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STORMWATER REPORT

For

"176 Main Street Site Development"

176 Main Street
Wareham, MA

Prepared for

Warren 176 Main St QOZB, LLC
18 Church Street
Carver, MA 02366

Prepared by

G.A.F. Engineering, Inc.
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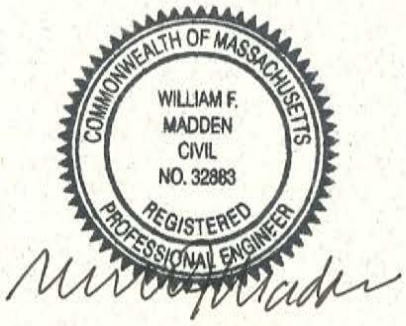

July 18, 2023
G.A.F. Job No.: 22-9822

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DRAINAGE NARRATIVE

General Description

This project consists of site alterations and improvements to allow the conversion of the existing facility for use as a restaurant. The area to the west of the building in the rear is proposed to be constructed with a crushed stone parking lot and stormwater management system. This area was previously used as gravel surfaced equipment storage area. Alterations to the site in front of the building consist of the installation of a grease trap for kitchen waste and re-striping of the paved parking lot.

A more detailed description of the project is outlined in the Project Narrative and Impacts Analysis document included with the Site Plan Review submittal.

Existing Conditions

Drainage from the subject lot and two adjacent up-gradient residential lots drain from west to east into Main Street. The existing drainage system consists of a crushed stone drainage trench which was installed in front of a landscaping area perpendicular and adjacent to Main Street. The total watershed area from the subject lot and up-gradient properties is 1.315 acres,

Soils as mapped by the USDA Natural Resources Conservation Service consist of Montauk-Urban land complex (636B), 0 to 8 percent slopes. These soils have a Hydrologic soil group (HSG) rating "C".

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 consists of a deep sump hooded catch basin which discharges to four interconnected leaching pits installed and surrounded by crushed stone. In infiltration rate of 0.27 inches/hour was used in the calculations consistent with HSG "C" soils.

Roof drains from the rear portion of the existing building will be connected to the new catch basin. The leaching pits are inter-connected. There is a six-inch outlet pipe set as high as possible out of the last pit on the south end of the system. This pipe is the initial overflow from the system. It will be installed along the south side of the building where it will be connected to a header pipe with three six-inch pop-up emitters.

In the event that severe storms inundate the system, stormwater will discharge along the north side of the building and flow into Main Street. This condition is modeled as a broad crested rectangular weir in the pond outlet calculations.

Drainage Summary

Table 1 – Pre-Development vs. Post-Development to Main Street (1S/1L)

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	2.78	0.207	1.79	0.193	-0.99	-0.014
10 yr	4.85	0.363	2.52	0.349	-2.33	-0.014
25 yr	6.16	0.465	3.77	0.450	-2.39	-0.015
100 yr	8.17	0.625	7.18	0.609	-0.99	-0.016

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.

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.

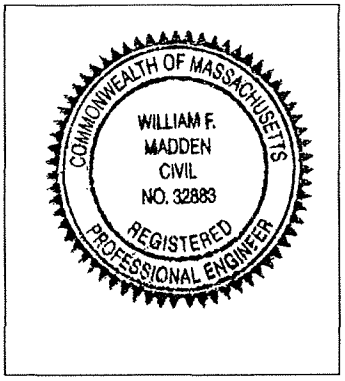
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the 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 7/19/23
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 a deep sump catch basin and leaching pits for the new crushed stone parking area behind the existing building. The*

combination of the catch basin and leaching pits provides 85% 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 a mix of new development and redevelopment. Impervious surfaces are being minimized for the new development portion of the project by specifying crushed stone parking in back of the existing building. Full compliance is provided for all of the Stormwater Management Standards for the new development project components.*

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: 7/6/23

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 commercial development located at 176 Main Street, Lot 1113 on Assessors Map 47.

Danny Warren

Warren 176 Main St QOZB, LLC

Existing Lots

Subcat Reach Pond Link

Routing Diagram for 9822 PRE
Prepared by GAF Engineering, Inc, Printed 7/19/2023
HydroCAD® 10.20-3c s/n 02319 © 2023 HydroCAD Software Solutions LLC

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	5.05	2
3	25 Year Storm	Type III 24-hr		Default	24.00	1	6.05	2
4	100 Year Storm	Type III 24-hr		Default	24.00	1	7.59	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.419	74	>75% Grass cover, Good, HSG C (1S)
0.132	98	Building Roof (1S)
0.552	83	Lot 1053 & 1054, 38% imp, HSG C (1S)
0.212	98	Pavement (1S)
1.315	**84**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.971	HSG C	1S
0.000	HSG D	
0.344	Other	1S
1.315		**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
0.000	0.000	0.419	0.000	0.000	0.419	>75% Grass cover, Good	1S
0.000	0.000	0.000	0.000	0.132	0.132	Building Roof	1S
0.000	0.000	0.552	0.000	0.000	0.552	Lot 1053 & 1054, 38% imp	1S
0.000	0.000	0.000	0.000	0.212	0.212	Pavement	1S
0.000	**0.000**	**0.971**	**0.000**	**0.344**	**1.315**	**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: Existing Lots Runoff Area=57,280 sf 42.11% Impervious Runoff Depth=1.89"
Flow Length=512' Tc=7.3 min CN=84 Runoff=2.78 cfs 0.207 af

Total Runoff Area = 1.315 ac Runoff Volume = 0.207 af Average Runoff Depth = 1.89"
57.89% Pervious = 0.761 ac 42.11% Impervious = 0.554 ac

Summary for Subcatchment 1S: Existing Lots

Runoff = 2.78 cfs @ 12.11 hrs, Volume= 0.207 af, Depth= 1.89"

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
*	24,064	83	Lot 1053 & 1054, 38% imp, HSG C
*	5,752	98	Building Roof
*	9,224	98	Pavement
	18,240	74	>75% Grass cover, Good, HSG C
	57,280	84	Weighted Average
	33,160		57.89% Pervious Area
	24,120		42.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
1.5	362	0.0640	4.07		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.4	100	0.0390	4.01		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.3	512	Total			

