STORMWATER REPORT

135 Great Plain Avenue
Wellesley, MA

PREPARED FOR

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February 2018

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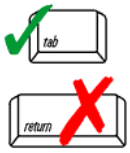
Checklist for Stormwater Report

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

WNM 2/16/18

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.

Stormwater Report Narrative

This Stormwater Report has been prepared to demonstrate compliance with the Massachusetts Stormwater Management Standards.

Project Description

The Applicant, Northland Residential Corporation, is proposing to construct a residential development that includes 24 townhouse units in 8 buildings and 20 duplex units in 10 buildings, ancillary landscaping and utility improvements to support this use (the Project).

Site Description

The Project Site is a 12.05-acre parcel of land (the Site) located at 135 Great Plain Avenue in Wellesley, Massachusetts (see Figure 1). The Site is bound by residential homes and Great Plain Avenue to the north, the Sudbury Aqueduct to the south, residential homes to the east, and residential homes to the west. See Figure 1, Site Locus Map.

Wetland Resource Areas on the Site include the following:

Table 1
Wetland Resource Areas

Name	*Critical Area*	*Zone 1 or Zone A*	*ORW or SRW*	*Zone II or IWPA*	*Other*
Fuller Brook	No	No	No	No	N/A

The Project's limit of work does not extend into the 200-foot Riverfront or 100-foot wetland buffer zones of this wetland resource area.

According to the National Resources Conservation Service (NRCS), surface soils on the Site include Charlton-Hollis-Rock with a Hydrologic Soil Group (HSG) A rating. Soil evaluations completed by CHA in April and June 2015 (included in Appendix C) primarily classified soil as sandy loam, which would be considered a HSG B soil with a Rawl's infiltration rate of 1.02 inches per hour. The Site is not considered to be within an area of rapid infiltration (soils with a saturated hydraulic conductivity greater than 2.4 inches per hour).

Existing Drainage Conditions

Under existing conditions, the Site is primarily wooded, with the exception of an open meadow in the center of the Site and Fuller Brook to the west. There is an existing single-family home, garage, stone building, gazebo and paved driveway with generally rolling topography. Figure 2 illustrates the existing drainage patterns on the Site. Currently, the Site is divided into two drainage areas as stormwater runoff flows to two Design Points, which have been identified as DP1 and DP2. Table 2 below provides a summary of the existing conditions hydrologic data.

Table 2
Existing Conditions Hydrologic Data

Drainage Area	*Discharge Location*	*Design Point*	*Area (acres)*	*Curve Number*	*Time of Concentration (min)*
EX1	West Abutters	DP1	2.6	56	18.0
EX2	Fuller Brook	DP2	7.8	58	17.9

Proposed Drainage Conditions

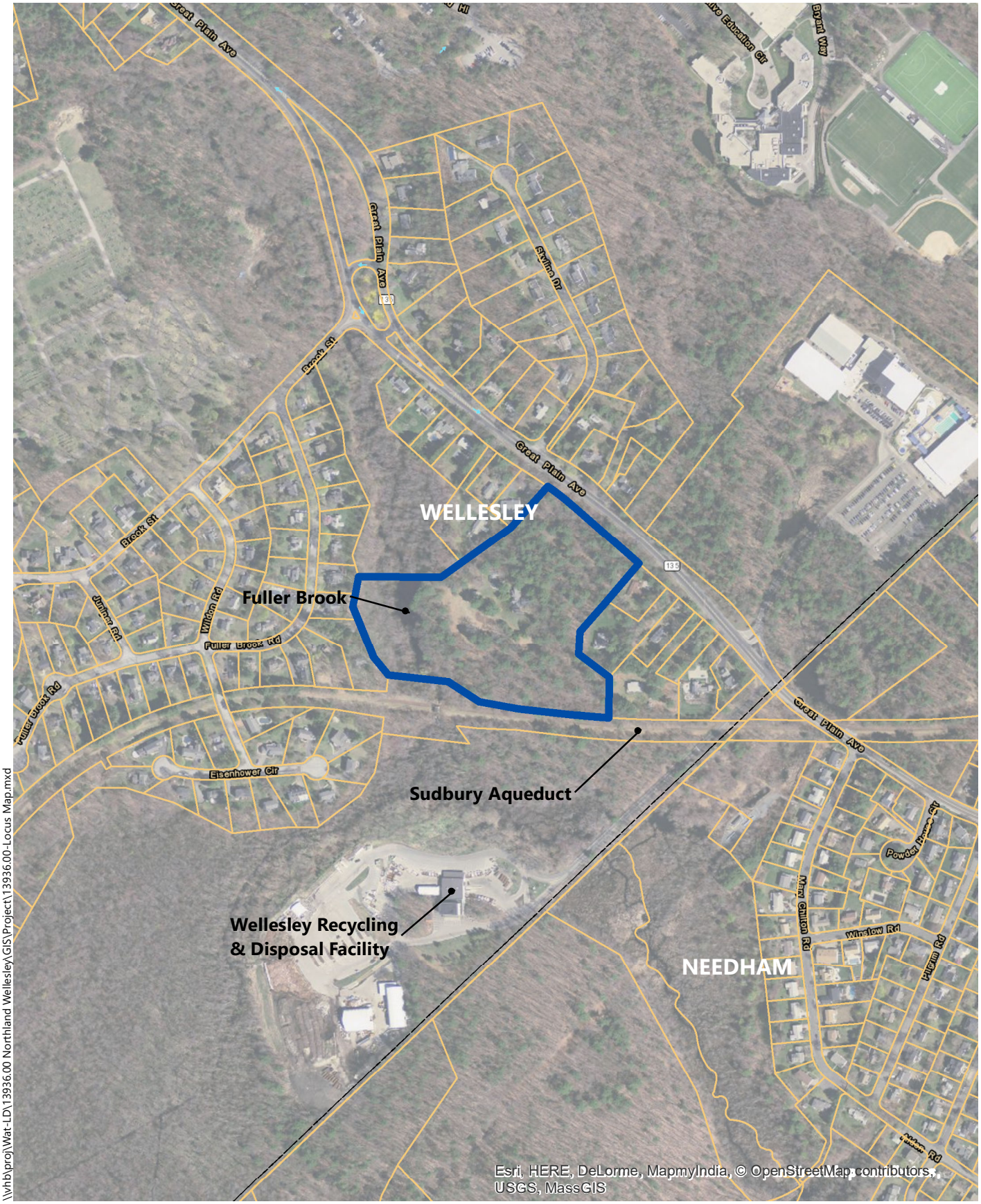
Figure 3 illustrates the proposed "post construction" drainage conditions for the project. As shown, the Site will be divided into five drainage areas that discharge treated stormwater to the two existing Design Points. Table 3 below provides a summary of the proposed conditions hydrologic data.

Table 3
Proposed Conditions Hydrologic Data

Drainage Area	*Discharge Location*	*Design Point*	*Area (acres)*	*Curve Number*	*Time of Concentration (min)*
PR1A	West Abutters	DP1	0.4	68	14.5
PR1B	West Abutters	DP1	0.4	68	12.0
PR2A	Fuller Brook	DP2	0.8	87	5.0
PR2B	Fuller Brook	DP2	3.7	86	5.5
PR2C	Fuller Brook	DP2	4.7	59	10.4

Integrated into the site design is a comprehensive stormwater management system that has been developed in accordance with the Massachusetts Stormwater Handbook. Stormwater from the entry drive and east townhomes and alley is collected and conveyed to a detention system (P2A) to control peak runoff rates. P2A overflows to an infiltration system (P2B) to the south. Other townhomes, duplexes, roadways and landscape areas drain directly to P2B. The remainder of the site drains via overland flow to the west or to the south to Fuller Brook.

Figure 1: Site Locus Map



\\vhb\proj\Wat-LD\13936.00 Northland Wellesley\GIS\Project\13936.00-Locus Map.mxd

0 125 250 500 Feet

135 Great Plain Avenue | Wellesley, MA

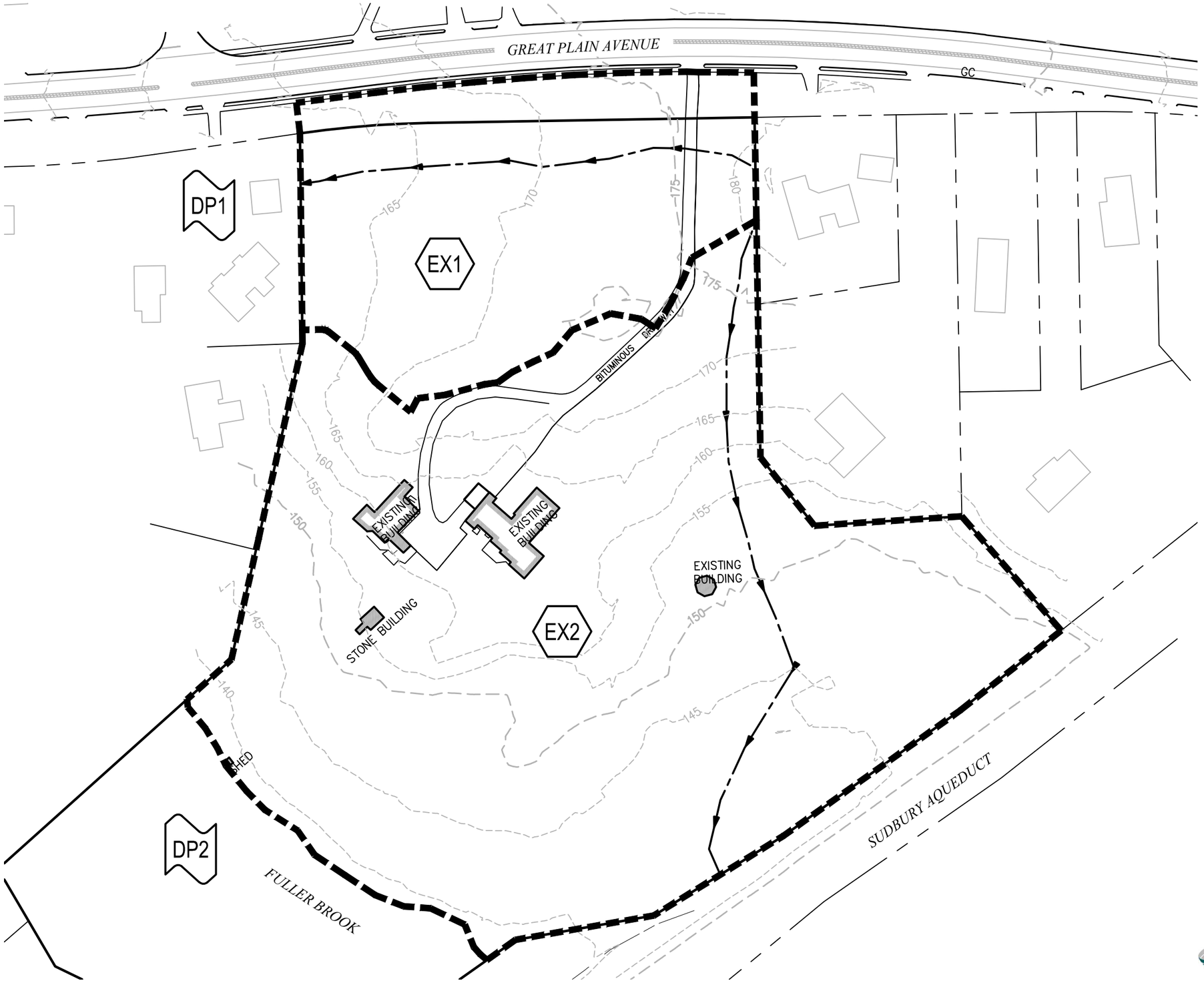
Project Site

Town Boundaries

Parcels

Locus Map

Figure 2: Existing Drainage Areas



Legend

SYMBOLS

X — DESIGN POINT

X — DRAINAGE AREA DESIGNATION

LINETYPES

DRAINAGE AREA BOUNDARY

TIME OF CONCENTRATION FLOW LINE

Existing Drainage Conditions

Figure 2

135 Great Plain Avenue
Wellesley, MA

February 2018

Figure 3: Proposed Drainage Areas

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GREAT PLAIN AVENUE

SUDBURY AQUEDUCT

FULLER BROOK

DP1

DP2

P1

P2A

P2B

PR1A

PR1B

PR2A

PR2B

PR2C

Legend

SYMBOLS

X — DESIGN POINT

X — DRAINAGE AREA DESIGNATION

LINETYPES

DRAINAGE AREA BOUNDARY

TIME OF CONCENTRATION FLOW LINE

0 50 100 Feet

Proposed Drainage Conditions

135 Great Plain Avenue
Wellesley, MA

Figure 3

February 2018

Regulatory Compliance

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

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

Standard 1: No New Untreated Discharges or Erosion to Wetlands

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

The Best Management Practices (BMPs) included in the proposed stormwater management system have been designed in accordance with the Massachusetts Stormwater Handbook. Supporting information and computations demonstrating that no new untreated discharges will result from the Project are presented through compliance with Standards 4 through 6.

All proposed Project stormwater outlets and conveyances have been designed to not cause erosion or scour to wetlands or receiving waters. Outlets from closed drainage systems have been designed with flared end sections and stone protection to dissipate discharge velocities.

Computations and supporting information for the sizing and selection of materials used to protect from scour and erosion are included in Appendix A.

Standard 2: Peak Rate Attenuation

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

The rainfall-runoff response of the Site under existing and proposed conditions was analyzed for storm events with recurrence intervals of 2, 10, 25 and 100-years. The results of the analysis, as summarized in Table 4 below, indicate that there is no increase in peak discharge rates between the existing and proposed conditions for all storm events.

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

Table 4
Peak Discharge Rates (cfs*)

Design Point	*2-year*	*10-year*	*25-year*	*100-year*
Design Point 1: West Abutters				
Existing	0.4	2.1	3.6	6.3
Proposed	0.4	1.2	1.8	2.8
Design Point 2: Fuller Brook				
Existing	1.4	7.3	12.1	20.5
Proposed	1.1	5.7	9.4	20.4

Standard 3: Stormwater Recharge

The Project has been designed to fully comply with Standard 3.

In accordance with the Stormwater Handbook, the Required Recharge Volume for the Project is 4,886 cubic feet.

Recharge of stormwater has been provided through the use of an underground infiltration system, which has been sized using the Static method. This infiltration BMP has been designed to drain completely within 72 hours. Table 5 below provides a summary of the proposed infiltration BMPs utilized for the Project.

Table 5
Summary of Recharge Calculations

Infiltration BMP	*Provided Recharge Volume (cubic feet)*
Underground Infiltration BMP	35,712
Total Provided Recharge	35,712
Total Required Recharge	4,886

Soil evaluations, computations, and supporting information are included in Appendix C.

Standard 4: Water Quality:

The Project has been designed to fully comply with Standard 4.

The proposed stormwater management system implements a treatment train of BMPs that has been designed to provide 80% TSS removal of stormwater runoff from all proposed impervious surfaces. Computations and supporting information, including the Long-Term Pollution Prevention Plan, are included in Appendix D.

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

The Project is not considered a LUHPPL.

Standard 6: Critical Areas

The Project will not discharge stormwater near or to a critical area.

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

The Project has been designed to fully comply with all ten of the Stormwater Management Standards.

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

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

Standard 9: Operation and Maintenance Plan

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

Standard 10: Prohibition of Illicit Discharges

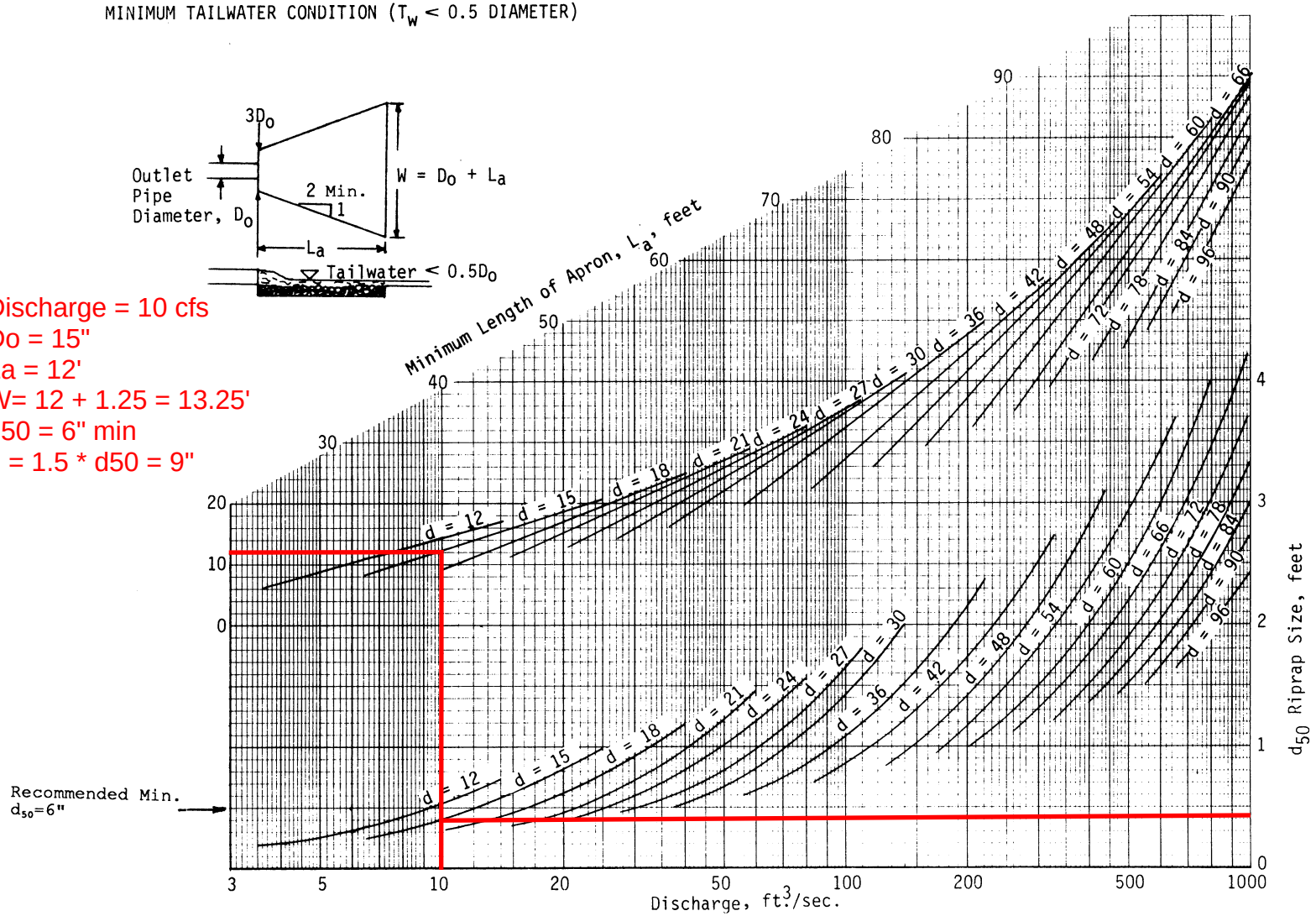
Sanitary sewer and storm drainage structures remaining from previous development which are part of the redevelopment area will be removed or will be incorporated into updated sanitary sewer and separate stormwater sewer systems. The design plans submitted with this report have been designed so that the components included therein are in full compliance with current standards. No statement is made with regard to the drainage system in portions of the site not included in the redevelopment project area. The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges.

Appendix A
Standard 1 Computations and Supporting Information

- Stone Outlet Protection for Pipe Ends

DESIGN OF OUTLET PROTECTION FROM A ROUND PIPE FLOWING FULL
MINIMUM TAILWATER CONDITION (T_w < 0.5 DIAMETER)

Discharge = 10 cfs
Do = 15"
La = 12'
W= 12 + 1.25 = 13.25'
d50 = 6" min
d = 1.5 * d50 = 9"

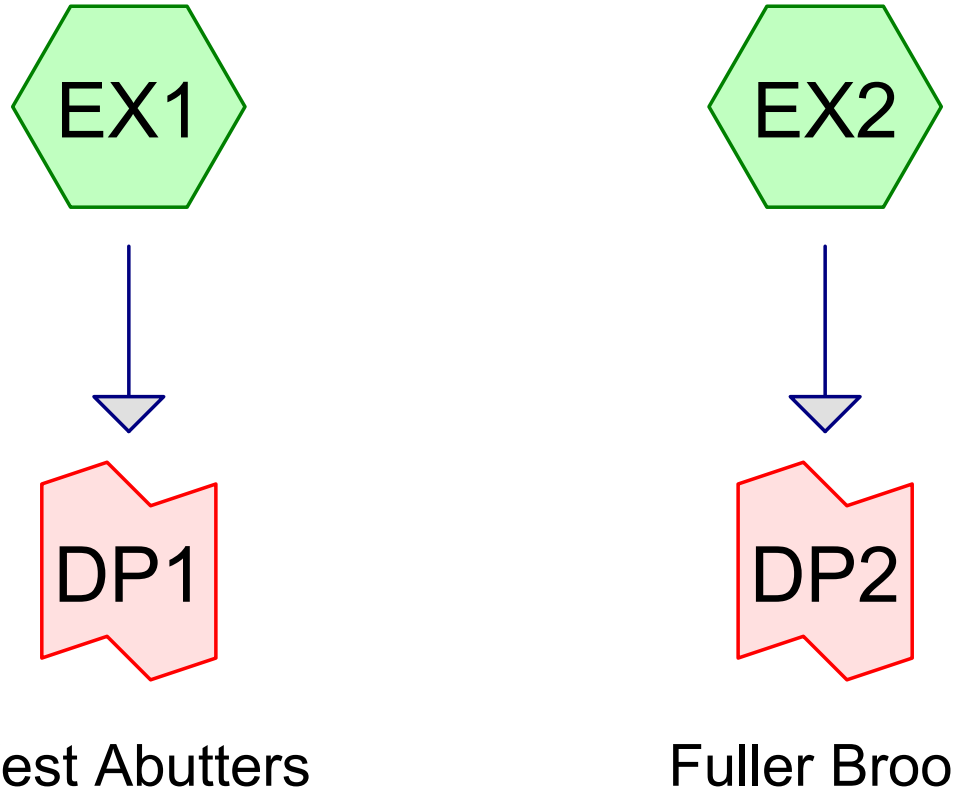


FES 1

Appendix B
Standard 2 Computations and Supporting Information

Rainfall depths used for this analysis were based on NOAA Atlas 14 Type III, 24-hour data with corresponding depths for the 2-, 10-, 25- and 100-year storm events of 3.33 in, 5.21 in, 6.39 in and 8.20 in, respectively. Runoff coefficients for the existing and proposed conditions, as previously shown in Tables 1 and 2 respectively, were determined using NRCS Technical Release 55 (TR-55) methodology as provided in HydroCAD. The HydroCAD model is based on the NRCS Technical Release 20 (TR-20) Model for Project Formulation Hydrology.

HydroCAD Analysis: Existing Conditions



Subcat Reach Pond Link

Routing Diagram for 13936.00-Existing
Prepared by VHB, Printed 2/16/2018

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
56,980	61	>75% Grass cover, Good, HSG B (EX2)
12,131	98	Paved parking, HSG B (EX1, EX2)
6,289	98	Roofs, HSG B (EX2)
379,231	55	Woods, Good, HSG B (EX1, EX2)
454,631	**57**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
454,631	HSG B	EX1, EX2
0	HSG C	
0	HSG D	
0	Other	
454,631		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
0	56,980	0	0	0	56,980	>75% Grass cover, Good	
0	12,131	0	0	0	12,131	Paved parking	
0	6,289	0	0	0	6,289	Roofs	
0	379,231	0	0	0	379,231	Woods, Good	
0	**454,631**	**0**	**0**	**0**	**454,631**	**TOTAL AREA**	

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

SubcatchmentEX1: Runoff Area=113,769 sf 2.30% Impervious Runoff Depth=0.32"
Flow Length=450' Slope=0.0300 '/' Tc=18.0 min CN=56 Runoff=0.35 cfs 3,049 cf

SubcatchmentEX2: Runoff Area=340,862 sf 4.64% Impervious Runoff Depth=0.39"
Flow Length=670' Tc=17.9 min CN=58 Runoff=1.44 cfs 11,025 cf

Link DP1: West Abutters Inflow=0.35 cfs 3,049 cf
Primary=0.35 cfs 3,049 cf

Link DP2: Fuller Brook Inflow=1.44 cfs 11,025 cf
Primary=1.44 cfs 11,025 cf

Total Runoff Area = 454,631 sf Runoff Volume = 14,074 cf Average Runoff Depth = 0.37"
95.95% Pervious = 436,211 sf 4.05% Impervious = 18,420 sf

Summary for Subcatchment EX1:

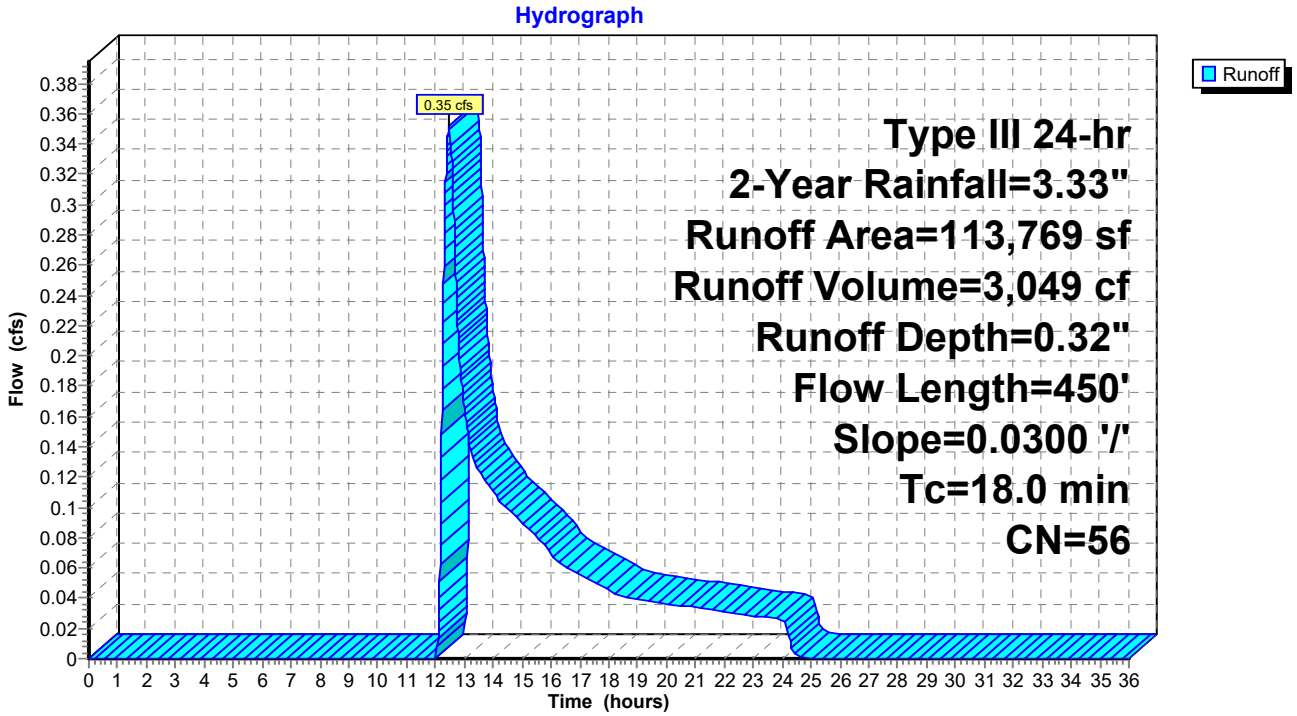
Runoff = 0.35 cfs @ 12.46 hrs, Volume= 3,049 cf, Depth= 0.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.33"

Area (sf)	CN	Description
2,613	98	Paved parking, HSG B
111,156	55	Woods, Good, HSG B
113,769	56	Weighted Average
111,156		97.70% Pervious Area
2,613		2.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
7.7	400	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.0	450	Total			

Subcatchment EX1:



Summary for Subcatchment EX2:

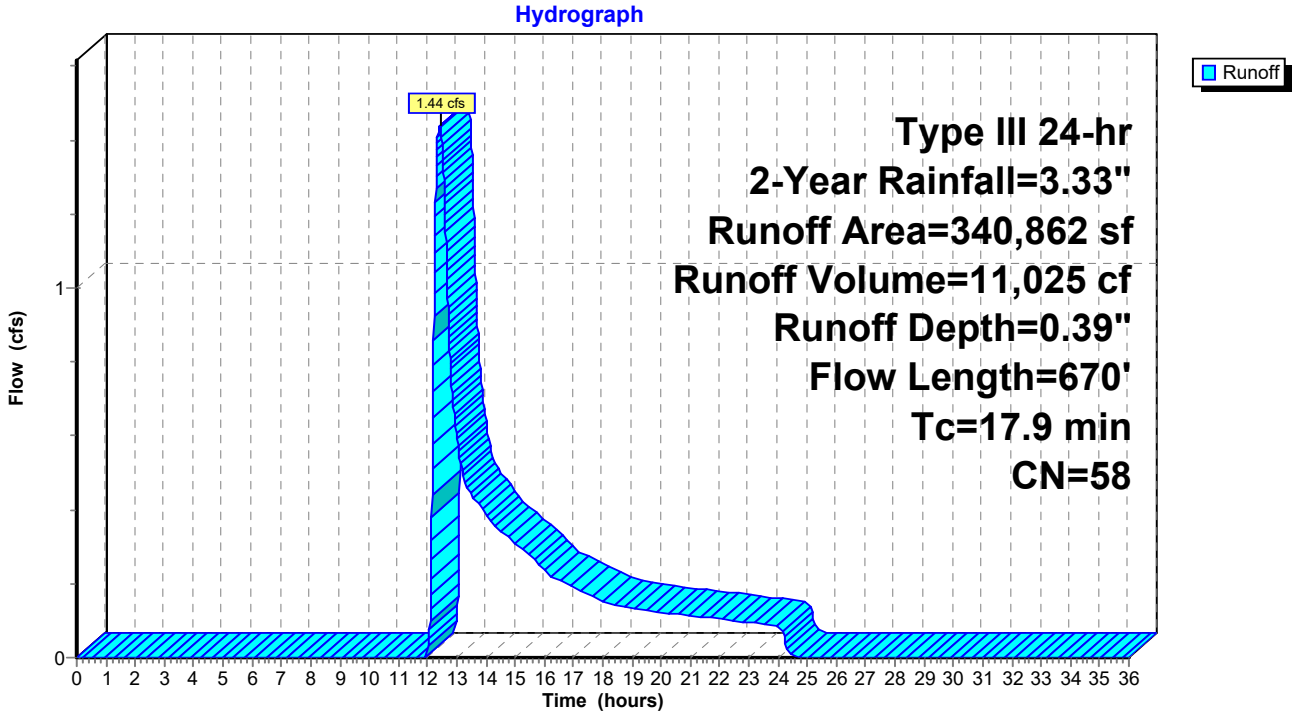
Runoff = 1.44 cfs @ 12.42 hrs, Volume= 11,025 cf, Depth= 0.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.33"

Area (sf)	CN	Description
9,518	98	Paved parking, HSG B
6,289	98	Roofs, HSG B
56,980	61	>75% Grass cover, Good, HSG B
268,075	55	Woods, Good, HSG B
340,862	58	Weighted Average
325,055		95.36% Pervious Area
15,807		4.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
3.5	305	0.0860	1.47		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.6	315	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.9	670	Total			

Subcatchment EX2:

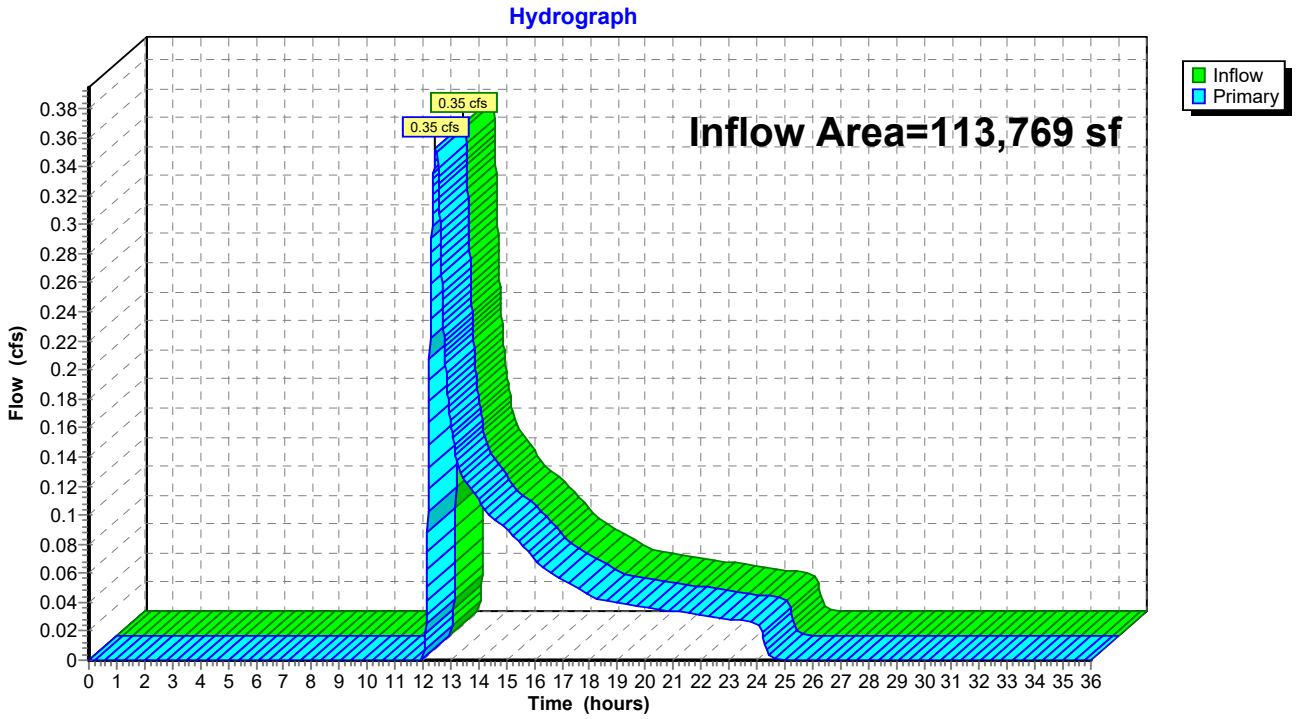


Summary for Link DP1: West Abutters

Inflow Area = 113,769 sf, 2.30% Impervious, Inflow Depth = 0.32" for 2-Year event
Inflow = 0.35 cfs @ 12.46 hrs, Volume= 3,049 cf
Primary = 0.35 cfs @ 12.46 hrs, Volume= 3,049 cf, Atten= 0%, Lag= 0.0 min

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

Link DP1: West Abutters

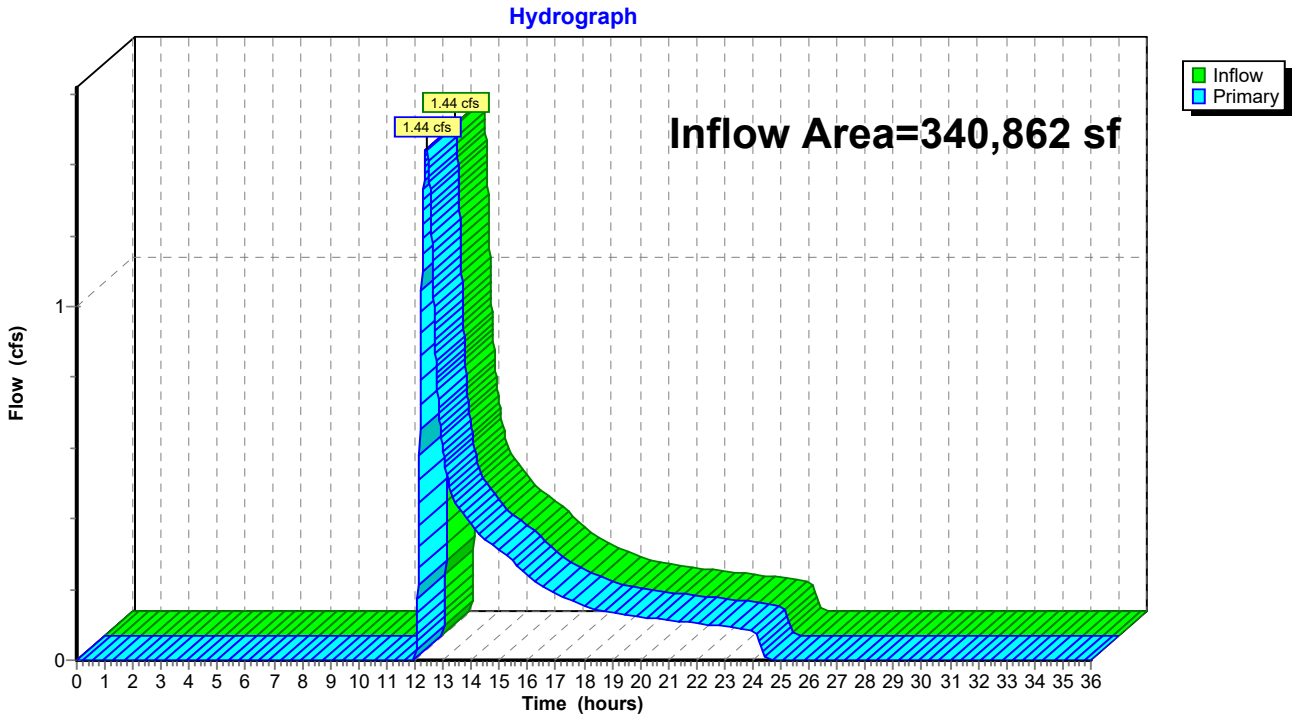


Summary for Link DP2: Fuller Brook

Inflow Area = 340,862 sf, 4.64% Impervious, Inflow Depth = 0.39" for 2-Year event
Inflow = 1.44 cfs @ 12.42 hrs, Volume= 11,025 cf
Primary = 1.44 cfs @ 12.42 hrs, Volume= 11,025 cf, Atten= 0%, Lag= 0.0 min

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

Link DP2: Fuller Brook



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

SubcatchmentEX1: Runoff Area=113,769 sf 2.30% Impervious Runoff Depth=1.15"
Flow Length=450' Slope=0.0300 '/' Tc=18.0 min CN=56 Runoff=2.08 cfs 10,919 cf

SubcatchmentEX2: Runoff Area=340,862 sf 4.64% Impervious Runoff Depth=1.29"
Flow Length=670' Tc=17.9 min CN=58 Runoff=7.26 cfs 36,531 cf

Link DP1: West Abutters Inflow=2.08 cfs 10,919 cf
Primary=2.08 cfs 10,919 cf

Link DP2: Fuller Brook Inflow=7.26 cfs 36,531 cf
Primary=7.26 cfs 36,531 cf

Total Runoff Area = 454,631 sf Runoff Volume = 47,449 cf Average Runoff Depth = 1.25"
95.95% Pervious = 436,211 sf 4.05% Impervious = 18,420 sf

Summary for Subcatchment EX1:

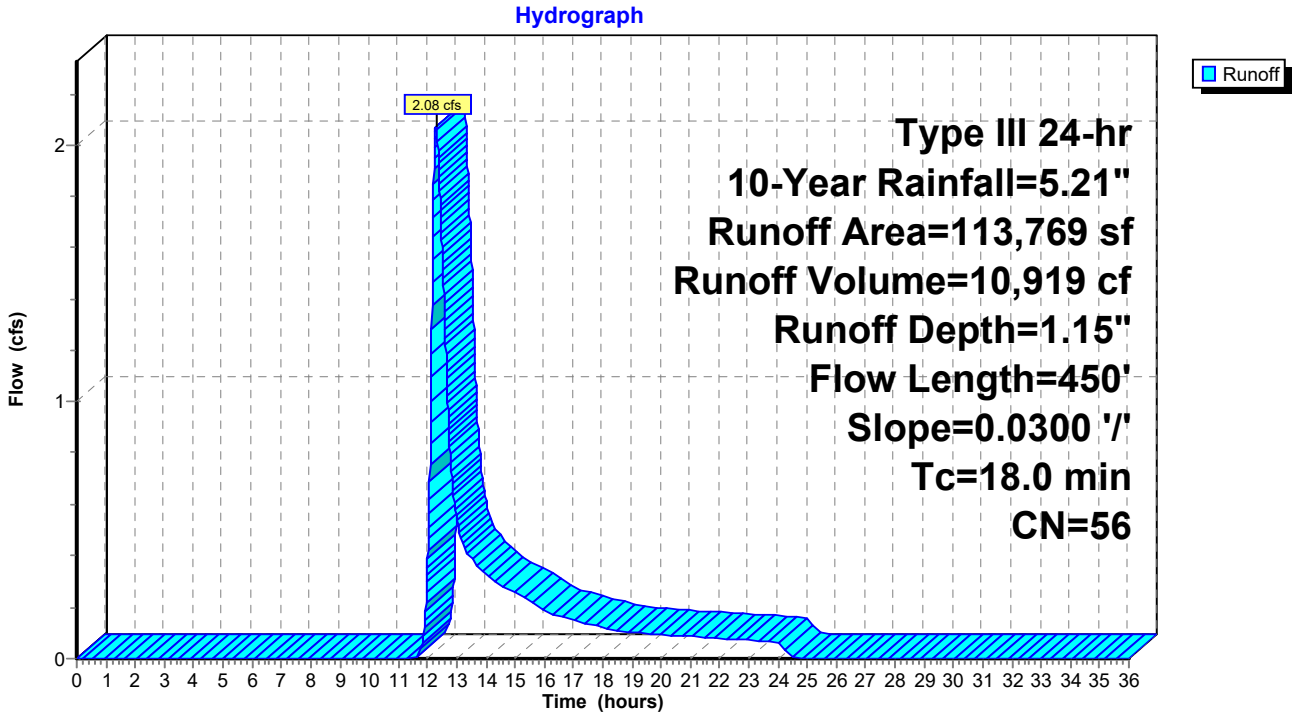
Runoff = 2.08 cfs @ 12.30 hrs, Volume= 10,919 cf, Depth= 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.21"

Area (sf)	CN	Description
2,613	98	Paved parking, HSG B
111,156	55	Woods, Good, HSG B
113,769	56	Weighted Average
111,156		97.70% Pervious Area
2,613		2.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
7.7	400	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.0	450	Total			

Subcatchment EX1:



Summary for Subcatchment EX2:

