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STORMWATER REPORT

For

"6 Chapel Lane Site Development"

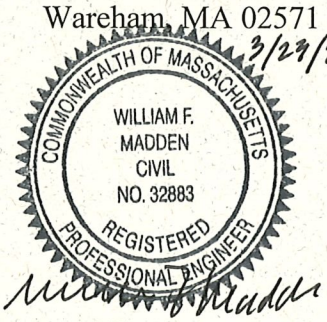
6 Chapel Lane
Wareham, MA

Prepared for

6 Chapel Lane, LLC
19 Depot Street
Wareham, MA 02571

Prepared by

G.A.F. Engineering, Inc.
266 Main Street
Wareham, MA 02571



November 14, 2022
Revised March 14, 2023
G.A.F. Job No.: 20-9499

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DRAINAGE NARRATIVE

General Description

This project consists of the construction of three two-family homes on a lot containing 36,180 square feet of upland and 234 feet of frontage on Chapel Lane. The development includes two access drives off the street which provides access to a parking lot in the front of the duplex units.

The drainage system for the parking lot consists of two proprietary catch basins which provide pretreatment prior to discharge to underground leaching chambers for storage and infiltration of the runoff. Roof runoff from the houses will be piped to the infiltration chambers.

Existing Conditions

The property was occupied by a church several years ago. The building and most of the foundation and concrete pads have been removed. The lot is lower than Chapel Lane and the adjacent properties along the sidelines. A small portion of the lot is graded toward the southeasterly abutter, who is also the project proponent. The area where the church foundation was removed is now the low point on the property. The rates and volumes of runoff calculated for the property stay within the property and infiltrate more or less uniformly.

Soils on the property as mapped by the USDA Natural Resources Conservation Service consist of Deerfield loamy fine sand (256B), 3 to 8 percent slopes along the westerly side of the lot, and Carver loamy coarse sand (259B), 3 to 8 percent slopes on the easterly side. These soils have a Hydrologic soil group (HSG) rating "A". Three test pits were excavated and logged by G.A.F. Engineering, Inc. on July 28, 2022. The locations and soil logs are shown on the site plans. The soils were confirmed to consist primarily of fine-medium sand and sand. Seasonal high groundwater was established at elevation 10.3 based on mottles observed in test pit 2.

There is no off-site design point since the present grades retain stormwater on the lot. Sub-catchment 1S in the pre-development analysis is the area of the lot in the urban grassed condition.

The volumes input for each storm event are as listed in the Point Precipitation Frequency Estimates published by NOAA Atlas 14, Volume 10, Version 3.

Proposed Conditions

The stormwater management system has been substantially revised due to a change in the site design which relocated the parking lot to the front of the proposed homes with an

access drive on either side of the parking lot. The drainage system has been simplified to include two proprietary catch basins which discharge to a system comprised of three rows of twelve Cultec chambers which are sized to store and infiltrate runoff from both the parking lot and roofs from the three duplex units.

This system has been sized to store and infiltrate all calculated storm events using a Rawls rate of 8.27 inches per hour for HSG A soils. The analysis of post-development runoff is now limited to two sub-catchments, that which is collected and infiltrated within the chamber system and the remaining lawn area which is much smaller than prior to development.

Sub-catchment 1S is the parking lot, access drives, and roof runoff conveyed to the Cultec units, modeled as Pond 1P.

Sub-catchment 2S is the remaining lawn area which is generally lower than the adjacent lots with the exception of the southerly abutter, who is also the project developer.

In summary, the development of the project in accordance with the design will provide the required stormwater runoff mitigation as well as protection to downgradient properties in compliance with the Massachusetts Stormwater Handbook and the applicable Town of Wareham rules and regulations.

Drainage Summary

Table 1 – Pre-Development vs. Post-Development (1S/2S)

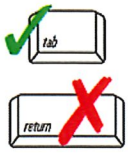
Storm Event	Pre		Post		Pre vs. Post changes	
	Peak Discharge (cfs)	Volume (ac-ft.)	Peak Discharge (cfs)	Volume (ac-ft.)	Peak Discharge (cfs)	Volume (ac-ft.)
2 yr	0	0	0	0	0	0
10 yr	0.03	0.014	0.02	0.007	-0.01	-0.007
25 yr	0.15	0.032	0.08	0.016	-0.07	-0.016
100 yr	0.52	0.068	0.29	0.035	-0.23	-0.033

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.

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[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.

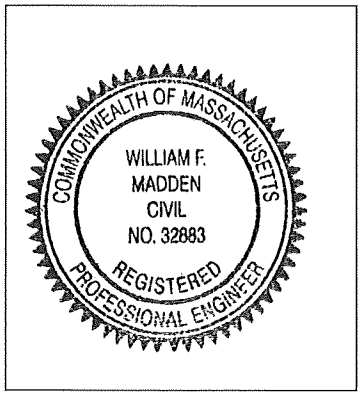
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



William F Madden 3/28/23
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.

COMPLIANCE WITH THE STORMWATER MANAGEMENT STANDARDS

The Stormwater Management Standards

1. No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.

    - *This project does not include any new stormwater conveyances or outfalls.*

2. Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.

    - *The drainage calculations confirm that this standard has been met.*

3. Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

    - *Recharge volume calculations are included in the report and confirm that this standard is met.*

4. Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:

    a. Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;
    b. Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and
    c. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.

    - *This project has specified proprietary catch basin units which exceed the required TSS removal rate for pretreatment based on the DEP Standard*

Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow. The combination of proprietary structures and infiltration chambers provides 96% TSS removal.

5. For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.

    - *This project is not considered a land use with higher potential pollutant load.*

6. Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.

    - *This project is not located within a Zone II of a public water supply and there are no critical areas downstream from the property.*

7. A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

- *This project is considered new development.*

8. A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

    - *Construction period erosion and sedimentation control measures are included on the design plans and in this report.*

9. A post-construction operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.

    - *The post-construction operation and maintenance plan has been listed on the design plans and in this report.*

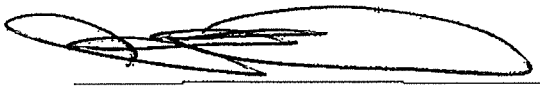
10. All illicit discharges to the stormwater management system are prohibited.

    - *An illicit discharge statement is included in this report.*

Date: 11/16/02

To whom it may concern:

I hereby certify that no illicit discharge connections presently exist nor will any be permitted in the future for the property and future residences located at 6 Chapel Lane, Wareham, Mass., shown as Lot 1036 on Assessors Map 43.