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: Existing Lots Runoff Area=57,280 sf 42.11% Impervious Runoff Depth=3.32"
Flow Length=512' Tc=7.3 min CN=84 Runoff=4.85 cfs 0.363 af

Total Runoff Area = 1.315 ac Runoff Volume = 0.363 af Average Runoff Depth = 3.32"
57.89% Pervious = 0.761 ac 42.11% Impervious = 0.554 ac

Summary for Subcatchment 1S: Existing Lots

Runoff = 4.85 cfs @ 12.10 hrs, Volume= 0.363 af, Depth= 3.32"

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=5.05"

	Area (sf)	CN	Description
*	24,064	83	Lot 1053 & 1054, 38% imp, HSG C
*	5,752	98	Building Roof
*	9,224	98	Pavement
	18,240	74	>75% Grass cover, Good, HSG C
	57,280	84	Weighted Average
	33,160		57.89% Pervious Area
	24,120		42.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
1.5	362	0.0640	4.07		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.4	100	0.0390	4.01		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.3	512	Total			

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: Existing Lots Runoff Area=57,280 sf 42.11% Impervious Runoff Depth=4.24"
Flow Length=512' Tc=7.3 min CN=84 Runoff=6.16 cfs 0.465 af

Total Runoff Area = 1.315 ac Runoff Volume = 0.465 af Average Runoff Depth = 4.24"
57.89% Pervious = 0.761 ac 42.11% Impervious = 0.554 ac

Summary for Subcatchment 1S: Existing Lots

Runoff = 6.16 cfs @ 12.10 hrs, Volume= 0.465 af, Depth= 4.24"

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=6.05"

	Area (sf)	CN	Description
*	24,064	83	Lot 1053 & 1054, 38% imp, HSG C
*	5,752	98	Building Roof
*	9,224	98	Pavement
	18,240	74	>75% Grass cover, Good, HSG C
	57,280	84	Weighted Average
	33,160		57.89% Pervious Area
	24,120		42.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
1.5	362	0.0640	4.07		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.4	100	0.0390	4.01		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.3	512	Total			

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: Existing Lots Runoff Area=57,280 sf 42.11% Impervious Runoff Depth=5.70"
Flow Length=512' Tc=7.3 min CN=84 Runoff=8.17 cfs 0.625 af

Total Runoff Area = 1.315 ac Runoff Volume = 0.625 af Average Runoff Depth = 5.70"
57.89% Pervious = 0.761 ac 42.11% Impervious = 0.554 ac

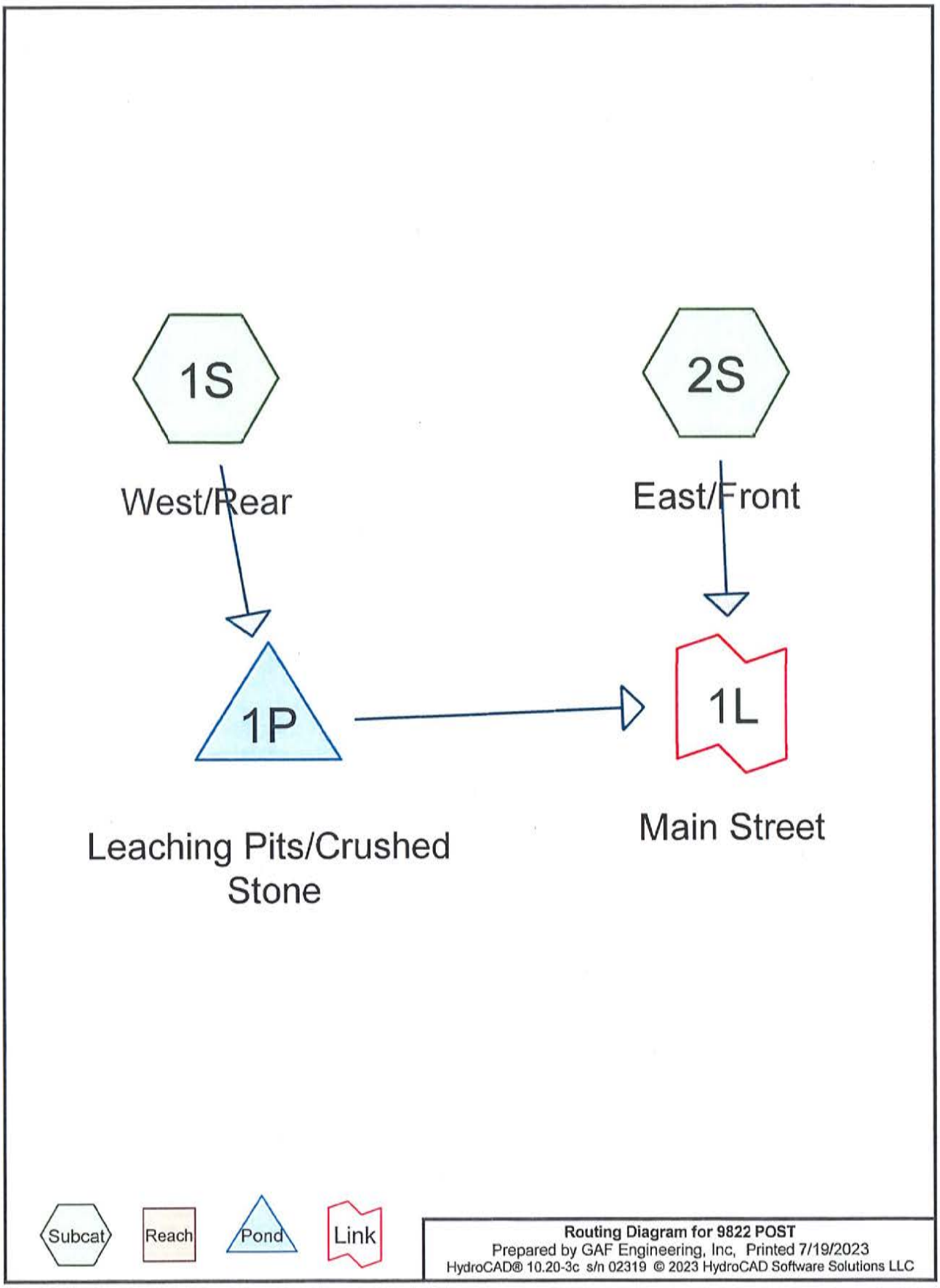
Summary for Subcatchment 1S: Existing Lots