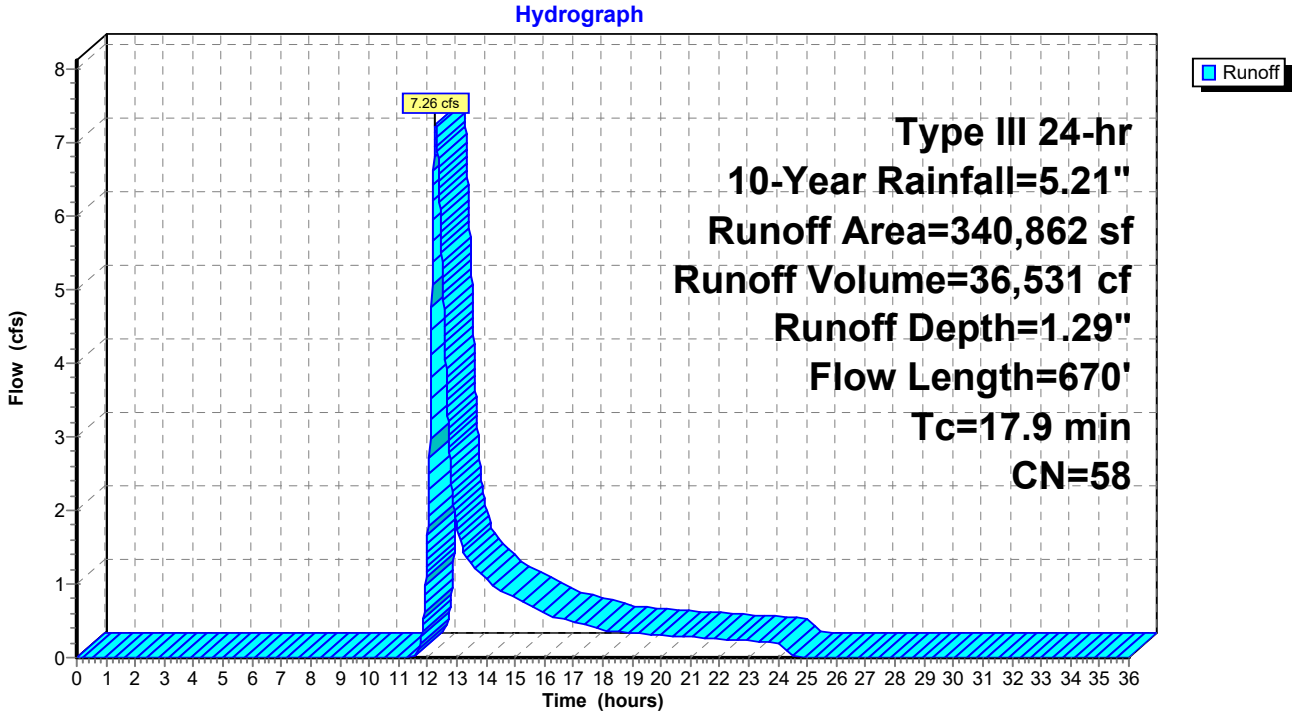
Runoff = 7.26 cfs @ 12.28 hrs, Volume= 36,531 cf, Depth= 1.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.21"

Area (sf)	CN	Description
9,518	98	Paved parking, HSG B
6,289	98	Roofs, HSG B
56,980	61	>75% Grass cover, Good, HSG B
268,075	55	Woods, Good, HSG B
340,862	58	Weighted Average
325,055		95.36% Pervious Area
15,807		4.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
3.5	305	0.0860	1.47		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.6	315	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.9	670	Total			

Subcatchment EX2:

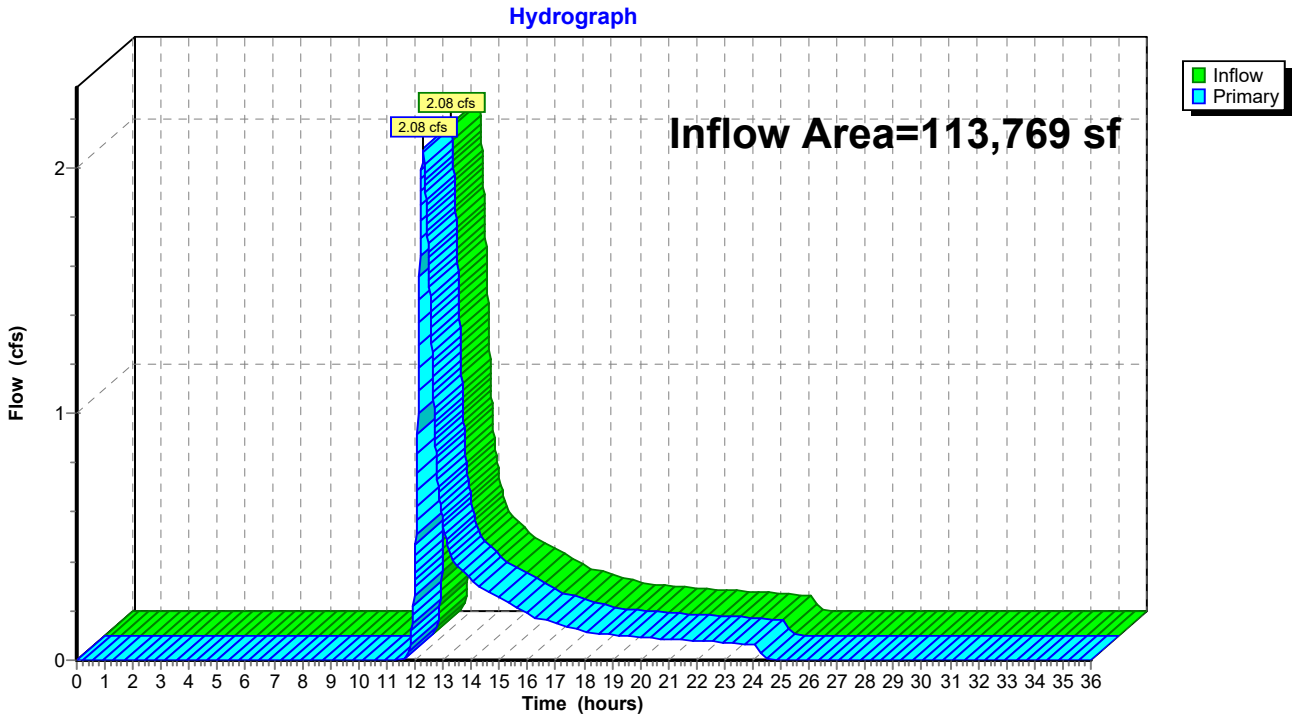


Summary for Link DP1: West Abutters

Inflow Area = 113,769 sf, 2.30% Impervious, Inflow Depth = 1.15" for 10-Year event
Inflow = 2.08 cfs @ 12.30 hrs, Volume= 10,919 cf
Primary = 2.08 cfs @ 12.30 hrs, Volume= 10,919 cf, Atten= 0%, Lag= 0.0 min

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

Link DP1: West Abutters

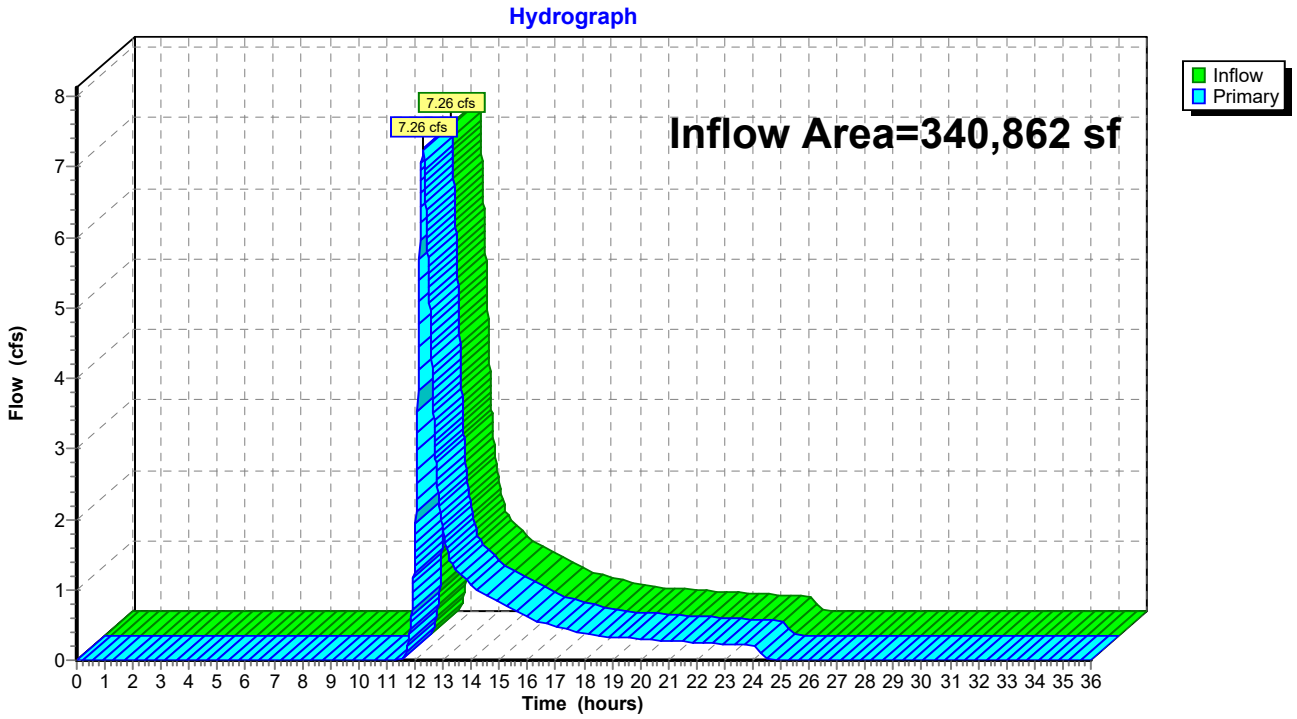


Summary for Link DP2: Fuller Brook

Inflow Area = 340,862 sf, 4.64% Impervious, Inflow Depth = 1.29" for 10-Year event
Inflow = 7.26 cfs @ 12.28 hrs, Volume= 36,531 cf
Primary = 7.26 cfs @ 12.28 hrs, Volume= 36,531 cf, Atten= 0%, Lag= 0.0 min

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

Link DP2: Fuller Brook



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

SubcatchmentEX1: Runoff Area=113,769 sf 2.30% Impervious Runoff Depth=1.83"
Flow Length=450' Slope=0.0300 '/' Tc=18.0 min CN=56 Runoff=3.60 cfs 17,366 cf

SubcatchmentEX2: Runoff Area=340,862 sf 4.64% Impervious Runoff Depth=2.00"
Flow Length=670' Tc=17.9 min CN=58 Runoff=12.12 cfs 56,937 cf

Link DP1: West Abutters Inflow=3.60 cfs 17,366 cf
Primary=3.60 cfs 17,366 cf

Link DP2: Fuller Brook Inflow=12.12 cfs 56,937 cf
Primary=12.12 cfs 56,937 cf

Total Runoff Area = 454,631 sf Runoff Volume = 74,304 cf Average Runoff Depth = 1.96"
95.95% Pervious = 436,211 sf 4.05% Impervious = 18,420 sf

Summary for Subcatchment EX1:

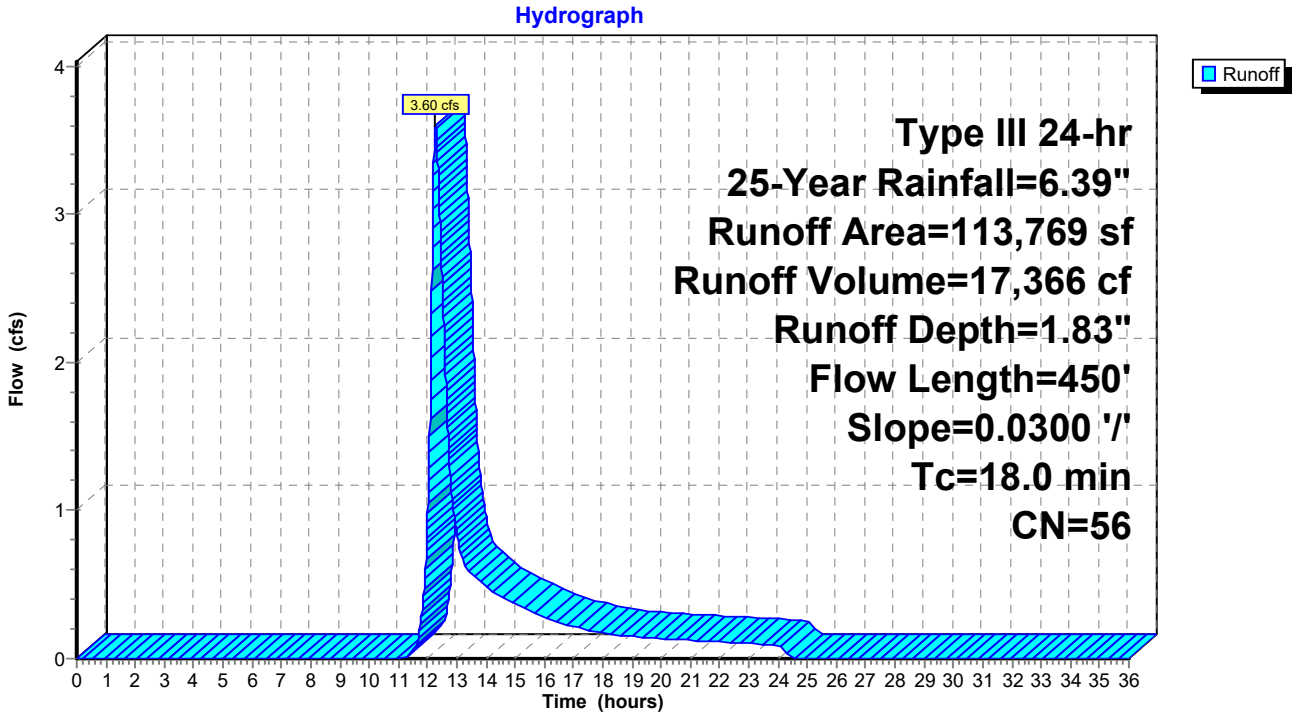
Runoff = 3.60 cfs @ 12.27 hrs, Volume= 17,366 cf, Depth= 1.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.39"

Area (sf)	CN	Description
2,613	98	Paved parking, HSG B
111,156	55	Woods, Good, HSG B
113,769	56	Weighted Average
111,156		97.70% Pervious Area
2,613		2.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
7.7	400	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.0	450	Total			

Subcatchment EX1:



Summary for Subcatchment EX2:

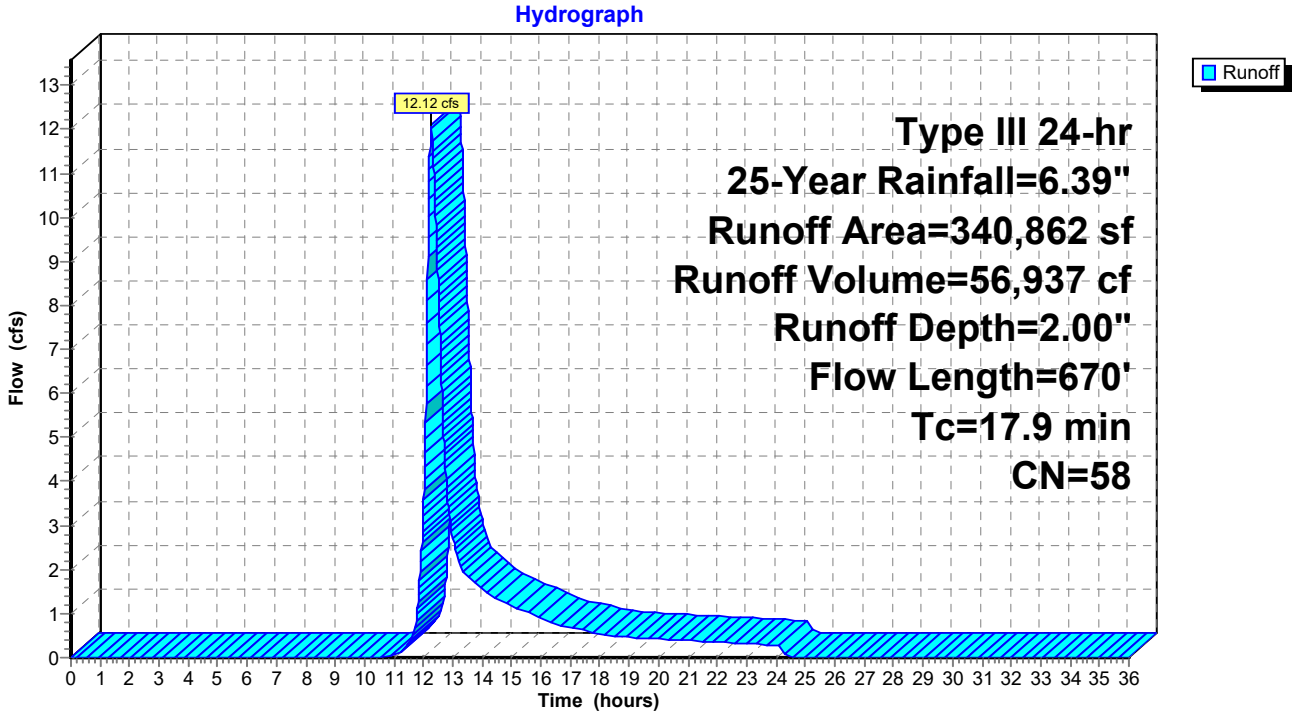
Runoff = 12.12 cfs @ 12.27 hrs, Volume= 56,937 cf, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.39"

Area (sf)	CN	Description
9,518	98	Paved parking, HSG B
6,289	98	Roofs, HSG B
56,980	61	>75% Grass cover, Good, HSG B
268,075	55	Woods, Good, HSG B
340,862	58	Weighted Average
325,055		95.36% Pervious Area
15,807		4.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
3.5	305	0.0860	1.47		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.6	315	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.9	670	Total			

Subcatchment EX2:

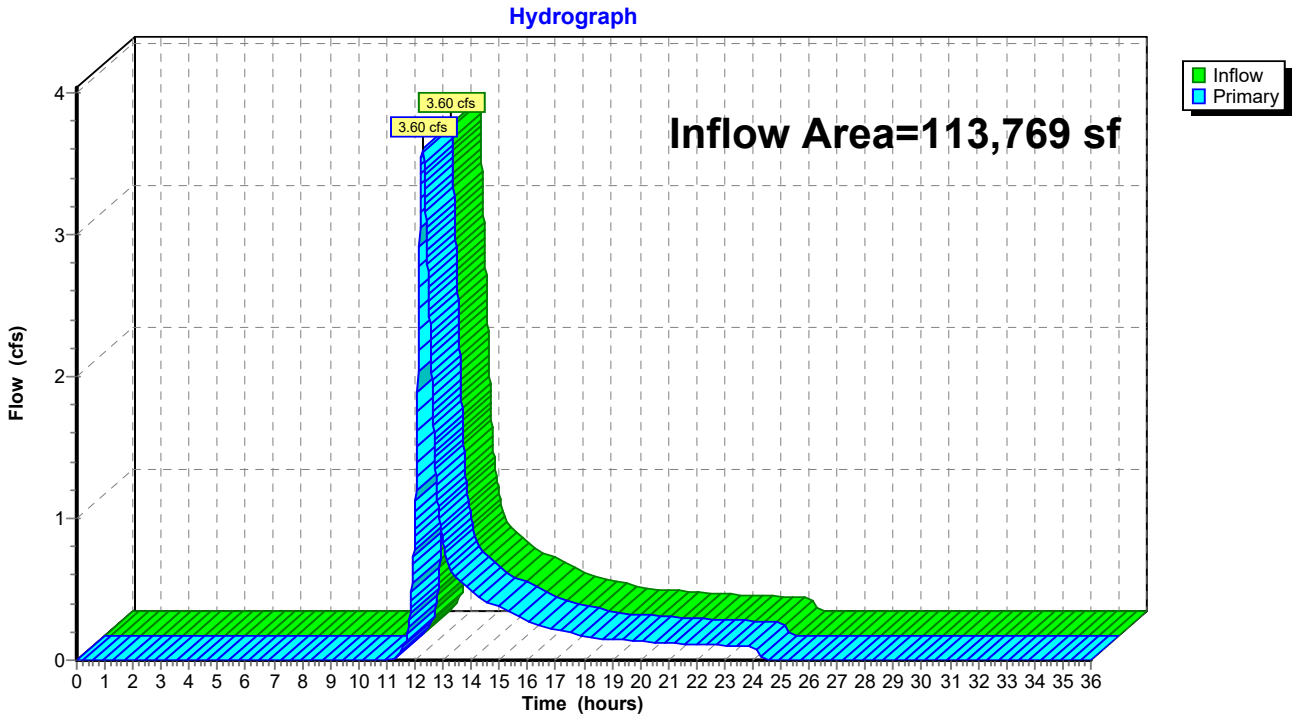


Summary for Link DP1: West Abutters

Inflow Area = 113,769 sf, 2.30% Impervious, Inflow Depth = 1.83" for 25-Year event
Inflow = 3.60 cfs @ 12.27 hrs, Volume= 17,366 cf
Primary = 3.60 cfs @ 12.27 hrs, Volume= 17,366 cf, Atten= 0%, Lag= 0.0 min

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

Link DP1: West Abutters

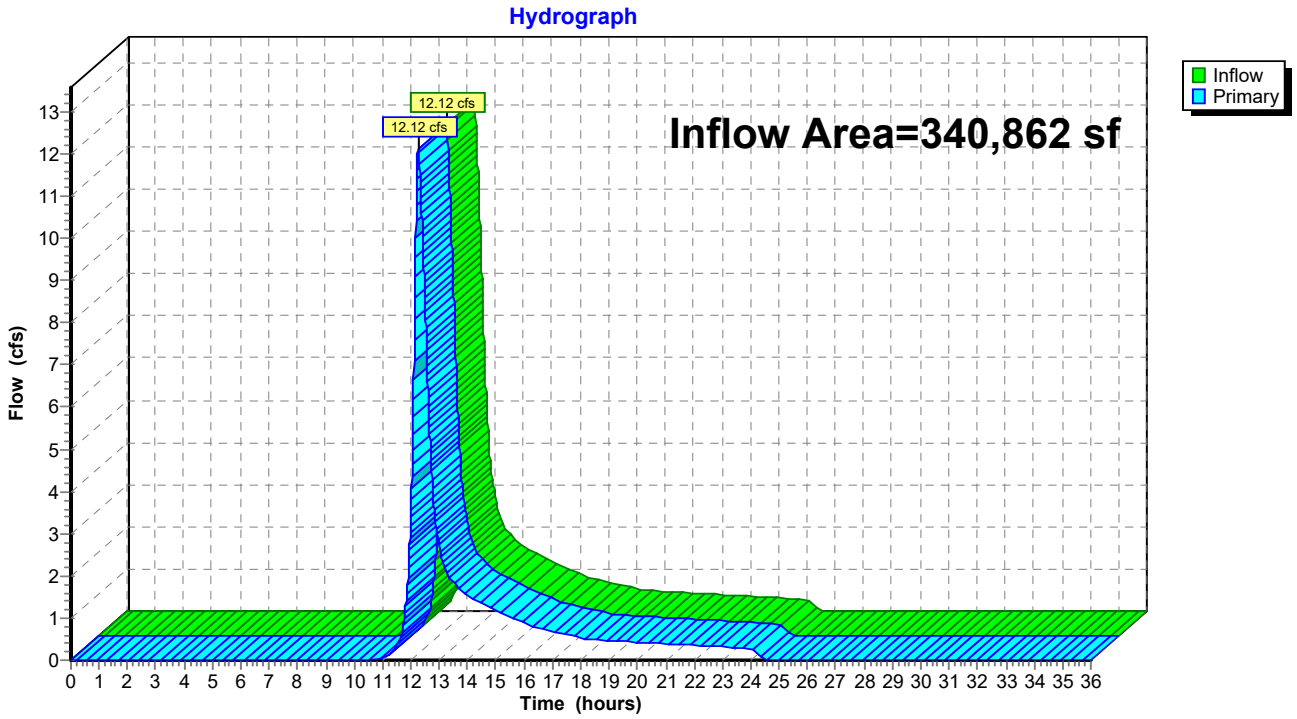


Summary for Link DP2: Fuller Brook

Inflow Area = 340,862 sf, 4.64% Impervious, Inflow Depth = 2.00" for 25-Year event
Inflow = 12.12 cfs @ 12.27 hrs, Volume= 56,937 cf
Primary = 12.12 cfs @ 12.27 hrs, Volume= 56,937 cf, Atten= 0%, Lag= 0.0 min

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

Link DP2: Fuller Brook



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

SubcatchmentEX1: Runoff Area=113,769 sf 2.30% Impervious Runoff Depth=3.03"
Flow Length=450' Slope=0.0300 '/' Tc=18.0 min CN=56 Runoff=6.31 cfs 28,757 cf

SubcatchmentEX2: Runoff Area=340,862 sf 4.64% Impervious Runoff Depth=3.26"
Flow Length=670' Tc=17.9 min CN=58 Runoff=20.52 cfs 92,536 cf

Link DP1: West Abutters Inflow=6.31 cfs 28,757 cf
Primary=6.31 cfs 28,757 cf

Link DP2: Fuller Brook Inflow=20.52 cfs 92,536 cf
Primary=20.52 cfs 92,536 cf

Total Runoff Area = 454,631 sf Runoff Volume = 121,293 cf Average Runoff Depth = 3.20"
95.95% Pervious = 436,211 sf 4.05% Impervious = 18,420 sf

Summary for Subcatchment EX1:

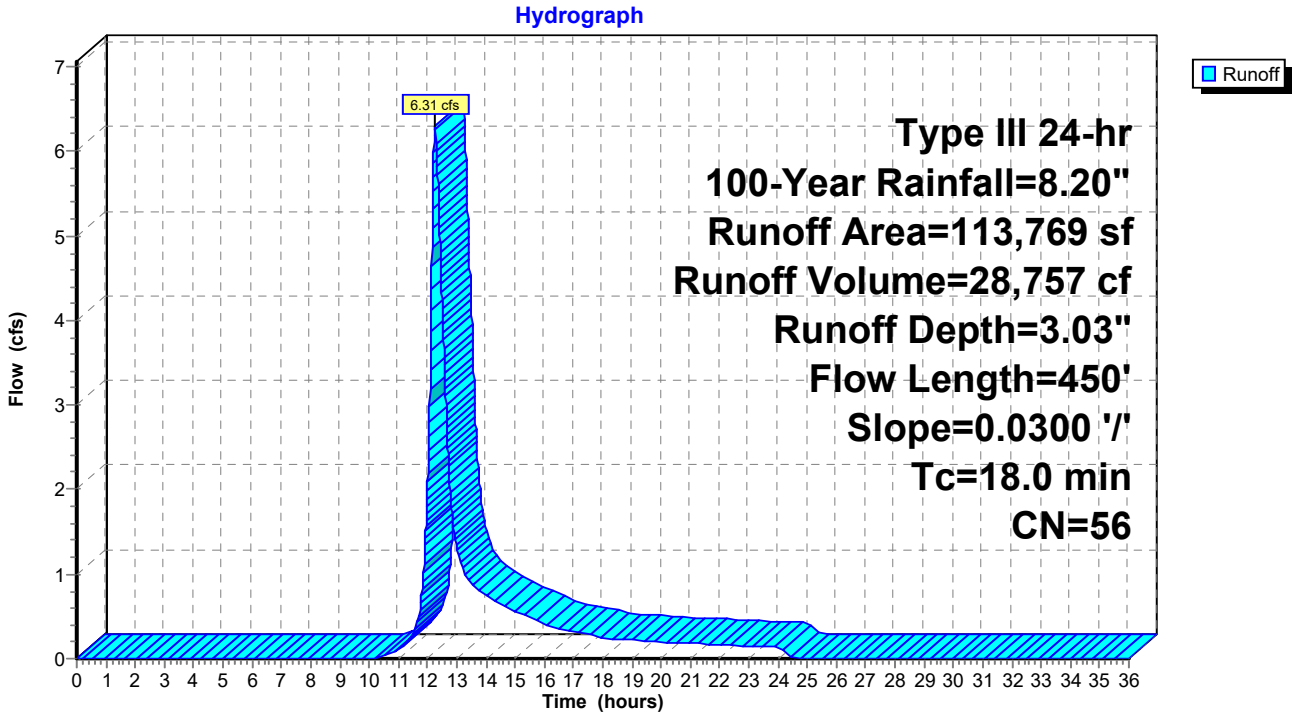
Runoff = 6.31 cfs @ 12.26 hrs, Volume= 28,757 cf, Depth= 3.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.20"

Area (sf)	CN	Description
2,613	98	Paved parking, HSG B
111,156	55	Woods, Good, HSG B
113,769	56	Weighted Average
111,156		97.70% Pervious Area
2,613		2.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
7.7	400	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
18.0	450	Total			

Subcatchment EX1:



Summary for Subcatchment EX2:

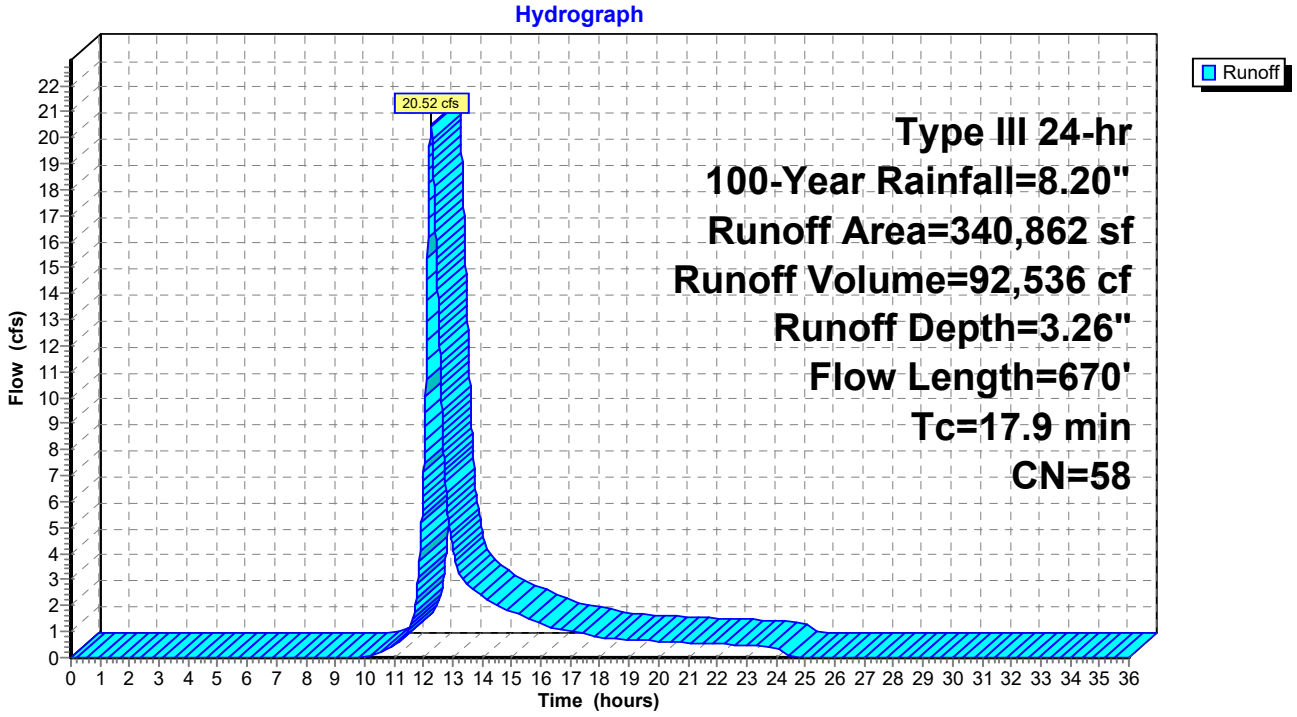
Runoff = 20.52 cfs @ 12.26 hrs, Volume= 92,536 cf, Depth= 3.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.20"

Area (sf)	CN	Description
9,518	98	Paved parking, HSG B
6,289	98	Roofs, HSG B
56,980	61	>75% Grass cover, Good, HSG B
268,075	55	Woods, Good, HSG B
340,862	58	Weighted Average
325,055		95.36% Pervious Area
15,807		4.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	50	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
3.5	305	0.0860	1.47		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.6	315	0.0250	0.79		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
17.9	670	Total			

Subcatchment EX2:

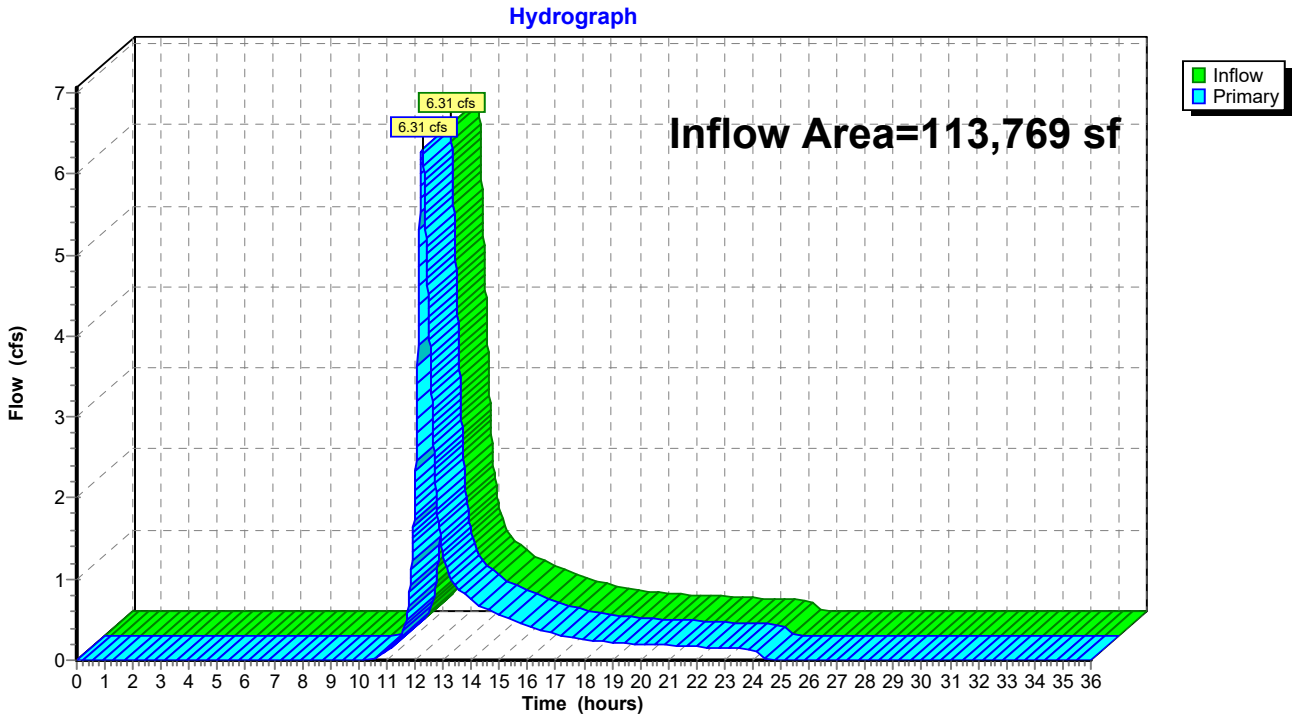


Summary for Link DP1: West Abutters

Inflow Area = 113,769 sf, 2.30% Impervious, Inflow Depth = 3.03" for 100-Year event
Inflow = 6.31 cfs @ 12.26 hrs, Volume= 28,757 cf
Primary = 6.31 cfs @ 12.26 hrs, Volume= 28,757 cf, Atten= 0%, Lag= 0.0 min

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

Link DP1: West Abutters

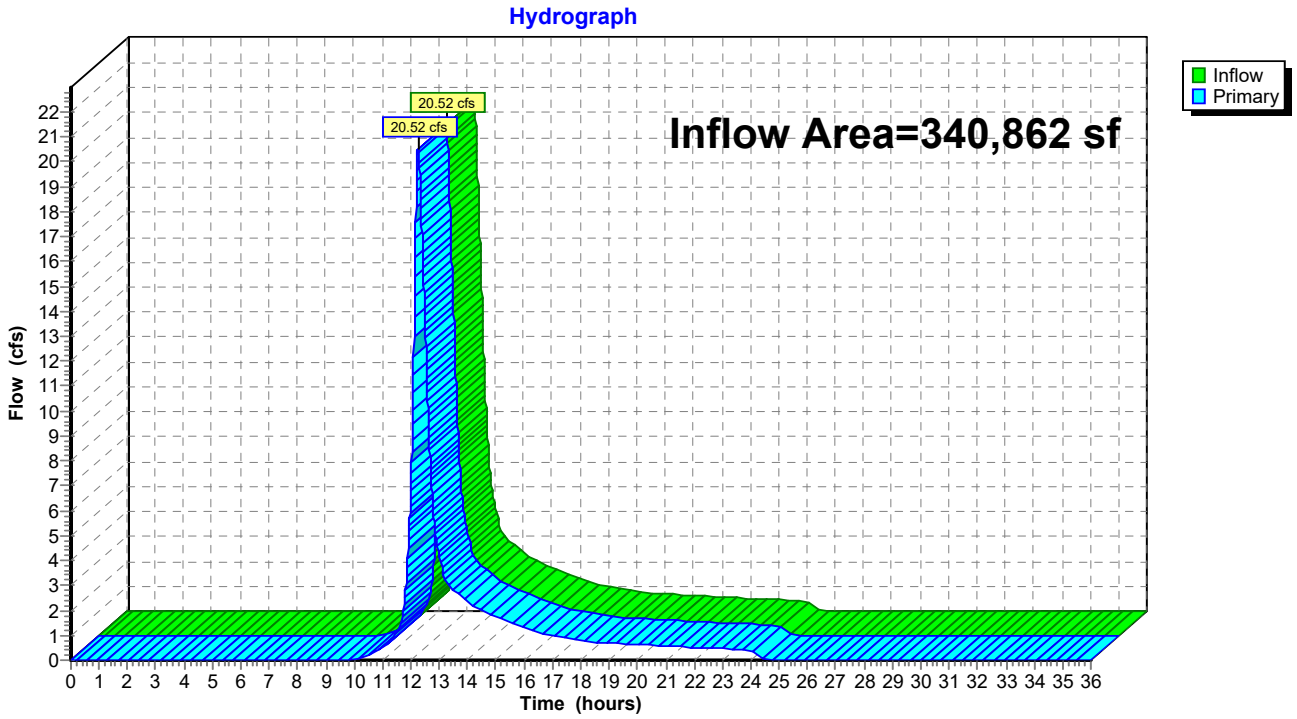


Summary for Link DP2: Fuller Brook

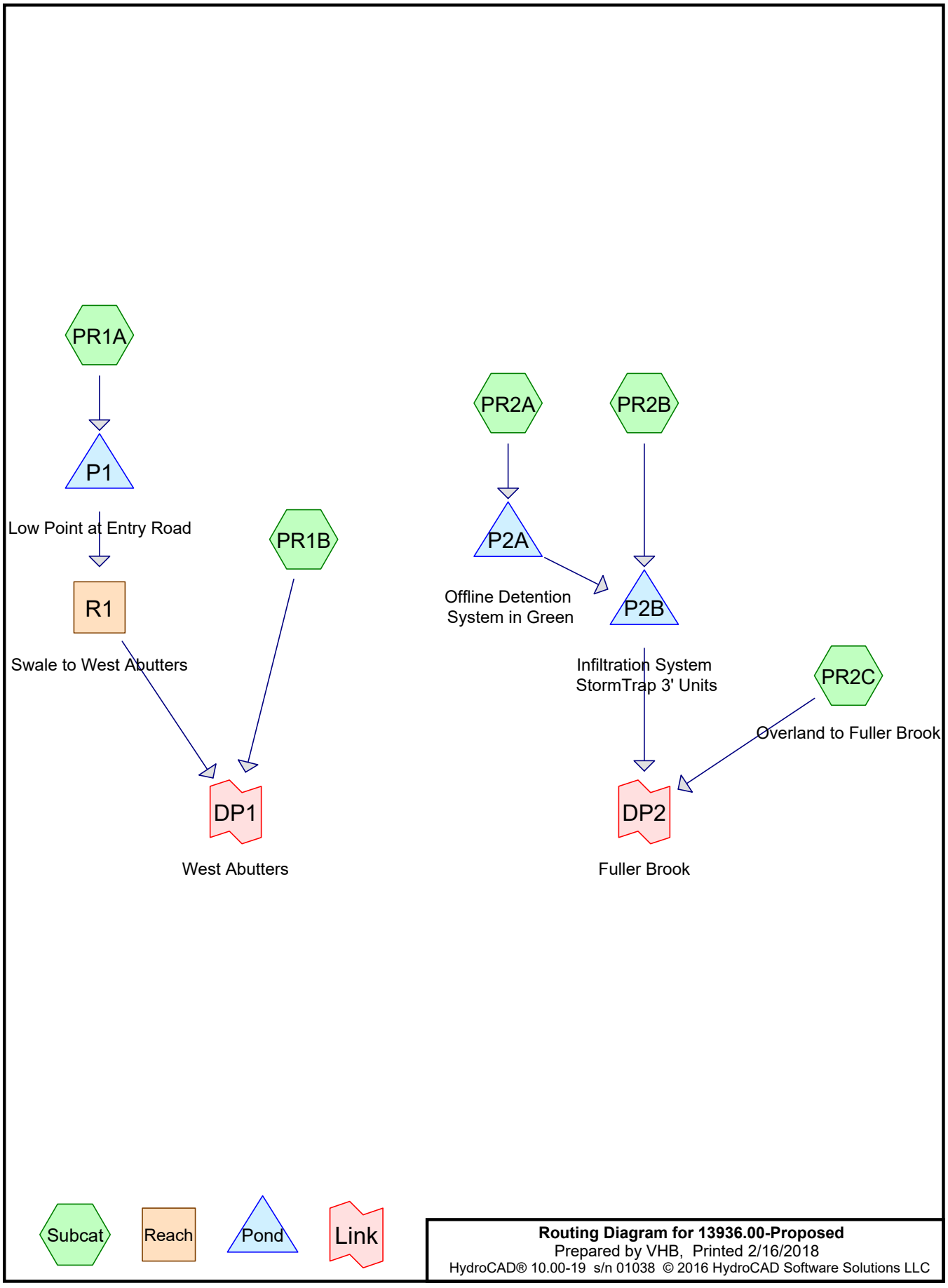
Inflow Area = 340,862 sf, 4.64% Impervious, Inflow Depth = 3.26" for 100-Year event
Inflow = 20.52 cfs @ 12.26 hrs, Volume= 92,536 cf
Primary = 20.52 cfs @ 12.26 hrs, Volume= 92,536 cf, Atten= 0%, Lag= 0.0 min

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

Link DP2: Fuller Brook



HydroCAD Analysis: Proposed Conditions



Routing Diagram for 13936.00-Proposed
Prepared by VHB, Printed 2/16/2018

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
155,450	61	>75% Grass cover, Good, HSG B (PR1A, PR1B, PR2A, PR2B, PR2C)
164,400	98	Paved parking, HSG B (PR1A, PR1B, PR2A, PR2B, PR2C)
134,580	55	Woods, Good, HSG B (PR1A, PR1B, PR2C)
454,430	**73**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
454,430	HSG B	PR1A, PR1B, PR2A, PR2B, PR2C
0	HSG C	
0	HSG D	
0	Other	
454,430		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Su Nu
0	155,450	0	0	0	155,450	>75% Grass cover, Good	
0	164,400	0	0	0	164,400	Paved parking	
0	134,580	0	0	0	134,580	Woods, Good	
0	**454,430**	**0**	**0**	**0**	**454,430**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	PR2B	0.00	0.00	1,080.0	0.0350	0.011	24.0	0.0	0.0
2	P1	171.50	171.40	10.0	0.0100	0.011	12.0	0.0	0.0
3	P2A	161.00	159.90	10.0	0.1100	0.011	24.0	0.0	0.0
4	P2B	143.80	143.70	10.0	0.0100	0.011	15.0	0.0	0.0

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

SubcatchmentPR1A: Runoff Area=18,475 sf 25.98% Impervious Runoff Depth=0.80"
Flow Length=270' Slope=0.0300 '/' Tc=14.5 min CN=68 Runoff=0.26 cfs 1,238 cf

SubcatchmentPR1B: Runoff Area=18,337 sf 25.63% Impervious Runoff Depth=0.80"
Flow Length=200' Slope=0.0300 '/' Tc=12.0 min CN=68 Runoff=0.28 cfs 1,229 cf

SubcatchmentPR2A: Runoff Area=51,327 sf 69.16% Impervious Runoff Depth=2.03"
Tc=5.0 min CN=87 Runoff=2.90 cfs 8,684 cf

SubcatchmentPR2B: Runoff Area=161,136 sf 67.58% Impervious Runoff Depth=1.95"
Flow Length=1,320' Tc=5.5 min CN=86 Runoff=8.60 cfs 26,166 cf

