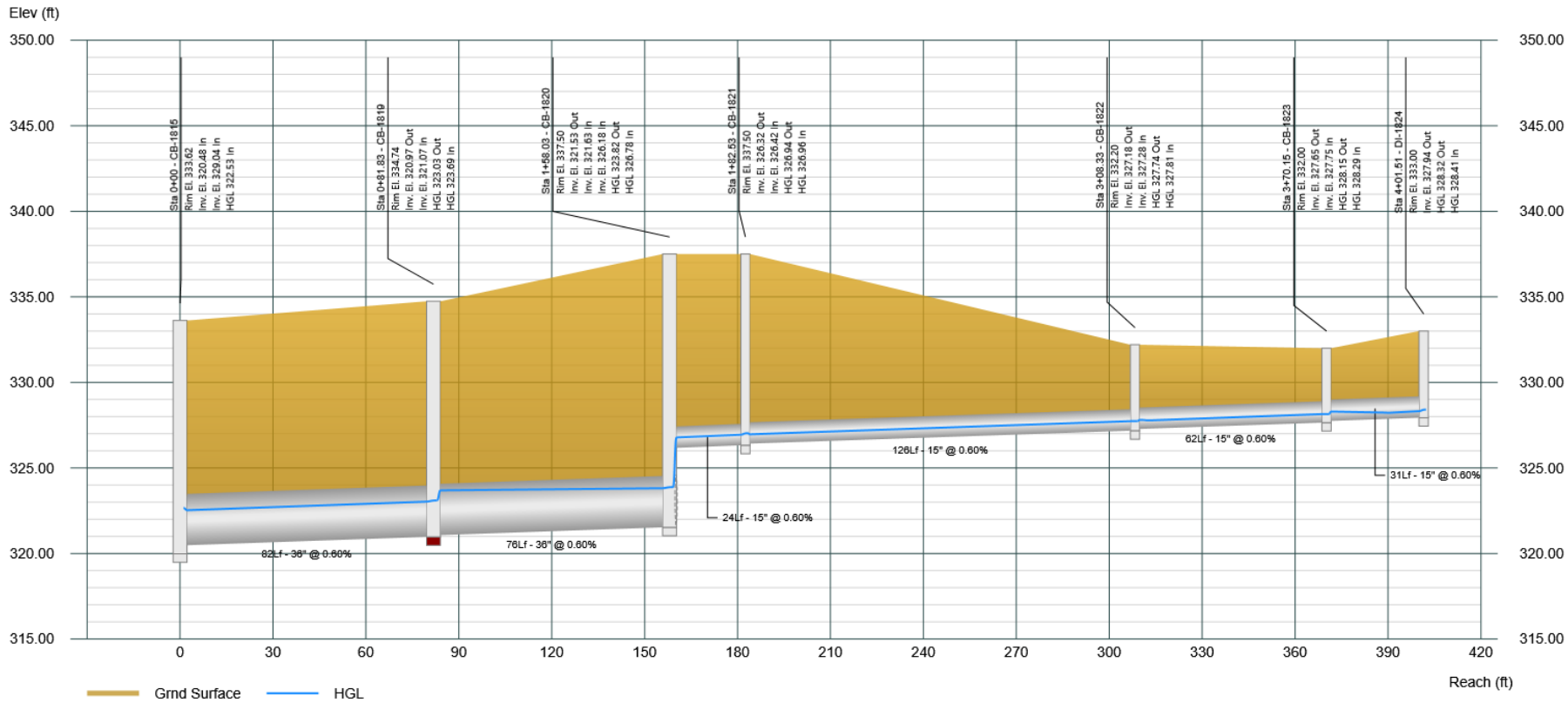
Project File: SD-1800.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024



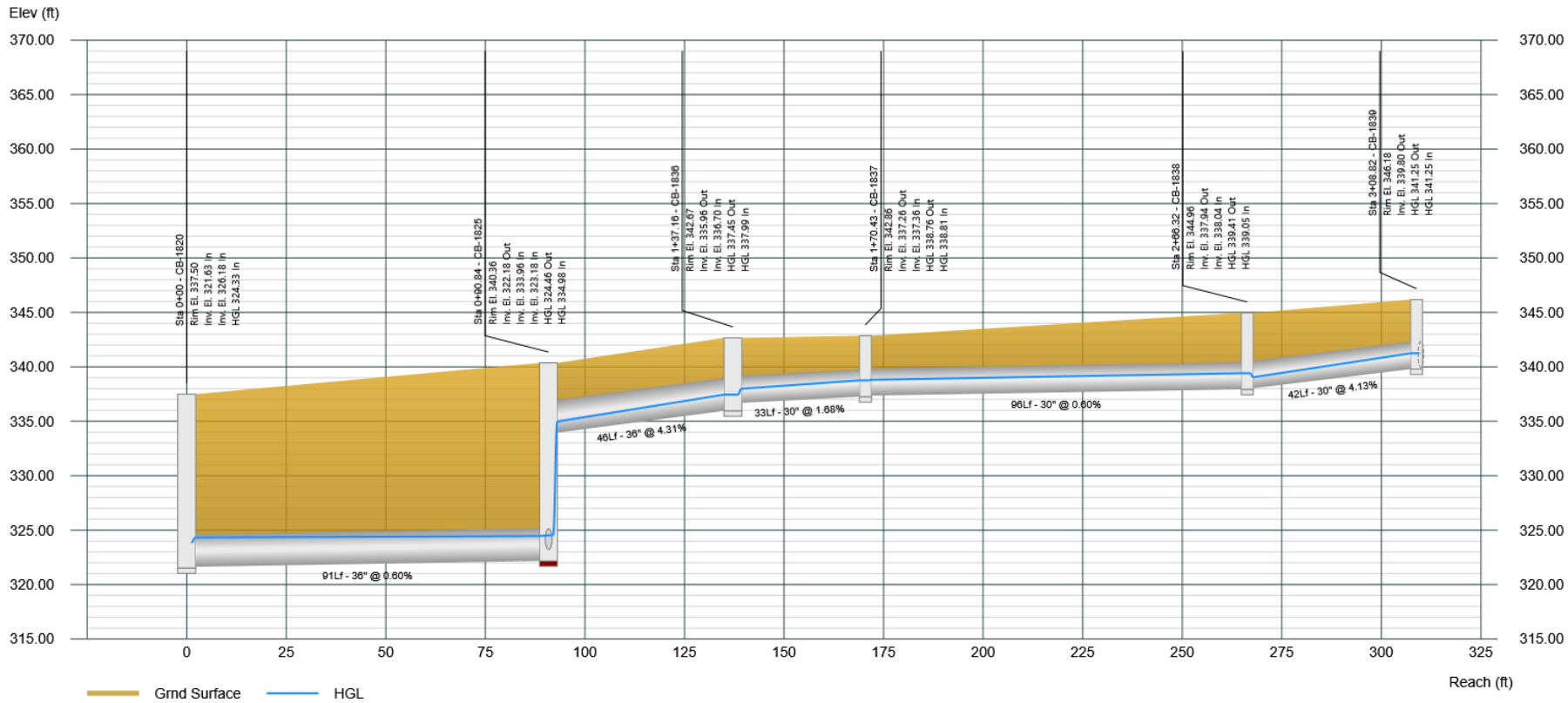
Project File: SD-1800.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024



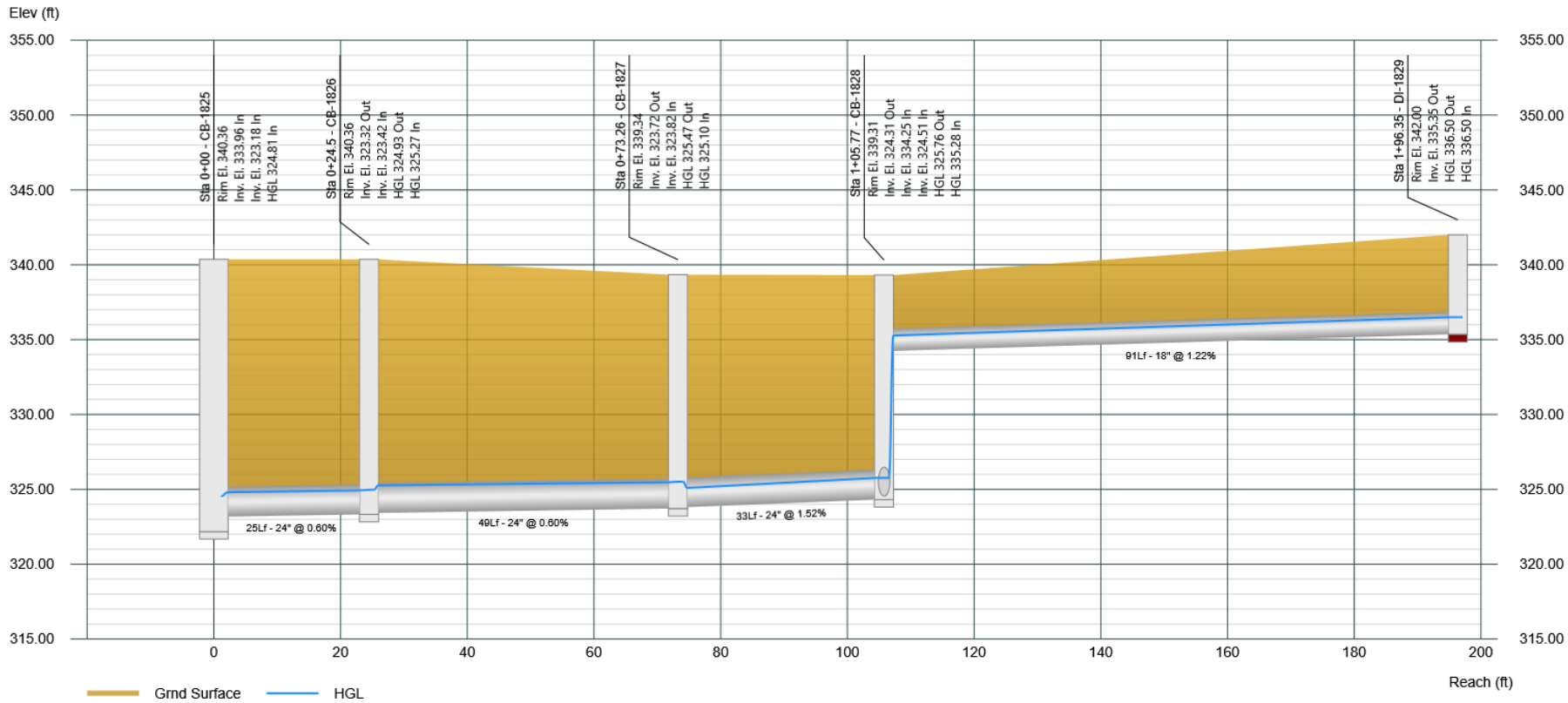
Project File: SD-1800.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024



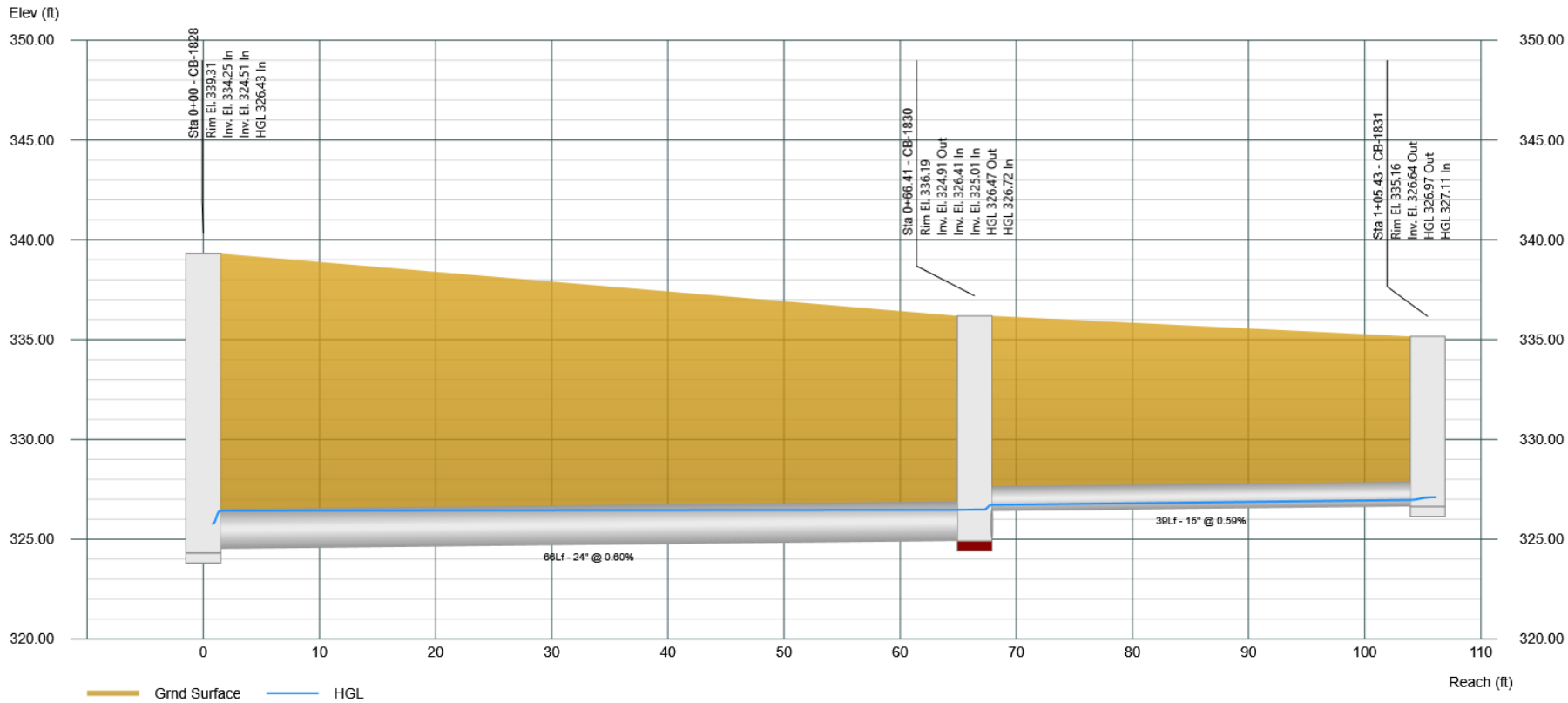
Project File: SD-1800.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024



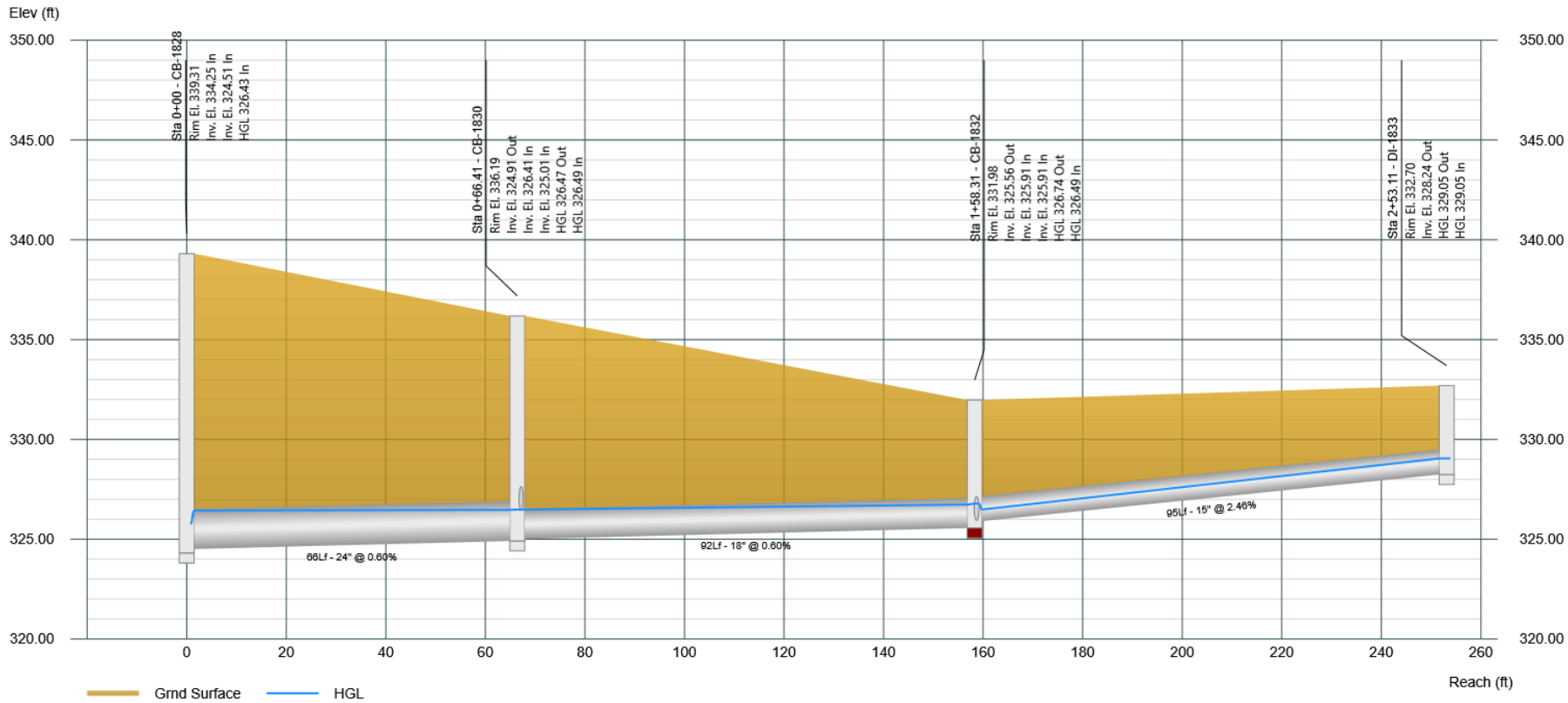
Project File: SD-1800.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024



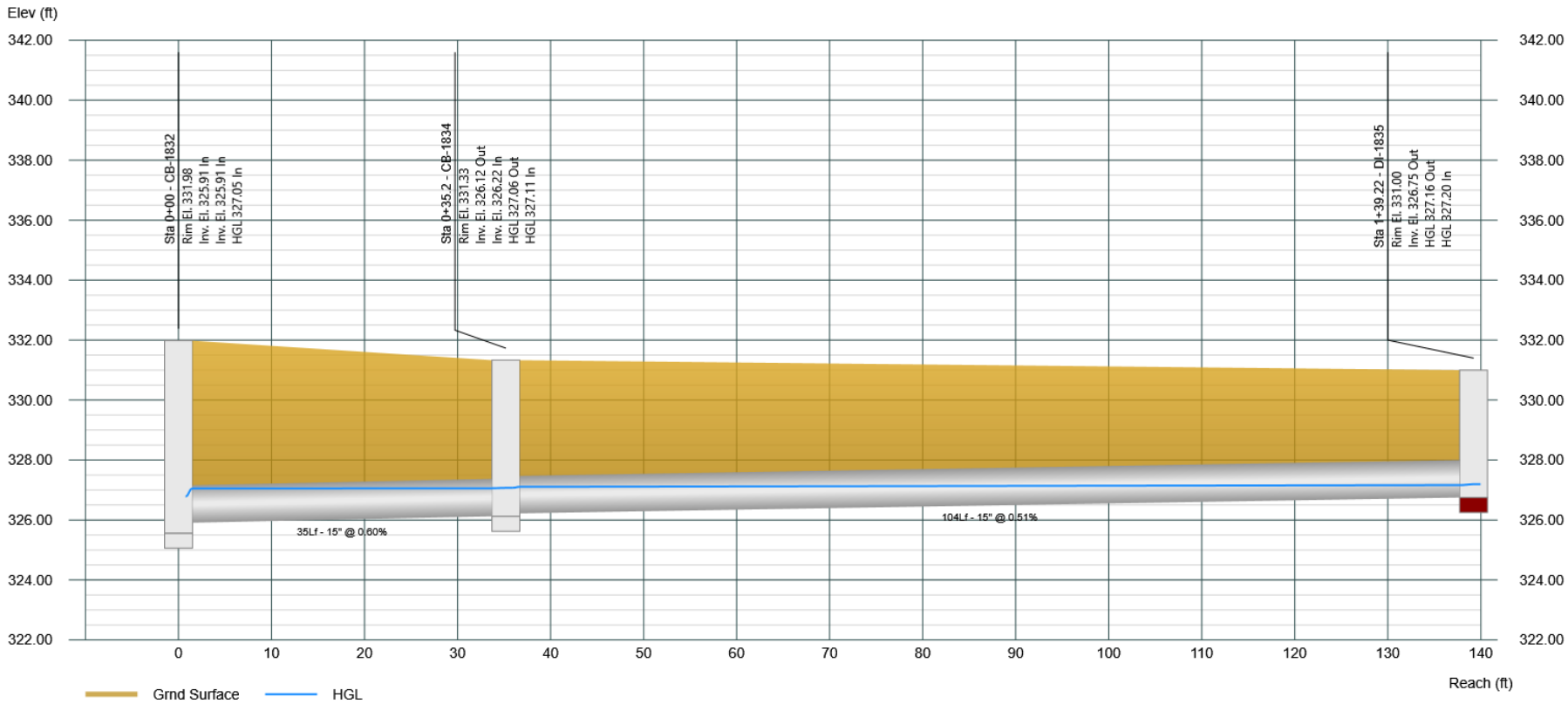
Project File: SD-1800.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024



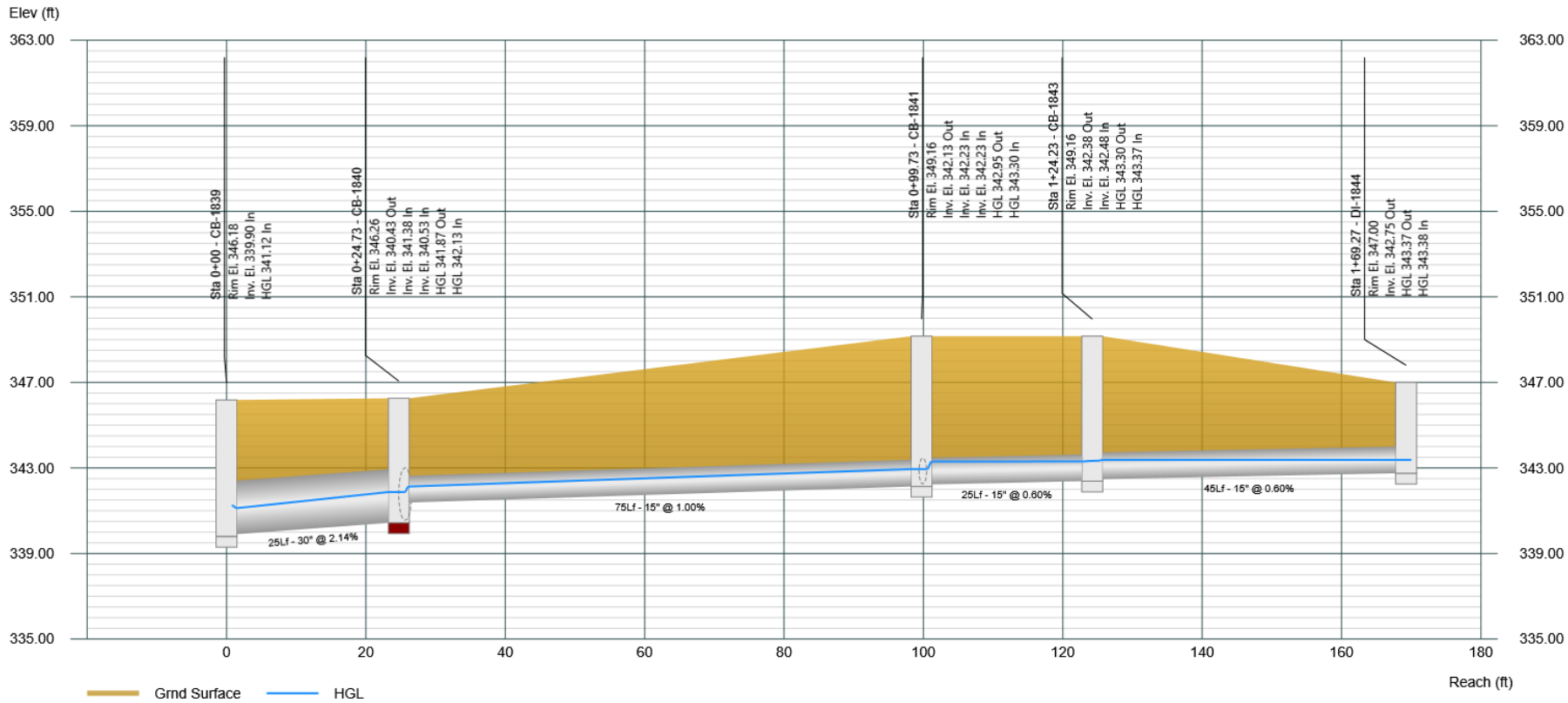
Project File: SD-1800.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024



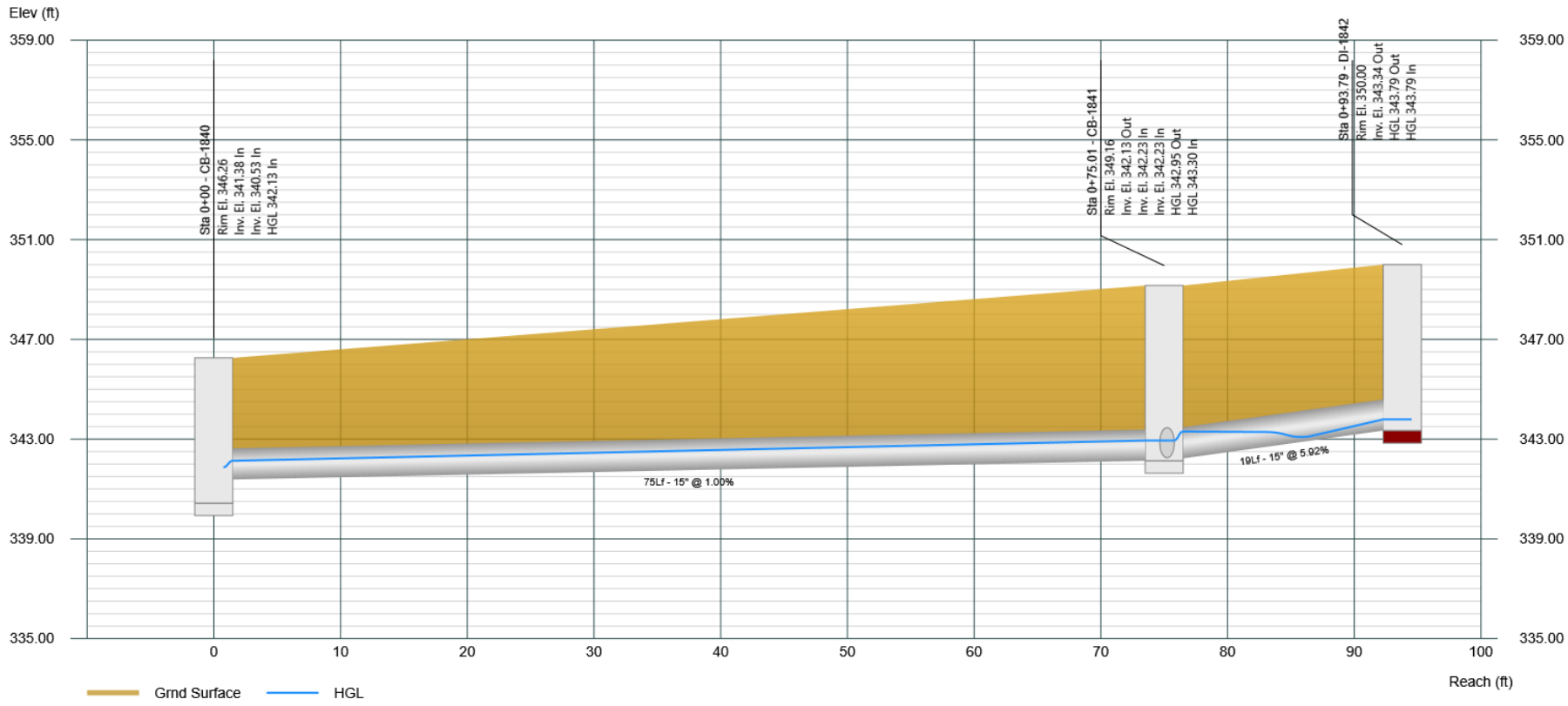
Project File: SD-1800.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024

