

**APPENDIX C:**  
**LOW PRESSURE CORE SEWER AREA VENDOR INFORMATION**



Environment One Corporation

**Pressure Sewer Preliminary  
Cost and Design Analysis**

**For**

**Bourne, MA Low Pressure Sewer Design**

**Prepared For:  
EPG**

**MA**

**Tel:  
Fax:  
Prepared By: M. Crowley  
February 14, 2024**

## Bourne, MA Low Pressure Sewer Design

**Prepared by :** M. Crowley

**On:** February 14, 2024

### **Notes :**

Elevations estimated using Google Earth. Station and valve quantities approximate. Analysis based upon drawings and data provided. Station recommendations are preliminary. GPD values impact retention times only, not line sizing or hydraulics. GP laterals to be 1.25".

Analysis valid only with pipe type listed. General recommendations for valve placement are: clean out valves at intervals of approximately 1,000 ft and at branch ends and junctions; isolation valves at branch junctions; and air release valves at peaks of 25 ft or more and/or at intervals of 2,000 to 2,500 ft. Lateral kits comprised of a ball and check valve are required to be installed between the pump discharge and street main on all installations. Laterals should be located as close to the public right of way as possible.

Quantities of grinder pumps, pipe, and valves are indicated on the cost page. The model of grinder pump(s) indicated is based upon the initial information provided to us but may not be the most appropriate for the specific location or requirements of the project. Costs of these items and their installation are best obtained from sources in your region.

We recommend you contact your local distributor of Environment One products for additional recommendations.

07.01.2020 - Initial analysis.

02.13.2024 - Rev1.

<<<<< **END OF NOTES** >>>>>

PRELIMINARY PRESSURE SEWER - PIPE SIZING AND BRANCH ANALYSIS

Bourne, MA Low Pressure Sewer Design

Prepared By:  
M. Crowley

February 14, 2024

Zone Number	Connects to Zone	Number of Pumps in Zone	Accum Pumps in Zone	Gals/day per Pump	Max Flow Per Pump (gpm)	Max Sim Ops	Max Flow (GPM)	Pipe Size (inches)	Max Velocity (FPS)	Length of Main this Zone	Friction Loss Factor (ft/100 ft)	Friction Loss This Zone	Accum Fric Loss (feet)	Max Main Elevation	Minimum Pump Elevation	Static Head (feet)	Total Dynamic Head (ft)
This spreadsheet was calculated using pipe diameters for: SDR11HDPE Friction loss calculations were based on a Constant for inside roughness "C" of: 150																	
1.00	2.00	9	9	200	11.00	3	33.00	2.00	3.57	510.00	2.52	12.85	81.73	41.00	16.00	25.00	106.73
2.00	3.00	9	18	200	11.00	4	44.00	3.00	2.19	718.00	0.65	4.67	68.88	41.00	23.00	18.00	86.88
3.00	6.00	8	26	200	11.00	5	55.00	3.00	2.74	1,093.00	0.98	10.74	64.21	41.00	23.00	18.00	82.21
4.00	6.00	4	4	200	11.00	3	33.00	2.00	3.57	291.00	2.52	7.33	60.80	41.00	23.00	18.00	78.80
5.00	6.00	4	4	200	11.00	3	33.00	2.00	3.57	676.00	2.52	17.03	70.50	41.00	25.00	16.00	86.50
6.00	8.00	8	42	200	11.00	6	66.00	3.00	3.29	960.00	1.38	13.22	53.47	41.00	14.00	27.00	80.47
7.00	8.00	7	7	200	11.00	3	33.00	2.00	3.57	1,155.00	2.52	29.10	69.35	41.00	8.00	33.00	102.35
8.00	20.00	0	49	200	11.00	6	66.00	3.00	3.29	161.00	1.38	2.22	40.25	41.00	12.00	29.00	69.25
9.00	11.00	3	3	200	11.00	2	22.00	2.00	2.38	128.00	1.19	1.52	65.60	41.00	15.00	26.00	91.60
10.00	11.00	3	3	200	11.00	2	22.00	2.00	2.38	229.00	1.19	2.72	66.80	41.00	8.00	33.00	99.80
11.00	13.00	3	9	200	11.00	3	33.00	2.00	3.57	287.00	2.52	7.23	64.08	41.00	17.00	24.00	88.08
12.00	13.00	3	3	200	11.00	2	22.00	2.00	2.38	198.00	1.19	2.35	59.20	41.00	17.00	24.00	83.20
13.00	15.00	9	21	200	11.00	5	55.00	3.00	2.74	528.00	0.98	5.19	56.85	41.00	9.00	32.00	88.85
14.00	15.00	3	3	200	11.00	2	22.00	2.00	2.38	212.00	1.19	2.52	54.18	41.00	14.00	27.00	81.18
15.00	17.00	1	25	200	11.00	5	55.00	3.00	2.74	192.00	0.98	1.89	51.66	41.00	16.00	25.00	76.66
16.00	17.00	8	8	200	11.00	3	33.00	2.00	3.57	517.00	2.52	13.03	62.80	41.00	12.00	29.00	91.80
17.00	19.00	6	39	200	11.00	6	66.00	3.00	3.29	396.00	1.38	5.45	49.77	41.00	13.00	28.00	77.77
18.00	19.00	5	5	200	11.00	3	33.00	2.00	3.57	388.00	2.52	9.78	54.10	41.00	12.00	29.00	83.10
19.00	20.00	1	45	200	11.00	6	66.00	3.00	3.29	457.00	1.38	6.29	44.32	41.00	13.00	28.00	72.32
20.00	23.00	17	111	200	11.00	8	88.00	4.00	2.65	982.00	0.69	6.79	38.03	41.00	13.00	28.00	66.03
21.00	22.00	9	9	200	11.00	3	33.00	2.00	3.57	545.00	2.52	13.73	48.55	41.00	21.00	20.00	68.55
22.00	23.00	9	18	200	11.00	4	44.00	3.00	2.19	551.00	0.65	3.58	34.82	41.00	27.00	14.00	48.82
23.00	34.00	7	136	200	11.00	9	99.00	4.00	2.98	440.00	0.86	3.78	31.24	32.00	25.00	7.00	38.24
24.00	27.00	8	8	200	11.00	3	33.00	2.00	3.57	647.00	2.52	16.30	87.78	32.00	8.00	24.00	111.78
25.00	26.00	9	9	200	11.00	3	33.00	2.00	3.57	366.00	2.52	9.22	84.64	32.00	23.00	9.00	93.64
26.00	27.00	5	14	200	11.00	4	44.00	3.00	2.19	606.00	0.65	3.94	75.42	32.00	23.00	9.00	84.42
27.00	29.00	6	28	200	11.00	5	55.00	3.00	2.74	647.00	0.98	6.36	71.48	32.00	32.00	0.00	71.48
28.00	29.00	9	9	200	11.00	3	33.00	2.00	3.57	837.00	2.52	21.09	86.21	32.00	28.00	4.00	90.21
29.00	31.00	14	51	200	11.00	7	77.00	3.00	3.83	1,473.00	1.83	26.99	65.12	32.00	12.00	20.00	85.12
30.00	31.00	3	3	200	11.00	2	22.00	2.00	2.38	393.00	1.19	4.67	42.80	32.00	26.00	6.00	48.80
31.00	33.00	6	60	200	11.00	7	77.00	3.00	3.83	378.00	1.83	6.93	38.13	32.00	28.00	4.00	42.13
32.00	33.00	3	3	200	11.00	2	22.00	2.00	2.38	382.00	1.19	4.54	35.74	32.00	24.00	8.00	43.74
33.00	34.00	1	64	200	11.00	7	77.00	3.00	3.83	204.00	1.83	3.74	31.20	32.00	25.00	7.00	38.20
34.00	58.00	12	212	200	11.00	11	121.00	4.00	3.65	618.00	1.25	7.70	27.46	32.00	26.00	6.00	33.46
35.00	36.00	9	9	200	11.00	3	33.00	2.00	3.57	1,064.00	2.52	26.81	54.49	31.00	18.00	13.00	67.49