SubcatchmentPR2C: Overland to Fuller Runoff Area=205,155 sf 5.12% Impervious Runoff Depth=0.42"
Flow Length=550' Tc=10.4 min CN=59 Runoff=1.14 cfs 7,240 cf

Reach R1: Swale to West Abutters Avg. Flow Depth=0.02' Max Vel=0.88 fps Inflow=0.20 cfs 746 cf
n=0.022 L=200.0' S=0.0250 '/' Capacity=430.31 cfs Outflow=0.20 cfs 746 cf

Pond P1: Low Point at Entry Road Peak Elev=171.73' Storage=126 cf Inflow=0.26 cfs 1,238 cf
Discarded=0.01 cfs 493 cf Primary=0.20 cfs 746 cf Outflow=0.22 cfs 1,238 cf

Pond P2A: Offline Detention System in Peak Elev=162.45' Storage=2,191 cf Inflow=2.90 cfs 8,684 cf
Outflow=1.04 cfs 8,680 cf

Pond P2B: Infiltration System StormTrap Peak Elev=145.29' Storage=19,468 cf Inflow=9.44 cfs 34,845 cf
Discarded=0.42 cfs 34,845 cf Primary=0.00 cfs 0 cf Outflow=0.42 cfs 34,845 cf

Link DP1: West Abutters Inflow=0.37 cfs 1,975 cf
Primary=0.37 cfs 1,975 cf

Link DP2: Fuller Brook Inflow=1.14 cfs 7,240 cf
Primary=1.14 cfs 7,240 cf

Total Runoff Area = 454,430 sf Runoff Volume = 44,557 cf Average Runoff Depth = 1.18"
63.82% Pervious = 290,030 sf 36.18% Impervious = 164,400 sf

Summary for Subcatchment PR1A:

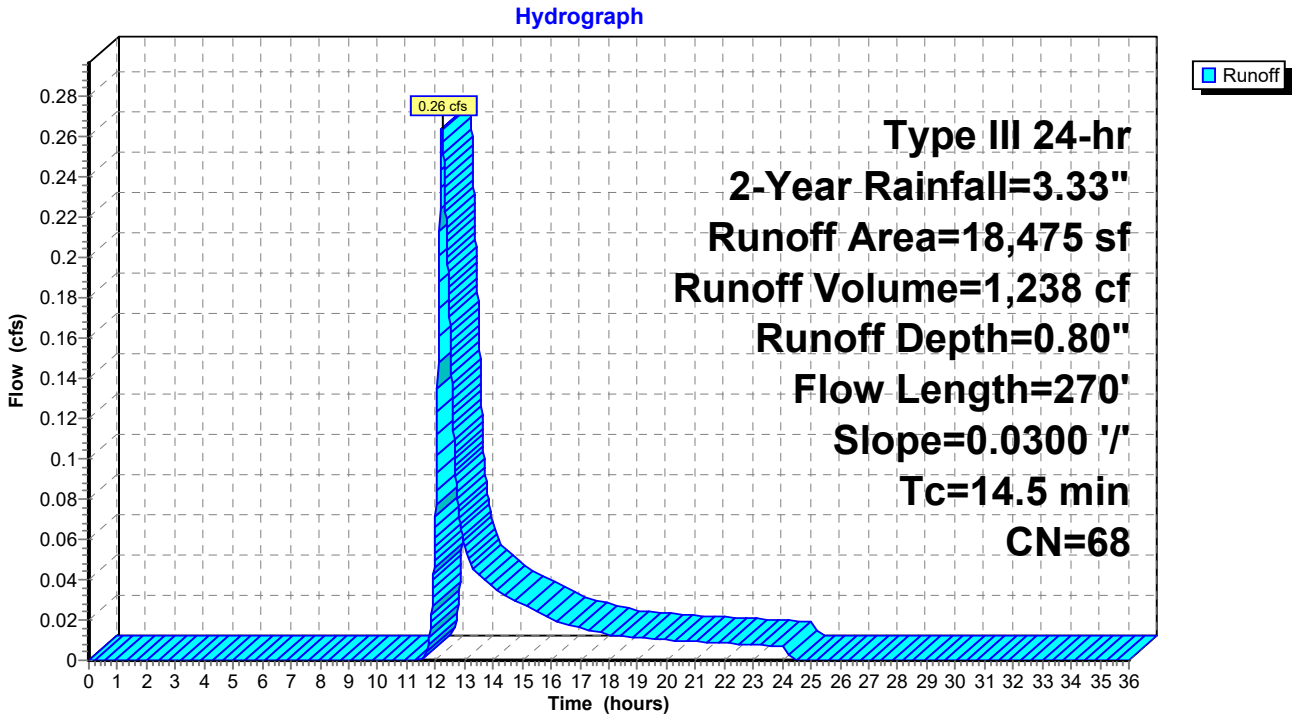
Runoff = 0.26 cfs @ 12.23 hrs, Volume= 1,238 cf, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.33"

Area (sf)	CN	Description
4,800	98	Paved parking, HSG B
8,802	55	Woods, Good, HSG B
4,873	61	>75% Grass cover, Good, HSG B
18,475	68	Weighted Average
13,675		74.02% Pervious Area
4,800		25.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
4.2	220	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.5	270	Total			

Subcatchment PR1A:



Summary for Subcatchment PR1B:

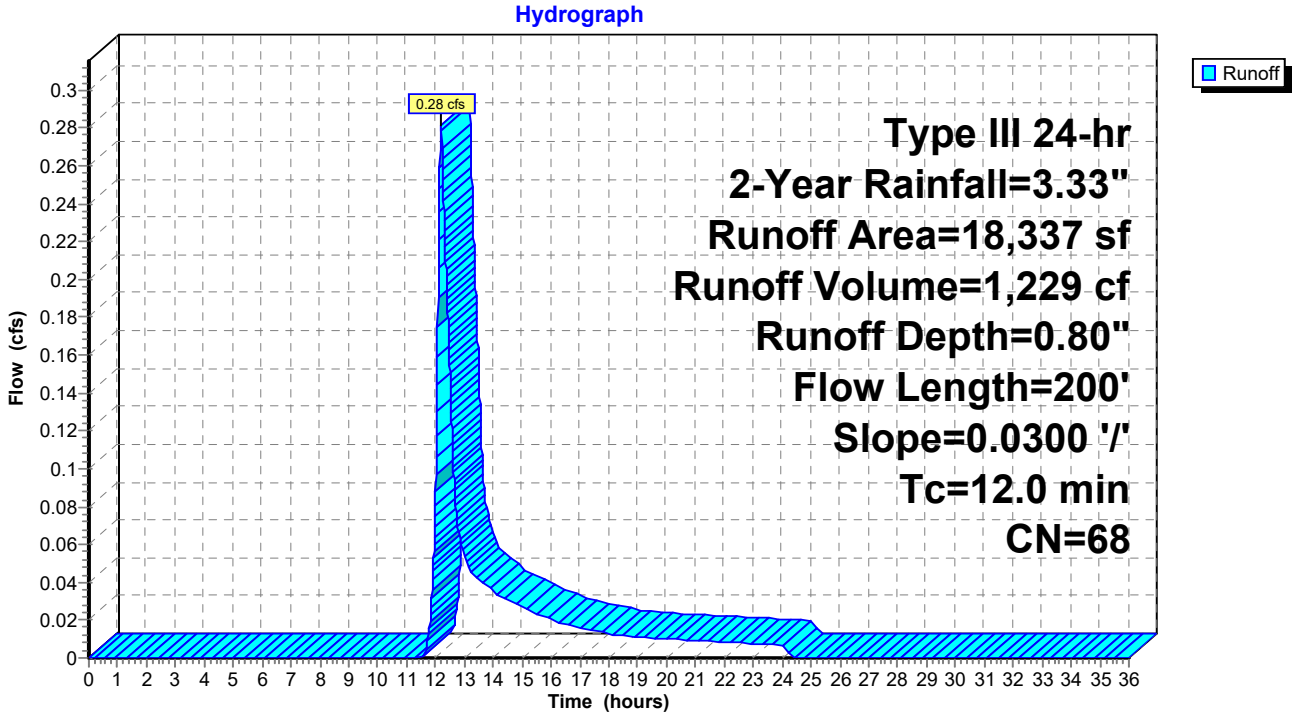
Runoff = 0.28 cfs @ 12.19 hrs, Volume= 1,229 cf, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.33"

Area (sf)	CN	Description
4,700	98	Paved parking, HSG B
6,100	55	Woods, Good, HSG B
7,537	61	>75% Grass cover, Good, HSG B
18,337	68	Weighted Average
13,637		74.37% Pervious Area
4,700		25.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	20	0.0300	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.33"
6.8	30	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
2.9	150	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.0	200	Total			

Subcatchment PR1B:



Summary for Subcatchment PR2A:

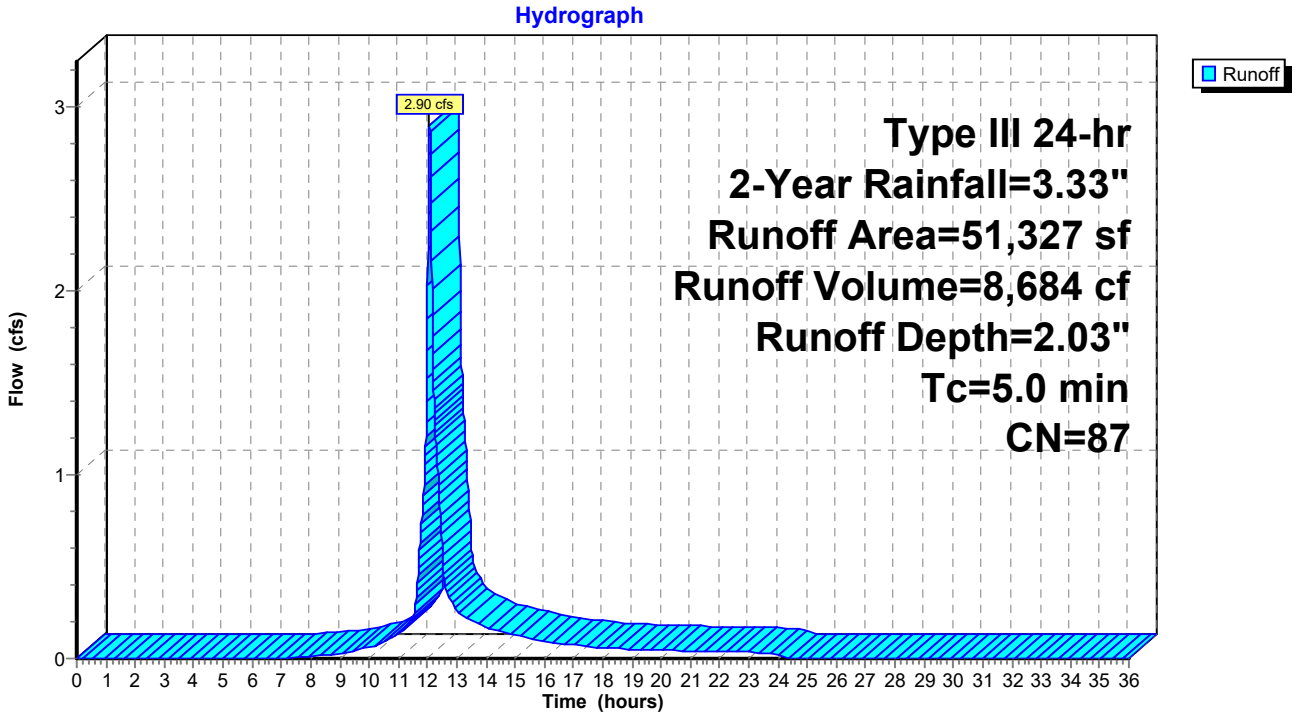
Runoff = 2.90 cfs @ 12.07 hrs, Volume= 8,684 cf, Depth= 2.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.33"

Area (sf)	CN	Description
35,500	98	Paved parking, HSG B
15,827	61	>75% Grass cover, Good, HSG B
51,327	87	Weighted Average
15,827		30.84% Pervious Area
35,500		69.16% Impervious Area

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

Subcatchment PR2A:



Summary for Subcatchment PR2B:

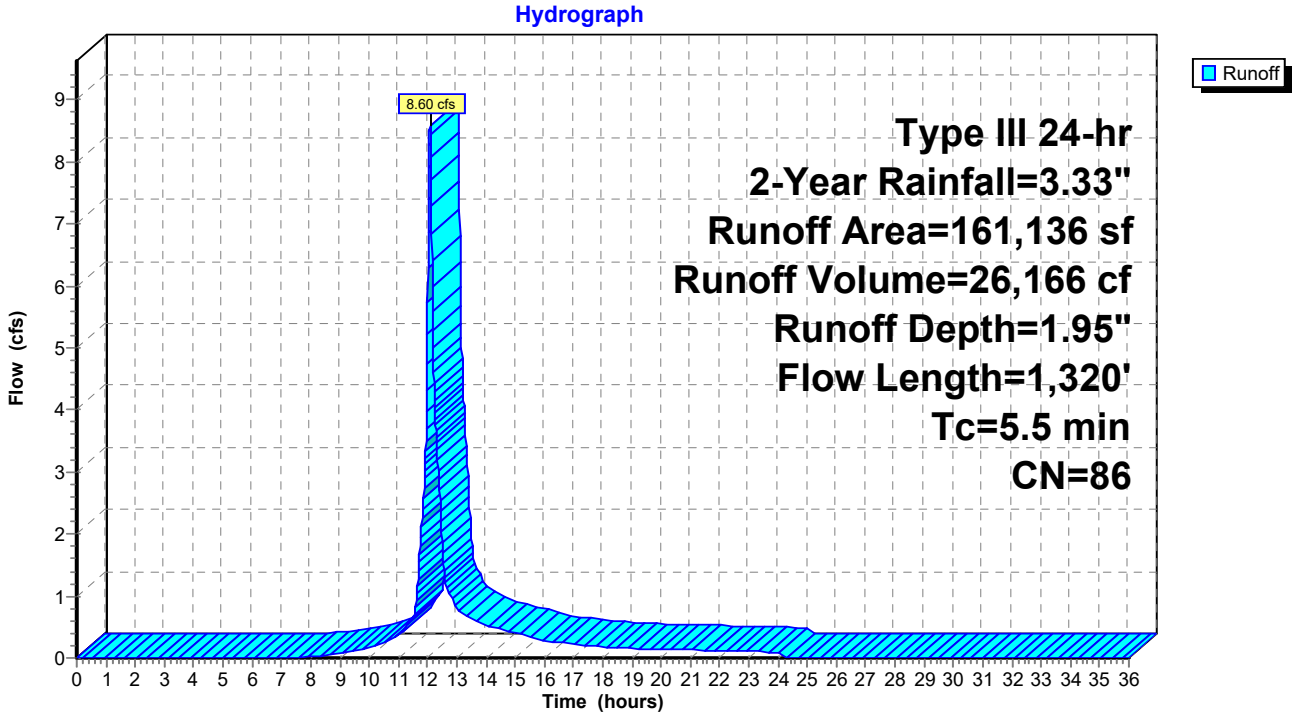
Runoff = 8.60 cfs @ 12.08 hrs, Volume= 26,166 cf, Depth= 1.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.33"

Area (sf)	CN	Description
108,900	98	Paved parking, HSG B
52,236	61	>75% Grass cover, Good, HSG B
161,136	86	Weighted Average
52,236		32.42% Pervious Area
108,900		67.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0600	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.33"
0.8	190	0.0350	3.80		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	1,080	0.0350	15.92	50.02	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011
5.5	1,320	Total			

Subcatchment PR2B:



Summary for Subcatchment PR2C: Overland to Fuller Brook

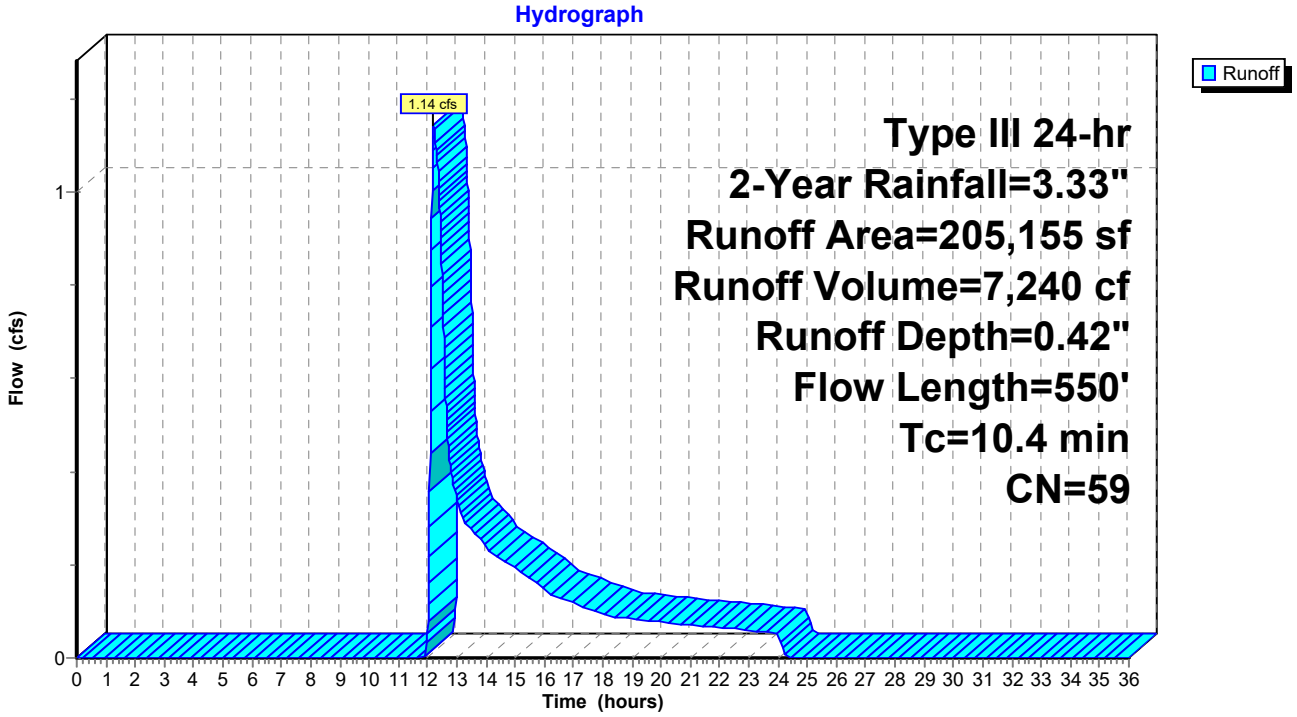
Runoff = 1.14 cfs @ 12.21 hrs, Volume= 7,240 cf, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.33"

Area (sf)	CN	Description
10,500	98	Paved parking, HSG B
74,977	61	>75% Grass cover, Good, HSG B
119,678	55	Woods, Good, HSG B
205,155	59	Weighted Average
194,655		94.88% Pervious Area
10,500		5.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0600	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.33"
1.5	150	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.3	350	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.4	550	Total			

Subcatchment PR2C: Overland to Fuller Brook



Summary for Reach R1: Swale to West Abutters

Inflow Area = 18,475 sf, 25.98% Impervious, Inflow Depth = 0.48" for 2-Year event
Inflow = 0.20 cfs @ 12.36 hrs, Volume= 746 cf
Outflow = 0.20 cfs @ 12.48 hrs, Volume= 746 cf, Atten= 2%, Lag= 6.9 min

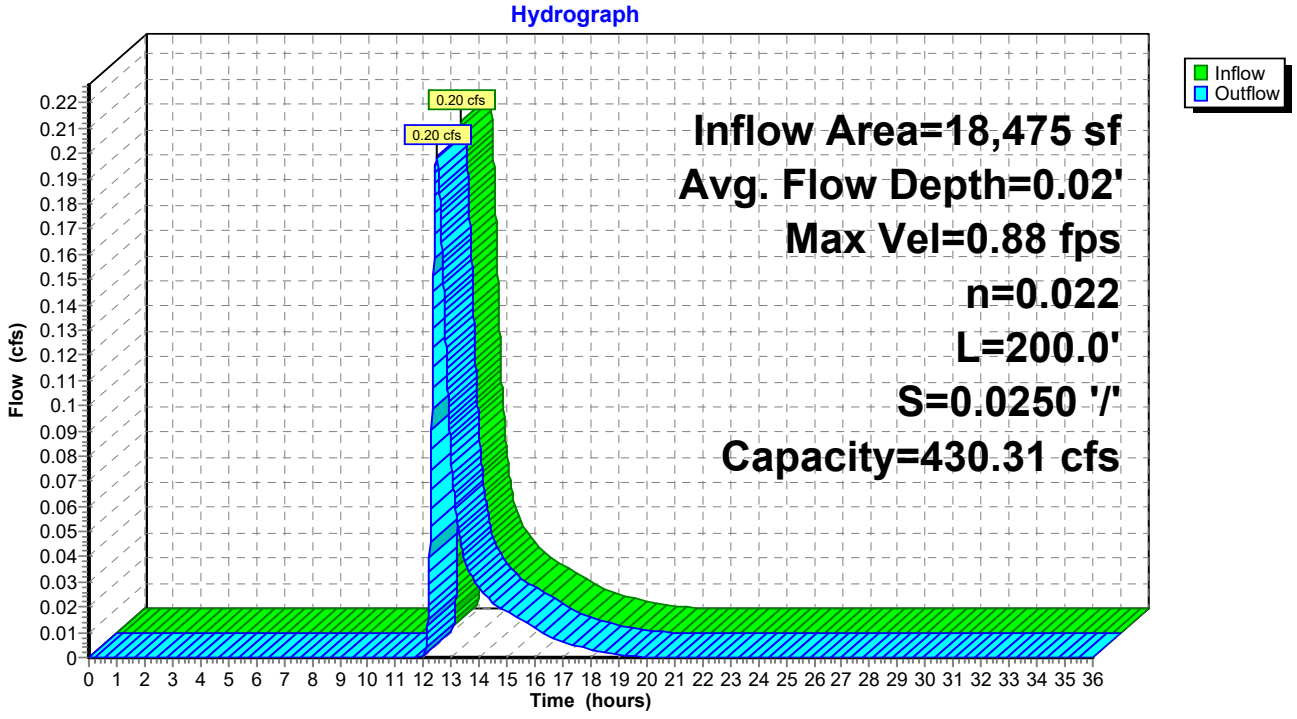
Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.88 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 0.78 fps, Avg. Travel Time= 4.2 min

Peak Storage= 45 cf @ 12.41 hrs
Average Depth at Peak Storage= 0.02'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 430.31 cfs

10.00' x 2.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 '/' Top Width= 22.00'
Length= 200.0' Slope= 0.0250 '/'
Inlet Invert= 169.00', Outlet Invert= 164.00'

‡

Reach R1: Swale to West Abutters



Summary for Pond P1: Low Point at Entry Road

Inflow Area = 18,475 sf, 25.98% Impervious, Inflow Depth = 0.80" for 2-Year event
Inflow = 0.26 cfs @ 12.23 hrs, Volume= 1,238 cf
Outflow = 0.22 cfs @ 12.36 hrs, Volume= 1,238 cf, Atten= 18%, Lag= 8.1 min
Discarded = 0.01 cfs @ 12.36 hrs, Volume= 493 cf
Primary = 0.20 cfs @ 12.36 hrs, Volume= 746 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 171.73' @ 12.36 hrs Surf.Area= 626 sf Storage= 126 cf

Plug-Flow detention time= 13.1 min calculated for 1,238 cf (100% of inflow)
Center-of-Mass det. time= 13.1 min (900.9 - 887.8)

Volume	Invert	Avail.Storage	Storage Description
#1	171.50'	1,113 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

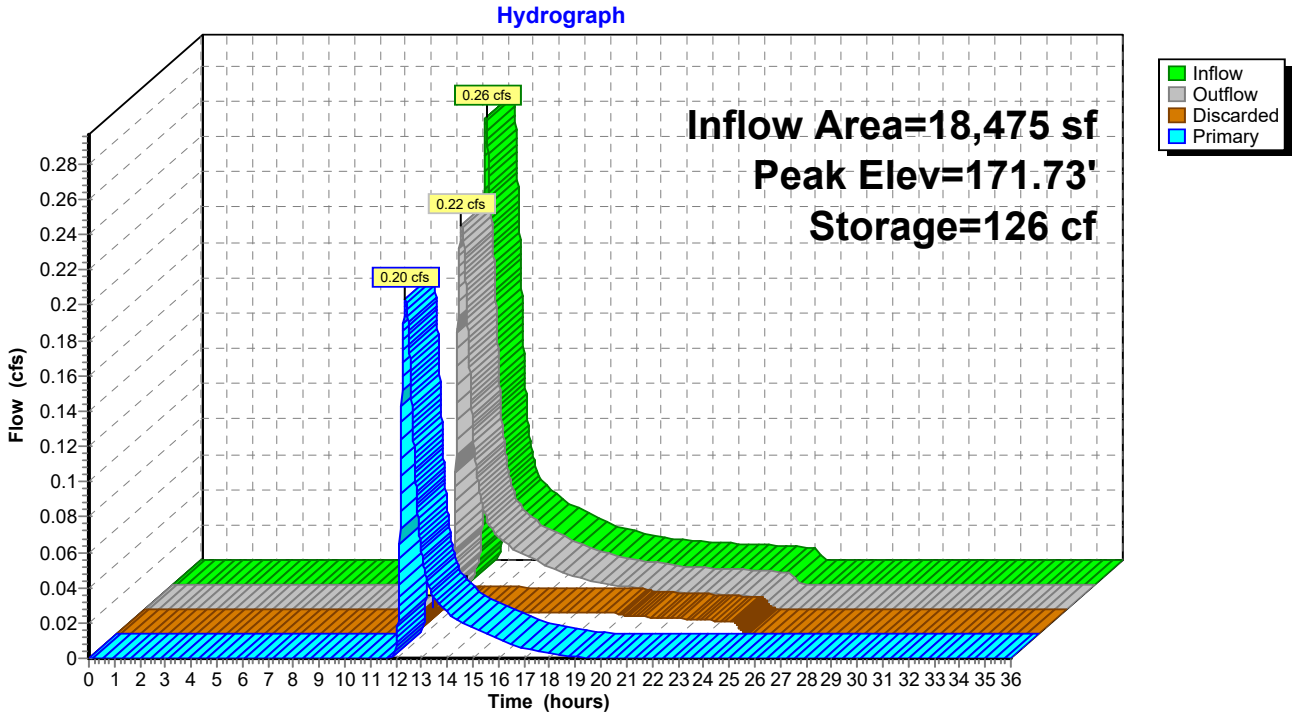
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
171.50	482	0	0
172.00	800	321	321
172.50	2,370	793	1,113

Device	Routing	Invert	Outlet Devices
#1	Discarded	171.50'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	171.50'	**12.0" Round Culvert** L= 10.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 171.50' / 171.40' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Discarded OutFlow Max=0.01 cfs @ 12.36 hrs HW=171.73' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.20 cfs @ 12.36 hrs HW=171.73' (Free Discharge)
↑—**2=Culvert** (Barrel Controls 0.20 cfs @ 2.29 fps)

Pond P1: Low Point at Entry Road



Summary for Pond P2A: Offline Detention System in Green

Inflow Area = 51,327 sf, 69.16% Impervious, Inflow Depth = 2.03" for 2-Year event
Inflow = 2.90 cfs @ 12.07 hrs, Volume= 8,684 cf
Outflow = 1.04 cfs @ 12.34 hrs, Volume= 8,680 cf, Atten= 64%, Lag= 16.0 min
Primary = 1.04 cfs @ 12.34 hrs, Volume= 8,680 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 162.45' @ 12.34 hrs Surf.Area= 1,709 sf Storage= 2,191 cf

Plug-Flow detention time= 41.4 min calculated for 8,680 cf (100% of inflow)
Center-of-Mass det. time= 41.1 min (857.3 - 816.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	161.00'	0 cf	**38.75'W x 44.10'L x 3.50'H Field A** 5,982 cf Overall - 5,982 cf Embedded = 0 cf x 40.0% Voids
#2A	161.00'	4,530 cf	**StormTrap SingleTrap 3-0** x 6 Inside #1 Inside= 101.7"W x 36.0"H => 22.99 sf x 15.40'L = 354.0 cf Outside= 101.7"W x 42.0"H => 29.68 sf x 15.40'L = 456.9 cf 3 Rows of 2 Chambers 25.44' x 30.79' Core + 6.66' Border = 38.75' x 44.10' System
		4,530 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	161.00'	**24.0" Round Culvert** L= 10.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 161.00' / 159.90' S= 0.1100 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	161.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	163.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=1.04 cfs @ 12.34 hrs HW=162.45' (Free Discharge)
└**1=Culvert** (Passes 1.04 cfs of 12.52 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 1.04 cfs @ 5.28 fps)
  └**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P2A: Offline Detention System in Green - Chamber Wizard Field A

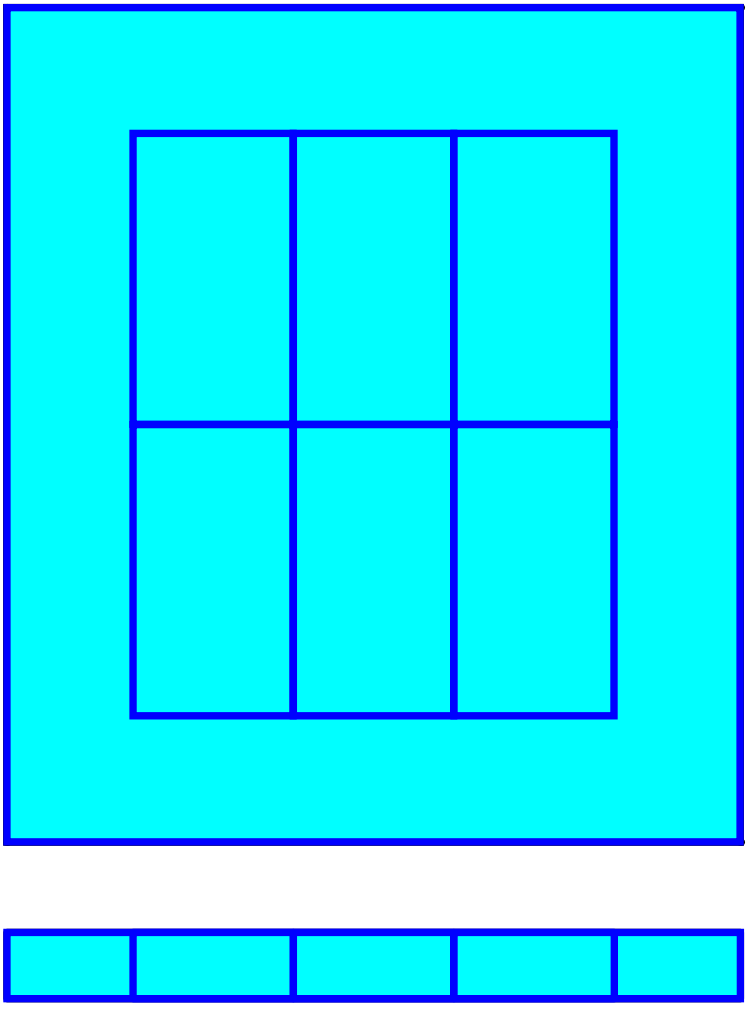
Chamber Model = StormTrap SingleTrap 3-0 (StormTrap ST2 SingleTrap®3'-0" tall Type II + IV)
Inside= 101.7"W x 36.0"H => 22.99 sf x 15.40'L = 354.0 cf
Outside= 101.7"W x 42.0"H => 29.68 sf x 15.40'L = 456.9 cf

2 Chambers/Row x 15.40' Long = 30.79' Row Length +79.9" Border x 2 = 44.10' Base Length
3 Rows x 101.7" Wide + 79.9" Side Border x 2 = 38.75' Base Width
42.0" Chamber Height = 3.50' Field Height

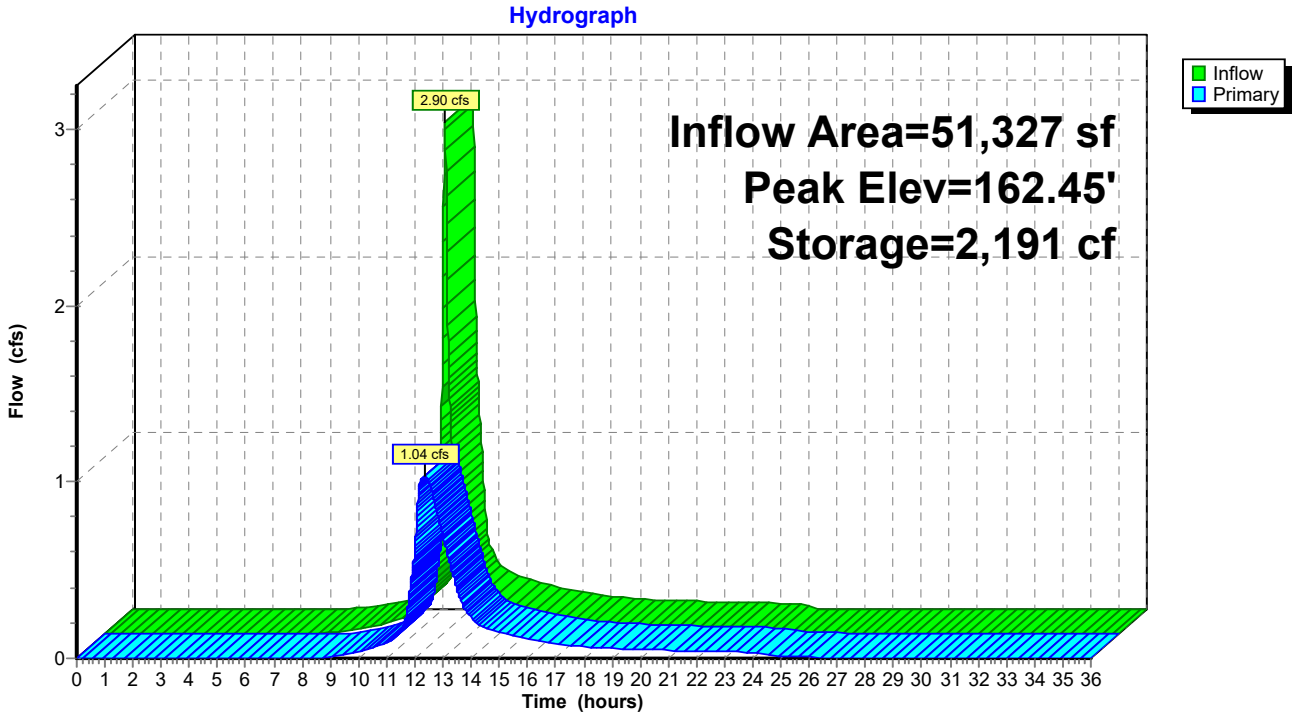
6 Chambers x 354.0 cf + 2,406.0 cf Border = 4,529.9 cf Chamber Storage
6 Chambers x 456.9 cf + 3,240.2 cf Border = 5,981.6 cf Displacement

Chamber Storage = 4,529.9 cf = 0.104 af
Overall Storage Efficiency = 75.7%
Overall System Size = 44.10' x 38.75' x 3.50'

6 Chambers (plus border)
221.5 cy Field



Pond P2A: Offline Detention System in Green



Summary for Pond P2B: Infiltration System StormTrap 3' Units

Inflow Area = 212,463 sf, 67.96% Impervious, Inflow Depth = 1.97" for 2-Year event
Inflow = 9.44 cfs @ 12.08 hrs, Volume= 34,845 cf
Outflow = 0.42 cfs @ 11.09 hrs, Volume= 34,845 cf, Atten= 96%, Lag= 0.0 min
Discarded = 0.42 cfs @ 11.09 hrs, Volume= 34,845 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 145.29' @ 15.81 hrs Surf.Area= 17,920 sf Storage= 19,468 cf

Plug-Flow detention time= 455.7 min calculated for 34,845 cf (100% of inflow)
Center-of-Mass det. time= 455.7 min (1,285.3 - 829.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	143.80'	3,584 cf	**98.10'W x 182.67'L x 4.00'H Field A** 71,681 cf Overall - 62,721 cf Embedded = 8,960 cf x 40.0% Voids
#2A	144.30'	48,192 cf	**StormTrap SingleTrap 3-0** x 110 Inside #1 Inside= 101.7"W x 36.0"H => 22.99 sf x 15.40'L = 354.0 cf Outside= 101.7"W x 42.0"H => 29.68 sf x 15.40'L = 456.9 cf 10 Rows of 11 Chambers 84.79' x 169.35' Core + 6.66' Border = 98.10' x 182.67' System
		51,777 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	143.80'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	143.80'	**15.0" Round Culvert** L= 10.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 143.80' / 143.70' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 1.23 sf
#3	Device 2	146.30'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.42 cfs @ 11.09 hrs HW=143.84' (Free Discharge)
↑└**1=Exfiltration** (Exfiltration Controls 0.42 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=143.80' (Free Discharge)
↑└**2=Culvert** (Controls 0.00 cfs)
↑└**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P2B: Infiltration System StormTrap 3' Units - Chamber Wizard Field A

Chamber Model = StormTrap SingleTrap 3-0 (StormTrap ST2 SingleTrap®3'-0" tall Type II + IV)
Inside= 101.7"W x 36.0"H => 22.99 sf x 15.40'L = 354.0 cf
Outside= 101.7"W x 42.0"H => 29.68 sf x 15.40'L = 456.9 cf

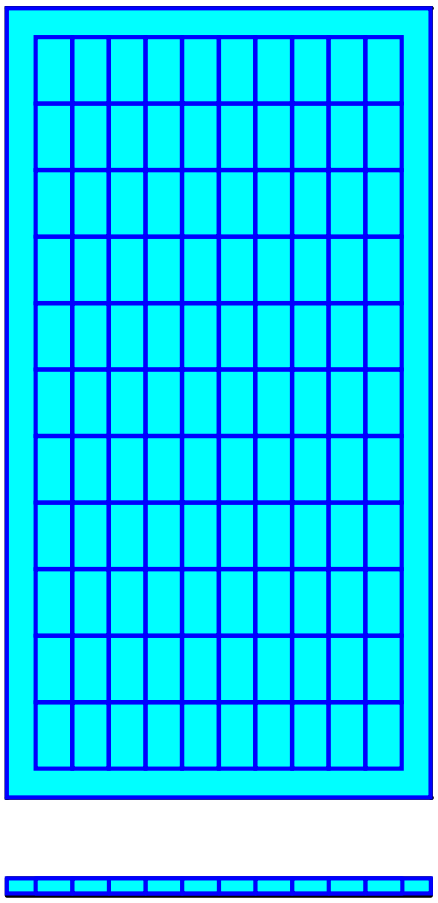
11 Chambers/Row x 15.40' Long = 169.35' Row Length +79.9" Border x 2 = 182.67' Base Length
10 Rows x 101.7" Wide + 79.9" Side Border x 2 = 98.10' Base Width
6.0" Base + 42.0" Chamber Height = 4.00' Field Height

110 Chambers x 354.0 cf + 9,253.4 cf Border = 48,192.5 cf Chamber Storage
110 Chambers x 456.9 cf + 12,461.9 cf Border = 62,721.3 cf Displacement

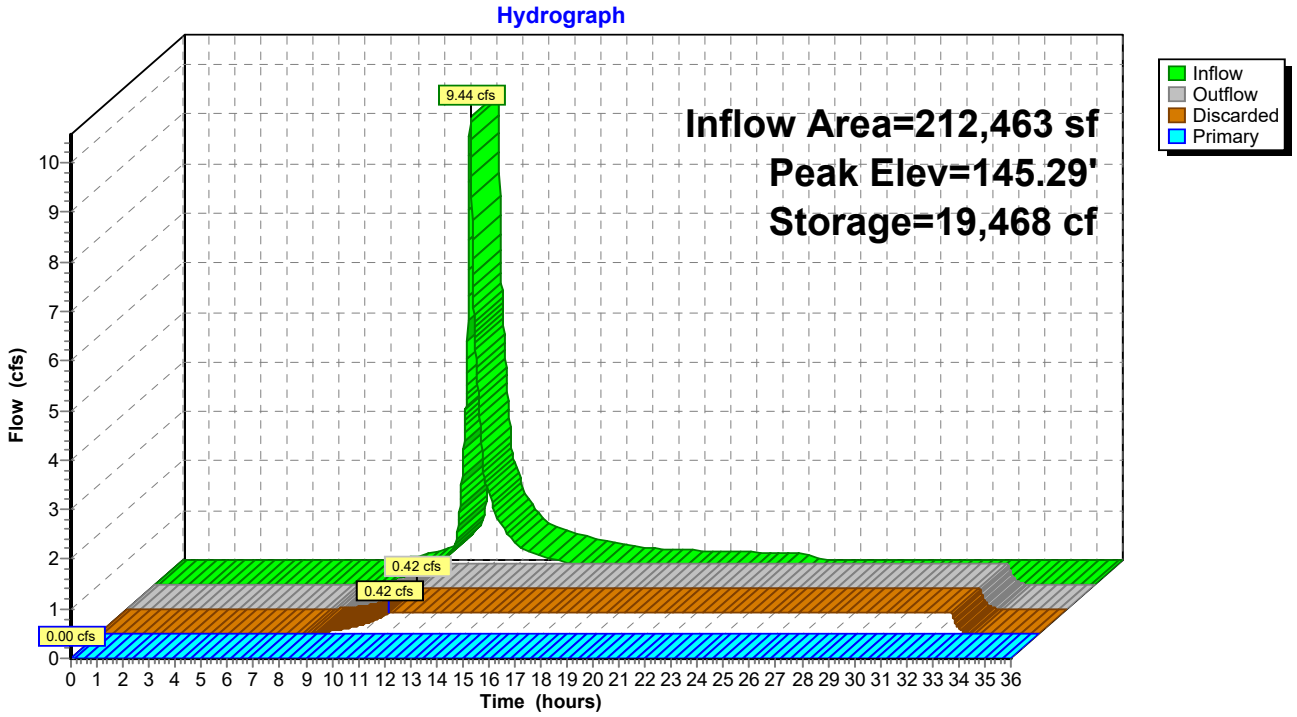
71,681.4 cf Field - 62,721.3 cf Chambers = 8,960.2 cf Stone x 40.0% Voids = 3,584.1 cf Stone Storage

Chamber Storage + Stone Storage = 51,776.5 cf = 1.189 af
Overall Storage Efficiency = 72.2%
Overall System Size = 182.67' x 98.10' x 4.00'

