Stormwater Management Plan

under the
Massachusetts Stormwater Management Regulations

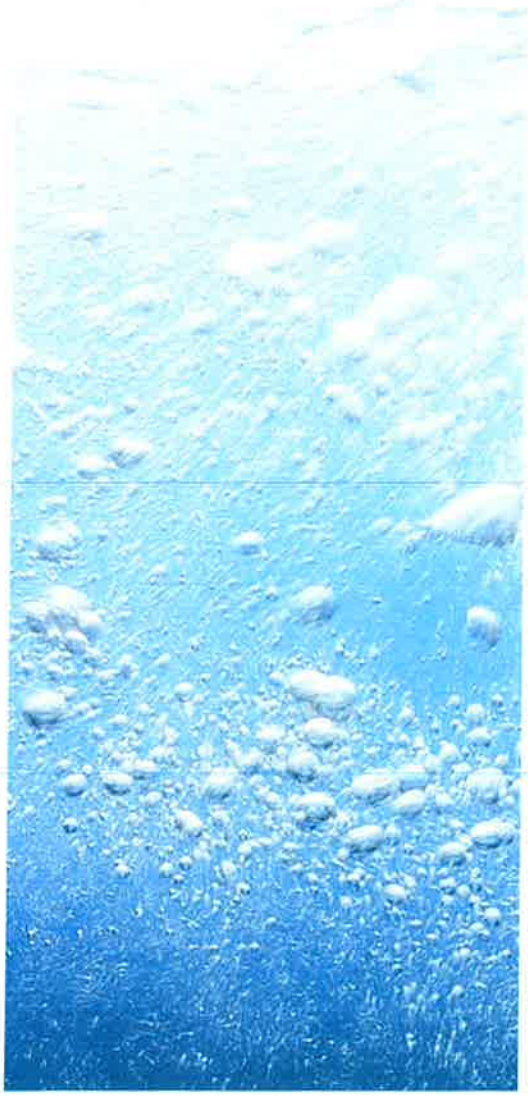
Definitive Subdivision

53 Williams Street
Beverly, MA

March 2019

Applicant:
MJP Properties

Submitted to:
City of Beverly, MA



Prepared by:
Griffin Engineering
Beverly, MA

TABLE OF CONTENTS

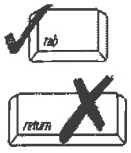
STORMWATER MANAGEMENT CHECKLIST

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

Signature and Date

Checklist

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

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☐ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

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

☒ An Illicit Discharge Compliance Statement is attached;

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

ATTACHMENT A

PROJECT DESCRIPTION

1.0 INTRODUCTION

This stormwater management report is prepared in support of the proposed residential development at 53 Williams Street (aka 57 Williams Street) in Beverly, MA. The project consists of removing a single-family residence and constructing two new single-family residences with frontage on a new private right-of-way turnaround.

According to the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management regulations, the proposed construction is exempt from MassDEP Stormwater Management requirements since the proposed development is a small residential subdivision (four or fewer lots). However, the regulations establish a framework for evaluating stormwater management systems that is used by the City of Beverly in evaluating new development projects. The narrative below compares the proposed construction to the MassDEP Stormwater Management requirements. The proposed drainage system is in full compliance with those standards as they apply to this combination redevelopment / new development project.

1.1 Existing Conditions

The parcel is approximately 1.08-acres (46,910 sq. ft.) in size and is currently developed with a single-family residence with associated walkways, landscaping, and utilities and four deteriorating concrete foundations that appear to have been left in place from a previous use. Wetland resource area (BVW) exists on the south side of the site flagged by Rimmer Environmental Associates. The project site is bounded to the north and east by a 200-ft buffer strip associated with the Trask Lane development, to the east by the City of Beverly golf course, to the south by a residential property and to the west by residential properties and Williams Street. The topography of the site consists of moderately steep sloping terrain with numerous ledge outcrops. The majority of the site drains south to the wetland resource area, with a small portion draining north towards a large wetland resource area on the abutting property. Runoff from the small on-site wetland resource area eventually drains towards the large off-site wetland resource area.

There is no municipal stormwater drainage system within Williams Street adjacent to the project. Stormwater runoff from approximately 240-linear feet of Williams Street flows onto the project site and overland towards the on-site wetland resource area.

1.2 Proposed Conditions

The proposed project involves razing the existing single-family residence at 53 Williams Street and constructing a 40-foot wide by 57-foot long private

hammerhead turnaround with two new single-family residences. Existing utilities in Williams Street are adequate for the proposed construction. The proposed single-family residences are modest-sized dwellings with associated driveways, utilities, stormwater management system, and landscaping. A site plan showing the proposed development and its stormwater management features has been separately provided.

The proposed project is a mixture of new development and redevelopment. When complete there will be an increase of approximately 4,677 square feet of impervious surfaces at the site. The proposed stormwater management system is designed to meet all stormwater management standards for the new impervious surfaces.

A small bituminous concrete apron will be constructed along the existing edge of pavement within Williams Street and adjacent to the project site directing stormwater runoff to a proposed deep-sump, hooded catch basin. Stormwater runoff captured by the catch basin will be directed to the on-site wetland resource area via a drain manhole, 12-inch diameter drain pipes and stone channel.

2.0 STORMWATER MANAGEMENT STANDARDS

2.1 Standard 1: No New Untreated Discharges

No new untreated discharges to wetlands or waterways are proposed.

2.2 Standard 2: Peak Rate Attenuation

Hydrologic modeling was conducted using a HydroCAD computer model. This model uses an approximation of Soil Conservation Service TR-20 methods to calculate runoff rates and volumes based on descriptions of land use, ground characteristics, and size.

The time of concentration (t_c) for each subcatchment was calculated in HydroCAD using sheet flow. Sheet flow uses roughness coefficients (Manning's *n*) and watercourse slope to calculate travel time of stormwater runoff for each subcatchment. The site was modeled using a maximum of 100-feet of sheet flow. A minimum time of concentration of 6 minutes was used for all subcatchments, for both existing and proposed conditions.

The post-development peak runoff rates do not exceed pre-development peak runoff rates at the discharge location for the 2, 10, 25, and 100-year design storm events. Type-III rainfall pattern were used as an input parameter to generate runoff. HydroCAD calculations have been provided in Attachment B for the 2, 10, 25, and 100-year storm events. Comparison of pre and post-development stormwater runoff calculation results are summarized in Tables 1 and 2 for the

drainage south towards the on-site wetland resource area and northeast towards the off-site wetland resource area.

Table 1: Comparison of Pre-Development and Post Development Peak Runoff Rates (cfs) Towards On-Site Wetland Resource Area

	Storm Frequency			
	2-Year	10-Year	25-Year	100-Year
Pre-Development	0.65	1.35	1.85	2.48
Post-Development	0.43	0.88	1.19	1.59

Table 2: Comparison of Pre-Development and Post Development Peak Runoff Rates (cfs) Northeast Towards Off-Site Wetland Resource Area

	Storm Frequency			
	2-Year	10-Year	25-Year	100-Year
Pre-Development	0.84	1.81	2.49	3.36
Post-Development	0.60	1.22	1.80	3.35

The volume of stormwater runoff from the project site has been decreased by approximately 14% (1,930 cubic feet) during the 100-year storm event. This is attributed to the proposed stormwater control berm with infiltration trench. Therefore, there is no threat of increased off-site flooding as a result of the proposed project.

2.3 Standard 3: Recharge

Site soils are mapped by the United States Department of Agriculture – Soil Conservation Service and NRCS web based soil survey as being Woodbridge Fine Sandy Loam ('C/D' Hydrologic Soil Group (HSG)). Based upon the surrounding soil mapping units and observed site conditions and test pits performed on January 29, 2019, we classified the soils on-site as 'C' HSG.

Stormwater management guidelines require that at a minimum the annual recharge from the post-development site approximate the annual recharge from pre-development conditions based on the hydrologic soil type. The required recharge volume is approximately 97 cf (4,677 sf new impervious area x 0.25-inches). Since greater than 100% of the new impervious surfaces are tributary to the proposed stormwater recharge device, an adjustment to the required

recharge volume is not needed for this project. The infiltration trench at the bottom of the stormwater control berm is the projects' recharge device. It has a total static volume of approximately 217 cf. Recharge Volume & Design calculations are provided in Attachment C.1.

As noted above, test pits were performed to analyze the subsurface soil conditions at the project site and assign an exfiltration rate. The native soil is primarily characterized as fine sandy-loam / loam. Therefore, the applicable Rawls Rate used for the drawdown calculations of the stormwater infiltration devices is 0.52 inches per hour. At this rate, the proposed infiltration trench will drawdown in approximately 35 hours. This is in compliance with the maximum 72-hours allowed by MassDEP Stormwater Management Regulations. Drawdown calculations and test pit field data forms are provided in Attachment C.3 and C.5, respectively.

2.4 Standard 4: Water Quality

The minimum required water quality treatment volume for the proposed residential development is one-half inch times the area of the new impervious surfaces. The reader is referred to Water Quality Volume Calculations provided in Attachment C.4.

The portion of the project site being paved (proposed driveways) consists of a stormwater treatment train consisting of a vegetated filter strip (lawn) and stormwater control berm. Stormwater runoff from the driveways will flow across the lawn for approximately 110-feet, allowing sediment and debris to be captured. For the purpose of estimating site TSS removal, the combination of the lawn and the stormwater control berm was assigned a 45% annual TSS removal efficiency. The proposed stormwater control berm has a static volume of approximately 1,824 cf below the top of berm which is greater than the required water quality volume of 195 cf.

