STORMWATER REPORT

FOR

Boundary Lane
Off Summer Street, Medway, MA

Definitive Subdivision Plan

Site Address:	69-67R Summer Street Medway, MA
Assessors:	Map 37, Lots 36 & 33
Date:	August 20, 2021 ***Revised February 15, 2022***
Prepared By:	Connorstone Engineering, Inc. 10 Southwest Cutoff, Suite 7 Northborough, MA 01532 Tel: (508) 393-9727 Fax: (508) 393-5242

TABLE OF CONTENTS

PROJECT NARRATIVE

Existing Conditions

The existing site consists of a 11.3 acre parcel at 69-67R Summer Street and is shown on Assessor's map 37 as parcels 36 and 33. The lot is currently developed with two single family houses located off a common driveway from Summer Street. The current zoning map shows the site is within the AR-1 District, which requires a minimum lot area of 44,000 square feet and 180 feet of frontage. Generally the eastern half of the site is fully developed with the two residential houses and agricultural uses. The current conditions include 27,840 square feet of impervious areas (pavement, roof areas, and/or compacted gravel surfaces). The western half of the site consists of wooded areas, wetlands, and a power company easement (overhead wires).

A wetland system including Bordering Vegetated Wetlands and intermittent stream is located to the rear of the site. This system flows generally from north to south toward the undeveloped wooded land abutting to the south of the project. There is also a smaller wetland area that has been delineated in the northeast corner of the site. This area connects via a culvert under the abutting driveway to a wetland along Summer Street.

The Natural Resource Conservation Service has mapped the soils within the development area as "Woodbridge fine sandy loam," which are typically moderately well drained soils with groundwater at 18 to 30 inches below grade. Test pits were performed by Connorstone Engineering, Inc. to determine confirm the soil classification and depth to groundwater for design of the stormwater management basin. The test pits within the basin showed loamy sand to fine sand material with a shallow groundwater elevation. There are also minor areas on-site mapped as "Ridgebury fine sandy loam." These soils are associated with wetland areas, and correlate to the delineated wetlands on-site.

Runoff from the project area flows in two flow patterns. Either to the rear wetland or to the front corner wetland. The subcatchment areas are approximately split down the central portion of the developed area. There are currently no stormwater controls on-site and all flow is via overland runoff. *The existing drainage subcatchment to the front culvert also includes some off-site areas from #67 Summer Street. This includes approximately 27,000 square feet area developed as a typical single family lot.*

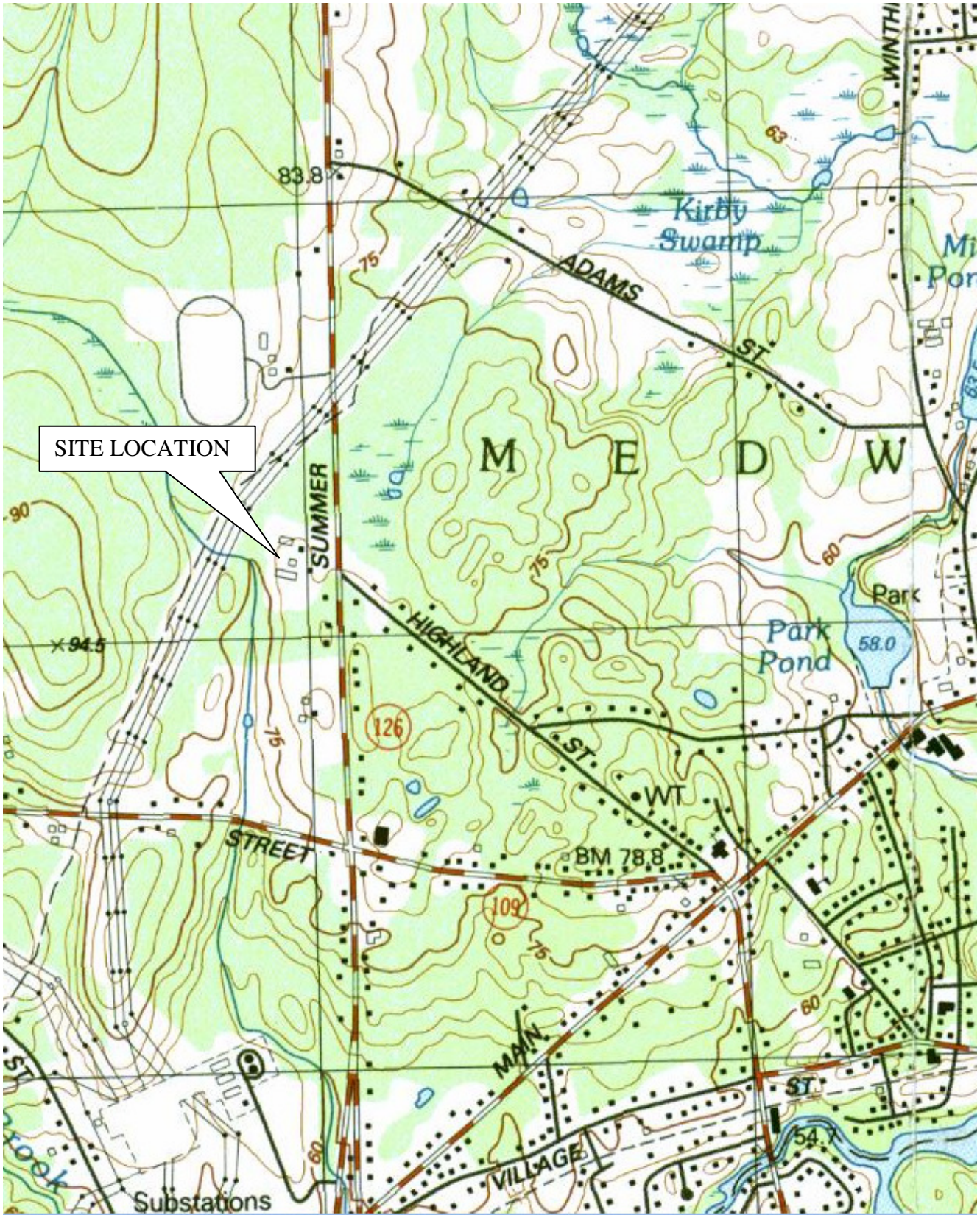
Proposed Conditions

The proposed project provides for a three (3) lot residential subdivision. The two existing houses are to remain and one new house lot has been proposed. All lots are greater than the minimum 44,000 sq. ft. lot area and minimum 180 feet of frontage. The project will include construction of a 350 foot long cul-de-sac roadway to provide the required access and lot frontage. The proposed roadway would be constructed in the same location as the existing paved common driveway. The pavement would be widened from 12 feet to the required 20 feet wide for fire access. The road profile has provided relatively flat grades with an up/down slope of 1% to 1.5% through the road. A "tee" type turnaround has also been provided at the end of the roadway for emergency and delivery vehicle maneuvering. The proposed project would result in 27,485 square feet of impervious area, which would result in a slight reduction in impervious areas when compared to the existing conditions.

The two existing lots are serviced by public water, sewer, gas, and underground electric. The Town's sewer main currently runs through an easement cross country through the site. The roadway would follow this alignment and maintain the sewer along the center line of the road. The proposed house would connect to this on-site sewer, gas and underground electric. Water supply would be via a recently installed well located near the propose house location.

The proposed stormwater management system has been designed to control both the peak rate and volume of runoff to match the pre-existing conditions through the 100 year storm event. Rainfall intensities were based upon the most current NOAA Atlas 14 data. The stormwater management system includes a surface collection system via LID techniques of overland flow over grassed surfaces. Runoff would then be directed to a shallow stormwater basin with a berm height of two (2) feet. This basin will provide for recharge to groundwater, treatment to 80% TSS, and control of off-site flows.

USGS LOCUS MAP



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.

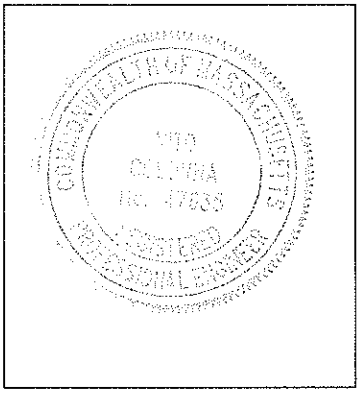
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



8-20-21
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): _____

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.

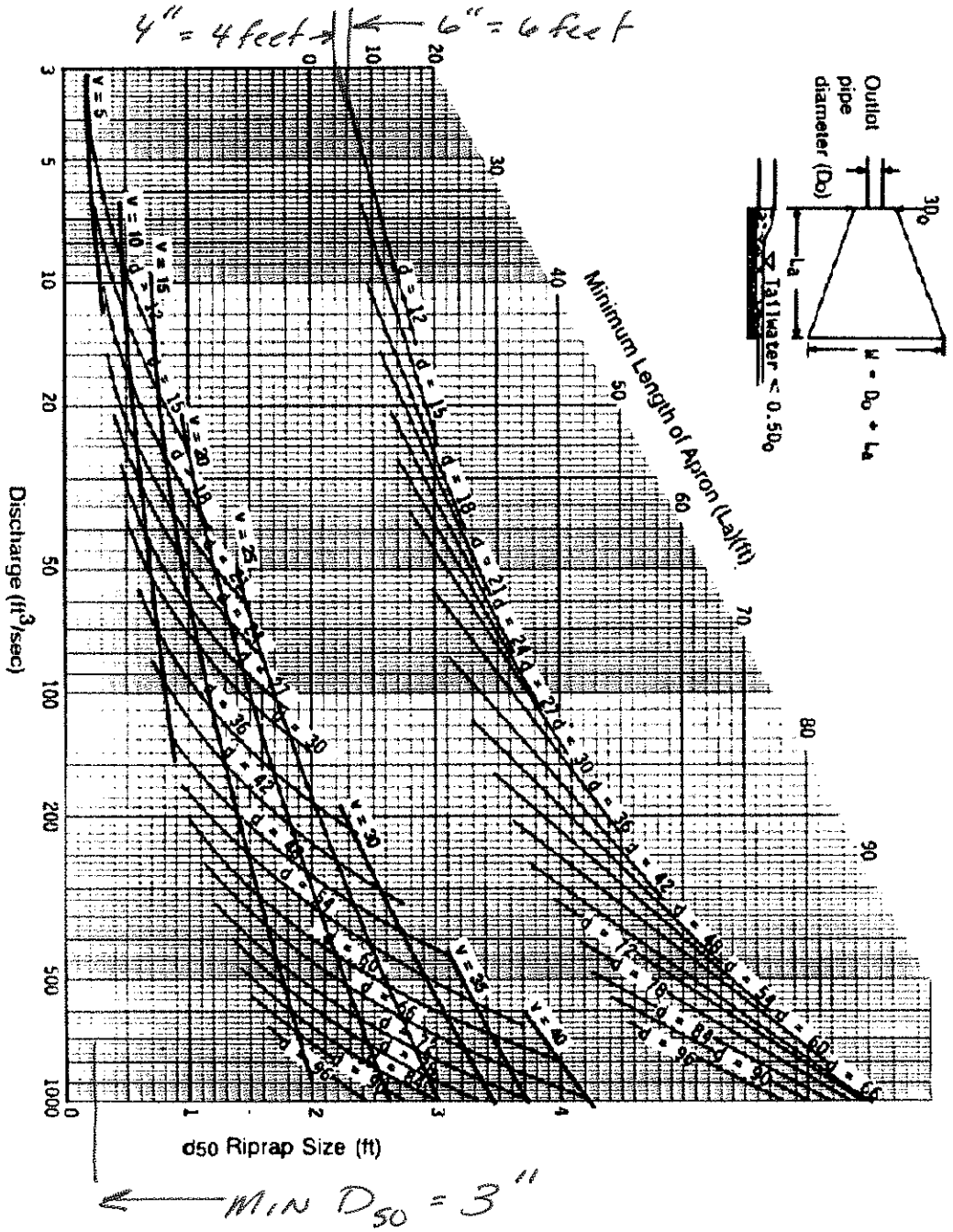
MA D.E.P. STORMWATER STANDARDS

Standard 1: No New Untreated Discharges

1. There are no new untreated discharges to any wetland resource area. The discharge locations are treated stormwater from the Stormwater System.

2. Stormwater Discharge Velocity: 6-ich outlet: $Q_{(100\ yr)}$=0.7 cfs $V_{(100\ yr)}$= 3.7 fps

3. Riprap sizing: Use: Riprap Size = 3"minimum / 6" proposed
   Length= 4 feet minimum (6" pipe) & 6 feet (12" pipe)



Standard 2: Peak Rate Attenuation

The project has been designed to mitigate the increase in impervious surfaces through the use of a surface stormwater basin.

The pre- and post-development stormwater runoff has been analyzed using HydroCAD 9.10, which is a stormwater modeling computer program utilizing a collection of techniques for the generation and routing of hydrographs, including Soil Conservation Service (SCS) Technical Release No. 20 (TR-20) and SCS Technical Release 55 (TR-55), *Urban Hydrology for Small Watersheds*..

Runoff from the development area flows toward the on-site wetland. This line was used as the analysis point in the analysis. A second analysis point was also provided along the rear property line. The results are as follows:

Analysis Point Front Wetland	**2-Year Storm Existing (Proposed)**	**10-Year Storm Existing (Proposed)**	**25-Year Storm Existing (Proposed)**	**100-Year Storm Existing (Proposed)**
Rate of Runoff	3.5 cfs (2.0 cfs)	7.4 cfs (4.5 cfs)	9.9 cfs (7.3 cfs)	13.8 cfs (12.8 cfs)
Volume of Runoff	0.31 ac-ft (0.19 ac-ft)	0.63 ac-ft (0.49 ac-ft)	0.85 ac-ft (0.70 c-ft)	1.19 ac-ft (1.03 ac-ft)

Analysis Point Rear Wetland	**2-Year Storm Existing (Proposed)**	**10-Year Storm Existing (Proposed)**	**25-Year Storm Existing (Proposed)**	**100-Year Storm Existing (Proposed)**
Rate of Runoff	*3.5 cfs* *(3.2 cfs)*	*8.0 cfs* *(7.6 cfs)*	*11.1 cfs* *(10.4 cfs)*	*15.8 cfs* *(15.0 cfs)*
Volume of Runoff	*(0.33 ac-ft)* *(0.31 ac-ft)*	*0.73 ac-ft* *(0.69 ac-ft)*	*1.01 ac-ft* *(0.95 ac-ft)*	*1.44 ac-ft* *(1.37 ac-ft)*

The analysis has also evaluated the culvert discharging from the from wetland under the abutting driveway, and results show sufficient capacity to contain runoff, and any headwater, within the project limits, and that the peak ponding elevation would not be increased by the project. The available storage area above the culvert was accounted for in the model including the grading modifications due to the proposed basin embankment. The culvert consists of a 15" RCP pipe with the bell end at headwall. A summary of the results are below:

Analysis Point Front Culvert	***2-Year Storm Existing (Proposed)***	***10-Year Storm Existing (Proposed)***	***25-Year Storm Existing (Proposed)***	***100-Year Storm Existing (Proposed)***
Peak Ponding Elevation at Culvert	*252.3 cfs* *(252.0 cfs)*	*253.3 cfs* *(252.5 cfs)*	*253.7 cfs* *(253.3 cfs)*	*254.3 cfs* *(254.2 cfs)*

Standard 3: Stormwater Recharge

The proposed stormwater management system has provided groundwater recharge through a subsurface drywell and an infiltration basin.

Required Recharge Volume:

Existing Impervious Area = 27,840 s.f.
Proposed Impervious Area = 27,485 s.f.
Required Recharge Volume = None (no increase in impervious area)

Proposed Recharge Volume:

Proposed Infiltration within basin

Available Volume =	2,390 C.F. (below outlet)
Drawdown Calculation:	(2,390 C.F.) / (1.02 in/hr x 1/12 x 4,600 sf) = 6 hours
Pretreatment =	25% (gravel / sod filter strip)

Total Recharge Volume = 2,390 c.f.

A mounding analysis of the basin has been attached to verify the resultant mound from the recharge volume would not impact the functionality of the system nor break out onto the ground surface.

Standard 4: Water Quality

The proposed stormwater management system has provided treatment through I infiltration basin. A recommended long-term pollution prevention plan has also been provided as part of the attached Operation and Maintenance Plan.

In accordance with section 26.5.8.3 of the Land Disturbance Bylaw, the system has been designed to "*Retain the volume of runoff equivalent to, or greater than, one inch multiplied by the total post-construction impervious surface area*."

Stormwater Basin

Proposed TSS Removal Rate = 80%
Total Phosphorus Removal = 60% to 70%
Tributary Impervious Area = 16,135 s.f.
Water Quality Volume = 16,135 s.f. x 1-inch / 12 = 1,345 C.F.
Proposed Volume = 2,390 C.F.

1 **BMP**	2 **TSS removal**	3 **Starting TSS** (5 from previous BMP)	4 **TSS Removal** **(2 * 3)**	5 **Remaining TSS** **(3 - 4)**
Inf. Basin	80%	100%	80%	20%
		Total TSS Removal =	**80%**	

Standard 5: Land Uses With Higher pollutant Loads

Not applicable - The proposed use is not classified as a land use with higher pollutant loads.

Standard 6: Critical Areas

Not applicable – The project is not located within a critical area

Standard 7: Redevelopment

Not applicable.

Standard 8: Construction Period Controls

Erosion controls have been provided on the plans including perimeter erosion barriers down-gradient of all proposed work, and sedimentation and erosion control notes are provided on the plans. The project is greater than 1 acre of disturbance, and would fall under the NPDES General Construction Permit. A copy of the SWPPP has been attached.

Temporary Sediment Trap:
Drainage Area=1 acre
Minimum storage volume = 1 acre x 3,600 cubic feet
Proposed volume below spillway outlet = 4,900 cubic feet
Spillway set at elevation 257, sized for capacity of 100 year storm event.

Standard 9: Operation and Maintenance Plan

An Operation and Maintenance Plan has been attached with this report.

Standard 10: Illicit Discharges

Based upon site observations, no illicit discharges have been observed on the site. Illicit discharges are prohibited. All existing sewerage flow and proposed flow from the site is, or will be, connected to the municipal sewer system.

Illicit Discharge Compliance Statement

Project: Boundary Lane
Summer Street, Medway, MA

Date: August 20, 2021

Engineer's Certification:

To the best of my knowledge, the attached plans, computations and specifications meet the requirements of Standard 10 of the Massachusetts Stormwater Handbook regarding illicit discharges to the stormwater management system. Based upon site observations no detectable illicit discharges exist on the site, and future Illicit discharges are prohibited. The proposed facility is serviced by the municipal sewerage system located within an easement running through the site. All existing and proposed sewerage discharges shall be connected to teh municipal sewer system. All current documents and attachments were prepared under my direction and qualified personnel properly gathered and evaluated the information submitted.

Name: Vito Colonna

Organization: Cornerstone Engineering

Signature: [signature]

Date: 8-20-2021

STORMWATER DRAINAGE SYSTEM DESIGN

The proposed cross culvert under the roadway has been designed for the 50 year storm event.

For the street drainage system, storm intensities were determined from exhibit 8-14 "*Intensity – Duration – Frequency Curve for Worcester, MA*" from the MassHighway Design Manual. The resulting analysis was performed using the Rational Method of determining peak storm flows. All storm sewer pipe sizes were determined using Manning's Equation for pipes flowing full.

The following table presents the hydraulic calculations performed for sizing the site drainage system. The structure references refer to those as shown on the site plan submitted with this report.

