DRAINAGE REPORT

ALLEN & MAJOR ASSOCIATES, INC.

27 Kimball Road
Amesbury, MA

APPLICANT:
MP Properties IV, LLC
One Boston Place
201 Washington Street, Suite 2100
Boston, MA 02108

PREPARED BY:
Allen & Major Associates, Inc.
Carlton M. Quinn, PE
100 Commerce Way, Suite 5
Woburn, Massachusetts 01801

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ISSUED:
1/26/2026

REVISED:

A&M PROJECT NO.:
3410-03

TABLE OF CONTENTS

SECTION 1.0 -
DRAINAGE REPORT

Introduction
The purpose of this drainage report is to provide an overview of the proposed stormwater management system (SMS) for the proposed residential development located at 27 Kimball Road, Amesbury, MA. The report will show by means of narrative, calculations and exhibits that the proposed stormwater management system will meet or exceed the Massachusetts Department of Environmental Protection (MassDEP) stormwater standards, and the Amesbury Stormwater Management Regulations.

The proposed site improvements include the development of 51 residential buildings for a total of 95 Units. The proposed site will include on-site drainage, above ground parking, landscaping, and utilities to service each building. The project will be serviced by municipal sewer, water and electric. The sewer service will require a pump station to connect to the municipal line upgradient.

The proposed SMS incorporates structural Best Management Practices (BMPs) to provide stormwater peak flow mitigation, quality treatment, and conveyance.

The SMS includes deep sump catch basins, proprietary separators, and detention/infiltration systems.

Site Categorization for Stormwater Regulations
The proposed site improvements at 27 Kimball Road are considered a new development under the DEP Stormwater Management Standards due to the net increase in impervious area. A new development project is required to meet all of Stormwater Management Standards listed within the MA DEP Stormwater Handbook.

Site Location and Access
The site is a single lot with 223.5 feet of frontage on Kimball Road, entirely within the City of Amesbury.

The parcel is abutted by several single-family residential houses (see existing conditions plan).

The site is accessed by an existing curb cut along Kimball Road. The proposed curb cut is wider and in the same area of the existing curb cut.

Existing Site Conditions
The site currently includes a two-story house with a gravel driveway and two garages. The site topography slopes from south to north with an isolated wetland at the south end of the property and a larger wetland area to the west.

The surface drainage flows were analyzed at three Study Points. Study Point #1 summarizes off-site flows generated from the eastern portion of the site. This area flows north to discharge to the municipal drainage system on Kimball Road. Study Point #2 summarizes off-site flows generated from the western portion of the site. This area flows to the wetland west of the property. Study Point #3 summarizes the smaller subcatchment area that flows to the isolated wetland on the southern portion of the site.

Watershed
The subject property is located within the Merrimack River Watershed. The Merrimack River watershed spans 5,0510 square miles across New Hampshire and Massachusetts. The City of Amesbury is specifically within the sub-watershed of the Powow River, a tributary of the Merrimack.

Existing Soil Conditions
The on-site soils were identified using the USDA Natural Resources Conservation Services (NRCS) Soil Survey for Essex County. The site is primarily soil type Fine Sandy Loam. A copy of the NRCS Custom Soil Resource Report is included in the appendix of this report.

Further investigation on the underlying soils has been conducted by performing test pits within the site in locations identified for stormwater management. The Subsurface Data Memorandum conducted by Haley and Aldrich has been attached to the Appendix of this stormwater report. The test pits show underlying soils to be primarily Fine Sandy Loam. Fine Sandy Loam have a Hydrologic Soil Group B designation which has been used throughout the design.

An exfiltration rate for the Fine Sandy Loam has been determined to be 1.02 inches per hour based upon Table 2.3.3 1982 Rawls Rate, Volume 3: Documenting Compliance with the Massachusetts's Stormwater Handbook.

FEMA Floodplain/Environmental Due Diligence
There are no of the site located within the FEMA Zone "AE" Special Flood Hazard Area Subject to Inundation by the 1% Annual Chance Flood (100-year floodplain). The official Flood Insurance Rate Map (FIRM) effective date July 8, 2025, community panel 25009C0102G. See section 3 of this report for a copy of the FEMA FIRM.

Environmentally Sensitive Zones
The Commonwealth of Massachusetts asserts control over numerous protected and regulated areas including: Areas of Critical Environmental Concern (ACEC); Outstanding Resource Waters (ORWs); Priority and Protected Habitat for rare and endangered species, and areas protected under the Wetlands Protection Act. The subject property is not located within any of these regulated areas.

Drainage Analysis Methodology
A peak rate of runoff will be determined using techniques and data found in the following:

1. Urban Hydrology for Small Watersheds – Technical Release 55 by the United States Department of Agriculture Soils Conservation Service, June 1986. Runoff curve numbers and 24-hour precipitation values were obtained from this reference.

2. HydroCAD © Stormwater Modeling System by HydroCAD Software Solutions LLC, version 10.20-7a. The HydroCAD program was used to generate the runoff hydrographs for the watershed areas, to determine discharge/ stage/storage characteristics for the stormwater BMPs, to perform drainage routing and to combine the results of the runoff hydrographs. HydroCAD uses the TR-20 methodology of the SCS Unit Hydrograph procedure (SCS-UH).

Proposed Conditions – Peak Rate of Runoff

The stormwater runoff analysis of the existing and proposed conditions includes an estimate of the peak rate of runoff from various rainfall events. Peak runoff rates were developed using TR55 Urban Hydrology for Small Watersheds, developed by the U.S. Department of Commerce, Engineering Division and the HydroCAD computer program. Further, the analysis has been prepared in accordance with the MassDEP and the City requirements and standard engineering practices. The peak rate of runoff has been estimated for each watershed during the 2, 10, 25, and 100-year storm events.

The proposed stormwater management system for the site consists of deep sump catch basins, proprietary separators, underground detention and infiltration systems, and an infiltration basin. These systems have been designed in accordance with the MA DEP Stormwater Management Policy to recharge groundwater and reduce rate of runoff from the parcel.

Study Point One summarizes off-site flows generated from the majority of the developed site. Flows have been directed to be captured within catch basins and routed to large underground detention systems to control runoff rates. The detention systems are then routed to an infiltration basin at the north end of the property that discharges at a controlled rate to a proposed manhole in Kimball Road. The systems have been sized to contain the 100-year storm without overtopping the emergency overflow berm on the infiltration basin. Additionally, there is an underground infiltration system (UIS-4) that holds the 100-year storm for groundwater recharge. A trench drain at the entrance of the site is directed to a water quality unit and a smaller detention system with an outlet control structure to control runoff rates before discharging to a second proposed manhole in Kimball Road. Detention systems are used throughout the design instead of infiltration due to the cut condition of the site (see test pits).

Study Point Two summarizes off-site flows generated by a western portion of the development. The flows are captured via catch basins and routed to two underground infiltration systems to satisfy recharge requirements before discharging to the wetland at a controlled rate.

Study Point Three does not exist in proposed conditions.

The stormwater runoff model indicates that the proposed site development reduces the rate of runoff during all storm events at the identified points of analysis. The following tables provide a summary of the estimated peak rate, in Cubic Feet per Second (CFS) at each of the three (3) Study Points for each of the design storm events. The HydroCAD worksheets are included in Section 4 and 5 of this report.

STUDY POINT #1				
	2-Year	10-Year	25-Year	100-Year
Existing Flow (CFS)	0.43	3.12	5.39	9.38
Proposed Flow (CFS)	0.43	1.44	2.22	4.74
Reduction %	**0.0%**	**53.8%**	**58.8%**	**49.5%**

STUDY POINT #2				
	2-Year	10-Year	25-Year	100-Year
Existing Flow (CFS)	0.32	2.93	5.16	9.07
Proposed Flow (CFS)	0.19	1.35	2.28	6.31
Reduction %	**40.6%**	**53.9%**	**55.8%**	**30.4%**

STUDY POINT #3				
	2-Year	10-Year	25-Year	100-Year
Existing Flow (CFS)	0.19	0.80	1.27	2.06
Proposed Flow (CFS)	0.00	0.00	0.00	0.00
Reduction %	**100.0%**	**100.0%**	**100.0%**	**100.0%**

MASSDEP Stormwater Performance Standards

The MA DEP Stormwater Management Policy was developed to improve water quality by implementing performance standards for stormwater management. The intent is to implement the stormwater management standards through the review of Notice of Intent filings by the issuing authority (Conservation Commission or DEP). The following section outlines how the proposed Stormwater Management System meets the standards set forth by the Policy.

BMP’s implemented in the design include –

- Deep Sump Catch Basins
- Proprietary Separators
- Subsurface Structures
- Infiltration Basin

Stormwater Best Management Practices (BMP's) have been incorporated into the design of the project to mitigate the anticipated pollutant loading. An Operations and Maintenance Plan has been developed for the project, which addresses the long-term maintenance requirements of the proposed system.

Temporary erosion and sedimentation controls will be incorporated into the construction phase of the project. These temporary controls may include straw bale and/or silt fence barriers, inlet sediment traps, slope stabilization, and stabilized construction entrances.