PRELIMINARY PRESSURE SEWER - PIPE SIZING AND BRANCH ANALYSIS

Bourne, MA Low Pressure Sewer Design

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February 14, 2024

Zone Number	Connects to Zone	Number of Pumps in Zone	Accum Pumps in Zone	Gals/day per Pump	Max Flow Per Pump (gpm)	Max Sim Ops	Max Flow (GPM)	Pipe Size (inches)	Max Velocity (FPS)	Length of Main this Zone	Friction Loss Factor (ft/100 ft)	Friction Loss This Zone	Accum Fric Loss (feet)	Max Main Elevation	Minimum Pump Elevation	Static Head (feet)	Total Dynamic Head (ft)
This spreadsheet was calculated using pipe diameters for: SDR11HDPE										Friction loss calculations were based on a Constant for inside roughness "C" of: 150							
36.00	37.00	9	18	200	11.00	4	44.00	3.00	2.19	706.00	0.65	4.59	27.68	31.00	18.00	13.00	40.68
37.00	40.00	6	24	200	11.00	5	55.00	3.00	2.74	420.00	0.98	4.13	23.09	31.00	17.00	14.00	37.09
38.00	39.00	9	9	200	11.00	3	33.00	2.00	3.57	359.00	2.52	9.04	30.21	31.00	10.00	21.00	51.21
39.00	40.00	4	13	200	11.00	4	44.00	3.00	2.19	340.00	0.65	2.21	21.17	31.00	18.00	13.00	34.17
40.00	42.00	3	40	200	11.00	6	66.00	3.00	3.29	229.00	1.38	3.15	18.96	31.00	23.00	8.00	26.96
41.00	42.00	9	9	200	11.00	3	33.00	2.00	3.57	962.00	2.52	24.24	40.05	31.00	30.00	1.00	41.05
42.00	44.00	0	49	200	11.00	6	66.00	3.00	3.29	105.00	1.38	1.45	15.81	31.00	20.00	11.00	26.81
43.00	44.00	9	9	200	11.00	3	33.00	2.00	3.57	478.00	2.52	12.04	26.40	31.00	20.00	11.00	37.40
44.00	46.00	2	60	200	11.00	7	77.00	3.00	3.83	296.00	1.83	5.42	14.36	31.00	15.00	16.00	30.36
45.00	46.00	7	7	200	11.00	3	33.00	2.00	3.57	315.00	2.52	7.94	16.88	31.00	15.00	16.00	32.88
46.00	140.00	1	68	200	11.00	7	77.00	3.00	3.83	232.00	1.83	4.25	8.94	31.00	15.00	16.00	24.94
47.00	48.00	9	9	200	11.00	3	33.00	2.00	3.57	542.00	2.52	13.66	40.30	47.00	38.00	9.00	49.30
48.00	50.00	6	15	200	11.00	4	44.00	3.00	2.19	490.00	0.65	3.18	26.64	31.00	16.00	15.00	41.64
49.00	50.00	3	3	200	11.00	2	22.00	2.00	2.38	312.00	1.19	3.71	27.17	31.00	15.00	16.00	43.17
50.00	51.00	9	27	200	11.00	5	55.00	3.00	2.74	546.00	0.98	5.36	23.46	31.00	12.00	19.00	42.46
51.00	53.00	7	34	200	11.00	6	66.00	3.00	3.29	610.00	1.38	8.40	18.10	31.00	11.00	20.00	38.10
52.00	53.00	2	2	200	11.00	2	22.00	2.00	2.38	81.00	1.19	0.96	10.66	31.00	9.00	22.00	32.66
53.00	140.00	7	43	200	11.00	6	66.00	3.00	3.29	364.00	1.38	5.01	9.70	31.00	10.00	21.00	30.70
54.00	140.00	5	23	200	11.00	5	55.00	3.00	2.74	262.00	0.98	2.57	7.26	31.00	24.00	7.00	14.26
55.00	54.00	6	6	200	11.00	3	33.00	2.00	3.57	399.00	2.52	10.05	17.31	31.00	8.00	23.00	40.31
56.00	54.00	9	12	200	11.00	4	44.00	3.00	2.19	651.00	0.65	4.23	11.49	31.00	22.00	9.00	20.49
57.00	56.00	3	3	200	11.00	2	22.00	2.00	2.38	211.00	1.19	2.51	14.00	31.00	10.00	21.00	35.00
58.00	60.00	3	215	200	11.00	12	132.00	4.00	3.98	208.00	1.46	3.05	19.76	31.00	27.00	4.00	23.76
59.00	141.00	9	236	200	11.00	12	132.00	4.00	3.98	357.00	1.46	5.23	7.71	31.00	31.00	0.00	7.71
60.00	59.00	12	227	200	11.00	12	132.00	4.00	3.98	615.00	1.46	9.00	16.71	31.00	29.00	2.00	18.71
61.00	64.00	3	3	200	11.00	2	22.00	2.00	2.38	253.00	1.19	3.01	11.10	31.00	27.00	4.00	15.10
62.00	142.00	9	488	200	11.00	20	220.00	6.00	3.06	446.00	0.57	2.56	4.09	31.00	30.00	1.00	5.09
63.00	62.00	9	479	200	11.00	20	220.00	6.00	3.06	422.00	0.57	2.42	6.51	31.00	30.00	1.00	7.51
64.00	63.00	5	470	200	11.00	19	209.00	6.00	2.90	303.00	0.52	1.58	8.09	31.00	27.00	4.00	12.09
65.00	64.00	2	462	200	11.00	19	209.00	6.00	2.90	236.00	0.52	1.23	9.32	31.00	23.00	8.00	17.32
66.00	67.00	9	9	200	11.00	3	33.00	2.00	3.57	338.00	2.52	8.52	21.50	31.00	13.00	18.00	39.50
67.00	65.00	9	18	200	11.00	4	44.00	3.00	2.19	563.00	0.65	3.66	12.98	31.00	23.00	8.00	20.98
68.00	65.00	0	442	200	11.00	18	198.00	6.00	2.75	101.00	0.47	0.48	9.80	31.00	23.00	8.00	17.80
69.00	70.00	9	9	200	11.00	3	33.00	2.00	3.57	677.00	2.52	17.06	37.29	31.00	19.00	12.00	49.29
70.00	70.10	3	12	200	11.00	4	44.00	3.00	2.19	164.00	0.65	1.07	20.23	31.00	26.00	5.00	25.23