DRAIN PIPE SIZING CALCULATIONS

PROJECT Boundary Lane LOCATION off Summer Street, Medway BY: VC n= 0.013

CLIENT Lindsay SHEET 1 OF 1 DATE: 8/20/2021 RETURN PERIOD **50 Year**

Line		Area	C	CA	Tc	rain	Inlet flow Q	Pipe flow Qd	Pipe Size	Pipe Length	Slope	flowing full		Rim (feet)		Inv. El	
FROM	TO	ac			min.	in/hr	cfs	cfs	in	ft	ft/ft	Qf	Vf	Upper	Lower	Upper	Lower
12" HW	outlet	0.30	0.30	0.09	5	7.2	0.65	**0.65**	12	50	0.010	**3.56**	4 54	258.60	258.60	256.25	255.75

Hydrologic Calculations (HydroCAD Model)

Existing & Proposed Conditions
2-yr, 10-yr, 25-yr & 100-yr storm events

NOAA Atlas 14, Volume 10, Version 3
Location name: Medway, Massachusetts, USA*
Latitude: 42.1501°, Longitude: -71.4422°
Elevation: 257.43 ft**
*source: USGS Maps
**source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G. M. Bonnin, D. Martin, B. Lin, T. Parzybok, M. Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

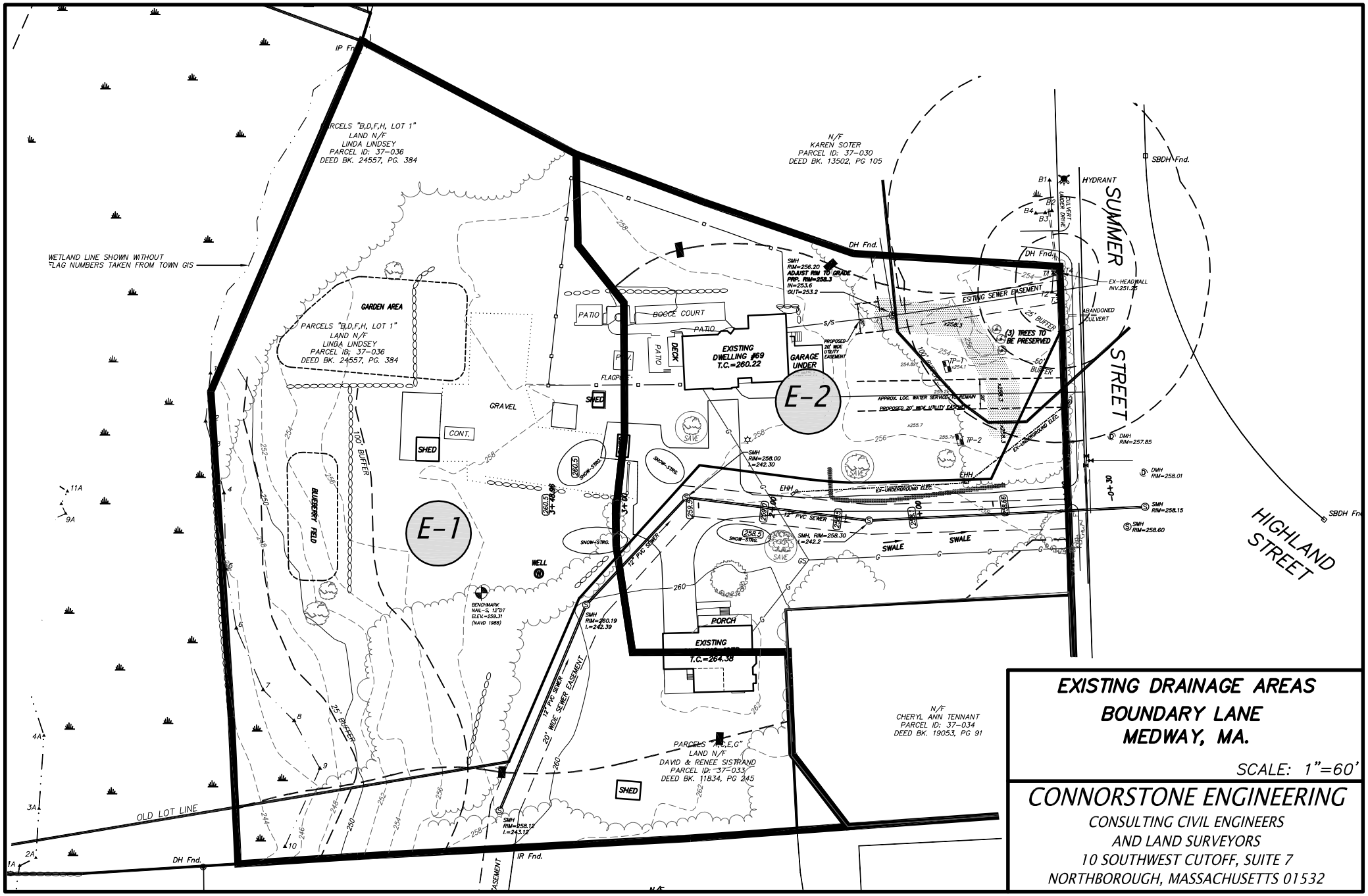
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.330 (0.269-0.430)	0.398 (0.325-0.515)	0.509 (0.415-0.658)	0.601 (0.490-0.778)	0.728 (0.593-0.943)	0.824 (0.671-1.07)	0.923 (0.751-1.20)	1.03 (0.838-1.34)	1.19 (0.963-1.54)	1.32 (1.07-1.71)
10-min	0.468 (0.382-0.609)	0.564 (0.460-0.735)	0.721 (0.587-0.940)	0.851 (0.694-1.12)	1.03 (0.840-1.35)	1.17 (0.951-1.52)	1.31 (1.06-1.70)	1.46 (1.19-1.90)	1.69 (1.36-2.17)	1.86 (1.50-2.42)
15-min	0.561 (0.458-0.731)	0.664 (0.542-0.865)	0.849 (0.692-1.11)	1.00 (0.817-1.32)	1.21 (0.989-1.59)	1.37 (1.12-1.79)	1.54 (1.25-2.00)	1.72 (1.40-2.24)	1.98 (1.60-2.55)	2.19 (1.77-2.84)
30-min	0.753 (0.614-0.980)	0.905 (0.739-1.18)	1.16 (0.947-1.52)	1.37 (1.12-1.81)	1.66 (1.35-2.17)	1.88 (1.53-2.46)	2.11 (1.72-2.75)	2.36 (1.92-3.08)	2.72 (2.20-3.56)	3.01 (2.43-3.94)
60-min	0.955 (0.780-1.24)	1.15 (0.939-1.50)	1.48 (1.21-1.93)	1.75 (1.43-2.29)	2.12 (1.72-2.76)	2.40 (1.95-3.13)	2.69 (2.19-3.50)	3.01 (2.45-3.93)	3.46 (2.81-4.53)	3.82 (3.10-5.00)
2-hr	1.23 (1.04-1.49)	1.49 (1.26-1.82)	1.91 (1.62-2.48)	2.26 (1.92-2.95)	2.75 (2.33-3.60)	3.11 (2.64-4.08)	3.50 (2.97-4.60)	3.95 (3.35-5.20)	4.63 (3.91-6.09)	5.21 (4.39-6.86)
3-hr	1.42 (1.21-1.73)	1.72 (1.46-2.11)	2.22 (1.89-2.87)	2.63 (2.24-3.42)	3.19 (2.71-4.16)	3.61 (3.07-4.73)	4.07 (3.45-5.35)	4.62 (3.91-6.09)	5.45 (4.61-7.17)	6.17 (5.21-8.12)
6-hr	1.81 (1.54-2.22)	2.21 (1.87-2.73)	2.84 (2.40-3.66)	3.37 (2.86-4.35)	4.10 (3.47-5.32)	4.64 (3.93-6.06)	5.23 (4.42-6.84)	5.95 (5.02-7.72)	7.07 (5.97-9.27)	8.04 (6.78-10.7)
12-hr	2.29 (1.94-2.79)	2.79 (2.37-3.45)	3.61 (3.05-4.61)	4.28 (3.63-5.53)	5.21 (4.41-6.77)	5.90 (4.99-7.69)	6.64 (5.61-8.66)	7.56 (6.38-9.81)	8.98 (7.58-11.8)	10.2 (8.63-13.4)
24-hr	2.75 (2.35-3.47)	3.36 (2.84-4.26)	4.41 (3.74-5.63)	5.27 (4.47-6.73)	6.45 (5.46-8.27)	7.32 (6.20-9.41)	8.27 (7.00-10.6)	9.46 (8.00-12.2)	11.3 (9.53-14.7)	12.9 (10.8-16.9)
2-day	3.12 (2.68-3.92)	3.90 (3.32-4.91)	5.18 (4.42-6.54)	6.24 (5.35-7.83)	7.70 (6.58-9.71)	8.76 (7.50-11.0)	9.95 (8.51-12.6)	11.5 (9.82-14.5)	13.9 (11.8-18.2)	16.0 (13.5-21.0)
3-day	3.41 (2.93-4.29)	4.25 (3.63-5.32)	5.63 (4.82-7.07)	6.77 (5.81-8.50)	8.34 (7.15-11.1)	9.49 (8.13-12.6)	10.8 (9.23-13.4)	12.4 (10.6-15.7)	15.0 (12.8-19.6)	17.4 (14.7-22.7)
4-day	3.68 (3.16-4.59)	4.55 (3.90-5.63)	5.98 (5.14-7.50)	7.16 (6.15-9.03)	8.80 (7.55-11.7)	9.99 (8.56-13.2)	11.3 (9.72-14.2)	13.0 (11.1-16.5)	15.7 (13.4-20.5)	18.1 (15.3-23.7)
7-day	4.42 (3.81-5.45)	5.35 (4.61-6.64)	6.86 (5.92-8.55)	8.11 (6.99-10.2)	9.84 (8.47-13.0)	11.1 (9.56-14.5)	12.5 (10.8-16.0)	14.2 (12.2-18.2)	16.9 (14.5-21.9)	19.3 (16.5-25.1)
10-day	5.13 (4.42-6.31)	6.09 (5.24-7.54)	7.65 (6.60-9.51)	8.94 (7.71-11.2)	10.7 (9.22-14.1)	12.0 (10.3-15.8)	13.5 (11.6-17.8)	15.2 (13.1-20.1)	17.8 (15.3-23.1)	20.1 (17.3-26.2)
20-day	7.24 (6.26-8.96)	8.26 (7.13-10.2)	9.93 (8.61-12.3)	11.3 (9.79-14.0)	13.2 (11.3-17.1)	14.7 (12.6-19.3)	16.1 (13.8-22.1)	17.8 (15.2-25.0)	20.2 (17.3-27.8)	22.1 (18.9-30.2)
30-day	8.99 (7.72-11.3)	10.0 (8.66-12.8)	11.8 (10.2-14.9)	13.2 (11.5-16.4)	15.2 (13.1-19.5)	16.7 (14.3-21.9)	18.3 (15.7-24.7)	19.9 (17.1-27.7)	22.0 (18.7-31.8)	23.7 (20.1-35.0)
45-day	11.1 (9.58-13.8)	12.3 (10.6-15.0)	14.1 (12.1-17.2)	15.6 (13.5-19.2)	17.6 (15.1-23.5)	19.2 (16.5-25.9)	20.8 (17.8-27.8)	22.3 (19.1-31.2)	24.2 (20.6-34.8)	25.6 (21.7-37.7)
60-day	13.0 (11.2-15.8)	14.1 (12.1-17.2)	16.0 (13.8-19.5)	17.5 (15.1-21.5)	19.6 (16.8-26.1)	21.3 (18.2-29.2)	22.9 (19.6-30.4)	24.3 (20.8-33.2)	26.1 (22.2-37.4)	27.2 (23.2-39.9)

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

Numbers in parentheses 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 corresponding value PMP value.

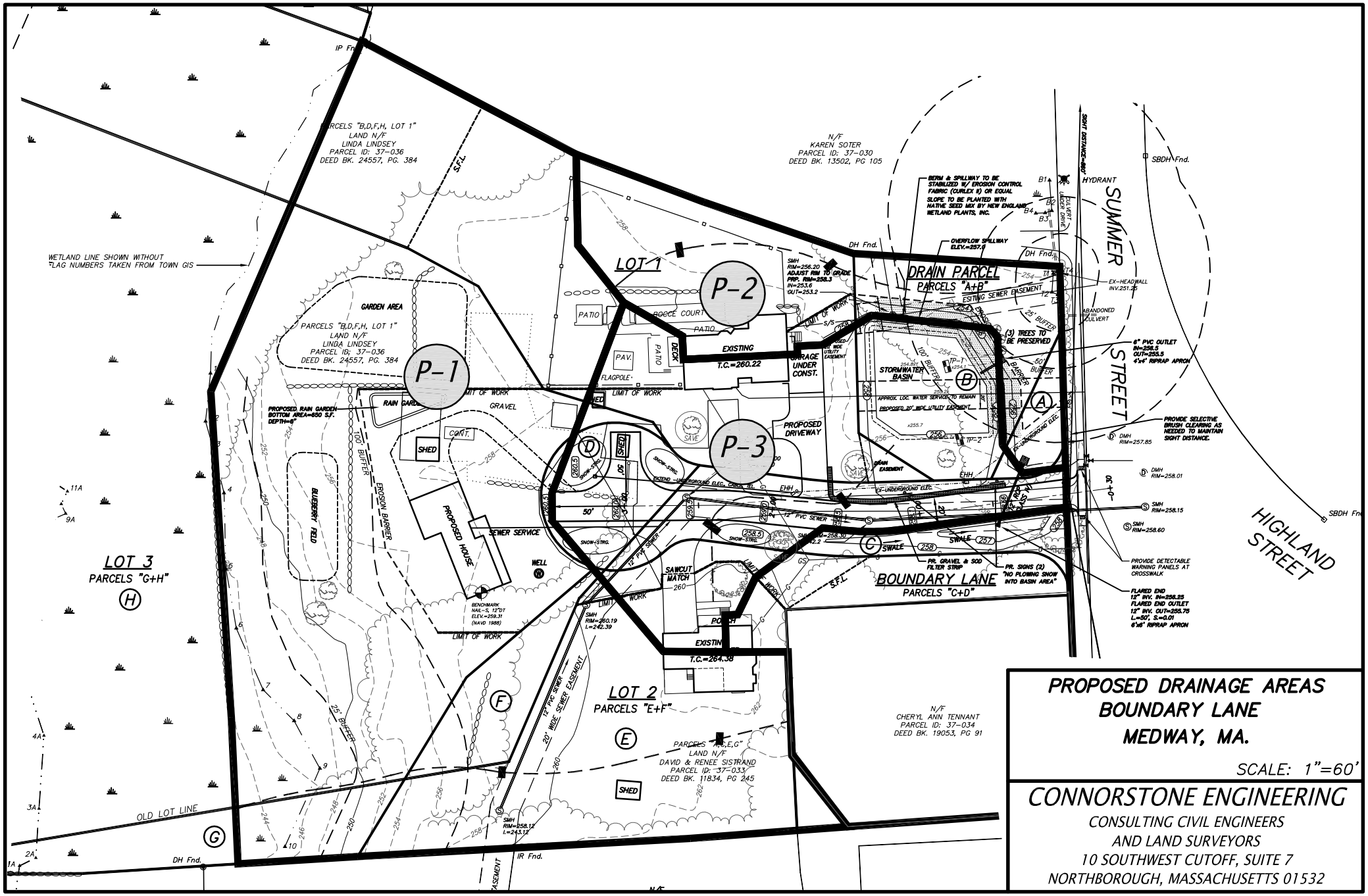
Please refer to NOAA Atlas 14 document for more information.

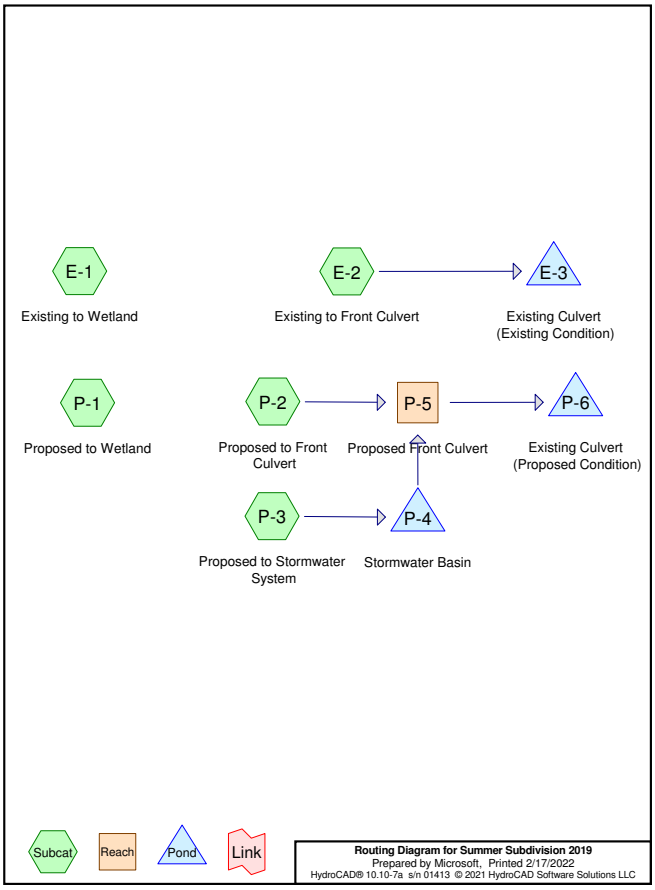


EXISTING DRAINAGE AREAS
BOUNDARY LANE
MEDWAY, MA.

SCALE: 1"=60'

CONNORSTONE ENGINEERING
CONSULTING CIVIL ENGINEERS
AND LAND SURVEYORS
10 SOUTHWEST CUTOFF, SUITE 7
NORTHBOROUGH, MASSACHUSETTS 01532


PROPOSED DRAINAGE AREAS
BOUNDARY LANE
MEDWAY, MA.
SCALE: 1"=60'
CONNORSTONE ENGINEERING
CONSULTING CIVIL ENGINEERS
AND LAND SURVEYORS
10 SOUTHWEST CUTOFF, SUITE 7
NORTHBOROUGH, MASSACHUSETTS 01532
LOT 1
LOT 2
PARCELS "E+F"
LOT 3
PARCELS "G+H"
BOUNDARY LANE
PARCELS "C+D"
DRAIN PARCEL
PARCELS "A+B"
P-1
P-2
P-3
PROPOSED HOUSE
PROPOSED DRIVEWAY
EXISTING GARAGE UNDER CONST.
STORMWATER BASIN
GARDEN AREA
PROPOSED RAIN GARDEN BOTTOM AREA=650 S.F. DEPTH=6"
BLUEBERRY FIELD
SEWER SERVICE
WELL
SHED
BOCCE COURT
PATIO
DECK
P.A.V.
FLAGPOLE
GRAVEL
CONT.
SAWCUT MATCH
EXISTING T.C.=264.38
EXISTING T.C.=260.22
LIMIT OF WORK
100' BUFFER
50' BUFFER
25' BUFFER
EROSION BARRIER
20' WIDE SEWER EASEMENT
12" PVC SEWER
OLD LOT LINE
S.F.L.
WETLAND LINE SHOWN WITHOUT FLAG NUMBERS TAKEN FROM TOWN GIS
PARCELS "B,D,F,H, LOT 1" LAND N/F LINDA LINDSEY PARCEL ID: 37-036 DEED BK. 24557, PG. 384
N/F KAREN SOTER PARCEL ID: 37-030 DEED BK. 13502, PG 105
N/F CHERYL ANN TENNANT PARCEL ID: 37-034 DEED BK. 19053, PG 91
PARCELS "A,E,G" LAND N/F DAVID & RENEE SISTRAND PARCEL ID: 37-033 DEED BK. 11834, PG 245
BENCHMARK NAIL-S, 12"DT ELEV.=259.31 (NAVD 1988)
BERM & SPILLWAY TO BE STABILIZED W/ EROSION CONTROL FABRIC (CURLEX II) OR EQUAL
SLOPE TO BE PLANTED WITH NATIVE SEED MIX BY NEW ENGLAND WETLAND PLANTS, INC.
OVERFLOW SPILLWAY ELEV.=257.0
(3) TREES TO BE PRESERVED
6" PVC OUTLET IN=256.5 OUT=255.5 4'x4' RIPRAP APRON
PROVIDE SELECTIVE BRUSH CLEARING AS NEEDED TO MAINTAIN SIGHT DISTANCE.
PROVIDE DETECTABLE WARNING PANELS AT CROSSWALK
FLARED END 12" INV. IN=256.25 FLARED END OUTLET 12" INV. OUT=255.75 L=50', S.=0.01 6'x6' RIPRAP APRON
PR. GRAVEL & SOD FILTER STRIP
PR. SIGNS (2) "NO PLOWING SNOW INTO BASIN AREA"
SMH RIM=256.20 ADJUST RIM TO GRADE PRP. RIM=258.3 IN=253.6 OUT=253.2
SMH RIM=260.19 I.=242.39
SMH RIM=258.12 I.=243.12
SMH RIM=258.30 I.=252.2
SMH RIM=258.15
SMH RIM=258.60
DMH RIM=257.85
DMH RIM=258.01
EX-HEADWALL INV.251.25
ABANDONED CULVERT
HYDRANT
SBDH Fnd.
DH Fnd.
IP Fnd.
IR Fnd.
HIGHLAND STREET
SUMMER STREET
SIGHT DISTANCE=400'



Summary for Subcatchment E-1: Existing to Wetland

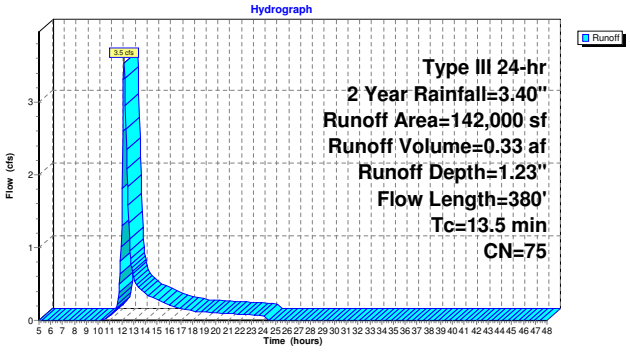
Runoff = 3.5 cfs @ 12.20 hrs, Volume= 0.33 af, Depth= 1.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.40"

