DRAINAGE ANALYSIS

FOR
Site Plan
157 Cottage Street

LOCATED IN
FRANKLIN, MASSACHUSETTS

PREPARED FOR
157 Cottage Street, LLC
37 East Central Street
Franklin, MA 02038

PREPARED BY
UNITED CONSULTANTS, INC.
850 FRANKLIN STREET, SUITE 11D
WRENTHAM, MA. 02093

DATE: March 31, 2025

Table of Contents

APPENDIX A

I. DESCRIPTION

This report is offered in support of the stormwater management system designed for the "Site Plan – 157 Cottage Street Central Street" in Franklin, Massachusetts. The primary goals of this system are to collect the stormwater runoff generated from the proposed parking area as well as the front portion of the exiting building. The runoff will be directed to a Stormceptor 450i water quality unit for TSS removal prior to discharge an underground infiltration area. This provided for infiltration of stormwater which was not previously part of the stormwater system. It should be noted that the rates and volumes of runoff to the existing Catch Basin were shown to be reduced. This is based on the model not having a restriction of the existing 6 inch pipe. Both the pre-development and post-development conditions flowing offsite are summarized in Appendix B.

II. Purpose

The purpose of this report is to examine the hydrological and hydraulic aspects of the proposed 157 Cottage Street Site Plan. This report was developed for review by the Town of Franklin Planning Board to obtain the necessary permits to allow the project to proceed.

This report considers the overall hydrological impact of proposed additional development upon the local watersheds with specific emphasis directed toward the adjacent and immediate downstream areas. The hydrology and criteria are consistent with the Town of Franklin Planning Board and MASS DEP Storm Water Management Policies.

III. Pre-Development Conditions

The site consists of a parcel of land containing 32,436 +/- square feet of land which is located off of Cottage Street in Franklin. The 157 Cottage Street parcel is currently developed with an existing masonry building and paved parking areas, fenced storage areas and landscaping. The soils for the site were taken from the soil survey of Norfolk and Suffolk counties. The soils are classified as Urban Land. Ahydrologic soil group A was used in the analysis. Soil testing was conducted on the site to determine soil types and permeability rates. See the soil logs and permeability test results located in Appendix F. Two permeability tests were completed on site and the infiltration rate was calculated using 50 percent of the slowest rate observed. Utilizing a Hydrocad computer model the pre-development and post development conditions were calculated. This included an analysis of the watershed utilizing a Hydrologic soil group A. A comparison of the pre-development vs. post development rate and volume of runoff can be found in Appendix B.

IV. Post Development Conditions

The proposed development will consist of remodeling the existing building, construction exit stairs and a handicap access walkway system, a sidewalk and an expansion of the existing parking area. The existing stormwater system will be upgraded with the existing catch basin being removed and a water quality unit and underground infiltration area being constructed. Curbing will be added and the storm-water runoff will be directed to the proposed drainage system.

The proposed parking area storm-water will be captured in a water quality unit with an inlet grate and will then be directed to the underground infiltration area. The proposed infiltration system will promote groundwater re-charge as required by the Town of Franklin Stormwater Regulations. The existing six inch pipe will be connected to the underground infiltration area to provide an overflow of stormwater which will be directed to an existing catch basin in Cottage Street. Municipal utility connections are also included in the project. The building is connected to the town's water and sewer systems. The project design includes the construction of one site driveway and the closing off of the existing curb cuts. The drainage system for the building and parking area consists of a closed drainage system.

TSS removal will be accomplished by a treatment train. The site will be treated by a water quality unit and an underground infiltration system. Utilizing the same computer model as the existing conditions we have modeled the changes in surfaces and ground cover and have calculated the post development conditions.
All calculations for the above have been included in this report. Pre-development calculations are in Appendix C. Post-development calculations are located in Appendix D.

V. Conclusion

Stormwater from the existing and proposed parking areas will be captured by the water quality unit for TSS removal which will then be directed to the underground infiltration area. The front half of the existing building roofs will be captured and directed to a underground infiltration pond. The comparison in Appendix B summarizes the rate and volumes of runoff leaving the site in both the pre-development and post-development conditions. This comparison indicates that there is not an increase in the rate or volume of runoff during the 2-year, 10-year, 25-year or 100-year storm events.

VI. Stormwater Management Standards

Refer to Checklist for Stormwater Report in Appendix I

Town of Franklin Stormwater Management Bylaw – Chapter 153 – Bylaw Amendment 21-867

Impervious Coverage 157 Cottage Street site =

0.8" x 21,659 sq. ft. impervious = 1,444 cubic feet (Required)

Storage in Infiltration Area below the outlet invert = 1,449 cubic feet (Provided)

This narrative is for the 157 Cottage Street site

LID Measures
- No disturbance is proposed to any Wetland Resource Area.
- Existing Vegetation Removal is minimal with re-development of existing areas proposed.

Standard 1: No New Untreated Discharges
No new untreated discharges are proposed.
The site does not currently have any stormwater treatment. A stormwater system has been proposed to provide for TSS removal which includes the installation of a water quality unit and an underground infiltration area.

Standard 2: Peak Rate Attenuation
The drainage system has been designed to match or reduce the rate and volume of storm-water runoff from the site when comparing the pre-development conditions to the post development conditions. See Appendix B of this report for a summary of the design storms.

Standard 3: Recharge
- Soil testing has been completed. See Appendix F or this report for permeability test results and sheet 4 for soil testing information.

- Drawdown within 72 hours
  Storage Volume below outlet = 1,449 cubic feet
  Time = (1,449) / (12.5"/hr x 1'/12" x 1,524 sf. = 0.92 hours < 72 hours

Standard 4: Water Quality

- The owner will be responsible for compliance with the standard four requirements.
- Refer to the Operation and Maintenance Plan and the Storm-water Facilities Plan for the Inspection and Maintenance Schedule and the Operation and Maintenance Schedule.
- See Appendix E for the Manufactures TSS removal rate. The site is located within a zone II. The Underground Infiltration Area has been designed with an infiltration rate of 12.5 inches per hour. This led to the Water Quality unit being modeled with a 1" WQV.
- The proposed project will include a Water Quality Unit which will provide TSS removal. The summary of the Manufacturers' Predicted Net Annual results as well as the TSS Removal Worksheet are included.

Standard 5: Land uses with higher potential pollutant loads

None proposed.

Standard 6: Critical Areas

N/A

Standard 7: Re-developments and Other Projects

A portion of the site is being re-developed. The storm-water standards have been met for the project. The

Standard 8: Construction Period Pollution Prevention and Erosion Sedimentation Control

- Refer to sheet 6 for the Inspection and Maintenance Schedule and the Operation and Maintenance Schedule.
- The project will not be covered by a NPDES Construction General Permit.

Standard 9: Operation and Maintenance Plan

- Refer to the Operation and Maintenance Plan in Appendix J.
- The owner will be responsible for the storm-water management system, implementation of the operation and maintenance, the maintenance costs, and completion of the maintenance logs.

- Refer to Appendix J for the Sample Maintenance Log for the Operation and Maintenance Schedule.

Standard 10: Prohibition of Illicit Discharges

- Owner to be responsible for compliance with avoiding illicit discharges.
- The site will be connected to the town sewer system.

Stage-Area-Storage for Pond 1P: POND 1 (continued)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
277.04	1,524	703
277.05	1,524	712
277.06	1,524	722
277.07	1,524	731
277.08	1,524	741
277.09	1,524	751
277.10	1,524	761
277.11	1,524	770
277.12	1,524	780
277.13	1,524	790
277.14	1,524	800
277.15	1,524	810
277.16	1,524	820
277.17	1,524	830
277.18	1,524	840
277.19	1,524	850
277.20	1,524	860
277.21	1,524	871
277.22	1,524	881
277.23	1,524	891
277.24	1,524	901
277.25	1,524	912
277.26	1,524	922
277.27	1,524	932
277.28	1,524	943
277.29	1,524	953
277.30	1,524	964
277.31	1,524	974
277.32	1,524	984
277.33	1,524	995
277.34	1,524	1,006
277.35	1,524	1,016
277.36	1,524	1,027
277.37	1,524	1,037
277.38	1,524	1,048
277.39	1,524	1,058
277.40	1,524	1,069
277.41	1,524	1,080
277.42	1,524	1,090
277.43	1,524	1,101
277.44	1,524	1,112
277.45	1,524	1,123
277.46	1,524	1,133
277.47	1,524	1,144
277.48	1,524	1,155
277.49	1,524	1,166
277.50	1,524	1,177
277.51	1,524	1,187
277.52	1,524	1,198
277.53	1,524	1,209
277.54	1,524	1,220
277.55	1,524	1,231
277.56	1,524	1,242
277.57	1,524	1,252
277.58	1,524	1,263
277.59	1,524	1,274
277.60	1,524	1,285
277.61	1,524	1,296
277.62	1,524	1,307
277.63	1,524	1,318
277.64	1,524	1,329
277.65	1,524	1,340
277.66	1,524	1,351
277.67	1,524	1,362
277.68	1,524	1,373
277.69	1,524	1,384
277.70	1,524	1,395
277.71	1,524	1,406
277.72	1,524	1,417
277.73	1,524	1,428
277.74	1,524	1,438
277.75	1,524	1,449
277.76	1,524	1,460
277.77	1,524	1,471
277.78	1,524	1,482
277.79	1,524	1,493
277.80	1,524	1,504
277.81	1,524	1,515
277.82	1,524	1,526
277.83	1,524	1,537
277.84	1,524	1,548
277.85	1,524	1,559
277.86	1,524	1,570
277.87	1,524	1,581
277.88	1,524	1,592
277.89	1,524	1,603
277.90	1,524	1,614
277.91	1,524	1,625
277.92	1,524	1,636
277.93	1,524	1,646
277.94	1,524	1,657
277.95	1,524	1,668
277.96	1,524	1,679
277.97	1,524	1,690
277.98	1,524	1,701
277.99	1,524	1,712
278.00	1,524	1,722
278.01	1,524	1,733
278.02	1,524	1,744
278.03	1,524	1,755
278.04	1,524	1,766
278.05	1,524	1,776
278.06	1,524	1,787
278.07	1,524	1,798

Storage below the Outlet Invert Town of Franklin Stormwater Management By law

APPENDIX B

Pre-Development vs. Post Development Rate and Volume of Runoff

This analysis was prepared to show the summary of the pre-development and post development rate and volume of runoff as required by the Town of Franklin Storm-water Requirements.

The pre-development watershed area "X-CB" is located in the western and southern portion of the site an is directed to the existing catch basin which is located within the low spot of the parking area. Post-development Reach 7R was provided to show the flow through the existing 6 inch pipe to the offsite connection. A comparison of the rate and volume for pre-development area X-CB and post-development Reach 7R (Proposed Outlet to Exist CB) is provided below:

2-year storm event (CFS)		
Pre		Post
X-CB	vs	7R
0.86		0.00

2 year storm event (A.F.)		
Pre		Post
X-CB	vs	7R
0.063		0.000

10 year storm event (CFS)		
Pre		Post
X-CB	vs	7R
1.90		0.04

10 year storm event (A.F.)		
Pre		Post
X-CB	vs	7R
0.135		0.001

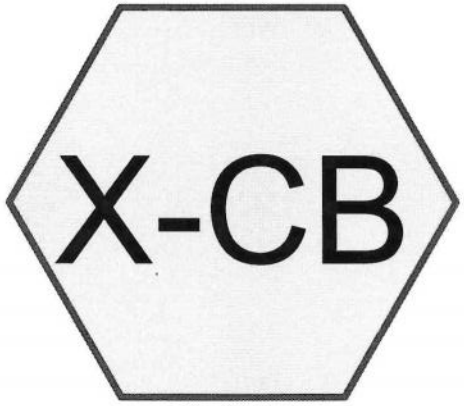
25 year storm event (CFS)		
Pre		Post
X-CB	vs	7R
2.60		0.53

10 year storm event (A.F.)		
Pre		Post
X-CB	vs	7R
0.185		0.020

100 year storm event (CFS)		
Pre		Post
X-CB	vs	7R
3.70		1.10

100 year storm event (A.F.)		
Pre		Post
X-CB	vs	7R
0.265		0.058

APPENDIX C



X-CB

Subcat Reach Pond Link

Drainage Diagram for UC1655-PRE
Prepared by United Consultants, Inc.

