Storm Water Report

For

"Red Robin Pastures"
61-63 County Street
Dover, Massachusetts

Prepared for and
Owned by: Red Robin Pastures LLC
1218 Great Plain Avenue
Needham MA 02492 or its successor in title (the "Owner")

Operation & Maintenance
Responsibility: Red Robin Pastures LLC
1218 Great Plain Avenue
Needham MA 02492 or its successor in title (the "Owner")

Prepared By: Ronald Tiberi P.E.
9 Massachusetts Ave
Natick, MA 01760

April 5, 2021
Rev.-September 13, 2021

SECTION 1 - Project Title

Applicant:	Red Robin Pastures LLC 1218 Great Plain Avenue Needham MA 02492
Project Name:	Red Robin Pastures
Project Address:	61-63 County Street, Dover MA
Engineer:	Ronald Tiberi P.E. 9 Massachusetts Ave Natick, MA 01760
Date:	September 13, 2021

SECTION 2 - Project Introduction & Description:

The project consists of the construction of a Residential Development consisting of 34 apartment units: 5 One Bedroom, 17 Two Bedroom and 12 Three Bedroom units spread across three levels of residential living space. There is also a basement which will include additional resident storage and back-of-the-house functions including indoor trash storage. The three main levels and basement are all accessible by elevator. There is a 1,027 SF meeting room/ common area with private bathrooms and an outdoor 410 SF fenced patio area adjacent to the one story entry foyer. The total project consists of some 2.52 Acres of land of which will be developed for building, parking and drainage appurtenances.

The project includes the construction of one building with two wings, access road and parking. The proposed building footprints is some 16000 square feet±. The proposed project will maintain septic and roof drainage systems. A proposed parking area will include a stormwater systems will also be constructed in the designated open space area. The project layout was set to minimize impact on the wetland areas and maximize the separation distances to the known wetlands on the property.

Drainage evaluations are conducted using HydroCAD 10.00-24 software, and the methodology of the Massachusetts Stormwater Handbook guidance on the Stormwater Policy.

SECTION 3 – Stormwater checklist:

See attached.

SECTION 4 – LID Measures & Drainage Summary:

Pre-development conditions-

The subject property consists of three parcels located at 61 and 63 County Street identified as Assessors ID's 25-98, 25-10 & 25-11. The property is comprised of a total of 109809 square feet of land and is currently occupied by two existing single-family dwellings, gravel driveways and landscaped areas. The property is located in the General Residence Zoning District -R1 and is abutted by single family residences to the west, north and easterly sides, Dover Village Condominiums consisting of four units are in close proximity to the west, on County Street. See Figure 1 of existing catchment areas.

The topography for the site ranges from an elevation of 305'± at the property frontage along the County Street to elevation 267'± located near the northly part of the site. The northern part of the property is landscaped and has slopes that vary from gradual to steep. According to the NRCS Soil Survey for Norfolk County, the entire site predominantly consists of Canton Fine Sandy Loam (map ID 420B).

Subsurface explorations and the soil evaluations conducted by Cheney Engineering from, 2019, to 2021 including some 28 testpits and percolation tests, for Title V soil conditions vary from sand to loamy sands. The recharge area and target depth hydrological soils are soil Type A (see soil evaluator's testpit logs TPD 1-3 for drainage area attached). The infiltration rates used for this material range from 8.27 inches/hour.

The existing site drainage predominately flows from south to north towards the wetland area off the northeasterly border. Based upon soil testing and State Certified Evaluator reports a Hydrologic Soil group A were used in computations. Watershed modeling was conducted using HydroCAD software that combines SCS runoff methodology with standard hydraulic calculations for a Type III 24-hr Storm event.

The predominate drainage area, **E2**, drains directly toward the rear of the parcel with a small area **E1** which currently drains off the property towards the abutters on the southwesterly side of the parcel. See Drainage Area Plan Figure of existing catchment areas.

Watershed modeling was conducted using HydroCAD 10-24 software that combines SCS runoff methodology with standard hydraulic calculations. See attached computations with diagram and corresponding drainage area figures. Table 1 Summaries rate (cfs) per design point.

TABLE 1 EXISTING CONDITIONS (ET)

Catchment	2yr (cfs)		10yr (cfs)		25yr (cfs)		100yr (cfs)	
E1	0.25		0.97		1.53		2.46	
E2	0.52		2.72		4.46		7.47	
ET~	0.77		3.69		5.99		9.93	

Post-Development Conditions-

The proposed areas will be predominately directed to the north of the property. Overall drainage patterns will remain unchanged and with the slope reductions, along with proposed lawn surfaces, and infiltration systems volumes of the runoff after development will remain essentially unchanged and/or reduced. See Drainage Area Plan Figure of proposed catchment areas.

The post-development conditions are defined by the areas altered by the proposed plan. The proposed conditions have been designed to meet the Massachusetts Department of Environmental Protection (MassDEP) Wetland and Stormwater requirements of TSS and Phosphorous removal using stormwater management systems as the stormceptor systems, deep sump catch basins and infiltration systems.

The stormwater management system has been designed so that post-development rates match or decrease peak pre-development runoff rates for the entire site for storm events. Computations provided are for the 2, 10, 25 and 100-year, 24-hour storm events. Infiltration leaching systems with a 8.27 in per hour soils infiltration rate storage basin will be required to accommodate runoff for a 2, 10, 25, 100 year 24-hour storms.

The front drainage area designated **P1** is much reduced to the south of the property. Area **P2** is broken down to designated areas **P2A** the Building structure & Parking areas, and **P2B** the remaining landscape areas to the north. All the runoff from **P2A** will be contained by drainage controls and directed to treatments systems and infiltration system to the north. All Surface runoff is directed to grass swales to the north and collected in two STC 450i Stormceptor units prior to entering infiltration basins

See Drainage Area Plan Figure 1 for the re-aligned drainage catchments, analysis points of discharge and Table 2 to for the associated runoff rates.

TABLE 2 PROPOSED CONDITIONS

Design Point (Catchment)	2yr (cfs)		10yr (cfs)		25yr (cfs)		100yr (cfs)	
P1	0.07		0.25		0.38		0.60	
(**P2A**)	0.0		1.40		2.05		3.66	
(**P2B**)	0.32		1.27		1.99		3.21	
P2-Total Comp	0.32		1.94		3.21		5.27	
PT ~	0.39		2.19		3.59		5.87	

Most the surface runoff will be directed through the center to the rear of the property, then directed to infiltration/storage basin, basin provides retention for substantial flows the balance of the flow is then directed to a control structure regulating rate of flow before discharge toward the northerly interior along a 78’ long stilling basin and level

curb spreader. The proposed drainage areas are compensated for changes in flow rates by slope reductions and drainage system controls and the overall impact from proposed development has no adverse drainage effect as demonstrated in the attached Hydrocad reports.

SECTION 5 – Stormwater Standards:

Standard 1: No New Untreated Discharges

There will be no untreated discharges. Existing overland flow is on essentially over ground surfaces. The proposed conditioned will be on a vegetated landscaped surface with native growth grass/plant. The sheet flow discharge energy from the road/parking areas will be dissipated by infiltration basin, and 78' stilling basin and outflow spreader.

Standard 2: Peak Rate Attenuation

Infiltration systems with a 8.27 in per hour soils infiltration rate for the storage basin will accommodate runoff for a 2, 10, 25, 100 year 24-hour storms. (See calculations attached). Site combined area summary comparisons are shown in Table 3.

TABLE 3 PRE/POST RUNOFF SUMMARY

Post Analysis Point	**2 Year**	**10 Year**	**25 Year**	**100 Year**
PT (CFS)	0.39	2.19	3.59	5.87
Pre-Analysis Point	**2 Year**	**10 Year**	**25 Year**	**100 Year**
ET (CFS)	0.77	3.69	5.99	9.93

NET % Change	**2 Year**	**10 Year**	**25 Year**	**100 Year**
ET-PT (CFS)	-51%	-59%	-60%	-59%

Standard 3: Stormwater Recharge

Based on the soil explorations, percolation tests, and observations conducted by Massachusetts Certified Soil Evaluator at the site the hydrological soil is soil type A.

The required recharge volume calculation is provided in the drainage calculations. The static method was used for sizing the infiltration.

_ STANDARD #3: The pre-development annual recharge for the site has been approximated in the post-developed condition, and as illustrated below will more than satisfy the minimum requirements. The Recharge Volume is based on the Static Method per the MassDEP Stormwater Management Standards, Volume 3, Chapter 1.
For purposes of the analysis and demonstrate compliance with Standard #3, the recharge volume calculation assumes the site is a Hydrologic Soil Group "A" (HSG-A). The BMP requires 0.60 inches over the impervious surface for a class A soil to be recharged

Impervious Area = 49743 square feet

Recharge Volume (Rv) = (F) x (Impervious Area)
Where:
Rv = Required Recharge Volume, expressed in cubic feet
F = Target Depth Factor associated with each Hydrologic Soil Group
Impervious Area = proposed pavement in square feet

Recharge Volume (Rv) = (F) x (Impervious Area)
= (0.60 inches)*(1/12 inches/ft)* (49743 square feet)
= (0.05 feet)*(49743 square feet)
= 2487 ft3

Recharge Provided Storage ACF R-Tank Areas total storage = 9600 ft3
9600> 2487 ft3 Required

The recharge of the roof runoff leaching systems need to include all storm events.

TIME TO DRAIN

Time(drawdown)= [Rv/(K x Bottom Area)]

PR1- Rv=9600cf
K=8.27 in/hr
Bottom Area= 2814

Time to Drain = 9600/[(8.27in/hr/12"/ft)x 2814]= 4.95 Hours

Standard 4: Water Quality

_ STANDARD #4: The proposed stormwater management system has been designed so that for each drainage area and outfall the 80% TSS removal standard has been met. (see attached worksheet).

Water Quality Volume (VWQ) = (DWQ/12 inches/foot)*(AIMP * 49743 s.f./acre)
VWQ = Required Water Quality Volume in cubic feet

DWQ = Water Quality Depth
X_ one inch for discharges within a Zone II or Interim Wellhead Protection Area,

to or near another critical area, runoff from a land use with higher potential pollutant loading (LUHPPL), or exfiltration to soils with infiltration rate greater than 2.4 inches/hour.
_ ½-inch for discharges to other areas.

AIMP = Impervious Area (in acres)

= (1.0 inches)*(1/12 inches/ft)* (1.42)
= (0.083 feet)*(1.42 Acre)
= 0.094 ft3

See the attached TSS removal work sheets.
See attached Total Phosphorus removal sheets

Infiltration Basin **1P** has been designed with a control structure. The control structure itself acts as the higher emergency overflow, which discharges towards the rear via a level spreader. (See Detail Sheet)

The infiltration field consists of 783 AFC R-TANKS HD-3 units, overflow from which is piped to a seventy-eight foot stilling basin and level spreader.

The BMPs are sized for the 1-inch water quality volume. The basins were designed to treat the WQV attributed as shown in Standard 3 of this report.

Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPLs)
This residential development is not a Land Use with Higher Potential Pollutant Loads.

Standard 6: Critical Areas

No Critical areas on the property are to be adversely impacted.

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

The site is a is required to meet these standards to the maximum extent practicable, all standards are met.

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

The applicant will use filter sock erosion controls. Silt sacks will be used in Catch basins within 100 of construction limits. Project limits, lay down and staging areas will be noted on the erosion control plan and coincide with erosion control systems.

The Applicant: Red Robin Pastures LLC, 1218 Great Plain Avenue, Needham MA 02492, will be ultimately responsible for compliance.

A filter sock will be placed and maintained along the downstream boundary of the disturbed material. The barrier will be installed at onset of construction and will be removed on the establishment of the vegetation. See the plans for the site development, as well as attached pollution prevention plans. The project's identified resident inspector will be responsible for monitoring the controls.

The overall project site does disturb more than one acre area initiating an NPDES permit requirement. Stormwater Pollution Prevention Plan has been prepared and included as Attachment D.

Standard 9: Operation and Maintenance Plan

A Long-Term Operation and Maintenance (O&M) Plan has been developed for the proposed stormwater management system as a separate document attached.

Standard 10: Prohibition of Illicit Discharges

There are no expected illicit discharges to the stormwater management system from applicants use of its property. The applicant will submit the Illicit Discharge Compliance Statement prior to the discharge of stormwater runoff to the post-construction stormwater best management practices and prior to the issuance of a Certificate of Compliance.

Pollution Prevention Plan Certification

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

Signed: _____Date: _____

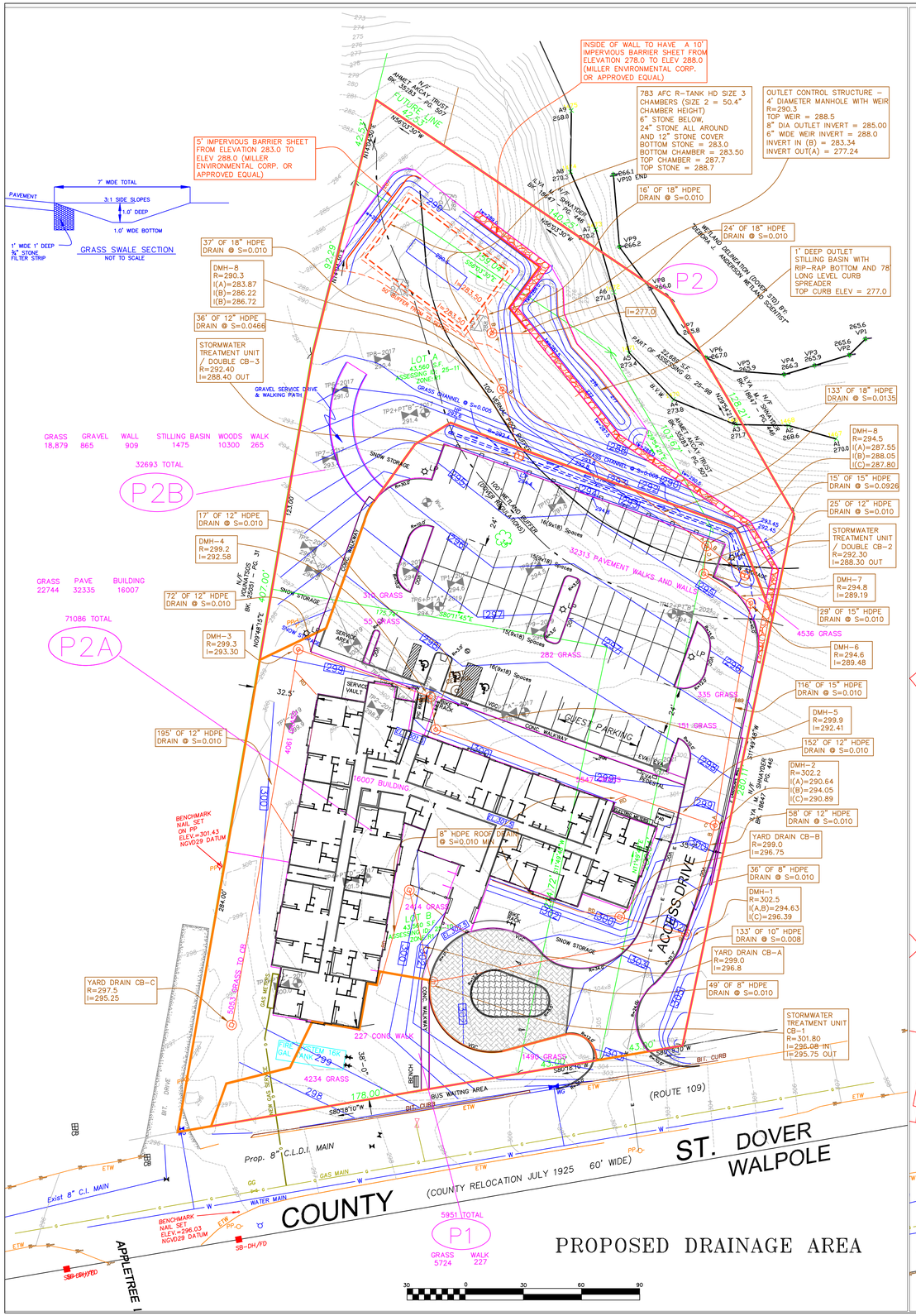
ATTACHMENTS

Drainage Plan -Existing Drainage Catchments & Post Development Catchments

Stormwater Checklist
HydroCad Analysis

Soils Report
Soil Testing Reports
TSS Removal Calculation Sheet
Phosphorous Removal Sheets
O&M PLAN
SPILL PREVENTION PLAN

FIGURES



PROFESSIONAL ENGINEER DATE

REVISIONS

No.	DATE	DESCRIPTION

DRAINAGE AREA PLAN
IN
DOVER, MASSACHUSETTS

63 COUNTY STREET

PREPARED FOR:
25 HAVEN STREET
DOVER MA

DRAWING SCALE: 1 inch = 30 feet
PROJECT NUMBER: 3516
DATE: FEB 12, 2020 SHEET 1 OF 1

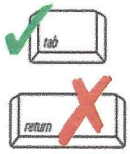
Stormwater Checklist

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

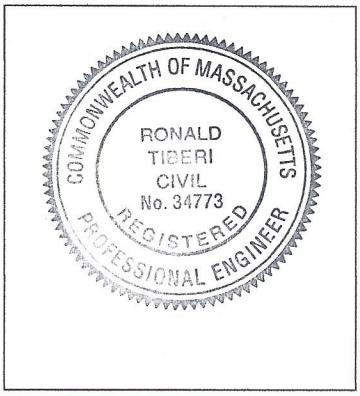
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



9/17/21

Signature and Date

Checklist

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

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

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

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.

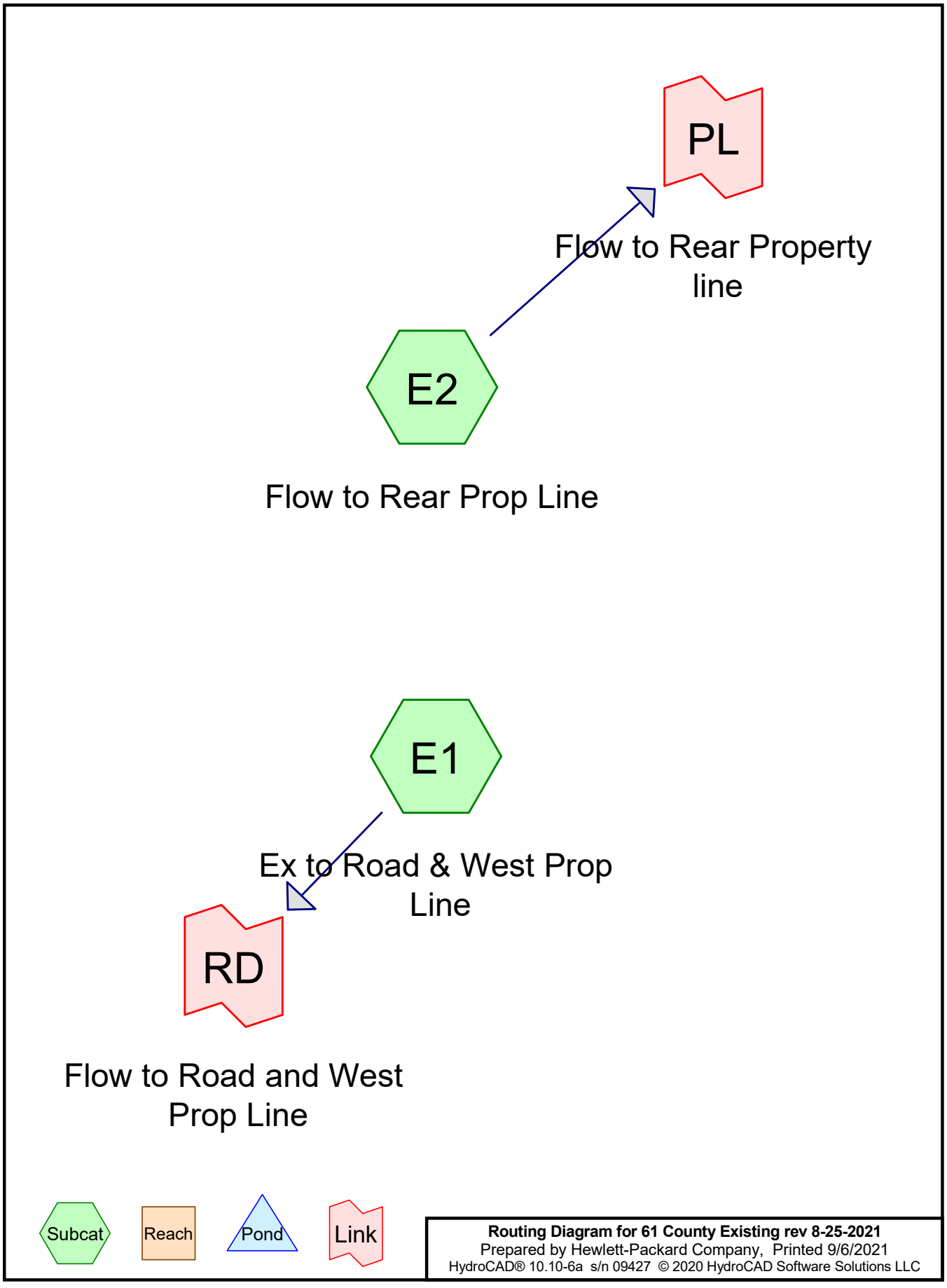
Standard 10: Prohibition of Illicit Discharges

☐ 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.

HYDROCAD DATA



Routing Diagram for 61 County Existing rev 8-25-2021
Prepared by Hewlett-Packard Company, Printed 9/6/2021

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 Year Storm	Type III 24-hr		Default	24.00	1	3.41	2
2	10 Year Storm	Type III 24-hr		Default	24.00	1	5.31	2
3	25 Year Storm	Type III 24-hr		Default	24.00	1	6.49	2
4	100 Year Storm	Type III 24-hr		Default	24.00	1	8.31	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.019	61	>75% Grass cover, Good, HSG B (E1, E2)
0.158	85	Gravel roads, HSG B (E1, E2)
0.015	98	Paved parking, HSG B (E1, E2)
0.073	98	Roofs, HSG B (E1, E2)
2.256	55	Woods, Good, HSG B (E1, E2)

Summary for Subcatchment E1: Ex to Road & West Prop Line

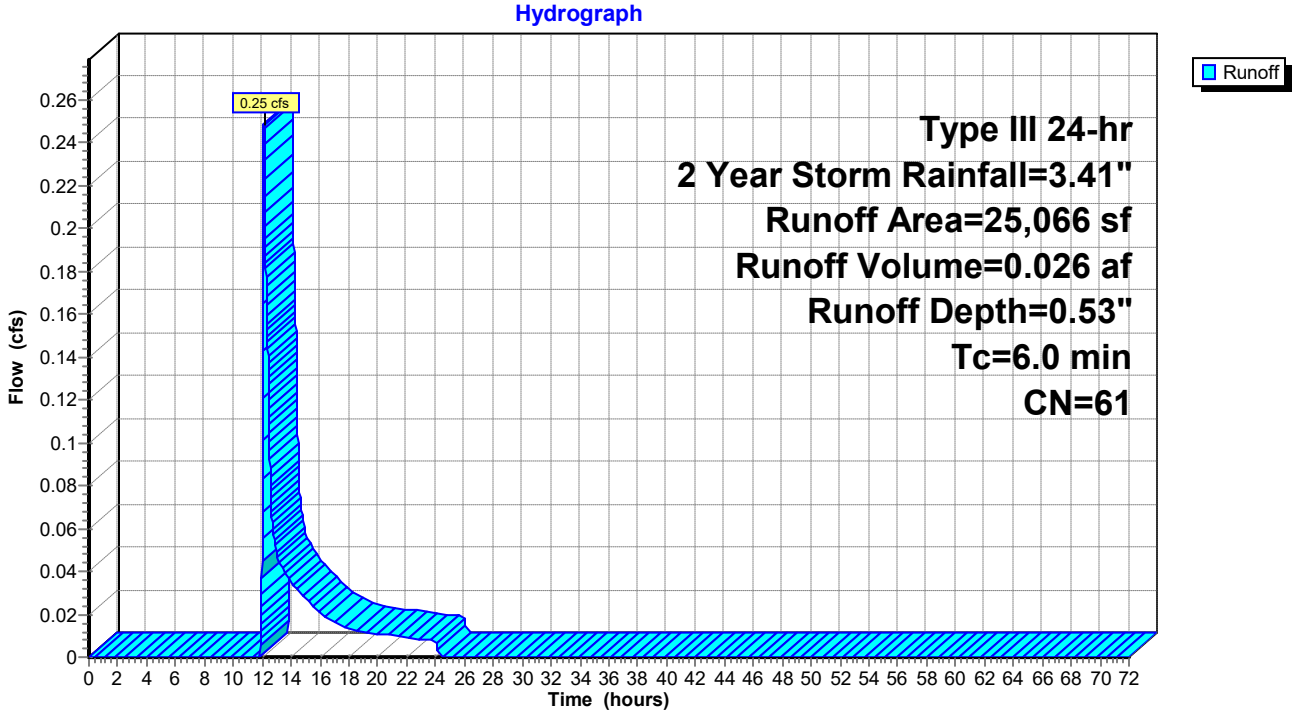
Runoff = 0.25 cfs @ 12.12 hrs, Volume= 0.026 af, Depth= 0.53"
Routed to Link RD : Flow to Road and West Prop Line

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Storm Rainfall=3.41"

Area (sf)	CN	Description
1,875	98	Roofs, HSG B
2,316	85	Gravel roads, HSG B
20,342	55	Woods, Good, HSG B
129	98	Paved parking, HSG B
404	61	>75% Grass cover, Good, HSG B
25,066	61	Weighted Average
23,062		92.01% Pervious Area
2,004		7.99% Impervious Area

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

Subcatchment E1: Ex to Road & West Prop Line



Summary for Subcatchment E2: Flow to Rear Prop Line

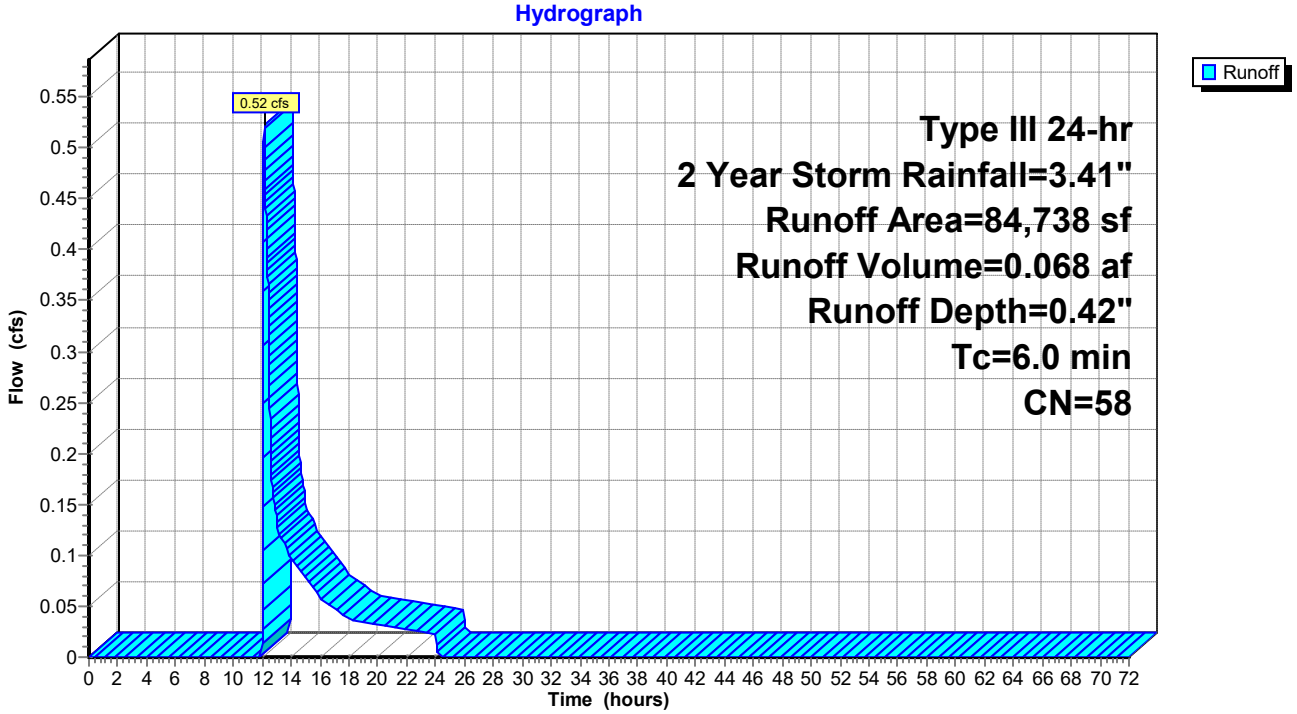
Runoff = 0.52 cfs @ 12.13 hrs, Volume= 0.068 af, Depth= 0.42"
Routed to Link PL : Flow to Rear Property line

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Storm Rainfall=3.41"

Area (sf)	CN	Description
77,946	55	Woods, Good, HSG B
4,546	85	Gravel roads, HSG B
1,302	98	Roofs, HSG B
431	61	>75% Grass cover, Good, HSG B
513	98	Paved parking, HSG B
84,738	58	Weighted Average
82,923		97.86% Pervious Area
1,815		2.14% Impervious Area

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

Subcatchment E2: Flow to Rear Prop Line

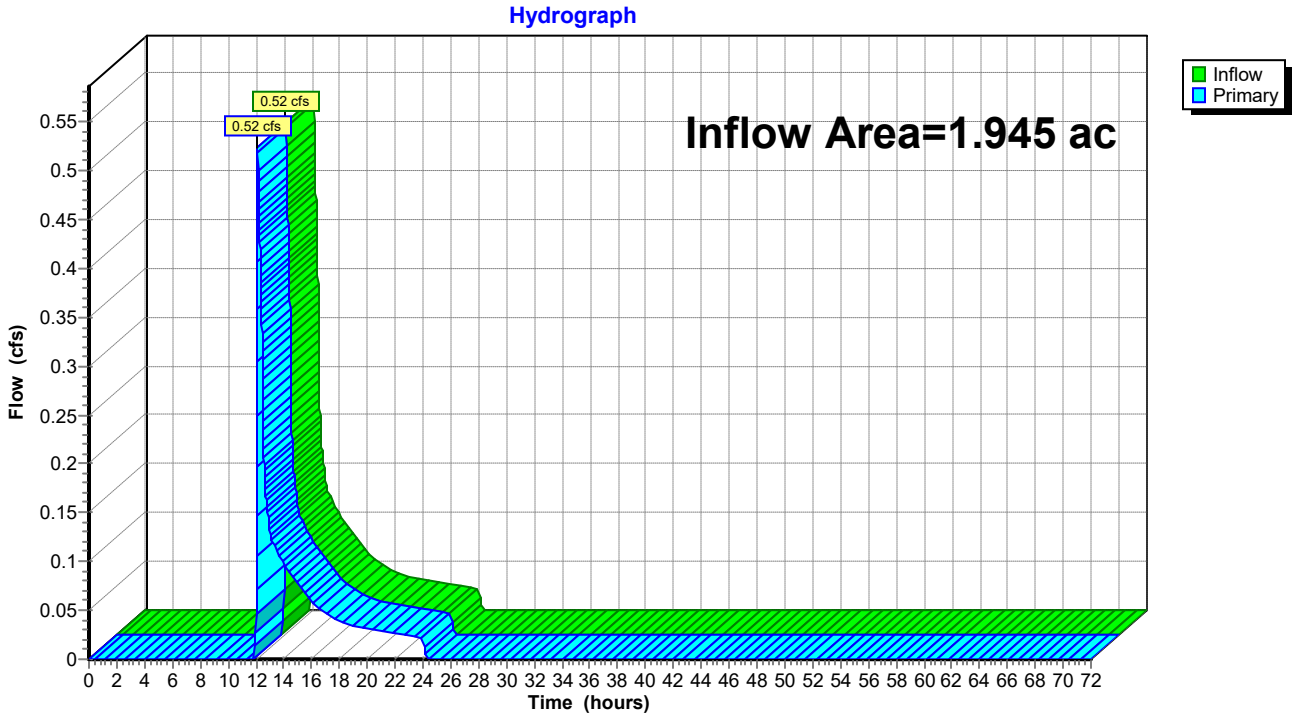


Summary for Link PL: Flow to Rear Property line

Inflow Area = 1.945 ac, 2.14% Impervious, Inflow Depth = 0.42" for 2 Year Storm event
Inflow = 0.52 cfs @ 12.13 hrs, Volume= 0.068 af
Primary = 0.52 cfs @ 12.13 hrs, Volume= 0.068 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node Out