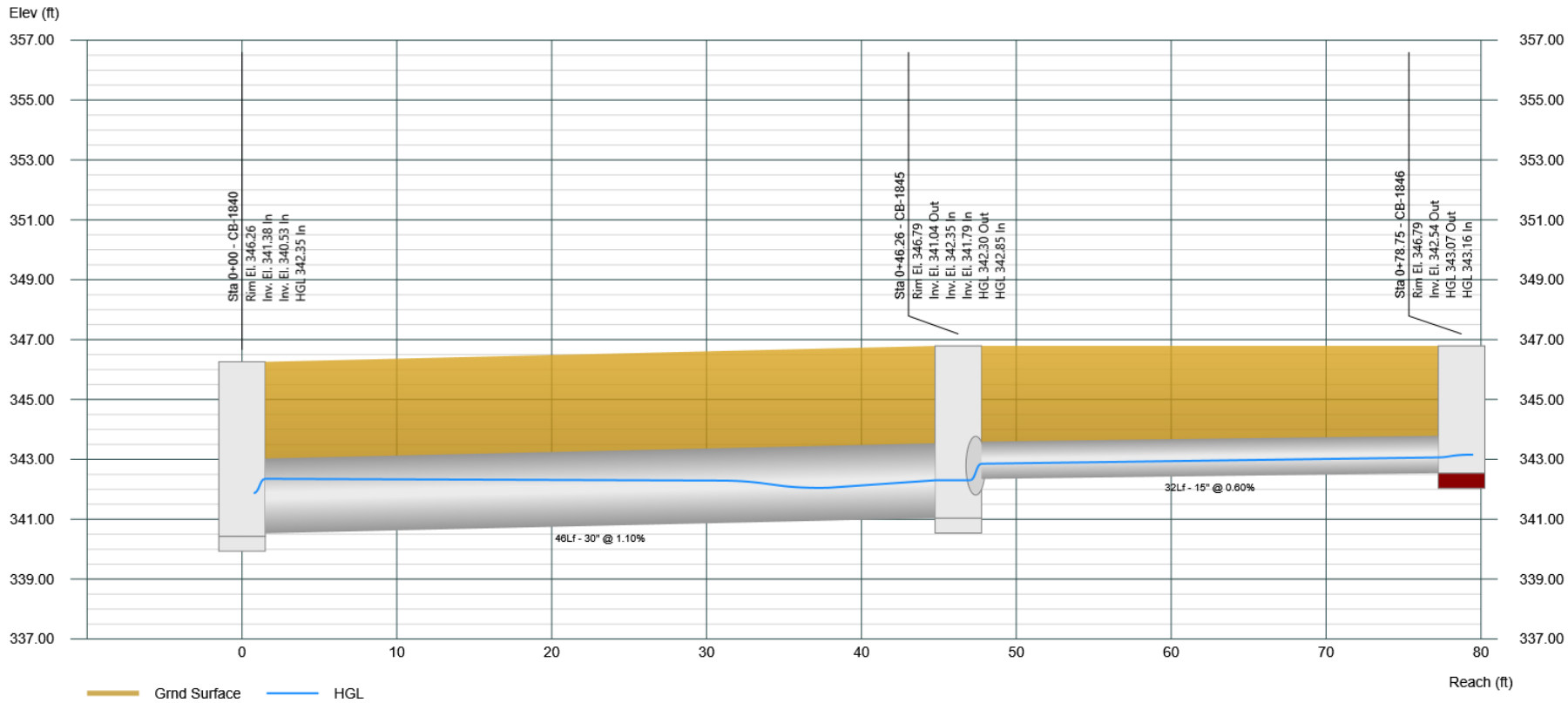


Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024



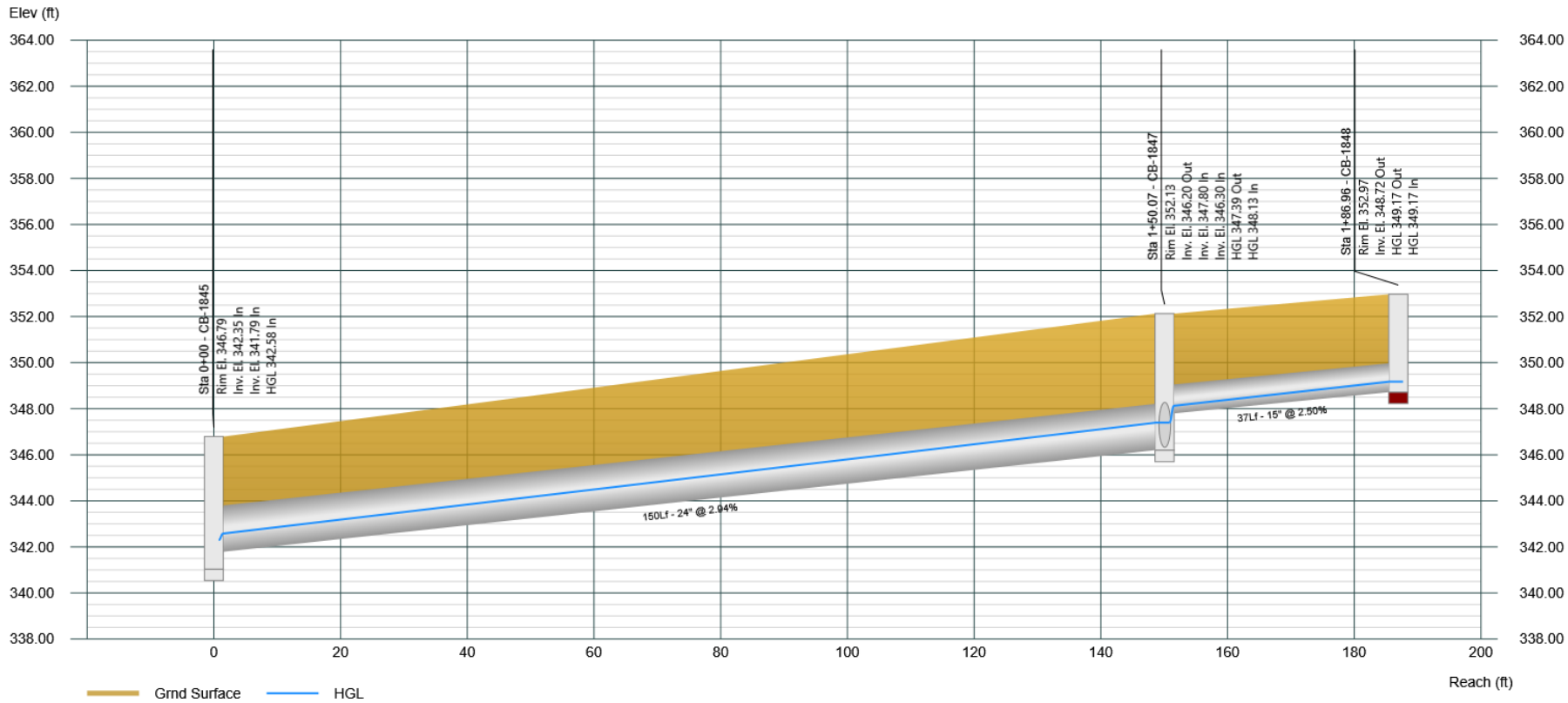
Project File: SD-1800.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024

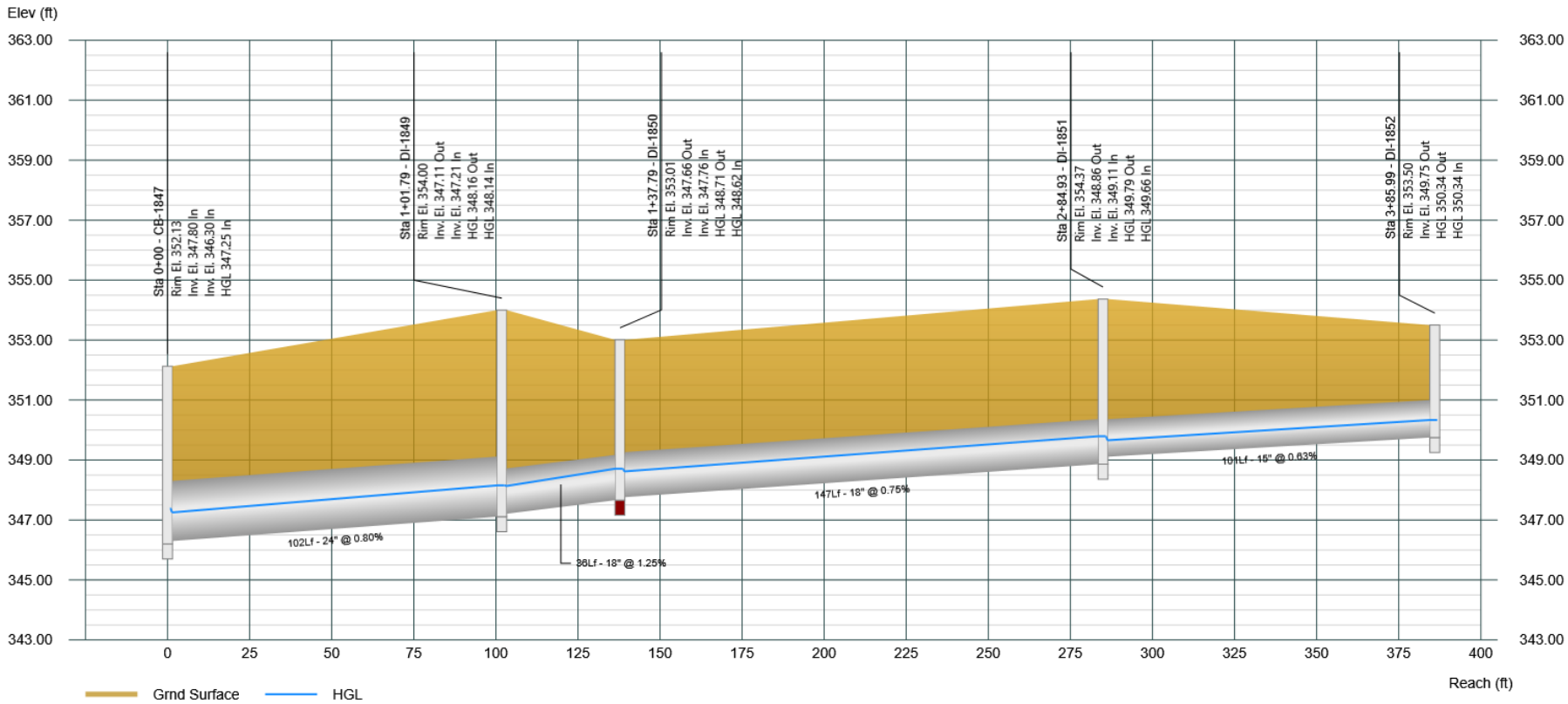


Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024



Project File: SD-1800.sws

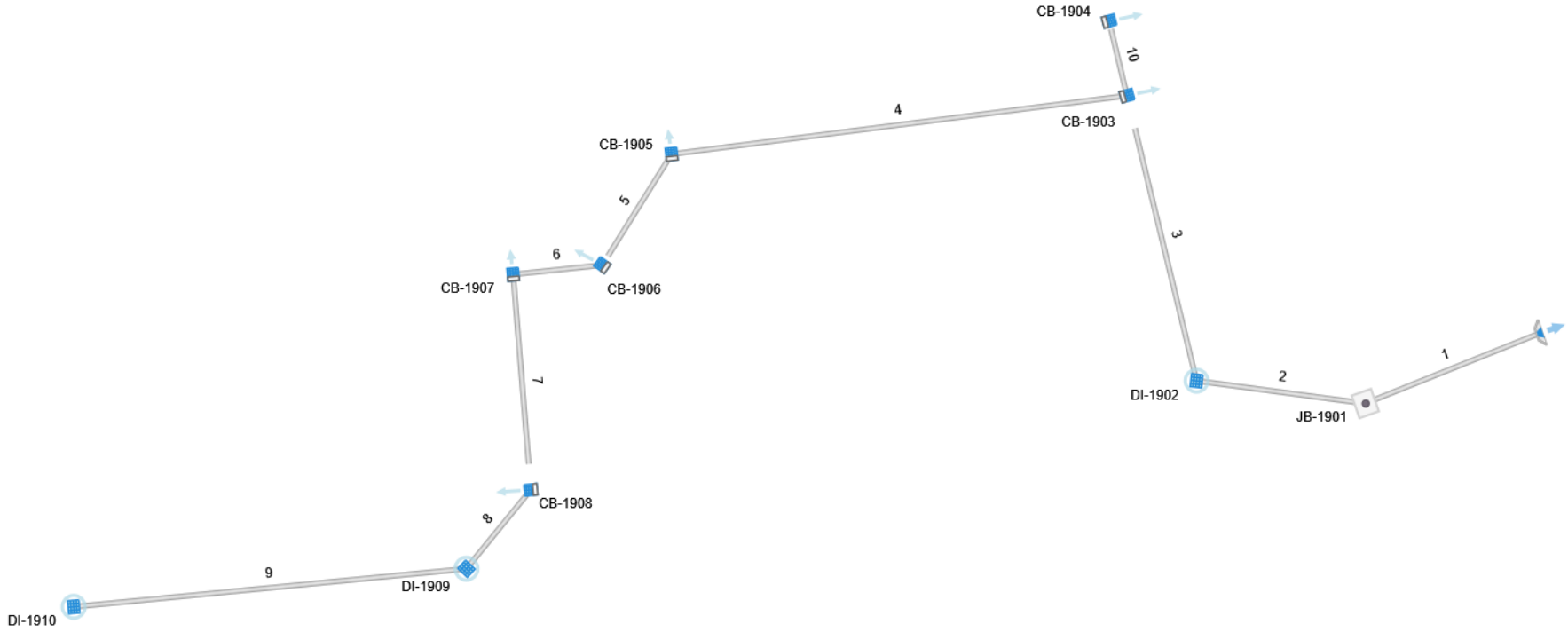
SYSTEM 1900 – REPORTS AND PROFILES

Plan View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1900

02-27-2024



Project File: SD-1900.sws

Storm Sewer Tabulation

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1900

02-27-2024

Line ID	Length	Drng Area		Rational	C x A		Tc		Intensity	Total Q	Capacity	Velocity	Line		Invert Elev		HGL Elev		Surface Elev		Line No
		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
	(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
1900-1901	65.75	0.000	1.620	0.00	0.00	1.18	5.0	6.77	6.64	7.85	27.78	5.13	18	7.00	303.05	298.45	304.12	303.40	318.00	301.00	1
1901-1902	61.67	0.220	1.620	0.65	0.14	1.18	5.0	6.70	6.66	7.87	32.76	9.45	18	9.73	319.50	313.50	320.57	314.06	350.50	318.00	2
1902-1903	93.76	0.210	1.400	0.85	0.18	1.04	5.0	6.55	6.71	6.96	20.47	7.48	18	3.80	349.56	346.00	350.57	346.65	354.21	350.50	3
1903-1905	166.36	0.060	0.990	0.85	0.05	0.69	5.0	6.18	6.81	4.70	9.09	6.19	15	1.98	353.26	349.96	354.13	350.62	360.90	354.21	4
1905-1906	43.21	0.080	0.930	0.85	0.07	0.64	5.0	6.07	6.85	4.37	8.27	5.60	15	1.64	354.07	353.36	354.91	354.06	363.64	360.90	5
1906-1907	32.50	0.050	0.850	0.85	0.04	0.57	5.0	5.95	6.88	3.93	5.00	4.18	15	0.60	354.37	354.17	355.22	355.11	363.64	363.64	6
1907-1908	68.52	0.040	0.800	0.85	0.03	0.53	5.0	5.70	6.96	3.68	5.07	4.64	15	0.62	354.89	354.47	355.66	355.24	366.34	363.64	7
1908-1909	34.23	0.370	0.760	0.65	0.24	0.49	5.0	5.62	6.98	3.45	10.46	5.52	15	2.63	355.89	354.99	356.63	355.55	360.09	366.34	8
1909-1910	143.09	0.390	0.390	0.65	0.25	0.25	5.0	5.00	7.19	1.82	2.82	3.18	12	0.63	356.89	355.99	357.46	356.89	361.00	360.09	9
1903-1904	24.50	0.200	0.200	0.85	0.17	0.17	5.0	5.00	7.19	1.22	5.00	1.04	15	0.60	349.96	349.81	351.04	351.03	354.21	354.21	10

Notes: IDF File = The Point.IDF, Return Period = 10-yrs.

Project File: SD-1900.sws

Energy Grade Line Calculations

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1900

02-27-2024

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)
1	18	7.85	298.45	1.50	1.77	303.40	4.44	0.31	303.71	65.75	303.05	1.07²	1.35	304.12	5.82	0.53	304.65	0.013	0.940	304.12	304.65	0.00
2	18	7.87	313.50	0.56‡	0.60	314.06	13.07	2.66	315.10	61.67	319.50	1.07²	1.35	320.57	5.83	0.53	321.10	0.013	6.000	320.57	321.10	0.00
3	18	6.96	346.00	0.65‡	0.74	346.65	9.44	1.39	347.48	93.76	349.56	1.01²	1.26	350.57	5.52	0.47	351.04	0.013	3.563	350.57	351.04	0.00
4	15	4.70	349.96	0.66‡	0.65	350.62	7.21	0.81	351.25	166.36	353.26	0.87²	0.91	354.13	5.17	0.42	354.54	0.013	3.295	354.13	354.54	0.00
5	15	4.37	353.36	0.70‡	0.71	354.06	6.19	0.60	354.61	43.21	354.07	0.84²	0.87	354.91	5.01	0.39	355.30	0.013	0.683	354.91	355.30	0.00
6	15	3.93	354.17	0.94	0.99	355.11	3.96	0.24	355.36	32.50	354.37	0.85	0.89	355.22	4.41	0.30	355.52	0.013	0.164	355.29	355.59	0.07
7	15	3.68	354.47	0.77‡	0.79	355.24	4.66	0.34	355.65	68.52	354.89	0.77	0.79	355.66	4.63	0.33	356.00	0.013	0.346	355.74	356.07	0.07
8	15	3.45	354.99	0.56‡	0.53	355.55	6.49	0.66	356.12	34.23	355.89	0.74²	0.76	356.63	4.54	0.32	356.95	0.013	0.833	356.63	356.95	0.00
9	12	1.82	355.99	0.90	0.75	356.89	2.44	0.09	356.98	143.09	356.89	0.57²	0.46	357.46	3.92	0.24	357.70	0.013	0.717	357.46	357.70	0.00
10	15	1.22	349.81	1.22	1.22	351.03	1.00	0.02	351.05	24.50	349.96	1.08	1.13	351.04	1.08	0.02	351.06	0.013	0.008	351.05	351.07	0.01

Notes: Return Period = 10-yrs. ² Critical depth. ‡ Supercritical.

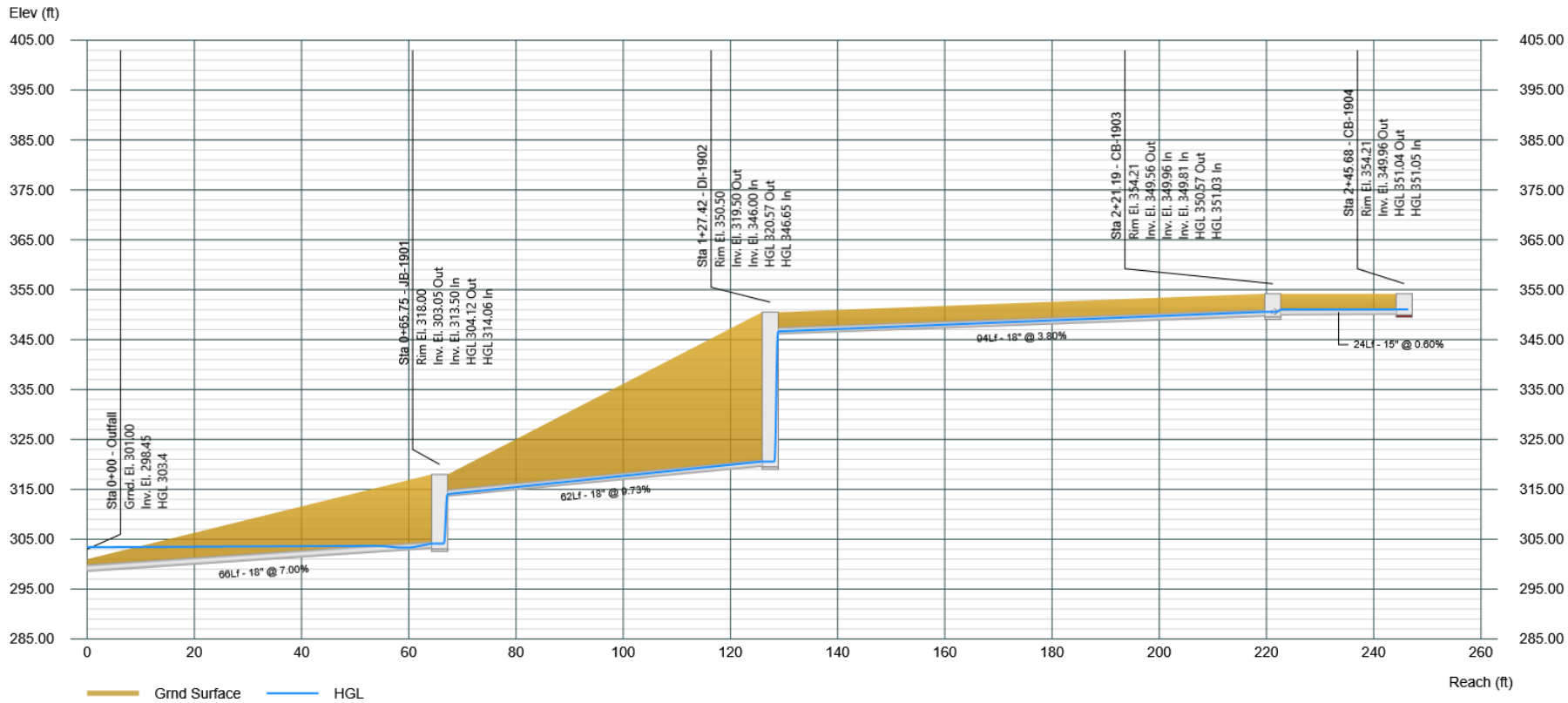
Project File: SD-1900.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1900

02-27-2024



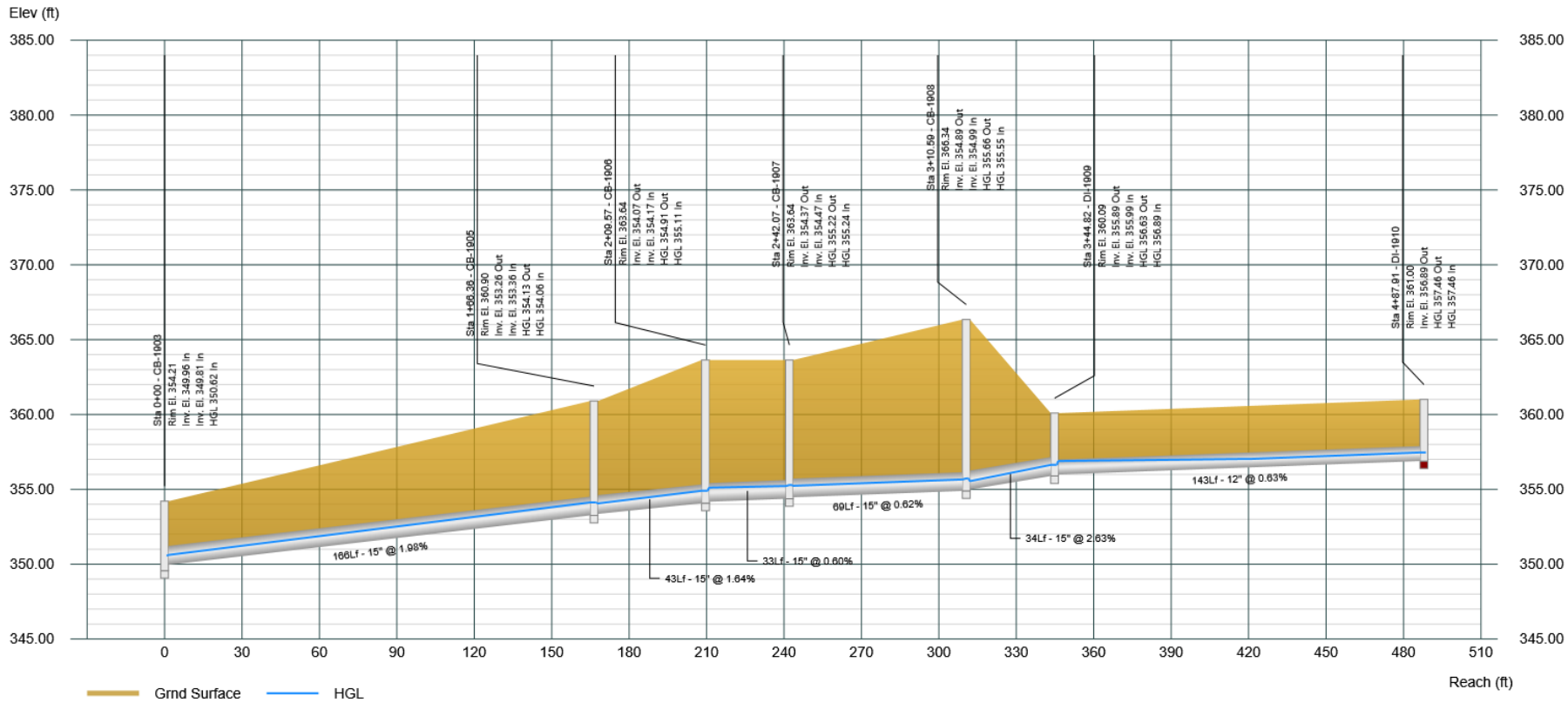
Project File: SD-1900.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1900

02-27-2024



Project File: SD-1900.sws

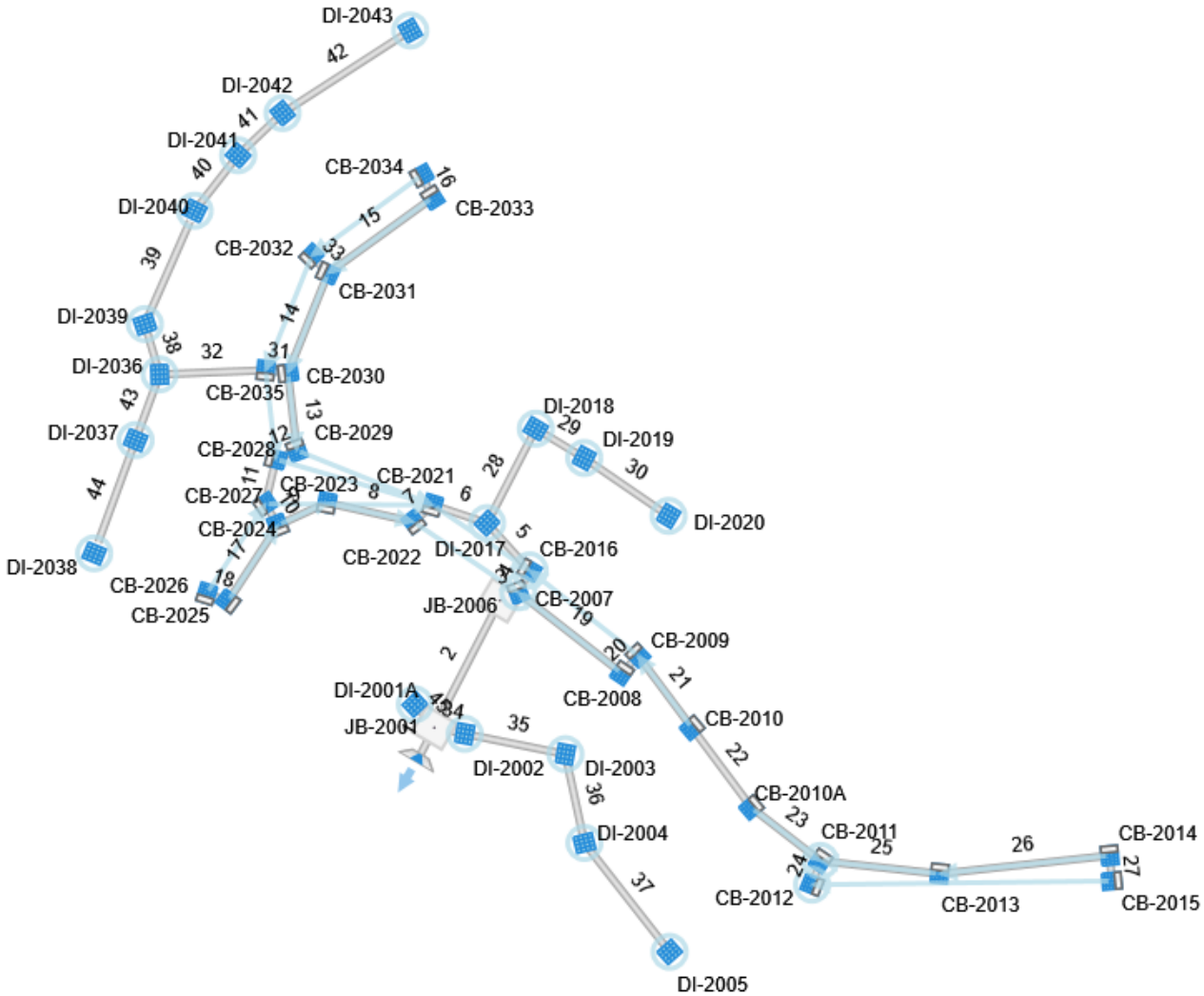
SYSTEM 2000 – REPORTS AND PROFILES

Plan View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2000

02-27-2024



Project File: SD-2000.sws

Storm Sewer Tabulation

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2000

02-29-2024

Line ID	Length	Drng Area		Rational	C x A		Tc		Intensity	Total Q	Capacity	Velocity	Line		Invert Elev		HGL Elev		Surface Elev		Line No
		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
	(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
2000-2001	29.10	0.000	12.944	0.00	0.00	9.16	5.0	8.07	6.30	57.76	138.73	9.17	42	1.90	341.90	341.35	344.23	343.40	348.50	346.00	1
2001-2006	141.62	0.000	10.514	0.00	0.00	7.58	5.0	7.93	6.34	48.06	214.53	6.63	42	4.55	348.44	342.00	350.56	345.06	359.40	348.50	2
2006-2007	21.59	0.300	10.514	0.85	0.26	7.58	5.0	7.89	6.35	48.14	77.93	6.85	42	0.60	348.67	348.54	350.99	351.03	359.17	359.40	3
2007-2016	24.50	0.310	8.930	0.85	0.26	6.24	5.0	7.09	6.56	40.90	99.65	8.72	36	2.23	349.32	348.77	351.36	350.54	359.17	359.17	4
2016-2017	65.00	0.020	8.620	0.75	0.02	5.98	5.0	6.98	6.59	39.35	68.72	7.03	36	1.06	350.11	349.42	352.11	351.94	359.80	359.17	5
2017-2021	62.10	0.220	5.040	0.85	0.19	3.65	5.0	6.89	6.61	24.10	67.31	8.60	30	2.69	354.67	353.00	356.31	354.22	360.74	359.80	6
2021-2022	26.46	0.090	4.820	0.85	0.08	3.46	5.0	6.83	6.63	22.92	31.77	6.89	30	0.60	355.40	355.24	357.01	356.84	361.01	360.74	7
2022-2023	96.60	0.070	4.730	0.85	0.06	3.38	5.0	6.65	6.68	22.59	43.76	6.19	30	1.14	356.60	355.50	358.19	357.45	364.57	361.01	8
2023-2024	57.88	0.080	4.660	0.85	0.07	3.32	5.0	6.53	6.71	22.31	39.88	6.29	30	0.95	357.25	356.70	358.82	358.54	366.73	364.57	9
2024-2027	24.48	0.110	4.380	0.85	0.09	3.09	5.0	6.47	6.73	20.76	31.77	5.37	30	0.60	357.49	357.35	359.26	359.26	366.73	366.73	10
2027-2028	44.38	0.090	4.270	0.85	0.08	2.99	5.0	6.36	6.76	20.23	31.77	5.41	30	0.60	357.86	357.59	359.52	359.51	366.06	366.73	11
2028-2029	24.50	0.050	4.180	0.85	0.04	2.92	5.0	6.29	6.78	19.77	31.77	5.34	30	0.60	358.11	357.96	359.80	359.80	366.06	366.06	12
2029-2030	74.84	0.060	4.130	0.85	0.05	2.87	5.0	6.11	6.84	19.64	31.77	6.54	30	0.60	358.65	358.21	360.14	359.67	369.24	366.06	13
2030-2031	104.88	0.080	0.750	0.85	0.07	0.64	5.0	5.38	7.06	4.50	24.78	7.20	18	5.57	367.49	361.65	368.30	362.11	374.62	369.24	14
2031-2033	135.85	0.350	0.520	0.85	0.30	0.44	5.0	5.13	7.14	3.16	13.72	6.48	15	4.52	376.51	370.37	377.22	370.80	381.01	374.62	15
2033-2034	24.50	0.170	0.170	0.85	0.14	0.14	5.0	5.00	7.19	1.04	5.00	1.24	15	0.60	376.76	376.61	377.50	377.50	381.01	381.01	16
2024-2025	91.07	0.090	0.200	0.85	0.08	0.17	5.0	5.14	7.14	1.21	11.58	4.42	15	3.21	365.41	362.48	365.85	362.77	369.91	366.73	17
2025-2026	24.49	0.110	0.110	0.85	0.09	0.09	5.0	5.00	7.19	0.67	5.00	2.13	15	0.60	365.66	365.51	365.99	365.97	369.91	369.91	18
2007-2008	137.33	0.160	1.284	0.85	0.14	1.09	5.0	7.44	6.46	7.05	8.13	5.18	18	0.60	353.01	352.19	354.09	353.27	361.28	359.17	19
2008-2009	24.50	0.090	1.124	0.85	0.08	0.96	5.0	7.36	6.48	6.19	8.13	3.75	18	0.60	353.26	353.11	354.54	354.48	361.28	361.28	20
2009-2010	91.12	0.070	1.034	0.85	0.06	0.88	5.0	7.05	6.57	5.77	8.13	4.16	18	0.60	353.90	353.36	354.87	354.66	363.73	361.28	21
2010-2010A	100.20	0.024	0.964	0.85	0.02	0.82	5.0	6.70	6.66	5.46	7.92	4.98	18	0.57	354.57	354.00	355.47	354.89	364.40	363.73	22

Notes: IDF File = The Point.IDF, Return Period = 10-yrs.