PRELIMINARY PRESSURE SEWER - PIPE SIZING AND BRANCH ANALYSIS

Bourne, MA Low Pressure Sewer Design

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M. Crowley

February 14, 2024

Zone Number	Connects to Zone	Number of Pumps in Zone	Accum Pumps in Zone	Gals/day per Pump	Max Flow Per Pump (gpm)	Max Sim Ops	Max Flow (GPM)	Pipe Size (inches)	Max Velocity (FPS)	Length of Main this Zone	Friction Loss Factor (ft/100 ft)	Friction Loss This Zone	Accum Fric Loss (feet)	Max Main Elevation	Minimum Pump Elevation	Static Head (feet)	Total Dynamic Head (ft)
This spreadsheet was calculated using pipe diameters for: SDR11HDPE Friction loss calculations were based on a Constant for inside roughness "C" of: 150																	
70.10	71.00	6	67	200	11.00	7	77.00	3.00	3.83	390.00	1.83	7.14	19.16	31.00	25.00	6.00	25.16
71.00	68.00	4	93	200	11.00	8	88.00	4.00	2.65	321.00	0.69	2.22	12.02	31.00	24.00	7.00	19.02
72.00	68.00	2	349	200	11.00	16	176.00	6.00	2.45	229.00	0.38	0.87	10.67	31.00	23.00	8.00	18.67
73.00	74.00	4	4	200	11.00	3	33.00	2.00	3.57	1,053.00	2.52	26.53	58.36	47.00	44.00	3.00	61.36
74.00	72.00	4	8	200	11.00	3	33.00	2.00	3.57	840.00	2.52	21.16	31.83	31.00	22.00	9.00	40.83
75.00	72.00	7	339	200	11.00	15	165.00	6.00	2.29	445.00	0.34	1.50	12.17	31.00	21.00	10.00	22.17
76.00	75.00	9	9	200	11.00	3	33.00	2.00	3.57	764.00	2.52	19.25	31.42	31.00	20.00	11.00	42.42
77.00	75.00	7	323	200	11.00	15	165.00	6.00	2.29	452.00	0.34	1.52	13.69	31.00	20.00	11.00	24.69
78.00	77.00	4	4	200	11.00	3	33.00	2.00	3.57	419.00	2.52	10.56	24.25	31.00	20.00	11.00	35.25
79.00	77.00	6	312	200	11.00	15	165.00	6.00	2.29	403.00	0.34	1.36	15.05	31.00	18.00	13.00	28.05
80.00	81.00	9	9	200	11.00	3	33.00	2.00	3.57	501.00	2.52	12.62	36.92	33.00	17.00	16.00	52.92
81.00	82.20	5	14	200	11.00	4	44.00	3.00	2.19	211.00	0.65	1.37	24.30	33.00	33.00	0.00	24.30
82.00	82.10	9	9	200	11.00	3	33.00	2.00	3.57	411.00	2.52	10.35	37.25	34.00	34.00	0.00	37.25
82.10	82.20	4	35	200	11.00	6	66.00	3.00	3.29	288.00	1.38	3.97	26.90	32.00	32.00	0.00	26.90
82.20	70.10	0	49	200	11.00	6	66.00	3.00	3.29	274.00	1.38	3.77	22.93	31.00	30.00	1.00	23.93
83.00	82.10	6	22	200	11.00	5	55.00	3.00	2.74	477.00	0.98	4.69	31.59	32.00	28.00	4.00	35.59
84.00	85.00	9	9	200	11.00	3	33.00	2.00	3.57	600.00	2.52	15.12	48.26	32.00	18.00	14.00	62.26
85.00	83.00	5	14	200	11.00	4	44.00	3.00	2.19	239.00	0.65	1.55	33.14	32.00	26.00	6.00	39.14
86.00	83.00	2	2	200	11.00	2	22.00	2.00	2.38	136.00	1.19	1.62	33.21	32.00	25.00	7.00	40.21
87.00	71.00	9	22	200	11.00	5	55.00	3.00	2.74	677.00	0.98	6.65	18.67	31.00	27.00	4.00	22.67
88.00	87.00	8	13	200	11.00	4	44.00	3.00	2.19	617.00	0.65	4.01	22.68	31.00	25.00	6.00	28.68
89.00	88.00	5	5	200	11.00	3	33.00	2.00	3.57	174.00	2.52	4.38	27.06	31.00	16.00	15.00	42.06
90.00	91.00	9	9	200	11.00	3	33.00	2.00	3.57	608.00	2.52	15.32	35.66	31.00	19.00	12.00	47.66
91.00	94.00	3	12	200	11.00	4	44.00	3.00	2.19	280.00	0.65	1.82	20.34	31.00	17.00	14.00	34.34
92.00	93.00	9	9	200	11.00	3	33.00	2.00	3.57	579.00	2.52	14.59	36.89	31.00	16.00	15.00	51.89
93.00	94.00	9	18	200	11.00	4	44.00	3.00	2.19	582.00	0.65	3.78	22.30	31.00	16.00	15.00	37.30
94.00	79.00	2	32	200	11.00	6	66.00	3.00	3.29	252.00	1.38	3.47	18.52	31.00	17.00	14.00	32.52
95.00	79.00	3	274	200	11.00	13	143.00	6.00	1.99	263.00	0.26	0.68	15.73	31.00	16.00	15.00	30.73
96.00	97.00	9	9	200	11.00	3	33.00	2.00	3.57	555.00	2.52	13.98	35.90	31.00	13.00	18.00	53.90
97.00	98.00	9	18	200	11.00	4	44.00	3.00	2.19	407.00	0.65	2.64	21.92	31.00	13.00	18.00	39.92
98.00	95.00	5	23	200	11.00	5	55.00	3.00	2.74	361.00	0.98	3.55	19.28	31.00	14.00	17.00	36.28
99.00	95.00	2	248	200	11.00	13	143.00	6.00	1.99	293.00	0.26	0.76	16.49	31.00	17.00	14.00	30.49
100.00	101.00	9	9	200	11.00	3	33.00	2.00	3.57	417.00	2.52	10.51	34.23	31.00	11.00	20.00	54.23
101.00	102.00	9	18	200	11.00	4	44.00	3.00	2.19	431.00	0.65	2.80	23.72	31.00	15.00	16.00	39.72
102.00	99.00	5	23	200	11.00	5	55.00	3.00	2.74	451.00	0.98	4.43	20.92	31.00	17.00	14.00	34.92