Area Listing (all nodes)

Area (acres)	CN	Description (subcats)
0.225	39	>75% Grass cover, Good, HSG A (X-CB)
0.372	98	Paved parking & roofs (X-CB)
0.597		

2 YR PRE-DEVELOPMENT

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment X-CB: X-CB Runoff Area=25,990 sf Runoff Depth=1.26"
Flow Length=179' Tc=6.0 min CN=76 Runoff=0.86 cfs 0.063 af

Total Runoff Area = 0.597 ac Runoff Volume = 0.063 af Average Runoff Depth = 1.26"
37.70% Pervious Area = 0.225 ac 62.30% Impervious Area = 0.372 ac

Subcatchment X-CB: X-CB

Runoff = 0.86 cfs @ 12.09 hrs, Volume= 0.063 af, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2YR-noaa Rainfall=3.36"

Area (sf)	CN	Description
16,193	98	Paved parking & roofs
9,797	39	>75% Grass cover, Good, HSG A
25,990	76	Weighted Average
9,797		Pervious Area
16,193		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	34	0.1180	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.36"
0.5	8	0.2500	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.36"
0.3	8	0.5000	0.38		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.36"
0.5	36	0.0320	1.25		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	27	0.0320	3.63		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	66	0.0270	3.34		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.3					**Direct Entry, MIN TC**
6.0	179	Total			

10 YR PRE-DEVELOPMENT

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment X-CB: X-CB Runoff Area=25,990 sf Runoff Depth=2.72"
Flow Length=179' Tc=6.0 min CN=76 Runoff=1.90 cfs 0.135 af

Total Runoff Area = 0.597 ac Runoff Volume = 0.135 af Average Runoff Depth = 2.72"
37.70% Pervious Area = 0.225 ac 62.30% Impervious Area = 0.372 ac

Subcatchment X-CB: X-CB

Runoff = 1.90 cfs @ 12.09 hrs, Volume= 0.135 af, Depth= 2.72"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10YR-noaa Rainfall=5.22"

Area (sf)	CN	Description
16,193	98	Paved parking & roofs
9,797	39	>75% Grass cover, Good, HSG A
25,990	76	Weighted Average
9,797		Pervious Area
16,193		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	34	0.1180	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.36"
0.5	8	0.2500	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.36"
0.3	8	0.5000	0.38		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.36"
0.5	36	0.0320	1.25		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	27	0.0320	3.63		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	66	0.0270	3.34		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.3					**Direct Entry, MIN TC**
6.0	179	Total			

25 YR PRE-DEVELOPMENT

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment X-CB: X-CB Runoff Area=25,990 sf Runoff Depth=3.72"
Flow Length=179' Tc=6.0 min CN=76 Runoff=2.60 cfs 0.185 af

Total Runoff Area = 0.597 ac Runoff Volume = 0.185 af Average Runoff Depth = 3.72"
37.70% Pervious Area = 0.225 ac 62.30% Impervious Area = 0.372 ac

Subcatchment X-CB: X-CB

Runoff = 2.60 cfs @ 12.09 hrs, Volume= 0.185 af, Depth= 3.72"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25YR-noaa Rainfall=6.39"

Area (sf)	CN	Description
16,193	98	Paved parking & roofs
9,797	39	>75% Grass cover, Good, HSG A
25,990	76	Weighted Average
9,797		Pervious Area
16,193		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	34	0.1180	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.36"
0.5	8	0.2500	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.36"
0.3	8	0.5000	0.38		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.36"
0.5	36	0.0320	1.25		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	27	0.0320	3.63		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	66	0.0270	3.34		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.3					**Direct Entry, MIN TC**
6.0	179	Total			

100 YR PRE-DEVELOPMENT

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment X-CB: X-CB Runoff Area=25,990 sf Runoff Depth=5.32"
Flow Length=179' Tc=6.0 min CN=76 Runoff=3.70 cfs 0.265 af

Total Runoff Area = 0.597 ac Runoff Volume = 0.265 af Average Runoff Depth = 5.32"
37.70% Pervious Area = 0.225 ac 62.30% Impervious Area = 0.372 ac

Subcatchment X-CB: X-CB

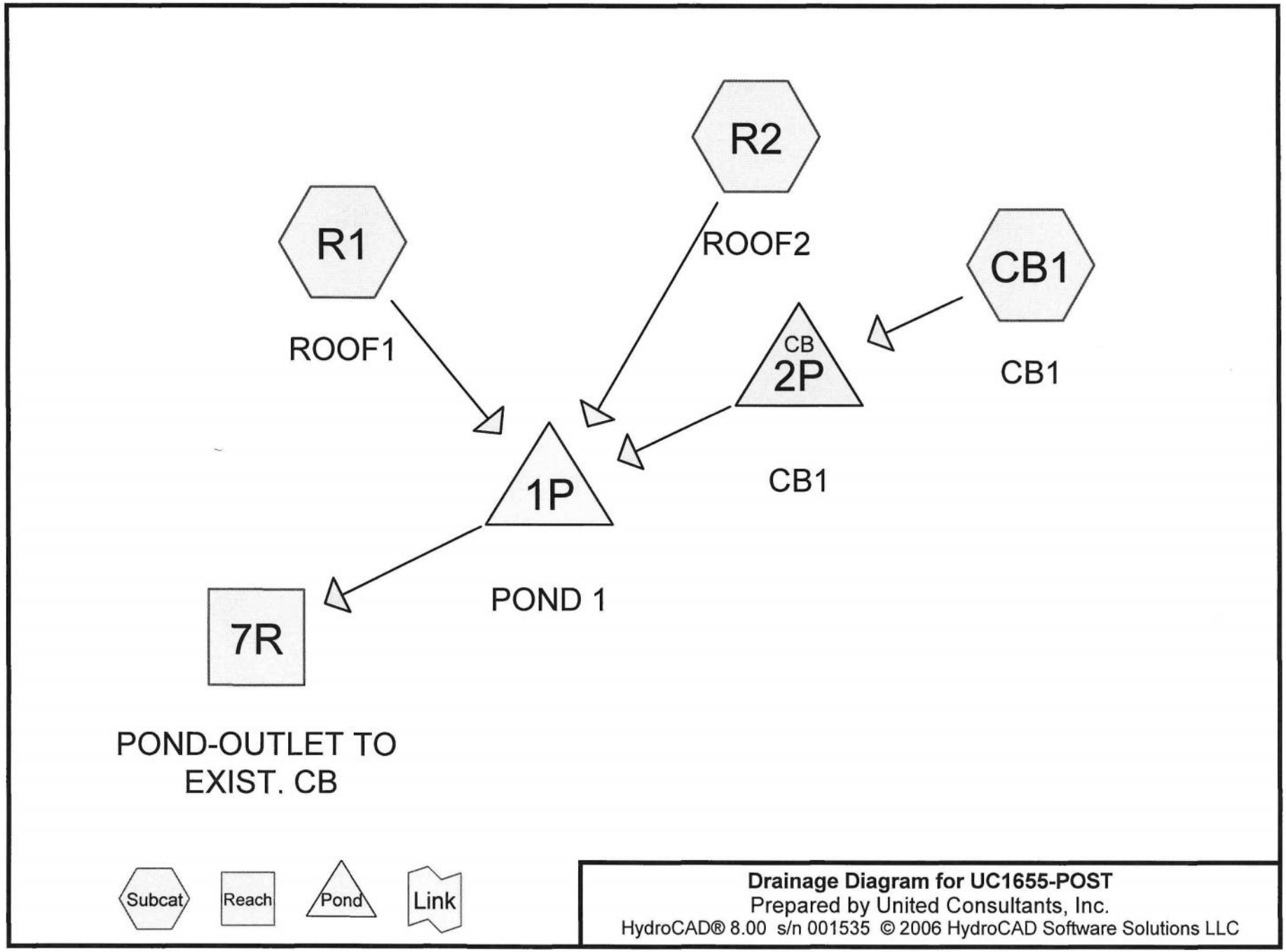
Runoff = 3.70 cfs @ 12.09 hrs, Volume= 0.265 af, Depth= 5.32"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100YR-noaa Rainfall=8.18"

Area (sf)	CN	Description
16,193	98	Paved parking & roofs
9,797	39	>75% Grass cover, Good, HSG A
25,990	76	Weighted Average
9,797		Pervious Area
16,193		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	34	0.1180	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.36"
0.5	8	0.2500	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.36"
0.3	8	0.5000	0.38		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.36"
0.5	36	0.0320	1.25		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	27	0.0320	3.63		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	66	0.0270	3.34		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
2.3					**Direct Entry, MIN TC**
6.0	179	Total			

APPENDIX D



Drainage Diagram for UC1655-POST
Prepared by United Consultants, Inc.

Area Listing (all nodes)

Area (acres)	CN	Description (subcats)
0.187	39	>75% Grass cover, Good, HSG A (CB1)
0.416	98	Paved parking & roofs (CB1,R1,R2)
0.603		

2 YR POST-DEVELOPMENT

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment CB1: CB1 Runoff Area=22,239 sf Runoff Depth=1.26"
Tc=6.0 min CN=76 Runoff=0.74 cfs 0.054 af

Subcatchment R1: ROOF1 Runoff Area=1,476 sf Runoff Depth=3.13"
Flow Length=46' Slope=0.0100 '/' Tc=6.2 min CN=98 Runoff=0.11 cfs 0.009 af

Subcatchment R2: ROOF2 Runoff Area=2,543 sf Runoff Depth=3.13"
Flow Length=46' Slope=0.0100 '/' Tc=6.2 min CN=98 Runoff=0.19 cfs 0.015 af

Reach 7R: POND-OUTLET TO EXIST. CB Avg. Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
D=6.0" n=0.010 L=87.0' S=0.0086 '/' Capacity=0.68 cfs Outflow=0.00 cfs 0.000 af

Pond 1P: POND 1 Peak Elev=276.61' Storage=370 cf Inflow=1.03 cfs 0.078 af
Discarded=0.44 cfs 0.078 af Primary=0.00 cfs 0.000 af Outflow=0.44 cfs 0.078 af

Pond 2P: CB1 Peak Elev=280.24' Inflow=0.74 cfs 0.054 af
Outflow=0.74 cfs 0.054 af

Total Runoff Area = 0.603 ac Runoff Volume = 0.078 af Average Runoff Depth = 1.55"
31.01% Pervious Area = 0.187 ac 68.99% Impervious Area = 0.416 ac

Subcatchment CB1: CB1

Runoff = 0.74 cfs @ 12.09 hrs, Volume= 0.054 af, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2YR-noaa Rainfall=3.36"

Area (sf)	CN	Description
14,096	98	Paved parking & roofs
8,143	39	>75% Grass cover, Good, HSG A
22,239	76	Weighted Average
8,143		Pervious Area
14,096		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, MIN TC**

Subcatchment R1: ROOF1

Runoff = 0.11 cfs @ 12.09 hrs, Volume= 0.009 af, Depth= 3.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2YR-noaa Rainfall=3.36"

Area (sf)	CN	Description
1,476	98	Paved parking & roofs
1,476		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, MIN TC**
0.2	46	0.0100	3.71	0.73	**Circular Channel (pipe),** Diam= 6.0" Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.010 PVC, smooth interior
6.2	46	Total			

Subcatchment R2: ROOF2

Runoff = 0.19 cfs @ 12.09 hrs, Volume= 0.015 af, Depth= 3.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2YR-noaa Rainfall=3.36"

Area (sf)	CN	Description
2,543	98	Paved parking & roofs
2,543		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, MIN TC**
0.2	46	0.0100	3.71	0.73	**Circular Channel (pipe),** Diam= 6.0" Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.010 PVC, smooth interior
6.2	46	Total			

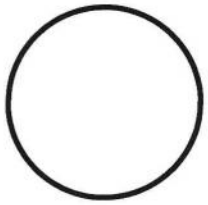
Reach 7R: POND-OUTLET TO EXIST. CB

Inflow Area = 0.603 ac, Inflow Depth = 0.00" for 2YR-noaa event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs, Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 0.50', Capacity at Bank-Full= 0.68 cfs