6 Chapel Lane, LLC

Existing Conditions

Subcat Reach Pond Link

Routing Diagram for 9499PRE
Prepared by GAF Engineering, Inc, Printed 3/13/2023

Project Notes

Rainfall events imported from "9499POST.hcp"

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 Year Storm	Type III 24-hr		Default	24.00	1	3.44	2
2	10 Year Storm	Type III 24-hr		Default	24.00	1	5.04	2
3	25 Year Storm	Type III 24-hr		Default	24.00	1	6.04	2
4	100 Year Storm	Type III 24-hr		Default	24.00	1	7.58	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.831	39	>75% Grass cover, Good, HSG A (1S)
0.831	**39**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.831	HSG A	1S
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
0.831		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.831	0.000	0.000	0.000	0.000	0.831	>75% Grass cover, Good	1S
0.831	**0.000**	**0.000**	**0.000**	**0.000**	**0.831**	**TOTAL AREA**	

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing Conditions Runoff Area=36,180 sf 0.00% Impervious Runoff Depth=0.01"
Flow Length=155' Tc=8.1 min CN=39 Runoff=0.00 cfs 0.000 af

Total Runoff Area = 0.831 ac Runoff Volume = 0.000 af Average Runoff Depth = 0.01"
100.00% Pervious = 0.831 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Existing Conditions

Runoff = 0.00 cfs @ 23.07 hrs, Volume= 0.000 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Storm Rainfall=3.44"

Area (sf)	CN	Description
36,180	39	>75% Grass cover, Good, HSG A
36,180		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.9	105	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.1	155	Total			

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing Conditions Runoff Area=36,180 sf 0.00% Impervious Runoff Depth=0.21"
Flow Length=155' Tc=8.1 min CN=39 Runoff=0.03 cfs 0.014 af

Total Runoff Area = 0.831 ac Runoff Volume = 0.014 af Average Runoff Depth = 0.21"
100.00% Pervious = 0.831 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Existing Conditions

Runoff = 0.03 cfs @ 12.50 hrs, Volume= 0.014 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Storm Rainfall=5.04"

Area (sf)	CN	Description
36,180	39	>75% Grass cover, Good, HSG A
36,180		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.9	105	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.1	155	Total			

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing Conditions Runoff Area=36,180 sf 0.00% Impervious Runoff Depth=0.46"
Flow Length=155' Tc=8.1 min CN=39 Runoff=0.15 cfs 0.032 af

Total Runoff Area = 0.831 ac Runoff Volume = 0.032 af Average Runoff Depth = 0.46"
100.00% Pervious = 0.831 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: Existing Conditions

Runoff = 0.15 cfs @ 12.37 hrs, Volume= 0.032 af, Depth= 0.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Storm Rainfall=6.04"

Area (sf)	CN	Description
36,180	39	>75% Grass cover, Good, HSG A
36,180		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.9	105	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.1	155	Total			

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Existing Conditions Runoff Area=36,180 sf 0.00% Impervious Runoff Depth=0.99"
Flow Length=155' Tc=8.1 min CN=39 Runoff=0.52 cfs 0.068 af

Total Runoff Area = 0.831 ac Runoff Volume = 0.068 af Average Runoff Depth = 0.99"
100.00% Pervious = 0.831 ac 0.00% Impervious = 0.000 ac

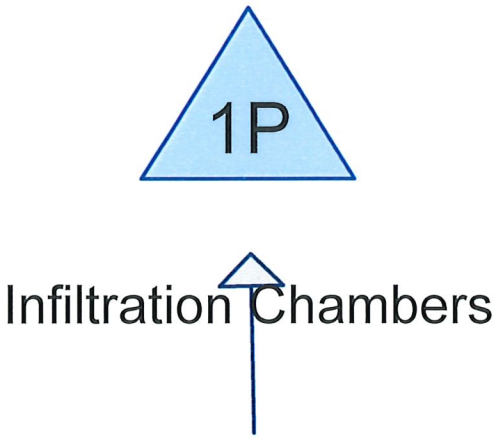
Summary for Subcatchment 1S: Existing Conditions

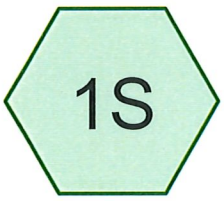
Runoff = 0.52 cfs @ 12.17 hrs, Volume= 0.068 af, Depth= 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Storm Rainfall=7.58"

Area (sf)	CN	Description
36,180	39	>75% Grass cover, Good, HSG A
36,180		100.00% Pervious Area

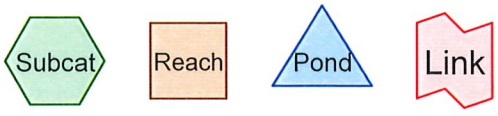
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.9	105	0.0150	1.97		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
8.1	155	Total			





Roofs & Front Yard

Back & Side Yards



Routing Diagram for 9499POST REV1
Prepared by GAF Engineering, Inc, Printed 3/13/2023

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 Year Storm	Type III 24-hr		Default	24.00	1	3.44	2
2	10 Year Storm	Type III 24-hr		Default	24.00	1	5.04	2
3	25 Year Storm	Type III 24-hr		Default	24.00	1	6.04	2
4	100 Year Storm	Type III 24-hr		Default	24.00	1	7.58	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.542	39	>75% Grass cover, Good, HSG A (1S, 2S)
0.184	98	Parking Lot (1S)
0.105	98	Roofs (1S)
0.831	**60**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.542	HSG A	1S, 2S
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.289	Other	1S
0.831		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.542	0.000	0.000	0.000	0.000	0.542	>75% Grass cover, Good	1S, 2S
0.000	0.000	0.000	0.000	0.184	0.184	Parking Lot	1S
0.000	0.000	0.000	0.000	0.105	0.105	Roofs	1S
0.542	**0.000**	**0.000**	**0.000**	**0.289**	**0.831**	**TOTAL AREA**	

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

Subcatchment 1S: Roofs & Front Yard Runoff Area=17,584 sf 71.57% Impervious Runoff Depth=1.66"
Tc=6.0 min CN=81 Runoff=0.78 cfs 0.056 af

Subcatchment 2S: Back & Side Yards Runoff Area=18,596 sf 0.00% Impervious Runoff Depth=0.01"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Pond 1P: Infiltration Chambers Peak Elev=11.92' Storage=279 cf Inflow=0.78 cfs 0.056 af
Outflow=0.34 cfs 0.056 af

Total Runoff Area = 0.831 ac Runoff Volume = 0.056 af Average Runoff Depth = 0.81"
65.22% Pervious = 0.542 ac 34.78% Impervious = 0.289 ac

Summary for Subcatchment 1S: Roofs & Front Yard

Runoff = 0.78 cfs @ 12.09 hrs, Volume= 0.056 af, Depth= 1.66"
Routed to Pond 1P : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Storm Rainfall=3.44"

	Area (sf)	CN	Description
*	8,000	98	Parking Lot
*	4,584	98	Roofs
	5,000	39	>75% Grass cover, Good, HSG A
	17,584	81	Weighted Average
	5,000		28.43% Pervious Area
	12,584		71.57% Impervious Area

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

Summary for Subcatchment 2S: Back & Side Yards

Runoff = 0.00 cfs @ 23.06 hrs, Volume= 0.000 af, Depth= 0.01"
Routed to nonexistent node 2P

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Storm Rainfall=3.44"

Area (sf)	CN	Description
18,596	39	>75% Grass cover, Good, HSG A
18,596		100.00% Pervious Area