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Zone Number	Connects to Zone	Number of Pumps in Zone	Accum Pumps in Zone	Gals/day per Pump	Max Flow Per Pump (gpm)	Max Sim Ops	Max Flow (GPM)	Pipe Size (inches)	Max Velocity (FPS)	Length of Main this Zone	Friction Loss Factor (ft/100 ft)	Friction Loss This Zone	Accum Fric Loss (feet)	Max Main Elevation	Minimum Pump Elevation	Static Head (feet)	Total Dynamic Head (ft)
This spreadsheet was calculated using pipe diameters for: SDR11HDPE											Friction loss calculations were based on a Constant for inside roughness "C" of: 150						
103.00	99.00	3	223	200	11.00	12	132.00	4.00	3.98	280.00	1.46	4.10	20.59	31.00	21.00	10.00	30.59
104.00	105.00	9	9	200	11.00	3	33.00	2.00	3.57	496.00	2.52	12.50	39.08	32.00	18.00	14.00	53.08
105.00	106.00	9	18	200	11.00	4	44.00	3.00	2.19	429.00	0.65	2.79	26.58	32.00	23.00	9.00	35.58
106.00	103.00	5	23	200	11.00	5	55.00	3.00	2.74	326.00	0.98	3.20	23.79	32.00	30.00	2.00	25.79
107.00	103.00	3	197	200	11.00	11	121.00	4.00	3.65	278.00	1.25	3.46	24.05	32.00	32.00	0.00	24.05
108.00	109.00	9	9	200	11.00	3	33.00	2.00	3.57	58.00	2.52	1.46	31.33	36.00	30.00	6.00	37.33
109.00	110.00	9	18	200	11.00	4	44.00	3.00	2.19	321.00	0.65	2.09	29.87	35.00	35.00	0.00	29.87
110.00	107.00	5	23	200	11.00	5	55.00	3.00	2.74	380.00	0.98	3.73	27.78	33.00	33.00	0.00	27.78
111.00	112.00	9	9	200	11.00	3	33.00	2.00	3.57	771.00	2.52	19.42	62.64	40.00	21.00	19.00	81.64
112.00	117.00	9	18	200	11.00	4	44.00	3.00	2.19	893.00	0.65	5.80	43.22	32.00	23.00	9.00	52.22
113.00	115.00	5	5	200	11.00	3	33.00	2.00	3.57	214.00	2.52	5.39	50.90	32.00	24.00	8.00	58.90
114.00	115.00	3	3	200	11.00	2	22.00	2.00	2.38	445.00	1.19	5.29	50.80	32.00	31.00	1.00	51.80
115.00	116.00	9	17	200	11.00	4	44.00	3.00	2.19	765.00	0.65	4.97	45.51	32.00	23.00	9.00	54.51
116.00	117.00	4	21	200	11.00	5	55.00	3.00	2.74	318.00	0.98	3.12	40.54	32.00	23.00	9.00	49.54
117.00	121.00	7	46	200	11.00	6	66.00	3.00	3.29	483.00	1.38	6.65	37.42	32.00	22.00	10.00	47.42
118.00	119.00	9	9	200	11.00	3	33.00	2.00	3.57	406.00	2.52	10.23	49.62	34.00	21.00	13.00	62.62
119.00	120.00	9	18	200	11.00	4	44.00	3.00	2.19	810.00	0.65	5.26	39.39	34.00	15.00	19.00	58.39
120.00	121.00	6	24	200	11.00	5	55.00	3.00	2.74	342.00	0.98	3.36	34.13	32.00	20.00	12.00	46.13
121.00	107.00	0	70	200	11.00	7	77.00	3.00	3.83	367.00	1.83	6.72	30.77	32.00	22.00	10.00	40.77
122.00	107.00	3	101	200	11.00	8	88.00	4.00	2.65	364.00	0.69	2.52	26.57	32.00	24.00	8.00	34.57
123.00	125.00	7	7	200	11.00	3	33.00	2.00	3.57	354.00	2.52	8.92	68.22	32.00	13.00	19.00	87.22
124.00	125.00	6	6	200	11.00	3	33.00	2.00	3.57	212.00	2.52	5.34	64.64	32.00	16.00	16.00	80.64
125.00	128.00	6	19	200	11.00	5	55.00	3.00	2.74	942.00	0.98	9.25	59.30	32.00	24.00	8.00	67.30
126.00	127.00	9	9	200	11.00	3	33.00	2.00	3.57	597.00	2.52	15.04	69.16	32.00	16.00	16.00	85.16
127.00	128.00	7	16	200	11.00	4	44.00	3.00	2.19	626.00	0.65	4.07	54.12	32.00	16.00	16.00	70.12
128.00	130.00	3	38	200	11.00	6	66.00	3.00	3.29	307.00	1.38	4.23	50.05	32.00	18.00	14.00	64.05
129.00	130.00	8	8	200	11.00	3	33.00	2.00	3.57	525.00	2.52	13.23	59.05	32.00	10.00	22.00	81.05
130.00	132.00	6	52	200	11.00	7	77.00	3.00	3.83	401.00	1.83	7.35	45.82	32.00	13.00	19.00	64.82
131.00	132.00	7	7	200	11.00	3	33.00	2.00	3.57	454.00	2.52	11.44	49.91	32.00	13.00	19.00	68.91
132.00	134.00	4	63	200	11.00	7	77.00	3.00	3.83	307.00	1.83	5.62	38.47	32.00	13.00	19.00	57.47
133.00	134.00	4	4	200	11.00	3	33.00	2.00	3.57	314.00	2.52	7.91	40.76	32.00	13.00	19.00	59.76
134.00	122.00	2	69	200	11.00	7	77.00	3.00	3.83	343.00	1.83	6.28	32.85	32.00	18.00	14.00	46.85
135.00	122.00	2	29	200	11.00	5	55.00	3.00	2.74	161.00	0.98	1.58	28.15	32.00	24.00	8.00	36.15
136.00	137.00	9	9	200	11.00	3	33.00	2.00	3.57	935.00	2.52	23.56	56.69	32.00	17.00	15.00	71.69
137.00	135.00	10	27	200	11.00	5	55.00	3.00	2.74	507.00	0.98	4.98	33.13	32.00	30.00	2.00	35.13

PRELIMINARY PRESSURE SEWER - PIPE SIZING AND BRANCH ANALYSIS

Bourne, MA Low Pressure Sewer Design

Prepared By:  
M. Crowley

February 14, 2024

Zone Number	Connects to Zone	Number of Pumps in Zone	Accum Pumps in Zone	Gals/day per Pump	Max Flow Per Pump (gpm)	Max Sim Ops	Max Flow (GPM)	Pipe Size (inches)	Max Velocity (FPS)	Length of Main this Zone	Friction Loss Factor (ft/100 ft)	Friction Loss This Zone	Accum Friction Loss (feet)	Max Main Elevation	Minimum Pump Elevation	Static Head (feet)	Total Dynamic Head (ft)
This spreadsheet was calculated using pipe diameters for: SDR11HDPE										Friction loss calculations were based on a Constant for inside roughness "C" of: 150							
138.00	137.00	2	2	200	11.00	2	22.00	2.00	2.38	312.00	1.19	3.71	36.84	32.00	30.00	2.00	38.84
139.00	137.00	6	6	200	11.00	3	33.00	2.00	3.57	833.00	2.52	20.99	54.12	32.00	28.00	4.00	58.12
140.00	141.00	0	134	200	11.00	9	99.00	4.00	2.98	257.00	0.86	2.21	4.69	31.00	24.00	7.00	11.69
141.00	142.00	0	370	200	11.00	16	176.00	6.00	2.45	250.00	0.38	0.95	2.48	31.00	30.00	1.00	3.48
142.00	142.00	0	858	200	11.00	31	341.00	8.00	2.80	428.00	0.36	1.53	1.53	16.00	16.00	0.00	1.53

Note: This analysis is valid only with the use of progressive cavity type grinder pumps as manufactured by Environment One.