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link PL: Flow to Rear Property line

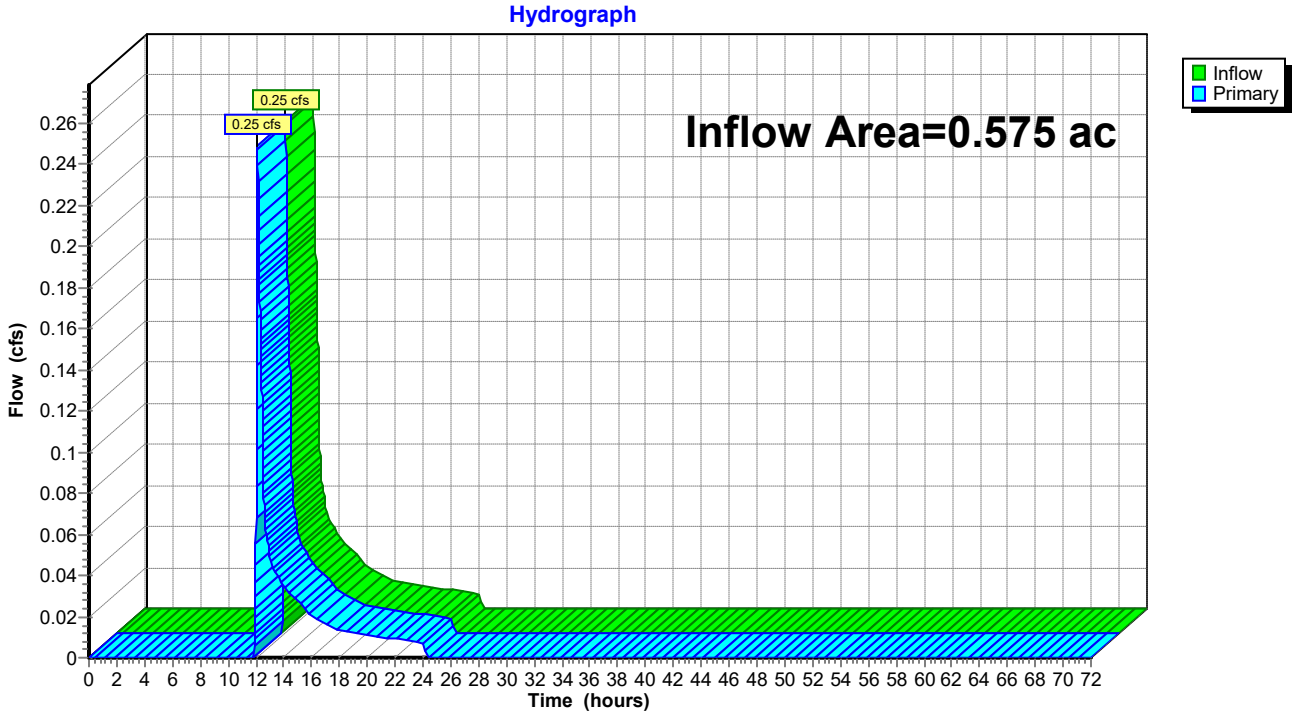


Summary for Link RD: Flow to Road and West Prop Line

Inflow Area = 0.575 ac, 7.99% Impervious, Inflow Depth = 0.53" for 2 Year Storm event
Inflow = 0.25 cfs @ 12.12 hrs, Volume= 0.026 af
Primary = 0.25 cfs @ 12.12 hrs, Volume= 0.026 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link RD: Flow to Road and West Prop Line



Summary for Subcatchment E1: Ex to Road & West Prop Line

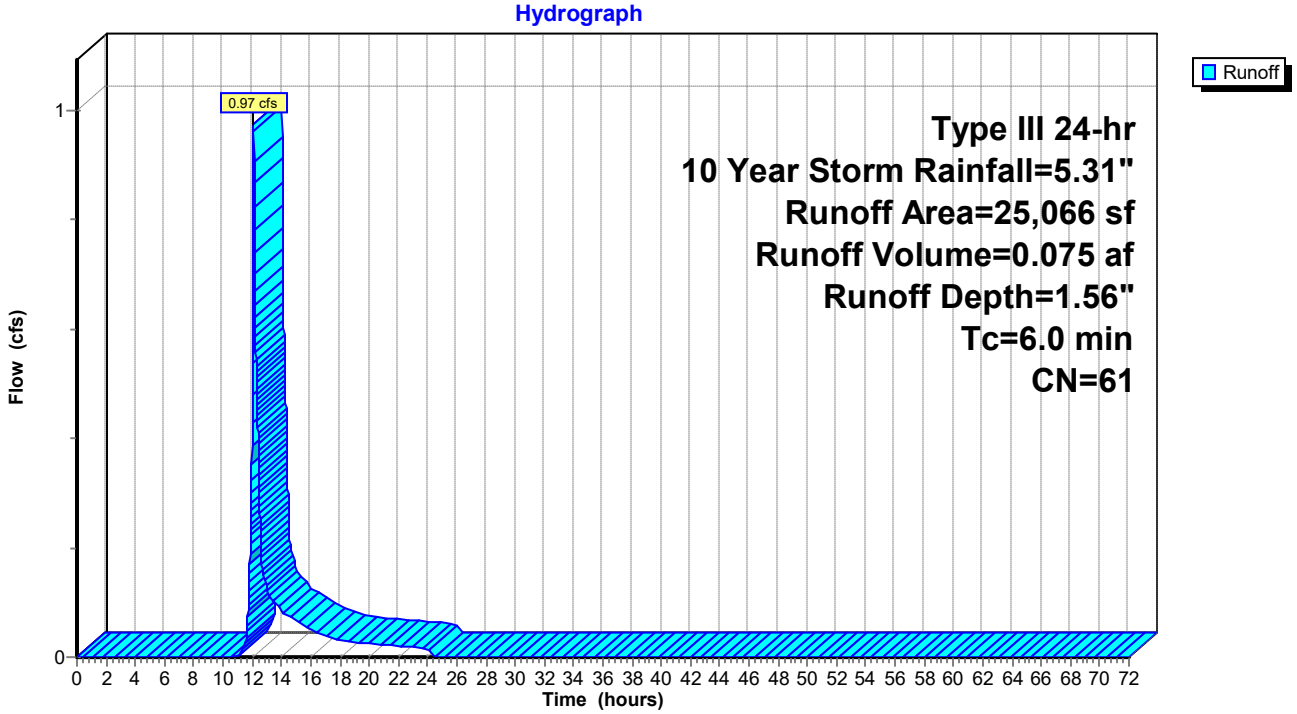
Runoff = 0.97 cfs @ 12.10 hrs, Volume= 0.075 af, Depth= 1.56"
Routed to Link RD : Flow to Road and West Prop Line

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Storm Rainfall=5.31"

Area (sf)	CN	Description
1,875	98	Roofs, HSG B
2,316	85	Gravel roads, HSG B
20,342	55	Woods, Good, HSG B
129	98	Paved parking, HSG B
404	61	>75% Grass cover, Good, HSG B
25,066	61	Weighted Average
23,062		92.01% Pervious Area
2,004		7.99% Impervious Area

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

Subcatchment E1: Ex to Road & West Prop Line



Summary for Subcatchment E2: Flow to Rear Prop Line

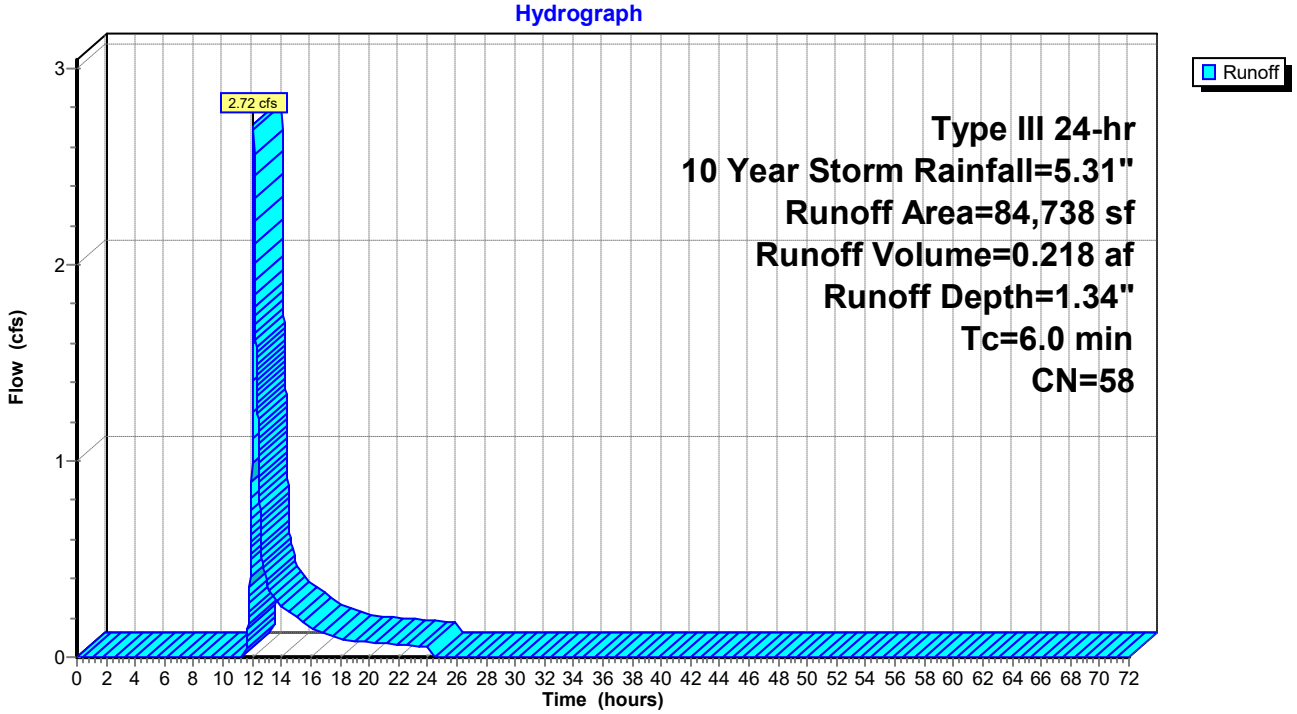
Runoff = 2.72 cfs @ 12.10 hrs, Volume= 0.218 af, Depth= 1.34"
Routed to Link PL : Flow to Rear Property line

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Storm Rainfall=5.31"

Area (sf)	CN	Description
77,946	55	Woods, Good, HSG B
4,546	85	Gravel roads, HSG B
1,302	98	Roofs, HSG B
431	61	>75% Grass cover, Good, HSG B
513	98	Paved parking, HSG B
84,738	58	Weighted Average
82,923		97.86% Pervious Area
1,815		2.14% Impervious Area

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

Subcatchment E2: Flow to Rear Prop Line

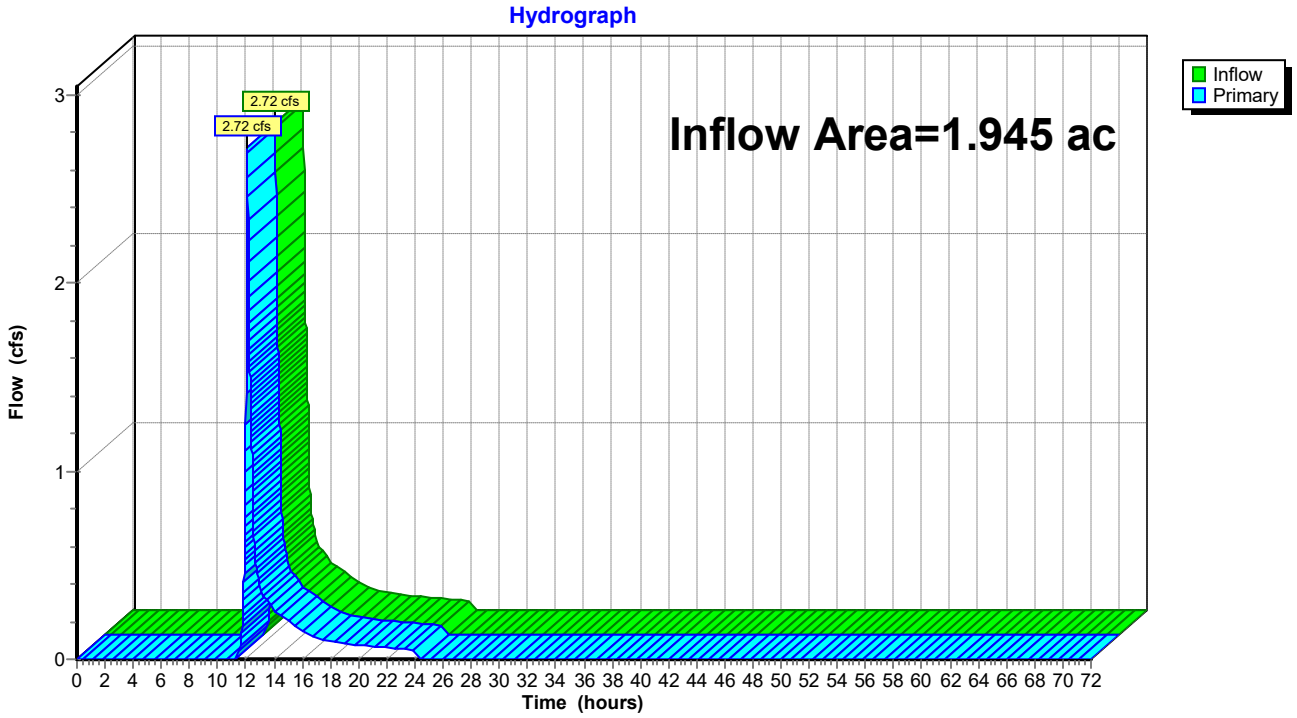


Summary for Link PL: Flow to Rear Property line

Inflow Area = 1.945 ac, 2.14% Impervious, Inflow Depth = 1.34" for 10 Year Storm event
Inflow = 2.72 cfs @ 12.10 hrs, Volume= 0.218 af
Primary = 2.72 cfs @ 12.10 hrs, Volume= 0.218 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node Out

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link PL: Flow to Rear Property line

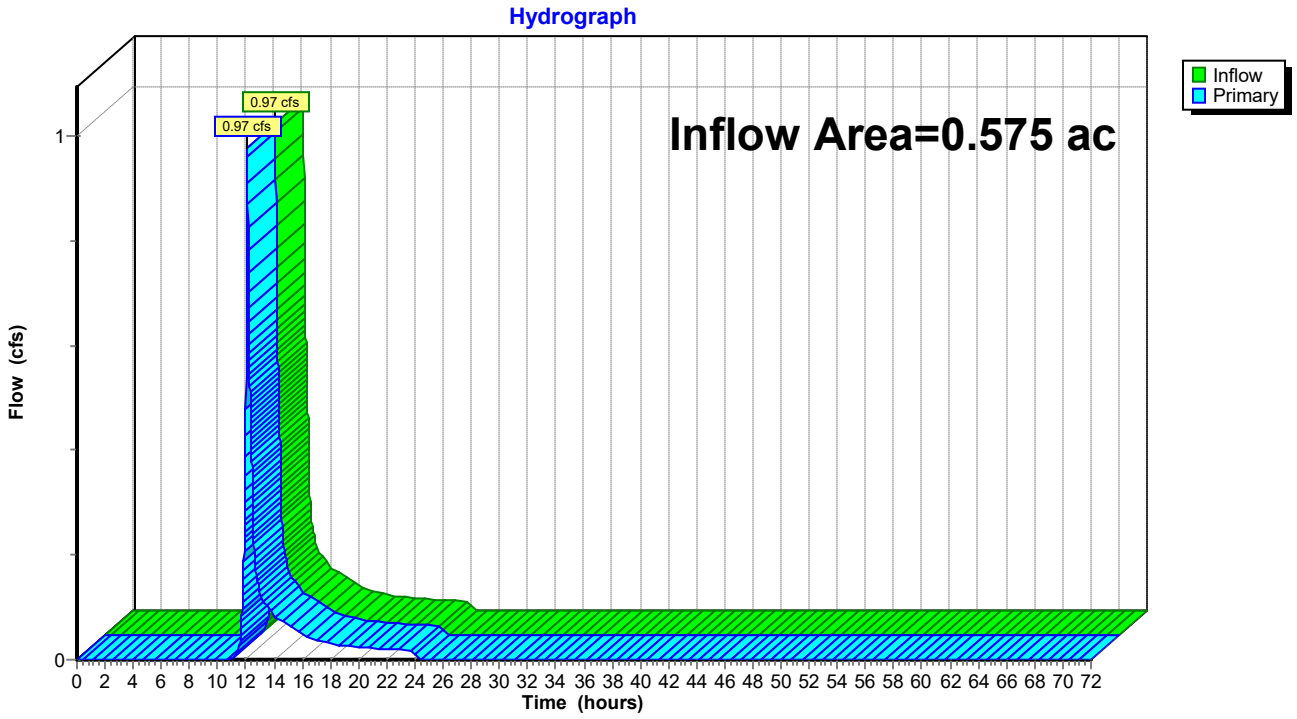


Summary for Link RD: Flow to Road and West Prop Line

Inflow Area = 0.575 ac, 7.99% Impervious, Inflow Depth = 1.56" for 10 Year Storm event
Inflow = 0.97 cfs @ 12.10 hrs, Volume= 0.075 af
Primary = 0.97 cfs @ 12.10 hrs, Volume= 0.075 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link RD: Flow to Road and West Prop Line



Summary for Subcatchment E1: Ex to Road & West Prop Line

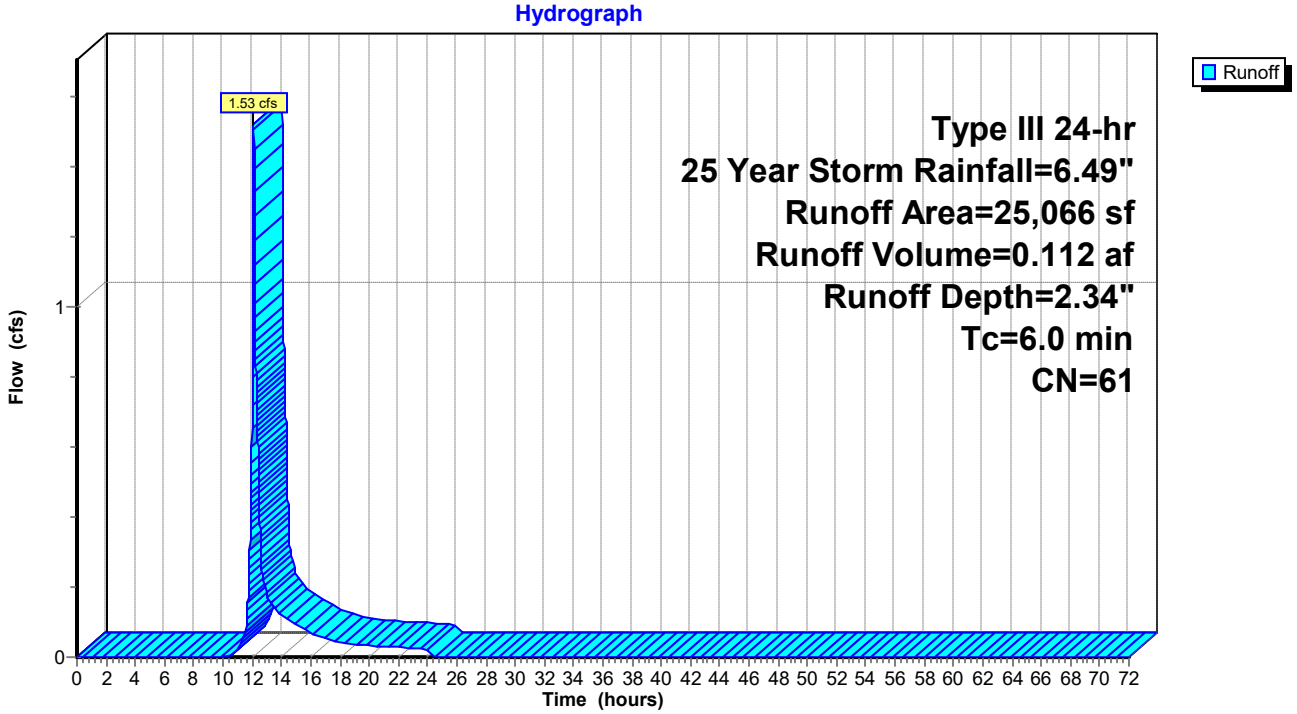
Runoff = 1.53 cfs @ 12.09 hrs, Volume= 0.112 af, Depth= 2.34"
Routed to Link RD : Flow to Road and West Prop Line

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Storm Rainfall=6.49"

Area (sf)	CN	Description
1,875	98	Roofs, HSG B
2,316	85	Gravel roads, HSG B
20,342	55	Woods, Good, HSG B
129	98	Paved parking, HSG B
404	61	>75% Grass cover, Good, HSG B
25,066	61	Weighted Average
23,062		92.01% Pervious Area
2,004		7.99% Impervious Area

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

Subcatchment E1: Ex to Road & West Prop Line



Summary for Subcatchment E2: Flow to Rear Prop Line

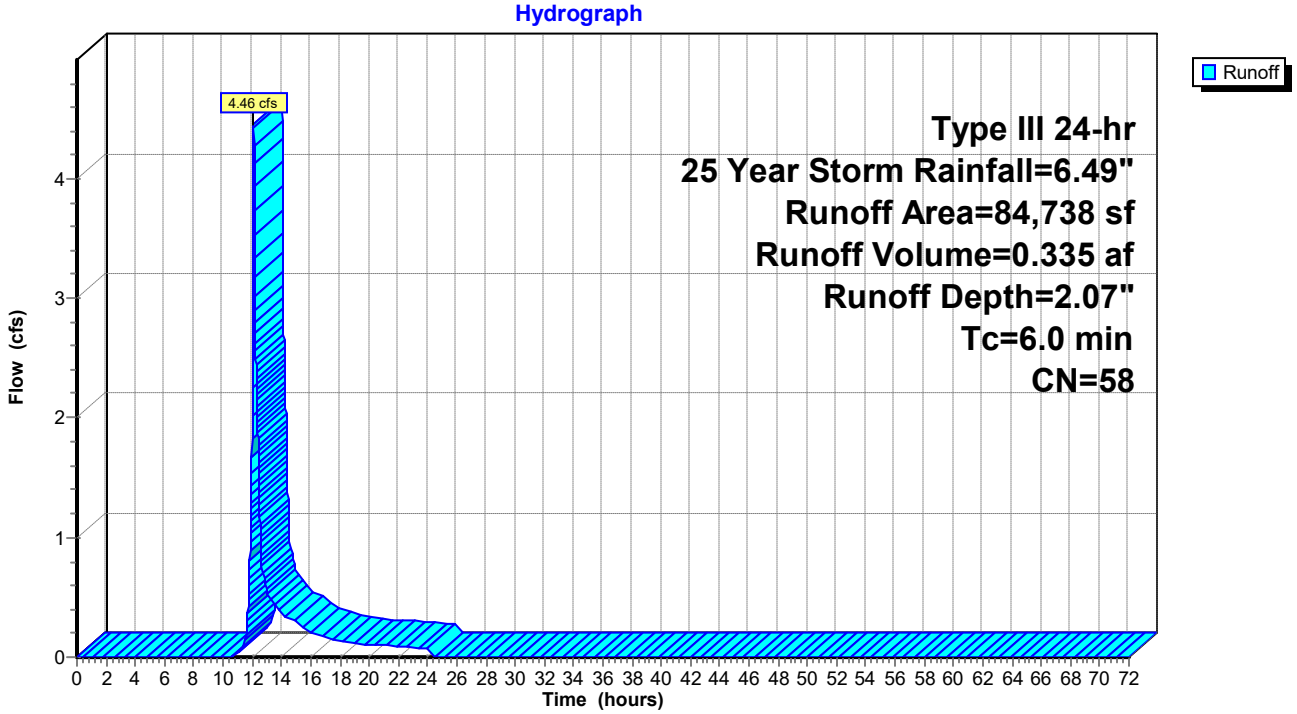
Runoff = 4.46 cfs @ 12.10 hrs, Volume= 0.335 af, Depth= 2.07"
Routed to Link PL : Flow to Rear Property line

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Storm Rainfall=6.49"

Area (sf)	CN	Description
77,946	55	Woods, Good, HSG B
4,546	85	Gravel roads, HSG B
1,302	98	Roofs, HSG B
431	61	>75% Grass cover, Good, HSG B
513	98	Paved parking, HSG B
84,738	58	Weighted Average
82,923		97.86% Pervious Area
1,815		2.14% Impervious Area

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

Subcatchment E2: Flow to Rear Prop Line

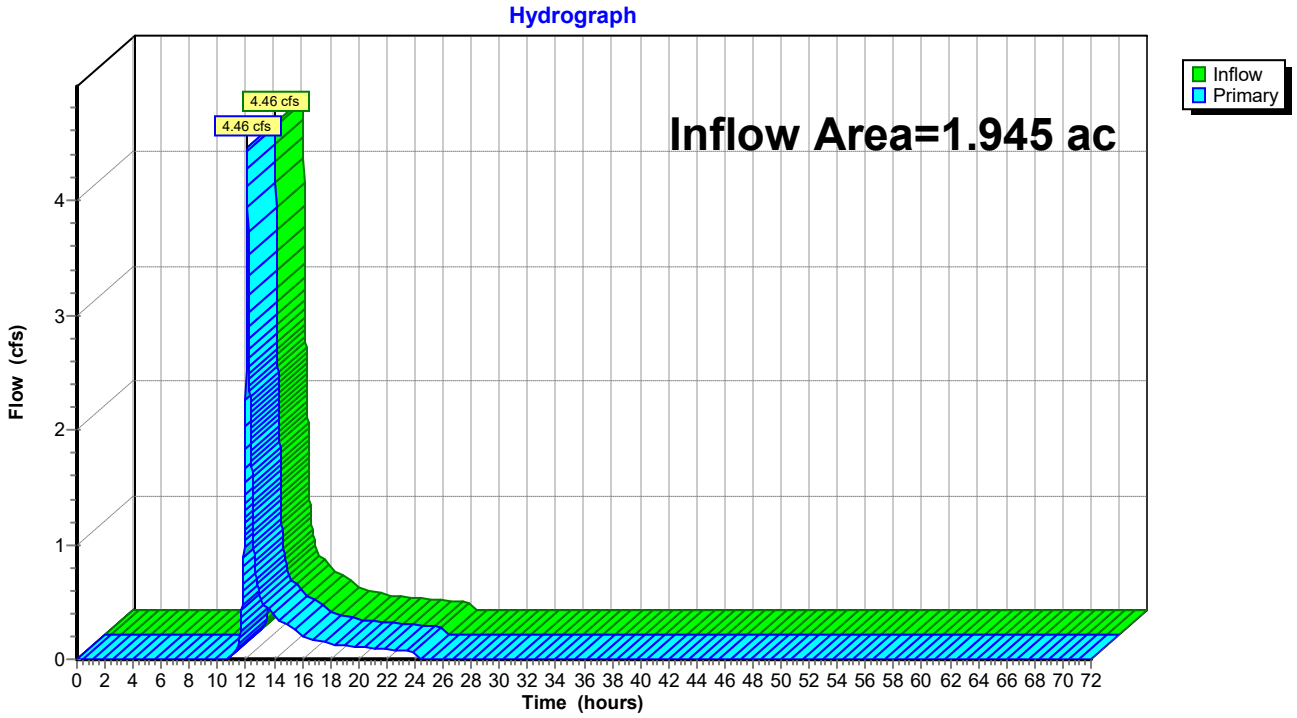


Summary for Link PL: Flow to Rear Property line

Inflow Area = 1.945 ac, 2.14% Impervious, Inflow Depth = 2.07" for 25 Year Storm event
Inflow = 4.46 cfs @ 12.10 hrs, Volume= 0.335 af
Primary = 4.46 cfs @ 12.10 hrs, Volume= 0.335 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node Out

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link PL: Flow to Rear Property line

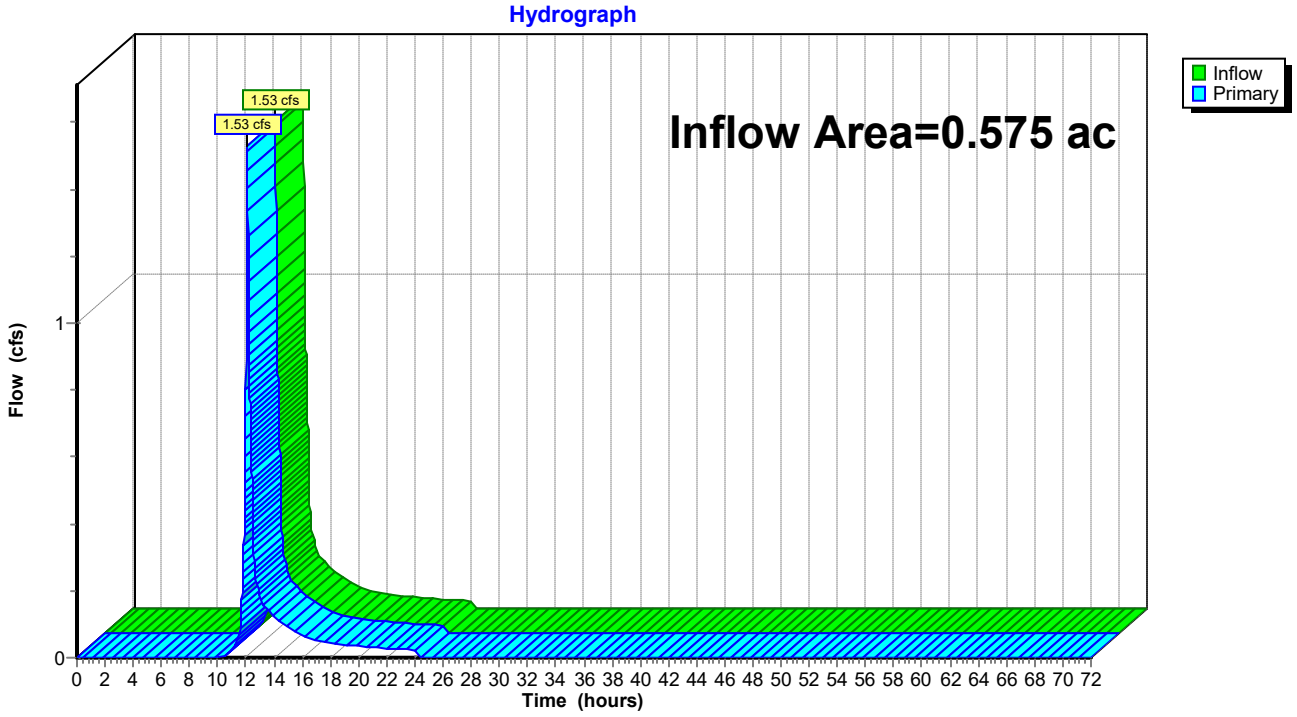


Summary for Link RD: Flow to Road and West Prop Line

Inflow Area = 0.575 ac, 7.99% Impervious, Inflow Depth = 2.34" for 25 Year Storm event
Inflow = 1.53 cfs @ 12.09 hrs, Volume= 0.112 af
Primary = 1.53 cfs @ 12.09 hrs, Volume= 0.112 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link RD: Flow to Road and West Prop Line