Project File: SD-2000.sws

Storm Sewer Tabulation

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2000

02-29-2024

Line ID	Length	Drng Area		Rational	C x A		Tc		Intensity	Total Q	Capacity	Velocity	Line		Invert Elev		HGL Elev		Surface Elev		Line No
		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
	(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
2010A-2011	91.42	0.230	0.940	0.85	0.20	0.80	5.0	6.41	6.75	5.39	8.65	5.03	18	0.68	355.29	354.67	356.18	355.54	363.79	364.40	23
2011-2012	24.50	0.270	0.270	0.85	0.23	0.23	5.0	5.00	7.19	1.65	6.48	3.72	15	1.01	359.54	359.29	360.05	359.76	363.79	363.79	24
2011-2013	131.06	0.020	0.440	0.85	0.02	0.37	5.0	5.87	6.91	2.58	5.00	4.07	15	0.60	356.18	355.39	356.83	356.03	364.40	363.79	25
2013-2014	187.31	0.150	0.420	0.85	0.13	0.36	5.0	5.11	7.15	2.55	5.00	4.05	15	0.60	357.40	356.28	358.05	356.91	361.90	364.40	26
2014-2015	24.50	0.270	0.270	0.85	0.23	0.23	5.0	5.00	7.19	1.65	5.00	2.19	15	0.60	357.65	357.50	358.33	358.32	361.90	361.90	27
2017-2018	105.02	1.630	3.560	0.65	1.06	2.31	5.0	5.44	7.04	16.29	26.39	5.98	24	1.36	352.24	350.81	353.67	352.82	358.20	359.80	28
2018-2019	60.08	1.150	1.930	0.65	0.75	1.25	5.0	5.32	7.08	8.88	13.28	6.79	18	1.60	353.40	352.44	354.54	353.40	357.00	358.20	29
2019-2020	107.77	0.780	0.780	0.65	0.51	0.51	5.0	5.00	7.19	3.64	6.80	5.05	15	1.11	354.70	353.50	355.46	354.17	358.00	357.00	30
2030-2035	24.50	0.130	3.320	0.85	0.11	2.18	5.0	6.04	6.86	14.97	17.52	6.27	24	0.60	359.30	359.15	360.72	360.58	369.24	369.24	31
2035-2036	116.37	0.480	3.190	0.65	0.31	2.07	5.0	5.78	6.93	14.38	22.95	5.53	24	1.03	360.50	359.30	361.84	361.21	363.62	369.24	32
2031-2032	24.50	0.150	0.150	0.85	0.13	0.13	5.0	5.00	7.19	0.92	8.13	0.77	18	0.60	367.74	367.59	368.63	368.63	374.62	374.62	33
2001-2002	33.91	0.270	1.240	0.65	0.18	0.81	5.0	6.24	6.80	5.48	8.81	3.25	18	0.60	344.01	343.80	345.31	345.26	347.83	348.50	34
2002-2003	112.05	0.120	0.970	0.65	0.08	0.63	5.0	5.86	6.91	4.36	8.81	3.59	18	0.60	344.78	344.11	345.58	345.43	350.36	347.83	35
2003-2004	87.55	0.350	0.850	0.65	0.23	0.55	5.0	5.55	7.01	3.87	5.42	4.76	15	0.60	345.40	344.88	346.19	345.66	348.00	350.36	36
2004-2005	140.03	0.500	0.500	0.65	0.33	0.33	5.0	5.00	7.19	2.34	2.99	4.32	12	0.60	346.39	345.55	347.05	346.20	348.48	348.00	37
2036-2039	50.79	0.310	2.070	0.65	0.20	1.35	5.0	5.69	6.96	9.37	15.18	7.15	18	1.78	362.00	361.10	363.17	362.05	366.09	363.62	38
2039-2040	121.54	0.160	1.760	0.65	0.10	1.14	5.0	5.53	7.01	8.02	25.69	8.78	18	5.10	368.33	362.13	369.42	362.75	371.86	366.09	39
2040-2041	71.37	0.110	1.600	0.65	0.07	1.04	5.0	5.41	7.05	7.34	11.23	7.69	15	2.58	370.42	368.58	371.50	369.38	373.77	371.86	40
2041-2042	63.26	0.340	1.490	0.65	0.22	0.97	5.0	5.30	7.09	6.87	11.23	7.45	15	2.58	372.25	370.62	373.30	371.39	375.50	373.77	41
2042-2043	160.74	1.150	1.150	0.65	0.75	0.75	5.0	5.00	7.19	5.37	6.34	7.93	12	2.70	376.84	372.50	377.77	373.23	379.84	375.50	42
2036-2037	68.29	0.310	0.640	0.65	0.20	0.42	5.0	5.42	7.05	2.93	7.20	3.45	15	1.24	362.20	361.35	362.89	362.41	365.00	363.62	43
2037-2038	117.57	0.330	0.330	0.65	0.21	0.21	5.0	5.00	7.19	1.54	3.92	2.97	12	1.03	363.52	362.30	364.04	363.11	367.34	365.00	44

Notes: IDF File = The Point.IDF, Return Period = 10-yrs.

Project File: SD-2000.sws

Storm Sewer Tabulation

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2000

02-29-2024

Line ID	Length	Drng Area		Rational	C x A		Tc		Intensity	Total Q	Capacity	Velocity	Line		Invert Elev		HGL Elev		Surface Elev		Line No
		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
	(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
2001-2001A	30.88	1.190	1.190	0.65	0.77	0.77	5.0	5.00	7.19	5.56	8.81	3.53	18	0.60	344.09	343.90	345.27	345.24	347.35	348.50	45

Notes: IDF File = The Point.IDF, Return Period = 10-yrs.

Project File: SD-2000.sws

Energy Grade Line Calculations

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2000

02-29-2024

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)
1	42	57.76	341.35	2.05‡	5.87	343.40	9.84	1.51	344.80	29.10	341.90	2.33[2]	6.79	344.23	8.50	1.12	345.35	0.013	0.555	344.23	345.35	0.00
2	42	48.06	342.00	3.06	8.92	345.06	5.39	0.45	345.51	141.62	348.44	2.12[2]	6.11	350.56	7.87	0.96	351.53	0.013	6.016	350.56	351.53	0.00
3	42	48.14	348.54	2.48	7.30	351.03	6.59	0.68	351.70	21.59	348.67	2.32	6.76	350.99	7.12	0.79	351.78	0.013	0.075	351.06	351.84	0.06
4	36	40.90	348.77	1.77‡	4.33	350.54	9.44	1.39	352.05	24.50	349.32	2.04[2]	5.11	351.36	8.00	0.99	352.35	0.013	0.305	351.36	352.35	0.00
5	36	39.35	349.42	2.52	6.35	351.94	6.20	0.60	352.54	65.00	350.11	2.00[2]	5.00	352.11	7.86	0.96	353.07	0.013	0.529	352.11	353.07	0.00
6	30	24.10	353.00	1.22‡	2.37	354.22	10.15	1.60	355.41	62.10	354.67	1.64[2]	3.41	356.31	7.06	0.77	357.09	0.013	1.673	356.31	357.09	0.00
7	30	22.92	355.24	1.60[1]	3.32	356.84	6.91	0.74	357.58	26.46	355.40	1.61	3.33	357.01	6.88	0.74	357.74	0.013	0.158	357.05	357.78	0.04
8	30	22.59	355.50	1.95	4.10	357.45	5.51	0.47	357.92	96.60	356.60	1.59[2]	3.29	358.19	6.87	0.73	358.92	0.013	1.003	358.19	358.92	0.00
9	30	22.31	356.70	1.85	3.89	358.54	5.74	0.51	359.06	57.88	357.25	1.58[2]	3.27	358.82	6.83	0.73	359.55	0.013	0.493	358.82	359.55	0.00
10	30	20.76	357.35	1.91	4.02	359.26	5.16	0.41	359.67	24.48	357.49	1.77	3.72	359.26	5.58	0.48	359.75	0.013	0.079	359.30	359.79	0.04
11	30	20.23	357.59	1.92	4.05	359.51	5.00	0.39	359.90	44.38	357.86	1.67	3.47	359.52	5.82	0.53	360.05	0.013	0.149	359.56	360.09	0.04
12	30	19.77	357.96	1.84	3.88	359.80	5.10	0.40	360.21	24.50	358.11	1.70	3.55	359.80	5.58	0.48	360.29	0.013	0.080	359.83	360.31	0.03
13	30	19.64	358.21	1.46‡	2.98	359.67	6.59	0.68	360.43	74.84	358.65	1.48[2]	3.03	360.14	6.48	0.65	360.79	0.013	0.361	360.14	360.79	0.00
14	18	4.50	361.65	0.46‡	0.46	362.11	9.77	1.48	362.79	104.88	367.49	0.81[2]	0.97	368.30	4.63	0.33	368.63	0.013	5.839	368.30	368.63	0.00
15	15	3.16	370.37	0.42‡	0.37	370.80	8.58	1.15	371.38	135.85	376.51	0.71[2]	0.72	377.22	4.38	0.30	377.51	0.013	6.135	377.22	377.51	0.00
16	15	1.04	376.61	0.89	0.93	377.50	1.11	0.02	377.52	24.50	376.76	0.74	0.76	377.50	1.37	0.03	377.53	0.013	0.011	377.52	377.55	0.02
17	15	1.21	362.48	0.29‡	0.21	362.77	5.70	0.50	363.07	91.07	365.41	0.44[2]	0.39	365.85	3.14	0.15	366.00	0.013	2.926	365.85	366.00	0.00
18	15	0.67	365.51	0.45	0.40	365.97	1.67	0.04	366.01	24.49	365.66	0.33	0.26	365.99	2.59	0.10	366.09	0.013	0.084	366.05	366.15	0.06
19	18	7.05	352.19	1.08[3]	1.36	353.27	5.18	0.42	353.68	137.33	353.01	1.08	1.36	354.09	5.18	0.42	354.51	0.013	0.824	354.20	354.62	0.11
20	18	6.19	353.11	1.37	1.70	354.48	3.65	0.21	354.69	24.50	353.26	1.28	1.61	354.54	3.86	0.23	354.77	0.013	0.077	354.56	354.79	0.02
21	18	5.77	353.36	1.31	1.63	354.66	3.53	0.19	354.86	91.12	353.90	0.97	1.21	354.87	4.79	0.36	355.23	0.013	0.370	354.94	355.30	0.07
22	18	5.46	354.00	0.89[1]	1.09	354.89	4.99	0.39	355.36	100.20	354.57	0.90	1.10	355.47	4.96	0.38	355.85	0.013	0.490	355.50	355.89	0.04

Notes: Return Period = 10-yrs. [1] Critical depth. [2] Critical depth. [3] Normal depth. ‡ Supercritical.

Project File: SD-2000.sws

Energy Grade Line Calculations

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2000

02-29-2024

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	18	5.39	354.67	0.87‡	1.06	355.54	5.11	0.41	355.95	91.42	355.29	0.89²	1.09	356.18	4.96	0.38	356.56	0.013	0.615	356.18	356.56	0.00
24	15	1.65	359.29	0.46‡	0.41	359.76	3.98	0.25	359.99	24.50	359.54	0.51²	0.48	360.05	3.47	0.19	360.24	0.013	0.247	360.05	360.24	0.00
25	15	2.58	355.39	0.64‡	0.63	356.03	4.11	0.26	356.59	131.06	356.18	0.65	0.64	356.83	4.03	0.25	357.08	0.013	0.489	356.85	357.10	0.02
26	15	2.55	356.28	0.63‡	0.62	356.91	4.09	0.26	357.17	187.31	357.40	0.64	0.64	358.05	4.02	0.25	358.30	0.013	1.124	358.11	358.36	0.06
27	15	1.65	357.50	0.82	0.85	358.32	1.94	0.06	358.38	24.50	357.65	0.68	0.68	358.33	2.44	0.09	358.42	0.013	0.039	358.37	358.46	0.04
28	24	16.29	350.81	2.00	3.14	352.82	5.19	0.42	353.24	105.02	352.24	1.43²	2.40	353.67	6.78	0.71	354.38	0.013	1.147	353.67	354.38	0.00
29	18	8.88	352.44	0.96‡	1.20	353.40	7.40	0.85	354.54	60.08	353.40	1.14²	1.44	354.54	6.18	0.59	355.13	0.013	0.590	354.54	355.13	0.00
30	15	3.64	353.50	0.67‡	0.67	354.17	5.46	0.46	355.19	107.77	354.70	0.76²	0.79	355.46	4.64	0.33	355.79	0.013	0.609	355.46	355.79	0.00
31	24	14.97	359.15	1.42³	2.39	360.58	6.26	0.61	361.19	24.50	359.30	1.42	2.39	360.72	6.27	0.61	361.33	0.013	0.147	360.80	361.42	0.08
32	24	14.38	359.30	1.91	3.09	361.21	4.66	0.34	361.54	116.37	360.50	1.34²	2.24	361.84	6.41	0.64	362.48	0.013	0.938	361.84	362.48	0.00
33	18	0.92	367.59	1.04	1.30	368.63	0.70	0.01	368.63	24.50	367.74	0.89	1.09	368.63	0.84	0.01	368.64	0.013	0.004	368.64	368.65	0.01
34	18	5.48	343.80	1.46	1.75	345.26	3.13	0.15	345.41	33.91	344.01	1.30	1.63	345.31	3.37	0.18	345.48	0.012	0.070	345.32	345.50	0.02
35	18	4.36	344.11	1.32	1.65	345.43	2.64	0.11	345.54	112.05	344.78	0.80	0.96	345.58	4.54	0.32	345.90	0.012	0.362	345.62	345.94	0.04
36	15	3.87	344.88	0.78‡	0.81	345.66	4.79	0.36	346.02	87.55	345.40	0.79	0.82	346.19	4.73	0.35	346.54	0.012	0.525	346.26	346.61	0.07
37	12	2.34	345.55	0.65‡	0.54	346.20	4.34	0.29	346.66	140.03	346.39	0.65	0.54	347.05	4.30	0.29	347.33	0.012	0.670	347.16	347.45	0.12
38	18	9.37	361.10	0.95‡	1.18	362.05	7.95	0.98	362.89	50.79	362.00	1.17²	1.48	363.17	6.34	0.63	363.80	0.012	0.905	363.17	363.80	0.00
39	18	8.02	362.13	0.62‡	0.69	362.75	11.67	2.12	363.92	121.54	368.33	1.08²	1.36	369.42	5.88	0.54	369.95	0.012	6.029	369.42	369.95	0.00
40	15	7.34	368.58	0.80‡	0.83	369.38	8.88	1.23	370.32	71.37	370.42	1.08²	1.13	371.50	6.50	0.66	372.16	0.012	1.838	371.50	372.16	0.00
41	15	6.87	370.62	0.77‡	0.79	371.39	8.66	1.16	372.35	63.26	372.25	1.05²	1.10	373.30	6.25	0.61	373.91	0.012	1.554	373.30	373.91	0.00
42	12	5.37	372.50	0.72‡	0.61	373.23	8.82	1.21	374.21	160.74	376.84	0.94²	0.76	377.77	7.03	0.77	378.54	0.012	4.334	377.77	378.54	0.00
43	15	2.93	361.35	1.06	1.11	362.41	2.64	0.11	362.52	68.29	362.20	0.69²	0.69	362.89	4.26	0.28	363.17	0.013	0.648	362.89	363.17	0.00
44	12	1.54	362.30	0.81	0.68	363.11	2.25	0.08	363.19	117.57	363.52	0.53²	0.42	364.04	3.68	0.21	364.25	0.012	1.060	364.04	364.25	0.00

Notes: Return Period = 10-yrs. ² Critical depth. ³ Normal depth. ‡ Supercritical.

Project File: SD-2000.sws

Energy Grade Line Calculations

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2000

02-29-2024

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)
45	18	5.56	343.90	1.34	1.66	345.24	3.34	0.17	345.41	30.88	344.09	1.18	1.50	345.27	3.72	0.21	345.49	0.012	0.073	345.33	345.55	0.06

Notes: Return Period = 10-yrs.

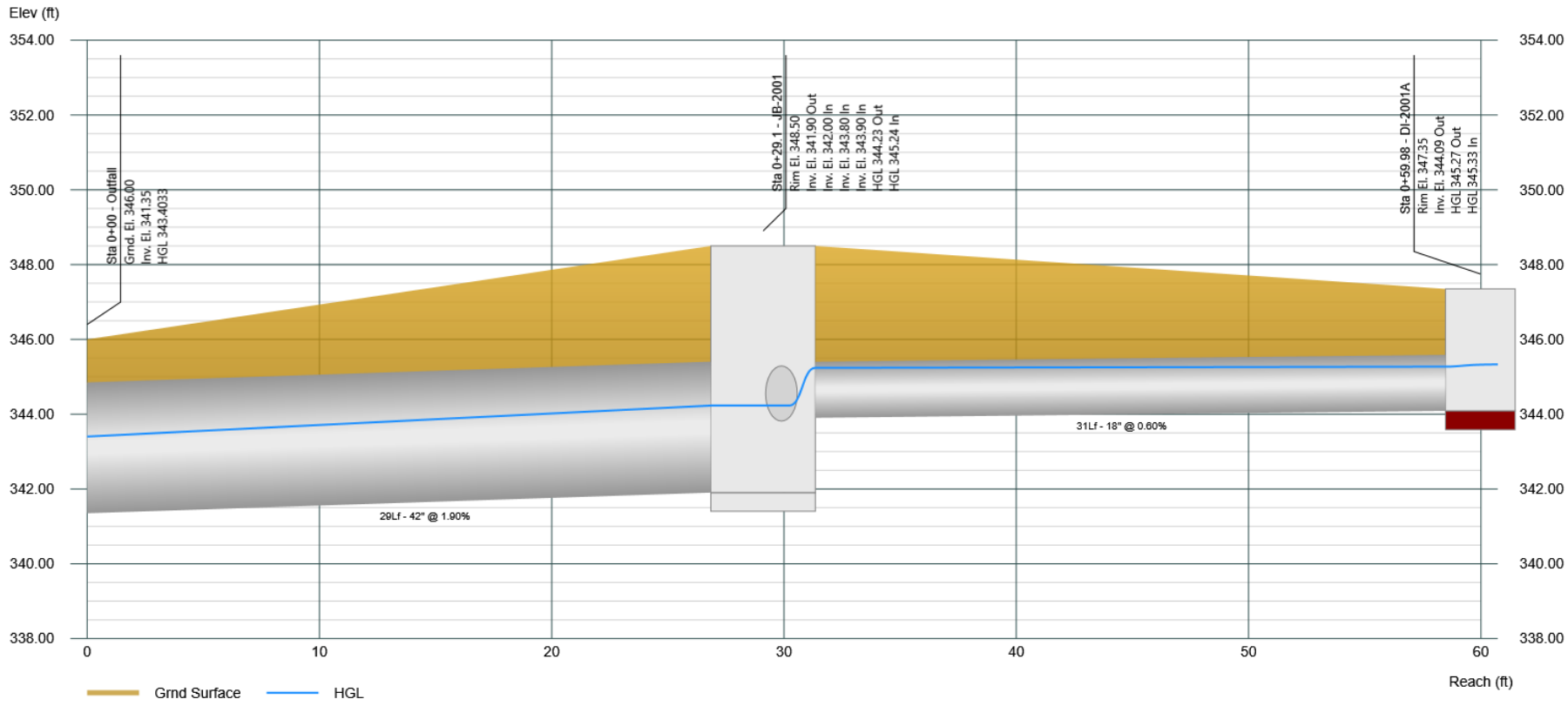
Project File: SD-2000.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2000

02-27-2024



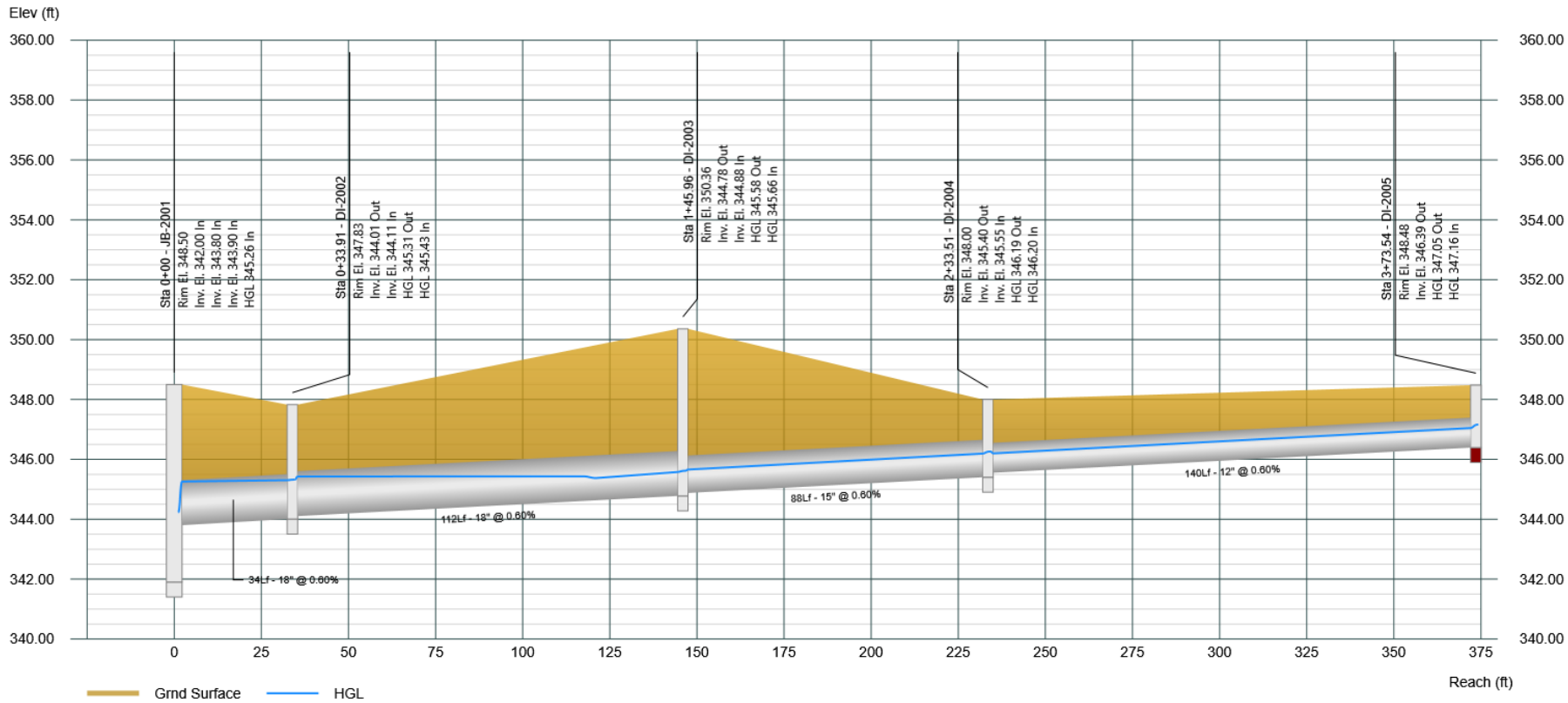
Project File: SD-2000.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2000

02-27-2024



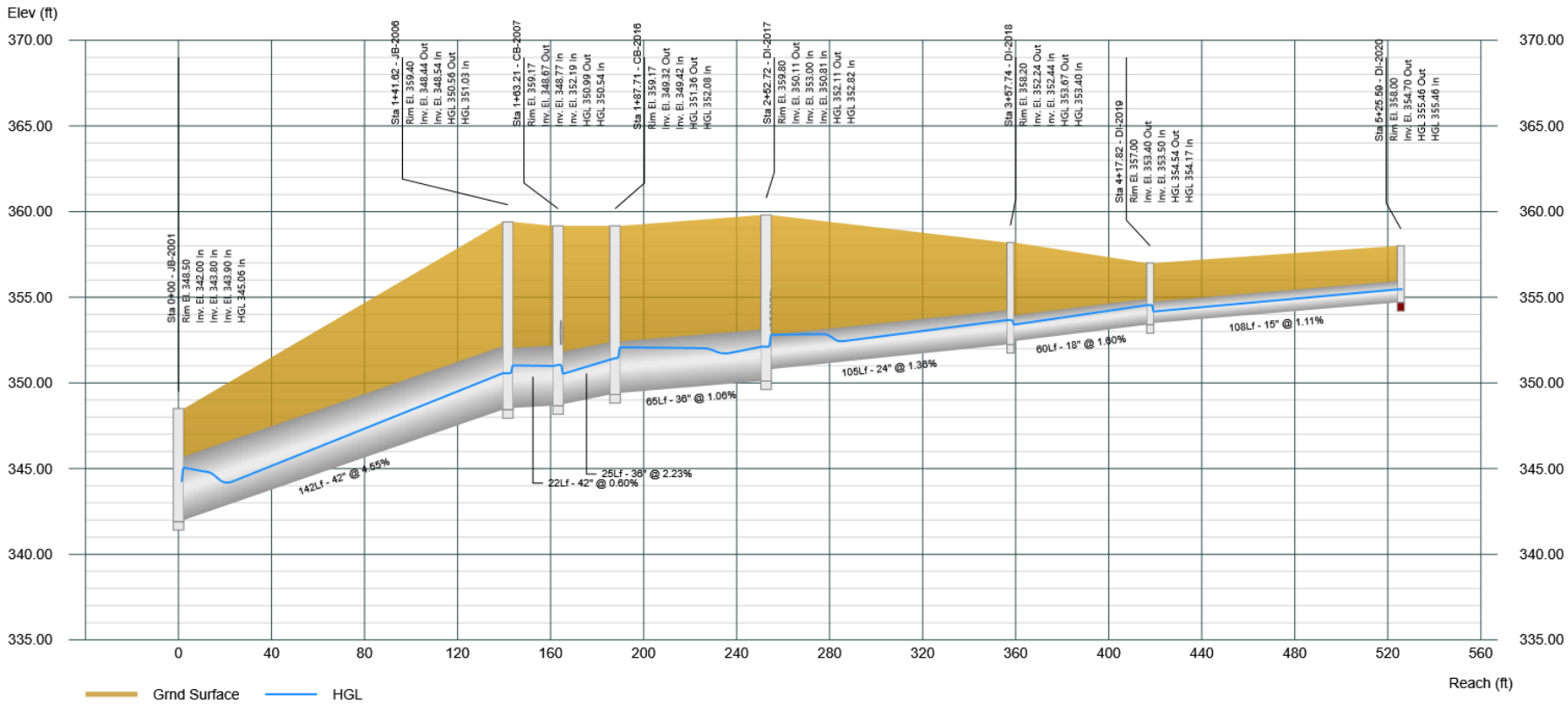
Project File: SD-2000.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2000