	Area (sf)	CN	Description
	41,000	70	Woods, Good, HSG C
	88,880	74	>75% Grass cover, Good, HSG C
	4,200	98	Paved parking, HSG C
*	7,920	96	Gravel
	142,000	75	Weighted Average
	137,800		97.04% Pervious Area
	4,200		2.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0150	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
2.5	150	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.1	180	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.5	380	Total			

Subcatchment E-1: Existing to Wetland



Summary for Subcatchment E-2: Existing to Front Culvert

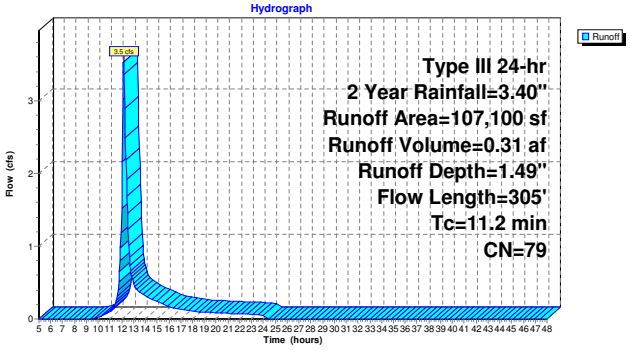
Runoff = 3.5 cfs @ 12.16 hrs, Volume= 0.31 af, Depth= 1.49"
Routed to Pond E-3 : Existing Culvert (Existing Condition)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.40"

Area (sf)	CN	Description
3,500	70	Woods, Good, HSG C
10,500	77	Woods, Good, HSG D
50,380	74	>75% Grass cover, Good, HSG C
15,720	98	Paved parking, HSG C
27,000	80	1/2 acre lots, 25% imp, HSG C
107,100	79	Weighted Average
84,630		79.02% Pervious Area
22,470		20.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.0400	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
1.9	100	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.3	155	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.2	305	Total			

Subcatchment E-2: Existing to Front Culvert



Summary for Subcatchment P-1: Proposed to Wetland

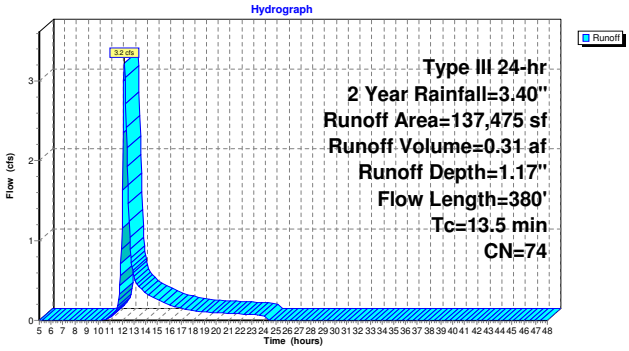
Runoff = 3.2 cfs @ 12.20 hrs, Volume= 0.31 af, Depth= 1.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.40"

Area (sf)	CN	Description
36,000	70	Woods, Good, HSG C
93,140	74	>75% Grass cover, Good, HSG C
3,845	98	Paved parking, HSG C
4,490	98	Roofs, HSG C
137,475	74	Weighted Average
129,140		93.94% Pervious Area
8,335		6.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0150	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
2.5	150	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.1	180	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.5	380	Total			

Subcatchment P-1: Proposed to Wetland



Summary for Subcatchment P-2: Proposed to Front Culvert

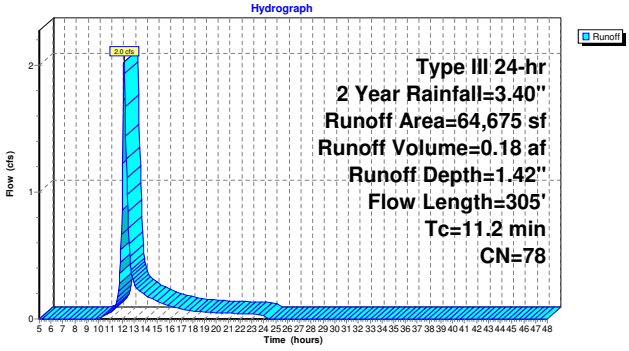
Runoff = 2.0 cfs @ 12.16 hrs, Volume= 0.18 af, Depth= 1.42"
Routed to Reach P-5 : Proposed Front Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.40"

Area (sf)	CN	Description
3,710	70	Woods, Good, HSG C
5,300	77	Woods, Good, HSG D
23,620	74	>75% Grass cover, Good, HSG C
2,030	80	>75% Grass cover, Good, HSG D
3,015	98	Paved parking, HSG C
27,000	80	1/2 acre lots, 25% imp, HSG C
64,675	78	Weighted Average
54,910		84.90% Pervious Area
9,765		15.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.0400	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
1.9	100	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.3	155	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.2	305	Total			

Subcatchment P-2: Proposed to Front Culvert



Summary for Subcatchment P-3: Proposed to Stormwater System

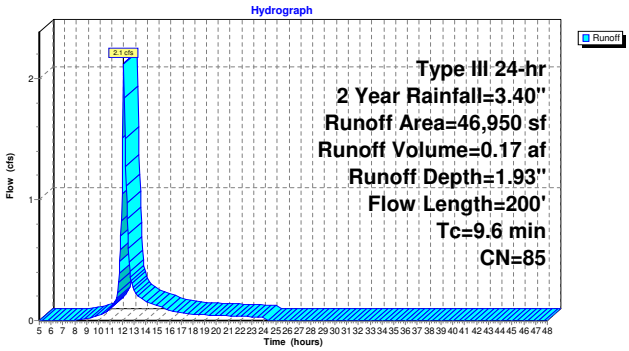
Runoff = 2.1 cfs @ 12.14 hrs, Volume= 0.17 af, Depth= 1.93"
Routed to Pond P-4 : Stormwater Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.40"

	Area (sf)	CN	Description
	13,280	98	Paved parking, HSG C
	2,855	98	Roofs, HSG C
	24,745	74	>75% Grass cover, Good, HSG C
	1,470	80	>75% Grass cover, Good, HSG D
*	4,600	98	Basin Bottom Area
	46,950	85	Weighted Average
	26,215		55.84% Pervious Area
	20,735		44.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
0.8	100	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	50	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.6	200	Total			

Subcatchment P-3: Proposed to Stormwater System



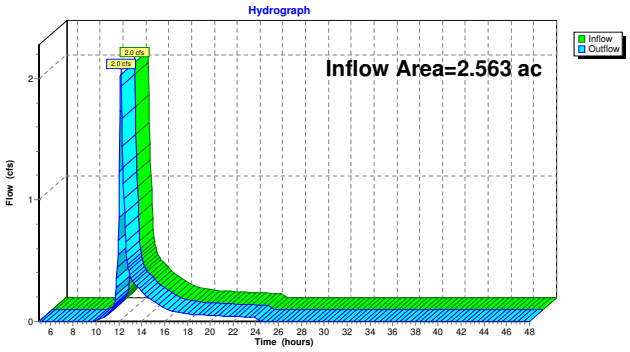
Summary for Reach P-5: Proposed Front Culvert

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.563 ac, 27.32% Impervious, Inflow Depth = 0.89" for 2 Year event
Inflow = 2.0 cfs @ 12.16 hrs, Volume= 0.19 af
Outflow = 2.0 cfs @ 12.16 hrs, Volume= 0.19 af, Atten= 0%, Lag= 0.0 min
Routed to Pond P-6 : Existing Culvert (Proposed Condition)

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Reach P-5: Proposed Front Culvert



Summary for Pond E-3: Existing Culvert (Existing Condition)

Inflow Area = 2.459 ac, 20.98% Impervious, Inflow Depth = 1.49" for 2 Year event
Inflow = 3.5 cfs @ 12.16 hrs, Volume= 0.31 af
Outflow = 3.5 cfs @ 12.17 hrs, Volume= 0.30 af, Atten= 1%, Lag= 0.2 min
Primary = 3.5 cfs @ 12.17 hrs, Volume= 0.30 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 252.34' @ 12.17 hrs Surf.Area= 80 sf Storage= 39 cf

Plug-Flow detention time= 0.3 min calculated for 0.30 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (847.9 - 847.6)

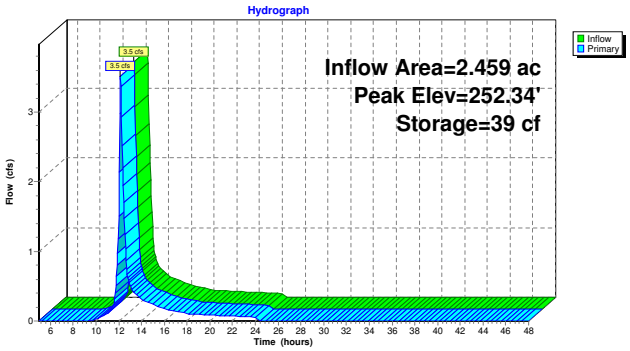
Volume	Invert	Avail.Storage	Storage Description
#1	251.25'	22,611 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
251.25	10	0	0
252.00	40	19	19
253.00	160	100	119
253.50	1,505	416	535
254.00	3,750	1,314	1,849
254.50	7,040	2,698	4,546
255.00	9,920	4,240	8,786
256.00	17,730	13,825	22,611

Device	Routing	Invert	Outlet Devices
#1	Primary	251.25'	**15.0" Round Culvert** L= 40.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 251.25' / 251.00' S= 0.0063 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Primary	255.20'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=3.4 cfs @ 12.17 hrs HW=252.32' (Free Discharge)
1=Culvert (Barrel Controls 3.4 cfs @ 4.11 fps)
2=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

Pond E-3: Existing Culvert (Existing Condition)



Summary for Pond P-4: Stormwater Basin

Inflow Area = 1.078 ac, 44.16% Impervious, Inflow Depth = 1.93" for 2 Year event
Inflow = 2.1 cfs @ 12.14 hrs, Volume= 0.17 af
Outflow = 0.2 cfs @ 13.04 hrs, Volume= 0.17 af, Atten= 89%, Lag= 54.3 min
Discarded = 0.2 cfs @ 13.04 hrs, Volume= 0.16 af
Primary = 0.1 cfs @ 13.04 hrs, Volume= 0.02 af
Routed to Reach P-5 : Proposed Front Culvert

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 256.67' @ 13.04 hrs Surf.Area= 5,131 sf Storage= 3,269 cf

Plug-Flow detention time= 187.0 min calculated for 0.17 af (100% of inflow)
Center-of-Mass det. time= 186.8 min (1,013.6 - 826.8)

Volume	Invert	Avail.Storage	Storage Description
#1	256.00'	12,118 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

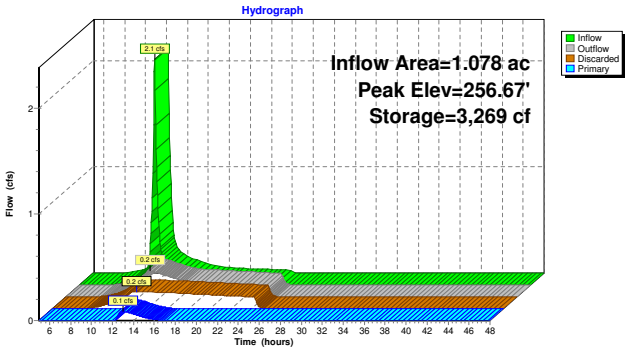
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
256.00	4,600	0	0	4,600
257.00	5,400	4,995	4,995	5,438
258.00	9,000	7,124	12,118	9,051

Device	Routing	Invert	Outlet Devices
#1	Discarded	256.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 254.00'
#2	Primary	257.00'	**10.0' long x 5.0' 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 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Primary	256.50'	**6.0" Round Culvert** L= 18.0' Ke= 0.500 Inlet / Outlet Invert= 256.50' / 255.50' S= 0.0556 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf

Discarded OutFlow Max=0.2 cfs @ 13.04 hrs HW=256.67' (Free Discharge)
└**1=Exfiltration** (Controls 0.2 cfs)

Primary OutFlow Max=0.1 cfs @ 13.04 hrs HW=256.67' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)
└**3=Culvert** (Inlet Controls 0.1 cfs @ 1.41 fps)

Pond P-4: Stormwater Basin



Summary for Pond P-6: Existing Culvert (Proposed Condition)

Inflow Area = 2.563 ac, 27.32% Impervious, Inflow Depth = 0.89" for 2 Year event
Inflow = 2.0 cfs @ 12.16 hrs, Volume= 0.19 af
Outflow = 2.0 cfs @ 12.17 hrs, Volume= 0.19 af, Atten= 1%, Lag= 0.1 min
Primary = 2.0 cfs @ 12.17 hrs, Volume= 0.19 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 252.03' @ 12.17 hrs Surf.Area= 43 sf Storage= 20 cf

Plug-Flow detention time= 0.3 min calculated for 0.19 af (100% of inflow)
Center-of-Mass det. time= 0.3 min (849.2 - 848.9)

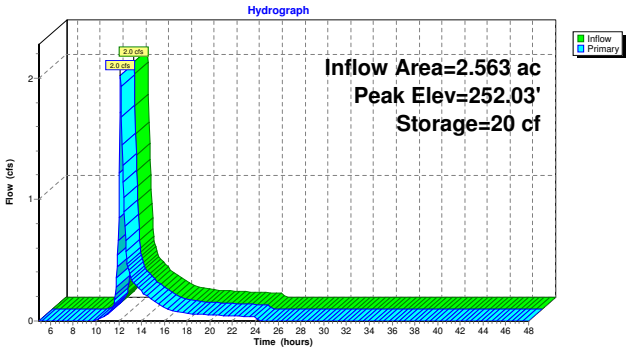
Volume	Invert	Avail.Storage	Storage Description
#1	251.25'	10,370 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

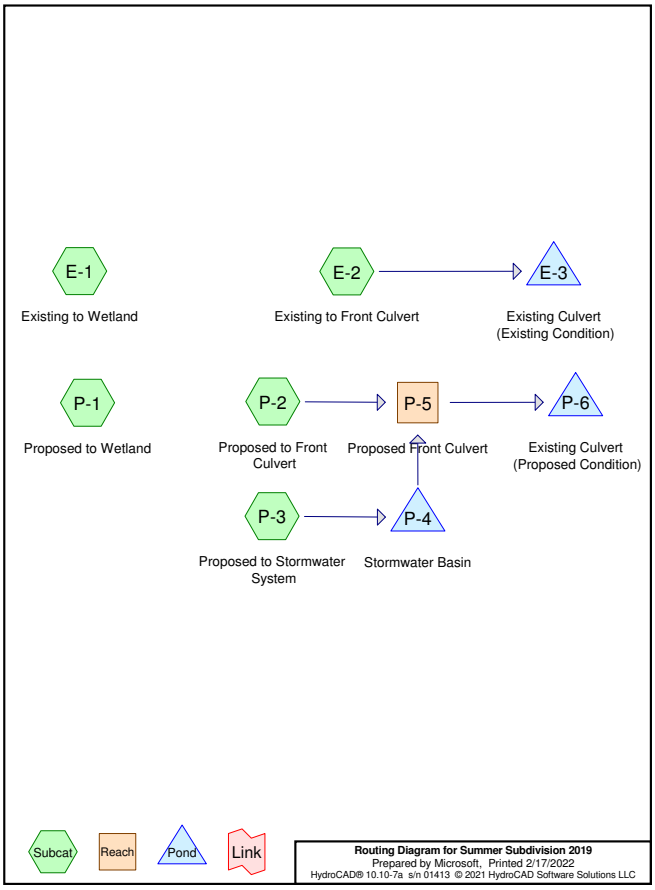
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
251.25	10	0	0
252.00	40	19	19
253.00	160	100	119
253.50	1,505	416	535
254.00	3,070	1,144	1,679
254.50	4,980	2,013	3,691
255.00	6,580	2,890	6,581
255.50	8,575	3,789	10,370

Device	Routing	Invert	Outlet Devices
#1	Primary	251.25'	**15.0" Round Culvert** L= 40.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 251.25' / 251.00' S= 0.0063 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Primary	255.20'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=2.0 cfs @ 12.17 hrs HW=252.02' (Free Discharge)
└**1=Culvert** (Barrel Controls 2.0 cfs @ 3.59 fps)
└**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Pond P-6: Existing Culvert (Proposed Condition)





Summary for Subcatchment E-1: Existing to Wetland

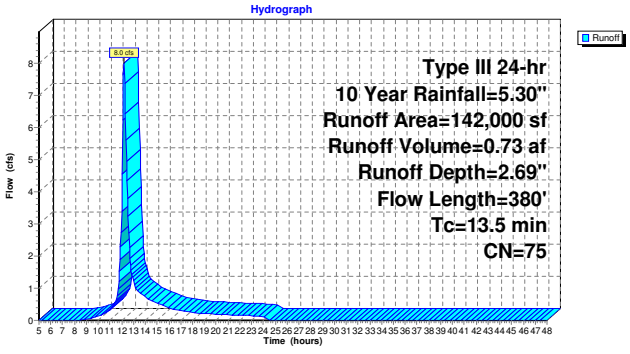
Runoff = 8.0 cfs @ 12.19 hrs, Volume= 0.73 af, Depth= 2.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=5.30"

	Area (sf)	CN	Description
	41,000	70	Woods, Good, HSG C
	88,880	74	>75% Grass cover, Good, HSG C
	4,200	98	Paved parking, HSG C
*	7,920	96	Gravel
	142,000	75	Weighted Average
	137,800		97.04% Pervious Area
	4,200		2.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0150	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
2.5	150	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.1	180	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.5	380	Total			

Subcatchment E-1: Existing to Wetland



Summary for Subcatchment E-2: Existing to Front Culvert

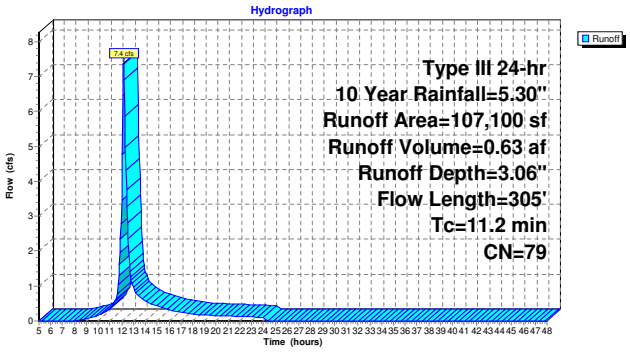
Runoff = 7.4 cfs @ 12.16 hrs, Volume= 0.63 af, Depth= 3.06"
Routed to Pond E-3 : Existing Culvert (Existing Condition)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=5.30"

Area (sf)	CN	Description
3,500	70	Woods, Good, HSG C
10,500	77	Woods, Good, HSG D
50,380	74	>75% Grass cover, Good, HSG C
15,720	98	Paved parking, HSG C
27,000	80	1/2 acre lots, 25% imp, HSG C
107,100	79	Weighted Average
84,630		79.02% Pervious Area
22,470		20.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.0400	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
1.9	100	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.3	155	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.2	305	Total			

Subcatchment E-2: Existing to Front Culvert



Summary for Subcatchment P-1: Proposed to Wetland

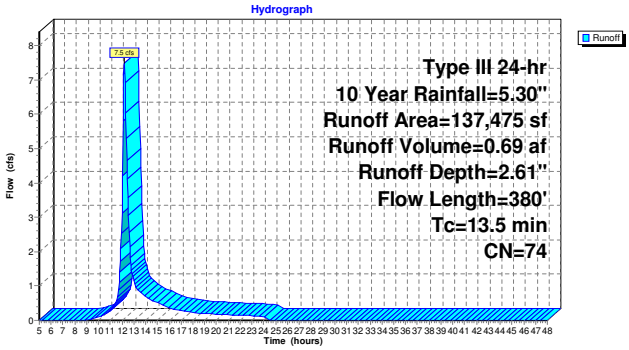
Runoff = 7.5 cfs @ 12.19 hrs, Volume= 0.69 af, Depth= 2.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=5.30"

Area (sf)	CN	Description
36,000	70	Woods, Good, HSG C
93,140	74	>75% Grass cover, Good, HSG C
3,845	98	Paved parking, HSG C
4,490	98	Roofs, HSG C
137,475	74	Weighted Average
129,140		93.94% Pervious Area
8,335		6.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0150	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
2.5	150	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.1	180	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.5	380	Total			

Subcatchment P-1: Proposed to Wetland



Summary for Subcatchment P-2: Proposed to Front Culvert

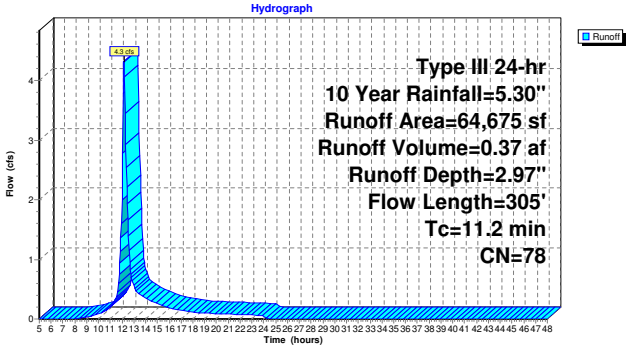
Runoff = 4.3 cfs @ 12.16 hrs, Volume= 0.37 af, Depth= 2.97"
Routed to Reach P-5 : Proposed Front Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=5.30"