110 Chambers (plus border)
2,654.9 cy Field
331.9 cy Stone



Pond P2B: Infiltration System StormTrap 3' Units

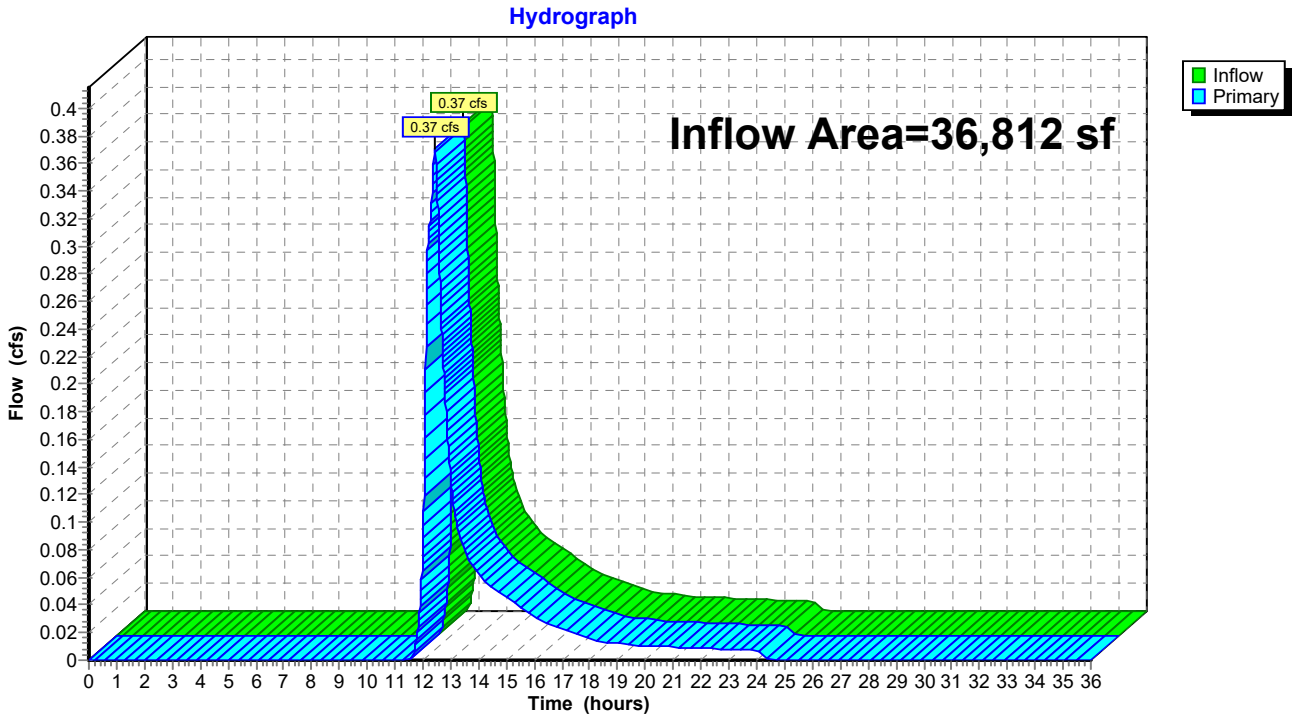


Summary for Link DP1: West Abutters

Inflow Area = 36,812 sf, 25.81% Impervious, Inflow Depth = 0.64" for 2-Year event
Inflow = 0.37 cfs @ 12.42 hrs, Volume= 1,975 cf
Primary = 0.37 cfs @ 12.42 hrs, Volume= 1,975 cf, Atten= 0%, Lag= 0.0 min

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

Link DP1: West Abutters

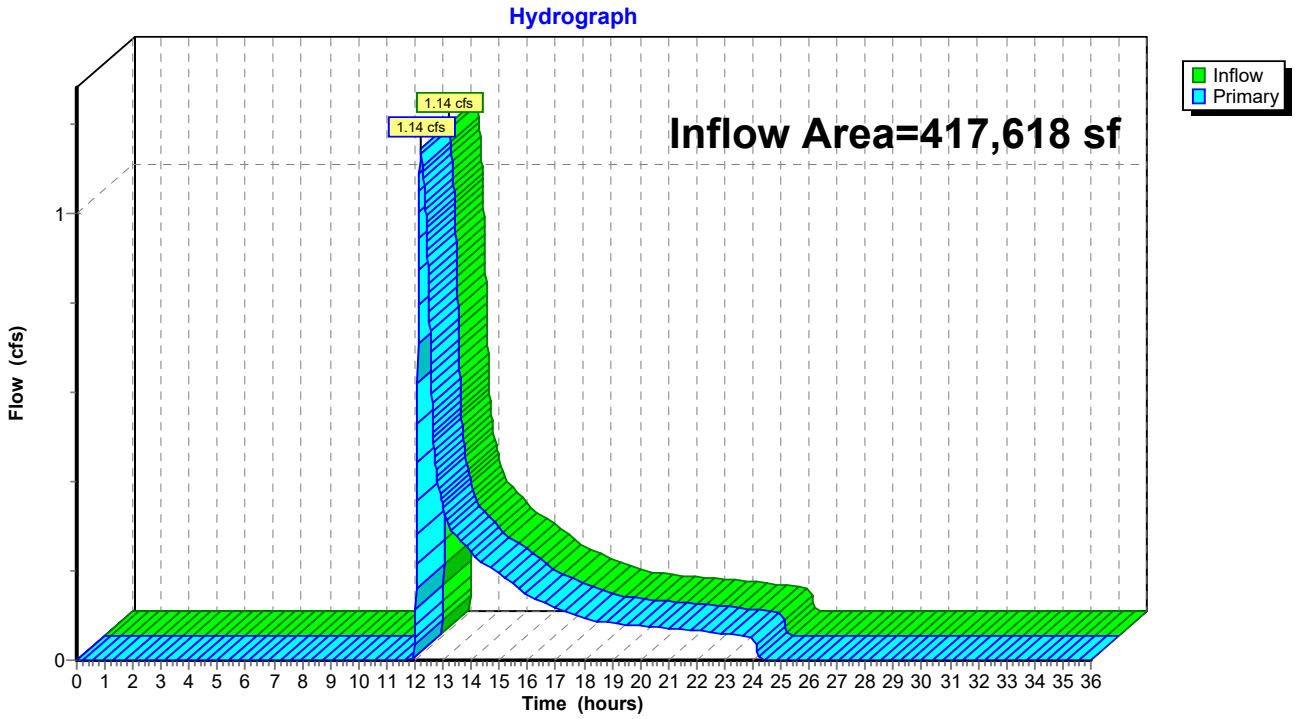


Summary for Link DP2: Fuller Brook

Inflow Area = 417,618 sf, 37.09% Impervious, Inflow Depth = 0.21" for 2-Year event
Inflow = 1.14 cfs @ 12.21 hrs, Volume= 7,240 cf
Primary = 1.14 cfs @ 12.21 hrs, Volume= 7,240 cf, Atten= 0%, Lag= 0.0 min

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

Link DP2: Fuller Brook



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

SubcatchmentPR1A: Runoff Area=18,475 sf 25.98% Impervious Runoff Depth=2.03"
Flow Length=270' Slope=0.0300 '/' Tc=14.5 min CN=68 Runoff=0.75 cfs 3,126 cf

SubcatchmentPR1B: Runoff Area=18,337 sf 25.63% Impervious Runoff Depth=2.03"
Flow Length=200' Slope=0.0300 '/' Tc=12.0 min CN=68 Runoff=0.80 cfs 3,103 cf

SubcatchmentPR2A: Runoff Area=51,327 sf 69.16% Impervious Runoff Depth=3.77"
Tc=5.0 min CN=87 Runoff=5.28 cfs 16,106 cf

SubcatchmentPR2B: Runoff Area=161,136 sf 67.58% Impervious Runoff Depth=3.66"
Flow Length=1,320' Tc=5.5 min CN=86 Runoff=15.92 cfs 49,193 cf

SubcatchmentPR2C: Overland to Fuller Runoff Area=205,155 sf 5.12% Impervious Runoff Depth=1.36"
Flow Length=550' Tc=10.4 min CN=59 Runoff=5.73 cfs 23,167 cf

Reach R1: Swale to West Abutters Avg. Flow Depth=0.05' Max Vel=1.38 fps Inflow=0.65 cfs 2,491 cf
n=0.022 L=200.0' S=0.0250 '/' Capacity=430.31 cfs Outflow=0.64 cfs 2,491 cf

Pond P1: Low Point at Entry Road Peak Elev=171.93' Storage=268 cf Inflow=0.75 cfs 3,126 cf
Discarded=0.02 cfs 635 cf Primary=0.65 cfs 2,491 cf Outflow=0.67 cfs 3,126 cf

Pond P2A: Offline Detention System in Peak Elev=163.30' Storage=3,477 cf Inflow=5.28 cfs 16,106 cf
Outflow=3.50 cfs 16,101 cf

Pond P2B: Infiltration System StormTrap Peak Elev=146.46' Storage=38,218 cf Inflow=17.43 cfs 65,294 cf
Discarded=0.42 cfs 42,145 cf Primary=0.80 cfs 7,872 cf Outflow=1.23 cfs 50,018 cf

Link DP1: West Abutters Inflow=1.21 cfs 5,594 cf
Primary=1.21 cfs 5,594 cf

Link DP2: Fuller Brook Inflow=5.73 cfs 31,040 cf
Primary=5.73 cfs 31,040 cf

Total Runoff Area = 454,430 sf Runoff Volume = 94,695 cf Average Runoff Depth = 2.50"
63.82% Pervious = 290,030 sf 36.18% Impervious = 164,400 sf

Summary for Subcatchment PR1A:

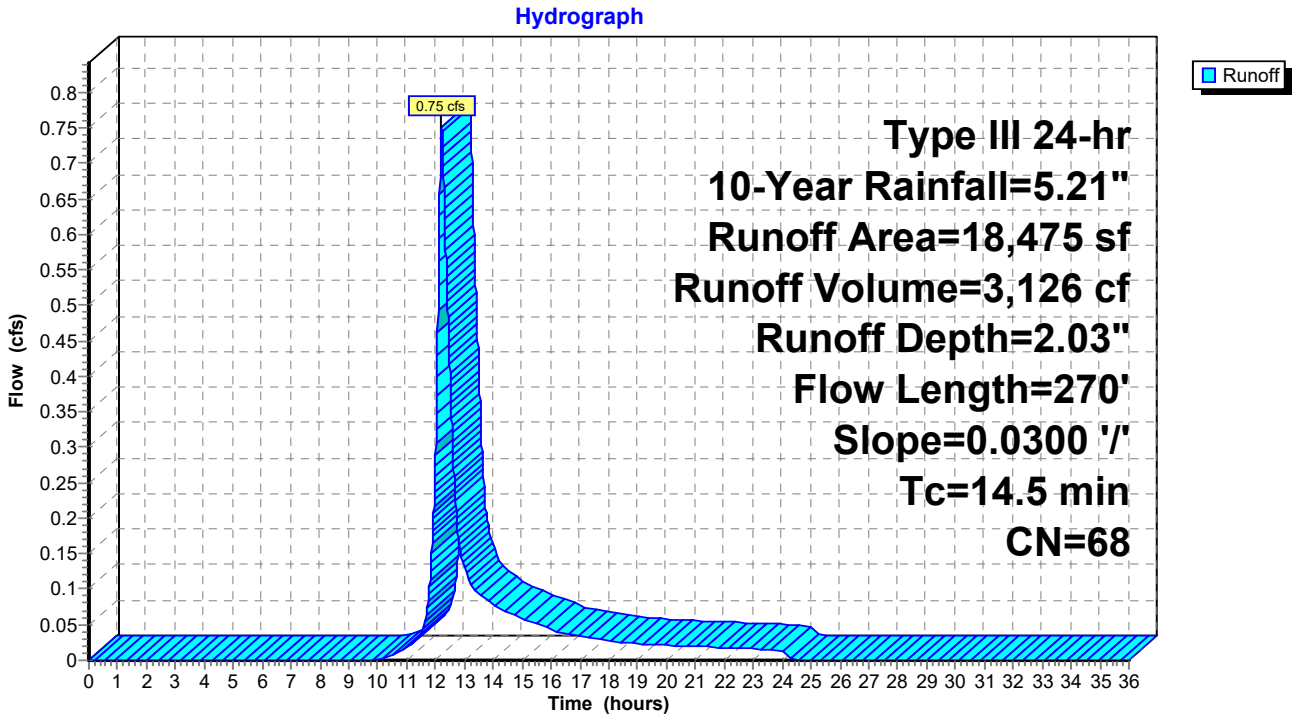
Runoff = 0.75 cfs @ 12.21 hrs, Volume= 3,126 cf, Depth= 2.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.21"

Area (sf)	CN	Description
4,800	98	Paved parking, HSG B
8,802	55	Woods, Good, HSG B
4,873	61	>75% Grass cover, Good, HSG B
18,475	68	Weighted Average
13,675		74.02% Pervious Area
4,800		25.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
4.2	220	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.5	270	Total			

Subcatchment PR1A:



Summary for Subcatchment PR1B:

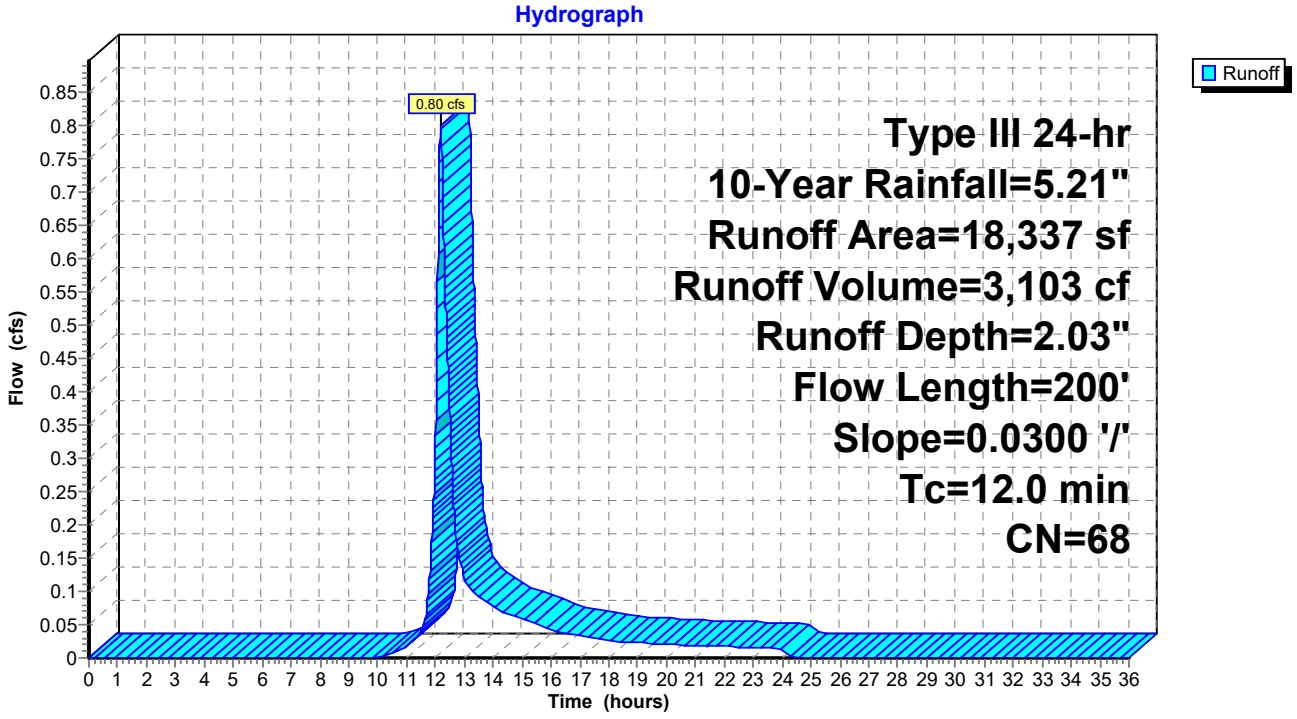
Runoff = 0.80 cfs @ 12.17 hrs, Volume= 3,103 cf, Depth= 2.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.21"

Area (sf)	CN	Description
4,700	98	Paved parking, HSG B
6,100	55	Woods, Good, HSG B
7,537	61	>75% Grass cover, Good, HSG B
18,337	68	Weighted Average
13,637		74.37% Pervious Area
4,700		25.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	20	0.0300	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.33"
6.8	30	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
2.9	150	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.0	200	Total			

Subcatchment PR1B:



Summary for Subcatchment PR2A:

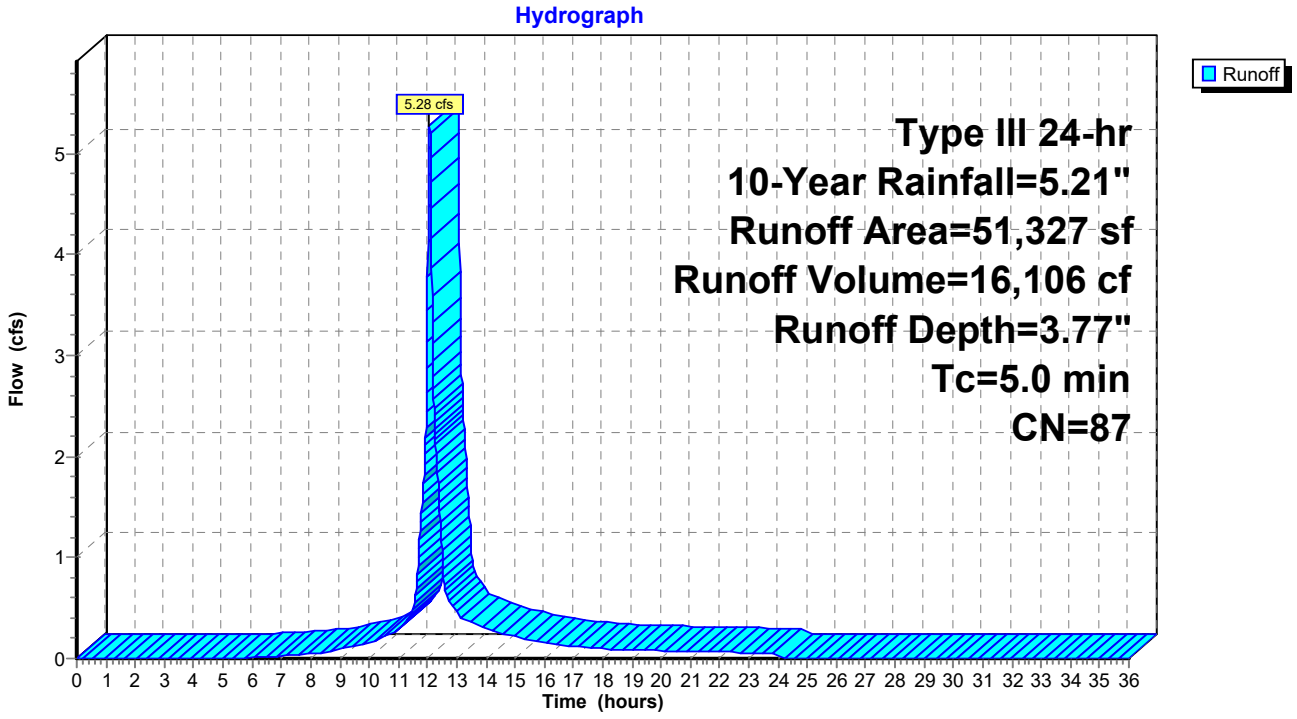
Runoff = 5.28 cfs @ 12.07 hrs, Volume= 16,106 cf, Depth= 3.77"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.21"

Area (sf)	CN	Description
35,500	98	Paved parking, HSG B
15,827	61	>75% Grass cover, Good, HSG B
51,327	87	Weighted Average
15,827		30.84% Pervious Area
35,500		69.16% Impervious Area

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

Subcatchment PR2A:



Summary for Subcatchment PR2B:

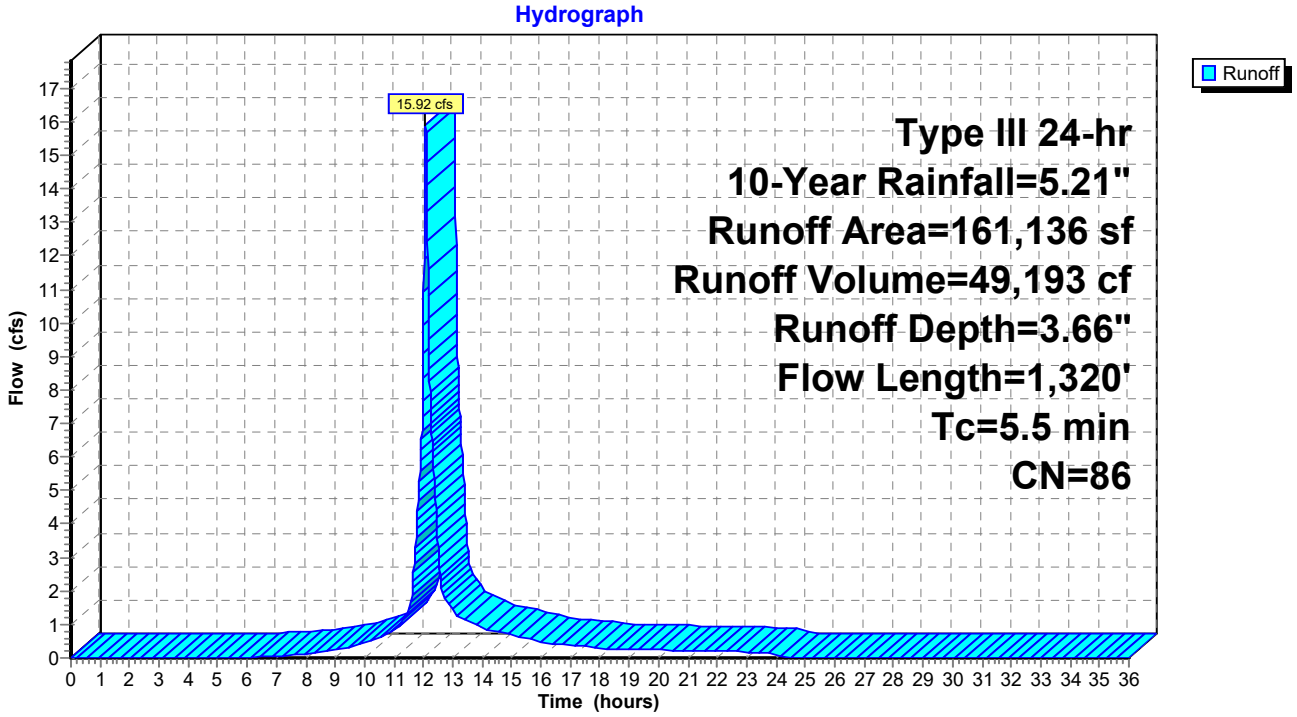
Runoff = 15.92 cfs @ 12.08 hrs, Volume= 49,193 cf, Depth= 3.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.21"

Area (sf)	CN	Description
108,900	98	Paved parking, HSG B
52,236	61	>75% Grass cover, Good, HSG B
161,136	86	Weighted Average
52,236		32.42% Pervious Area
108,900		67.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0600	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.33"
0.8	190	0.0350	3.80		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	1,080	0.0350	15.92	50.02	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011
5.5	1,320	Total			

Subcatchment PR2B:



Summary for Subcatchment PR2C: Overland to Fuller Brook

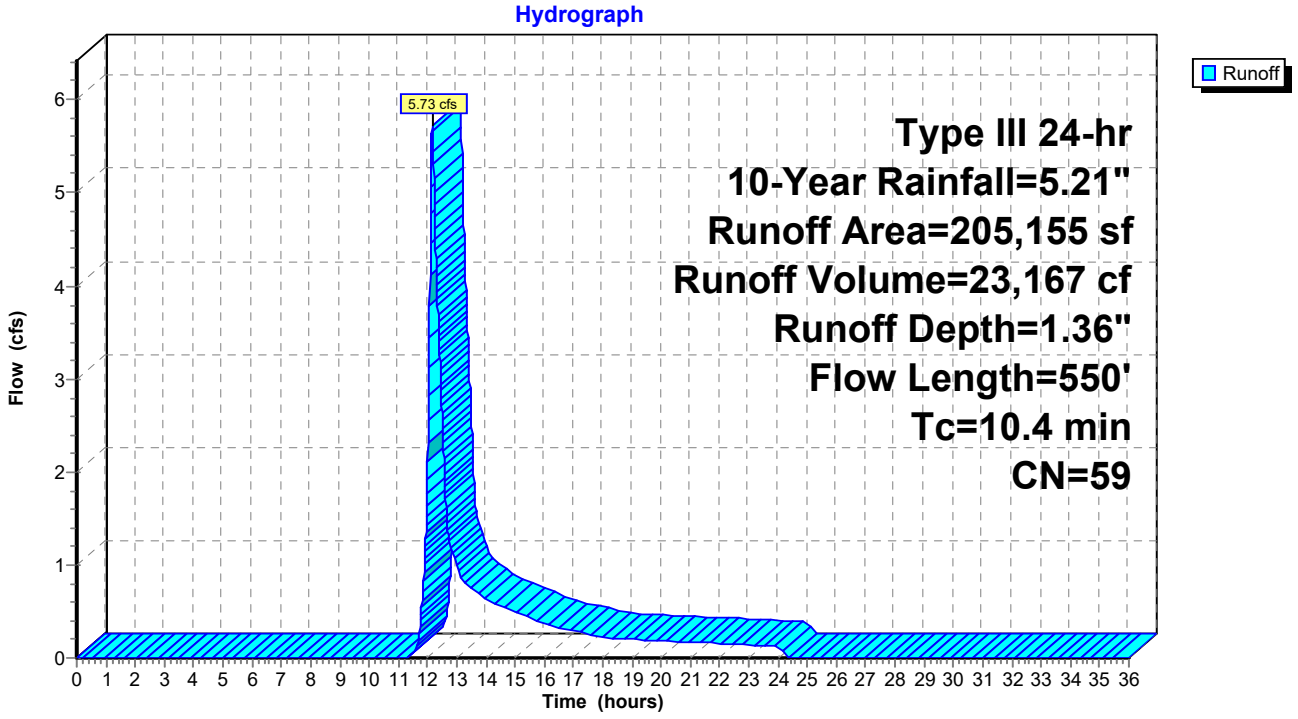
Runoff = 5.73 cfs @ 12.16 hrs, Volume= 23,167 cf, Depth= 1.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.21"

Area (sf)	CN	Description
10,500	98	Paved parking, HSG B
74,977	61	>75% Grass cover, Good, HSG B
119,678	55	Woods, Good, HSG B
205,155	59	Weighted Average
194,655		94.88% Pervious Area
10,500		5.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0600	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.33"
1.5	150	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.3	350	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.4	550	Total			

Subcatchment PR2C: Overland to Fuller Brook



Summary for Reach R1: Swale to West Abutters

Inflow Area = 18,475 sf, 25.98% Impervious, Inflow Depth = 1.62" for 10-Year event
Inflow = 0.65 cfs @ 12.29 hrs, Volume= 2,491 cf
Outflow = 0.64 cfs @ 12.36 hrs, Volume= 2,491 cf, Atten= 1%, Lag= 4.0 min

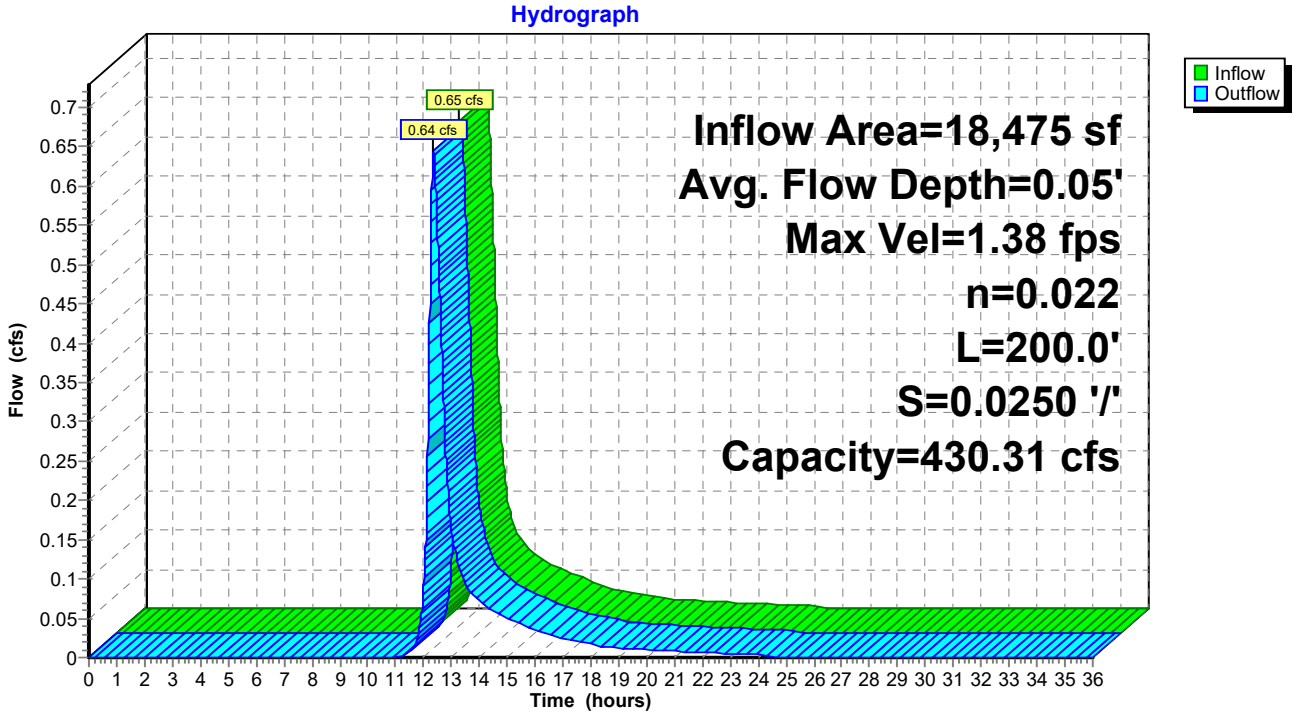
Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.38 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 0.81 fps, Avg. Travel Time= 4.1 min

Peak Storage= 93 cf @ 12.32 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 430.31 cfs

10.00' x 2.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 '/' Top Width= 22.00'
Length= 200.0' Slope= 0.0250 '/'
Inlet Invert= 169.00', Outlet Invert= 164.00'

‡

Reach R1: Swale to West Abutters



Summary for Pond P1: Low Point at Entry Road

Inflow Area = 18,475 sf, 25.98% Impervious, Inflow Depth = 2.03" for 10-Year event
Inflow = 0.75 cfs @ 12.21 hrs, Volume= 3,126 cf
Outflow = 0.67 cfs @ 12.29 hrs, Volume= 3,126 cf, Atten= 11%, Lag= 5.0 min
Discarded = 0.02 cfs @ 12.29 hrs, Volume= 635 cf
Primary = 0.65 cfs @ 12.29 hrs, Volume= 2,491 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 171.93' @ 12.29 hrs Surf.Area= 757 sf Storage= 268 cf

Plug-Flow detention time= 11.9 min calculated for 3,125 cf (100% of inflow)
Center-of-Mass det. time= 11.9 min (870.3 - 858.4)

Volume	Invert	Avail.Storage	Storage Description
#1	171.50'	1,113 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

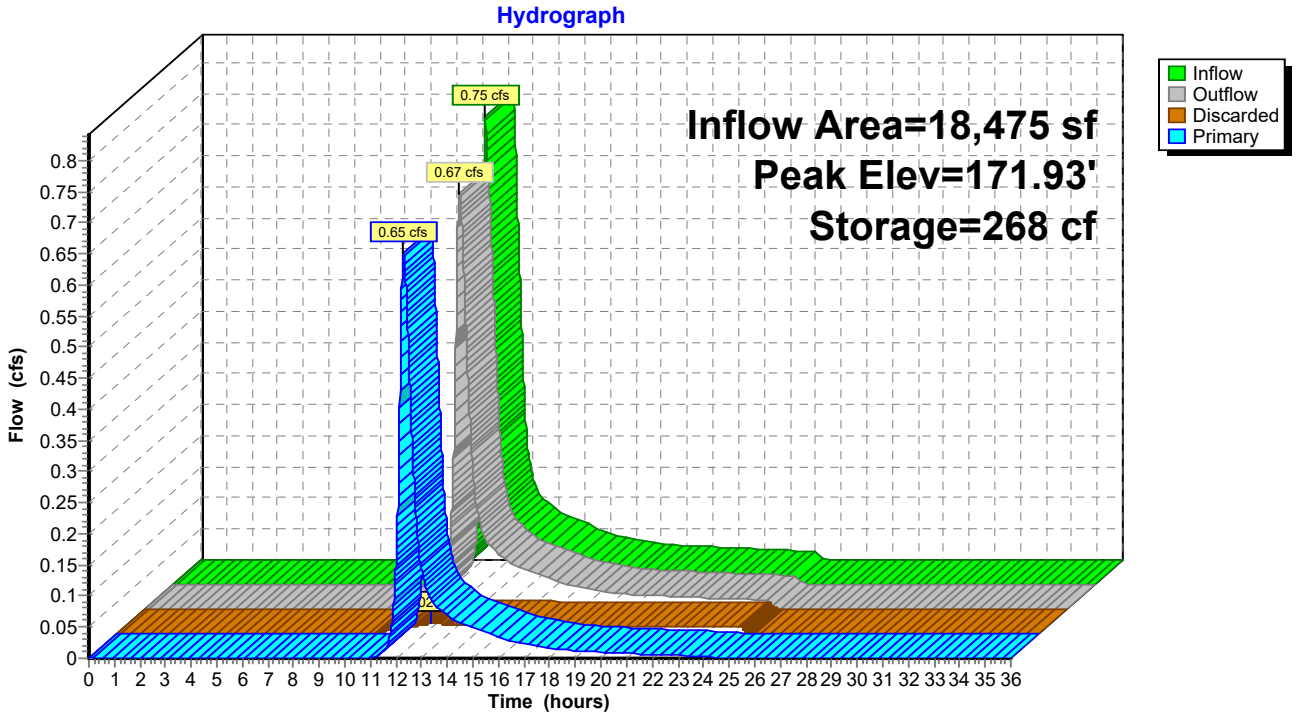
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
171.50	482	0	0
172.00	800	321	321
172.50	2,370	793	1,113

Device	Routing	Invert	Outlet Devices
#1	Discarded	171.50'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	171.50'	**12.0" Round Culvert** L= 10.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 171.50' / 171.40' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Discarded OutFlow Max=0.02 cfs @ 12.29 hrs HW=171.93' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.65 cfs @ 12.29 hrs HW=171.93' (Free Discharge)
↑—**2=Culvert** (Barrel Controls 0.65 cfs @ 2.95 fps)

Pond P1: Low Point at Entry Road



Summary for Pond P2A: Offline Detention System in Green

Inflow Area = 51,327 sf, 69.16% Impervious, Inflow Depth = 3.77" for 10-Year event
Inflow = 5.28 cfs @ 12.07 hrs, Volume= 16,106 cf
Outflow = 3.50 cfs @ 12.15 hrs, Volume= 16,101 cf, Atten= 34%, Lag= 4.9 min
Primary = 3.50 cfs @ 12.15 hrs, Volume= 16,101 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 163.30' @ 12.15 hrs Surf.Area= 1,709 sf Storage= 3,477 cf

Plug-Flow detention time= 35.3 min calculated for 16,101 cf (100% of inflow)
Center-of-Mass det. time= 35.2 min (833.9 - 798.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	161.00'	0 cf	**38.75'W x 44.10'L x 3.50'H Field A** 5,982 cf Overall - 5,982 cf Embedded = 0 cf x 40.0% Voids
#2A	161.00'	4,530 cf	**StormTrap SingleTrap 3-0** x 6 Inside #1 Inside= 101.7"W x 36.0"H => 22.99 sf x 15.40'L = 354.0 cf Outside= 101.7"W x 42.0"H => 29.68 sf x 15.40'L = 456.9 cf 3 Rows of 2 Chambers 25.44' x 30.79' Core + 6.66' Border = 38.75' x 44.10' System
		4,530 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	161.00'	**24.0" Round Culvert** L= 10.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 161.00' / 159.90' S= 0.1100 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	161.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	163.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=3.49 cfs @ 12.15 hrs HW=163.30' (Free Discharge)
└**1=Culvert** (Passes 3.49 cfs of 21.57 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 1.35 cfs @ 6.90 fps)
  └**3=Sharp-Crested Rectangular Weir** (Weir Controls 2.14 cfs @ 1.80 fps)

Pond P2A: Offline Detention System in Green - Chamber Wizard Field A

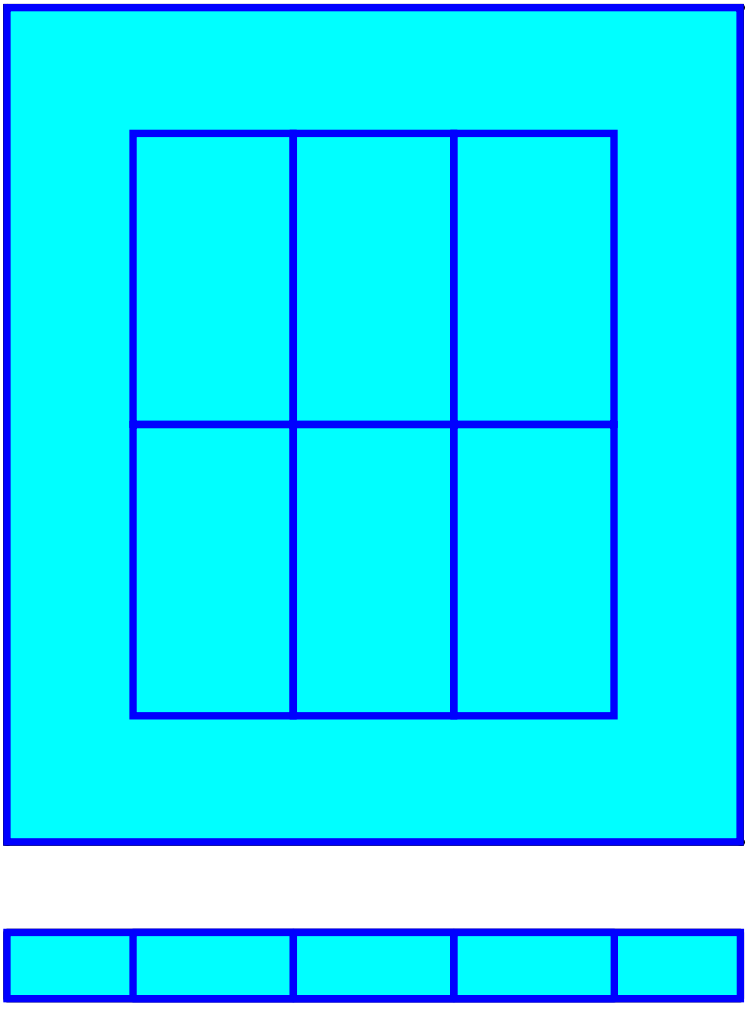
Chamber Model = StormTrap SingleTrap 3-0 (StormTrap ST2 SingleTrap®3'-0" tall Type II + IV)
Inside= 101.7"W x 36.0"H => 22.99 sf x 15.40'L = 354.0 cf
Outside= 101.7"W x 42.0"H => 29.68 sf x 15.40'L = 456.9 cf

2 Chambers/Row x 15.40' Long = 30.79' Row Length +79.9" Border x 2 = 44.10' Base Length
3 Rows x 101.7" Wide + 79.9" Side Border x 2 = 38.75' Base Width
42.0" Chamber Height = 3.50' Field Height

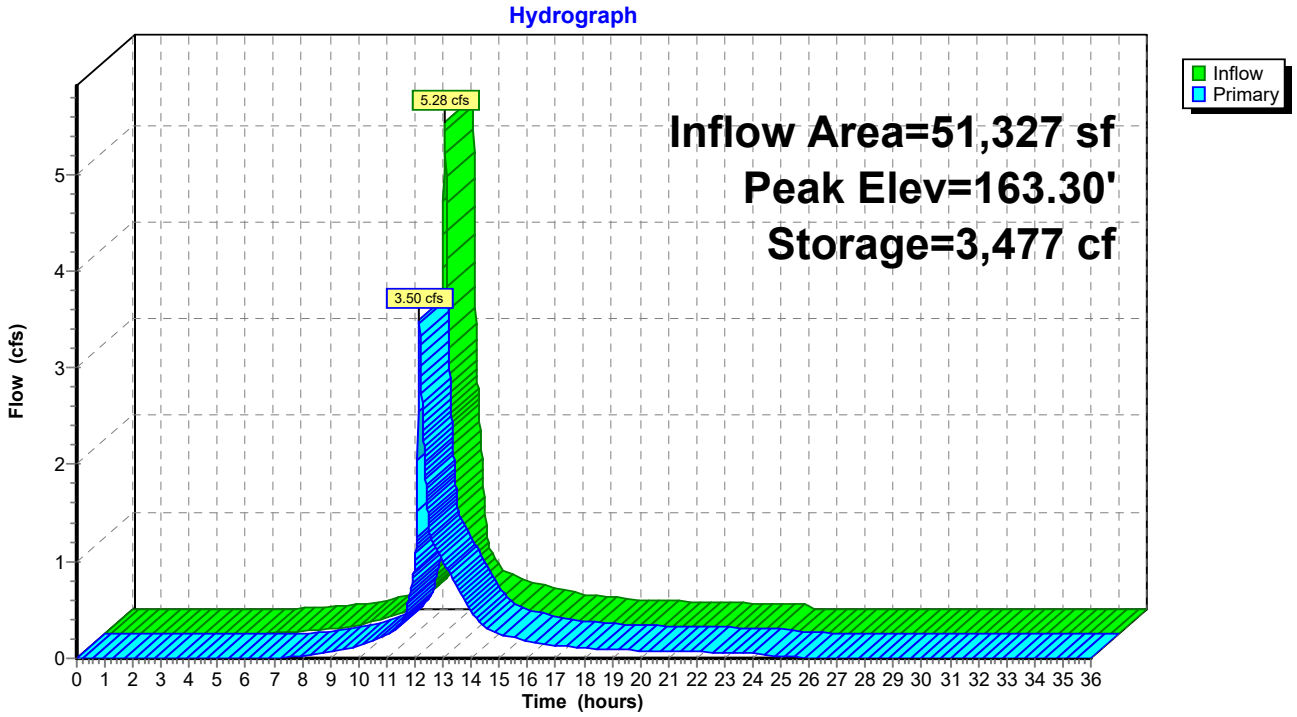
6 Chambers x 354.0 cf + 2,406.0 cf Border = 4,529.9 cf Chamber Storage
6 Chambers x 456.9 cf + 3,240.2 cf Border = 5,981.6 cf Displacement

Chamber Storage = 4,529.9 cf = 0.104 af
Overall Storage Efficiency = 75.7%
Overall System Size = 44.10' x 38.75' x 3.50'

6 Chambers (plus border)
221.5 cy Field



Pond P2A: Offline Detention System in Green



Summary for Pond P2B: Infiltration System StormTrap 3' Units

Inflow Area = 212,463 sf, 67.96% Impervious, Inflow Depth = 3.69" for 10-Year event
Inflow = 17.43 cfs @ 12.10 hrs, Volume= 65,294 cf
Outflow = 1.23 cfs @ 14.24 hrs, Volume= 50,018 cf, Atten= 93%, Lag= 128.3 min
Discarded = 0.42 cfs @ 9.61 hrs, Volume= 42,145 cf
Primary = 0.80 cfs @ 14.24 hrs, Volume= 7,872 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 146.46' @ 14.24 hrs Surf.Area= 17,920 sf Storage= 38,218 cf

Plug-Flow detention time= 537.3 min calculated for 50,004 cf (77% of inflow)
Center-of-Mass det. time= 453.7 min (1,263.9 - 810.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	143.80'	3,584 cf	**98.10'W x 182.67'L x 4.00'H Field A** 71,681 cf Overall - 62,721 cf Embedded = 8,960 cf x 40.0% Voids
#2A	144.30'	48,192 cf	**StormTrap SingleTrap 3-0** x 110 Inside #1 Inside= 101.7"W x 36.0"H => 22.99 sf x 15.40'L = 354.0 cf Outside= 101.7"W x 42.0"H => 29.68 sf x 15.40'L = 456.9 cf 10 Rows of 11 Chambers 84.79' x 169.35' Core + 6.66' Border = 98.10' x 182.67' System
		51,777 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	143.80'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	143.80'	**15.0" Round Culvert** L= 10.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 143.80' / 143.70' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 1.23 sf
#3	Device 2	146.30'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.42 cfs @ 9.61 hrs HW=143.84' (Free Discharge)
↑└**1=Exfiltration** (Exfiltration Controls 0.42 cfs)

Primary OutFlow Max=0.80 cfs @ 14.24 hrs HW=146.46' (Free Discharge)
↑└**2=Culvert** (Passes 0.80 cfs of 10.34 cfs potential flow)
↑└**3=Sharp-Crested Rectangular Weir** (Weir Controls 0.80 cfs @ 1.29 fps)

Pond P2B: Infiltration System StormTrap 3' Units - Chamber Wizard Field A

Chamber Model = StormTrap SingleTrap 3-0 (StormTrap ST2 SingleTrap®3'-0" tall Type II + IV)
Inside= 101.7"W x 36.0"H => 22.99 sf x 15.40'L = 354.0 cf
Outside= 101.7"W x 42.0"H => 29.68 sf x 15.40'L = 456.9 cf