6.0" Diameter Pipe, n= 0.010 PVC, smooth interior
Length= 87.0' Slope= 0.0086 '/'
Inlet Invert= 277.75', Outlet Invert= 277.00'



Pond 1P: POND 1

Inflow Area = 0.603 ac, Inflow Depth = 1.55" for 2YR-noaa event
Inflow = 1.03 cfs @ 12.09 hrs, Volume= 0.078 af
Outflow = 0.44 cfs @ 11.99 hrs, Volume= 0.078 af, Atten= 57%, Lag= 0.0 min
Discarded = 0.44 cfs @ 11.99 hrs, Volume= 0.078 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 276.61' @ 12.33 hrs Surf.Area= 1,524 sf Storage= 370 cf

Plug-Flow detention time= 4.2 min calculated for 0.078 af (100% of inflow)
Center-of-Mass det. time= 4.2 min (826.9 - 822.7)

Volume	Invert	Avail.Storage	Storage Description
#1	276.00'	2,538 cf	**25.40'W x 60.00'L x 5.00'H Prismatoid**
			7,620 cf Overall - 1,275 cf Embedded = 6,345 cf x 40.0% Voids
#2	276.75'	1,275 cf	**24.0"D x 58.00'L Horizontal Cylinder** x 7 Inside #1
		3,813 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**12.500 in/hr Exfiltration over Surface area**
#2	Primary	277.75'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.44 cfs @ 11.99 hrs HW=276.05' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.44 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=276.00' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Pond 2P: CB1

Inflow Area = 0.511 ac, Inflow Depth = 1.26" for 2YR-noaa event
Inflow = 0.74 cfs @ 12.09 hrs, Volume= 0.054 af
Outflow = 0.74 cfs @ 12.09 hrs, Volume= 0.054 af, Atten= 0%, Lag= 0.0 min
Primary = 0.74 cfs @ 12.09 hrs, Volume= 0.054 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 280.24' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	280.20'	**0.20' x 0.20' Horiz. Orifice/Grate X 6.00 columns**
			X 6 rows Limited to weir flow C= 0.600

Primary OutFlow Max=0.73 cfs @ 12.09 hrs HW=280.24' (Free Discharge)
↑—**1=Orifice/Grate** (Weir Controls 0.73 cfs @ 0.65 fps)

10 YR POST-DEVELOPMENT

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment CB1: CB1 Runoff Area=22,239 sf Runoff Depth=2.72"
Tc=6.0 min CN=76 Runoff=1.63 cfs 0.116 af

Subcatchment R1: ROOF1 Runoff Area=1,476 sf Runoff Depth=4.98"
Flow Length=46' Slope=0.0100 '/' Tc=6.2 min CN=98 Runoff=0.17 cfs 0.014 af

Subcatchment R2: ROOF2 Runoff Area=2,543 sf Runoff Depth=4.98"
Flow Length=46' Slope=0.0100 '/' Tc=6.2 min CN=98 Runoff=0.30 cfs 0.024 af

Reach 7R: POND-OUTLET TO EXIST. CB Avg. Depth=0.08' Max Vel=1.90 fps Inflow=0.04 cfs 0.001 af
D=6.0" n=0.010 L=87.0' S=0.0086 '/' Capacity=0.68 cfs Outflow=0.04 cfs 0.001 af

Pond 1P: POND 1 Peak Elev=277.87' Storage=1,576 cf Inflow=2.09 cfs 0.154 af
Discarded=0.44 cfs 0.153 af Primary=0.04 cfs 0.001 af Outflow=0.48 cfs 0.154 af

Pond 2P: CB1 Peak Elev=280.27' Inflow=1.63 cfs 0.116 af
Outflow=1.63 cfs 0.116 af

Total Runoff Area = 0.603 ac Runoff Volume = 0.154 af Average Runoff Depth = 3.06"
31.01% Pervious Area = 0.187 ac 68.99% Impervious Area = 0.416 ac

Subcatchment CB1: CB1

Runoff = 1.63 cfs @ 12.09 hrs, Volume= 0.116 af, Depth= 2.72"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10YR-noaa Rainfall=5.22"

Area (sf)	CN	Description
14,096	98	Paved parking & roofs
8,143	39	>75% Grass cover, Good, HSG A
22,239	76	Weighted Average
8,143		Pervious Area
14,096		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, MIN TC**

Subcatchment R1: ROOF1

Runoff = 0.17 cfs @ 12.09 hrs, Volume= 0.014 af, Depth= 4.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10YR-noaa Rainfall=5.22"

Area (sf)	CN	Description
1,476	98	Paved parking & roofs
1,476		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, MIN TC**
0.2	46	0.0100	3.71	0.73	**Circular Channel (pipe),** Diam= 6.0" Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.010 PVC, smooth interior
6.2	46	Total			

Subcatchment R2: ROOF2

Runoff = 0.30 cfs @ 12.09 hrs, Volume= 0.024 af, Depth= 4.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10YR-noaa Rainfall=5.22"

Area (sf)	CN	Description
2,543	98	Paved parking & roofs
2,543		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, MIN TC**
0.2	46	0.0100	3.71	0.73	**Circular Channel (pipe),** Diam= 6.0" Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.010 PVC, smooth interior
6.2	46	Total			

Reach 7R: POND-OUTLET TO EXIST. CB

Inflow Area = 0.603 ac, Inflow Depth = 0.01" for 10YR-noaa event
Inflow = 0.04 cfs @ 12.51 hrs, Volume= 0.001 af
Outflow = 0.04 cfs @ 12.53 hrs, Volume= 0.001 af, Atten= 1%, Lag= 1.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.90 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.11 fps, Avg. Travel Time= 1.3 min

Peak Storage= 2 cf @ 12.51 hrs, Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 0.50', Capacity at Bank-Full= 0.68 cfs

6.0" Diameter Pipe, n= 0.010 PVC, smooth interior
Length= 87.0' Slope= 0.0086 '/'
Inlet Invert= 277.75', Outlet Invert= 277.00'

Pond 1P: POND 1

Inflow Area = 0.603 ac, Inflow Depth = 3.06" for 10YR-noaa event
Inflow = 2.09 cfs @ 12.09 hrs, Volume= 0.154 af
Outflow = 0.48 cfs @ 12.51 hrs, Volume= 0.154 af, Atten= 77%, Lag= 25.0 min
Discarded = 0.44 cfs @ 11.78 hrs, Volume= 0.153 af
Primary = 0.04 cfs @ 12.51 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 277.87' @ 12.51 hrs Surf.Area= 1,524 sf Storage= 1,576 cf

Plug-Flow detention time= 19.7 min calculated for 0.154 af (100% of inflow)
Center-of-Mass det. time= 19.7 min (829.4 - 809.7)

Volume	Invert	Avail.Storage	Storage Description
#1	276.00'	2,538 cf	**25.40'W x 60.00'L x 5.00'H Prismatoid**
			7,620 cf Overall - 1,275 cf Embedded = 6,345 cf x 40.0% Voids
#2	276.75'	1,275 cf	**24.0"D x 58.00'L Horizontal Cylinder** x 7 Inside #1
		3,813 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**12.500 in/hr Exfiltration over Surface area**
#2	Primary	277.75'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.44 cfs @ 11.78 hrs HW=276.05' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.44 cfs)

Primary OutFlow Max=0.04 cfs @ 12.51 hrs HW=277.87' (Free Discharge)
↑—**2=Orifice/Grate** (Orifice Controls 0.04 cfs @ 1.16 fps)

Pond 2P: CB1

Inflow Area = 0.511 ac, Inflow Depth = 2.72" for 10YR-noaa event
Inflow = 1.63 cfs @ 12.09 hrs, Volume= 0.116 af
Outflow = 1.63 cfs @ 12.09 hrs, Volume= 0.116 af, Atten= 0%, Lag= 0.0 min
Primary = 1.63 cfs @ 12.09 hrs, Volume= 0.116 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 280.27' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	280.20'	**0.20' x 0.20' Horiz. Orifice/Grate X 6.00 columns**
			X 6 rows Limited to weir flow C= 0.600

Primary OutFlow Max=1.62 cfs @ 12.09 hrs HW=280.27' (Free Discharge)
↑—**1=Orifice/Grate** (Weir Controls 1.62 cfs @ 0.84 fps)

25 YR POST-DEVELOPMENT

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment CB1: CB1 Runoff Area=22,239 sf Runoff Depth=3.72"
Tc=6.0 min CN=76 Runoff=2.23 cfs 0.158 af

Subcatchment R1: ROOF1 Runoff Area=1,476 sf Runoff Depth=6.15"
Flow Length=46' Slope=0.0100 '/' Tc=6.2 min CN=98 Runoff=0.21 cfs 0.017 af

Subcatchment R2: ROOF2 Runoff Area=2,543 sf Runoff Depth=6.15"
Flow Length=46' Slope=0.0100 '/' Tc=6.2 min CN=98 Runoff=0.36 cfs 0.030 af

Reach 7R: POND-OUTLET TO EXIST. CB Avg. Depth=0.33' Max Vel=3.81 fps Inflow=0.53 cfs 0.020 af
D=6.0" n=0.010 L=87.0' S=0.0086 '/' Capacity=0.68 cfs Outflow=0.53 cfs 0.020 af

Pond 1P: POND 1 Peak Elev=278.31' Storage=2,048 cf Inflow=2.80 cfs 0.206 af
Discarded=0.44 cfs 0.185 af Primary=0.53 cfs 0.020 af Outflow=0.97 cfs 0.206 af

Pond 2P: CB1 Peak Elev=280.30' Inflow=2.23 cfs 0.158 af
Outflow=2.23 cfs 0.158 af

Total Runoff Area = 0.603 ac Runoff Volume = 0.206 af Average Runoff Depth = 4.09"
31.01% Pervious Area = 0.187 ac 68.99% Impervious Area = 0.416 ac

Subcatchment CB1: CB1

Runoff = 2.23 cfs @ 12.09 hrs, Volume= 0.158 af, Depth= 3.72"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr-NOAA Rainfall=6.39"

Area (sf)	CN	Description
14,096	98	Paved parking & roofs
8,143	39	>75% Grass cover, Good, HSG A
22,239	76	Weighted Average
8,143		Pervious Area
14,096		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, MIN TC**

Subcatchment R1: ROOF1

Runoff = 0.21 cfs @ 12.09 hrs, Volume= 0.017 af, Depth= 6.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr-NOAA Rainfall=6.39"

Area (sf)	CN	Description
1,476	98	Paved parking & roofs
1,476		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, MIN TC**
0.2	46	0.0100	3.71	0.73	**Circular Channel (pipe),** Diam= 6.0" Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.010 PVC, smooth interior
6.2	46	Total			

Subcatchment R2: ROOF2

Runoff = 0.36 cfs @ 12.09 hrs, Volume= 0.030 af, Depth= 6.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25yr-NOAA Rainfall=6.39"

Area (sf)	CN	Description
2,543	98	Paved parking & roofs
2,543		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, MIN TC**
0.2	46	0.0100	3.71	0.73	**Circular Channel (pipe),** Diam= 6.0" Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.010 PVC, smooth interior
6.2	46	Total			

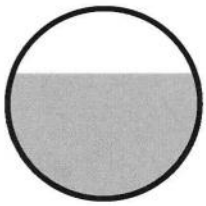
Reach 7R: POND-OUTLET TO EXIST. CB

Inflow Area = 0.603 ac, Inflow Depth = 0.40" for 25yr-NOAA event
Inflow = 0.53 cfs @ 12.38 hrs, Volume= 0.020 af
Outflow = 0.53 cfs @ 12.39 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.81 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.41 fps, Avg. Travel Time= 0.6 min

Peak Storage= 12 cf @ 12.39 hrs, Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 0.50', Capacity at Bank-Full= 0.68 cfs

6.0" Diameter Pipe, n= 0.010 PVC, smooth interior
Length= 87.0' Slope= 0.0086 '/'
Inlet Invert= 277.75', Outlet Invert= 277.00'



Pond 1P: POND 1

Inflow Area = 0.603 ac, Inflow Depth = 4.09" for 25yr-NOAA event
Inflow = 2.80 cfs @ 12.09 hrs, Volume= 0.206 af
Outflow = 0.97 cfs @ 12.38 hrs, Volume= 0.206 af, Atten= 65%, Lag= 17.6 min
Discarded = 0.44 cfs @ 11.70 hrs, Volume= 0.185 af
Primary = 0.53 cfs @ 12.38 hrs, Volume= 0.020 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 278.31' @ 12.38 hrs Surf.Area= 1,524 sf Storage= 2,048 cf