Area (sf)	CN	Description
3,710	70	Woods, Good, HSG C
5,300	77	Woods, Good, HSG D
23,620	74	>75% Grass cover, Good, HSG C
2,030	80	>75% Grass cover, Good, HSG D
3,015	98	Paved parking, HSG C
27,000	80	1/2 acre lots, 25% imp, HSG C
64,675	78	Weighted Average
54,910		84.90% Pervious Area
9,765		15.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.0400	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
1.9	100	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.3	155	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.2	305	Total			

Subcatchment P-2: Proposed to Front Culvert



Summary for Subcatchment P-3: Proposed to Stormwater System

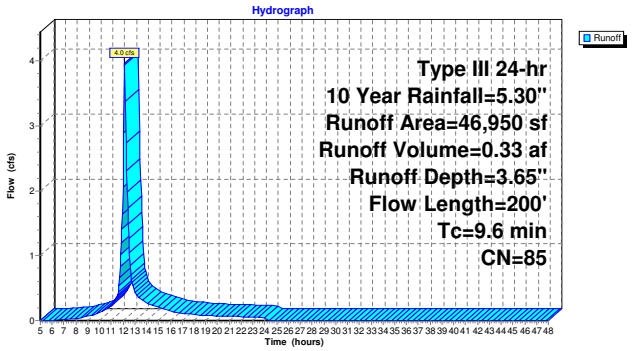
Runoff = 4.0 cfs @ 12.14 hrs, Volume= 0.33 af, Depth= 3.65"
Routed to Pond P-4 : Stormwater Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=5.30"

	Area (sf)	CN	Description
	13,280	98	Paved parking, HSG C
	2,855	98	Roofs, HSG C
	24,745	74	>75% Grass cover, Good, HSG C
	1,470	80	>75% Grass cover, Good, HSG D
*	4,600	98	Basin Bottom Area
	46,950	85	Weighted Average
	26,215		55.84% Pervious Area
	20,735		44.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
0.8	100	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	50	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.6	200	Total			

Subcatchment P-3: Proposed to Stormwater System



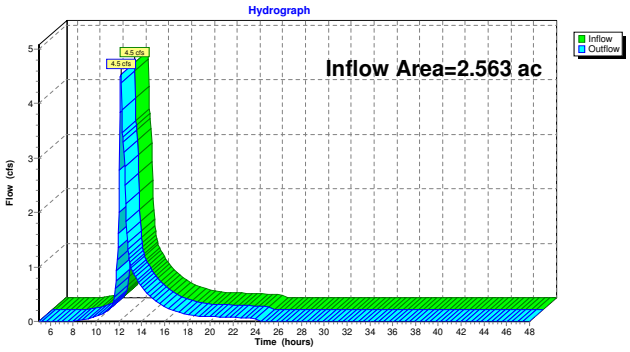
Summary for Reach P-5: Proposed Front Culvert

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.563 ac, 27.32% Impervious, Inflow Depth = 2.28" for 10 Year event
Inflow = 4.5 cfs @ 12.17 hrs, Volume= 0.49 af
Outflow = 4.5 cfs @ 12.17 hrs, Volume= 0.49 af, Atten= 0%, Lag= 0.0 min
Routed to Pond P-6 : Existing Culvert (Proposed Condition)

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Reach P-5: Proposed Front Culvert



Summary for Pond E-3: Existing Culvert (Existing Condition)

Inflow Area = 2.459 ac, 20.98% Impervious, Inflow Depth = 3.06" for 10 Year event
Inflow = 7.4 cfs @ 12.16 hrs, Volume= 0.63 af
Outflow = 6.9 cfs @ 12.20 hrs, Volume= 0.63 af, Atten= 7%, Lag= 2.3 min
Primary = 6.9 cfs @ 12.20 hrs, Volume= 0.63 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 253.30' @ 12.20 hrs Surf.Area= 956 sf Storage= 284 cf

Plug-Flow detention time= 0.3 min calculated for 0.63 af (100% of inflow)
Center-of-Mass det. time= 0.3 min (827.0 - 826.7)

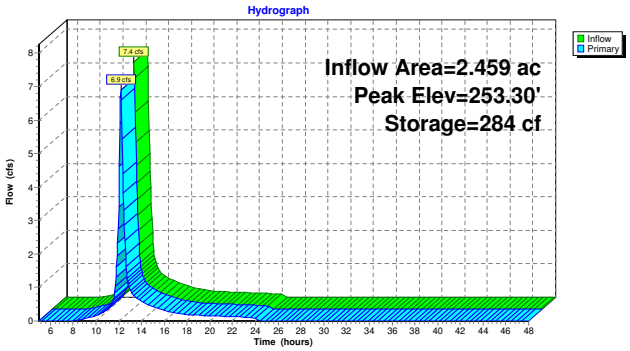
Volume	Invert	Avail.Storage	Storage Description
#1	251.25'	22,611 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
251.25	10	0	0
252.00	40	19	19
253.00	160	100	119
253.50	1,505	416	535
254.00	3,750	1,314	1,849
254.50	7,040	2,698	4,546
255.00	9,920	4,240	8,786
256.00	17,730	13,825	22,611

Device	Routing	Invert	Outlet Devices
#1	Primary	251.25'	**15.0" Round Culvert** L= 40.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 251.25' / 251.00' S= 0.0063 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Primary	255.20'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=6.9 cfs @ 12.20 hrs HW=253.29' (Free Discharge)
1=Culvert (Barrel Controls 6.9 cfs @ 5.61 fps)
2=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

Pond E-3: Existing Culvert (Existing Condition)



Summary for Pond P-4: Stormwater Basin

Inflow Area = 1.078 ac, 44.16% Impervious, Inflow Depth = 3.65" for 10 Year event
Inflow = 4.0 cfs @ 12.14 hrs, Volume= 0.33 af
Outflow = 1.4 cfs @ 12.48 hrs, Volume= 0.33 af, Atten= 65%, Lag= 20.5 min
Discarded = 0.2 cfs @ 12.48 hrs, Volume= 0.21 af
Primary = 1.2 cfs @ 12.48 hrs, Volume= 0.12 af
Routed to Reach P-5 : Proposed Front Culvert

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 257.09' @ 12.48 hrs Surf.Area= 5,686 sf Storage= 5,492 cf

Plug-Flow detention time= 153.7 min calculated for 0.33 af (100% of inflow)
Center-of-Mass det. time= 153.7 min (962.3 - 808.6)

Volume	Invert	Avail.Storage	Storage Description
#1	256.00'	12,118 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

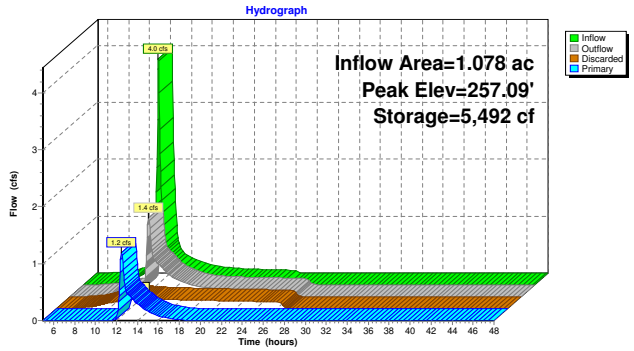
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
256.00	4,600	0	0	4,600
257.00	5,400	4,995	4,995	5,438
258.00	9,000	7,124	12,118	9,051

Device	Routing	Invert	Outlet Devices
#1	Discarded	256.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 254.00'
#2	Primary	257.00'	**10.0' long x 5.0' 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 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Primary	256.50'	**6.0" Round Culvert** L= 18.0' Ke= 0.500 Inlet / Outlet Invert= 256.50' / 255.50' S= 0.0556 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf

Discarded OutFlow Max=0.2 cfs @ 12.48 hrs HW=257.09' (Free Discharge)
└**1=Exfiltration** (Controls 0.2 cfs)

Primary OutFlow Max=1.2 cfs @ 12.48 hrs HW=257.09' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 0.6 cfs @ 0.70 fps)
└**3=Culvert** (Inlet Controls 0.6 cfs @ 2.80 fps)

Pond P-4: Stormwater Basin



Summary for Pond P-6: Existing Culvert (Proposed Condition)

Inflow Area = 2.563 ac, 27.32% Impervious, Inflow Depth = 2.28" for 10 Year event
Inflow = 4.5 cfs @ 12.17 hrs, Volume= 0.49 af
Outflow = 4.5 cfs @ 12.17 hrs, Volume= 0.49 af, Atten= 1%, Lag= 0.3 min
Primary = 4.5 cfs @ 12.17 hrs, Volume= 0.49 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 252.54' @ 12.17 hrs Surf.Area= 105 sf Storage= 58 cf

Plug-Flow detention time= 0.3 min calculated for 0.49 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (825.9 - 825.6)

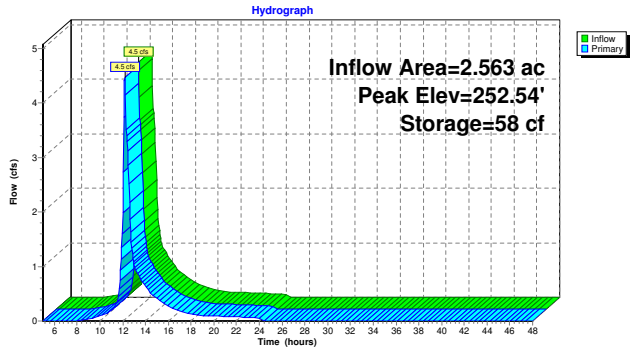
Volume	Invert	Avail.Storage	Storage Description
#1	251.25'	10,370 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

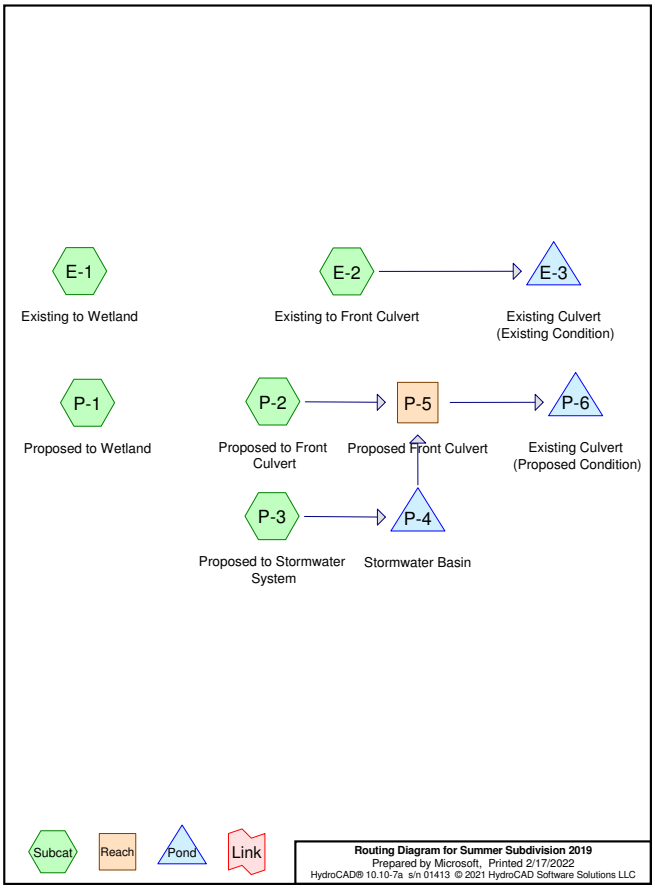
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
251.25	10	0	0
252.00	40	19	19
253.00	160	100	119
253.50	1,505	416	535
254.00	3,070	1,144	1,679
254.50	4,980	2,013	3,691
255.00	6,580	2,890	6,581
255.50	8,575	3,789	10,370

Device	Routing	Invert	Outlet Devices
#1	Primary	251.25'	**15.0" Round Culvert** L= 40.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 251.25' / 251.00' S= 0.0063 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Primary	255.20'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=4.4 cfs @ 12.17 hrs HW=252.52' (Free Discharge)
└**1=Culvert** (Barrel Controls 4.4 cfs @ 4.36 fps)
└**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Pond P-6: Existing Culvert (Proposed Condition)





Summary for Subcatchment E-1: Existing to Wetland

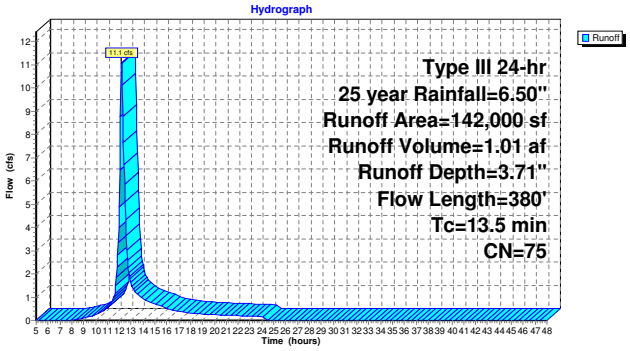
Runoff = 11.1 cfs @ 12.19 hrs, Volume= 1.01 af, Depth= 3.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.50"

	Area (sf)	CN	Description
	41,000	70	Woods, Good, HSG C
	88,880	74	>75% Grass cover, Good, HSG C
	4,200	98	Paved parking, HSG C
*	7,920	96	Gravel
	142,000	75	Weighted Average
	137,800		97.04% Pervious Area
	4,200		2.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0150	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
2.5	150	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.1	180	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.5	380	Total			

Subcatchment E-1: Existing to Wetland



Summary for Subcatchment E-2: Existing to Front Culvert

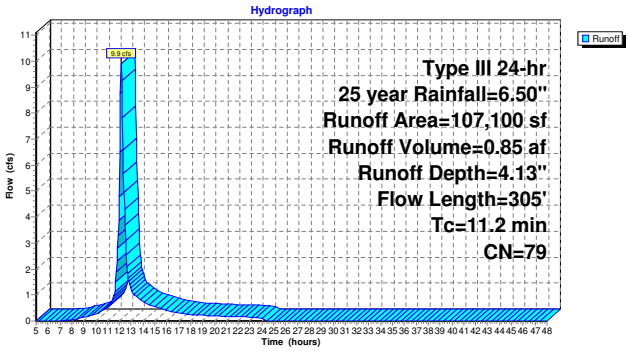
Runoff = 9.9 cfs @ 12.16 hrs, Volume= 0.85 af, Depth= 4.13"
Routed to Pond E-3 : Existing Culvert (Existing Condition)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.50"

Area (sf)	CN	Description
3,500	70	Woods, Good, HSG C
10,500	77	Woods, Good, HSG D
50,380	74	>75% Grass cover, Good, HSG C
15,720	98	Paved parking, HSG C
27,000	80	1/2 acre lots, 25% imp, HSG C
107,100	79	Weighted Average
84,630		79.02% Pervious Area
22,470		20.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.0400	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
1.9	100	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.3	155	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.2	305	Total			

Subcatchment E-2: Existing to Front Culvert



Summary for Subcatchment P-1: Proposed to Wetland

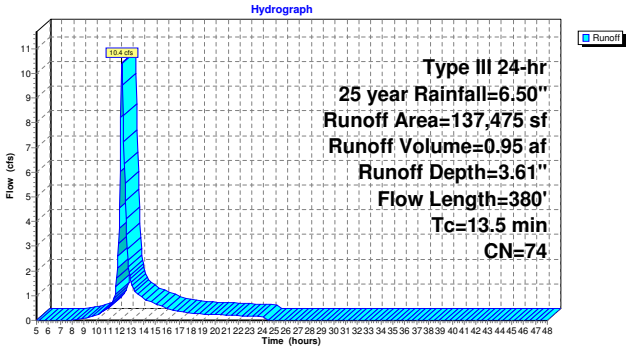
Runoff = 10.4 cfs @ 12.19 hrs, Volume= 0.95 af, Depth= 3.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.50"

Area (sf)	CN	Description
36,000	70	Woods, Good, HSG C
93,140	74	>75% Grass cover, Good, HSG C
3,845	98	Paved parking, HSG C
4,490	98	Roofs, HSG C
137,475	74	Weighted Average
129,140		93.94% Pervious Area
8,335		6.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0150	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
2.5	150	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.1	180	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.5	380	Total			

Subcatchment P-1: Proposed to Wetland



Summary for Subcatchment P-2: Proposed to Front Culvert

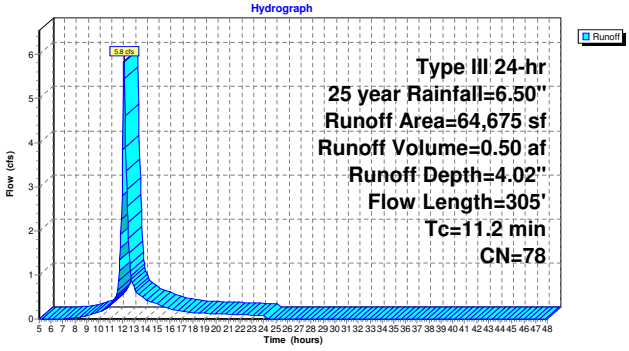
Runoff = 5.8 cfs @ 12.16 hrs, Volume= 0.50 af, Depth= 4.02"
Routed to Reach P-5 : Proposed Front Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.50"

Area (sf)	CN	Description
3,710	70	Woods, Good, HSG C
5,300	77	Woods, Good, HSG D
23,620	74	>75% Grass cover, Good, HSG C
2,030	80	>75% Grass cover, Good, HSG D
3,015	98	Paved parking, HSG C
27,000	80	1/2 acre lots, 25% imp, HSG C
64,675	78	Weighted Average
54,910		84.90% Pervious Area
9,765		15.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.0400	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
1.9	100	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.3	155	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.2	305	Total			

Subcatchment P-2: Proposed to Front Culvert



Summary for Subcatchment P-3: Proposed to Stormwater System

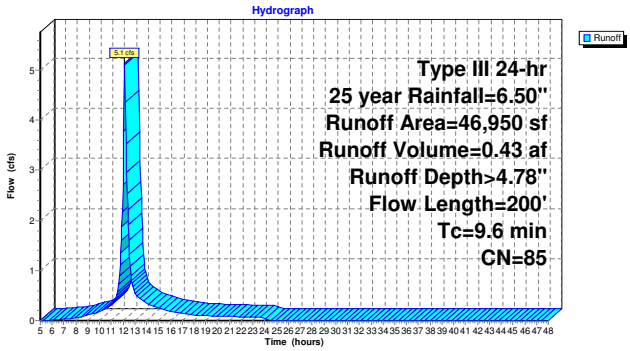
Runoff = 5.1 cfs @ 12.13 hrs, Volume= 0.43 af, Depth> 4.78"
Routed to Pond P-4 : Stormwater Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.50"

	Area (sf)	CN	Description
	13,280	98	Paved parking, HSG C
	2,855	98	Roofs, HSG C
	24,745	74	>75% Grass cover, Good, HSG C
	1,470	80	>75% Grass cover, Good, HSG D
*	4,600	98	Basin Bottom Area
	46,950	85	Weighted Average
	26,215		55.84% Pervious Area
	20,735		44.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
0.8	100	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	50	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.6	200	Total			

Subcatchment P-3: Proposed to Stormwater System



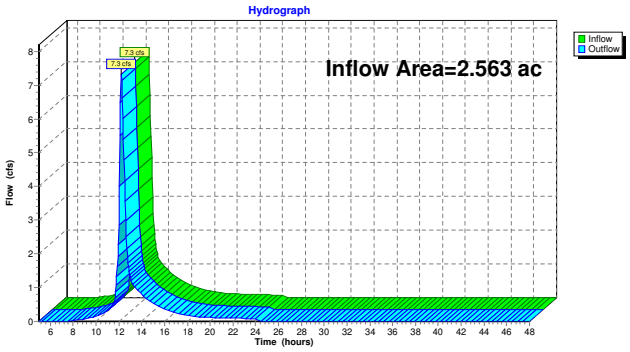
Summary for Reach P-5: Proposed Front Culvert

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.563 ac, 27.32% Impervious, Inflow Depth = 3.26" for 25 year event
Inflow = 7.3 cfs @ 12.22 hrs, Volume= 0.70 af
Outflow = 7.3 cfs @ 12.22 hrs, Volume= 0.70 af, Atten= 0%, Lag= 0.0 min
Routed to Pond P-6 : Existing Culvert (Proposed Condition)

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Reach P-5: Proposed Front Culvert



Summary for Pond E-3: Existing Culvert (Existing Condition)