02-27-2024



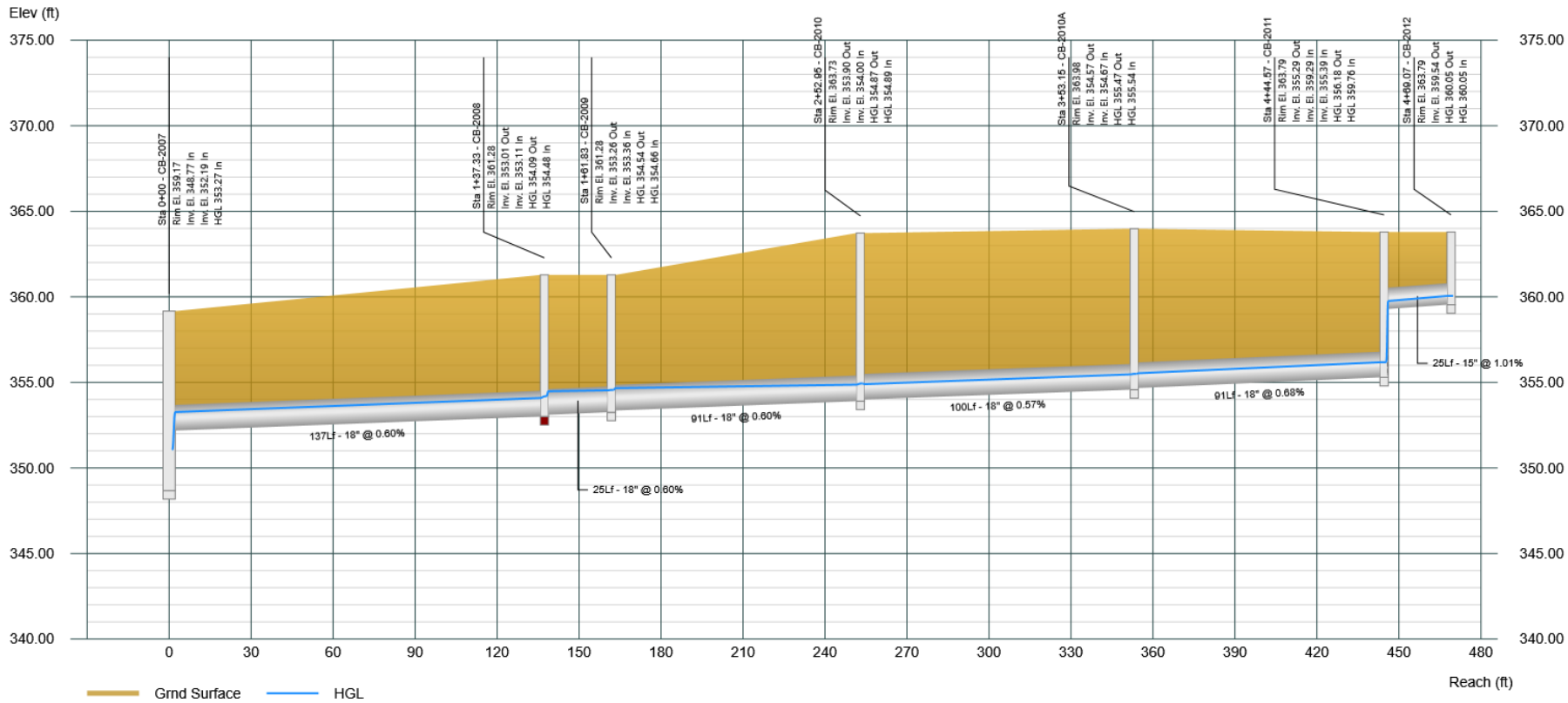
Project File: SD-2000.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2000

02-27-2024



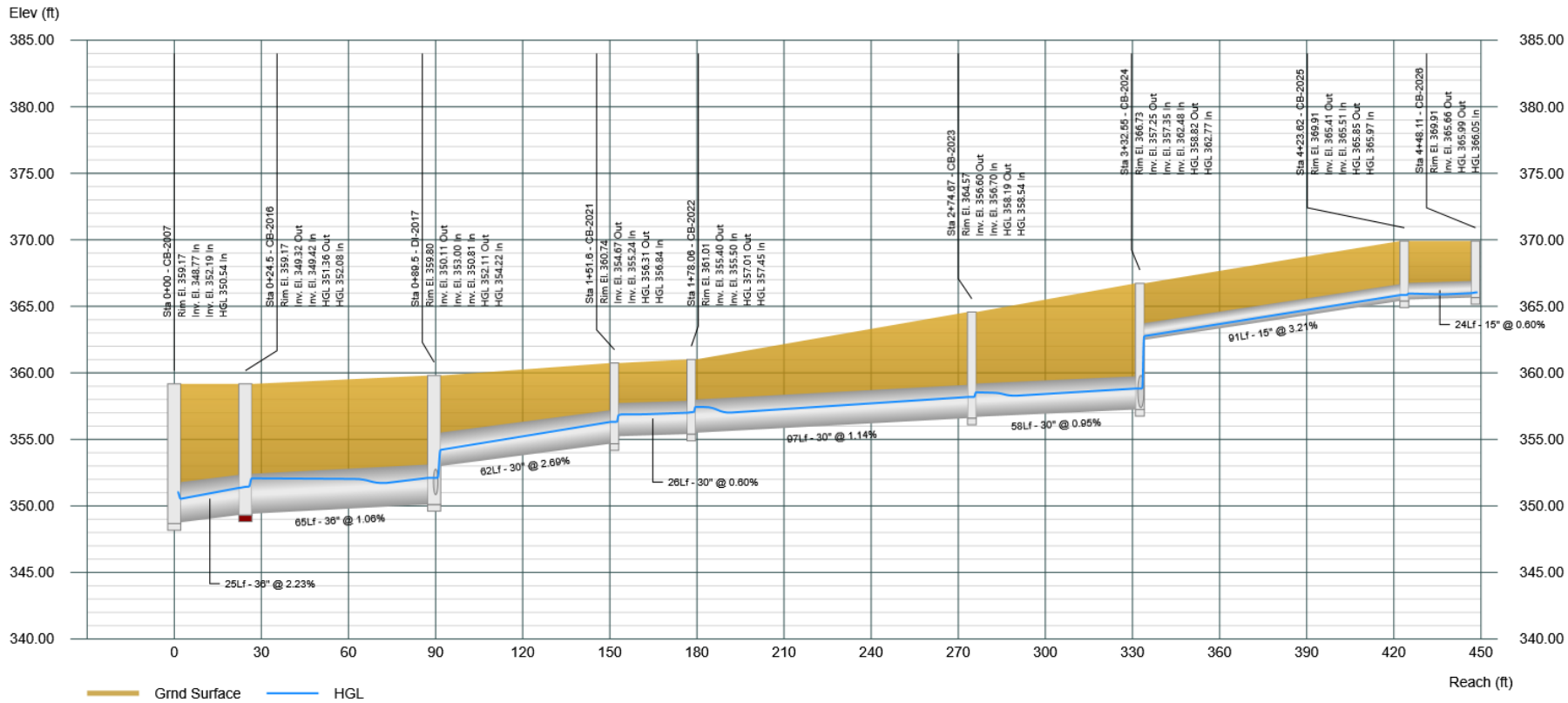
Project File: SD-2000.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2000

02-27-2024



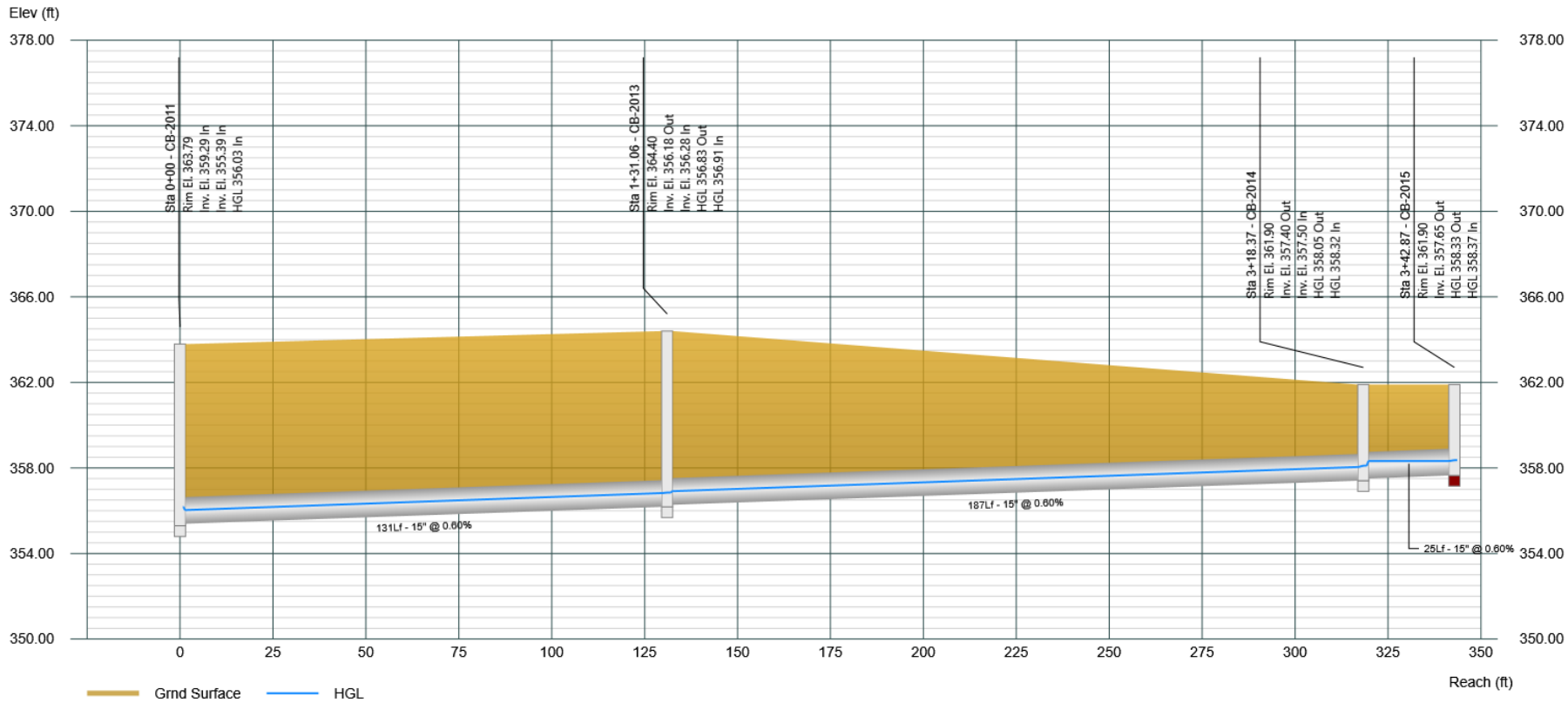
Project File: SD-2000.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2000

02-27-2024



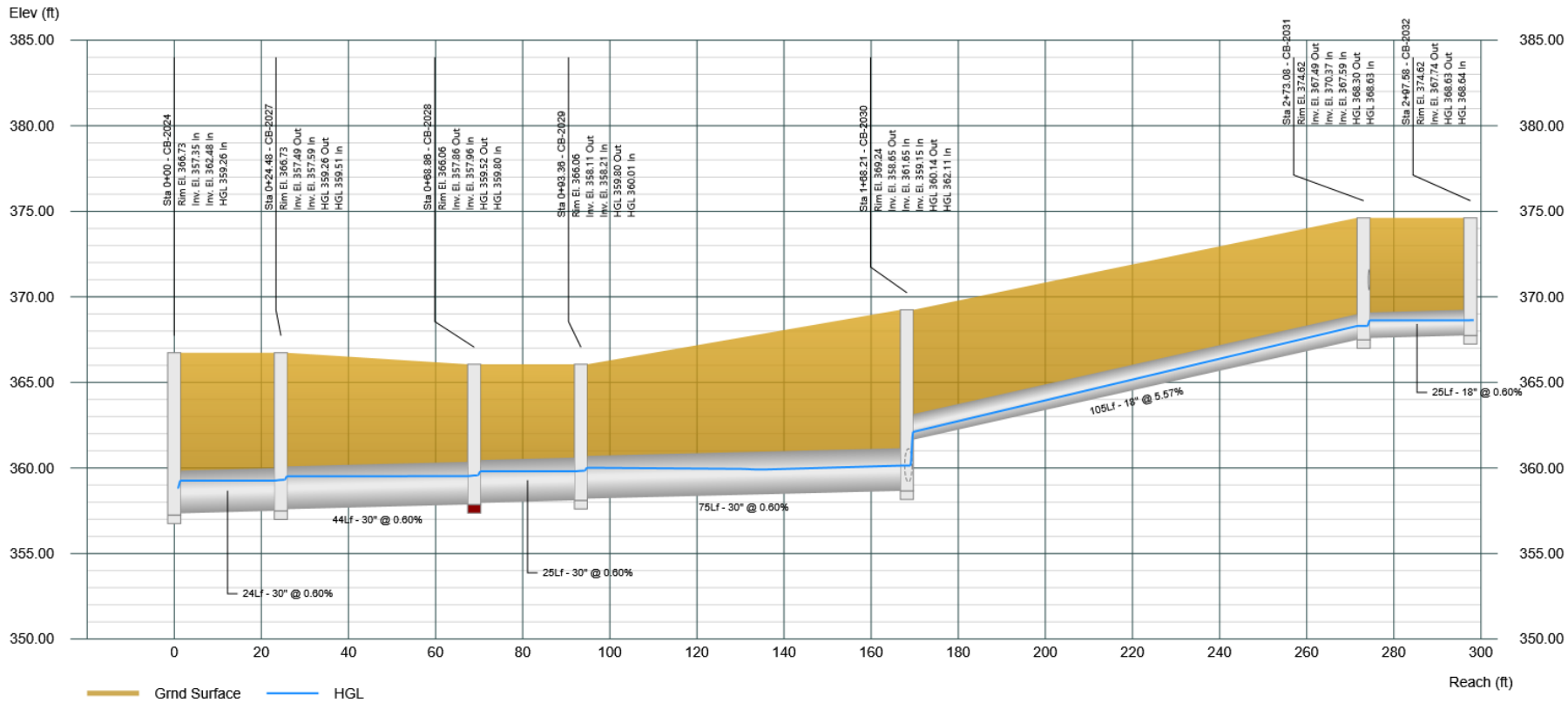
Project File: SD-2000.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2000

02-27-2024



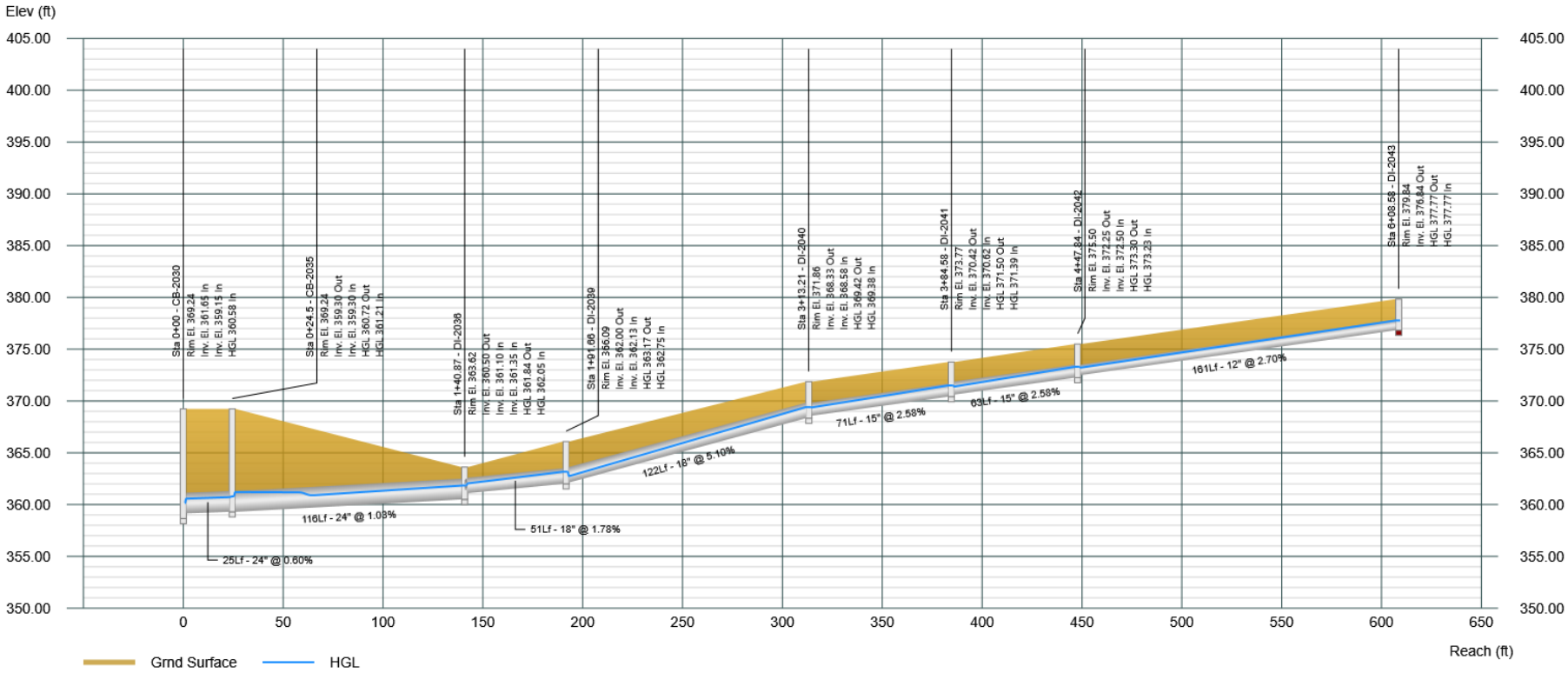
Project File: SD-2000.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2000

02-29-2024



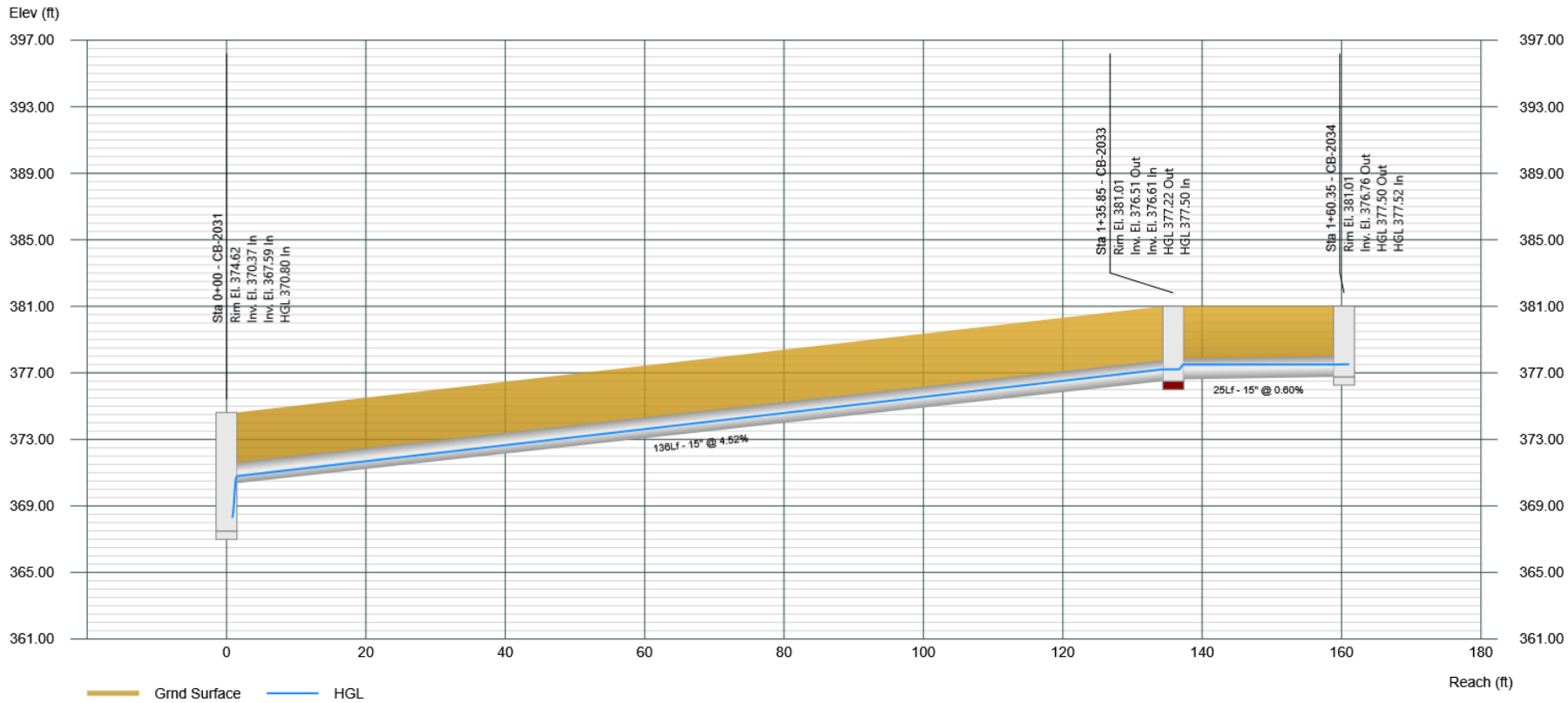
Project File: SD-2000.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2000

02-27-2024



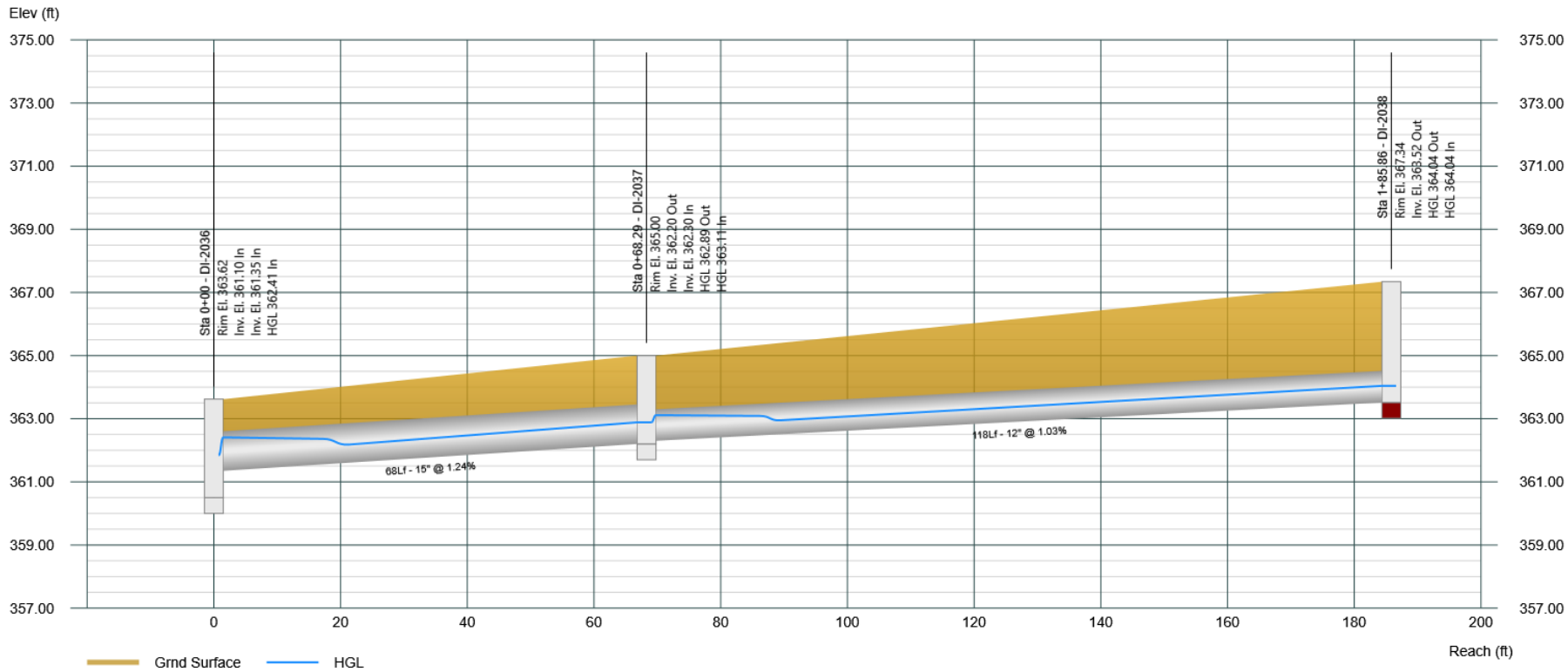
Project File: SD-2000.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2000

02-29-2024



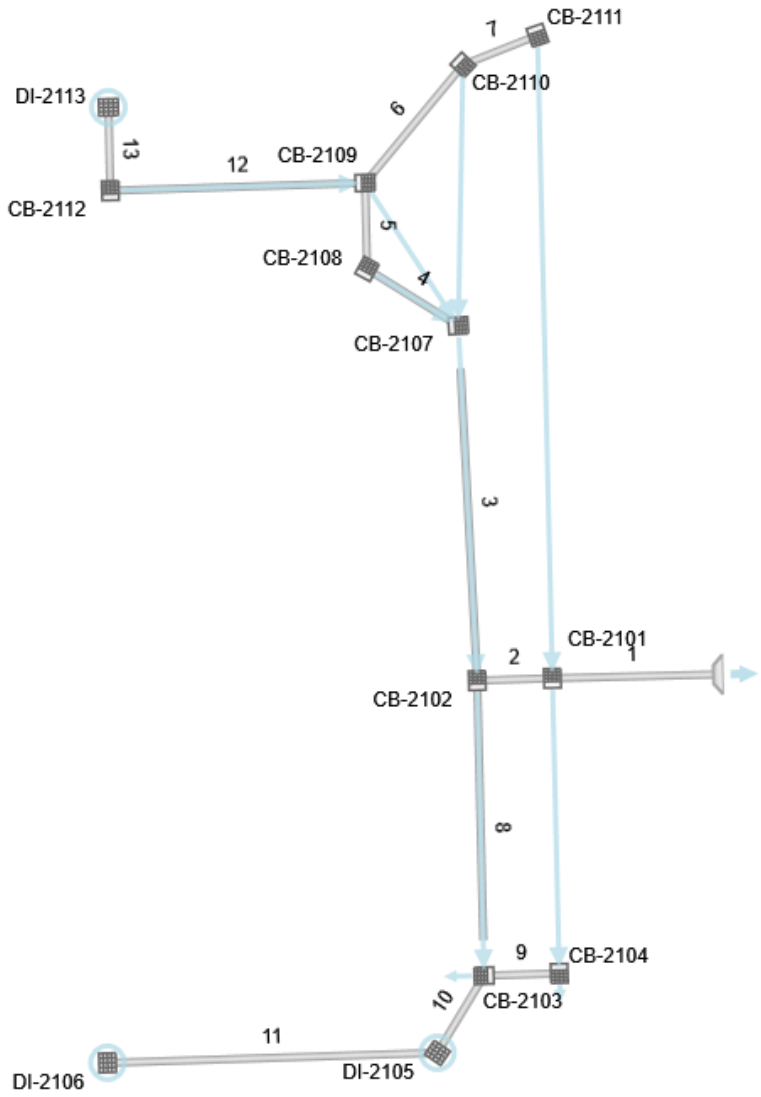
SYSTEM 2100 – REPORTS AND PROFILES

Plan View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2100

02-27-2024



Project File: SD-2100.sws

Storm Sewer Tabulation

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2100

02-27-2024

Line ID	Length	Drng Area		Rational	C x A		Tc		Intensity	Total Q	Capacity	Velocity	Line		Invert Elev		HGL Elev		Surface Elev		Line No
		Incr	Total		Incr	Total	Inlet	Syst					Size	Slope	Up	Dn	Up	Dn	Up	Dn	
	(ft)	(ac)	(ac)	(C)			(min)	(min)	(in/hr)	(cfs)	(cfs)	(ft/s)	(in)	(%)	(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	
2100-2101	52.20	0.150	1.690	0.85	0.13	1.32	5.0	5.94	6.89	9.06	31.84	5.68	18	9.20	345.25	340.45	346.40	343.71	367.12	349.00	1
2101-2102	24.50	0.100	1.540	0.85	0.09	1.19	5.0	5.87	6.91	8.21	8.93	5.73	18	0.72	359.49	359.31	360.62	360.45	367.12	367.12	2
2102-2107	101.24	0.080	0.650	0.85	0.07	0.52	5.0	5.63	6.98	3.66	9.00	5.59	15	1.94	364.84	362.87	365.60	363.45	369.29	367.12	3
2107-2108	33.81	0.080	0.570	0.85	0.07	0.46	5.0	5.53	7.01	3.19	7.14	4.03	15	1.22	365.35	364.94	366.07	365.77	370.15	369.29	4
2108-2109	24.50	0.060	0.490	0.85	0.05	0.39	5.0	5.46	7.04	2.73	7.68	3.77	15	1.42	365.80	365.45	366.46	366.23	370.15	370.15	5
2109-2110	46.32	0.060	0.120	0.85	0.05	0.10	5.0	5.15	7.14	0.73	5.00	1.13	15	0.60	366.18	365.90	366.72	366.72	370.71	370.15	6
2110-2111	25.71	0.060	0.060	0.85	0.05	0.05	5.0	5.00	7.19	0.37	6.79	2.43	15	1.11	366.56	366.28	366.80	366.49	370.81	370.71	7
2102-2103	84.07	0.090	0.790	0.85	0.08	0.58	5.0	5.53	7.01	4.06	8.13	2.81	18	0.60	360.24	359.74	361.24	361.16	365.35	367.12	8
2103-2104	24.50	0.050	0.050	0.85	0.04	0.04	5.0	5.00	7.19	0.31	10.89	0.78	15	2.84	361.10	360.40	361.41	361.42	365.35	365.35	9
2103-2105	26.70	0.190	0.650	0.85	0.16	0.46	5.0	5.43	7.05	3.24	5.42	3.49	15	0.60	360.51	360.34	361.33	361.31	365.50	365.35	10
2105-2106	107.50	0.460	0.460	0.65	0.30	0.30	5.0	5.00	7.19	2.15	2.99	4.19	12	0.60	361.35	360.71	361.97	361.33	363.76	365.50	11
2109-2112	83.00	0.020	0.310	0.85	0.02	0.23	5.0	5.10	7.15	1.68	5.42	3.65	15	0.60	366.40	365.90	366.92	366.39	372.78	370.15	12
2112-2113	23.75	0.290	0.290	0.75	0.22	0.22	5.0	5.00	7.19	1.56	2.99	3.73	12	0.60	366.64	366.50	367.17	367.02	369.05	372.78	13

Notes: IDF File = The Point.IDF, Return Period = 10-yrs.