Plug-Flow detention time= 21.3 min calculated for 0.205 af (100% of inflow)
Center-of-Mass det. time= 21.3 min (824.9 - 803.6)

Volume	Invert	Avail.Storage	Storage Description
#1	276.00'	2,538 cf	**25.40'W x 60.00'L x 5.00'H Prismatoid**
			7,620 cf Overall - 1,275 cf Embedded = 6,345 cf x 40.0% Voids
#2	276.75'	1,275 cf	**24.0"D x 58.00'L Horizontal Cylinder** x 7 Inside #1
		3,813 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**12.500 in/hr Exfiltration over Surface area**
#2	Primary	277.75'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.44 cfs @ 11.70 hrs HW=276.05' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.44 cfs)

Primary OutFlow Max=0.53 cfs @ 12.38 hrs HW=278.31' (Free Discharge)
2=Orifice/Grate (Orifice Controls 0.53 cfs @ 2.68 fps)

Pond 2P: CB1

Inflow Area = 0.511 ac, Inflow Depth = 3.72" for 25yr-NOAA event
Inflow = 2.23 cfs @ 12.09 hrs, Volume= 0.158 af
Outflow = 2.23 cfs @ 12.09 hrs, Volume= 0.158 af, Atten= 0%, Lag= 0.0 min
Primary = 2.23 cfs @ 12.09 hrs, Volume= 0.158 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 280.30' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	280.20'	**0.20' x 0.20' Horiz. Orifice/Grate X 6.00 columns**
			X 6 rows Limited to weir flow C= 0.600

Primary OutFlow Max=2.22 cfs @ 12.09 hrs HW=280.30' (Free Discharge)
1=Orifice/Grate (Orifice Controls 2.22 cfs @ 1.54 fps)

100 YR POST-DEVELOPMENT

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment CB1: CB1 Runoff Area=22,239 sf Runoff Depth=5.32"
Tc=6.0 min CN=76 Runoff=3.17 cfs 0.226 af

Subcatchment R1: ROOF1 Runoff Area=1,476 sf Runoff Depth=7.94"
Flow Length=46' Slope=0.0100 '/' Tc=6.2 min CN=98 Runoff=0.27 cfs 0.022 af

Subcatchment R2: ROOF2 Runoff Area=2,543 sf Runoff Depth=7.94"
Flow Length=46' Slope=0.0100 '/' Tc=6.2 min CN=98 Runoff=0.47 cfs 0.039 af

Reach 7R: POND-OUTLET TO EXIST. CB Avg. Depth=0.50' Max Vel=3.93 fps Inflow=1.10 cfs 0.058 af
D=6.0" n=0.010 L=87.0' S=0.0086 '/' Capacity=0.68 cfs Outflow=0.70 cfs 0.058 af

Pond 1P: POND 1 Peak Elev=279.34' Storage=2,803 cf Inflow=3.90 cfs 0.287 af
Discarded=0.44 cfs 0.229 af Primary=1.10 cfs 0.058 af Outflow=1.54 cfs 0.287 af

Pond 2P: CB1 Peak Elev=280.41' Inflow=3.17 cfs 0.226 af
Outflow=3.17 cfs 0.226 af

Total Runoff Area = 0.603 ac Runoff Volume = 0.287 af Average Runoff Depth = 5.72"
31.01% Pervious Area = 0.187 ac 68.99% Impervious Area = 0.416 ac

Subcatchment CB1: CB1

Runoff = 3.17 cfs @ 12.09 hrs, Volume= 0.226 af, Depth= 5.32"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100YR-noaa Rainfall=8.18"

Area (sf)	CN	Description
14,096	98	Paved parking & roofs
8,143	39	>75% Grass cover, Good, HSG A
22,239	76	Weighted Average
8,143		Pervious Area
14,096		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, MIN TC**

Subcatchment R1: ROOF1

Runoff = 0.27 cfs @ 12.09 hrs, Volume= 0.022 af, Depth= 7.94"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100YR-noaa Rainfall=8.18"

Area (sf)	CN	Description
1,476	98	Paved parking & roofs
1,476		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, MIN TC**
0.2	46	0.0100	3.71	0.73	**Circular Channel (pipe),** Diam= 6.0" Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.010 PVC, smooth interior
6.2	46	Total			

Subcatchment R2: ROOF2

Runoff = 0.47 cfs @ 12.09 hrs, Volume= 0.039 af, Depth= 7.94"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100YR-noaa Rainfall=8.18"

Area (sf)	CN	Description
2,543	98	Paved parking & roofs
2,543		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, MIN TC**
0.2	46	0.0100	3.71	0.73	**Circular Channel (pipe),** Diam= 6.0" Area= 0.2 sf Perim= 1.6' r= 0.13' n= 0.010 PVC, smooth interior
6.2	46	Total			

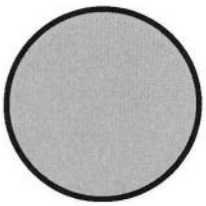
Reach 7R: POND-OUTLET TO EXIST. CB

Inflow Area = 0.603 ac, Inflow Depth = 1.16" for 100YR-noaa event
Inflow = 1.10 cfs @ 12.32 hrs, Volume= 0.058 af
Outflow = 0.70 cfs @ 12.15 hrs, Volume= 0.058 af, Atten= 36%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.93 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 2.70 fps, Avg. Travel Time= 0.5 min

Peak Storage= 17 cf @ 12.15 hrs, Average Depth at Peak Storage= 0.50'
Bank-Full Depth= 0.50', Capacity at Bank-Full= 0.68 cfs

6.0" Diameter Pipe, n= 0.010 PVC, smooth interior
Length= 87.0' Slope= 0.0086 '/'
Inlet Invert= 277.75', Outlet Invert= 277.00'



Pond 1P: POND 1

Inflow Area = 0.603 ac, Inflow Depth = 5.72" for 100YR-noaa event
Inflow = 3.90 cfs @ 12.09 hrs, Volume= 0.287 af
Outflow = 1.54 cfs @ 12.32 hrs, Volume= 0.287 af, Atten= 61%, Lag= 14.2 min
Discarded = 0.44 cfs @ 11.62 hrs, Volume= 0.229 af
Primary = 1.10 cfs @ 12.32 hrs, Volume= 0.058 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 279.34' @ 12.32 hrs Surf.Area= 1,524 sf Storage= 2,803 cf

Plug-Flow detention time= 21.8 min calculated for 0.287 af (100% of inflow)
Center-of-Mass det. time= 21.8 min (818.0 - 796.2)

Volume	Invert	Avail.Storage	Storage Description
#1	276.00'	2,538 cf	**25.40'W x 60.00'L x 5.00'H Prismatoid**
			7,620 cf Overall - 1,275 cf Embedded = 6,345 cf x 40.0% Voids
#2	276.75'	1,275 cf	**24.0"D x 58.00'L Horizontal Cylinder** x 7 Inside #1
		3,813 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	0.00'	**12.500 in/hr Exfiltration over Surface area**
#2	Primary	277.75'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.44 cfs @ 11.62 hrs HW=276.05' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.44 cfs)

Primary OutFlow Max=1.10 cfs @ 12.32 hrs HW=279.34' (Free Discharge)
↑—**2=Orifice/Grate** (Orifice Controls 1.10 cfs @ 5.58 fps)

Pond 2P: CB1

Inflow Area = 0.511 ac, Inflow Depth = 5.32" for 100YR-noaa event
Inflow = 3.17 cfs @ 12.09 hrs, Volume= 0.226 af
Outflow = 3.17 cfs @ 12.09 hrs, Volume= 0.226 af, Atten= 0%, Lag= 0.0 min
Primary = 3.17 cfs @ 12.09 hrs, Volume= 0.226 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 280.41' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	280.20'	**0.20' x 0.20' Horiz. Orifice/Grate X 6.00 columns**
			X 6 rows Limited to weir flow C= 0.600

Primary OutFlow Max=3.16 cfs @ 12.09 hrs HW=280.41' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 3.16 cfs @ 2.19 fps)

APPENDIX E

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: 157 Cottage Street

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Contech Stormceptor	0.50	1.00	0.50	0.50

Total TSS Removal = 50%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: UC1655

Prepared By: RRG

Date: 3/31/2025

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: 157 Cottage Street

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Infiltration Basin	0.80	1.00	0.80	0.20

Total TSS Removal = 80 %

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: UC1655

Prepared By: RRG

Date: 3/31/2025

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

Project:	**157 Cottage Street**
Location:	**Franklin, MA**
Prepared For:	**United Consultants Inc**

CONTECH ENGINEERED SOLUTIONS

Purpose: To calculate the water quality flow rate (WQF) over a given site area. In this situation the WQF is derived from the first 1" of runoff from the contributing impervious surface.

Reference: Massachusetts Dept. of Environmental Protection Wetlands Program / United States Department of Agriculture Natural Resources Conservation Service TR-55 Manual

Procedure: Determine unit peak discharge using Figure 3 or 4. Figure 4 is in tabular form so is preferred. Using the tc, read the unit peak discharge (qu) from Figure 3 or Table in Figure 4. qu is expressed in the following units: cfs/mi^2/watershed inches (csm/in).

Compute Q Rate using the following equation:

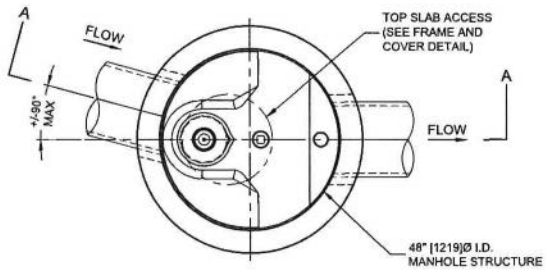
$$Q = (qu)\ (A)\ (WQV)$$

where:

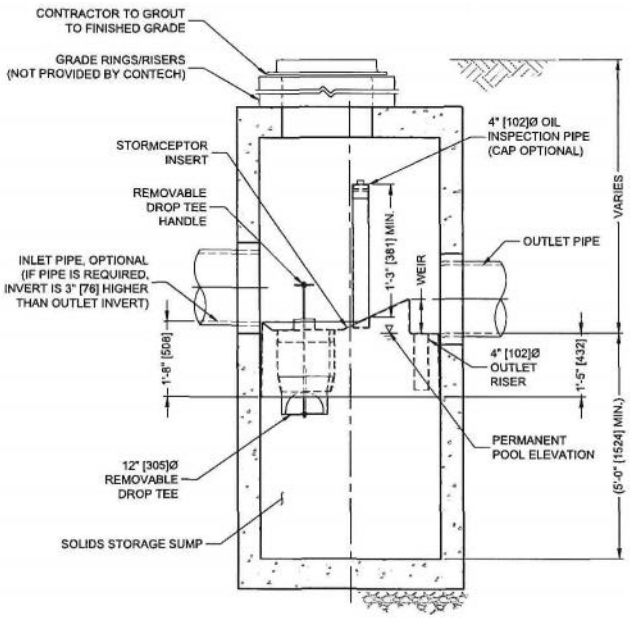
Q = flow rate associated with first 1" of runoff
qu = the unit peak discharge, in csm/in.
A = impervious surface drainage area (in square miles)
WQV = water quality volume in watershed inches (1" in this case)

Structure Name	Impv. (acres)	A (miles^2)	t_c (min)	t_c (hr)	WQV (in)	qu (csm/in.)	Q (cfs)
WQU(CB1)	0.32	0.0005056	6.0	0.100	1.00	774.00	0.39

The WQf sizing calculation selects the minimum size CDS/Cascade/StormCeptor model capable of operating at the computed WQf peak flowrate prior to bypassing. It assumes free discharge of the WQf through the unit and ignores the routing effect of any upstream storm drain piping. As with all hydrodynamic separators, there will be some impact to the Hydraulic Gradient of the corresponding drainage system, and evaluation of this impact should be considered in the design.