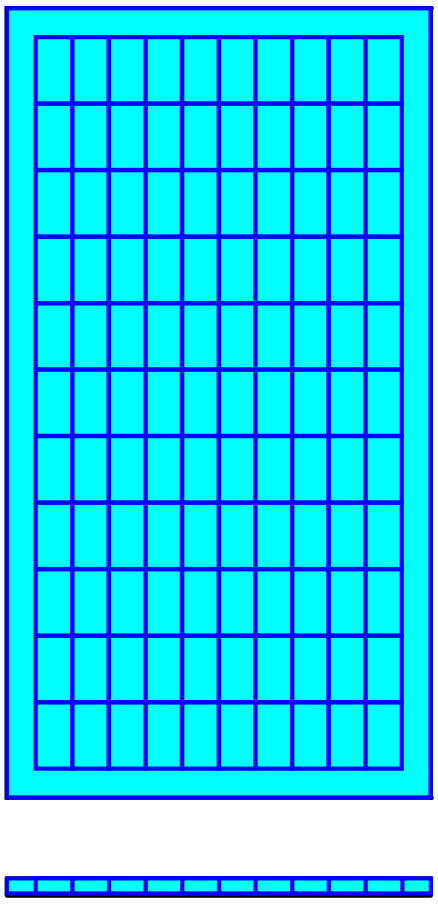
11 Chambers/Row x 15.40' Long = 169.35' Row Length +79.9" Border x 2 = 182.67' Base Length
10 Rows x 101.7" Wide + 79.9" Side Border x 2 = 98.10' Base Width
6.0" Base + 42.0" Chamber Height = 4.00' Field Height

110 Chambers x 354.0 cf + 9,253.4 cf Border = 48,192.5 cf Chamber Storage
110 Chambers x 456.9 cf + 12,461.9 cf Border = 62,721.3 cf Displacement

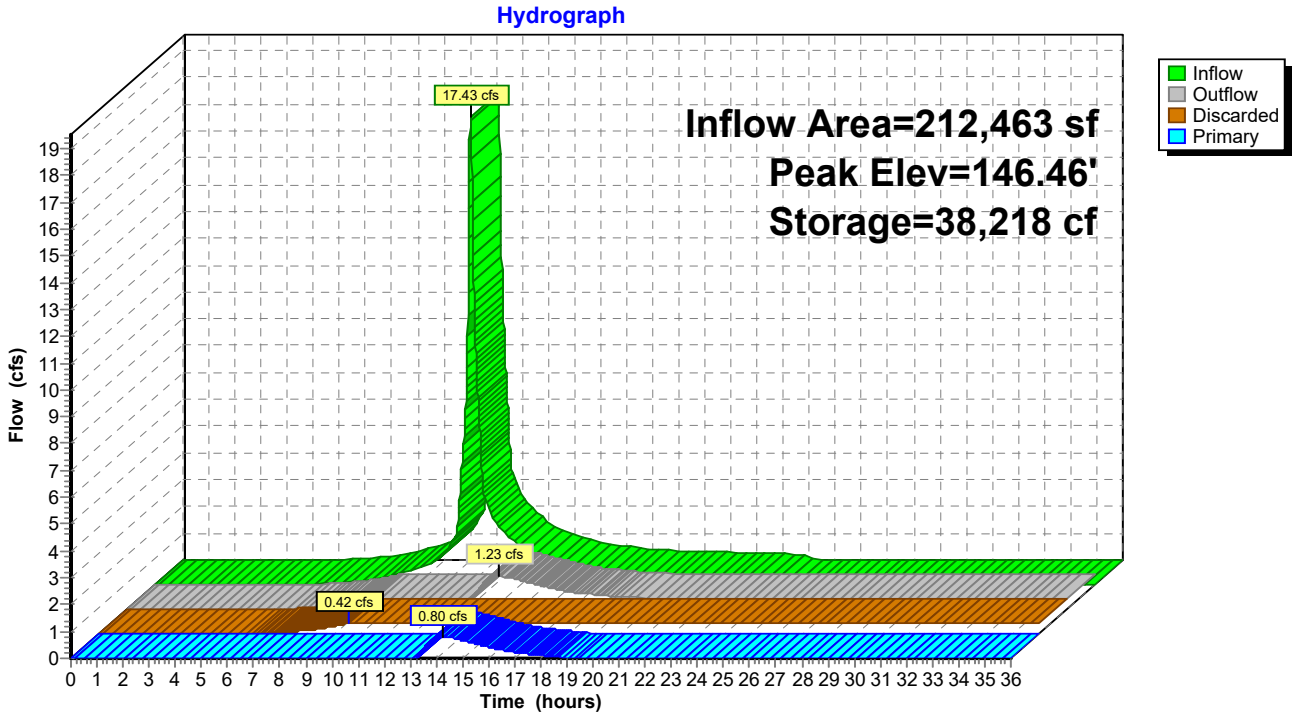
71,681.4 cf Field - 62,721.3 cf Chambers = 8,960.2 cf Stone x 40.0% Voids = 3,584.1 cf Stone Storage

Chamber Storage + Stone Storage = 51,776.5 cf = 1.189 af
Overall Storage Efficiency = 72.2%
Overall System Size = 182.67' x 98.10' x 4.00'

110 Chambers (plus border)
2,654.9 cy Field
331.9 cy Stone



Pond P2B: Infiltration System StormTrap 3' Units

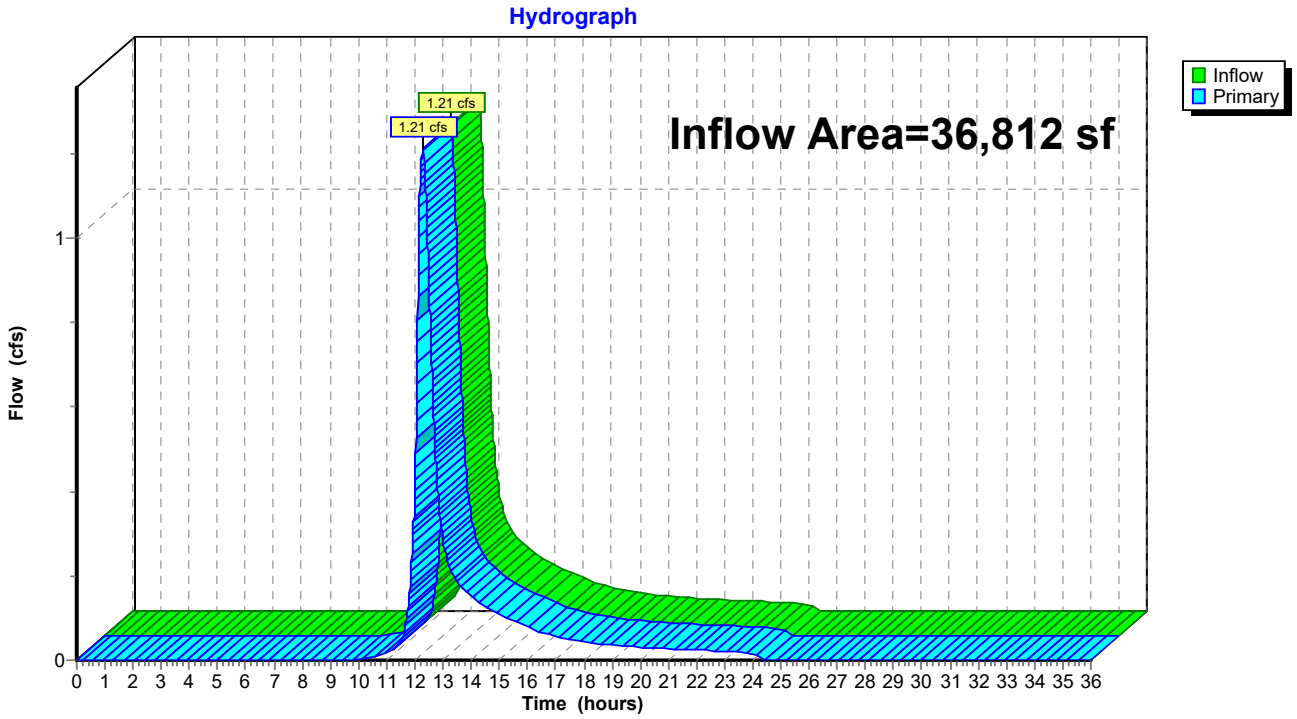


Summary for Link DP1: West Abutters

Inflow Area = 36,812 sf, 25.81% Impervious, Inflow Depth = 1.82" for 10-Year event
Inflow = 1.21 cfs @ 12.29 hrs, Volume= 5,594 cf
Primary = 1.21 cfs @ 12.29 hrs, Volume= 5,594 cf, Atten= 0%, Lag= 0.0 min

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

Link DP1: West Abutters

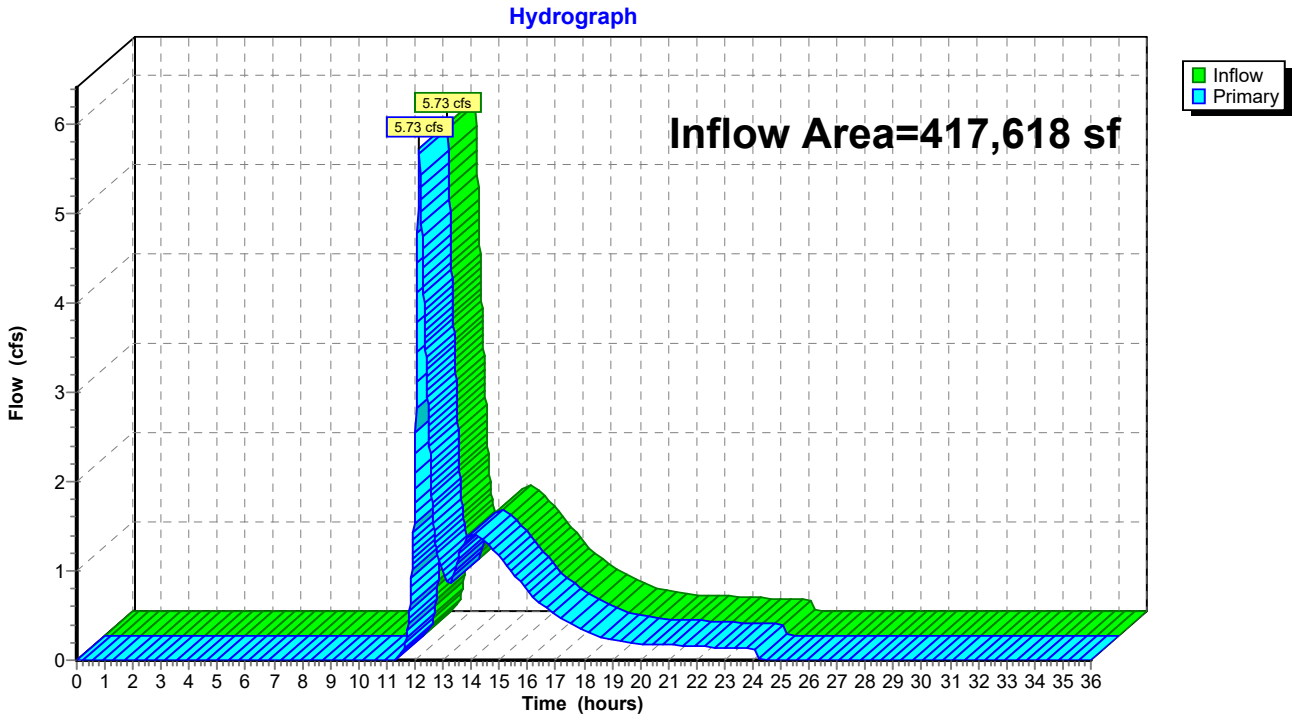


Summary for Link DP2: Fuller Brook

Inflow Area = 417,618 sf, 37.09% Impervious, Inflow Depth = 0.89" for 10-Year event
Inflow = 5.73 cfs @ 12.16 hrs, Volume= 31,040 cf
Primary = 5.73 cfs @ 12.16 hrs, Volume= 31,040 cf, Atten= 0%, Lag= 0.0 min

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

Link DP2: Fuller Brook



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

SubcatchmentPR1A: Runoff Area=18,475 sf 25.98% Impervious Runoff Depth=2.92"
Flow Length=270' Slope=0.0300 '/' Tc=14.5 min CN=68 Runoff=1.10 cfs 4,501 cf

SubcatchmentPR1B: Runoff Area=18,337 sf 25.63% Impervious Runoff Depth=2.92"
Flow Length=200' Slope=0.0300 '/' Tc=12.0 min CN=68 Runoff=1.17 cfs 4,468 cf

SubcatchmentPR2A: Runoff Area=51,327 sf 69.16% Impervious Runoff Depth=4.89"
Tc=5.0 min CN=87 Runoff=6.78 cfs 20,921 cf

SubcatchmentPR2B: Runoff Area=161,136 sf 67.58% Impervious Runoff Depth=4.78"
Flow Length=1,320' Tc=5.5 min CN=86 Runoff=20.54 cfs 64,200 cf

SubcatchmentPR2C: Overland to Fuller Runoff Area=205,155 sf 5.12% Impervious Runoff Depth=2.09"
Flow Length=550' Tc=10.4 min CN=59 Runoff=9.41 cfs 35,771 cf

Reach R1: Swale to West Abutters Avg. Flow Depth=0.06' Max Vel=1.60 fps Inflow=0.97 cfs 3,810 cf
n=0.022 L=200.0' S=0.0250 '/' Capacity=430.31 cfs Outflow=0.96 cfs 3,810 cf

Pond P1: Low Point at Entry Road Peak Elev=172.04' Storage=358 cf Inflow=1.10 cfs 4,501 cf
Discarded=0.02 cfs 691 cf Primary=0.97 cfs 3,810 cf Outflow=0.99 cfs 4,501 cf

Pond P2A: Offline Detention System in Peak Elev=163.49' Storage=3,765 cf Inflow=6.78 cfs 20,921 cf
Outflow=5.84 cfs 20,916 cf

Pond P2B: Infiltration System StormTrap Peak Elev=146.66' Storage=41,561 cf Inflow=25.71 cfs 85,115 cf
Discarded=0.42 cfs 43,367 cf Primary=2.82 cfs 25,128 cf Outflow=3.25 cfs 68,496 cf

Link DP1: West Abutters Inflow=1.83 cfs 8,278 cf
Primary=1.83 cfs 8,278 cf

Link DP2: Fuller Brook Inflow=9.41 cfs 60,899 cf
Primary=9.41 cfs 60,899 cf

Total Runoff Area = 454,430 sf Runoff Volume = 129,860 cf Average Runoff Depth = 3.43"
63.82% Pervious = 290,030 sf 36.18% Impervious = 164,400 sf

Summary for Subcatchment PR1A:

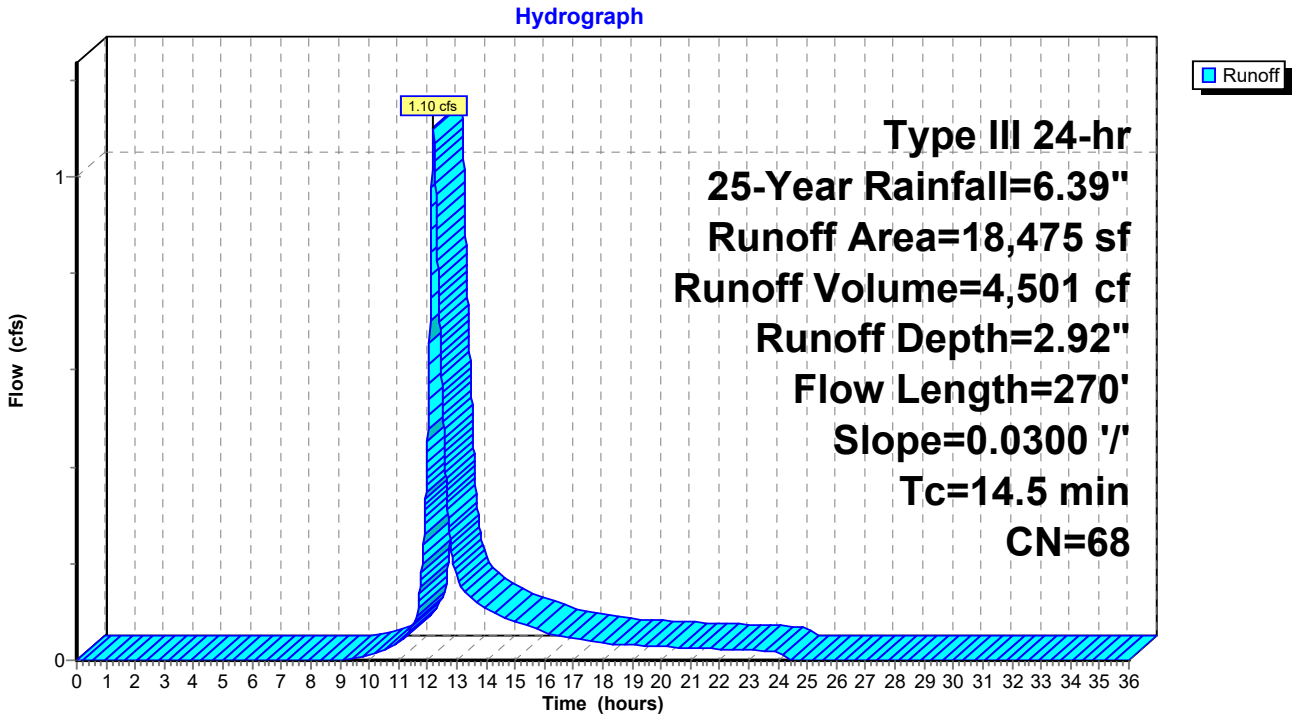
Runoff = 1.10 cfs @ 12.20 hrs, Volume= 4,501 cf, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.39"

Area (sf)	CN	Description
4,800	98	Paved parking, HSG B
8,802	55	Woods, Good, HSG B
4,873	61	>75% Grass cover, Good, HSG B
18,475	68	Weighted Average
13,675		74.02% Pervious Area
4,800		25.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
4.2	220	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.5	270	Total			

Subcatchment PR1A:



Summary for Subcatchment PR1B:

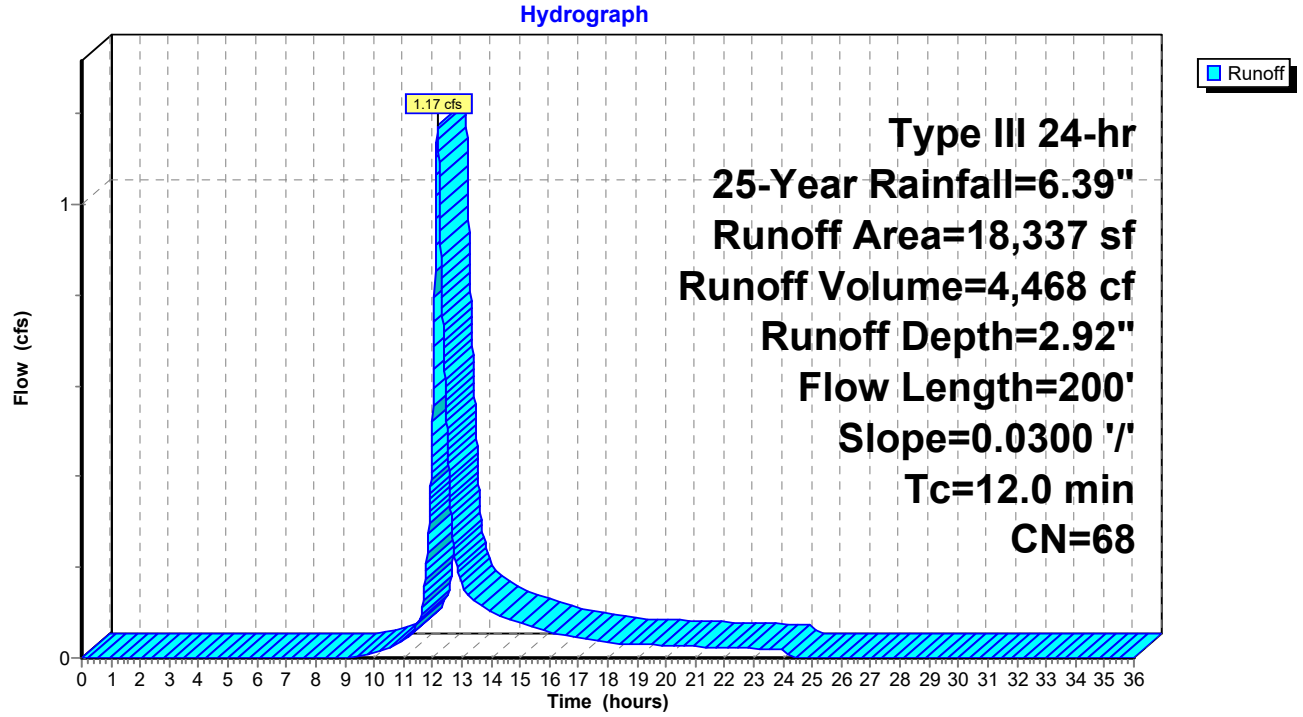
Runoff = 1.17 cfs @ 12.17 hrs, Volume= 4,468 cf, Depth= 2.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.39"

Area (sf)	CN	Description
4,700	98	Paved parking, HSG B
6,100	55	Woods, Good, HSG B
7,537	61	>75% Grass cover, Good, HSG B
18,337	68	Weighted Average
13,637		74.37% Pervious Area
4,700		25.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	20	0.0300	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.33"
6.8	30	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
2.9	150	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.0	200	Total			

Subcatchment PR1B:



Summary for Subcatchment PR2A:

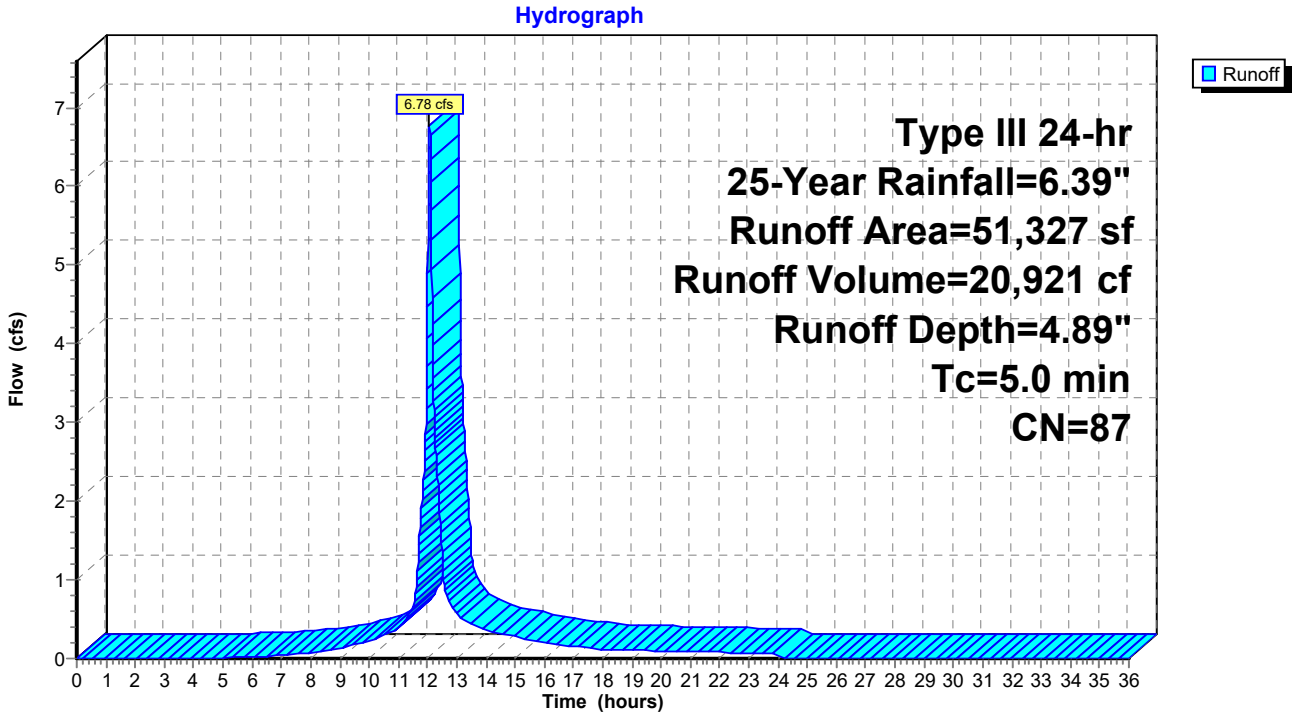
Runoff = 6.78 cfs @ 12.07 hrs, Volume= 20,921 cf, Depth= 4.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.39"

Area (sf)	CN	Description
35,500	98	Paved parking, HSG B
15,827	61	>75% Grass cover, Good, HSG B
51,327	87	Weighted Average
15,827		30.84% Pervious Area
35,500		69.16% Impervious Area

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

Subcatchment PR2A:



Summary for Subcatchment PR2B:

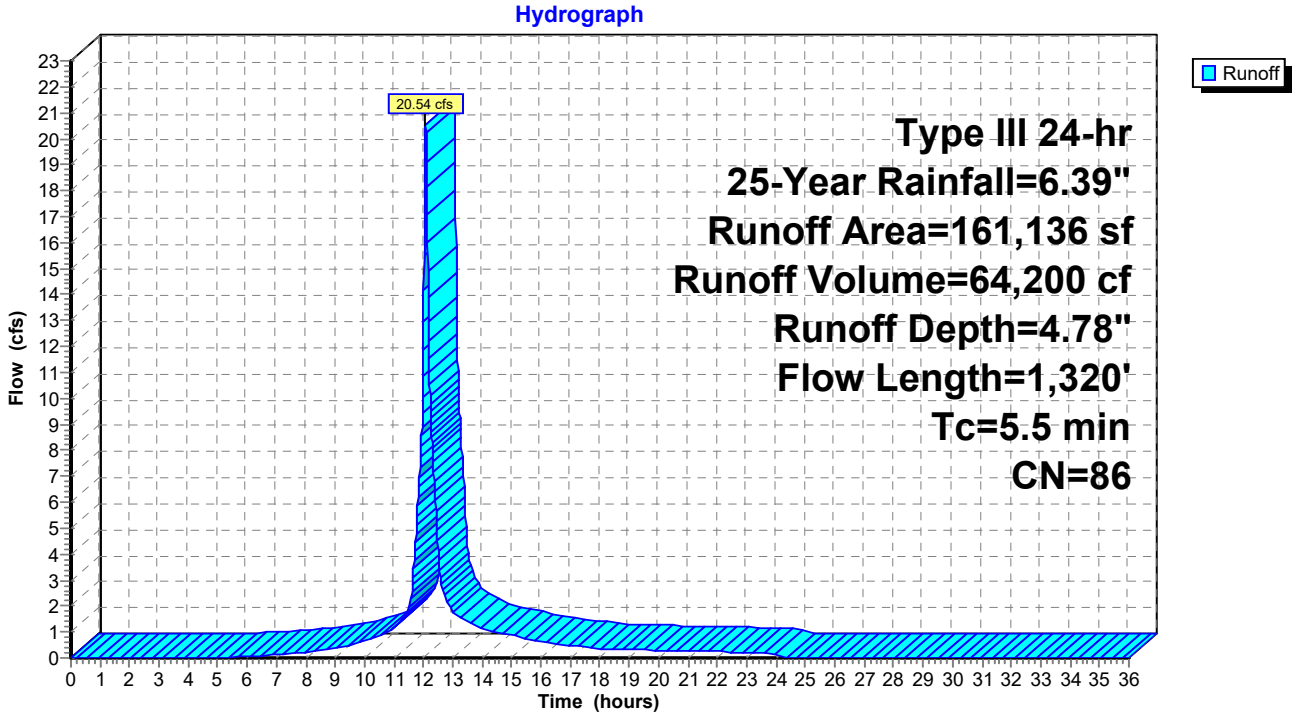
Runoff = 20.54 cfs @ 12.08 hrs, Volume= 64,200 cf, Depth= 4.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.39"

Area (sf)	CN	Description
108,900	98	Paved parking, HSG B
52,236	61	>75% Grass cover, Good, HSG B
161,136	86	Weighted Average
52,236		32.42% Pervious Area
108,900		67.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0600	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.33"
0.8	190	0.0350	3.80		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	1,080	0.0350	15.92	50.02	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011
5.5	1,320	Total			

Subcatchment PR2B:



Summary for Subcatchment PR2C: Overland to Fuller Brook

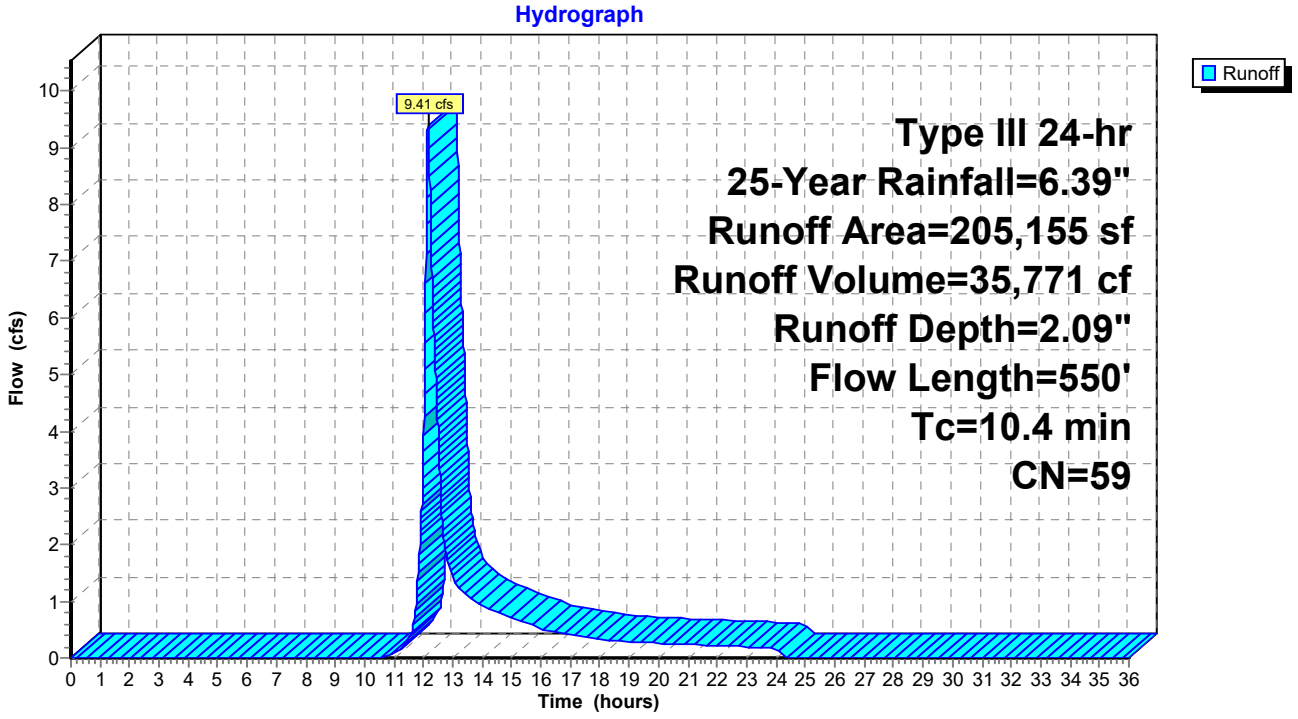
Runoff = 9.41 cfs @ 12.15 hrs, Volume= 35,771 cf, Depth= 2.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.39"

Area (sf)	CN	Description
10,500	98	Paved parking, HSG B
74,977	61	>75% Grass cover, Good, HSG B
119,678	55	Woods, Good, HSG B
205,155	59	Weighted Average
194,655		94.88% Pervious Area
10,500		5.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0600	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.33"
1.5	150	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.3	350	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.4	550	Total			

Subcatchment PR2C: Overland to Fuller Brook



Summary for Reach R1: Swale to West Abutters

Inflow Area = 18,475 sf, 25.98% Impervious, Inflow Depth = 2.47" for 25-Year event
Inflow = 0.97 cfs @ 12.28 hrs, Volume= 3,810 cf
Outflow = 0.96 cfs @ 12.34 hrs, Volume= 3,810 cf, Atten= 1%, Lag= 3.6 min

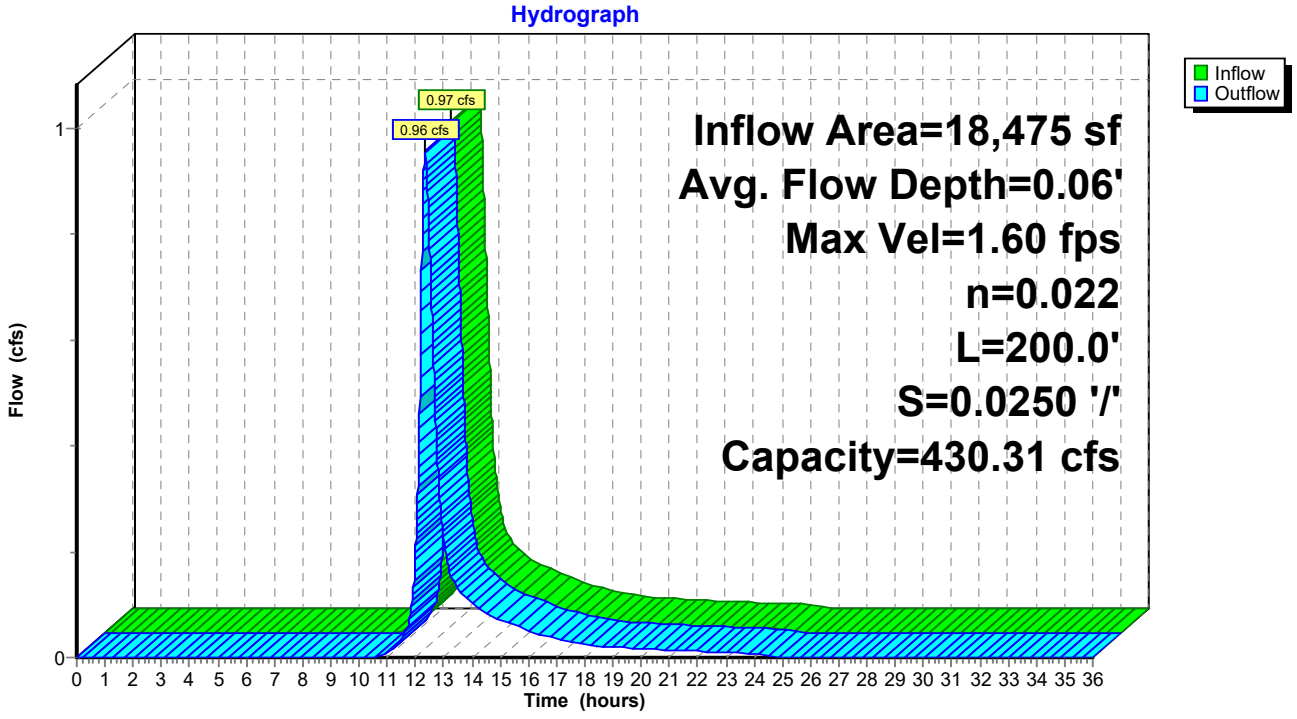
Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.60 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 0.82 fps, Avg. Travel Time= 4.1 min

Peak Storage= 120 cf @ 12.30 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 430.31 cfs

10.00' x 2.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 '/' Top Width= 22.00'
Length= 200.0' Slope= 0.0250 '/'
Inlet Invert= 169.00', Outlet Invert= 164.00'

‡

Reach R1: Swale to West Abutters



Summary for Pond P1: Low Point at Entry Road

Inflow Area = 18,475 sf, 25.98% Impervious, Inflow Depth = 2.92" for 25-Year event
Inflow = 1.10 cfs @ 12.20 hrs, Volume= 4,501 cf
Outflow = 0.99 cfs @ 12.28 hrs, Volume= 4,501 cf, Atten= 10%, Lag= 4.6 min
Discarded = 0.02 cfs @ 12.28 hrs, Volume= 691 cf
Primary = 0.97 cfs @ 12.28 hrs, Volume= 3,810 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 172.04' @ 12.28 hrs Surf.Area= 937 sf Storage= 358 cf

Plug-Flow detention time= 10.9 min calculated for 4,500 cf (100% of inflow)
Center-of-Mass det. time= 10.9 min (858.6 - 847.6)

Volume	Invert	Avail.Storage	Storage Description
#1	171.50'	1,113 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

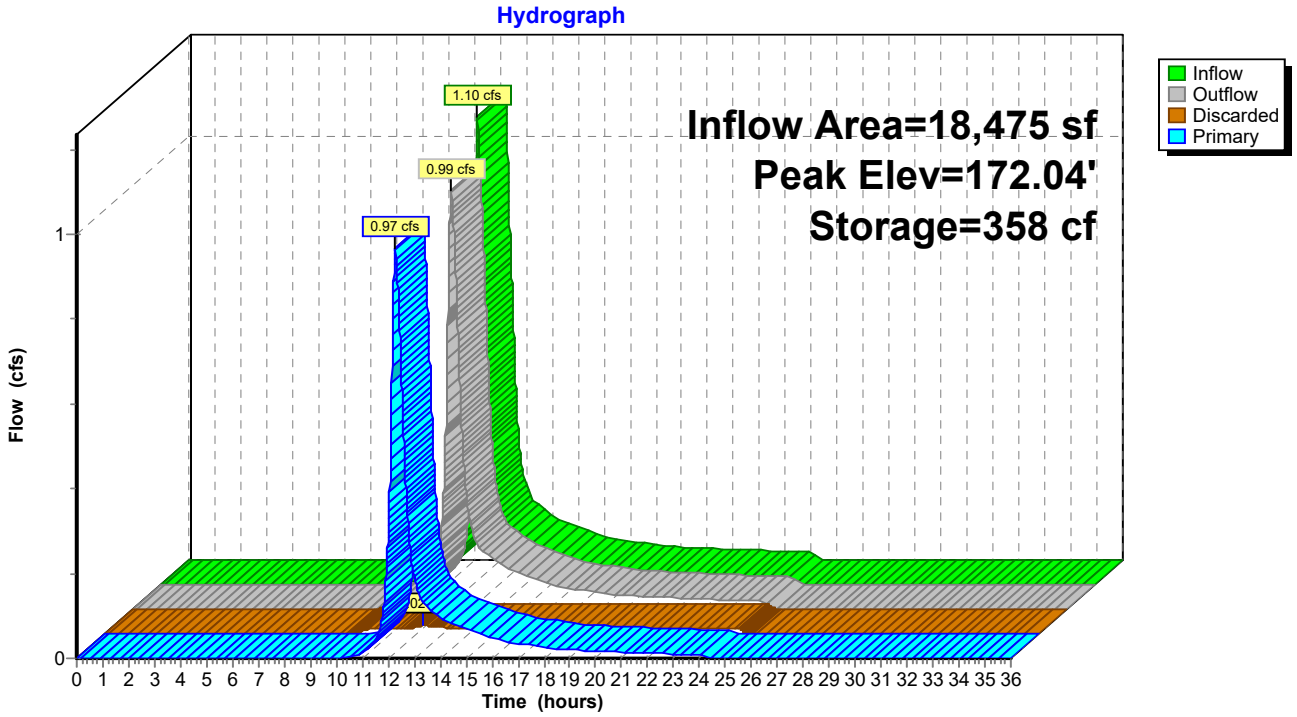
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
171.50	482	0	0
172.00	800	321	321
172.50	2,370	793	1,113

Device	Routing	Invert	Outlet Devices
#1	Discarded	171.50'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	171.50'	**12.0" Round Culvert** L= 10.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 171.50' / 171.40' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Discarded OutFlow Max=0.02 cfs @ 12.28 hrs HW=172.04' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.97 cfs @ 12.28 hrs HW=172.04' (Free Discharge)
↑—**2=Culvert** (Barrel Controls 0.97 cfs @ 3.21 fps)

Pond P1: Low Point at Entry Road



Summary for Pond P2A: Offline Detention System in Green

Inflow Area = 51,327 sf, 69.16% Impervious, Inflow Depth = 4.89" for 25-Year event
Inflow = 6.78 cfs @ 12.07 hrs, Volume= 20,921 cf
Outflow = 5.84 cfs @ 12.12 hrs, Volume= 20,916 cf, Atten= 14%, Lag= 2.7 min
Primary = 5.84 cfs @ 12.12 hrs, Volume= 20,916 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 163.49' @ 12.12 hrs Surf.Area= 1,709 sf Storage= 3,765 cf

Plug-Flow detention time= 31.7 min calculated for 20,916 cf (100% of inflow)
Center-of-Mass det. time= 31.5 min (823.1 - 791.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	161.00'	0 cf	**38.75'W x 44.10'L x 3.50'H Field A** 5,982 cf Overall - 5,982 cf Embedded = 0 cf x 40.0% Voids
#2A	161.00'	4,530 cf	**StormTrap SingleTrap 3-0** x 6 Inside #1 Inside= 101.7"W x 36.0"H => 22.99 sf x 15.40'L = 354.0 cf Outside= 101.7"W x 42.0"H => 29.68 sf x 15.40'L = 456.9 cf 3 Rows of 2 Chambers 25.44' x 30.79' Core + 6.66' Border = 38.75' x 44.10' System
		4,530 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	161.00'	**24.0" Round Culvert** L= 10.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 161.00' / 159.90' S= 0.1100 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	161.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	163.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=5.83 cfs @ 12.12 hrs HW=163.49' (Free Discharge)
└**1=Culvert** (Passes 5.83 cfs of 23.10 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 1.42 cfs @ 7.21 fps)
  └**3=Sharp-Crested Rectangular Weir** (Weir Controls 4.41 cfs @ 2.30 fps)

Pond P2A: Offline Detention System in Green - Chamber Wizard Field A

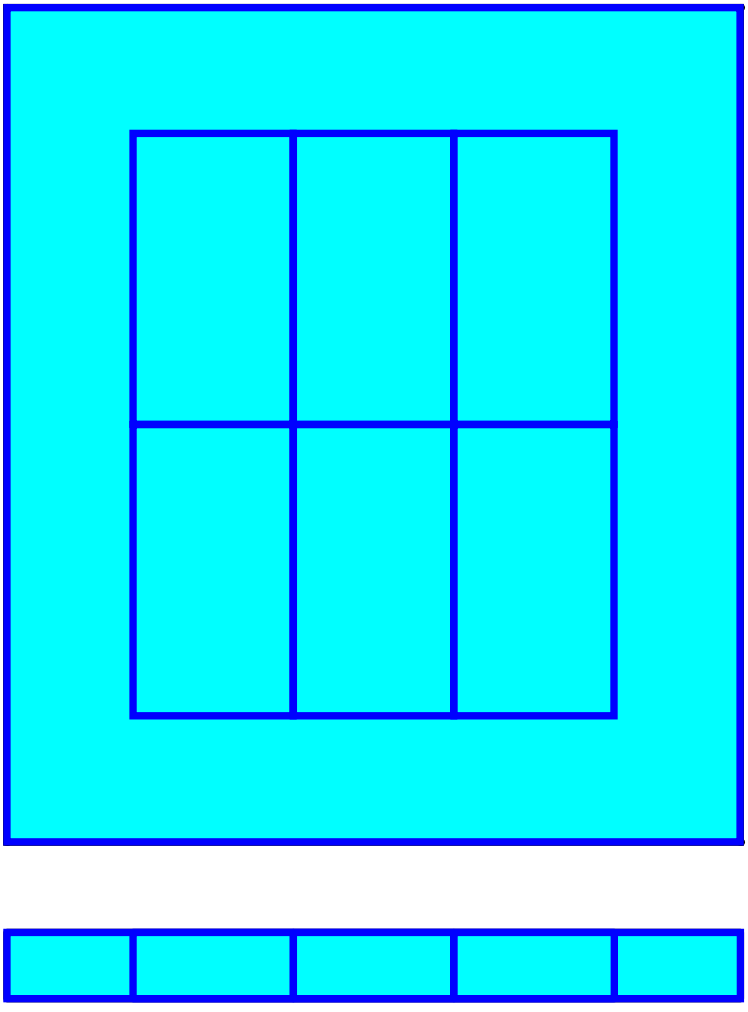
Chamber Model = StormTrap SingleTrap 3-0 (StormTrap ST2 SingleTrap®3'-0" tall Type II + IV)
Inside= 101.7"W x 36.0"H => 22.99 sf x 15.40'L = 354.0 cf
Outside= 101.7"W x 42.0"H => 29.68 sf x 15.40'L = 456.9 cf