Project File: SD-2100.sws

Energy Grade Line Calculations

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2100

02-27-2024

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)
1	18	9.06	340.45	1.50	1.77	343.71	5.13	0.41	344.12	52.20	345.25	1.15²	1.45	346.40	6.24	0.60	347.00	0.013	2.885	346.40	347.00	0.00
2	18	8.21	359.31	1.13³	1.43	360.45	5.73	0.51	360.96	24.50	359.49	1.13	1.43	360.62	5.73	0.51	361.13	0.013	0.177	360.70	361.21	0.08
3	15	3.66	362.87	0.58‡	0.56	363.45	6.55	0.67	363.97	101.24	364.84	0.77²	0.79	365.60	4.64	0.34	365.94	0.013	1.967	365.60	365.94	0.00
4	15	3.19	364.94	0.83	0.87	365.77	3.67	0.21	365.98	33.81	365.35	0.72²	0.73	366.07	4.40	0.30	366.37	0.013	0.385	366.07	366.37	0.00
5	15	2.73	365.45	0.78	0.80	366.23	3.40	0.18	366.41	24.50	365.80	0.66²	0.66	366.46	4.14	0.27	366.73	0.013	0.318	366.46	366.73	0.00
6	15	0.73	365.90	0.82	0.85	366.72	0.85	0.01	366.73	46.32	366.18	0.55	0.52	366.72	1.41	0.03	366.76	0.013	0.024	366.74	366.77	0.01
7	15	0.37	366.28	0.21‡	0.14	366.49	2.69	0.11	366.77	25.71	366.56	0.24	0.17	366.80	2.16	0.07	366.88	0.013	0.108	366.85	366.92	0.05
8	18	4.06	359.74	1.42	1.73	361.16	2.35	0.09	361.25	84.07	360.24	0.99	1.24	361.24	3.27	0.17	361.40	0.013	0.158	361.26	361.42	0.02
9	15	0.31	360.40	1.02	1.07	361.42	0.29	0.00	361.42	24.50	361.10	0.31	0.24	361.41	1.27	0.03	361.44	0.013	0.016	361.44	361.46	0.02
10	15	3.24	360.34	0.97	1.02	361.31	3.19	0.16	361.47	26.70	360.51	0.82	0.85	361.33	3.80	0.22	361.55	0.012	0.082	361.41	361.64	0.09
11	12	2.15	360.71	0.62‡	0.51	361.33	4.19	0.27	361.68	107.50	361.35	0.62²	0.51	361.97	4.19	0.27	362.24	0.012	0.565	361.97	362.24	0.00
12	15	1.68	365.90	0.49‡	0.44	366.39	3.81	0.23	366.75	83.00	366.40	0.52²	0.48	366.92	3.49	0.19	367.11	0.012	0.357	366.92	367.11	0.00
13	12	1.56	366.50	0.52‡	0.41	367.02	3.79	0.22	367.24	23.75	366.64	0.53	0.43	367.17	3.67	0.21	367.38	0.012	0.143	367.26	367.47	0.09

Notes: Return Period = 10-yrs. ² Critical depth. ³ Normal depth. ‡ Supercritical.

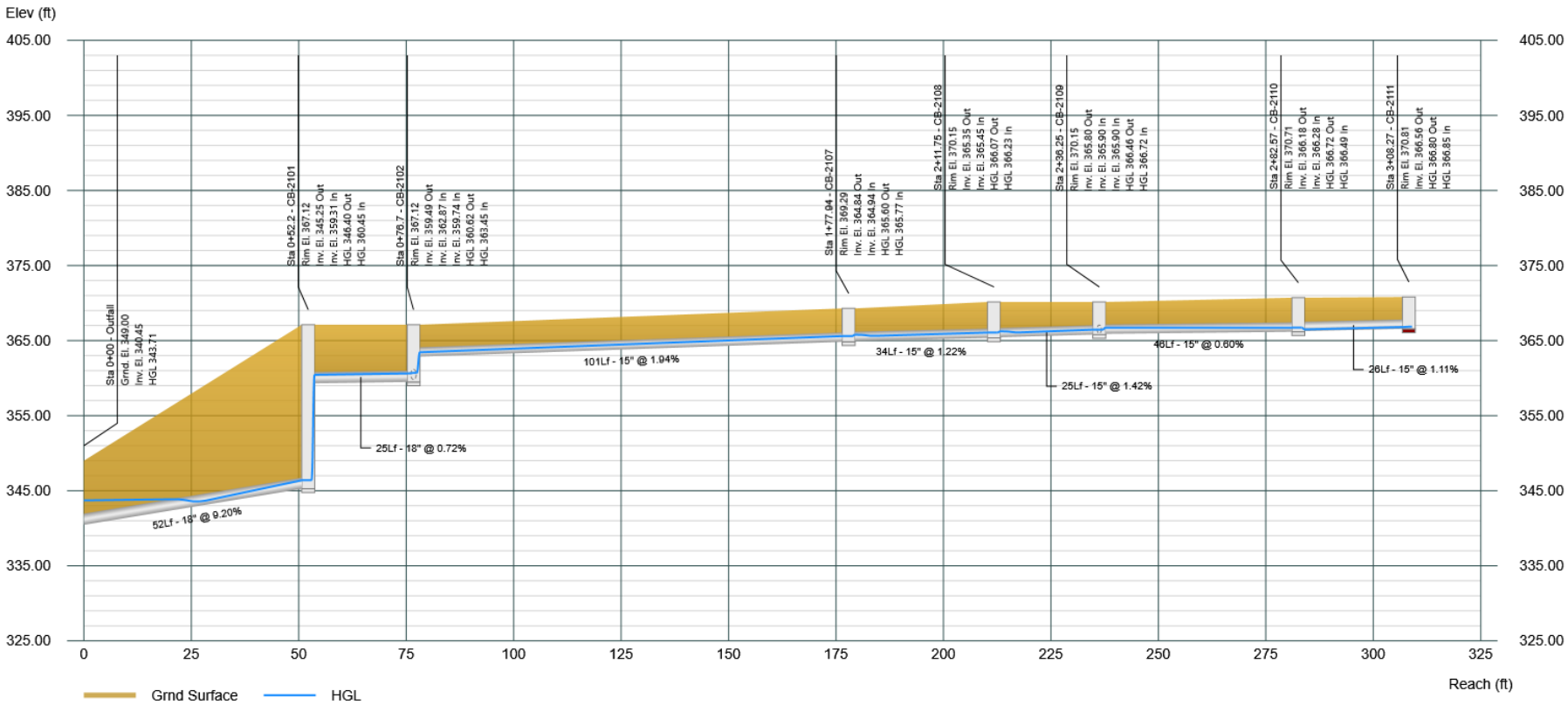
Project File: SD-2100.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2100

02-27-2024



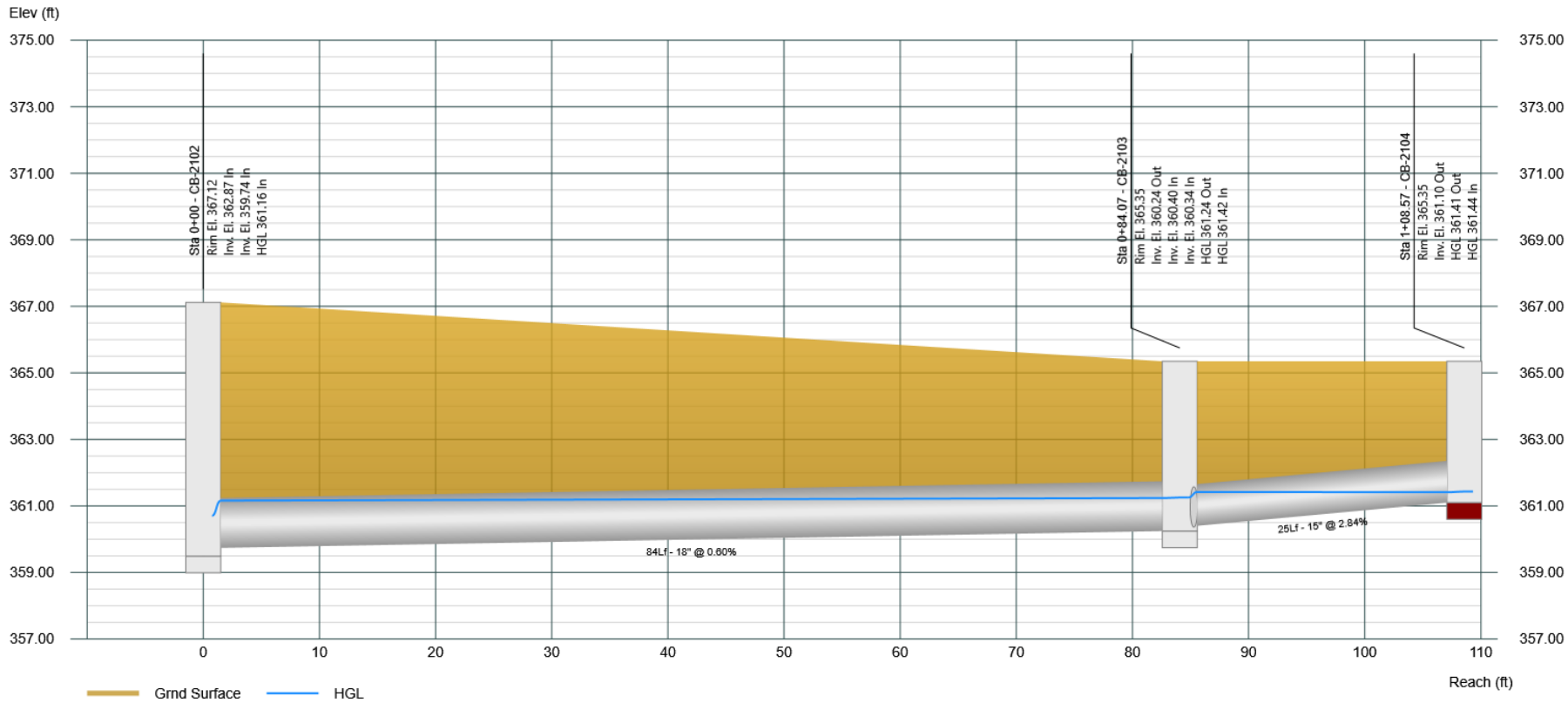
Project File: SD-2100.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2100

02-27-2024



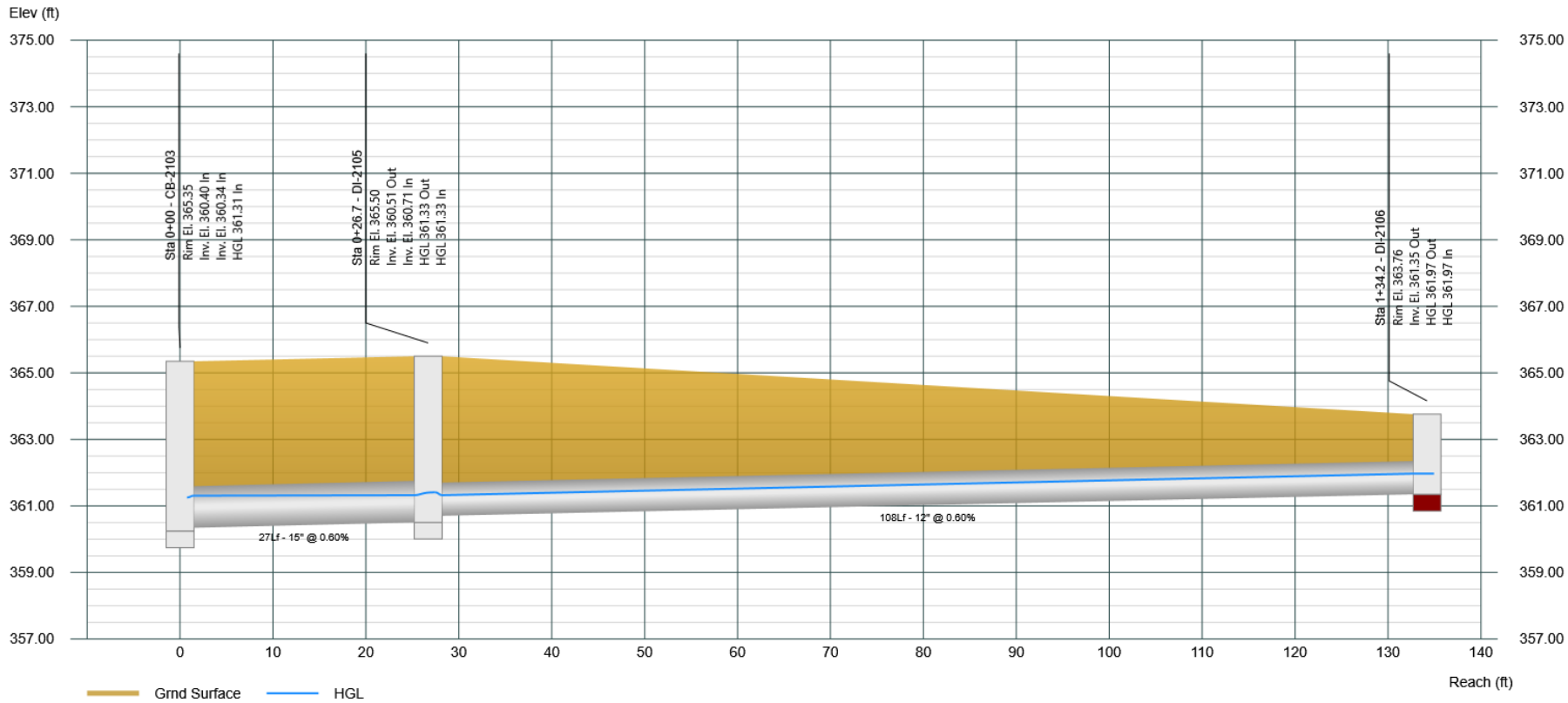
Project File: SD-2100.sws

Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2100

02-27-2024

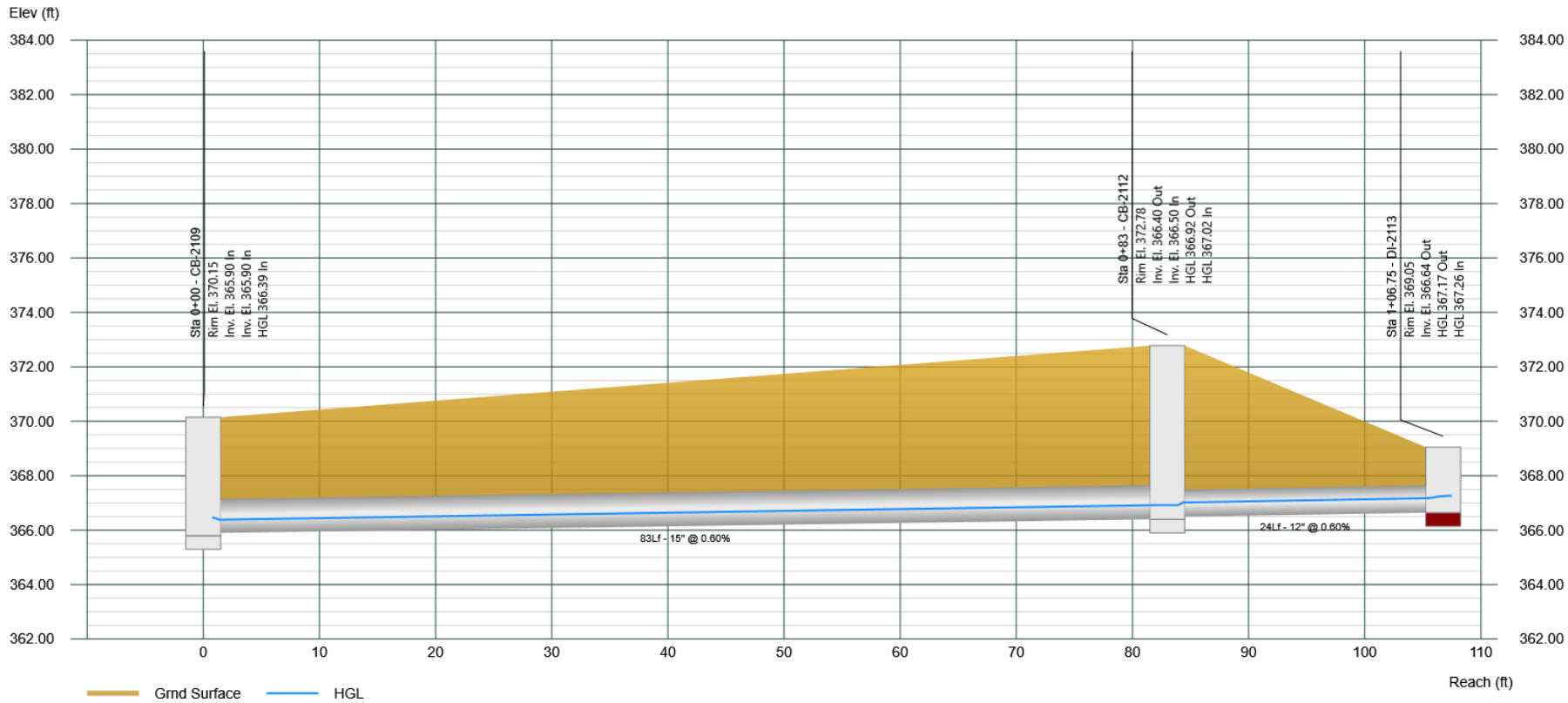


Profile View

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2100

02-27-2024



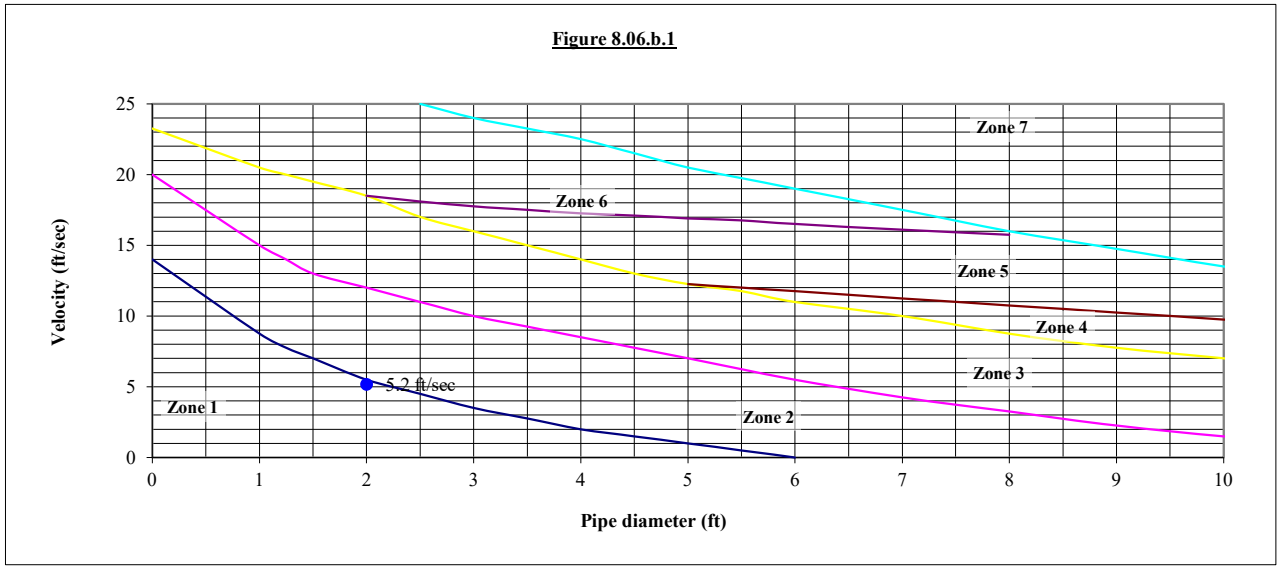
Project File: SD-2100.sws

VELOCITY DISSIPATOR CALCULATIONS

DESIGN OF RIPRAP OUTLET PROTECTION WORKSHEET

Project:	The Point - CD Package 3	Date:	2/27/2024
Project Number:	AWH-20000	Calculated By:	TD
Outlet Number:	EW-1100		

Outlet flowrate =	15.45	cfs
Pipe diameter =	24	inches
Number of pipes =	1	
Pipe separation =	0	feet
Outlet Velocity =	5.17	ft/sec



Zone from graph above = 2

Outlet pipe diameter	24 in.	Length =	12.0 ft.
Outlet flowrate	15.5 cfs	Width =	6.8 ft.
Outlet velocity	5.2 ft/sec	Stone diameter =	6 in.
Material =	Class B	Thickness =	18 in.

Zone	Material	Diameter	Thickness	Length	Width
1	Class A	3	12	4 x D(o)	3 x D(o)
2	Class B	6	18	6 x D(o)	3 x D(o)
3	Class I	13	24	8 x D(o)	3 x D(o)
4	Class I	13	24	8 x D(o)	3 x D(o)
5	Class II	23	36	10 x D(o)	3 x D(o)
6	Class II	23	36	10 x D(o)	3 x D(o)
7	Special study required				

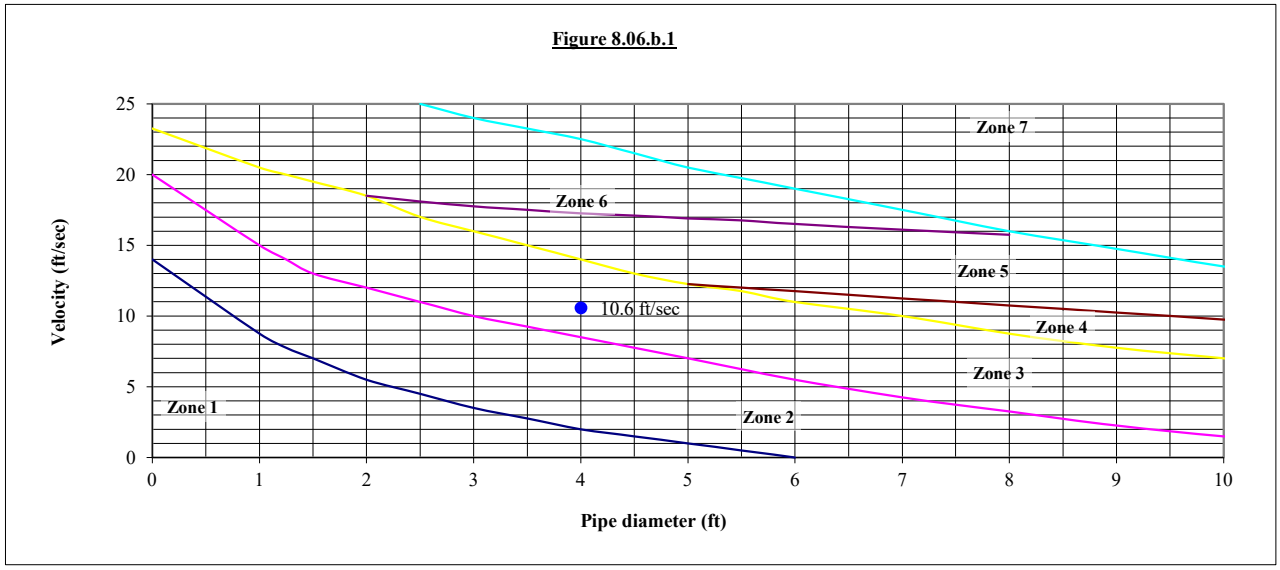
1. Calculations based on NY DOT method - Pages 8.06.05 through 8.06.06 in NC Erosion Control Manual

2. Outlet velocity based on full-flow velocity

DESIGN OF RIPRAP OUTLET PROTECTION WORKSHEET

Project:	The Point - CD Package 3	Date:	2/27/2024
Project Number:	AWH-20000	Calculated By:	TD
Outlet Number:	EW-1800		

Outlet flowrate =	59.18	cfs
Pipe diameter =	48	inches
Number of pipes =	1	
Pipe separation =	0	feet
Outlet Velocity =	10.57	ft/sec



Zone from graph above = 3

Outlet pipe diameter	48 in.	Length =	32.0 ft.
Outlet flowrate	59.2 cfs	Width =	16.8 ft.
Outlet velocity	10.6 ft/sec	Stone diameter =	13 in.
Material =	Class I	Thickness =	24 in.

Zone	Material	Diameter	Thickness	Length	Width
1	Class A	3	12	4 x D(o)	3 x D(o)
2	Class B	6	18	6 x D(o)	3 x D(o)
3	Class I	13	24	8 x D(o)	3 x D(o)
4	Class I	13	24	8 x D(o)	3 x D(o)
5	Class II	23	36	10 x D(o)	3 x D(o)
6	Class II	23	36	10 x D(o)	3 x D(o)
7	Special study required				

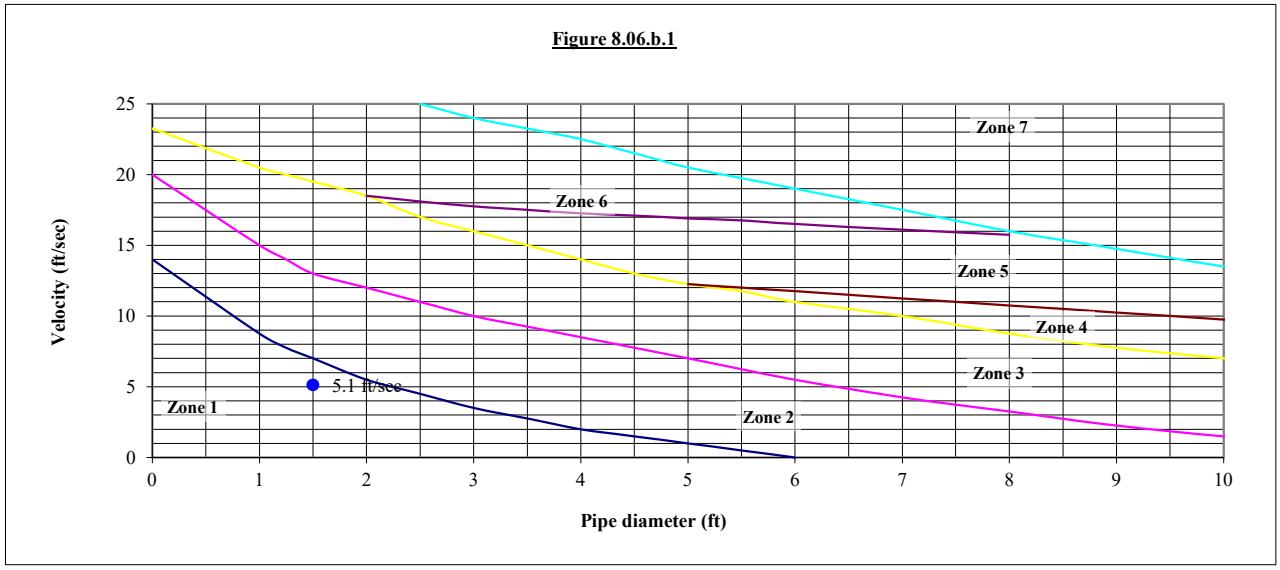
1. Calculations based on NY DOT method - Pages 8.06.05 through 8.06.06 in NC Erosion Control Manual

2. Outlet velocity based on full-flow velocity

DESIGN OF RIPRAP OUTLET PROTECTION WORKSHEET

Project:	The Point - CD Package 3	Date:	2/27/2024
Project Number:	AWH-20000	Calculated By:	TD
Outlet Number:	EW-1900		

Outlet flowrate =	7.85	cfs
Pipe diameter =	18	inches
Number of pipes =	1	
Pipe separation =	0	feet
Outlet Velocity =	5.13	ft/sec



Zone from graph above = 2

Outlet pipe diameter	18 in.	Length =	9.0 ft.
Outlet flowrate	7.9 cfs	Width =	5.1 ft.
Outlet velocity	5.1 ft/sec	Stone diameter =	6 in.
Material =	Class B	Thickness =	18 in.

Zone	Material	Diameter	Thickness	Length	Width
1	Class A	3	12	4 x D(o)	3 x D(o)
2	Class B	6	18	6 x D(o)	3 x D(o)
3	Class I	13	24	8 x D(o)	3 x D(o)
4	Class I	13	24	8 x D(o)	3 x D(o)
5	Class II	23	36	10 x D(o)	3 x D(o)
6	Class II	23	36	10 x D(o)	3 x D(o)
7	Special study required				

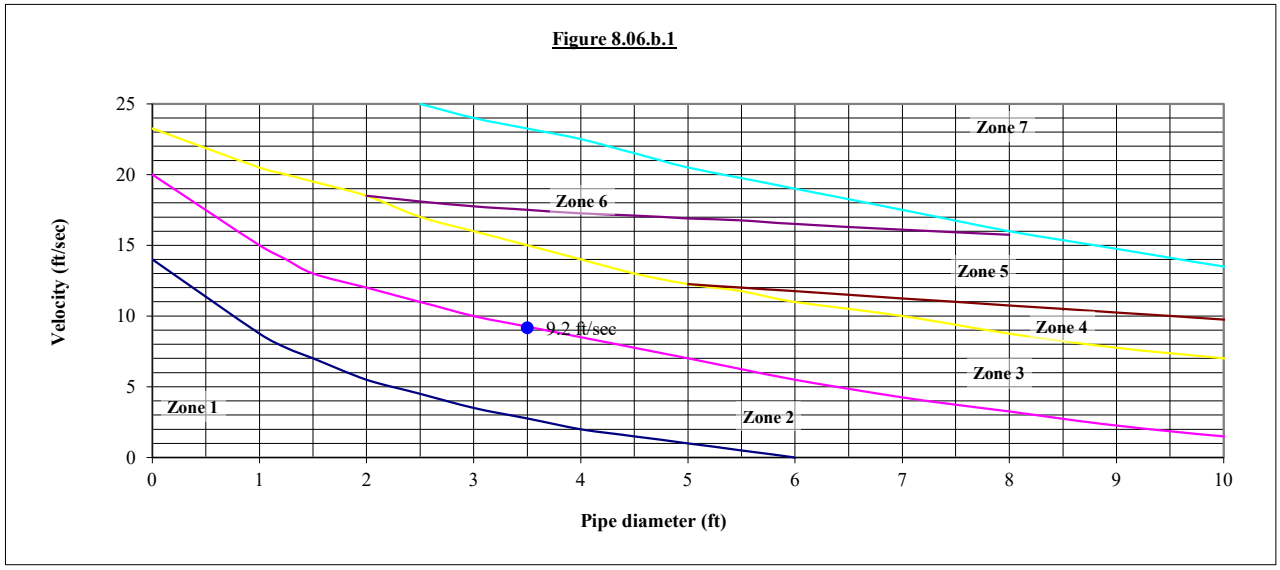
1. Calculations based on NY DOT method - Pages 8.06.05 through 8.06.06 in NC Erosion Control Manual

2. Outlet velocity based on full-flow velocity

DESIGN OF RIPRAP OUTLET PROTECTION WORKSHEET

Project:	The Point - CD Package 3	Date:	2/27/2024
Project Number:	AWH-20000	Calculated By:	TD
Outlet Number:	EW-2000		

Outlet flowrate =	57.76	cfs
Pipe diameter =	42	inches
Number of pipes =	1	
Pipe separation =	0	feet
Outlet Velocity =	9.17	ft/sec



Zone from graph above = 3

Outlet pipe diameter	42 in.	Length =	28.0 ft.
Outlet flowrate	57.8 cfs	Width =	14.7 ft.
Outlet velocity	9.2 ft/sec	Stone diameter =	13 in.
Material =	Class I	Thickness =	24 in.