PLAN VIEW
TOP SLAB NOT SHOWN



SECTION A-A

Stormceptor®
FOR PATENT INFORMATION, GO TO www.ContechES.com/SP

STORMCEPTOR DESIGN NOTES

THE STANDARD STC450I CONFIGURATION WITH ROUND, SOLID FRAME AND COVER, AND INLET PIPE IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

STORMCEPTOR STC450I RATED TREATMENT CAPACITY IS 0.40 CFS, OR PER LOCAL REGULATIONS

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES

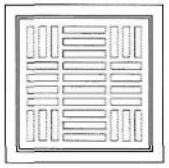
SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (cfs [L/s])	
PEAK FLOW RATE (cfs [L/s])	
RETURN PERIOD OF PEAK FLOW (yrs)	
RIM ELEVATION	

PIPE DATA:	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			

NOTES / SPECIAL REQUIREMENTS:

FRAME AND COVER
(MAY VARY)
NOT TO SCALE



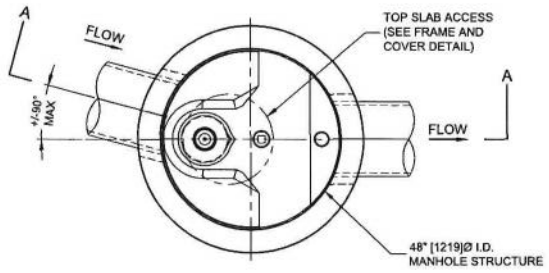
FRAME AND GRATE
(MAY VARY)
NOT TO SCALE

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. STORMCEPTOR WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STORMCEPTOR STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2' [610], AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
5. STORMCEPTOR STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C478 AND AASHTO LOAD FACTOR DESIGN METHOD.
6. ALTERNATE UNITS ARE SHOWN IN MILLIMETERS [mm].

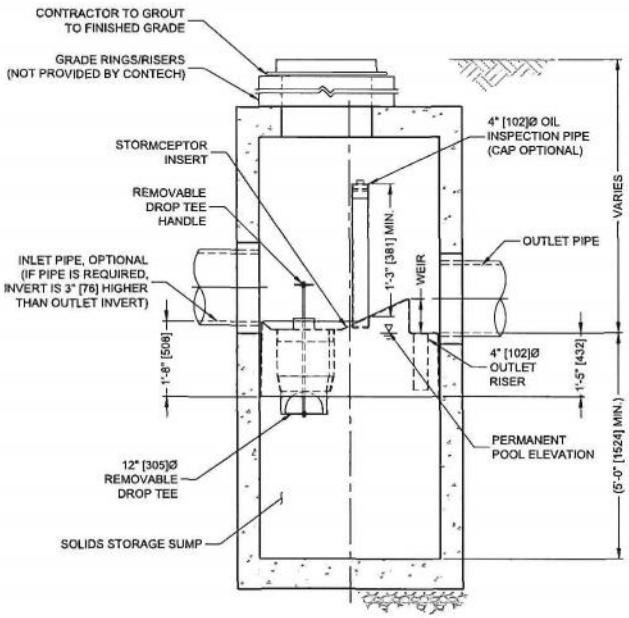
INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMCEPTOR MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH
ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

STC450i
STORMCEPTOR
STANDARD DETAIL



PLAN VIEW
TOP SLAB NOT SHOWN



SECTION A-A

Stormceptor®
FOR PATENT INFORMATION, GO TO www.ContechES.com/IP

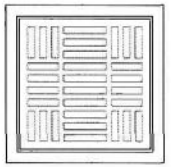
STORMCEPTOR DESIGN NOTES

THE STANDARD STC450I CONFIGURATION WITH ROUND, SOLID FRAME AND COVER, AND INLET PIPE IS SHOWN. ALTERNATE CONFIGURATIONS ARE AVAILABLE AND ARE LISTED BELOW. SOME CONFIGURATIONS MAY BE COMBINED TO SUIT SITE REQUIREMENTS.

STORMCEPTOR STC450I RATED TREATMENT CAPACITY IS 0.40 CFS, OR PER LOCAL REGULATIONS

CONFIGURATION DESCRIPTION
GRATED INLET ONLY (NO INLET PIPE)
GRATED INLET WITH INLET PIPE OR PIPES
CURB INLET ONLY (NO INLET PIPE)
CURB INLET WITH INLET PIPE OR PIPES

FRAME AND COVER
(MAY VARY)
NOT TO SCALE



FRAME AND GRATE
(MAY VARY)
NOT TO SCALE

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (cfs [L/s])	
PEAK FLOW RATE (cfs [L/s])	
RETURN PERIOD OF PEAK FLOW (yrs)	
RIM ELEVATION	

PIPE DATA:	INVERT	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			

NOTES / SPECIAL REQUIREMENTS:

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. STORMCEPTOR WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STORMCEPTOR STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2' [610], AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
5. STORMCEPTOR STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C478 AND AASHTO LOAD FACTOR DESIGN METHOD.
6. ALTERNATE UNITS ARE SHOWN IN MILLIMETERS [mm].

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMCEPTOR MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH
ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

STC450i
STORMCEPTOR
STANDARD DETAIL

APPENDIX F

Guelph Permeameter Calculations

Input

Result

Support: all@soilmoisture.com

Head #1

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir): 1
Enter water Head Height ("H" in cm): 5
Enter the Borehole Radius ("a" in cm): 3

Enter the soil texture-structure category (enter one of the below numbers): 4

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 14.1000

$\alpha^* =$ 0.36 (cm^{-1})

$C =$ 0.80315
$Q =$ 8.2767

$K_{fs} =$ 2.49E-02 cm/sec
######## cm/min
2.49E-04 m/sec
5.88E-01 inch/min
9.80E-03 inch/sec

$\Phi_m =$ 8.91E-02 (cm^2/sec)

Head #2

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir): 1
Enter water Head Height ("H" in cm): 10
Enter the Borehole Radius ("a" in cm): 3

Enter the soil texture-structure category (enter one of the below numbers): 4

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 19.8000

$\alpha^* =$ 0.36 (cm^{-1})

$C =$ 1.28754
$Q =$ 11.5052

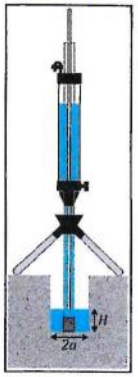
$K_{fs} =$ 1.77E-02 cm/sec
######## cm/min
1.77E-04 m/ses
4.17E-01 inch/min
6.95E-03 inch/sec

$\Phi_m =$ 4.90E-02 (cm^2/sec)

Average

$K_{fs} =$ 2.13E-02 cm/sec
1.28E+00 cm/min
2.13E-04 m/s
5.02E-01 inch/min
8.37E-03 inch/sec

$\Phi_m =$ 5.91E-02 (cm^2/min)



Two Head Method

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir): 1

Enter the first water Head Height ("H1" in cm): 5
Enter the second water Head Height ("H2" in cm): 10

Enter the Borehole Radius ("a" in cm): 3

Enter the soil texture-structure category (enter one of the below numbers): 4

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

$\alpha^* =$ 0.36 (cm^{-1})

Steady State Rate of Water Level Change ("R1" in cm/min): 14.1000

Steady State Rate of Water Level Change ("R2" in cm/min): 19.8000

1.95

$Q_1 =$ 0.5076

$Q_2 =$ 0.7056

$C_1 =$ 0.80315

$C_2 =$ 1.28754

$G_1 =$ 0.00496

$G_2 =$ 0.00397

$G_3 =$ 0.05569

$G_4 =$ 0.02415

$K_{fs} =$ 2.87E-04 cm/sec
1.72E-02 cm/min
2.87E-06 m/sec
6.79E-03 inch/min
1.13E-04 inch/sec

$\Phi_m =$ 1.12E-02 (cm^2/sec)

Calculations formulas related to shape factor (C). Where H_1 is the first water head height (cm), H_2 is the second water head height (cm), a is borehole radius (cm and α^* is macroscopic capillary length factor which is decided according to the soil texture-structure category. For one-head method, only C_1 needs to be calculated while for two-head method, C_1 and C_2 are calculated (Zang et al., 1998).

Soil Texture-Structure Category	$\alpha^*(cm^{-1})$	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_1/a}{2.102 + 0.118\left(\frac{H_1}{a}\right)}\right)^{0.631}$ $C_2 = \left(\frac{H_2/a}{2.102 + 0.118\left(\frac{H_2}{a}\right)}\right)^{0.631}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091\left(\frac{H_1}{a}\right)}\right)^{0.683}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091\left(\frac{H_2}{a}\right)}\right)^{0.683}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093\left(\frac{H_1}{a}\right)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093\left(\frac{H_2}{a}\right)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093\left(\frac{H_1}{a}\right)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093\left(\frac{H_2}{a}\right)}\right)^{0.754}$

Calculation formulas related to one-head and two-head methods. Where R is steady-state rate of fall of water in reservoir (cm/s), K_{fs} is Soil saturated hydraulic conductivity (cm/s), Φ_m is Soil matric flux potential (cm^2/s), α^* is Macroscopic capillary length parameter (from Table 2), a is Borehole radius (cm), H_1 is the first head of water established in borehole (cm), H_2 is the second head of water established in borehole (cm) and C is Shape factor (from Table 2).

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi\left(\frac{H_1}{\alpha^*}\right)}$ $\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)\alpha^* + 2\pi H_1}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1H_2(H_2 - H_1) + \alpha^2(H_1C_2 - H_2C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1H_2(H_2 - H_1) + \alpha^2(H_1C_2 - H_2C_1))}$ $K_{fs} = G_2Q_2 - G_1Q_1$ $G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_4 = \frac{(2H_1^2 + a^2C_2)C_2}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $\Phi_m = G_3Q_2 - G_4Q_2$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	

Guelph Permeameter Data Sheet

Investigator: CARLOS QUINTAL Date: 3/19/25

Location: COTTAGE ST - FRANK Test Id: #1

Depth of hole: 33" Radius: 3 CM (standard calcs assume 3 cm radius)

Reservoirs used during test (check one): Combined: ✓ Inner only: _____

Reservoir constant used: 35,22

Water level in well = 5 cm

Time t (min)	Dt (min)	Water level in reservoir h (cm)	Dh (cm)	Rate of change Dh/ Dt
0		20		
0:11	0,18	25	5	27,3
0:26	0,25	30	5	20,0
0:44	0,30	35	5	16,7
1:05	0,35	40	5	14,3
1:26	0,35	45	5	14,3
1:47	0,35	50	5	14,3
2:08	0,35	55	5	14,3
2:31	0,38	60	5	13,0
2:55	0,40	65	5	12,5
3:18	0,38	70	5	13,0

Steady rate for 3 consecutive readings (R_1): 14,1

Water level in well = 10 cm

Time t (min)	Dt (min)	Water level in reservoir h (cm)	Dh (cm)	Rate of change Dh/ Dt
0		25		
0:12	0,20	30	5	25,0
0:26	0,23	35	5	21,4
0:42	0,27	40	5	18,8
0:57	0,25	45	5	20,0
1:13	0,27	50	5	18,8
1:29	0,27	55	5	18,8
1:45	0,27	60	5	18,8
2:00	0,25	65	5	20,0
2:15	0,25	70	5	20,0

Steady rate for 3 consecutive readings (R_2): 19,6

Comments:

K_{fs} = 0.502 in/min = 30 in/hr

GP FIELD DATA SHEET

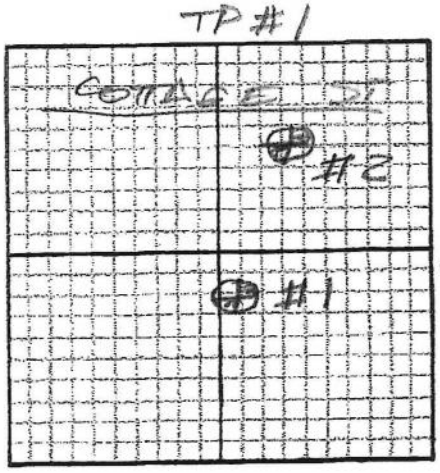
SECTION 1: SITE INFORMATION

Date 3/19/25 Investigator CARLOS QUINTAL - BRIAN LANE

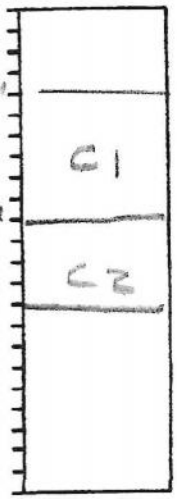
Site Location COTTAGE ST. FRANKLIN, MA

Dominant Soil Type(s) WOODLOCLE SANDY LOAM

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

RESTRICTIVE LAYER @ 84"