The Massachusetts Department of Environmental Protection has established ten (10) Stormwater Management Standards. A project that meets or exceeds the standards is presumed to satisfy the regulatory requirements regarding stormwater management. The Standards are enumerated below as well as descriptions and supporting calculations as to how the Project will comply with the Standards:

1. *No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.*

   The proposed development will not introduce any new outfalls with direct discharge to a wetland area or waters of the Commonwealth of Massachusetts. All discharges will be treated for water quality and the rate will not be increased over existing conditions.

2. *Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.*

   The proposed development has been designed so that the post-development peak discharge rates do not exceed the predevelopment peak discharge rates. A summary of the existing and proposed discharge rates is included within this document.

3. *Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.*

   The existing annual recharge for the site has been approximated in the proposed condition. There are proposed subsurface infiltration systems designed to meet this requirement. Stormwater runoff generated from the impervious areas of the proposed development are routed through these infiltration BMPs. The proposed Recharge Volume is based on the Static Method per the MA DEP Stormwater Management Standards, Volume 3, Chapter 1.

The test pit's show underlying soils to be primarily Sandy Loam. Sandy Loam have a Hydrologic Soil Group "B" designation (Table 2.3.3 1982 Rawls Rate, Volume 3: Documenting Compliance with the Massachusetts's Stormwater Handbook.)

See the appendix located at section 6 of this report for stormwater recharge calculations.

4. *Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This standard is met when:*
    - *Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;*
    - *Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and*
    - *Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.*

Standard #4 is met when structural stormwater best management practices are sized to capture and treat the required water quality volume and pretreatment is provided in accordance with the Massachusetts Stormwater Handbook. Standard #4 also requires that suitable source control measures are identified in the Long-term Pollution Prevention Plan. The water quality volume for the site development is captured and treated using deep sump catch basins, proprietary separators, and either underground detention systems or an infiltration basin.

The implemented BMPs have been designed to treat the contributing water quality volume. These water quality calculations can be seen within the appendix of this report.

The proposed stormwater management system has been designed to remove 80% of the average annual post-construction load for each treatment train. The TSS removal calculations can be seen within the appendix of this report.

The TSS removal efficiencies for the proprietary separator are based on the values assigned under the Technology Acceptance and Reciprocity Partnership (TARP) testing protocol. The TARP is a workgroup of the Environmental Council of States that was originally comprised of California, Illinois, Maryland, Massachusetts, New Jersey, New York, Pennsylvania and Virginia. TARP is recognized in the MA DEP Stormwater Management Handbook as a valid source for assigning TSS removal efficiencies for proprietary separators.

5. *For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.*

   Pretreatment and Source reduction is provided to the maximum extent practicable. The drainage system will be designed to treat 1" water quality volume utilizing the BMPs listed in Table LUHPPL, within the Massachusetts Stormwater Handbook, Volume 1: Overview of the Massachusetts Stormwater Standards, Chapter 1, Page 14. This requirement only applies to stormwater discharges that come into contract with the actual area or activity on the site that may generate the higher potential pollutant load.

6. *Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and*

Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.

The project site does not discharge stormwater within a Zone II or Interim Wellhead Protection Area or near a critical area. Critical Areas are Outstanding Resource Waters as designated in 314 CMR 4.00, Special Resource Waters as designated in 314 CMR 4.00, recharge areas for public water supplies as defined in 310 CMR 22.02, bathing beaches as defined in 105 CMR 445.000, cold-water fisheries as defined in 314 CMR 9.02 and 310 CMR 10.04, and shellfish growing areas as defined in 314 CMR 9.02 and 310 CMR 10.04.

7. *A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.*

   The proposed project is not considered a re-development project under the Stormwater Management Handbook guidelines as there is an increase in the amount of impervious area.

8. *A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.*

   A plan to control construction-related impacts, including erosion, sedimentation and other pollutant sources during construction has been developed. A detailed Erosion and Sedimentation Control Plan is included in the Permit Drawings. The proponent will prepare and submit a Stormwater Pollution Prevention Plan (SWPPP) prior to commencement of construction activities that will result in the disturbance of one acre of land or more.

9. *A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.*

A Long-Term Operation & Maintenance (O&M) Plan has been developed for the proposed stormwater management system and is included within this document. See Section 2.0 of this report.

10. *All illicit discharges to the stormwater management system are prohibited.*

    There are no expected illicit discharges to the stormwater management system. 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.

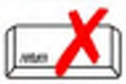
See the next page for the MassDEP Stormwater Checklist.

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.

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

1/26/26

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): Underground Infiltration Systems, Infiltration Bain

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 (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 (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 (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.

SECTION 2.0 -
OPERATION & MAINTENANCE PLAN

Introduction

In accordance with the standards set forth by the Stormwater Management Policy issued by the Massachusetts Department of Environmental Protection (MassDEP), Allen & Major Associates, Inc. has prepared the following Operations & Maintenance (O&M) Plan for the existing development at 27 Kimball Road, Amesbury, MA.

The plan is broken down into three major sections. The first section describes construction-related erosion and sedimentation controls (Demolition & Construction Maintenance Plan). The second section describes the long-term pollution prevention measures (Long Term Pollution Prevention Plan). The third section is a post-construction operation and maintenance plan designed to address the long-term maintenance needs of the stormwater management system (Long-Term Maintenance Plan – Facilities Description).

Notification Procedures for Change of Responsibility for O&M

The Stormwater Management System (SMS) for this project shall be owned by MP Properties IV, LLC (applicant). The owner shall be legally responsible for the long-term operation and maintenance of this SMS as outlined in this Operation and Maintenance Plan.

The owner shall submit an annual summary report and the completed Operation & Maintenance Schedule & Checklist to the Conservation Commission (via email or print copy), highlighting inspection and maintenance activities including performances of BMPs. Should ownership of the SMS change, the owner will continue to be responsible until the succeeding owner shall notify the Commission that the succeeding owner has assumed such responsibility. Upon subsequent transfers, the responsibility shall continue to be that of transferring owner until the transferee owner notifies the Commission of its assumption of responsibility.

In the event the SMS will serve multiple lots/owners, such as the subdivision of the existing parcel or creation of lease areas, the owner(s) shall establish an association on other legally enforceable arrangements under which the association or a single party shall have legal responsibility for the operation and maintenance of the entire SMS. The legal instrument creating such responsibility shall be recorded with the Registry of Deeds and promptly following its recording, a copy thereof shall be furnished to the Commission.

Contact Information

Stormwater Management System Owner:	MP Properties IV, LLC 201 Washington Street, Suite 2100 Boston, MA 02108 Phone: 617-780-0550

Emergency Contact Information:

MP Properties IV, LLC (Owner/Operator)	Phone: 617-780-0550
Allen & Major Associates, Inc. (Site Civil Engineer)	Phone: (781) 935-6889
Amesbury Department of Public Works	Phone: 978-388-8116
Amesbury Conservation Commission	Phone: 978-388-8110
Amesbury Fire Department (non-emergency line)	Phone: 978-388-8185
MassDEP Emergency Response	Phone: (888) 304-1133
Clean Harbors Inc (24-Hour Line)	Phone: (800) 645-8265

Demolition & Construction Maintenance Plan

1. Call Digsafe: 1-888-344-7233
2. Contact the City at least three (3) days prior to start of demolition and/or construction activities.
3. Install Erosion Control measures as shown on the Plans prepared by A&M. The City shall review the installation of straw bales and silt fencing prior to the start of any site demolition work. Install Construction fencing if determined to be necessary at the commencement of construction.
4. Install construction entrances, straw bales, and silt fence at the locations shown on the Erosion Control Plan prepared by A&M.
5. Site access shall be achieved only from the designated construction entrances.
6. Cut and clear trees in construction areas only (within the limit of work; see plans).
7. Stockpiles of materials subject to erosion shall be stabilized with erosion control matting or temporary seeding whenever practicable, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased.
8. Install silt sacks and straw bales around each drain inlet prior to any demolition and or construction activities.

9. All erosion control measures shall be inspected weekly and after every rainfall event. Records of these inspections shall be kept on-site for review.
10. All erosion control measures shall be maintained, repaired, or replaced as required or at the direction of the owner's engineer or the City.
11. Sediment accumulation up-gradient of the straw bales, silt fence, and stone check dams greater than 6" in depth shall be removed and disposed of in accordance with all applicable regulations.
12. If it appears that sediment is exiting the site, silt sacks shall be installed in all catch basins adjacent to the site. Sediment accumulation on all adjacent catch basin inlets shall be removed and the silt sack replaced if torn or damaged.
13. Install stone check dams on-site during construction as needed. Refer to the erosion control details. Temporary sediment basins combined with stone check damns shall be installed on-site during construction to control and collect runoff from upland areas of this site during demolition and construction activities.
14. The contractor shall comply with the Sedimentation and Erosion Control Notes as shown on the Site Development Plans and Specifications.
15. The stabilized construction entrances shall be inspected weekly and records of inspections kept. The entrances shall be maintained by adding additional clean, angular, durable stone to remove the soil from the construction vehicle's tires when exiting the site. If soil is still leaving the site via the construction vehicle tires, adjacent roadways shall be kept clean by street sweeping.
16. Dust pollution shall be controlled using on-site water trucks and/or an approved soil stabilization product.
17. During demolition and construction activities, Status Reports on compliance with this O&M Document shall be submitted weekly. The report shall document any deficiencies and corrective actions taken by the applicant.