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

Summary for Pond 1P: Infiltration Chambers

Inflow Area = 0.404 ac, 71.57% Impervious, Inflow Depth = 1.66" for 2 Year Storm event
Inflow = 0.78 cfs @ 12.09 hrs, Volume= 0.056 af
Outflow = 0.34 cfs @ 12.32 hrs, Volume= 0.056 af, Atten= 57%, Lag= 13.7 min
Discarded = 0.34 cfs @ 12.32 hrs, Volume= 0.056 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 11.92' @ 12.32 hrs Surf.Area= 1,651 sf Storage= 279 cf

Plug-Flow detention time= 4.4 min calculated for 0.056 af (100% of inflow)
Center-of-Mass det. time= 4.3 min (840.3 - 836.0)

Volume	Invert	Avail.Storage	Storage Description
#1	11.50'	1,588 cf	**13.00'W x 127.00'L x 3.00'H Prismatoid** 4,953 cf Overall - 983 cf Embedded = 3,970 cf x 40.0% Voids
#2	12.50'	983 cf	**Cultec R-150XLHD** x 36 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 3 rows
		2,571 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	11.50'	**8.270 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.34 cfs @ 12.32 hrs HW=11.92' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.34 cfs)

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

Subcatchment 1S: Roofs & Front Yard Runoff Area=17,584 sf 71.57% Impervious Runoff Depth=3.02"
Tc=6.0 min CN=81 Runoff=1.43 cfs 0.102 af

Subcatchment 2S: Back & Side Yards Runoff Area=18,596 sf 0.00% Impervious Runoff Depth=0.21"
Tc=6.0 min CN=39 Runoff=0.02 cfs 0.007 af

Pond 1P: Infiltration Chambers Peak Elev=12.73' Storage=940 cf Inflow=1.43 cfs 0.102 af
Outflow=0.38 cfs 0.102 af

Total Runoff Area = 0.831 ac Runoff Volume = 0.109 af Average Runoff Depth = 1.58"
65.22% Pervious = 0.542 ac 34.78% Impervious = 0.289 ac

Summary for Subcatchment 1S: Roofs & Front Yard

Runoff = 1.43 cfs @ 12.09 hrs, Volume= 0.102 af, Depth= 3.02"
Routed to Pond 1P : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Storm Rainfall=5.04"

	Area (sf)	CN	Description
*	8,000	98	Parking Lot
*	4,584	98	Roofs
	5,000	39	>75% Grass cover, Good, HSG A
	17,584	81	Weighted Average
	5,000		28.43% Pervious Area
	12,584		71.57% Impervious Area

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

Summary for Subcatchment 2S: Back & Side Yards

Runoff = 0.02 cfs @ 12.47 hrs, Volume= 0.007 af, Depth= 0.21"
Routed to nonexistent node 2P

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Storm Rainfall=5.04"

Area (sf)	CN	Description
18,596	39	>75% Grass cover, Good, HSG A
18,596		100.00% Pervious Area

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

Summary for Pond 1P: Infiltration Chambers

Inflow Area = 0.404 ac, 71.57% Impervious, Inflow Depth = 3.02" for 10 Year Storm event
Inflow = 1.43 cfs @ 12.09 hrs, Volume= 0.102 af
Outflow = 0.38 cfs @ 12.46 hrs, Volume= 0.102 af, Atten= 73%, Lag= 22.6 min
Discarded = 0.38 cfs @ 12.46 hrs, Volume= 0.102 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 12.73' @ 12.46 hrs Surf.Area= 1,651 sf Storage= 940 cf

Plug-Flow detention time= 13.9 min calculated for 0.102 af (100% of inflow)
Center-of-Mass det. time= 13.8 min (832.6 - 818.7)

Volume	Invert	Avail.Storage	Storage Description
#1	11.50'	1,588 cf	**13.00'W x 127.00'L x 3.00'H Prismatoid** 4,953 cf Overall - 983 cf Embedded = 3,970 cf x 40.0% Voids
#2	12.50'	983 cf	**Cultec R-150XLHD** x 36 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 3 rows
		2,571 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	11.50'	**8.270 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.38 cfs @ 12.46 hrs HW=12.73' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.38 cfs)

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

Subcatchment 1S: Roofs & Front Yard Runoff Area=17,584 sf 71.57% Impervious Runoff Depth=3.92"
Tc=6.0 min CN=81 Runoff=1.84 cfs 0.132 af

Subcatchment 2S: Back & Side Yards Runoff Area=18,596 sf 0.00% Impervious Runoff Depth=0.46"
Tc=6.0 min CN=39 Runoff=0.08 cfs 0.016 af

Pond 1P: Infiltration Chambers Peak Elev=13.18' Storage=1,451 cf Inflow=1.84 cfs 0.132 af
Outflow=0.41 cfs 0.132 af

Total Runoff Area = 0.831 ac Runoff Volume = 0.148 af Average Runoff Depth = 2.14"
65.22% Pervious = 0.542 ac 34.78% Impervious = 0.289 ac

Summary for Subcatchment 1S: Roofs & Front Yard

Runoff = 1.84 cfs @ 12.09 hrs, Volume= 0.132 af, Depth= 3.92"
Routed to Pond 1P : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Storm Rainfall=6.04"

	Area (sf)	CN	Description
*	8,000	98	Parking Lot
*	4,584	98	Roofs
	5,000	39	>75% Grass cover, Good, HSG A
	17,584	81	Weighted Average
	5,000		28.43% Pervious Area
	12,584		71.57% Impervious Area

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

Summary for Subcatchment 2S: Back & Side Yards

Runoff = 0.08 cfs @ 12.34 hrs, Volume= 0.016 af, Depth= 0.46"
Routed to nonexistent node 2P

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Storm Rainfall=6.04"

Area (sf)	CN	Description
18,596	39	>75% Grass cover, Good, HSG A
18,596		100.00% Pervious Area

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

Summary for Pond 1P: Infiltration Chambers

Inflow Area = 0.404 ac, 71.57% Impervious, Inflow Depth = 3.92" for 25 Year Storm event
Inflow = 1.84 cfs @ 12.09 hrs, Volume= 0.132 af
Outflow = 0.41 cfs @ 12.51 hrs, Volume= 0.132 af, Atten= 78%, Lag= 25.2 min
Discarded = 0.41 cfs @ 12.51 hrs, Volume= 0.132 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 13.18' @ 12.51 hrs Surf.Area= 1,651 sf Storage= 1,451 cf

Plug-Flow detention time= 21.8 min calculated for 0.132 af (100% of inflow)
Center-of-Mass det. time= 21.8 min (833.1 - 811.3)

Volume	Invert	Avail.Storage	Storage Description
#1	11.50'	1,588 cf	**13.00'W x 127.00'L x 3.00'H Prismatoid** 4,953 cf Overall - 983 cf Embedded = 3,970 cf x 40.0% Voids
#2	12.50'	983 cf	**Cultec R-150XLHD** x 36 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 3 rows
		2,571 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	11.50'	**8.270 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.41 cfs @ 12.51 hrs HW=13.17' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.41 cfs)

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

Subcatchment 1S: Roofs & Front Yard Runoff Area=17,584 sf 71.57% Impervious Runoff Depth=5.35"
Tc=6.0 min CN=81 Runoff=2.49 cfs 0.180 af

Subcatchment 2S: Back & Side Yards Runoff Area=18,596 sf 0.00% Impervious Runoff Depth=0.99"
Tc=6.0 min CN=39 Runoff=0.29 cfs 0.035 af