As required by the Stormwater Management Standards, a Long-Term Pollution Prevention Plan has been prepared for the project and is provided in Attachment D. The plan identifies suitable practices for source control and pollution prevention throughout the useful life of the site.

2.5 Standard 5: Land Uses with Higher Potential Pollutant Loads

In accordance with the Massachusetts Stormwater Management Standards, the proposed primary site use is not considered a Land Use with Higher Potential Pollutant Load (LUHPPL). Therefore, this standard does not apply.

2.6 Standard 6: Critical Areas

The project site is not tributary to an environmentally-critical area as defined by

the Massachusetts Stormwater Management Standards. Therefore, this standard does not apply to this project.

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

The site has been previously developed with a single-family building and associated walkways, utilities, and landscaping and four deteriorating concrete foundations. The 4,677 sq. ft. increase in impervious surfaces is considered new development and the remaining portion of the project site is redevelopment.

The proposed project meets all the standards except for standard 4 which is met to the maximum extent practicable. The proposed project provides the required water quality volume and LUHPPL, but only has TSS removal rate of 45%. This is less than the 80% required by Standard 4. However, this project is not anticipated to produce high pollutant loads due to the single-family home use. Additionally, there is very little discharge from the site: the stormwater calculations show that the berm contains all tributary runoff up to the 10-year storm event. Low maintenance and country drainage type BMPs were applied to this project given the project size and use (two-single family residences).

2.8 Standard 8: Construction Period Pollution Prevention and Erosion and Sediment Control

The proposed project includes a comprehensive set of mitigation measures to protect the existing and surrounding sites from impacts due to construction. Prior to work commencing on-site, there will be a preconstruction conference with the contractor. The purpose of this meeting will be to coordinate the best methods for erosion and sedimentation control and other construction-related issues. The implementation of a comprehensive soil and erosion control plan will occur prior to any construction activities within the project area. In general, the following sequence of events will occur:

- Erosion and sedimentation control devices will be installed along the edge of the down-gradient side of the project area prior to construction as depicted on the site plan. In addition to providing for sedimentation deposition and reducing runoff during storm events, this barrier will limit the work area for the equipment operators.

- Erosion and sedimentation control devices will be inspected daily during periods of active construction and bi-weekly during the remainder of the construction period. Sediments will be removed from the barriers as soon as they reach a depth of 6-inches.

- Runoff from the site will be directed through sedimentation control barriers.

- During construction, disturbed areas will be kept to a minimum and vegetative stabilization of these areas will occur as soon as practicable.

- Temporary seeding, mulching, or other suitable stabilization measures will be used to protect exposed critical areas should unprotected soils remain exposed for prolonged periods.

- The proposed proprietary separator will be protected from sediment inflow during construction through the installation of silt sacks or by surrounding them with a barrier of staked haybales.

- The paved parking lot will be swept until the site has been stabilized. Sweeping will occur as necessary.

Construction activities shall be monitored on-site by the construction supervisor to ensure that the soil erosion and sediment control features are installed properly, maintained, and to evaluate the need for additional erosion control and/or stabilization measures. The inspector will perform the following tasks:

- Supervise the installation and maintenance of the soil erosion and sediment control features.

- Evaluate the need for additional soil erosion and sediment control features.

- Scheduled inspections of erosion control features, including construction entrance, haybales, and dust control.

- Supervise and monitor temporary and permanent stabilization activities.

2.9 Standard 9: Operation and Maintenance Plan

An Operations & Maintenance Plan has been provided in Attachment E. City of Beverly will own and maintain the catch basin in Williams Street, 12-inch pipe, and discharge. Lot 1 owner will be responsible for the stormwater control berm.

2.10 Standard 10: Illicit Discharges

The submitted Long-Term Pollution Prevention Plan (Attachment D) specifies measures to prevent illicit discharges from entering the stormwater management system. Source control and response plans are also specified to prevent illicit discharges from being conveyed through the stormwater management system.

Consistent with the Massachusetts Stormwater Handbook, the property owner(s) will submit a signed Illicit Discharge Compliance Statement prior to discharging any

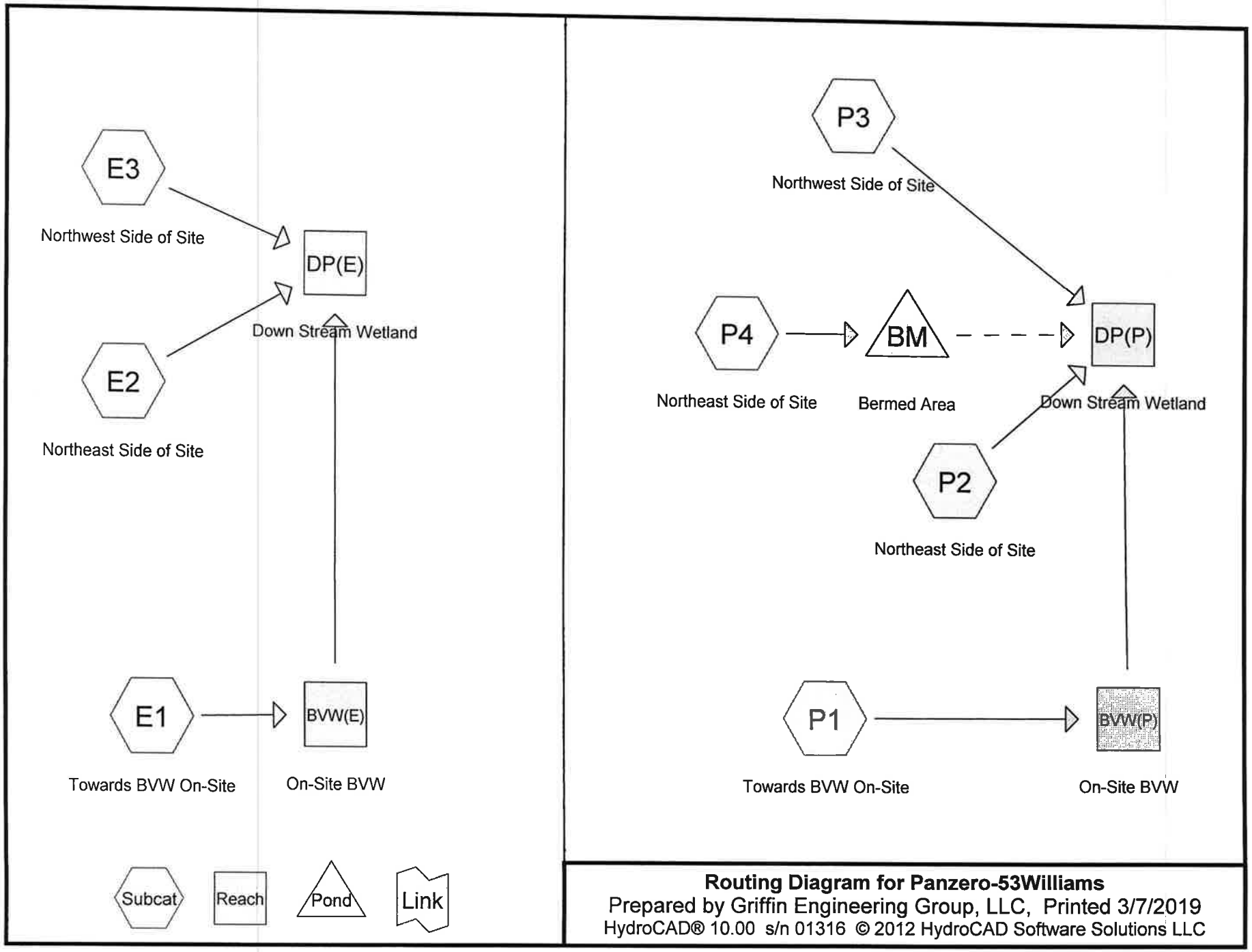
stormwater runoff to the post-construction stormwater BMP's. A draft copy of the Illicit Discharge Statement is provided in Attachment F

3.0 SUMMARY

The proposed drainage system and site redevelopment plans for the two-lot subdivision conforms to MassDEP Stormwater Management Regulations. The proposed drainage system will treat and remove TSS and other pollutants throughout the project area and minimize erosion. Proper construction and operation and maintenance of the proposed drainage system are critical to its long-term performance. To that end, an Operations and Maintenance Plan and Long-Term Pollution Prevention Plan have been prepared and will be instituted throughout the facility's life.

ATTACHMENT B

SUBCATCHMENT PLANS (REDUCED SCALE, 11X17) & DRAINAGE CALCULATIONS (HYDROCAD)



Routing Diagram for Panzero-53Williams

Prepared by Griffin Engineering Group, LLC, Printed 3/7/2019

SUBDIVISION DRAWING INDEX:
C-1: EXISTING CONDITIONS PLAN
C-2: PLAN OF LAND
C-3: SITE PLAN

N

PLAN BK. 168 PLAN 44

20' WIDE SEWER EASEMENT (PLAN NO. 204 OF 1978)

N/F
HOWARD
58 WILLIAMS ST.
MAP 28, LOT 113

N/F
FOLLY HILL ASSOCIATES TRUST
TRASK LANE
MAP 28, LOT 126

MAP 28, LOT 114
1.08 ACRES
46,910.3± SF

E-1
E-2
E-3

TP1
TP2
TP3
TP4
TP5
TP6
TP7

100' BUFFER

I. ROD FND.

N/F
MENDOLA
51 WILLIAMS ST.
MAP 28, LOT 115

N/F
ADAMO
49 WILLIAMS ST.
MAP 28, LOT 116

N/F
LANGSTAFF
47 WILLIAMS ST.
MAP 28, LOT 117

WILLIAMS STREET
(F/K/A BATES ROAD-
40' WIDE PUBLIC WAY)

N/F
CITY OF BEVERLY
134 MCKAY ST.
MAP 29, LOT 46

N/F
FCS REALTY TRUST
41R WILLIAMS ST.
MAP 28, LOT 119

100' BUFFER

50' BUFFER

25' BUFFER

LEGEND

N90°00'00"E 28.84'	PROPERTY LINE
	100' BUFFER ZONE
	50' NO-BUILD ZONE
	25' NO-DISTURB ZONE
A3 A4	WETLAND
	CONTOUR
	EDGE OF PAVEMENT
	BUILDING
	WATER LINE
S S	SEWER LINE
	TELEPHONE POLE
G G	GAS LINE
	SPOT GRADE
	LEDGE
	TREELINE
15	TREE W/CALIPER
TP5	TEST PIT
	STONEWALL

GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.