Inflow Area = 2.459 ac, 20.98% Impervious, Inflow Depth = 4.13" for 25 year event
Inflow = 9.9 cfs @ 12.16 hrs, Volume= 0.85 af
Outflow = 8.2 cfs @ 12.24 hrs, Volume= 0.85 af, Atten= 17%, Lag= 4.8 min
Primary = 8.2 cfs @ 12.24 hrs, Volume= 0.85 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 253.74' @ 12.24 hrs Surf.Area= 2,573 sf Storage= 1,020 cf

Plug-Flow detention time= 1.1 min calculated for 0.85 af (100% of inflow)
Center-of-Mass det. time= 0.6 min (818.8 - 818.2)

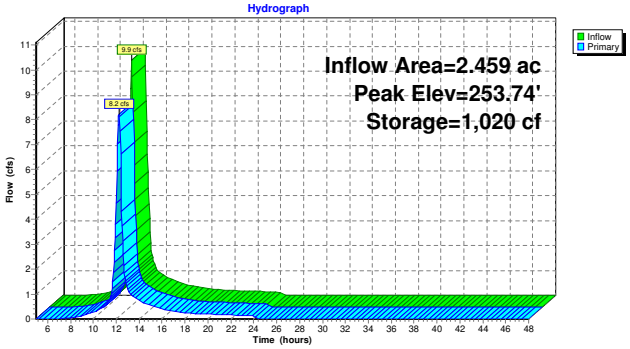
Volume	Invert	Avail.Storage	Storage Description
#1	251.25'	22,611 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
251.25	10	0	0
252.00	40	19	19
253.00	160	100	119
253.50	1,505	416	535
254.00	3,750	1,314	1,849
254.50	7,040	2,698	4,546
255.00	9,920	4,240	8,786
256.00	17,730	13,825	22,611

Device	Routing	Invert	Outlet Devices
#1	Primary	251.25'	**15.0" Round Culvert** L= 40.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 251.25' / 251.00' S= 0.0063 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Primary	255.20'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=8.2 cfs @ 12.24 hrs HW=253.73' (Free Discharge)
1=Culvert (Barrel Controls 8.2 cfs @ 6.68 fps)
2=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

Pond E-3: Existing Culvert (Existing Condition)



Summary for Pond P-4: Stormwater Basin

Inflow Area = 1.078 ac, 44.16% Impervious, Inflow Depth > 4.78" for 25 year event
Inflow = 5.1 cfs @ 12.13 hrs, Volume= 0.43 af
Outflow = 2.9 cfs @ 12.31 hrs, Volume= 0.43 af, Atten= 43%, Lag= 10.7 min
Discarded = 0.2 cfs @ 12.31 hrs, Volume= 0.23 af
Primary = 2.7 cfs @ 12.31 hrs, Volume= 0.20 af
Routed to Reach P-5 : Proposed Front Culvert

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 257.20' @ 12.31 hrs Surf.Area= 6,046 sf Storage= 6,136 cf

Plug-Flow detention time= 135.3 min calculated for 0.43 af (100% of inflow)
Center-of-Mass det. time= 135.1 min (936.2 - 801.1)

Volume	Invert	Avail.Storage	Storage Description
#1	256.00'	12,118 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

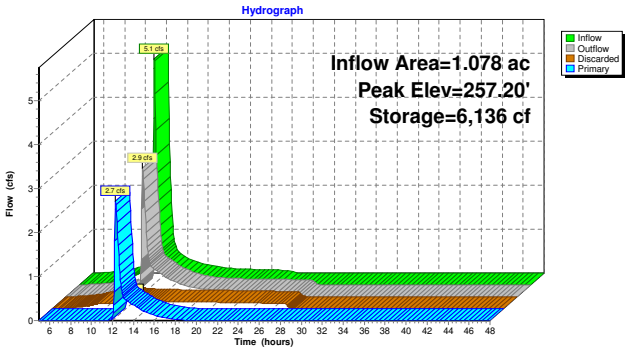
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
256.00	4,600	0	0	4,600
257.00	5,400	4,995	4,995	5,438
258.00	9,000	7,124	12,118	9,051

Device	Routing	Invert	Outlet Devices
#1	Discarded	256.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 254.00'
#2	Primary	257.00'	**10.0' long x 5.0' 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 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Primary	256.50'	**6.0" Round Culvert** L= 18.0' Ke= 0.500 Inlet / Outlet Invert= 256.50' / 255.50' S= 0.0556 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf

Discarded OutFlow Max=0.2 cfs @ 12.31 hrs HW=257.20' (Free Discharge)
└**1=Exfiltration** (Controls 0.2 cfs)

Primary OutFlow Max=2.7 cfs @ 12.31 hrs HW=257.20' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 2.1 cfs @ 1.04 fps)
└**3=Culvert** (Inlet Controls 0.6 cfs @ 3.22 fps)

Pond P-4: Stormwater Basin



Summary for Pond P-6: Existing Culvert (Proposed Condition)

Inflow Area = 2.563 ac, 27.32% Impervious, Inflow Depth = 3.26" for 25 year event
Inflow = 7.3 cfs @ 12.22 hrs, Volume= 0.70 af
Outflow = 6.9 cfs @ 12.27 hrs, Volume= 0.70 af, Atten= 5%, Lag= 3.1 min
Primary = 6.9 cfs @ 12.27 hrs, Volume= 0.70 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 253.31' @ 12.27 hrs Surf.Area= 997 sf Storage= 299 cf

Plug-Flow detention time= 0.4 min calculated for 0.70 af (100% of inflow)
Center-of-Mass det. time= 0.3 min (815.9 - 815.6)

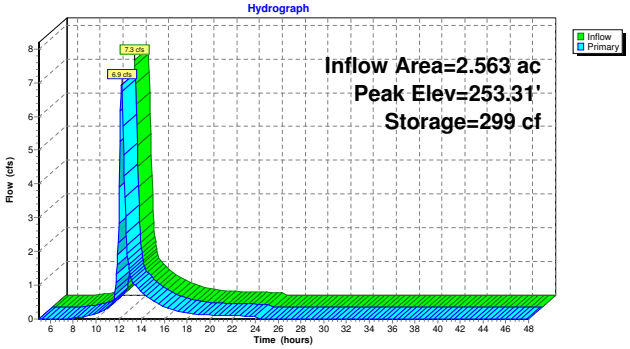
Volume	Invert	Avail.Storage	Storage Description
#1	251.25'	10,370 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

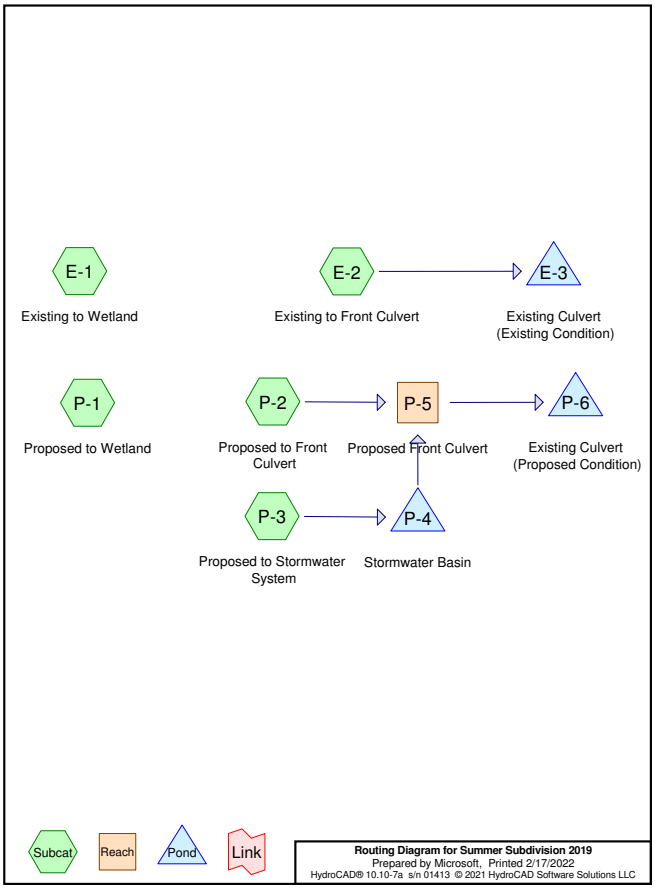
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
251.25	10	0	0
252.00	40	19	19
253.00	160	100	119
253.50	1,505	416	535
254.00	3,070	1,144	1,679
254.50	4,980	2,013	3,691
255.00	6,580	2,890	6,581
255.50	8,575	3,789	10,370

Device	Routing	Invert	Outlet Devices
#1	Primary	251.25'	**15.0" Round Culvert** L= 40.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 251.25' / 251.00' S= 0.0063 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Primary	255.20'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=6.9 cfs @ 12.27 hrs HW=253.30' (Free Discharge)
└**1=Culvert** (Barrel Controls 6.9 cfs @ 5.63 fps)
└**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Pond P-6: Existing Culvert (Proposed Condition)





Summary for Subcatchment E-1: Existing to Wetland

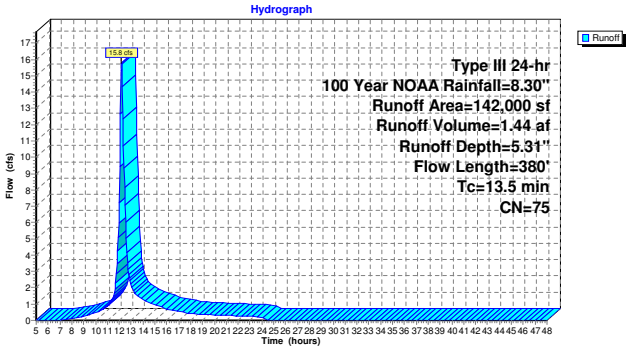
Runoff = 15.8 cfs @ 12.19 hrs, Volume= 1.44 af, Depth= 5.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year NOAA Rainfall=8.30"

	Area (sf)	CN	Description
	41,000	70	Woods, Good, HSG C
	88,880	74	>75% Grass cover, Good, HSG C
	4,200	98	Paved parking, HSG C
*	7,920	96	Gravel
	142,000	75	Weighted Average
	137,800		97.04% Pervious Area
	4,200		2.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0150	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
2.5	150	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.1	180	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.5	380	Total			

Subcatchment E-1: Existing to Wetland



Summary for Subcatchment E-2: Existing to Front Culvert

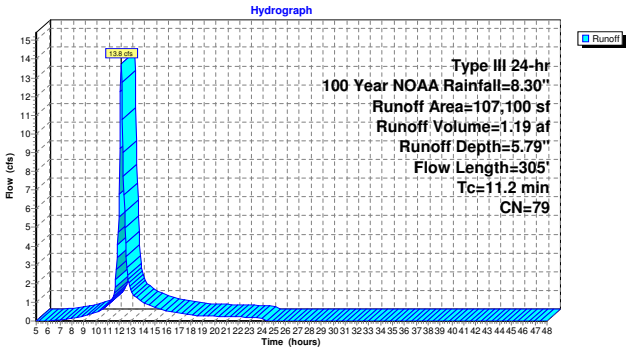
Runoff = 13.8 cfs @ 12.15 hrs, Volume= 1.19 af, Depth= 5.79"
Routed to Pond E-3 : Existing Culvert (Existing Condition)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year NOAA Rainfall=8.30"

Area (sf)	CN	Description
3,500	70	Woods, Good, HSG C
10,500	77	Woods, Good, HSG D
50,380	74	>75% Grass cover, Good, HSG C
15,720	98	Paved parking, HSG C
27,000	80	1/2 acre lots, 25% imp, HSG C
107,100	79	Weighted Average
84,630		79.02% Pervious Area
22,470		20.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.0400	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
1.9	100	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.3	155	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.2	305	Total			

Subcatchment E-2: Existing to Front Culvert



Summary for Subcatchment P-1: Proposed to Wetland

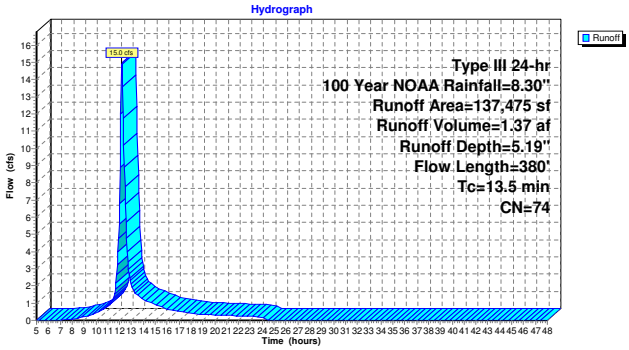
Runoff = 15.0 cfs @ 12.19 hrs, Volume= 1.37 af, Depth= 5.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year NOAA Rainfall=8.30"

Area (sf)	CN	Description
36,000	70	Woods, Good, HSG C
93,140	74	>75% Grass cover, Good, HSG C
3,845	98	Paved parking, HSG C
4,490	98	Roofs, HSG C
137,475	74	Weighted Average
129,140		93.94% Pervious Area
8,335		6.06% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	50	0.0150	0.09		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
2.5	150	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.1	180	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.5	380	Total			

Subcatchment P-1: Proposed to Wetland



Summary for Subcatchment P-2: Proposed to Front Culvert

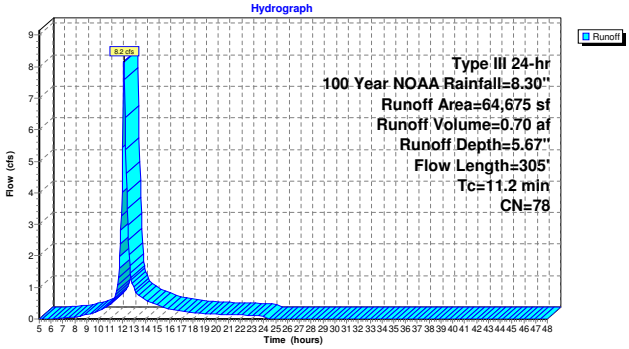
Runoff = 8.2 cfs @ 12.16 hrs, Volume= 0.70 af, Depth= 5.67"
Routed to Reach P-5 : Proposed Front Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year NOAA Rainfall=8.30"

Area (sf)	CN	Description
3,710	70	Woods, Good, HSG C
5,300	77	Woods, Good, HSG D
23,620	74	>75% Grass cover, Good, HSG C
2,030	80	>75% Grass cover, Good, HSG D
3,015	98	Paved parking, HSG C
27,000	80	1/2 acre lots, 25% imp, HSG C
64,675	78	Weighted Average
54,910		84.90% Pervious Area
9,765		15.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	50	0.0400	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
1.9	100	0.0150	0.86		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.3	155	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
11.2	305	Total			

Subcatchment P-2: Proposed to Front Culvert



Summary for Subcatchment P-3: Proposed to Stormwater System

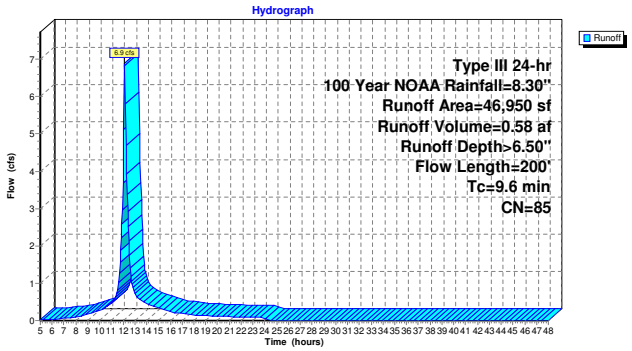
Runoff = 6.9 cfs @ 12.13 hrs, Volume= 0.58 af, Depth> 6.50"
Routed to Pond P-4 : Stormwater Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year NOAA Rainfall=8.30"

	Area (sf)	CN	Description
	13,280	98	Paved parking, HSG C
	2,855	98	Roofs, HSG C
	24,745	74	>75% Grass cover, Good, HSG C
	1,470	80	>75% Grass cover, Good, HSG D
*	4,600	98	Basin Bottom Area
	46,950	85	Weighted Average
	26,215		55.84% Pervious Area
	20,735		44.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
0.8	100	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.8	50	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.6	200	Total			

Subcatchment P-3: Proposed to Stormwater System



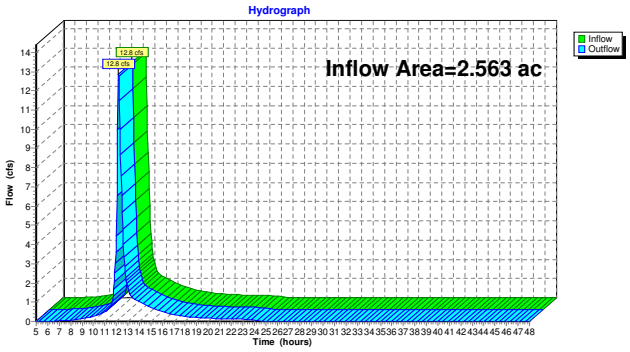
Summary for Reach P-5: Proposed Front Culvert

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.563 ac, 27.32% Impervious, Inflow Depth = 4.81" for 100 Year NOAA event
Inflow = 12.8 cfs @ 12.18 hrs, Volume= 1.03 af
Outflow = 12.8 cfs @ 12.18 hrs, Volume= 1.03 af, Atten= 0%, Lag= 0.0 min
Routed to Pond P-6 : Existing Culvert (Proposed Condition)

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Reach P-5: Proposed Front Culvert



Summary for Pond E-3: Existing Culvert (Existing Condition)

Inflow Area = 2.459 ac, 20.98% Impervious, Inflow Depth = 5.79" for 100 Year NOAA event
Inflow = 13.8 cfs @ 12.15 hrs, Volume= 1.19 af
Outflow = 9.5 cfs @ 12.29 hrs, Volume= 1.19 af, Atten= 31%, Lag= 7.9 min
Primary = 9.5 cfs @ 12.29 hrs, Volume= 1.19 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 254.25' @ 12.29 hrs Surf.Area= 5,397 sf Storage= 2,993 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 1.2 min (809.8 - 808.6)

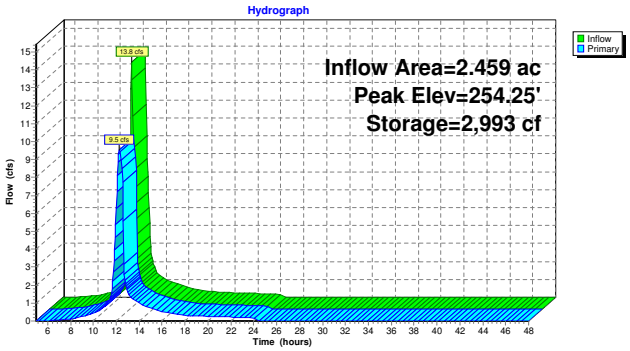
Volume	Invert	Avail.Storage	Storage Description
#1	251.25'	22,611 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
251.25	10	0	0
252.00	40	19	19
253.00	160	100	119
253.50	1,505	416	535
254.00	3,750	1,314	1,849
254.50	7,040	2,698	4,546
255.00	9,920	4,240	8,786
256.00	17,730	13,825	22,611

Device	Routing	Invert	Outlet Devices
#1	Primary	251.25'	**15.0" Round Culvert** L= 40.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 251.25' / 251.00' S= 0.0063 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Primary	255.20'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Primary OutFlow Max=9.5 cfs @ 12.29 hrs HW=254.25' (Free Discharge)
1=Culvert (Barrel Controls 9.5 cfs @ 7.76 fps)
2=Broad-Crested Rectangular Weir (Controls 0.0 cfs)

Pond E-3: Existing Culvert (Existing Condition)



Summary for Pond P-4: Stormwater Basin

[82] Warning: Early inflow requires earlier time span

Inflow Area = 1.078 ac, 44.16% Impervious, Inflow Depth > 6.50" for 100 Year NOAA event
Inflow = 6.9 cfs @ 12.13 hrs, Volume= 0.58 af
Outflow = 5.5 cfs @ 12.22 hrs, Volume= 0.58 af, Atten= 20%, Lag= 5.3 min
Discarded = 0.2 cfs @ 12.22 hrs, Volume= 0.26 af
Primary = 5.3 cfs @ 12.22 hrs, Volume= 0.33 af
Routed to Reach P-5 : Proposed Front Culvert

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 257.33' @ 12.22 hrs Surf.Area= 6,473 sf Storage= 6,927 cf

Plug-Flow detention time= 117.4 min calculated for 0.58 af (100% of inflow)
Center-of-Mass det. time= 117.2 min (910.2 - 793.0)

Volume	Invert	Avail.Storage	Storage Description
#1	256.00'	12,118 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

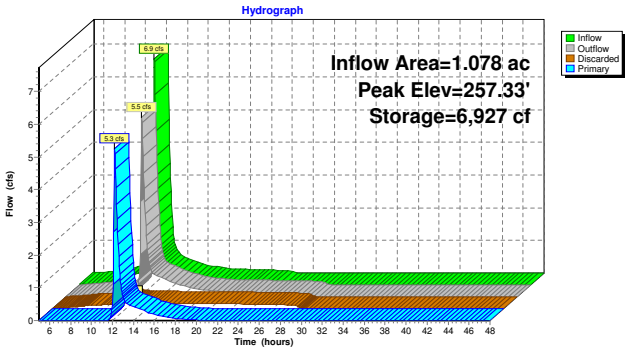
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
256.00	4,600	0	0	4,600
257.00	5,400	4,995	4,995	5,438
258.00	9,000	7,124	12,118	9,051