Pond 1P: Infiltration Chambers Peak Elev=14.07' Storage=2,285 cf Inflow=2.49 cfs 0.180 af
Outflow=0.45 cfs 0.180 af

Total Runoff Area = 0.831 ac Runoff Volume = 0.215 af Average Runoff Depth = 3.11"
65.22% Pervious = 0.542 ac 34.78% Impervious = 0.289 ac

Summary for Subcatchment 1S: Roofs & Front Yard

Runoff = 2.49 cfs @ 12.09 hrs, Volume= 0.180 af, Depth= 5.35"
Routed to Pond 1P : Infiltration Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=7.58"

	Area (sf)	CN	Description
*	8,000	98	Parking Lot
*	4,584	98	Roofs
	5,000	39	>75% Grass cover, Good, HSG A
	17,584	81	Weighted Average
	5,000		28.43% Pervious Area
	12,584		71.57% Impervious Area

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

Summary for Subcatchment 2S: Back & Side Yards

Runoff = 0.29 cfs @ 12.13 hrs, Volume= 0.035 af, Depth= 0.99"
Routed to nonexistent node 2P

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=7.58"

Area (sf)	CN	Description
18,596	39	>75% Grass cover, Good, HSG A
18,596		100.00% Pervious Area

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

Summary for Pond 1P: Infiltration Chambers

Inflow Area = 0.404 ac, 71.57% Impervious, Inflow Depth = 5.35" for 100 Year Storm event
Inflow = 2.49 cfs @ 12.09 hrs, Volume= 0.180 af
Outflow = 0.45 cfs @ 12.54 hrs, Volume= 0.180 af, Atten= 82%, Lag= 27.3 min
Discarded = 0.45 cfs @ 12.54 hrs, Volume= 0.180 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 14.07' @ 12.54 hrs Surf.Area= 1,651 sf Storage= 2,285 cf

Plug-Flow detention time= 34.4 min calculated for 0.180 af (100% of inflow)
Center-of-Mass det. time= 34.4 min (836.9 - 802.5)

Volume	Invert	Avail.Storage	Storage Description
#1	11.50'	1,588 cf	**13.00'W x 127.00'L x 3.00'H Prismatoid** 4,953 cf Overall - 983 cf Embedded = 3,970 cf x 40.0% Voids
#2	12.50'	983 cf	**Cultec R-150XLHD** x 36 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 3 rows
		2,571 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	11.50'	**8.270 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.45 cfs @ 12.54 hrs HW=14.07' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.45 cfs)

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: 6 Chapel Lane, Wareham, Mass

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)
Proprietary Catch Basins	0.80	1.00	0.80	0.20
Infiltration Chambers	0.80	0.20	0.16	0.04

Total TSS Removal = 96 %

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

Project: 6 Chapel Lane, LLC

Prepared By: G.A.F. Engineering, Inc

Date: March 14, 2023

*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

Water Quality Volume to Discharge Rate Calculation

This project specifies proprietary drainage structures in order to achieve greater than 44% TSS removal prior to discharge to the infiltration BMPs. A flow rate is required to be calculated based on the required water quality volume and total amount of impervious surface directed to the proprietary structure. The calculations are based on the standardized method developed by DEP effective October 15, 2013.

Equation: $Q = (qu)(A)(WQV)$

Where: Q = peak flow rate associated with first 1.00 inches 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 (1.00 inches in this case)

The determination of qu is based on the time of concentration and Figure 4 Table in the DEP guidance document. Both of the areas draining to the proprietary structures have a time of concentration of 6 minutes.

Water Quality Catch Basin 1:

$Q = (774)(0.000104)(1.00) = 0.08$ cfs

Water Quality Catch Basin 2:

$Q = (774)(0.000183)(1.00) = 0.14$ cfs

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Water Quality Volume Calculation

Required Water Quality Depth = 1.0 inch volume from paved surfaces.

Pavement Area to Cultec System Pond 1P = 8,000 sf

WQV = 8,000 sf x 1.0 in x 1 ft/12 in = 667 cf

Volume Available in System = 2,571 cf (HydroCAD)

2,571 cf > 667 cf OK

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Required Recharge Volume Calculation

Chamber System

Total Impervious Area to Chamber System Pond 1 = 12,584 sf

Required Recharge Depth = 0.6 inches (HSG A Soil)

Required Recharge Volume = 12,584 sf x 0.6"/12 = 629.2 cf

Available Storage = 2,571 cf (HydroCAD)

2,571 cf > 629.2 cf - OK

Recharge System Drawdown time (72 hours maximum for 100 year storm volume)

$$\text{Time} = \frac{\text{Storage Volume}}{(\text{Rawls Rate})\ (\text{Bottom Area})}$$

$$\text{Time} = \frac{2{,}285\ \text{cf}}{(8.27\ \text{inches/hour})\ (1\text{ft}/12\text{inches})\ (1{,}651\ \text{sf})}$$

= 2.0 hours < 72 hours – OK

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March 14, 2023
G.A.F. Job No.: 20-9499

Groundwater Mounding Calculations

Groundwater Mounding Analysis based on a 2 inch volume 24 hour storm event.
Chamber System Exfiltration Rate entered into HydroCAD is 8.27 inches/hour for HSG A soils.

Infiltration Chambers

Discarded Storm Volume = 0.020 acre-feet
Bottom Area = 1,651 square feet
Duration of Exfiltration = 13.25 hours (Hydrograph)

Calculate the infiltrated volume of runoff to a rate in feet per day

0.020 af x 43,560 sf/acre = 871.2 cf

871.2 cf ÷ 1,651 sf = 0.53 feet

0.53 feet ÷ 13.25 hours x 24 hours/day = 0.96 feet/day

Using the Hantush calculator input R = 0.96 feet/day and K = 9.60 feet/day

Groundwater Mound = 0.68 feet at the center of the basin

Summary for Pond 1P: Infiltration Chambers

Inflow Area = 0.404 ac, 71.57% Impervious, Inflow Depth = 0.60" for Two Inch Storm event
Inflow = 0.27 cfs @ 12.10 hrs, Volume= 0.020 af
Outflow = 0.26 cfs @ 12.11 hrs, Volume= 0.020 af, Atten= 2%, Lag= 1.0 min
Discarded = 0.26 cfs @ 12.11 hrs, Volume= 0.020 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 11.52' @ 12.11 hrs Surf.Area= 1,651 sf Storage= 16 cf

