STORMWATER REPORT

Reign Car Wash

Wareham, Massachusetts

PREPARED FOR

First Hartford Realty Corporation
149 Colonial Road
Manchester, Connecticut 06042

PREPARED BY

1 Cedar Street
Suite 400
Providence, RI 02903
401.272.8100

June 28, 2021

Table of Contents

Appendices

List of Tables

List of Figures

Reign Car Wash

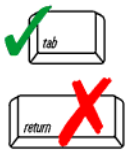
Checklist for Stormwater Report

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

6.24.21

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): Infiltration Basins

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☒ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

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

☐ An Illicit Discharge Compliance Statement is attached;

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

Stormwater Report Narrative

This Stormwater Report has been prepared to demonstrate compliance with the Massachusetts Stormwater Management Standards in accordance with the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00) and Water Quality Certification Regulations (314 CMR 9.00) to the maximum extent practicable.

Project Description

The Applicant, First Hartford Realty Corporation, is proposing to construct a car wash on a parcel of land, about 1.7 acres, located at 3013 Cranberry Highway in Wareham, Massachusetts (the Site). As proposed, the Project consists of a 6,830 square foot building footprint, ancillary landscape improvements, parking spaces for 28 vehicles, stormwater management, and utility improvements to support this use.

The Project will entail the construction of commercial space and is not considered a Land Use with Higher Potential Pollutant Loads (LUHPPL).

Site Description

The Site is approximately 1.7± acres identified as parcel 12-LC1. The site is located on the south side of Cranberry Highway and is bounded by mostly developed land to the west, east, and south. To the north and on the opposite side of Cranberry Highway, is Dicks Pond.

The site is currently developed as a restaurant, identified as the 99-Restaurant, and associated parking lot, sidewalks, and some utility infrastructure that remains (see Figure 1). The Site lies within the Buzzards Bay watershed.

MassGIS indicates there are no wetlands located on the site, but there is a 100 ft. wetland buffer zone going through a small portion of the site. The buffer zone is associated with Dick's Pond (Waterbody ID: MA95038_2008), a 52-acre pond located to the North of the Site.

The Natural Resource Conservation Service (NRCS) has multiple mapped soil types on the site with the predominant soil type identified as Carver urban land complex with a Hydrologic Soil Group (HSG) A rating. The site also contains a small area with Udipsamments, which all has an HSG A rating. Based on the soil evaluation included in Appendix C, the Site is within an area of rapid infiltration (soils with a saturated hydraulic conductivity greater than 2.4 inches per hour). An infiltration rate of 8.27 in/hr was used to model the stormwater BMPs, based on geotechnical investigations performed in the area of the basins.

Existing Drainage Conditions

Under existing conditions, the Site is predominantly parking lot pavement, roofs, and mulch landscape islands. The Site is bordered on three sides by developed land, and one side by Cranberry Highway. Figure 2 illustrates the existing drainage patterns on the Site. The Site is divided into three drainage areas as stormwater runoff flows to three Design Points. They

have been identified as the Cranberry Highway drainage system, an existing catch basin onsite, and an existing catch basin in the drive aisle to the south of the site.

Proposed Drainage Conditions

Figure 3 illustrates the proposed "post construction" drainage conditions for the project. As shown, the Site will be divided into 12 drainage areas that discharge stormwater to 4 design points.

The project is considered a redevelopment and is required to meet, to the maximum extent practicable, Standards 1, 2, 3, and the pretreatment and structural stormwater best management practice requirements of Standards 4, 5, and 6 of the Massachusetts Stormwater Handbook. A redevelopment shall comply with the remaining Standards and improve existing conditions. See pages A1-A3 below for a list of how the project is complying with the Massachusetts Stormwater Standards

Because the Project is located within an area of rapid infiltration, the proposed stormwater management system has been designed to treat the 1-inch Water Quality Volume at Infiltration Basins 1 and 2, and the 0.5-inch Water Quality Volume at Infiltration Basin 3. Due to lack of space, the project was not able to size a basin for the 1-inch Water Quality Basin. The project cannot meet the required 44% pre-treatment TSS removal prior to infiltration because of the grades across the site and the high groundwater. Infiltration systems provide 80% TSS removal.

The access drive and parking lot will be graded to curb breaks. Curb breaks are constructed with a stone diaphragm to help slow the runoff and provide an area for settling of sediment. Stormwater will then flow to sediment forebays prior to discharge to at-grade infiltration basins.

The roof runoff will be piped directly to the existing onsite catch basin.

The proposed drainage conditions will reduce peak rates for all storm events listed in the Standard 2 section of this report.

Figure 1: Site Locus Map

Figure 1

Locus Map
Reign Car Wash
Wareham, Massachusetts

0 1000 2000 Feet

Figure 2: Existing Drainage Areas


CRANBERRY HWY (ROUTES 6 & 28)
(PUBLIC- VARIABLE WIDTH)
53A
637B
702C
DP-1
DP-2
DP-3
1
2
3
LOT 1
AREA = 47,613 SQ. FT.
(1.093 ACRES)
"99 RESTAURANT"
1 STORY WOOD
BUILDING
ZONE AE BASE FLOOD ELEV=14.0'
PROPOSED LOB B-2
AREA=30,083 SQ. FT.
(0.691 ACRES)
FORMER CINEMA DRIVE
(PRIVATE - 50' WIDE)
N/F
TRT WAREHAM LLC
3003 CRAN HWY
12/0/N8
BOOK 34912 PAGE 237
N/F
TRT WAREHAM, LLC
3013 CRAN HWY
12/0/LC31
BOOK 34912, PAGE 237
LCP 16393S
N/F
OSJ OF WAREHAM, LLC
3005 CRAN HWY
BOOK 46134 PAGE 326
1 STORY
WOOD
GARAGE
Legend
SYMBOLS
DESIGN POINT
DRAINAGE AREA DESIGNATION
POND
LINETYPES
DRAINAGE AREA BOUNDARY
TIME OF CONCENTRATION FLOW LINE
SOIL TYPE BOUNDARY
100' BUFFER ZONE
SCS SOIL CLASSIFICATIONS
53A FREETOWN MUCK, PONDED, 0 TO 1 PERCENT SLOPES, HSG B/D
637B CARVER - URBAN LAND COMPLEX, 0 TO 8 PERCENT SLOPES, HSG A
702C UDIPSAMMENTS, 8 TO 15 PERCENT SLOPES, HSG A
0 10 20 40 Feet

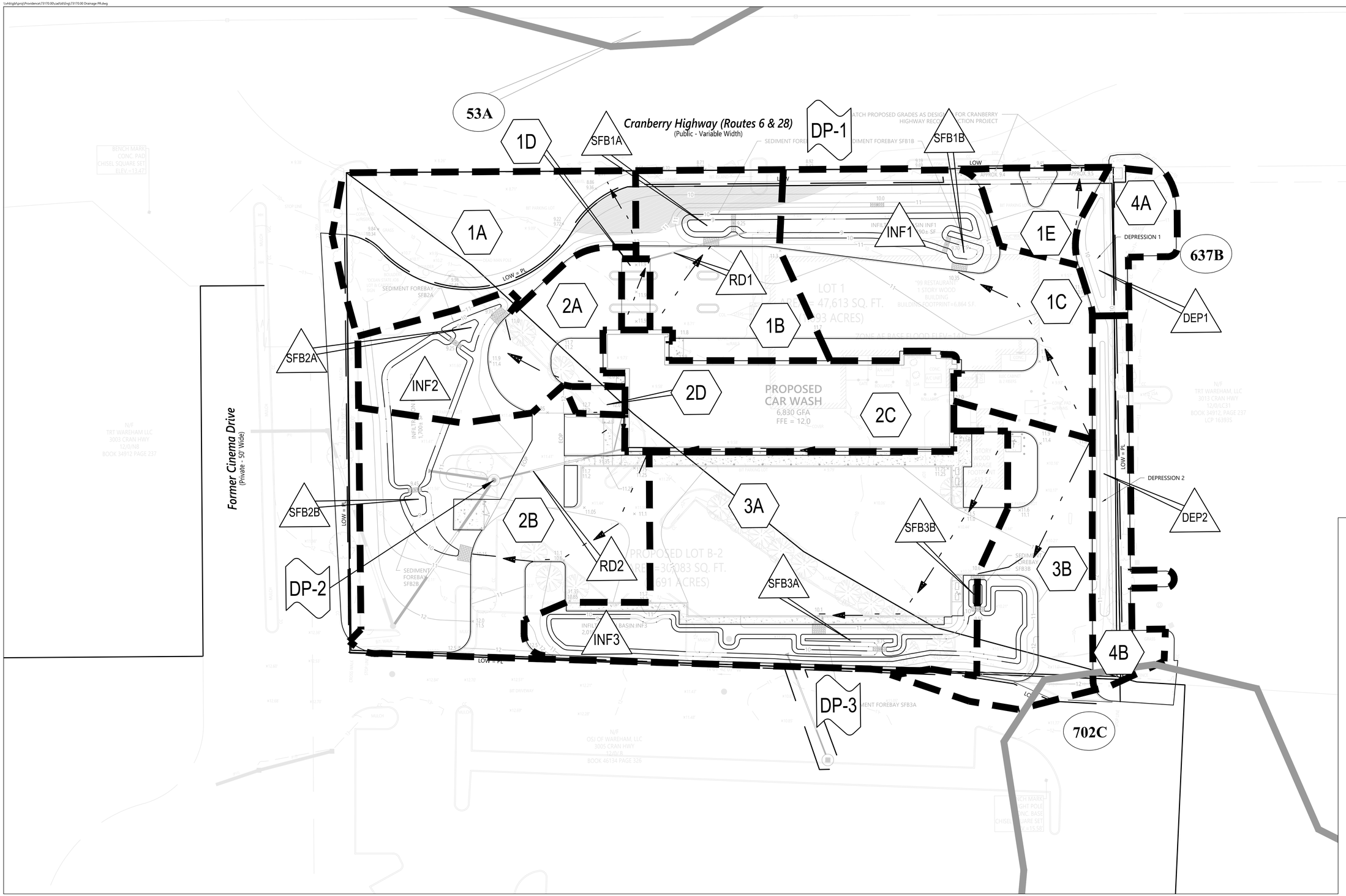
Existing Drainage Conditions

Reign Car Wash

Wareham, MA

Source: VHB
Prepared for: Permit
Date: 6/28/2021

Figure 3: Proposed Drainage Areas



Legend

SYMBOLS

- DESIGN POINT
- DRAINAGE AREA DESIGNATION
- POND

LINETYPES

- DRAINAGE AREA BOUNDARY
- TIME OF CONCENTRATION FLOW LINE
- SOIL TYPE BOUNDARY
- 100' BUFFER ZONE

SCS SOIL CLASSIFICATIONS

- 53A — FREETOWN MUCK, PONDED, 0 TO 1 PERCENT SLOPES, HSG B/D
- 637B — CARVER - URBAN LAND COMPLEX, 0 TO 8 PERCENT SLOPES, HSG A
- 702C — UDIPSAMMENTS, 8 TO 15 PERCENT SLOPES, HSG A

0 10 20 40 Feet

Proposed Drainage Conditions

Reign Car Wash

Wareham, MA

Source: **VHB**
Prepared for: **Permit**
Date: **6/28/2021**

Regulatory Compliance

Massachusetts Department of Environmental Protection (DEP) - Stormwater Management Standards

As demonstrated below, the proposed Project fully complies with the DEP Stormwater Management Standards.

Standard 1: No New Untreated Discharges or Erosion to Wetlands

The Project has been designed to fully comply with Standard 1.

There are no new stormwater discharges directly to a wetland or water.

All proposed Project stormwater outlets and conveyances have been designed to not cause erosion or scour.

Standard 2: Peak Rate Attenuation

The Project has been designed to fully comply with Standard 2.

The rainfall-runoff response of the Site under existing and proposed conditions was analyzed for storm events with recurrence intervals of 2, 10, 25, 50, and 100 years.

Computations and supporting information regarding the hydrologic modeling are included in Appendix B.

Table 1 - Peak Discharge Rates (cfs*)

Design Point	2-year	10-year	25-year	50-year	100-year
Design Point: DP1 Cranberry Highway					
Existing	4.10	6.17	7.45	8.45	9.46
Proposed	0.51	0.75	1.07	1.70	2.25
Design Point: DP2 Existing Catch Basin - Onsite					
Existing	1.07	1.60	1.93	2.19	2.45
Proposed	0.53	0.78	0.93	0.98	1.00
Design Point: DP3 Existing Catch Basin – South of Site					
Existing	0.52	0.80	0.97	1.11	1.25
Proposed	0.00	0.12	0.26	0.38	0.47

*cfs- cubic feet per second

Design Point: DP4 Proposed Depression					
Existing	0.00	0.00	0.00	0.00	0.00
Proposed	0.00	0.00	0.00	0.00	0.00

*cfs- cubic feet per second

Standard 3: Stormwater Recharge

The Project has been designed to improve recharge on the site. The required recharge volume is being infiltrated to the maximum extent practicable. The impervious roof is not directed to an infiltrating system that would provide recharge because of elevation. The below grade roof drain would not have sufficient cover to reach an infiltration system.

Recharge of stormwater has been provided using surface infiltration, which have been sized using the static method. Each infiltration BMP has been designed to drain completely within 72 hours. Soil evaluation (including Geotechnical Report), computations, and supporting information are included in Appendix C.

Standard 4: Water Quality

The Project does meet the Standard 4 design requirements to the maximum extent practicable.

Infiltration system 1 and 2 will provide water quality treatment for 1" of captured runoff through infiltration, but only achieving 27% pre-treatment. Because of high groundwater and the required separation from the bottom of the infiltration system to seasonal high groundwater, it was infeasible to include a deep sump catch basin in the pre-treatment train.

Infiltration system 3 again only achieves 27% pre-treatment and is sized to treat 0.5" of captured runoff only. Infiltration system 3 could not be larger because of lack of space and required separation to seasonal high groundwater.

Computations and supporting information, including the Long-Term Pollution Prevention Plan, are included in Appendix D.

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

The Project is not considered a LUHPPL.

Standard 6: Critical Areas

The Project does not discharge stormwater to a critical area.

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the Maximum Extent Practicable

The Project is a redevelopment and results in a decrease in impervious surface of 32%, from 73,289± SF to 49,887± SF.

The Project complies with the Stormwater Standards 2 and 3 and the pre-treatment and structural stormwater best management practices of Standards 4, 5, and 6, to the maximum extent practicable.

The Project fully complies with standard 1, 8, 9, 10, and the long-term pollution prevention plan component of standard 4

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

The Project will disturb approximately 1.6 acres of land and is therefore required to obtain coverage under the Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) Construction General Permit. As required under this permit, a Stormwater Pollution Prevention Plan (SWPPP) will be developed and submitted before land disturbance begins. Recommended construction period pollution prevention and erosion and sedimentation controls to be finalized in the SWPPP are included in Appendix E.

Standard 9: Operation and Maintenance Plan

In compliance with Standard 9, a Post Construction Stormwater Operation and Maintenance (O&M) Plan has been developed for the Project. The O&M Plan is included in Appendix D as part of the Long-Term Pollution Prevention Plan.

Standard 10: Prohibition of Illicit Discharges

Sanitary sewer and storm drainage structures not required for re-use will be removed. Separate storm drainage and sanitary sewer connections are proposed. The design plans submitted with this report have been designed so that the components included therein are in full compliance with current standards. The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges.

Appendix A - Standard 1 Computations and Supporting Information

Reign Car Wash

Pipe Sizing Calculations

The closed drainage system was designed for the 50-Year storm event, in accordance with the Wareham Subdivision Rules and Regulations.

Drainage pipes were sized using Manning's Equation for full-flow capacity and the Rational Method.

1 Cedar Street
Providence, RI 02903

Storm Drainage Computations

Name: Reign Car Wash, Wareham
Client: First Hartford Realty Corp.

Proj. No.: **73170.00**
Date: **6/21/2021**
Computed by: **SAP**
Checked by: **KC**

Rainfall Intensity - 50 Year Duration NOAA ATLAS 14

DESCRIPTION	LOCATION		AREA	C	C x A	SUM	FLOW TIME (MIN)		i*	DESIGN					CAPACITY		PROFILE						
	FROM	TO	(AC.)			C x A	PIPE	CONC TIME		Q cfs	V fps	n	PIPE SIZE	SLOPE	Q full ft^3/s	V full ft/s	LENGTH ft	FALL ft	RIM	INV UPPER	INV LOWER	W.S.E. ft	Freeboard ft	
	Trench Drain	WYE	0.019	0.470	0.009	0.009	0.11	5.0	6.7	0.06	2.7	0.010	4	2.78%	0.41	4.7	18	0.50	12.00	9.00	8.50	8.9	3.1	
	RD - Building	EX CB - Onsite	0.157	0.900	0.141	0.141	0.35	5.0	6.7	0.95	2.8	0.012	8	0.53%	0.95	2.7	59	0.31	0.00	8.61	8.30	8.5	-8.5	
	RD - Canopy	INF1	0.010	0.900	0.009	0.009	0.47	5.0	6.7	0.06	1.6	0.012	6	1.11%	0.64	3.3	45	0.50	0.00	9.50	9.00	9.5	-9.5	

Appendix B - Standard 2 Computations and Supporting Information

Rainfall volumes used for this analysis were based on the Natural Resources Conservation Service (NRCS) Type III, 24-hour storm event and NOAA Atlas 14 precipitation depths for the site: 3.44, 5.04, 6.03, 6.79, 7.57 inches, respectively. Runoff coefficients for the existing and proposed conditions, were determined using NRCS Technical Release 55 (TR-55) methodology as provided in HydroCAD. The HydroCAD model is based on the NRCS Technical Release 20 (TR 20) Model for Project Formulation Hydrology.

NOAA Atlas 14, Volume 10, Version 3
Location name: East Wareham, Massachusetts, USA*
Latitude: 41.7584°, Longitude: -70.6612°
Elevation: 10.33 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.294** (0.239-0.357)	**0.364** (0.296-0.443)	**0.479** (0.388-0.584)	**0.574** (0.462-0.703)	**0.705** (0.552-0.892)	**0.803** (0.618-1.03)	**0.907** (0.682-1.20)	**1.03** (0.731-1.37)	**1.21** (0.828-1.64)	**1.36** (0.912-1.87)
10-min	**0.416** (0.338-0.506)	**0.515** (0.419-0.628)	**0.677** (0.548-0.826)	**0.812** (0.654-0.994)	**0.998** (0.782-1.26)	**1.14** (0.875-1.46)	**1.29** (0.966-1.70)	**1.46** (1.03-1.93)	**1.71** (1.17-2.33)	**1.93** (1.29-2.65)
15-min	**0.489** (0.398-0.595)	**0.606** (0.493-0.738)	**0.798** (0.646-0.972)	**0.956** (0.770-1.17)	**1.18** (0.920-1.49)	**1.34** (1.03-1.72)	**1.51** (1.14-2.00)	**1.71** (1.22-2.27)	**2.02** (1.38-2.73)	**2.27** (1.52-3.12)
30-min	**0.707** (0.575-0.860)	**0.874** (0.710-1.06)	**1.15** (0.929-1.40)	**1.37** (1.11-1.68)	**1.69** (1.32-2.13)	**1.92** (1.48-2.46)	**2.17** (1.63-2.86)	**2.46** (1.75-3.26)	**2.89** (1.98-3.92)	**3.25** (2.18-4.46)
60-min	**0.924** (0.752-1.12)	**1.14** (0.927-1.39)	**1.50** (1.21-1.83)	**1.79** (1.44-2.19)	**2.20** (1.72-2.78)	**2.50** (1.93-3.21)	**2.82** (2.12-3.73)	**3.20** (2.27-4.24)	**3.76** (2.58-5.10)	**4.23** (2.84-5.81)
2-hr	**1.25** (1.02-1.51)	**1.55** (1.26-1.87)	**2.03** (1.66-2.47)	**2.44** (1.98-2.97)	**3.00** (2.37-3.78)	**3.42** (2.65-4.37)	**3.86** (2.94-5.09)	**4.40** (3.15-5.79)	**5.21** (3.60-7.01)	**5.90** (3.99-8.04)
3-hr	**1.47** (1.21-1.77)	**1.82** (1.49-2.19)	**2.38** (1.95-2.88)	**2.86** (2.33-3.46)	**3.51** (2.78-4.39)	**3.99** (3.11-5.08)	**4.51** (3.44-5.91)	**5.13** (3.69-6.72)	**6.08** (4.22-8.14)	**6.89** (4.68-9.34)
6-hr	**1.91** (1.58-2.29)	**2.33** (1.93-2.79)	**3.01** (2.48-3.61)	**3.58** (2.93-4.31)	**4.36** (3.48-5.42)	**4.94** (3.88-6.23)	**5.56** (4.27-7.22)	**6.30** (4.56-8.19)	**7.40** (5.18-9.84)	**8.33** (5.71-11.2)
12-hr	**2.42** (2.02-2.88)	**2.89** (2.40-3.43)	**3.65** (3.03-4.35)	**4.29** (3.54-5.13)	**5.16** (4.14-6.35)	**5.82** (4.59-7.26)	**6.51** (5.01-8.33)	**7.30** (5.33-9.41)	**8.43** (5.95-11.1)	**9.37** (6.47-12.5)
24-hr	**2.91** (2.44-3.43)	**3.44** (2.88-4.06)	**4.31** (3.60-5.10)	**5.04** (4.18-5.98)	**6.03** (4.87-7.36)	**6.79** (5.38-8.38)	**7.57** (5.84-9.56)	**8.43** (6.21-10.8)	**9.65** (6.87-12.6)	**10.6** (7.41-14.1)
2-day	**3.35** (2.82-3.92)	**3.97** (3.35-4.66)	**5.00** (4.20-5.87)	**5.85** (4.89-6.89)	**7.02** (5.71-8.50)	**7.91** (6.31-9.69)	**8.83** (6.87-11.1)	**9.85** (7.31-12.5)	**11.3** (8.10-14.6)	**12.5** (8.75-16.3)
3-day	**3.68** (3.11-4.29)	**4.34** (3.67-5.06)	**5.42** (4.57-6.34)	**6.32** (5.30-7.42)	**7.55** (6.17-9.10)	**8.49** (6.80-10.4)	**9.46** (7.39-11.8)	**10.5** (7.85-13.3)	**12.0** (8.67-15.5)	**13.2** (9.34-17.3)
4-day	**3.97** (3.37-4.62)	**4.64** (3.94-5.41)	**5.75** (4.87-6.71)	**6.67** (5.62-7.81)	**7.94** (6.50-9.53)	**8.90** (7.15-10.8)	**9.89** (7.73-12.3)	**11.0** (8.21-13.8)	**12.5** (9.02-16.0)	**13.7** (9.68-17.8)
7-day	**4.74** (4.05-5.48)	**5.44** (4.64-6.30)	**6.59** (5.61-7.65)	**7.55** (6.39-8.78)	**8.86** (7.29-10.5)	**9.86** (7.96-11.9)	**10.9** (8.54-13.4)	**12.0** (9.01-14.9)	**13.4** (9.77-17.1)	**14.5** (10.4-18.8)
10-day	**5.45** (4.67-6.28)	**6.17** (5.29-7.12)	**7.36** (6.29-8.51)	**8.35** (7.10-9.68)	**9.71** (8.01-11.5)	**10.8** (8.71-12.9)	**11.8** (9.28-14.4)	**12.9** (9.76-16.0)	**14.3** (10.5-18.1)	**15.3** (11.0-19.7)
20-day	**7.54** (6.51-8.64)	**8.36** (7.21-9.58)	**9.69** (8.34-11.1)	**10.8** (9.24-12.4)	**12.3** (10.2-14.5)	**13.5** (11.0-16.0)	**14.7** (11.6-17.6)	**15.8** (12.1-19.4)	**17.2** (12.7-21.6)	**18.1** (13.1-23.1)
30-day	**9.31** (8.06-10.6)	**10.2** (8.83-11.6)	**11.7** (10.1-13.3)	**12.9** (11.1-14.8)	**14.5** (12.1-17.0)	**15.9** (12.9-18.7)	**17.1** (13.5-20.4)	**18.3** (14.0-22.4)	**19.7** (14.6-24.6)	**20.6** (15.0-26.2)
45-day	**11.5** (10.0-13.1)	**12.5** (10.9-14.2)	**14.1** (12.3-16.1)	**15.5** (13.4-17.7)	**17.3** (14.5-20.1)	**18.8** (15.4-22.0)	**20.2** (16.0-23.9)	**21.4** (16.5-26.1)	**22.8** (17.1-28.4)	**23.8** (17.4-30.0)
60-day	**13.4** (11.7-15.2)	**14.5** (12.6-16.4)	**16.2** (14.1-18.4)	**17.7** (15.3-20.1)	**19.7** (16.5-22.8)	**21.3** (17.5-24.8)	**22.8** (18.1-26.9)	**24.1** (18.7-29.2)	**25.5** (19.2-31.7)	**26.4** (19.4-33.2)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