BEVERLY PLANNING BOARD

DATE:

No.	Date	Description

Revisions

Griffin Engineering Group, LLC
495 Cabot Street, 2nd Floor
Beverly, MA 01915
Tel: 978-927-5111
Fax: 978-927-5103

DEFINITIVE SUBDIVISION PLAN
53 WILLIAMS ST
BEVERLY, MA

EXISTING WATERSHED

Scale: 1"=20'
Job No.:
File Name:
Date: 3/4/19

W-1

Summary for Subcatchment E1: Towards BVW On-Site

Runoff = 0.65 cfs @ 12.23 hrs, Volume= 2,802 cf, Depth> 1.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.10"

	Area (sf)	CN	Description
*	1,087	98	House/Walks
*	471	98	Conc. Foundation
	3,816	74	>75% Grass cover, Good, HSG C
*	1,644	98	Exposed Ledge
	2,229	98	Water Surface, HSG D
	23,630	70	Woods, Good, HSG C
	32,877	75	Weighted Average
	27,446		83.48% Pervious Area
	5,431		16.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	51	0.0900	0.27		**Sheet Flow, Grass** Grass: Short n= 0.150 P2= 3.10"
9.3	49	0.0400	0.09		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.10"
2.6	190	0.0600	1.22		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
15.1	290	Total			

Summary for Subcatchment E2: Northeast Side of Site

Runoff = 0.13 cfs @ 12.27 hrs, Volume= 618 cf, Depth> 0.81"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.10"

	Area (sf)	CN	Description
*	180	98	Conc. Foundation
*	65	98	Exposed Ledge
	8,855	70	Woods, Good, HSG C
	9,100	71	Weighted Average
	8,855		97.31% Pervious Area
	245		2.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	109	0.0400	0.10		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.10"

Summary for Subcatchment E3: Northwest Side of Site

Runoff = 0.10 cfs @ 12.13 hrs, Volume= 356 cf, Depth> 0.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.10"

	Area (sf)	CN	Description
*	422	98	Exposed Ledge
	4,511	70	Woods, Good, HSG C
	4,933	72	Weighted Average
	4,511		91.45% Pervious Area
	422		8.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	66	0.0900	0.13		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.10"

Summary for Reach BVW(E): On-Site BVW

Inflow Area = 32,877 sf, 16.52% Impervious, Inflow Depth > 1.02" for 2-yr event
Inflow = 0.65 cfs @ 12.23 hrs, Volume= 2,802 cf
Outflow = 0.65 cfs @ 12.23 hrs, Volume= 2,802 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Reach DP(E): Down Stream Wetland

Inflow Area = 46,910 sf, 13.00% Impervious, Inflow Depth > 0.97" for 2-yr event
Inflow = 0.84 cfs @ 12.22 hrs, Volume= 3,776 cf
Outflow = 0.84 cfs @ 12.22 hrs, Volume= 3,776 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Subcatchment E1: Towards BVW On-Site

Runoff = 1.35 cfs @ 12.21 hrs, Volume= 5,598 cf, Depth> 2.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.50"

	Area (sf)	CN	Description
*	1,087	98	House/Walks
*	471	98	Conc. Foundation
	3,816	74	>75% Grass cover, Good, HSG C
*	1,644	98	Exposed Ledge
	2,229	98	Water Surface, HSG D
	23,630	70	Woods, Good, HSG C
	32,877	75	Weighted Average
	27,446		83.48% Pervious Area
	5,431		16.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	51	0.0900	0.27		**Sheet Flow, Grass** Grass: Short n= 0.150 P2= 3.10"
9.3	49	0.0400	0.09		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.10"
2.6	190	0.0600	1.22		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
15.1	290	Total			

Summary for Subcatchment E2: Northeast Side of Site

Runoff = 0.29 cfs @ 12.25 hrs, Volume= 1,319 cf, Depth> 1.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.50"

	Area (sf)	CN	Description
*	180	98	Conc. Foundation
*	65	98	Exposed Ledge
	8,855	70	Woods, Good, HSG C
	9,100	71	Weighted Average
	8,855		97.31% Pervious Area
	245		2.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	109	0.0400	0.10		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.10"

Summary for Subcatchment E3: Northwest Side of Site

Runoff = 0.22 cfs @ 12.13 hrs, Volume= 747 cf, Depth> 1.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.50"

	Area (sf)	CN	Description
*	422	98	Exposed Ledge
	4,511	70	Woods, Good, HSG C
	4,933	72	Weighted Average
	4,511		91.45% Pervious Area
	422		8.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	66	0.0900	0.13		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.10"

Summary for Reach BVW(E): On-Site BVW

Inflow Area = 32,877 sf, 16.52% Impervious, Inflow Depth > 2.04" for 10-yr event
Inflow = 1.35 cfs @ 12.21 hrs, Volume= 5,598 cf
Outflow = 1.35 cfs @ 12.21 hrs, Volume= 5,598 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Reach DP(E): Down Stream Wetland

Inflow Area = 46,910 sf, 13.00% Impervious, Inflow Depth > 1.96" for 10-yr event
Inflow = 1.81 cfs @ 12.21 hrs, Volume= 7,664 cf
Outflow = 1.81 cfs @ 12.21 hrs, Volume= 7,664 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Subcatchment E1: Towards BVW On-Site

Runoff = 1.85 cfs @ 12.21 hrs, Volume= 7,585 cf, Depth> 2.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.40"

	Area (sf)	CN	Description
*	1,087	98	House/Walks
*	471	98	Conc. Foundation
	3,816	74	>75% Grass cover, Good, HSG C
*	1,644	98	Exposed Ledge
	2,229	98	Water Surface, HSG D
	23,630	70	Woods, Good, HSG C
	32,877	75	Weighted Average
	27,446		83.48% Pervious Area
	5,431		16.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	51	0.0900	0.27		**Sheet Flow, Grass** Grass: Short n= 0.150 P2= 3.10"
9.3	49	0.0400	0.09		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.10"
2.6	190	0.0600	1.22		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
15.1	290	Total			

Summary for Subcatchment E2: Northeast Side of Site

Runoff = 0.42 cfs @ 12.25 hrs, Volume= 1,830 cf, Depth> 2.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.40"

	Area (sf)	CN	Description
*	180	98	Conc. Foundation
*	65	98	Exposed Ledge
	8,855	70	Woods, Good, HSG C
	9,100	71	Weighted Average
	8,855		97.31% Pervious Area
	245		2.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	109	0.0400	0.10		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.10"

Summary for Subcatchment E3: Northwest Side of Site

Runoff = 0.30 cfs @ 12.13 hrs, Volume= 1,030 cf, Depth> 2.51"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.40"

	Area (sf)	CN	Description
*	422	98	Exposed Ledge
	4,511	70	Woods, Good, HSG C
	4,933	72	Weighted Average
	4,511		91.45% Pervious Area
	422		8.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	66	0.0900	0.13		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.10"

Summary for Reach BVW(E): On-Site BVW

Inflow Area = 32,877 sf, 16.52% Impervious, Inflow Depth > 2.77" for 25-yr event
Inflow = 1.85 cfs @ 12.21 hrs, Volume= 7,585 cf
Outflow = 1.85 cfs @ 12.21 hrs, Volume= 7,585 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Reach DP(E): Down Stream Wetland

Inflow Area = 46,910 sf, 13.00% Impervious, Inflow Depth > 2.67" for 25-yr event
Inflow = 2.49 cfs @ 12.20 hrs, Volume= 10,445 cf
Outflow = 2.49 cfs @ 12.20 hrs, Volume= 10,445 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Subcatchment E1: Towards BVW On-Site

Runoff = 2.48 cfs @ 12.20 hrs, Volume= 10,140 cf, Depth> 3.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=6.50"

	Area (sf)	CN	Description
*	1,087	98	House/Walks
*	471	98	Conc. Foundation
	3,816	74	>75% Grass cover, Good, HSG C
*	1,644	98	Exposed Ledge
	2,229	98	Water Surface, HSG D
	23,630	70	Woods, Good, HSG C
	32,877	75	Weighted Average
	27,446		83.48% Pervious Area
	5,431		16.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.2	51	0.0900	0.27		**Sheet Flow, Grass** Grass: Short n= 0.150 P2= 3.10"
9.3	49	0.0400	0.09		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.10"
2.6	190	0.0600	1.22		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
15.1	290	Total			

Summary for Subcatchment E2: Northeast Side of Site

Runoff = 0.57 cfs @ 12.25 hrs, Volume= 2,498 cf, Depth> 3.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=6.50"

	Area (sf)	CN	Description
*	180	98	Conc. Foundation
*	65	98	Exposed Ledge
	8,855	70	Woods, Good, HSG C
	9,100	71	Weighted Average
	8,855		97.31% Pervious Area
	245		2.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.7	109	0.0400	0.10		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.10"