2 Chambers/Row x 15.40' Long = 30.79' Row Length +79.9" Border x 2 = 44.10' Base Length
3 Rows x 101.7" Wide + 79.9" Side Border x 2 = 38.75' Base Width
42.0" Chamber Height = 3.50' Field Height

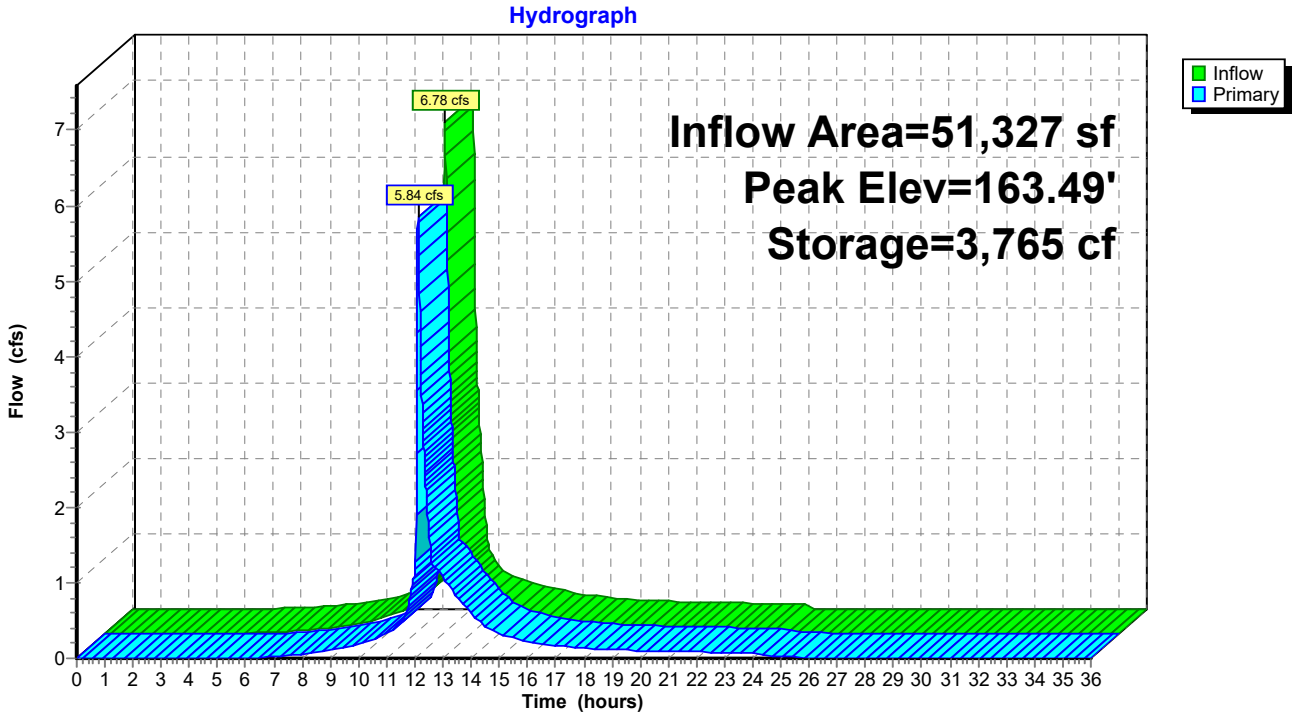
6 Chambers x 354.0 cf + 2,406.0 cf Border = 4,529.9 cf Chamber Storage
6 Chambers x 456.9 cf + 3,240.2 cf Border = 5,981.6 cf Displacement

Chamber Storage = 4,529.9 cf = 0.104 af
Overall Storage Efficiency = 75.7%
Overall System Size = 44.10' x 38.75' x 3.50'

6 Chambers (plus border)
221.5 cy Field



Pond P2A: Offline Detention System in Green



Summary for Pond P2B: Infiltration System StormTrap 3' Units

Inflow Area = 212,463 sf, 67.96% Impervious, Inflow Depth = 4.81" for 25-Year event
Inflow = 25.71 cfs @ 12.09 hrs, Volume= 85,115 cf
Outflow = 3.25 cfs @ 12.85 hrs, Volume= 68,496 cf, Atten= 87%, Lag= 45.4 min
Discarded = 0.42 cfs @ 8.88 hrs, Volume= 43,367 cf
Primary = 2.82 cfs @ 12.85 hrs, Volume= 25,128 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 146.66' @ 12.85 hrs Surf.Area= 17,920 sf Storage= 41,561 cf

Plug-Flow detention time= 414.4 min calculated for 68,477 cf (80% of inflow)
Center-of-Mass det. time= 339.0 min (1,140.9 - 801.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	143.80'	3,584 cf	**98.10'W x 182.67'L x 4.00'H Field A** 71,681 cf Overall - 62,721 cf Embedded = 8,960 cf x 40.0% Voids
#2A	144.30'	48,192 cf	**StormTrap SingleTrap 3-0** x 110 Inside #1 Inside= 101.7"W x 36.0"H => 22.99 sf x 15.40'L = 354.0 cf Outside= 101.7"W x 42.0"H => 29.68 sf x 15.40'L = 456.9 cf 10 Rows of 11 Chambers 84.79' x 169.35' Core + 6.66' Border = 98.10' x 182.67' System
		51,777 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	143.80'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	143.80'	**15.0" Round Culvert** L= 10.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 143.80' / 143.70' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 1.23 sf
#3	Device 2	146.30'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.42 cfs @ 8.88 hrs HW=143.84' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.42 cfs)

Primary OutFlow Max=2.82 cfs @ 12.85 hrs HW=146.66' (Free Discharge)
└**2=Culvert** (Passes 2.82 cfs of 11.03 cfs potential flow)
└**3=Sharp-Crested Rectangular Weir** (Weir Controls 2.82 cfs @ 1.97 fps)

Pond P2B: Infiltration System StormTrap 3' Units - Chamber Wizard Field A

Chamber Model = StormTrap SingleTrap 3-0 (StormTrap ST2 SingleTrap®3'-0" tall Type II + IV)
Inside= 101.7"W x 36.0"H => 22.99 sf x 15.40'L = 354.0 cf
Outside= 101.7"W x 42.0"H => 29.68 sf x 15.40'L = 456.9 cf

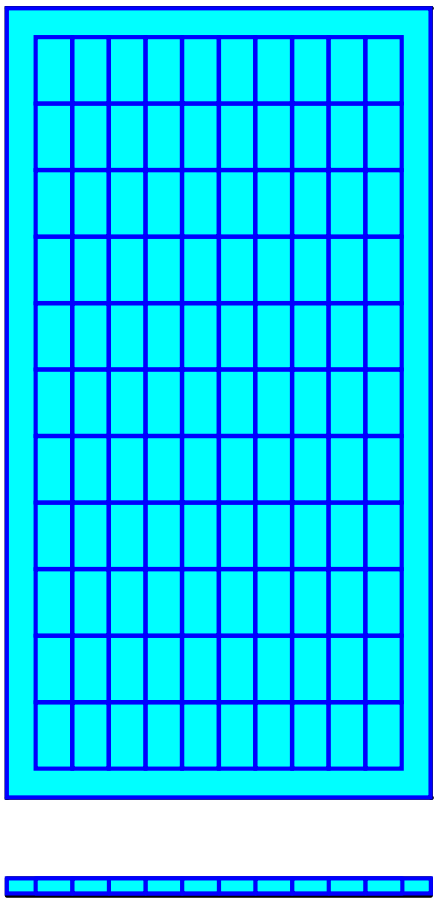
11 Chambers/Row x 15.40' Long = 169.35' Row Length +79.9" Border x 2 = 182.67' Base Length
10 Rows x 101.7" Wide + 79.9" Side Border x 2 = 98.10' Base Width
6.0" Base + 42.0" Chamber Height = 4.00' Field Height

110 Chambers x 354.0 cf + 9,253.4 cf Border = 48,192.5 cf Chamber Storage
110 Chambers x 456.9 cf + 12,461.9 cf Border = 62,721.3 cf Displacement

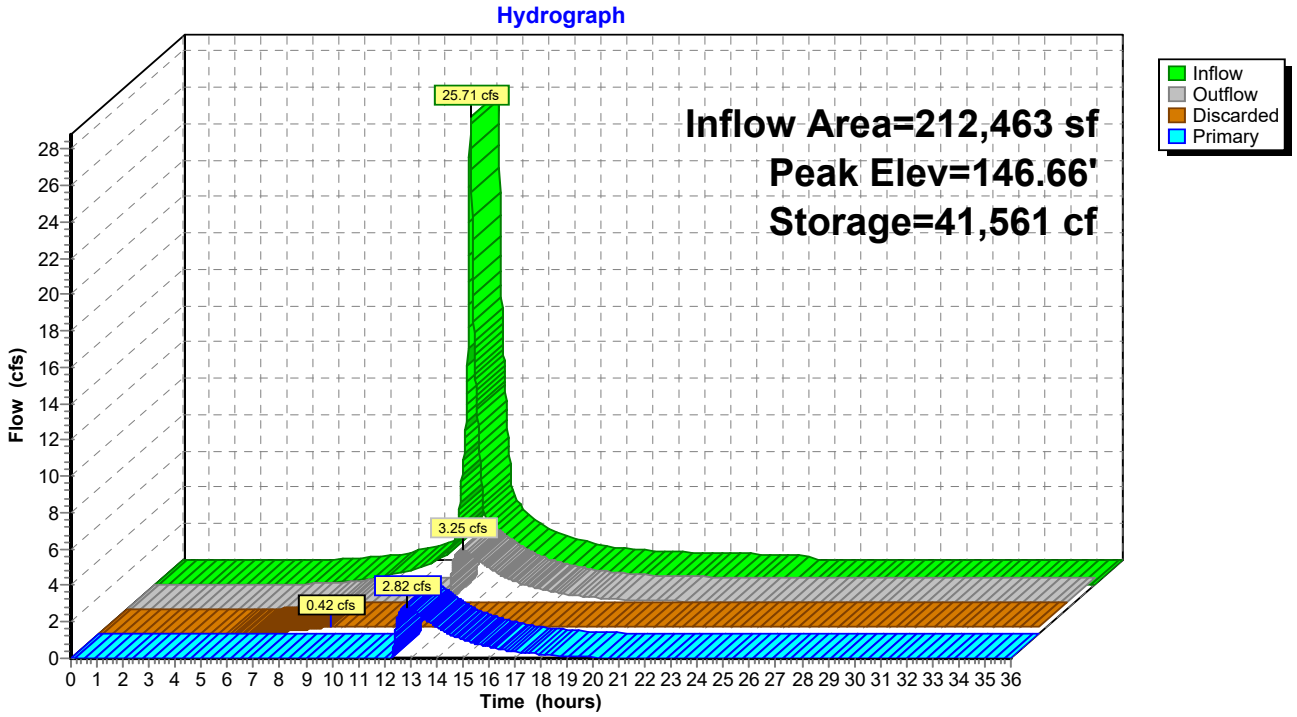
71,681.4 cf Field - 62,721.3 cf Chambers = 8,960.2 cf Stone x 40.0% Voids = 3,584.1 cf Stone Storage

Chamber Storage + Stone Storage = 51,776.5 cf = 1.189 af
Overall Storage Efficiency = 72.2%
Overall System Size = 182.67' x 98.10' x 4.00'

110 Chambers (plus border)
2,654.9 cy Field
331.9 cy Stone



Pond P2B: Infiltration System StormTrap 3' Units

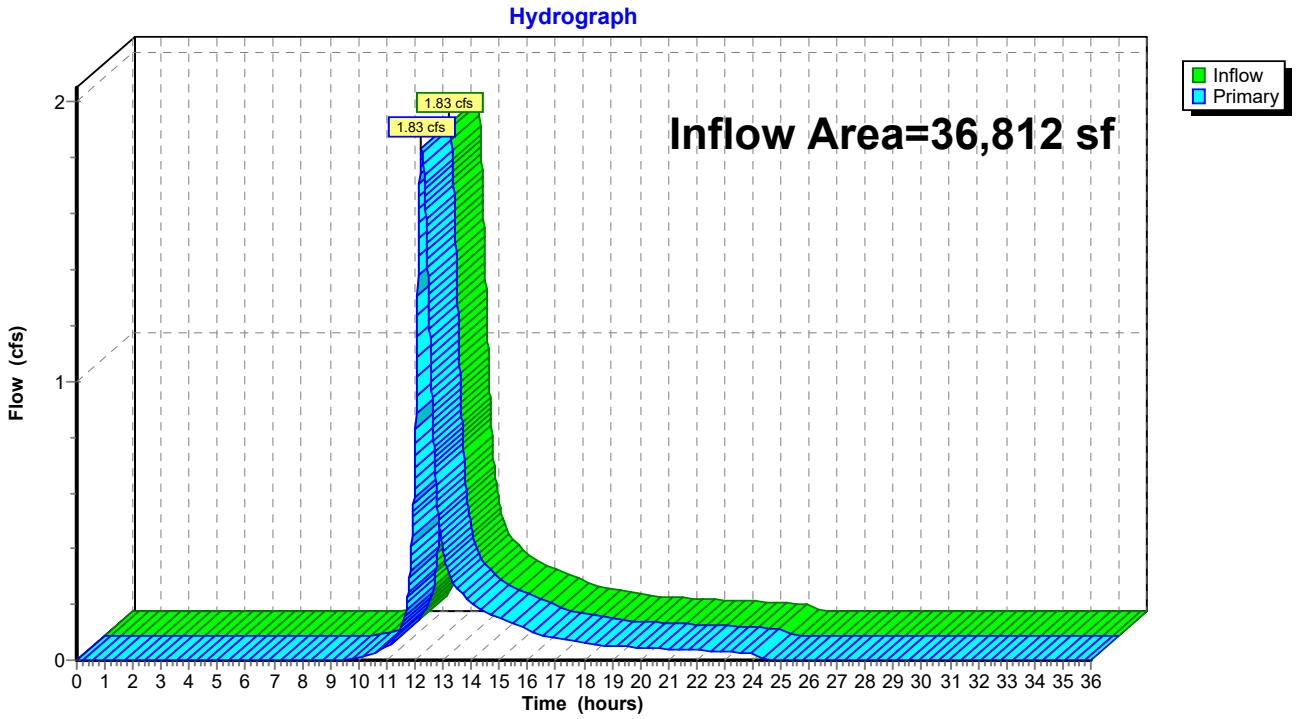


Summary for Link DP1: West Abutters

Inflow Area = 36,812 sf, 25.81% Impervious, Inflow Depth = 2.70" for 25-Year event
Inflow = 1.83 cfs @ 12.25 hrs, Volume= 8,278 cf
Primary = 1.83 cfs @ 12.25 hrs, Volume= 8,278 cf, Atten= 0%, Lag= 0.0 min

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

Link DP1: West Abutters

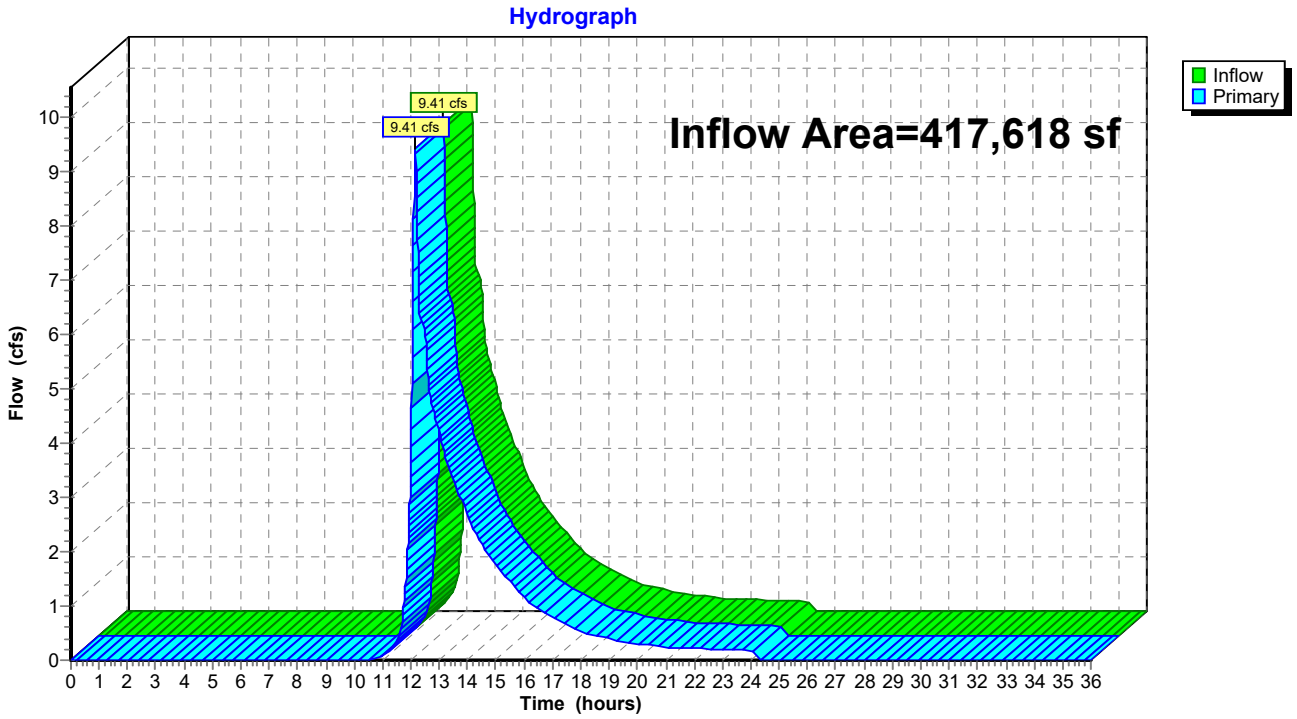


Summary for Link DP2: Fuller Brook

Inflow Area = 417,618 sf, 37.09% Impervious, Inflow Depth = 1.75" for 25-Year event
Inflow = 9.41 cfs @ 12.15 hrs, Volume= 60,899 cf
Primary = 9.41 cfs @ 12.15 hrs, Volume= 60,899 cf, Atten= 0%, Lag= 0.0 min

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

Link DP2: Fuller Brook



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

SubcatchmentPR1A: Runoff Area=18,475 sf 25.98% Impervious Runoff Depth=4.40"
Flow Length=270' Slope=0.0300 '/' Tc=14.5 min CN=68 Runoff=1.68 cfs 6,780 cf

SubcatchmentPR1B: Runoff Area=18,337 sf 25.63% Impervious Runoff Depth=4.40"
Flow Length=200' Slope=0.0300 '/' Tc=12.0 min CN=68 Runoff=1.79 cfs 6,729 cf

SubcatchmentPR2A: Runoff Area=51,327 sf 69.16% Impervious Runoff Depth=6.64"
Tc=5.0 min CN=87 Runoff=9.06 cfs 28,420 cf

SubcatchmentPR2B: Runoff Area=161,136 sf 67.58% Impervious Runoff Depth=6.53"
Flow Length=1,320' Tc=5.5 min CN=86 Runoff=27.59 cfs 87,623 cf

SubcatchmentPR2C: Overland to Fuller Runoff Area=205,155 sf 5.12% Impervious Runoff Depth=3.37"
Flow Length=550' Tc=10.4 min CN=59 Runoff=15.74 cfs 57,626 cf

Reach R1: Swale to West Abutters Avg. Flow Depth=0.07' Max Vel=1.87 fps Inflow=1.43 cfs 6,008 cf
n=0.022 L=200.0' S=0.0250 '/' Capacity=430.31 cfs Outflow=1.43 cfs 6,008 cf

Pond P1: Low Point at Entry Road Peak Elev=172.19' Storage=525 cf Inflow=1.68 cfs 6,780 cf
Discarded=0.03 cfs 772 cf Primary=1.43 cfs 6,008 cf Outflow=1.47 cfs 6,780 cf

Pond P2A: Offline Detention System in Peak Elev=163.68' Storage=4,043 cf Inflow=9.06 cfs 28,420 cf
Outflow=8.52 cfs 28,415 cf

Pond P2B: Infiltration System Peak Elev=147.16' Storage=49,539 cf Inflow=35.89 cfs 116,038 cf
Discarded=0.42 cfs 44,971 cf Primary=10.00 cfs 53,324 cf Outflow=10.42 cfs 98,295 cf

Link DP1: West Abutters Inflow=2.82 cfs 12,738 cf
Primary=2.82 cfs 12,738 cf

Link DP2: Fuller Brook Inflow=20.39 cfs 110,950 cf
Primary=20.39 cfs 110,950 cf

Total Runoff Area = 454,430 sf Runoff Volume = 187,179 cf Average Runoff Depth = 4.94"
63.82% Pervious = 290,030 sf 36.18% Impervious = 164,400 sf

Summary for Subcatchment PR1A:

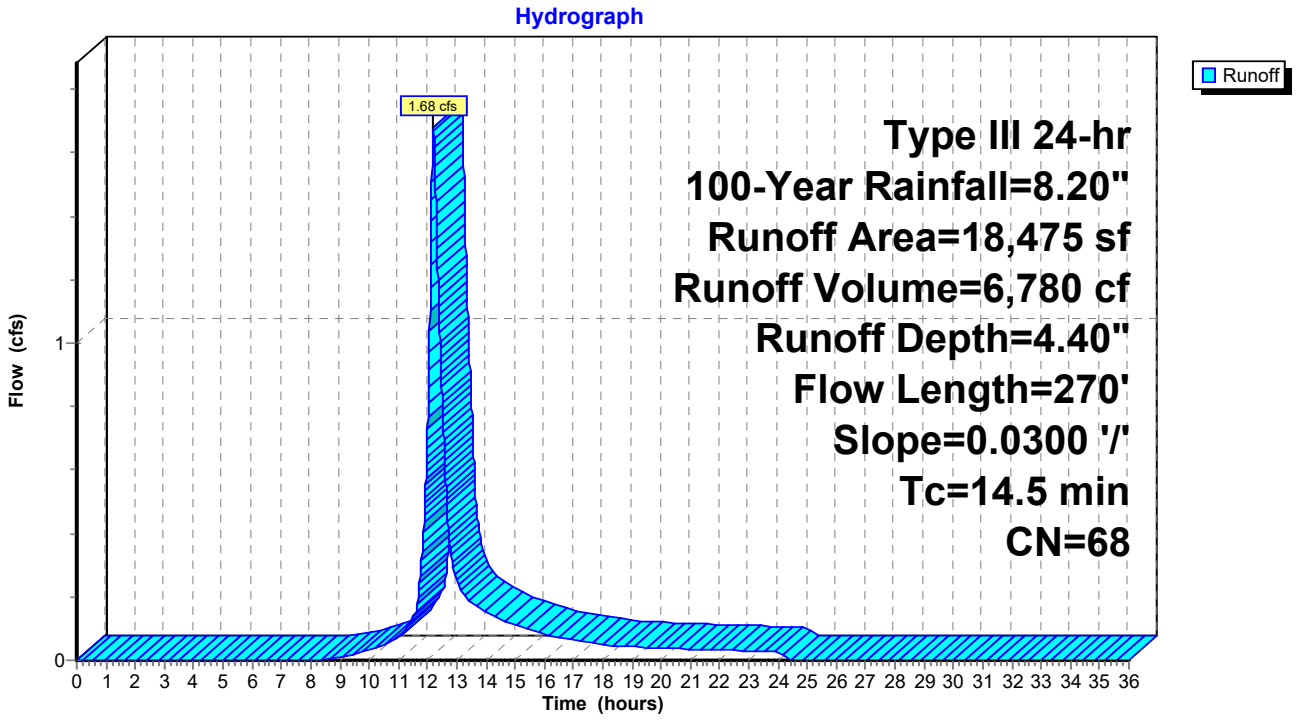
Runoff = 1.68 cfs @ 12.20 hrs, Volume= 6,780 cf, Depth= 4.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.20"

Area (sf)	CN	Description
4,800	98	Paved parking, HSG B
8,802	55	Woods, Good, HSG B
4,873	61	>75% Grass cover, Good, HSG B
18,475	68	Weighted Average
13,675		74.02% Pervious Area
4,800		25.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
4.2	220	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.5	270	Total			

Subcatchment PR1A:



Summary for Subcatchment PR1B:

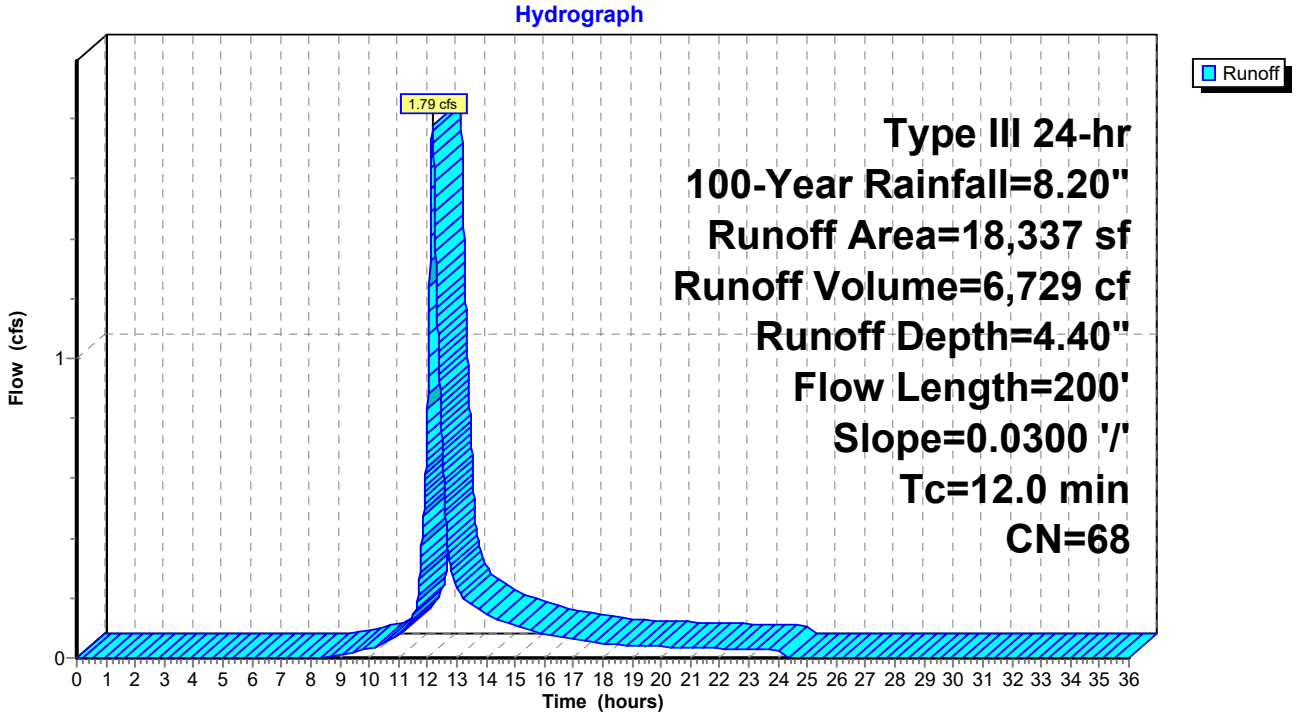
Runoff = 1.79 cfs @ 12.17 hrs, Volume= 6,729 cf, Depth= 4.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.20"

Area (sf)	CN	Description
4,700	98	Paved parking, HSG B
6,100	55	Woods, Good, HSG B
7,537	61	>75% Grass cover, Good, HSG B
18,337	68	Weighted Average
13,637		74.37% Pervious Area
4,700		25.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	20	0.0300	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.33"
6.8	30	0.0300	0.07		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.33"
2.9	150	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.0	200	Total			

Subcatchment PR1B:



Summary for Subcatchment PR2A:

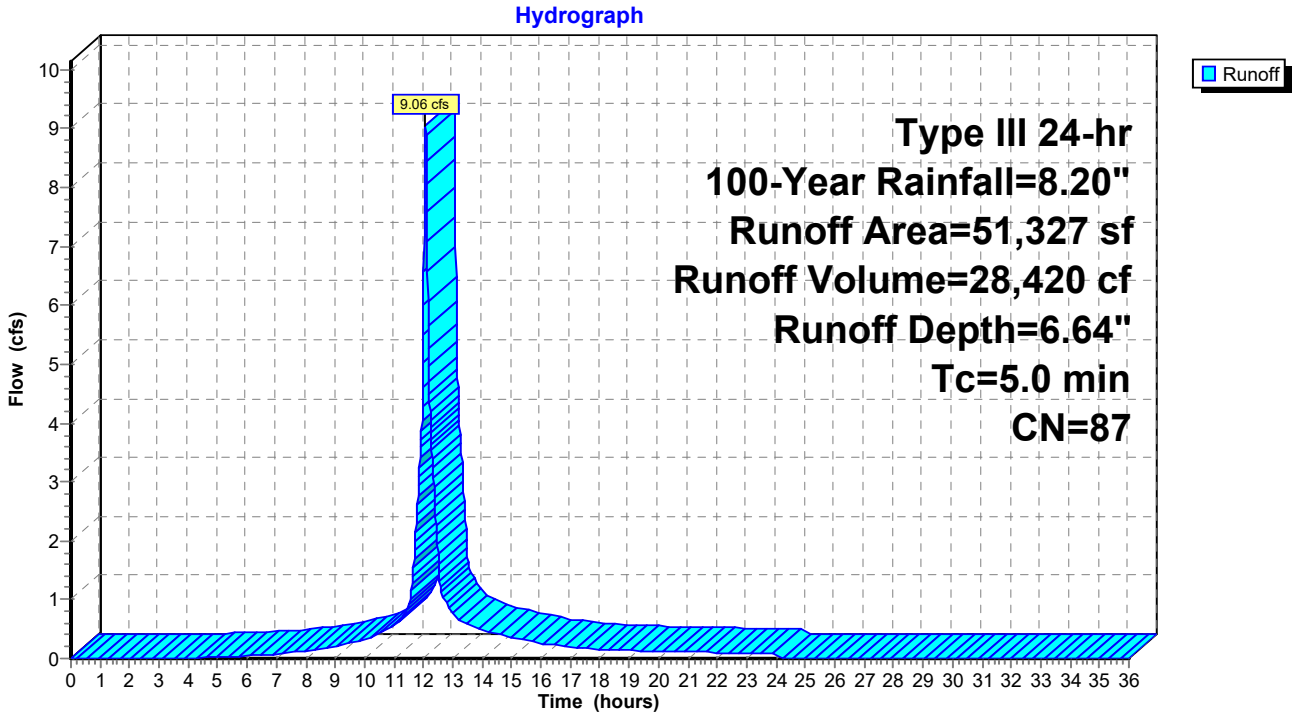
Runoff = 9.06 cfs @ 12.07 hrs, Volume= 28,420 cf, Depth= 6.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.20"

Area (sf)	CN	Description
35,500	98	Paved parking, HSG B
15,827	61	>75% Grass cover, Good, HSG B
51,327	87	Weighted Average
15,827		30.84% Pervious Area
35,500		69.16% Impervious Area

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

Subcatchment PR2A:



Summary for Subcatchment PR2B:

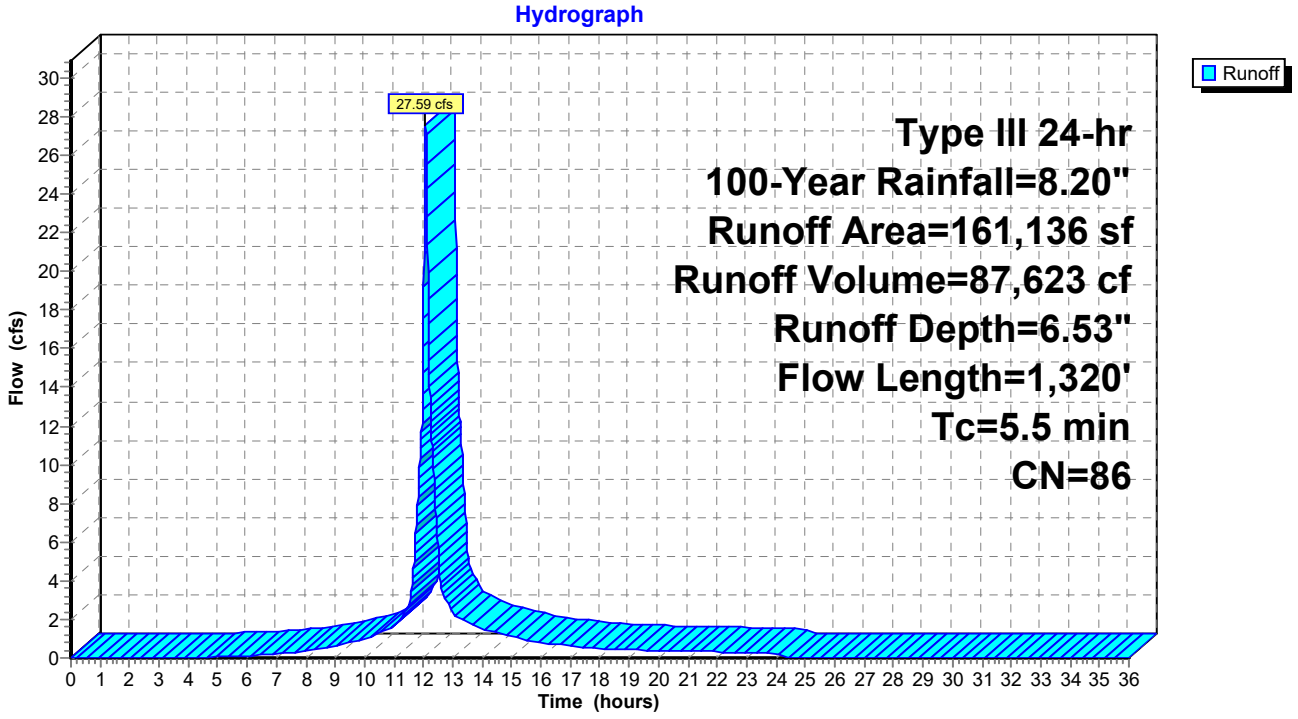
Runoff = 27.59 cfs @ 12.08 hrs, Volume= 87,623 cf, Depth= 6.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.20"

Area (sf)	CN	Description
108,900	98	Paved parking, HSG B
52,236	61	>75% Grass cover, Good, HSG B
161,136	86	Weighted Average
52,236		32.42% Pervious Area
108,900		67.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0600	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.33"
0.8	190	0.0350	3.80		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.1	1,080	0.0350	15.92	50.02	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011
5.5	1,320	Total			

Subcatchment PR2B:



Summary for Subcatchment PR2C: Overland to Fuller Brook

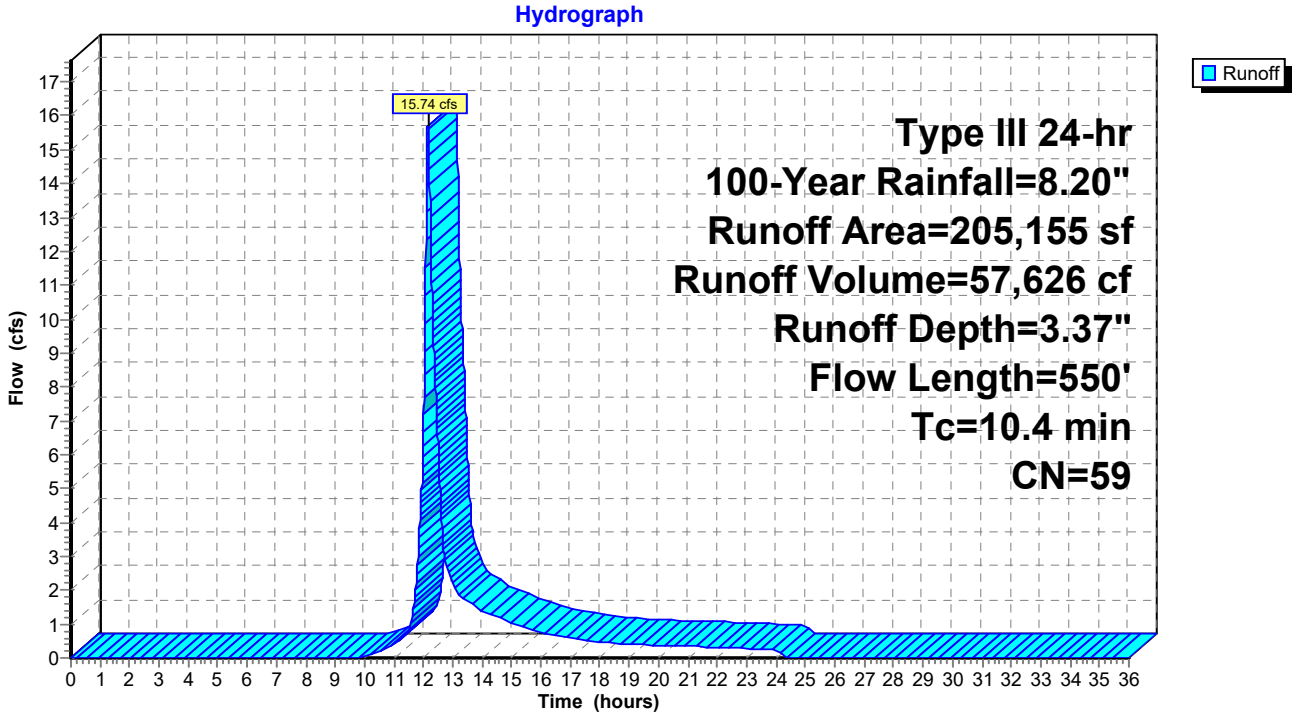
Runoff = 15.74 cfs @ 12.15 hrs, Volume= 57,626 cf, Depth= 3.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.20"

Area (sf)	CN	Description
10,500	98	Paved parking, HSG B
74,977	61	>75% Grass cover, Good, HSG B
119,678	55	Woods, Good, HSG B
205,155	59	Weighted Average
194,655		94.88% Pervious Area
10,500		5.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	50	0.0600	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.33"
1.5	150	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.3	350	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.4	550	Total			

Subcatchment PR2C: Overland to Fuller Brook



Summary for Reach R1: Swale to West Abutters

Inflow Area = 18,475 sf, 25.98% Impervious, Inflow Depth = 3.90" for 100-Year event
Inflow = 1.43 cfs @ 12.28 hrs, Volume= 6,008 cf
Outflow = 1.43 cfs @ 12.33 hrs, Volume= 6,008 cf, Atten= 0%, Lag= 3.0 min

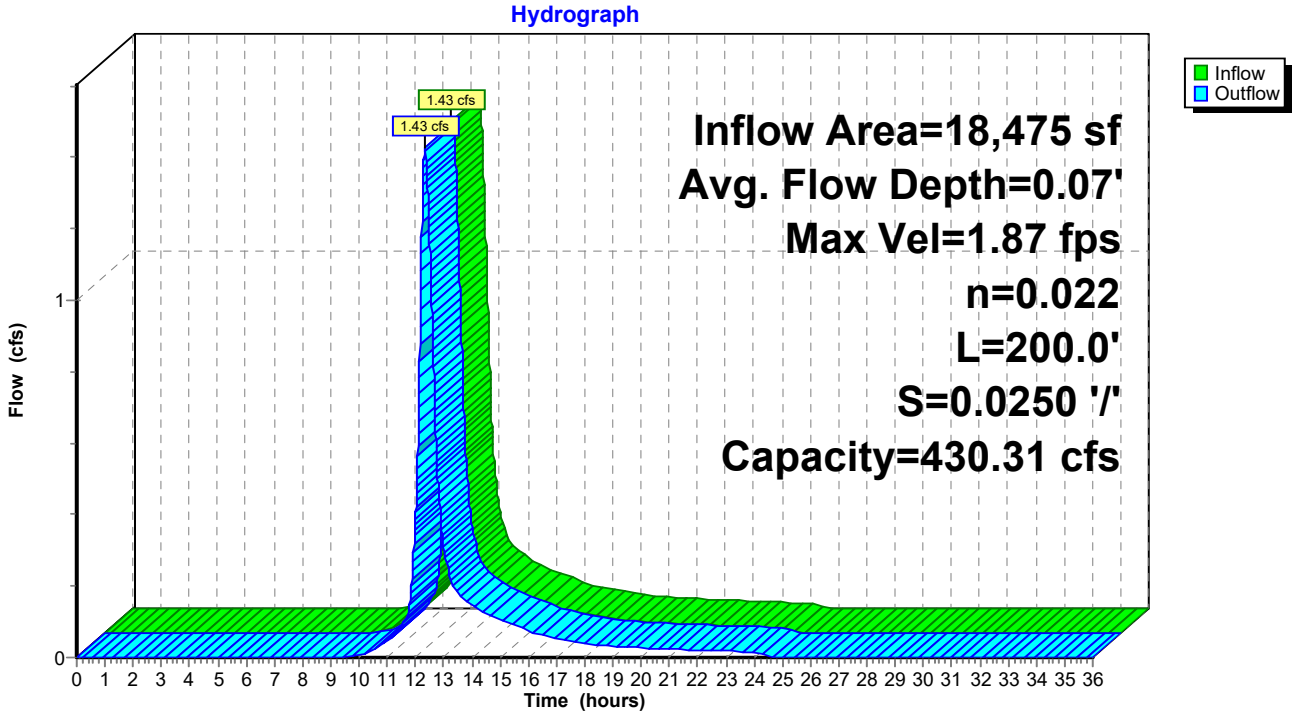
Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.87 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 0.84 fps, Avg. Travel Time= 4.0 min

Peak Storage= 152 cf @ 12.30 hrs
Average Depth at Peak Storage= 0.07'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 430.31 cfs

10.00' x 2.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 3.0 '/' Top Width= 22.00'
Length= 200.0' Slope= 0.0250 '/'
Inlet Invert= 169.00', Outlet Invert= 164.00'

‡

Reach R1: Swale to West Abutters



Summary for Pond P1: Low Point at Entry Road

Inflow Area = 18,475 sf, 25.98% Impervious, Inflow Depth = 4.40" for 100-Year event
Inflow = 1.68 cfs @ 12.20 hrs, Volume= 6,780 cf
Outflow = 1.47 cfs @ 12.28 hrs, Volume= 6,780 cf, Atten= 13%, Lag= 5.1 min
Discarded = 0.03 cfs @ 12.28 hrs, Volume= 772 cf
Primary = 1.43 cfs @ 12.28 hrs, Volume= 6,008 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 172.19' @ 12.28 hrs Surf.Area= 1,388 sf Storage= 525 cf

Plug-Flow detention time= 10.0 min calculated for 6,780 cf (100% of inflow)
Center-of-Mass det. time= 9.9 min (845.7 - 835.8)

Volume	Invert	Avail.Storage	Storage Description
#1	171.50'	1,113 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