Runoff = 8.17 cfs @ 12.10 hrs, Volume= 0.625 af, Depth= 5.70"

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=7.59"

	Area (sf)	CN	Description
*	24,064	83	Lot 1053 & 1054, 38% imp, HSG C
*	5,752	98	Building Roof
*	9,224	98	Pavement
	18,240	74	>75% Grass cover, Good, HSG C
	57,280	84	Weighted Average
	33,160		57.89% Pervious Area
	24,120		42.11% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
1.5	362	0.0640	4.07		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.4	100	0.0390	4.01		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
7.3	512	Total			



Routing Diagram for 9822 POST
Prepared by GAF Engineering, Inc, Printed 7/19/2023
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Project Notes

Rainfall events imported from "9822 PRE.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	5.05	2
3	25 Year Storm	Type III 24-hr		Default	24.00	1	6.05	2
4	100 Year Storm	Type III 24-hr		Default	24.00	1	7.59	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.252	74	>75% Grass cover, Good, HSG C (1S, 2S)
0.088	98	Building Roof (1S)
0.008	98	Crushed Stone Access (2S)
0.118	98	Crushed stone parking & access (1S)
0.552	83	Lot 1053 & 1054, 38% imp, HSG C (1S)
0.034	98	Pavement & Cement pads (1S)
0.219	98	Pavement & Concrete Steps (2S)
0.044	98	Roof (2S)
1.315	**87**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.804	HSG C	1S, 2S
0.000	HSG D	
0.511	Other	1S, 2S
1.315		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchm Numbers
0.000	0.000	0.252	0.000	0.000	0.252	>75% Grass cover, Good	1S, 2S
0.000	0.000	0.000	0.000	0.088	0.088	Building Roof	1S
0.000	0.000	0.000	0.000	0.008	0.008	Crushed Stone Access	2S
0.000	0.000	0.000	0.000	0.118	0.118	Crushed stone parking & access	1S
0.000	0.000	0.552	0.000	0.000	0.552	Lot 1053 & 1054, 38% imp	1S
0.000	0.000	0.000	0.000	0.034	0.034	Pavement & Cement pads	1S
0.000	0.000	0.000	0.000	0.219	0.219	Pavement & Concrete Steps	2S
0.000	0.000	0.000	0.000	0.044	0.044	Roof	2S
0.000	**0.000**	**0.804**	**0.000**	**0.511**	**1.315**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Nam
1	1P	9.30	7.53	177.0	0.0100	0.012	0.0	6.0	0.0	

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: West/Rear Runoff Area=40,730 sf 47.99% Impervious Runoff Depth=1.96"
Flow Length=242' Tc=6.0 min CN=85 Runoff=2.15 cfs 0.153 af

Subcatchment 2S: East/Front Runoff Area=16,550 sf 71.58% Impervious Runoff Depth=2.48"
Tc=6.0 min CN=91 Runoff=1.08 cfs 0.079 af

Pond 1P: Leaching Pits/Crushed Stone Peak Elev=11.85' Storage=3,084 cf Inflow=2.15 cfs 0.153 af
Discarded=0.02 cfs 0.022 af Primary=0.42 cfs 0.084 af Outflow=0.44 cfs 0.105 af

Link 1L: Main Street Inflow=1.08 cfs 0.163 af
Primary=1.08 cfs 0.163 af

Total Runoff Area = 1.315 ac Runoff Volume = 0.232 af Average Runoff Depth = 2.11"
45.19% Pervious = 0.594 ac 54.81% Impervious = 0.721 ac

Summary for Subcatchment 1S: West/Rear

Runoff = 2.15 cfs @ 12.09 hrs, Volume= 0.153 af, Depth= 1.96"
Routed to Pond 1P : Leaching Pits/Crushed Stone

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
*	24,064	83	Lot 1053 & 1054, 38% imp, HSG C
*	3,818	98	Building Roof
*	1,461	98	Pavement & Cement pads
*	5,124	98	Crushed stone parking & access
	6,263	74	>75% Grass cover, Good, HSG C
	40,730	85	Weighted Average
	21,183		52.01% Pervious Area
	19,547		47.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.6	192	0.1150	5.46		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.0	242	Total			

Summary for Subcatchment 2S: East/Front

Runoff = 1.08 cfs @ 12.09 hrs, Volume= 0.079 af, Depth= 2.48"
Routed to Link 1L : Main Street

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
*	1,934	98	Roof
*	9,548	98	Pavement & Concrete Steps
*	365	98	Crushed Stone Access
	4,703	74	>75% Grass cover, Good, HSG C
	16,550	91	Weighted Average
	4,703		28.42% Pervious Area
	11,847		71.58% Impervious Area

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

Summary for Pond 1P: Leaching Pits/Crushed Stone

Inflow Area = 0.935 ac, 47.99% Impervious, Inflow Depth = 1.96" for 2 Year Storm event
Inflow = 2.15 cfs @ 12.09 hrs, Volume= 0.153 af
Outflow = 0.44 cfs @ 12.53 hrs, Volume= 0.105 af, Atten= 79%, Lag= 26.5 min
Discarded = 0.02 cfs @ 12.53 hrs, Volume= 0.022 af
Primary = 0.42 cfs @ 12.53 hrs, Volume= 0.084 af
Routed to Link 1L : Main Street

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 11.85' @ 12.53 hrs Surf.Area= 2,743 sf Storage= 3,084 cf

Plug-Flow detention time= 256.0 min calculated for 0.105 af (69% of inflow)
Center-of-Mass det. time= 158.8 min (981.7 - 822.9)

Volume	Invert	Avail.Storage	Storage Description
#1	11.50'	3,393 cf	**Custom Stage Data (Conic)** Listed below (Recalc)
#2	3.00'	1,896 cf	**14.00'W x 46.00'L x 8.50'H Crushed Stone** 5,474 cf Overall - 735 cf Embedded = 4,739 cf x 40.0% Voids
#3	4.00'	735 cf	**6.00'D x 6.50'H Leaching Pits** x 4 Inside #2
		6,024 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
11.50	650	0	0	650
12.00	3,000	841	841	3,001
12.50	3,950	1,732	2,573	3,957
12.70	4,250	820	3,393	4,260