Device	Routing	Invert	Outlet Devices
#1	Discarded	256.00'	**1.020 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 254.00'
#2	Primary	257.00'	**10.0' long x 5.0' 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 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Primary	256.50'	**6.0" Round Culvert** L= 18.0' Ke= 0.500 Inlet / Outlet Invert= 256.50' / 255.50' S= 0.0556 '/' Cc= 0.900 n= 0.012, Flow Area= 0.20 sf

Discarded OutFlow Max=0.2 cfs @ 12.22 hrs HW=257.32' (Free Discharge)
└**1=Exfiltration** (Controls 0.2 cfs)

Primary OutFlow Max=5.1 cfs @ 12.22 hrs HW=257.32' (Free Discharge)
├**2=Broad-Crested Rectangular Weir** (Weir Controls 4.4 cfs @ 1.38 fps)
└**3=Culvert** (Inlet Controls 0.7 cfs @ 3.64 fps)

Pond P-4: Stormwater Basin



Summary for Pond P-6: Existing Culvert (Proposed Condition)

Inflow Area = 2.563 ac, 27.32% Impervious, Inflow Depth = 4.81" for 100 Year NOAA event
Inflow = 12.8 cfs @ 12.18 hrs, Volume= 1.03 af
Outflow = 9.5 cfs @ 12.32 hrs, Volume= 1.02 af, Atten= 26%, Lag= 8.2 min
Primary = 9.5 cfs @ 12.32 hrs, Volume= 1.02 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 254.24' @ 12.32 hrs Surf.Area= 3,993 sf Storage= 2,532 cf

Plug-Flow detention time= 2.8 min calculated for 1.02 af (100% of inflow)
Center-of-Mass det. time= 1.4 min (807.8 - 806.4)

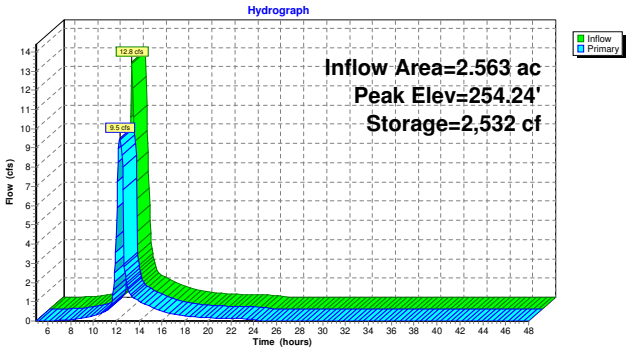
Volume	Invert	Avail.Storage	Storage Description
#1	251.25'	10,370 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
251.25	10	0	0
252.00	40	19	19
253.00	160	100	119
253.50	1,505	416	535
254.00	3,070	1,144	1,679
254.50	4,980	2,013	3,691
255.00	6,580	2,890	6,581
255.50	8,575	3,789	10,370

Device	Routing	Invert	Outlet Devices
#1	Primary	251.25'	**15.0" Round Culvert** L= 40.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 251.25' / 251.00' S= 0.0063 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Primary	255.20'	**10.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

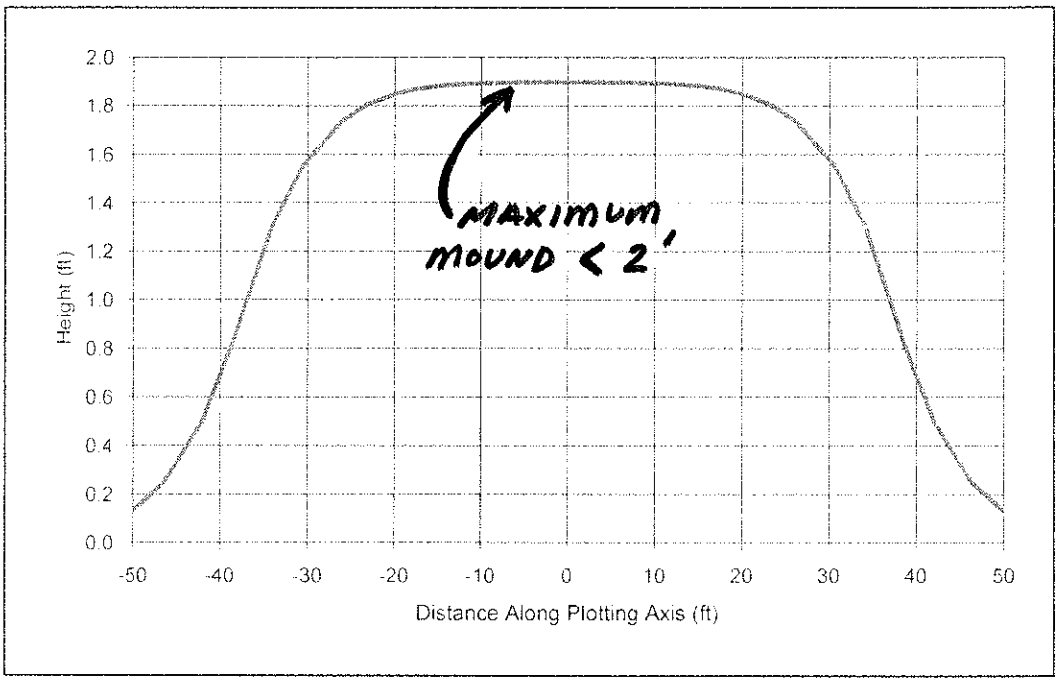
Primary OutFlow Max=9.5 cfs @ 12.32 hrs HW=254.23' (Free Discharge)
├**1=Culvert** (Barrel Controls 9.5 cfs @ 7.74 fps)
└**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Pond P-6: Existing Culvert (Proposed Condition)



Groundwater Mounding Analysis

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



COMPANY: CSEI

PROJECT: Boundary Lane

ANALYST: vc

DATE: 8/23/2021 TIME: 8:52:12 AM

INPUT PARAMETERS

Application rate: 0.533 c.ft/day/sq. ft
Duration of application: 1 days
Fillable porosity: 0.28
Hydraulic conductivity: 2.04 ft/day
Initial saturated thickness: 10 ft
Length of application area: 75 ft
Width of application area: 60 ft
No constant head boundary used
Plotting axis from Y-Axis: 0 degrees
Edge of recharge area:
positive X: 0 ft
positive Y: 37.5 ft
Total volume applied: 2398.5 c.ft

MODEL RESULTS

X (ft)	Y (ft)	Plot Axis (ft)	Mound Height (ft)
0	-50	-50	0.13
0	-42	-42	0.5
0	-34.1	-34	1.31
0	-26.1	-26	1.74
0	-19.9	-20	1.85
0	-15	-15	1.88
0	-11.1	-11	1.89
0	-7.7	-8	1.9
0	-4.8	-5	1.9
0	-2.9	-3	1.9
0	-1.6	-2	1.9
0	0	0	1.9
0	1.6	2	1.9
0	2.9	3	1.9
0	4.8	5	1.9
0	7.7	8	1.9
0	11.1	11	1.89
0	15	15	1.88
0	19.9	20	1.85
0	26.1	26	1.74
0	34.1	34	1.31
0	42	42	0.5
0	50	50	0.13

Hydrograph for Pond P-4: Stormwater Basin

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
5.00	0.0	1	256.00	0.0	0.0	0.0
6.00	0.0	22	256.00	0.0	0.0	0.0
7.00	0.1	43	256.01	0.1	0.1	0.0
8.00	0.1	73	256.02	0.1	0.1	0.0
9.00	0.2	166	256.04	0.1	0.1	0.0
10.00	0.3	548	256.12	0.1	0.1	0.0
11.00	0.5	1,389	256.29	0.1	0.1	0.0
12.00	**3.7**	**4,830**	**256.97**	**0.6**	**0.2**	**0.4**
13.00	**0.7**	**5,241**	**257.05**	**0.9**	**0.2**	**0.7**
14.00	0.5	4,746	256.95	0.6	0.2	0.4
15.00	0.3	4,200	256.85	0.5	0.2	0.3
16.00	0.2	3,761	256.77	0.4	0.2	0.2
17.00	0.2	3,404	256.70	0.3	0.2	0.1
18.00	0.1	3,128	256.64	0.2	0.2	0.1
19.00	0.1	2,896	256.60	0.2	0.2	0.0
20.00	0.1	2,712	256.56	0.2	0.2	0.0
21.00	0.1	2,543	256.53	0.2	0.1	0.0
22.00	0.1	2,371	256.49	0.1	0.1	0.0
23.00	0.1	2,177	256.46	0.1	0.1	0.0
24.00	0.1	1,959	256.41	0.1	0.1	0.0
25.00	0.0	1,509	256.32	0.1	0.1	0.0
26.00	0.0	1,046	256.22	0.1	0.1	0.0
27.00	0.0	609	256.13	0.1	0.1	0.0
28.00	0.0	195	256.04	0.1	0.1	0.0
29.00	0.0	4	256.00	0.0	0.0	0.0
30.00	0.0	0	256.00	0.0	0.0	0.0
31.00	0.0	0	256.00	0.0	0.0	0.0
32.00	0.0	0	256.00	0.0	0.0	0.0
33.00	0.0	0	256.00	0.0	0.0	0.0
34.00	0.0	0	256.00	0.0	0.0	0.0
35.00	0.0	0	256.00	0.0	0.0	0.0
36.00	0.0	0	256.00	0.0	0.0	0.0
37.00	0.0	0	256.00	0.0	0.0	0.0
38.00	0.0	0	256.00	0.0	0.0	0.0
39.00	0.0	0	256.00	0.0	0.0	0.0
40.00	0.0	0	256.00	0.0	0.0	0.0
41.00	0.0	0	256.00	0.0	0.0	0.0
42.00	0.0	0	256.00	0.0	0.0	0.0
43.00	0.0	0	256.00	0.0	0.0	0.0
44.00	0.0	0	256.00	0.0	0.0	0.0
45.00	0.0	0	256.00	0.0	0.0	0.0
46.00	0.0	0	256.00	0.0	0.0	0.0
47.00	0.0	0	256.00	0.0	0.0	0.0
48.00	0.0	0	256.00	0.0	0.0	0.0

De-water @ 29 hrs. ✓ok

Storage Volume = 2,390 ft

Stage-Area-Storage for Pond P-4: Stormwater Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
256.00	4,600	0	257.04	5,435	5,211
256.02	4,615	92	257.06	5,452	5,320
256.04	4,631	185	257.08	5,469	5,429
256.06	4,646	277	257.10	5,487	5,539
256.08	4,662	370	257.12	5,504	5,649
256.10	4,677	464	257.14	5,522	5,759
256.12	4,693	558	257.16	5,539	5,870
256.14	4,708	652	257.18	5,557	5,981
256.16	4,724	746	257.20	5,574	6,092
256.18	4,739	841	257.22	5,592	6,204
256.20	4,755	935	257.24	5,610	6,316
256.22	4,770	1,031	257.26	5,627	6,428
256.24	4,786	1,126	257.28	5,645	6,541
256.26	4,802	1,222	257.30	5,663	6,654
256.28	4,818	1,318	257.32	5,680	6,767
256.30	4,833	1,415	257.34	5,698	6,881
256.32	4,849	1,512	257.36	5,716	6,995
256.34	4,865	1,609	257.38	5,734	7,110
256.36	4,881	1,706	257.40	5,752	7,225
256.38	4,896	1,804	257.42	5,770	7,340
256.40	4,912	1,902	257.44	5,787	7,455
256.42	4,928	2,001	257.46	5,805	7,571
256.44	4,944	2,099	257.48	5,823	7,688
256.46	4,960	2,198	257.50	5,841	7,804
256.48	4,976	2,298	257.52	5,859	7,921
256.50	4,992	2,397	257.54	5,877	8,039
256.52	5,008	2,497	257.56	5,895	8,156
256.54	5,024	2,598	257.58	5,914	8,274
256.56	5,040	2,698	257.60	5,932	8,393
256.58	5,056	2,799	257.62	5,950	8,512
256.60	5,072	2,901	257.64	5,968	8,631
256.62	5,088	3,002	257.66	5,986	8,750
256.64	5,105	3,104	257.68	6,004	8,870
256.66	5,121	3,206	257.70	6,023	8,991
256.68	5,137	3,309	257.72	6,041	9,111
256.70	5,153	3,412	257.74	6,059	9,232
256.72	5,170	3,515	257.76	6,078	9,354
256.74	5,186	3,619	257.78	6,096	9,475
256.76	5,202	3,722	257.80	6,114	9,597
256.78	5,218	3,827	257.82	6,133	9,720
256.80	5,235	3,931	257.84	6,151	9,843
256.82	5,251	4,036	257.86	6,170	9,966
256.84	5,268	4,141	257.88	6,188	10,090
256.86	5,284	4,247	257.90	6,207	10,214
256.88	5,301	4,353	257.92	6,225	10,338
256.90	5,317	4,459	257.94	6,244	10,463
256.92	5,334	4,565	257.96	6,263	10,588
256.94	5,350	4,672	257.98	6,281	10,713
256.96	5,367	4,779	258.00	**6,300**	**10,839**
256.98	5,383	4,887			
257.00	5,400	4,995			
257.02	5,417	5,103			

Soil Mapping

Map Scale: 1:1,490 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
70A	Ridgebury fine sandy loam, 0 to 3 percent slopes	D	0.9	10.0%
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	D	1.5	17.0%
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	C/D	6.6	72.9%
Totals for Area of Interest			**9.1**	**100.0%**

Stormwater Operation & Maintenance Plan (O&M)

Stormwater Operations and Management Plan and Long-term Pollution Prevention Program

Boundary Lane
off Summer Street, Medway, MA

Stormwater Management System Owner: Homeowners Association
& Responsible Party

This Operation and Maintenance Plan has been prepared in accordance with the MA Department of Environmental Protection stormwater standards and recommendations outlined in the stormwater handbook. This plan outlines the minimum efforts necessary to ensure that the stormwater collection and treatment system and sedimentation and erosion control system for this site operates in accordance with Massachusetts Department of Environmental Protection (DEP) stormwater management policy. Efforts in addition to the minimum listed herein may be required to ensure adequate stormwater management. This plan includes general site restrictions, routing/non-routine operation and maintenance; reporting and record keeping; and an estimated budget.

General Conditions

The following conditions are imposed as part of this Plan.

- Illicit discharges into stormwater management system are perpetually prohibited.
- Apply fertilizers and pesticides sparingly to prevent wash-off. The use of fertilizers should be limited to slow-release, organic fertilizers within 100 feet of any wetland.
- Store lawn and deicing chemicals and/or salt under cover. Fertilizers, herbicides, pesticides shall not be stored within 100 feet of any wetland.
- Washing of vehicles should be minimized. Areas for washing shall not be allowed on impervious surfaces draining toward the stormwater management system. Washing shall be on pervious vegetated areas.
- No fertilization or pesticide application in or near any wetland resource area
- Pick up pet waste and dispose of properly in the trash.
- Store, use and dispose of household hazardous wastes properly
- Limit exterior washing of vehicles to locations that drain to pervious surfaces and away from storm drains
- Maintain vehicles and clean up fluid spills/drips from pavement areas
- Use alternative deicers such as calcium chloride and magnesium chloride in lieu of sodium based deicers

If requested, all inspection reports shall be submitted to the Conservation Commission and Town Engineering Department annually.

Operation and Maintenance:

All stormwater management facilities should be inspected a minimum of two times per year, with one inspection following a major storm (greater than 1 inch) per year. Upon completion of inspection, the inspector should specify any necessary corrective actions to be taken by ownership of the facility. The items to be inspected and maintained are described in the following sections.

Based on the observed conditions, the Responsible Party shall immediately schedule the appropriate maintenance. Some minor maintenance, such as the removal of blockages, debris and saplings in the basins may be conducted at the time of the inspection. More difficult maintenance activities, requiring special equipment, will have to be scheduled, such as the removal of excessive sediment or the repair of eroded areas. All sediment must be removed at least once per year.

Infiltration Basin

The infiltration basin is located to the north of the roadway near the entrance with Summer Street. The basin should be inspected a minimum of two times per year, with one inspection following a major storm (greater than 1 inch) per year., the inspector shall visually inspect the basin, noting each of the items listed below (Vegetation, Dewatering, Inlets, Outlets and Structural Stability). If any of the items are in need of attention, it shall be noted and the proper remedial action initiated, as described below, as soon as possible.

At a minimum of twice per year, mow the buffer area, side slopes, and basin bottom. Remove trash and debris; remove grass clippings and accumulated organic matter. Infiltration basins shall not maintain any woody vegetation. Maintenance shall include removal of any sediments excessive of 6-inches.

The inspector shall visit the after the rainfall of a major storm has ended to ensure that the facility has drained to the appropriate level. If significant water remains ponded in the system three (3) days after the latest rainfall, sediment removal/blockage removal activities shall be investigated and/or performed.

The embankment and side slopes of the detention basins should exhibit no visible signs of erosion, settlement, slope failure, wildlife damage, or vehicle damage. Damaged side slopes should be repaired using similar fill of adequate permeability. Damaged embankments should be filled and compacted with impermeable soils to prevent seepage. Eroded areas should be reseeded as discussed under “vegetation”. Repeated repairs to side slopes may necessitate the flattening of the slopes to ensure structural stability. Signs of vehicle damage may necessitate the construction of fences around certain areas.

Vegetation should be dense (and aesthetically acceptable on all portions of the device, including the side slopes, basin floor, buffer strips and the embankments. The inspector shall determine the areas where grass should be mowed, and the areas which should be protected against erosion. In addition, recently seeded areas should be inspected for failures. Grasses of the fescue family can be mowed a minimum of twice per year, in July and late September. In addition to grass maintenance, any other vegetation in the basin area or access areas which has reached nuisance levels, (e.g., bushes, trees and weeds) should be trimmed or removed. Per Conservation Commission requirements, fertilizers should not be used within the basin.

Repairs to damaged or deteriorating structures shall be made as soon as possible. Materials that cannot be adequately repaired must be replaced.

Gravel & Sod Filter Strip

A pea gravel diaphragm and vegetated sod strip is located along the right hand shoulder of the roadway upgradient of the infiltration basin. The areas should be inspected at the same time as the infiltration basin. Sod areas shall be maintained as indicated below under “vegetation.” The gravel strip shall be inspected for debris/clogging, displacement of material, or other signs of damage. Debris noted on the surface should be cleaned and any stone displaced shall be replaced to maintain a uniform surface.

Pipe Inlets / Outlets / Headwalls

All inlets and outlet shall be checked for: built up debris or blockages; signs of seepage; separation of joints; cracks, breaks, or deterioration of materials; and the outlet channel itself shall be free from obstruction (e.g., fallen trees), bank scour, or the undermining of riprap.

Eroded areas shall be revegetated as described under “vegetation”. In channels with repeated erosion problems, riprap may have to be added to protect the slope. When slope failure or settlement is apparent, damaged areas shall be filled, compacted and graded. Damaged natural areas along the outlet channel shall be filled, compacted, and reseeded, or lined with geotextile fabric, if necessary. Damaged rip rapped areas shall be replaced and supplemented.

The inspector shall ensure that there are no signs of scour around the inlets. Vegetation and riprap shall be in good condition (e.g., grass shall be dense and healthy looking; riprap shall be free from undermining and/or deterioration). Inlet structures shall be free from cracks, breaks, or deterioration of materials. If scour is evident, the damaged area shall be filled, compacted and reseeded, stabilized with a geotextile fabric, or lined with riprap in that order. If rip rapped areas have been damaged, the riprap shall be replaced or supplemented. The use of concentrated flow dissipation devices, such as level spreaders, may help to eliminate inlet scour problems.

Debris Accumulation

The inspector shall check pavement and pervious surfaces for both sediment and debris accumulations. Debris and sediment shall be removed at the time of the inspection, if feasible. Sediment shall not be allowed to accumulate and restrict flows. Most debris can be removed by hand or with hand tools (e.g. shovel). Some larger objects, such as fallen tree limbs, may have to be cut up before removal by hand is possible.

Vegetation

The initial vegetation inspection shall occur four (4) weeks after final stabilization of the site; vegetation shall be dense on all portions of the project, including the side slopes, buffer strips and the embankments). The inspector shall determine and document: (1) whether fertilizing is required (2) the areas where grass shall be mowed, and (3) the areas which shall be protected against erosion. In addition, recently seeded areas shall be inspected for failures.

Eroded areas shall be filled and compacted, if necessary, and reseeded as soon as possible. If an area erodes twice, then a geotextile fabric is to be installed to stabilize the area to allow vegetation to be established. These maintenance activities shall take place during the planting season. Areas affected by lack of rainfall shall be watered. If a recently established vegetated area is determined to be inadequate for erosion control it shall be refertilized with microbial release, not sulfur encapsulated, fertilizer, (using half of the rate originally applied). If the stand is more than 60% damaged, it shall be reestablished, following the original preparation and seeding instructions. Areas of repeated erosion/scour problems shall be lined with riprap only after twice attempting to stabilize the area with geotextile fabric.