Summary for Subcatchment E1: Ex to Road & West Prop Line

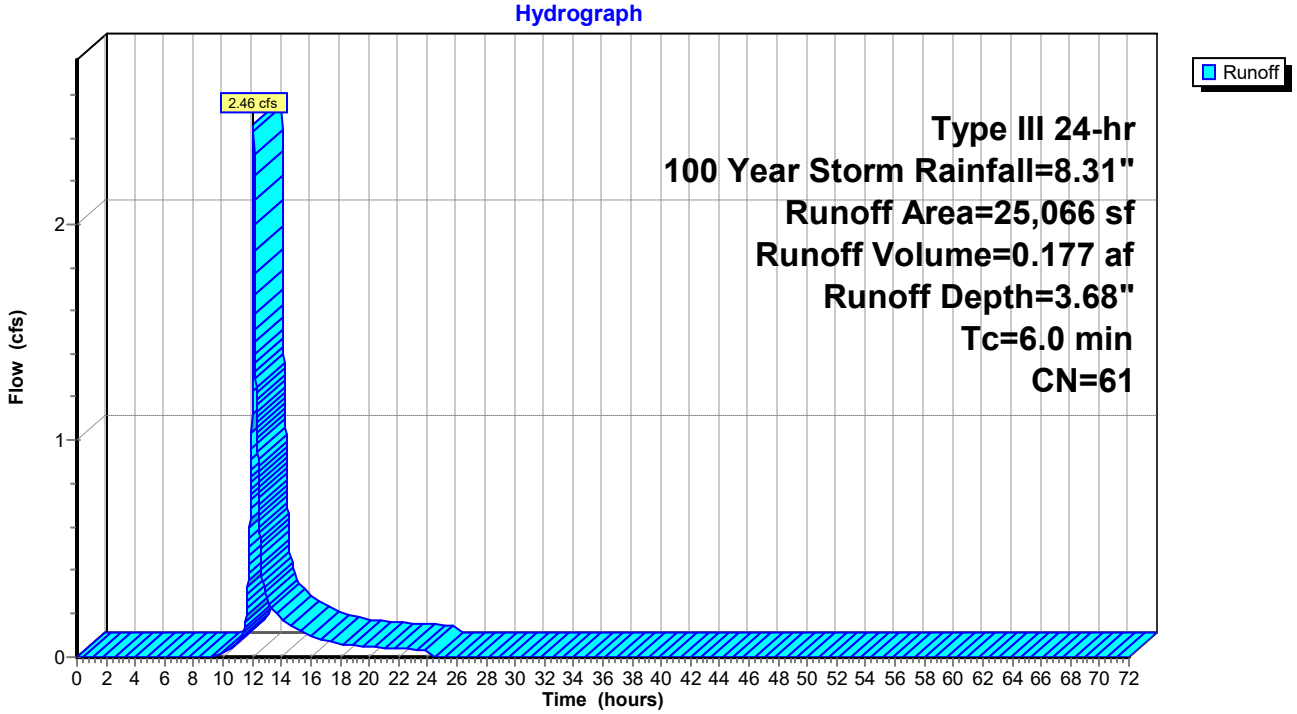
Runoff = 2.46 cfs @ 12.09 hrs, Volume= 0.177 af, Depth= 3.68"
Routed to Link RD : Flow to Road and West Prop Line

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=8.31"

Area (sf)	CN	Description
1,875	98	Roofs, HSG B
2,316	85	Gravel roads, HSG B
20,342	55	Woods, Good, HSG B
129	98	Paved parking, HSG B
404	61	>75% Grass cover, Good, HSG B
25,066	61	Weighted Average
23,062		92.01% Pervious Area
2,004		7.99% Impervious Area

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

Subcatchment E1: Ex to Road & West Prop Line



Summary for Subcatchment E2: Flow to Rear Prop Line

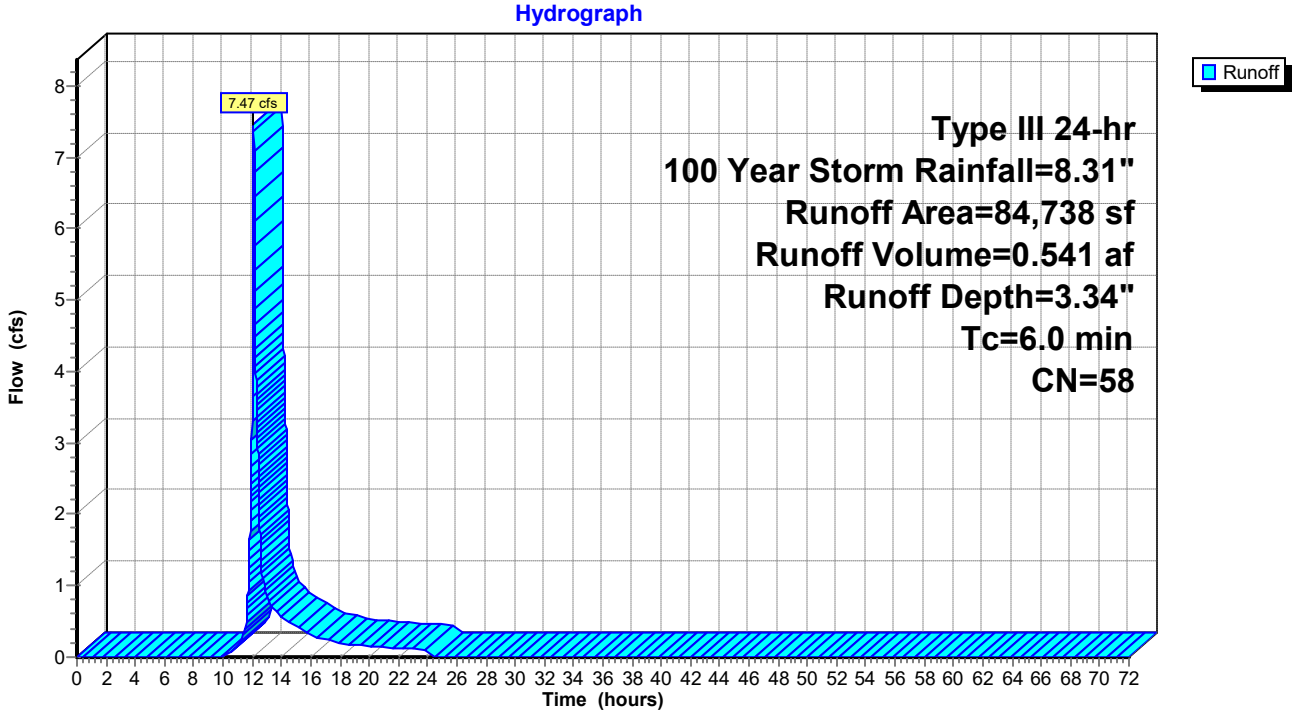
Runoff = 7.47 cfs @ 12.09 hrs, Volume= 0.541 af, Depth= 3.34"
Routed to Link PL : Flow to Rear Property line

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=8.31"

Area (sf)	CN	Description
77,946	55	Woods, Good, HSG B
4,546	85	Gravel roads, HSG B
1,302	98	Roofs, HSG B
431	61	>75% Grass cover, Good, HSG B
513	98	Paved parking, HSG B
84,738	58	Weighted Average
82,923		97.86% Pervious Area
1,815		2.14% Impervious Area

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

Subcatchment E2: Flow to Rear Prop Line

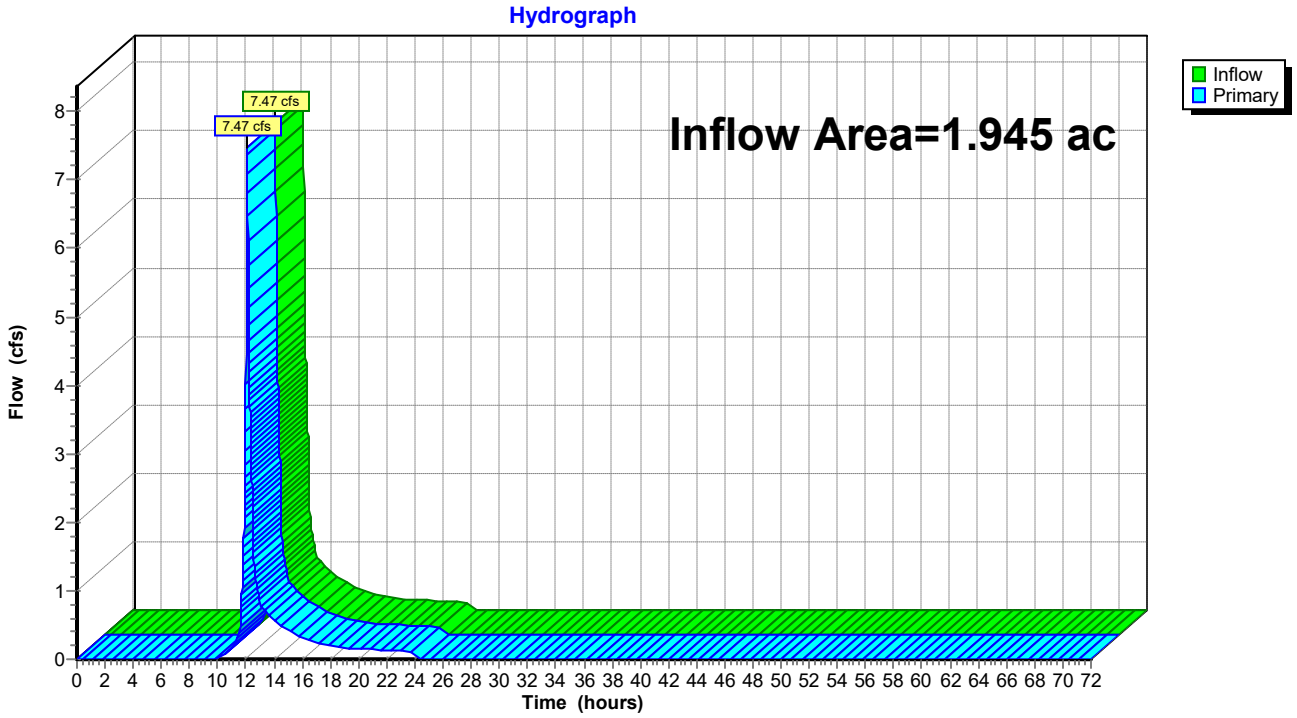


Summary for Link PL: Flow to Rear Property line

Inflow Area = 1.945 ac, 2.14% Impervious, Inflow Depth = 3.34" for 100 Year Storm event
Inflow = 7.47 cfs @ 12.09 hrs, Volume= 0.541 af
Primary = 7.47 cfs @ 12.09 hrs, Volume= 0.541 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node Out

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link PL: Flow to Rear Property line

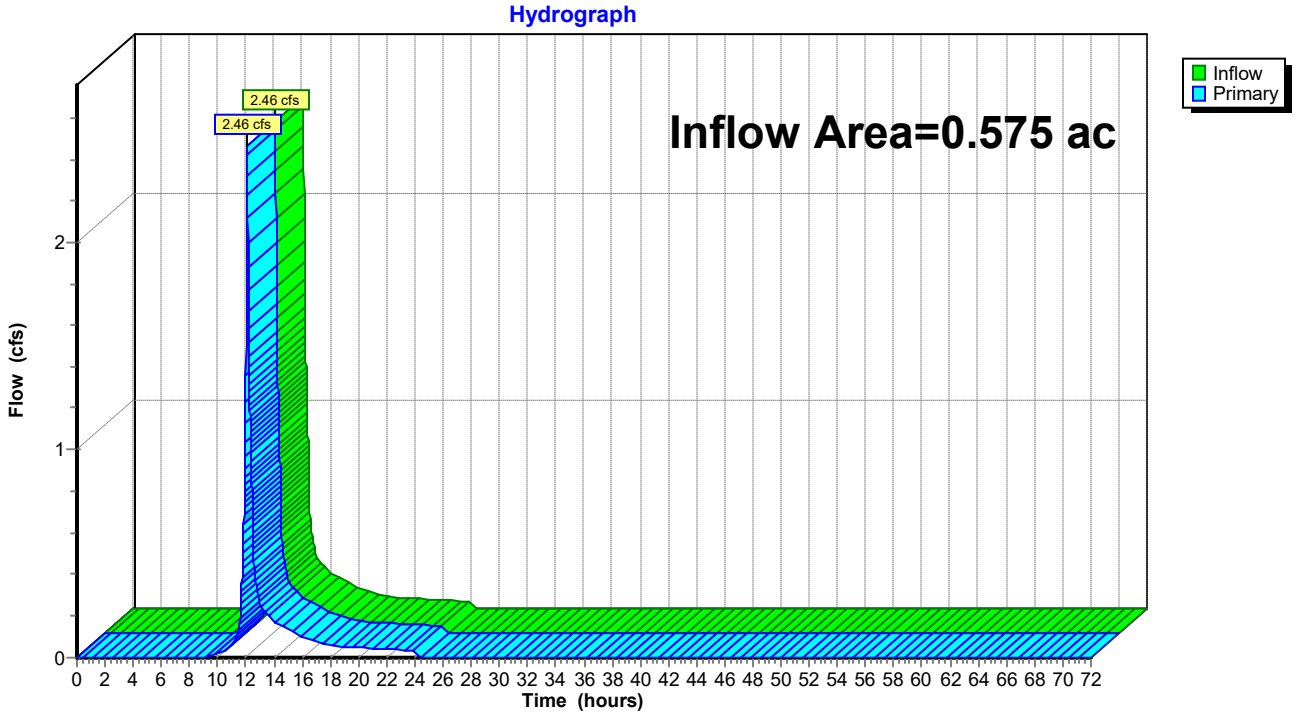


Summary for Link RD: Flow to Road and West Prop Line

Inflow Area = 0.575 ac, 7.99% Impervious, Inflow Depth = 3.68" for 100 Year Storm event
Inflow = 2.46 cfs @ 12.09 hrs, Volume= 0.177 af
Primary = 2.46 cfs @ 12.09 hrs, Volume= 0.177 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link RD: Flow to Road and West Prop Line



61 County Existing rev 8-25-2021
Prepared by Hewlett-Packard Company

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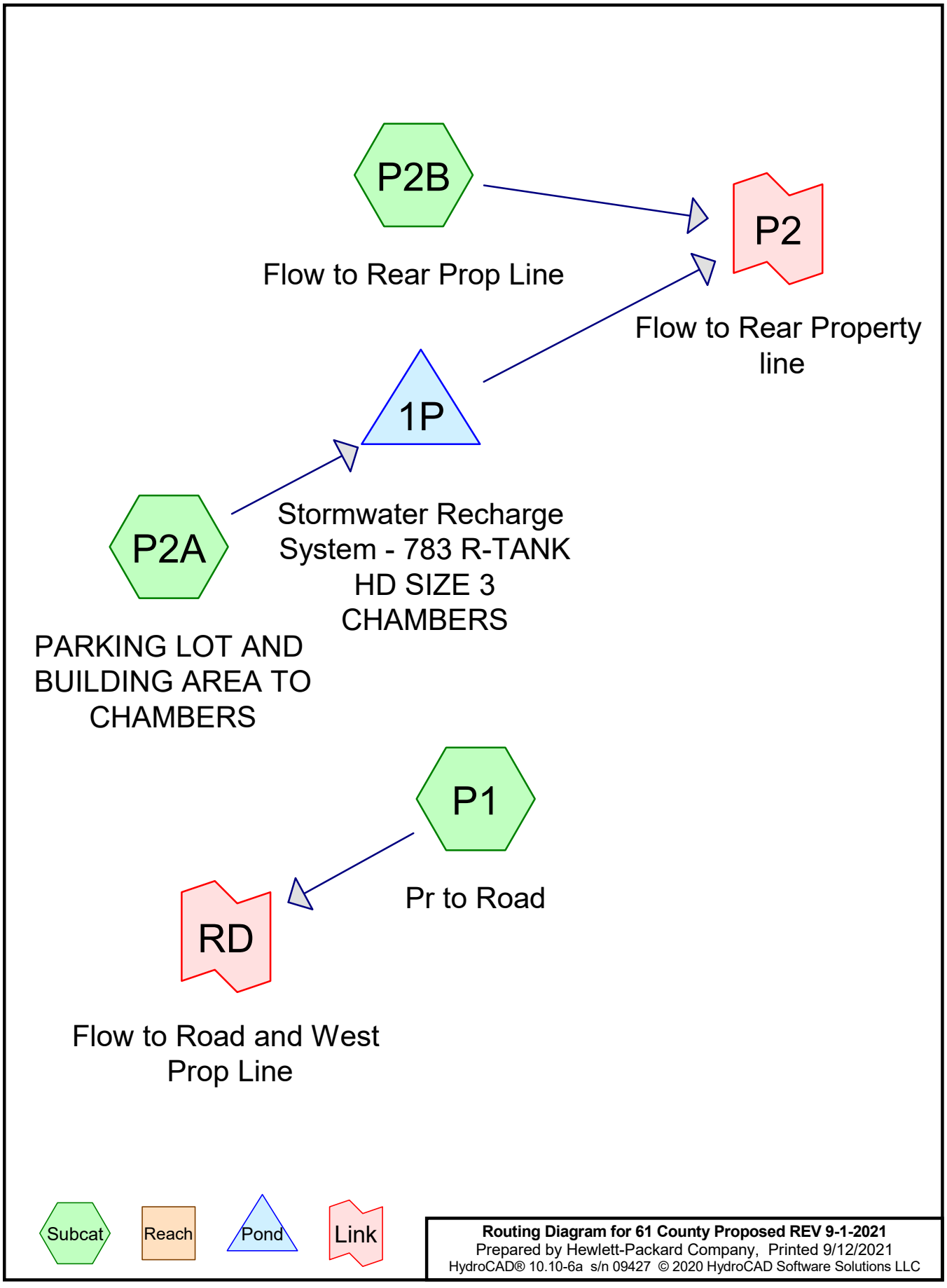


Routing Diagram for 61 County Proposed REV 9-1-2021
Prepared by Hewlett-Packard Company, Printed 9/12/2021

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 Year Storm	Type III 24-hr		Default	24.00	1	3.41	2
2	10 Year Storm	Type III 24-hr		Default	24.00	1	5.31	2
3	25 Year Storm	Type III 24-hr		Default	24.00	1	6.49	2
4	100 Year Storm	Type III 24-hr		Default	24.00	1	8.31	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.087	61	>75% Grass cover, Good, HSG B (P1, P2A, P2B)
0.005	98	CONC WALK (P1)
0.020	85	Gravel roads, HSG B (P2B)
0.742	98	Paved parking, HSG B (P2A)
0.367	98	Roofs, HSG B (P2A)
0.034	61	Stilling Basin, HSG B (P2B)
0.006	98	Walk (P2B)
0.021	98	Walls, HSG B (P2B)
0.236	55	Woods, Good, HSG B (P2B)

Summary for Subcatchment P1: Pr to Road

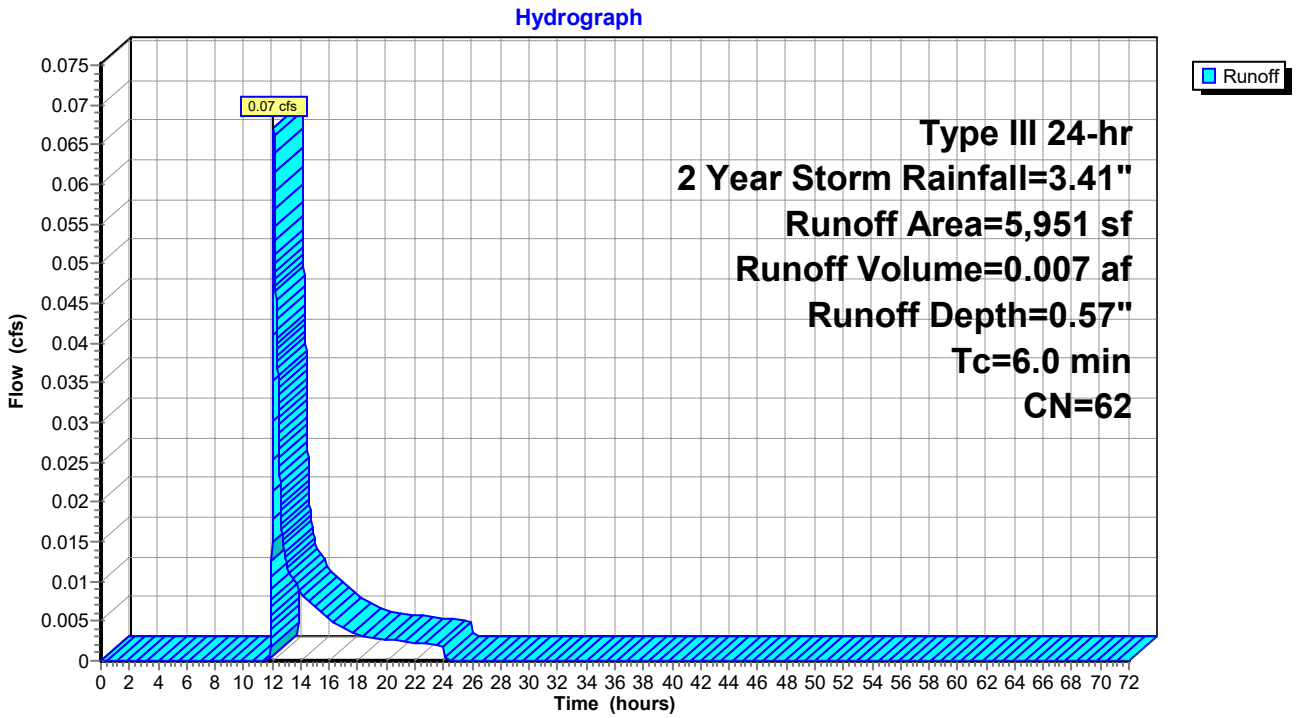
Runoff = 0.07 cfs @ 12.11 hrs, Volume= 0.007 af, Depth= 0.57"
Routed to Link RD : Flow to Road and West Prop Line

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Storm Rainfall=3.41"

	Area (sf)	CN	Description
	5,724	61	>75% Grass cover, Good, HSG B
*	227	98	CONC WALK
	5,951	62	Weighted Average
	5,724		96.19% Pervious Area
	227		3.81% Impervious Area

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

Subcatchment P1: Pr to Road



Summary for Subcatchment P2A: PARKING LOT AND BUILDING AREA TO CHAMBERS

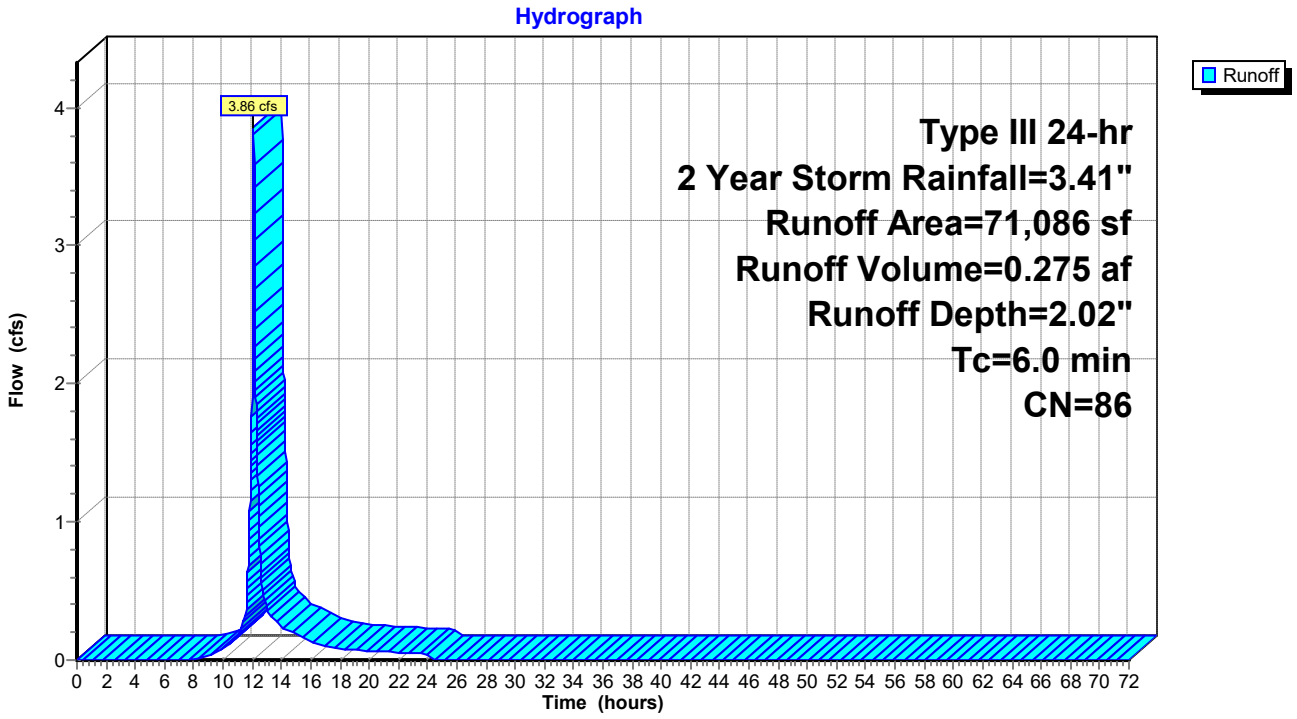
Runoff = 3.86 cfs @ 12.09 hrs, Volume= 0.275 af, Depth= 2.02"
Routed to Pond 1P : Stormwater Recharge System - 783 R-TANK HD SIZE 3 CHAMBERS

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Storm Rainfall=3.41"

Area (sf)	CN	Description
16,007	98	Roofs, HSG B
22,744	61	>75% Grass cover, Good, HSG B
32,335	98	Paved parking, HSG B
71,086	86	Weighted Average
22,744		32.00% Pervious Area
48,342		68.00% Impervious Area

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

Subcatchment P2A: PARKING LOT AND BUILDING AREA TO CHAMBERS



Summary for Subcatchment P2B: Flow to Rear Prop Line

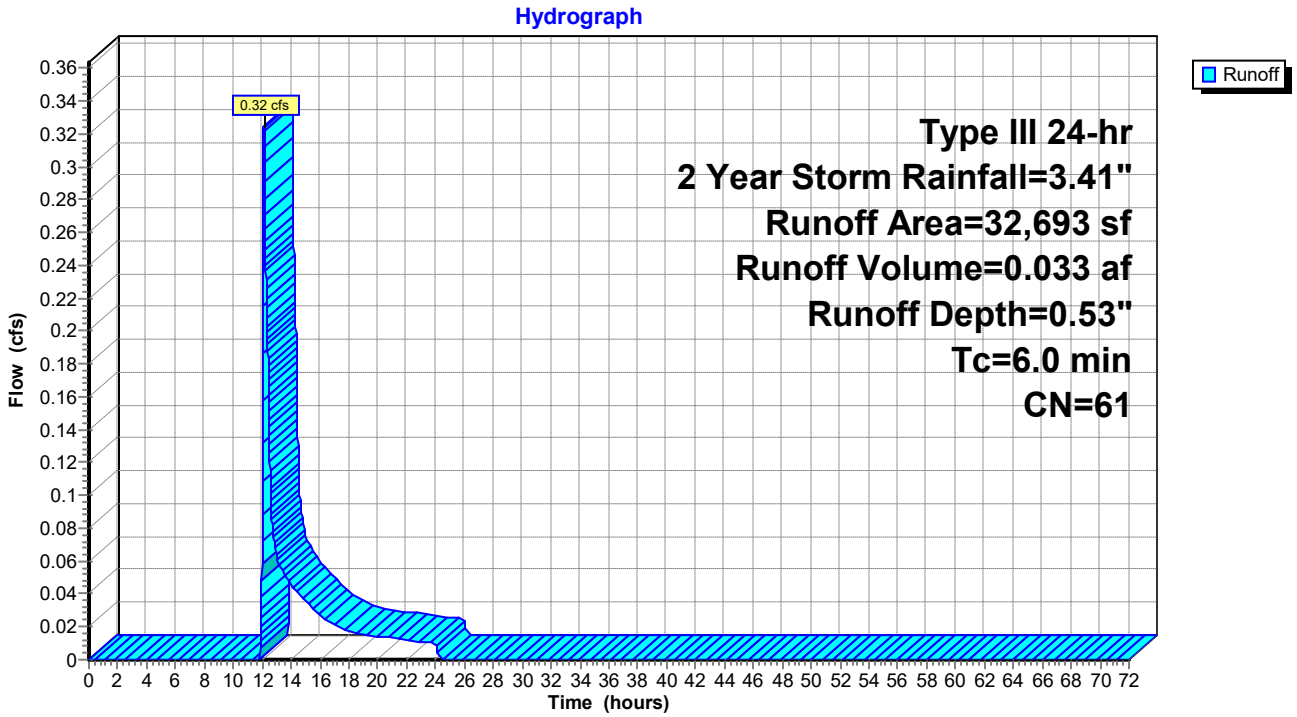
Runoff = 0.32 cfs @ 12.12 hrs, Volume= 0.033 af, Depth= 0.53"
Routed to Link P2 : Flow to Rear Property line

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Storm Rainfall=3.41"

	Area (sf)	CN	Description
*	909	98	Walls, HSG B
	18,879	61	>75% Grass cover, Good, HSG B
	865	85	Gravel roads, HSG B
*	1,475	61	Stilling Basin, HSG B
	10,300	55	Woods, Good, HSG B
*	265	98	Walk
	32,693	61	Weighted Average
	31,519		96.41% Pervious Area
	1,174		3.59% Impervious Area

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

Subcatchment P2B: Flow to Rear Prop Line



Summary for Pond 1P: Stormwater Recharge System - 783 R-TANK HD SIZE 3 CHAMBERS

Inflow Area = 1.632 ac, 68.00% Impervious, Inflow Depth = 2.02" for 2 Year Storm event
Inflow = 3.86 cfs @ 12.09 hrs, Volume= 0.275 af
Outflow = 0.54 cfs @ 11.70 hrs, Volume= 0.275 af, Atten= 86%, Lag= 0.0 min
Discarded = 0.54 cfs @ 11.70 hrs, Volume= 0.275 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link P2 : Flow to Rear Property line

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 284.80' @ 12.64 hrs Surf.Area= 2,832 sf Storage= 3,758 cf

Plug-Flow detention time= 48.6 min calculated for 0.275 af (100% of inflow)
Center-of-Mass det. time= 48.6 min (868.4 - 819.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	283.00'	2,407 cf	**42.06'W x 67.34'L x 5.70'H Field A** 16,141 cf Overall - 10,123 cf Embedded = 6,018 cf x 40.0% Voids
#2A	283.50'	9,616 cf	**ACF R-Tank HD 3** x 783 Inside #1 Inside= 15.7"W x 50.4"H => 5.24 sf x 2.35'L = 12.3 cf Outside= 15.7"W x 50.4"H => 5.51 sf x 2.35'L = 12.9 cf 783 Chambers in 29 Rows
		12,024 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	283.00'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	285.00'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	288.00'	**0.5' long x 0.7' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32