Summary for Subcatchment E3: Northwest Side of Site

Runoff = 0.41 cfs @ 12.12 hrs, Volume= 1,398 cf, Depth> 3.40"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=6.50"

	Area (sf)	CN	Description
*	422	98	Exposed Ledge
	4,511	70	Woods, Good, HSG C
	4,933	72	Weighted Average
	4,511		91.45% Pervious Area
	422		8.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	66	0.0900	0.13		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.10"

Summary for Reach BVW(E): On-Site BVW

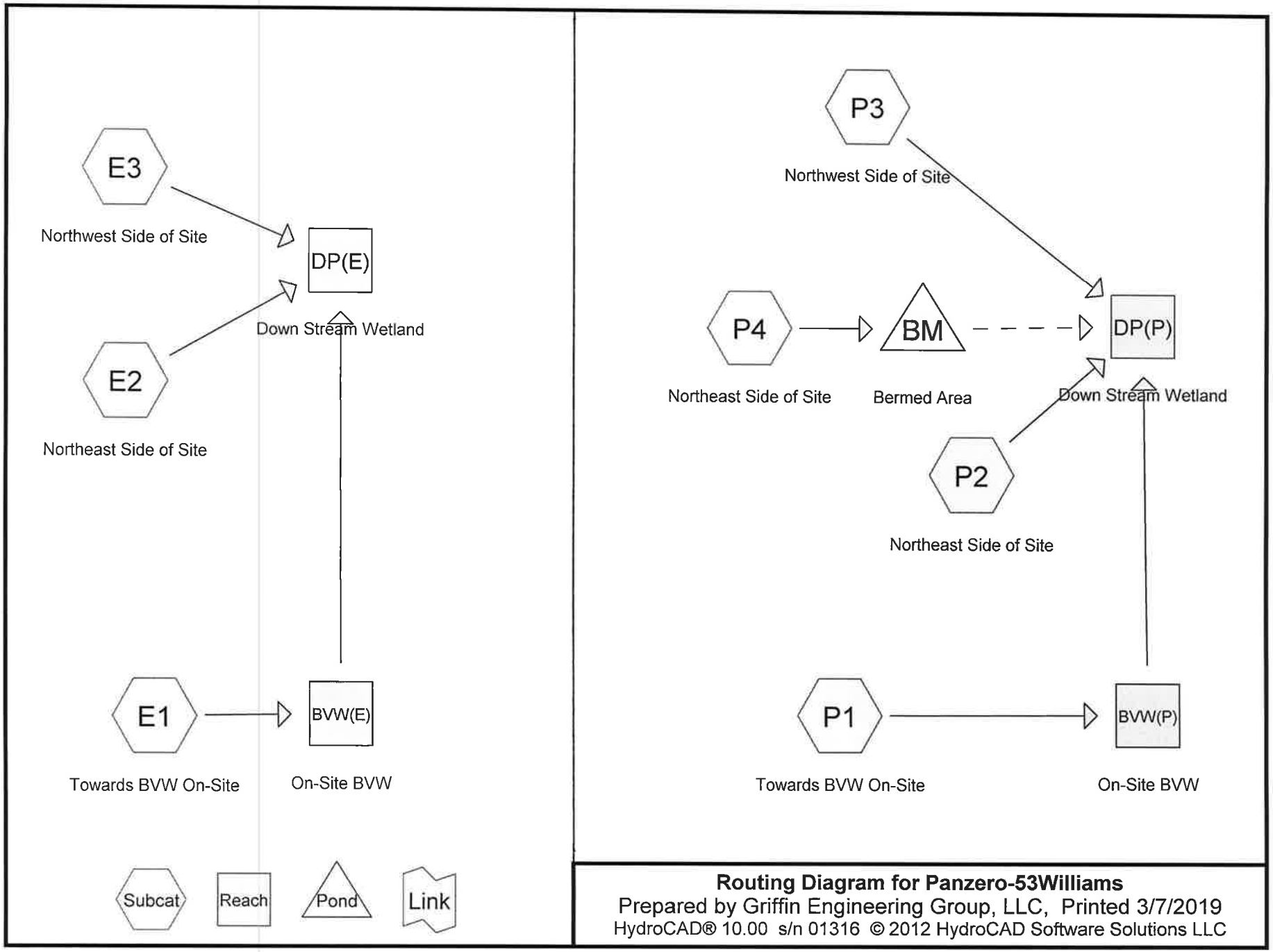
Inflow Area = 32,877 sf, 16.52% Impervious, Inflow Depth > 3.70" for 100-yr event
Inflow = 2.48 cfs @ 12.20 hrs, Volume= 10,140 cf
Outflow = 2.48 cfs @ 12.20 hrs, Volume= 10,140 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Reach DP(E): Down Stream Wetland

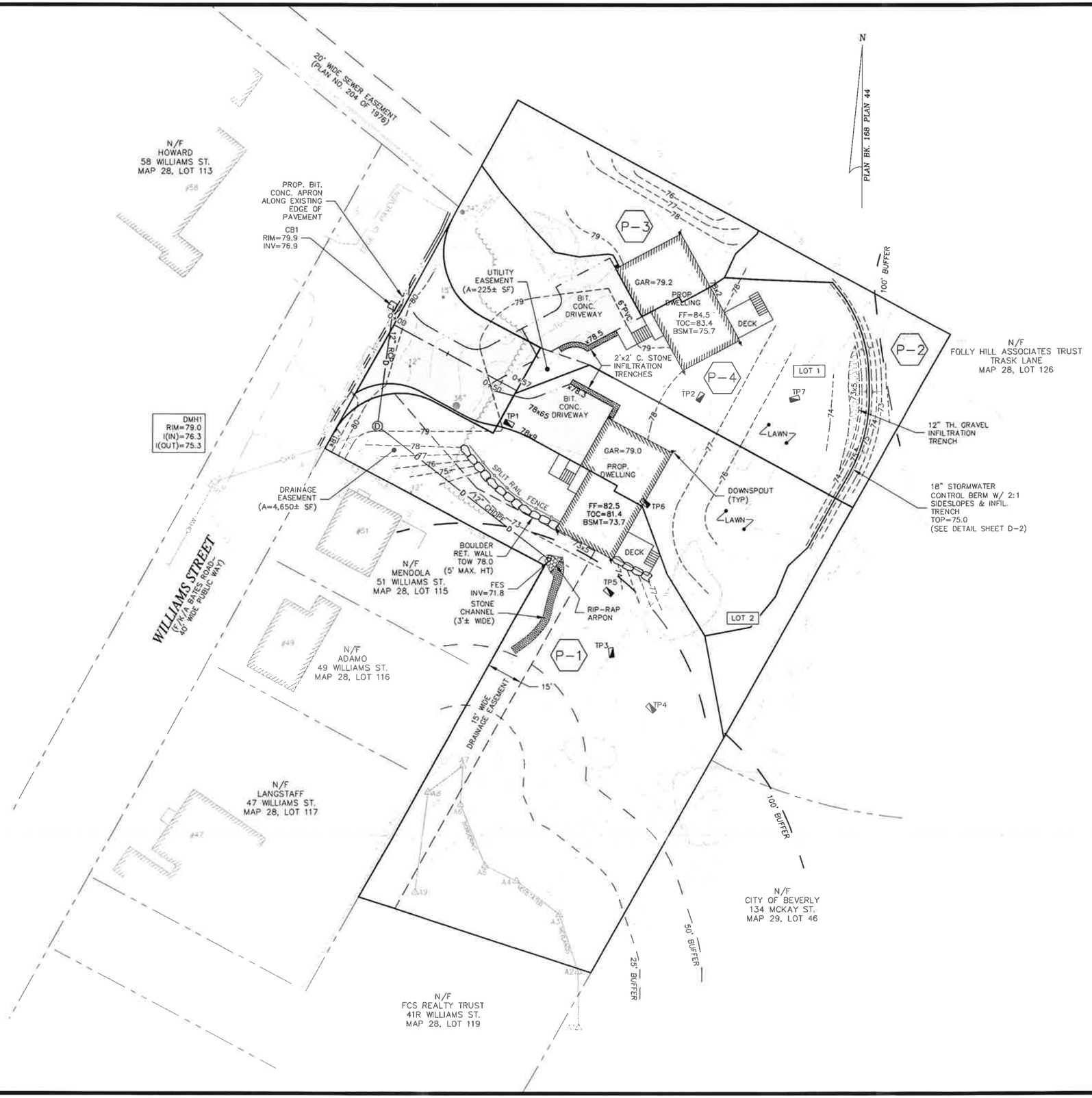
Inflow Area = 46,910 sf, 13.00% Impervious, Inflow Depth > 3.59" for 100-yr event
Inflow = 3.36 cfs @ 12.20 hrs, Volume= 14,036 cf
Outflow = 3.36 cfs @ 12.20 hrs, Volume= 14,036 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs / 3



Routing Diagram for Panzero-53Williams

Prepared by Griffin Engineering Group, LLC, Printed 3/7/2019



LEGEND

- PROPERTY LINE
- 100' BUFFER ZONE
- 50' NO-BUILD ZONE
- 25' NO-DISTURB ZONE
- WETLAND
- CONTOUR
- EDGE OF PAVEMENT
- BUILDING
- WATER LINE
- SEWER LINE
- TELEPHONE POLE
- GAS LINE
- SPOT GRADE
- LEDGE
- TREELINE
- TREE W/CALIPER
- TP5 TEST PIT
- STONEWALL
- PROP. PROPERTY LINE
- PROP. EDGE OF PAVEMENT
- PROP. BUILDING
- PROP. DRAIN LINE
- PROP. GRADING
- EROSION CONTROL