Long-Term Pollution Prevention Plan

Standard #4 from the MassDEP Stormwater Management Handbook requires that a Long-Term Pollution Prevention Plan (LTPPP) be prepared and incorporated as part of the Operation and Maintenance Plan of the Stormwater Management System. The purpose of the LTPPP is to identify potential sources of pollution that may affect the quality of stormwater discharges, and to describe the implementation of practices to reduce the pollutants in stormwater discharges. The following items describe the source control and proper procedures of the LTPPP.

- Housekeeping
  The existing development has been designed to maintain a high level of water quality treatment for all stormwater discharge to the wetland areas. An Operation and Maintenance (O&M) plan has been prepared and is included in this section of the report. The owner (or its designee) is responsible for adherence to the O&M plan in a strict and complete manner.

- Storing of Materials & Water Products
  The trash and waste program for the site includes exterior dumpsters. There is a trash contractor used to pick up the waste material in the dumpsters. The stormwater drainage system has water quality inlets designed to capture trash and debris.
- Vehicle Washing
  Outdoor vehicle washing has the potential to result in high loads of nutrients, metals, and hydrocarbons during dry weather conditions, as the detergent-rich water used to wash the grime off the vehicle enters the stormwater drainage system. The existing development does not include any designated vehicle washing areas, nor is it expected that any vehicle washing will take place on-site.
- Spill Prevention & Response
  Sources of potential spill hazards include vehicle fluids, liquid fuels, pesticides, paints, solvents, and liquid cleaning products. The majority of the spill hazards would likely occur within the buildings and would not enter the stormwater drainage system. However, there are spill hazards from vehicle fluids or liquid fuels located outside of the buildings. These exterior spill hazards have the potential to enter the stormwater drainage system and are to be addressed as follows:
  1. Spill hazards of pesticides, paints, and solvents shall be remediated using the Manufacturers' recommended spill cleanup protocol.
  2. Vehicle fluids and liquid fuel spill shall be remediated according to the local and state regulations governing fuel spills.
  3. The owner shall have the following equipment and materials on hand to address a spill clean-up: brooms, dust pans, mops, rags, gloves, absorptive material, sand, sawdust, plastic and metal trash containers.
  4. All spills shall be cleaned up immediately after discovery.
  5. Spills of toxic or hazardous material shall be reported, regardless of size, to the Massachusetts Department of Environmental Protection at (888) 304-1333.

6. Should a spill occur, the pollution prevention plan will be adjusted to include measures to prevent another spill of a similar nature. A description of the spill, along with the causes and cleanup measures will be included in the updated pollution prevention plan.

- Maintenance of Lawns, Gardens, and Other Landscaped Areas
  It should be recognized that this is a general guideline towards achieving high quality and well-groomed landscaped areas. The grounds staff/landscape contractor must recognize the shortcomings of a general maintenance plan such as this, and modify and/or augment it based on weekly, monthly, and yearly observations. In order to assure the highest quality conditions, the staff must also recognize and appreciate the need to be aware of the constantly changing conditions of the landscaping and be able to respond to them on a proactive basis. No trees shall be planted over the drain lines or recharge area, and that only shallow rooted plants and shrubs will be allowed.

  - Fertilizer
    Maintenance practices should be aimed at reducing environmental, mechanical and pest stresses to promote healthy and vigorous growth. When necessary, pest outbreaks should be treated with the most sensitive control measure available. Synthetic chemical controls should be used only as a last resort to organic and biological control methods. Fertilizer, synthetic chemical controls and pest management applications (when necessary) shall be performed only by licensed applicators in accordance with the manufacturer's label instructions when environmental conditions are conducive to controlled product application.

    Only slow-release organic fertilizers should be used in the planting and mulch areas to limit the amount of nutrients that could enter downstream resource areas. Fertilization of the planting and mulch areas will be performed within manufacturers labeling instructions and shall not exceed an NPK ration of 1:1:1 (i.e. Triple 10 fertilizer mix), considered a low nitrogen mixture. Fertilizers approved for the use under this O&M Plan are as follows:

    Type: LESCO® 28-0-12 (Lawn Fertilizer)
    MERIT® 0.2 Plus Turf Fertilizer
    MOMENTUM™ Force Weed & Feed

  - Suggested Aeration Program
    In-season aeration of lawn areas is good cultural practice, and is recommended whenever feasible. It should be accomplished with a solid thin tine aeration method to reduce disruption to the use of the area. The

depth of solid tine aeration is similar to core type, but should be performed when the soil is somewhat drier for a greater overall effect.

Depending on the intensity of use, it can be expected that all landscaped lawn areas will need aeration to reduce compaction at least once per year. The first operation should occur in late May following the spring season. Methods of reducing compaction will vary based on the nature of the compaction. Compaction on newly established landscaped areas is generally limited to the top 2-3" and can be alleviated using hollow core or thin tine aeration methods.

The spring aeration should consist of two passes at opposite directions with 1/4" hollow core tines penetrating 3-5" into the soil profile. Aeration should occur when the soil is moist but not saturated. The soil cores should be shattered in place and dragged or swept back into the turf to control thatch. If desired the cores may also be removed and the area top-dressed with sand or sandy loam. If the area drains on average too slowly, the topdressing should contain a higher percentage of sand. If it is draining on average too quickly, the top dressing should contain a higher percentage of soil and organic matter.

- Landscape Maintenance Program Practices:
  - Lawn

    1. Mow a minimum of once a week in spring, to a height of 2" to 2 1/2" high. Mowing should be frequent enough so that no more than 1/3 of grass blade is removed at each mowing. The top growth supports the roots; the shorter the grass is cute, the less the roots will grow. Short cutting also dries out the soil and encourages weeds to germinate.
    2. Mow approximately once every two weeks from July 1st to August 15th depending on lawn growth.
    3. Mow on a ten-day cycle in fall, when growth is stimulated by cooler nights and increased moisture.
    4. Do not remove grass clippings after mowing.
    5. Keep mower blades sharp to prevent ragged cuts on grass leaves, which cause a brownish appearance and increase the chance for disease to enter a leaf.

  - Shrubs

    1. Mulch not more than 3" depth with shredded pine or fir bark.

2. Hand prune annually, immediately after blooming, to remove 1/3 of the above-ground biomass (older stems). Stem removals are to occur within 6″ of the ground to open up shrub and maintain two-year wood (the blooming wood).
3. Hand-prune evergreen shrubs only as needed to remove dead and damaged wood and to maintain the naturalistic form of the shrub. Never mechanically shear evergreen shrubs.

- Trees
  1. Provide aftercare of new tree plantings for the first three years.
  2. Do not fertilize trees, it artificially stimulates them (unless tree health warrants).
  3. Water once a week for the first year; twice a month for the second; once a month for the third year.
  4. Prune trees on a four-year cycle.
- Invasive Species
  1. Inform the Conservation Commission Agent prior to the removal of invasive species proposed either through hand work or through chemical removal.

- Storage and Use of Herbicides and Pesticides

  Integrated Pest Management is the combination of all methods (of pest control) which may prevent, reduce, suppress, eliminate, or repel an insect population. The main requirements necessary to support any pest population are food, shelter and water, and any upset of the balance of these will assist in controlling a pest population. Scientific pest management is the knowledgeable use of all pest control methods (sanitation, mechanical, chemical) to benefit mankind's health, welfare, comfort, property and food. A Pest Management Professional (PMP) should be retained who is licensed with the Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs, Department of Agricultural Resources.

  The site manager will be provided with approved bulletin before entering into or renewing an agreement to apply pesticides for the control of indoor household or structural pests, refer to 333 CMR 13.08.

  Before beginning each application, the applicator must post a Department approved notice on all of the entrances to the treated room or area. The applicator must leave such notices posted after the application. The notice will be posted at conspicuous point(s) of access to the area treated. The location and number of signs will be determined by the configuration of the area to be treated based on the applicator's best judgment. It is intended to give sufficient notice so that no one comes into an area being treated unaware that the applicator is working and pesticides are being applied. However, if the contracting entity does not want the signs posted, he/she may sign a Department approved waiver indicating this.

The applicator or employer will provide to any person upon their request the following information on previously conducted applications:

1. Name and phone number of pest control company;
2. Date and time of the application;
3. Name and license number of the applicator;
4. Target pests; and
5. Name and EPA Registration Number of pesticide products applied.