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PRELIMINARY PRESSURE SEWER - ACCUMULATED RETENTION TIME(HR)

Bourne, MA Low Pressure Sewer Design

Prepared By:  
M. Crowley

February 14, 2024

Zone Number	Connects to Zone	Accumulated Total of Pumps this Zone	Pipe Size (inches)	Gallons per 100 lineal feet	Length of Zone	Capacity of Zone	Average Daily Flow	Average Fluid Changes per Day	Average Retention Time (Hr)	Accumulated Retention Time (Hr)
This spreadsheet was calculated using pipe diameters for: SDR11HDPE							Gals per Day per Dwelling			200
1.00	2.00	9	2.00	15.40	510.00	78.55	1,800	22.91	1.05	6.95
2.00	3.00	18	3.00	33.47	718.00	240.29	3,600	14.98	1.60	5.90
3.00	6.00	26	3.00	33.47	1,093.00	365.79	5,200	14.22	1.69	4.30
4.00	6.00	4	2.00	15.40	291.00	44.82	800	17.85	1.34	3.95
5.00	6.00	4	2.00	15.40	676.00	104.12	800	7.68	3.12	5.73
6.00	8.00	42	3.00	33.47	960.00	321.28	8,400	26.15	0.92	2.61
7.00	8.00	7	2.00	15.40	1,155.00	177.90	1,400	7.87	3.05	4.74
8.00	20.00	49	3.00	33.47	161.00	53.88	9,800	181.88	0.13	1.69
9.00	11.00	3	2.00	15.40	128.00	19.72	600	30.43	0.79	5.07
10.00	11.00	3	2.00	15.40	229.00	35.27	600	17.01	1.41	5.69
11.00	13.00	9	2.00	15.40	287.00	44.21	1,800	40.72	0.59	4.28
12.00	13.00	3	2.00	15.40	198.00	30.50	600	19.67	1.22	4.91
13.00	15.00	21	3.00	33.47	528.00	176.70	4,200	23.77	1.01	3.69
14.00	15.00	3	2.00	15.40	212.00	32.65	600	18.37	1.31	3.99
15.00	17.00	25	3.00	33.47	192.00	64.26	5,000	77.81	0.31	2.68
16.00	17.00	8	2.00	15.40	517.00	79.63	1,600	20.09	1.19	3.57
17.00	19.00	39	3.00	33.47	396.00	132.53	7,800	58.86	0.41	2.37
18.00	19.00	5	2.00	15.40	388.00	59.76	1,000	16.73	1.43	3.40
19.00	20.00	45	3.00	33.47	457.00	152.94	9,000	58.85	0.41	1.97
20.00	23.00	111	4.00	55.31	982.00	543.18	22,200	40.87	0.59	1.56
21.00	22.00	9	2.00	15.40	545.00	83.95	1,800	21.44	1.12	3.32
22.00	23.00	18	3.00	33.47	551.00	184.40	3,600	19.52	1.23	2.20
23.00	34.00	136	4.00	55.31	440.00	243.38	27,200	111.76	0.21	0.97
24.00	27.00	8	2.00	15.40	647.00	99.66	1,600	16.06	1.49	4.72
25.00	26.00	9	2.00	15.40	366.00	56.37	1,800	31.93	0.75	5.72
26.00	27.00	14	3.00	33.47	606.00	202.81	2,800	13.81	1.74	4.96
27.00	29.00	28	3.00	33.47	647.00	216.53	5,600	25.86	0.93	3.23
28.00	29.00	9	2.00	15.40	837.00	128.92	1,800	13.96	1.72	4.02
29.00	31.00	51	3.00	33.47	1,473.00	492.96	10,200	20.69	1.16	2.30
30.00	31.00	3	2.00	15.40	393.00	60.53	600	9.91	2.42	3.56
31.00	33.00	60	3.00	33.47	378.00	126.50	12,000	94.86	0.25	1.14
32.00	33.00	3	2.00	15.40	382.00	58.84	600	10.20	2.35	3.24
33.00	34.00	64	3.00	33.47	204.00	68.27	12,800	187.49	0.13	0.88
34.00	58.00	212	4.00	55.31	618.00	341.84	42,400	124.04	0.19	0.76
35.00	36.00	9	2.00	15.40	1,064.00	163.89	1,800	10.98	2.19	5.46

PRELIMINARY PRESSURE SEWER - ACCUMULATED RETENTION TIME(HR)