No.	Date	Description
		Revisions

Griffin Engineering Group, LLC
495 Cabot Street, 2nd Floor
Beverly, MA 01915
Tel: 978-927-5111
Fax: 978-927-5103

DEFINITIVE SUBDIVISION PLAN
53 WILLIAMS ST
BEVERLY, MA

PROPOSED WATERSHED

Scale: 1"=20'
Job No.:
File Name:
Date: 3/7/19

W-2

Summary for Subcatchment P1: Towards BVW On-Site

Runoff = 0.43 cfs @ 12.21 hrs, Volume= 1,807 cf, Depth> 1.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.10"

	Area (sf)	CN	Description
	4,870	74	>75% Grass cover, Good, HSG C
*	697	98	Exposed Ledge
	11,577	70	Woods, Good, HSG C
	2,229	98	Water Surface, HSG D
*	726	98	Roof
	20,099	76	Weighted Average
	16,447		81.83% Pervious Area
	3,652		18.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	55	0.1500	0.23		**Sheet Flow, Grass** Grass: Dense n= 0.240 P2= 3.10"
7.7	45	0.0200	0.10		**Sheet Flow, Swale** Grass: Dense n= 0.240 P2= 3.10"
2.7	163	0.0400	1.00		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
14.4	263	Total			

Summary for Subcatchment P2: Northeast Side of Site

Runoff = 0.07 cfs @ 12.11 hrs, Volume= 238 cf, Depth> 0.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.10"

Area (sf)	CN	Description
1,092	74	>75% Grass cover, Good, HSG C
2,407	70	Woods, Good, HSG C
3,499	71	Weighted Average
3,499		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	30	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"

Summary for Subcatchment P3: Northwest Side of Site

Runoff = 0.14 cfs @ 12.13 hrs, Volume= 477 cf, Depth> 1.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.10"

	Area (sf)	CN	Description
*	422	98	Exposed Ledge
	1,409	70	Woods, Good, HSG C
*	708	98	Roof
	2,005	74	>75% Grass cover, Good, HSG C
	4,544	79	Weighted Average
	3,414		75.13% Pervious Area
	1,130		24.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	66	0.0900	0.13		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.10"

Summary for Subcatchment P4: Northeast Side of Site

Runoff = 0.45 cfs @ 12.23 hrs, Volume= 1,966 cf, Depth> 1.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.10"

	Area (sf)	CN	Description
*	3,547	98	Driveway
	7,674	74	>75% Grass cover, Good, HSG C
	1,504	70	Woods, Good, HSG C
*	1,434	98	Roof
	4,609	71	Meadow, non-grazed, HSG C
	18,768	79	Weighted Average
	13,787		73.46% Pervious Area
	4,981		26.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	70	0.0400	0.09		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.10"
0.3	14	0.0200	0.91		**Sheet Flow, Driveway** Smooth surfaces n= 0.011 P2= 3.10"
3.0	16	0.0100	0.09		**Sheet Flow, Grass** Grass: Short n= 0.150 P2= 3.10"
1.0	157	0.0300	2.60		**Shallow Concentrated Flow, Grass** Grassed Waterway Kv= 15.0 fps
16.7	257	Total			

Summary for Reach BVW(P): On-Site BVW

Inflow Area = 20,099 sf, 18.17% Impervious, Inflow Depth > 1.08" for 2-yr event
Inflow = 0.43 cfs @ 12.21 hrs, Volume= 1,807 cf
Outflow = 0.43 cfs @ 12.21 hrs, Volume= 1,807 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Reach DP(P): Down Stream Wetland

Inflow Area = 28,142 sf, 16.99% Impervious, Inflow Depth > 1.08" for 2-yr event
Inflow = 0.60 cfs @ 12.18 hrs, Volume= 2,522 cf
Outflow = 0.60 cfs @ 12.18 hrs, Volume= 2,522 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Pond BM: Bermed Area

Inflow Area = 18,768 sf, 26.54% Impervious, Inflow Depth > 1.26" for 2-yr event
Inflow = 0.45 cfs @ 12.23 hrs, Volume= 1,966 cf
Outflow = 0.02 cfs @ 16.36 hrs, Volume= 1,004 cf, Atten= 95%, Lag= 247.4 min
Discarded = 0.02 cfs @ 16.36 hrs, Volume= 1,004 cf
Secondary = 0.00 cfs @ 4.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 74.73' @ 16.36 hrs Surf.Area= 2,017 sf Storage= 1,216 cf

Plug-Flow detention time= 341.1 min calculated for 1,004 cf (51% of inflow)
Center-of-Mass det. time= 220.0 min (1,075.2 - 855.2)

Volume	Invert	Avail.Storage	Storage Description
#1	73.50'	4,948 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
73.50	149	0	0
74.00	718	217	217
75.00	2,496	1,607	1,824
75.50	10,000	3,124	4,948

Device	Routing	Invert	Outlet Devices
#1	Secondary	75.00'	**120.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Discarded	73.50'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.02 cfs @ 16.36 hrs HW=74.73' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Secondary OutFlow Max=0.00 cfs @ 4.00 hrs HW=73.50' TW=0.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Subcatchment P1: Towards BVW On-Site

Runoff = 0.88 cfs @ 12.20 hrs, Volume= 3,556 cf, Depth> 2.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.50"

	Area (sf)	CN	Description
	4,870	74	>75% Grass cover, Good, HSG C
*	697	98	Exposed Ledge
	11,577	70	Woods, Good, HSG C
	2,229	98	Water Surface, HSG D
*	726	98	Roof
	20,099	76	Weighted Average
	16,447		81.83% Pervious Area
	3,652		18.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	55	0.1500	0.23		**Sheet Flow, Grass** Grass: Dense n= 0.240 P2= 3.10"
7.7	45	0.0200	0.10		**Sheet Flow, Swale** Grass: Dense n= 0.240 P2= 3.10"
2.7	163	0.0400	1.00		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
14.4	263	Total			

Summary for Subcatchment P2: Northeast Side of Site

Runoff = 0.15 cfs @ 12.11 hrs, Volume= 508 cf, Depth> 1.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.50"

Area (sf)	CN	Description
1,092	74	>75% Grass cover, Good, HSG C
2,407	70	Woods, Good, HSG C
3,499	71	Weighted Average
3,499		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	30	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"

Summary for Subcatchment P3: Northwest Side of Site

Runoff = 0.27 cfs @ 12.12 hrs, Volume= 898 cf, Depth> 2.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.50"

	Area (sf)	CN	Description
*	422	98	Exposed Ledge
	1,409	70	Woods, Good, HSG C
*	708	98	Roof
	2,005	74	>75% Grass cover, Good, HSG C
	4,544	79	Weighted Average
	3,414		75.13% Pervious Area
	1,130		24.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	66	0.0900	0.13		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.10"

Summary for Subcatchment P4: Northeast Side of Site

Runoff = 0.87 cfs @ 12.23 hrs, Volume= 3,704 cf, Depth> 2.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.50"

	Area (sf)	CN	Description
*	3,547	98	Driveway
	7,674	74	>75% Grass cover, Good, HSG C
	1,504	70	Woods, Good, HSG C
*	1,434	98	Roof
	4,609	71	Meadow, non-grazed, HSG C
	18,768	79	Weighted Average
	13,787		73.46% Pervious Area
	4,981		26.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	70	0.0400	0.09		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.10"
0.3	14	0.0200	0.91		**Sheet Flow, Driveway** Smooth surfaces n= 0.011 P2= 3.10"
3.0	16	0.0100	0.09		**Sheet Flow, Grass** Grass: Short n= 0.150 P2= 3.10"
1.0	157	0.0300	2.60		**Shallow Concentrated Flow, Grass** Grassed Waterway Kv= 15.0 fps
16.7	257	Total			

Summary for Reach BVW(P): On-Site BVW

Inflow Area = 20,099 sf, 18.17% Impervious, Inflow Depth > 2.12" for 10-yr event
Inflow = 0.88 cfs @ 12.20 hrs, Volume= 3,556 cf
Outflow = 0.88 cfs @ 12.20 hrs, Volume= 3,556 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Reach DP(P): Down Stream Wetland

Inflow Area = 28,142 sf, 16.99% Impervious, Inflow Depth > 2.44" for 10-yr event
Inflow = 1.22 cfs @ 12.17 hrs, Volume= 5,711 cf
Outflow = 1.22 cfs @ 12.17 hrs, Volume= 5,711 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Pond BM: Bermed Area

Inflow Area = 18,768 sf, 26.54% Impervious, Inflow Depth > 2.37" for 10-yr event
Inflow = 0.87 cfs @ 12.23 hrs, Volume= 3,704 cf
Outflow = 0.24 cfs @ 12.74 hrs, Volume= 2,082 cf, Atten= 72%, Lag= 30.4 min
Discarded = 0.03 cfs @ 12.74 hrs, Volume= 1,334 cf
Secondary = 0.21 cfs @ 12.74 hrs, Volume= 748 cf

Routing by Dyn-Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 75.01' @ 12.74 hrs Surf.Area= 2,614 sf Storage= 1,844 cf

Plug-Flow detention time= 253.4 min calculated for 2,081 cf (56% of inflow)
Center-of-Mass det. time= 142.9 min (979.9 - 837.0)

Volume	Invert	Avail.Storage	Storage Description
#1	73.50'	4,948 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
73.50	149	0	0
74.00	718	217	217
75.00	2,496	1,607	1,824
75.50	10,000	3,124	4,948

Device	Routing	Invert	Outlet Devices
#1	Secondary	75.00'	**120.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Discarded	73.50'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 12.74 hrs HW=75.01' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.03 cfs)