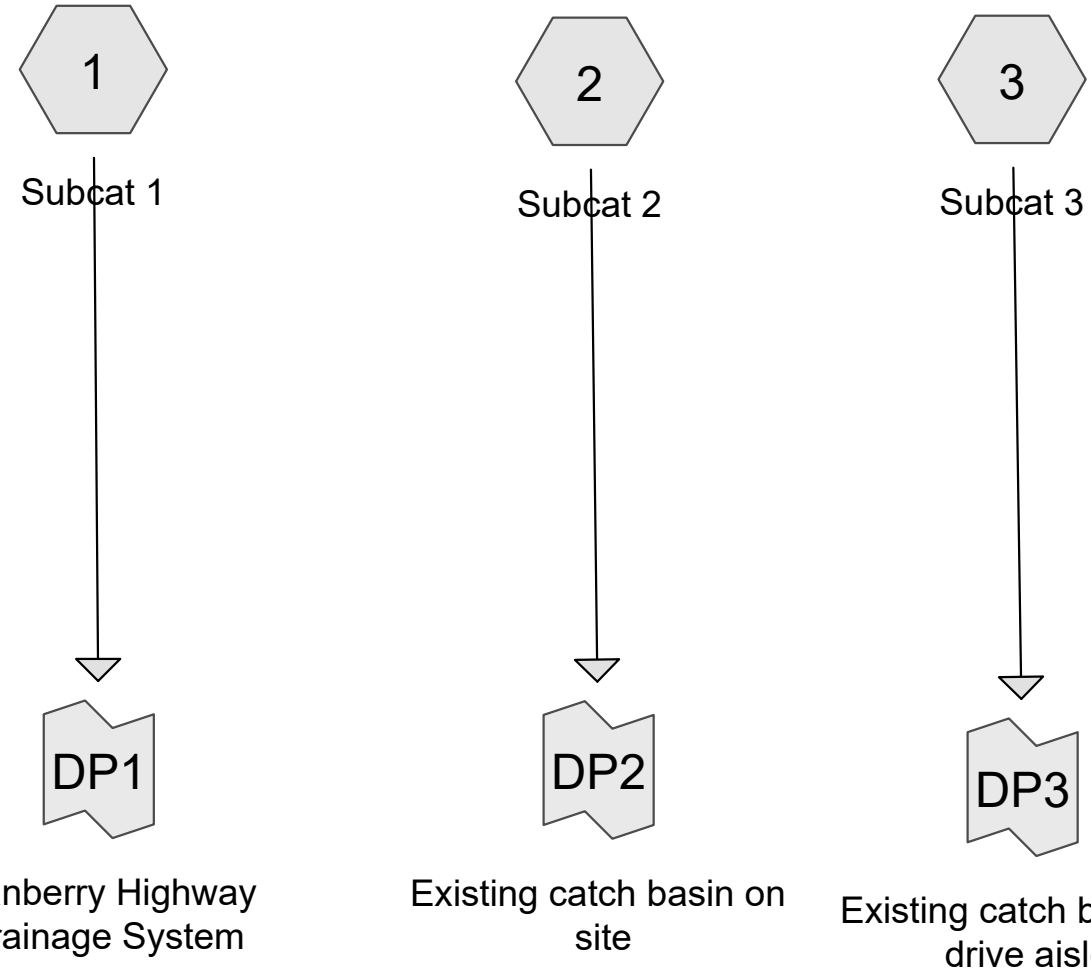
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical

HydroCAD Analysis: Existing Conditions



Subcat Reach Pond Link

Routing Diagram for 73170.00 Drainage EX
Prepared by VHB, Printed 6/21/2021

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Subcat 1 Runoff Area=58,956 sf 89.59% Impervious Runoff Depth=2.97"
Flow Length=255' Tc=6.0 min CN=69/98 Runoff=4.09 cfs 14,583 cf

Subcatchment2: Subcat 2 Runoff Area=15,241 sf 91.18% Impervious Runoff Depth=3.00"
Flow Length=90' Tc=6.0 min CN=68/98 Runoff=1.07 cfs 3,811 cf

Subcatchment3: Subcat 3 Runoff Area=8,071 sf 81.47% Impervious Runoff Depth=2.77"
Flow Length=73' Tc=6.0 min CN=68/98 Runoff=0.52 cfs 1,865 cf

Link DP1: Cranberry Highway Drainage System Inflow=4.09 cfs 14,583 cf
Primary=4.09 cfs 14,583 cf

Link DP2: Existing catch basin on site Inflow=1.07 cfs 3,811 cf
Primary=1.07 cfs 3,811 cf

Link DP3: Existing catch basin in drive aisle Inflow=0.52 cfs 1,865 cf
Primary=0.52 cfs 1,865 cf

Total Runoff Area = 82,267 sf Runoff Volume = 20,259 cf Average Runoff Depth = 2.96"
10.91% Pervious = 8,979 sf 89.09% Impervious = 73,289 sf

Summary for Subcatchment 1: Subcat 1

Runoff = 4.09 cfs @ 12.09 hrs, Volume= 14,583 cf, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
45,275	98	Paved parking, HSG A
5,959	68	<50% Grass cover, Poor, HSG A
180	96	Gravel surface, HSG A
7,542	98	Roofs, HSG A
58,956	95	Weighted Average
6,139	69	10.41% Pervious Area
52,817	98	89.59% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0090	0.90		**Sheet Flow, Pavement** Smooth surfaces n= 0.011 P2= 3.44"
2.2	205	0.0060	1.57		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
2.9					**Direct Entry, Min. 6 mins**
6.0	255	Total			

Summary for Subcatchment 2: Subcat 2

Runoff = 1.07 cfs @ 12.09 hrs, Volume= 3,811 cf, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
1,344	68	<50% Grass cover, Poor, HSG A
13,897	98	Paved parking, HSG A
15,241	95	Weighted Average
1,344	68	8.82% Pervious Area
13,897	98	91.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0150	1.11		**Sheet Flow, Pavement** Smooth surfaces n= 0.011 P2= 3.44"
0.2	40	0.0180	2.72		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
5.0					**Direct Entry, Min. 6 mins**
6.0	90	Total			

Summary for Subcatchment 3: Subcat 3

Runoff = 0.52 cfs @ 12.09 hrs, Volume= 1,865 cf, Depth= 2.77"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
1,496	68	<50% Grass cover, Poor, HSG A
6,575	98	Paved parking, HSG A
8,071	92	Weighted Average
1,496	68	18.53% Pervious Area
6,575	98	81.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.4	50	0.0030	0.58		**Sheet Flow, Pavement** Smooth surfaces n= 0.011 P2= 3.44"
0.2	23	0.0060	1.57		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
4.4					**Direct Entry, Min. 6 mins**
6.0	73	Total			

Summary for Link DP1: Cranberry Highway Drainage System

Inflow Area = 58,956 sf, 89.59% Impervious, Inflow Depth = 2.97" for 2-Year event
Inflow = 4.09 cfs @ 12.09 hrs, Volume= 14,583 cf
Primary = 4.09 cfs @ 12.09 hrs, Volume= 14,583 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP2: Existing catch basin on site

Inflow Area = 15,241 sf, 91.18% Impervious, Inflow Depth = 3.00" for 2-Year event
Inflow = 1.07 cfs @ 12.09 hrs, Volume= 3,811 cf
Primary = 1.07 cfs @ 12.09 hrs, Volume= 3,811 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP3: Existing catch basin in drive aisle

Inflow Area = 8,071 sf, 81.47% Impervious, Inflow Depth = 2.77" for 2-Year event
Inflow = 0.52 cfs @ 12.09 hrs, Volume= 1,865 cf
Primary = 0.52 cfs @ 12.09 hrs, Volume= 1,865 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Subcat 1 Runoff Area=58,956 sf 89.59% Impervious Runoff Depth=4.51"
Flow Length=255' Tc=6.0 min CN=69/98 Runoff=6.15 cfs 22,157 cf

Subcatchment2: Subcat 2 Runoff Area=15,241 sf 91.18% Impervious Runoff Depth=4.55"
Flow Length=90' Tc=6.0 min CN=68/98 Runoff=1.60 cfs 5,776 cf

Subcatchment3: Subcat 3 Runoff Area=8,071 sf 81.47% Impervious Runoff Depth=4.27"
Flow Length=73' Tc=6.0 min CN=68/98 Runoff=0.80 cfs 2,869 cf

Link DP1: Cranberry Highway Drainage System Inflow=6.15 cfs 22,157 cf
Primary=6.15 cfs 22,157 cf

Link DP2: Existing catch basin on site Inflow=1.60 cfs 5,776 cf
Primary=1.60 cfs 5,776 cf

Link DP3: Existing catch basin in drive aisle Inflow=0.80 cfs 2,869 cf
Primary=0.80 cfs 2,869 cf

Total Runoff Area = 82,267 sf Runoff Volume = 30,802 cf Average Runoff Depth = 4.49"
10.91% Pervious = 8,979 sf 89.09% Impervious = 73,289 sf

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Subcat 1 Runoff Area=58,956 sf 89.59% Impervious Runoff Depth=5.47"
Flow Length=255' Tc=6.0 min CN=69/98 Runoff=7.44 cfs 26,892 cf

Subcatchment2: Subcat 2 Runoff Area=15,241 sf 91.18% Impervious Runoff Depth=5.51"
Flow Length=90' Tc=6.0 min CN=68/98 Runoff=1.93 cfs 7,004 cf

Subcatchment3: Subcat 3 Runoff Area=8,071 sf 81.47% Impervious Runoff Depth=5.21"
Flow Length=73' Tc=6.0 min CN=68/98 Runoff=0.97 cfs 3,503 cf

Link DP1: Cranberry Highway Drainage System Inflow=7.44 cfs 26,892 cf
Primary=7.44 cfs 26,892 cf

Link DP2: Existing catch basin on site Inflow=1.93 cfs 7,004 cf
Primary=1.93 cfs 7,004 cf

Link DP3: Existing catch basin in drive aisle Inflow=0.97 cfs 3,503 cf
Primary=0.97 cfs 3,503 cf

Total Runoff Area = 82,267 sf Runoff Volume = 37,398 cf Average Runoff Depth = 5.46"
10.91% Pervious = 8,979 sf 89.09% Impervious = 73,289 sf

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Subcat 1 Runoff Area=58,956 sf 89.59% Impervious Runoff Depth=6.22"
Flow Length=255' Tc=6.0 min CN=69/98 Runoff=8.42 cfs 30,544 cf

Subcatchment2: Subcat 2 Runoff Area=15,241 sf 91.18% Impervious Runoff Depth=6.26"
Flow Length=90' Tc=6.0 min CN=68/98 Runoff=2.19 cfs 7,950 cf

Subcatchment3: Subcat 3 Runoff Area=8,071 sf 81.47% Impervious Runoff Depth=5.94"
Flow Length=73' Tc=6.0 min CN=68/98 Runoff=1.11 cfs 3,993 cf

Link DP1: Cranberry Highway Drainage System Inflow=8.42 cfs 30,544 cf
Primary=8.42 cfs 30,544 cf

Link DP2: Existing catch basin on site Inflow=2.19 cfs 7,950 cf
Primary=2.19 cfs 7,950 cf

Link DP3: Existing catch basin in drive aisle Inflow=1.11 cfs 3,993 cf
Primary=1.11 cfs 3,993 cf

Total Runoff Area = 82,267 sf Runoff Volume = 42,487 cf Average Runoff Depth = 6.20"
10.91% Pervious = 8,979 sf 89.09% Impervious = 73,289 sf

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Subcat 1 Runoff Area=58,956 sf 89.59% Impervious Runoff Depth=6.98"
Flow Length=255' Tc=6.0 min CN=69/98 Runoff=9.44 cfs 34,304 cf

Subcatchment2: Subcat 2 Runoff Area=15,241 sf 91.18% Impervious Runoff Depth=7.03"
Flow Length=90' Tc=6.0 min CN=68/98 Runoff=2.45 cfs 8,924 cf

Subcatchment3: Subcat 3 Runoff Area=8,071 sf 81.47% Impervious Runoff Depth=6.69"
Flow Length=73' Tc=6.0 min CN=68/98 Runoff=1.25 cfs 4,500 cf

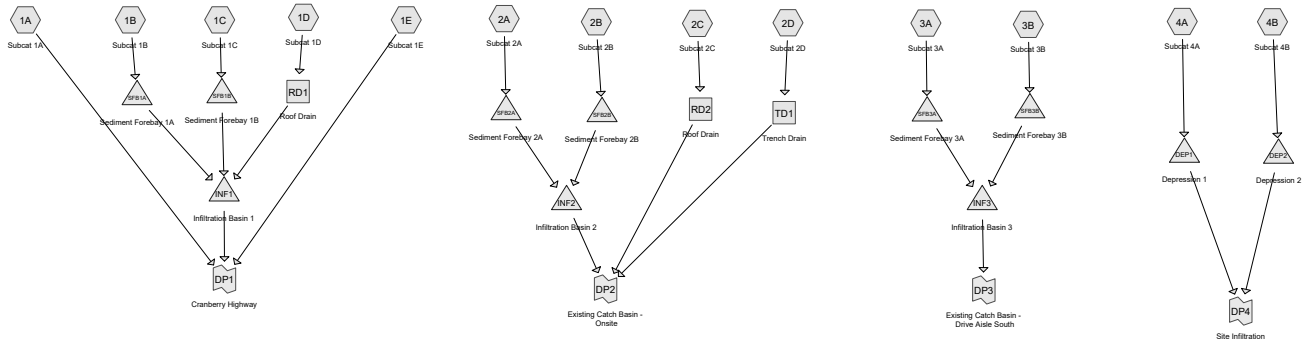
Link DP1: Cranberry Highway Drainage System Inflow=9.44 cfs 34,304 cf
Primary=9.44 cfs 34,304 cf

Link DP2: Existing catch basin on site Inflow=2.45 cfs 8,924 cf
Primary=2.45 cfs 8,924 cf

Link DP3: Existing catch basin in drive aisle Inflow=1.25 cfs 4,500 cf
Primary=1.25 cfs 4,500 cf

Total Runoff Area = 82,267 sf Runoff Volume = 47,727 cf Average Runoff Depth = 6.96"
10.91% Pervious = 8,979 sf 89.09% Impervious = 73,289 sf

HydroCAD Analysis: Proposed Conditions



Subcat Reach Pond Link

Routing Diagram for 73170.00 Drainage PR
Prepared by VHB, Printed 6/25/2021

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1A: Subcat 1A Runoff Area=7,580 sf 68.02% Impervious Runoff Depth=2.18"
Flow Length=28' Slope=0.0900 '/' Tc=6.0 min CN=39/98 Runoff=0.39 cfs 1,379 cf

Subcatchment1B: Subcat 1B Runoff Area=5,889 sf 56.95% Impervious Runoff Depth=1.83"
Flow Length=50' Slope=0.0200 '/' Tc=6.0 min CN=39/98 Runoff=0.25 cfs 897 cf

Subcatchment1C: Subcat 1C Runoff Area=11,489 sf 61.89% Impervious Runoff Depth=1.99"
Flow Length=100' Tc=6.0 min CN=39/98 Runoff=0.53 cfs 1,902 cf

Subcatchment1D: Subcat 1D Runoff Area=422 sf 100.00% Impervious Runoff Depth=3.21"
Flow Length=35' Slope=0.0100 '/' Tc=6.0 min CN=0/98 Runoff=0.03 cfs 113 cf

Subcatchment1E: Subcat 1E Runoff Area=1,806 sf 88.69% Impervious Runoff Depth=2.84"
Flow Length=45' Slope=0.0300 '/' Tc=6.0 min CN=39/98 Runoff=0.12 cfs 428 cf

Subcatchment2A: Subcat 2A Runoff Area=6,040 sf 41.92% Impervious Runoff Depth=1.35"
Flow Length=66' Tc=6.0 min CN=39/98 Runoff=0.19 cfs 678 cf

Subcatchment2B: Subcat 2B Runoff Area=13,337 sf 45.50% Impervious Runoff Depth=1.46"
Flow Length=107' Tc=6.0 min CN=39/98 Runoff=0.46 cfs 1,625 cf

Subcatchment2C: Subcat 2C Runoff Area=6,831 sf 100.00% Impervious Runoff Depth=3.21"
Tc=6.0 min CN=0/98 Runoff=0.51 cfs 1,825 cf

Subcatchment2D: Subcat 2D Runoff Area=306 sf 100.00% Impervious Runoff Depth=3.21"
Flow Length=36' Tc=6.0 min CN=0/98 Runoff=0.02 cfs 82 cf

Subcatchment3A: Subcat 3A Runoff Area=16,792 sf 70.28% Impervious Runoff Depth=2.26"
Flow Length=135' Tc=7.8 min CN=39/98 Runoff=0.84 cfs 3,156 cf

Subcatchment3B: Subcat 3B Runoff Area=6,418 sf 73.30% Impervious Runoff Depth=2.35"
Flow Length=85' Tc=6.0 min CN=39/98 Runoff=0.35 cfs 1,258 cf

Subcatchment4A: Subcat 4A Runoff Area=2,096 sf 0.00% Impervious Runoff Depth=0.01"
Tc=6.0 min CN=39/98 Runoff=0.00 cfs 1 cf

Subcatchment4B: Subcat 4B Runoff Area=3,262 sf 0.03% Impervious Runoff Depth=0.01"
Tc=6.0 min CN=39/98 Runoff=0.00 cfs 2 cf

Reach RD1: Roof Drain Avg. Flow Depth=0.08' Max Vel=1.69 fps Inflow=0.03 cfs 113 cf
6.0" Round Pipe n=0.012 L=45.0' S=0.0111 '/' Capacity=0.64 cfs Outflow=0.03 cfs 113 cf

Reach RD2: Roof Drain Avg. Flow Depth=0.35' Max Vel=2.74 fps Inflow=0.51 cfs 1,825 cf
8.0" Round Pipe n=0.012 L=59.0' S=0.0051 '/' Capacity=0.93 cfs Outflow=0.51 cfs 1,825 cf

Reach TD1: Trench Drain Avg. Flow Depth=0.05' Max Vel=2.59 fps Inflow=0.02 cfs 82 cf
4.0" Round Pipe n=0.010 L=17.0' S=0.0294 '/' Capacity=0.42 cfs Outflow=0.02 cfs 82 cf

Pond DEP1: Depression 1 Peak Elev=9.50' Storage=0 cf Inflow=0.00 cfs 1 cf
Outflow=0.00 cfs 1 cf

Pond DEP2: Depression 2 Peak Elev=10.50' Storage=0 cf Inflow=0.00 cfs 2 cf
Outflow=0.00 cfs 2 cf

Pond INF1: Infiltration Basin 1 Peak Elev=9.71' Storage=643 cf Inflow=0.81 cfs 2,820 cf
Discarded=0.21 cfs 2,820 cf Primary=0.00 cfs 0 cf Outflow=0.21 cfs 2,820 cf

Pond INF2: Infiltration Basin 2 Peak Elev=9.13' Storage=209 cf Inflow=0.64 cfs 2,224 cf
Discarded=0.30 cfs 2,224 cf Primary=0.00 cfs 0 cf Outflow=0.30 cfs 2,224 cf

Pond INF3: Infiltration Basin 3 Peak Elev=9.29' Storage=618 cf Inflow=1.19 cfs 4,338 cf
Discarded=0.45 cfs 4,338 cf Primary=0.00 cfs 0 cf Outflow=0.45 cfs 4,338 cf

Pond SFB1A: Sediment Forebay 1A Peak Elev=9.30' Storage=34 cf Inflow=0.25 cfs 897 cf
Outflow=0.25 cfs 869 cf

Pond SFB1B: Sediment Forebay 1B Peak Elev=9.77' Storage=73 cf Inflow=0.53 cfs 1,902 cf
Outflow=0.53 cfs 1,838 cf

Pond SFB2A: Sediment Forebay 2A Peak Elev=9.30' Storage=28 cf Inflow=0.19 cfs 678 cf
Outflow=0.19 cfs 655 cf

Pond SFB2B: Sediment Forebay 2B Peak Elev=9.53' Storage=72 cf Inflow=0.46 cfs 1,625 cf
Outflow=0.45 cfs 1,569 cf

Pond SFB3A: Sediment Forebay 3A Peak Elev=9.87' Storage=76 cf Inflow=0.84 cfs 3,156 cf
Outflow=0.84 cfs 3,101 cf

Pond SFB3B: Sediment Forebay 3B Peak Elev=9.62' Storage=25 cf Inflow=0.35 cfs 1,258 cf
Outflow=0.35 cfs 1,237 cf

Link DP1: Cranberry Highway Inflow=0.51 cfs 1,807 cf
Primary=0.51 cfs 1,807 cf

Link DP2: Existing Catch Basin - Onsite Inflow=0.53 cfs 1,907 cf
Primary=0.53 cfs 1,907 cf

Link DP3: Existing Catch Basin - Drive Aisle South Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf

Link DP4: Site Infiltration
Primary=0.00 cfs 0 cf

Total Runoff Area = 82,266 sf Runoff Volume = 13,347 cf Average Runoff Depth = 1.95"
39.36% Pervious = 32,379 sf 60.64% Impervious = 49,887 sf

Summary for Subcatchment 1A: Subcat 1A

Runoff = 0.39 cfs @ 12.09 hrs, Volume= 1,379 cf, Depth= 2.18"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
5,156	98	Paved parking, HSG A
2,424	39	>75% Grass cover, Good, HSG A
7,580	79	Weighted Average
2,424	39	31.98% Pervious Area
5,156	98	68.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	28	0.0900	0.25		**Sheet Flow, Grass**
					Grass: Short n= 0.150 P2= 3.44"
4.1					**Direct Entry, Min. 6 mins**
6.0	28	Total			

Summary for Subcatchment 1B: Subcat 1B

Runoff = 0.25 cfs @ 12.09 hrs, Volume= 897 cf, Depth= 1.83"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
3,354	98	Paved parking, HSG A
2,535	39	>75% Grass cover, Good, HSG A
0	98	Roofs, HSG A
5,889	73	Weighted Average
2,535	39	43.05% Pervious Area
3,354	98	56.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.24		**Sheet Flow, Pavement**
					Smooth surfaces n= 0.011 P2= 3.44"
5.3					**Direct Entry, Min. 6 mins**
6.0	50	Total			