Device	Routing	Invert	Outlet Devices
#1	Primary	12.30'	**5.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	10.90'	**6" Emitters X 3.00** 6.000" Diameter, C= 0.600 3.4' Long Tube, Hazen-Williams C= 130 Inlet / Outlet Elev. = 7.53' / 10.90'
#3	Device 2	9.30'	**6.0" Round Culvert** L= 177.0' Ke= 0.500 Inlet / Outlet Invert= 9.30' / 7.53' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#4	Discarded	3.00'	**0.270 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.02 cfs @ 12.53 hrs HW=11.85' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.42 cfs @ 12.53 hrs HW=11.85' (Free Discharge)
├**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└**2=6" Emitters** (Passes 0.42 cfs of 2.69 cfs potential flow)
└**3=Culvert** (Outlet Controls 0.42 cfs @ 2.13 fps)

Summary for Link 1L: Main Street

Inflow Area = 1.315 ac, 54.81% Impervious, Inflow Depth = 1.48" for 2 Year Storm event
Inflow = 1.08 cfs @ 12.09 hrs, Volume= 0.163 af
Primary = 1.08 cfs @ 12.09 hrs, Volume= 0.163 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

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: West/Rear Runoff Area=40,730 sf 47.99% Impervious Runoff Depth=3.41"
Flow Length=242' Tc=6.0 min CN=85 Runoff=3.70 cfs 0.266 af

Subcatchment 2S: East/Front Runoff Area=16,550 sf 71.58% Impervious Runoff Depth=4.03"
Tc=6.0 min CN=91 Runoff=1.72 cfs 0.128 af

Pond 1P: Leaching Pits/Crushed Stone Peak Elev=12.44' Storage=4,979 cf Inflow=3.70 cfs 0.266 af
Discarded=0.03 cfs 0.026 af Primary=1.28 cfs 0.192 af Outflow=1.31 cfs 0.218 af

Link 1L: Main Street Inflow=2.18 cfs 0.320 af
Primary=2.18 cfs 0.320 af

Total Runoff Area = 1.315 ac Runoff Volume = 0.394 af Average Runoff Depth = 3.59"
45.19% Pervious = 0.594 ac 54.81% Impervious = 0.721 ac

Summary for Subcatchment 1S: West/Rear

Runoff = 3.70 cfs @ 12.09 hrs, Volume= 0.266 af, Depth= 3.41"
Routed to Pond 1P : Leaching Pits/Crushed Stone

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=5.05"

	Area (sf)	CN	Description
*	24,064	83	Lot 1053 & 1054, 38% imp, HSG C
*	3,818	98	Building Roof
*	1,461	98	Pavement & Cement pads
*	5,124	98	Crushed stone parking & access
	6,263	74	>75% Grass cover, Good, HSG C
	40,730	85	Weighted Average
	21,183		52.01% Pervious Area
	19,547		47.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.6	192	0.1150	5.46		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.0	242	Total			

Summary for Subcatchment 2S: East/Front

Runoff = 1.72 cfs @ 12.08 hrs, Volume= 0.128 af, Depth= 4.03"
Routed to Link 1L : Main Street

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=5.05"

	Area (sf)	CN	Description
*	1,934	98	Roof
*	9,548	98	Pavement & Concrete Steps
*	365	98	Crushed Stone Access
	4,703	74	>75% Grass cover, Good, HSG C
	16,550	91	Weighted Average
	4,703		28.42% Pervious Area
	11,847		71.58% Impervious Area

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

Summary for Pond 1P: Leaching Pits/Crushed Stone

Inflow Area = 0.935 ac, 47.99% Impervious, Inflow Depth = 3.41" for 10 Year Storm event
Inflow = 3.70 cfs @ 12.09 hrs, Volume= 0.266 af
Outflow = 1.31 cfs @ 12.36 hrs, Volume= 0.218 af, Atten= 65%, Lag= 16.6 min
Discarded = 0.03 cfs @ 12.36 hrs, Volume= 0.026 af
Primary = 1.28 cfs @ 12.36 hrs, Volume= 0.192 af
Routed to Link 1L : Main Street

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 12.44' @ 12.36 hrs Surf.Area= 4,478 sf Storage= 4,979 cf

Plug-Flow detention time= 179.6 min calculated for 0.218 af (82% of inflow)
Center-of-Mass det. time= 108.1 min (915.2 - 807.1)

Volume	Invert	Avail.Storage	Storage Description
#1	11.50'	3,393 cf	**Custom Stage Data (Conic)** Listed below (Recalc)
#2	3.00'	1,896 cf	**14.00'W x 46.00'L x 8.50'H Crushed Stone** 5,474 cf Overall - 735 cf Embedded = 4,739 cf x 40.0% Voids
#3	4.00'	735 cf	**6.00'D x 6.50'H Leaching Pits** x 4 Inside #2
		6,024 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
11.50	650	0	0	650
12.00	3,000	841	841	3,001
12.50	3,950	1,732	2,573	3,957
12.70	4,250	820	3,393	4,260

Device	Routing	Invert	Outlet Devices
#1	Primary	12.30'	**5.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	10.90'	**6" Emitters X 3.00** 6.000" Diameter, C= 0.600 3.4' Long Tube, Hazen-Williams C= 130 Inlet / Outlet Elev. = 7.53' / 10.90'
#3	Device 2	9.30'	**6.0" Round Culvert** L= 177.0' Ke= 0.500 Inlet / Outlet Invert= 9.30' / 7.53' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#4	Discarded	3.00'	**0.270 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.03 cfs @ 12.36 hrs HW=12.44' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=1.25 cfs @ 12.36 hrs HW=12.44' (Free Discharge)
├**1=Broad-Crested Rectangular Weir** (Weir Controls 0.72 cfs @ 1.01 fps)
└**2=6" Emitters** (Passes 0.53 cfs of 3.44 cfs potential flow)
└**3=Culvert** (Outlet Controls 0.53 cfs @ 2.72 fps)

Summary for Link 1L: Main Street

Inflow Area = 1.315 ac, 54.81% Impervious, Inflow Depth = 2.92" for 10 Year Storm event
Inflow = 2.18 cfs @ 12.09 hrs, Volume= 0.320 af
Primary = 2.18 cfs @ 12.09 hrs, Volume= 0.320 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