NO WATER

Comments and Notes (topography, slope, vegetation, etc.):

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, CA 93130 USA
Phone: 805-964-3525 - Fax: (805) 683-2189 - Email: sales@soilmoisture.com
Website: http://www.soilmoisture.com

SOILMOISTURE®

Guelph Permeameter Calculations

Input

Result

Support: ali@soilmoisture.com

Head #1

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir): 1
Enter water Head Height ("H" in cm): 5
Enter the Borehole Radius ("a" in cm): 3

Enter the soil texture-structure category (enter one of the below numbers): 4

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 9.9000

$\alpha^* =$ 0.36 (cm^{-1})

$C =$ 0.80315
$Q =$ 5.8113

$K_{fs} =$ 1.75E-02 cm/sec
######## cm/min
1.75E-04 m/sec
4.13E-01 inch/min
6.88E-03 inch/sec

$\Phi_m =$ 4.85E-02 (cm^2/min)

Head #2

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir): 1
Enter water Head Height ("H" in cm): 10
Enter the Borehole Radius ("a" in cm): 3

Enter the soil texture-structure category (enter one of the below numbers): 4

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min): 19.7000

$\alpha^* =$ 0.36 (cm^{-1})

$C =$ 1.28754
$Q =$ 11.5639

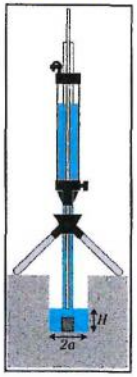
$K_{fs} =$ 1.77E-02 cm/sec
######## cm/min
1.77E-04 m/ses
4.19E-01 inch/min
6.98E-03 inch/sec

$\Phi_m =$ 4.93E-02 (cm^2/min)

Average

$K_{fs} =$ 1.76E-02 cm/sec
1.06E+00 cm/min
1.78E-04 m/s
4.16E-01 inch/min
6.93E-03 inch/sec

$\Phi_m =$ 4.89E-02 (cm^2/min)



Two Head Method

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir): 1

Enter the first water Head Height ("H1" in cm): 5
Enter the second water Head Height ("H2" in cm): 10

Enter the Borehole Radius ("a" in cm): 3

Enter the soil texture-structure category (enter one of the below numbers): 4

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

$\alpha^* =$ 0.36 (cm^{-1})

Steady State Rate of Water Level Change ("R1" in cm/min): 9.9000

Steady State Rate of Water Level Change ("R2" in cm/min): 19.7000

1.95

$Q_1 =$ 0.3564

$Q_2 =$ 0.7092

$C_1 =$ 0.80315

$C_2 =$ 1.28754

$G_1 =$ 0.00496

$G_2 =$ 0.00397

$G_3 =$ 0.05569

$G_4 =$ 0.02415

$K_{fs} =$ 1.05E-03 cm/sec
6.31E-02 cm/min
1.05E-05 m/sec
2.48E-02 inch/min
4.14E-04 inch/sec

$\Phi_m =$ 2.72E-03 (cm^2/min)

Calculation formulas related to shape factor (G). Where H_1 is the first water head height (cm), H_2 is the second water head height (cm), a is borehole radius (cm) and α^* is macroscopic capillary length factor which is decided according to the soil texture-structure category. For one-head method, only C_1 needs to be calculated while for two-head method, C_1 and C_2 are calculated (Zang et al., 1998).

Soil Texture-Structure Category	$\alpha^*(cm^{-1})$	Shape Factor
Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.	0.01	$C_1 = \left(\frac{H_1/a}{2.102 + 0.118\left(H_1/a\right)}\right)^{0.655}$ $C_2 = \left(\frac{H_2/a}{2.102 + 0.118\left(H_2/a\right)}\right)^{0.655}$
Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.	0.04	$C_1 = \left(\frac{H_1/a}{1.992 + 0.091\left(H_1/a\right)}\right)^{0.655}$ $C_2 = \left(\frac{H_2/a}{1.992 + 0.091\left(H_2/a\right)}\right)^{0.655}$
Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.	0.12	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093\left(H_1/a\right)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093\left(H_2/a\right)}\right)^{0.754}$
Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macro pores, etc.	0.36	$C_1 = \left(\frac{H_1/a}{2.074 + 0.093\left(H_1/a\right)}\right)^{0.754}$ $C_2 = \left(\frac{H_2/a}{2.074 + 0.093\left(H_2/a\right)}\right)^{0.754}$

Calculation formulas related to one-head and two-head methods. Where R is steady-state rate of fall of water in reservoir (cm/s), K_{fs} is Soil saturated hydraulic conductivity (cm/s), Φ_m is Soil matric flux potential (cm^2/s), α^* is Macroscopic capillary length parameter (from Table 2), a is Borehole radius (cm), H_1 is the first head of water established in borehole (cm), H_2 is the second head of water established in borehole (cm) and C is Shape factor (from Table 2).

One Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$	$K_{fs} = \frac{C_1 \times Q_1}{2\pi H_1^2 + \pi a^2 C_1 + 2\pi\left(\frac{H_1}{\alpha^*}\right)}$
One Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$	$\Phi_m = \frac{C_1 \times Q_1}{(2\pi H_1^2 + \pi a^2 C_1)\alpha^* + 2\pi H_1}$
Two Head, Combined Reservoir	$Q_1 = \bar{R}_1 \times 35.22$ $Q_2 = \bar{R}_2 \times 35.22$	$G_1 = \frac{H_2 C_1}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $G_2 = \frac{H_1 C_2}{\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $K_{fs} = G_2Q_2 - G_1Q_1$ $G_3 = \frac{(2H_2^2 + a^2C_2)C_1}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$
Two Head, Inner Reservoir	$Q_1 = \bar{R}_1 \times 2.16$ $Q_2 = \bar{R}_2 \times 2.16$	$G_4 = \frac{(2H_1^2 + a^2C_1)C_2}{2\pi(2H_1H_2(H_2 - H_1) + a^2(H_1C_2 - H_2C_1))}$ $\Phi_m = G_3Q_1 - G_4Q_2$

Guelph Permeameter Data Sheet

Investigator: CARLOS QUINTAL Date: 3/19/25

Location: COTTAGE ST. FERN Test Id: #2

Depth of hole: 24" Radius: 3 CM (standard calcs assume 3 cm radius)

Reservoirs used during test (check one): Combined: ✓ Inner only: _____

Reservoir constant used: 35.22

Water level in well = 5 cm

Time *t* (min)	D*t* (min)	Water level in reservoir *h* (cm)	D*h* (cm)	Rate of change D*h*/ D*t*
0		20		
0;22	0,37	25	5	13,6
0;52	0,50	30	5	10,0
1:21	0,48	35	5	10,3
1;51	0,50	40	5	10,0
2;21	0,50	45	5	10,0
2;52	0,52	50	5	9,7
3;23	0,52	55	5	9,7
3;53	0,50	60	5	10,0
4;23	0,50	65	5	10,0
4;55	0,53	70	5	9,4

Steady rate for 3 consecutive readings (R_1): 9,9

Water level in well = 10 cm

Time *t* (min)	D*t* (min)	Water level in reservoir *h* (cm)	D*h* (cm)	Rate of change D*h*/ D*t*
0		25		
0;09	0,15	30	5	33,3
0;22	0,22	35	5	23,1
0;37	0,25	40	5	20,0
0;52	0,25	45	5	20,0
1;07	0,25	50	5	20,0
1;23	0,27	55	5	18,8
1;39	0,27	60	5	18,8
1;57	0,30	65	5	16,7
2;12	0,25	70	5	20,0

Steady rate for 3 consecutive readings (R_2): 19,7

Comments:

$K_{fs} = 0,416 \text{ in/min} = 25 \text{ in/hr}$

GP FIELD DATA SHEET

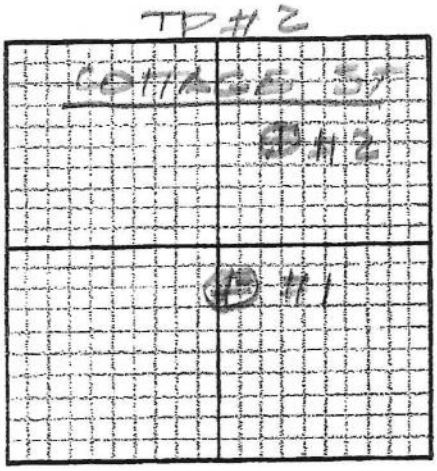
SECTION 1: SITE INFORMATION

Date 3/19/25 Investigator CARLOS QUINTA - BRIAN LAIRE

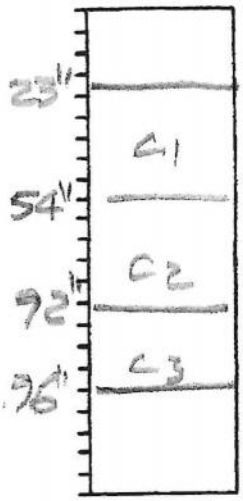
Site Location COTTAGE ST - FRANKLIN - MA

Dominant Soil Type(s) WALPOLE SANDY LOAM

Site Map:



Soil Profile Description (horizon depth, texture, structure, color, etc.):



Presence of special soil conditions (mottling, water table depth, hardpan, induration, compacted layers, etc.):

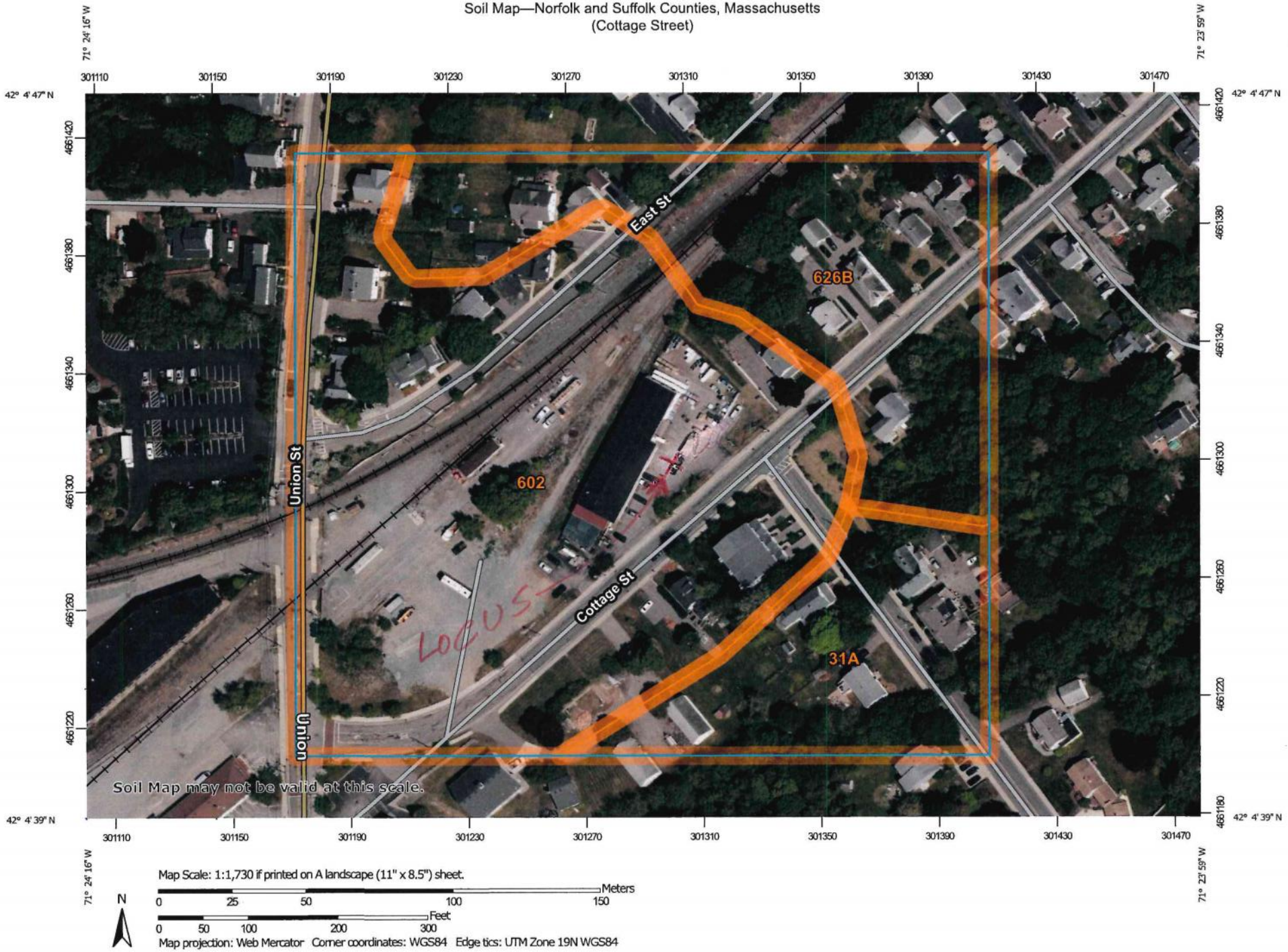
RESTRICTIVE LAYER @ 92"