Summary for Subcatchment 1C: Subcat 1C

Runoff = 0.53 cfs @ 12.09 hrs, Volume= 1,902 cf, Depth= 1.99"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
4,378	39	>75% Grass cover, Good, HSG A
7,111	98	Paved parking, HSG A
11,489	76	Weighted Average
4,378	39	38.11% Pervious Area
7,111	98	61.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.94		**Sheet Flow, Pavement** Smooth surfaces n= 0.011 P2= 3.44"
0.3	50	0.0190	2.80		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
4.8					**Direct Entry, Min. 6 mins**
6.0	100	Total			

Summary for Subcatchment 1D: Subcat 1D

Runoff = 0.03 cfs @ 12.09 hrs, Volume= 113 cf, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
422	98	Roofs, HSG A
422	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	35	0.0100	0.88		**Sheet Flow, Roof** Smooth surfaces n= 0.011 P2= 3.44"
5.3					**Direct Entry, Min. 6 mins**
6.0	35	Total			

Summary for Subcatchment 1E: Subcat 1E

Runoff = 0.12 cfs @ 12.09 hrs, Volume= 428 cf, Depth= 2.84"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
204	39	>75% Grass cover, Good, HSG A
1,601	98	Paved parking, HSG A
1,806	91	Weighted Average
204	39	11.31% Pervious Area
1,601	98	88.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	45	0.0300	1.43		**Sheet Flow, Pavement**
					Smooth surfaces n= 0.011 P2= 3.44"
5.5					**Direct Entry, Pavement**
6.0	45	Total			

Summary for Subcatchment 2A: Subcat 2A

Runoff = 0.19 cfs @ 12.09 hrs, Volume= 678 cf, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
3,508	39	>75% Grass cover, Good, HSG A
2,532	98	Paved parking, HSG A
6,040	64	Weighted Average
3,508	39	58.08% Pervious Area
2,532	98	41.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.3	34	0.0100	0.11		**Sheet Flow, Grass**
					Grass: Short n= 0.150 P2= 3.44"
0.3	16	0.0190	0.97		**Sheet Flow, Pavement**
					Smooth surfaces n= 0.011 P2= 3.44"
0.1	16	0.0300	3.52		**Shallow Concentrated Flow, Pavement**
					Paved Kv= 20.3 fps
0.3					**Direct Entry, Pavement**
6.0	66	Total			

Summary for Subcatchment 2B: Subcat 2B

Runoff = 0.46 cfs @ 12.09 hrs, Volume= 1,625 cf, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
7,268	39	>75% Grass cover, Good, HSG A
6,069	98	Paved parking, HSG A
13,337	66	Weighted Average
7,268	39	54.50% Pervious Area
6,069	98	45.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0110	0.98		**Sheet Flow, Pavement** Smooth surfaces n= 0.011 P2= 3.44"
0.5	57	0.0100	2.03		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
4.6					**Direct Entry, Min. 6 mins**
6.0	107	Total			

Summary for Subcatchment 2C: Subcat 2C

Runoff = 0.51 cfs @ 12.09 hrs, Volume= 1,825 cf, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
6,831	98	Roofs, HSG A
6,831	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. 6 mins**

Summary for Subcatchment 2D: Subcat 2D

Runoff = 0.02 cfs @ 12.09 hrs, Volume= 82 cf, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
306	98	Paved parking, HSG A
306	98	100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	21	0.0100	0.79		**Sheet Flow, Pavement** Smooth surfaces n= 0.011 P2= 3.44"
0.0	15	0.0330	5.51	0.60	**Pipe Channel, ACO KlassikDrain K100** 4.0" x 5.0" Ellipse Area= 0.1 sf Perim= 1.2' r= 0.09' n= 0.010 PVC, smooth interior
5.6					**Direct Entry, Min. 6 mins**
6.0	36	Total			

Summary for Subcatchment 3A: Subcat 3A

Runoff = 0.84 cfs @ 12.11 hrs, Volume= 3,156 cf, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
11,802	98	Paved parking, HSG A
4,990	39	>75% Grass cover, Good, HSG A
16,792	80	Weighted Average
4,990	39	29.72% Pervious Area
11,802	98	70.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	40	0.0130	0.12		**Sheet Flow, Grass** Grass: Short n= 0.150 P2= 3.44"
0.2	10	0.0110	0.71		**Sheet Flow, Pavement** Smooth surfaces n= 0.011 P2= 3.44"
2.2	85	0.0010	0.64		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
7.8	135	Total			

Summary for Subcatchment 3B: Subcat 3B

Runoff = 0.35 cfs @ 12.09 hrs, Volume= 1,258 cf, Depth= 2.35"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
4,704	98	Paved parking, HSG A
1,714	39	>75% Grass cover, Good, HSG A
6,418	82	Weighted Average
1,714	39	26.70% Pervious Area
4,704	98	73.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.24		**Sheet Flow, Pavement** Smooth surfaces n= 0.011 P2= 3.44"
0.4	35	0.0060	1.57		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
4.9					**Direct Entry, Min. 6 mins**
6.0	85	Total			

Summary for Subcatchment 4A: Subcat 4A

Runoff = 0.00 cfs @ 23.02 hrs, Volume= 1 cf, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
0	98	Paved parking, HSG A
2,095	39	>75% Grass cover, Good, HSG A
2,096	39	Weighted Average
2,095	39	100.00% Pervious Area
0	98	0.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. 6 mins**

Summary for Subcatchment 4B: Subcat 4B

Runoff = 0.00 cfs @ 23.01 hrs, Volume= 2 cf, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.44"

Area (sf)	CN	Description
3,261	39	>75% Grass cover, Good, HSG A
1	98	Paved parking, HSG A
3,262	39	Weighted Average
3,261	39	99.97% Pervious Area
1	98	0.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. 6 mins**

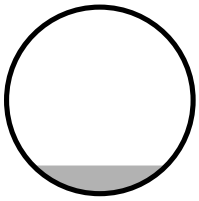
Summary for Reach RD1: Roof Drain

Inflow Area = 422 sf,100.00% Impervious, Inflow Depth = 3.21" for 2-Year event
Inflow = 0.03 cfs @ 12.09 hrs, Volume= 113 cf
Outflow = 0.03 cfs @ 12.10 hrs, Volume= 113 cf, Atten= 2%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.69 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.56 fps, Avg. Travel Time= 1.3 min

Peak Storage= 1 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.08' , Surface Width= 0.36'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.64 cfs

6.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 45.0' Slope= 0.0111 '/'
Inlet Invert= 9.50', Outlet Invert= 9.00'



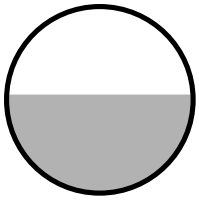
Summary for Reach RD2: Roof Drain

Inflow Area = 6,831 sf,100.00% Impervious, Inflow Depth = 3.21" for 2-Year event
Inflow = 0.51 cfs @ 12.09 hrs, Volume= 1,825 cf
Outflow = 0.51 cfs @ 12.10 hrs, Volume= 1,825 cf, Atten= 1%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.74 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.93 fps, Avg. Travel Time= 1.1 min

Peak Storage= 11 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.35' , Surface Width= 0.67'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 0.93 cfs

8.0" Round Pipe
n= 0.012 Corrugated PP, smooth interior
Length= 59.0' Slope= 0.0051 '/'
Inlet Invert= 8.60', Outlet Invert= 8.30'



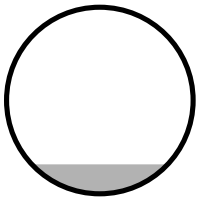
Summary for Reach TD1: Trench Drain

Inflow Area = 306 sf,100.00% Impervious, Inflow Depth = 3.21" for 2-Year event
Inflow = 0.02 cfs @ 12.09 hrs, Volume= 82 cf
Outflow = 0.02 cfs @ 12.09 hrs, Volume= 82 cf, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.59 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 0.87 fps, Avg. Travel Time= 0.3 min

Peak Storage= 0 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.05' , Surface Width= 0.24'
Bank-Full Depth= 0.33' Flow Area= 0.1 sf, Capacity= 0.42 cfs

4.0" Round Pipe
n= 0.010 PVC, smooth interior
Length= 17.0' Slope= 0.0294 '/'
Inlet Invert= 9.00', Outlet Invert= 8.50'



Summary for Pond DEP1: Depression 1

Inflow Area = 2,096 sf, 0.00% Impervious, Inflow Depth = 0.01" for 2-Year event
Inflow = 0.00 cfs @ 23.02 hrs, Volume= 1 cf
Outflow = 0.00 cfs @ 23.04 hrs, Volume= 1 cf, Atten= 0%, Lag= 0.7 min
Discarded = 0.00 cfs @ 23.04 hrs, Volume= 1 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 9.50' @ 23.04 hrs Surf.Area= 171 sf Storage= 0 cf

Plug-Flow detention time= 0.4 min calculated for 1 cf (100% of inflow)
Center-of-Mass det. time= 0.4 min (1,272.8 - 1,272.4)

Volume	Invert	Avail.Storage	Storage Description
#1	9.50'	108 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
9.50	171	89.4	0	0	171
10.00	264	95.7	108	108	275

Device	Routing	Invert	Outlet Devices
#1	Discarded	9.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 23.04 hrs HW=9.50' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.03 cfs)

Summary for Pond DEP2: Depression 2

Inflow Area = 3,262 sf, 0.03% Impervious, Inflow Depth = 0.01" for 2-Year event
Inflow = 0.00 cfs @ 23.01 hrs, Volume= 2 cf
Outflow = 0.00 cfs @ 23.02 hrs, Volume= 2 cf, Atten= 0%, Lag= 0.5 min
Discarded = 0.00 cfs @ 23.02 hrs, Volume= 2 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 10.50' @ 23.02 hrs Surf.Area= 164 sf Storage= 0 cf

Plug-Flow detention time= 0.4 min calculated for 2 cf (100% of inflow)
Center-of-Mass det. time= 0.4 min (1,215.8 - 1,215.4)

Volume	Invert	Avail.Storage	Storage Description
#1	10.50'	140 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
10.50	164	248.6	0	0	164
11.00	415	255.0	140	140	450

Device	Routing	Invert	Outlet Devices
#1	Discarded	10.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 23.02 hrs HW=10.50' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.03 cfs)

Summary for Pond INF1: Infiltration Basin 1

Inflow Area = 17,799 sf, 61.16% Impervious, Inflow Depth = 1.90" for 2-Year event
Inflow = 0.81 cfs @ 12.09 hrs, Volume= 2,820 cf
Outflow = 0.21 cfs @ 12.45 hrs, Volume= 2,820 cf, Atten= 74%, Lag= 21.9 min
Discarded = 0.21 cfs @ 12.45 hrs, Volume= 2,820 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 9.71' @ 12.45 hrs Surf.Area= 1,106 sf Storage= 643 cf

Plug-Flow detention time= 18.0 min calculated for 2,820 cf (100% of inflow)

Center-of-Mass det. time= 18.0 min (790.1 - 772.1)

Volume	Invert	Avail.Storage	Storage Description
#1	9.00'	2,934 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
9.00	711	234.6	0	0	711
10.00	1,289	248.5	986	986	1,297
11.00	2,693	318.7	1,948	2,934	4,479

Device	Routing	Invert	Outlet Devices
#1	Discarded	9.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	10.00'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.21 cfs @ 12.45 hrs HW=9.71' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=9.00' (Free Discharge)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond INF2: Infiltration Basin 2

Inflow Area = 19,377 sf, 44.39% Impervious, Inflow Depth = 1.38" for 2-Year event
Inflow = 0.64 cfs @ 12.09 hrs, Volume= 2,224 cf
Outflow = 0.30 cfs @ 12.26 hrs, Volume= 2,224 cf, Atten= 53%, Lag= 10.3 min
Discarded = 0.30 cfs @ 12.26 hrs, Volume= 2,224 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 9.13' @ 12.26 hrs Surf.Area= 1,581 sf Storage= 209 cf

Plug-Flow detention time= 3.4 min calculated for 2,223 cf (100% of inflow)
Center-of-Mass det. time= 3.4 min (777.8 - 774.4)

Volume	Invert	Avail.Storage	Storage Description
#1	9.00'	3,232 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
9.00	1,529	171.0	0	0	1,529
10.00	1,936	182.2	1,729	1,729	1,890
10.50	4,224	348.1	1,503	3,232	8,892

Device	Routing	Invert	Outlet Devices
#1	Discarded	9.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	9.50'	**8.0" Round Culvert** L= 30.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 9.50' / 8.20' S= 0.0433 '/' Cc= 0.900 n= 0.013 Cast iron, coated, Flow Area= 0.35 sf

Discarded OutFlow Max=0.30 cfs @ 12.26 hrs HW=9.13' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.30 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=9.00' (Free Discharge)
↑—**2=Culvert** (Controls 0.00 cfs)

Summary for Pond INF3: Infiltration Basin 3

Inflow Area = 23,210 sf, 71.12% Impervious, Inflow Depth = 2.24" for 2-Year event
Inflow = 1.19 cfs @ 12.11 hrs, Volume= 4,338 cf
Outflow = 0.45 cfs @ 12.37 hrs, Volume= 4,338 cf, Atten= 62%, Lag= 16.0 min
Discarded = 0.45 cfs @ 12.37 hrs, Volume= 4,338 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 9.29' @ 12.37 hrs Surf.Area= 2,328 sf Storage= 618 cf

Plug-Flow detention time= 6.8 min calculated for 4,335 cf (100% of inflow)
Center-of-Mass det. time= 6.8 min (773.4 - 766.7)

Volume	Invert	Avail.Storage	Storage Description
#1	9.00'	4,359 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
9.00	1,996	619.6	0	0	1,996
10.00	3,267	641.8	2,606	2,606	4,312
10.50	3,751	531.6	1,753	4,359	14,606

Device	Routing	Invert	Outlet Devices
#1	Discarded	9.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	9.32'	**6.0" Round FES** L= 52.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 9.32' / 8.70' S= 0.0119 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.45 cfs @ 12.37 hrs HW=9.29' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.45 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=9.00' (Free Discharge)
↑—**2=FES** (Controls 0.00 cfs)

Summary for Pond SFB1A: Sediment Forebay 1A

Inflow Area = 5,889 sf, 56.95% Impervious, Inflow Depth = 1.83" for 2-Year event
Inflow = 0.25 cfs @ 12.09 hrs, Volume= 897 cf
Outflow = 0.25 cfs @ 12.09 hrs, Volume= 869 cf, Atten= 0%, Lag= 0.3 min
Primary = 0.25 cfs @ 12.09 hrs, Volume= 869 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Peak Elev= 9.30' @ 12.09 hrs Surf.Area= 131 sf Storage= 34 cf

Plug-Flow detention time= 35.8 min calculated for 869 cf (97% of inflow)
Center-of-Mass det. time= 16.6 min (772.2 - 755.7)

Volume	Invert	Avail.Storage	Storage Description
#1	9.00'	156 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
9.00	100	50.0	0	0	100
10.00	220	59.9	156	156	203

Device	Routing	Invert	Outlet Devices
#1	Primary	9.25'	**8.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.25 cfs @ 12.09 hrs HW=9.29' (Free Discharge)
↑—**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.25 cfs @ 0.69 fps)

Summary for Pond SFB1B: Sediment Forebay 1B

Inflow Area = 11,489 sf, 61.89% Impervious, Inflow Depth = 1.99" for 2-Year event
Inflow = 0.53 cfs @ 12.09 hrs, Volume= 1,902 cf
Outflow = 0.53 cfs @ 12.09 hrs, Volume= 1,838 cf, Atten= 1%, Lag= 0.1 min
Primary = 0.53 cfs @ 12.09 hrs, Volume= 1,838 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 9.77' @ 12.09 hrs Surf.Area= 130 sf Storage= 73 cf

Plug-Flow detention time= 38.1 min calculated for 1,838 cf (97% of inflow)
Center-of-Mass det. time= 17.5 min (773.0 - 755.5)

Volume	Invert	Avail.Storage	Storage Description
#1	9.00'	105 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
9.00	64	34.1	0	0	64
10.00	153	47.7	105	105	162

Device	Routing	Invert	Outlet Devices
#1	Primary	9.70'	**8.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.51 cfs @ 12.09 hrs HW=9.77' (Free Discharge)
↑—**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.51 cfs @ 0.88 fps)

Summary for Pond SFB2A: Sediment Forebay 2A

Inflow Area = 6,040 sf, 41.92% Impervious, Inflow Depth = 1.35" for 2-Year event
Inflow = 0.19 cfs @ 12.09 hrs, Volume= 678 cf
Outflow = 0.19 cfs @ 12.09 hrs, Volume= 655 cf, Atten= 0%, Lag= 0.4 min
Primary = 0.19 cfs @ 12.09 hrs, Volume= 655 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 9.30' @ 12.09 hrs Surf.Area= 112 sf Storage= 28 cf

Plug-Flow detention time= 38.2 min calculated for 655 cf (97% of inflow)
Center-of-Mass det. time= 17.7 min (773.9 - 756.3)

Volume	Invert	Avail.Storage	Storage Description
#1	9.00'	144 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
9.00	77	37.1	0	0	77
10.00	224	73.1	144	144	397

Device	Routing	Invert	Outlet Devices
#1	Primary	9.25'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.19 cfs @ 12.09 hrs HW=9.29' (Free Discharge)
↑**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.19 cfs @ 0.69 fps)

Summary for Pond SFB2B: Sediment Forebay 2B

Inflow Area = 13,337 sf, 45.50% Impervious, Inflow Depth = 1.46" for 2-Year event
Inflow = 0.46 cfs @ 12.09 hrs, Volume= 1,625 cf
Outflow = 0.45 cfs @ 12.09 hrs, Volume= 1,569 cf, Atten= 2%, Lag= 0.3 min
Primary = 0.45 cfs @ 12.09 hrs, Volume= 1,569 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 9.53' @ 12.09 hrs Surf.Area= 197 sf Storage= 72 cf

Plug-Flow detention time= 39.6 min calculated for 1,568 cf (96% of inflow)
Center-of-Mass det. time= 18.5 min (774.6 - 756.1)

Volume	Invert	Avail.Storage	Storage Description
#1	9.00'	371 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
9.00	82	34.6	0	0	82
10.00	339	88.4	196	196	612
10.10	3,786	373.0	175	371	11,062

Device	Routing	Invert	Outlet Devices
#1	Primary	9.45'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.44 cfs @ 12.09 hrs HW=9.53' (Free Discharge)
↑—**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.44 cfs @ 0.92 fps)

Summary for Pond SFB3A: Sediment Forebay 3A

Inflow Area = 16,792 sf, 70.28% Impervious, Inflow Depth = 2.26" for 2-Year event
Inflow = 0.84 cfs @ 12.11 hrs, Volume= 3,156 cf
Outflow = 0.84 cfs @ 12.11 hrs, Volume= 3,101 cf, Atten= 0%, Lag= 0.3 min
Primary = 0.84 cfs @ 12.11 hrs, Volume= 3,101 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 9.87' @ 12.11 hrs Surf.Area= 193 sf Storage= 76 cf

Plug-Flow detention time= 21.6 min calculated for 3,099 cf (98% of inflow)
Center-of-Mass det. time= 10.4 min (767.4 - 757.0)

Volume	Invert	Avail.Storage	Storage Description
#1	9.00'	103 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
9.00	15	74.3	0	0	15
10.00	236	96.9	103	103	335

Device	Routing	Invert	Outlet Devices
#1	Primary	9.75'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.82 cfs @ 12.11 hrs HW=9.87' (Free Discharge)
↑—**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.82 cfs @ 1.14 fps)

Summary for Pond SFB3B: Sediment Forebay 3B

Inflow Area = 6,418 sf, 73.30% Impervious, Inflow Depth = 2.35" for 2-Year event
Inflow = 0.35 cfs @ 12.09 hrs, Volume= 1,258 cf
Outflow = 0.35 cfs @ 12.09 hrs, Volume= 1,237 cf, Atten= 0%, Lag= 0.2 min
Primary = 0.35 cfs @ 12.09 hrs, Volume= 1,237 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 9.62' @ 12.09 hrs Surf.Area= 63 sf Storage= 25 cf

Plug-Flow detention time= 20.3 min calculated for 1,236 cf (98% of inflow)
Center-of-Mass det. time= 9.6 min (764.9 - 755.3)

Volume	Invert	Avail.Storage	Storage Description
#1	9.00'	55 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
9.00	22	19.9	0	0	22
10.00	98	39.1	55	55	117

Device	Routing	Invert	Outlet Devices
#1	Primary	9.55'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.34 cfs @ 12.09 hrs HW=9.62' (Free Discharge)
1=Sharp-Crested Rectangular Weir (Weir Controls 0.34 cfs @ 0.85 fps)

Summary for Link DP1: Cranberry Highway

Inflow Area = 27,185 sf, 64.90% Impervious, Inflow Depth = 0.80" for 2-Year event
Inflow = 0.51 cfs @ 12.09 hrs, Volume= 1,807 cf
Primary = 0.51 cfs @ 12.09 hrs, Volume= 1,807 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP2: Existing Catch Basin - Onsite

Inflow Area = 26,513 sf, 59.36% Impervious, Inflow Depth = 0.86" for 2-Year event
Inflow = 0.53 cfs @ 12.10 hrs, Volume= 1,907 cf
Primary = 0.53 cfs @ 12.10 hrs, Volume= 1,907 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP3: Existing Catch Basin - Drive Aisle South

Inflow Area = 23,210 sf, 71.12% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link DP4: Site Infiltration

Inflow Area = 5,357 sf, 0.02% Impervious, Inflow Depth = 0.00" for 2-Year event
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1A: Subcat 1A Runoff Area=7,580 sf 68.02% Impervious Runoff Depth=3.33"
Flow Length=28' Slope=0.0900 '/' Tc=6.0 min CN=39/98 Runoff=0.57 cfs 2,106 cf

Subcatchment1B: Subcat 1B Runoff Area=5,889 sf 56.95% Impervious Runoff Depth=2.82"
Flow Length=50' Slope=0.0200 '/' Tc=6.0 min CN=39/98 Runoff=0.37 cfs 1,386 cf

Subcatchment1C: Subcat 1C Runoff Area=11,489 sf 61.89% Impervious Runoff Depth=3.05"
Flow Length=100' Tc=6.0 min CN=39/98 Runoff=0.79 cfs 2,922 cf

Subcatchment1D: Subcat 1D Runoff Area=422 sf 100.00% Impervious Runoff Depth=4.80"
Flow Length=35' Slope=0.0100 '/' Tc=6.0 min CN=0/98 Runoff=0.05 cfs 169 cf

Subcatchment1E: Subcat 1E Runoff Area=1,806 sf 88.69% Impervious Runoff Depth=4.28"
Flow Length=45' Slope=0.0300 '/' Tc=6.0 min CN=39/98 Runoff=0.18 cfs 645 cf

Subcatchment2A: Subcat 2A Runoff Area=6,040 sf 41.92% Impervious Runoff Depth=2.13"
Flow Length=66' Tc=6.0 min CN=39/98 Runoff=0.28 cfs 1,074 cf

Subcatchment2B: Subcat 2B Runoff Area=13,337 sf 45.50% Impervious Runoff Depth=2.30"
Flow Length=107' Tc=6.0 min CN=39/98 Runoff=0.67 cfs 2,555 cf

Subcatchment2C: Subcat 2C Runoff Area=6,831 sf 100.00% Impervious Runoff Depth=4.80"
Tc=6.0 min CN=0/98 Runoff=0.76 cfs 2,734 cf

Subcatchment2D: Subcat 2D Runoff Area=306 sf 100.00% Impervious Runoff Depth=4.80"
Flow Length=36' Tc=6.0 min CN=0/98 Runoff=0.03 cfs 122 cf

Subcatchment3A: Subcat 3A Runoff Area=16,792 sf 70.28% Impervious Runoff Depth=3.44"
Flow Length=135' Tc=7.8 min CN=39/98 Runoff=1.24 cfs 4,810 cf