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: West/Rear Runoff Area=40,730 sf 47.99% Impervious Runoff Depth=4.35"
Flow Length=242' Tc=6.0 min CN=85 Runoff=4.68 cfs 0.339 af

Subcatchment 2S: East/Front Runoff Area=16,550 sf 71.58% Impervious Runoff Depth=5.01"
Tc=6.0 min CN=91 Runoff=2.11 cfs 0.159 af

Pond 1P: Leaching Pits/Crushed Stone Peak Elev=12.57' Storage=5,487 cf Inflow=4.68 cfs 0.339 af
Discarded=0.04 cfs 0.028 af Primary=2.47 cfs 0.264 af Outflow=2.51 cfs 0.291 af

Link 1L: Main Street Inflow=3.75 cfs 0.422 af
Primary=3.75 cfs 0.422 af

Total Runoff Area = 1.315 ac Runoff Volume = 0.497 af Average Runoff Depth = 4.54"
45.19% Pervious = 0.594 ac 54.81% Impervious = 0.721 ac

Summary for Subcatchment 1S: West/Rear

Runoff = 4.68 cfs @ 12.09 hrs, Volume= 0.339 af, Depth= 4.35"
Routed to Pond 1P : Leaching Pits/Crushed Stone

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=6.05"

	Area (sf)	CN	Description
*	24,064	83	Lot 1053 & 1054, 38% imp, HSG C
*	3,818	98	Building Roof
*	1,461	98	Pavement & Cement pads
*	5,124	98	Crushed stone parking & access
	6,263	74	>75% Grass cover, Good, HSG C
	40,730	85	Weighted Average
	21,183		52.01% Pervious Area
	19,547		47.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.6	192	0.1150	5.46		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.0	242	Total			

Summary for Subcatchment 2S: East/Front

Runoff = 2.11 cfs @ 12.08 hrs, Volume= 0.159 af, Depth= 5.01"
Routed to Link 1L : Main Street

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=6.05"

	Area (sf)	CN	Description
*	1,934	98	Roof
*	9,548	98	Pavement & Concrete Steps
*	365	98	Crushed Stone Access
	4,703	74	>75% Grass cover, Good, HSG C
	16,550	91	Weighted Average
	4,703		28.42% Pervious Area
	11,847		71.58% Impervious Area

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

Summary for Pond 1P: Leaching Pits/Crushed Stone

Inflow Area = 0.935 ac, 47.99% Impervious, Inflow Depth = 4.35" for 25 Year Storm event
Inflow = 4.68 cfs @ 12.09 hrs, Volume= 0.339 af
Outflow = 2.51 cfs @ 12.22 hrs, Volume= 0.291 af, Atten= 46%, Lag= 7.8 min
Discarded = 0.04 cfs @ 12.22 hrs, Volume= 0.028 af
Primary = 2.47 cfs @ 12.22 hrs, Volume= 0.264 af
Routed to Link 1L : Main Street

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 12.57' @ 12.22 hrs Surf.Area= 4,699 sf Storage= 5,487 cf

Plug-Flow detention time= 152.7 min calculated for 0.291 af (86% of inflow)
Center-of-Mass det. time= 91.3 min (891.7 - 800.3)

Volume	Invert	Avail.Storage	Storage Description
#1	11.50'	3,393 cf	**Custom Stage Data (Conic)** Listed below (Recalc)
#2	3.00'	1,896 cf	**14.00'W x 46.00'L x 8.50'H Crushed Stone** 5,474 cf Overall - 735 cf Embedded = 4,739 cf x 40.0% Voids
#3	4.00'	735 cf	**6.00'D x 6.50'H Leaching Pits** x 4 Inside #2
		6,024 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
11.50	650	0	0	650
12.00	3,000	841	841	3,001
12.50	3,950	1,732	2,573	3,957
12.70	4,250	820	3,393	4,260

Device	Routing	Invert	Outlet Devices
#1	Primary	12.30'	**5.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	10.90'	**6" Emitters X 3.00** 6.000" Diameter, C= 0.600 3.4' Long Tube, Hazen-Williams C= 130 Inlet / Outlet Elev. = 7.53' / 10.90'
#3	Device 2	9.30'	**6.0" Round Culvert** L= 177.0' Ke= 0.500 Inlet / Outlet Invert= 9.30' / 7.53' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#4	Discarded	3.00'	**0.270 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.04 cfs @ 12.22 hrs HW=12.57' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=2.45 cfs @ 12.22 hrs HW=12.57' (Free Discharge)
├**1=Broad-Crested Rectangular Weir** (Weir Controls 1.89 cfs @ 1.40 fps)
└**2=6" Emitters** (Passes 0.56 cfs of 3.58 cfs potential flow)
└**3=Culvert** (Outlet Controls 0.56 cfs @ 2.83 fps)

Summary for Link 1L: Main Street

Inflow Area = 1.315 ac, 54.81% Impervious, Inflow Depth = 3.85" for 25 Year Storm event
Inflow = 3.75 cfs @ 12.16 hrs, Volume= 0.422 af
Primary = 3.75 cfs @ 12.16 hrs, Volume= 0.422 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

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: West/Rear Runoff Area=40,730 sf 47.99% Impervious Runoff Depth=5.82"
Flow Length=242' Tc=6.0 min CN=85 Runoff=6.17 cfs 0.453 af

Subcatchment 2S: East/Front Runoff Area=16,550 sf 71.58% Impervious Runoff Depth=6.52"
Tc=6.0 min CN=91 Runoff=2.70 cfs 0.206 af

Pond 1P: Leaching Pits/Crushed Stone Peak Elev=12.79' Storage=6,024 cf Inflow=6.17 cfs 0.453 af
Discarded=0.04 cfs 0.030 af Primary=5.28 cfs 0.374 af Outflow=5.32 cfs 0.404 af

Link 1L: Main Street Inflow=7.72 cfs 0.581 af
Primary=7.72 cfs 0.581 af

Total Runoff Area = 1.315 ac Runoff Volume = 0.660 af Average Runoff Depth = 6.02"
45.19% Pervious = 0.594 ac 54.81% Impervious = 0.721 ac