Zone	Material	Diameter	Thickness	Length	Width
1	Class A	3	12	4 x D(o)	3 x D(o)
2	Class B	6	18	6 x D(o)	3 x D(o)
3	Class I	13	24	8 x D(o)	3 x D(o)
4	Class I	13	24	8 x D(o)	3 x D(o)
5	Class II	23	36	10 x D(o)	3 x D(o)
6	Class II	23	36	10 x D(o)	3 x D(o)
7	Special study required				

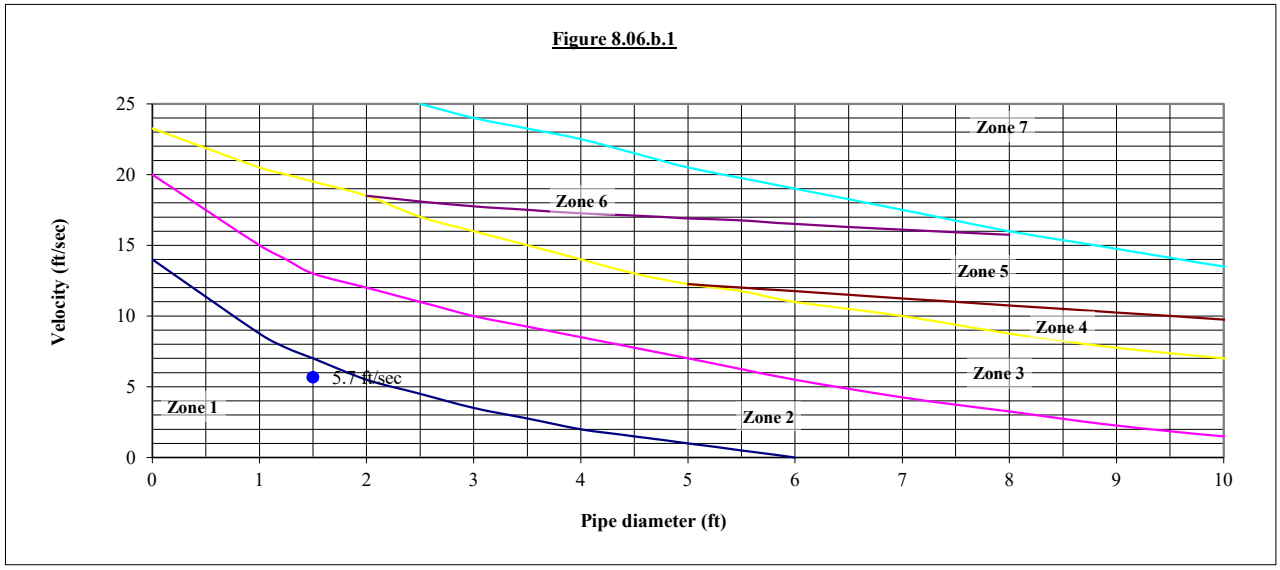
1. Calculations based on NY DOT method - Pages 8.06.05 through 8.06.06 in NC Erosion Control Manual

2. Outlet velocity based on full-flow velocity

DESIGN OF RIPRAP OUTLET PROTECTION WORKSHEET

Project:	The Point - CD Package 3	Date:	2/27/2024
Project Number:	AWH-20000	Calculated By:	TD
Outlet Number:	EW-2100		

Outlet flowrate =	9.06	cfs
Pipe diameter =	18	inches
Number of pipes =	1	
Pipe separation =	0	feet
Outlet Velocity =	5.68	ft/sec



Zone from graph above = 2

Outlet pipe diameter	18 in.	Length =	9.0 ft.
Outlet flowrate	9.1 cfs	Width =	5.1 ft.
Outlet velocity	5.7 ft/sec	Stone diameter =	6 in.
Material =	Class B	Thickness =	18 in.

Zone	*Material*	*Diameter*	*Thickness*	*Length*	*Width*
1	*Class A*	*3*	*12*	*4 x D(o)*	*3 x D(o)*
2	*Class B*	*6*	*18*	*6 x D(o)*	*3 x D(o)*
3	*Class I*	*13*	*24*	*8 x D(o)*	*3 x D(o)*
4	*Class I*	*13*	*24*	*8 x D(o)*	*3 x D(o)*
5	*Class II*	*23*	*36*	*10 x D(o)*	*3 x D(o)*
6	*Class II*	*23*	*36*	*10 x D(o)*	*3 x D(o)*
7	*Special study required*				

1. Calculations based on NY DOT method - Pages 8.06.05 through 8.06.06 in NC Erosion Control Manual

2. Outlet velocity based on full-flow velocity

HY-8 Energy Dissipation Results

External Energy Dissipator

Parameter	Value	Units
Select Culvert and Flow		
Crossing	Crossing 1	
Culvert	Culvert 1	
Flow	611.70	cfs
Culvert Data		
Culvert Width (including multiple barrels)	7.0	ft
Culvert Height	7.0	ft
Outlet Depth	3.76	ft
Outlet Velocity	10.98	ft/s
Froude Number	1.41	
Tailwater Depth	3.50	ft
Tailwater Velocity	7.05	ft/s
Tailwater Slope (SO)	0.0123	
External Dissipator Data		
External Dissipator Category	Streambed Level Structures	
External Dissipator Type	Riprap Basin	
Restrictions		
Froude Number	<3	
Input Data		
Condition to be used to Compute Basin Outlet Velocity	Best Fit Curve	
D50 of the Riprap Mixture		
Note:	Minimum HS/D50 = 2 is Obtained if D50 = 0.341 ft	
D50 of the Riprap Mixture	0.341	ft
DMax of the Riprap Mixture	1.500	ft
Results		
Brink Depth	3.761	ft
Brink Velocity	10.976	ft/s
Depth (YE)	3.492	ft
Riprap Thickness	2.250	ft
Riprap Foreslope	3.0000	ft
Check HS/D50		
Note:	OK if HS/D50 > 2.0	
HS/D50	2.049	
HS/D50 Check	HS/D50 is OK	
Check D50/YE		
Note:	OK if 0.1 < D50/YE < 0.7	

Check D50/YE	0.098	
D50/YE Check	D50/YE is NOT OK	
Basin Length (LB)	28.000	ft
Basin Width	25.667	ft
Apron Length	7.000	ft
Pool Length	21.000	ft
Pool Depth (HS)	0.699	ft
TW/YE	1.002	
Tailwater Depth (TW)	3.499	ft
Average Velocity with TW	2.342	ft/s
Critical Depth (Yc)	1.444	ft
Average Velocity with Yc	6.493	ft/s
Downstream Riprap for High TW		
Distance: 1 LB		
Velocity	9.557	ft/s
Size	0.595	ft
Distance: 2 LB		
Velocity	6.639	ft/s
Size	0.287	ft
Distance: 3 LB		
Velocity	4.413	ft/s
Size	0.127	ft
Distance: 4 LB		
Velocity	3.303	ft/s
Size	0.071	ft

INLET/GUTTER SPREAD REPORTS

Inlet Report

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1100

02-27-2024

Line No	Inlet		Q				Curb		Grate			Gutter							Inlet			Byp Line No
	Id	Type	Catch (cfs)	Carry (cfs)	Capt (cfs)	Byp (cfs)	Ht (in)	L (ft)	L (ft)	W (ft)	Area (sqft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	CB-1101	Combination	0.25	0.00	0.25	0.00	3.0	3.00	3.00	2.00	-	0.010	2.00	0.040	0.020	0.013	0.10	3.15	0.16	1.28	2.5	4
2	CB-1102	Combination	0.54	0.00	0.48	0.06	3.0	3.00	3.00	2.00	-	0.010	2.00	0.040	0.020	0.013	0.13	4.70	0.21	1.70	2.5	3
3	CB-1103	Combination	0.14	0.06	0.19	0.00	3.0	3.00	3.00	2.00	-	0.010	2.00	0.040	0.020	0.013	0.09	2.70	0.14	1.16	2.5	6
4	CB-1104	Combination	0.14	0.00	0.14	0.00	3.0	3.00	3.00	2.00	-	0.010	2.00	0.040	0.020	0.013	0.08	2.20	0.13	1.03	2.5	7
5	DI-1105	Drop Grate	2.16	0.00	2.16	0.00	-	-	2.00	2.00	4.00	Sag	2.00	0.020	0.020	0.013	0.20	22.05	0.20	22.05	0.0	0
6	CB-1106	Combination	0.65	0.01	0.66	0.00	3.0	3.00	3.00	2.00	0.45	Sag	2.00	0.050	0.020	0.013	0.15	4.50	0.15	4.50	0.0	0
7	CB-1107	Combination	0.68	0.05	0.73	0.00	3.0	3.00	3.00	2.00	0.52	Sag	2.00	0.050	0.020	0.013	0.16	5.00	0.16	5.00	0.0	0
8	CB-1108	Combination	0.58	0.01	0.57	0.01	3.0	3.00	3.00	2.00	-	0.026	2.00	0.050	0.020	0.013	0.13	3.45	0.13	3.45	0.0	6
9	DI-1109	Drop Grate	0.36	0.00	0.36	0.00	-	-	2.00	2.00	0.22	Sag	2.00	0.050	0.020	0.013	0.09	11.28	0.09	11.28	0.0	0
10	CB-1110	Combination	0.71	0.04	0.70	0.05	3.0	3.00	3.00	2.00	-	0.024	2.00	0.050	0.020	0.013	0.14	4.10	0.14	4.10	0.0	7
11	DI-1111	Drop Grate	0.31	0.00	0.31	0.00	-	-	2.00	2.00	0.19	Sag	2.00	0.050	0.020	0.013	0.09	11.28	0.09	11.28	0.0	0
12	CB-1112	Combination	0.65	0.00	0.64	0.01	3.0	3.00	3.00	2.00	-	0.046	2.00	0.050	0.020	0.013	0.12	3.00	0.12	3.00	0.0	8
13	CB-1113	Combination	0.88	0.00	0.84	0.04	3.0	3.00	3.00	2.00	-	0.042	2.00	0.050	0.020	0.013	0.14	3.80	0.14	3.80	0.0	10
14	DI-1114	Drop Grate	1.20	0.00	1.20	0.00	-	-	2.00	2.00	0.24	Sag	2.00	0.050	0.020	0.013	0.87	89.32	0.87	89.32	0.0	0

Notes: Return Period = 1-yrs. All curb inlets are Horiz throat.,

Project File: Storm System 1100-SPREAD.sws

Inlet Report

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024

Line No	Inlet		Q				Curb		Grate			Gutter							Inlet			Byp Line No
	Id	Type	Catch (cfs)	Carry (cfs)	Capt (cfs)	Byp (cfs)	Ht (in)	L (ft)	L (ft)	W (ft)	Area (sqft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	DI-1801	Manhole	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	CB-1802	Drop Grate	0.29	0.00	0.29	0.00	-	-	2.00	2.00	3.22	Sag	2.00	0.050	0.020	0.013	0.05	7.21	0.05	7.21	0.0	0
3	CB-1803	Combination	0.65	0.01	0.65	0.00	3.0	3.00	3.00	2.00	-	0.049	2.00	0.050	0.020	0.013	0.12	2.95	0.17	1.35	2.5	35
4	CB-1804	Combination	0.51	0.00	0.51	0.00	3.0	3.00	3.00	2.00	-	0.049	2.00	0.050	0.020	0.013	0.11	2.45	0.15	1.23	2.5	7
5	CB-1811	Combination	0.61	0.00	0.59	0.02	3.0	3.00	3.00	2.00	-	0.027	2.00	0.050	0.020	0.013	0.13	3.45	0.18	1.47	2.5	0
6	CB-1812	Combination	0.48	0.00	0.48	0.00	3.0	3.00	2.00	2.00	-	0.027	2.00	0.050	0.020	0.013	0.12	2.95	0.17	1.34	2.5	7
7	CB-1813	Combination	0.37	0.00	0.37	0.00	3.0	3.00	2.00	2.00	-	0.013	2.00	0.050	0.020	0.013	0.12	3.20	0.18	1.42	2.5	8
8	CB-1815	Combination	0.75	0.00	0.75	0.00	3.0	3.00	3.00	2.00	3.22	Sag	2.00	0.050	0.020	0.013	0.09	1.72	0.23	1.89	2.5	7
9	CB-1819	Combination	0.37	0.00	0.37	0.00	3.0	3.00	3.00	2.00	-	0.027	2.00	0.050	0.020	0.013	0.11	2.45	0.15	1.23	2.5	8
10	CB-1820	Combination	0.27	0.00	0.27	0.00	3.0	3.00	3.00	2.00	-	0.036	2.00	0.050	0.020	0.013	0.09	1.84	0.13	1.03	2.5	9
11	CB-1825	Combination	0.24	0.15	0.38	0.00	3.0	3.00	3.00	2.00	-	0.023	2.00	0.050	0.020	0.013	0.11	2.65	0.11	2.65	0.0	10
12	CB-1836	Combination	1.02	0.10	0.97	0.15	3.0	3.00	3.00	2.00	-	0.027	2.00	0.050	0.020	0.013	0.16	4.85	0.23	1.84	2.5	11
13	CB-1837	Combination	0.48	0.00	0.47	0.01	3.0	3.00	3.00	2.00	-	0.026	2.00	0.050	0.020	0.013	0.12	2.95	0.17	1.35	2.5	39
14	CB-1838	Combination	0.48	0.00	0.47	0.00	3.0	3.00	3.00	2.00	-	0.021	2.00	0.050	0.020	0.013	0.12	3.20	0.18	1.41	2.5	13
15	CB-1839	Combination	0.17	0.01	0.18	0.00	3.0	3.00	3.00	2.00	-	0.026	2.00	0.050	0.020	0.013	0.08	1.68	0.12	0.95	2.5	14
16	CB-1840	Combination	0.24	0.01	0.25	0.00	3.0	3.00	3.00	2.00	-	0.027	2.00	0.050	0.020	0.013	0.09	1.86	0.13	1.06	2.5	14
17	CB-1841	Combination	0.75	0.00	0.74	0.01	3.0	3.00	3.00	2.00	-	0.050	2.00	0.050	0.020	0.013	0.13	3.25	0.18	1.42	2.5	16
18	DI-1842	Drop Grate	0.70	0.00	0.70	0.00	-	-	2.00	2.00	3.22	Sag	2.00	0.050	0.020	0.013	0.09	11.48	0.09	11.48	0.0	0
19	CB-1843	Combination	0.71	0.00	0.70	0.01	3.0	3.00	3.00	2.00	-	0.045	2.00	0.050	0.020	0.013	0.13	3.25	0.18	1.43	2.5	15
20	DI-1844	Drop Grate	0.18	0.00	0.18	0.00	-	-	2.00	2.00	3.22	Sag	2.00	0.050	0.020	0.013	0.04	5.85	0.04	5.85	0.0	0
21	CB-1845	Combination	0.88	0.04	0.83	0.09	3.0	3.00	3.00	2.00	-	0.025	2.00	0.050	0.020	0.013	0.15	4.50	0.22	1.75	2.5	0
22	CB-1846	Combination	0.95	0.01	0.87	0.10	3.0	3.00	3.00	2.00	-	0.026	2.00	0.050	0.020	0.013	0.15	4.60	0.22	1.76	2.5	12

Notes: Return Period = 1-yrs. All curb inlets are Horiz throat.,

Project File: SD-1800.sws

Inlet Report

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024

Line No	Inlet		Q				Curb		Grate			Gutter							Inlet			Byp Line No
	Id	Type	Catch (cfs)	Carry (cfs)	Capt (cfs)	Byp (cfs)	Ht (in)	L (ft)	L (ft)	W (ft)	Area (sqft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
23	CB-1847	Combination	0.88	0.00	0.85	0.04	3.0	3.00	3.00	2.00	-	0.046	2.00	0.050	0.020	0.013	0.13	3.70	0.19	1.53	2.5	21
24	CB-1848	Combination	0.71	0.00	0.70	0.01	3.0	3.00	3.00	2.00	-	0.049	2.00	0.050	0.020	0.013	0.12	3.15	0.17	1.40	2.5	22
25	DI-1849	Drop Grate	0.68	0.00	0.68	0.00	-	-	2.00	2.00	3.22	Sag	2.00	0.050	0.020	0.013	0.09	11.25	0.09	11.25	0.0	0
26	CB-1806	Combination	0.51	0.00	0.51	0.00	3.0	3.00	3.00	2.00	-	0.049	2.00	0.050	0.020	0.013	0.11	2.45	0.15	1.23	2.5	4
27	CB-1807	Combination	0.61	0.00	0.61	0.01	3.0	3.00	3.00	2.00	-	0.049	2.00	0.050	0.020	0.013	0.12	2.80	0.16	1.32	2.5	3
28	CB-1808	Combination	0.31	0.00	0.31	0.00	3.0	3.00	3.00	2.00	-	0.049	2.00	0.050	0.020	0.013	0.09	1.80	0.13	1.02	2.5	26
29	CB-1809	Combination	0.54	0.00	0.54	0.00	3.0	3.00	3.00	2.00	-	0.049	2.00	0.050	0.020	0.013	0.11	2.60	0.16	1.26	2.5	27
30	CB-1821	Combination	0.27	0.00	0.27	0.00	3.0	3.00	3.00	2.00	-	0.036	2.00	0.050	0.020	0.013	0.09	1.84	0.13	1.03	2.5	34
31	CB-1822	Combination	0.23	0.00	0.23	0.00	3.0	3.00	3.00	2.00	3.22	Sag	2.00	0.050	0.020	0.013	0.03	0.52	0.17	1.40	2.5	0
32	CB-1823	Combination	0.38	0.00	0.38	0.00	3.0	3.00	3.00	2.00	0.23	Sag	2.00	0.050	0.020	0.013	0.08	1.52	0.22	1.81	2.5	0
33	DI-1824	Drop Grate	0.49	0.00	0.49	0.00	-	-	2.00	2.00	3.22	Sag	2.00	0.050	0.020	0.013	0.08	9.50	0.08	9.50	0.0	0
34	CB-1816	Combination	1.19	0.08	1.27	0.00	3.0	3.00	3.00	2.00	3.22	Sag	2.00	0.050	0.020	0.013	0.14	3.79	0.28	3.79	2.5	0
35	CB-1817	Combination	0.75	0.00	0.67	0.08	3.0	3.00	3.00	2.00	-	0.013	2.00	0.050	0.020	0.013	0.16	4.85	0.23	1.84	2.5	34
36	DI-1818	Drop Grate	0.39	0.00	0.39	0.00	-	-	2.00	2.00	3.22	Sag	2.00	0.050	0.020	0.013	0.06	8.41	0.06	8.41	0.0	0
37	CB-1826	Combination	0.03	0.00	0.03	0.00	3.0	3.00	3.00	2.00	-	0.023	2.00	0.050	0.020	0.013	0.05	0.92	0.05	0.92	0.0	30
38	CB-1827	Combination	0.14	0.00	0.14	0.00	3.0	3.00	3.00	2.00	-	0.044	2.00	0.050	0.020	0.013	0.07	1.36	0.10	0.77	2.5	42
39	CB-1828	Combination	0.51	0.01	0.52	0.00	3.0	3.00	3.00	2.00	-	0.044	2.00	0.050	0.020	0.013	0.11	2.60	0.16	1.26	2.5	0
40	DI-1829	Drop Grate	4.99	0.00	4.99	0.00	-	-	2.00	2.00	3.22	Sag	2.00	0.050	0.020	0.013	0.35	37.09	0.35	37.09	0.0	0
41	CB-1830	Combination	0.34	0.00	0.34	0.00	3.0	3.00	3.00	2.00	-	0.048	2.00	0.050	0.020	0.013	0.09	1.88	0.13	1.06	2.5	43
42	CB-1831	Combination	0.37	0.00	0.37	0.00	3.0	3.00	3.00	2.00	-	0.048	2.00	0.050	0.020	0.013	0.10	1.96	0.14	1.10	2.5	45
43	CB-1832	Combination	0.51	0.00	0.51	0.00	3.0	3.00	3.00	2.00	-	0.048	2.00	0.050	0.020	0.013	0.11	2.50	0.15	1.24	2.5	0
44	DI-1833	Drop Grate	2.26	0.00	2.26	0.00	-	-	2.00	2.00	3.22	Sag	2.00	0.050	0.020	0.013	0.21	22.69	0.21	22.69	0.0	0

Notes: Return Period = 1-yrs. All curb inlets are Horiz throat.,

Project File: SD-1800.sws

Inlet Report

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1800

02-27-2024

Line No	Inlet		Q				Curb		Grate			Gutter							Inlet			Byp Line No
	Id	Type	Catch (cfs)	Carry (cfs)	Capt (cfs)	Byp (cfs)	Ht (in)	L (ft)	L (ft)	W (ft)	Area (sqft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
45	CB-1834	Combination	0.51	0.00	0.51	0.00	3.0	3.00	3.00	2.00	-	0.048	2.00	0.050	0.020	0.013	0.11	2.50	0.15	1.24	2.5	0
46	DI-1835	Drop Grate	0.36	0.00	0.36	0.00	-	-	2.00	2.00	3.22	Sag	2.00	0.050	0.020	0.013	0.06	8.12	0.06	8.12	0.0	0
47	DI-1850	Drop Grate	0.99	0.00	0.99	0.00	-	-	2.00	2.00	3.22	Sag	2.00	0.050	0.020	0.013	0.12	13.91	0.12	13.91	3.0	25
48	DI-1851	Drop Grate	2.18	0.00	2.18	0.00	-	-	2.00	2.00	3.22	Sag	2.00	0.050	0.020	0.013	0.20	22.22	0.20	22.22	3.0	47
49	DI-1852	Drop Grate	1.20	0.00	1.20	0.00	-	-	2.00	2.00	3.22	Sag	2.00	0.050	0.020	0.013	0.14	15.53	0.14	15.53	3.0	48
50	DI-1814	Drop Grate	2.60	0.00	2.60	0.00	-	-	2.00	2.00	2.00	Sag	2.00	0.050	0.020	0.013	0.23	24.71	0.23	24.71	3.0	7
51	DI-1805	Drop Grate	1.56	0.00	1.56	0.00	-	-	2.00	2.00	2.00	Sag	2.00	0.050	0.020	0.013	0.16	18.15	0.16	18.15	3.0	4

Notes: Return Period = 1-yrs. All curb inlets are Horiz throat.,

Project File: SD-1800.sws

Inlet Report

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-1900

02-27-2024

Line No	Inlet		Q				Curb		Grate			Gutter							Inlet			Byp Line No
	Id	Type	Catch (cfs)	Carry (cfs)	Capt (cfs)	Byp (cfs)	Ht (in)	L (ft)	L (ft)	W (ft)	Area (sqft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	JB-1901	Manhole	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	DI-1902	Drop Grate	0.57	0.00	0.57	0.00	-	-	2.00	2.00	0.25	Sag	2.00	0.050	0.020	0.013	0.18	19.55	0.18	19.55	0.0	0
3	CB-1903	Combination	0.71	0.00	0.70	0.01	3.0	3.00	3.00	2.00	-	0.049	2.00	0.050	0.020	0.013	0.12	3.15	0.12	3.15	0.0	0
4	CB-1905	Combination	0.20	0.00	0.20	0.00	3.0	3.00	3.00	2.00	-	0.017	2.00	0.050	0.020	0.013	0.09	1.88	0.09	1.88	0.0	0
5	CB-1906	Combination	0.27	0.00	0.27	0.00	3.0	3.00	3.00	2.00	-	0.042	2.00	0.050	0.020	0.013	0.09	1.78	0.09	1.78	0.0	0
6	CB-1907	Combination	0.17	0.00	0.17	0.00	3.0	3.00	3.00	2.00	-	0.042	2.00	0.050	0.020	0.013	0.07	1.50	0.07	1.50	0.0	0
7	CB-1908	Combination	0.14	0.00	0.14	0.00	3.0	3.00	3.00	2.00	-	0.034	2.00	0.050	0.020	0.013	0.07	1.42	0.11	0.73	3.0	0
8	DI-1909	Drop Grate	0.96	0.00	0.96	0.00	-	-	2.00	2.00	0.79	Sag	2.00	0.050	0.020	0.013	0.12	13.70	0.12	13.70	0.0	0
9	DI-1910	Drop Grate	1.01	0.00	1.01	0.00	-	-	2.00	2.00	2.00	Sag	2.00	0.050	0.020	0.013	0.12	14.12	0.12	14.12	3.0	8
10	CB-1904	Combination	0.68	0.00	0.68	0.00	3.0	3.00	3.00	2.00	-	0.049	2.00	0.050	0.020	0.013	0.12	3.05	0.12	3.05	0.0	0

Notes: Return Period = 1-yrs. All curb inlets are Horiz throat.,

Project File: SD-1900.sws

Inlet Report

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2000

02-27-2024

Line No	Inlet		Q				Curb		Grate			Gutter							Inlet			Byp Line No
	Id	Type	Catch (cfs)	Carry (cfs)	Capt (cfs)	Byp (cfs)	Ht (in)	L (ft)	L (ft)	W (ft)	Area (sqft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	JB-2001	Manhole	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	JB-2006	Manhole	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3	CB-2007	Combination	1.02	0.01	1.03	0.00	3.0	3.00	3.00	2.00	0.62	Sag	2.00	0.050	0.020	0.013	0.12	2.79	0.26	2.79	2.5	0
4	CB-2016	Combination	1.05	0.04	1.10	0.00	3.0	3.00	3.00	2.00	0.64	Sag	2.00	0.050	0.020	0.013	0.12	2.79	0.26	2.79	2.5	0
5	DI-2017	Drop Grate	0.06	0.00	0.06	0.00	-	-	2.00	2.00	0.04	Sag	2.00	0.050	0.020	0.013	0.09	11.28	0.09	11.28	0.0	0
6	CB-2021	Combination	0.75	0.00	0.70	0.04	3.0	3.00	3.00	2.00	-	0.026	2.00	0.050	0.020	0.013	0.14	4.00	0.20	1.61	2.5	4
7	CB-2022	Combination	0.31	0.00	0.31	0.00	3.0	3.00	3.00	2.00	-	0.028	2.00	0.050	0.020	0.013	0.10	2.00	0.14	1.14	2.5	3
8	CB-2023	Combination	0.24	0.00	0.24	0.00	3.0	3.00	3.00	2.00	-	0.037	2.00	0.050	0.020	0.013	0.09	1.74	0.12	0.98	2.5	7
9	CB-2024	Combination	0.27	0.00	0.27	0.00	3.0	3.00	3.00	2.00	-	0.037	2.00	0.050	0.020	0.013	0.09	1.82	0.13	1.03	2.5	8
10	CB-2027	Combination	0.37	0.01	0.39	0.00	3.0	3.00	3.00	2.00	-	0.032	2.00	0.050	0.020	0.013	0.11	2.35	0.11	2.35	0.0	6
11	CB-2028	Combination	0.31	0.00	0.31	0.00	3.0	3.00	3.00	2.00	-	0.028	2.00	0.050	0.020	0.013	0.10	2.00	0.14	1.14	2.5	6
12	CB-2029	Combination	0.17	0.00	0.17	0.00	3.0	3.00	3.00	2.00	-	0.029	2.00	0.050	0.020	0.013	0.08	1.60	0.11	0.91	2.5	6
13	CB-2030	Combination	0.20	0.00	0.20	0.00	3.0	3.00	3.00	2.00	-	0.050	2.00	0.050	0.020	0.013	0.08	1.54	0.11	0.88	2.5	12
14	CB-2031	Combination	0.27	0.13	0.40	0.00	3.0	3.00	3.00	2.00	-	0.050	2.00	0.050	0.020	0.013	0.10	1.98	0.14	1.13	2.5	13
15	CB-2033	Combination	1.19	0.00	1.06	0.13	3.0	3.00	3.00	2.00	-	0.043	2.00	0.050	0.020	0.013	0.15	4.45	0.22	1.74	2.5	14
16	CB-2034	Combination	0.58	0.00	0.58	0.00	3.0	3.00	3.00	2.00	-	0.043	2.00	0.050	0.020	0.013	0.12	2.85	0.17	1.33	2.5	33
17	CB-2025	Combination	0.31	0.00	0.31	0.00	3.0	3.00	3.00	2.00	-	0.025	2.00	0.050	0.020	0.013	0.10	2.10	0.14	1.16	2.5	9
18	CB-2026	Combination	0.37	0.00	0.36	0.01	3.0	3.00	3.00	2.00	-	0.021	2.00	0.050	0.020	0.021	0.14	3.75	0.19	1.55	2.5	10
19	CB-2008	Combination	0.54	0.00	0.54	0.01	3.0	3.00	3.00	2.00	-	0.030	2.00	0.050	0.020	0.013	0.12	3.10	0.17	1.39	2.5	3
20	CB-2009	Combination	0.31	0.00	0.31	0.00	3.0	3.00	3.00	2.00	-	0.028	2.00	0.050	0.020	0.013	0.10	2.05	0.14	1.14	2.5	4
21	CB-2010	Combination	0.24	0.00	0.24	0.00	3.0	3.00	3.00	2.00	-	0.020	2.00	0.050	0.020	0.013	0.10	1.94	0.14	1.10	2.5	20
22	CB-2010A	Combination	0.08	0.00	0.08	0.00	3.0	3.00	2.00	2.00	-	0.007	2.00	0.050	0.020	0.013	0.08	1.56	0.12	0.81	3.0	23