- Pet Waste Management
  The owner's landscape crew (or designee) shall remove any obvious pet waste that has been left behind by pet owners within the development. The pet waste shall be disposed of in accordance with local and state regulations.
- Operations and Management of Septic Systems
  There are no proposed septic systems within the limits of the project.
- Management of Deicing Chemicals and Snow
  Snow will be stockpiled on site until the accumulated snow becomes a hazard to the daily operations of the site. It will be the responsibility of the snow removal contractor to properly dispose of transported snow according to MassDEP, Bureau of Resource Protection – Snow Disposal Guideline #BRPG01-01, governing the proper disposal of snow. It will be the responsibility of the snow removal contractor to follow these guidelines and all applicable laws and regulations

  The owner's maintenance staff (or its designee) will be responsible for the clearing of the sidewalk and building entrances. The owner may be required to use a de-icing agent such as potassium chloride to maintain a safe walking surface. If used, the de-icing agent for the walkways and building entrances will be kept within the storage rooms located within the building. If used, de-icing agents will not be stored outside. The owner's maintenance staff will limit the application of sand.

Long-Term Maintenance Plan – Facilities Description

A maintenance log will be kept (i.e. report) summarizing inspections, maintenance, and any corrective actions taken. The log will include the date on which each inspection or maintenance task was performed, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task. If a maintenance task requires the clean-out of any sediments or debris, the location where the sediment and debris was disposed after removal will be indicated. The log will be made accessible to department staff and a copy provided to the department upon request.

The following is a description of the Stormwater Management System for the project site.

Stormwater Collection System – On-Site:

The stormwater collection system is a series of inlets located at low points within the limits of the paved area. All of the proposed on-site catch basins incorporate a deep sump and hooded outlet. The catch basins are connected by a closed gravity pipe network that pass through proprietary separators prior to entering the underground detention chambers.

Structural Pretreatment BMPs: Regular maintenance of these BMPs is especially critical because they typically receive the highest concentration of suspended solids during the first flush of a storm event.

- Deep Sump Catch Basin
  Inspect catch basins to ensure that the catch basins are working in their intended fashion and that they are free of debris. Structures will be skimmed of floatable debris at each inspection and sediment will be removed at a minimum once per year (typically after snow season) or when sediment has accumulated to within 2 feet of the outlet invert. If the basin outlet is designed with a hood to trap floatable materials (i.e., Snout), check to ensure watertight seal is working.

- Proprietary Separators

  Separators shall be operated in strict accordance with manufacturer's recommended practices. Available manufacturer specific O&M plans attached as Appendix. Separators shall be inspected to ensure that they are working in their intended fashion and that they are free of debris. Structures shall be cleaned with a vacuum truck at least once annually (typically after snow season) or when sediment has accumulated to a depth of six inches (6"), whichever is more frequent.

Infiltration BMPs:

- Infiltration Basin:
  Inspect to ensure proper functioning. Mow the buffer area, side slopes, and basin bottom if grassed floor; rake if stone bottom; remove trash and debris; remove grass clippings and accumulated organic matter.

  Inspect and clean pretreatment devices.

- Subsurface Structures:
  Because subsurface structures are installed underground, they are extremely difficult to maintain. Remove any debris that might clog the system.

Other BMPs and Accessories:

- Outlet Structures
  Clear trash and debris as necessary/

Other Maintenance Activity:

- Mosquito Control - Both above ground and underground stormwater BMPs have the potential to serve as mosquito breeding areas. Good design, proper operation and maintenance, and treatment with larvicides can minimize this potential. See the supplemental information for Mosquito Control in Stormwater Management Practices, and the Operation and Maintenance Plan Schedule for inspection schedule.
- Street Sweeping - Clear accumulations of winter sand in parking lots and along roadways at least once a year, preferably in the spring. Accumulations on pavement may be removed by pavement sweeping. Accumulations of sand along road shoulders may be removed by grading excess sand to the pavement edge and removing it manually or by a front-end loader.

Inspection and Maintenance Frequency and Corrective Measures

In accordance with MA DEP Stormwater Handbook: Volume 2, Chapter 2; the previously described BMPs will be inspected and the identified deficiencies will be corrected. Clean-out must include the removal and legal disposal of any accumulated sediments, trash, and debris. In any and all cases, operations, inspections, and maintenance activities shall utilize best practical measures to avoid and minimize impacts to wetland resource areas outside the footprint of the SMS.

Supplemental Information

- Operation & Maintenance Plan Schedule
- Massachusetts Stormwater Handbook, Chapter 5, Miscellaneous Stormwater Topics, Mosquito Control in Stormwater Management Practices.

OPERATION AND MAINTENANCE PLAN SCHEDULE **Date: 1/26/2025**

ALLEN & MAJOR ASSOCIATES, INC.

Project: 27 Kimball Road
Project Address: 27 Kimball Road, Amesbury, MA

Responsible for O&M Plan: MP Properties IV, LLC
Address: One Boston Place 201 Washington Street, Suite 2100
Phone: 617-780-0550

All information within table is derived from Massachussetts Stormwater Handbook: Volume 2, Chapter 2

BMP CATEGORY	BMP OR MAINTENANCE ACTIVITY	SCHEDULE/ FREQUENCY	NOTES	ESTIMATED ANNUAL MAINTENANCE COST	INSPECTION PERFORMED	
					DATE:	BY:
STRUCTURAL PRETREATMENT BMPs	DEEP SUMP CATCH BASIN	Four times per year (quarterly).	Inspect and clean catch basin units whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.	$1,000		
STRUCTURAL PRETREATMENT BMPs	PROPRIETARY SEPARATORS	In accordance with manufacturers requirements, but no less than twice a year following installation and once a year thereafter.	Remove sediment and other trapped pollutants at frequency or level specified by manufacturer.	$2,000		
INFILTRATION BMPs	INFILTRATION BASIN	Inspect after every major storm during first 3 months of operation and twice a year thereafter. Clean pretreatment devices twice a year and after every major storm.	Inspect to ensure proper functioning. Mow the buffer area, side slopes, and basin bottom if grassed floor; rake if stone bottom; remove trash and debris; remove grass clippings and accumulated organic matter. Inspect and clean pretreatment devices.	$1,500		
INFILTRATION BMPs	SUBSURFACE STRUCTURES	Inspect structure inlets at least twice a year. Remove debris that may clog the system as needed.	Because subsurface structures are installed underground, they are extremely difficult to maintain. Remove any debris that might clog the system.	$500		
BMP ACCESSORIES	OUTLET STRUCTURES	Periodic cleaning of Outlet Control Structures as needed.	Clear trash and debris as necessary.	$500		

OTHER MAINTENANCE ACTIVITY	**MOSQUITO CONTROL**	Inspect BMPs as needed to ensure the system's drainage time is less than the maximum 72 hour period.	Massachusetts stormwater handbook requires all stormwater practices that are designed to drain do so within 72 hours to reduce the number of mosquitos that mature to adults since the aquatic stage of a mosquito is 7-10 days.	$100		
	SNOW STORAGE	Clear and remove snow to approved storage locations as necessary to ensure systems are working properly and are protected from meltwater pollutants.	Carefully select snow disposal sites before winter. Avoid dumping removed snow over catch basins, or in detention ponds, sediment forebays, rivers, wetlands, and flood plains. It is also prohibited to dump snow in the bioretention basins or gravel swales.	$500		
	STREET SWEEPING	Clear accumulations of winter sand in parking lots and along roadways at least once a year, preferably in the spring.	Sweep, power broom or vacuum paved areas. Submit information that confirms that all street sweepings have been completed in accordance with state and local requirements	$2,000		

Chapter 5
Miscellaneous Stormwater Topics

Mosquito Control in Stormwater Management Practices

Both aboveground and underground stormwater BMPs have the potential to serve as mosquito breeding areas. Good design, proper operation and maintenance and treatment with larvicides can minimize this potential.

EPA recommends that stormwater treatment practices dewater within 3 days (72 hours) to reduce the number of mosquitoes that mature to adults, since the aquatic stage of many mosquito species is 7 to 10 days. Massachusetts has had a 72-hour dewatering rule in its Stormwater Management Standards since 1996. The 2008 technical specifications for BMPs set forth in Volume 2, Chapter 2 of the Massachusetts Stormwater Handbook also concur with this practice by requiring that all stormwater practices designed to drain do so within 72 hours.

Some stormwater practices are designed to include permanent wet pools. These practices – if maintained properly – can limit mosquito breeding by providing habitat for mosquito predators. Additional measures that can be taken to reduce mosquito populations include increasing water circulation, attracting mosquito predators by adding suitable habitat, and applying larvicides.

The Massachusetts State Reclamation and Mosquito Control Board (SRMCB), through the Massachusetts Mosquito Control Districts, can undertake further mosquito control actions specifically for the purpose of mosquito control pursuant to Massachusetts General Law Chapter 252. The Mosquito Control Board, http://www.mass.gov/agr/mosquito/, describes mosquito control methods and is in the process of developing guidance documents that describe Best Management Practices for mosquito control projects.

The SRMCB and Mosquito Control Districts are not responsible for operating and maintaining stormwater BMPs to reduce mosquito populations. The owners of property that construct the stormwater BMPs or municipalities that "accept" them through local subdivision approval are responsible for their maintenance.[1] The SRMCB is composed of officials from MassDEP, Department of Agricultural Resources, and Department of Conservation and Recreation. The nine (9) Mosquito Control Districts overseen by the SRMCB are located throughout Massachusetts, covering 176 municipalities.