Summary for Subcatchment 1S: West/Rear

Runoff = 6.17 cfs @ 12.09 hrs, Volume= 0.453 af, Depth= 5.82"
Routed to Pond 1P : Leaching Pits/Crushed Stone

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=7.59"

	Area (sf)	CN	Description
*	24,064	83	Lot 1053 & 1054, 38% imp, HSG C
*	3,818	98	Building Roof
*	1,461	98	Pavement & Cement pads
*	5,124	98	Crushed stone parking & access
	6,263	74	>75% Grass cover, Good, HSG C
	40,730	85	Weighted Average
	21,183		52.01% Pervious Area
	19,547		47.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.44"
0.6	192	0.1150	5.46		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
6.0	242	Total			

Summary for Subcatchment 2S: East/Front

Runoff = 2.70 cfs @ 12.08 hrs, Volume= 0.206 af, Depth= 6.52"
Routed to Link 1L : Main Street

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=7.59"

	Area (sf)	CN	Description
*	1,934	98	Roof
*	9,548	98	Pavement & Concrete Steps
*	365	98	Crushed Stone Access
	4,703	74	>75% Grass cover, Good, HSG C
	16,550	91	Weighted Average
	4,703		28.42% Pervious Area
	11,847		71.58% Impervious Area

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

Summary for Pond 1P: Leaching Pits/Crushed Stone

[93] Warning: Storage range exceeded by 0.09'

Inflow Area = 0.935 ac, 47.99% Impervious, Inflow Depth = 5.82" for 100 Year Storm event
Inflow = 6.17 cfs @ 12.09 hrs, Volume= 0.453 af
Outflow = 5.32 cfs @ 12.12 hrs, Volume= 0.404 af, Atten= 14%, Lag= 2.3 min
Discarded = 0.04 cfs @ 12.12 hrs, Volume= 0.030 af
Primary = 5.28 cfs @ 12.12 hrs, Volume= 0.374 af
Routed to Link 1L : Main Street

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 12.79' @ 12.12 hrs Surf.Area= 4,894 sf Storage= 6,024 cf

Plug-Flow detention time= 129.3 min calculated for 0.404 af (89% of inflow)
Center-of-Mass det. time= 77.8 min (870.1 - 792.3)

Volume	Invert	Avail.Storage	Storage Description
#1	11.50'	3,393 cf	**Custom Stage Data (Conic)** Listed below (Recalc)
#2	3.00'	1,896 cf	**14.00'W x 46.00'L x 8.50'H Crushed Stone** 5,474 cf Overall - 735 cf Embedded = 4,739 cf x 40.0% Voids
#3	4.00'	735 cf	**6.00'D x 6.50'H Leaching Pits** x 4 Inside #2
		6,024 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
11.50	650	0	0	650
12.00	3,000	841	841	3,001
12.50	3,950	1,732	2,573	3,957
12.70	4,250	820	3,393	4,260

Device	Routing	Invert	Outlet Devices
#1	Primary	12.30'	**5.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	10.90'	**6" Emitters X 3.00** 6.000" Diameter, C= 0.600 3.4' Long Tube, Hazen-Williams C= 130 Inlet / Outlet Elev. = 7.53' / 10.90'
#3	Device 2	9.30'	**6.0" Round Culvert** L= 177.0' Ke= 0.500 Inlet / Outlet Invert= 9.30' / 7.53' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf
#4	Discarded	3.00'	**0.270 in/hr Exfiltration over Wetted area**

Discarded OutFlow Max=0.04 cfs @ 12.12 hrs HW=12.79' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=5.09 cfs @ 12.12 hrs HW=12.78' (Free Discharge)
├**1=Broad-Crested Rectangular Weir** (Weir Controls 4.50 cfs @ 1.87 fps)
└**2=6" Emitters** (Passes 0.59 cfs of 3.80 cfs potential flow)
└**3=Culvert** (Outlet Controls 0.59 cfs @ 3.00 fps)

Summary for Link 1L: Main Street

Inflow Area = 1.315 ac, 54.81% Impervious, Inflow Depth = 5.30" for 100 Year Storm event
Inflow = 7.72 cfs @ 12.12 hrs, Volume= 0.581 af
Primary = 7.72 cfs @ 12.12 hrs, Volume= 0.581 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: 176 Main Street, Wareham, Mass

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Infiltration Trench	0.80	0.75	0.60	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15
	0.00	0.15	0.00	0.15

Total TSS Removal = 85%

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

Project: Barcade Warren QOZB, LLC

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

Date: 18-Jul-23

*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 Calculation

Required Water Quality Depth = 0.50 inch volume from paved surfaces.

Impervious Area to Infiltration System Pond 1P = 19,547 sf

WQV = 19,547 sf x 0.50 in x 1 ft/12 in = 814.5 cf

Volume Available in System = 6,024 cf (HydroCAD)

6,024 cf > 814.5 cf OK

Required Recharge Volume Calculation

Galley System

Total Impervious Area to Chamber System Pond 1 = 19,547 sf

Required Recharge Depth = 0.25 inches (HSG C Soil)

Required Recharge Volume = 19,547 sf x 0.25"/12 = 407.2 cf

Available Storage = 6,024 cf (HydroCAD)

6,024 cf > 407.2 cf - OK

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

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

$$\text{Time} = \frac{6{,}024\ \text{cf}}{(0.27\ \text{inches/hour})\ (1\text{ft}/12\text{inches})\ (644\ \text{sf})}$$

= 416 hours > 72 hours – Non compliant with the requirement

The infiltration rate of 0.27 inches per hour is conservative with respect to establishing storage volumes necessary to maintain peak storm rates and volumes below pre-development levels. It is this assumed rate which results in the drawdown calculation exceeding 72 hours. This project is providing stormwater controls where none presently exist and therefore is an improvement on existing conditions.

Construction Period Pollution Prevention and

Erosion & Sedimentation Control Plan

Narrative: This project consists of the construction of a crushed stone parking lot and subsurface 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.
- Install construction entrance.
- Remove existing pavement, concrete slabs, and other unwanted materials.
- Install underground utilities.
- Install grease trap.
- Install catch basin, leaching pit, and connection to pop-up emitters.
- Install paved parking spaces and concrete patio.
- Grade the crushed stone parking lot and install stone.
- Remove construction entrance.
- Loam and seed the site. Install landscaping.
- 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: 176 Main St QOZB, LLC
P.O. Box 1206
Carver, MA 02336

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 to mitigate potential increase in runoff to Main Street. A deep sump hooded catch basin will be installed at the central low point of the crushed stone parking area. Roof drains from the building will be connected to the catch basin, which discharges to four interconnected leaching pits. The infiltration system is provided with an overflow pipe which terminates at a header pipe with three six inch diameter emitters adjacent to the existing parking lot.