Snow Removal

Snow shall not be plowed toward the wetlands, buffer zones, or stormwater basins. Snow plowing shall be directed to the shoulder of the roadway except along the shoulder abutting the stormwater basin. All drainage flow paths shall be uncovered and functional immediately after snow plowing.

Reporting and Record Keeping

The responsible party will be responsible for maintaining accurate Maintenance and Disposal Logs for all maintenance and inspections. The maintenance and disposal logs shall be kept on site for a minimum of three (3) years and be available for inspection by the Town municipal departments or other auditing authority, including inspections, repairs, replacement and disposal (for disposal, the log shall indicate the type of material and the disposal location). This will be a perpetual requirement of the Owners or their Designated Party.

Inspection Reports shall be submitted annually, by June 1st of each year to the Conservation Commission and City Engineer. The Site Maintenance Log will be completed as described above, and at a minimum will include the following items:

- Date of Inspection;
- Name and signature of Inspector;
- Last rain event;
- BMP's inspected and condition;
- Specific maintenance task;
- Staff or contractor performing maintenance activity;
- Verification of maintenance activity;
- For disposal include type of material and the disposal location; and
- Recommended additional maintenance tasks.

Estimated Budget

The estimated annual budget to perform the routine scheduled maintenance is approximately $1,000.00. This estimate does not include the repair of structures, pipes, embankments; cleaning drain lines; snow plowing; or other non-routine tasks.

Emergency Response Plan / Spill Control Practices

On-site storage of hazardous materials shall be allowed.

In the event of an accident in the parking lot or driveway where a significant amount of gasoline or other petroleum product is released, the following procedure should be followed:

1. Immediately contact the following agencies:

   Medway Fire Department (508) 533-3211
   MassDEP Emergency response (888) 304-1133

2. Provide support to agencies listed above, which may include contacting an outside contractor to provide clean-up or contacting a Licensed Site Professional (LSP) to lead the clean-up.

If the volume of spill has reached the catch basins or water quality structure, these structures should be cleaned by a licensed liquid waste hauler. The outlet to the drainage system should be inspected. If there is evidence of discharge from the drainage system, additional corrective actions must be taken extending to the receiving water or beyond.

The MassDEP fact sheet summarizing the management of spills of oil and hazardous materials has been attached for additional information.

Stormwater Operations and Maintenance BMP Inspection Form

Project: **Boundary Lane** **Date:**

Owner: **By:**

Location: **Off Summer Street**
Medway, MA

Rain Events: **24 hrs** _____
72 hrs _____

Infiltration Basin

Vegetation Condition	Water Depth	Sediment Depth	Outlet Condition	Action Required

Inlet / Outlets

	Inlet Condition	Outlet Condition	Downstream Condition	Action Required
At Road Entrance				
At Stormwater Basin				

Pavement / Vegetation

	Condition	Action Required
Driveway		
Vegetation		

Comments: _____

_____

_____

_____

Signature:_____

Massachusetts Department of ENVIRONMENTAL PROTECTION

f a c t s h e e t

Managing spills of oil and hazardous materials

Information for municipalities

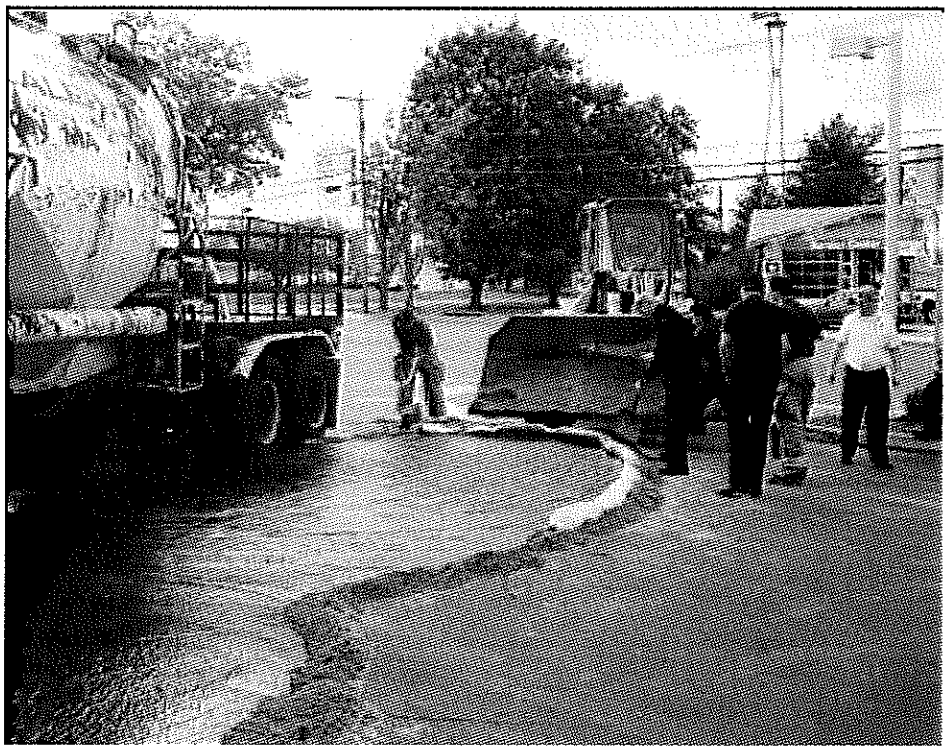
Purpose

Oil or chemical spill responses are local events. Because timely action is critical to the success of any cleanup, the Massachusetts Department of Environmental Protection (MassDEP) has prepared this guide to help municipal officials:

- Take defensive action at all spills to identify receptors and limit/contain the release
- After relevant training, take proactive actions to control and clean up spills of limited scope
- Provide support, in accordance with the Incident Management System, to the Fire Department, which normally is the lead agency in spill response situations
- Determine when MassDEP or a Licensed Site Professional (LSP) needs to lead a cleanup
- Represent the municipality's interests in cleanup decisions

Who must clean up a spill?

The primary responsibility for hiring contractors for on-site cleanup and disposal of waste materials, including all associated costs, rests with the person or party that causes or contributes to the release and/or with the owner of the property where it happens. They are collectively referred to as Potentially Responsible Parties (PRPs).[1]



Methuen Fire Department response to liquid asphalt spill. Photo by Steven Ross, MassDEP.

1 M.G.L. Chapter 21E (the Massachusetts Oil and Hazardous Material Release Prevention Act) and 310 CMR 40.0000 (the Massachusetts Contingency Plan, or MCP) spell out the procedures and requirements for release notification, spill response and the cleanup standards that must be met.

Does the size, type, or location of a spill make a difference?

Yes. Depending on the size and type of spill, MassDEP and other local, state, and federal agencies may have a role in spill response. The PRP must report spills to MassDEP if they exceed specific thresholds. Some releases are exempt from reporting requirements under the MCP. These are spills that involve:

- less than 10 gallons of petroleum and which does not impact a waterbody
- less than one pound of hazardous chemicals and which does not pose an imminent hazard
- fuel from passenger vehicle accidents or
- a vault or building with a watertight floor and with walls that completely contain all released chemicals

Regardless of whether MassDEP notification is required, all spills of oil and hazardous materials must be cleaned up to the extent that no risk to human health is present.

Who responds to oil and hazardous material releases of a limited scope?

The fire department normally responds to spills, initiates containment, and usually directs cleanup of spills of limited scope, i.e. those that do not trigger MassDEP reporting thresholds. When the PRP is unable or unwilling to take responsibility, the fire department may also arrange for cleanup, either by hiring an outside contractor or by using in-house resources. The municipal public works department or other local agencies sometimes provide support. MassDEP generally does not respond to non-reportable releases or those of limited scope, but will be available for technical support. MassDEP will always respond to larger and more complicated spills with potential for posing imminent health, safety, or environmental hazards. MassDEP also attempts to respond to releases where public safety officials request assistance in directing the cleanup.

What specific roles do local officials play?

First responders to a spill are usually equipped to take some action to contain it. Containment is critical to protecting resources at risk. For example, the fire department might take measures to stop the flow or contain the release with absorbents, while public works personnel deliver and spread sand, pick up debris, and provide street drainage maps to aid in the spill investigation. Some municipalities have one or more environmental cleanup firm on retainer to help deal with responses to spills of limited scope.

When PRPs are unable or unwilling to respond, a statewide comprehensive "Hazardous Materials and Medical Waste Collection and Disposal" (FAC36) contract can be used by towns, cities, and state agencies to hire cleanup companies. The contract also provides for emergency response preparedness training for government workers. The contract establishes "Not to Exceed" rates for labor, transportation, and oil and hazardous materials disposal. Information about the Comm-PASS contract may be found at the web site of the Massachusetts Operational Services Division at www.mass.gov/osd.

What training is necessary for cleanup workers?

Because of their roles as first responders and the associated risks of direct exposure to hazardous chemicals, fire department personnel typically undergo training to deal with petroleum and chemical releases, as described in OSHA 1910.120. The International Association of Fire Fighters and the Massachusetts Firefighting Academy offer training programs.

Basic awareness training is highly recommended for staff from other municipal agencies who may be at less risk of direct exposure but still play critical support roles.

How do wastes from spill cleanups need to be handled?

Sand and absorbents contaminated with petroleum can be reused, disposed, or otherwise handled as described in MassDEP policy WSC-94-400, Interim Remediation Waste Management Policy for Petroleum Contaminated Soils, www.mass.gov/dep/images/wsc94400.pdf. But sand and absorbents that are saturated

Massachusetts Department of
Environmental Protection
One Winter Street
Boston, MA 02108-4746

Commonwealth of Massachusetts
Mitt Romney, Governor
Kerry Healey, Lt. Governor

Executive Office of
Environmental Affairs
Stephen R. Pritchard, Secretary

Department of
Environmental Protection
Robert W. Golledge, Jr.,
Commissioner

Produced by the
Bureau of Waste Site Cleanup,
2/01, rev. 4/04, 4/06
Printed on recycled paper

This information is available in alternate format by calling our ADA Coordinator at (617) 56-1057.

with petroleum products or by other hazardous chemicals may need special handling (disposal) by licensed transporters. Depending on the size and severity of a spill, a Licensed Site Professional (LSP) may also need to be hired to oversee the cleanup and sign-off on the disposal. MassDEP requires municipalities to properly manage and store small quantities of hazardous materials from spill cleanups. If storage that is consistent with MassDEP guidelines is not possible, an environmental waste removal firm should be hired to remove the material.

Contacting MassDEP Regional Offices:

Northeast Regional Office – 205B Lowell Street, Wilmington, Massachusetts 01887
http://www.mass.gov/dep/about/region/northeas.htm (978) 694-3200
Southeast Regional Office - 20 Riverside Dr., Lakeville, MA 02347
http://www.mass.gov/dep/about/region/southeas.htm (508) 946-2700
Central Regional Office - 627 Main St., Worcester, MA 01608
http://www.mass.gov/dep/about/region/centralr.htm (508) 792-7650
Western Regional Office - 436 Dwight St., Springfield, MA 01103
http://www.mass.gov/dep/about/region/westernr.htm (413) 784-1100

Visit http://www.mass.gov/dep/about/region/findyour.htm to determine which MassDEP regional office serves your community.

For more information:

- If you have questions, please email MassDEP at BWSC.Information@state.ma.us.
- For copies of MassDEP regulations, policies, and other publications, visit: http://www.mass.gov/dep/bwsc/pubs.htm

Related regulations and guidance documents:

- Interim Remediation Waste Management Policy for Petroleum Contaminated Soil, WSC-94-400, www.mass.gov/dep/images/wsc94400.pdf
- Reuse and Disposal of Contaminated Soil at Massachusetts Landfills, COMM-97-001, http://www.mass.gov/dep/recycle/laws/97-001.htm
- Characteristics of Hazardous Waste, 310 CMR 30.120, http://www.mass.gov/dep/service/regulations/310cmr30.pdf
- A Summary of Requirements for Small Quantity Generators, http://www.mass.gov/dep/recycle/laws/sqgsum.pdf

MassDEP Telephone numbers:

- Hazardous Waste Compliance Assistance Line – (617) 292-5898
- Household Hazardous Products Hotline – (800) 343-3420

Above ground or underground storage tanks:
Call the local fire department or the Massachusetts Department of Fire Services at (978) 567-3100 or 413-587-3181.

LSP information:
Visit the LSP Board's web page at http://www.mass.gov/lsp or call (617) 556-1091.

MassDEP 24-hour Spill Reporting

To report a release of oil or hazardous materials, and other environmental emergencies, call the MassDEP 24-hour notification line toll-free at

(888) 304-1133

Massachusetts Department of Environmental Protection
One Winter Street
Boston, MA 02108-4746

Commonwealth of Massachusetts
Mitt Romney, Governor
Kerry Healey, Lt. Governor

Executive Office of Environmental Affairs
Stephen R. Pritchard, Secretary

Department of Environmental Protection
Robert W. Golledge, Jr., Commissioner

Produced by the Bureau of Waste Site Cleanup, 2/01, rev. 4/04, 4/06
Printed on recycled paper

This information is available in alternate format by calling our ADA Coordinator at (617) 56-1057.

Stormwater Pollution Prevention Plan (SWPPP)

Stormwater Pollution Prevention Plan

for

Boundary Lane
Summer St. Medway, MA

This Stormwater Pollution Prevention Pan has been prepared in accordance with the MA Department of Environmental Protection Stormwater Standards and NPDES General Construction Permit for Stormwater Discharges from Construction Activities. All work shall be in accordance with the order of conditions issued by the Local Conservation Commission.

1.1 Project Information

Project Name and Location:	69-67R Summer Street Medway, MA
Owner Name and Address:	
Site Operator:	_____ _____ _____
Accompanying Documents:	Plans titled "Definitive Subdivision Plan, Boundary Lane, Medway, MA" prepared by Connorstone Engineering, are to be considered a part of this document.
NDPES Tracking Number:	_____
Latitude/Longitude:	Lat: 42.15050 Long: 71.44110
Project Description:	Four (4) lot residential subdivision
Estimated Dates:	Start: Fall 2021 Completion: Spring 2023
Name of Receiving Waters:	1. Unnamed stream tributary to Hopping Brook 2. Wetland tributary to Chicken Brook
Estimated Area of Disturbance:	1.5 Acres

1.2 Contact Information / Responsible Parties (complete prior to construction)

Operator(s):

Company Name:
Address:
Telephone #:
Area of Control: Entire Site

Project Manager(s) or Site Supervisor(s):

Company Name:.
Name:
Address:
Telephone #:
Area of Control: Entire Site

This SWPPP was Prepared by:

Connorstone Engineering, Inc.
10 Southwest Cutoff
Northborough, MA
508-393-9727

Emergency 24-Hour Contact:

Company Name:.
Name:
Address:
Telephone #:

Subcontractors:

Each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the Subcontractor Certifications/Agreement (Attached).

1.3 Existing Conditions

The existing site consists of a 11.3 acre parcel at 69-67R Summer Street and is shown on Assessor's map 37 as parcels 36 and 33. The lot is currently developed with two single family houses located off a common driveway from Summer Street. The current zoning map shows the site is within the AR-1 District, which requires a minimum lot area of 44,000 square feet and 180 feet of frontage. Generally the eastern half of the site is fully developed with the two residential houses and agricultural uses. The current conditions include 27,840 square feet of impervious areas (pavement, roof areas, and/or compacted gravel surfaces). The western half of the site consists of wooded areas, wetlands, and a power company easement (overhead wires).

The Natural Resource Conservation Service has mapped the soils within the development area as "Woodbridge fine sandy loam," which are typically moderately well drained soils with groundwater at 18 to 30 inches below grade. Test pits were performed by Connorstone Engineering, Inc. to determine confirm the soil classification and depth to groundwater for design of the stormwater management basin. The test pits within the basin showed loamy sand to fine sand material with a shallow groundwater elevation. There are also minor areas on-site mapped as "Ridgebury fine sandy loam." These soils are associated with wetland areas, and correlate to the delineated wetlands on-site.

Runoff from the project area flows in two flow patterns. Either to the rear wetland or to the front corner wetland. The subcatchment areas are approximately split down the central portion of the developed area. There are currently no stormwater controls on-site and all flow is via overland runoff..

1.4 Proposed Development / Nature of Construction Activities

The proposed project provides for a three (3) lot residential subdivision. The two existing houses are to remain and one new house lot has been proposed. All lots are greater than the minimum 44,000 sq. ft. lot area and minimum 180 feet of frontage. The project will include construction of a 350 foot long cul-de-sac roadway to provide the required access and lot frontage. The proposed roadway would be constructed in the same location as the existing paved common driveway. The pavement would be widened from 12 feet to the required 20 feet wide for fire access. The road profile has provided relatively flat grades with an up/down slope of 1% to 1.5% through the road. A "tee" type turnaround has also been provided at the end of the roadway for emergency and delivery vehicle maneuvering. The proposed project would result in 27,485 square feet of impervious area, which would result in a slight reduction in impervious areas when compared to the existing conditions.

The proposed stormwater management system has been designed to control both the peak rate and volume of runoff to match the pre-existing conditions through the 100 year storm event. Rainfall intensities were based upon the most current NOAA Atlas 14 data. The stormwater management system includes a surface collection system via LID techniques of overland flow over grassed surfaces. Runoff would then be directed to a shallow stormwater basin with a berm height of two (2) feet. This basin will provide for recharge to groundwater, treatment to 80% TSS, and control of off-site flows.

1.5 Construction Site Estimates

Total parcel area	11.3 acres
Total land disturbance:	1.5 acres
Impervious area before construction:	0.6 acres
Impervious area after construction:	0.6 acres

1.6 Sensitive Areas / Wetland Resources

A wetland system including Bordering Vegetated Wetlands and intermittent stream is located to the rear of the site. This system flows generally from north to south toward the undeveloped wooded land abutting to the south of the project. There is also a smaller wetland area that has been delineated in the northeast corner of the site. This area connects via a culvert under the abutting driveway to a wetland along Summer Street.

1.7 Discharge Information

Stormwater generally flows in two directions.

The area that flows to the northeast ultimately connects to Chicken Brook (approximately 4,000 feet from the site). This water body is not classified under the MA Surface Water Quality Standards 314 CMR 4. Based upon the Massachusetts year 2016 integrated list of waters this surface water is an impaired water due to e. coli, and is listed as a Category 5 water, 'Waters requiring a TMDL.'

The area that flows to the west ultimately connects to Hopping Brook. This water body is not classified under the MA Surface Water Quality Standards 314 CMR 4. Based upon the Massachusetts year 2016 integrated list of waters this surface water is an impaired water due to e. coli, and is listed as a Category 5 water, 'Waters requiring a TMDL.'

1.8 Endangered Species Certification

The proposed project is not located in an Estimated or Priority Habitat of Rare Wildlife as indicated on the 2017 Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP)

1.9 Potential Sources of Pollution

Potential sources of sediment to stormwater runoff:

- Clearing and grubbing operations
- Grading and site excavation operations
- Vehicle tracking
- Topsoil stripping and stockpiling
- Landscaping operations

Potential pollutants and sources, other than sediment, to stormwater runoff:

- Combined Staging Area—small fueling activities, minor equipment maintenance, sanitary facilities, and hazardous waste storage.
- Materials Storage Area—general building materials, solvents, adhesives, paving materials, paints, aggregates, trash, etc.
- Construction Activity—paving, curb/gutter installation, concrete pouring/mortar/stucco, building construction, and Concrete Washout Area.

1.10 REQUIREMENT TO POST A NOTICE OF YOUR PERMIT COVERAGE.

The operator must post a sign or other notice conspicuously at a safe, publicly accessible location in close proximity to the project site. At a minimum, the notice must include the NPDES Permit tracking number and a contact name and phone number for obtaining additional project information. The notice must be located so that it is visible from the public road that is nearest to the active part of the construction site, and it must use a font large enough to be readily viewed from a public right-of-way.

2.1 General Construction Sequencing of Major Activities

Estimated Schedule: 18-24 months

General Sequencing Plan

1. Install sediment control barriers and construction entrance off Summer Street.
2. Remove the existing structures and pavement areas.
3. Install Temporary Sediment Basins (if required)
4. Clear, stump & grub roadway areas.
5. Begin construction of Roadway.
6. Install roadway cross culvert prior to completing placement of fill near station 0+50 to prevent ponding on abutting land and blockage of drainage flow paths.
7. Install utilities.
8. Install gravel base and binder course pavement.
9. Begin Lot development.
10. Perform final landscaping and stabilization
11. Clean and sediment and final installation of the stormwater basin.
12. Place final top course pavement.
13. Remove the remaining siltation devises as the area becomes stable.