Bourne, MA Low Pressure Sewer Design

Prepared By:  
M. Crowley

February 14, 2024

Zone Number	Connects to Zone	Accumulated Total of Pumps this Zone	Pipe Size (inches)	Gallons per 100 lineal feet	Length of Zone	Capacity of Zone	Average Daily Flow	Average Fluid Changes per Day	Average Retention Time (Hr)	Accumulated Retention Time (Hr)
This spreadsheet was calculated using pipe diameters for: SDR11HDPE							Gals per Day per Dwelling			200
36.00	37.00	18	3.00	33.47	706.00	236.27	3,600	15.24	1.58	3.28
37.00	40.00	24	3.00	33.47	420.00	140.56	4,800	34.15	0.70	1.70
38.00	39.00	9	2.00	15.40	359.00	55.30	1,800	32.55	0.74	2.78
39.00	40.00	13	3.00	33.47	340.00	113.79	2,600	22.85	1.05	2.05
40.00	42.00	40	3.00	33.47	229.00	76.64	8,000	104.39	0.23	1.00
41.00	42.00	9	2.00	15.40	962.00	148.18	1,800	12.15	1.98	2.74
42.00	44.00	49	3.00	33.47	105.00	35.14	9,800	278.89	0.09	0.77
43.00	44.00	9	2.00	15.40	478.00	73.63	1,800	24.45	0.98	1.66
44.00	46.00	60	3.00	33.47	296.00	99.06	12,000	121.14	0.20	0.68
45.00	46.00	7	2.00	15.40	315.00	48.52	1,400	28.85	0.83	1.31
46.00	140.00	68	3.00	33.47	232.00	77.64	13,600	175.16	0.14	0.48
47.00	48.00	9	2.00	15.40	542.00	83.48	1,800	21.56	1.11	4.64
48.00	50.00	15	3.00	33.47	490.00	163.99	3,000	18.29	1.31	3.53
49.00	50.00	3	2.00	15.40	312.00	48.06	600	12.49	1.92	4.14
50.00	51.00	27	3.00	33.47	546.00	182.73	5,400	29.55	0.81	2.22
51.00	53.00	34	3.00	33.47	610.00	204.15	6,800	33.31	0.72	1.41
52.00	53.00	2	2.00	15.40	81.00	12.48	400	32.06	0.75	1.43
53.00	140.00	43	3.00	33.47	364.00	121.82	8,600	70.60	0.34	0.69
54.00	140.00	23	3.00	33.47	262.00	87.68	4,600	52.46	0.46	0.80
55.00	54.00	6	2.00	15.40	399.00	61.46	1,200	19.53	1.23	2.03
56.00	54.00	12	3.00	33.47	651.00	217.87	2,400	11.02	2.18	2.98
57.00	56.00	3	2.00	15.40	211.00	32.50	600	18.46	1.30	4.28
58.00	60.00	215	4.00	55.31	208.00	115.05	43,000	373.75	0.06	0.56
59.00	141.00	236	4.00	55.31	357.00	197.47	47,200	239.03	0.10	0.32
60.00	59.00	227	4.00	55.31	615.00	340.18	45,400	133.46	0.18	0.50
61.00	64.00	3	2.00	15.40	253.00	38.97	600	15.40	1.56	2.03
62.00	142.00	488	6.00	119.90	446.00	534.75	97,600	182.52	0.13	0.25
63.00	62.00	479	6.00	119.90	422.00	505.97	95,800	189.34	0.13	0.38
64.00	63.00	470	6.00	119.90	303.00	363.29	94,000	258.74	0.09	0.47
65.00	64.00	462	6.00	119.90	236.00	282.96	92,400	326.55	0.07	0.55
66.00	67.00	9	2.00	15.40	338.00	52.06	1,800	34.57	0.69	2.50
67.00	65.00	18	3.00	33.47	563.00	188.42	3,600	19.11	1.26	1.80
68.00	65.00	442	6.00	119.90	101.00	121.10	88,400	729.99	0.03	0.58
69.00	70.00	9	2.00	15.40	677.00	104.28	1,800	17.26	1.39	2.98
70.00	70.10	12	3.00	33.47	164.00	54.89	2,400	43.73	0.55	1.59