Construction Period Best Management Practices for Mosquito Control

To minimize mosquito breeding during construction, it is essential that the following actions be taken to minimize the creation of standing pools by taking the following actions:

- ***Minimize Land Disturbance:*** Minimizing land disturbance reduces the likelihood of mosquito breeding by reducing silt in runoff that will cause construction period controls to clog and retain standing pools of water for more than 72 hours.
- ***Catch Basin inlets:*** Inspect and refresh filter fabric, hay bales, filter socks or stone dams on a regular basis to ensure that any stormwater ponded at the inlet drains within 8 hours after precipitation stops. Shorter periods may be necessary to avoid hydroplaning in roads

[1] MassDEP and MassHighway understand that the numerous stormwater BMPs along state highways pose a unique challenge. To address this challenge, the 2004 MassHighway Stormwater Handbook will provide additional information on appropriate operation and maintenance practices for mosquito control when the Handbook is revised to reflect the 2008 changes to the Stormwater Management Standards..

caused by water ponded at the catch basin inlet. Treat catch basin sumps with larvicides such as *Bacillus sphaericus* (*Bs*) using a licensed pesticide applicator.

- ***Check Dams:*** If temporary check dams are used during the construction period to lag peak rate of runoff or pond runoff for exfiltration, inspect and repair the check dams on a regular basis to ensure that any stormwater ponded behind the check dam drains within 72 hours.
- ***Design construction period sediment traps*** to dewater within 72 hours after precipitation. Because these traps are subject to high silt loads and tend to clog, treat them with the larvicide *Bs* after it rains from June through October, until the first frost occurs.
- ***Construction period open conveyances:*** When temporary manmade ditches are used for channelizing construction period runoff, inspect them on a regular basis to remove any accumulated sediment to restore flow capacity to the temporary ditch.
- ***Revegetating Disturbed Surfaces:*** Revegetating disturbed surfaces reduces sediment in runoff that will cause construction period controls to clog and retain standing pools of water for greater than 72 hours.
- ***Sediment fences/hay bale barriers:*** When inspections find standing pools of water beyond the 24-hour period after a storm, take action to restore barrier to its normal function.

<u>Post-Construction Stormwater Treatment Practices</u>

- Mosquito control begins with the environmentally sensitive site design. Environmentally sensitive site design that minimizes impervious surfaces reduces the amount of stormwater runoff. Disconnecting runoff using the LID Site Design credits outlined in the Massachusetts Stormwater Handbook reduces the amount of stormwater that must be conveyed to a treatment practice. Utilizing green roofs minimizes runoff from smaller storms. Storage media must be designed to dewater within 72 hours after precipitation.
- Mosquito control continues with the selection of structural stormwater BMPs that are unlikely to become breeding grounds for mosquitoes, such as:
    - ***Bioretention Areas/Rain Gardens/Sand Filter:*** These practices tend not to result in mosquito breeding. If any level spreaders, weirs or sediment forebays are used as part of the design, inspect them and correct them as necessary to prevent standing pools of water for more than 72 hours.
    - ***Infiltration Trenches:*** This practice tends not to result in mosquito breeding. If any level spreaders, weirs, or sediment forebays are used as part of the design, inspect them and correct them as necessary to prevent standing pools of water for more than 72 hours.
- Another mosquito control strategy is to select BMPs that can become habitats for mosquito predators, such as:
    - ***Constructed Stormwater Wetlands:*** Habitat features can be incorporated in constructed stormwater wetlands to attract dragonflies, amphibians, turtles, birds, bats, and other natural predators of mosquitoes.
    - ***Wet Basins:*** Wet basins can be designed to incorporate fish habitat features, such as deep pools. Introduce fish in consultation with Massachusetts Division of Fisheries and Wildlife. Vegetation within wet basins designed as fish habitat must be properly managed to ensure that vegetation does not overtake the habitat. Proper design to ensure that no low circulation or "dead" zones are created may reduce the potential for mosquito breeding. Introducing bubblers may increase water circulation in the wet basin.

Effective mosquito controls require proponents to design structural BMPs to prevent ponding and facilitate maintenance and, if necessary, the application of larvicides. Examples of such design practices include the following:

- ***Basins:*** Provide perimeter access around wet basins, extended dry detention basins and dry detention basins for both larviciding and routine maintenance. Control vegetation to ensure that access pathways stay open.
- ***BMPs without a permanent pool of water:*** All structural BMPs that do not rely on a permanent pool of water must drain and completely dewater within 72 hours after precipitation. This includes dry detention basins, extended dry detention basins, infiltration basins, and dry water quality swales. Use underdrains at extended dry detention basins to drain the small pools that form due to accumulation of silts. Wallace indicates that extended dry extended detention basins may breed more mosquitoes than wet basins. It is, therefore, imperative to design outlets from extended dry detention basins to completely dewater within the 72-hour period.
- ***Energy Dissipators and Flow Spreaders:*** Currier and Moeller, 2000 indicate that shallow recesses in energy dissipators and flow spreaders trap water where mosquitoes breed. Set the riprap in grout to reduce the shallow recesses and minimize mosquito breeding.
- ***Outlet control structures:*** Debris trapped in small orifices or on trash racks of outlet control structures such as multiple stage outlet risers may clog the orifices or the trash rack, causing a standing pool of water. Optimize the orifice size or trash rack mesh size to provide required peak rate attenuation/water quality detention/retention time while minimizing clogging.
- ***Rain Barrels and Cisterns:*** Seal lids to reduce the likelihood of mosquitoes laying eggs in standing water. Install mosquito netting over inlets. The cistern system should be designed to ensure that all collected water is drained into it within 72 hours.
- ***Subsurface Structures, Deep Sump Catch Basins, Oil Grit Separators, and Leaching Catch Basins:*** Seal all manhole covers to reduce likelihood of mosquitoes laying eggs in standing water. Install mosquito netting over the outlet (CALTRANS 2004).

The Operation and Maintenance Plan should provide for mosquito prevention and control.

- ***Check dams:*** Inspect permanent check dams on the schedule set forth in the O&M Plan. Inspect check dams 72 hours after storms for standing water ponding behind the dam. Take corrective action if standing water is found.
- ***Cisterns:*** Apply *Bs* larvicide in the cistern if any evidence of mosquitoes is found. The Operation and Maintenance Plan shall specify how often larvicides should be applied to waters in the cistern.
- ***Water quality swales:*** Remove and properly dispose of any accumulated sediment as scheduled in the Operation and Maintenance Plan.
- ***Larvicide Treatment:*** The Operation and Maintenance Plan must include measures to minimize mosquito breeding, including larviciding.
- The party identified in the Operation and Maintenance Plan as responsible for maintenance shall see that larvicides are applied as necessary to the following stormwater treatment practices: catch basins, oil/grit separators, wet basins, wet water quality swales, dry extended detention basins, infiltration basins, and constructed stormwater wetlands. The Operation and Maintenance Plan must ensure that all larvicides are applied by a licensed pesticide applicator and in compliance with all pesticide label requirements.
- The Operation and Maintenance Plan should identify the appropriate larvicide and the time and method of application. For example, *Bacillus sphaericus (Bs*), the preferred

larvicide for stormwater BMPs, should be hand-broadcast.[2] Alternatively, Altosid, a Methopren product, may be used. Because some practices are designed to dewater between storms, such as dry extended detention and infiltration basins, the Operation and Maintenance Plan should provide that larviciding must be conducted during or immediately after wet weather, when the detention or infiltration basin has a standing pool of water, unless a product is used that can withstand extended dry periods.

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[2] *Bacillus thuringienis israelensis* or *Bti* is usually applied by helicopter to wetlands and floodplains

Roads and Stormwater BMPs

In general, the stormwater BMPs used for land development projects can also be used for new roadways and roadway improvement projects. However, for improvement of existing roads, there are often constraints that limit the choice of BMP. These constraints derive from the linear configuration of the road, the limited area within the existing right-of-way, the structural and safety requirements attendant to good roadway design, and the long-term maintainability of the roadway drainage systems. The MassHighway Handbook provides strategies for dealing with the constraints associated with providing stormwater BMPs for roadway redevelopment projects.

Roadway design can minimize impacts caused by stormwater. Reducing roadway width reduces the total and peak volume of runoff. Designing a road with country drainage (no road shoulders or curbs) disconnects roadway runoff. Disconnection of roadway runoff is eligible for the Low Impact Site Design Credit provided the drainage is disconnected in accordance with specifications outlined in Volume 3.

Like other parties, municipalities that work within wetlands jurisdictional areas and adjacent buffer zones must design and implement structural stormwater best management practices in accordance with the Stormwater Management Standards and the Stormwater Management Handbook. In addition, in municipalities and areas where state agencies operate stormwater systems, the DPWs (or other town or state agencies) must meet the "good housekeeping" requirement of the municipality's or agency's MS4 permit.