2.2 Erosion and Sediment Controls

General Conditions – Prior to initiating construction, all sedimentation and erosion control measures shall be installed as shown on the plans and detail drawings. This plan depicts the minimum required sedimentation and erosion controls. The contractor shall employ additional sedimentation and erosion control measures as necessitated by site conditions, or as directed by the owner, the owner's representative, or the conservation commission to ensure protection of all wetland resources and control sediment transport. if sedimentation plumes occur, the contractor shall stop work and install additional sedimentation control devices immediately to prevent further sedimentation.

Temporary Stabilization – Topsoil stockpiles and disturbed portions of the site where construction activity temporarily ceases for at least 14 days will be stabilized with a temporary seed and mulch no later than 14 days from the last construction activity in that area. The temporary seed shall be Erosion Control mix. Seeding shall be nutrient enriched hydroseed with tackifer and cellulose or other degradable fibers capable of retaining moisture.

Permanent Stabilization – Disturbed portion of the site where construction activity ceases shall be stabilized with permanent seed no later than 14 days after the last construction activity. The permanent seed mix consists of tall fescue, and annual rye. Prior to seeding, ground agricultural limestone shall be applied. Seeding shall be nutrient enriched hydroseed with tackifers and cellulose or other degradable fibers capable of retaining moisture.

Erosion Barrier (Perimeter Controls) – Erosion Barriers shall consist of compost filter socks. Prior to the commencement of work, filter socks shall be installed along the edge of proposed development, and as indicated on the plans. Additional erosion barriers shall be located as conditions warrant or as directed by the owner, his representatives, or the local authority.

Track out controls / **Construction Entrance –** A stabilized stone apron construction entrance shall be at all construction entrances to help prevent vehicle tracking of sediments. All vehicles shall enter and exit the sit via the stabilized construction entrance. The contractor shall inspect the construction entrance daily and after heavy use. If mud and soil clogs the voids in the crushed stone reducing the effectiveness, the pad shall be top dressed with new, clean stone. If the pad becomes completely clogged, replacement of the entire pad may be necessary. Dump trucks hauling material from the construction site will be covered with a tarpaulin.

Track out controls / **Street Sweeping** – Street sweeping in the vicinity of the project area shall be performed as needed until the project limits have been stabilized. All sediment tracked outside the limit of work shall be swept at the end of each working day.

Inlet Protection – All existing and proposed drainage system inlets, which may receive stormwater flow from disturbed areas, shall be provided with inlet protection (catch basin inserts). The contractor shall maintain these devices until all work is completed and all areas have been adequately stabilized.

Temporary Sediment Traps– Sediment traps and/or basins shall be constructed as necessitated by field conditions. The minimum volume shall be 1800 cubic feet of storage for each acre of drainage area. Sediment traps/basins should be readily accessible for maintenance and sediment removal, and should remain in operation and be properly maintained until the site area is permanently stabilized by vegetation and/or when permanent structures are in place. Remove basin after drainage area has been permanently stabilized, inspected, and approved. Before removing dam, drain water and remove sediment; place waste material in designated disposal areas. Smooth site to blend with surrounding area and stabilize.

Dust Control – Dust control measures shall be implemented and maintained properly throughout dry weather periods until all disturbed areas have been permanently stabilized. Methods for dust control shall include water sprinkling and/or other methods approved by the engineer.

Soil Stockpiles – Soil stockpiles shall be stabilized to prevent erosion along with perimeter sedimentation controls. No materials subject to erosion shall be stockpiled overnight within 100 feet of a wetland unless covered.

Dewatering Operations – Dewatering operations, if required, shall discharge onto stabilized areas. All discharge water is to pass through sedimentation control devices to prevent impacts upon water bodies, bordering vegetated wetlands, drainage systems and abutting properties. No discharges from dewatering operations shall be discharged directly to the drainage system.

Snow Removal – Snow shall be plowed to the shoulder of the roadway. Any excess of that which can be stored on-site shall be removed. Snow shall not be plowed into the constructed wetland or into the 20-foot buffer zone to any wetland area. All catch basins shall be uncovered and functional immediately after snow plowing. Any snow piles shall be placed so that it will not interfere with runoff flow.

Topsoil – Topsoil shall be stripped and stockpiled on-site for reuse, unless otherwise noted on the plans (per stockpile requirements). Materials shall be re-used on-site to the maximum extent practical. Any excess shall be properly exported off-site.

Minimize Soil Compaction – Within the limits of the infiltration galley, the use of heavy equipment shall be limited to the maximum extent practical.

Vehicle Washing – Vehicle and equipment washing, other than hose down with clean water, shall not be allowed. All wash down water shall be directed to a sediment control device (not directly to any stormwater drainage system or wetland).

Fertilizer Discharge Restrictions.

- Apply at a rate and in amounts consistent with manufacturer's specifications,
- Apply during the growing season, and preferably timed to coincide as closely as possible to the period of maximum vegetation uptake and growth;
- Avoid applying before heavy rains that could cause excess nutrients to be discharged;
- Never apply to frozen ground;
- Never apply to stormwater conveyance channels with flowing water; and
- Follow all other federal, state, tribal, and local requirements regarding fertilizer application.

Washing of Applicators and Containers used for Paint, Concrete, or Other Materials. - Direct all wash water into a leak-proof container or leak-proof pit. The container or pit must be designed so that no overflows can occur due to inadequate sizing or precipitation Handle washout or cleanout wastes as follows: Do not dump liquid wastes in storm sewers; Dispose of liquid wastes in accordance with applicable regulations; and. Remove and dispose of hardened concrete waste consistent with your handling of other construction wastes. Locate any washout or cleanout activities as far away as possible from surface waters and stormwater inlets or conveyances, and, to the extent practicable, designate areas to be used for these activities and conduct such activities only in these areas.

2.3 Inspection and Maintenance Schedule

The responsible party shall be responsible for maintaining all temporary and permanent sedimentation and erosion controls until work is complete and all areas have been permanently stabilized. At such time all sedimentation and erosion control measures shall be removed. These are the inspection and maintenance practices that will be used to maintain erosion and sediment controls during construction.

Schedule:

- All control measures will be inspected at least *once each week*.
- All erosion components shall be inspected within 24 hours following any precipitation event of 0.25 inches.
- Depth of precipitation events shall be based upon NCDC reporting.

Maintenance Practices:

- All measures will be maintained in good working order; if a repair is necessary, it will be initiated within 24 hours of report of any deficiencies.
- Built up sediment shall be removed from the silt fence when it reaches a depth equal to one-third the height of the fence.
- The sediment traps shall be inspected for depth of sediment, and built up sediment will be removed when it reached 25 percent of the design capacity or at the end of the job. Check embankment for: settlement, seepage, or slumping along the toe or around pipe. Look for signs of piping. Repair immediately. Remove trash and other debris from principal spillway, emergency spillway, and pool area. Clean or replace gravel when sediment pool does not drain properly.
- Any diversion dikes will be inspected for breaches and promptly repaired.
- Temporary and permanent seeding and planting will be inspected for bare spots, washouts and healthy growth.
- Contractor to maintain a supply of erosion control devises on site at all times to repair any broken or damaged materials.
- Street sweeping shall be performed throughout construction as required. Any sediment tracked onto public ways shall be swept by the end of the working day.
- Catch basins and Stormceptors shall be maintained throughout construction and cleaned whenever sediment reaches 12-inches in catch basins and 8-inches in Stormceptors.

The site superintendent, will select three individuals who will be responsible for inspections, maintenance and repair activities, and filling out the inspection and maintenance reports. Personnel selected for inspection and maintenance responsibilities shall be a "qualified personnel" as defined in section 4. D of the GCP. Staff shall be trained in all inspection and maintenance practices for keeping the erosion and sediment controls used onsite in good working order.

An *inspection report* will be made after each inspection. Copies of the reports shall be maintained on site. At a minimum, the inspection report must include:

- The inspection date;
- Names, titles, and qualifications of personnel making the inspection;
- Weather information for the period since the last inspection including estimate of the beginning and duration of each storm event, approximate amount of rainfall for each storm event (in inches), and whether any discharges occurred;
- Location(s) of discharges of sediment or other pollutants from the site;
- Location(s) of BMPs that need to be maintained;
- Location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location;
- Location(s) where additional BMPs are needed that did not exist at the time of inspection; and
- Corrective action required including implementation dates.

The inspection report must be signed in accordance with Appendix G, Section 11 of the GCP.

2.5 Staff and Training Requirements.

Prior to the commencement of earth-disturbing activities or pollutant-generating activities, whichever occurs first, you must ensure that the following personnel understand the requirements of this permit and their specific responsibilities with respect to those requirements:

- Personnel who are responsible for the design, installation, maintenance, and/or repair of stormwater controls (including pollution prevention measures);
- Personnel responsible for the application and storage of treatment chemicals (if applicable);
- Personnel who are responsible for conducting inspections as required in Part 4.1.1; and
- Personnel who are responsible for taking corrective actions.

Notes: (1) If the person requiring training is a new employee, who starts after you commence earth-disturbing or pollutant-generating activities, you must ensure that this person has the proper understanding as required above prior to assuming particular responsibilities related to compliance with this permit. (2) For emergency-related construction activities, the requirement to train personnel prior to commencement of earth-disturbing activities does not apply, however, such personnel must have the required training prior to NOI submission.

The operator is responsible for ensuring that all activities on the site comply with the requirements of the permit. The operator is not required to provide or document formal training for subcontractors or other outside service providers, but you must ensure that such personnel understand any requirements of the permit that may be affected by the work they are subcontracted to perform. At a minimum, personnel must be trained to understand the following if related to the scope of their job duties (e.g., only personnel responsible for conducting inspections need to understand how to conduct inspections):

- The location of all stormwater controls on the site required by this permit, and how they are to be maintained;
- The proper procedures to follow with respect to the permit's pollution prevention requirements; and
- When and how to conduct inspections, record applicable findings, and take corrective actions.

3.1 Storage, Handling, and Waste Disposal

Building Products - Shall be covered or stored inside to prevent any discharge of pollutants. Comply with all application, disposal, and registration requirements.

Pesticides, herbicides, insecticides and fertilizers - Shall be covered or stored inside to prevent any discharge of pollutants. Comply with all application, disposal, and registration requirements.

Diesel fuel, oil, hydraulic fluids, other petroleum products, and other chemicals- store chemicals in water-tight containers, and provide either (1) cover (e.g., plastic sheeting or temporary roofs) to prevent these containers from coming into contact with rainwater, or (2) a similarly effective means designed to prevent the discharge of pollutants from these areas (e.g., spill kits), or provide secondary containment (e.g., spill berms, decks, spill containment pallets). Clean up spills immediately, using dry clean-up methods where possible, and dispose of used materials properly. Do not clean surfaces or spills by hosing the area down. Eliminate the source of the spill to prevent a discharge or a continuation of an ongoing discharge

Hazardous Waste - Separate hazardous or toxic waste from construction and domestic waste. Store waste in sealed containers, which are constructed of suitable materials to prevent leakage and corrosion, and which are labeled in accordance with applicable Resource Conservation and Recovery Act (RCRA) requirements and all other applicable federal, state, tribal, or local requirements; iii. Store all containers that will be stored outside within appropriatelysized secondary containment (e.g., spill berms, decks, spill containment pallets) to prevent spills from being discharged, or provide a similarly effective means designed to prevent the discharge of pollutants from these areas (e.g., storing chemicals in covered area or having a spill kit available on site);

Dispose of hazardous or toxic waste in accordance with the manufacturer's recommended method of disposal and in compliance with federal, state, tribal, and local requirements. site personnel will be instructed in these practice and the individual who manages the day to day site operations, will be responsible for seeing that these procedures are followed.

Clean up spills immediately, using dry clean-up methods where possible, and dispose of used materials properly. Do not clean surfaces or spills by hosing the area down. Eliminate the source of the spill to prevent a discharge or a furtherance of an ongoing discharge

Sanitary Waste – All sanitary waste will be collected from the portable units a minimum of once per week by the sanitary pumping company, licensed by the Commonwealth of Massachusetts and as required by the local regulation. Position units in a secure location where they cannot be tipped over.

Waste Materials – All waste materials will be collected and stored in a securely lidded metal dumpster rented from a licensed waster management company. The dumpster will meet all local and State solid waster management regulations. All trash and construction debris from the site will be deposited in the dumpster. The dumpster will be emptied at least twice per month or more often if necessary, and the waste will be hauled to the waste management company. On work days, clean up and dispose of waste in designated waste containers. Clean up immediately if containers overflow. No construction waste materials will be buried onsite. All personnel will be instructed regarding the correct procedure for waste disposal. Notices stating these practices will be posted in the office trailer. The individual managing the day-to-day site operations will be responsible for seeing that these procedures are followed.

3.2 Building Material Inventory for Pollution Prevention Plan

The materials or substances listed below are expected to be present onsite during construction:

- Concrete
- Petroleum based products including asphalt concrete/emulsions, fuel(s), oil, etc.
- Wood
- Fertilizers and tachifiers
- Paints (enamel, latex and oil based stains)
- Metal studs and products
- Masonry block
- Roofing shingles
- Gypsum and plaster
- Stone products

Construction equipment and maintenance materials will be stored at the combined staging area and materials storage areas. A watertight container will be used to store hand tools, small parts, and other construction materials.

3.2 Spill Prevention Material Management Practices

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff.

Good Housekeeping – The following good housekeeping practices will be followed onsite during the construction project**.**

- An effort will be made to store only enough products to do the job.
- All materials stored onsite will be stored in a neat, orderly manner in this appropriate containers and, if possible, under a roof or other enclosure.
- Products will be kept in their original containers and with the original manufacturers' label.
- Substances will not be mixed with one another unless recommended by the manufactures.
- Whenever possible, all of a product will be used up before disposing of the container.
- Manufacturers' recommendation for proper use and disposal will be followed.
- The Site Superintendent will inspect daily to ensure proper use and disposal of materials.
- Hazardous Procedures – In accordance with industry standards and Applicable regulations

Product Specific Practices – The following product specific practices will be followed onsite:
Petroleum Products – Transport and delivery of fuel in approved containers only.
Fertilizers – In accordance with labeling
Paints – In accordance with labeling

Spill Control Practices – Any spills of hazardous materials shall be contained and cleaned up immediately. If appropriate, the Massachusetts Department of Environmental Protection (DEP) shall be notified. There shall, at all times when work is underway on-site, be an individual present who is trained in proper spill control practices.

In the event that hazardous material, gasoline or other petroleum is released, the following procedure should be followed:

1. Immediately contact the following agencies:
   Medway Fire Department (508) 533-3211
   MassDEP Emergency Response (888) 304-1133

2. Provide support to agencies listed above, which may include contacting an outside contractor to provide clean-up or contacting a Licensed Site Professional (LSP) to lead the clean-up.

Where a release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Part 110, 40 CFR Part 117 or 40 CFR Part 302, occurs during a 24-hour period:

- Provide notice to the National Response Center (NRC) (800–424–8802; in the Washington, DC, metropolitan area call 202–267–2675) in accordance with the requirements of 40 CFR Part 110, 40 CFR Part 117 and 40 CFR Part 302 as soon as site staff have knowledge of the discharge; and

- Within 7 calendar days of knowledge of the release, provide a description of the release, the circumstances leading to the release, and the date of the release. You must also implement measures to prevent the reoccurrence of such releases and to respond to such releases.

Vehicle Fueling and Maintenance – All major equipment/vehicle fueling and maintenance will be performed off-site. When vehicle fueling must occur on-site, the fueling activity will occur in the staging area outside the buffer zone or resource area. Only minor equipment maintenance will occur on-site. All equipment fluids generated from maintenance activities will be disposed of into designated drums stored on spill pallets in accordance with Part 3.1 of the GCP. Absorbent, spill-cleanup materials and spill kits will be available at the combined staging and materials storage area. Drip pans will be placed under all equipment receiving maintenance and vehicles and equipment parked overnight.

3.3 Non-Storm Water Discharges

It is expected that the following non-storm water discharge will occur from the site during the construction period:

- Pavement wash waters (where no spills or leaks of toxic or hazardous material have occurred).
- Discharges from Fire Fighting activities
- Hydrant and water line flushing
- Landscape irrigation
- Vehicle wash
- Water for dust control
- Foundation / footing drains
- Construction dewatering water

4.0 Record Keeping / Updating of Documentation

This document is intended as a living document to be continuously revised and updated based on changing site conditions and the progression of construction. The SWPPP shall be continuously revised to indicate the condition and location of the various Best Management Practices.

Copies of the GCP, signed and certified NOI, and EPA notification of receipt must be included in the SWPPP. This SWPPP plan, the approved drawings made part of this document, inspection reports (made at least weekly), and required logs shall be maintained on site at all times. Inspection reports shall be retained with the SWPPP for at least three years.

The following inspection reports and logs shall be maintained:

- Inspection Reports
- Corrective Action Log
- SWPPP Amendment Log
- Grading and Stabilization Activities Log

5.0 Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: _____ Title: _____

Signature: _____ Date: _____

Contact information: _____

_____

SWPPP Attachments

- ***NPDES NOI – EPA***
- ***Inspection Reports***
- ***Corrective Action Log***
- ***SWPPP Amendment Log***
- ***Subcontractor Certifications/Agreements***
- ***NPDES Construction General Permit***

Download at:
https://www.epa.gov/npdes/epas-2017-construction-general-permit-cgp-and-related-documents

Stormwater Construction Site Inspection Report

General Information			
Project Name	**Boundary Lane**		
	Medway, MA	**Location**	
Date of Inspection		**Start/End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Describe present phase of construction			

Type of Inspection:
❑ Regular ❑ Pre-storm event ❑ During storm event ❑ Post-storm event

Weather Information

Has there been a storm event since the last inspection? ❑Yes ❑No
If yes, provide:
Within 24 Hours: _____ inches
Within 72 Hours: _____ inches
Within 7 days: _____ inches

Weather at time of this inspection?
❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snowing ❑ High Winds
❑ Other: Temperature:

Have any discharges occurred since the last inspection? ❑Yes ❑No
If yes, describe:

Are there any discharges at the time of inspection? ❑Yes ❑No
If yes, describe:

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
1	Construction Entrance and Street Sweeping	❑Yes ❑No	❑Yes ❑No	
2	Sediment Trap	❑Yes ❑No	❑Yes ❑No	Any Evidence of Overtopping_____ Sediment Depth_____
3	Erosion Barrier	❑Yes ❑No	❑Yes ❑No	Any Evidence of Overtopping_____ Sediment Depth_____
4	Soil Stockpile Protection / Stabilization	❑Yes ❑No	❑Yes ❑No	
5	Designated Construction Material Stockpile Areas	❑Yes ❑No	❑Yes ❑No	
6	Catch Basin Inlet Protection	❑Yes ❑No	❑Yes ❑No	Any Evidence of Bypass_____

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
7	Vegetated Swale & Check Dam	❑Yes ❑No	❑Yes ❑No	
8	Are natural resource areas protected with barriers or similar BMPs?	❑Yes ❑No	❑Yes ❑No	
9	Are discharge points and receiving waters free of any sediment deposits?	❑Yes ❑No	❑Yes ❑No	
10	Is trash/litter from work areas collected and placed in covered dumpsters?	❑Yes ❑No	❑Yes ❑No	
11	Are materials that are potential stormwater contaminants stored inside or under cover?	❑Yes ❑No	❑Yes ❑No	
12	Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	❑Yes ❑No	❑Yes ❑No	
13	Are washout facilities (e.g., paint, stucco, concrete) available, clearly marked, and maintained?	❑Yes ❑No	❑Yes ❑No	
14	Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	❑Yes ❑No	❑Yes ❑No	
15	Are all slopes and disturbed areas not actively being worked properly stabilized?	❑Yes ❑No	❑Yes ❑No	
16	(other)			

Non-Compliance

Describe any incidents of non-compliance not described above:

Additional Comments / Description of Current Site Work

CERTIFICATION STATEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name and title: _____

Signature:_____**Date:**_____

Corrective Action Log

Project Name:
SWPPP Contact:

Inspection Date	Inspector Name(s)	Description of BMP Deficiency	Corrective Action Needed (including planned date/responsible person)	Date Action Taken/Responsible person

SWPPP Amendment Log

Project Name:
SWPPP Contact:

Amendment No.	Description of the Amendment	Date of Amendment	Amendment Prepared by [Name(s) and Title]

SUBCONTRACTOR CERTIFICATION
STORMWATER POLLUTION PREVENTION PLAN

Project Number: _____

Project Title: _____

Operator(s): _____

As a subcontractor, you are required to comply with the Stormwater Pollution Prevention Plan (SWPPP) for any work that you perform on-site. Any person or group who violates any condition of the SWPPP may be subject to substantial penalties or loss of contract. You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP. A copy of the SWPPP is available for your review at the office trailer.

Each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement:

I certify under the penalty of law that I have read and understand the terms and conditions of the SWPPP for the above designated project and agree to follow the BMPs and practices described in the SWPPP.

This certification is hereby signed in reference to the above named project:

Company: _____

Address: _____

Telephone Number: _____

Type of construction service to be provided: _____

_____

_____

Signature: _____

Title: _____

Date: _____