Discarded OutFlow Max=0.54 cfs @ 11.70 hrs HW=283.06' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.54 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=283.00' (Free Discharge)
├**2=Orifice/Grate** (Controls 0.00 cfs)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Stormwater Recharge System - 783 R-TANK HD SIZE 3 CHAMBERS - Chamber Wizard Field A

Chamber Model = ACF R-Tank HD 3 (ACF Environmental R-Tank HD)
Inside= 15.7"W x 50.4"H => 5.24 sf x 2.35'L = 12.3 cf
Outside= 15.7"W x 50.4"H => 5.51 sf x 2.35'L = 12.9 cf

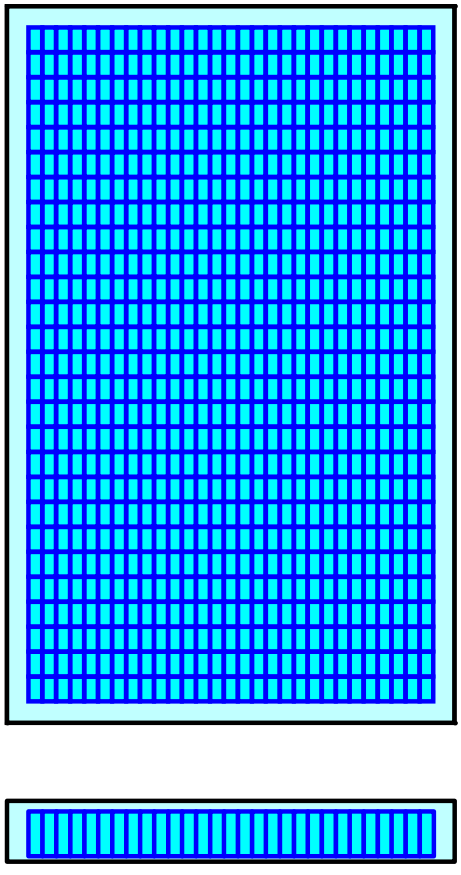
27 Chambers/Row x 2.35' Long = 63.34' Row Length +24.0" End Stone x 2 = 67.34' Base Length
29 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 42.06' Base Width
6.0" Stone Base + 50.4" Chamber Height + 12.0" Stone Cover = 5.70' Field Height

783 Chambers x 12.3 cf = 9,616.5 cf Chamber Storage
783 Chambers x 12.9 cf = 10,122.6 cf Displacement

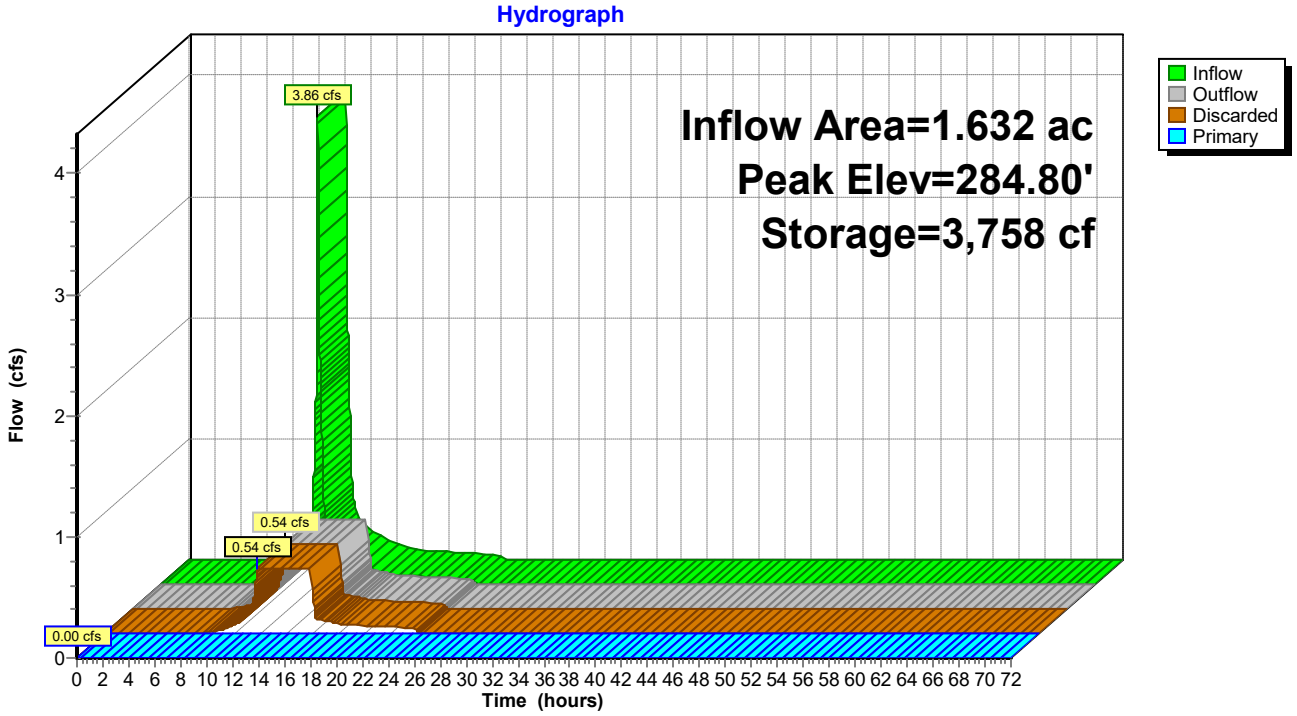
16,141.1 cf Field - 10,122.6 cf Chambers = 6,018.4 cf Stone x 40.0% Voids = 2,407.4 cf Stone Storage

Chamber Storage + Stone Storage = 12,023.9 cf = 0.276 af
Overall Storage Efficiency = 74.5%
Overall System Size = 67.34' x 42.06' x 5.70'

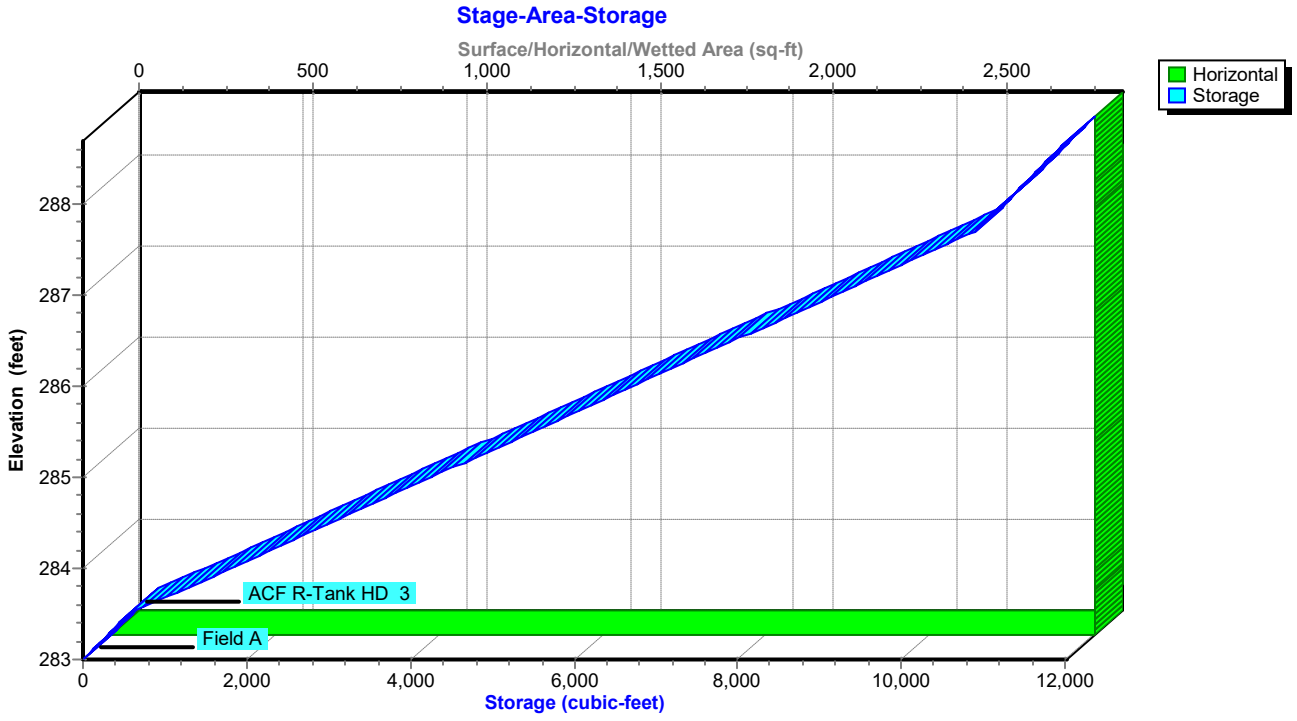
783 Chambers
597.8 cy Field
222.9 cy Stone



Pond 1P: Stormwater Recharge System - 783 R-TANK HD SIZE 3 CHAMBERS



Pond 1P: Stormwater Recharge System - 783 R-TANK HD SIZE 3 CHAMBERS

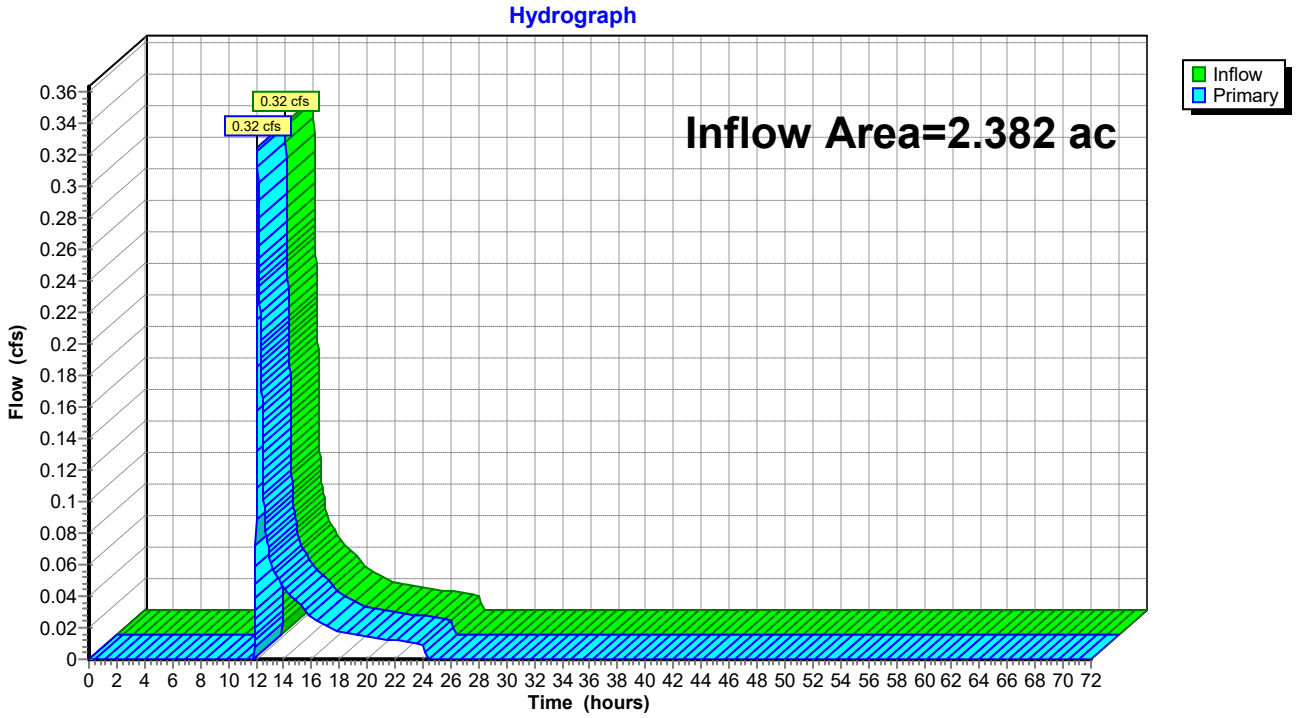


Summary for Link P2: Flow to Rear Property line

Inflow Area = 2.382 ac, 47.71% Impervious, Inflow Depth = 0.17" for 2 Year Storm event
Inflow = 0.32 cfs @ 12.12 hrs, Volume= 0.033 af
Primary = 0.32 cfs @ 12.12 hrs, Volume= 0.033 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node Out

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P2: Flow to Rear Property line

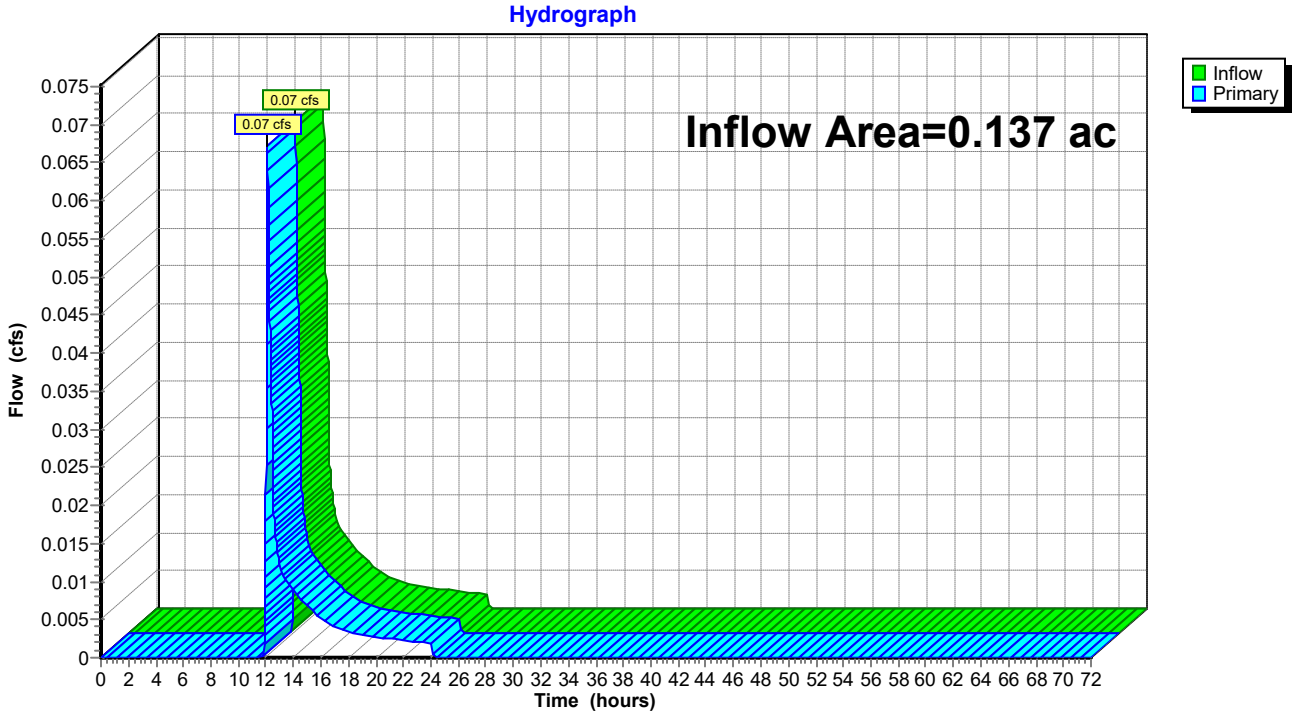


Summary for Link RD: Flow to Road and West Prop Line

Inflow Area = 0.137 ac, 3.81% Impervious, Inflow Depth = 0.57" for 2 Year Storm event
Inflow = 0.07 cfs @ 12.11 hrs, Volume= 0.007 af
Primary = 0.07 cfs @ 12.11 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link RD: Flow to Road and West Prop Line



Summary for Subcatchment P1: Pr to Road

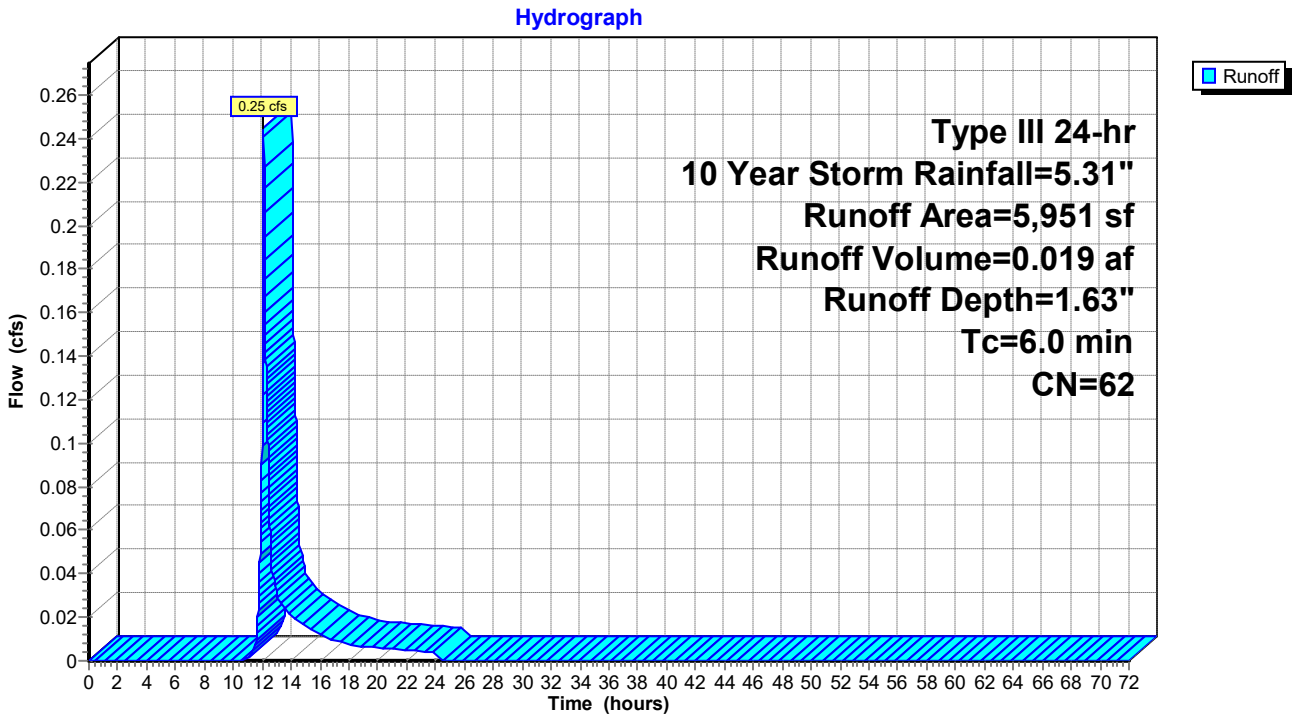
Runoff = 0.25 cfs @ 12.10 hrs, Volume= 0.019 af, Depth= 1.63"
Routed to Link RD : Flow to Road and West Prop Line

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Storm Rainfall=5.31"

	Area (sf)	CN	Description
	5,724	61	>75% Grass cover, Good, HSG B
*	227	98	CONC WALK
	5,951	62	Weighted Average
	5,724		96.19% Pervious Area
	227		3.81% Impervious Area

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

Subcatchment P1: Pr to Road



Summary for Subcatchment P2A: PARKING LOT AND BUILDING AREA TO CHAMBERS

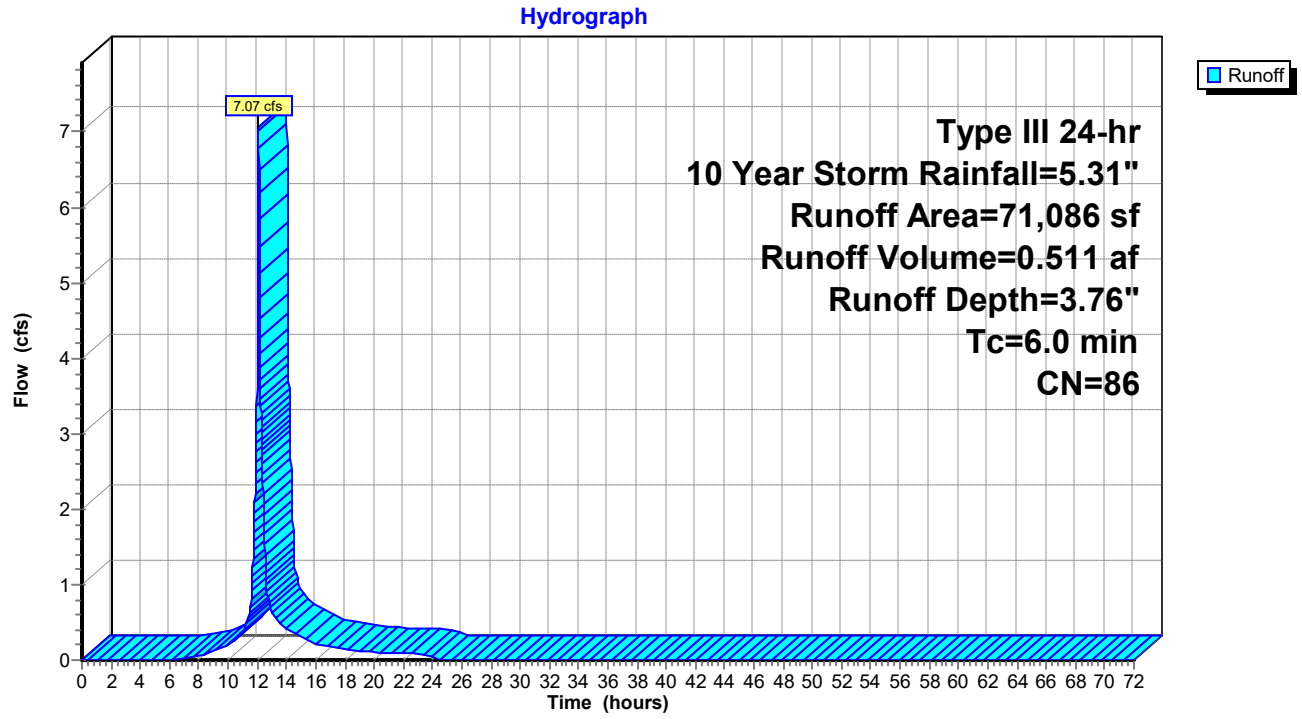
Runoff = 7.07 cfs @ 12.09 hrs, Volume= 0.511 af, Depth= 3.76"
Routed to Pond 1P : Stormwater Recharge System - 783 R-TANK HD SIZE 3 CHAMBERS

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Storm Rainfall=5.31"

Area (sf)	CN	Description
16,007	98	Roofs, HSG B
22,744	61	>75% Grass cover, Good, HSG B
32,335	98	Paved parking, HSG B
71,086	86	Weighted Average
22,744		32.00% Pervious Area
48,342		68.00% Impervious Area

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

Subcatchment P2A: PARKING LOT AND BUILDING AREA TO CHAMBERS



Summary for Subcatchment P2B: Flow to Rear Prop Line

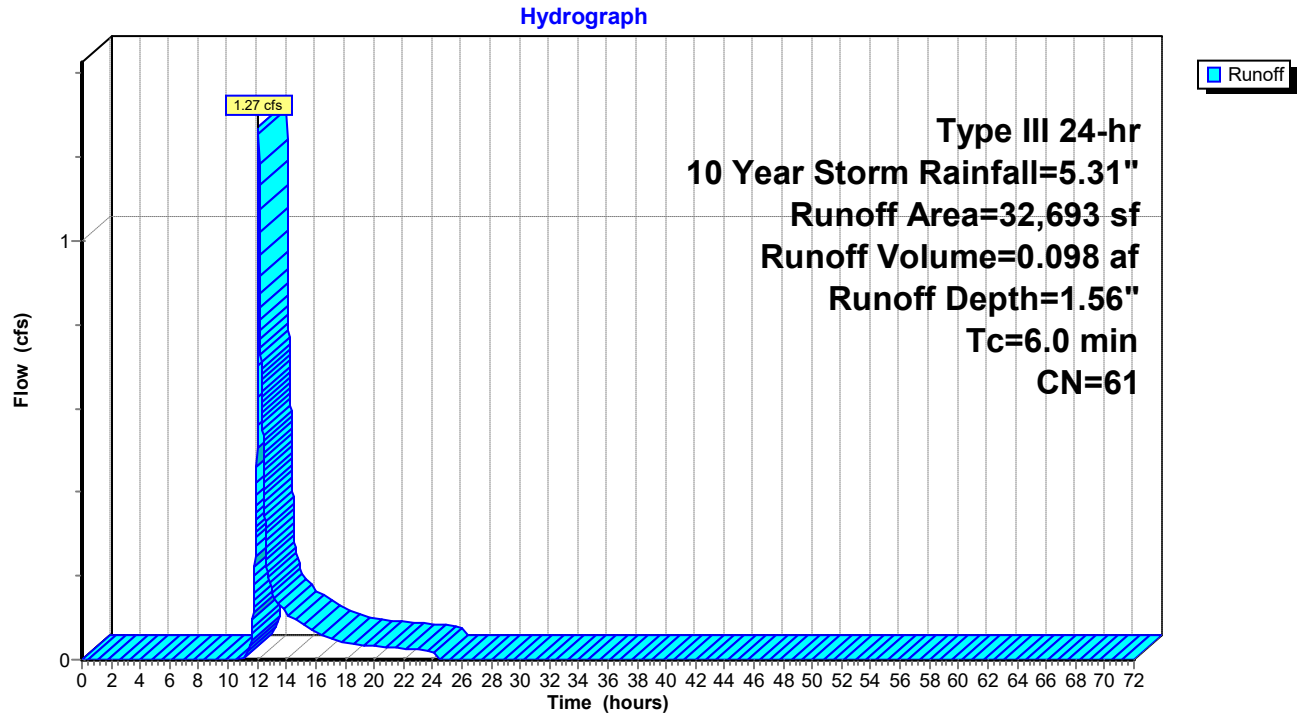
Runoff = 1.27 cfs @ 12.10 hrs, Volume= 0.098 af, Depth= 1.56"
Routed to Link P2 : Flow to Rear Property line

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Storm Rainfall=5.31"

	Area (sf)	CN	Description
*	909	98	Walls, HSG B
	18,879	61	>75% Grass cover, Good, HSG B
	865	85	Gravel roads, HSG B
*	1,475	61	Stilling Basin, HSG B
	10,300	55	Woods, Good, HSG B
*	265	98	Walk
	32,693	61	Weighted Average
	31,519		96.41% Pervious Area
	1,174		3.59% Impervious Area

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

Subcatchment P2B: Flow to Rear Prop Line



Summary for Pond 1P: Stormwater Recharge System - 783 R-TANK HD SIZE 3 CHAMBERS

Inflow Area = 1.632 ac, 68.00% Impervious, Inflow Depth = 3.76" for 10 Year Storm event
Inflow = 7.07 cfs @ 12.09 hrs, Volume= 0.511 af
Outflow = 1.94 cfs @ 12.44 hrs, Volume= 0.511 af, Atten= 73%, Lag= 21.5 min
Discarded = 0.54 cfs @ 11.38 hrs, Volume= 0.412 af
Primary = 1.40 cfs @ 12.44 hrs, Volume= 0.099 af
Routed to Link P2 : Flow to Rear Property line

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 286.02' @ 12.44 hrs Surf.Area= 2,832 sf Storage= 6,773 cf

Plug-Flow detention time= 58.9 min calculated for 0.511 af (100% of inflow)
Center-of-Mass det. time= 58.9 min (861.0 - 802.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	283.00'	2,407 cf	**42.06'W x 67.34'L x 5.70'H Field A** 16,141 cf Overall - 10,123 cf Embedded = 6,018 cf x 40.0% Voids
#2A	283.50'	9,616 cf	**ACF R-Tank HD 3** x 783 Inside #1 Inside= 15.7"W x 50.4"H => 5.24 sf x 2.35'L = 12.3 cf Outside= 15.7"W x 50.4"H => 5.51 sf x 2.35'L = 12.9 cf 783 Chambers in 29 Rows
		12,024 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	283.00'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	285.00'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	288.00'	**0.5' long x 0.7' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32

Discarded OutFlow Max=0.54 cfs @ 11.38 hrs HW=283.06' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.54 cfs)

Primary OutFlow Max=1.40 cfs @ 12.44 hrs HW=286.02' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 1.40 cfs @ 4.00 fps)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Stormwater Recharge System - 783 R-TANK HD SIZE 3 CHAMBERS - Chamber Wizard Field A

Chamber Model = ACF R-Tank HD 3 (ACF Environmental R-Tank HD)
Inside= 15.7"W x 50.4"H => 5.24 sf x 2.35'L = 12.3 cf
Outside= 15.7"W x 50.4"H => 5.51 sf x 2.35'L = 12.9 cf

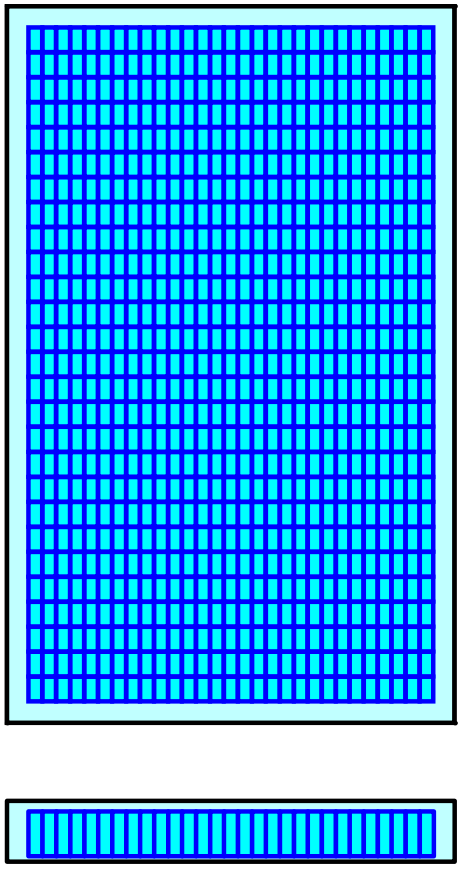
27 Chambers/Row x 2.35' Long = 63.34' Row Length +24.0" End Stone x 2 = 67.34' Base Length
29 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 42.06' Base Width
6.0" Stone Base + 50.4" Chamber Height + 12.0" Stone Cover = 5.70' Field Height