MassHighway has taken stormwater management one step further by working with MassDEP to develop the MassHighway Storm Water Handbook for Highways and Bridges. The purpose of the MassHighway Handbook is to provide guidance for persons involved in the design, permitting, review and implementation of state highway projects, especially those involving existing roadways where physical constraints often limit the stormwater management options available. These constraints, like those common to redevelopment sites, may make it difficult to comply precisely with the requirements of the Stormwater Management Standards and the Massachusetts Stormwater Handbook.[3] In response to these constraints, MassDEP and MHD developed specific design, permitting, review and implementation practices that meet the unique challenges of providing environmental protection for existing state roads. The information in the MassHighway Handbook may also aid in the planning and design of projects to build new highways and to add lanes to existing highways, since they may face similar difficulties in meeting the requirements of the Stormwater Management Standards.

Although it is very useful, the MassHighway Handbook does not allow MassHighway projects to proceed without individual review and approval by the issuing authority when subject to the Wetlands Protection Act Regulations, 310 CMR 10.00, or the 401 Water Quality Certification Regulations, 314 CMR 9.00. For example, MassHighway must provide a Conservation Commission with a project-specific Operation and Maintenance Plan in accordance with Standard 9 that documents how the project's post-construction BMPs will be operated and maintained.[4]

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[3] The 2004 MassHighway Handbook outlines standardized methods for dealing with these constraints as they apply to highway redevelopment projects. MassDEP and MassHighway intend to work together to provide guidance for add a lane projects when the 2004 Handbook is revised to reflect the 2008 changes to the Stormwater Management Standards.

[4] The general permit for municipal separate storm sewer systems (the MS4 Permit) requires MassHighway to develop and implement procedures for the proper operation and maintenance of stormwater BMPs. To

Some municipalities have asked if the MassHighway Handbook governs municipal road projects. The answer is no.[5] The MassHighway Handbook was developed in response to the unique problems and challenges arising out of the management of the state highway system. Like other project proponents, cities and towns planning road or other projects in areas subject to jurisdiction under the Wetlands Protection Act must design and implement LID, non-structural and structural best management practices in accordance with the Stormwater Management Standards and the Massachusetts Stormwater Handbook.

avoid duplication of effort, MassHighway may be able rely on the same procedures to fulfill the operation and maintenance requirements of Standard 9 and the MS 4 Permit.

[5] Although the MassHighway Handbook does not govern municipal road projects, cities and towns may find some of the information presented in the Handbook useful.

Massachusetts Department of Environmental Protection
Bureau of Water Resources
Snow Disposal Guidance

Effective Date: December 23, 2019

Applicability: Applies to all federal, state, regional and local agencies, as well as to private businesses.

Supersedes: Bureau of Resource Protection (BRP) Snow Disposal Guideline No. BRPG97-1 issued December 12, 1997 and BRPG01-01 issued March 8, 2001; Bureau of Water Resources (BWR) snow disposal guidance issued December 21, 2015 and December 12, 2018.

Approved by: Kathleen Baskin, Assistant Commissioner, Bureau of Water Resources

PURPOSE: To provide guidelines to all government agencies and private businesses regarding snow disposal site selection, site preparation and maintenance, and emergency snow disposal options that are protective of wetlands, drinking water, and water bodies, and are acceptable to the Massachusetts Department of Environmental Protection (MassDEP), Bureau of Water Resources.

APPLICABILITY: These Guidelines are issued by MassDEP's Bureau of Water Resources on behalf of all Bureau Programs (including Drinking Water Supply, Wetlands and Waterways, Wastewater Management, and Watershed Planning and Permitting). They apply to all federal agencies, state agencies, state authorities, municipal agencies and private businesses disposing of snow in the Commonwealth of Massachusetts.

INTRODUCTION

Finding a place to dispose of collected snow poses a challenge to municipalities and businesses as they clear roads, parking lots, bridges, and sidewalks. While MassDEP is aware of the threats to public safety caused by snow, collected snow that is contaminated with road salt, sand, litter, and automotive pollutants such as oil also threatens public health and the environment.

As snow melts, road salt, sand, litter, and other pollutants are transported into surface water or through the soil where they may eventually reach the groundwater. Road salt and other pollutants can contaminate water supplies and are toxic to aquatic life at certain levels. Sand washed into waterbodies can create sand bars or fill in wetlands and ponds, impacting aquatic life, causing flooding, and affecting our use of these resources.

There are several steps that communities can take to minimize the impacts of snow disposal on public health and the environment. These steps will help communities avoid the costs of a contaminated water supply, degraded waterbodies, and flooding. Everything that occurs on the land has the potential to impact the Commonwealth's water resources. Given the authority of local government over the use of the land, municipal officials and staff have a critically important role to play in protecting our water resources.

The purpose of these guidelines is to help federal agencies, state agencies, state authorities, municipalities and businesses select, prepare, and maintain appropriate snow disposal sites before the snow begins to accumulate through the winter. Following these guidelines and obtaining the necessary approvals may also help municipalities in cases when seeking reimbursement for snow disposal costs from the Federal Emergency Management Agency is possible.

RECOMMENDED GUIDELINES

These snow disposal guidelines address: (1) site selection; (2) site preparation and maintenance; and (3) emergency snow disposal.

1. SITE SELECTION

The key to selecting effective snow disposal sites is to locate them adjacent to or on pervious surfaces in upland areas or upland locations on impervious surfaces away from water resources and drinking water wells. At these locations, the snow meltwater can filter into the soil, leaving behind sand and debris which can be removed in the spring. The following conditions should be followed:

- Within water supply Zone A and Zone II, avoid storage or disposal of snow and ice containing deicing chemicals that has been collected from streets located outside these zones. Municipalities may have a water supply protection land use control that prohibits the disposal of snow and ice containing deicing chemicals from outside the Zone A and Zone II, subject to the Massachusetts Drinking Water Regulations at 310 CMR 22.20C and 310 CMR 22.21(2).
- Avoid storage or disposal of snow or ice in Interim Wellhead Protection Areas (IWPA) of public water supply wells, and within 75 feet of a private well, where road salt may contaminate water supplies.
- Avoid dumping snow into any waterbody, including rivers, the ocean, reservoirs, ponds, or wetlands. In addition to water quality impacts and flooding, snow disposed of in open water can cause navigational hazards when it freezes into ice blocks.
- Avoid dumping snow on MassDEP-designated high and medium-yield aquifers where it may contaminate groundwater.
- Avoid dumping snow in sanitary landfills and gravel pits. Snow meltwater will create more contaminated leachate in landfills posing a greater risk to groundwater, and in gravel pits, there is little opportunity for pollutants to be filtered out of the meltwater because groundwater is close to the land surface.

- Avoid disposing of snow on top of storm drain catch basins or in stormwater drainage systems including detention basins, swales or ditches. Snow combined with sand and debris may block a stormwater drainage system, causing localized flooding. A high volume of sand, sediment, and litter released from melting snow also may be quickly transported through the system into surface water.

Recommended Site Selection Procedures

It is important that the municipal Department of Public Works or Highway Department, Conservation Commission, and Board of Health work together to select appropriate snow disposal sites. The following steps should be taken:

- Estimate how much snow disposal capacity may be needed for the season so that an adequate number of disposal sites can be selected and prepared.
- Identify sites that could potentially be used for snow disposal, such as municipal open space (e.g., parking lots or parks).
- Select sites located in upland locations that are not likely to impact sensitive environmental resources first.
- If more storage space is still needed, prioritize the sites with the least environmental impact (using the site selection criteria, and local or MassGIS maps as a guide).

Snow Disposal Mapping Assistance

MassDEP has an online mapping tool to assist in identifying possible locations to potentially dispose of snow. MassDEP encourages municipalities to use this tool to identify possible snow disposal options. The tool identifies wetland resource areas, public drinking water supplies and other sensitive locations where snow should not be disposed. The tool may be accessed through the Internet at the following web address:
https://maps.env.state.ma.us/dep/arcgis/js/templates/PSF/.

2. SITE PREPARATION AND MAINTENANCE

In addition to carefully selecting disposal sites before the winter begins, it is important to prepare and maintain these sites to maximize their effectiveness. The following maintenance measures should be undertaken for all snow disposal sites:

- A silt fence or equivalent barrier should be placed securely on the downgradient side of the snow disposal site.
- Wherever possible maintain a 50-foot vegetated buffer between the disposal site and adjacent waterbodies to filter pollutants from the meltwater.
- Clear debris from the site prior to using the site for snow disposal.
- Clear debris from the site and properly dispose of it at the end of the snow season, and no later than May 15.