Subcatchment3B: Subcat 3B Runoff Area=6,418 sf 73.30% Impervious Runoff Depth=3.58"
Flow Length=85' Tc=6.0 min CN=39/98 Runoff=0.52 cfs 1,913 cf

Subcatchment4A: Subcat 4A Runoff Area=2,096 sf 0.00% Impervious Runoff Depth=0.21"
Tc=6.0 min CN=39/98 Runoff=0.00 cfs 36 cf

Subcatchment4B: Subcat 4B Runoff Area=3,262 sf 0.03% Impervious Runoff Depth=0.21"
Tc=6.0 min CN=39/98 Runoff=0.00 cfs 57 cf

Reach RD1: Roof Drain Avg. Flow Depth=0.09' Max Vel=1.90 fps Inflow=0.05 cfs 169 cf
6.0" Round Pipe n=0.012 L=45.0' S=0.0111 '/' Capacity=0.64 cfs Outflow=0.05 cfs 169 cf

Reach RD2: Roof Drain Avg. Flow Depth=0.46' Max Vel=2.98 fps Inflow=0.76 cfs 2,734 cf
8.0" Round Pipe n=0.012 L=59.0' S=0.0051 '/' Capacity=0.93 cfs Outflow=0.75 cfs 2,734 cf

Reach TD1: Trench Drain Avg. Flow Depth=0.06' Max Vel=2.90 fps Inflow=0.03 cfs 122 cf
4.0" Round Pipe n=0.010 L=17.0' S=0.0294 '/' Capacity=0.42 cfs Outflow=0.03 cfs 122 cf

Pond DEP1: Depression 1 Peak Elev=9.50' Storage=0 cf Inflow=0.00 cfs 36 cf
Outflow=0.00 cfs 36 cf

Pond DEP2: Depression 2 Peak Elev=10.50' Storage=0 cf Inflow=0.00 cfs 57 cf
Outflow=0.00 cfs 57 cf

Pond INF1: Infiltration Basin 1 Peak Elev=10.04' Storage=1,041 cf Inflow=1.20 cfs 4,385 cf
Discarded=0.26 cfs 4,258 cf Primary=0.17 cfs 128 cf Outflow=0.43 cfs 4,385 cf

Pond INF2: Infiltration Basin 2 Peak Elev=9.32' Storage=509 cf Inflow=0.94 cfs 3,550 cf
Discarded=0.32 cfs 3,544 cf Primary=0.00 cfs 0 cf Outflow=0.32 cfs 3,544 cf

Pond INF3: Infiltration Basin 3 Peak Elev=9.52' Storage=1,207 cf Inflow=1.75 cfs 6,647 cf
Discarded=0.50 cfs 6,483 cf Primary=0.10 cfs 164 cf Outflow=0.60 cfs 6,647 cf

Pond SFB1A: Sediment Forebay 1A Peak Elev=9.31' Storage=36 cf Inflow=0.37 cfs 1,386 cf
Outflow=0.37 cfs 1,358 cf

Pond SFB1B: Sediment Forebay 1B Peak Elev=9.80' Storage=76 cf Inflow=0.79 cfs 2,922 cf
Outflow=0.78 cfs 2,858 cf

Pond SFB2A: Sediment Forebay 2A Peak Elev=9.31' Storage=29 cf Inflow=0.28 cfs 1,074 cf
Outflow=0.28 cfs 1,051 cf

Pond SFB2B: Sediment Forebay 2B Peak Elev=9.55' Storage=76 cf Inflow=0.67 cfs 2,555 cf
Outflow=0.66 cfs 2,498 cf

Pond SFB3A: Sediment Forebay 3A Peak Elev=9.91' Storage=83 cf Inflow=1.24 cfs 4,810 cf
Outflow=1.24 cfs 4,755 cf

Pond SFB3B: Sediment Forebay 3B Peak Elev=9.64' Storage=26 cf Inflow=0.52 cfs 1,913 cf
Outflow=0.52 cfs 1,892 cf

Link DP1: Cranberry Highway Inflow=0.75 cfs 2,878 cf
Primary=0.75 cfs 2,878 cf

Link DP2: Existing Catch Basin - Onsite Inflow=0.78 cfs 2,856 cf
Primary=0.78 cfs 2,856 cf

Link DP3: Existing Catch Basin - Drive Aisle South Inflow=0.10 cfs 164 cf
Primary=0.10 cfs 164 cf

Link DP4: Site Infiltration
Primary=0.00 cfs 0 cf

Total Runoff Area = 82,266 sf Runoff Volume = 20,530 cf Average Runoff Depth = 2.99"
39.36% Pervious = 32,379 sf 60.64% Impervious = 49,887 sf

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1A: Subcat 1A Runoff Area=7,580 sf 68.02% Impervious Runoff Depth=4.08"
Flow Length=28' Slope=0.0900 '/' Tc=6.0 min CN=39/98 Runoff=0.68 cfs 2,580 cf

Subcatchment1B: Subcat 1B Runoff Area=5,889 sf 56.95% Impervious Runoff Depth=3.49"
Flow Length=50' Slope=0.0200 '/' Tc=6.0 min CN=39/98 Runoff=0.45 cfs 1,715 cf

Subcatchment1C: Subcat 1C Runoff Area=11,489 sf 61.89% Impervious Runoff Depth=3.76"
Flow Length=100' Tc=6.0 min CN=39/98 Runoff=0.95 cfs 3,598 cf

Subcatchment1D: Subcat 1D Runoff Area=422 sf 100.00% Impervious Runoff Depth=5.79"
Flow Length=35' Slope=0.0100 '/' Tc=6.0 min CN=0/98 Runoff=0.06 cfs 204 cf

Subcatchment1E: Subcat 1E Runoff Area=1,806 sf 88.69% Impervious Runoff Depth=5.19"
Flow Length=45' Slope=0.0300 '/' Tc=6.0 min CN=39/98 Runoff=0.21 cfs 781 cf

Subcatchment2A: Subcat 2A Runoff Area=6,040 sf 41.92% Impervious Runoff Depth=2.69"
Flow Length=66' Tc=6.0 min CN=39/98 Runoff=0.34 cfs 1,355 cf

Subcatchment2B: Subcat 2B Runoff Area=13,337 sf 45.50% Impervious Runoff Depth=2.88"
Flow Length=107' Tc=6.0 min CN=39/98 Runoff=0.81 cfs 3,204 cf

Subcatchment2C: Subcat 2C Runoff Area=6,831 sf 100.00% Impervious Runoff Depth=5.79"
Tc=6.0 min CN=0/98 Runoff=0.90 cfs 3,297 cf

Subcatchment2D: Subcat 2D Runoff Area=306 sf 100.00% Impervious Runoff Depth=5.79"
Flow Length=36' Tc=6.0 min CN=0/98 Runoff=0.04 cfs 148 cf

Subcatchment3A: Subcat 3A Runoff Area=16,792 sf 70.28% Impervious Runoff Depth=4.21"
Flow Length=135' Tc=7.8 min CN=39/98 Runoff=1.49 cfs 5,885 cf

Subcatchment3B: Subcat 3B Runoff Area=6,418 sf 73.30% Impervious Runoff Depth=4.37"
Flow Length=85' Tc=6.0 min CN=39/98 Runoff=0.62 cfs 2,335 cf

Subcatchment4A: Subcat 4A Runoff Area=2,096 sf 0.00% Impervious Runoff Depth=0.45"
Tc=6.0 min CN=39/98 Runoff=0.01 cfs 79 cf

Subcatchment4B: Subcat 4B Runoff Area=3,262 sf 0.03% Impervious Runoff Depth=0.46"
Tc=6.0 min CN=39/98 Runoff=0.01 cfs 124 cf

Reach RD1: Roof Drain Avg. Flow Depth=0.10' Max Vel=2.00 fps Inflow=0.06 cfs 204 cf
6.0" Round Pipe n=0.012 L=45.0' S=0.0111 '/' Capacity=0.64 cfs Outflow=0.06 cfs 204 cf

Reach RD2: Roof Drain Avg. Flow Depth=0.53' Max Vel=3.05 fps Inflow=0.90 cfs 3,297 cf
8.0" Round Pipe n=0.012 L=59.0' S=0.0051 '/' Capacity=0.93 cfs Outflow=0.89 cfs 3,297 cf

Reach TD1: Trench Drain Avg. Flow Depth=0.07' Max Vel=3.06 fps Inflow=0.04 cfs 148 cf
4.0" Round Pipe n=0.010 L=17.0' S=0.0294 '/' Capacity=0.42 cfs Outflow=0.04 cfs 148 cf

Pond DEP1: Depression 1 Peak Elev=9.50' Storage=0 cf Inflow=0.01 cfs 79 cf
Outflow=0.01 cfs 79 cf

Pond DEP2: Depression 2 Peak Elev=10.50' Storage=0 cf Inflow=0.01 cfs 124 cf
Outflow=0.01 cfs 124 cf

Pond INF1: Infiltration Basin 1 Peak Elev=10.10' Storage=1,115 cf Inflow=1.44 cfs 5,424 cf
Discarded=0.27 cfs 4,925 cf Primary=0.57 cfs 499 cf Outflow=0.84 cfs 5,424 cf

Pond INF2: Infiltration Basin 2 Peak Elev=9.48' Storage=774 cf Inflow=1.14 cfs 4,480 cf
Discarded=0.33 cfs 4,476 cf Primary=0.00 cfs 0 cf Outflow=0.33 cfs 4,476 cf

Pond INF3: Infiltration Basin 3 Peak Elev=9.65' Storage=1,541 cf Inflow=2.10 cfs 8,144 cf
Discarded=0.53 cfs 7,678 cf Primary=0.23 cfs 466 cf Outflow=0.77 cfs 8,144 cf

Pond SFB1A: Sediment Forebay 1A Peak Elev=9.32' Storage=37 cf Inflow=0.45 cfs 1,715 cf
Outflow=0.45 cfs 1,686 cf

Pond SFB1B: Sediment Forebay 1B Peak Elev=9.81' Storage=78 cf Inflow=0.95 cfs 3,598 cf
Outflow=0.94 cfs 3,534 cf

Pond SFB2A: Sediment Forebay 2A Peak Elev=9.32' Storage=30 cf Inflow=0.34 cfs 1,355 cf
Outflow=0.34 cfs 1,332 cf

Pond SFB2B: Sediment Forebay 2B Peak Elev=9.57' Storage=79 cf Inflow=0.81 cfs 3,204 cf
Outflow=0.80 cfs 3,148 cf

Pond SFB3A: Sediment Forebay 3A Peak Elev=9.93' Storage=88 cf Inflow=1.49 cfs 5,885 cf
Outflow=1.49 cfs 5,830 cf

Pond SFB3B: Sediment Forebay 3B Peak Elev=9.65' Storage=27 cf Inflow=0.62 cfs 2,335 cf
Outflow=0.63 cfs 2,314 cf

Link DP1: Cranberry Highway Inflow=1.05 cfs 3,860 cf
Primary=1.05 cfs 3,860 cf

Link DP2: Existing Catch Basin - Onsite Inflow=0.93 cfs 3,444 cf
Primary=0.93 cfs 3,444 cf

Link DP3: Existing Catch Basin - Drive Aisle South Inflow=0.23 cfs 466 cf
Primary=0.23 cfs 466 cf

Link DP4: Site Infiltration
Primary=0.00 cfs 0 cf

Total Runoff Area = 82,266 sf Runoff Volume = 25,303 cf Average Runoff Depth = 3.69"
39.36% Pervious = 32,379 sf 60.64% Impervious = 49,887 sf

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1A: Subcat 1A Runoff Area=7,580 sf 68.02% Impervious Runoff Depth=4.68"
Flow Length=28' Slope=0.0900 '/' Tc=6.0 min CN=39/98 Runoff=0.78 cfs 2,955 cf

Subcatchment1B: Subcat 1B Runoff Area=5,889 sf 56.95% Impervious Runoff Depth=4.03"
Flow Length=50' Slope=0.0200 '/' Tc=6.0 min CN=39/98 Runoff=0.51 cfs 1,978 cf

Subcatchment1C: Subcat 1C Runoff Area=11,489 sf 61.89% Impervious Runoff Depth=4.32"
Flow Length=100' Tc=6.0 min CN=39/98 Runoff=1.09 cfs 4,135 cf

Subcatchment1D: Subcat 1D Runoff Area=422 sf 100.00% Impervious Runoff Depth=6.55"
Flow Length=35' Slope=0.0100 '/' Tc=6.0 min CN=0/98 Runoff=0.06 cfs 230 cf

Subcatchment1E: Subcat 1E Runoff Area=1,806 sf 88.69% Impervious Runoff Depth=5.89"
Flow Length=45' Slope=0.0300 '/' Tc=6.0 min CN=39/98 Runoff=0.24 cfs 886 cf

Subcatchment2A: Subcat 2A Runoff Area=6,040 sf 41.92% Impervious Runoff Depth=3.15"
Flow Length=66' Tc=6.0 min CN=39/98 Runoff=0.40 cfs 1,585 cf

Subcatchment2B: Subcat 2B Runoff Area=13,337 sf 45.50% Impervious Runoff Depth=3.36"
Flow Length=107' Tc=6.0 min CN=39/98 Runoff=0.95 cfs 3,734 cf

Subcatchment2C: Subcat 2C Runoff Area=6,831 sf 100.00% Impervious Runoff Depth=6.55"
Tc=6.0 min CN=0/98 Runoff=1.02 cfs 3,729 cf

Subcatchment2D: Subcat 2D Runoff Area=306 sf 100.00% Impervious Runoff Depth=6.55"
Flow Length=36' Tc=6.0 min CN=0/98 Runoff=0.05 cfs 167 cf

Subcatchment3A: Subcat 3A Runoff Area=16,792 sf 70.28% Impervious Runoff Depth=4.81"
Flow Length=135' Tc=7.8 min CN=39/98 Runoff=1.70 cfs 6,732 cf

Subcatchment3B: Subcat 3B Runoff Area=6,418 sf 73.30% Impervious Runoff Depth=4.99"
Flow Length=85' Tc=6.0 min CN=39/98 Runoff=0.71 cfs 2,667 cf

Subcatchment4A: Subcat 4A Runoff Area=2,096 sf 0.00% Impervious Runoff Depth=0.69"
Tc=6.0 min CN=39/98 Runoff=0.02 cfs 121 cf

Subcatchment4B: Subcat 4B Runoff Area=3,262 sf 0.03% Impervious Runoff Depth=0.70"
Tc=6.0 min CN=39/98 Runoff=0.03 cfs 189 cf

Reach RD1: Roof Drain Avg. Flow Depth=0.11' Max Vel=2.08 fps Inflow=0.06 cfs 230 cf
6.0" Round Pipe n=0.012 L=45.0' S=0.0111 '/' Capacity=0.64 cfs Outflow=0.06 cfs 230 cf

Reach RD2: Roof Drain Avg. Flow Depth=0.67' Max Vel=3.05 fps Inflow=1.02 cfs 3,729 cf
8.0" Round Pipe n=0.012 L=59.0' S=0.0051 '/' Capacity=0.93 cfs Outflow=0.93 cfs 3,729 cf

Reach TD1: Trench Drain Avg. Flow Depth=0.07' Max Vel=3.17 fps Inflow=0.05 cfs 167 cf
4.0" Round Pipe n=0.010 L=17.0' S=0.0294 '/' Capacity=0.42 cfs Outflow=0.05 cfs 167 cf

Pond DEP1: Depression 1 Peak Elev=9.50' Storage=0 cf Inflow=0.02 cfs 121 cf
Outflow=0.02 cfs 121 cf

Pond DEP2: Depression 2 Peak Elev=10.50' Storage=1 cf Inflow=0.03 cfs 189 cf
Outflow=0.03 cfs 189 cf

Pond INF1: Infiltration Basin 1 Peak Elev=10.13' Storage=1,159 cf Inflow=1.65 cfs 6,251 cf
Discarded=0.28 cfs 5,427 cf Primary=0.89 cfs 824 cf Outflow=1.16 cfs 6,251 cf

Pond INF2: Infiltration Basin 2 Peak Elev=9.61' Storage=1,001 cf Inflow=1.33 cfs 5,239 cf
Discarded=0.34 cfs 5,195 cf Primary=0.04 cfs 41 cf Outflow=0.37 cfs 5,236 cf

Pond INF3: Infiltration Basin 3 Peak Elev=9.74' Storage=1,800 cf Inflow=2.40 cfs 9,323 cf
Discarded=0.56 cfs 8,557 cf Primary=0.34 cfs 766 cf Outflow=0.90 cfs 9,323 cf

Pond SFB1A: Sediment Forebay 1A Peak Elev=9.32' Storage=38 cf Inflow=0.51 cfs 1,978 cf
Outflow=0.52 cfs 1,949 cf

Pond SFB1B: Sediment Forebay 1B Peak Elev=9.82' Storage=79 cf Inflow=1.09 cfs 4,135 cf
Outflow=1.08 cfs 4,072 cf

Pond SFB2A: Sediment Forebay 2A Peak Elev=9.32' Storage=31 cf Inflow=0.40 cfs 1,585 cf
Outflow=0.40 cfs 1,562 cf

Pond SFB2B: Sediment Forebay 2B Peak Elev=9.58' Storage=82 cf Inflow=0.95 cfs 3,734 cf
Outflow=0.93 cfs 3,677 cf

Pond SFB3A: Sediment Forebay 3A Peak Elev=9.95' Storage=91 cf Inflow=1.70 cfs 6,732 cf
Outflow=1.70 cfs 6,677 cf

Pond SFB3B: Sediment Forebay 3B Peak Elev=9.66' Storage=28 cf Inflow=0.71 cfs 2,667 cf
Outflow=0.71 cfs 2,646 cf

Link DP1: Cranberry Highway Inflow=1.65 cfs 4,666 cf
Primary=1.65 cfs 4,666 cf

Link DP2: Existing Catch Basin - Onsite Inflow=0.98 cfs 3,937 cf
Primary=0.98 cfs 3,937 cf

Link DP3: Existing Catch Basin - Drive Aisle South Inflow=0.34 cfs 766 cf
Primary=0.34 cfs 766 cf

Link DP4: Site Infiltration
Primary=0.00 cfs 0 cf

Total Runoff Area = 82,266 sf Runoff Volume = 29,109 cf Average Runoff Depth = 4.25"
39.36% Pervious = 32,379 sf 60.64% Impervious = 49,887 sf

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1A: Subcat 1A Runoff Area=7,580 sf 68.02% Impervious Runoff Depth=5.30"
Flow Length=28' Slope=0.0900 '/' Tc=6.0 min CN=39/98 Runoff=0.89 cfs 3,348 cf

Subcatchment1B: Subcat 1B Runoff Area=5,889 sf 56.95% Impervious Runoff Depth=4.60"
Flow Length=50' Slope=0.0200 '/' Tc=6.0 min CN=39/98 Runoff=0.59 cfs 2,256 cf

Subcatchment1C: Subcat 1C Runoff Area=11,489 sf 61.89% Impervious Runoff Depth=4.91"
Flow Length=100' Tc=6.0 min CN=39/98 Runoff=1.24 cfs 4,702 cf

Subcatchment1D: Subcat 1D Runoff Area=422 sf 100.00% Impervious Runoff Depth=7.33"
Flow Length=35' Slope=0.0100 '/' Tc=6.0 min CN=0/98 Runoff=0.07 cfs 258 cf

Subcatchment1E: Subcat 1E Runoff Area=1,806 sf 88.69% Impervious Runoff Depth=6.61"
Flow Length=45' Slope=0.0300 '/' Tc=6.0 min CN=39/98 Runoff=0.27 cfs 995 cf

Subcatchment2A: Subcat 2A Runoff Area=6,040 sf 41.92% Impervious Runoff Depth=3.64"
Flow Length=66' Tc=6.0 min CN=39/98 Runoff=0.47 cfs 1,834 cf

Subcatchment2B: Subcat 2B Runoff Area=13,337 sf 45.50% Impervious Runoff Depth=3.87"
Flow Length=107' Tc=6.0 min CN=39/98 Runoff=1.11 cfs 4,302 cf

Subcatchment2C: Subcat 2C Runoff Area=6,831 sf 100.00% Impervious Runoff Depth=7.33"
Tc=6.0 min CN=0/98 Runoff=1.14 cfs 4,173 cf

Subcatchment2D: Subcat 2D Runoff Area=306 sf 100.00% Impervious Runoff Depth=7.33"
Flow Length=36' Tc=6.0 min CN=0/98 Runoff=0.05 cfs 187 cf

Subcatchment3A: Subcat 3A Runoff Area=16,792 sf 70.28% Impervious Runoff Depth=5.44"
Flow Length=135' Tc=7.8 min CN=39/98 Runoff=1.93 cfs 7,618 cf

Subcatchment3B: Subcat 3B Runoff Area=6,418 sf 73.30% Impervious Runoff Depth=5.64"
Flow Length=85' Tc=6.0 min CN=39/98 Runoff=0.81 cfs 3,014 cf

Subcatchment4A: Subcat 4A Runoff Area=2,096 sf 0.00% Impervious Runoff Depth=0.98"
Tc=6.0 min CN=39/98 Runoff=0.03 cfs 172 cf

Subcatchment4B: Subcat 4B Runoff Area=3,262 sf 0.03% Impervious Runoff Depth=0.98"
Tc=6.0 min CN=39/98 Runoff=0.05 cfs 267 cf

Reach RD1: Roof Drain Avg. Flow Depth=0.11' Max Vel=2.14 fps Inflow=0.07 cfs 258 cf
6.0" Round Pipe n=0.012 L=45.0' S=0.0111 '/' Capacity=0.64 cfs Outflow=0.07 cfs 258 cf

Reach RD2: Roof Drain Avg. Flow Depth=0.67' Max Vel=3.05 fps Inflow=1.14 cfs 4,173 cf
8.0" Round Pipe n=0.012 L=59.0' S=0.0051 '/' Capacity=0.93 cfs Outflow=0.94 cfs 4,173 cf

Reach TD1: Trench Drain Avg. Flow Depth=0.08' Max Vel=3.27 fps Inflow=0.05 cfs 187 cf
4.0" Round Pipe n=0.010 L=17.0' S=0.0294 '/' Capacity=0.42 cfs Outflow=0.05 cfs 187 cf

Pond DEP1: Depression 1 Peak Elev=9.50' Storage=1 cf Inflow=0.03 cfs 172 cf
Outflow=0.03 cfs 172 cf

Pond DEP2: Depression 2 Peak Elev=10.55' Storage=10 cf Inflow=0.05 cfs 267 cf
Outflow=0.04 cfs 267 cf

Pond INF1: Infiltration Basin 1 Peak Elev=10.17' Storage=1,215 cf Inflow=1.89 cfs 7,124 cf
Discarded=0.28 cfs 5,934 cf Primary=1.30 cfs 1,190 cf Outflow=1.59 cfs 7,124 cf

Pond INF2: Infiltration Basin 2 Peak Elev=9.72' Storage=1,198 cf Inflow=1.56 cfs 6,057 cf
Discarded=0.35 cfs 5,840 cf Primary=0.14 cfs 221 cf Outflow=0.49 cfs 6,061 cf

Pond INF3: Infiltration Basin 3 Peak Elev=9.83' Storage=2,085 cf Inflow=2.72 cfs 10,556 cf
Discarded=0.58 cfs 9,447 cf Primary=0.43 cfs 1,109 cf Outflow=1.01 cfs 10,556 cf

Pond SFB1A: Sediment Forebay 1A Peak Elev=9.33' Storage=39 cf Inflow=0.59 cfs 2,256 cf
Outflow=0.59 cfs 2,228 cf