PRELIMINARY PRESSURE SEWER - ACCUMULATED RETENTION TIME(HR)

Bourne, MA Low Pressure Sewer Design

Prepared By:  
M. Crowley

February 14, 2024

Zone Number	Connects to Zone	Accumulated Total of Pumps this Zone	Pipe Size (inches)	Gallons per 100 lineal feet	Length of Zone	Capacity of Zone	Average Daily Flow	Average Fluid Changes per Day	Average Retention Time (Hr)	Accumulated Retention Time (Hr)
This spreadsheet was calculated using pipe diameters for: SDR11HDPE							Gals per Day per Dwelling			200
70.10	71.00	67	3.00	33.47	390.00	130.52	13,400	102.67	0.23	1.04
71.00	68.00	93	4.00	55.31	321.00	177.56	18,600	104.76	0.23	0.81
72.00	68.00	349	6.00	119.90	229.00	274.57	69,800	254.22	0.09	0.67
73.00	74.00	4	2.00	15.40	1,053.00	162.19	800	4.93	4.87	7.48
74.00	72.00	8	2.00	15.40	840.00	129.38	1,600	12.37	1.94	2.61
75.00	72.00	339	6.00	119.90	445.00	533.55	67,800	127.07	0.19	0.86
76.00	75.00	9	2.00	15.40	764.00	117.68	1,800	15.30	1.57	2.43
77.00	75.00	323	6.00	119.90	452.00	541.94	64,600	119.20	0.20	1.06
78.00	77.00	4	2.00	15.40	419.00	64.54	800	12.40	1.94	3.00
79.00	77.00	312	6.00	119.90	403.00	483.19	62,400	129.14	0.19	1.25
80.00	81.00	9	2.00	15.40	501.00	77.17	1,800	23.33	1.03	2.90
81.00	82.20	14	3.00	33.47	211.00	70.61	2,800	39.65	0.61	1.87
82.00	82.10	9	2.00	15.40	411.00	63.31	1,800	28.43	0.84	2.44
82.10	82.20	35	3.00	33.47	288.00	96.38	7,000	72.63	0.33	1.60
82.20	70.10	49	3.00	33.47	274.00	91.70	9,800	106.87	0.22	1.27
83.00	82.10	22	3.00	33.47	477.00	159.64	4,400	27.56	0.87	2.47
84.00	85.00	9	2.00	15.40	600.00	92.42	1,800	19.48	1.23	4.39
85.00	83.00	14	3.00	33.47	239.00	79.98	2,800	35.01	0.69	3.15
86.00	83.00	2	2.00	15.40	136.00	20.95	400	19.10	1.26	3.72
87.00	71.00	22	3.00	33.47	677.00	226.57	4,400	19.42	1.24	2.04
88.00	87.00	13	3.00	33.47	617.00	206.49	2,600	12.59	1.91	3.95
89.00	88.00	5	2.00	15.40	174.00	26.80	1,000	37.31	0.64	4.59
90.00	91.00	9	2.00	15.40	608.00	93.65	1,800	19.22	1.25	3.75
91.00	94.00	12	3.00	33.47	280.00	93.71	2,400	25.61	0.94	2.50
92.00	93.00	9	2.00	15.40	579.00	89.18	1,800	20.18	1.19	4.05
93.00	94.00	18	3.00	33.47	582.00	194.77	3,600	18.48	1.30	2.86
94.00	79.00	32	3.00	33.47	252.00	84.34	6,400	75.89	0.32	1.57
95.00	79.00	274	6.00	119.90	263.00	315.33	54,800	173.78	0.14	1.39
96.00	97.00	9	2.00	15.40	555.00	85.49	1,800	21.06	1.14	4.07
97.00	98.00	18	3.00	33.47	407.00	136.21	3,600	26.43	0.91	2.93
98.00	95.00	23	3.00	33.47	361.00	120.81	4,600	38.08	0.63	2.02
99.00	95.00	248	6.00	119.90	293.00	351.30	49,600	141.19	0.17	1.56
100.00	101.00	9	2.00	15.40	417.00	64.23	1,800	28.02	0.86	4.16
101.00	102.00	18	3.00	33.47	431.00	144.24	3,600	24.96	0.96	3.31
102.00	99.00	23	3.00	33.47	451.00	150.93	4,600	30.48	0.79	2.35