3. SNOW DISPOSAL APPROVALS

Proper snow disposal may be undertaken through one of the following approval procedures:

- Routine snow disposal – Minimal, if any, administrative review is required in these cases when upland and pervious snow disposal locations or upland locations on impervious surfaces that have functioning and maintained stormwater management systems have been identified, mapped, and used for snow disposal following ordinary snowfalls. Use of upland and pervious snow disposal sites avoids wetland resource areas and allows snow meltwater to recharge groundwater and will help filter pollutants, sand, and other debris. This process will address the majority of snow removal efforts until an entity exhausts all available upland snow disposal sites. The location and mapping of snow disposal sites will help facilitate each entity's routine snow management efforts.
- Emergency Certifications – If an entity demonstrates that there is no remaining capacity at upland snow disposal locations, local conservation commissions may issue an Emergency Certification under the Massachusetts Wetlands Protection regulations to authorize snow disposal in buffer zones to wetlands, certain open water areas, and certain wetland resource areas (i.e. within flood plains). Emergency Certifications can only be issued at the request of a public agency or by order of a public agency for the protection of the health or safety of citizens, and are limited to those activities necessary to abate the emergency. See 310 CMR 10.06(1)-(4). Use the following guidelines in these emergency situations:
    - Dispose of snow in open water with adequate flow and mixing to prevent ice dams from forming.
    - Do not dispose of snow in salt marshes, vegetated wetlands, certified vernal pools, shellfish beds, mudflats, drinking water reservoirs and their tributaries, Zone IIs or IWPAs of public water supply wells, Outstanding Resource Waters, or Areas of Critical Environmental Concern.
    - Do not dispose of snow where trucks may cause shoreline damage or erosion.
    - Consult with the municipal Conservation Commission to ensure that snow disposal in open water complies with local ordinances and bylaws.

- Severe Weather Emergency Declarations – In the event of a large-scale severe weather event, MassDEP may issue a broader Emergency Declaration under the Wetlands Protection Act which allows federal agencies, state agencies, state authorities, municipalities, and businesses greater flexibility in snow disposal practices. Emergency Declarations typically authorize greater snow disposal options while protecting especially sensitive resources such as public drinking water supplies, vernal pools, land containing shellfish, FEMA designated floodways, coastal dunes, and salt marsh. In the event of severe winter storm emergencies, the snow disposal site maps created by municipalities will enable MassDEP and the Massachusetts Emergency Management Agency (MEMA) in helping communities identify appropriate snow disposal locations.

  If upland disposal sites have been exhausted, the Emergency Declaration issued by MassDEP allows for snow disposal near water bodies. In these situations, a buffer of at least 50 feet, preferably vegetated, should still be maintained between the site and the waterbody. Furthermore, it is essential that the other guidelines for preparing and maintaining snow disposal sites be followed to minimize the threat to adjacent waterbodies.

Under extraordinary conditions, when all land-based snow disposal options are exhausted, the Emergency Declaration issued by MassDEP may allow disposal of snow in certain waterbodies under certain conditions. ***A federal agency, state agency, state authority, municipality or business seeking to dispose of snow in a waterbody should take the following steps***:

- Call the emergency contact phone number [(888) 304-1133)] and notify the MEMA of the municipality's intent.
- MEMA will ask for some information about where the requested disposal will take place.
- MEMA will confirm that the disposal is consistent with MassDEP's Severe Weather Emergency Declaration and these guidelines and is therefore approved.

During declared statewide snow emergency events, MassDEP's website will also highlight the emergency contact phone number [(888) 304-1133)] for authorizations and inquiries. For further non-emergency information about this Guidance you may contact your MassDEP Regional Office Service Center:

Northeast Regional Office, Wilmington, 978-694-3246
Southeast Regional Office, Lakeville, 508-946-2714
Central Regional Office, Worcester, 508-792-7650
Western Regional Office, Springfield, 413-755-2114

CONTECH® CONSTRUCTION PRODUCTS INC.

CDS® Inspection and Maintenance Guide

CDS TECHNOLOGIES

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

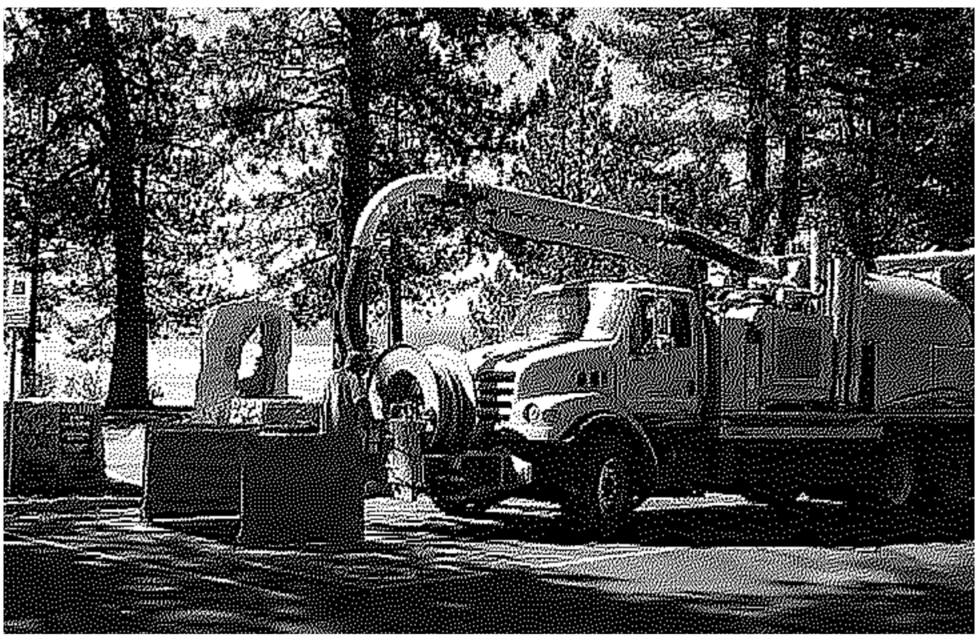
Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	yd3	m3
CDS2015-4	4	1.2	3.0	0.9	0.5	0.4
CDS2015	5	1.5	3.0	0.9	1.3	1.0
CDS2020	5	1.5	3.5	1.1	1.3	1.0
CDS2025	5	1.5	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities



Support

- Drawings and specifications are available at www.contechstormwater.com.
- Site-specific design support is available from our engineers.

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800.925.5240
contechstormwater.com

CDS Inspection & Maintenance Log

CDS Model: ______________________ Location: ______________________

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than eighteen inches the system should be cleaned out. **Note: To avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.**

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

CONTECH ENGINEERED SOLUTIONS

Inspection & Maintenance Guide for

Corrugated Steel Pipe Underground Infiltration Systems

Safety: Before entering into any storm sewer or underground detention/infiltration system check to make sure all OSHA and local safety regulations and guidelines are observed during the maintenance process. Hard hats, safety glasses, steel-toed boots and any other appropriate personal protective equipment shall be worn at all times.

Frequency: Inspections shall be completed annually.

Inspection Check List:

√ Check quality of parking lot surface.

- Is there evidence of potholes or sinkholes?
- Is there evidence of an unusual amount of silt and soil build-up on the surface?

√ Check for pipe symmetry (uniform curvature).

- Flexible steel pipe is designed to handle minor deflections. Pipe structures deflected more than 7% from design shape, or those that show localized distortions may require further investigation.

√ Check for pipe joint quality.

- Is there evidence of backfill material infiltrating into the pipe structure?

√ Silt Deposition

- If accumulated silt is interfering with the operation of the infiltration system (i.e.: blocking infiltration holes or if silt deposition has significantly reduced the storage capacity of the system) it should be removed. This can be accomplished by the use of a "clam shell" device or vactor truck.

Maintenance:

Underground storm water detention and retention systems should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size or configuration of the system.

Inspection

Inspection is the key to effective maintenance and is easily performed. CONTECH recommends ongoing quarterly inspections of the accumulated sediment. Sediment deposition and transport may vary from year to year and quarterly inspections will help insure that systems are cleaned out at the appropriate time. Inspections should be performed more often in the winter months in climates where sanding operations may lead to rapid accumulations, or in equipment wash-down areas. It is very useful to keep a record of each inspection. A sample inspection log is included for your use.

Systems should be cleaned when inspection reveals that accumulated sediment or trash is clogging the discharge orifice. CONTECH suggests that all systems be designed with an access/inspection manhole situated at or near the inlet and the outlet orifice. Should it be necessary to get inside the system to perform maintenance activities, all appropriate precautions regarding confined space entry and OSHA regulations should be followed.