Pond SFB1B: Sediment Forebay 1B Peak Elev=9.83' Storage=81 cf Inflow=1.24 cfs 4,702 cf
Outflow=1.23 cfs 4,639 cf

Pond SFB2A: Sediment Forebay 2A Peak Elev=9.33' Storage=32 cf Inflow=0.47 cfs 1,834 cf
Outflow=0.47 cfs 1,811 cf

Pond SFB2B: Sediment Forebay 2B Peak Elev=9.60' Storage=85 cf Inflow=1.11 cfs 4,302 cf
Outflow=1.09 cfs 4,246 cf

Pond SFB3A: Sediment Forebay 3A Peak Elev=9.96' Storage=95 cf Inflow=1.93 cfs 7,618 cf
Outflow=1.93 cfs 7,563 cf

Pond SFB3B: Sediment Forebay 3B Peak Elev=9.67' Storage=28 cf Inflow=0.81 cfs 3,014 cf
Outflow=0.81 cfs 2,993 cf

Link DP1: Cranberry Highway Inflow=2.19 cfs 5,533 cf
Primary=2.19 cfs 5,533 cf

Link DP2: Existing Catch Basin - Onsite Inflow=1.00 cfs 4,581 cf
Primary=1.00 cfs 4,581 cf

Link DP3: Existing Catch Basin - Drive Aisle South Inflow=0.43 cfs 1,109 cf
Primary=0.43 cfs 1,109 cf

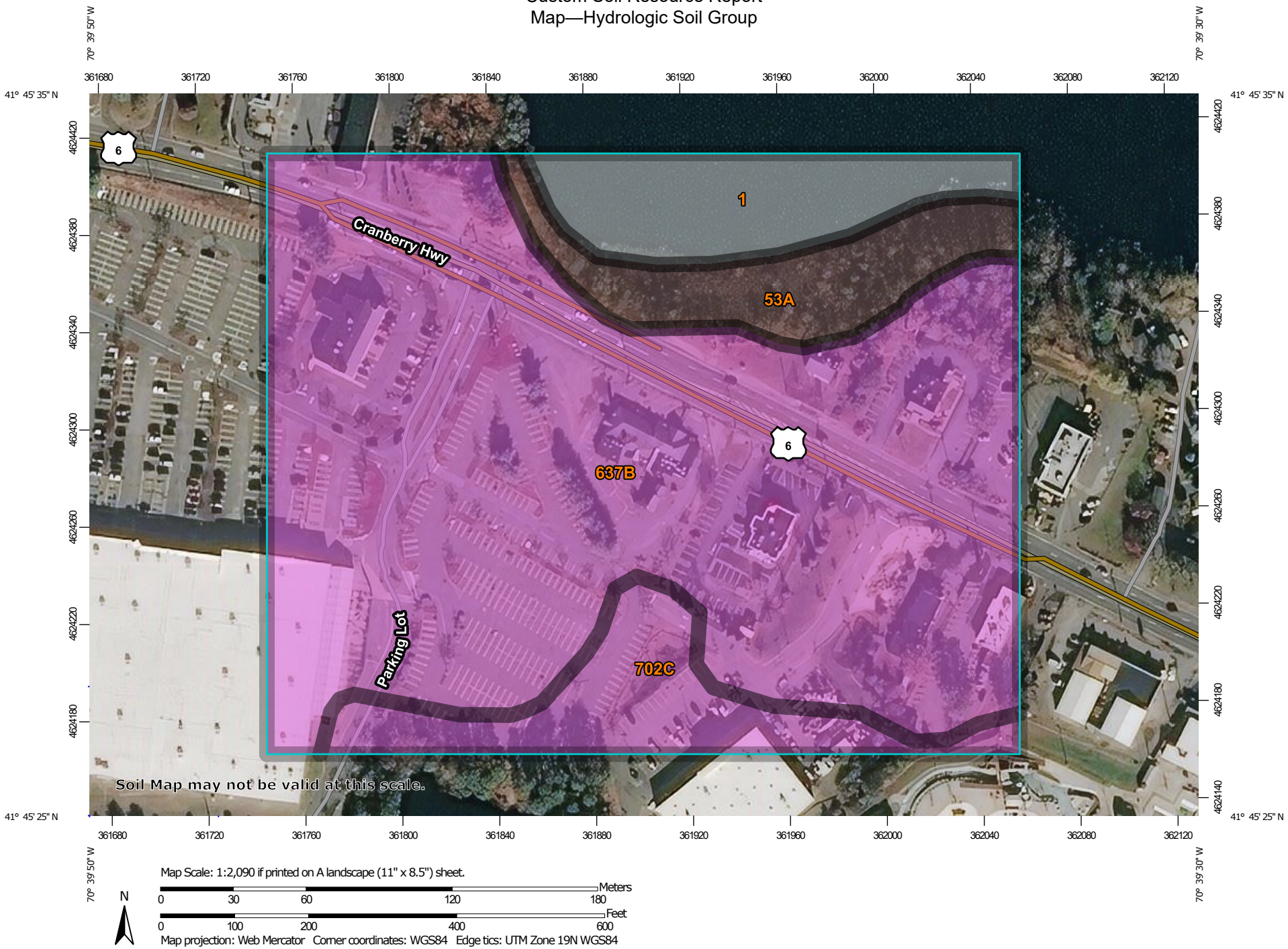
Link DP4: Site Infiltration
Primary=0.00 cfs 0 cf

Total Runoff Area = 82,266 sf Runoff Volume = 33,125 cf Average Runoff Depth = 4.83"
39.36% Pervious = 32,379 sf 60.64% Impervious = 49,887 sf

Appendix C - Standard 3 Computations and Supporting Information

Reign Car Wash

Soil Evaluation and Analysis


70° 39' 50" W
70° 39' 30" W
41° 45' 35" N
41° 45' 25" N
361680
361720
361760
361800
361840
361880
361920
361960
362000
362040
362080
362120
4624420
4624380
4624340
4624300
4624260
4624220
4624180
4624140
Cranberry Hwy
6
1
53A
637B
702C
Parking Lot
Soil Map may not be valid at this scale.
Map Scale: 1:2,090 if printed on A landscape (11" x 8.5") sheet.
N
Meters
0 30 60 120 180
Feet
0 100 200 400 600
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 13, Jun 9, 2020

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

Date(s) aerial images were photographed: Jul 10, 2018—Nov 17, 2018

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.

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Water		1.7	8.9%
53A	Freetown muck, ponded, 0 to 1 percent slopes	B/D	1.6	8.4%
637B	Carver - Urban land complex, 0 to 8 percent slopes	A	13.9	73.2%
702C	Udipsamments, 8 to 15 percent slopes	A	1.8	9.6%
Totals for Area of Interest			**19.1**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

EXPLORATION PLAN

3013 Cranberry Highway Car Wash ■ Wareham, Massachusetts
February 11, 2021 ■ Terracon Project No. J1215000

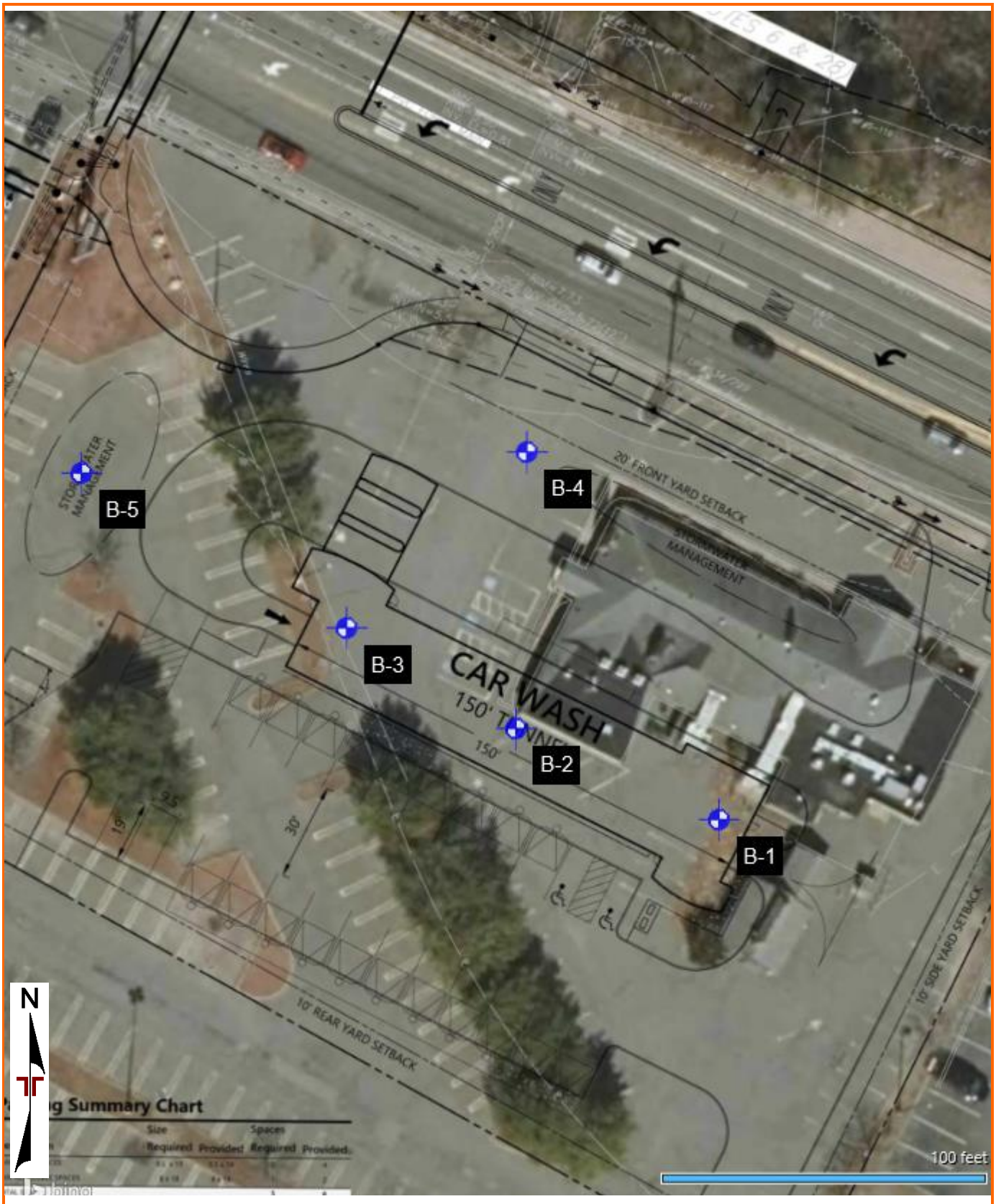


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

BORING LOG NO. B-1

PROJECT: 3013 Cranberry Highway Car Wash

CLIENT: First Hartford Realty Corporation
Manchester, CT

SITE: 3013 Cranberry Highway
Wareham, MA

LOCATION See Exploration Plan

Latitude: 41.7583° Longitude: -70.6612°

Approximate Surface Elev.: 11 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS
		0.5	3-inches of asphalt 10.5+/-					
1			**FILL - POORLY GRADED SAND**, trace silt, brown, loose				10	8-4-5-5 N=9
		2.5	8.5+/-					
2			**POORLY GRADED SAND (SP)**, trace silt, brown to light brown, very loose to medium dense				3	4-4-4-4 N=8
				5	▽			
			No recovery, rock at end of sampler				0	1-1-1-3 N=2
			Similar, trace gravel				6	2-1-1-1 N=2
				10			14	4-5-5-6 N=10
				15			22	5-6-7-8 N=13
				20			24	8-5-5-6 N=10
		21.0	-10+/-					
			Boring Terminated at 21 Feet					

Stratification lines are approximate. In-situ, the transition may be gradual.
Samples obtained using a 2" O.D. split spoon sampler

Hammer Type: Automatic

Advancement Method:
2-1/4-inch I.D. hollow stem augers

Abandonment Method:
Borings backfilled with soil cuttings upon completion. Sealed with bituminous cold patch at surface.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *5 feet while drilling*

Terracon
77 Sundial Ave, Ste 401W
Manchester, NH

Boring Started: 01-25-2021 | Boring Completed: 01-25-2021

Drill Rig: CME-850X | Driller: P. Michaud

Project No.: J1215000

BORING LOG NO. B-2

PROJECT: 3013 Cranberry Highway Car Wash

CLIENT: First Hartford Realty Corporation
Manchester, CT

SITE: 3013 Cranberry Highway
Wareham, MA

LOCATION See Exploration Plan

Latitude: 41.7584° Longitude: -70.6614°

Approximate Surface Elev.: 11 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS
		0.5	10.5+/-					
		3-inches of asphalt						
1		**FILL - POORLY GRADED SAND**, light brown, medium dense					12	4-5-5-4 N=10
		2.5	8.5+/-					
2		**POORLY GRADED SAND (SP)**, brownish gray to gray, very loose to medium dense			▽		16	5-7-8-8 N=15
		Similar, trace silt		5			16	3-4-5-7 N=9
							24	6-6-6-6 N=12
				10			11	2-3-3-3 N=6
				15			10	2-2-2-4 N=4
				20			14	1-2-2-2 N=4
				25				

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Samples obtained using a 2" O.D. split spoon sampler

Advancement Method:
2-1/4-inch I.D. hollow stem augers, then wash and drive method with 4-inch casing

Abandonment Method:
Borings backfilled with soil cuttings upon completion. Sealed with bituminous cold patch at surface.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *4.5 feet while drilling*

Terracon
77 Sundial Ave, Ste 401W
Manchester, NH

Boring Started: 01-25-2021 | Boring Completed: 01-25-2021

Drill Rig: CME-850X | Driller: P. Michaud

Project No.: J1215000

BORING LOG NO. B-2

PROJECT: 3013 Cranberry Highway Car Wash

CLIENT: First Hartford Realty Corporation
Manchester, CT

SITE: 3013 Cranberry Highway
Wareham, MA

LOCATION See Exploration Plan

Latitude: 41.7584° Longitude: -70.6614°

Approximate Surface Elev.: 11 (Ft.) +/-

DEPTH ELEVATION (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS
2					7	2-1-2-3 N=3
		30			10	1-1-1-2 N=2
		35			11	1-2-2-3 N=4
		40			10	2-2-4-6 N=6
		45			8	1-4-6-7 N=10
		50				

POORLY GRADED SAND (SP), brownish gray to gray, very loose to medium dense
(continued)

Stratification lines are approximate. In-situ, the transition may be gradual.
Samples obtained using a 2" O.D. split spoon sampler

Hammer Type: Automatic

Advancement Method:
2-1/4-inch I.D. hollow stem augers, then wash and drive method with 4-inch casing

Abandonment Method:
Borings backfilled with soil cuttings upon completion. Sealed with bituminous cold patch at surface.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *4.5 feet while drilling*

Terracon
77 Sundial Ave, Ste 401W
Manchester, NH

Boring Started: 01-25-2021 Boring Completed: 01-25-2021

Drill Rig: CME-850X Driller: P. Michaud

Project No.: J1215000

BORING LOG NO. B-2

PROJECT: 3013 Cranberry Highway Car Wash

CLIENT: First Hartford Realty Corporation
Manchester, CT

SITE: 3013 Cranberry Highway
Wareham, MA

LOCATION See Exploration Plan

Latitude: 41.7584° Longitude: -70.6614°

Approximate Surface Elev.: 11 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS
2		**POORLY GRADED SAND (SP)**, brownish gray to gray, very loose to medium dense *(continued)*					5	4-4-5-5 N=9
		54.5	-43.5+/-					
		Roller Bit Refusal at 54.5 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.
Samples obtained using a 2" O.D. split spoon sampler

Hammer Type: Automatic

Advancement Method:
2-1/4-inch I.D. hollow stem augers, then wash and drive method with 4-inch casing

Abandonment Method:
Borings backfilled with soil cuttings upon completion. Sealed with bituminous cold patch at surface.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *4.5 feet while drilling*

Terracon
77 Sundial Ave, Ste 401W
Manchester, NH

Boring Started: 01-25-2021 | Boring Completed: 01-25-2021

Drill Rig: CME-850X | Driller: P. Michaud

Project No.: J1215000

BORING LOG NO. B-3

PROJECT: 3013 Cranberry Highway Car Wash

CLIENT: First Hartford Realty Corporation
Manchester, CT

SITE: 3013 Cranberry Highway
Wareham, MA

LOCATION See Exploration Plan

Latitude: 41.7585° Longitude: -70.6616°

Approximate Surface Elev.: 10 (Ft.) +/-

MODEL LAYER	DEPTH	ELEVATION (Ft.)		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS
	0.5	9.5+/-	3-inches of asphalt					
1	2.5	7.5+/-	**FILL - POORLY GRADED SAND**, trace gravel and glass, light brown, medium dense				12	10-10-10-10 N=20
2			**POORLY GRADED SAND (SP)**, brown to dark brown, very loose to medium dense				24	8-8-9-8 N=17
				5	▽		24	3-3-4-3 N=7
							20	2-1-2-2 N=3
			Similar, trace gravel	10			24	1-1-1-1 N=2
			Similar, trace silt	15			24	1-1-1-1 N=2
				20			24	2-3-2-3 N=5
	22.0	-12+/-	***Boring Terminated at 22 Feet***					

Stratification lines are approximate. In-situ, the transition may be gradual.
Samples obtained using a 2" O.D. split spoon sampler

Hammer Type: Automatic

Advancement Method:
2-1/4-inch I.D. hollow stem augers

Abandonment Method:
Borings backfilled with soil cuttings upon completion. Sealed with bituminous cold patch at surface.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *5.5 feet while drilling*

Terracon
77 Sundial Ave, Ste 401W
Manchester, NH

Boring Started: 01-25-2021 | Boring Completed: 01-25-2021

Drill Rig: CME-850X | Driller: P. Michaud

Project No.: J1215000

BORING LOG NO. B-4

PROJECT: 3013 Cranberry Highway Car Wash

CLIENT: First Hartford Realty Corporation
Manchester, CT

SITE: 3013 Cranberry Highway
Wareham, MA

LOCATION See Exploration Plan

Latitude: 41.7586° Longitude: -70.6614°

Approximate Surface Elev.: 11 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS
		0.5	10.5+/-					
		3-inches of asphalt						
1		**FILL - POORLY GRADED SAND**, gray to dark brown, medium dense			▽		14	6-6-7-8 N=13
							16	5-7-9-10 N=16
				5				
		6.5	4.5+/-				15	4-6-6-5 N=12
		Wood fibers at 6.5 feet.						
2		**POORLY GRADED SAND (SP)**, light brown, loose to medium dense					24	2-5-5-5 N=10
				10				
							24	4-4-4-4 N=8
		12.0	-1+/-					
		Boring Terminated at 12 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.
Samples obtained using a 2" O.D. split spoon sampler

Hammer Type: Automatic

Advancement Method:
2-1/4-inch I.D. hollow stem augers

Abandonment Method:
Borings backfilled with soil cuttings upon completion. Sealed with bituminous cold patch at surface.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *3.5 feet while drilling*

Terracon
77 Sundial Ave, Ste 401W
Manchester, NH

Boring Started: 01-25-2021 | Boring Completed: 01-25-2021

Drill Rig: CME-850X | Driller: P. Michaud

Project No.: J1215000

BORING LOG NO. B-5

PROJECT: 3013 Cranberry Highway Car Wash

CLIENT: First Hartford Realty Corporation
Manchester, CT

SITE: 3013 Cranberry Highway
Wareham, MA

LOCATION See Exploration Plan

Latitude: 41.7586° Longitude: -70.6619°

Approximate Surface Elev.: 11 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS
		0.5	10.5+/-					
		3-inches of asphalt						
2		**POORLY GRADED SAND (SP)**, trace gravel and silt, brown to grayish brown, loose to medium dense					15	10-11-9-9 N=20
							12	10-13-13-14 N=26
				5				
					▽		1	5-5-5-4 N=10
							16	2-4-3-3 N=7
		Similar, trace gravel		10			6	4-3-2-3 N=5
		12.0	-1+/-					
		Boring Terminated at 12 Feet						

Stratification lines are approximate. In-situ, the transition may be gradual.
Samples obtained using a 2" O.D. split spoon sampler

Hammer Type: Automatic

Advancement Method:
2-1/4-inch I.D. hollow stem augers

Abandonment Method:
Borings backfilled with soil cuttings upon completion. Sealed with bituminous cold patch at surface.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *7 feet while drilling*

Terracon
77 Sundial Ave, Ste 401W
Manchester, NH

Boring Started: 01-25-2021 | Boring Completed: 01-25-2021

Drill Rig: CME-850X | Driller: P. Michaud

Project No.: J1215000

Reign Car Wash

Required and Provided Recharge Volumes

Recharge Calculations

Project Name: Reign Car Wash
Proj. No.: 73170.00
Date: 6/24/2021
Project Location: Wareham, MA
Calculated by: SAP

Proposed Impervious Surface Summary

Net Proposed Impervious Areas by Hydrologic Soil Group (HSG) in acres

Subcatchment	HSG A	HSG B	HSG C	HSG D	Total Area
PR 1A(DOT DRAINAGE)	0.00				0.00
PR 1B	0.08				0.08
PR 1C	0.16				0.16
PR 1D	0.01				0.01
PR 1E	0.04				0.04
PR 2A	0.06				0.06
PR 2B	0.14				0.14
PR 2C	0.16				0.16
PR 2D	0.01				0.01
PR 3A	0.27				0.27
PR 3B	0.10				0.10
TOTAL	**1.02**	**0.00**	**0.00**	**0.00**	**1.02**

Required Recharge Volume (Cubic Feet)

HSG	Area (acres)	Recharge Depth* (in.)	Volume (c.f.)
A	1.0	0.60	2,222
B	0.0	0.35	0
C	0.0	0.25	0
D	0.0	0.10	0
TOTAL			**2,222**

Assumptions:

* Massachusetts DEP Infiltration requirement: HSG A = 0.60 in; HSG B = 0.35 in; HSG C = 0.25 in; HSG D = 0.10 in.