Notes: Return Period = 1-yrs. All curb inlets are Horiz throat.,

Project File: SD-2000.sws

Inlet Report

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2000

02-27-2024

Line No	Inlet		Q				Curb		Grate			Gutter							Inlet			Byp Line No
	Id	Type	Catch (cfs)	Carry (cfs)	Capt (cfs)	Byp (cfs)	Ht (in)	L (ft)	L (ft)	W (ft)	Area (sqft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
23	CB-2011	Combination	0.78	0.00	0.78	0.00	3.0	3.00	3.00	2.00	0.48	Sag	2.00	0.050	0.020	0.013	0.10	1.92	0.24	1.97	2.5	0
24	CB-2012	Combination	0.92	0.12	1.04	0.00	3.0	3.00	3.00	2.00	0.56	Sag	2.00	0.050	0.020	0.013	0.12	2.79	0.26	2.79	2.5	0
25	CB-2013	Combination	0.07	0.00	0.07	0.00	3.0	3.00	3.00	2.00	-	0.004	2.00	0.050	0.020	0.013	0.08	1.62	0.11	0.91	2.5	23
26	CB-2014	Combination	0.51	0.00	0.51	0.00	3.0	3.00	2.00	2.00	-	0.014	2.00	0.050	0.020	0.013	0.14	3.75	0.20	1.41	3.0	25
27	CB-2015	Combination	0.92	0.00	0.79	0.12	3.0	3.00	3.00	2.00	-	0.014	2.00	0.050	0.020	0.013	0.16	5.20	0.24	1.93	2.5	24
28	DI-2018	Drop Grate	4.24	0.00	4.24	0.00	-	-	2.00	2.00	1.37	Sag	2.00	0.050	0.020	0.013	0.33	34.94	0.33	34.94	0.0	0
29	DI-2019	Drop Grate	2.99	0.00	2.99	0.00	-	-	2.00	2.00	0.82	Sag	2.00	0.050	0.020	0.013	0.46	47.55	0.46	47.55	0.0	0
30	DI-2020	Drop Grate	2.03	0.00	2.03	0.00	-	-	2.00	2.00	0.64	Sag	2.00	0.050	0.020	0.013	0.35	36.64	0.35	36.64	0.0	0
31	CB-2035	Combination	0.44	0.00	0.44	0.00	3.0	3.00	3.00	2.00	-	0.044	2.00	0.050	0.020	0.013	0.11	2.30	0.15	1.19	2.5	11
32	DI-2036	Drop Grate	1.25	0.00	1.25	0.00	-	-	2.00	2.00	3.22	Sag	2.00	0.050	0.020	0.013	0.14	15.92	0.14	15.92	0.0	0
33	CB-2032	Combination	0.51	0.00	0.51	0.00	3.0	3.00	3.00	2.00	-	0.044	2.00	0.050	0.020	0.013	0.11	2.55	0.16	1.26	2.5	31
34	DI-2002	Drop Grate	0.70	0.00	0.70	0.00	-	-	2.00	2.00	2.00	Sag	2.00	0.050	0.020	0.013	0.09	11.48	0.09	11.48	3.0	1
35	DI-2003	Drop Grate	0.31	0.00	0.31	0.00	-	-	2.00	2.00	2.00	Sag	2.00	0.050	0.020	0.013	0.06	7.52	0.06	7.52	3.0	34
36	DI-2004	Drop Grate	0.91	0.00	0.91	0.00	-	-	2.00	2.00	2.00	Sag	2.00	0.050	0.020	0.013	0.11	13.27	0.11	13.27	3.0	35
37	DI-2005	Drop Grate	1.30	0.00	1.30	0.00	-	-	2.00	2.00	2.00	Sag	2.00	0.050	0.020	0.013	0.14	16.30	0.14	16.30	3.0	36
38	DI-2039	Drop Grate	0.81	0.00	0.81	0.00	-	-	2.00	2.00	2.00	Sag	2.00	0.050	0.020	0.013	0.10	12.40	0.10	12.40	3.0	32
39	DI-2040	Drop Grate	0.42	0.00	0.42	0.00	-	-	2.00	2.00	2.00	Sag	2.00	0.050	0.020	0.013	0.07	8.69	0.07	8.69	3.0	38
40	DI-2041	Drop Grate	0.29	0.00	0.29	0.00	-	-	2.00	2.00	2.00	Sag	2.00	0.050	0.020	0.013	0.05	7.21	0.05	7.21	3.0	39
41	DI-2042	Drop Grate	0.88	0.00	0.88	0.00	-	-	2.00	2.00	2.00	Sag	2.00	0.050	0.020	0.013	0.11	13.06	0.11	13.06	3.0	40
42	DI-2043	Drop Grate	2.99	0.00	2.99	0.00	-	-	2.00	2.00	2.00	Sag	2.00	0.050	0.020	0.013	0.25	26.93	0.25	26.93	3.0	41
43	DI-2037	Drop Grate	0.81	0.00	0.81	0.00	-	-	2.00	2.00	2.00	Sag	2.00	0.050	0.020	0.013	0.10	12.40	0.10	12.40	3.0	32
44	DI-2038	Drop Grate	0.86	0.00	0.86	0.00	-	-	2.00	2.00	2.00	Sag	2.00	0.050	0.020	0.013	0.11	12.84	0.11	12.84	3.0	43

Notes: Return Period = 1-yrs. All curb inlets are Horiz throat.,

Project File: SD-2000.sws

Inlet Report

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2000

02-27-2024

Line No	Inlet		Q				Curb		Grate			Gutter							Inlet			Byp Line No
	Id	Type	Catch (cfs)	Carry (cfs)	Capt (cfs)	Byp (cfs)	Ht (in)	L (ft)	L (ft)	W (ft)	Area (sqft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
45	DI-2001A	Drop Grate	3.09	0.00	3.09	0.00	-	-	2.00	2.00	2.00	Sag	2.00	0.050	0.020	0.013	0.26	27.50	0.26	27.50	3.0	1

Notes: Return Period = 1-yrs.,

Project File: SD-2000.sws

Inlet Report

Stormwater Studio 2024 v 3.0.0.33

Project Name: SD-2100

02-27-2024

Line No	Inlet		Q				Curb		Grate			Gutter							Inlet			Byp Line No
	Id	Type	Catch (cfs)	Carry (cfs)	Capt (cfs)	Byp (cfs)	Ht (in)	L (ft)	L (ft)	W (ft)	Area (sqft)	So (ft/ft)	W (ft)	Sw (ft/ft)	Sx (ft/ft)	n	Depth (ft)	Spread (ft)	Depth (ft)	Spread (ft)	Depr (in)	
1	CB-2101	Combination	0.51	0.00	0.50	0.01	3.0	3.00	3.00	2.00	-	0.021	2.00	0.050	0.020	0.013	0.13	3.35	0.18	1.45	2.5	9
2	CB-2102	Combination	0.34	0.00	0.34	0.00	3.0	3.00	3.00	2.00	-	0.021	2.00	0.050	0.020	0.013	0.11	2.50	0.15	1.24	2.5	8
3	CB-2107	Combination	0.27	0.00	0.27	0.00	3.0	3.00	3.00	2.00	-	0.036	2.00	0.050	0.020	0.013	0.09	1.84	0.13	1.04	2.5	2
4	CB-2108	Combination	0.27	0.00	0.27	0.00	3.0	3.00	3.00	2.00	-	0.021	2.00	0.050	0.020	0.013	0.10	2.05	0.14	1.14	2.5	3
5	CB-2109	Combination	0.20	0.00	0.20	0.00	3.0	3.00	3.00	2.00	-	0.021	2.00	0.050	0.020	0.013	0.09	1.82	0.13	1.03	2.5	3
6	CB-2110	Combination	0.20	0.00	0.20	0.00	3.0	3.00	3.00	2.00	-	0.014	2.00	0.050	0.020	0.013	0.10	1.96	0.14	1.10	2.5	3
7	CB-2111	Combination	0.20	0.00	0.20	0.00	3.0	3.00	3.00	2.00	-	0.012	2.00	0.050	0.020	0.013	0.10	2.05	0.14	1.14	2.5	1
8	CB-2103	Combination	0.31	0.00	0.31	0.00	3.0	3.00	3.00	2.00	-	0.021	2.00	0.050	0.020	0.013	0.11	2.30	0.15	1.19	2.5	0
9	CB-2104	Combination	0.17	0.01	0.18	0.00	3.0	3.00	3.00	2.00	-	0.021	2.00	0.050	0.020	0.013	0.09	1.74	0.12	0.98	2.5	0
10	DI-2105	Drop Grate	0.65	0.00	0.65	0.00	-	-	2.00	2.00	2.00	Sag	2.00	0.050	0.020	0.013	0.09	10.97	0.09	10.97	3.0	8
11	DI-2106	Drop Grate	1.20	0.00	1.20	0.00	-	-	2.00	2.00	2.00	Sag	2.00	0.050	0.020	0.013	0.14	15.53	0.14	15.53	3.0	10
12	CB-2112	Combination	0.07	0.00	0.07	0.00	3.0	3.00	2.00	2.00	-	0.020	2.00	0.050	0.020	0.013	0.06	1.22	0.09	0.69	2.5	5
13	DI-2113	Drop Grate	0.87	0.00	0.87	0.00	-	-	2.00	2.00	2.00	Sag	2.00	0.050	0.020	0.013	0.11	12.94	0.11	12.94	3.0	12

Notes: Return Period = 1-yrs. All curb inlets are Horiz throat.,

Project File: SD-2100.sws

GREENWAY CULVERT CALCULATIONS

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Feb 27 2024

Culvert 1

Invert Elev Dn (ft)	=	366.00
Pipe Length (ft)	=	21.00
Slope (%)	=	4.52
Invert Elev Up (ft)	=	366.95
Rise (in)	=	15.0
Shape	=	Circular
Span (in)	=	15.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

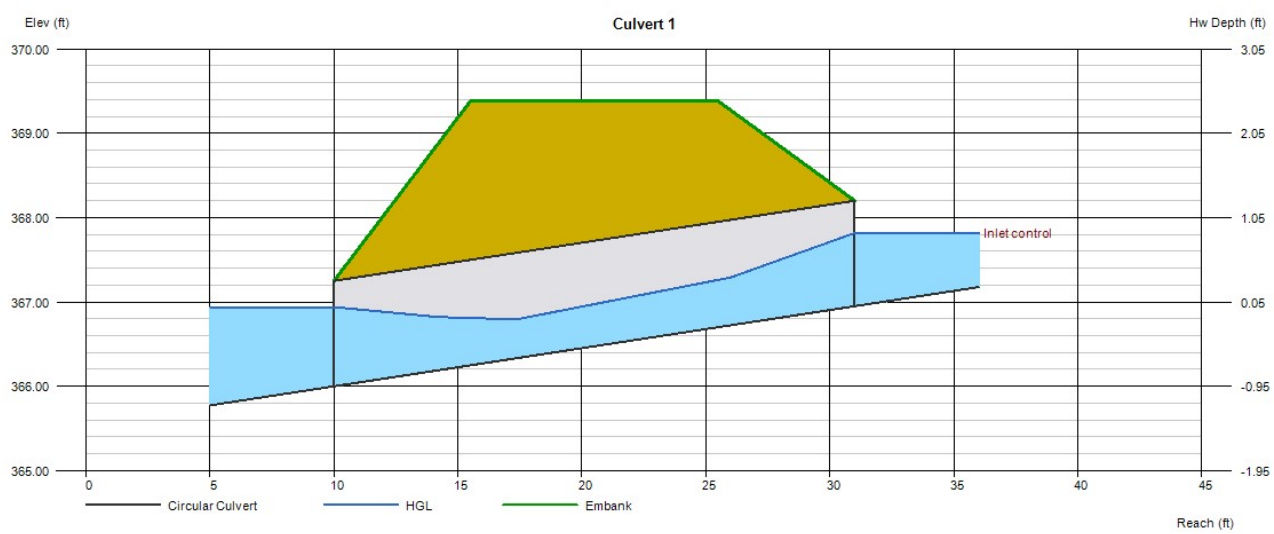
Top Elevation (ft)	=	369.38
Top Width (ft)	=	10.00
Crest Width (ft)	=	5.00

Calculations

Qmin (cfs)	=	2.47
Qmax (cfs)	=	2.47
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	2.47
Qpipe (cfs)	=	2.47
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	2.50
Veloc Up (ft/s)	=	4.00
HGL Dn (ft)	=	366.94
HGL Up (ft)	=	367.58
Hw Elev (ft)	=	367.82
Hw/D (ft)	=	0.69
Flow Regime	=	Inlet Control

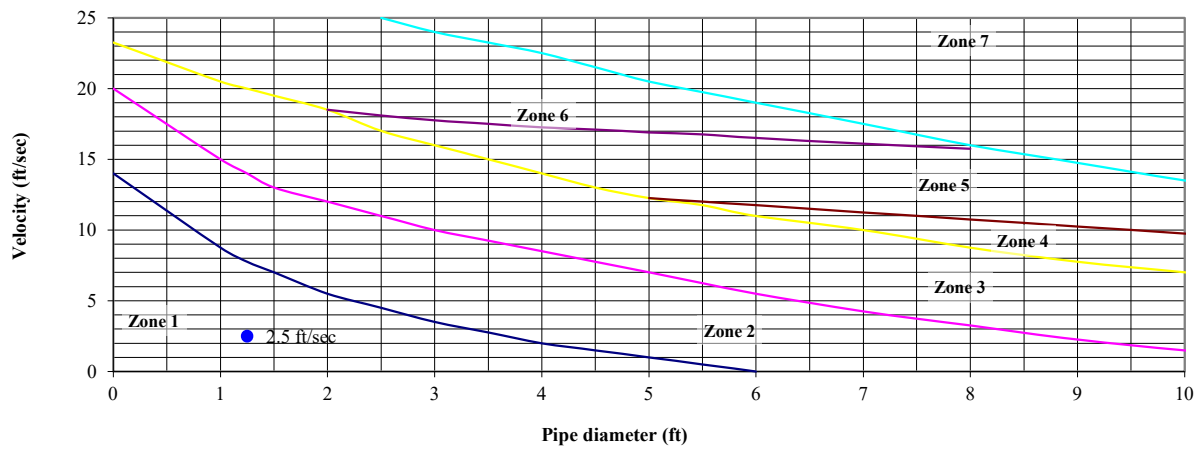


DESIGN OF RIPRAP OUTLET PROTECTION WORKSHEET

Project:	The Point - CD Package 3	Date:	2/27/2024
Project Number:	AWH-20000	Calculated By:	TD
Outlet Number:	Greenway Culvert 1		

Outlet flowrate =	2.47	cfs
Pipe diameter =	15	inches
Number of pipes =	1	
Pipe separation =	0	feet
Outlet Velocity =	2.5	ft/sec

Figure 8.06.b.1



Zone from graph above = 1

Outlet pipe diameter	15 in.	Length =	5.0 ft.
Outlet flowrate	2.5 cfs	Width =	3.3 ft.
Outlet velocity	2.5 ft/sec	Stone diameter =	3 in.
Material =	Class A	Thickness =	12 in.

Zone	Material	Diameter	Thickness	Length	Width
1	Class A	3	12	4 x D(o)	3 x D(o)
2	Class B	6	18	6 x D(o)	3 x D(o)
3	Class I	13	24	8 x D(o)	3 x D(o)
4	Class I	13	24	8 x D(o)	3 x D(o)
5	Class II	23	36	10 x D(o)	3 x D(o)
6	Class II	23	36	10 x D(o)	3 x D(o)
7	Special study required				

1. Calculations based on NY DOT method - Pages 8.06.05 through 8.06.06 in NC Erosion Control Manual

2. Outlet velocity based on full-flow velocity

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Feb 27 2024

Circular Culvert

Invert Elev Dn (ft)	=	357.33
Pipe Length (ft)	=	27.00
Slope (%)	=	7.41
Invert Elev Up (ft)	=	359.33
Rise (in)	=	15.0
Shape	=	Circular
Span (in)	=	15.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

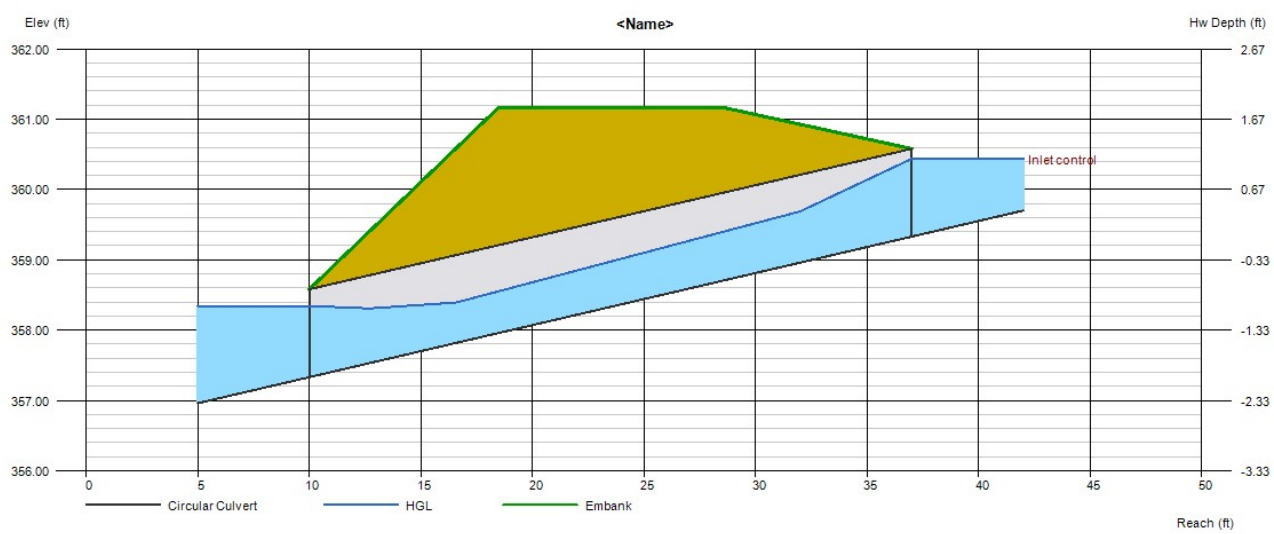
Top Elevation (ft)	=	361.17
Top Width (ft)	=	10.00
Crest Width (ft)	=	13.67

Calculations

Qmin (cfs)	=	3.72
Qmax (cfs)	=	3.72
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

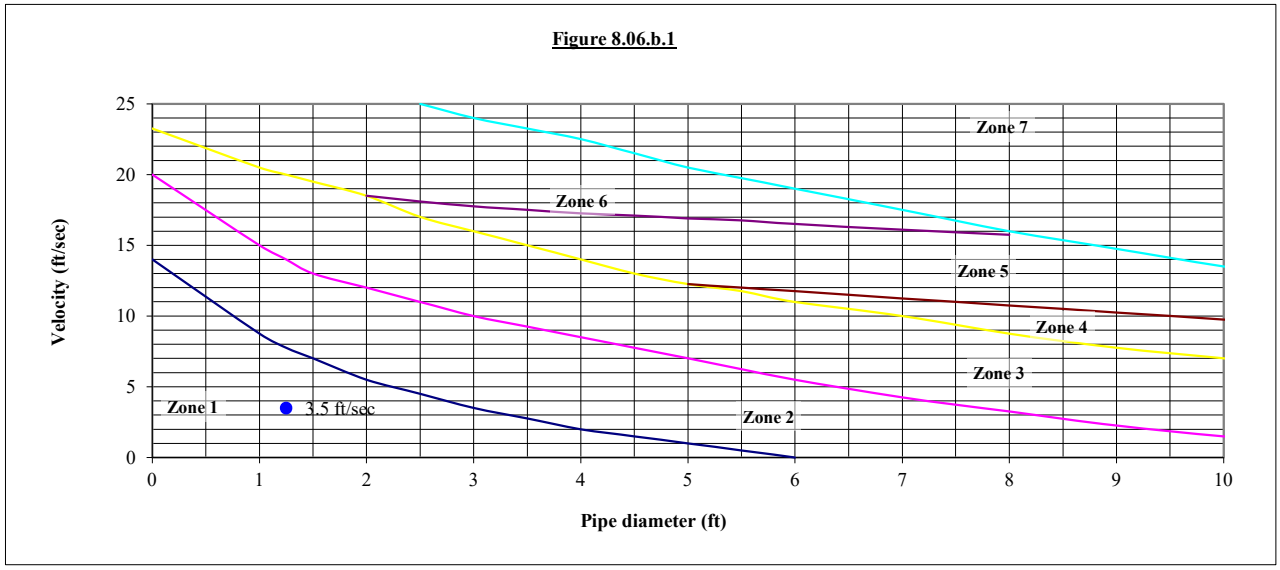
Qtotal (cfs)	=	3.72
Qpipe (cfs)	=	3.72
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	3.49
Veloc Up (ft/s)	=	4.63
HGL Dn (ft)	=	358.34
HGL Up (ft)	=	360.11
Hw Elev (ft)	=	360.44
Hw/D (ft)	=	0.89
Flow Regime	=	Inlet Control



DESIGN OF RIPRAP OUTLET PROTECTION WORKSHEET

Project:	The Point - CD Package 3	Date:	2/27/2024
Project Number:	AWH-20000	Calculated By:	TD
Outlet Number:	Greenway Culvert 2		

Outlet flowrate =	3.72	cfs
Pipe diameter =	15	inches
Number of pipes =	1	
Pipe separation =	0	feet
Outlet Velocity =	3.49	ft/sec



Zone from graph above = 1

Outlet pipe diameter	15 in.	Length =	5.0 ft.
Outlet flowrate	3.7 cfs	Width =	3.3 ft.
Outlet velocity	3.5 ft/sec	Stone diameter =	3 in.
Material =	Class A	Thickness =	12 in.

Zone	Material	Diameter	Thickness	Length	Width
1	Class A	3	12	4 x D(o)	3 x D(o)
2	Class B	6	18	6 x D(o)	3 x D(o)
3	Class I	13	24	8 x D(o)	3 x D(o)
4	Class I	13	24	8 x D(o)	3 x D(o)
5	Class II	23	36	10 x D(o)	3 x D(o)
6	Class II	23	36	10 x D(o)	3 x D(o)
7	Special study required				

1. Calculations based on NY DOT method - Pages 8.06.05 through 8.06.06 in NC Erosion Control Manual

2. Outlet velocity based on full-flow velocity

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Feb 27 2024

Greenway Culvert 3

Invert Elev Dn (ft)	=	346.52
Pipe Length (ft)	=	26.00
Slope (%)	=	7.69
Invert Elev Up (ft)	=	348.52
Rise (in)	=	15.0
Shape	=	Circular
Span (in)	=	15.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

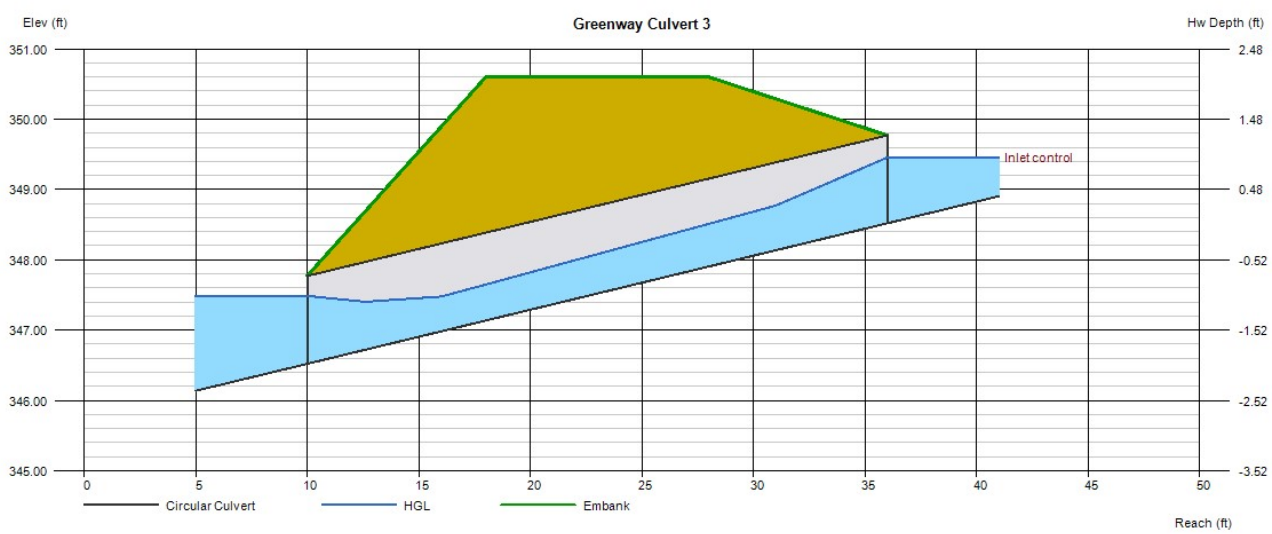
Top Elevation (ft)	=	350.60
Top Width (ft)	=	10.00
Crest Width (ft)	=	10.00

Calculations

Qmin (cfs)	=	2.89
Qmax (cfs)	=	2.89
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

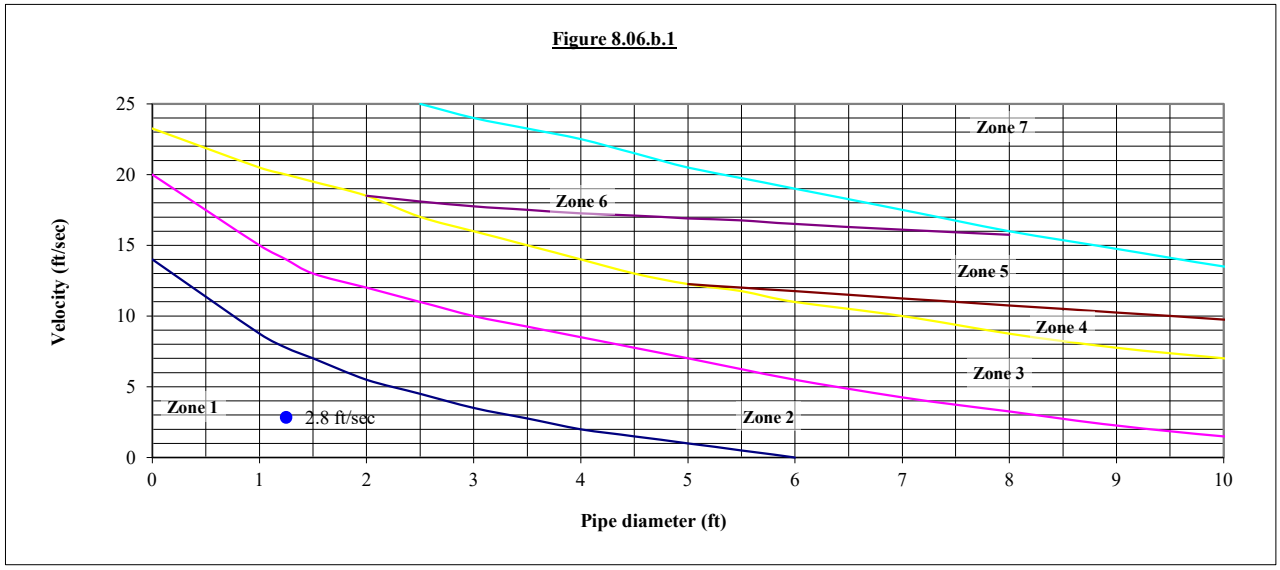
Qtotal (cfs)	=	2.89
Qpipe (cfs)	=	2.89
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	2.84
Veloc Up (ft/s)	=	4.22
HGL Dn (ft)	=	347.49
HGL Up (ft)	=	349.20
Hw Elev (ft)	=	349.46
Hw/D (ft)	=	0.75
Flow Regime	=	Inlet Control



DESIGN OF RIPRAP OUTLET PROTECTION WORKSHEET

Project:	The Point - CD Package 3	Date:	2/27/2024
Project Number:	AWH-20000	Calculated By:	TD
Outlet Number:	Greenway Culvert 3		

Outlet flowrate =	2.89	cfs
Pipe diameter =	15	inches
Number of pipes =	1	
Pipe separation =	0	feet
Outlet Velocity =	2.84	ft/sec



Zone from graph above = 1

Outlet pipe diameter	15 in.	Length =	5.0 ft.
Outlet flowrate	2.9 cfs	Width =	3.3 ft.
Outlet velocity	2.8 ft/sec	Stone diameter =	3 in.
Material =	Class A	Thickness =	12 in.

Zone	*Material*	*Diameter*	*Thickness*	*Length*	*Width*
1	*Class A*	*3*	*12*	*4 x D(o)*	*3 x D(o)*
2	*Class B*	*6*	*18*	*6 x D(o)*	*3 x D(o)*
3	*Class I*	*13*	*24*	*8 x D(o)*	*3 x D(o)*
4	*Class I*	*13*	*24*	*8 x D(o)*	*3 x D(o)*
5	*Class II*	*23*	*36*	*10 x D(o)*	*3 x D(o)*
6	*Class II*	*23*	*36*	*10 x D(o)*	*3 x D(o)*
7	*Special study required*				

1. Calculations based on NY DOT method - Pages 8.06.05 through 8.06.06 in NC Erosion Control Manual

2. Outlet velocity based on full-flow velocity

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Feb 27 2024

Greenway Culvert 4

Invert Elev Dn (ft)	=	313.00
Pipe Length (ft)	=	19.25
Slope (%)	=	3.90
Invert Elev Up (ft)	=	313.75
Rise (in)	=	15.0
Shape	=	Circular
Span (in)	=	15.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

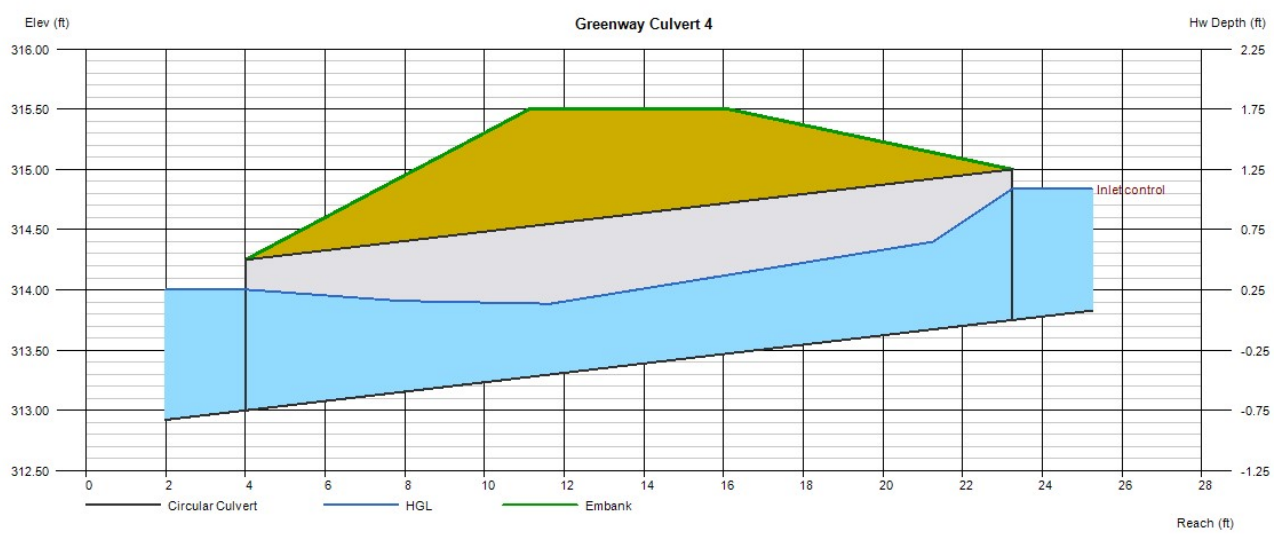
Top Elevation (ft)	=	315.50
Top Width (ft)	=	5.00
Crest Width (ft)	=	5.00

Calculations

Qmin (cfs)	=	3.52
Qmax (cfs)	=	3.52
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

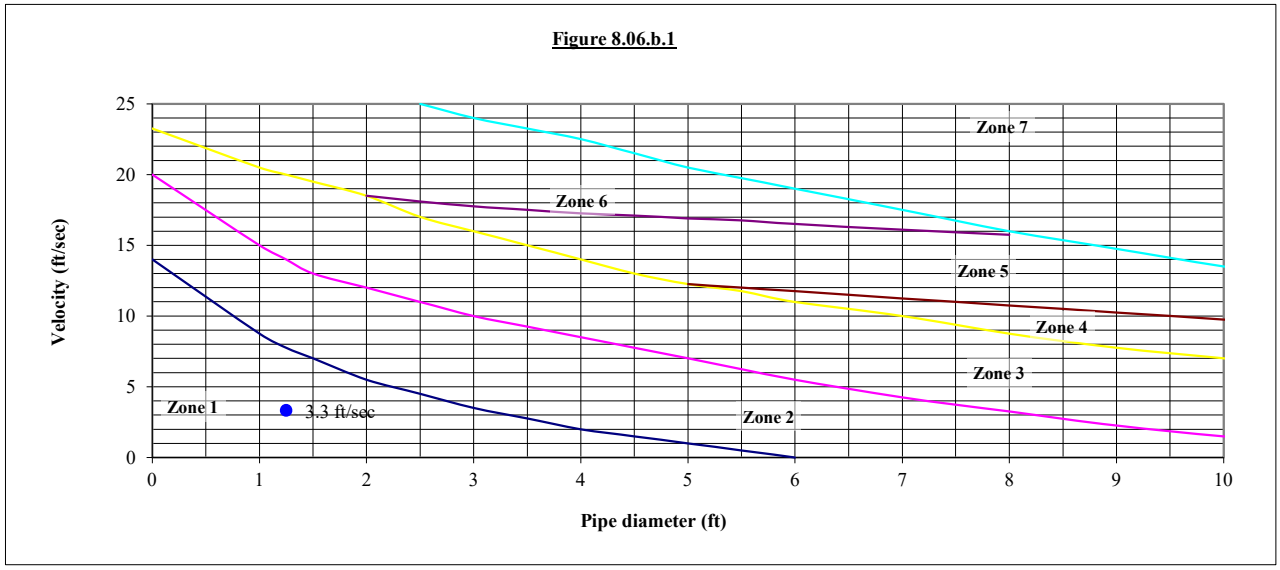
Qtotal (cfs)	=	3.52
Qpipe (cfs)	=	3.52
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	3.33
Veloc Up (ft/s)	=	4.53
HGL Dn (ft)	=	314.00
HGL Up (ft)	=	314.51
Hw Elev (ft)	=	314.84
Hw/D (ft)	=	0.87
Flow Regime	=	Inlet Control



DESIGN OF RIPRAP OUTLET PROTECTION WORKSHEET

Project:	The Point - CD Package 3	Date:	2/27/2024
Project Number:	AWH-20000	Calculated By:	TD
Outlet Number:	Greenway Culvert 4		

Outlet flowrate =	3.52	cfs
Pipe diameter =	15	inches
Number of pipes =	1	
Pipe separation =	0	feet
Outlet Velocity =	3.33	ft/sec



Zone from graph above = 1

Outlet pipe diameter	15 in.	Length =	5.0 ft.
Outlet flowrate	3.5 cfs	Width =	3.3 ft.
Outlet velocity	3.3 ft/sec	Stone diameter =	3 in.
Material =	Class A	Thickness =	12 in.