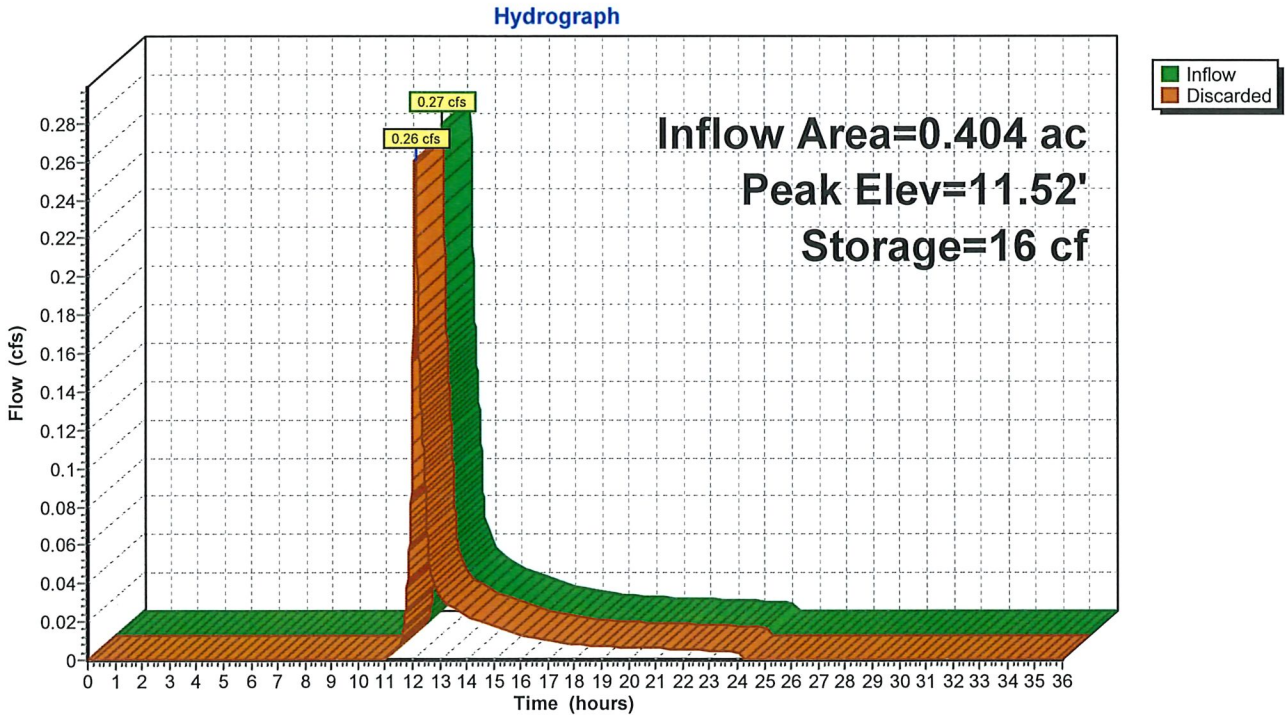
Plug-Flow detention time= 1.0 min calculated for 0.020 af (100% of inflow)
Center-of-Mass det. time= 1.0 min (867.4 - 866.4)

Volume	Invert	Avail.Storage	Storage Description
#1	11.50'	1,588 cf	**13.00'W x 127.00'L x 3.00'H Prismatoid** 4,953 cf Overall - 983 cf Embedded = 3,970 cf x 40.0% Voids
#2	12.50'	983 cf	**Cultec R-150XLHD** x 36 Inside #1 Effective Size= 29.8"W x 18.0"H => 2.65 sf x 10.25'L = 27.2 cf Overall Size= 33.0"W x 18.5"H x 11.00'L with 0.75' Overlap Row Length Adjustment= +0.75' x 2.65 sf x 3 rows
		2,571 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	11.50'	**8.270 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.32 cfs @ 12.11 hrs HW=11.52' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.32 cfs)

Pond 1P: Infiltration Chambers



This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
0.9600	*R*	**Recharge (infiltration) rate (feet/day)**
0.200	Sy	**Specific yield, Sy (dimensionless, between 0 and 1)**
9.60	K	**Horizontal hydraulic conductivity, Kh (feet/day)***
6.500	x	**1/2 length of basin (x direction, in feet)**
63.500	y	**1/2 width of basin (y direction, in feet)**
1.000	t	**duration of infiltration period (days)**
40.000	hi(0)	**initial thickness of saturated zone (feet)**

40.678	h(max)	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.678	Δh(max)	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Conversion Table

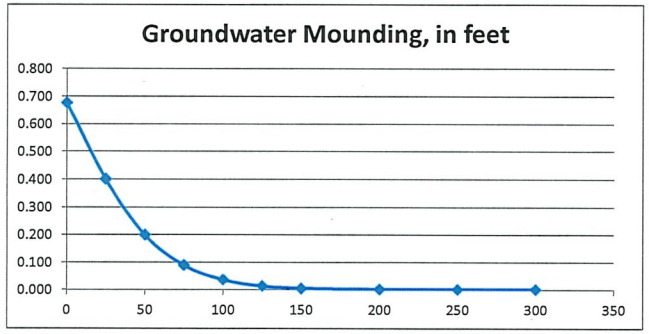
inch/hour	feet/day
0.67	1.33
2.00	4.00

hours	days
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
0.678	0
0.402	25
0.200	50
0.090	75
0.037	100
0.014	125
0.005	150
0.002	200
0.002	250
0.002	300

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

Construction Period Pollution Prevention and

Erosion & Sedimentation Control Plan

Narrative: This project consists of the construction of three two-family dwellings with associated access drive, parking lot, utilities, and stormwater management system.

Responsible Parties: The site contractor and owner.

Construction Period Operation / Maintenance Plan:

- Provide sufficient refuse containers and empty as needed.
- Inspect erosion controls daily. Repair or replace as needed.
- Police the area for safety hazards and trash on a daily basis.
- Store materials away from drainage and resource areas.
- Provide or receive only the materials which can be installed promptly.
- Inspect vehicles for leaks and repair or replace when necessary.
- Provide dust control with watering.
- Maintain truck runoff pads.
- Maintain an inspection log to document problem areas and corrective actions.
- Provide temporary stabilization of disturbed areas and soil stockpiles which will remain in place for more than 30 days. (erosion control fabric, mulch, hydroseed, etc.)
- Provide a contact person for complaints and notification of problems.

Construction Sequence:

- Install erosion controls per the plans.
- Install silt sacks and outlet hoods in existing catch basins.
- Clear trees, remove existing debris, foundations, slabs, and other unwanted materials.
- Conduct bulk site excavation. Remove topsoil and subsoil. Stockpile onsite.
- Excavate for building foundations.
- Install foundations and backfill.
- Install underground utilities.
- Construct housing units.
- Install sanitary sewer.
- Fill and grade the site around buildings.
- Install chamber infiltration system, catch basins, and roof drain piping.
- Remove construction entrance.
- Loam and seed the site. Install landscaping.
- Install gravel base material for parking lot and site access drives.
- Install binder course and cape cod berm.

- Install top course of pavement.
- Remove erosion controls once site is stabilized.

Maintenance Schedule:

- Erosion controls are to be inspected daily and repaired or replaced as needed.
- Trash is to be picked up daily.
- Water shall be used for dust control as needed.
- Silt sacks shall be emptied or replaced when full.
- Vehicles shall be inspected daily for any leaks and repaired or replaced as needed.

Long Term Operation and Maintenance Plan

Responsible Party: Current and Future Owners
6 Chapel Lane
Wareham, MA 02571

The property owner is responsible for the inspection, operation and maintenance of the Stormwater Management System. The manager of the facility will be provided with copies of the approved site design and as-built plans to make them aware of the locations of system components. A copy of this Operation and Maintenance (O & M) Plan should also be provided.