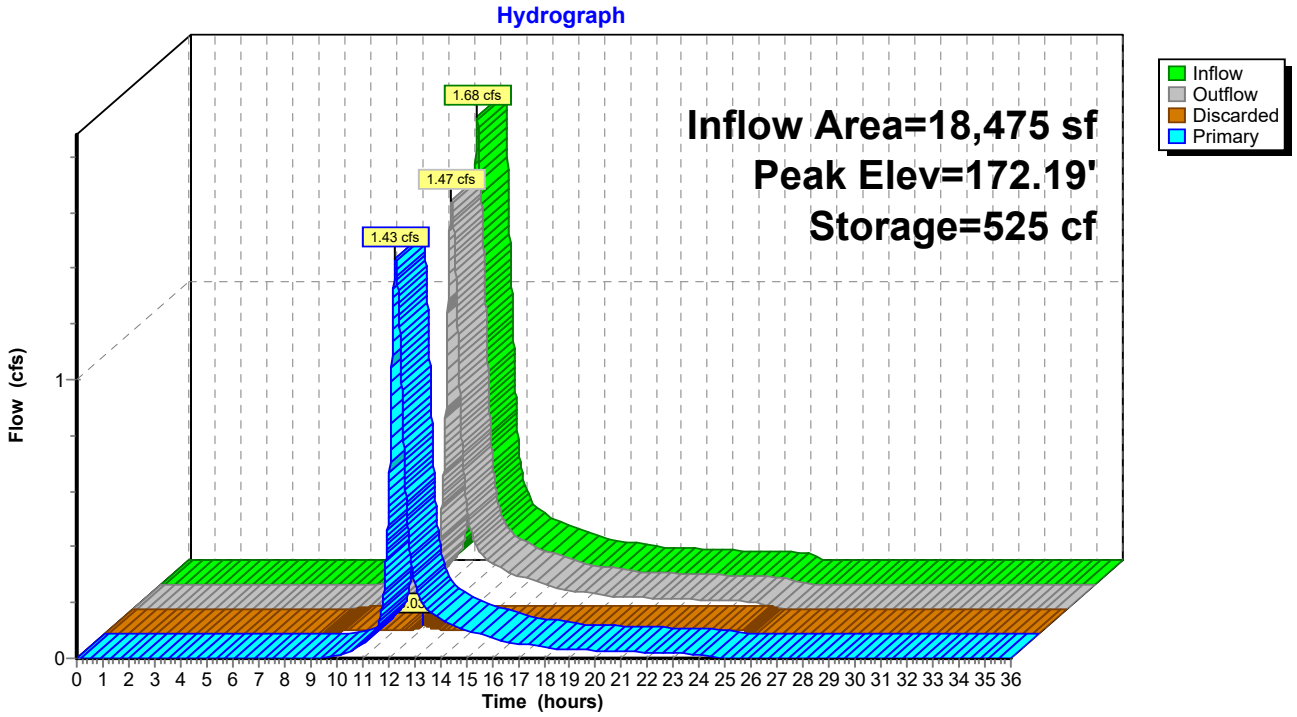
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
171.50	482	0	0
172.00	800	321	321
172.50	2,370	793	1,113

Device	Routing	Invert	Outlet Devices
#1	Discarded	171.50'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	171.50'	**12.0" Round Culvert** L= 10.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 171.50' / 171.40' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf

Discarded OutFlow Max=0.03 cfs @ 12.28 hrs HW=172.19' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=1.43 cfs @ 12.28 hrs HW=172.19' (Free Discharge)
↑—**2=Culvert** (Barrel Controls 1.43 cfs @ 3.51 fps)

Pond P1: Low Point at Entry Road



Summary for Pond P2A: Offline Detention System in Green

Inflow Area = 51,327 sf, 69.16% Impervious, Inflow Depth = 6.64" for 100-Year event
Inflow = 9.06 cfs @ 12.07 hrs, Volume= 28,420 cf
Outflow = 8.52 cfs @ 12.10 hrs, Volume= 28,415 cf, Atten= 6%, Lag= 1.6 min
Primary = 8.52 cfs @ 12.10 hrs, Volume= 28,415 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 163.68' @ 12.10 hrs Surf.Area= 1,709 sf Storage= 4,043 cf

Plug-Flow detention time= 28.1 min calculated for 28,408 cf (100% of inflow)
Center-of-Mass det. time= 28.1 min (811.4 - 783.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	161.00'	0 cf	**38.75'W x 44.10'L x 3.50'H Field A** 5,982 cf Overall - 5,982 cf Embedded = 0 cf x 40.0% Voids
#2A	161.00'	4,530 cf	**StormTrap SingleTrap 3-0** x 6 Inside #1 Inside= 101.7"W x 36.0"H => 22.99 sf x 15.40'L = 354.0 cf Outside= 101.7"W x 42.0"H => 29.68 sf x 15.40'L = 456.9 cf 3 Rows of 2 Chambers 25.44' x 30.79' Core + 6.66' Border = 38.75' x 44.10' System
		4,530 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	161.00'	**24.0" Round Culvert** L= 10.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 161.00' / 159.90' S= 0.1100 '/' Cc= 0.900 n= 0.011, Flow Area= 3.14 sf
#2	Device 1	161.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	163.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=8.51 cfs @ 12.10 hrs HW=163.68' (Free Discharge)
└**1=Culvert** (Passes 8.51 cfs of 24.48 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 1.47 cfs @ 7.50 fps)
  └**3=Sharp-Crested Rectangular Weir** (Weir Controls 7.04 cfs @ 2.69 fps)

Pond P2A: Offline Detention System in Green - Chamber Wizard Field A

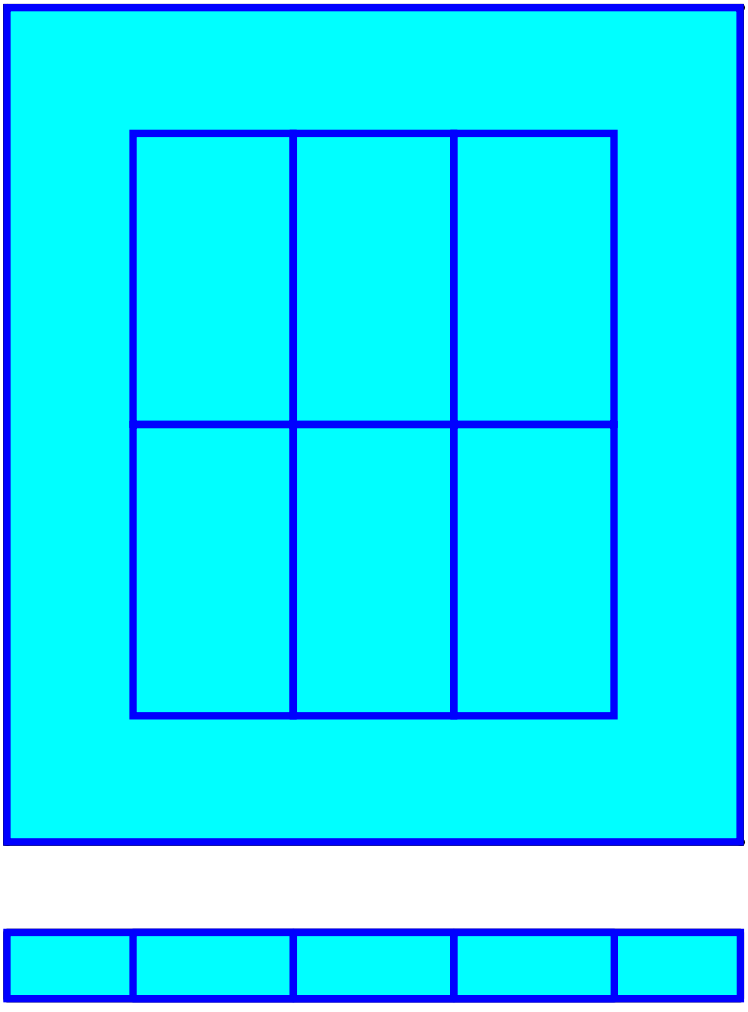
Chamber Model = StormTrap SingleTrap 3-0 (StormTrap ST2 SingleTrap®3'-0" tall Type II + IV)
Inside= 101.7"W x 36.0"H => 22.99 sf x 15.40'L = 354.0 cf
Outside= 101.7"W x 42.0"H => 29.68 sf x 15.40'L = 456.9 cf

2 Chambers/Row x 15.40' Long = 30.79' Row Length +79.9" Border x 2 = 44.10' Base Length
3 Rows x 101.7" Wide + 79.9" Side Border x 2 = 38.75' Base Width
42.0" Chamber Height = 3.50' Field Height

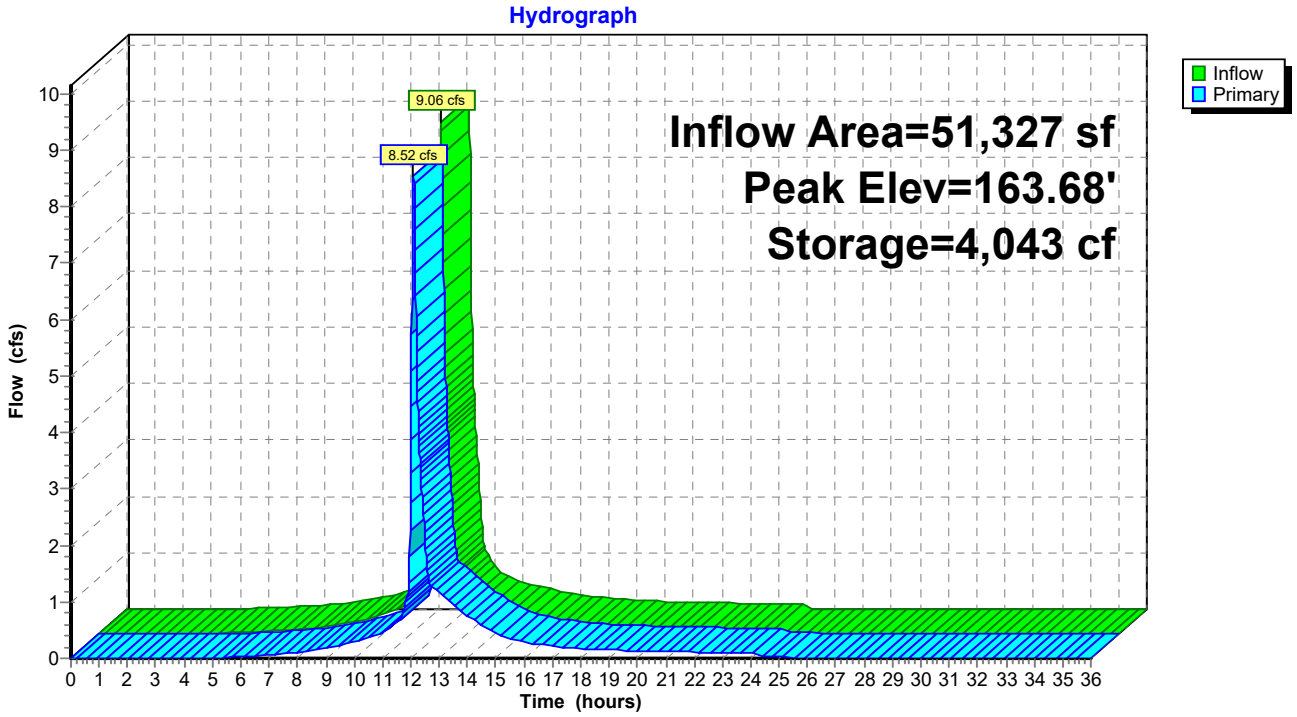
6 Chambers x 354.0 cf + 2,406.0 cf Border = 4,529.9 cf Chamber Storage
6 Chambers x 456.9 cf + 3,240.2 cf Border = 5,981.6 cf Displacement

Chamber Storage = 4,529.9 cf = 0.104 af
Overall Storage Efficiency = 75.7%
Overall System Size = 44.10' x 38.75' x 3.50'

6 Chambers (plus border)
221.5 cy Field



Pond P2A: Offline Detention System in Green



Summary for Pond P2B: Infiltration System StormTrap 3' Units

Inflow Area = 212,463 sf, 67.96% Impervious, Inflow Depth = 6.55" for 100-Year event
Inflow = 35.89 cfs @ 12.08 hrs, Volume= 116,038 cf
Outflow = 10.42 cfs @ 12.42 hrs, Volume= 98,295 cf, Atten= 71%, Lag= 20.1 min
Discarded = 0.42 cfs @ 7.98 hrs, Volume= 44,971 cf
Primary = 10.00 cfs @ 12.42 hrs, Volume= 53,324 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 147.16' @ 12.42 hrs Surf.Area= 17,920 sf Storage= 49,539 cf

Plug-Flow detention time= 308.7 min calculated for 98,267 cf (85% of inflow)
Center-of-Mass det. time= 243.6 min (1,036.2 - 792.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	143.80'	3,584 cf	**98.10'W x 182.67'L x 4.00'H Field A** 71,681 cf Overall - 62,721 cf Embedded = 8,960 cf x 40.0% Voids
#2A	144.30'	48,192 cf	**StormTrap SingleTrap 3-0** x 110 Inside #1 Inside= 101.7"W x 36.0"H => 22.99 sf x 15.40'L = 354.0 cf Outside= 101.7"W x 42.0"H => 29.68 sf x 15.40'L = 456.9 cf 10 Rows of 11 Chambers 84.79' x 169.35' Core + 6.66' Border = 98.10' x 182.67' System
		51,777 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	143.80'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	143.80'	**15.0" Round Culvert** L= 10.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 143.80' / 143.70' S= 0.0100 '/' Cc= 0.900 n= 0.011, Flow Area= 1.23 sf
#3	Device 2	146.30'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.42 cfs @ 7.98 hrs HW=143.84' (Free Discharge)
↑└**1=Exfiltration** (Exfiltration Controls 0.42 cfs)

Primary OutFlow Max=9.99 cfs @ 12.42 hrs HW=147.16' (Free Discharge)
↑└**2=Culvert** (Passes 9.99 cfs of 12.22 cfs potential flow)
↑└**3=Sharp-Crested Rectangular Weir** (Weir Controls 9.99 cfs @ 3.03 fps)

Pond P2B: Infiltration System StormTrap 3' Units - Chamber Wizard Field A

Chamber Model = StormTrap SingleTrap 3-0 (StormTrap ST2 SingleTrap®3'-0" tall Type II + IV)
Inside= 101.7"W x 36.0"H => 22.99 sf x 15.40'L = 354.0 cf
Outside= 101.7"W x 42.0"H => 29.68 sf x 15.40'L = 456.9 cf

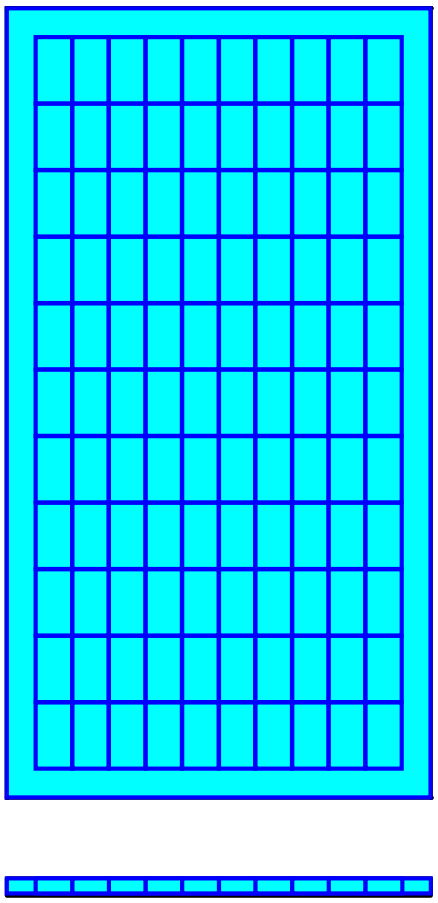
11 Chambers/Row x 15.40' Long = 169.35' Row Length +79.9" Border x 2 = 182.67' Base Length
10 Rows x 101.7" Wide + 79.9" Side Border x 2 = 98.10' Base Width
6.0" Base + 42.0" Chamber Height = 4.00' Field Height

110 Chambers x 354.0 cf + 9,253.4 cf Border = 48,192.5 cf Chamber Storage
110 Chambers x 456.9 cf + 12,461.9 cf Border = 62,721.3 cf Displacement

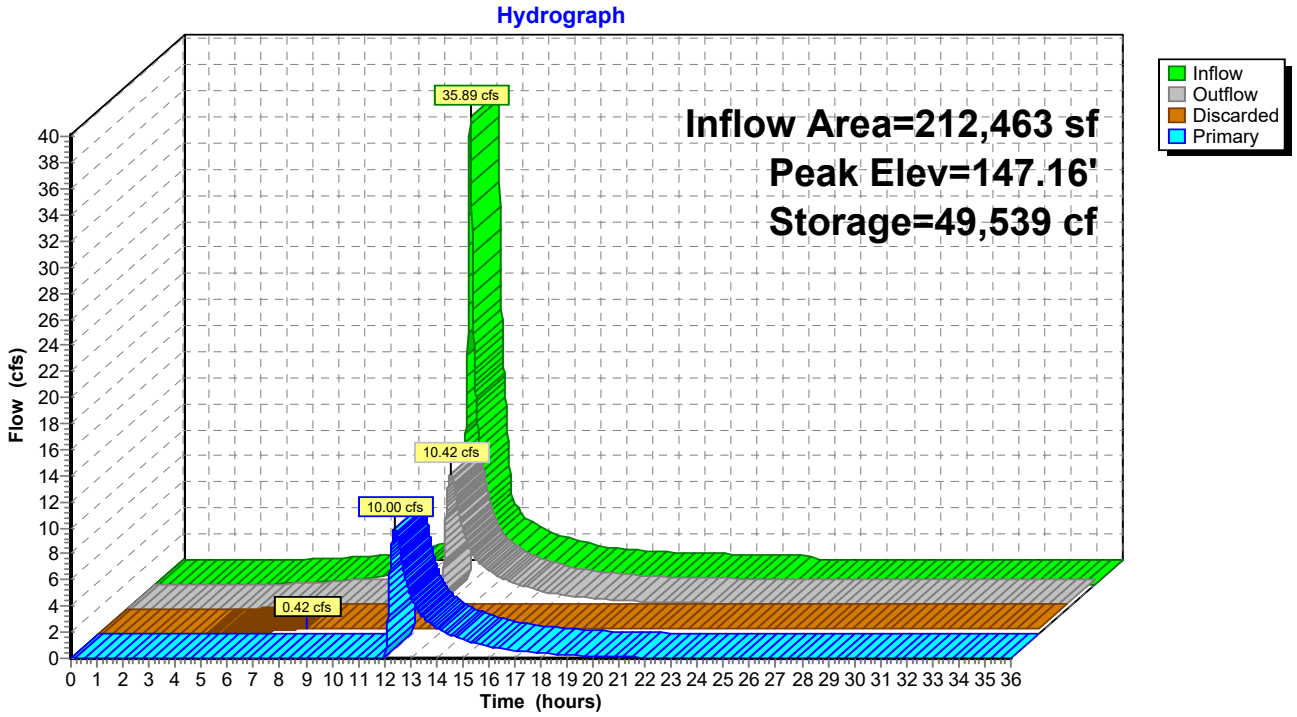
71,681.4 cf Field - 62,721.3 cf Chambers = 8,960.2 cf Stone x 40.0% Voids = 3,584.1 cf Stone Storage

Chamber Storage + Stone Storage = 51,776.5 cf = 1.189 af
Overall Storage Efficiency = 72.2%
Overall System Size = 182.67' x 98.10' x 4.00'

110 Chambers (plus border)
2,654.9 cy Field
331.9 cy Stone



Pond P2B: Infiltration System StormTrap 3' Units

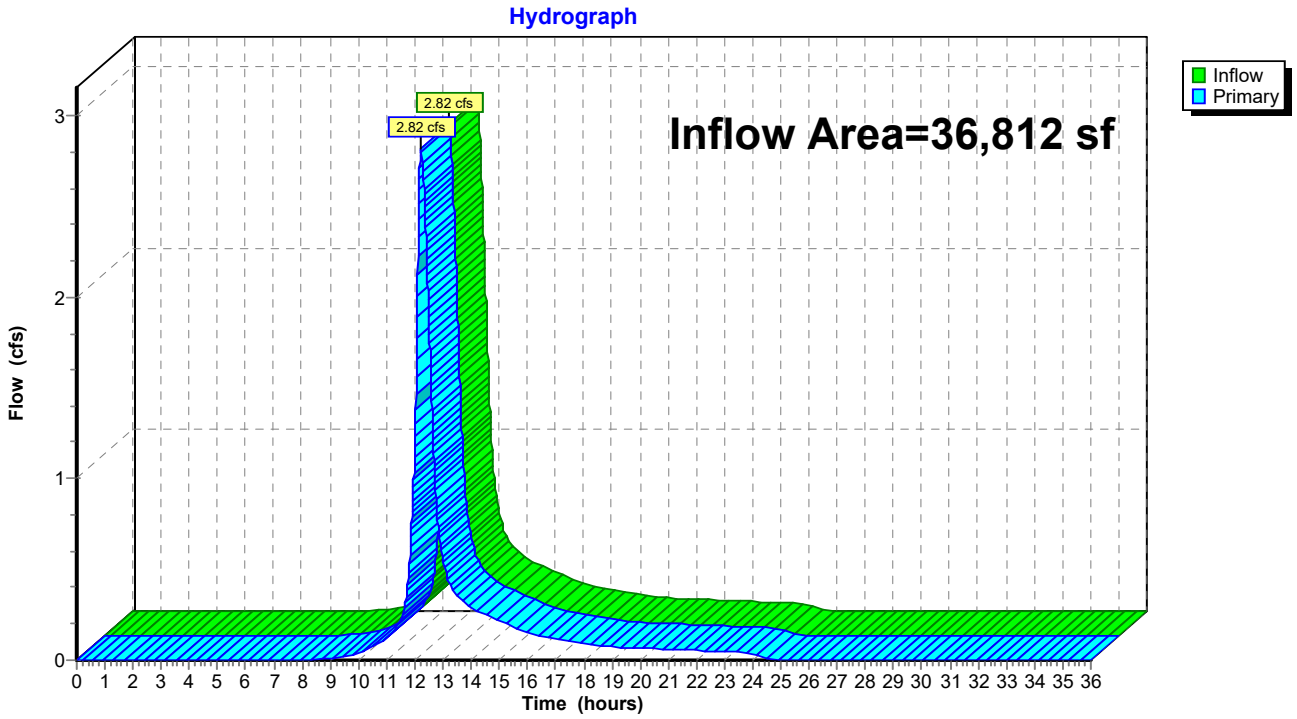


Summary for Link DP1: West Abutters

Inflow Area = 36,812 sf, 25.81% Impervious, Inflow Depth = 4.15" for 100-Year event
Inflow = 2.82 cfs @ 12.22 hrs, Volume= 12,738 cf
Primary = 2.82 cfs @ 12.22 hrs, Volume= 12,738 cf, Atten= 0%, Lag= 0.0 min

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

Link DP1: West Abutters

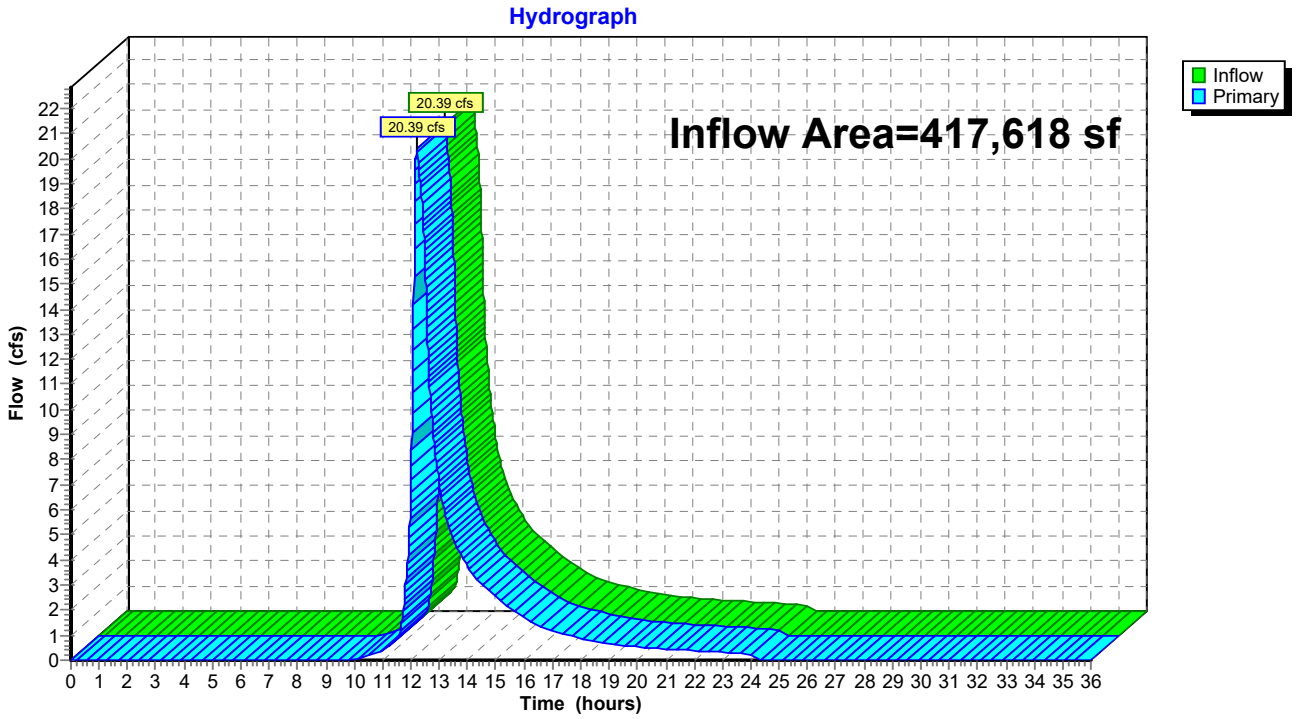


Summary for Link DP2: Fuller Brook

Inflow Area = 417,618 sf, 37.09% Impervious, Inflow Depth = 3.19" for 100-Year event
Inflow = 20.39 cfs @ 12.20 hrs, Volume= 110,950 cf
Primary = 20.39 cfs @ 12.20 hrs, Volume= 110,950 cf, Atten= 0%, Lag= 0.0 min

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

Link DP2: Fuller Brook



Appendix C
Standard 3 Computations and Supporting Information

- NRCS Soil Survey Map
- CHA Soil Evaluation
- Recharge and Drawdown Calculations

NRCS Soil Survey Map

Hydrologic Soil Group—Norfolk and Suffolk Counties, Massachusetts

Map Scale: 1:6,390 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 300 600 1200 1800

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 12, Sep 15, 2016

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

Date(s) aerial images were photographed: Mar 30, 2011—Sep 28, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Norfolk and Suffolk Counties, Massachusetts (MA616)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
1	Water		0.2	0.1%
51	Swansea muck, 0 to 1 percent slopes	B/D	12.6	7.6%
52	Freetown muck, 0 to 1 percent slopes	B/D	14.3	8.6%
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	A	56.3	34.1%
260B	Sudbury fine sandy loam, 2 to 8 percent slopes	B	4.6	2.8%
305B	Paxton fine sandy loam, 3 to 8 percent slopes	C	2.5	1.5%
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	C/D	9.3	5.6%
420B	Canton fine sandy loam, 3 to 8 percent slopes	B	2.5	1.5%
420C	Canton fine sandy loam, 8 to 15 percent slopes	B	2.9	1.7%
420D	Canton fine sandy loam, 15 to 35 percent slopes	A	3.8	2.3%
422C	Canton fine sandy loam, 8 to 15 percent slopes, extremely stony	B	6.9	4.2%
422D	Canton fine sandy loam, 15 to 35 percent slopes, extremely stony	B	2.1	1.3%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	A	23.5	14.2%
652	Udorthents, refuse substratum	A	5.5	3.4%
653	Udorthents, sandy	A	18.3	11.1%
Totals for Area of Interest			**165.2**	**100.0%**

Description

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

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

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

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

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

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

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

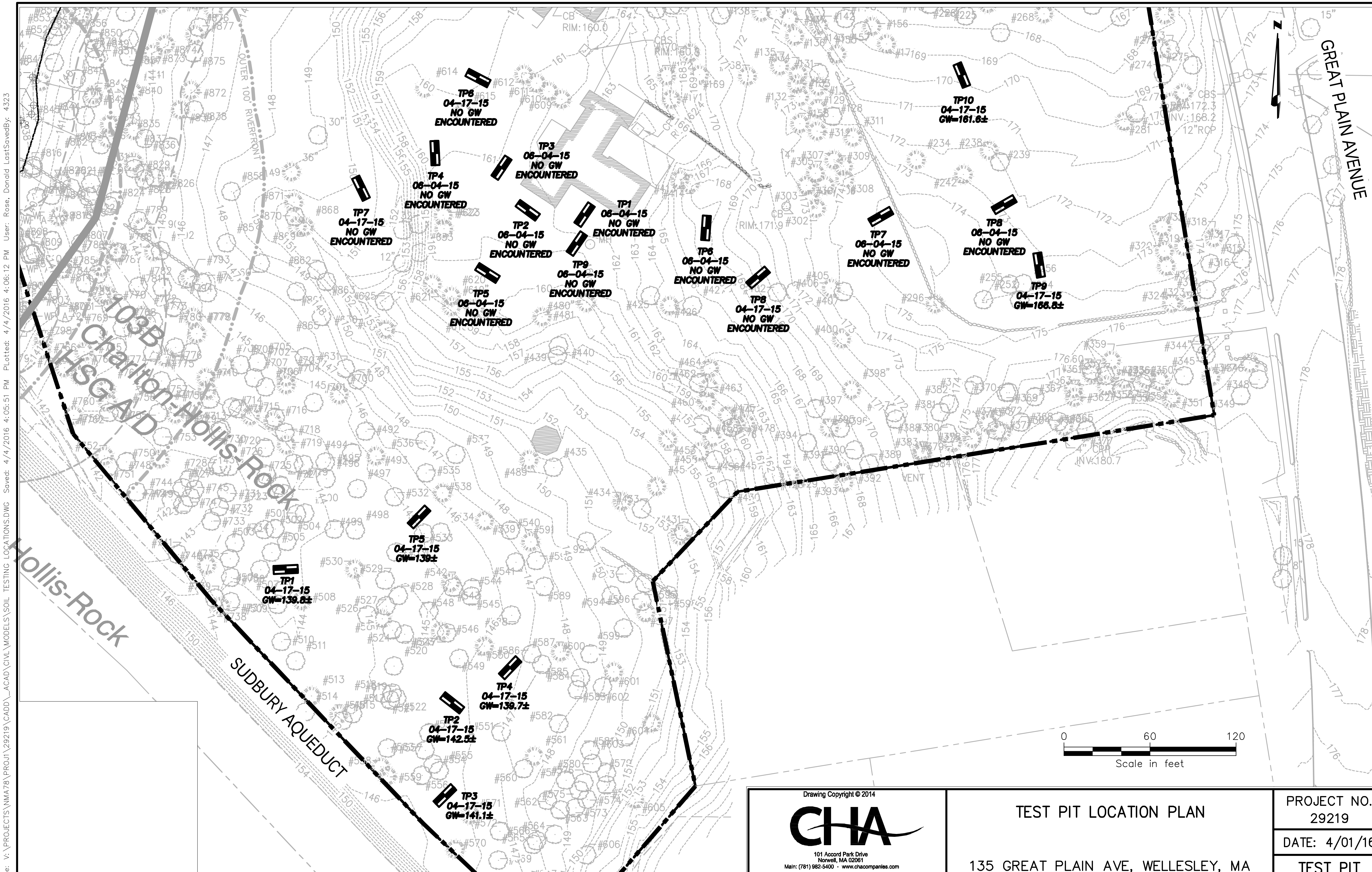
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

CHA Soil Evaluation



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TEST PIT LOCATION PLAN

135 GREAT PLAIN AVE, WELLESLEY, MA

PROJECT NO. 29219

DATE: 4/01/16

TEST PIT

File: V:\PROJECTS\NMA78\PROJ1\29219\CADD_ACAD\CIVIL\MODELS\SOIL TESTING LOCATIONS.DWG Saved: 4/4/2016 4:05:51 PM PLotted: 4/4/2016 4:06:12 PM User: Rose, Donald LastSavedBy: 4323

Commonwealth of Massachusetts
City/Town of Wellesley

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

A. Facility Information

Northland Residential
Owner Name

135 Great Plain Ave
Street Address

Map/Lot #

Wellesley
City

MA
State

Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade ☐ Repair

2. Soil Survey Available? ☒ Yes ☐ No If yes: NRCS (Source) 103B (Soil Map Unit)

Charlton-Hollis-Rock
Soil Name

Soil Limitations

Ablation Till
Geologic/Parent Material

Hills
Landform

3. Surficial Geological Report Available? ☒ Yes ☐ No If yes: 9/1989 (Year Published/Source) 1:25,000 (Publication Scale) (Map Unit)

4. Flood Rate Insurance Map

Above the 500-year flood boundary? ☒ Yes ☐ No
If Yes, continue to #5.

Within the 100-year flood boundary? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No

MassGIS Wetland Data Layer:
Wetland Type

7. Current Water Resource Conditions (USGS): 4/2015 (Month/Year) Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed:

Commonwealth of Massachusetts
City/Town of Wellesley

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

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP1 | 4/17/15 (Date) | 8:00 am (Time) | overcast (Weather)
4/17/15

1. Location

Ground Elevation at Surface of Hole: 143.8+/- feet Latitude/Longitude: /

Description of Location: Wooded portion of Residential Lot

2. Land Use: Residential (e.g., woodland, agricultural field, vacant lot, etc.) | No (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 1-2% (Slope (%))

Vegetation | Landform | Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from:

Open Water Body	feet	Drainage Way	feet	Wetlands	>200' feet
Property Line	>50' feet	Drinking Water Well	feet	Other	feet

4. Parent Material: ____ Unsuitable Materials Present: ☐ Yes ☐ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 48" Depth Weeping from Pit | ____ Depth Standing Water in Hole

Estimated Depth to High Groundwater: 48" inches 139.8+/- elevation

Commonwealth of Massachusetts
City/Town of Wellesley
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP1 4/17/15

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12"	A	10YR3/2				Sandy Loam			Wk Blocky	V. Friable	
12-27"	B	7.5YR3/2				Sandy Loam			Wk Blocky	V. Friable	
27-48"	C1	2.5Y6/4	48"			Med Sand	10%		Single Grain	Loose	
48-132"	C2	2.5Y6/4				V Fine Sandy Loam			Blocky	Friable	

Additional Notes:

Sand in C1 layer was rusty in color. C2 had mottling and was moist. No water from the bottom of the test pit. Water filling test pit was from C1 layer.

Commonwealth of Massachusetts
City/Town of Wellesley
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP2 4/17/15 | 4/17/15 Date | 8:30 am Time | overcast Weather

1. Location

Ground Elevation at Surface of Hole: 145.8+/- feet | Latitude/Longitude: /

2. Land Use: Residential Lot (e.g., woodland, agricultural field, vacant lot, etc.) | Surface Stones (e.g., cobbles, stones, boulders, etc.) | 1-2% Slope (%)

Wooded Vegetation | Landform | Position on Landscape (SU, SH, BS, FS,

3. Distances from:

Open Water Body	feet	Drainage Way	feet	Wetlands	>200' feet
Property Line	>50' feet	Drinking Water Well	feet	Other	feet

4. Parent Material: | Unsuitable Materials Present: ☐ Yes ☐ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No | If yes: 40" Depth Weeping from Pit | Depth Standing Water in Hole

Estimated Depth to High Groundwater: 40" inches | 142.5+/- elevation

Commonwealth of Massachusetts
City/Town of Wellesley
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP2 4/17/15

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-14"	A	10YR3/2				Sandy Loam			Wk. Blocky	V. Friable	
14-30"	B	7.5YR4/6				Sandy Loam			Wk. Blocky	V. Friable	
30-120"	C	2.5Y6/4	40"			Sandy Loam			Blocky	Friable	Pockets of med. Sand

Additional Notes:

No water from bottom of the pit. C2 was moist.

Commonwealth of Massachusetts
City/Town of Wellesley

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

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP3 | 4/17/15 (Date) | 9:20 am (Time) | overcast (Weather)
4/17/15

1. Location

Ground Elevation at Surface of Hole: 145.7+/- feet Latitude/Longitude: /

Description of Location: Wooded portion of Residential Lot

2. Land Use: Residential Lot (e.g., woodland, agricultural field, vacant lot, etc.) | No (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 1-2% (Slope (%))

Wooded (Vegetation) | (Landform) | (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from:

Open Water Body	feet	Drainage Way	feet	Wetlands	>200' feet
Property Line	>15' feet	Drinking Water Well	feet	Other	feet

4. Parent Material: _____ Unsuitable Materials Present: ☐ Yes ☐ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 56" Depth Weeping from Pit | Depth Standing Water in Hole

Estimated Depth to High Groundwater: 556" inches 141.1+/- elevation

Commonwealth of Massachusetts
City/Town of Wellesley
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP3 4/17/15

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-13"	A	10YR3/2				Sandy Loam			Wk. Block	V. Friable	
13-26"	B	7.5YR4/6				Sandy Loam			Wk. Block	V. Friable	
26-56"	C1	2.5Y6/3				Fine to Med Sand			Single Grain	Loose	
56-120"	C2	2.5Y6/4	56"			Fine Sandy Loam			Blocky	Friable	

Additional Notes:

No groundwater at the bottom of the pit. C2 was moist. C1 was rust colored at the bottom of the layer.

Commonwealth of Massachusetts
City/Town of Wellesley
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP4 4/17/15 | 4/17/15 (Date) | 10:00 am (Time) | overcast (Weather)

1. Location

Ground Elevation at Surface of Hole: 146.7+/- feet | Latitude/Longitude: /

2. Land Use: Residential Lot (e.g., woodland, agricultural field, vacant lot, etc.) | No (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 2-3% (Slope (%))

Wooded (Vegetation) | (Landform) | (Position on Landscape (SU, SH, BS, FS,)

3. Distances from:

Open Water Body	feet	Drainage Way	feet	Wetlands	>200' feet
Property Line	>100' feet	Drinking Water Well	feet	Other	feet

4. Parent Material: | Unsuitable Materials Present: ☐ Yes ☐ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No | If yes: 84" (Depth Weeping from Pit) | (Depth Standing Water in Hole)

Estimated Depth to High Groundwater: 84" inches | 139.7+/- elevation

Commonwealth of Massachusetts
City/Town of Wellesley
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP4 4/17/15

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-13"	A	10YR3/2				Sandy Loam			Wk. Blocky	V. Friable	
13-20"	B	7.5YR4/6				Sandy Loam			Wk. Blocky	V. Friable	
20-46"	C1	2.5Y6/3				Fine Sandy Loam			Wk. Blocky	V. Friable	
46-96"	C2	2.5Y6/4				V. Fine Loamy Sand			Wk. Blocky	V. Friable	

Additional Notes:

C2 pockets of medium sand and moist

Commonwealth of Massachusetts
City/Town of Wellesley

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

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP5 4/17/15 | 4/17/15 (Date) | 10:40 (Time) | Overcast (Weather)

1. Location

   Ground Elevation at Surface of Hole: 145'+/- feet Latitude/Longitude: /

   Description of Location:

2. Land Use: Residential Lot (e.g., woodland, agricultural field, vacant lot, etc.) | No (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 2-3% (Slope (%))

   Wooded (Vegetation) | (Landform) | (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from:

Open Water Body	feet	Drainage Way	feet	Wetlands	>200' feet
Property Line	>100' feet	Drinking Water Well	feet	Other	feet

4. Parent Material: Unsuitable Materials Present: ☐ Yes ☐ No

   If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 84" Depth Weeping from Pit | Depth Standing Water in Hole

   Estimated Depth to High Groundwater: 60" inches 139'+/- elevation

Commonwealth of Massachusetts
City/Town of Wellesley
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP5 4/17/15

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-13"	A	10YR3/2				Sandy Loam			Wk. Blocky	V. Friable	
13-28"	B	7.5YR4/6				Sandy Loam			Wk. Blocky	V. Friable	
28-60"	C1	2.5Y6/3				Med. Sand			Loose	Single Grain	
60-84"	C2	2.5Y6/4	60"			V. Fine Sandy Loam			Wk. Blocky	Friable	

Additional Notes:

Commonwealth of Massachusetts
City/Town of Wellesley
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP6 4/17/15 | 4/17/15 (Date) | 12:00 pm (Time) | overcast (Weather)

1. Location

   Ground Elevation at Surface of Hole: 160'+/- feet | Latitude/Longitude: /

2. Land Use: Residential Lot (e.g., woodland, agricultural field, vacant lot, etc.) | Surface Stones (e.g., cobbles, stones, boulders, etc.) | 2-3% Slope (%)

   Grass (Vegetation) | Landform | Position on Landscape (SU, SH, BS, FS,

3. Distances from: Open Water Body ____ feet | Drainage Way ____ feet | Wetlands >200' feet

   Property Line >150' feet | Drinking Water Well ____ feet | Other ____ feet

4. Parent Material: ____ Unsuitable Materials Present: ☐ Yes ☐ No

   If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ____ Depth Weeping from Pit | ____ Depth Standing Water in Hole

   Estimated Depth to High Groundwater: ____ inches | ____ elevation

Commonwealth of Massachusetts
City/Town of Wellesley
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP6 4/17/15

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-18"	A	10YR3/2				Sandy Loam			Wk. Blocky	V. Friable	
18-30"	B	7.5YR4/6				Sandy Loam			Wk. Blocky	V. Friable	
30-109"	C1	2.5Y6/2				Gravely M. to Coarse Sand	55%	10%	Loose	Single Grain	
109-144"	C2	2.5Y7/2				V. Fine Sand			Loose	Single Grain	

Additional Notes:

No mottles, no groundwater

Commonwealth of Massachusetts
City/Town of Wellesley

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

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP7 4/17/15 | 4/17/15 (Date) | 1:00 pm (Time) | Overcast (Weather)

1. Location

   Ground Elevation at Surface of Hole: 150.5'+/- feet Latitude/Longitude: /

   Description of Location:

2. Land Use: Residential Lot (e.g., woodland, agricultural field, vacant lot, etc.) | Surface Stones (e.g., cobbles, stones, boulders, etc.) | 3-5% Slope (%)

   Grassed Vegetation | Landform | Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from:

Open Water Body	feet	Drainage Way	feet	Wetlands	>200' feet
Property Line	>200' feet	Drinking Water Well	feet	Other	feet

4. Parent Material: Unsuitable Materials Present: ☐ Yes ☐ No

   If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: Depth Weeping from Pit | Depth Standing Water in Hole

   Estimated Depth to High Groundwater: inches | elevation

Commonwealth of Massachusetts
City/Town of Wellesley
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP7 4/17/15

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-8"	A	10YR3/2				Sandy Loam			Wk. Blocky	V. Friable	
8-15"	B	7.5YR4/6				Sandy Loam			Wk. Blocky	V. Friable	
15-56"	C1	2.5Y6/2				Grav. Med to Coarse Sand	50%	5%	Loose	Single Grain	
56-156"	C2	2.5Y7/2				Fine Loamy Sand			Wk. Blocky	V. Friable	

Additional Notes:

C2 pockets of Very Fine Sandy Loam and moist.