Zone	Material	Diameter	Thickness	Length	Width
1	Class A	3	12	4 x D(o)	3 x D(o)
2	Class B	6	18	6 x D(o)	3 x D(o)
3	Class I	13	24	8 x D(o)	3 x D(o)
4	Class I	13	24	8 x D(o)	3 x D(o)
5	Class II	23	36	10 x D(o)	3 x D(o)
6	Class II	23	36	10 x D(o)	3 x D(o)
7	Special study required				

1. Calculations based on NY DOT method - Pages 8.06.05 through 8.06.06 in NC Erosion Control Manual

2. Outlet velocity based on full-flow velocity

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Feb 27 2024

Greenway Culvert 5

Invert Elev Dn (ft)	=	312.00
Pipe Length (ft)	=	21.50
Slope (%)	=	4.65
Invert Elev Up (ft)	=	313.00
Rise (in)	=	15.0
Shape	=	Circular
Span (in)	=	15.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

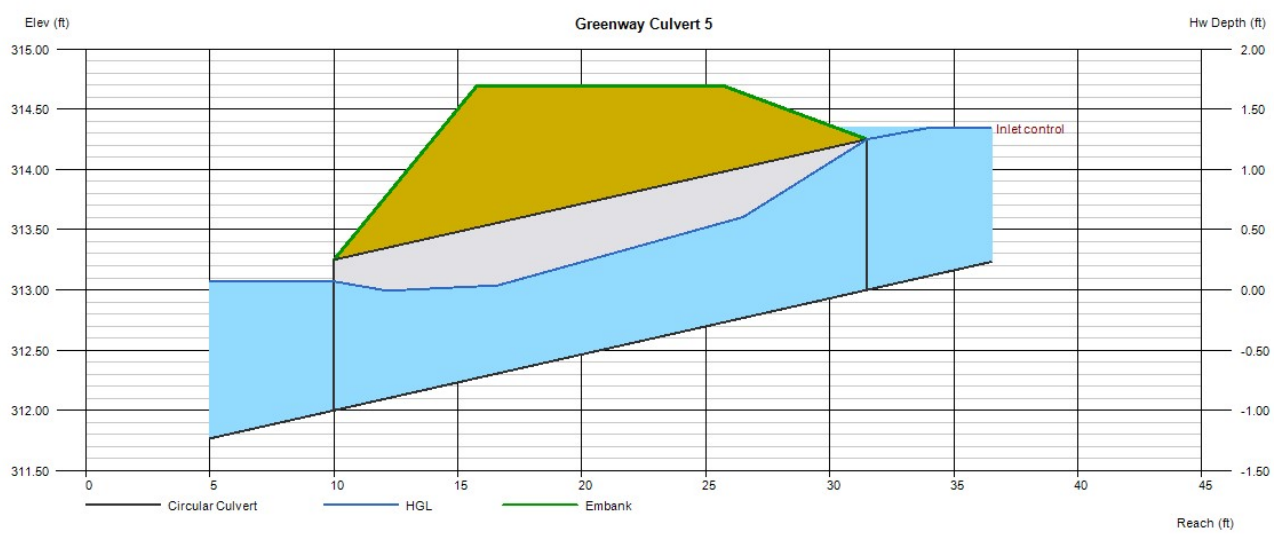
Top Elevation (ft)	=	314.69
Top Width (ft)	=	10.00
Crest Width (ft)	=	5.00

Calculations

Qmin (cfs)	=	4.83
Qmax (cfs)	=	4.83
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

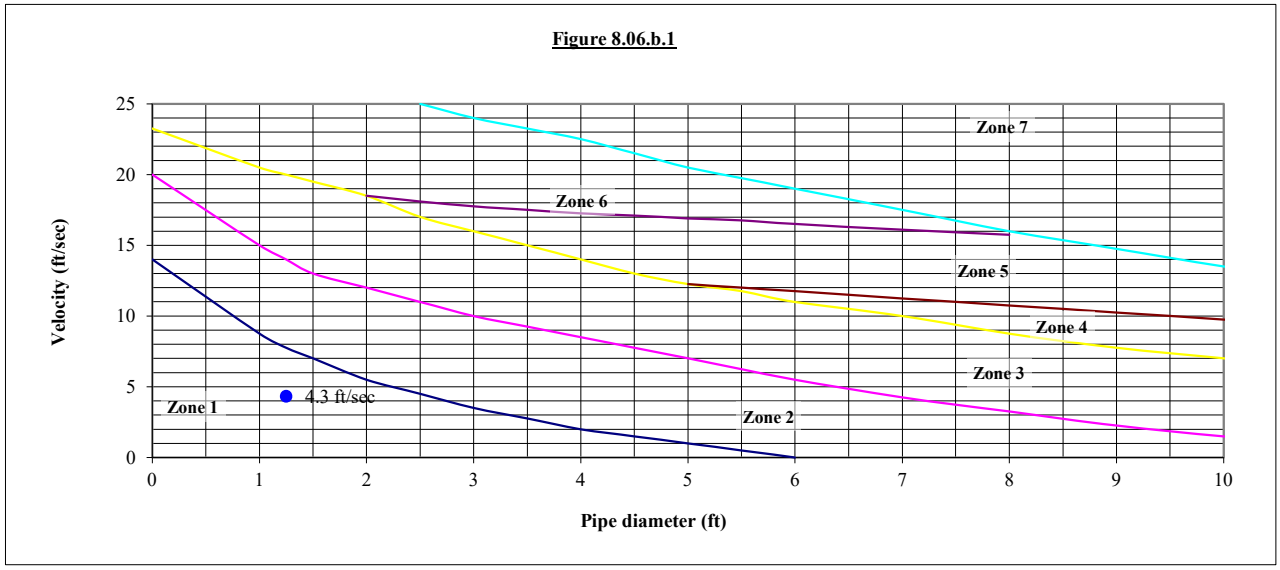
Qtotal (cfs)	=	4.83
Qpipe (cfs)	=	4.83
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	4.32
Veloc Up (ft/s)	=	5.17
HGL Dn (ft)	=	313.07
HGL Up (ft)	=	313.89
Hw Elev (ft)	=	314.35
Hw/D (ft)	=	1.08
Flow Regime	=	Inlet Control



DESIGN OF RIPRAP OUTLET PROTECTION WORKSHEET

Project:	The Point - CD Package 3	Date:	2/27/2024
Project Number:	AWH-20000	Calculated By:	TD
Outlet Number:	Greenway Culvert 5		

Outlet flowrate =	4.83	cfs
Pipe diameter =	15	inches
Number of pipes =	1	
Pipe separation =	0	feet
Outlet Velocity =	4.32	ft/sec



Zone from graph above = 1

Outlet pipe diameter	15 in.	Length =	5.0 ft.
Outlet flowrate	4.8 cfs	Width =	3.3 ft.
Outlet velocity	4.3 ft/sec	Stone diameter =	3 in.
Material =	Class A	Thickness =	12 in.

Zone	Material	Diameter	Thickness	Length	Width
1	Class A	3	12	4 x D(o)	3 x D(o)
2	Class B	6	18	6 x D(o)	3 x D(o)
3	Class I	13	24	8 x D(o)	3 x D(o)
4	Class I	13	24	8 x D(o)	3 x D(o)
5	Class II	23	36	10 x D(o)	3 x D(o)
6	Class II	23	36	10 x D(o)	3 x D(o)
7	Special study required				

1. Calculations based on NY DOT method - Pages 8.06.05 through 8.06.06 in NC Erosion Control Manual

2. Outlet velocity based on full-flow velocity

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Feb 27 2024

Greenway Culvert 6

Invert Elev Dn (ft)	=	298.00
Pipe Length (ft)	=	21.00
Slope (%)	=	2.38
Invert Elev Up (ft)	=	298.50
Rise (in)	=	15.0
Shape	=	Circular
Span (in)	=	15.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

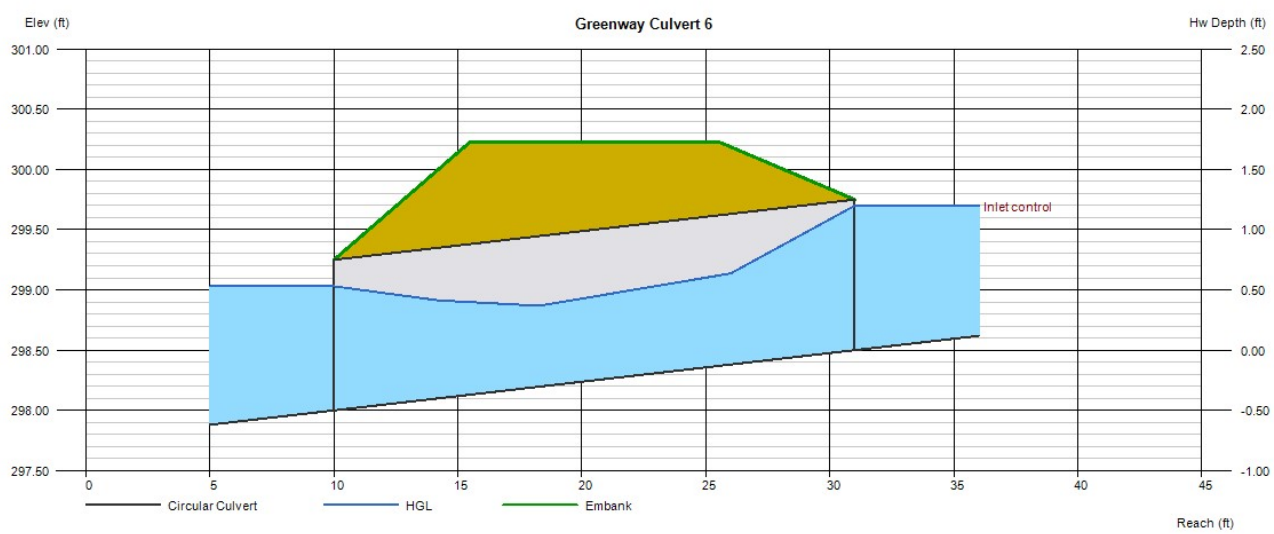
Top Elevation (ft)	=	300.23
Top Width (ft)	=	10.00
Crest Width (ft)	=	5.00

Calculations

Qmin (cfs)	=	4.02
Qmax (cfs)	=	4.02
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

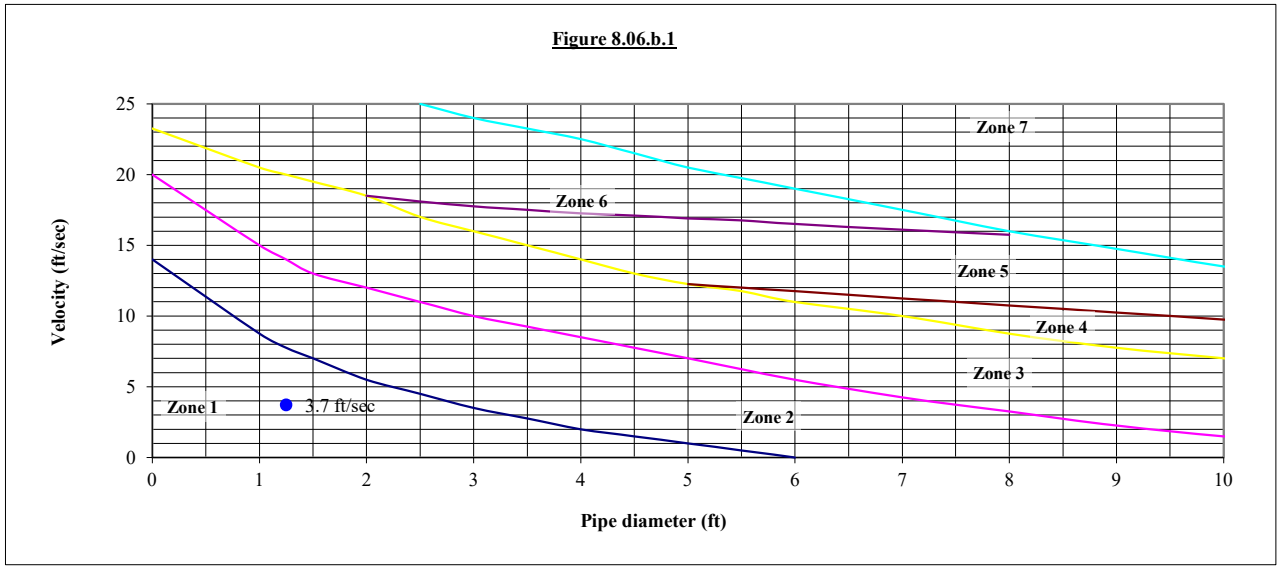
Qtotal (cfs)	=	4.02
Qpipe (cfs)	=	4.02
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	3.72
Veloc Up (ft/s)	=	4.77
HGL Dn (ft)	=	299.03
HGL Up (ft)	=	299.31
Hw Elev (ft)	=	299.70
Hw/D (ft)	=	0.96
Flow Regime	=	Inlet Control



DESIGN OF RIPRAP OUTLET PROTECTION WORKSHEET

Project:	The Point - CD Package 3	Date:	2/27/2024
Project Number:	AWH-20000	Calculated By:	TD
Outlet Number:	Greenway Culvert 6		

Outlet flowrate =	4.02	cfs
Pipe diameter =	15	inches
Number of pipes =	1	
Pipe separation =	0	feet
Outlet Velocity =	3.72	ft/sec



Zone from graph above = 1

Outlet pipe diameter	15 in.	Length =	5.0 ft.
Outlet flowrate	4.0 cfs	Width =	3.3 ft.
Outlet velocity	3.7 ft/sec	Stone diameter =	3 in.
Material =	Class A	Thickness =	12 in.

Zone	Material	Diameter	Thickness	Length	Width
1	Class A	3	12	4 x D(o)	3 x D(o)
2	Class B	6	18	6 x D(o)	3 x D(o)
3	Class I	13	24	8 x D(o)	3 x D(o)
4	Class I	13	24	8 x D(o)	3 x D(o)
5	Class II	23	36	10 x D(o)	3 x D(o)
6	Class II	23	36	10 x D(o)	3 x D(o)
7	Special study required				

1. Calculations based on NY DOT method - Pages 8.06.05 through 8.06.06 in NC Erosion Control Manual

2. Outlet velocity based on full-flow velocity

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Feb 27 2024

Greenway Culvert 7

Invert Elev Dn (ft)	=	301.00
Pipe Length (ft)	=	22.50
Slope (%)	=	2.22
Invert Elev Up (ft)	=	301.50
Rise (in)	=	12.0
Shape	=	Circular
Span (in)	=	12.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

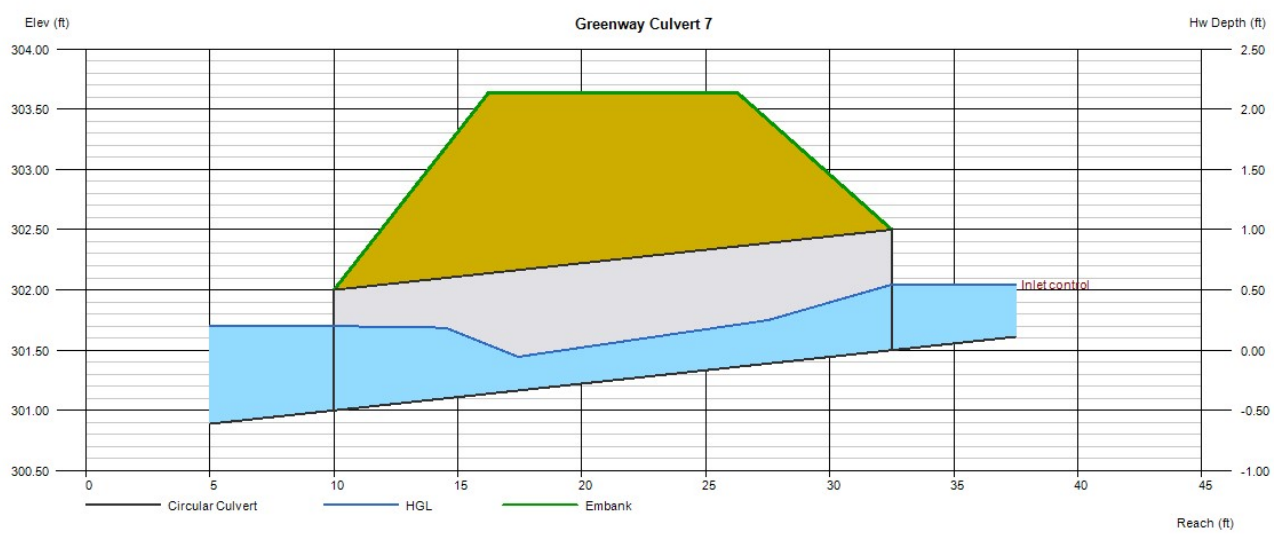
Top Elevation (ft)	=	303.64
Top Width (ft)	=	10.00
Crest Width (ft)	=	5.00

Calculations

Qmin (cfs)	=	0.91
Qmax (cfs)	=	0.91
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	0.91
Qpipe (cfs)	=	0.91
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	1.55
Veloc Up (ft/s)	=	3.11
HGL Dn (ft)	=	301.70
HGL Up (ft)	=	301.90
Hw Elev (ft)	=	302.04
Hw/D (ft)	=	0.54
Flow Regime	=	Inlet Control

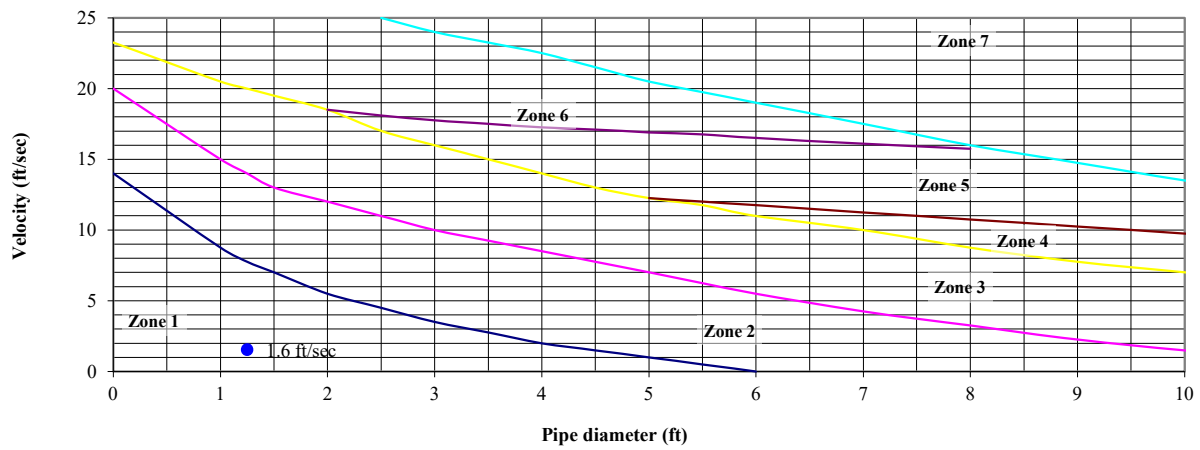


DESIGN OF RIPRAP OUTLET PROTECTION WORKSHEET

Project:	The Point - CD Package 3	Date:	2/27/2024
Project Number:	AWH-20000	Calculated By:	TD
Outlet Number:	Greenway Culvert 7		

Outlet flowrate =	0.91	cfs
Pipe diameter =	15	inches
Number of pipes =	1	
Pipe separation =	0	feet
Outlet Velocity =	1.55	ft/sec

Figure 8.06.b.1



Zone from graph above = 1

Outlet pipe diameter	15 in.	Length =	5.0 ft.
Outlet flowrate	0.9 cfs	Width =	3.3 ft.
Outlet velocity	1.6 ft/sec	Stone diameter =	3 in.
Material =	Class A	Thickness =	12 in.

Zone	*Material*	*Diameter*	*Thickness*	*Length*	*Width*
1	*Class A*	*3*	*12*	*4 x D(o)*	*3 x D(o)*
2	*Class B*	*6*	*18*	*6 x D(o)*	*3 x D(o)*
3	*Class I*	*13*	*24*	*8 x D(o)*	*3 x D(o)*
4	*Class I*	*13*	*24*	*8 x D(o)*	*3 x D(o)*
5	*Class II*	*23*	*36*	*10 x D(o)*	*3 x D(o)*
6	*Class II*	*23*	*36*	*10 x D(o)*	*3 x D(o)*
7	*Special study required*				

1. Calculations based on NY DOT method - Pages 8.06.05 through 8.06.06 in NC Erosion Control Manual

2. Outlet velocity based on full-flow velocity

Culvert Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Tuesday, Feb 27 2024

Greenway Culvert 8

Invert Elev Dn (ft)	=	299.00
Pipe Length (ft)	=	24.40
Slope (%)	=	4.10
Invert Elev Up (ft)	=	300.00
Rise (in)	=	12.0
Shape	=	Circular
Span (in)	=	12.0
No. Barrels	=	1
n-Value	=	0.012
Culvert Type	=	Circular Concrete
Culvert Entrance	=	Groove end projecting (C)
Coeff. K,M,c,Y,k	=	0.0045, 2, 0.0317, 0.69, 0.2

Embankment

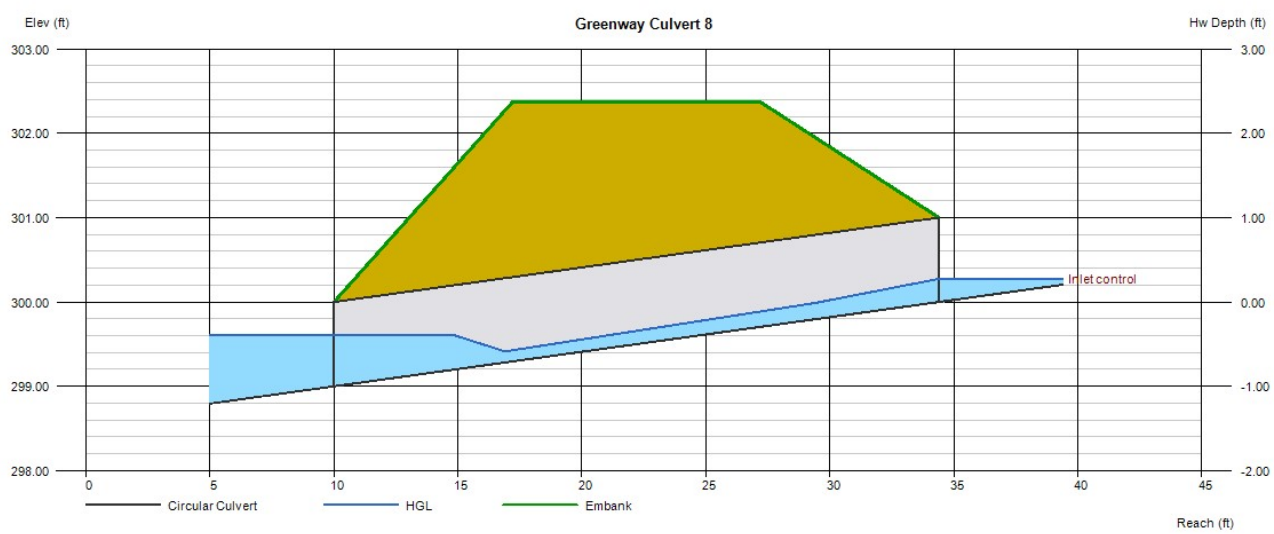
Top Elevation (ft)	=	302.37
Top Width (ft)	=	10.00
Crest Width (ft)	=	5.00

Calculations

Qmin (cfs)	=	0.28
Qmax (cfs)	=	0.28
Tailwater Elev (ft)	=	(dc+D)/2

Highlighted

Qtotal (cfs)	=	0.28
Qpipe (cfs)	=	0.28
Qovertop (cfs)	=	0.00
Veloc Dn (ft/s)	=	0.56
Veloc Up (ft/s)	=	2.22
HGL Dn (ft)	=	299.61
HGL Up (ft)	=	300.22
Hw Elev (ft)	=	300.27
Hw/D (ft)	=	0.27
Flow Regime	=	Inlet Control

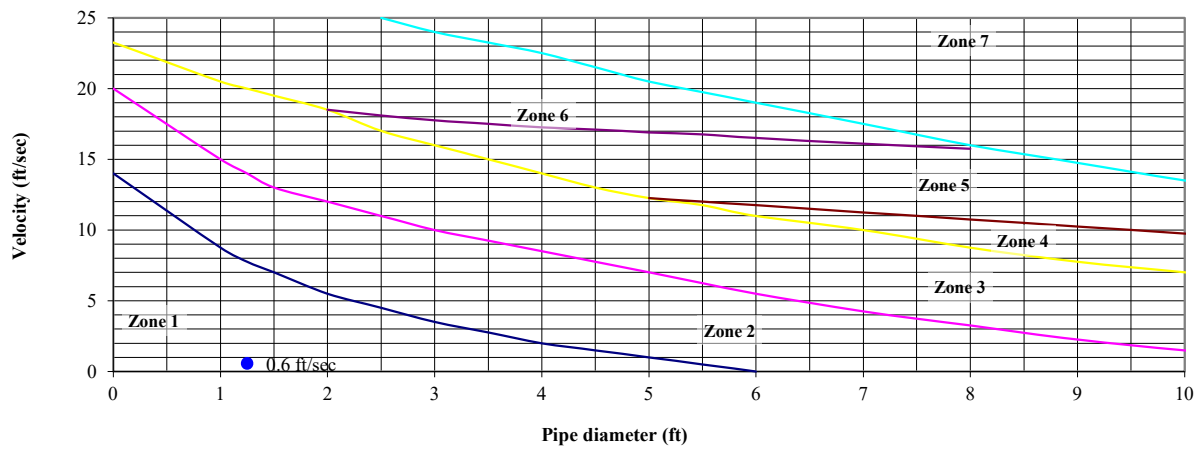


DESIGN OF RIPRAP OUTLET PROTECTION WORKSHEET

Project:	The Point - CD Package 3	Date:	2/27/2024
Project Number:	AWH-20000	Calculated By:	TD
Outlet Number:	Greenway Culvert 8		

Outlet flowrate =	0.28	cfs
Pipe diameter =	15	inches
Number of pipes =	1	
Pipe separation =	0	feet
Outlet Velocity =	0.56	ft/sec

Figure 8.06.b.1



Zone from graph above = 1

Outlet pipe diameter	15 in.	Length =	5.0 ft.
Outlet flowrate	0.3 cfs	Width =	3.3 ft.
Outlet velocity	0.6 ft/sec	Stone diameter =	3 in.
Material =	Class A	Thickness =	12 in.

Zone	*Material*	*Diameter*	*Thickness*	*Length*	*Width*
1	*Class A*	*3*	*12*	*4 x D(o)*	*3 x D(o)*
2	*Class B*	*6*	*18*	*6 x D(o)*	*3 x D(o)*
3	*Class I*	*13*	*24*	*8 x D(o)*	*3 x D(o)*
4	*Class I*	*13*	*24*	*8 x D(o)*	*3 x D(o)*
5	*Class II*	*23*	*36*	*10 x D(o)*	*3 x D(o)*
6	*Class II*	*23*	*36*	*10 x D(o)*	*3 x D(o)*
7	*Special study required*				

1. Calculations based on NY DOT method - Pages 8.06.05 through 8.06.06 in NC Erosion Control Manual

2. Outlet velocity based on full-flow velocity