PRELIMINARY PRESSURE SEWER - ACCUMULATED RETENTION TIME(HR)

Bourne, MA Low Pressure Sewer Design

Prepared By:  
M. Crowley

February 14, 2024

Zone Number	Connects to Zone	Accumulated Total of Pumps this Zone	Pipe Size (inches)	Gallons per 100 lineal feet	Length of Zone	Capacity of Zone	Average Daily Flow	Average Fluid Changes per Day	Average Retention Time (Hr)	Accumulated Retention Time (Hr)
This spreadsheet was calculated using pipe diameters for: SDR11HDPE							Gals per Day per Dwelling			200
103.00	99.00	223	4.00	55.31	280.00	154.88	44,600	287.97	0.08	1.64
104.00	105.00	9	2.00	15.40	496.00	76.40	1,800	23.56	1.02	4.19
105.00	106.00	18	3.00	33.47	429.00	143.57	3,600	25.07	0.96	3.17
106.00	103.00	23	3.00	33.47	326.00	109.10	4,600	42.16	0.57	2.21
107.00	103.00	197	4.00	55.31	278.00	153.77	39,400	256.23	0.09	1.73
108.00	109.00	9	2.00	15.40	58.00	8.93	1,800	201.49	0.12	3.23
109.00	110.00	18	3.00	33.47	321.00	107.43	3,600	33.51	0.72	3.11
110.00	107.00	23	3.00	33.47	380.00	127.17	4,600	36.17	0.66	2.40
111.00	112.00	9	2.00	15.40	771.00	118.76	1,800	15.16	1.58	5.94
112.00	117.00	18	3.00	33.47	893.00	298.86	3,600	12.05	1.99	4.36
113.00	115.00	5	2.00	15.40	214.00	32.96	1,000	30.34	0.79	5.57
114.00	115.00	3	2.00	15.40	445.00	68.54	600	8.75	2.74	7.52
115.00	116.00	17	3.00	33.47	765.00	256.02	3,400	13.28	1.81	4.78
116.00	117.00	21	3.00	33.47	318.00	106.42	4,200	39.47	0.61	2.97
117.00	121.00	46	3.00	33.47	483.00	161.64	9,200	56.92	0.42	2.37
118.00	119.00	9	2.00	15.40	406.00	62.54	1,800	28.78	0.83	5.16
119.00	120.00	18	3.00	33.47	810.00	271.08	3,600	13.28	1.81	4.32
120.00	121.00	24	3.00	33.47	342.00	114.46	4,800	41.94	0.57	2.52
121.00	107.00	70	3.00	33.47	367.00	122.82	14,000	113.99	0.21	1.95
122.00	107.00	101	4.00	55.31	364.00	201.34	20,200	100.33	0.24	1.97
123.00	125.00	7	2.00	15.40	354.00	54.53	1,400	25.68	0.93	5.93
124.00	125.00	6	2.00	15.40	212.00	32.65	1,200	36.75	0.65	5.65
125.00	128.00	19	3.00	33.47	942.00	315.25	3,800	12.05	1.99	4.99
126.00	127.00	9	2.00	15.40	597.00	91.96	1,800	19.57	1.23	5.80
127.00	128.00	16	3.00	33.47	626.00	209.50	3,200	15.27	1.57	4.57
128.00	130.00	38	3.00	33.47	307.00	102.74	7,600	73.97	0.32	3.00
129.00	130.00	8	2.00	15.40	525.00	80.86	1,600	19.79	1.21	3.89
130.00	132.00	52	3.00	33.47	401.00	134.20	10,400	77.50	0.31	2.68
131.00	132.00	7	2.00	15.40	454.00	69.93	1,400	20.02	1.20	3.57
132.00	134.00	63	3.00	33.47	307.00	102.74	12,600	122.64	0.20	2.37
133.00	134.00	4	2.00	15.40	314.00	48.36	800	16.54	1.45	3.62
134.00	122.00	69	3.00	33.47	343.00	114.79	13,800	120.22	0.20	2.17
135.00	122.00	29	3.00	33.47	161.00	53.88	5,800	107.64	0.22	2.20
136.00	137.00	9	2.00	15.40	935.00	144.02	1,800	12.50	1.92	4.87
137.00	135.00	27	3.00	33.47	507.00	169.68	5,400	31.83	0.75	2.95

PRELIMINARY PRESSURE SEWER - ACCUMULATED RETENTION TIME (HR)  
Bourne, MA Low Pressure Sewer Design

Prepared By:  
M. Crowley

February 14, 2024

Zone Number	Connects to Zone	Accumulated Total of Pumps this Zone	Pipe Size (inches)	Gallons per 100 lineal feet	Length of Zone	Capacity of Zone	Average Daily Flow	Average Fluid Changes per Day	Average Retention Time (Hr)	Accumulated Retention Time (Hr)
This spreadsheet was calculated using pipe diameters for: SDR11HDPE							Gals per Day per Dwelling			200
138.00	137.00	2	2.00	15.40	312.00	48.06	400	8.32	2.88	5.83
139.00	137.00	6	2.00	15.40	833.00	128.31	1,200	9.35	2.57	5.52
140.00	141.00	134	4.00	55.31	257.00	142.15	26,800	188.53	0.13	0.35
141.00	142.00	370	6.00	119.90	250.00	299.75	74,000	246.87	0.10	0.22
142.00	142.00	858	8.00	203.19	428.00	869.65	171,600	197.32	0.12	0.12