Secondary OutFlow Max=0.21 cfs @ 12.74 hrs HW=75.01' TW=0.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.21 cfs @ 0.22 fps)

Summary for Subcatchment P1: Towards BVW On-Site

Runoff = 1.19 cfs @ 12.20 hrs, Volume= 4,790 cf, Depth> 2.86"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.40"

	Area (sf)	CN	Description
	4,870	74	>75% Grass cover, Good, HSG C
*	697	98	Exposed Ledge
	11,577	70	Woods, Good, HSG C
	2,229	98	Water Surface, HSG D
*	726	98	Roof
	20,099	76	Weighted Average
	16,447		81.83% Pervious Area
	3,652		18.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	55	0.1500	0.23		**Sheet Flow, Grass** Grass: Dense n= 0.240 P2= 3.10"
7.7	45	0.0200	0.10		**Sheet Flow, Swale** Grass: Dense n= 0.240 P2= 3.10"
2.7	163	0.0400	1.00		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
14.4	263	Total			

Summary for Subcatchment P2: Northeast Side of Site

Runoff = 0.22 cfs @ 12.11 hrs, Volume= 706 cf, Depth> 2.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.40"

Area (sf)	CN	Description
1,092	74	>75% Grass cover, Good, HSG C
2,407	70	Woods, Good, HSG C
3,499	71	Weighted Average
3,499		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	30	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"

Summary for Subcatchment P3: Northwest Side of Site

Runoff = 0.35 cfs @ 12.12 hrs, Volume= 1,190 cf, Depth> 3.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.40"

	Area (sf)	CN	Description
*	422	98	Exposed Ledge
	1,409	70	Woods, Good, HSG C
*	708	98	Roof
	2,005	74	>75% Grass cover, Good, HSG C
	4,544	79	Weighted Average
	3,414		75.13% Pervious Area
	1,130		24.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	66	0.0900	0.13		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.10"

Summary for Subcatchment P4: Northeast Side of Site

Runoff = 1.16 cfs @ 12.23 hrs, Volume= 4,909 cf, Depth> 3.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=5.40"

	Area (sf)	CN	Description
*	3,547	98	Driveway
	7,674	74	>75% Grass cover, Good, HSG C
	1,504	70	Woods, Good, HSG C
*	1,434	98	Roof
	4,609	71	Meadow, non-grazed, HSG C
	18,768	79	Weighted Average
	13,787		73.46% Pervious Area
	4,981		26.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	70	0.0400	0.09		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.10"
0.3	14	0.0200	0.91		**Sheet Flow, Driveway** Smooth surfaces n= 0.011 P2= 3.10"
3.0	16	0.0100	0.09		**Sheet Flow, Grass** Grass: Short n= 0.150 P2= 3.10"
1.0	157	0.0300	2.60		**Shallow Concentrated Flow, Grass** Grassed Waterway Kv= 15.0 fps
16.7	257	Total			

Summary for Reach BVW(P): On-Site BVW

Inflow Area = 20,099 sf, 18.17% Impervious, Inflow Depth > 2.86" for 25-yr event
Inflow = 1.19 cfs @ 12.20 hrs, Volume= 4,790 cf
Outflow = 1.19 cfs @ 12.20 hrs, Volume= 4,790 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Reach DP(P): Down Stream Wetland

Inflow Area = 28,142 sf, 16.99% Impervious, Inflow Depth > 3.62" for 25-yr event
Inflow = 1.80 cfs @ 12.39 hrs, Volume= 8,491 cf
Outflow = 1.80 cfs @ 12.39 hrs, Volume= 8,491 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Pond BM: Bermed Area

Inflow Area = 18,768 sf, 26.54% Impervious, Inflow Depth > 3.14" for 25-yr event
Inflow = 1.16 cfs @ 12.23 hrs, Volume= 4,909 cf
Outflow = 0.83 cfs @ 12.40 hrs, Volume= 3,192 cf, Atten= 28%, Lag= 10.5 min
Discarded = 0.03 cfs @ 12.40 hrs, Volume= 1,387 cf
Secondary = 0.80 cfs @ 12.40 hrs, Volume= 1,805 cf

Routing by Dyn-Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 75.02' @ 12.40 hrs Surf.Area= 2,781 sf Storage= 1,874 cf

Plug-Flow detention time= 186.0 min calculated for 3,192 cf (65% of inflow)
Center-of-Mass det. time= 85.7 min (914.7 - 829.0)

Volume	Invert	Avail.Storage	Storage Description
#1	73.50'	4,948 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
73.50	149	0	0
74.00	718	217	217
75.00	2,496	1,607	1,824
75.50	10,000	3,124	4,948

Device	Routing	Invert	Outlet Devices
#1	Secondary	75.00'	**120.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Discarded	73.50'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 12.40 hrs HW=75.02' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.03 cfs)

Secondary OutFlow Max=0.80 cfs @ 12.40 hrs HW=75.02' TW=0.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.80 cfs @ 0.35 fps)

Summary for Subcatchment P1: Towards BVW On-Site

Runoff = 1.59 cfs @ 12.20 hrs, Volume= 6,372 cf, Depth> 3.80"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=6.50"

	Area (sf)	CN	Description
	4,870	74	>75% Grass cover, Good, HSG C
*	697	98	Exposed Ledge
	11,577	70	Woods, Good, HSG C
	2,229	98	Water Surface, HSG D
*	726	98	Roof
	20,099	76	Weighted Average
	16,447		81.83% Pervious Area
	3,652		18.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.0	55	0.1500	0.23		**Sheet Flow, Grass** Grass: Dense n= 0.240 P2= 3.10"
7.7	45	0.0200	0.10		**Sheet Flow, Swale** Grass: Dense n= 0.240 P2= 3.10"
2.7	163	0.0400	1.00		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
14.4	263	Total			

Summary for Subcatchment P2: Northeast Side of Site

Runoff = 0.30 cfs @ 12.10 hrs, Volume= 963 cf, Depth> 3.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=6.50"

Area (sf)	CN	Description
1,092	74	>75% Grass cover, Good, HSG C
2,407	70	Woods, Good, HSG C
3,499	71	Weighted Average
3,499		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	30	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"

Summary for Subcatchment P3: Northwest Side of Site

Runoff = 0.46 cfs @ 12.12 hrs, Volume= 1,561 cf, Depth> 4.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=6.50"

	Area (sf)	CN	Description
*	422	98	Exposed Ledge
	1,409	70	Woods, Good, HSG C
*	708	98	Roof
	2,005	74	>75% Grass cover, Good, HSG C
	4,544	79	Weighted Average
	3,414		75.13% Pervious Area
	1,130		24.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.6	66	0.0900	0.13		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.10"

Summary for Subcatchment P4: Northeast Side of Site

Runoff = 1.51 cfs @ 12.23 hrs, Volume= 6,438 cf, Depth> 4.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=6.50"

	Area (sf)	CN	Description
*	3,547	98	Driveway
	7,674	74	>75% Grass cover, Good, HSG C
	1,504	70	Woods, Good, HSG C
*	1,434	98	Roof
	4,609	71	Meadow, non-grazed, HSG C
	18,768	79	Weighted Average
	13,787		73.46% Pervious Area
	4,981		26.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.4	70	0.0400	0.09		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.10"
0.3	14	0.0200	0.91		**Sheet Flow, Driveway** Smooth surfaces n= 0.011 P2= 3.10"
3.0	16	0.0100	0.09		**Sheet Flow, Grass** Grass: Short n= 0.150 P2= 3.10"
1.0	157	0.0300	2.60		**Shallow Concentrated Flow, Grass** Grassed Waterway Kv= 15.0 fps
16.7	257	Total			

Summary for Reach BVW(P): On-Site BVW

Inflow Area = 20,099 sf, 18.17% Impervious, Inflow Depth > 3.80" for 100-yr event
Inflow = 1.59 cfs @ 12.20 hrs, Volume= 6,372 cf
Outflow = 1.59 cfs @ 12.20 hrs, Volume= 6,372 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Reach DP(P): Down Stream Wetland

Inflow Area = 28,142 sf, 16.99% Impervious, Inflow Depth > 5.16" for 100-yr event
Inflow = 3.35 cfs @ 12.25 hrs, Volume= 12,103 cf
Outflow = 3.35 cfs @ 12.25 hrs, Volume= 12,103 cf, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs / 3

Summary for Pond BM: Bermed Area

Inflow Area = 18,768 sf, 26.54% Impervious, Inflow Depth > 4.12" for 100-yr event
Inflow = 1.51 cfs @ 12.23 hrs, Volume= 6,438 cf
Outflow = 1.47 cfs @ 12.26 hrs, Volume= 4,650 cf, Atten= 3%, Lag= 2.2 min
Discarded = 0.04 cfs @ 12.26 hrs, Volume= 1,444 cf
Secondary = 1.44 cfs @ 12.26 hrs, Volume= 3,206 cf

Routing by Dyn-Stor-Ind method, Time Span= 4.00-24.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 75.03' @ 12.26 hrs Surf.Area= 2,918 sf Storage= 1,900 cf

Plug-Flow detention time= 144.8 min calculated for 4,647 cf (72% of inflow)
Center-of-Mass det. time= 55.5 min (876.8 - 821.3)

Volume	Invert	Avail.Storage	Storage Description
#1	73.50'	4,948 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
73.50	149	0	0
74.00	718	217	217
75.00	2,496	1,607	1,824
75.50	10,000	3,124	4,948