783 Chambers x 12.3 cf = 9,616.5 cf Chamber Storage
783 Chambers x 12.9 cf = 10,122.6 cf Displacement

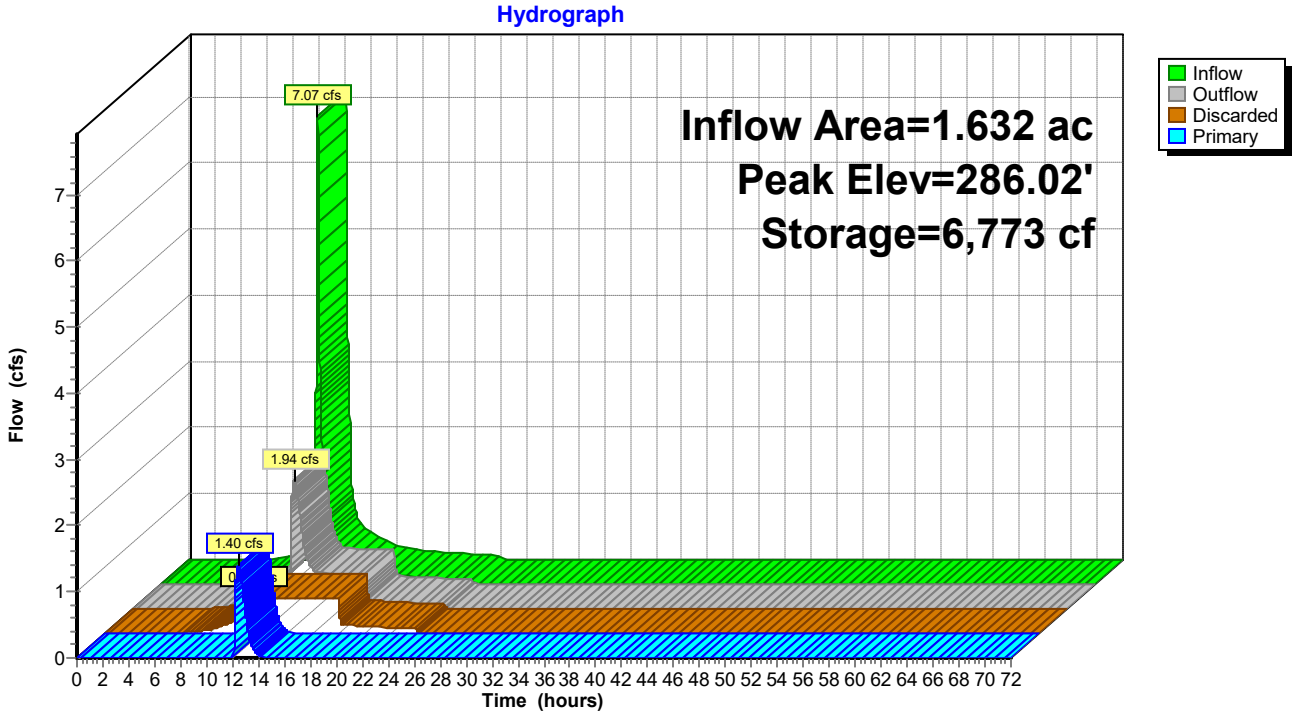
16,141.1 cf Field - 10,122.6 cf Chambers = 6,018.4 cf Stone x 40.0% Voids = 2,407.4 cf Stone Storage

Chamber Storage + Stone Storage = 12,023.9 cf = 0.276 af
Overall Storage Efficiency = 74.5%
Overall System Size = 67.34' x 42.06' x 5.70'

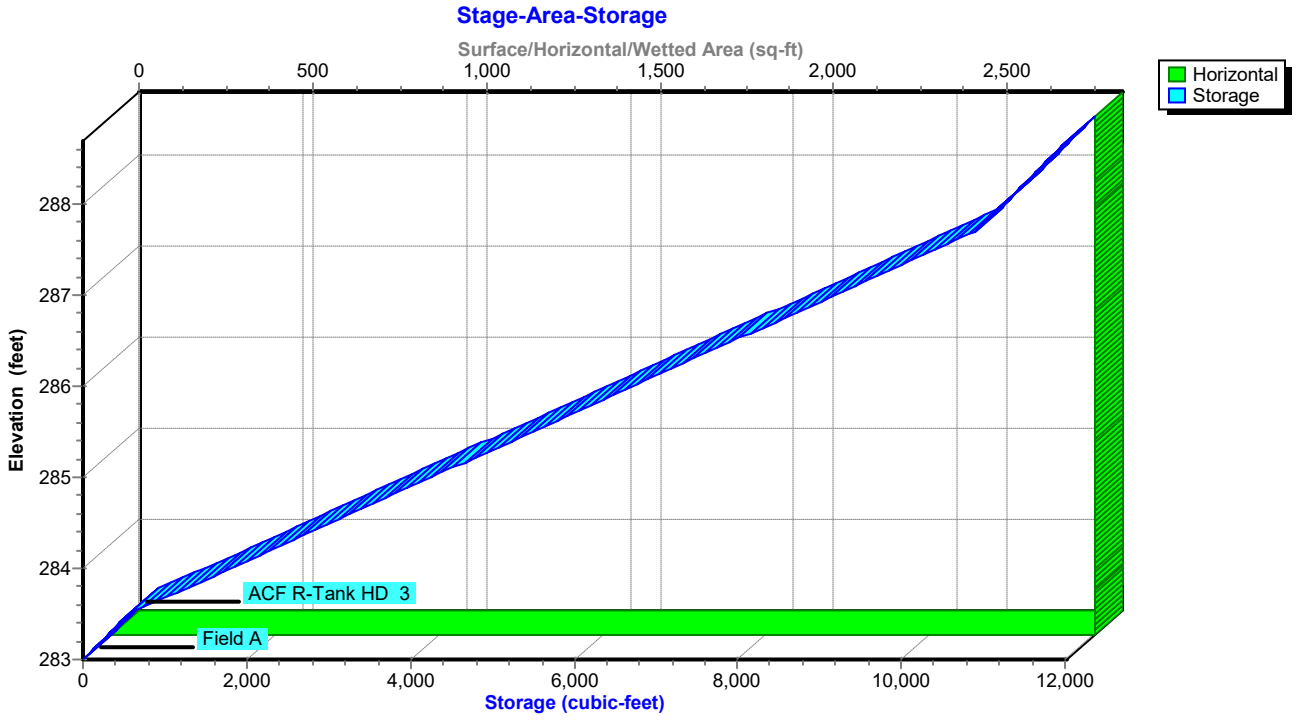
783 Chambers
597.8 cy Field
222.9 cy Stone



Pond 1P: Stormwater Recharge System - 783 R-TANK HD SIZE 3 CHAMBERS



Pond 1P: Stormwater Recharge System - 783 R-TANK HD SIZE 3 CHAMBERS

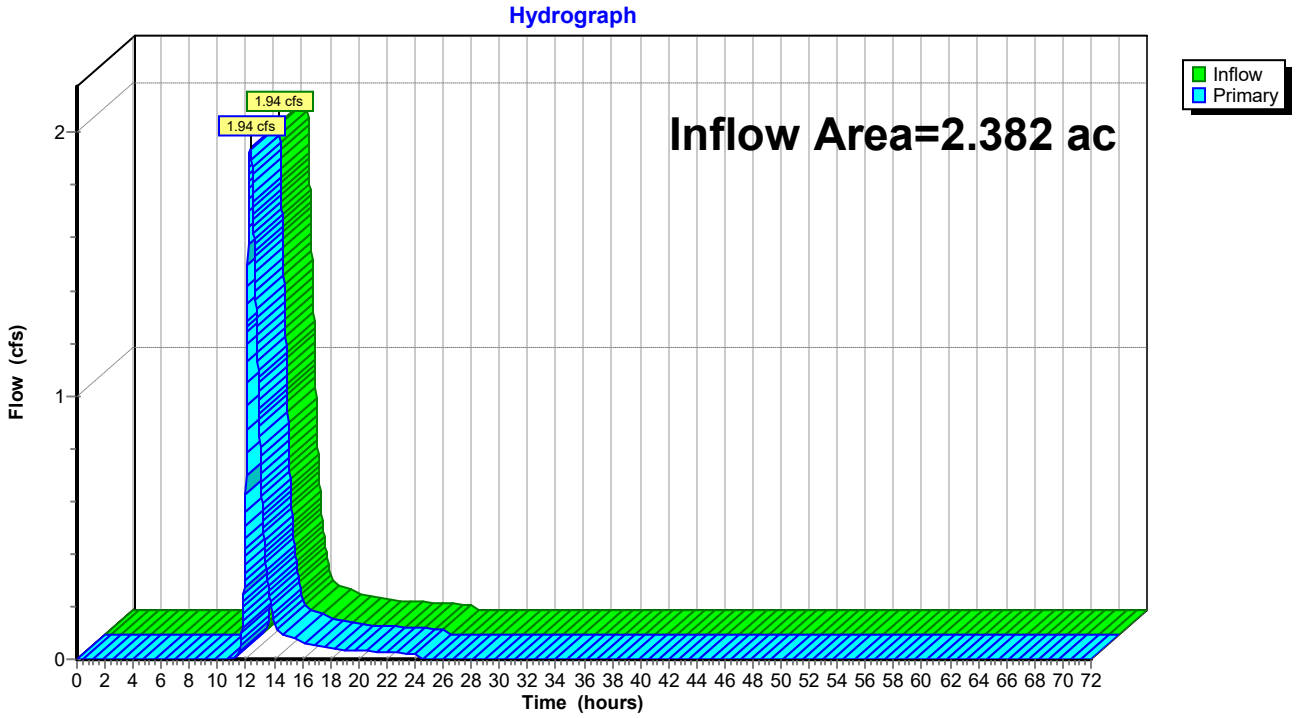


Summary for Link P2: Flow to Rear Property line

Inflow Area = 2.382 ac, 47.71% Impervious, Inflow Depth = 0.99" for 10 Year Storm event
Inflow = 1.94 cfs @ 12.33 hrs, Volume= 0.197 af
Primary = 1.94 cfs @ 12.33 hrs, Volume= 0.197 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node Out

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P2: Flow to Rear Property line

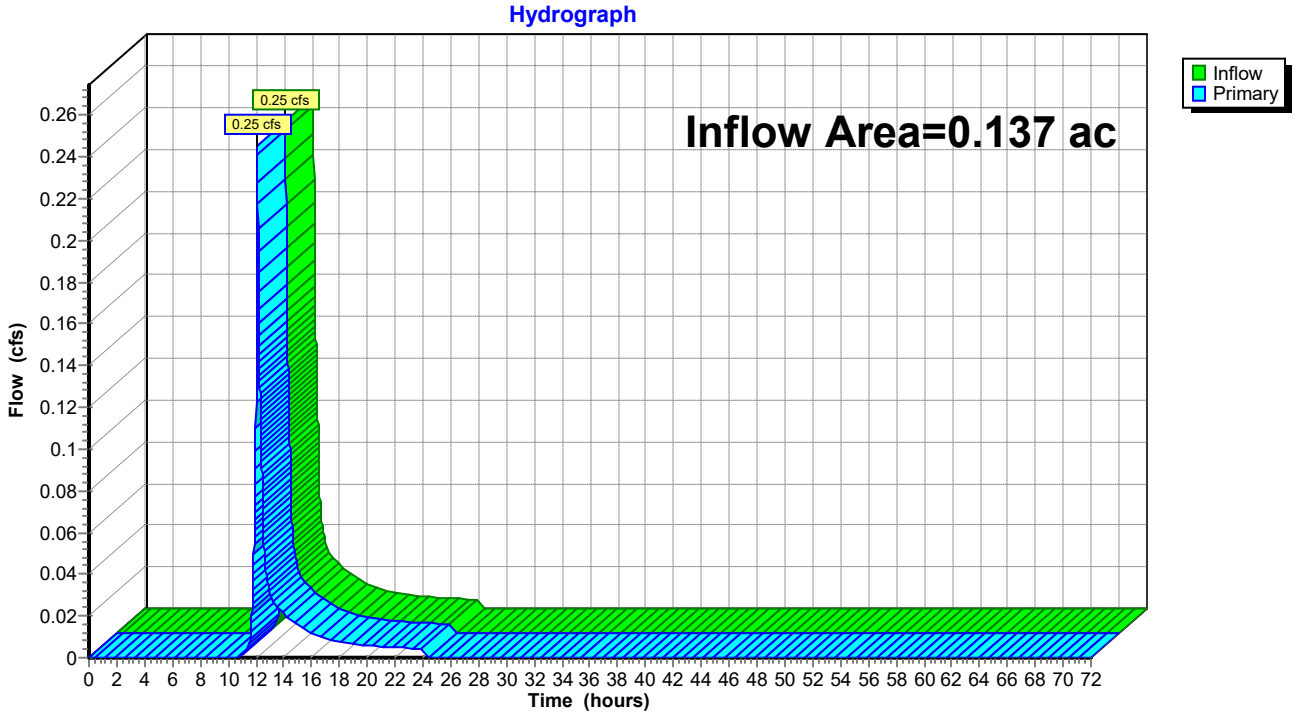


Summary for Link RD: Flow to Road and West Prop Line

Inflow Area = 0.137 ac, 3.81% Impervious, Inflow Depth = 1.63" for 10 Year Storm event
Inflow = 0.25 cfs @ 12.10 hrs, Volume= 0.019 af
Primary = 0.25 cfs @ 12.10 hrs, Volume= 0.019 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link RD: Flow to Road and West Prop Line



Summary for Subcatchment P1: Pr to Road

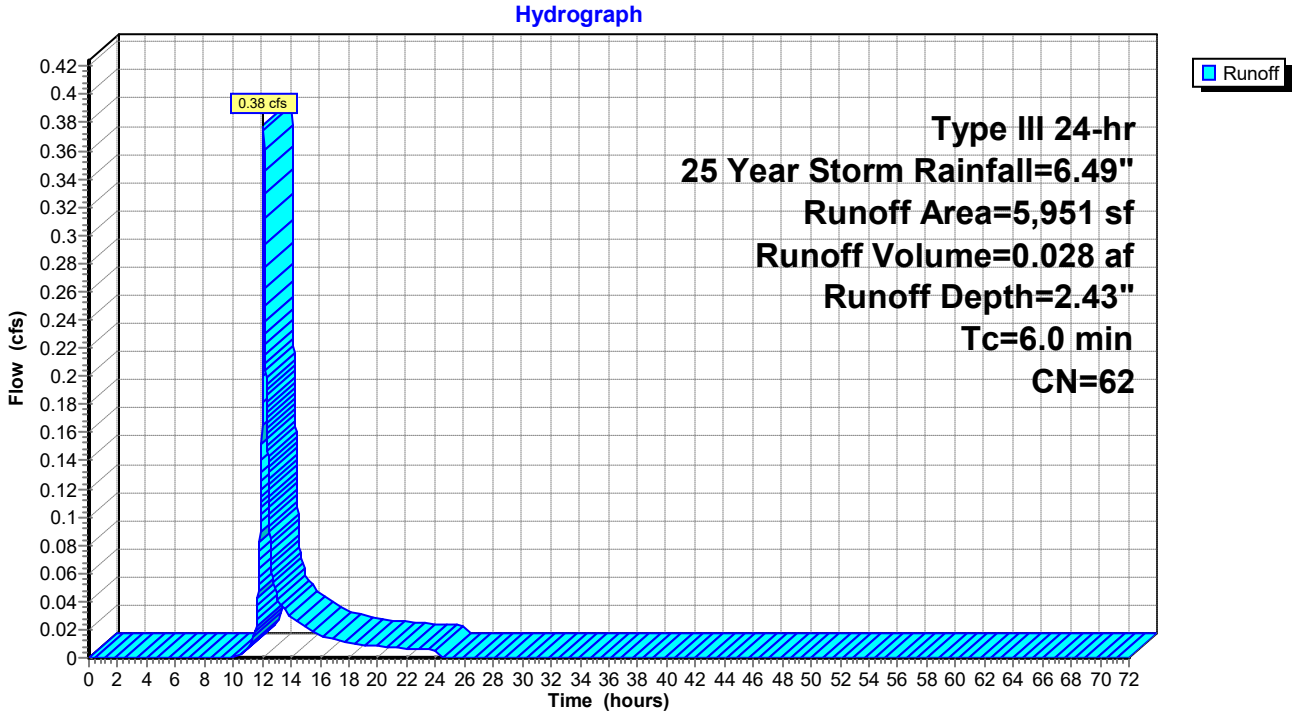
Runoff = 0.38 cfs @ 12.09 hrs, Volume= 0.028 af, Depth= 2.43"
Routed to Link RD : Flow to Road and West Prop Line

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Storm Rainfall=6.49"

	Area (sf)	CN	Description
	5,724	61	>75% Grass cover, Good, HSG B
*	227	98	CONC WALK
	5,951	62	Weighted Average
	5,724		96.19% Pervious Area
	227		3.81% Impervious Area

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

Subcatchment P1: Pr to Road



Summary for Subcatchment P2A: PARKING LOT AND BUILDING AREA TO CHAMBERS

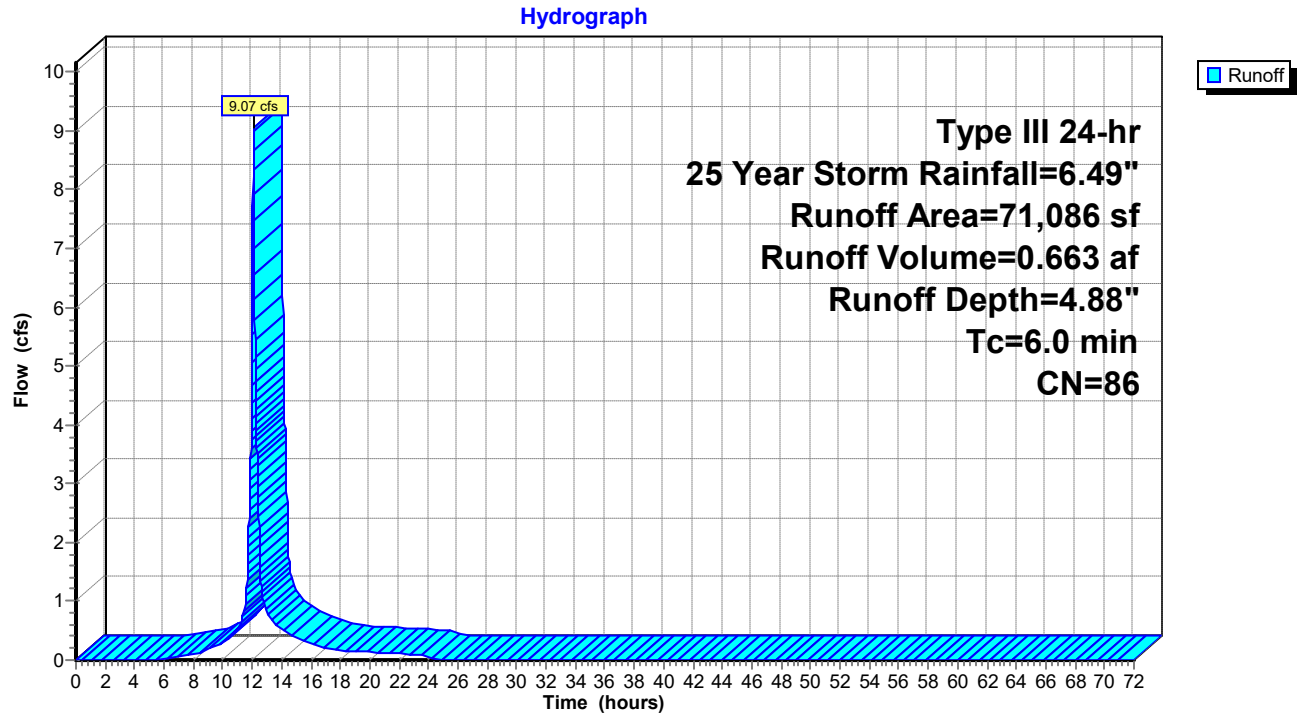
Runoff = 9.07 cfs @ 12.09 hrs, Volume= 0.663 af, Depth= 4.88"
Routed to Pond 1P : Stormwater Recharge System - 783 R-TANK HD SIZE 3 CHAMBERS

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Storm Rainfall=6.49"

Area (sf)	CN	Description
16,007	98	Roofs, HSG B
22,744	61	>75% Grass cover, Good, HSG B
32,335	98	Paved parking, HSG B
71,086	86	Weighted Average
22,744		32.00% Pervious Area
48,342		68.00% Impervious Area

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

Subcatchment P2A: PARKING LOT AND BUILDING AREA TO CHAMBERS



Summary for Subcatchment P2B: Flow to Rear Prop Line

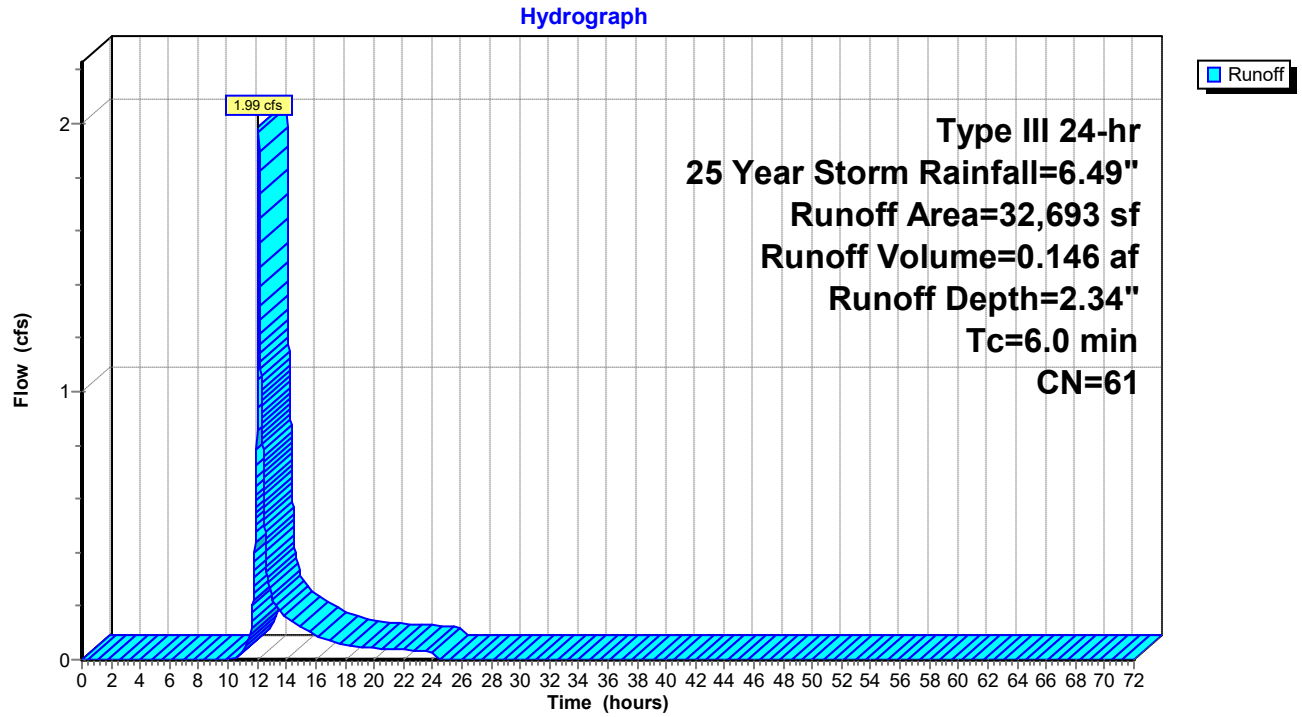
Runoff = 1.99 cfs @ 12.09 hrs, Volume= 0.146 af, Depth= 2.34"
Routed to Link P2 : Flow to Rear Property line

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Storm Rainfall=6.49"

	Area (sf)	CN	Description
*	909	98	Walls, HSG B
	18,879	61	>75% Grass cover, Good, HSG B
	865	85	Gravel roads, HSG B
*	1,475	61	Stilling Basin, HSG B
	10,300	55	Woods, Good, HSG B
*	265	98	Walk
	32,693	61	Weighted Average
	31,519		96.41% Pervious Area
	1,174		3.59% Impervious Area

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

Subcatchment P2B: Flow to Rear Prop Line



Summary for Pond 1P: Stormwater Recharge System - 783 R-TANK HD SIZE 3 CHAMBERS

Inflow Area = 1.632 ac, 68.00% Impervious, Inflow Depth = 4.88" for 25 Year Storm event
Inflow = 9.07 cfs @ 12.09 hrs, Volume= 0.663 af
Outflow = 2.60 cfs @ 12.43 hrs, Volume= 0.663 af, Atten= 71%, Lag= 20.5 min
Discarded = 0.54 cfs @ 11.12 hrs, Volume= 0.475 af
Primary = 2.05 cfs @ 12.43 hrs, Volume= 0.188 af
Routed to Link P2 : Flow to Rear Property line

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 286.83' @ 12.43 hrs Surf.Area= 2,832 sf Storage= 8,746 cf

Plug-Flow detention time= 57.2 min calculated for 0.663 af (100% of inflow)
Center-of-Mass det. time= 57.2 min (852.1 - 794.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	283.00'	2,407 cf	**42.06'W x 67.34'L x 5.70'H Field A** 16,141 cf Overall - 10,123 cf Embedded = 6,018 cf x 40.0% Voids
#2A	283.50'	9,616 cf	**ACF R-Tank HD 3** x 783 Inside #1 Inside= 15.7"W x 50.4"H => 5.24 sf x 2.35'L = 12.3 cf Outside= 15.7"W x 50.4"H => 5.51 sf x 2.35'L = 12.9 cf 783 Chambers in 29 Rows
		12,024 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	283.00'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	285.00'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	288.00'	**0.5' long x 0.7' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32

Discarded OutFlow Max=0.54 cfs @ 11.12 hrs HW=283.06' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.54 cfs)

Primary OutFlow Max=2.05 cfs @ 12.43 hrs HW=286.83' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 2.05 cfs @ 5.88 fps)
└**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 1P: Stormwater Recharge System - 783 R-TANK HD SIZE 3 CHAMBERS - Chamber Wizard Field A

Chamber Model = ACF R-Tank HD 3 (ACF Environmental R-Tank HD)
Inside= 15.7"W x 50.4"H => 5.24 sf x 2.35'L = 12.3 cf
Outside= 15.7"W x 50.4"H => 5.51 sf x 2.35'L = 12.9 cf

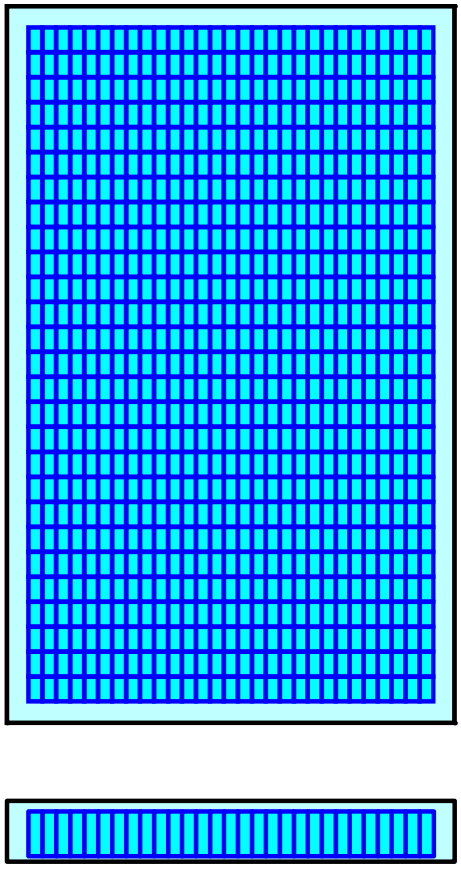
27 Chambers/Row x 2.35' Long = 63.34' Row Length +24.0" End Stone x 2 = 67.34' Base Length
29 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 42.06' Base Width
6.0" Stone Base + 50.4" Chamber Height + 12.0" Stone Cover = 5.70' Field Height

783 Chambers x 12.3 cf = 9,616.5 cf Chamber Storage
783 Chambers x 12.9 cf = 10,122.6 cf Displacement

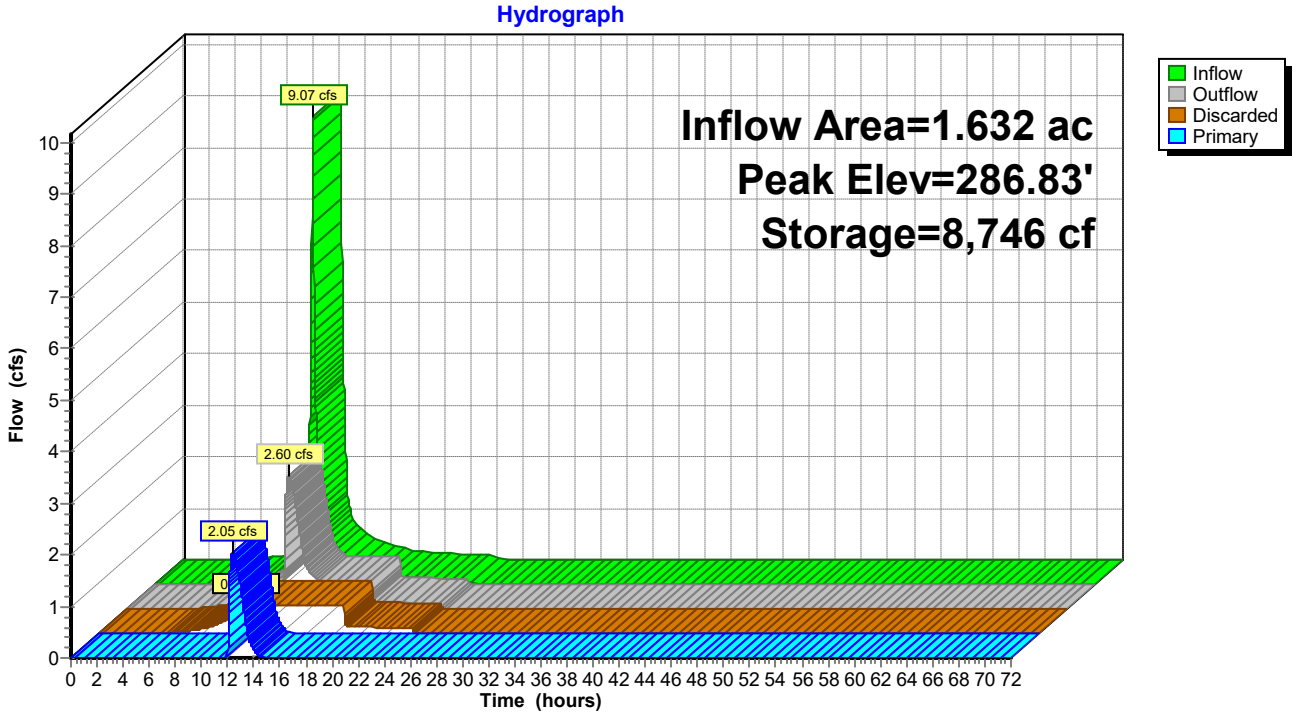
16,141.1 cf Field - 10,122.6 cf Chambers = 6,018.4 cf Stone x 40.0% Voids = 2,407.4 cf Stone Storage

Chamber Storage + Stone Storage = 12,023.9 cf = 0.276 af
Overall Storage Efficiency = 74.5%
Overall System Size = 67.34' x 42.06' x 5.70'