Capture Area Adjustment

Required Recharge Volume	2,222	c.f.
Total Site Impervious Area	1.02	acres
Total Site Impervious Area Draining to Recharge Facilities	0.83	acres
Capture Area Adjustment Factor	1.229	-
Adjusted Required Recharge Volume:	**2,730**	**c.f.**

Provided Recharge Volume and Drawdown Times Summary

BMP	Outlet Elev.	Vol. Below Outlet(CF)	Drawdown
INF 1	10.0'	986	24.20 HRS
INF 2	9.50'	813	24.20 HRS
INF 3	9.32'	698	24.20 HRS

RECHARGE VOLUME (CF) PROVIDED TOTAL = 2,497

Reign Car Wash

72-hour Drawdown Analysis

Hydrograph for Pond DEP1: Depression 1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Discarded (cfs)
0.00	0.00	0	9.50	0.00
2.50	0.00	0	9.50	0.00
5.00	0.00	0	9.50	0.00
7.50	0.00	0	9.50	0.00
10.00	**0.00**	**0**	**9.50**	**0.00**
12.50	**0.02**	**0**	**9.50**	**0.02**
15.00	0.00	0	9.50	0.00
17.50	0.00	0	9.50	0.00
20.00	0.00	0	9.50	0.00
22.50	0.00	0	9.50	0.00
25.00	0.00	0	9.50	0.00
27.50	0.00	0	9.50	0.00
30.00	0.00	0	9.50	0.00
32.50	0.00	0	9.50	0.00
35.00	0.00	0	9.50	0.00
37.50	0.00	0	9.50	0.00
40.00	0.00	0	9.50	0.00
42.50	0.00	0	9.50	0.00
45.00	0.00	0	9.50	0.00
47.50	0.00	0	9.50	0.00
50.00	0.00	0	9.50	0.00
52.50	0.00	0	9.50	0.00
55.00	0.00	0	9.50	0.00
57.50	0.00	0	9.50	0.00
60.00	0.00	0	9.50	0.00
62.50	0.00	0	9.50	0.00
65.00	0.00	0	9.50	0.00
67.50	0.00	0	9.50	0.00
70.00	0.00	0	9.50	0.00

Hydrograph for Pond DEP2: Depression 2

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Discarded (cfs)
0.00	0.00	0	10.50	0.00
2.50	0.00	0	10.50	0.00
5.00	0.00	0	10.50	0.00
7.50	0.00	0	10.50	0.00
10.00	**0.00**	**0**	**10.50**	**0.00**
12.50	**0.03**	**7**	**10.54**	**0.03**
15.00	0.01	0	10.50	0.01
17.50	0.00	0	10.50	0.00
20.00	0.00	0	10.50	0.00
22.50	0.00	0	10.50	0.00
25.00	0.00	0	10.50	0.00
27.50	0.00	0	10.50	0.00
30.00	0.00	0	10.50	0.00
32.50	0.00	0	10.50	0.00
35.00	0.00	0	10.50	0.00
37.50	0.00	0	10.50	0.00
40.00	0.00	0	10.50	0.00
42.50	0.00	0	10.50	0.00
45.00	0.00	0	10.50	0.00
47.50	0.00	0	10.50	0.00
50.00	0.00	0	10.50	0.00
52.50	0.00	0	10.50	0.00
55.00	0.00	0	10.50	0.00
57.50	0.00	0	10.50	0.00
60.00	0.00	0	10.50	0.00
62.50	0.00	0	10.50	0.00
65.00	0.00	0	10.50	0.00
67.50	0.00	0	10.50	0.00
70.00	0.00	0	10.50	0.00

Hydrograph for Pond INF1: Infiltration Basin 1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	9.00	0.00	0.00	0.00
2.50	0.00	0	9.00	0.00	0.00	0.00
5.00	0.02	2	9.00	0.02	0.02	0.00
7.50	0.04	4	9.01	0.04	0.04	0.00
10.00	**0.09**	**9**	**9.01**	**0.09**	**0.09**	**0.00**
12.50	**0.44**	**1,062**	**10.06**	**0.53**	**0.26**	**0.27**
15.00	0.09	315	9.39	0.18	0.18	0.00
17.50	0.04	5	9.01	0.04	0.04	0.00
20.00	0.03	3	9.00	0.03	0.03	0.00
22.50	0.02	3	9.00	0.02	0.02	0.00
25.00	0.00	0	9.00	0.00	0.00	0.00
27.50	0.00	0	9.00	0.00	0.00	0.00
30.00	0.00	0	9.00	0.00	0.00	0.00
32.50	0.00	0	9.00	0.00	0.00	0.00
35.00	0.00	0	9.00	0.00	0.00	0.00
37.50	0.00	0	9.00	0.00	0.00	0.00
40.00	0.00	0	9.00	0.00	0.00	0.00
42.50	0.00	0	9.00	0.00	0.00	0.00
45.00	0.00	0	9.00	0.00	0.00	0.00
47.50	0.00	0	9.00	0.00	0.00	0.00
50.00	0.00	0	9.00	0.00	0.00	0.00
52.50	0.00	0	9.00	0.00	0.00	0.00
55.00	0.00	0	9.00	0.00	0.00	0.00
57.50	0.00	0	9.00	0.00	0.00	0.00
60.00	0.00	0	9.00	0.00	0.00	0.00
62.50	0.00	0	9.00	0.00	0.00	0.00
65.00	0.00	0	9.00	0.00	0.00	0.00
67.50	0.00	0	9.00	0.00	0.00	0.00
70.00	0.00	0	9.00	0.00	0.00	0.00

Hydrograph for Pond INF2: Infiltration Basin 2

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	9.00	0.00	0.00	0.00
2.50	0.00	0	9.00	0.00	0.00	0.00
5.00	0.02	1	9.00	0.02	0.02	0.00
7.50	0.03	3	9.00	0.03	0.03	0.00
10.00	**0.07**	**6**	**9.00**	**0.07**	**0.07**	**0.00**
12.50	**0.40**	**1,189**	**9.71**	**0.48**	**0.35**	**0.13**
15.00	0.08	6	9.00	0.08	0.08	0.00
17.50	0.04	3	9.00	0.04	0.04	0.00
20.00	0.03	2	9.00	0.03	0.03	0.00
22.50	0.02	2	9.00	0.02	0.02	0.00
25.00	0.00	0	9.00	0.00	0.00	0.00
27.50	0.00	0	9.00	0.00	0.00	0.00
30.00	0.00	0	9.00	0.00	0.00	0.00
32.50	0.00	0	9.00	0.00	0.00	0.00
35.00	0.00	0	9.00	0.00	0.00	0.00
37.50	0.00	0	9.00	0.00	0.00	0.00
40.00	0.00	0	9.00	0.00	0.00	0.00
42.50	0.00	0	9.00	0.00	0.00	0.00
45.00	0.00	0	9.00	0.00	0.00	0.00
47.50	0.00	0	9.00	0.00	0.00	0.00
50.00	0.00	0	9.00	0.00	0.00	0.00
52.50	0.00	0	9.00	0.00	0.00	0.00
55.00	0.00	0	9.00	0.00	0.00	0.00
57.50	0.00	0	9.00	0.00	0.00	0.00
60.00	0.00	0	9.00	0.00	0.00	0.00
62.50	0.00	0	9.00	0.00	0.00	0.00
65.00	0.00	0	9.00	0.00	0.00	0.00
67.50	0.00	0	9.00	0.00	0.00	0.00
70.00	0.00	0	9.00	0.00	0.00	0.00

Hydrograph for Pond INF3: Infiltration Basin 3

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	9.00	0.00	0.00	0.00
2.50	0.01	1	9.00	0.01	0.01	0.00
5.00	0.04	3	9.00	0.04	0.04	0.00
7.50	0.06	5	9.00	0.06	0.06	0.00
10.00	**0.14**	**11**	**9.01**	**0.13**	**0.13**	**0.00**
12.50	**0.70**	**2,025**	**9.81**	**0.99**	**0.58**	**0.41**
15.00	0.13	10	9.00	0.13	0.13	0.00
17.50	0.06	5	9.00	0.06	0.06	0.00
20.00	0.04	3	9.00	0.04	0.04	0.00
22.50	0.03	3	9.00	0.03	0.03	0.00
25.00	0.00	0	9.00	0.00	0.00	0.00
27.50	0.00	0	9.00	0.00	0.00	0.00
30.00	0.00	0	9.00	0.00	0.00	0.00
32.50	0.00	0	9.00	0.00	0.00	0.00
35.00	0.00	0	9.00	0.00	0.00	0.00
37.50	0.00	0	9.00	0.00	0.00	0.00
40.00	0.00	0	9.00	0.00	0.00	0.00
42.50	0.00	0	9.00	0.00	0.00	0.00
45.00	0.00	0	9.00	0.00	0.00	0.00
47.50	0.00	0	9.00	0.00	0.00	0.00
50.00	0.00	0	9.00	0.00	0.00	0.00
52.50	0.00	0	9.00	0.00	0.00	0.00
55.00	0.00	0	9.00	0.00	0.00	0.00
57.50	0.00	0	9.00	0.00	0.00	0.00
60.00	0.00	0	9.00	0.00	0.00	0.00
62.50	0.00	0	9.00	0.00	0.00	0.00
65.00	0.00	0	9.00	0.00	0.00	0.00
67.50	0.00	0	9.00	0.00	0.00	0.00
70.00	0.00	0	9.00	0.00	0.00	0.00

Hydrograph for Pond SFB1A: Sediment Forebay 1A

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	9.00	0.00
2.50	0.00	16	9.15	0.00
5.00	0.01	28	9.25	0.01
7.50	0.01	29	9.25	0.01
10.00	**0.03**	**29**	**9.26**	**0.03**
12.50	**0.14**	**32**	**9.28**	**0.14**
15.00	0.03	29	9.26	0.03
17.50	0.01	29	9.26	0.01
20.00	0.01	29	9.25	0.01
22.50	0.01	29	9.25	0.01
25.00	0.00	28	9.25	0.00
27.50	0.00	28	9.25	0.00
30.00	0.00	28	9.25	0.00
32.50	0.00	28	9.25	0.00
35.00	0.00	28	9.25	0.00
37.50	0.00	28	9.25	0.00
40.00	0.00	28	9.25	0.00
42.50	0.00	28	9.25	0.00
45.00	0.00	28	9.25	0.00
47.50	0.00	28	9.25	0.00
50.00	0.00	28	9.25	0.00
52.50	0.00	28	9.25	0.00
55.00	0.00	28	9.25	0.00
57.50	0.00	28	9.25	0.00
60.00	0.00	28	9.25	0.00
62.50	0.00	28	9.25	0.00
65.00	0.00	28	9.25	0.00
67.50	0.00	28	9.25	0.00
70.00	0.00	28	9.25	0.00

Hydrograph for Pond SFB1B: Sediment Forebay 1B

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	9.00	0.00
2.50	0.01	35	9.43	0.00
5.00	0.02	65	9.71	0.02
7.50	0.03	65	9.71	0.03
10.00	**0.06**	**66**	**9.72**	**0.06**
12.50	**0.28**	**70**	**9.75**	**0.29**
15.00	0.06	66	9.72	0.06
17.50	0.03	65	9.71	0.03
20.00	0.02	65	9.71	0.02
22.50	0.02	65	9.71	0.02
25.00	0.00	64	9.70	0.00
27.50	0.00	64	9.70	0.00
30.00	0.00	64	9.70	0.00
32.50	0.00	64	9.70	0.00
35.00	0.00	64	9.70	0.00
37.50	0.00	64	9.70	0.00
40.00	0.00	64	9.70	0.00
42.50	0.00	64	9.70	0.00
45.00	0.00	64	9.70	0.00
47.50	0.00	64	9.70	0.00
50.00	0.00	64	9.70	0.00
52.50	0.00	64	9.70	0.00
55.00	0.00	64	9.70	0.00
57.50	0.00	64	9.70	0.00
60.00	0.00	64	9.70	0.00
62.50	0.00	64	9.70	0.00
65.00	0.00	64	9.70	0.00
67.50	0.00	64	9.70	0.00
70.00	0.00	64	9.70	0.00

Hydrograph for Pond SFB2A: Sediment Forebay 2A

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	9.00	0.00
2.50	0.00	12	9.14	0.00
5.00	0.01	23	9.25	0.01
7.50	0.01	23	9.25	0.01
10.00	**0.02**	**24**	**9.26**	**0.02**
12.50	**0.12**	**26**	**9.28**	**0.12**
15.00	0.02	24	9.26	0.02
17.50	0.01	24	9.26	0.01
20.00	0.01	23	9.25	0.01
22.50	0.01	23	9.25	0.01
25.00	0.00	23	9.25	0.00
27.50	0.00	23	9.25	0.00
30.00	0.00	23	9.25	0.00
32.50	0.00	23	9.25	0.00
35.00	0.00	23	9.25	0.00
37.50	0.00	23	9.25	0.00
40.00	0.00	23	9.25	0.00
42.50	0.00	23	9.25	0.00
45.00	0.00	23	9.25	0.00
47.50	0.00	23	9.25	0.00
50.00	0.00	23	9.25	0.00
52.50	0.00	23	9.25	0.00
55.00	0.00	23	9.25	0.00
57.50	0.00	23	9.25	0.00
60.00	0.00	23	9.25	0.00
62.50	0.00	23	9.25	0.00
65.00	0.00	23	9.25	0.00
67.50	0.00	23	9.25	0.00
70.00	0.00	23	9.25	0.00

Hydrograph for Pond SFB2B: Sediment Forebay 2B

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	9.00	0.00
2.50	0.01	30	9.28	0.00
5.00	0.01	58	9.46	0.01
7.50	0.02	59	9.46	0.02
10.00	**0.05**	**60**	**9.47**	**0.05**
12.50	**0.27**	**67**	**9.51**	**0.28**
15.00	0.06	60	9.47	0.06
17.50	0.03	59	9.46	0.03
20.00	0.02	58	9.46	0.02
22.50	0.02	58	9.46	0.02
25.00	0.00	57	9.45	0.00
27.50	0.00	57	9.45	0.00
30.00	0.00	57	9.45	0.00
32.50	0.00	57	9.45	0.00
35.00	0.00	57	9.45	0.00
37.50	0.00	57	9.45	0.00
40.00	0.00	57	9.45	0.00
42.50	0.00	57	9.45	0.00
45.00	0.00	57	9.45	0.00
47.50	0.00	57	9.45	0.00
50.00	0.00	57	9.45	0.00
52.50	0.00	57	9.45	0.00
55.00	0.00	57	9.45	0.00
57.50	0.00	57	9.45	0.00
60.00	0.00	57	9.45	0.00
62.50	0.00	57	9.45	0.00
65.00	0.00	57	9.45	0.00
67.50	0.00	57	9.45	0.00
70.00	0.00	57	9.45	0.00

Hydrograph for Pond SFB3A: Sediment Forebay 3A

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	9.00	0.00
2.50	0.01	55	9.75	0.01
5.00	0.03	57	9.76	0.03
7.50	0.04	58	9.77	0.04
10.00	**0.10**	**59**	**9.78**	**0.10**
12.50	**0.51**	**70**	**9.84**	**0.52**
15.00	0.09	59	9.78	0.09
17.50	0.05	58	9.77	0.05
20.00	0.03	57	9.76	0.03
22.50	0.02	57	9.76	0.02
25.00	0.00	55	9.75	0.00
27.50	0.00	55	9.75	0.00
30.00	0.00	55	9.75	0.00
32.50	0.00	55	9.75	0.00
35.00	0.00	55	9.75	0.00
37.50	0.00	55	9.75	0.00
40.00	0.00	55	9.75	0.00
42.50	0.00	55	9.75	0.00
45.00	0.00	55	9.75	0.00
47.50	0.00	55	9.75	0.00
50.00	0.00	55	9.75	0.00
52.50	0.00	55	9.75	0.00
55.00	0.00	55	9.75	0.00
57.50	0.00	55	9.75	0.00
60.00	0.00	55	9.75	0.00
62.50	0.00	55	9.75	0.00
65.00	0.00	55	9.75	0.00
67.50	0.00	55	9.75	0.00
70.00	0.00	55	9.75	0.00

Hydrograph for Pond SFB3B: Sediment Forebay 3B

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	9.00	0.00
2.50	0.01	21	9.55	0.00
5.00	0.01	21	9.56	0.01
7.50	0.02	22	9.56	0.02
10.00	**0.04**	**22**	**9.57**	**0.04**
12.50	**0.18**	**24**	**9.59**	**0.18**
15.00	0.04	22	9.56	0.04
17.50	0.02	22	9.56	0.02
20.00	0.01	21	9.56	0.01
22.50	0.01	21	9.55	0.01
25.00	0.00	21	9.55	0.00
27.50	0.00	21	9.55	0.00
30.00	0.00	21	9.55	0.00
32.50	0.00	21	9.55	0.00
35.00	0.00	21	9.55	0.00
37.50	0.00	21	9.55	0.00
40.00	0.00	21	9.55	0.00
42.50	0.00	21	9.55	0.00
45.00	0.00	21	9.55	0.00
47.50	0.00	21	9.55	0.00
50.00	0.00	21	9.55	0.00
52.50	0.00	21	9.55	0.00
55.00	0.00	21	9.55	0.00
57.50	0.00	21	9.55	0.00
60.00	0.00	21	9.55	0.00
62.50	0.00	21	9.55	0.00
65.00	0.00	21	9.55	0.00
67.50	0.00	21	9.55	0.00
70.00	0.00	21	9.55	0.00

Appendix D - Standard 4 Computations and Supporting Information

Required:

- Long-Term Pollution Prevention Plan
- Water Quality Volume Calculations
- TSS Removal Worksheets

Reign Car Wash

Long –Term Pollution Prevention Plan

Long-Term Pollution Prevention Plan

This Long-Term Pollution Prevention Plan has been developed to establish site management practices that improve the quality of stormwater discharges from the Project.

Pollutant Control Approach

Maintenance of Pavement Systems

Standard Asphalt Pavement

Regular maintenance of pavement surfaces will prevent pollutants such as oil and grease, trash, and sediments from entering the stormwater management system. The following practices should be performed:

- Sweep or vacuum asphalt pavement areas annually with a commercial cleaning unit and dispose of removed material.
- Check dumpster areas frequently for spillage and/or pavement staining and clean as necessary
- Routinely pick up and remove litter from the parking areas, islands, and perimeter landscaping.

Maintenance of Vegetated Areas

Proper maintenance of vegetated areas can prevent the pollution of stormwater runoff by controlling the source of pollutants such as suspended sediments, excess nutrients, and chemicals from landscape care products. Practices that should be followed under the regular maintenance of the vegetated landscape include:

- Inspect planted areas on a semi-annual basis and remove any litter.
- Maintain planted areas adjacent to pavement to prevent soil washout.
- Immediately clean any soil deposited on pavement.
- Re-seed bare areas; install appropriate erosion control measures when native soil is exposed or erosion channels are forming.
- Plant alternative mixture of grass species in the event of unsuccessful establishment.

- The grass vegetation should be cut to a height between three and four inches.
- Pesticide/Herbicide Usage – No pesticides are to be used unless a single spot treatment is required for a specific control application.
- Fertilizer usage should be avoided. If deemed necessary, slow release fertilizer should be used. Fertilizer may be used to begin the establishment of vegetation in bare or damaged areas, but should not be applied on a regular basis unless necessary.

Management of Snow and Ice

Storage and Disposal

Snow shall be stockpiled on standard pavement surfaces so sand and salt may be swept in the spring or removed as snow melts and drains through the stormwater management system. Key practices for the safe storage and disposal of snow include:

- Under no circumstances shall snow be disposed or stored in stormwater management areas.

Salt and Deicing Chemicals

The amount of salt and deicing chemicals to be used on the site shall be reduced to the minimum amount needed to provide safe pedestrian and vehicle travel. The following practices should be followed to control the amount of salt and deicing materials that come into contact with stormwater runoff:

- Devices used for spreading salt and deicing chemicals should be capable of varying the rate of application based on the site specific conditions.
- Sand and salt should be stockpiled under covered storage facilities that prevent precipitation and adjacent runoff from coming in contact with the deicing materials.

Spill Prevention and Response Plan

Spill prevention equipment and training will be provided by CFS.

Initial Notification

In the event of a spill the facility and/or construction manager or supervisor will be notified immediately.

FACILITY MANAGER

Name: TBD Home Phone: _____

Phone: _____ E-mail: _____

CONSTRUCTION MANAGER

Name: TBD Home Phone: _____

Phone: _____ E-mail: _____

The supervisor will first contact the Fire Department and then notify the Police Department, the Public Health Commission and the Conservation Commission. The Fire Department is ultimately responsible for matters of public health and safety and should be notified immediately.

Further Notification

The State Department of Environmental Protection (DEP)/Department of Environmental Services (DES) and the EPA may be notified depending upon the nature and severity of the spill. The attached list of emergency phone numbers shall be posted in the main construction/facility office and readily accessible to all employees. A hazardous waste spill report shall be completed as necessary using the attached form.

Emergency Notification Phone Numbers

1. FACILITY MANAGER

Name: TBD Home Phone: _____

Phone: _____ E-mail: _____

ALTERENATE

Name: _____ Home Phone: _____

Phone: _____ E-mail: _____

2. FIRE DEPARTMENT

Emergency: **911**

Business: (508) 295-6725

POLICE DEPARTMENT

Emergency: **911**

Business: (508) 295-1212

3. CLEANUP CONTRACTOR:

Address: _____

Phone: _____

4. MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION

Emergency: 1-888-304-1133

Southeast Region – Lakeville Office: 508-946-2700

5. NATIONAL RESPONSE CENTER

Phone: (800) 424-8802

ALTERNATE: U.S. ENVIRONMENTAL PROTECTION AGENCY

Emergency: _____

Business: 888-372-7341

Hazardous Waste / Oil Spill Report

Date _____ Time _____ AM / PM

Exact location (Transformer #) _____

Type of equipment _____ Make _____ Size _____

S / N _____ Weather Conditions _____

On or near Water ☐ Yes If Yes, name of body of Water _____

☐ No

Type of chemical/oil spilled _____

Amount of chemical/oil spilled _____

Cause of Spill _____

Measures taken to contain or clean up spill _____

Amount of chemical/oil recovered _____ Method _____

Material collected as a result of cleanup:

_____ Drums containing _____

_____ Drums containing _____

_____ Drums containing _____

Location and method of debris disposal

_____

Name and address of any person, firm, or corporation suffering damages:

_____

Procedures, method, and precautions instituted to prevent a similar occurrence from recurring:

_____

Spill reported to General Office by _____ Time _____ AM / PM

Spill reported to DEP / National Response Center by _____

DEP Date _____ Time _____ AM / PM Inspector _____

NRC Date _____ Time _____ AM / PM Inspector _____

Additional comments: _____

Assessment - Initial Containment

The supervisor or manager will assess the incident and initiate containment control measures with the appropriate spill containment equipment included in the spill kit kept on-site. A list of recommended spill equipment to be kept on site is included on the following page.

Fire / Police Department	911

Emergency Response Equipment

The following equipment and materials shall be maintained at all times and stored in a secure area for long-term emergency response need.

Supplies		***Recommended Suppliers***
SORBENT PILLOWS/"PIGS"	**2**	http://www.newpig.com
SORBENT BOOM/SOCK	**25 FEET**	Item # KIT276 — mobile container with two pigs, 26 feet of sock, 50 pads, and five pounds of absorbent (or equivalent)
SORBENT PADS	**50**	
LITE-DRI® ABSORBENT	**5**	
POUNDS		http://www.forestry-suppliers.com
SHOVEL	**1**	Item # 43210 — Manhole cover pick (or equivalent)
PRY BAR	**1**	
GOGGLES	**1 PAIR**	Item # 33934 — Shovel (or equivalent)
GLOVES – HEAVY	**1 PAIR**	Item # 90926 — Gloves (or equivalent)
		Item # 23334 — Goggles (or equivalent)

Stormwater Operation and Maintenance Plan

Project Information

Site

3013 Cranberry Highway
East Wareham, Massachusetts 02538

Owner – to be changed after property is sold

First Hartford Realty Corporation
149 Colonial Road
Manchester, Connecticut 06042

Site Supervisor

TBD

Name: _____

Telephone: _____

Cell phone: _____

Email: _____

Description of Stormwater Maintenance Measures

The following Operation and Maintenance (O&M) program is proposed to ensure the continued effectiveness of the stormwater management system. Attached to this plan are a Stormwater Best Management Practices Checklist and Maintenance Figure for use during the long term operation and maintenance of the stormwater management system.

Parking Lot

- Sweep with mechanized cleaning equipment on an annual basis.

Catch Basin

- Catch basin shall be inspected and cleaned a minimum of at least twice per year by a licensed contractor.
- Sediment (if more than six inches deep) and/or floatable pollutants shall be pumped from the basin and disposed of at an approved offsite facility in accordance with all applicable regulations.
- Any sediment accumulations in excess of half of the unit's sump depth shall be removed.
- Any structural damage or other indication of malfunction will be reported to the site manager and repaired as necessary
- During colder periods, the catch basin grates must be kept free of snow and ice.
- During warmer periods, the catch basin grates must be kept free of leaves, litter, sand, and debris.
- Material shall be removed by a licensed contractor, who shall be responsible for disposing of the material off-site in a manner consistent with all local, state, and federal regulations.