Device	Routing	Invert	Outlet Devices
#1	Secondary	75.00'	**120.0' long x 2.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 Coef. (English) 2.54 2.61 2.61 2.60 2.66 2.70 2.77 2.89 2.88 2.85 3.07 3.20 3.32
#2	Discarded	73.50'	**0.520 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.04 cfs @ 12.26 hrs HW=75.03' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.04 cfs)

Secondary OutFlow Max=1.43 cfs @ 12.26 hrs HW=75.03' TW=0.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.43 cfs @ 0.43 fps)

ATTACHMENT C
STORMWATER COMPUTATIONS

C.1 – Recharge Calculations

C.2 – Drawdown Analysis

C.3 – Water Quality Volume Calculations

C.4 – TSS Removal Calculation Worksheets

C.5 – Test Pit Data Forms

Griffin Engineering Group, LLC
495 Cabot Street, Suite 2
Beverly, MA 01915

Phone: 978-927-5111; Fax: 978-927-5103

RECHARGE VOLUME & DESIGN CALCULATIONS

Job Name: Panzero - 53 Williams St
Job No: 1802
Date: 3/7/2019
Designer: MBP
Checked By: RHG

IMPERVIOUS AREA:

	Total	
	(sf)	(acres)
Existing*	1,738	0.04
Proposed	6,415	0.15
Net Increase	4,677	0.11
Net Decrease	0	0.00

Required Volume (Rv) to Recharge per MassDEP:
For Increase in Impervious Area:

C Type Soils" 0.25 in
Rv=(4677 sf) x (0.25) x (1'/12") = 97 cf

For All Impervious Area:
Rv=(6415 sf) x (0.25) x (1'/12") = 134 cf

** Standard to be met for increase in Impervious Surfaces.*

Impervious Area Tributary to Infiltration Field: 4,981 sf
Percentage of Total New Impervious Surfaces: 100.0%
Ratio of Total Impervious Area to Tributary Area: 0.939
Adjusted Min. Required Recharge Volume: 97 cf

Recharge Structure Design (Static Method):

Total Static Storage Capacity Provided by Berm*: 217 cf
*** Ref to HydroCAD**

Griffin Engineering Group, LLC
495 Cabot Street, Suite 2
Beverly, MA 01915

Phone: 978-927-5111; Fax: 978-927-5103

DRAWDOWN ANALYSIS

Job Name: Panzero - 53 Williams St
Job No: 1802
Date 3/7/2019
Designer MBP
Checked By: RHG

DRAWDOWN CALCULATION:
Equation: Drawdown = D / IR (hrs)
D = Depth of Water in Structure (in)
IR = Infiltration Rate* (in/hr)

	D	IR*	Drawdown
Berm Area	18	0.52	**34.6**

* Rawls Rate for Loam Used

MassDEP requires drawdown to be less than 72 hours -> **OK**

Griffin Engineering Group, LLC
495 Cabot Street, Suite 2
Beverly, MA 01915

Phone: 978-927-5111; Fax: 978-927-5103

WATER QUALITY VOLUME CALCULATION

Job Name: Panzero - 53 Williams St
Job No: 1802
Date 3/7/2019
Designer MBP
Checked By: RHG

REQ. WATER QUALITY VOLUME (WQV) DEPTH = 0.5 inch(s) of runoff

IMPERVIOUS AREA:

	Total	
	(sf)	(acres)
Existing*	1,738	0.04
Proposed	6,415	0.15
Net Increase	4,677	0.11

Calculations:
WQV = Imp. Area x 0.5-inch x 1-foot/12-inches

Required Water Quality Volume per MA DEP: **195 cf**

Provided Water Quality Volume to Outlet: **1,824 cf**

INSTRUCTIONS:

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

Non-automated: Mar. 4, 2008

Location: Proposed Driveway (P-4)

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Vegetated Filter Strip & Stormwater Control Berm	**45%**	**1.00**	**0.45**	**0.55**

Total TSS Removal = **45%**

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

Project: Panzero - 53 Williams St

Prepared By: MBP

Date: March 2019

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

Commonwealth of Massachusetts
City/Town of Hamilton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-2 **Date:** 1/29/2019

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10	Ap	10 YR 2/2	---	---	---	L	<2.0%	<2.0%	Massive	Friable	
10-26	B1	10YR 4/6	---	---	---	L	<2.0%	<2.0%	Massive	Friable	
26-39	B/C	10YR 3/6	36	---	---	FSL	<2.0%	<2.0%	Massive	Friable	
39-50	C1	10YR 5/4				FSL	<2.0%	<2.0%	Massive	Friable	

Additional Notes:

1) Seepage @36".

2) Refusal @50".

3)

Commonwealth of Massachusetts
City/Town of Hamilton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-3 **Date:** 1/29/2019

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-6	Ap	10 YR 2/2	---	---	---	L	<2.0%	<2.0%	Massive	Friable	

Additional Notes:

1) Ledge @6".

2)

3)

Commonwealth of Massachusetts
City/Town of Hamilton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-1 **Date:** 1/29/2019

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-27	Fill	---	---	---	---	---	---	---	---	---	
27-48	B	10YR 3/6	---	---	---	L	<2.0%	<2.0%	Massive	Friable	
48-54	C	10YR 4/6	---	---	---	FSL	<2.0%	<2.0%	Massive	Friable	

Additional Notes:

1) Standing water @48".

2) No Refusal.

3)

Commonwealth of Massachusetts
City/Town of Hamilton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-4 **Date:** 1/29/2019

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-4	Ap	10 YR 2/2	---	---	---	L	<2.0%	<2.0%	Massive	Friable	
4-16	B1	10YR 4/6	---	---	---	L	<2.0%	<2.0%	Massive	Friable	
16-24	B/C	10YR 3/6	---	---	---	FSL	<2.0%	<2.0%	Massive	Friable	
24-32	C1	10YR 5/4				FSL	<2.0%	<2.0%	Massive	Friable	

Additional Notes:

1) Refusal @32".

2)

3)

Commonwealth of Massachusetts
City/Town of Hamilton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-5 **Date:** 1/29/2019

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10	Ap	10 YR 2/2	---	---	---	L	<2.0%	<2.0%	Massive	Friable	
10-30	B	10 YR 4/6	---	---	---	L	<2.0%	<2.0%	Massive	Friable	

Additional Notes:

1) Refusal @30".

2)

3)

Commonwealth of Massachusetts
City/Town of Hamilton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-6 **Date:** 1/29/2019

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-18	Ap	10 YR 2/2	---	---	---	L	<2.0%	<2.0%	Massive	Friable	

Additional Notes:

1) Ledge @18".

2)

3)

ATTACHMENT D

LONG TERM POLLUTION PREVENTION PLAN

Long Term Pollution Prevention Plan

Long Term Pollution Prevention Plan (LTPPP) has be prepared and incorporated into the long term operation and maintenance plan of the projects stormwater management system. The purpose of the LTPPP is to identify potential sources of pollution that may affect the quality of stormwater discharges and to describe suggested practices to reduce pollutants in stormwater discharges.

Good housekeeping practices - The subject property owners are to keep the site in a neat and orderly condition so that pollutants are not conveyed to the storm drainage system. Materials swept, blown or washed into the stormwater system can decrease the system's effectiveness. Some examples of good housekeeping practices are pavement sweeping, litter control, contained outdoor waste, and protected material storage areas.

Provisions for storing materials and waste products inside or under cover – There are no exterior (un-covered) storage areas associated with the project site.

The trash and recycling program include a weekly curbside trash pickup. A trash disposal company hired by the city will pick up waste materials and properly dispose at a state approved disposal facility.

The stormwater drainage system has vegetated filter strip and stormwater control berm to capture and retain trash, debris, and sediments.

Requirements for routine inspections and maintenance of stormwater BMP's - Consistent with Standard 9 of the Massachusetts Stormwater Management Regulations, an Operation and Maintenance Plan has been provided in the Stormwater Management Report. The plan details routine inspection and maintenance of the stormwater BMP's along with associated record keeping forms.

Spill prevention and response plans – Sources of potential spill hazards include vehicle fluids and fuels, pesticides, paints, solvents, and liquid cleaning products. The majority of the spill hazards would likely occur within the building and would not enter the stormwater drainage system. However, there are spill hazards from vehicle fluids and fuels located outside of the buildings. These exterior spill hazards have the potential to enter the stormwater drainage system and are to be addressed as follows:

1) Spill hazards of pesticides, paints, and solvents shall be remediated using the Manufacturers' recommended spill cleanup protocol.
2) Vehicle fluid and fuel spills shall be remediated according to local and state regulations governing fuel spills.
3) The property owners shall have the following equipment and materials on hand

to address a spill clean-up: brooms, dust-pans, mops, rags, gloves, trash bags, trash containers, and absorptive materials such as sand, sawdust, or kitty litter.

4) Spills of toxic or hazardous materials shall be reported to the Massachusetts Department of Environmental Protection at 1-888-304-1133.

Provisions for maintenance of lawns, garden, and other landscaped areas - It should be a general goal of the subject property owners to achieve a high-quality, well-groomed and stable landscape that evolves throughout the seasons and protects the overall condition of the property. All landscaped areas are to be maintained with dense vegetative growth or a layer of mulch so as to minimize sediment transport. Litter and waste is to be removed weekly from the landscaped areas, driveway and turnaround and disposed of properly.

Requirements for storage and use of fertilizer, herbicides, and pesticides - Fertilizers, herbicides, and pesticides are not to be stored on-site or within the buildings. Should use of some become necessary, application should be performed by a state licensed contractor in accordance with the manufacturer's label instruction and when environmental conditions are conducive to product application

Pet waste management provisions - All pet waste is to be scooped up, sealed in a plastic bag, and disposed of properly in the garbage. Pet waste should never be deposited in the stormwater management system for it contains high level of fecal coliform bacteria.