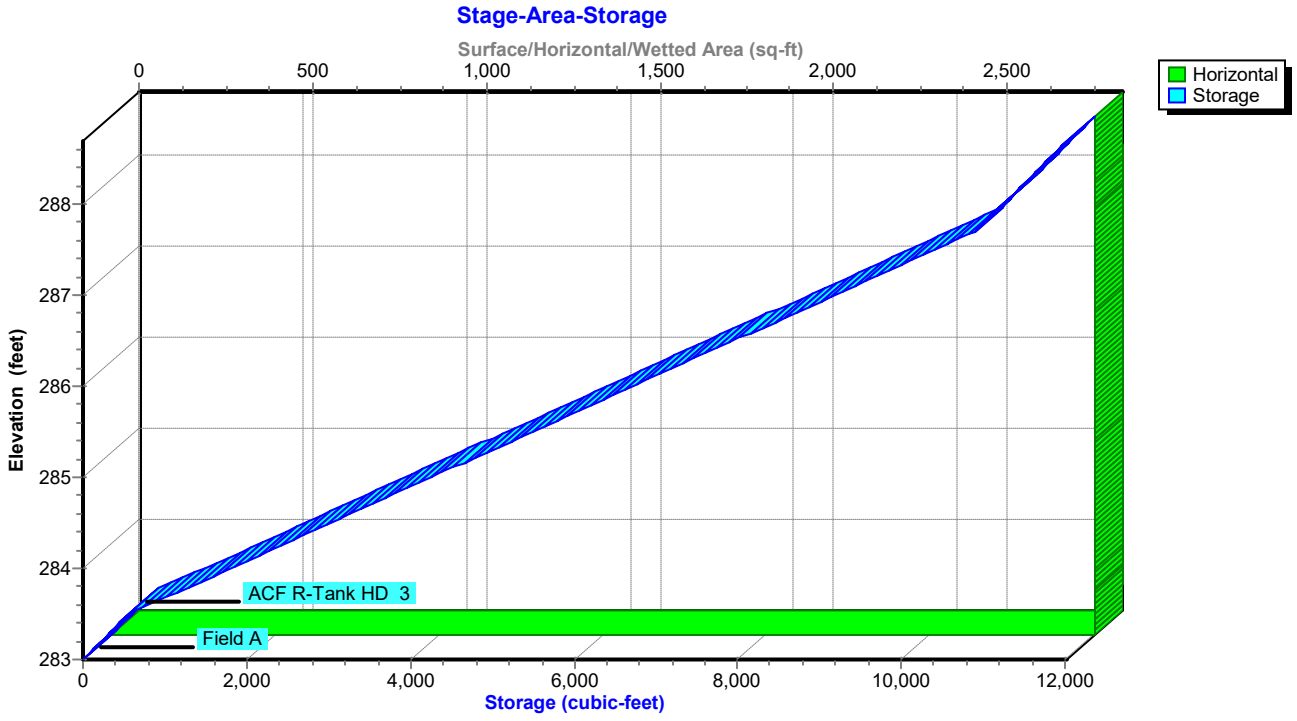
783 Chambers
597.8 cy Field
222.9 cy Stone



Pond 1P: Stormwater Recharge System - 783 R-TANK HD SIZE 3 CHAMBERS



Pond 1P: Stormwater Recharge System - 783 R-TANK HD SIZE 3 CHAMBERS

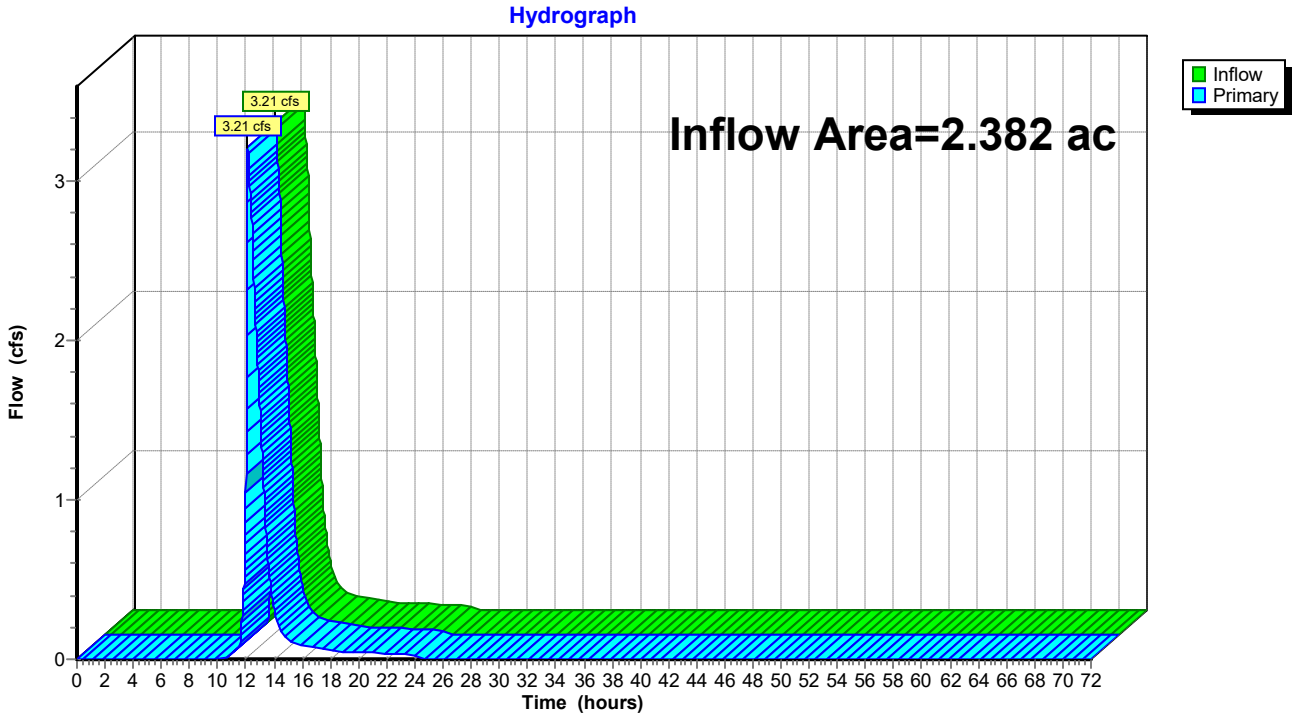


Summary for Link P2: Flow to Rear Property line

Inflow Area = 2.382 ac, 47.71% Impervious, Inflow Depth = 1.69" for 25 Year Storm event
Inflow = 3.21 cfs @ 12.13 hrs, Volume= 0.335 af
Primary = 3.21 cfs @ 12.13 hrs, Volume= 0.335 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node Out

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P2: Flow to Rear Property line

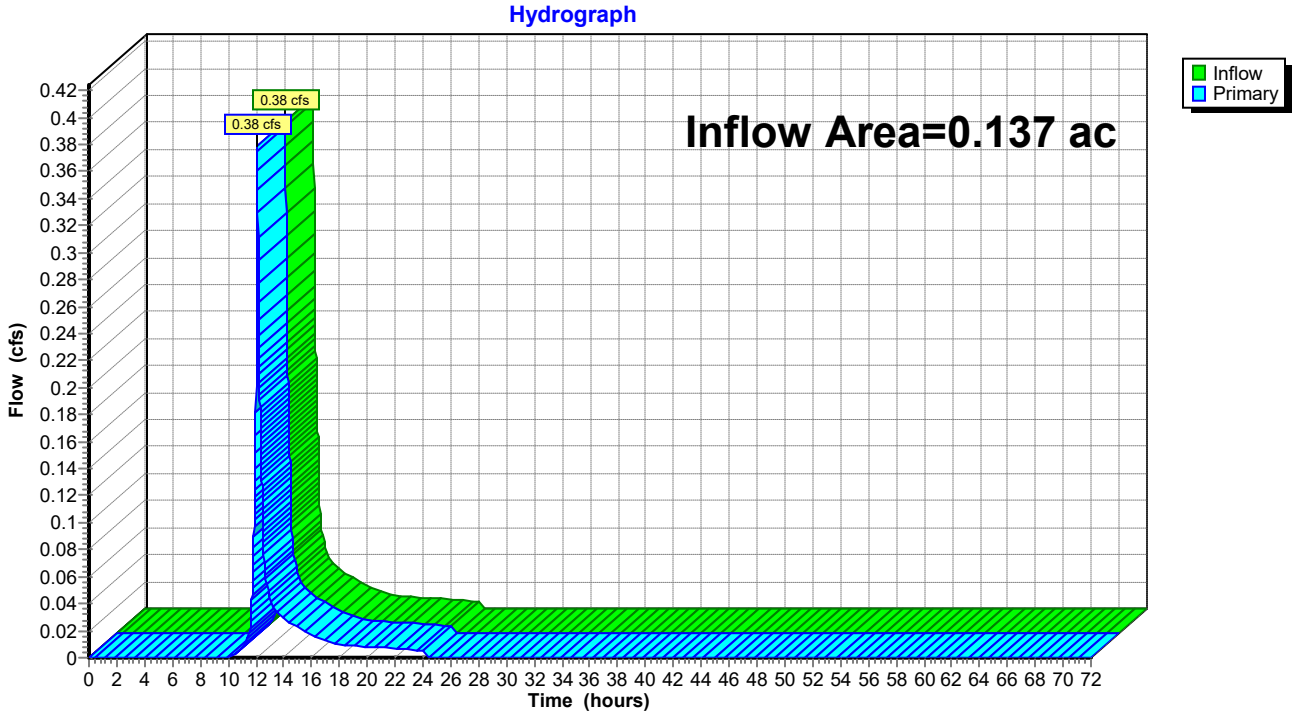


Summary for Link RD: Flow to Road and West Prop Line

Inflow Area = 0.137 ac, 3.81% Impervious, Inflow Depth = 2.43" for 25 Year Storm event
Inflow = 0.38 cfs @ 12.09 hrs, Volume= 0.028 af
Primary = 0.38 cfs @ 12.09 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link RD: Flow to Road and West Prop Line



Summary for Subcatchment P1: Pr to Road

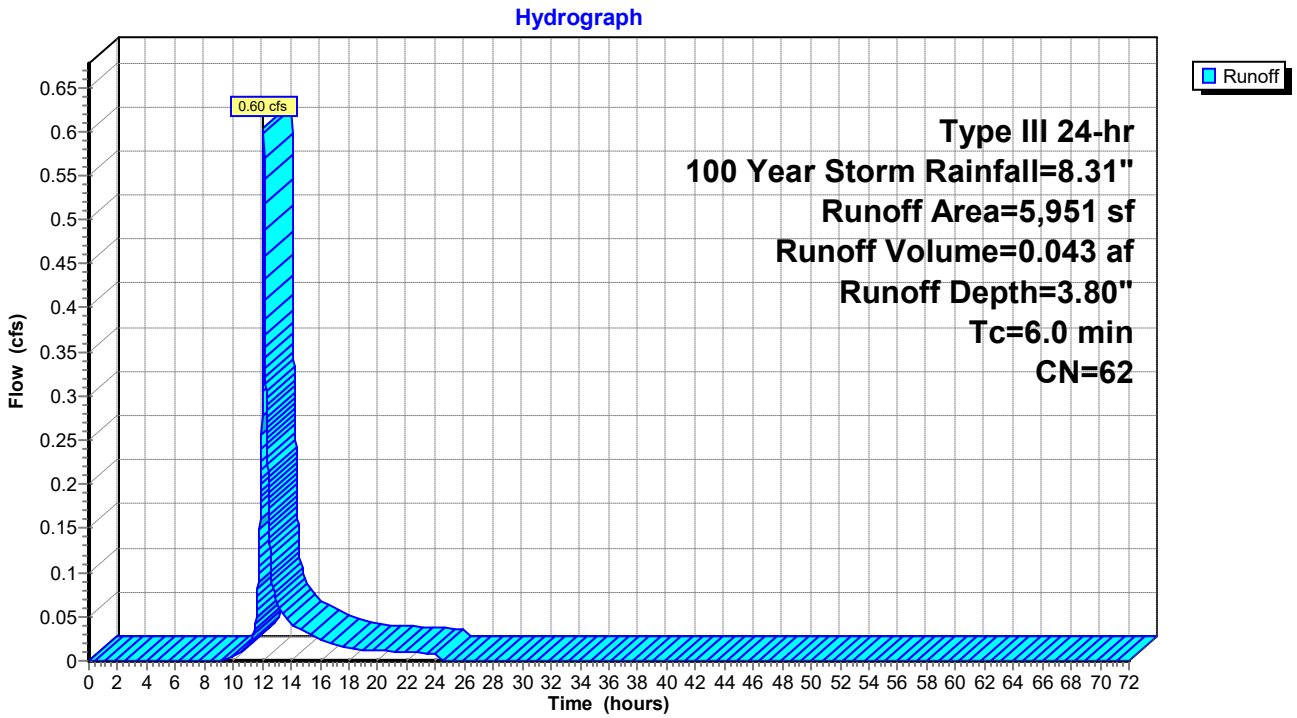
Runoff = 0.60 cfs @ 12.09 hrs, Volume= 0.043 af, Depth= 3.80"
Routed to Link RD : Flow to Road and West Prop Line

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=8.31"

	Area (sf)	CN	Description
	5,724	61	>75% Grass cover, Good, HSG B
*	227	98	CONC WALK
	5,951	62	Weighted Average
	5,724		96.19% Pervious Area
	227		3.81% Impervious Area

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

Subcatchment P1: Pr to Road



Summary for Subcatchment P2A: PARKING LOT AND BUILDING AREA TO CHAMBERS

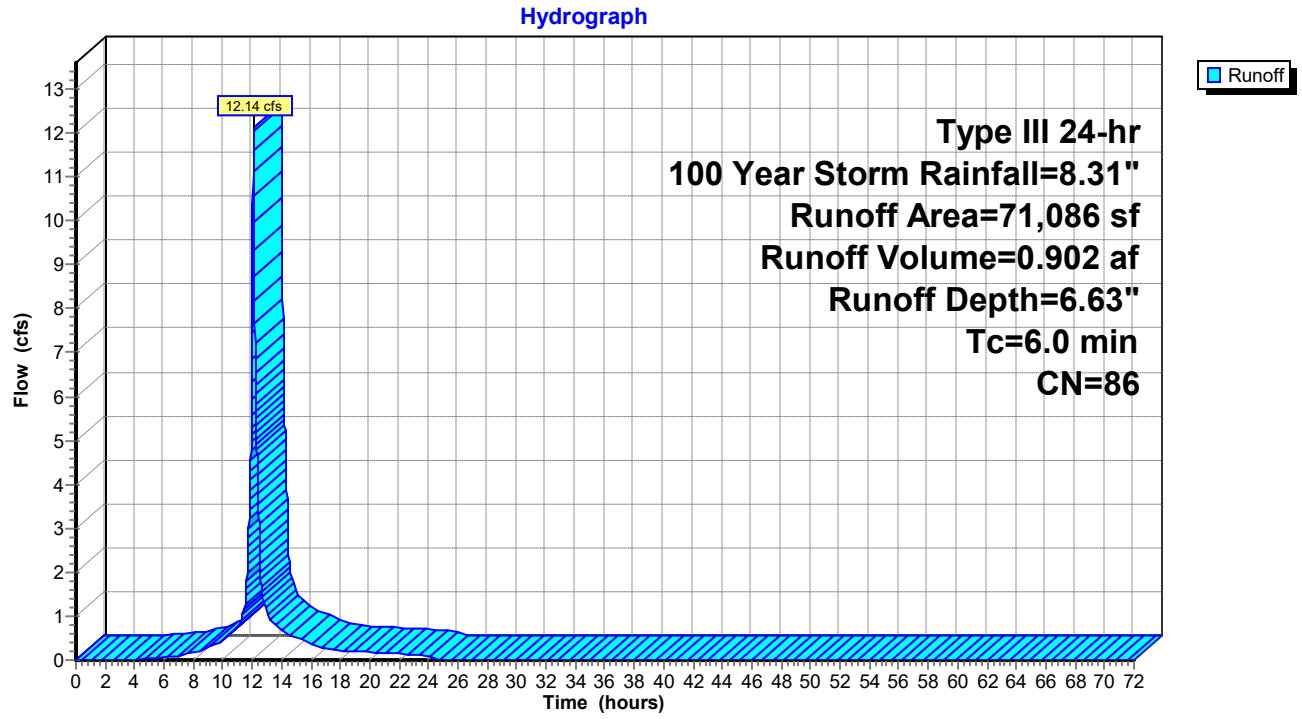
Runoff = 12.14 cfs @ 12.08 hrs, Volume= 0.902 af, Depth= 6.63"
Routed to Pond 1P : Stormwater Recharge System - 783 R-TANK HD SIZE 3 CHAMBERS

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=8.31"

Area (sf)	CN	Description
16,007	98	Roofs, HSG B
22,744	61	>75% Grass cover, Good, HSG B
32,335	98	Paved parking, HSG B
71,086	86	Weighted Average
22,744		32.00% Pervious Area
48,342		68.00% Impervious Area

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

Subcatchment P2A: PARKING LOT AND BUILDING AREA TO CHAMBERS



Summary for Subcatchment P2B: Flow to Rear Prop Line

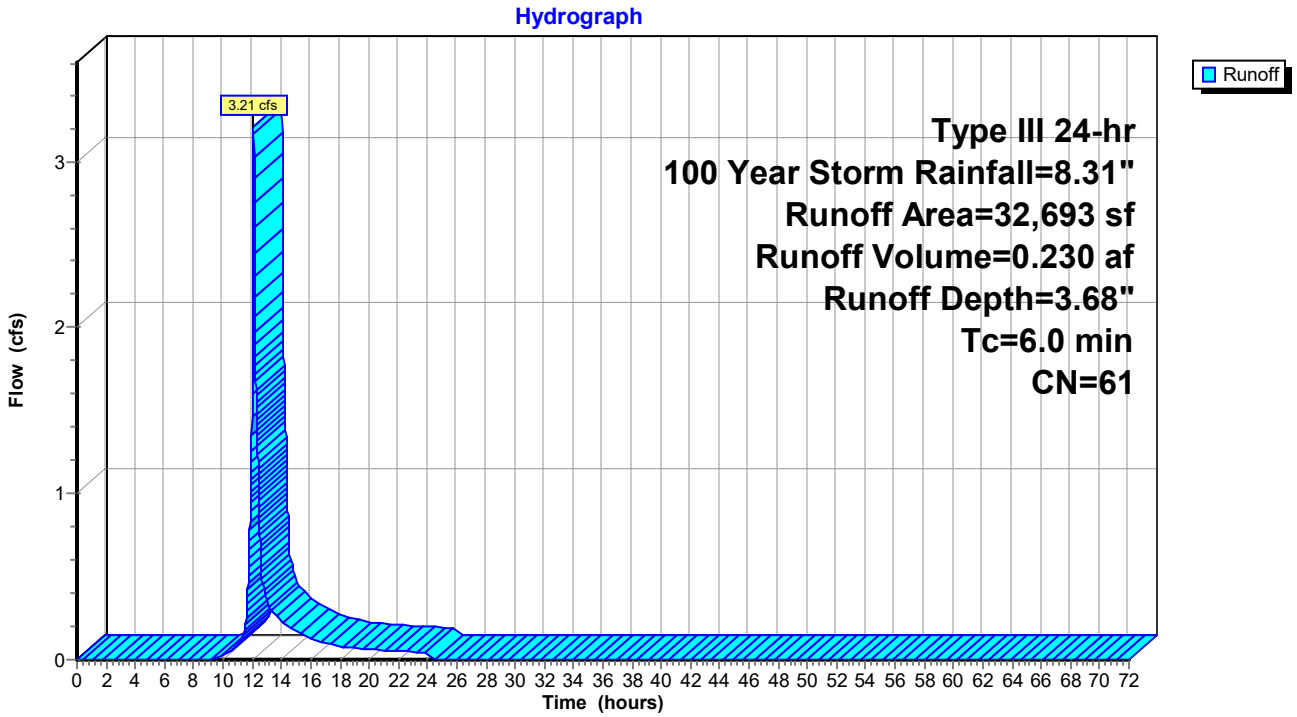
Runoff = 3.21 cfs @ 12.09 hrs, Volume= 0.230 af, Depth= 3.68"
Routed to Link P2 : Flow to Rear Property line

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=8.31"

	Area (sf)	CN	Description
*	909	98	Walls, HSG B
	18,879	61	>75% Grass cover, Good, HSG B
	865	85	Gravel roads, HSG B
*	1,475	61	Stilling Basin, HSG B
	10,300	55	Woods, Good, HSG B
*	265	98	Walk
	32,693	61	Weighted Average
	31,519		96.41% Pervious Area
	1,174		3.59% Impervious Area

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

Subcatchment P2B: Flow to Rear Prop Line



Summary for Pond 1P: Stormwater Recharge System - 783 R-TANK HD SIZE 3 CHAMBERS

Inflow Area = 1.632 ac, 68.00% Impervious, Inflow Depth = 6.63" for 100 Year Storm event
Inflow = 12.14 cfs @ 12.08 hrs, Volume= 0.902 af
Outflow = 4.20 cfs @ 12.36 hrs, Volume= 0.902 af, Atten= 65%, Lag= 16.4 min
Discarded = 0.54 cfs @ 10.43 hrs, Volume= 0.558 af
Primary = 3.66 cfs @ 12.36 hrs, Volume= 0.344 af
Routed to Link P2 : Flow to Rear Property line

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 288.57' @ 12.36 hrs Surf.Area= 2,832 sf Storage= 11,881 cf

Plug-Flow detention time= 56.2 min calculated for 0.902 af (100% of inflow)
Center-of-Mass det. time= 56.2 min (842.7 - 786.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	283.00'	2,407 cf	**42.06'W x 67.34'L x 5.70'H Field A** 16,141 cf Overall - 10,123 cf Embedded = 6,018 cf x 40.0% Voids
#2A	283.50'	9,616 cf	**ACF R-Tank HD 3** x 783 Inside #1 Inside= 15.7"W x 50.4"H => 5.24 sf x 2.35'L = 12.3 cf Outside= 15.7"W x 50.4"H => 5.51 sf x 2.35'L = 12.9 cf 783 Chambers in 29 Rows
		12,024 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	283.00'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	285.00'	**8.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	288.00'	**0.5' long x 0.7' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32

Discarded OutFlow Max=0.54 cfs @ 10.43 hrs HW=283.06' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.54 cfs)

Primary OutFlow Max=3.66 cfs @ 12.36 hrs HW=288.57' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 3.03 cfs @ 8.67 fps)
└**3=Broad-Crested Rectangular Weir** (Weir Controls 0.63 cfs @ 2.21 fps)

Pond 1P: Stormwater Recharge System - 783 R-TANK HD SIZE 3 CHAMBERS - Chamber Wizard Field A

Chamber Model = ACF R-Tank HD 3 (ACF Environmental R-Tank HD)
Inside= 15.7"W x 50.4"H => 5.24 sf x 2.35'L = 12.3 cf
Outside= 15.7"W x 50.4"H => 5.51 sf x 2.35'L = 12.9 cf

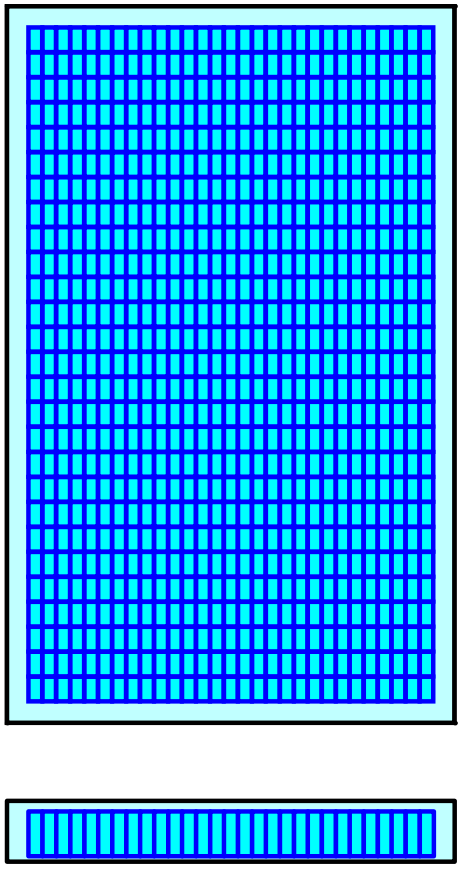
27 Chambers/Row x 2.35' Long = 63.34' Row Length +24.0" End Stone x 2 = 67.34' Base Length
29 Rows x 15.7" Wide + 24.0" Side Stone x 2 = 42.06' Base Width
6.0" Stone Base + 50.4" Chamber Height + 12.0" Stone Cover = 5.70' Field Height

783 Chambers x 12.3 cf = 9,616.5 cf Chamber Storage
783 Chambers x 12.9 cf = 10,122.6 cf Displacement

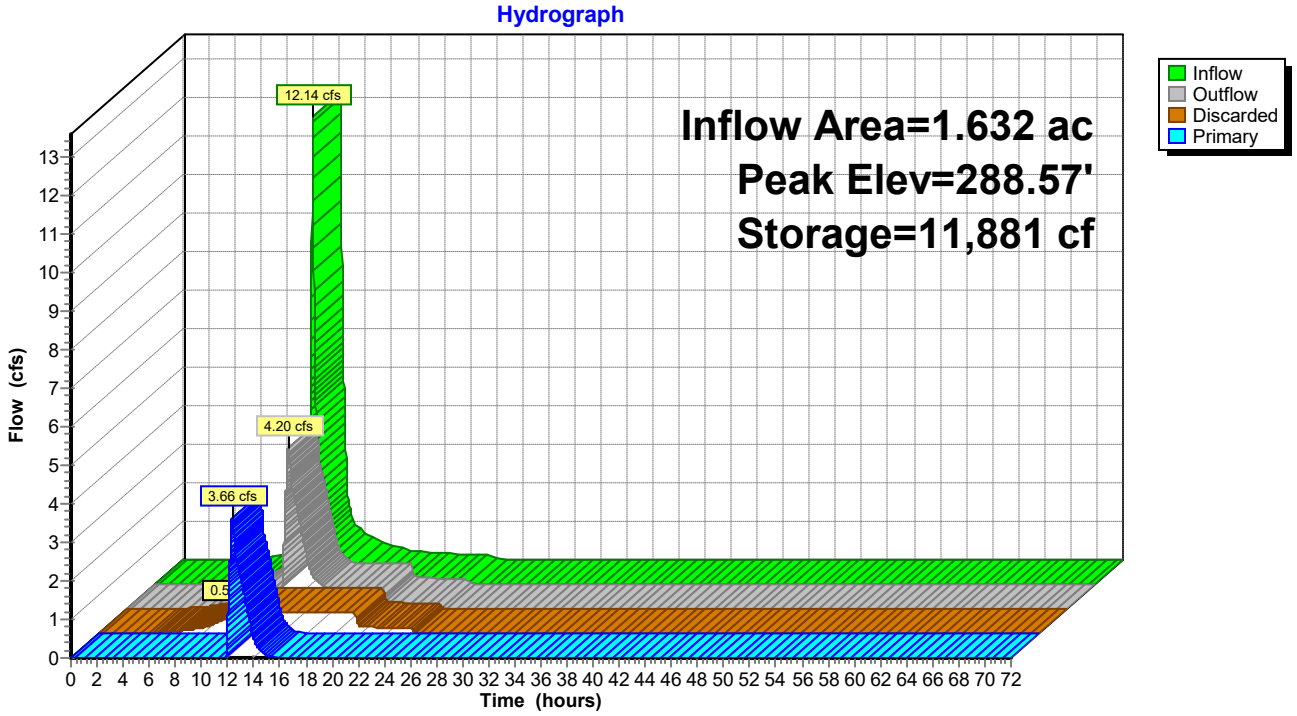
16,141.1 cf Field - 10,122.6 cf Chambers = 6,018.4 cf Stone x 40.0% Voids = 2,407.4 cf Stone Storage

Chamber Storage + Stone Storage = 12,023.9 cf = 0.276 af
Overall Storage Efficiency = 74.5%
Overall System Size = 67.34' x 42.06' x 5.70'

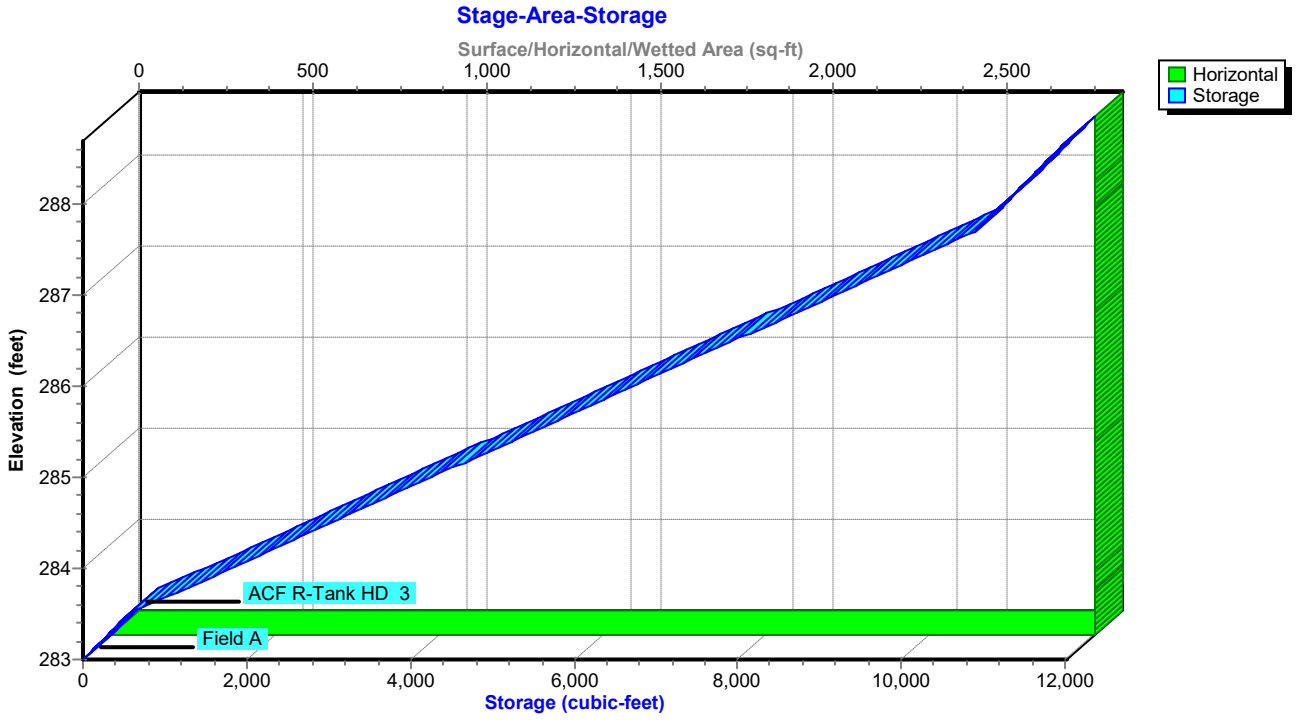
783 Chambers
597.8 cy Field
222.9 cy Stone