Commonwealth of Massachusetts
City/Town of Wellesley
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP8 4/17/15 | 4/17/15 (Date) | 1:30 pm (Time) | overcast (Weather)

1. Location

Ground Elevation at Surface of Hole: 169.5'+/- feet | Latitude/Longitude: /

2. Land Use: Residential Lot (e.g., woodland, agricultural field, vacant lot, etc.) | yes (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 10-12% (Slope (%))

Wooded (Vegetation) | (Landform) | (Position on Landscape (SU, SH, BS, FS,

3. Distances from:

Open Water Body	feet	Drainage Way	feet	Wetlands	>200' feet
Property Line	>100' feet	Drinking Water Well	feet	Other	feet

4. Parent Material: | Unsuitable Materials Present: ☐ Yes ☐ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☒ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No | If yes: (Depth Weeping from Pit) (Depth Standing Water in Hole)

Estimated Depth to High Groundwater: inches | elevation

Commonwealth of Massachusetts
City/Town of Wellesley
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP8 4/17/15

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10"	A	10YR3/2							Wk. Blocky	V. Friable	
10-27"	B	7.5YR4/6							Wk. Blocky	V. Friable	
27-60"	C	2.5Y7/2				Gravely Loamy Sand	35%	10%	Blocky	Firm	Firm in Place

Additional Notes:

Ledge at bottom of hole. Refusal at 60"

Commonwealth of Massachusetts
City/Town of Wellesley

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

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP9 4/17/15 | 4/17/15 Date | 2:00 pm Time | overcast Weather

1. Location

Ground Elevation at Surface of Hole: 173'+/- feet | Latitude/Longitude: /

Description of Location:

2. Land Use: Residential Lot (e.g., woodland, agricultural field, vacant lot, etc.) | yes Surface Stones (e.g., cobbles, stones, boulders, etc.) | 2-4% Slope (%)

Wooded Vegetation | Landform | Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from:

Open Water Body	feet	Drainage Way	feet	Wetlands	>200' feet
Property Line	>100' feet	Drinking Water Well	feet	Other	feet

4. Parent Material: | Unsuitable Materials Present: ☐ Yes ☐ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No | If yes: 74" Depth Weeping from Pit | 85" Depth Standing Water in Hole

Estimated Depth to High Groundwater: 74" inches | 166.8'+/- elevation

Commonwealth of Massachusetts
City/Town of Wellesley
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP9 4/17/15

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-8"	A	10YR3/2				Sandy Loam			Wk. Blocky	V. Friable	
8-23"	B	7.5YR4/6				Sandy Loam			Wk. Blocky	V. Friable	
23-112"	C	2.5Y7/2				Gravely Loamy Sand	35%	10%	Wk. Blocky	V. Friable	Firm in place

Additional Notes:

C2 Firm in place

Commonwealth of Massachusetts
City/Town of Wellesley
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP10 | 4/17/15 | 2:45 pm | overcast
4/17/15 (Date | Time | Weather)

1. Location

Ground Elevation at Surface of Hole: 169.8'+/- feet Latitude/Longitude: /

2. Land Use: Residential Lot (e.g., woodland, agricultural field, vacant lot, etc.) | No (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5-6% (Slope (%))
Wooded (Vegetation) | (Landform) | (Position on Landscape (SU, SH, BS, FS,)

3. Distances from:

Open Water Body	feet	Drainage Way	feet	Wetlands	>200' feet
Property Line	>100' feet	Drinking Water Well	feet	Other	feet

4. Parent Material: _____ Unsuitable Materials Present: ☐ Yes ☐ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 99" Depth Weeping from Pit | 112" Depth Standing Water in Hole

Estimated Depth to High Groundwater: 99" inches 161.6'+/- elevation

Commonwealth of Massachusetts
City/Town of Wellesley
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP10 4/17/15

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-9"	A	10YR3/2				Sandy Loam			Wk. Blocky	V. Friable	
9-24"	B	7.5YR4/6				Sandy Loam			Wk. Blocky	V. Friable	
24-120"	C	2.5Y7/2				Gravely Loamy Sand	35%	10%	Wk. Blocky	V. Friable	Firm in Place

Additional Notes:

C2 Firm in place.

Commonwealth of Massachusetts
City/Town of Wellesley

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

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole # _____	Obs. Hole # _____
☐ Depth observed standing water in observation hole	_____ inches	_____ inches
☒ Depth weeping from side of observation hole	_____ inches	_____ inches
☒ Depth to soil redoximorphic features (mottles)	_____ inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

_____ Index Well Number _____ Reading Date

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole # _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

Obs. Hole # _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material
   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?
      ☐ Yes ☐ No
   b. If yes, at what depth was it observed? Upper boundary: _____ inches Lower boundary: _____ inches
   c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of Wellesley
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

	4/17/15
Signature of Soil Evaluator	Date
Donald Rose, SE#2799	6/30/2016
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
Name of Board of Health Witness	Board of Health

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Commonwealth of Massachusetts
City/Town of Wellesley
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Field Diagrams

Use this sheet for field diagrams:

Commonwealth of Massachusetts
City/Town of Wellesley

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

A. Facility Information

Northland Residential
Owner Name

135 Great Plain Ave
Street Address

Map/Lot #

Wellesley
City

MA
State

Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade ☐ Repair

2. Soil Survey Available? ☒ Yes ☐ No If yes: NRCS (Source) 103B (Soil Map Unit)

Charlton-Hollis-Rock
Soil Name

Soil Limitations

Ablation Till
Geologic/Parent Material

Hills
Landform

3. Surficial Geological Report Available? ☒ Yes ☐ No If yes: 9/1989 (Year Published/Source) 1:25,000 (Publication Scale) (Map Unit)

4. Flood Rate Insurance Map

Above the 500-year flood boundary? ☒ Yes ☐ No
If Yes, continue to #5.

Within the 100-year flood boundary? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No

MassGIS Wetland Data Layer:
Wetland Type

7. Current Water Resource Conditions (USGS): 6/2015 (Month/Year) Range: ☐ Above Normal ☐ Normal ☐ Below Normal

8. Other references reviewed:

Commonwealth of Massachusetts
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Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP1 | 6/04/15 (Date) | 08:00 am (Time) | Clear (Weather)
6/04/15

1. Location

Ground Elevation at Surface of Hole: 162.4+/- feet Latitude/Longitude: /

Description of Location: Grass portion of Residential Lot

2. Land Use: Residential (e.g., woodland, agricultural field, vacant lot, etc.) | No (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 1-2% (Slope (%))

Grassed (Vegetation) | (Landform) | (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from:

Open Water Body	feet	Drainage Way	feet	Wetlands	>200' feet
Property Line	>150' feet	Drinking Water Well	feet	Other	feet

4. Parent Material: _____ Unsuitable Materials Present: ☒ Yes ☐ No

If Yes: ☐ Disturbed Soil ☒ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Estimated Depth to High Groundwater: _____ inches _____ elevation

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

C. On-Site Review (continued)

Deep Observation Hole Number: TP1 6/04/15

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-14"	A	10YR3/2				Sandy Loam			Wk Blocky	V. Friable	
14-28"	B	7.5YR4/6				Sandy Loam			Wk Blocky	V. Friable	
28-102"	C	2.5Y5/4				Fine to Med Sand			Single Grain	Loose	

Additional Notes:

Existing septic system encountered.

Refusal met at depth 102". No groundwater encountered. C layer was moist.

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

C. On-Site Review (continued)

Deep Observation Hole Number: TP2 6/04/15 | 6/04/15 (Date) | 10:00 am (Time) | Clear (Weather)

1. Location

   Ground Elevation at Surface of Hole: 161.3+/- feet | Latitude/Longitude: /

2. Land Use: Residential Lot (e.g., woodland, agricultural field, vacant lot, etc.) | Surface Stones (e.g., cobbles, stones, boulders, etc.) | 1-2% Slope (%)

   Vegetation: Grass | Landform | Position on Landscape (SU, SH, BS, FS,

3. Distances from:
   - Open Water Body: feet
   - Drainage Way: feet
   - Wetlands: >200' feet
   - Property Line: >150' feet
   - Drinking Water Well: feet
   - Other: feet

4. Parent Material: | Unsuitable Materials Present: ☐ Yes ☐ No

   If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No | If yes: Depth Weeping from Pit | Depth Standing Water in Hole

   Estimated Depth to High Groundwater: inches | elevation

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

C. On-Site Review (continued)

Deep Observation Hole Number: TP2 6/04/15

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-24"	A	10YR3/2				Sandy Loam			Wk. Blocky	V. Friable	
24-40"	B	7.5YR4/6				Sandy Loam			Wk. Blocky	V. Friable	
40-81"	C1	2.5Y6/4				Med-Coarse Sand	40%		Single Grain	Loose	
81-120"	C2	2.5Y7/2				V. Fine Sand			Massive	Loose	
120"+	C3	2.5Y7/2				Loamy Sand			Blocky	Firm	

Additional Notes:

No groundwater encountered. C2 and C3 were moist.

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

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP3 | 6/04/15 (Date) | 11:00 am (Time) | Clear (Weather)
6/04/15

1. Location

Ground Elevation at Surface of Hole: 161.2+/- feet Latitude/Longitude: /

Description of Location: Grass portion of Residential Lot

2. Land Use: Residential Lot (e.g., woodland, agricultural field, vacant lot, etc.) | No (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 2-3% (Slope (%))

Grass (Vegetation) | (Landform) | (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from:

Open Water Body	feet	Drainage Way	feet	Wetlands	>200' feet
Property Line	>200' feet	Drinking Water Well	feet	Other	feet

4. Parent Material: _____ Unsuitable Materials Present: ☐ Yes ☐ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

Estimated Depth to High Groundwater: _____ inches _____ elevation

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

C. On-Site Review (continued)

Deep Observation Hole Number: TP3 6/04/15

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12"	A	10YR3/2				Sandy Loam			Wk. Block	V. Friable	
12-30"	B	7.5YR4/6				Sandy Loam			Wk. Block	V. Friable	
30-92"	C1	2.5Y5/4				Med to Coarse Sand	40%	10%	Single Grain	Loose	Pockets of M-C Sand
92-116"	C2	2.5Y7/2				Fine Sand			Single Grain	Loose	
116-135	C3	2.5Y7/2				Loamy Sand			Blocky	Firm	

Additional Notes:

No groundwater encountered. C2 and C3 were moist.

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C. On-Site Review (continued)

Deep Observation Hole Number: TP4 6/04/15 | 6/04/15 (Date) | 11:40 am (Time) | Clear (Weather)

1. Location

Ground Elevation at Surface of Hole: 160.7+/- feet | Latitude/Longitude: /

2. Land Use: Residential Lot (e.g., woodland, agricultural field, vacant lot, etc.) | No (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 1-2% (Slope (%))

Grass (Vegetation) | (Landform) | (Position on Landscape (SU, SH, BS, FS,

3. Distances from:

Open Water Body	feet	Drainage Way	feet	Wetlands	>200' feet
Property Line	>150' feet	Drinking Water Well	feet	Other	feet

4. Parent Material: | Unsuitable Materials Present: ☐ Yes ☐ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No | If yes: Depth Weeping from Pit | Depth Standing Water in Hole

Estimated Depth to High Groundwater: inches | elevation

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

C. On-Site Review (continued)

Deep Observation Hole Number: TP4 6/04/15

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10"	A	10YR3/2				Sandy Loam			Wk. Blocky	V. Friable	
10-18"	B	7.5YR4/6				Sandy Loam			Wk. Blocky	V. Friable	
18-120"	C1	2.5Y5/4				Med-Coarse Sand			Single Grain	Loose	
120-134"	C2	2.5Y7/2				Fine to Med Sand			Single Grain	Loose	

Additional Notes:

No groundwater encountered. C1 and C2 were dry.

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

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP5 | 6/0415 (Date) | 10:30 (Time) | Clear (Weather)
6/04/15

1. Location

Ground Elevation at Surface of Hole: 160.6+/- feet Latitude/Longitude: /

Description of Location:

2. Land Use: Residential Lot (e.g., woodland, agricultural field, vacant lot, etc.) | No (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 1-2% (Slope (%))
Grass (Vegetation) | (Landform) | (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from:
Open Water Body: feet | Drainage Way: feet | Wetlands: >200' feet
Property Line: >200' feet | Drinking Water Well: feet | Other: feet

4. Parent Material: Unsuitable Materials Present: ☐ Yes ☐ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: Depth Weeping from Pit | Depth Standing Water in Hole

Estimated Depth to High Groundwater: inches | elevation

Commonwealth of Massachusetts
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Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP5 6/04/15

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-6"	A	10YR3/2				Sandy Loam			Wk. Blocky	V. Friable	
0-22"	B	7.5YR4/6				Sandy Loam			Wk. Blocky	V. Friable	
22-65"	C1	2.5Y5/4				Gravely Med to C Sand	40%		Loose	Single Grain	Fine gravel
65-123"	C2	2.5Y5/4				Gravely Med to C Sand	40%		Loose	Single Grain	Coarse gravel
123-130"	C3	2.5Y7/2				Fine to Med Sand			Loose	Single Grain	

Additional Notes:

No groundwater encountered.

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

C. On-Site Review (continued)

Deep Observation Hole Number: TP6 6/04/15 | 6/04/15 (Date) | 12:00 pm (Time) | overcast (Weather)

1. Location

   Ground Elevation at Surface of Hole: 167.6+/- feet Latitude/Longitude: /

2. Land Use: Residential Lot (e.g., woodland, agricultural field, vacant lot, etc.) | Surface Stones (e.g., cobbles, stones, boulders, etc.) | 2-3% Slope (%)

   Wooded Vegetation | Landform | Position on Landscape (SU, SH, BS, FS,

3. Distances from:

Open Water Body	feet	Drainage Way	feet	Wetlands	>200' feet
Property Line	>120' feet	Drinking Water Well	feet	Other	feet

4. Parent Material: _____ Unsuitable Materials Present: ☐ Yes ☐ No

   If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: _____ Depth Weeping from Pit | _____ Depth Standing Water in Hole

   Estimated Depth to High Groundwater: _____ inches | _____ elevation

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

C. On-Site Review (continued)

Deep Observation Hole Number: TP6 6/04/15

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12"	A	10YR3/2				Sandy Loam			Wk. Blocky	V. Friable	
12-26"	B	7.5YR4/6				Sandy Loam			Wk. Blocky	V. Friable	
26-86"	C1	2.5Y7/2				Gravely Loamy Sand	30%	20%	Single Grain	Loose	

Additional Notes:

No mottles, no groundwater encountered. Refusal met at 86".

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

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP7 | 6/04/15 (Date) | 12:45 pm (Time) | Clear (Weather)
6/04/15

1. Location

Ground Elevation at Surface of Hole: 174.8+/- feet Latitude/Longitude: /

Description of Location:

2. Land Use: Residential Lot (e.g., woodland, agricultural field, vacant lot, etc.) | Yes (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 3-5% (Slope (%))
Wooded (Vegetation) | Landform | Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from:
Open Water Body: feet | Drainage Way: feet | Wetlands: >400' feet
Property Line: >140' feet | Drinking Water Well: feet | Other: feet

4. Parent Material: Unsuitable Materials Present: ☒ Yes ☐ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☒ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: Depth Weeping from Pit | Depth Standing Water in Hole

Estimated Depth to High Groundwater: inches | elevation

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

C. On-Site Review (continued)

Deep Observation Hole Number: TP7 6/04/15

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10"	A	10YR3/2				Sandy Loam			Wk. Blocky	V. Friable	
10-24"	B	7.5YR4/6				Sandy Loam			Wk. Blocky	V. Friable	
24-96"	C	2.5Y6/2				Loamy Sand	25%	15%	Blocky	Firm	Firm in Place

Additional Notes:

No Mottles, no groundwater encountered. Refusal / Ledge met at 96".

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

C. On-Site Review (continued)

Deep Observation Hole Number: TP8 6/04/15 | 6/04/15 (Date) | 1:30 pm (Time) | Clear (Weather)

1. Location

   Ground Elevation at Surface of Hole: 172.8+/- feet Latitude/Longitude: /

2. Land Use: Residential Lot (e.g., woodland, agricultural field, vacant lot, etc.) | yes (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 10-12% (Slope (%))

   Vegetation: Wooded | Landform: | Position on Landscape (SU, SH, BS, FS,

3. Distances from:

Open Water Body	feet	Drainage Way	feet	Wetlands	>200' feet
Property Line	>100' feet	Drinking Water Well	feet	Other	feet

4. Parent Material: _____ Unsuitable Materials Present: ☐ Yes ☐ No

   If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☒ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: Depth Weeping from Pit _____ Depth Standing Water in Hole _____

   Estimated Depth to High Groundwater: _____ inches _____ elevation

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

C. On-Site Review (continued)

Deep Observation Hole Number: TP8 6/04/15

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-13"	A	10YR3/2				Sandy Loam			Wk. Blocky	V. Friable	
13-25"	B	7.5YR4/6				Sandy Loam			Wk. Blocky	V. Friable	
25-80"	C	2.5Y7/2				Loamy Sand	20%	10%	Blocky	Firm	Firm in Place

Additional Notes:

Ledge at bottom of hole. Refusal at 80"

No groundwater encountered.

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

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: TP9 6/04/15 | 6/04/15 (Date) | 2:30 pm (Time) | Clear (Weather)

1. Location

   Ground Elevation at Surface of Hole: 161.5+/- feet Latitude/Longitude: /

   Description of Location:

2. Land Use: Residential Lot (e.g., woodland, agricultural field, vacant lot, etc.) | yes (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 1-2% (Slope (%))

   Grassed (Vegetation) | (Landform) | (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from:

Open Water Body	feet	Drainage Way	feet	Wetlands	>200' feet
Property Line	>100' feet	Drinking Water Well	feet	Other	feet

4. Parent Material: Unsuitable Materials Present: ☒ Yes ☐ No

   If Yes: ☐ Disturbed Soil ☐ Fill Material ☒ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: Depth Weeping from Pit | Depth Standing Water in Hole

   Estimated Depth to High Groundwater: inches | elevation

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

C. On-Site Review (continued)

Deep Observation Hole Number: TP9 6/04/15

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-28"	A	10YR3/2				Sandy Loam			Wk. Blocky	V. Friable	
28-49"	B	7.5YR4/6				Sandy Loam			Wk. Blocky	V. Friable	
49-53"	C1	2.5Y5/4	49"			V. Fine Sand			Wk. Blocky	V. Friable	Firm in place
53-58"	C2	2.5Y5/4				Med to C Sand	30%		Single Grain	Loose	
58-64"	C3	2.5Y7/2				Loamy Sand/Till	20%		Blocky	Firm	Firm in Place

Additional Notes:

Mottles at 49" due to perched water - no mottles below. No groundwater encountered.

Excavation stopped at depth 64" due to unsuitable material.

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

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole # _____	Obs. Hole # _____
☐ Depth observed standing water in observation hole	_____ inches	_____ inches
☐ Depth weeping from side of observation hole	_____ inches	_____ inches
☒ Depth to soil redoximorphic features (mottles)	_____ inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

_____ Index Well Number _____ Reading Date

$S_h = S_c – [S_r \times (OW_c – OW_{max})/OW_r]$

Obs. Hole # _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

Obs. Hole # _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material
   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?
      ☐ Yes ☐ No
   b. If yes, at what depth was it observed? Upper boundary: _____ inches Lower boundary: _____ inches
   c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

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F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

	6/04/15
Signature of Soil Evaluator	Date
Donald Rose, SE#2799	6/30/2016
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
Name of Board of Health Witness	Board of Health

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams

Use this sheet for field diagrams:

Recharge and Drawdown Calculations

Recharge Calculations

Project Name: 135 Great Plain Ave **Proj. No.:** 13936.00

Date: 2/16/2018

Project Location: Wellesley, MA **Calculated by:** WNM

Impervious Surface Summary

Existing Impervious Areas by Hydrologic Soil Group (HSG) in acres

Ground Cover	HSG A	HSG B	HSG C	HSG D	Total Area
Impervious	--	0.42	--	--	0.42
TOTAL	**--**	**0.42**	**--**	**--**	**0.42**

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

Ground Cover	HSG A	HSG B	HSG C	HSG D	Total Area
Impervious	--	3.80	--	--	3.80
TOTAL	**--**	**3.80**	**--**	**--**	**3.80**

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

Ground Cover	HSG A	HSG B	HSG C	HSG D	Total Area
Impervious	--	3.38	--	--	3.38
TOTAL	**--**	**3.38**	**--**	**--**	**3.38**

Required Recharge Volume (Cubic Feet) (MassDEP)

HSG	Area (acres)	Recharge Depth* (in.)	Volume (c.f.)
A	--	0.60	--
B	3.4	0.35	4,294
C	--	0.25	--
D	--	0.10	--
TOTAL			**4,294**

Assumptions:

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

Capture Area Adjustment

Required Recharge Volume	4,294	c.f.
Total Proposed Site Impervious Area	3.80	acres
Total Proposed Site Impervious Area Draining to Recharge Facilities	3.34	acres
Percent Impervious (Net) Draining to Recharge Facilities	87.9%	
Capture Area Adjustment Factor	1.138	-

Adjusted Required Recharge Volume:	**4,886**	**c.f.**

Provided Recharge Volume (Cubic Feet) and Drawdown Times

SUBSURFACE INFILTRATION BASINS

Subsurface Infiltration Basin (Recharge Volume and Drawdown Time)
Infiltration Volumes beneath weir elevation of 146.3
StormTrap SingleTrap 3-0 chambers on a 6" stone base

Basin Volume Below Orifice

Elevation	Bottom Area (s.f.)	Volume below 146.3 (c.f.)	Description
146.30	17,920	35,712	Volume of chambers and stone
TOTAL		**35,712**	

Assumptions:
Recharge Rate: 1.02 in/hr* *Rawls rate classification for Sandy Loam

Total Drawdown Time: **23.4 hours**

Total Recharge Volume: **35,712 c.f.**

Recharge Volume Summary

Basin	Volume
Subsurface Infiltration Basin Recharge Provided:	35,712 c.f.
Total Recharge Volume Provided:	**35,712 c.f.**

Adjusted Required Recharge Volume: **4,886 c.f.**

Appendix D
Standard 4 Computations and Supporting Information

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

Long –Term Pollution Prevention Plan

Long-Term Pollution Prevention Plan

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

Pollutant Control Approach

Maintenance of Pavement Systems

Standard Asphalt Pavement

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

- Sweep or vacuum asphalt pavement areas with a commercial cleaning unit and dispose of removed material.
- Routinely pick up and remove litter from the parking areas, islands, and perimeter landscaping.

Maintenance of Vegetated Areas

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

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

Management of Snow and Ice

Storage and Disposal

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

- Under no circumstances shall snow be disposed or stored in wetland resource areas.
- Under no circumstances shall snow be disposed or stored in stormwater basins, ponds, rain gardens, swales, channels, or trenches.

Salt and Deicing Chemicals

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

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

Spill Prevention and Response Plan

Spill prevention equipment and training will be provided by the property management company.

Initial Notification

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

FACILITY MANAGER

Name: _____ Home Phone: _____

Phone: _____ E-mail: _____

CONSTRUCTION MANAGER

Name: _____ Home Phone: _____

Phone: _____ E-mail: _____

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

Further Notification

Based on the assessment from the Fire Chief, additional notification to a cleanup contractor may be made. The Massachusetts Department of Environmental Protection (DEP) and the EPA may be notified depending upon the nature and severity of the spill. The Fire Chief will be responsible for determining the level of cleanup and notification required. The attached list of emergency phone numbers shall be posted in the main construction/facility office and readily accessible to all employees. A hazardous waste spill report shall be completed as necessary using the attached form.

Emergency Notification Phone Numbers

1. FACILITY MANAGER

Name: _____ Home Phone: _____

Phone: _____ E-mail: _____

ALTERENATE

Name: _____ Home Phone: _____

Phone: _____ E-mail: _____

2. FIRE DEPARTMENT

Emergency: **911**

Business: (781) 235-1300

POLICE DEPARTMENT

Emergency: **911**

Business: (781) 235-1212

3. CLEANUP CONTRACTOR:

Address: _____

Phone: _____

4. MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION

Emergency: _____

Northeast Region – Woburn Office: _____

5. NATIONAL RESPONSE CENTER

Phone: (800) 424-8802

ALTERNATE: U.S. ENVIRONMENTAL PROTECTION AGENCY

Emergency: _____

Business: _____

6. CONSERVATION COMMISSION

Contact: _____

Phone: (781) 235-3090

7. HEALTH DEPARTMENT

Contact: _____

Phone: (781) 235-0135

Hazardous Waste / Oil Spill Report

Date _____ Time _____ AM / PM

Exact location (Transformer #) _____

Type of equipment _____ Make _____ Size _____

S / N _____ Weather Conditions _____

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

☐ No

Type of chemical/oil spilled _____

Amount of chemical/oil spilled _____

Cause of Spill _____

Measures taken to contain or clean up spill _____

Amount of chemical/oil recovered _____ Method _____

Material collected as a result of cleanup:

_____ Drums containing _____

_____ Drums containing _____

_____ Drums containing _____

Location and method of debris disposal

_____

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

_____

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

_____

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

Spill reported to DEP / National Response Center by _____

DEP Date _____ Time _____ AM / PM Inspector _____

NRC Date _____ Time _____ AM / PM Inspector _____

Additional comments: _____

Assessment - Initial Containment

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

Fire / Police Department	911
Wellesley Health Department	(781) 235-0135
Wellesley Conservation Commission:	(781) 235-3090

Emergency Response Equipment

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

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

Stormwater Operation and Maintenance Plan

Project Information

Site

135 Great Plain Avenue
Wellesley, MA

Owner

Northland Residential Corporation
80 Beharrell Street
Concord, MA 01742

Site Supervisor – to be determined

Name: _____

Telephone: _____

Cell phone: _____

Email: _____

Description of Stormwater Maintenance Measures

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

Catch Basins

- All catch basins shall be inspected and cleaned a minimum of at least four times per year.
- Sediment (if more than two feet deep from the bottom of the structure) and/or floatable pollutants shall be pumped from the basin and disposed of at an approved offsite facility in accordance with all applicable regulations.
- Any structural damage or other indication of malfunction will be reported to the site manager and repaired as necessary
- During colder periods, the catch basin grates must be kept free of snow and ice.
- During warmer periods, the catch basin grates must be kept free of leaves, litter, sand, and debris.

Subsurface Infiltration/Detention System

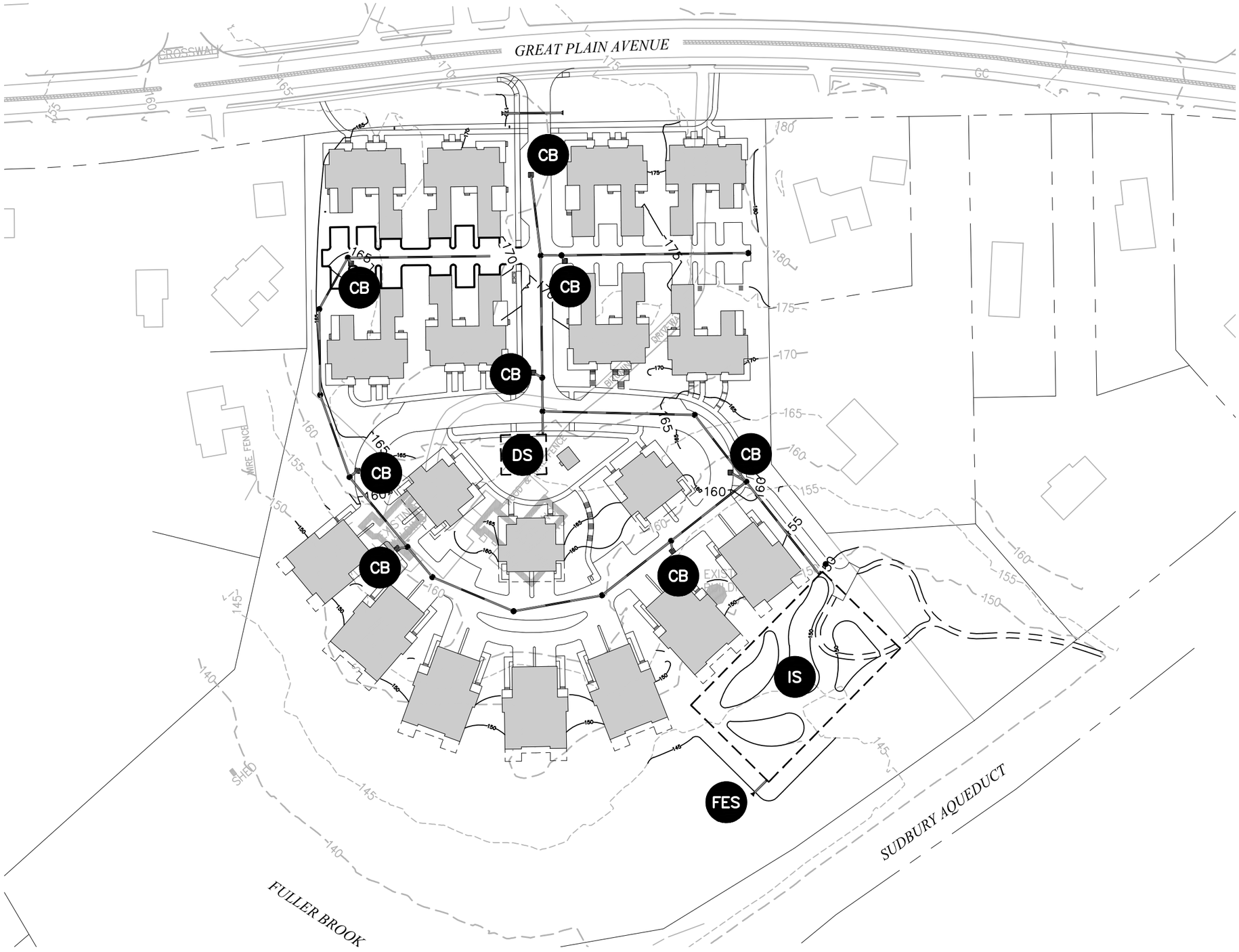
- The subsurface infiltration/detention systems shall be inspected at least once each year by removing the manhole/access port covers and determining the thickness of sediment that has accumulated.
- If sediment is more than five inches deep from the bottom of the structure, it must be suspended via flushing with clean water and removed using a vactor truck.
- Manufacturer's specifications and instructions for cleaning the sediment removal row is provided as an attachment to this section.
- Emergency overflow pipes shall be examined at least once each year and verified that no blockage has occurred.
- System shall be observed after rainfalls to see if it is properly draining.

Stormwater Outfalls

- Inspect outfall locations monthly for the first three months after construction to ensure proper functioning and correct any areas that have settled or experienced washouts.
- Inspect outfalls annually after initial three month period.
- Annual inspections should be supplemented after large storms, when washouts may occur.

- Maintain vegetation around outfalls to prevent blockages at the outfall.
- Maintain riprap pad below each outfall and replace any washouts.
- Remove and dispose of any trash or debris at the outfall.

\\vhb\proj\Wat-LD\13936.00 Northland Wellesley\cad\ld\Eng\Stormwater\13936.00-BMP Maintenance Location Figure.dwg



LEGEND

- CB — DEEP SUMP CATCH BASIN WITH HOOD
- FES — STORMWATER OUTFALL
- DS — DETENTION SYSTEM
- IS — INFILTRATION SYSTEM

0 50 100 Feet

BMP Maintenance Location Figure

Figure 1

135 Great Plain Avenue
Wellesley, MA

February 2018

135 Great Plain Avenue, Wellesley, Massachusetts
Long-Term Best Management Practices – Maintenance/ Evaluation Checklist

Best Management Practice	Inspection Frequency	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning/Repair Needed ☐yes ☐no (List Items)	Date of Cleaning/Repair	Performed by
Catch basins	Four times per year			• Clean accumulated sand and sediment whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin; • Floatables	☐yes ☐no		
Subsurface Infiltration/Detention System	In accordance with manufacturer's recommendations but no less than twice a year following installation and no less than once a year thereafter.			• Remove any debris that might clog the system • Stadia rod may be inserted through inspection ports to determine the depth of sediment. Cleanout is required if the sediment has accumulated to an average depth exceeding 5" from the bottom of the structure, per the manufacturer's recommendations.	☐yes ☐no		
Stormwater Outfalls	Monthly for the first three months after construction and no less than once a year thereafter.			• Maintain vegetation around outfalls to prevent blockages • Maintain riprap pad below each outfall and replace any washouts • Remove and dispose of any trash or debris at the outfall	☐yes ☐no		

Stormwater Control Manager _____

STORMTRAP MAINTENANCE MANUAL

1. Introduction

Regular inspections are recommended to ensure that the system is functioning as designed. Please call your Authorized StormTrap Representative if you have questions in regards to the inspection and maintenance of the StormTrap system. Prior to entry into any underground storm sewer or underground detention systems, appropriate OSHA and local safety regulations and guidelines should be followed.

2. Inspection Schedules for Municipalities

StormTrap Stormwater Management Systems are recommended for inspection whenever the upstream and downstream catch basins and stormwater pipes of the stormwater collection system are inspected or maintained. This will economize the cost of the inspection if it is done at the same time the Municipal crews are visiting the area.

3. Inspection Schedules for Private Development

StormTrap Stormwater Management Systems, for a private development, are recommended for inspection after each major storm water event. At a minimum, until a cleaning schedule can be established, an annual inspection is recommended. If inspected on an annual basis, the inspection should be conducted before the stormwater season begins to be sure that everything is functioning properly for the upcoming storm season.

4. Inspection Process

Inspections should be done such that at least 2-3 days has lapsed since the most recent rain event to allow for draining. Visually inspect the system at all manhole locations. Utilizing a sediment pole, measure and document the amount of silt at each manhole location (Figure 1). Inspect each pipe opening to ensure that the silt level or any foreign objects are not blocking the pipes. Be sure to inspect the outlet pipe(s) because this is typically the smallest

pipe in the system. It is common that most of the larger materials will be collected upstream of the system in catch basins, and it is therefore important at time of inspections to check these structures for large trash or blockages.

Remove any blockages if you can during the inspection process only if you can do so safely from the top of the system without entering into the system**. Do not go into the system under any circumstances** without proper ventilation equipment and training. Pass any information requiring action onto the appropriate maintenance personnel if you cannot remove the blockages from above during the inspection process. Be sure to describe the location of each manhole and the type of material that needs to be removed.

The sediment level of the system should also be measured and recorded during the inspection process. Recording the sediment level at each manhole is very important in order get a history of sediment that can be graphed over time (i.e. years) in order to estimate when the system will need to be maintained next. It is also important to keep these records to verify that the inspection process was actually performed if anyone asks for your records in the future.

The sediment level in the underground detention system can be determined from the outside of the system by opening up all the manholes and using a sediment pole to measure the amount of sediment at each location. Force the stick to the bottom of the system and then remove it and measure the amount of sediment at that location. Again, do not go into the system under any circumstances without proper ventilation equipment and training.

5. When to Clean the System

Any blockages should be safely removed as soon as practical so that the Stormwater detention system will fill and drain properly before the next stormwater event.

The Dry Detention System should be completely cleaned whenever the sediment occupies more than 10% to 15% of the originally designed system's volume. The Wet Detention System should be cleaned when the sediment occupies more than 30% or 1/3rd of the originally designed system's volume. NOTE: Check with your municipality in regards to

cleaning criteria, as the allowable sediment before cleaning may be more or less then described above.

6. How to Clean the StormTrap

The system should be completely cleaned back to 100% of the originally designed storage volume whenever the above sediment levels have been reached. Be sure to wait at least 3 days after a stormwater event to be sure that the system is completely drained (if it is a Dry Detention System), and all of the sediments have settled to the bottom of the system (if it is a Wet Detention System).

Do not enter the System unless you are properly trained, equipped, and qualified to enter a confined space as identified by local occupational safety and health regulations.

There are many maintenance companies that are in business to help you clean your underground stormwater detention systems and water quality units. Please call your StormTrap representative for referrals in your area.

A. Dry Detention System Cleaning

Maintenance is typically performed using a vacuum truck. Sediment should be flushed towards a vacuum hose for thorough removal. For a Dry Detention System, remove the manhole cover at the top of the system and lower a vacuum hose into one of the rows of the StormTrap system. Open up the manhole at the opposite end of the StormTrap and use sewer jetting equipment to force water in the same row from one end of the StormTrap row to the opposite side. The rows of the StormTrap are completely open in one contiguous channel from one end to the other for easy cleaning.

Place the vacuum hose and the sewer jetting equipment in the next row and repeat the process until all of the rows have been cleaned.

When finished, replace all covers that were removed and dispose of the collected material properly.

B. Wet Detention System Cleaning

If the system was designed to maintain a permanent pool of water, floatables and any oil should be removed in a separate procedure prior to the removal of all sediment.

The floatable trash is removed first by using a bucket strainer to capture and remove any floating debris.

The floatable oils are then removed off the top of the water by using the vacuum truck to suck off any floatable fluids and liquids.

The next step is to use the vacuum truck to gently remove the clarified water above the sediment layer.

The final step is to clean the sediment for each row as described above in the paragraph "A. Dry Detention System Cleaning". For smaller systems, the vacuum truck can remove all of the sediment in the basin without using the sewer jetting equipment because of the smaller space.

7. Inspection Reports

Proof of these inspections is the responsibility of the property owner. All inspection reports and data should be kept on site or at a location where they will be accessible for years in the future. Some municipalities require these inspection and cleaning reports to be forwarded to the proper governmental permitting agency on an annual basis.

Refer to your local and national regulations for any additional maintenance requirements and schedules not contained herein. Inspections should be a part of your standard operating procedure.

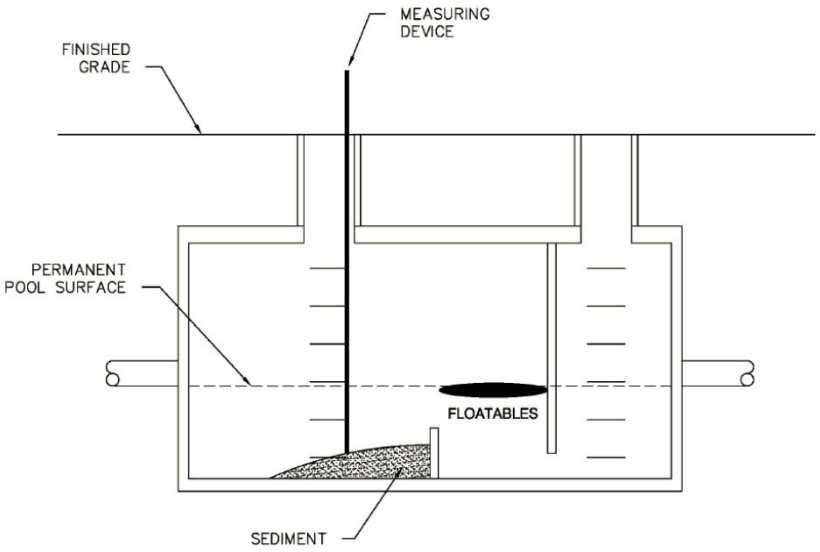


Figure 1. During inspection, measure the distance from finished grade to the top of the sediment inside the system.

Sample inspection and maintenance log

Date	Depth of Sediment	Accumulated Trash	Maintenance Performed	Maintenance Personnel	Comments
2/5/2012	3”	None	Sediment Removal/Vac	B. Johnson	

PHONE 815 941 4549
FAX 331 318 5347
WEB www.stormtrap.com
EMAIL info@stormtrap.com
1287 Windham Parkway
Romeoville, Illinois 60446

Water Quality Volume Calculations

Water Quality Volume Calculations

Project Name: 135 Great Plain Ave
Proj. No.: 13936.00
Date: 2/15/2018
Project Location: Wellesley, MA
Calculated by: WNM

Subsurface Infiltration System

			Area (Acres)
		Total Impervious Area=	3.80
Required:			
	Runoff Depth to be Treated (in.)		Required Volume (c.f.)
Water Quality Volume	0.5		6,897
Provided:			
			Provided Volume (c.f.) Below Weir El
			38,814

TSS Removal Worksheets

TSS Removal Calculation Worksheet

VHB, Inc..
101 Walnut Street
Post Office Box 9151
Watertown, MA 02471
(617) 924-1770

Project Name:	**135 Great Plain Ave**	Sheet:	**1 of 1**
Project Number:	**13936.00**	Date:	**February 2018**
Location:	**Wellesley, MA**	Computed by:	**WNM**
Discharge Point:	**DP-2**	Checked by:	**CRQ**
Drainage Area(s):	**PR2A, PR2B**		

A	B	C	D	E
BMP*	TSS Removal Rate*	Starting TSS Load**	Amount Removed (C*D)	Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**25%**	**1.00**	**0.25**	**0.75**
Subsurface Infiltration Structure	**80%**	**0.75**	**0.60**	**0.15**
	0%	**0.15**	**0.00**	**0.15**
	0%	**0.15**	**0.00**	**0.15**
	0%	**0.15**	**0.00**	**0.15**

* BMP and TSS Removal Rate Values from the MassDEP Stormwater Handbook Vol. 1.

** Equals remaining load from previous BMP (E)

Treatment Train TSS Removal = **85%**

Appendix E
Standard 8 Supporting Information

- Recommended Construction Period Pollution Prevention and Erosion and Sedimentation Controls

Recommended Construction Period Pollution Prevention and Erosion and Sedimentation Controls

Erosion and Sedimentation Control Measures

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

Straw Wattles

Straw wattles will be placed to trap sediment transported by runoff before it reaches the drainage system or leaves the construction site.

Silt Fencing

In areas where high runoff velocities or high sediment loads are expected, straw wattles may be backed up with silt fencing. This semi-permeable barrier made of a synthetic porous fabric will provide additional protection. The silt fences and straw wattle barrier will be replaced as determined by periodic field inspections.

Catch Basin Protection

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

Gravel and Construction Entrance/Exit

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

Diversion Channels

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

Temporary Sediment Basins

Temporary sediment basins will be designed either as excavations or bermed stormwater detention structures (depending on grading) that will retain runoff for a sufficient period of time to allow suspended soil particles to settle out prior to discharge. These temporary basins will be located based on construction needs as determined by the contractor and outlet devices will be designed to control velocity and sediment. Points of discharge from sediment basins will be stabilized to minimize erosion.

Vegetative Slope Stabilization

Stabilization of open soil surfaces will be implemented within 14 days after grading or construction activities have temporarily or permanently ceased, unless there is sufficient snow cover to prohibit implementation. Vegetative slope stabilization will be used to minimize erosion on slopes of 3:1 or flatter. Annual grasses, such as annual rye, will be used to ensure rapid germination and production of root mass. Permanent stabilization will be completed with the planting of perennial grasses or legumes. Establishment of temporary and permanent vegetative cover may be established by hydro-seeding or sodding. A suitable topsoil, good seedbed preparation, and adequate lime, fertilizer and water will be provided for effective establishment of these vegetative stabilization methods. Mulch will also be used after permanent seeding to protect soil from the impact of falling rain and to increase the capacity of the soil to absorb water.

Maintenance

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

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

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

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

- The underside of straw wattles should be kept in close contact with the earth and reset as necessary.

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

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

135 Great Plain Avenue, Wellesley, Massachusetts
Construction Best Management Practices – Maintenance/ Evaluation Checklist

Best Management Practice	Inspection Frequency	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning/Repair Needed ☐yes ☐no (List Items)	Date of Cleaning/Repair	Performed by:
Straw Wattles/Silt Fencing	In accordance with NPDES CGP			• Inspect for accumulated sediment behind straw wattles/silt fencing and remove as needed. • Separation of straw wattles with the earth and each other. Make adjustments to eliminate separations. • Damaged or broken straw wattles/ silt fence. Replace as necessary.	☐**yes** ☐**no**		
Gravel Construction Entrance	In accordance with NPDES CGP			• Accumulated sediment • Remove sediment that is spilled, dropped, washed or tracked onto pavements outside limit of work.	☐**yes** ☐**no**		
Catch Basin Protection	In accordance with NPDES CGP			• Accumulated sediment within silt sacks. Remove sediment as necessary. • Rips or torn silt sacks. Replace damaged silt sacks.	☐**yes** ☐**no**		
Diversion Channels	In accordance with NPDES CGP			• Cracking, • Erosion, • Leakage in the embankments • Repair diversion channels as necessary to prevent downstream erosion and sedimentation.	☐**yes** ☐**no**		
Temporary Sedimentation Basins	In accordance with NPDES CGP			• Cracking, • Erosion, • Leakage in the embankments • Accumulation of sediment. • Remove sediment and make repairs as necessary to ensure proper function of sediment basin.	☐**yes** ☐**no**		
Vegetated Slope Stabilization	In accordance with NPDES CGP			• Cracking, • Erosion • Repair/reaplace as necessary to ensure proper function of slope stabilization and to prevent downstream erosion and sedimentation.	☐**yes** ☐**no**		

Stormwater Control Manager _____