Provisions for operation and management of septic systems – There are no septic systems associated with the project site. The sanitary sewer is proposed to be connected to the city sewer main in Williams Street.

Snow disposal and deicing chemicals – The private turnaround is designed with 25 feet by 47 feet of pavement and minimum 14-foot wide grass reserve strip located on the north side of the private way. This should provide ample width to maintain reasonable travel lanes with snow cast along the edge of the roadway and reserve strip. Snow removal has generally not been necessary in newly-constructed residential subdivisions in Beverly in recent years, with the exception of limited clearing of snow banks at intersections to provide a path for adjoining sidewalks and to increase visibility. In these instances snow is usually moved less than 100 feet to a more convenient location. No snow is to be moved to within 100 feet of a wetland resource area.

The individual property owners will be responsible for the clearing of their individual driveways and building entrances. The owners may be required to use a de-icing agent such as salt or potassium chloride to maintain a safe walking surface. The de-icing agent for the walkways and building entrances may be kept on site within the building (i.e. garage). De-icing agents are not be stored outside.

ATTACHMENT E

OPERATION & MAINTENANCE PLAN

OPERATION & MAINTENANCE PLAN

System Owner:

MJP Properties (or Successors)

Party Responsible for O&M:

MJP Properties shall be responsible for the construction phase operation and maintenance plan. Lot 1 owner will be responsible for the operation and maintenance of the stormwater control berm. City of Beverly will own and maintain the catch basin in Williams Street, 12-inch pipe, and discharge. Should ownership of the property change, the succeeding owner shall assume all responsibilities for implementing this Operation and Maintenance Plan.

Note: The system inspectors should note that drainage pipes, catchbasin, manholes, and treatment devices are considered "confined spaces" subject to strict OSHA standards regarding safe entry. Confined spaces present inherent hazards to workers. Only appropriately trained staff with appropriate safety equipment and monitors may enter confined spaces, and then only with a specific entry permit. Also, this work may pose hazards to workers, such as soft ground, flowing or standing water, snakes and rodents. Again, only appropriately trained staff with the necessary safety equipment should undertake such work.

Phase I: Construction Phase Controls

Roadway Construction Phasing: Construction shall proceed in the following sequence:

1. Install Erosion Controls downhill of work areas. Inspection and maintenance of these Erosion Controls are required throughout the project as detailed below.
2. Clear & Grub areas only as needed.
3. Bring road alignments to rough subgrade.
4. Install underground utilities. Protect all drainage system inlets.
5. Install stormwater control berm and stone channel.
6. Fine grade road and install binder course of bituminous pavement. Install drainage grates and protect with silt sacks.
7. Adjust manholes frame and covers/grates and install final paving.

Throughout construction, haybales and siltation controls are to be placed around drain inlets and low points in the excavation to prevent silt from entering the drainage system. These controls are to be inspected daily and maintained throughout the duration of the construction phase, and removed only when needed to pave the surfaces. The siltation controls shall be maintained and sediment removed as needed throughout construction.

The contractor shall install non-woven geotextile fabric between the frame and grate of catchbasins during construction to capture sediment. The fabric shall be maintained and sediment removed as needed throughout construction.

Home Construction Phasing: Construction shall proceed in the following sequence.

1. Install Erosion Controls downhill of work areas. Inspection and maintenance of these Erosion Controls is required throughout the project as detailed below.

2. Clear & Grub lot.

3. Install construction entrance (rip rap apron) along street line for construction vehicles entering and exiting.

4. Excavate foundation hole. Install foundation and first floor deck.

5. Backfill around the foundation, construct boulder retaining wall.

6. Install building utilities, and rough grade site. Construct structure.

7. Install driveway and landscaping

Part II: Post-Development Operation and Maintenance

1). Inspections. Inspection of the drainage system components are to be performed by the System Owner during the first year of operation on a quarterly basis. The inspection frequency can be reduced after the first year to annual inspections provided that the quarterly inspections do not indicate the need for more frequent inspections. If more frequent inspections become appropriate at any time, they should be implemented. Inspections should be documented by taking necessary notes, measurements, photographs, and retaining service receipts. The following inspections are required of the system owner.

Roadway. Remove debris from the hammerhead turnaround as it accumulates, as part of normal site clean-up. Weekly patrolling for litter is recommended. Sand from ice control should be removed monthly via a street sweeper during the winter season. Significant oil leaks should be swept up and disposed of using

oil-absorbent material as they are discovered. Any oil spills or leaks that reach the catchbasins must be reported to the Massachusetts DEP oil spill hotline.

Vegetated Filter Strip & Stormwater Control Berm. During the first year, the vegetated filter strip, berm and the infiltration stone bottom should be inspected after major storms to ensure proper function and stabilization. Water levels should be recorded over several days. After the first year the berm should be inspected twice per year for erosion, sediment accumulation, subsidence, cracking or tree growth on the embankments. All trash and debris should be removed from the vegetation filter strip, berm and surrounding area. The side slopes should be mowed at least twice annually. Silt should be removed from the rip rap areas as it accumulates. After an extended period of dry weather the berm should be inspect for any standing water.

Catchbasins & Drain Manholes - Remove the grate or cover and visually inspect for corrosion and structural damage. Inspect pipe inlets and bottoms for signs of infiltration or inflow. The grate or cover and hoods on the catchbasins should be inspected on a quarterly basis during the first and year and semi-annual thereafter. Cleaning of the catchbasins should be done on a yearly basis and by a vacuum truck or clamshell. The contractor is to take care to avoid damaging the catchbasin hood. While cleaning, if a layer of oil is observed floating on the water surface, place an oil-absorbent pillow on the surface, allow to soak and remove. Repeat this process until the oil layer is removed. Alternatively, have the oil layer pumped out by a licensed disposal contractor and appropriately disposed of. The oil absorbent pillows must be drummed for disposal by a licensed disposal contractor.

2) Snow Storage Area – The private roadway turnaround is designed with 25 feet of pavement and grass area north of pavement. This should provide ample width to maintain reasonable travel lanes with snow cast along the edge of the roadway and on the grassy area. Snow removal has not proven necessary in newly-constructed residential subdivisions in Beverly in recent years, with the possible exception of very limited clearing of snow banks at intersections to provide a path for adjoining sidewalks and to increased visibility. In these instances snow is usually moved less than 100 feet to a more convenient location.

TABLE 1: Construction Phase Inspection and Maintenance Procedures

Control	Inspection Frequency (1)	Maintenance Procedure
Construction Entrance	Weekly	a
Silt Fence	Weekly	a
Rip Rap	Weekly	a
Stormwater Control Berm	Weekly	a
Dust Control	Daily	b
Permanent Stabilization	Weekly	c

1. Inspection frequencies are a minimum. Site conditions may warrant more frequent review. All control shall be inspected after each storm event which exceeds 0.5 inches in 24-hours.

2. Maintenance Procedures shall be reviewed and revised as necessary to protect the environment.

   a. Remove accumulated debris and replace as necessary.
   b. Water or calcium chloride shall be utilized to prevent the generation of dust.
   c. Disturbed areas shall either be paved or stabilized by permanent seeding.

Inspection forms are to be completed weekly and retained with project files.

INSPECTION AND MAINTENANCE REPORT FORM

TO BE COMPLETED EVERY 7 DAYS AND WITHIN 24 HOURS OF A RAINFALL EVENT OF 0.5 INCHES OR MORE

INSPECTOR:_____
DATE:_____
INSPECTOR'S QUALIFICATIONS:

_____

_____

DAYS SINCE LAST RAINFALL:_____

AMOUNT OF LAST RAINFALL:_____ INCHES

STABILIZATION MEASURES

Project Area	Date Since Last Disturbed	Date of Next Disturbance	Stabilized? (Yes/No)	Stabilized With	Condition
North East South West					

STABILIZATION REQUIRED:

_____

_____

TO BE PERFORMED BY:_____ ON OR BEFORE_____

INSPECTION AND MAINTENANCE REPORT FORM

STABILIZED CONSTRUCTION ENTRANCE

Does Sediment Get Tracked onto the Road?	Is the Gravel Clean or is it Filled with Sediment?	Does All Traffic Use the Stabilized Exit to Leave the Site?

MAINTENANCE REQUIRED FOR ENTRANCE:

_____
_____
_____
_____
_____

TO BE PERFORMED BY:_____ ON OR BEFORE_____

INSPECTION AND MAINTENANCE REPORT FORM

SILT FENCE, HAYBALES, AND/OR STRAW WATTLES

Location	Depth of Sediment Build-Up	Sediment Need Removal?	Need Replacement?
Eastern Side			
Southern Side			
Western Side			
Northern Side			

MAINTENANCE REQUIRED:

_____

_____

TO BE PERFORMED BY:_____ ON OR BEFORE_____

INSPECTION AND MAINTENANCE REPORT FORM

STORMWATER CONTROL BERM

Depth of Sediment Build-Up	Sediment Need Removal?	Need Replacement?

MAINTENANCE REQUIRED:

_____
_____
_____
_____

TO BE PERFORMED BY:_____ ON OR BEFORE_____

ATTACHMENT F

ILLICIT DISCHARGE
STATEMENT

ILLICIT DISCHARGE COMPLIANCE STATEMENT

I verify that no illicit discharges exist on the site and through the implementation of a pollution prevention plan measures are set forth to prevent illicit discharges from entering the stormwater management system.

Signature	Print Name	Date
Title	Company	
Signature	Print Name	Date
Title	Company	
Signature	Print Name	Date
Title	Company	