System Description: The drainage system consists of two primary components, Best Management Practices (BMPs), which collect, treat, and infiltrate stormwater runoff from all storm events up to and including the 100 year storm event. Paved areas are graded to proprietary catch basins located at the low points on the west side of each entrance drive. These units provide the necessary pretreatment prior to discharge to the storage and infiltration system. The infiltration system consists of Cultec Recharger 150XLHD leaching chambers surrounded by crushed stone. The roof runoff from the buildings does not require pretreatment and is piped directly into the leaching chambers.

Parking Lot Sweeping: Parking lot sweeping is an effective non-structural source control that will remove sediment from paved surfaces. Parking lot sweeping should be done with a high efficiency vacuum sweeper or regenerative air sweeper. Parking lot sweeping should be done twice per year. Once removed from paved surfaces, the sweepings must be handled and disposed of properly in one of the ways approved by MassDEP. (See Policy #BAW-18-001: Reuse and Disposal of Street Sweepings)

Proprietary Catch Basins: Proprietary catch basins are underground drainage structures designed to remove a greater percentage of total suspended solids when compared to traditional deep sump catch basins. They also remove trash, debris, and coarse sediment from stormwater and provide temporary spill containment for floatables such as oil and grease. Inspect the units monthly, and clean at least two times per year at the end of the foliage and snow removal seasons. Sediments must also be removed when sediment has reached the depth recommended for cleanout per the manufacturer's specifications. If there is evidence that they have been contaminated by a spill or other means, the cleanings must be evaluated in accordance with the MassDEP hazardous waste regulations, 310 CMR 30.00 and handled as hazardous waste.

Leaching Trenches and Chambers: Leaching trenches and chambers shall be inspected after every major storm event for the first few months after installation to ensure proper stabilization and function. Thereafter inspection shall occur annually. Water depth in the chambers should be observed in the inspection ports after major storms to determine proper function. Exfiltration

rates are determined by the drop in water level over the time it takes for the unit to empty. A comparison of exfiltration rate measurements taken over a period of years can provide helpful information in the event that clogging problems occur.

Public Safety Features: The drainage system frames, grates, and covers have all been specified for H20 loading. Catch basin grates are bicycle and pedestrian safe.

Operation and Maintenance Budget: The estimated annual cost for inspection and sediment removal associated with the maintenance of the Stormwater Management System is $2,500.

Reference: For full details on drainage system Construction, Operation and Maintenance refer to the current edition of the Massachusetts Stormwater Handbook.

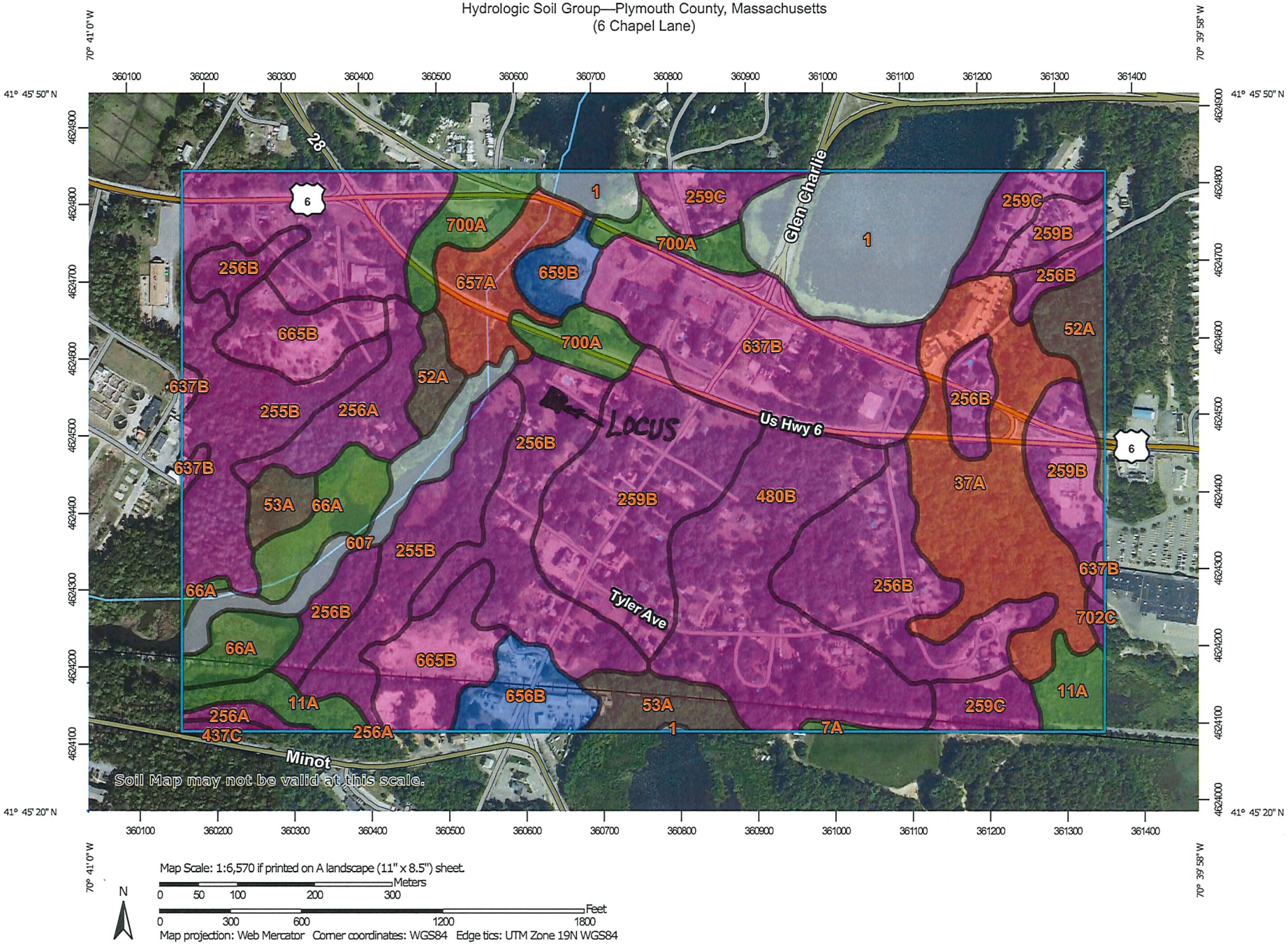
OPERATION AND MAINTENANCE LOG

This template is intended to comply with the operation and maintenance log requirements of the 2008 DEP Stormwater Management Handbook. Copies of this log should be made for all inspections and kept on file for three years from the inspection date.

Name/Company of Inspector:
Date/Time of Inspection:
Weather Conditions: (Note current weather and any recent precipitation events)

Stormwater BMP	Inspection Observations	Actions Required

Hydrologic Soil Group—Plymouth County, Massachusetts
(6 Chapel Lane)



Map Scale: 1:6,570 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 300 600 1200 1800

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 Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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 1:12,000.