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)

Deep Sump Catch Basins: Deep sump catch basins are underground drainage structures designed to remove total suspended solids. They also remove trash, debris, and coarse sediment from stormwater and provide temporary spill containment for floatables such as oil and grease. Inspect the unit 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 the depth has accumulated to within two feet of the outlet pipe. 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 Pits: Leaching pits 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 $1,500.

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

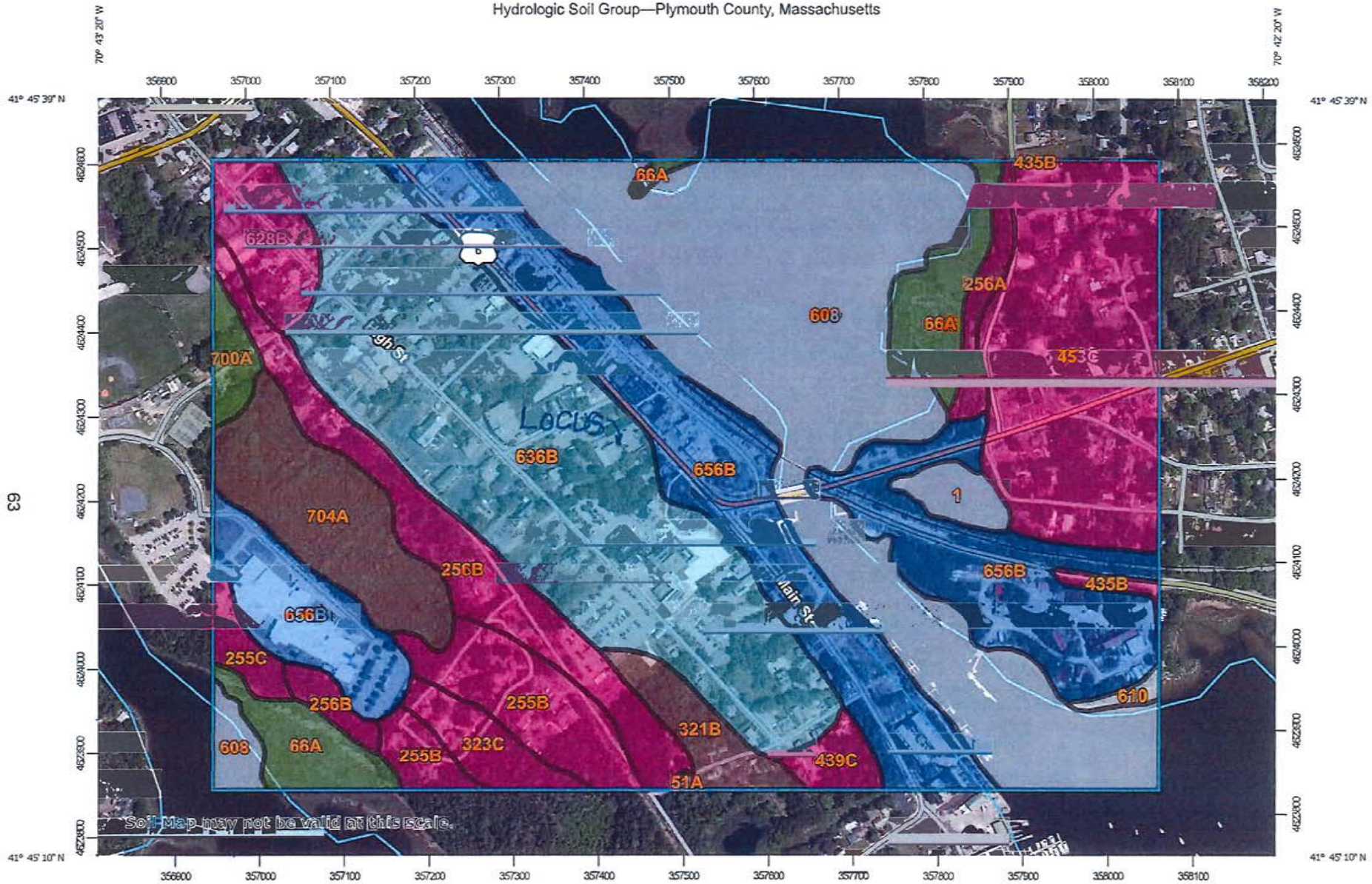
OPERATION AND MAINTENANCE LOG

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



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: Jun 10, 2022—Jun 30, 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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Water		1.8	0.9%
51A	Swansea muck, 0 to 1 percent slopes	B/D	0.1	0.1%
66A	Ipswich - Pawcatuck - Matunuck complex, 0 to 2 percent slopes, very frequently flooded	A/D	8.2	3.9%
255B	Windsor loamy sand, 3 to 8 percent slopes	A	7.9	3.8%
255C	Windsor loamy sand, 8 to 15 percent slopes	A	1.6	0.8%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	A	2.0	1.0%
256B	Deerfield loamy fine sand, 3 to 8 percent slopes	A	11.2	5.4%
321B	Birchwood sand, 3 to 8 percent slopes, very stony	B/D	3.4	1.6%
323C	Poquonock sand, 8 to 15 percent slopes, very stony	A	2.9	1.4%
435B	Plymouth loamy coarse sand, 3 to 8 percent slopes	A	0.6	0.3%
439C	Gloucester - Canton complex, 8 to 15 percent slopes	A	1.7	0.8%
453C	Gloucester - Canton complex, 8 to 15 percent slopes, extremely bouldery	A	21.8	10.5%
608	Water, ocean		45.5	21.9%
610	Beaches, sand		0.5	0.2%
628B	Canton - Urban land complex, 0 to 8 percent slopes	A	4.5	2.1%
636B	Montauk-Urban land complex, 0 to 8 percent slopes	C	41.6	20.0%
656B	Udorthents - Urban land complex, 0 to 8 percent slopes	B	41.4	19.9%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
700A	Udipsamments, wet substratum, 0 to 3 percent slopes	A/D	1.6	0.8%
704A	Freetown and Swansea coarse sands, 0 to 3 percent slopes, sanded surface and inactive	B/D	9.7	4.7%
Totals for Area of Interest			**208.0**	**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.