Comments and Notes (topography, slope, vegetation, etc.):

SOILMOISTURE EQUIPMENT CORP.
P.O. Box 30025, Santa Barbara, CA 93130 USA
Phone: 805-964-3525 - Fax: (805) 683-2189 - Email: sales@soilmoisture.com
Website: http://www.soilmoisture.com

SOILMOISTURE

Soil Map—Norfolk and Suffolk Counties, Massachusetts
(Cottage Street)



Map Scale: 1:1,730 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 20, Aug 27, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
31A	Walpole sandy loam, 0 to 3 percent slopes	1.8	14.9%
602	Urban land, 0 to 15 percent slopes	7.0	58.8%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	3.1	26.3%
Totals for Area of Interest		**12.0**	**100.0%**

Norfolk and Suffolk Counties, Massachusetts

602—Urban land, 0 to 15 percent slopes

Map Unit Setting

National map unit symbol: vkyj
Mean annual precipitation: 32 to 50 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 99 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Parent material: Excavated and filled land

Minor Components

Rock outcrops

Percent of map unit: 1 percent
Hydric soil rating: Unranked

Data Source Information

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 20, Aug 27, 2024

Norfolk and Suffolk Counties, Massachusetts

31A—Walpole sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svkl
Elevation: 0 to 1,350 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Walpole and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Walpole

Setting

Landform: Depressions
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy glaciofluvial deposits derived from igneous, metamorphic and sedimentary rock

Typical profile

Oe - 0 to 1 inches: mucky peat
A - 1 to 7 inches: sandy loam
Bg - 7 to 21 inches: sandy loam
BC - 21 to 25 inches: gravelly sandy loam
C - 25 to 65 inches: very gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 4 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Moderate (about 6.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Ecological site: F144AY028MA - Wet Outwash
Hydric soil rating: Yes

Minor Components

Scarboro

Percent of map unit: 10 percent
Landform: Depressions
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: F144AY031MA - Very Wet Outwash
Hydric soil rating: Yes

Sudbury

Percent of map unit: 10 percent
Landform: Outwash plains
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Linear
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

Data Source Information

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 20, Aug 27, 2024

Norfolk and Suffolk Counties, Massachusetts

626B—Merrimac-Urban land complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyr9
Elevation: 0 to 820 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Merrimac and similar soils: 45 percent
Urban land: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

Landform: Outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Side slope, crest, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)

Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Description of Urban Land

Typical profile

M - 0 to 10 inches: cemented material

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Hinckley

Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Windsor

Percent of map unit: 5 percent
Landform: Outwash terraces, dunes, outwash plains, deltas
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex

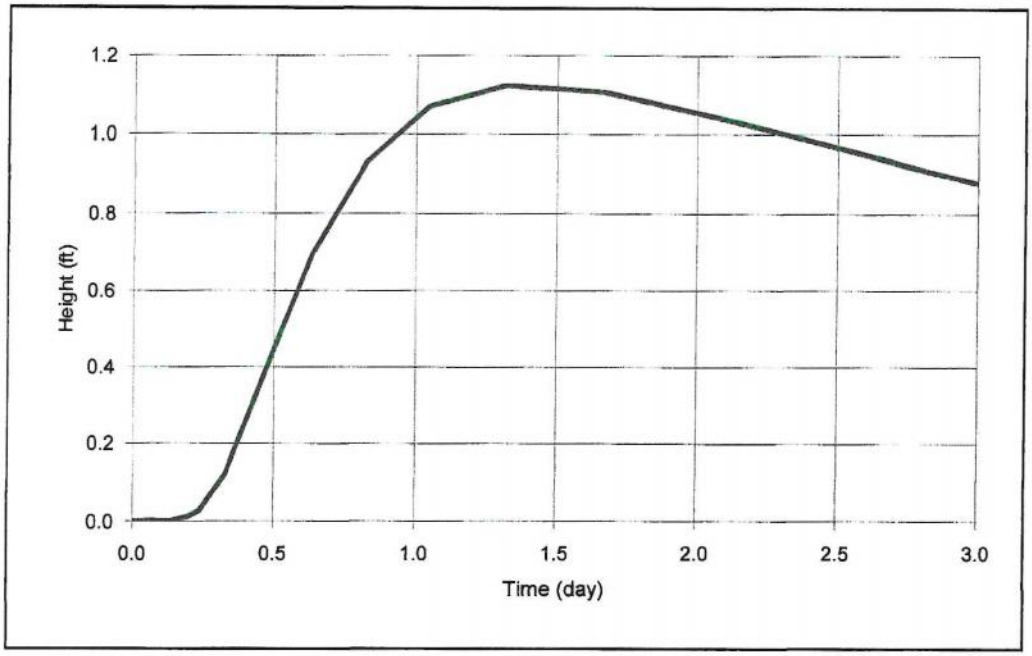
Across-slope shape: Linear, convex
Hydric soil rating: No

Data Source Information

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 20, Aug 27, 2024

APPENDIX G

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: CAQ

PROJECT: 157 Cottage St., Franklin

ANALYST: caq

DATE: 4/7/2025 TIME: 3:21:07 PM

INPUT PARAMETERS

Application rate: 25.13 c.ft/day/sq. ft
Duration of application: 0.2 day
Total simulation time: 3 day
Fillable porosity: 0.2
Hydraulic conductivity: 50 ft/day
Initial saturated thickness: 3 ft
Length of application area: 60 ft
Width of application area: 25.4 ft
No constant head boundary used
Groundwater mounding @
X coordinate: 60 ft
Y coordinate: 12.7 ft
Total volume applied: 7659.624 cft

MODEL RESULTS

Time (day)	Mound Height (ft)
0	0
0	0
0	0
0	0
0	0
0	0
0.1	0
0.1	0
0.1	0
0.1	0
0.2	0.01
0.2	0.03
0.3	0.12
0.5	0.39
0.6	0.7
0.8	0.93
1	1.07
1.3	1.12
1.7	1.1
2.2	1.03
3	0.88

APPENDIX H

CHECKLIST FOR DESIGNERS

GOALS and NEEDS Addressed:

1. Create a visually appealing community
2. Stabilize and increase property values
3. Encourage low impact development
4. Preserve the Town's historic and cultural heritage
5. Protect Franklin's natural environment, including habitat, water resources, and ecosystem services

FRANKLIN POLICY:
Subdivision plans and site plans for all forms of development shall adhere to the principles of environmental and aesthetic compatibility and energy-efficient design.

BEST DEVELOPMENT PRACTICES The site plan should be designed to address the following to the maximum extent practicable	Incorporated into Project?
Unique natural features have been preserved *(the development program should either avoid altering or showcase significant natural features)*	N/A
Native vegetation planted in disturbed areas as needed to enhance or restore habitat	yes
Historic and cultural resources have been preserved (*the development program should either avoid altering or showcase significant historic and cultural features)*	N/A
Clearing, grading, and building placement consider view sheds	N/A Existing Building
Cut and fill have been minimized	yes
Buildings blend into the natural topography	N/A Existing Building
Buildings are oriented to the sun and wind for maximum energy efficiency *Vegetated protection from northwest (winter) winds is provided* *Deciduous species planted or retained close to the East, South and West building edges*	N/A Existing Building
Conforms to §185-31 of the Town of Franklin Zoning Code and/or Chapter 300 of the Town of Franklin Subdivision Regulations	Yes See Waiver Request.

GOALS and NEEDS addressed:

1. Protect local and regional wetlands and water bodies;
2. Maximize groundwater recharge to retain a viable local groundwater supply; and
3. Minimize pollutants in stormwater runoff.

FRANKLIN POLICY: In addition to MassDEP's Stormwater Management Standards, all new development projects in Franklin must meet the following performance measures. All redevelopment projects shall meet the standards and if they fail to meet the standards, shall retrofit or expand existing stormwater management systems to improve existing conditions.

1. Post-development peak discharge rates and volumes from the site shall not exceed pre-development peak discharge rates and volumes from the site.
2. All drainage facilities proposed shall utilize best management practices as outlined in the Massachusetts Stormwater Management Standards.
3. All sites will have an Operation and Maintenance plan to insure future compliance.

Additionally, new development projects must:

1. Retain the volume of runoff equivalent to, or greater than, one (1.0) inch multiplied by the total post-construction impervious surface area on the site AND/OR
2. Remove 90% of the average annual load of Total Suspended Solids (TSS) generated from the total post-construction impervious area on the site AND 60% of the average annual load of Total Phosphorus (TP) generated from the total post-construction impervious surface area on the site.

And redevelopment projects must:

1. Retain the volume of runoff equivalent to, or greater than, 0.80 inch multiplied by the total post-construction impervious surface area on the site AND/OR
2. Remove 80% of the average annual post-construction load of Total Suspended Solids (TSS) generated from the total post-construction impervious area on the site AND 50% of the average annual load of Total Phosphorus (TP) generated from the total post-construction impervious surface area on the site.

BEST DEVELOPMENT PRACTICES The site plan should be designed to address the following to the maximum extent practicable	Incorporated into Project?
Vegetated swales *(recommended to convey runoff from roadways & parking lots)*	Not Proposed
Vegetated filter strips *(recommended to filter and infiltrate runoff from roadways, parking lots, and driveways; use along roadsides and parking lots)*	Not Proposed
Constructed wetlands *(preferred method for stormwater retention & pollutant removal)*	Not Proposed
Bioretention cells *(rain gardens) (recommended on residential lots and parking lot islands)*	Not Proposed
Pervious paving surfaces *(recommended in overflow parking and low-traffic areas)*	N/A
Sediment Forebays *(use in combination with other BDP)*	Not Proposed
Roof gardens *(encouraged on flat or gently sloped commercial and industrial rooftops)*	Not Proposed
Retention/Detention basins *(may be used in series with other practices to provide pre-treatment)*	Yes
Recharge Systems *(suitable for all areas of development)*	Yes
Drain pipe/catch basin systems *(as required to collect runoff when other systems are not practical)*	Yes
If utilizing drain pipe and/or catch basin systems, have you documented that other systems are infeasible?	Re-Development

Erosion & Sedimentation Control

Checklist for Designers

GOALS and NEEDS addressed:

1. Minimize clearing and regrading
2. Prevent erosion and sedimentation

FRANKLIN POLICIES:

a) Any proposed project on a previously undeveloped site shall accommodate the development program in a way that minimizes clearing and re-grading, especially in areas of steep slopes, erosion-prone soils, or sensitive vegetation. For redevelopment projects, the site plan shall concentrate development in previously-disturbed areas to the extent possible.

b) As a condition of approval, every proposed project shall submit and adhere to an erosion control plan that addresses soil stabilization, sediment retention, perimeter protection, construction scheduling, and traffic area stabilization and dust control.

c) If the proposed project is in an area under conservation jurisdiction, the project will require permitting deemed appropriate by the Conservation Commission.