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: Plymouth County, Massachusetts
Survey Area Data: Version 15, Sep 9, 2022

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

Date(s) aerial images were photographed: Dec 31, 2009—Oct 9, 2020

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Water		14.2	6.6%
7A	Rainberry coarse sand, 0 to 3 percent slopes, sanded surface	A/D	0.3	0.1%
11A	Rainberry coarse sand, 0 to 3 percent slopes	A/D	4.4	2.0%
37A	Massasoit - Mashpee complex, 0 to 3 percent slopes	D	16.6	7.7%
52A	Freetown muck, 0 to 1 percent slopes	B/D	4.7	2.2%
53A	Freetown muck, ponded, 0 to 1 percent slopes	B/D	4.8	2.2%
66A	Ipswich - Pawcatuck - Matunuck complex, 0 to 2 percent slopes, very frequently flooded	A/D	6.6	3.1%
255B	Windsor loamy sand, 3 to 8 percent slopes	A	29.1	13.5%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	A	5.6	2.6%
256B	Deerfield loamy fine sand, 3 to 8 percent slopes	A	29.8	13.8%
259B	Carver loamy coarse sand, 3 to 8 percent slopes	A	21.3	9.9%
259C	Carver loamy coarse sand, 8 to 15 percent slopes	A	7.8	3.6%
437C	Plymouth loamy coarse sand, 8 to 15 percent slopes, bouldery	A	0.4	0.2%
480B	Plymouth - Carver complex, 3 to 8 percent slopes	A	18.6	8.7%
607	Water, saline		4.7	2.2%
637B	Carver - Urban land complex, 0 to 8 percent slopes	A	17.2	8.0%
656B	Udorthents - Urban land complex, 0 to 8 percent slopes	B	3.8	1.7%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
657A	Aquepts, 0 to 3 percent slopes	D	5.4	2.5%
659B	Udorthents, 0 to 8 percent slopes, gravelly	B	2.1	1.0%
665B	Udipsamments, 0 to 8 percent slopes	A	9.8	4.6%
700A	Udipsamments, wet substratum, 0 to 3 percent slopes	A/D	7.8	3.6%
702C	Udipsamments, 8 to 15 percent slopes	A	0.3	0.1%
Totals for Area of Interest			**215.4**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

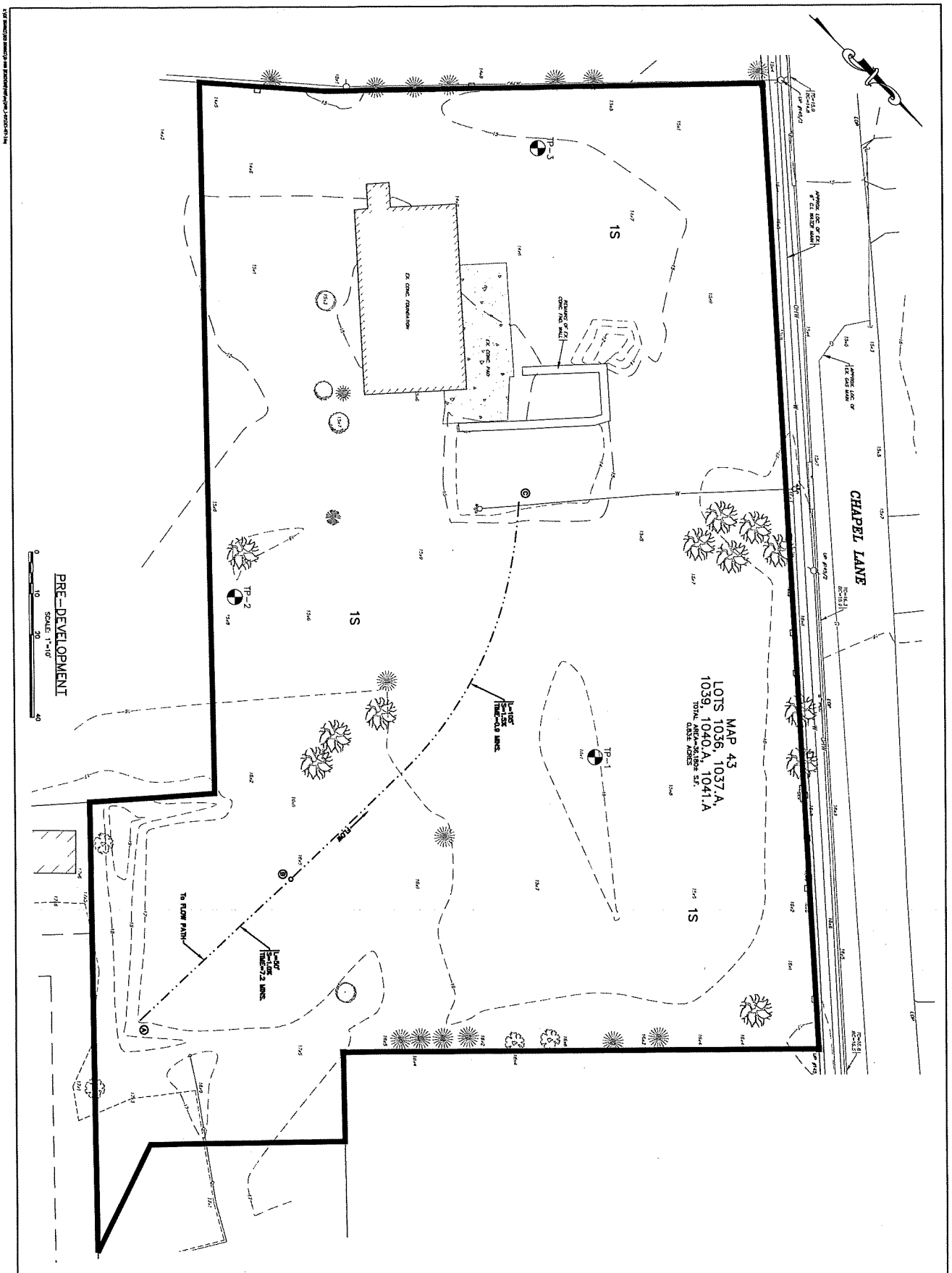
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