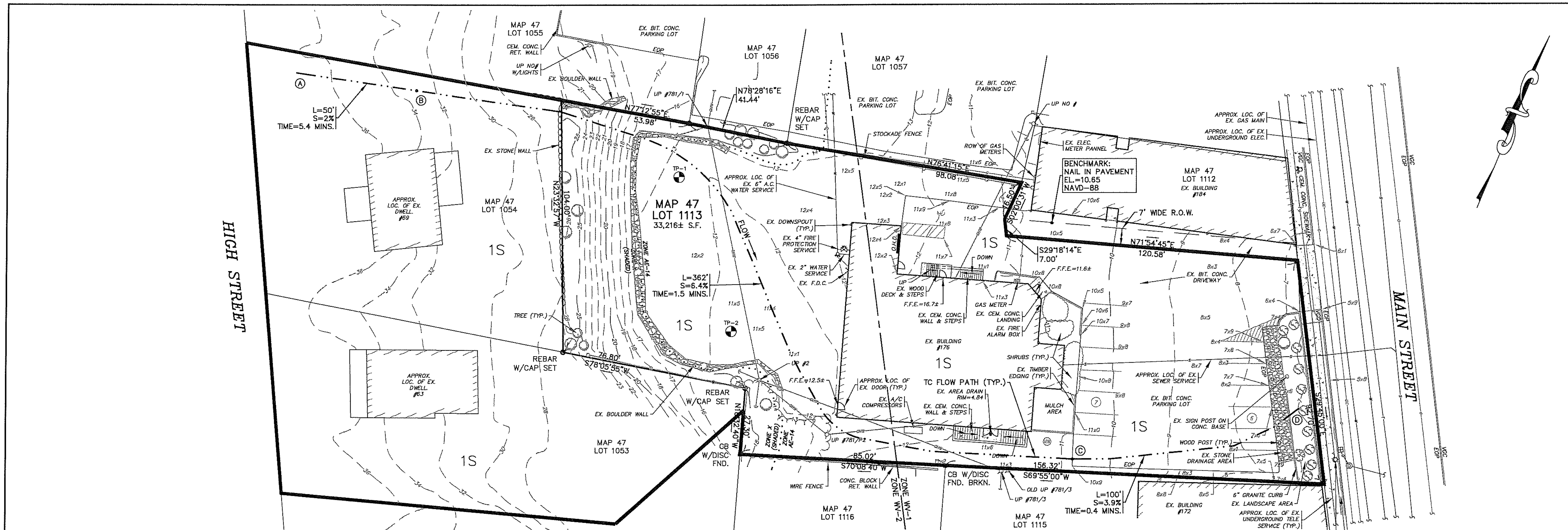
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

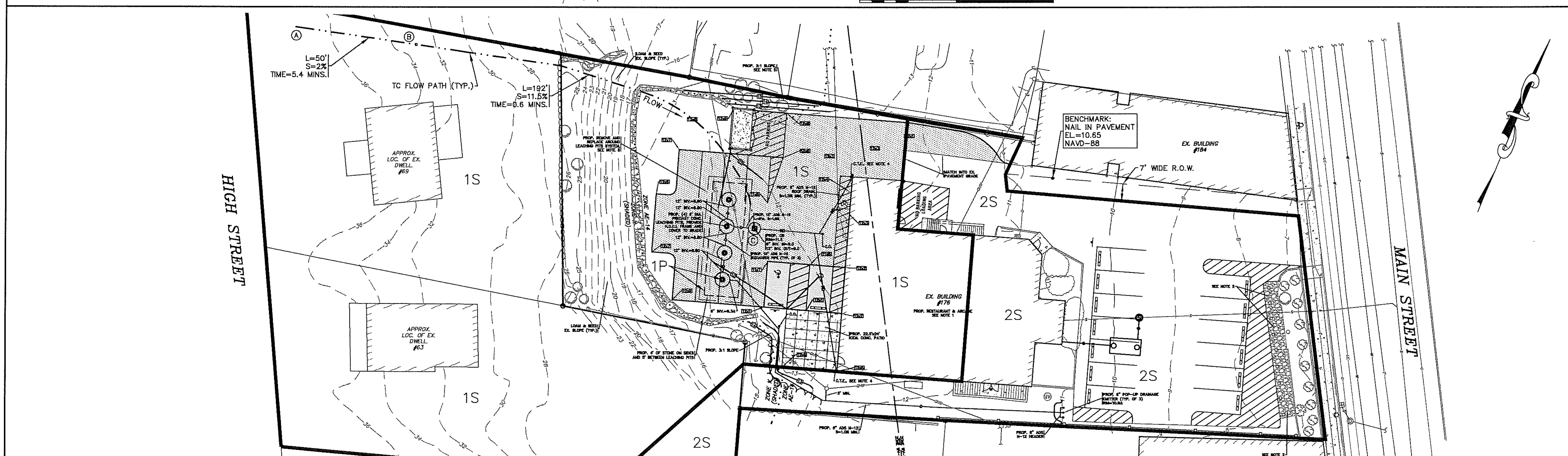
Component Percent Cutoff: None Specified

Tie-break Rule: Higher



PRE DEVELOPMENT WATERSHED PLAN

SCALE: 1"=20'



POST DEVELOPMENT WATERSHED MAP

SCALE: 1"=20'

REV.	DATE	BY	APP'D	DESCRIPTION

APPROVED BY:

APPROVED BY:

DATE: JULY 18, 2023
DRAWN BY: JMP
CHECKED BY: RJR
JOB NO.: 21-9822
SCALE: 1" = 20'

PRE & POST DEVELOPMENT WATERSHED MAPS

176 MAIN STREET WAREHAM, MA

PREPARED FOR:

WARREN 176 MAIN ST. QOZB, LLC
P.O. BOX 1206 CARVER, 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@gafenginc.com

JOB NO.: 21-9822

DWG. 1 OF 1