Surface Infiltration Basin

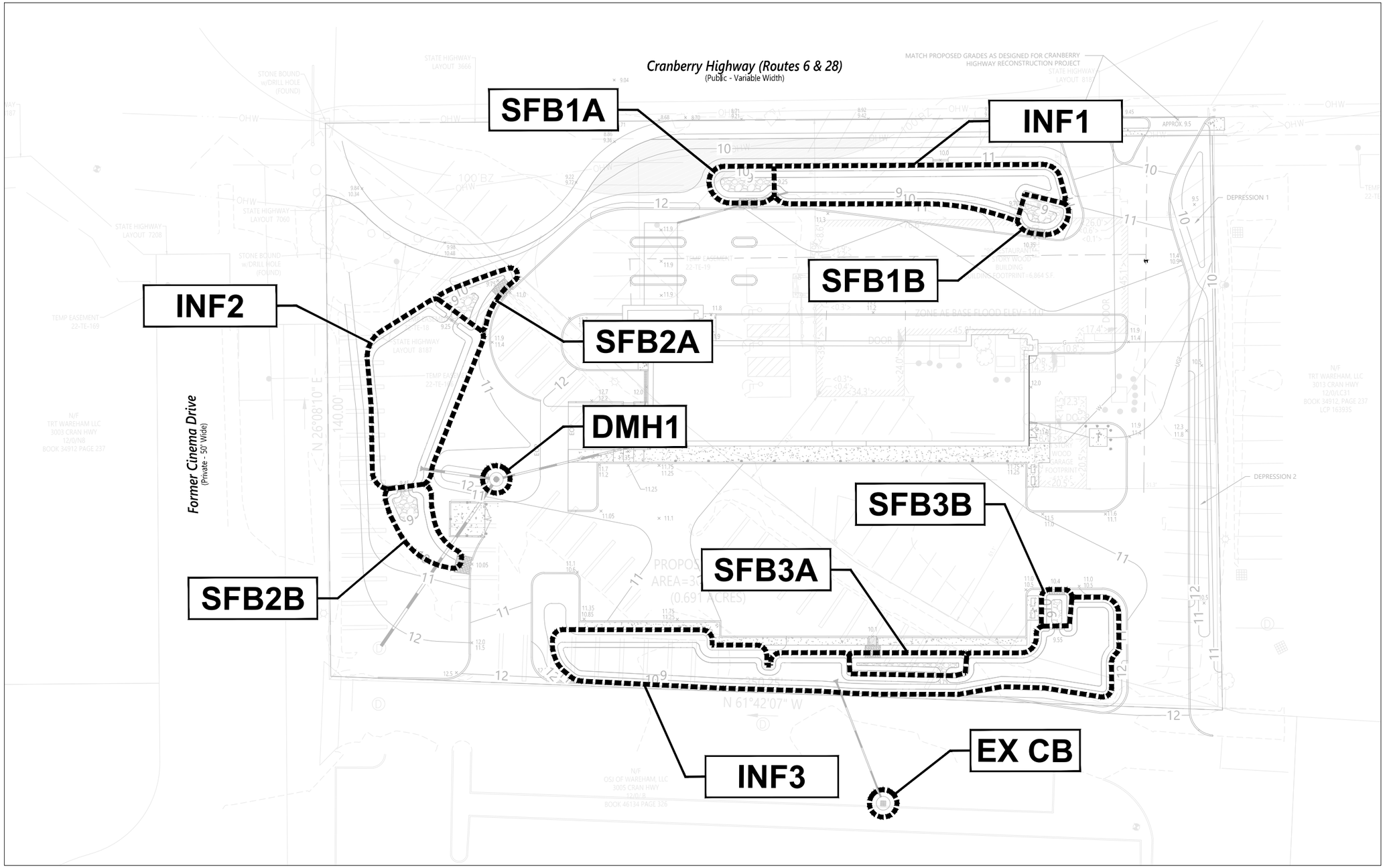
- Infiltration basins should be inspected after every major storm for the first few months to ensure proper stabilization and function.
- The grass on the side slopes should be mowed, and grass clippings, organic matter, and accumulated trash and debris removed, at least twice during the growing season.
- Eroded or barren spots should be reseeded immediately after inspection to prevent additional erosion and accumulation of sediment.
- Deep tilling can be used to break up a clogged surface area.
- Sediment should be removed from the basin as necessary. Removal procedures should not take place until the floor of the basin is thoroughly dry.

- Infiltration basins should be inspected at least twice a year to ensure proper stabilization and function.
- Light equipment, which will not compact the underlying soil, should be used to remove the top layer.

Sediment Forebay

- Inspect the forebay monthly and remove any deposited sediment at least four times per year.
- Correct any ponding, erosion, and replant any vegetation that has died.

\\vhb\gbl\proj\Providence\73170.00\cad\ld\Eng\STORMWATER\73170.00 O&M Figure.dwg



LEGEND

CB	CATCH BASIN
DMH	DRAINAGE MANHOLE
INF	STORMWATER INFILTRATION
SFB	SEDIMENT FOREBAY

Operations and Maintenance Location Plan

Reign Car Wash
Wareham, MA

Source: **VHB**
Prepared for: **Permits**
Date: **06/21/2021**

0 20 40 80 Feet

Reign Car Wash, Wareham, MA
Long Term Best Management Practices – Maintenance/ Evaluation Checklist

Best Management Practice	Inspection Frequency	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning/Repair Needed ☐yes ☐no (List Items)	Date of Cleaning/Repair	Performed by
Asphalt Pavement	Annually			• Sweep or vacuum asphalt pavement areas annually with a commercial cleaning unit and dispose of removed material. • Check loading docks and dumpster areas frequently for spillage and/or pavement staining and clean as necessary • Routinely pick up and remove litter from the parking areas, islands, and perimeter landscaping.			
Catch Basin	Bi-annually			• All catch basins / landscape drains shall be inspected and cleaned at least twice per year. • Sediment (if more than six inches deep) and/or floatable pollutants shall be pumped from the basin and disposed of at an approved offsite facility in accordance with all applicable regulations. • Any structural damage or other indication of malfunction will be reported to the site manager and repaired as necessary. • During colder periods, the catch basin / landscape drain grates must be kept free of snow and ice. • During warmer periods, the catch basin / landscape drain grates must be kept free of leaves, litter, sand, and debris.	☐**yes** ☐**no**		

Best Management Practice	Inspection Frequency	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning/Repair Needed ☐yes ☐no (List Items)	Date of Cleaning/Repair	Performed by
Surface Infiltration Basin	Bi-annually			• Infiltration basins should be inspected after every major storm for the first few months to ensure proper stabilization and function. • The grass on the sideslopes and in the buffer areas should be mowed, and grass clippings, organic matter, and accumulated trash and debris removed, at least twice during the growing season. • Eroded or barren spots should be reseeded immediately after inspection to prevent additional erosion and accumulation of sediment. • Deep tilling can be used to break up a clogged surface area. • Sediment should be removed from the basin as necessary. Removal procedures should not take place until the floor of the basin is thoroughly dry. • Infiltration basins should be inspected at least twice a year to ensure proper stabilization and function. • Light equipment, which will not compact the underlying soil, should be used to remove the top layer.	☐yes ☐no		
Sediment Forebay	Monthly			• Inspect Monthly • Maintain vegetation to prevent erosion and blockage • Clean forebay of sediment at least four times per year	☐yes ☐no		

Stormwater Control Manager _____

Reign Car Wash, Wareham, MA
Construction Best Management Practices – Maintenance/ Evaluation Checklist

Best Management Practice	Inspection Frequency	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning/Repair Needed ☐yes ☐no (List Items)	Date of Cleaning/Repair	Performed by:
Erosion Control Barriers/Silt Fencing	Weekly and after ½" storm events or greater			Inspect for deterioration or failure. Remove sediment as necessary.	☐yes ☐no		
Silt Sack Catch Basin Protection	Weekly and after ½" storm events or greater			Inspect for proper operation of catch basin. If clogged, dispose of sediment.	☐yes ☐no		
Gravel and Construction Entrance/Exit	Weekly and after ½" storm events or greater			Inspect for breakdown of crushed-stone. Reapply stone if necessary to depths specified in construction documents.	☐yes ☐no		

Stormwater Control Manager _____

Reign Car Wash

Water Quality Volume Calculations

Water Quality Volume Calculations

Project Name: Reign Car Wash **Proj. No.:** 73170.00

Project Location: Wareham, MA **Date:** 6/24/2012

Calculated by: SAP

Checked by: KC

	Runoff Depth to be Treated (in.)	Impervious Area (SF)	**Required Volume (c.f.)**	
To INF 1	**1**	10,925	910	
To INF 2	**1**	8,777	731	
To INF 3	**0.5**	16,387	683	Seeking waiver
Provided: (per HydroCAD)			**Provided Static Vol. Below Outlet (c.f.)**	
INF 1	**1**	10,925	986	
INF 2	**1**	8,777	813	
INF 3	**0.5**	16,387	698	

Summary for Pond DEP1: Depression 1

Inflow Area = 2,096 sf, 0.00% Impervious, Inflow Depth = 0.00" for WQV event
Inflow = 0.00 cfs @ 12.09 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 12.10 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.5 min
Discarded = 0.00 cfs @ 12.10 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 9.50' @ 12.10 hrs Surf.Area= 171 sf Storage= 0 cf

Plug-Flow detention time= 0.4 min calculated for 0 cf (100% of inflow)
Center-of-Mass det. time= 0.4 min (788.3 - 787.9)

Volume	Invert	Avail.Storage	Storage Description
#1	9.50'	108 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
9.50	171	89.4	0	0	171
10.00	264	95.7	108	108	275

Device	Routing	Invert	Outlet Devices
#1	Discarded	9.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 12.10 hrs HW=9.50' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.03 cfs)

Stage-Area-Storage for Pond DEP1: Depression 1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
9.50	171	0
9.51	173	2
9.52	174	3
9.53	176	5
9.54	178	7
9.55	179	9
9.56	181	11
9.57	183	12
9.58	185	14
9.59	186	16
9.60	188	18
9.61	190	20
9.62	191	22
9.63	193	24
9.64	195	26
9.65	197	28
9.66	199	30
9.67	200	32
9.68	202	34
9.69	204	36
9.70	206	38
9.71	208	40
9.72	209	42
9.73	211	44
9.74	213	46
9.75	215	48
9.76	217	50
9.77	219	52
9.78	221	55
9.79	222	57
9.80	224	59
9.81	226	61
9.82	228	64
9.83	230	66
9.84	232	68
9.85	234	71
9.86	236	73
9.87	238	75
9.88	240	78
9.89	242	80
9.90	244	83
9.91	246	85
9.92	248	87
9.93	250	90
9.94	252	92
9.95	254	95
9.96	256	98
9.97	258	100
9.98	260	103
9.99	262	105
10.00	**264**	**108**

Summary for Pond DEP2: Depression 2

Inflow Area = 3,262 sf, 0.03% Impervious, Inflow Depth = 0.00" for WQV event
Inflow = 0.00 cfs @ 12.09 hrs, Volume= 0 cf
Outflow = 0.00 cfs @ 12.10 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.5 min
Discarded = 0.00 cfs @ 12.10 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 10.50' @ 12.10 hrs Surf.Area= 164 sf Storage= 0 cf

Plug-Flow detention time= 0.4 min calculated for 0 cf (100% of inflow)
Center-of-Mass det. time= 0.4 min (788.3 - 787.9)

Volume	Invert	Avail.Storage	Storage Description
#1	10.50'	140 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
10.50	164	248.6	0	0	164
11.00	415	255.0	140	140	450

Device	Routing	Invert	Outlet Devices
#1	Discarded	10.50'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 12.10 hrs HW=10.50' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Stage-Area-Storage for Pond DEP2: Depression 2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
10.50	164	0
10.51	168	2
10.52	172	3
10.53	176	5
10.54	180	7
10.55	184	9
10.56	188	11
10.57	192	12
10.58	196	14
10.59	201	16
10.60	205	18
10.61	209	20
10.62	214	23
10.63	218	25
10.64	223	27
10.65	227	29
10.66	232	32
10.67	236	34
10.68	241	36
10.69	246	39
10.70	251	41
10.71	255	44
10.72	260	46
10.73	265	49
10.74	270	52
10.75	275	54
10.76	280	57
10.77	285	60
10.78	290	63
10.79	296	66
10.80	301	69
10.81	306	72
10.82	311	75
10.83	317	78
10.84	322	81
10.85	328	84
10.86	333	88
10.87	339	91
10.88	344	94
10.89	350	98
10.90	356	101
10.91	361	105
10.92	367	109
10.93	373	112
10.94	379	116
10.95	385	120
10.96	391	124
10.97	397	128
10.98	403	132
10.99	409	136
11.00	**415**	**140**

Summary for Pond INF1: Infiltration Basin 1

Inflow Area = 17,799 sf, 61.16% Impervious, Inflow Depth = 0.42" for WQV event
Inflow = 0.21 cfs @ 12.09 hrs, Volume= 626 cf
Outflow = 0.14 cfs @ 12.19 hrs, Volume= 626 cf, Atten= 34%, Lag= 6.0 min
Discarded = 0.14 cfs @ 12.19 hrs, Volume= 626 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 9.06' @ 12.19 hrs Surf.Area= 740 sf Storage= 42 cf

Plug-Flow detention time= 2.3 min calculated for 625 cf (100% of inflow)
Center-of-Mass det. time= 2.3 min (824.0 - 821.7)

Volume	Invert	Avail.Storage	Storage Description
#1	9.00'	2,934 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
9.00	711	234.6	0	0	711
10.00	1,289	248.5	986	986	1,297
11.00	2,693	318.7	1,948	2,934	4,479

Device	Routing	Invert	Outlet Devices
#1	Discarded	9.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	10.00'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.14 cfs @ 12.19 hrs HW=9.06' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.14 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=9.00' (Free Discharge)
↑—**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Stage-Area-Storage for Pond INF1: Infiltration Basin 1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
9.00	711	0	10.02	1,312	1,012
9.02	721	14	10.04	1,335	1,038
9.04	731	29	10.06	1,359	1,065
9.06	741	44	10.08	1,382	1,093
9.08	751	58	10.10	1,406	1,121
9.10	761	74	10.12	1,430	1,149
9.12	771	89	10.14	1,455	1,178
9.14	782	104	10.16	1,479	1,207
9.16	792	120	10.18	1,504	1,237
9.18	802	136	10.20	1,529	1,267
9.20	813	152	10.22	1,554	1,298
9.22	824	169	10.24	1,579	1,329
9.24	834	185	10.26	1,605	1,361
9.26	845	202	10.28	1,631	1,394
9.28	856	219	10.30	1,656	1,426
9.30	866	236	10.32	1,683	1,460
9.32	877	254	10.34	1,709	1,494
9.34	888	271	10.36	1,736	1,528
9.36	899	289	10.38	1,762	1,563
9.38	911	307	10.40	1,789	1,599
9.40	922	326	10.42	1,816	1,635
9.42	933	344	10.44	1,844	1,671
9.44	944	363	10.46	1,871	1,709
9.46	956	382	10.48	1,899	1,746
9.48	967	401	10.50	1,927	1,784
9.50	979	421	10.52	1,955	1,823
9.52	990	440	10.54	1,984	1,863
9.54	1,002	460	10.56	2,012	1,903
9.56	1,014	480	10.58	2,041	1,943
9.58	1,025	501	10.60	2,070	1,984
9.60	1,037	521	10.62	2,099	2,026
9.62	1,049	542	10.64	2,129	2,068
9.64	1,061	563	10.66	2,158	2,111
9.66	1,073	585	10.68	2,188	2,155
9.68	1,085	606	10.70	2,218	2,199
9.70	1,098	628	10.72	2,248	2,243
9.72	1,110	650	10.74	2,279	2,289
9.74	1,122	673	10.76	2,309	2,334
9.76	1,135	695	10.78	2,340	2,381
9.78	1,147	718	10.80	2,371	2,428
9.80	1,160	741	10.82	2,403	2,476
9.82	1,172	764	10.84	2,434	2,524
9.84	1,185	788	10.86	2,466	2,573
9.86	1,198	812	10.88	2,498	2,623
9.88	1,211	836	10.90	2,530	2,673
9.90	1,224	860	10.92	2,562	2,724
9.92	1,236	885	10.94	2,594	2,776
9.94	1,250	910	10.96	2,627	2,828
9.96	1,263	935	10.98	2,660	2,881
9.98	1,276	960	11.00	**2,693**	**2,934**
10.00	1,289	986			

Summary for Pond INF2: Infiltration Basin 2

Inflow Area = 19,377 sf, 44.39% Impervious, Inflow Depth = 0.30" for WQV event
Inflow = 0.17 cfs @ 12.10 hrs, Volume= 487 cf
Outflow = 0.16 cfs @ 12.12 hrs, Volume= 487 cf, Atten= 5%, Lag= 1.1 min
Discarded = 0.16 cfs @ 12.12 hrs, Volume= 487 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 9.01' @ 12.12 hrs Surf.Area= 1,532 sf Storage= 13 cf

Plug-Flow detention time= 1.3 min calculated for 487 cf (100% of inflow)
Center-of-Mass det. time= 1.3 min (826.4 - 825.1)

Volume	Invert	Avail.Storage	Storage Description
#1	9.00'	3,232 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
9.00	1,529	171.0	0	0	1,529
10.00	1,936	182.2	1,729	1,729	1,890
10.50	4,224	348.1	1,503	3,232	8,892

Device	Routing	Invert	Outlet Devices
#1	Discarded	9.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	9.50'	**8.0" Round Culvert** L= 30.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 9.50' / 8.20' S= 0.0433 '/' Cc= 0.900 n= 0.013 Cast iron, coated, Flow Area= 0.35 sf

Discarded OutFlow Max=0.29 cfs @ 12.12 hrs HW=9.01' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=9.00' (Free Discharge)
↑—**2=Culvert** (Controls 0.00 cfs)

Stage-Area-Storage for Pond INF2: Infiltration Basin 2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
9.00	1,529	0
9.02	1,537	31
9.04	1,544	61
9.06	1,552	92
9.08	1,560	124
9.10	1,568	155
9.12	1,575	186
9.14	1,583	218
9.16	1,591	250
9.18	1,599	281
9.20	1,607	314
9.22	1,614	346
9.24	1,622	378
9.26	1,630	411
9.28	1,638	443
9.30	1,646	476
9.32	1,654	509
9.34	1,662	542
9.36	1,670	576
9.38	1,678	609
9.40	1,686	643
9.42	1,694	677
9.44	1,702	711
9.46	1,710	745
9.48	1,718	779
9.50	1,727	813
9.52	1,735	848
9.54	1,743	883
9.56	1,751	918
9.58	1,759	953
9.60	1,767	988
9.62	1,776	1,024
9.64	1,784	1,059
9.66	1,792	1,095
9.68	1,801	1,131
9.70	1,809	1,167
9.72	1,817	1,203
9.74	1,826	1,240
9.76	1,834	1,276
9.78	1,842	1,313
9.80	1,851	1,350
9.82	1,859	1,387
9.84	1,868	1,424
9.86	1,876	1,462
9.88	1,885	1,499
9.90	1,893	1,537
9.92	1,902	1,575
9.94	1,910	1,613
9.96	1,919	1,651
9.98	1,927	1,690
10.00	1,936	1,729
10.02	2,011	1,768
10.04	2,087	1,809
10.06	2,164	1,851
10.08	2,243	1,896
10.10	2,323	1,941
10.12	2,405	1,988
10.14	2,488	2,037
10.16	2,572	2,088
10.18	2,658	2,140
10.20	2,745	2,194
10.22	2,834	2,250
10.24	2,924	2,308
10.26	3,016	2,367
10.28	3,109	2,428
10.30	3,203	2,491
10.32	3,299	2,556
10.34	3,396	2,623
10.36	3,495	2,692
10.38	3,595	2,763
10.40	3,696	2,836
10.42	3,799	2,911
10.44	3,903	2,988
10.46	4,009	3,067
10.48	4,116	3,148
10.50	**4,224**	**3,232**

Summary for Pond INF3: Infiltration Basin 3

Inflow Area = 23,210 sf, 71.12% Impervious, Inflow Depth = 0.52" for WQV event
Inflow = 0.31 cfs @ 12.11 hrs, Volume= 1,012 cf
Outflow = 0.30 cfs @ 12.13 hrs, Volume= 1,012 cf, Atten= 3%, Lag= 1.5 min
Discarded = 0.30 cfs @ 12.13 hrs, Volume= 1,012 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 9.01' @ 12.13 hrs Surf.Area= 2,009 sf Storage= 24 cf

Plug-Flow detention time= 1.3 min calculated for 1,011 cf (100% of inflow)
Center-of-Mass det. time= 1.3 min (812.9 - 811.6)

Volume	Invert	Avail.Storage	Storage Description
#1	9.00'	4,359 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
9.00	1,996	619.6	0	0	1,996
10.00	3,267	641.8	2,606	2,606	4,312
10.50	3,751	531.6	1,753	4,359	14,606

Device	Routing	Invert	Outlet Devices
#1	Discarded	9.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	9.32'	**6.0" Round FES** L= 52.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 9.32' / 8.70' S= 0.0119 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.20 sf

Discarded OutFlow Max=0.38 cfs @ 12.13 hrs HW=9.01' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.38 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=9.00' (Free Discharge)
↑—**2=FES** (Controls 0.00 cfs)

Stage-Area-Storage for Pond INF3: Infiltration Basin 3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
9.00	1,996	0
9.02	2,018	40
9.04	2,041	81
9.06	2,063	122
9.08	2,086	163
9.10	2,109	205
9.12	2,132	248
9.14	2,155	291
9.16	2,178	334
9.18	2,202	378
9.20	2,225	422
9.22	2,249	467
9.24	2,273	512
9.26	2,296	558
9.28	2,320	604
9.30	2,345	650
9.32	2,369	698
9.34	2,393	745
9.36	2,418	793
9.38	2,442	842
9.40	2,467	891
9.42	2,492	941
9.44	2,517	991
9.46	2,542	1,041
9.48	2,567	1,092
9.50	2,593	1,144
9.52	2,618	1,196
9.54	2,644	1,249
9.56	2,669	1,302
9.58	2,695	1,355
9.60	2,721	1,410
9.62	2,747	1,464
9.64	2,774	1,519
9.66	2,800	1,575
9.68	2,826	1,631
9.70	2,853	1,688
9.72	2,880	1,746
9.74	2,907	1,803
9.76	2,934	1,862
9.78	2,961	1,921
9.80	2,988	1,980
9.82	3,015	2,040
9.84	3,043	2,101
9.86	3,070	2,162
9.88	3,098	2,224
9.90	3,126	2,286
9.92	3,154	2,349
9.94	3,182	2,412
9.96	3,210	2,476
9.98	3,239	2,540
10.00	3,267	2,606
10.02	3,286	2,671
10.04	3,304	2,737
10.06	3,323	2,803
10.08	3,342	2,870
10.10	3,361	2,937
10.12	3,380	3,004
10.14	3,399	3,072
10.16	3,418	3,140
10.18	3,437	3,209
10.20	3,457	3,278
10.22	3,476	3,347
10.24	3,495	3,417
10.26	3,515	3,487
10.28	3,534	3,557
10.30	3,553	3,628
10.32	3,573	3,700
10.34	3,592	3,771
10.36	3,612	3,843
10.38	3,632	3,916
10.40	3,652	3,989
10.42	3,671	4,062
10.44	3,691	4,135
10.46	3,711	4,209
10.48	3,731	4,284
10.50	**3,751**	**4,359**

Project:	Reign Carwash	**Project #**	73170.00
Location:	Wareham, MA	**Sheet:**	1 of 1
Calculated By:	SAP	**Date:**	06/24/2021
Checked By:	KC	**Date:**	06/24/2021
Title:	SFB Pretreatment Calculations		