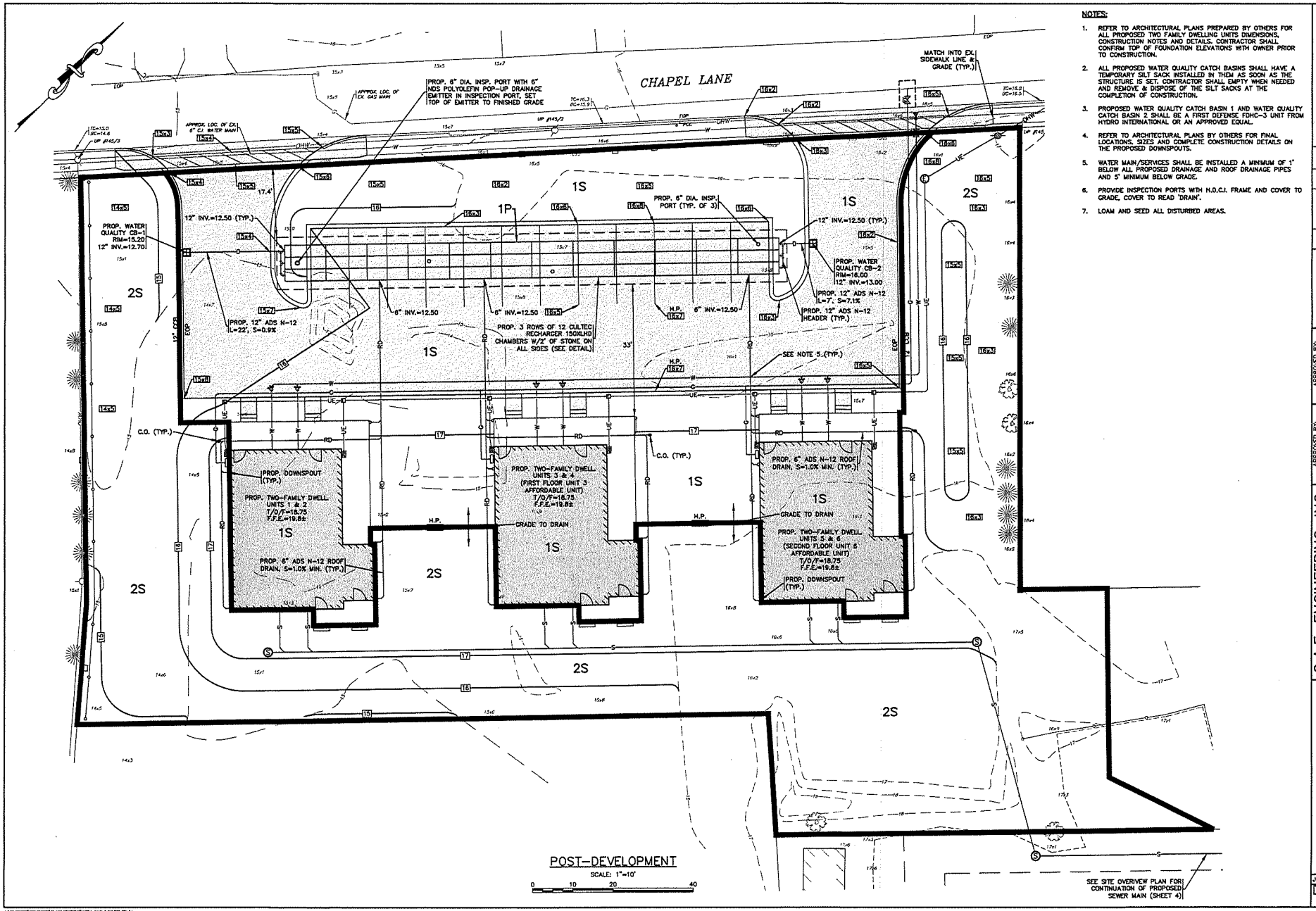
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



DWG. 1 OF 2	JOB NO.: 20-9499	PRE-DEVELOPMENT WATERSHED PLAN 6 CHAPEL LANE WAREHAM, MA PREPARED FOR: 6 CHAPEL LANE, LLC 19 DEPOT STREET WAREHAM, MA	G.A.F. ENGINEERING, INC. PROFESSIONAL ENGINEERS & LAND SURVEYORS 266 MAIN STREET – WAREHAM, MA 02571 TEL: (508) 295-6600 FAX: (508) 295-6634 E-MAIL: info@gafengnc.com COPYRIGHT © 2022 G.A.F. ENGINEERING, INC. NO PART OF THIS DOCUMENT MAY BE REPRODUCED, STORED, OR TRANSMITTED BY ANY MEANS, ELECTRONIC AND/OR MECHANICAL PHOTOCOPYING, WHAT SOEVER, WITHOUT THE EXPRESS WRITTEN CONSENT OF G.A.F. ENGINEERING, INC. WITH THE EXCEPTION OF ANY REGULATORY AUTHORITY WHICH MAY REPRODUCE IT IN CONJUNCTION WITH THE PERFORMANCE OF OFFICIAL BUSINESS UNDER ITS JURISDICTION. ANY MODIFICATIONS MADE TO THIS DOCUMENT WITHOUT THE EXPRESS WRITTEN CONSENT OF G.A.F. ENGINEERING, INC. SHALL RENDER IT UNUSABLE.	APPROVED BY:	APPROVED BY:	DATE: NOV. 14, 2022 DRAWN BY: JMP CHECKED BY: RJR JOB NO.: 20-9499 SCALE: 1" = 10'	1	3/14/23	JMP	WFM	NO CHANGE THIS SHEET
						REV.	DATE	BY	APP'D	DESCRIPTION



POST-DEVELOPMENT

SCALE: 1"=10'

0 10 20 40

NOTES:

1. REFER TO ARCHITECTURAL PLANS PREPARED BY OTHERS FOR ALL PROPOSED TWO FAMILY DWELLING UNITS DIMENSIONS, CONSTRUCTION NOTES AND DETAILS. CONTRACTOR SHALL CONFIRM TOP OF FOUNDATION ELEVATIONS WITH OWNER PRIOR TO CONSTRUCTION.
2. ALL PROPOSED WATER QUALITY CATCH BASINS SHALL HAVE A TEMPORARY SILT SACK INSTALLED IN THEM AS SOON AS THE STRUCTURE IS SET. CONTRACTOR SHALL EMPTY WHEN NEEDED AND REMOVE & DISPOSE OF THE SILT SACKS AT THE COMPLETION OF CONSTRUCTION.
3. PROPOSED WATER QUALITY CATCH BASIN 1 AND WATER QUALITY CATCH BASIN 2 SHALL BE A FIRST DEFENSE FDHC-3 UNIT FROM HYDRO INTERNATIONAL OR AN APPROVED EQUAL.
4. REFER TO ARCHITECTURAL PLANS BY OTHERS FOR FINAL LOCATIONS, SIZES AND COMPLETE CONSTRUCTION DETAILS ON THE PROPOSED DOWNSPOUTS.
5. WATER MAIN/SERVICES SHALL BE INSTALLED A MINIMUM OF 1' BELOW ALL PROPOSED DRAINAGE AND ROOF DRAINAGE PIPES AND 5' MINIMUM BELOW GRADE.
6. PROVIDE INSPECTION PORTS WITH H.D.C.I. FRAME AND COVER TO GRADE, COVER TO READ 'DRAIN'.
7. LOAM AND SEED ALL DISTURBED AREAS.

REV.	DATE	BY	APP'D	DESCRIPTION
1	3/14/23	JMP	WDJ	PER INITIAL PEER REVIEW/SITE PLAN LAYOUT

DATE: NOV. 14, 2022
DRAWN BY: JMP
CHECKED BY: RJR
JOB NO.: 20-9499
SCALE: 1" = 10'

APPROVED BY:

APPROVED BY:

G.A.F. ENGINEERING, INC.
PROFESSIONAL ENGINEERS & LAND SURVEYORS
266 MAIN STREET - WAREHAM, MA 02571
TEL: (508) 295-4600 FAX: (508) 295-6634

POST-DEVELOPMENT
WATERSHED PLAN

8 CHAPEL LANE WAREHAM, MA

PREPARED FOR:

6 CHAPEL LANE, LLC

19 DEPOT STREET WAREHAM, MA

JOB NO.: 20-9499

DWG. 2 OF 2