Pond 1P: Stormwater Recharge System - 783 R-TANK HD SIZE 3 CHAMBERS



Pond 1P: Stormwater Recharge System - 783 R-TANK HD SIZE 3 CHAMBERS

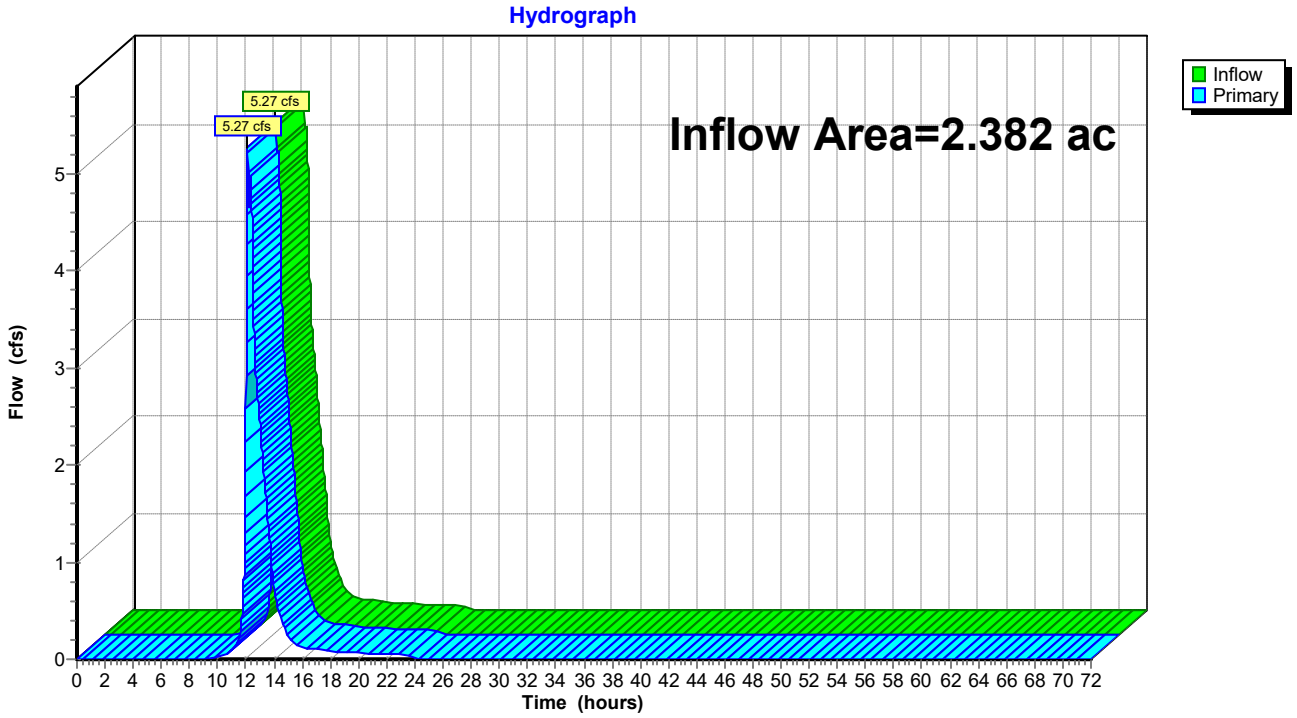


Summary for Link P2: Flow to Rear Property line

Inflow Area = 2.382 ac, 47.71% Impervious, Inflow Depth = 2.89" for 100 Year Storm event
Inflow = 5.27 cfs @ 12.11 hrs, Volume= 0.574 af
Primary = 5.27 cfs @ 12.11 hrs, Volume= 0.574 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node Out

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link P2: Flow to Rear Property line



Summary for Link RD: Flow to Road and West Prop Line

Inflow Area = 0.137 ac, 3.81% Impervious, Inflow Depth = 3.80" for 100 Year Storm event
Inflow = 0.60 cfs @ 12.09 hrs, Volume= 0.043 af
Primary = 0.60 cfs @ 12.09 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Link RD: Flow to Road and West Prop Line

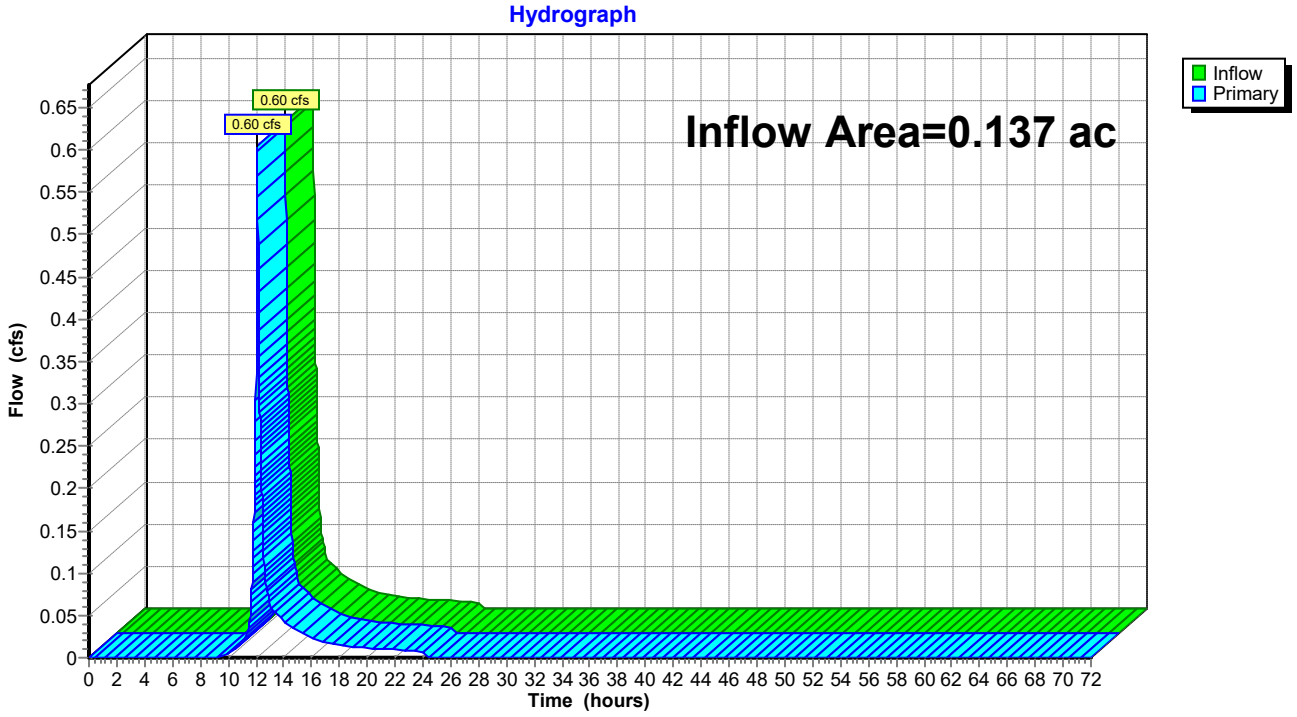


TABLE OF CONTENTS

SOILS REPORT & TESTING

Commonwealth of Massachusetts
City/Town of Dover

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

A. Facility Information

Red Robins Pasture LLC
Owner Name

61-63 County Street
Street Address

25-11, 25-10
Map/Lot #

Dover
City

MA
State

Zip Code

B. Site Information

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

2. Soil Survey Available? ☒ Yes ☐ No If yes: Web Soil Survey (Source) 420B (Soil Map Unit)

   Canton Fine Sandy Loam (Soil Name) well drained (Soil Limitations)

   coarse loamy over sandy melt-out (Geologic/Parent Material) ridges (Landform)

3. Surficial Geological Report Available? ☐ Yes ☐ No If yes: (Year Published/Source) (Publication Scale) (Map Unit)

4. Flood Rate Insurance Map

   Above the 500-year flood boundary? ☒ Yes ☐ No Within the 100-year flood boundary? ☐ Yes ☒ No
   If Yes, continue to #5.

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): 5/21 (Month/Year) Range: ☐ Above Normal ☒ Normal ☐ Below Normal

8. Other references reviewed: FIRM 25021C0159E

Commonwealth of Massachusetts
City/Town of Dover

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: TPD-1 | 5/25/21 (Date) | 12:00 (Time) | sunny (Weather)

1. Location

Ground Elevation at Surface of Hole: 288.2 feet Latitude/Longitude: 42.20402° / -71.26344

Description of Location: past end of drive

2. Land Use: SFH (e.g., woodland, agricultural field, vacant lot, etc.) | no (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 3-8 (Slope (%))

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

3. Distances from:

Open Water Body	>100 feet	Drainage Way	>50 feet	Wetlands	>80 feet
Property Line	>25 feet	Drinking Water Well	>100 feet	Other	feet

4. Parent Material: gravely till 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: 100 inches 279.8- elevation

Commonwealth of Massachusetts
City/Town of Dover

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

C. On-Site Review (continued)

Deep Observation Hole Number: TPD-1

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			
0-2	Oa	10YR 2/2									
2-3	Ap	10YR 3/4				SL			massive		
3-24	Bw	10YR 7/8				LS			granular		roots
24-100	C1	10YR 8/3				S	some		single grain		

Additional Notes:

For drainage area Infiltration using ROWLS tables = 8.27 in/hr

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

C. On-Site Review (continued)

Deep Observation Hole Number: TPD-2 | 5/25/21 (Date) | 12:00 (Time) | Sunny (Weather)

1. Location

Ground Elevation at Surface of Hole: 290.0 feet Latitude/Longitude: /

2. Land Use: SFH (e.g., woodland, agricultural field, vacant lot, etc.) | NA (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0-8 (Slope (%))

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

3. Distances from:

Open Water Body	>100 feet	Drainage Way	>50 feet	Wetlands	>80 feet
Property Line	>25 feet	Drinking Water Well	100 feet	Other	feet

4. Parent Material: gravelly till 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: 108 inches 281.0 elevation

Commonwealth of Massachusetts
City/Town of Dover

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

C. On-Site Review (continued)

Deep Observation Hole Number: TPD-2

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			
0-1	Oa	10 YR 3/3				SL			granular		
1-2	Ap	10 YR 3/4				SL			massive		
2-24	Bw	10 YR 7/8				LS			granular		
24-108	C1	10YR 8/3				S	some		single grain		

Additional Notes:

Bands of gravel C1 layer

For Drainage areas- Infiltration using ROWLS tables= 8.27 in/hr

Commonwealth of Massachusetts
City/Town of Dover

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

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole # TPD-1	Obs. Hole # TPD-2
☒ Depth observed standing water in observation hole	na inches	na inches
☒ Depth weeping from side of observation hole	na inches	na inches
☒ Depth to soil redoximorphic features (mottles)	na inches	na 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: 24 inches Lower boundary: 100 inches

   c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of Dover

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: TPD-3 | 5/25/21 (Date) | 12:00 (Time) | sunny (Weather)

1. Location

Ground Elevation at Surface of Hole: 289.5 feet Latitude/Longitude: 42.20402° / -71.26344

Description of Location: past end of drive

2. Land Use: SFH (e.g., woodland, agricultural field, vacant lot, etc.) | no (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 3-8 (Slope (%))

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

3. Distances from:

Open Water Body	>100 feet	Drainage Way	>50 feet	Wetlands	>80 feet
Property Line	>25 feet	Drinking Water Well	>100 feet	Other	feet

4. Parent Material: gravely till 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: 108 inches 280.5- elevation

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

C. On-Site Review (continued)

Deep Observation Hole Number: TPD-3

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			
0-1	Oa	10YR 2/2									
1-3	Ap	10YR 3/4				SL			massive		
3-18	Bw	10YR 7/8				LS			granular		roots
18-108	C1	10YR 8/1				S	some		single grain		

Additional Notes:

For drainage area Infiltration using ROWLS tables = 8.27 in/hr

Commonwealth of Massachusetts
City/Town of Dover

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

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole # TPD-3	Obs. Hole # _____
☒ Depth observed standing water in observation hole	na inches	na inches
☒ Depth weeping from side of observation hole	na inches	na inches
☒ Depth to soil redoximorphic features (mottles)	na inches	na 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: 18 inches Lower boundary: 108 inches

   c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

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

F. Board of Health Witness

Mike Angieri	Dover
Name of Board of Health Witness	Board of Health

G. Soil Evaluator 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.

Thomas A Ryder	5/25/21
Signature of Soil Evaluator	Date
Thomas Ryder /2121	6/2021
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License

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.

Norfolk and Suffolk Counties, Massachusetts

422B—Canton fine sandy loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2w818
Elevation: 0 to 1,180 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Canton, extremely stony, and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton, Extremely Stony

Setting

Landform: Ridges, hills, moraines
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest, nose slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material
A - 2 to 5 inches: fine sandy loam
Bw1 - 5 to 16 inches: fine sandy loam
Bw2 - 16 to 22 inches: gravelly fine sandy loam
2C - 22 to 67 inches: gravelly loamy sand

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 9.0 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water capacity: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Scituate, extremely stony

Percent of map unit: 6 percent
Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Footslope, backslope, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Charlton, extremely stony

Percent of map unit: 6 percent
Landform: Hills, ground moraines, ridges
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Swansea

Percent of map unit: 4 percent
Landform: Kettles, swamps, bogs, depressions, marshes
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Montauk, extremely stony

Percent of map unit: 4 percent
Landform: Hills, ground moraines, recessional moraines, drumlins
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, convex
Across-slope shape: Convex
Hydric soil rating: No

Data Source Information

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 16, Jun 11, 2020

Soil Map—Norfolk and Suffolk Counties, Massachusetts
(63 County Street)

Map Scale: 1:3,870 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

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 Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

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 16, Jun 11, 2020

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

Date(s) aerial images were photographed: Jul 28, 2019—Sep 24, 2019

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.

Map Unit Legend

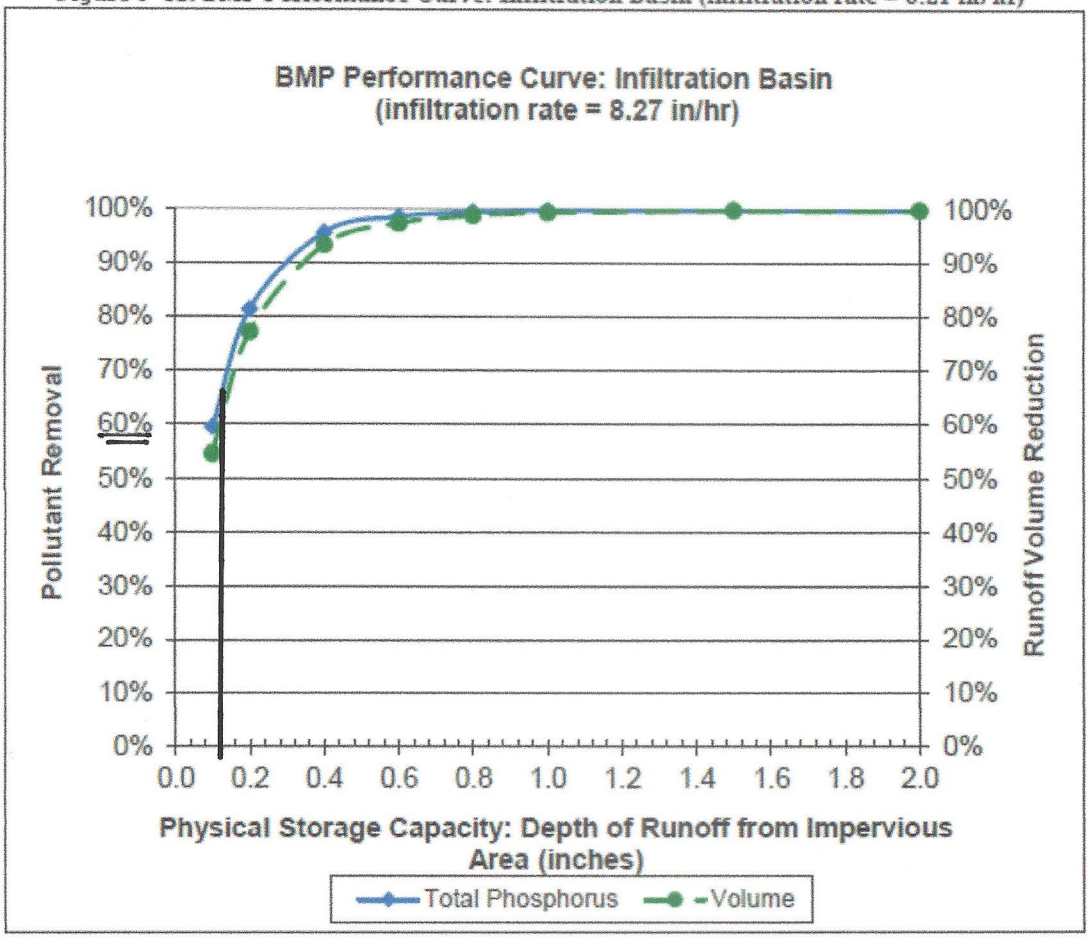
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
51	Swansea muck, 0 to 1 percent slopes	5.8	8.6%
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	0.7	1.0%
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	20.5	30.2%
245B	Hinckley loamy sand, 3 to 8 percent slopes	0.1	0.1%
253D	Hinckley loamy sand, 15 to 35 percent slopes	1.7	2.5%
300B	Montauk fine sandy loam, 3 to 8 percent slopes	1.7	2.5%
300C	Montauk fine sandy loam, 8 to 15 percent slopes	0.0	0.0%
420B	Canton fine sandy loam, 3 to 8 percent slopes	13.6	20.1%
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	14.4	21.2%
422C	Canton fine sandy loam, 8 to 15 percent slopes, extremely stony	1.4	2.0%
422D	Canton fine sandy loam, 15 to 35 percent slopes, extremely stony	7.9	11.7%
Totals for Area of Interest		**67.8**	**100.0%**

TSS & PHOSHOROUS

Table 3- 15: Infiltration Basin (8.27 in/hr) BMP Performance Table

Infiltration Basin (8.27 in/hr) BMP Performance Table: Long-Term Phosphorus Load Reduction								
BMP Capacity: Depth of Runoff Treated from Impervious Area (inches)	0.1	0.2	0.4	0.6	0.8	1.0	1.5	2.0
Runoff Volume Reduction	54.6%	77.2%	93.4%	97.5%	99.0%	99.6%	100.0%	100.0%
Cumulative Phosphorus Load Reduction	59%	81%	96%	99%	100%	100%	100%	100%

Figure 3- 12: BMP Performance Curve: Infiltration Basin (infiltration rate = 8.27 in/hr)



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

Version 1, Automated: Mar. 4, 2008

Location: County Street

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Street Sweeping - 2%	**0.02**	**1.00**	**0.02**	**0.98**
Grass Channel	**0.50**	**0.98**	**0.49**	**0.49**
Proprietary Treatment Practice	**0.00**	**0.49**	**0.00**	**0.49**
Infiltration Basin	**0.80**	**0.49**	**0.39**	**0.10**
	0.00	**0.10**	**0.00**	**0.10**

Total TSS Removal = **90%**

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

Project: Red Robin Pastures
Prepared By: Ron T
Date: 9/5/2021

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

Long Term Pollution Prevention/Operations and Maintenance Plan

For

"Red Robin Pastures"
61-63 County Street
Dover, Massachusetts

Prepared for and
Owned by: Red Robin Pastures LLC
1218 Great Plain Avenue
Needham MA 02492 or its successor in title (the "Owner")

Operation & Maintenance

Responsibility: Red Robin Pastures LLC
1218 Great Plain Avenue
Needham MA 02492 or its successor in title (the "Owner")

Prepared By: Ronald Tiberi P.E.
9 Massachusetts Ave
Natick, MA 01760

April 6, 2021
Rev. September 6, 2021

Stormwater Operations and Maintenance Responsibility

The combined stormwater systems operations and maintenance is the responsibility of the owner but can be performed by the Red Robin Pastures LLC property manager or their assigned agent.

Temporary Stormwater Measures

Should temporary stormwater measures and the structural or non-structural practices be employed to reduce or eliminate stormwater degradation and site erosion during construction of upgrades and or repairs. The placement, monitoring and successful operations of temporary measures shall be the Owner's responsibility with authority assigned to the construction manager, general contractor or site contractor, as applicable.

The temporary stormwater measures are as follows:

- Stabilized Construction Entrance
- Crushed Stone Check Dams
- Staked Erosion Control Barriers
- Silt Sacks
- Material Stockpiles with Containment Barrier and/or Mulch Covering
- Temporary Stormwater Settling Basin.

Please also refer to the project specific BMP reference documents contained in the project stormwater report, permit documents and SWPPP.

Permanent Stormwater Measures

Permanent stormwater measures are the structural or non-structural practices employed to reduce or eliminate stormwater degradation and site erosion following completion of construction, site stabilization and property occupancy. The placement, monitoring and successful operations of temporary measures shall be the Property Manager's responsibility. A third party stormwater agent may be contracted by the property manager for certain operation and maintenance responsibilities. All such contractual arrangements will be added to the final Stormwater Operations and Maintenance Plan with business registrations, certifications and insurances as applicable.

The proposed stormwater measures are as follows:

- Bituminous Pavement with Curbing (Access Drives and Parking) (30-yr replacement schedule)
- Catchbasins with Deep Sumps and outlet Hoods (75 year service life)
- R-Tank Underground Storage Chambers (75 year service life)
- Level Spreader discharge dissipater (75 year service Life)
- Stormceptor STC 450i Precast Concrete hydrodynamic structural units (50 year service life)

Please also refer to the project specific BMP reference documents contained in the project stormwater report, permit documents and SWPPP.

Stormwater Systems

The permanent stormwater systems are designed to enhance recharge to groundwater on a sitewide basis. In general, all the clean roof runoff will be collected, stored and infiltrated through underground chamber systems designed to replicate the naturally-occurring site-wide recharge characteristics of the locus. The associated site access and parking areas are conventional bituminous pavement with edging to direct surface flow into deep sump catch basins with outlet hoods. There are hydrodynamic structural units to collect and treat surface flows prior to recharge in underground storage systems. Collectively, the stormwater design will meet or exceed local, state and federal standards as designed when operated, monitored and maintained properly. Please also refer to the project specific BMP reference documents contained in the stormwater report, permit documents and SWPPP.

Stormwater Operations and Maintenance

The combined stormwater systems operations and maintenance can be performed by the Red Robin Pastures LLC property manager or their assigned agent. Nonetheless, due to proprietary product knowledge, training and specialty maintenance equipment required, it is recommended that the property manager secure and maintain a long term third party contract with an industry specific trained and licensed professional capable of operating, inspecting and maintaining R-Tank underground chamber systems, Catch-basins and stormceptor units.

The following activities should be carried out on an on-going basis to maintain good site operations:

• Site Maintenance: The site and all components are to be kept in a neat, orderly and clean fashion. Routine upkeep shall be performed by either the Owner's representatives, Property Management Staff and/or their assignees. Typical site maintenance activities shall include responsible construction practices, careful employment of temporary erosion control methods, street sweeping, landscape management and grounds maintenance.

• Trash Disposal: All common household waste materials shall be collected and stored in the building within secured enclosures. All residents and property management personnel will be instructed on proper onsite waste disposal practices. In addition to on-site signage, all residents will receive specific onsite disposal services, including recycling if applicable within their lease agreement documentation.

• Spill Control & Containment: Good housekeeping and spill control practices will minimize stormwater contamination from petroleum products, paints and cleaning products. All resident vehicles will be routinely monitored for leaks. Written notices will be distributed as required by property management staff. Habitual offenders will be removed from the

site with parking privileges revokes, if necessary. Emergency spill kits will be available on site to be operated and deployed by trained property management staff.
No hazardous or dangerous material or chemical storage will be permitted on premises in any quantity by either property management representatives, tenants or residents. Only common, over-the-counter household cleaning products within acceptable consumable legal limits will be permitted on site. Any and all such consumable products may be routinely disposed of within the onsite refuse receptacles, in accordance with state and federal laws.

Management, Training and Certification

The Red Robin Pastures permanent stormwater systems are to be monitored, operated and maintained by trained individuals, certified in stormwater management practices. Either the property management staff may become trained and certified or utilize a professional contractor with the appropriate training and certifications capable of responsibly ensuring stormwater systems operations and maintenance compliance.
Both the Owner and property manager shall maintain responsible and current records of all stormwater management training and certifications, as are required and performed within the SWPPP. Please also refer to the project BMP reference documents and sample report forms contained in the stormwater report, permit documents and SWPPP.

Observation/Corrective Logs

The Property Manager and/or their stormwater consultant(s) are responsible to complete stormwater observation logs in compliance with state and local stormwater compliance regulations, in addition to the suggested manufacturer specifications. Please also refer to the project specific sample report forms contained in the project stormwater report, permit documents and SWPPP as required.

When required and as necessary, corrective action shall be prepared and logged. The purpose and intent of corrective actions logged are to document a stormwater occurrence that required additional, amended or revised stormwater measures than the approved or permitted devices in operation. Both temporary and permanent stormwater measures may require corrective action. The documentation and corrective action reporting shall be the Owner's or Property Manager's responsibility.
Please also refer to the sample report forms contained in the project stormwater report, permit documents and SWPPP as required.

BMP's

Both temporary and permanent BMP inspection, operation and maintenance is critical to the health and success of stormwater system sustainability. Usual and customary BMP literature is included in the project stormwater report permit documents and SWPPP. However these representative BMP's shall be considered the minimum requirement, providing practical stormwater operation and maintenance guidance. Additional BMP's may be required, depending on actual site conditions to augment or replace current BMP's The use, replacement or amendment of onsite BMP's, whether temporary or permanent will be determined by either the

local or state stormwater official or the project engineer of record.

Operation

Once the infiltration facilities have been constructed and the site has been permanently stabilized and put into action, the operation of the drainage works will be routine. Storm water runoff is directed into the catch basin grates, to the drain manhole, and to the infiltration galley systems. The tank/galley systems have been designed to retain the majority flow and volume of runoff for the 2-year through 100-year storm event.

Maintenance

The storm water drainage system complies with the Best Management Practices (BMP) standards of the Massachusetts Department of Environmental Protection, as described in *Storm Water Management Policy*. In order to keep the drainage system operating under those standards, maintenance of the various components is required by the facilities operator, facility owner, or his service contractor. These items include:

A) Annual pavement sweeping before April 30th.
B) Minimum bi-annual cleaning of the 48" deep sump catch basins, including Stormceptors at the end of foliage season and snow removal seasons, and approved disposal of the recovered materials.
C) Bi-annual inspection of the drainage works may require remedial action. Any extensive damage repair for weather and non-weather related activities should be made immediately. Chronological Records of the repairs shall be kept in a file on-site. Records shall be kept for a period of at least 7-years.
D) Periodic checking and cleaning the catch basins on an as-needed basis to remove debris, trash, leaves, and accumulated sediment. The sumps must be monitored quarterly for the first 2-years of operation to measure the accumulation of sediment and/or pollutants that may be contained at the inlet sum. Then adjust the checking and monitoring to suit conditions expected for experience from the initial 2-year period.
E) Record keeping of the maintenance, checking and monitoring of the system shall be maintained by the owner. Service contractors shall provide the owner with receipt showing a clear description of their site visit; and, findings shall be clearly and legibly printed and dated on the receipt.
F) A copy of the service contractor's manifest record shall be provided to the owner and/or operator of the system.

DETAILED BMP REQUIREMENTS

Deep Sump Catch Basins:

1.Deep sump catch basins shall be inspected and all sediments and debris shall be removed four times per year unless the owner can determine through recorded observations that sediment accumulation does not warrant such frequent cleanings. If deep sump structure cleaning occurs less

than four times per year, cleaning shall occur when two feet of sediments have accumulated in the sump and at least once per year.

2.Silt sacks shall be installed on all catch basins in and around the development throughout the time of construction for any future repairs.

3.All sediments and hydrocarbons shall be disposed of off-site in accordance with all applicable local, state, and federal regulations.

Approximate annual costs $3400.00

Stormwater Infiltration/stilling Basin:

1.Stormwater basins shall be inspected at least twice per year to insure proper operation (during a storm event).

2.Inspections shall include ensuring that inlet, outlet, and splash pad rip-rap aprons are in good condition and that that interior wall systems are in good condition. Deficiencies shall be remedied immediately.

3.Inspections shall include an observation of the accumulation of sediment in the basin. Pretreatment BMPs are intended to capture and contain coarse sediments. Should indication of significant accumulation of sediments in the infiltration basin be observed, increased frequency of cleaning of the preceding sediment forebay and catch basins shall be implemented.

4.Inspections shall include ensuring that outlet structures are unobstructed and free-flowing per the Site Plan design specifications.

5.Inspections shall include ensuring that all berms are fully stabilized, structurally sound and not eroded. Deficiencies shall be remedied immediately.

6.Stormwater basins should be mowed and all clippings and debris removed at least twice per year. Debris shall be removed at more frequent intervals if warranted by extreme weather events. If wetland vegetation grows at the bottom of the stormwater basin, it shall only be mowed once per year at the beginning of the winter season.

7.Sediment should be removed at least once every 5 years or when 2-inches of sediment accumulates anywhere in the basin and disposed of off-site in accordance with all applicable local, state, and federal regulations. Two sedimentation markers shall be installed in the basin by a Registered Land Surveyors with a clear marking of the 2-inch accumulation line. It is recommended that stone bounds be installed with chiseled marks indicating the limit of accumulation, although other similarly permanent marking methods may be utilized.

Approximate annual costs $1200.00

Underground Infiltration Field:

1.Perform all pretreatment BMP maintenance, structural and non-structural, as required herein.

2.Inspect the infiltration field at least twice per year, approximately 2-4 days after a rainfall event to ensure that water is not still in the field (as it should have infiltrated into underlying soils by then). Should the infiltration field fail to infiltrate water sufficiently, the field system shall be excavated and replaced in accordance with the original design.

3. Basins should be mowed and all clippings and debris removed at least twice per year. Evasive shrubs or plants shall be removed to mitigate root intrusion. Observation ports shall be kept clear and accessible.

Approximate annual costs $2400.00

Stormwater Pipes, Inlets, downspouts and Outfalls:

1.All stormwater inlets and outfalls shall be inspected twice per year.

2.Trash, leaves, debris and sediment shall be removed from inlets and outfalls as needed to keep them free flowing.

3.If inspections indicate that stormwater pipelines have become partially obstructed with trash, leaves, debris or sediment, the pipelines shall be cleaned by water jet truck and the obstructions removed and disposed of.

Approximate annual costs $1000.00

StormCeptor System:

1. StormCeptor structure and equipment shall be inspected and maintained as per manufacturers recommendations. StormCeptor manual is attached to this plan.

Inspections should be conducted as follows:

-Post-construction inspection is required prior to putting the Stormceptor into service.

-Routine inspections are recommended first year to assess sediment accumulation. Subsequent inspection will be based upon data acquires in the first year to determine maintenance program as per manufacturers requirements.

-Inspections shall be performed immediately after oil, fuel, or other chemical spills.

Maintenance cleaning needed for optimum performance, the unit should be cleaned out once the sediment depth reaches the recommended maintenance sediment depth, which is approximately 15% of the unit's total storage capacity. The frequency should be adjusted based on historical inspection results due to variable site pollutant loading.

Approximate annual costs $1200.00

Stormwater BMP Inspection and Maintenance Log

Facility Name Red Robin Pastures	
Address 63 County Street	
Begin Date	End Date
Date of Last Rainfall/Rainfall Amount	

Date Inspected	BMP ID#	BMP Description	Inspected by:	Cause for Inspection	Exceptions Noted	Comments and Actions Taken (Dated)
	1P	R-Tank Structure				
	CB'S	Deep Sump Catch-basin				
	2	STORMCEPTOR				
	1	Outlet Structures- Level spreader/stilling basin				
	1	Wetland Setback Boundary				
	1	Slope stability				

Instructions: Record all inspections and maintenance for all treatment BMPs on this form. Use additional log sheets and/or attach extended comments or documentation as necessary. Submit a copy of the completed log with the annual independent inspectors' report to the municipality and start a new log at that time.

- BMP ID# — Always use ID# from the Operation and Maintenance Manual.
- Inspected by — Note all inspections and maintenance on this form, including the required independent annual inspection.
- Cause for inspection — Note if the inspection is routine, pre-rainy-season, post-storm, annual, or in response to a noted problem or complaint.
- Exceptions noted — Note any condition that requires correction or indicates a need for maintenance.
- Comments and actions taken — Describe any maintenance done and date completed and need for follow-up.

Construction Period Pollution and Prevention and Erosion and Sediment Control Plan

For

"Red Robin Pastures"
61-63 County Street
Dover, Massachusetts

Prepared for and
Owned by: Red Robin Pastures LLC
1218 Great Plain Avenue
Needham MA 02492 or its successor in title (the "Owner")

Operation & Maintenance
Responsibility: Red Robin Pastures LLC
1218 Great Plain Avenue
Needham MA 02492 or its successor in title (the "Owner")

Prepared By: Ronald Tiberi P.E.
9 Massachusetts Ave
Natick, MA 01760

April 6, 2021
Rev. Sept. 6, 2021

Storm Water Pollution Prevention Plan (SWPPP)

The Storm Water Pollution Prevention Plan was developed in accordance with the following:

1) Massachusetts Erosion and Sediment Control Guidelines For Urban and Suburban Areas (March 1997)
2) The Massachusetts Department of Environmental Protection's *Storm Water Policy* (February, 2008)
3) The United States Environmental Protection Agency's Storm Water Management for Construction Activities, Developing Pollution Prevention Plans and Best Management Practices.