Computations

SFB1A

- **Contributing impervious =** 3,354 sf
- **WQV** (1'/12") (3,354 sf)= 280 CF
- **Pretreatment Vol. Required** 10% x 280 = 28.0 CF
- **Pretreatment Vol Provided (Vol. below weir ELEV 9.25 in HydroCad) = 28 cf**

SFB1B

- **Contributing impervious =** 7,111 sf
- **WQV** (1'/12") (7,111 sf)= 593 CF
- **Pretreatment Vol. Required** 10% x 593 = 59.3 CF
- **Pretreatment Vol Provided (Vol. below weir ELEV 9.7 in HydroCad) = 64 cf**

SFB2A

- **Contributing impervious =** 2,532 sf
- **WQV** (1'/12") (2,532 sf)= 211 CF
- **Pretreatment Vol. Required** 10% x 211 = 21.1 CF
- **Pretreatment Vol Provided (Vol. below weir elev 9.25 in HydroCad) = 23 cf**

SFB2B

- **Contributing impervious =** 6,069 sf
- **WQV** (1'/12") (6,069 sf)= 506 CF
- **Pretreatment Vol. Required** 10% x 506 = 50.6 CF
- **Pretreatment Vol Provided (Vol. below weir elev 9.45 in HydroCad) = 57 cf**

SFB3A (Seeking reduced WQv of 0.5-inches over impervious surface)

- **Contributing impervious =** 11,802 sf
- **WQV** (0.5'/12") (11,802 sf)= 492 CF
- **Pretreatment Vol. Required** 10% x 492 = 49.2 CF
- **Pretreatment Vol Provided (Vol. below weir elev 9.75 in HydroCad) = 55 cf**

SFB3B (Seeking reduced WQv of 0.5-inches over impervious surface)

- **Contributing impervious =** 4,704 sf
- **WQV** (0.5'/12") (4,704 sf)= 196 CF
- **Pretreatment Vol. Required** 10% x 196 = 19.6 CF
- **Pretreatment Vol Provided (Vol. below weir elev 9.55 in HydroCad) = 21 cf**

Summary for Pond SFB1A: Sediment Forebay 1A

Inflow Area = 5,889 sf, 56.95% Impervious, Inflow Depth = 0.45" for WQV event
Inflow = 0.07 cfs @ 12.09 hrs, Volume= 221 cf
Outflow = 0.07 cfs @ 12.10 hrs, Volume= 193 cf, Atten= 0%, Lag= 0.5 min
Primary = 0.07 cfs @ 12.10 hrs, Volume= 193 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 9.27' @ 12.10 hrs Surf.Area= 128 sf Storage= 30 cf

Plug-Flow detention time= 91.3 min calculated for 193 cf (87% of inflow)
Center-of-Mass det. time= 34.3 min (822.2 - 787.9)

Volume	Invert	Avail.Storage	Storage Description
#1	9.00'	156 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
9.00	100	50.0	0	0	100
10.00	220	59.9	156	156	203

Device	Routing	Invert	Outlet Devices
#1	Primary	9.25'	**8.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.07 cfs @ 12.10 hrs HW=9.27' (Free Discharge)
1=Sharp-Crested Rectangular Weir (Weir Controls 0.07 cfs @ 0.44 fps)

Stage-Area-Storage for Pond SFB1A: Sediment Forebay 1A

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
9.00	100	0	9.51	155	65
9.01	101	1	9.52	157	66
9.02	102	2	9.53	158	68
9.03	103	3	9.54	159	69
9.04	104	4	9.55	160	71
9.05	105	5	9.56	161	73
9.06	106	6	9.57	163	74
9.07	107	7	9.58	164	76
9.08	108	8	9.59	165	77
9.09	109	9	9.60	166	79
9.10	110	10	9.61	168	81
9.11	111	12	9.62	169	82
9.12	112	13	9.63	170	84
9.13	113	14	9.64	171	86
9.14	114	15	9.65	173	88
9.15	115	16	9.66	174	89
9.16	116	17	9.67	175	91
9.17	117	18	9.68	177	93
9.18	118	20	9.69	178	95
9.19	119	21	9.70	179	96
9.20	120	22	9.71	180	98
9.21	121	23	9.72	182	100
9.22	122	24	9.73	183	102
9.23	123	26	9.74	184	104
9.24	125	27	9.75	186	105
9.25	126	28	9.76	187	107
9.26	127	29	9.77	188	109
9.27	128	31	9.78	190	111
9.28	129	32	9.79	191	113
9.29	130	33	9.80	192	115
9.30	131	35	9.81	194	117
9.31	132	36	9.82	195	119
9.32	133	37	9.83	196	121
9.33	134	39	9.84	198	123
9.34	136	40	9.85	199	125
9.35	137	41	9.86	200	127
9.36	138	43	9.87	202	129
9.37	139	44	9.88	203	131
9.38	140	45	9.89	205	133
9.39	141	47	9.90	206	135
9.40	142	48	9.91	207	137
9.41	144	50	9.92	209	139
9.42	145	51	9.93	210	141
9.43	146	53	9.94	211	143
9.44	147	54	9.95	213	145
9.45	148	55	9.96	214	147
9.46	149	57	9.97	216	150
9.47	151	58	9.98	217	152
9.48	152	60	9.99	219	154
9.49	153	62	10.00	**220**	**156**
9.50	154	63			

Summary for Pond SFB1B: Sediment Forebay 1B

Inflow Area = 11,489 sf, 61.89% Impervious, Inflow Depth = 0.49" for WQV event
Inflow = 0.14 cfs @ 12.09 hrs, Volume= 469 cf
Outflow = 0.14 cfs @ 12.09 hrs, Volume= 405 cf, Atten= 1%, Lag= 0.2 min
Primary = 0.14 cfs @ 12.09 hrs, Volume= 405 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 9.73' @ 12.09 hrs Surf.Area= 125 sf Storage= 68 cf

Plug-Flow detention time= 95.4 min calculated for 405 cf (86% of inflow)
Center-of-Mass det. time= 35.8 min (823.7 - 787.9)

Volume	Invert	Avail.Storage	Storage Description
#1	9.00'	105 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
9.00	64	34.1	0	0	64
10.00	153	47.7	105	105	162

Device	Routing	Invert	Outlet Devices
#1	Primary	9.70'	**8.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.14 cfs @ 12.09 hrs HW=9.73' (Free Discharge)
1=Sharp-Crested Rectangular Weir (Weir Controls 0.14 cfs @ 0.57 fps)

Stage-Area-Storage for Pond SFB1B: Sediment Forebay 1B

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
9.00	64	0	9.51	105	43
9.01	65	1	9.52	106	44
9.02	65	1	9.53	106	45
9.03	66	2	9.54	107	46
9.04	67	3	9.55	108	47
9.05	68	3	9.56	109	48
9.06	68	4	9.57	110	49
9.07	69	5	9.58	111	50
9.08	70	5	9.59	112	51
9.09	70	6	9.60	113	52
9.10	71	7	9.61	114	53
9.11	72	7	9.62	115	55
9.12	73	8	9.63	116	56
9.13	73	9	9.64	117	57
9.14	74	10	9.65	118	58
9.15	75	10	9.66	118	59
9.16	76	11	9.67	119	60
9.17	76	12	9.68	120	62
9.18	77	13	9.69	121	63
9.19	78	13	9.70	122	64
9.20	79	14	9.71	123	65
9.21	80	15	9.72	124	67
9.22	80	16	9.73	125	68
9.23	81	17	9.74	126	69
9.24	82	17	9.75	127	70
9.25	83	18	9.76	128	72
9.26	83	19	9.77	129	73
9.27	84	20	9.78	130	74
9.28	85	21	9.79	131	76
9.29	86	22	9.80	132	77
9.30	87	23	9.81	133	78
9.31	88	23	9.82	134	79
9.32	88	24	9.83	135	81
9.33	89	25	9.84	136	82
9.34	90	26	9.85	137	84
9.35	91	27	9.86	138	85
9.36	92	28	9.87	139	86
9.37	92	29	9.88	140	88
9.38	93	30	9.89	141	89
9.39	94	31	9.90	142	91
9.40	95	32	9.91	143	92
9.41	96	33	9.92	144	93
9.42	97	34	9.93	146	95
9.43	98	34	9.94	147	96
9.44	98	35	9.95	148	98
9.45	99	36	9.96	149	99
9.46	100	37	9.97	150	101
9.47	101	38	9.98	151	102
9.48	102	39	9.99	152	104
9.49	103	41	10.00	**153**	**105**
9.50	104	42			

Summary for Pond SFB2A: Sediment Forebay 2A

Inflow Area = 6,040 sf, 41.92% Impervious, Inflow Depth = 0.33" for WQV event
Inflow = 0.05 cfs @ 12.09 hrs, Volume= 167 cf
Outflow = 0.05 cfs @ 12.10 hrs, Volume= 144 cf, Atten= 0%, Lag= 0.5 min
Primary = 0.05 cfs @ 12.10 hrs, Volume= 144 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 9.27' @ 12.10 hrs Surf.Area= 109 sf Storage= 25 cf

Plug-Flow detention time= 96.2 min calculated for 144 cf (86% of inflow)
Center-of-Mass det. time= 36.1 min (824.0 - 787.9)

Volume	Invert	Avail.Storage	Storage Description
#1	9.00'	144 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
9.00	77	37.1	0	0	77
10.00	224	73.1	144	144	397

Device	Routing	Invert	Outlet Devices
#1	Primary	9.25'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.05 cfs @ 12.10 hrs HW=9.27' (Free Discharge)
1=Sharp-Crested Rectangular Weir (Weir Controls 0.05 cfs @ 0.45 fps)

Stage-Area-Storage for Pond SFB2A: Sediment Forebay 2A

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
9.00	77	0	9.51	142	55
9.01	78	1	9.52	144	57
9.02	79	2	9.53	145	58
9.03	80	2	9.54	147	59
9.04	81	3	9.55	148	61
9.05	83	4	9.56	150	62
9.06	84	5	9.57	151	64
9.07	85	6	9.58	153	65
9.08	86	7	9.59	154	67
9.09	87	7	9.60	156	69
9.10	88	8	9.61	158	70
9.11	89	9	9.62	159	72
9.12	91	10	9.63	161	73
9.13	92	11	9.64	162	75
9.14	93	12	9.65	164	77
9.15	94	13	9.66	165	78
9.16	95	14	9.67	167	80
9.17	97	15	9.68	169	82
9.18	98	16	9.69	170	83
9.19	99	17	9.70	172	85
9.20	100	18	9.71	173	87
9.21	102	19	9.72	175	88
9.22	103	20	9.73	177	90
9.23	104	21	9.74	178	92
9.24	105	22	9.75	180	94
9.25	107	23	9.76	182	96
9.26	108	24	9.77	183	97
9.27	109	25	9.78	185	99
9.28	110	26	9.79	187	101
9.29	112	27	9.80	188	103
9.30	113	28	9.81	190	105
9.31	114	29	9.82	192	107
9.32	116	31	9.83	194	109
9.33	117	32	9.84	195	111
9.34	118	33	9.85	197	113
9.35	120	34	9.86	199	115
9.36	121	35	9.87	201	117
9.37	122	37	9.88	202	119
9.38	124	38	9.89	204	121
9.39	125	39	9.90	206	123
9.40	127	40	9.91	208	125
9.41	128	42	9.92	209	127
9.42	129	43	9.93	211	129
9.43	131	44	9.94	213	131
9.44	132	45	9.95	215	133
9.45	134	47	9.96	217	135
9.46	135	48	9.97	218	137
9.47	137	50	9.98	220	140
9.48	138	51	9.99	222	142
9.49	139	52	10.00	**224**	**144**
9.50	141	54			

Summary for Pond SFB2B: Sediment Forebay 2B

Inflow Area = 13,337 sf, 45.50% Impervious, Inflow Depth = 0.36" for WQV event
Inflow = 0.12 cfs @ 12.09 hrs, Volume= 400 cf
Outflow = 0.12 cfs @ 12.10 hrs, Volume= 343 cf, Atten= 2%, Lag= 0.5 min
Primary = 0.12 cfs @ 12.10 hrs, Volume= 343 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 9.48' @ 12.10 hrs Surf.Area= 184 sf Storage= 63 cf

Plug-Flow detention time= 99.2 min calculated for 343 cf (86% of inflow)
Center-of-Mass det. time= 37.7 min (825.5 - 787.9)

Volume	Invert	Avail.Storage	Storage Description
#1	9.00'	371 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
9.00	82	34.6	0	0	82
10.00	339	88.4	196	196	612
10.10	3,786	373.0	175	371	11,062

Device	Routing	Invert	Outlet Devices
#1	Primary	9.45'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.12 cfs @ 12.10 hrs HW=9.48' (Free Discharge)
↑—**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.12 cfs @ 0.59 fps)

Stage-Area-Storage for Pond SFB2B: Sediment Forebay 2B

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
9.00	82	0
9.02	85	2
9.04	89	3
9.06	92	5
9.08	96	7
9.10	100	9
9.12	104	11
9.14	107	13
9.16	111	15
9.18	115	18
9.20	119	20
9.22	124	22
9.24	128	25
9.26	132	28
9.28	136	30
9.30	141	33
9.32	145	36
9.34	150	39
9.36	154	42
9.38	159	45
9.40	164	48
9.42	169	52
9.44	174	55
9.46	178	58
9.48	184	62
9.50	189	66
9.52	194	70
9.54	199	74
9.56	204	78
9.58	210	82
9.60	215	86
9.62	221	90
9.64	226	95
9.66	232	99
9.68	238	104
9.70	244	109
9.72	249	114
9.74	255	119
9.76	261	124
9.78	267	129
9.80	274	135
9.82	280	140
9.84	286	146
9.86	292	152
9.88	299	158
9.90	305	164
9.92	312	170
9.94	319	176
9.96	325	183
9.98	332	189
10.00	339	196
10.02	731	206
10.04	1,272	226
10.06	1,961	258
10.08	2,799	306
10.10	**3,786**	**371**

Summary for Pond SFB3A: Sediment Forebay 3A

Inflow Area = 16,792 sf, 70.28% Impervious, Inflow Depth = 0.56" for WQV event
Inflow = 0.22 cfs @ 12.11 hrs, Volume= 778 cf
Outflow = 0.22 cfs @ 12.12 hrs, Volume= 723 cf, Atten= 1%, Lag= 0.5 min
Primary = 0.22 cfs @ 12.12 hrs, Volume= 723 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 9.80' @ 12.12 hrs Surf.Area= 171 sf Storage= 63 cf

Plug-Flow detention time= 60.1 min calculated for 723 cf (93% of inflow)
Center-of-Mass det. time= 22.9 min (812.4 - 789.5)

Volume	Invert	Avail.Storage	Storage Description
#1	9.00'	103 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
9.00	15	74.3	0	0	15
10.00	236	96.9	103	103	335

Device	Routing	Invert	Outlet Devices
#1	Primary	9.75'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.22 cfs @ 12.12 hrs HW=9.80' (Free Discharge)
↑**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.22 cfs @ 0.73 fps)

Stage-Area-Storage for Pond SFB3A: Sediment Forebay 3A

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
9.00	15	0	9.51	95	25
9.01	16	0	9.52	97	26
9.02	17	0	9.53	99	27
9.03	18	0	9.54	102	28
9.04	19	1	9.55	104	29
9.05	20	1	9.56	106	30
9.06	21	1	9.57	109	31
9.07	22	1	9.58	111	32
9.08	23	2	9.59	113	33
9.09	24	2	9.60	116	35
9.10	25	2	9.61	118	36
9.11	26	2	9.62	121	37
9.12	28	3	9.63	123	38
9.13	29	3	9.64	126	39
9.14	30	3	9.65	129	41
9.15	31	3	9.66	131	42
9.16	33	4	9.67	134	43
9.17	34	4	9.68	137	45
9.18	35	4	9.69	139	46
9.19	37	5	9.70	142	47
9.20	38	5	9.71	145	49
9.21	40	6	9.72	148	50
9.22	41	6	9.73	150	52
9.23	42	6	9.74	153	53
9.24	44	7	9.75	156	55
9.25	45	7	9.76	159	56
9.26	47	8	9.77	162	58
9.27	49	8	9.78	165	60
9.28	50	9	9.79	168	61
9.29	52	9	9.80	171	63
9.30	54	10	9.81	174	65
9.31	55	10	9.82	177	66
9.32	57	11	9.83	180	68
9.33	59	11	9.84	183	70
9.34	61	12	9.85	186	72
9.35	62	13	9.86	189	74
9.36	64	13	9.87	192	76
9.37	66	14	9.88	196	78
9.38	68	15	9.89	199	80
9.39	70	15	9.90	202	82
9.40	72	16	9.91	205	84
9.41	74	17	9.92	209	86
9.42	76	17	9.93	212	88
9.43	78	18	9.94	215	90
9.44	80	19	9.95	219	92
9.45	82	20	9.96	222	94
9.46	84	21	9.97	226	97
9.47	86	21	9.98	229	99
9.48	88	22	9.99	232	101
9.49	90	23	10.00	**236**	**103**
9.50	92	24			

Summary for Pond SFB3B: Sediment Forebay 3B

Inflow Area = 6,418 sf, 73.30% Impervious, Inflow Depth = 0.58" for WQV event
Inflow = 0.09 cfs @ 12.09 hrs, Volume= 310 cf
Outflow = 0.09 cfs @ 12.09 hrs, Volume= 289 cf, Atten= 0%, Lag= 0.2 min
Primary = 0.09 cfs @ 12.09 hrs, Volume= 289 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 9.58' @ 12.09 hrs Surf.Area= 59 sf Storage= 23 cf

Plug-Flow detention time= 57.5 min calculated for 289 cf (93% of inflow)
Center-of-Mass det. time= 21.6 min (809.5 - 787.9)

Volume	Invert	Avail.Storage	Storage Description
#1	9.00'	55 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
9.00	22	19.9	0	0	22
10.00	98	39.1	55	55	117

Device	Routing	Invert	Outlet Devices
#1	Primary	9.55'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.09 cfs @ 12.09 hrs HW=9.58' (Free Discharge)
1=Sharp-Crested Rectangular Weir (Weir Controls 0.09 cfs @ 0.55 fps)

Stage-Area-Storage for Pond SFB3B: Sediment Forebay 3B

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
9.00	22	0
9.01	22	0
9.02	23	0
9.03	23	1
9.04	24	1
9.05	25	1
9.06	25	1
9.07	26	2
9.08	26	2
9.09	27	2
9.10	27	2
9.11	28	3
9.12	28	3
9.13	29	3
9.14	29	4
9.15	30	4
9.16	31	4
9.17	31	4
9.18	32	5
9.19	32	5
9.20	33	5
9.21	33	6
9.22	34	6
9.23	35	6
9.24	35	7
9.25	36	7
9.26	37	8
9.27	37	8
9.28	38	8
9.29	38	9
9.30	39	9
9.31	40	9
9.32	40	10
9.33	41	10
9.34	42	11
9.35	42	11
9.36	43	12
9.37	44	12
9.38	44	12
9.39	45	13
9.40	46	13
9.41	47	14
9.42	47	14
9.43	48	15
9.44	49	15
9.45	49	16
9.46	50	16
9.47	51	17
9.48	52	17
9.49	52	18
9.50	53	18
9.51	54	19
9.52	55	19
9.53	56	20
9.54	56	20
9.55	57	21
9.56	58	22
9.57	59	22
9.58	59	23
9.59	60	23
9.60	61	24
9.61	62	25
9.62	63	25
9.63	64	26
9.64	64	26
9.65	65	27
9.66	66	28
9.67	67	28
9.68	68	29
9.69	69	30
9.70	70	30
9.71	70	31
9.72	71	32
9.73	72	33
9.74	73	33
9.75	74	34
9.76	75	35
9.77	76	36
9.78	77	36
9.79	78	37
9.80	78	38
9.81	79	39
9.82	80	39
9.83	81	40
9.84	82	41
9.85	83	42
9.86	84	43
9.87	85	44
9.88	86	44
9.89	87	45
9.90	88	46
9.91	89	47
9.92	90	48
9.93	91	49
9.94	92	50
9.95	93	51
9.96	94	52
9.97	95	53
9.98	96	54
9.99	97	55
10.00	**98**	**55**

Reign Car Wash

TSS Removal Worksheets

TSS Removal Calculation Worksheet

Vanasse Hangen Brustlin, Inc.
Consulting Engineers and Planners
101 Walnut Street
Watertown, MA 02471
(617) 924-1770

Project Name:	**Reign Car Wash**	Sheet:	**1 of 1**
Project Number:	**73170.00**	Date:	**21-Jun-2021**
Location:	**Wareham, MA**	Computed by:	**SAP**
Discharge Point:		Checked by:	**KC**
Drainage Area(s):			

1. Pre-Treatment prior to Infiltration

BMP*	TSS Removal Rate*	Starting TSS Load**	Amount Removed (B*C)	Remaining Load (D-E)
Street Sweeping - 2%	**2%**	**100%**	**2%**	**98%**
Sediment Forebay	**25%**	**98%**	**25%**	**74%**
	0%	**74%**	**0%**	**74%**
		Pre-Treatment TSS Removal =		**27%**

2. Total TSS Removal including Pretreatment 1.

BMP*	TSS Removal Rate*	Starting TSS Load**	Amount Removed (B*C)	Remaining Load (D-E)
Infiltration Basin	**80%**	**100%**	**80%**	**20%**
	0%	**20%**	**0%**	**20%**
	0%	**20%**	**0%**	**20%**
	0%	**20%**	**0%**	**20%**

* BMP and TSS Removal Rate Values from the MassDEP Stormwater Handbook Vol. 1. Removal rates for proprietary devices are from approved studies and/or manufacturer data (attach study or data source, or remove this sentence if not applicable).

** Equals remaining load from previous BMP (E)

*** Stormceptor sizing calculation gives a TSS removal rate of 87%. To be conservative, 75% removal is used for this calculation based upon the NJCAT study provided on the MA STEP website. (Change name of device and the claimed removal rate shown on the calc. sheet. ALSO provide backup documentation to support TSS removal rate from the MA STEP website. Remove this sentence if not applicable.)

Appendix E - Standard 8 Supporting Information

Erosion and Sedimentation Control Measures

The following erosion and sedimentation controls are for use during the earthwork and construction phases of the project. The following controls are provided as recommendations for the site contractor and do not constitute or replace the final Stormwater Pollution Prevention Plan that must be fully implemented by the Contractor and owner in Compliance with EPA NPDES regulations.

Siltsock

Filter socks filled with compost will be placed to trap sediment transported by runoff before it reaches the drainage system or leaves the construction site.

Catch Basin Protection

Newly constructed and existing catch basins will be protected with hay bale barriers (where appropriate) or silt sacks throughout construction.

Gravel and Construction Entrance/Exit

A temporary crushed-stone construction entrance/exit will be constructed. A cross slope will be placed in the entrance to direct runoff to a protected catch basin inlet or settling area. If deemed necessary after construction begins, a wash pad may be included to wash off vehicle wheels before leaving the project site.

Diversion Channels

Diversion channels will be used to collect runoff from construction areas and discharge to either sedimentation basins or protected catch basin inlets.

Maintenance

- The contractor or subcontractor will be responsible for implementing each control shown on the Sedimentation and Erosion Control Plan. In accordance with EPA regulations, the contractor must sign a copy of a certification to verify that a plan has been prepared and that permit regulations are understood.

- The on-site contractor will inspect all sediment and erosion control structures periodically and after each rainfall event. Records of the inspections will be prepared and maintained on-site by the contractor.

- Silt shall be removed from behind barriers if greater than 6-inches deep or as needed.

- Damaged or deteriorated items will be repaired immediately after identification.

- Sediment that is collected in structures shall be disposed of properly and covered if stored on-site.

- Erosion control structures shall remain in place until all disturbed earth has been securely stabilized. After removal of structures, disturbed areas shall be regraded and stabilized as necessary.