BEST DEVELOPMENT PRACTICES The site plan should be designed to address the following to the maximum extent practicable.	Incorporated into Project?
Clearing and re-grading have been minimized	Yes
Plan identifies sensitive areas to be protected and areas that are suitable for development	Yes
Conservation Permits have been obtained *(when applicable)*	In Process

The erosion and sedimentation control plan addresses:
• Soil stabilization
  ○ *(cover or stabilize erodible surfaces not in immediate use)*
• Sediment retention
  ○ *(runoff interceptors and sediment traps/ponds)*
• Perimeter protection
  ○ *(vegetated buffers, compost socks or straw wattles at limit of work)*
• Construction scheduling
  ○ *(minimize disturbed area at any given time)*
• Traffic area stabilization
  ○ *(crushed rock or similar at construction vehicle entrance and parking areas)*
• Dust control
  ○ *(plan for stabilizing dry, dust-prone surfaces when necessary)*
• Vegetation
  ○ *(preserve existing vegetation and/or identify areas to be revegetated including proposed planting species, quantity and planting specifications)*
	See O+M

GOALS and NEEDS addressed:

1. Stabilize water use at a sustainable level;
2. Create landscapes that minimize habitat destruction and maximize habitat value;
3. Encourage the development of landscapes that provide environmental quality and visual relief through the planting of native or naturalized species

FRANKLIN POLICIES:

a) Site plans and landscape plans for all proposed projects shall take appropriate steps, as outlined in the Guidebook, to minimize water use for irrigation and to allow for natural recharge of groundwater. Landscape plans shall follow the guidelines in the Guidebook for selecting species that are most appropriate to the site conditions.

b) Native and habitat-creating species shall be used in all landscape plans to the maximum extent possible while still meeting the site's landscaping needs. Invasive species may not be planted in Franklin under any condition. Refer to the Massachusetts Prohibited Plant list for more information.

c) Actively promote the Town of Franklin's Water Conservation Measures.

BEST DEVELOPMENT PRACTICES The site plan must address all of the following principles.	Incorporated into Project?
Retain and Recharge water on site *(install bio-retention cells, vegetated filter strips and minimize lawn areas where feasible)*	Yes Infiltration Area
Preserve natural vegetation to the maximum extent practicable	Yes
Irrigation system is water efficient *(if an in-ground irrigation system is proposed, it is a water efficient system with timers and automatic sensors to prevent overwatering)*	No Irrigation
Preserve soil permeability *(minimize disturbing existing landscapes. Prepare new planting beds in accordance to the Planting Bed Guidelines on p. 13, and install 1-2" of shredded pine bark mulch on new planting areas)*	Yes
Minimize the use of turf grass *(when applicable, reduce the size of the lawn area; instead, plant a bio-retention cell, use alternative, drought tolerant groundcover)*	Yes
Specify variety of native and naturalized species *(species from the plant list have been incorporated into the landscape design, and no invasive species are used. Refer to the Plant Species Section and the Massachusetts Prohibited Plant List)*	Yes
Species are appropriate to the soil, site, and microclimate conditions *(select appropriate species from the plant list in this guidebook)*	Yes

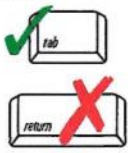
APPENDIX I

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has *not been submitted*, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☒ Reduced Impervious Area (Redevelopment Only)
- ☒ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☒ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

☐ is within the Zone II or Interim Wellhead Protection Area

☐ is near or to other critical areas

☒ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)

☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☐ The BMP is sized (and calculations provided) based on:

- ☐ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☒ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☒ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☒ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

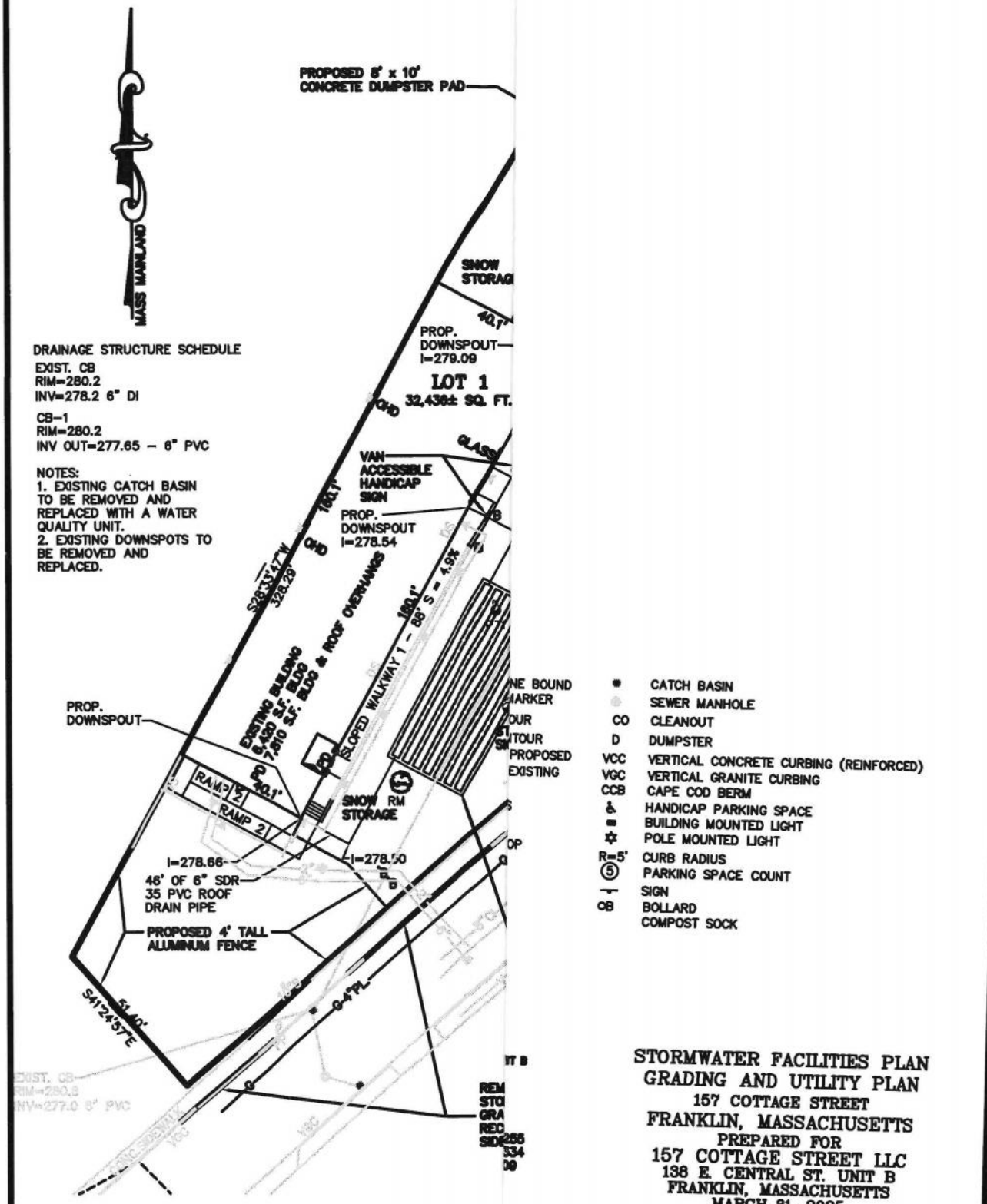
- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.



STORMWATER FACILITIES PLAN
GRADING AND UTILITY PLAN
157 COTTAGE STREET
FRANKLIN, MASSACHUSETTS

PREPARED FOR
157 COTTAGE STREET LLC
138 E. CENTRAL ST. UNIT B
FRANKLIN, MASSACHUSETTS
MARCH 31, 2025
SCALE: 1" = 20'

SITE PLAN APPROVAL
REQUIRED
FRANKLIN PLANNING BOARD

DATE

UNITED CONSULTANTS INC.
850 FRANKLIN STREET SUITE 11D
WRENTHAM, MASSACHUSETTS 02093
508-384-6060 FAX 508-384-6066

DATE	MAR. 31, 2025
SCALE	1" = 20'
PROJECT	UC1655
SHEET	1 OF 1

APPENDIX J

Operation and Maintenance Plan

FOR
Site Plan
157 Cottage Street

LOCATED IN
FRANKLIN, MASSACHUSETTS

PREPARED FOR
157 Cottage Street, LLC
37 East Central Street
Franklin, MA 02038

PREPARED BY
UNITED CONSULTANTS, INC.
850 FRANKLIN STREET, SUITE 11D
WRENTHAM, MA. 02093

DATE: March 31, 2025

Operation and Maintenance Plan

Good House Keeping Measures

1. The parking area and driveway will receive the minimum amount of sand and salt. Snow will be stored at the locations shown on the site plan.
2. The site landscaping will consist of mulch with trees, shrubs, turf lawn and existing landscaped areas. These areas will be assessed by the owner's landscape professional to determine the minimum amounts of fertilizers, herbicides and pesticides necessary and shall only apply the minimums necessary.
3. The site will be stabilized with landscaped areas with mulch and turf lawn. This will improve the existing site coverage.

Long Term Pollution Prevention Plan

The owner shall employ good housekeeping measures, which include removing trash and debris from the site, keeping trash in receptacles and complying with the long-term operation and maintenance plan.
The owner does not plan to store materials or waste products on the site.
The owner will not allow vehicles to be washed outside of the building.
The owner will have routine inspections and maintenance completed for the Storm-water BMP's. See the Yearly Inspection and Maintenance Log for details and schedule.
No hazardous materials for the business is anticipated. If hazardous materials are proposed in the future they will be stored within the building.
The owner will employ a landscape professional to determine and apply the minimum amounts of fertilizers, herbicides and pesticides. No storage of landscape materials on site is proposed.
The site is serviced by Town water and sewer.
A dumpster is proposed to provide refuse storage and will be emptied and disposed of offsite.
The owner will designate an emergency contact person prior to commencing construction.
Snow will be placed in the snow storage areas provided on the site plan. If necessary, excess parking spaces could be used for store snow.
The owner will apply the minimum amount of sand and salt necessary. The parking area will be swept four per year with one sweeping immediately following the last winter's sanding.
Sand piles will not be stored on site.

Operation and Maintenance Plan

See the Yearly Inspection and Maintenance Log for details and schedule.
During the construction period and after completion the Owner, 157 Cottage Steet, LLC shall be responsible for the operation and maintenance of the site and the drainage system.
Upon completion of the construction work the property owner shall be responsible for the maintenance of the drainage facilities.
The yearly estimated operation and maintenance budget is $1,500.

The owner will provide documentation which will be submitted to the Franklin DPW confirming when maintenance has been satisfactorily completed.

The owner of the stormwater management system will notify the Director of changes in ownership or assignment of financial responsibility.

157 Cottage Steet, LLC is the responsible party.

Owner

Name Title

Yearly Inspection and Maintenance Log

Page 1

100 and 110 East Central Street
Franklin, Massachusetts

Parking Lot Sweeping and Curb Inspection – Four Times Per Year

Date: _____ Performed By: _____
Date: _____ Performed By: _____
Date: _____ Performed By: _____
Date: _____ Performed By: _____

Notes:

Water Quality Unit - 4 Times per year

Date: _____ Performed By: _____
Date: _____ Performed By: _____
Date: _____ Performed By: _____
Date: _____ Performed By: _____

Cleaning Performed – 4 Times per year

Date: _____ Performed By: _____
Date: _____ Performed By: _____
Date: _____ Performed By: _____
Date: _____ Performed By: _____

Notes:

Underground Infiltration Area – 4 times per year

Date: _____ Performed By: _____
Date: _____ Performed By: _____
Date: _____ Performed By: _____
Date: _____ Performed By: _____

Cleaning Performed:

Date: _____ Performed By: _____
Date: _____ Performed By: _____
Date: _____ Performed By: _____
Date: _____ Performed By: _____

Notes:

Landscape Area Inspection – 4 times per year

Date: _____ Performed By: _____
Date: _____ Performed By: _____
Date: _____ Performed By: _____
Date: _____ Performed By: _____

Work Performed Repairs completed:

Date: _____ Performed By: _____

APPENDIX K

In Compliance with DEP Storm-water Management Standard 10

157 Cottage Street Site

No Illicit discharges to the storm-water management system, including wastewater discharges and discharges of storm-water contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease are proposed and shall not be allowed.

The Stormwater Facilities Plan located in Appendix I shall be part of this Illicit Discharge Compliance Statement.

157 Cottage Street , LLC is the responsible party.

Owner

Name Title

APPENDIX L