Erosion and Sedimentation Control Plan

This stormwater pollution prevention plan (SWPPP) document and permit includes an operation and maintenance plan (O&M Plan) that is referenced herein. The SWPPP Permit will be attached to this document when issued. The site owner and contractor in responsible charge are required affix their signature and date in the appropriate section that is also found in the rear section. Erosion and sedimentation will be controlled at the site by utilizing structural practices, stabilization practices, site maintenance and dust control. Site erosion and sedimentation inspection forms are included as part of the site erosion control plan and shall be implemented and executed during the site construction phase. It is important to stabilize the site as soon as possible with a temporary vegetative cover for soil stabilization to maximize the effectiveness of the temporary erosion controls. Before construction a hay bale/silt fence device shall be placed at the downgradient edges of all land disturbing activities of the work site.

Site Construction:

Red Robin Pastures LLC intends to develop the site at 61-63 County Street. The site work will disturb approximately 2.5 acres of land. FilterMitt/Socks as erosion control barrier (ECB) will be placed and maintained at the lowest elevation in the rear of the property toward which storm drainage runoff flows.

Before work commences on the site including placement of any fill, the downgradient perimeter of the work area shall be protected with a new row of ECB staked into the ground. Low spots that receive most of the drainage runoff shall be enhanced with a double row of ECB.

A site access gravel stone pad will be installed at the site entrance beginning at the edge of County Street to control the mud and dirt from being carried from the lot onto the public way.

The disturbed soil areas in the front part of the site shall be immediately finish graded and be stabilized with a perennial grass as soon as practical. A temporary Rye Grass shall be supplanted with the perennial grass for fast germination and establishment of a vegetative cover. Stockpiled soil material will be surrounded at the base with a woven filter fence barrier to control the migration of sediment from the piles.

The basin near wetlands shall be constructed in conjunction with the grading and filling of the site. Before the basin is allowed to receive any site stormwater flows, the drainage collection system shall be installed and made operational. Also, the subsurface infiltration systems shall be

constructed and bulkheaded off until the disturbed surfaces are stabilized.

Structural Practices:

1) **Filter Sock Controls** – A barrier will be constructed along downgradient slopes abutting the proposed parking lot, building footprints, edge of grading, and stockpile areas. The ECB shall be placed upland of the anchor stake. This control will be installed prior to major soil disturbance in the drainage area.

A.
All Certified Phase II Stormwater Products Microbial FilterMitt TM installations shall be done by a Phase II Stormwater Products Certified Professional.
B.
If installation is not done by a Certified Phase II Stormwater Products Certified Professional, than the installation of the project may not comply with the design specifications and performance standards; the project will be declined.
C.
A Certified Phase II Stormwater Products Microbial FilterMitt TM can be constructed on site or delivered prefilled: minimal onsite labor time.
D.
Can be tailored to site requirements; individual units can be made in lengths from 1-100 linear feet.
E.
When the Certified Phase II Stormwater Products Microbial FilterMitt TM is properly installed, water will not be able to bypass around the ends.
F.
Because the Certified Phase II Stormwater Products Microbial FilterMitt TM conforms to the grade, there is no need to re-grade with heavy equipment which causes soil disturbance and creates conditions for more erosion.
G.
The movement of heavy equipment compacts the soil which increases flowrate and damages soil structure making it more difficult to establish seed germination.
H.
Staking with hardwood stakes at maximum 10 foot intervals ensures stability against water flow for slopes 2:1 and greater. Ends of individual Certified Phase II Stormwater Products Microbial FilterMitt TM are overlapped and staked to ensure integrity on slopes 2:1 or greater
End stakes should be placed no more than one foot from terminal ends on slopes 2:1 or greater.
I.
Protective fencing is recommended to protect structures from construction disturbance, or vehicle and foot traffic. Fence should be placed in front of the Certified Phase II Stormwater Products Microbial FilterMitt TM.

<u>Erosion Control Barrier Inspection/Maintenance</u>

a) Erosion Control barriers should be inspected immediately after each runoff-producing rainfall and at least daily during prolonged rainfall.
b) Close attention should be paid to the repair of damaged bales, erosion beneath bales,

and flow around the ends of the bales.
c) Necessary repairs to barriers or replacement of bales shall be completed promptly.
d) Sediment deposits should be checked after each runoff-producing rainfall and should be removed when the level of deposition reaches approximately one-half the height of the barrier.
e) Any sediment deposits remaining in place after the Erosion Control barrier is no longer required shall be dressed to conform to the existing grade, prepared and seeded.

2) **Construction Entrances** – A stabilized construction entrance shall be placed at the site entrance before construction begins on the project to keep mud and sediment from being tracked off the construction site by vehicles leaving the site.
Construction Entrance Design/Construction Requirements

a) Remove all vegetation and other objectionable material from the subbase area. Grade and crown foundation for positive drainage.
b) Stone for a stabilized construction entrance shall be 1 to 3-inch stone placed on a stable foundation.
c) Pad dimensions: The minimum length of the gravel pad should be 30 feet. The pad should extend the full width of the access road, a 10 foot minimum width, or wide enough so that the largest construction vehicle will not extend outside the pad; whichever is greater. If significant traffic is expected at the entrance, then the stabilized construction entrance should be wide enough to fit two vehicles abreast.
d) A geotextile filter fabric shall be placed between the stone fill and the earth surface below the pad to reduce the migration of soil particles from the underlying soil into the stone and vice versa. The filter fabric should be Amoco woven polypropylene 1198 or equivalent.
e) Washing: If the site conditions are such that the majority of mud is not removed from the vehicle tires by the gravel pad, then the tires should be washed before the vehicle enters the road or street. The wash area should be a level area with 3-inch washed stone minimum, or a commercial rack.
f) Wash water should be directed into a sediment trap, a vegetated filter strip, or other approved sediment trapping device. Sediment shall be prevented from entering any watercourses.
g) A sediment fence/hay bale barrier should be installed down-gradient from the construction entrance in order to contain any sediment-laden runoff from the entrance.

<u>Construction Entrance Inspection/Maintenance</u>
a) The entrance should be maintained in a condition that will prevent tracking or flowing of sediment onto the public ways. This may require periodic topdressing with additional stone.
b) Inspect entrance/exit pad and sediment disposal area weekly and after heavy rains or heavy use.
c) Remove mud and sediment tracked or washed onto public road immediately.
d) Once mud and soil particles clog the voids in the gravel and the effectiveness of the gravel pad is no longer satisfactory, the pad must be top-dressed with new stone. Complete replacement of the pad may be necessary if the stone voids become clogged.
e) If washing facilities are used, the sediment traps should be cleaned out as often as necessary to assure that adequate trapping efficiency and storage volume is available.
f) Reshape pad as needed for drainage and runoff control.

g) Repair any broken road pavement on the Street immediately.
h) All temporary erosion and sediment control measures shall be removed within 30 days after final site stabilization is achieved or after the temporary practices are no longer needed. Trapped sediment shall be removed or stabilized on site. Disturbed soil areas resulting from removal shall be permanently stabilized.

3) **Construction Road Stabilization** – The stabilized construction road(s) will provide a means for construction vehicles to move around the site without causing significant erosion. The road stabilization will significantly speed up on-site work, avoid instances of immobilized machinery and delivery vehicles, and generally improve site efficiency and working conditions during adverse weather. The construction road(s) will be stabilized at the beginning of construction and maintained throughout construction. The stabilized construction road will not be located in a cut or fill area until after grading has been performed. Some of the stone used will remain in place for use as part of the final base course of the road. Permanent roads and parking areas will be paved as soon as practicable.

Construction Road Stabilization Design/Construction Requirements
a) A 6-inch course of 2 to 4-inch crushed rock, gravel base, or crushed surfacing base course should be applied immediately after grading or the completion of utility installation within the right-of-way. A 4-inch course of asphalt-treated base may be used in lieu of the crushed rock.
b) Temporary roads should follow the contour of the natural terrain to the maximum extent possible. Slopes should not exceed 15 percent. Roadways should be carefully graded to drain to the edge of the road, enabling storm water to travel the shortest route. Provide drainage swales on each side of the roadway in the case of a crowned section, or one side in the case of a superelevated section.
c) Drain inlets should be protected to prevent sediment-laden runoff from entering the structures.
d) Areas adjacent to culvert crossings and steep slopes should be seeded and mulched.
e) Dust control should be used when necessary.
Construction Road Stabilization Inspection/Maintenance
a) Inspect stabilized areas regularly, especially after large storm events. Add 2 to 4-inch crushed rock if necessary and re-stabilize any areas found to be eroding.
b) All temporary erosion and sediment control measures should be removed with 30 days after final site stabilization is achieved or after the temporary practices are no longer needed.
c) Trapped sediment should be removed or stabilized on site. Disturbed soil areas resulting from removal should be permanently stabilized.

4) **Inlet Protection** – Inlet Protection will be utilized around catch basin grates. The inlet protection will allow the storm drain inlets not tributary to infiltraton facilites to be used before final stabilization. Siltsack or equivalent will be utilized for the inlet protection. Siltsack is manufactured by ACF Environmental at 1-800-437-6746. Regular flow siltsack will be utilized, and if it does not allow enough storm water flow, hi-flow siltsack will be utilized.
Silt Sack (or equivalent) Inlet Protection Inspection/Maintenance Requirements
a) All trapping devices and the structures they protect should be inspected after every rain storm and repairs made as necessary.
b) Sediment should be removed from the trapping devices after the sediment has reached a

maximum depth of one-half the depth of the trap.
c) Sediment should be disposed of in a suitable area and protected from erosion by either structural or vegetative means.
d) After emptying, if the siltsack is ripped or torn in any way, it must be replaced.
e) Temporary traps should be removed and the area repaired as soon as the contributing drainage area to the inlet has been completely stabilized.

5) **Surface Roughening** – Roughening surface slopes is a temporary measure that will improve the success of vegetative stabilization, encourage water infiltration and decreases runoff velocity. The grooved slopes create irregularities in the soil surface to catch rainwater and retain lime, fertilizer, and seed. The soil surface is roughened by the creation of horizontal grooves or slight depressions (1 - 3" deep and 6 – 15" apart) parallel to the slope contour. Roughening can be used with both seeding and planting and temporary mulching to stabilize an area.
Surface Roughening Design/Construction Requirements
a) Roughening should be done as soon as possible after the vegetation has been removed from the slope and grading activities have ceased.
b) Roughening methods include stair-step grading, grooving, and tracking.
c) Graded areas with slopes greater than 3:1 but less than 2:1 should be roughened before seeding. Graded areas steeper than 2:1 should be stair-stepped with benches.
d) Areas which will be mowed (these areas should have slopes less steep than 3:1) may have small furrows left by disking, harrowing, raking, or seed-planting machinery operated on the contour. These areas need to be smoothed.
e) It is important to avoid excessive compacting of the soil surface when scarifying. Tracking with bulldozer treads is preferable to not roughening at all, but is not as effective as other forms of roughening because the soil compaction inhibits vegetation growth and causes higher runoff speed.

<u>Surface Roughening Inspection/Maintenance</u>
a) Surface roughened areas should be seeded as quickly as possible.
b) Regular inspections should be made. If rills appear, they should be regraded and reseeded immediately.

Stabilization Practices:

As required by the EPA, stabilization measures shall be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased, with the following exceptions.
1) Where the initiation of stabilization measures by the 14th day after construction activity temporary or permanently ceases is precluded by snow cover, stabilization measures shall be initiated as soon as practicable.
2) Where construction activity will resume on a portion of the site within 21 days from when activities ceased, (e.g. the total time period that construction activity is temporarily ceased is less than 21 days) then stabilization measures do not have to be initiated on that portion of the site by the 14th day after construction where activity had temporarily ceased.
1) **Temporary Seeding** – Temporary seeding will allow a short-term vegetative cover on disturbed site areas that may be in danger of erosion. Temporary seeding will be completed on stock piles and disturbed portions of the site where construction activity will have temporarily

ceased for at least 21 days. The temporary seedings should stabilize cleared and unvegetated areas that are not expected to be final graded for several weeks or months.

Temporary Seeding and Planting Procedures

a) Planting should preferably be completed between April 1st and June 30th, and September 1st through September 31st. If Planting is undertaken in the months of July and August, irrigation may be required. If planting is undertaken between October 1st and March 31st, mulching should be applied immediately after planting. If seeding is completed during the summer months, irrigation of some sort will probably be necessary.

b) Before seeding, install structural practice controls. Utilize Amoco supergrow or equivalent.

c) The seedbed should be firm with a fairly fine surface. Perform all cultural operations across or at right angles to the slope. A minimum of 2 to 4-inches of tilled topsoil is required. The topsoil should have a sandy loam to silt loam texture with 15% to 20% organic content.

d) Apply uniformly 2 tons of ground limestone per acre (100 lbs. Per 1,000 sq.ft.) or according to soil tests. Apply uniformly 10-10-10 analysis fertilizer at the rate of 400 lbs. per acre (14 lbs. per 1,000 sq.ft.) or as indicated by soil tests. Forty percent of the nitrogen should be in organic form. Work in lime and fertilizer to a depth of 4-inches using suitable equipment.

e) Select the appropriate seed species for temporary cover from the following table.

Species	Seeding Rate (lbs/1,000 sq.ft.)	Seeding Rate (lbs/acre)	Recommended Seeding Dates	Seed Cover required
Annual Ryegrass	1	40	April 1st to June 1st August 15th to Sept. 15th	¼ inch
Foxtail Millet	0.7	30	May 1st to June 30	1/2 to 3/4 inch
Oats	2	80	April 1st to July 1st August 15th to Sept. 15th	1 to 1-½ inch
Winter rye	3	120	August 15th to Oct. 15th	1 to 1-½ inch

Apply the seed uniformly by hydroseeding, broadcasting, or by hand.

f) Use effective mulch, such as clean grain straw; tacked and/or tied with netting to protect the seedbed and encourage plant growth.

Temporary Seeding Inspection/Maintenance

a) Inspect within 6 weeks of planting to see if stands are adequate. Check for damage within 24 hours of the end to a heavy rainfall, defined as a 2-year storm event (i.e., 3.2 inches of rainfall within a twenty-four hour period). Stands should be uniform and dense. Fertilize, reseed, and mulch damaged and sparse areas immediately. Tack or tie down mulch as necessary.

b) Seeds should be supplied with adequate moisture. Furnish water as needed, especially during periods of abnormally hot or dry weather. Water application rates should be controlled to prevent runoff.

2) **Mulching and Netting** – Mulching will provide immediate protection to exposed soils during the period of short construction delays, or over winter months through the application of plant residues, or other suitable materials, to exposed soil areas. In areas which have been seeded either for temporary or permanent cover, mulching should immediately follow seeding. On steep slopes, mulch must be supplemented with netting. The preferred mulching material is straw.

Mulch (Hay or Straw) Materials and Installation

a) Straw has been found to be one of the most effective organic mulch materials. The specifications for straw are described below, but other material may be appropriate. The straw should be air-dried; free of undesirable seeds & coarse materials. The application rate per 1,000 sq.ft. is 90-100 lbs. (2-3 bales) and the application rate per acre is 2 tons (100-120 bales). The application should cover about 90% of the surface. The use of straw mulch is appropriate where mulch is maintained for more than three months. Straw mulch is subject to wind blowing unless anchored, but is the most commonly used mulching material, and has the best microenvironment for germinating seeds.

Mulch Maintenance

a) Inspect after rainstorms to check for movement of mulch or erosion. If washout, breakage, or erosion occurs, repair surface, reseed, re-mulch, and install new netting.
b) Straw or grass mulches that blow or wash away should be repaired promptly.
c) If plastic netting is used to anchor mulch, care should be taken during initial mowings to keep the mower height high. Otherwise, the netting can wrap up on the mower blade shafts. After a period of time, the netting should degrade and become part of the root matrix.
d) Continue inspections until vegetation is well established.

3) **Geotextiles** - Geotextiles such as jute netting will be used in combination with other practices such as mulching to stabilize slopes.
The following geotextile materials or equivalent are to be utilized for structural and nonstructural controls as shown in the following table.

Practice	Manufacturer	Product	Remarks
Sediment Fence	Amoco	**Woven polypropylene 1198 or equivalent**	**0.425 mm opening**
Construction Entrance	**Amoco**	**Woven polypropylene 2002 or equivalent**	**0.300 mm opening**
Outlet Protection	**Amoco**	**Nonwoven polypropylene 4551 or equivalent**	**0.150 mm opening**
Erosion Control (slope stability)	**Amoco**	**Supergrow or equivalent**	**Erosion control revegetation mix, open polypropylene fiber on degradable polypropylene net scrim**

Amoco may be reached at (800) 445-7732

Geotextile Installation

a) Netting and matting require firm, continuous contact between the materials and the soil. If there is no contact, the material will not hold the soil and erosion will occur underneath the material.

Geotextile Inspection/Maintenance

a) In the field, regular inspections should be made to check for cracks, tears, or breaches in the fabric. The appropriate repairs should be made.

4) **Land Grading** – Grading on fill slopes, cut slopes, and stockpile areas will be undertaken only with full siltation controls in place.

Land Grading Design/Construction Requirements

a) Areas to be graded should be cleared and grubbed of all timber, logs, brush, rubbish, and vegetated matter that will interfere with the grading operation. Topsoil should be stripped and stockpiled for use on disturbed areas for establishment of vegetation. Cut slopes to be topsoiled should be thoroughly scarified to a minimum depth of 3-inches prior to placement of topsoil.
b) Fill materials should be generally free of brush, rubbish, rocks, and stumps. Frozen materials or soft and easily compressible materials should not be used in fills intended to support buildings, parking lots, roads, conduits, or other structures.
c) Earth fill intended to support structural measures should be compacted to a minimum of 90 percent of Standard Proctor Test density with proper moisture control, or as otherwise specified by the engineer responsible for the design. Compaction of other fills should be to the density required to control sloughing, erosion or excessive moisture content. Maximum thickness of fill layers prior to compaction should not exceed 9 inches.
d) The uppermost one foot of fill slopes should be compacted to at least 85 percent of the maximum unit weight (based on the modified AASHTO compaction test). This is usually accomplished by running heavy equipment over the fill.
e) All disturbed areas should be free draining, left with a neat and finished appearance, and should be protected from erosion.
Land Grading Stabilization Inspection/Maintenance
a) All slopes should be checked periodically to see that vegetation is in good condition. Any rills or damage from erosion and animal burrowing should be repaired immediately to avoid further damage.
b) If seeps develop on the slopes, the area should be evaluated to determine if the seep will cause an unstable condition. Subsurface drains or a gravel mulch may be required to solve seep problems. However, no seeps are anticipated.
c) Areas requiring revegetation should be repaired immediately. Slopes should be limed and fertilized as necessary to keep vegetation healthy. Control undesirable vegetation such as weeds and woody growth to avoid bank stability problems in the future.

5) **Topsoil** – Topsoil should help support vegetation on all disturbed areas throughout the site during the seeding process. The soil texture of the topsoil to be used will be a sandy loam to a

silt loam texture with 15% to 20% organic content.

Topsoil Placement
a) Topsoil should not be placed on frozen or muddy subsoils, when the subgrade is excessively wet, or when conditions exist that may otherwise be detrimental to proper grading or proposed seeding.
b) Do not place topsoil on slopes steeper than 2:1.
c) If topsoil and subsoils are not properly bonded, water will not infiltrate evenly into the soil profile and it will be difficult to establish vegetation. Topsoil should be worked into the subsoil layer below for a depth of at least 6 inches.

6) **Preserving Natural Vegetation** – The trees to be saved will be clearly flagged or marked with a bright colored ribbon. Snow fencing will be set at the drip/spread line of the trees and shrubs to be protected. Machinery will be kept away from tree roots.

7) **Permanent Seeding** – Permanent Seeding should be done immediately after the final design grades are achieved. Native species of grass should be used to establish perennial vegetative cover on disturbed areas. The revegetation should be completed early enough in the fall so that a good cover is established before cold weather inhibits growth until the spring. A good cover typically represents vegetation covering 75 percent or more of the ground surface.
Permanent Seeding Seedbed Preparation
g) In infertile or coarse-textured subsoil, it is recommended to spread topsoil over the finished slope at a minimum 2 to 6-inch depth and roll it to provide a firm seedbed. The topsoil must have a sandy loam to silt loam texture with 15% to 20% organic content. If construction fill operations have left soil exposed with a loose, rough, or irregular surface, smooth with blade and roll.
a) Loosen the soil to a depth of 3-5 inches with suitable agricultural or construction equipment.
b) Areas not to receive topsoil shall be treated to firm the seedbed after incorporation of the lime and fertilizer so that it is depressed no more than ½ - 1 inch beneath foot traffic. Areas to receive topsoil shall not be firmed until after topsoil, lime and fertilizer is applied and incorporated, at which time it shall be treated to firm the seedbed as described above.
Permanent Seeding Grass Selection/Application
a) Select an appropriate cool or warm season grass based on site conditions and seeding date. Apply the seed uniformly by hydroseeding, broadcasting, or by hand. Uniform seed distribution is essential. On steep slopes, hydroseeding may be the most effective seeding method. Surface roughening is particularly important when preparing slopes for hydroseeding.
b) Lime and fertilize.
c) Mulch the seedings with straw applied at the rate of ½ tons per acre. Anchor the mulch with erosion control netting or fabric on sloping areas. Amoco supergrow or equivalent should be utilized.

Permanent Seeding Inspection/Maintenance
a) Frequently inspect seeded areas for failure and make necessary repairs and reseed immediately. Conduct or follow-up survey after one year and replace failed grasses where necessary.
b) If vegetative cover is inadequate to prevent rill erosion, overseed and fertilize in

accordance with soil test results.
c) If a stand has less than 40% cover, reevaluate choice of grass seed and quantities of lime and fertilizer. Re-establish the stand following seedbed preparation and seeding recommendations, omitting lime and fertilizer in the absence of soil test results. If the season prevents re-sowing, mulch or jute netting is an effective temporary cover.
d) Seeded areas should be fertilized during the second growing season. Lime and fertilize thereafter at periodic intervals, as needed.

Dust Control:

Dust control will be utilized during the site construction phase. The following are methods of Dust Control that may be used on-site.
Vegetative Cover – The most practical method for disturbed areas not subject to traffic.
Calcium Chloride – Calcium chloride may be applied by mechanical spreader as loose, dry granules or flakes at a rate that keeps the surface moist but not so high as to cause water pollution or plant damage.
Sprinkling – The site may be sprinkled with water until the surface is wet. Sprinkling will be effective for dust control on haul roads and other traffic routes.
Stone – Stone will be used to stabilize construction roads; will also be effective for dust control.

Non-Stormwater Discharges:

During construction activities at the site, water from the site will be suitable for discharge to the detention areas and/or temporary sediment basin areas. Non-stormwater discharges will be directed to recharge groundwater as follows:
Uncontaminated groundwater from de-watering excavations will be conserved for recharge.
The construction de-watering and all non-stormwater discharges will be directed into a storm drain inlet equipped with a siltsack (or equivalent) inlet protection or a sediment trap.
The developer and site general contractor will comply with the E.P.A.'s Final General Permit for Construction Dewatering Discharges, (N.P.D.E.S., Section 402 and 40 C.F.R. 122.26(b) (14) (x), if required.

Stockpiling Material:

Stockpiled Material
1) Sediment Fence Barrier erosion control measures shall be placed surrounding the stockpile until it is removed from the site.
2) As needed, the stockpiled topsoil and subsoil may be used by re-distributing it around the site.

Solid Waste Disposal:

There should be no construction waste material on the site. No structures will be installed. The waste container in the upper site will be used for any trash. No trash is expected to be generated on the work site. If any trash or waste is found, it shall be handled and orderly disposed of in the current developed portion of the site.

Material Management Plan

An inventory will be kept of the material on site. There will be neat and orderly storage of hazardous materials. Regular garbage, rubbish, construction waste, and sanitary waste disposal will be employed. There will be prompt cleanup of any spills, either liquid or dry materials. The following practices will be used to avoid problems associated with the disposal of hazardous materials.

1) Check with local waste management authorities to determine what the requirements are for disposing of hazardous materials.
2) Use the entire product before disposing of the container.
3) Do not remove the original product label from the container, since it contains important information.
4) If surplus products must be disposed, do not mix products together unless specifically recommended by the manufacturer.
5) The correct method of disposal of hazardous materials varies with the product used. Follow the manufacturer's recommended method, which is often found on the label.

Hazardous Products: Hazardous Products may include but are not limited to paints, acids for cleaning masonry surfaces, cleaning solvents, and concrete curing compounds and additives. The following practices will help to avoid pollution of storm water by these products.

1) Have equipment to contain and clean up spills of hazardous materials in the areas where these materials are stored or used.
2) Contain and clean up spills immediately after they occur.
3) Keep materials in a dry covered area.

Pesticides: Pesticides may include but are not limited to insecticides, rodenticides, and herbicides. The following practices should be utilized to reduce the risks of using pesticides.

1) Handle the materials as infrequently as possible.
2) Observe all applicable Federal, State, and local regulations when using, handling, or disposing of these materials.

Petroleum Products: Oil, gasoline, lubricants, and asphalt substances such as paving materials are considered petroleum products. Petroleum products will most likely be used in areas where road construction of some type is occurring and at vehicle storage areas or areas of onsite fueling or equipment maintenance. The following practices should be utilized to reduce the pollution risks from using petroleum products.

1) Have equipment to contain and clean up petroleum spills in fuel storage areas or on board maintenance and fueling vehicles.
2) Where possible, store petroleum products and fuel vehicles in covered areas and construct dikes to contain any spills.
3) Contain and clean up petroleum spills immediately.
4) Preventive maintenance for onsite equipment should be done to prevent leakage. This may include checking for and fixing gas or oil leaks in construction vehicles on a regular basis.
5) Proper application of asphalt substances (see manufacturers' instructions) will also reduce the risk of a spill.

Fertilizers/Detergents:

No fertilizers, detergents, de-icing material and or pesticides are area lowed in any wetland jurisdictional area or any area hydrologically connected to said area.

Fertilizers and detergents contain nutrients such as phosphorous and nitrogen which can contribute to water pollution. The following practices should be utilized to reduce the risks of using fertilizer/detergent products.

1) Limit the application of fertilizers to the minimum area and the minimum recommended amounts.
2) Reduce the exposure of nutrients to storm water runoff by working the fertilizer deep into the soil (depth of 4 to 6 inches) instead of letting it remain on the surface.
3) Apply fertilizer more frequently, but at lower application rates.
4) Hydro-seeding where lime and fertilizers are applied to the ground surface in one application should be limited where possible.
5) Limit the use of detergents onsite; wash water containing detergents should not be discharged in the storm water system.
6) Apply fertilizer and use detergents only in the recommended manner and only in recommended amounts.

Spills: The site owner/supervisor will create and adopt a spill control plan that includes measures to stop the source of the spill, contain the spill, clean up the spill, dispose of materials contaminated by the spill, and identify and train personnel responsible for spill prevention and control. The following measures will be appropriate for a spill prevention and response plan.

1) Store and handle materials to prevent spills.
a) Tightly seal containers.
b) Make sure all containers are clearly labeled.
c) Stack containers neatly and securely.
2) Reduce storm water contact if there is a spill.
a) Have cleanup procedures clearly posted.
b) Have cleanup materials readily available.
c) Contain any liquid.
d) Stop the source of the spill.
e) Cover spill with absorbent materials such as kitty litter or sawdust.
3) Dispose of contaminated materials according to manufacturer's instructions or according to state or local requirements.
4) Identify personnel responsible for responding to a spill of toxic or hazardous materials.
a) Provide personnel spill response training.
b) Post names of spill response personnel.
c) Keep the spill area well ventilated.
d) If necessary, use a private firm that specializes in spill cleanup.
5) Spills that exceed Reportable Quantity (RQ) levels must be reported and documented.

Temporary Sanitary Waste Disposal:

Temporary sanitary waste facilities shall be provided in an easily accessible location on the site for all construction personnel and shall maintained according to the vendor's required maintenance schedule.

Snow Management Plan:

No fertilizers, detergents, de-icing material and or pesticides are area lowed in any wetland jurisdictional area or any area hydrologically connected to said area.

The proper management of snow and snow melt, in terms of snow removal and storage, use of deicing compounds, and other practices will prevent or minimize the major runoff and pollutant loading impacts. The following practices should be employed to avoid pollution impacts from snow.

1) Use of De-icing Compounds

a) The Town of Dover may agree to the use of certain chemicals for de-icing. Alternative de-icing compounds such as calcium chloride ($CaCl_2$) and calcium magnesium acetate (CMA) are possibilities.

b) Use a sand to salt ratio of 7 to 2 or greater.

c) There are no stockpiles of salt and sand stored or proposed on this site for de-icing.

2) Snow Removal and Storage: Place plowed snow in pervious areas where it can slowly infiltrate. This can be accomplished at the edge of the parking area surface.

3) Blow snow from paved areas to grass or pervious areas.

4) Utilize pavement sweeping and catch basin cleaning as a minimum bi-annual in the early spring (after winter storms),and mid-fall (after the leaf drop). The disposal of street sweepings shall comply with DEP/BWP Final Policy #94-092.

The preceding does not cover sweepings known to be contaminated by spills, and such sweepings should be collected separately and kept segregated.

Inspection/Maintenance:

Operator personnel must inspect the construction site at least once every 14 calendar days and within 24 hours of a storm event of ½-inch or greater. Refer to the Inspection/ Maintenance Requirements presented earlier in the "Structural and Stabilization Practices." The inspector should look for three primary things when inspecting erosion and sediment controls.

1) Whether or not the measure was installed /performed correctly.

2) Whether or not there has been damage to the measure since it was installed or performed.

3) Required action to be completed to correct any problems with the measure.

The inspector should prepare a report documenting the findings. The inspector should request the required maintenance or repair for the pollution prevention measures when the inspector finds that it is necessary for the measure to be effective. If the Storm Water Pollution Prevention Plan should be changed to allow for unexpected conditions, the inspector should request the changes. The inspector should notify the appropriate person to make the changes.

Construction Stormwater BMP Inspection, Maintenance, Corrective Action Log

Facility Name Red Robin Pastures	
Address 63 County Street	
Begin Date	End Date
Date of Last Rainfall/Rainfall Amount	

Inspection Date	BMP ID#	BMP Description	Inspected by:	Cause for Inspection	Exceptions Noted	Comments and Actions Taken (Dated)
	Erosion Control Barriers					
	Construction Entrances					
	Stockpiles Barriers					
	Slope Stability					
	Wetland Boundary					
	Sed. Basins					

Instructions: Record all inspections and maintenance for all treatment BMPs on this form. Use additional log sheets and/or attach extended comments or documentation as necessary. Submit a copy of the completed log with the annual independent inspectors' report to the municipality and start a new log at that time. To be completed at least once every 7 calendar days and within 24 hours of a storm event of 1 inch or greater.

- BMP ID# — Always use ID# from the Operation and Maintenance Manual.
- Inspected by — Note all inspections and maintenance on this form, including the required independent annual inspection.
- Cause for inspection — Note if the inspection is routine, pre-rainy-season, post-storm, annual, or in response to a noted problem or complaint.
- Exceptions noted — Note any condition that requires correction or indicates a need for maintenance.
- Comments and actions taken — Describe any maintenance done with date completed and need for follow-up.