Cleaning

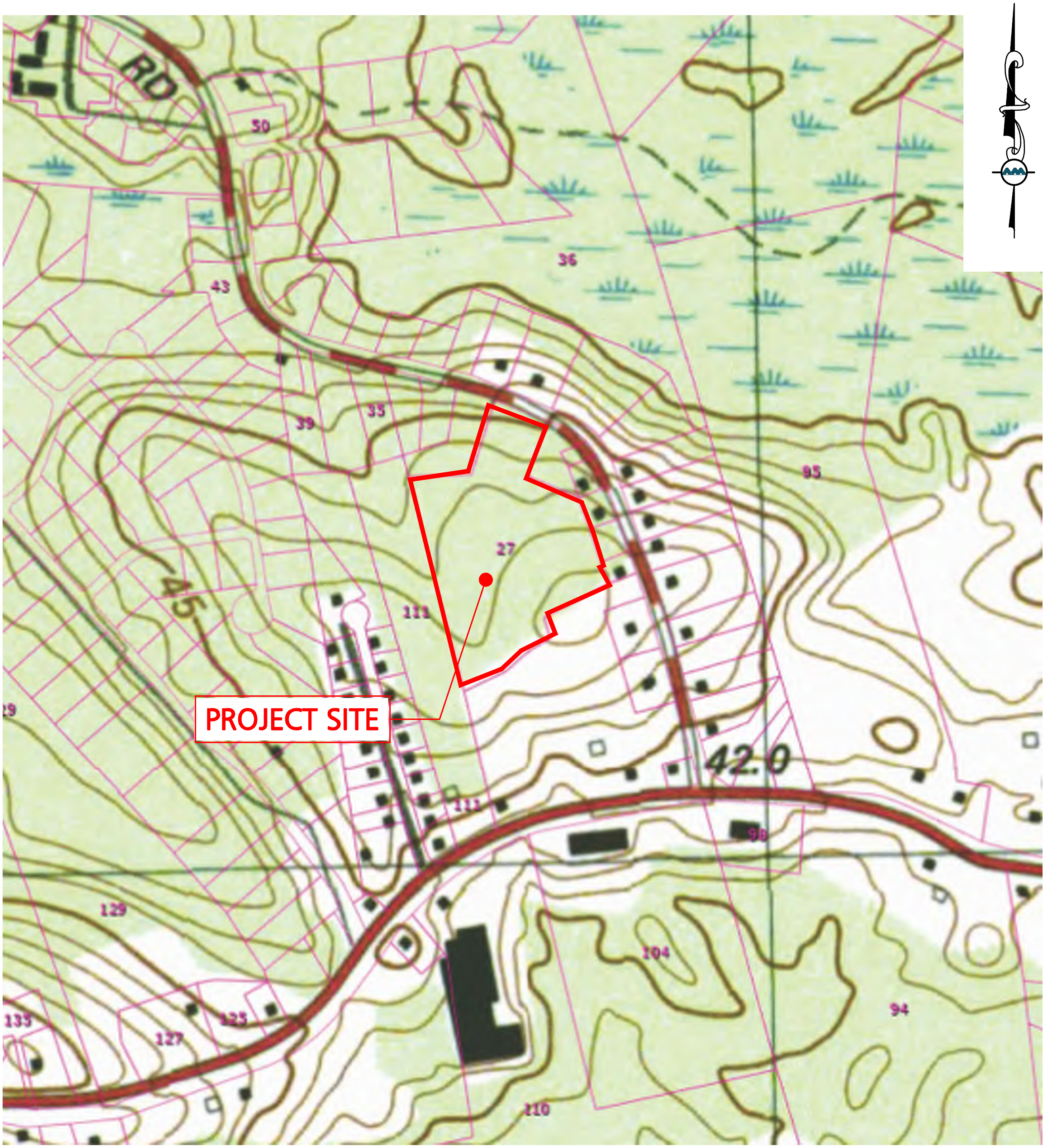
Maintaining an underground detention or retention system is easiest when there is no flow entering the system. For this reason, it is a good idea to schedule the cleanout during dry weather.

Accumulated sediment and trash can typically be evacuated through the manhole over the outlet orifice. If maintenance is not performed as recommended, sediment and trash may accumulate in front of the outlet orifice. Manhole covers should be securely seated following cleaning activities.

Inspection & Maintenance Log:

__” Diameter System			Location: Anywhere, USA		
Date	**Depth of Sediment**	**Accumulated Trash**	**Maintenance Performed**	**Maintenance Personnel**	Comments
12/01/99	2”	None	Removed Sediment	B. Johnson	Installed
03/01/00	1”	Some	Removed Sediment and Trash	B. Johnson	Swept parking lot
06/01/00	0”	None	None		
09/01/00	0”	Heavy	Removed Trash	S. Riley	
12/01/00	1”	None	Removed Sediment	S. Riley	
4/01/01	0”	None	None	S. Riley	
04/15/01	2”	Some	Removed Sediment and Trash	ACE Environmental Services	

SECTION 3.0 - EXHIBITS



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PROJECT:

27 KIMBALL ROAD
AMESBURY, MA

USGS SITE LOCUS MAP

PROJECT NO.	3410-03	DATE:	TBD
SCALE:	1"=500'	DWG. NAME:	EXHIBITS
DESIGNED BY:	BDP	CHECKED BY:	CMQ

SHEET No.

EX-1

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PROJECT:

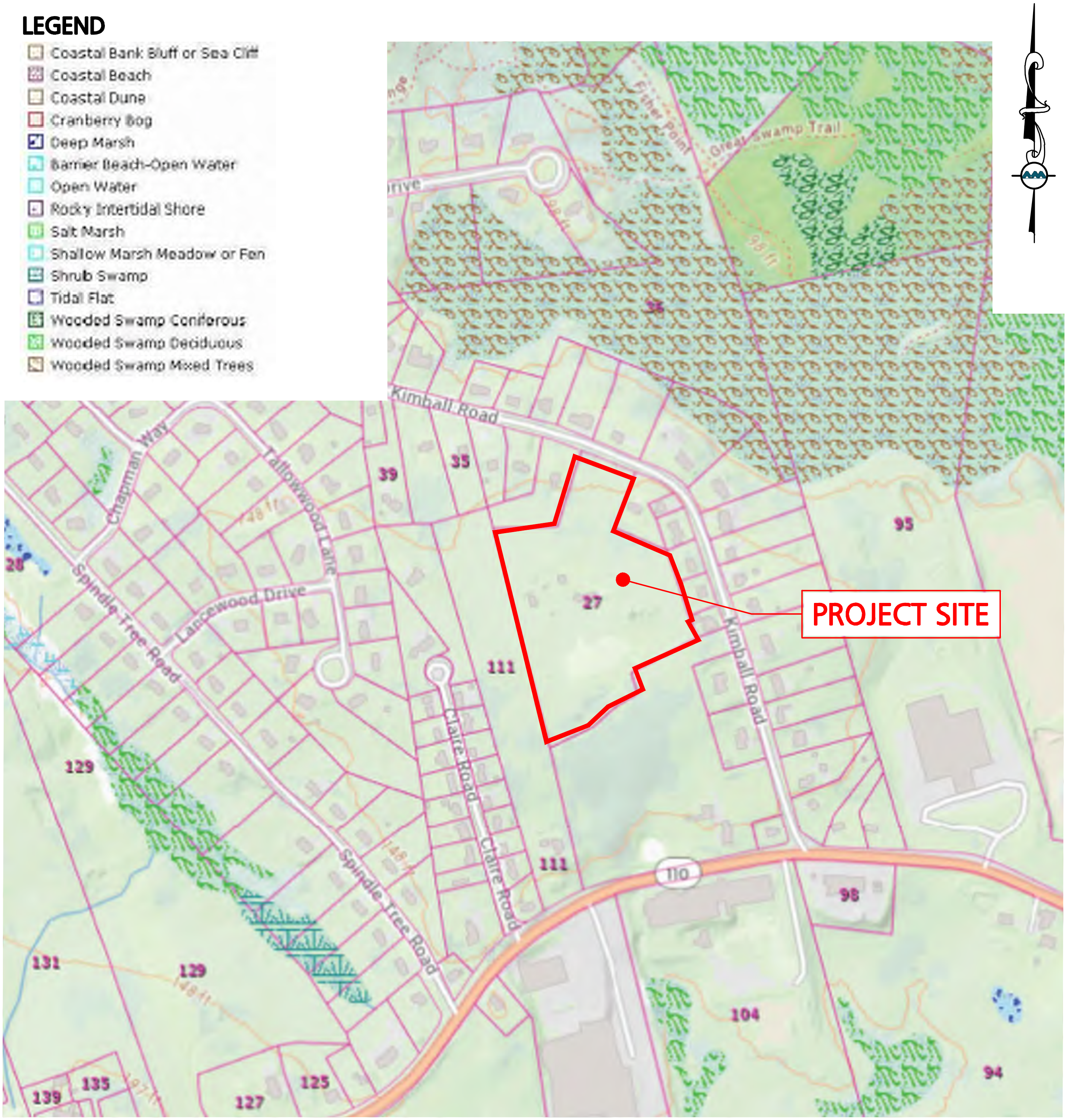
27 KIMBALL ROAD
AMESBURY, MA

AERIAL PHOTO

PROJECT NO.	3410-03	DATE:	TBD
SCALE:	1"=500'	DWG. NAME:	EXHIBITS
DESIGNED BY:	BDP	CHECKED BY:	CMQ

SHEET No.

EX-2



MA MAPPER DEP WETLANDS

PREPARED BY:

ALLEN & MAJOR ASSOCIATES, INC.

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WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

PROJECT:

27 KIMBALL ROAD
AMESBURY, MA

WETLANDS MAP

PROJECT NO.	3410-03	DATE:	TBD
SCALE:	1"=500'	DWG. NAME:	EXHIBITS
DESIGNED BY:	BDP	CHECKED BY:	CMQ

SHEET No.

EX-3

LEGEND

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

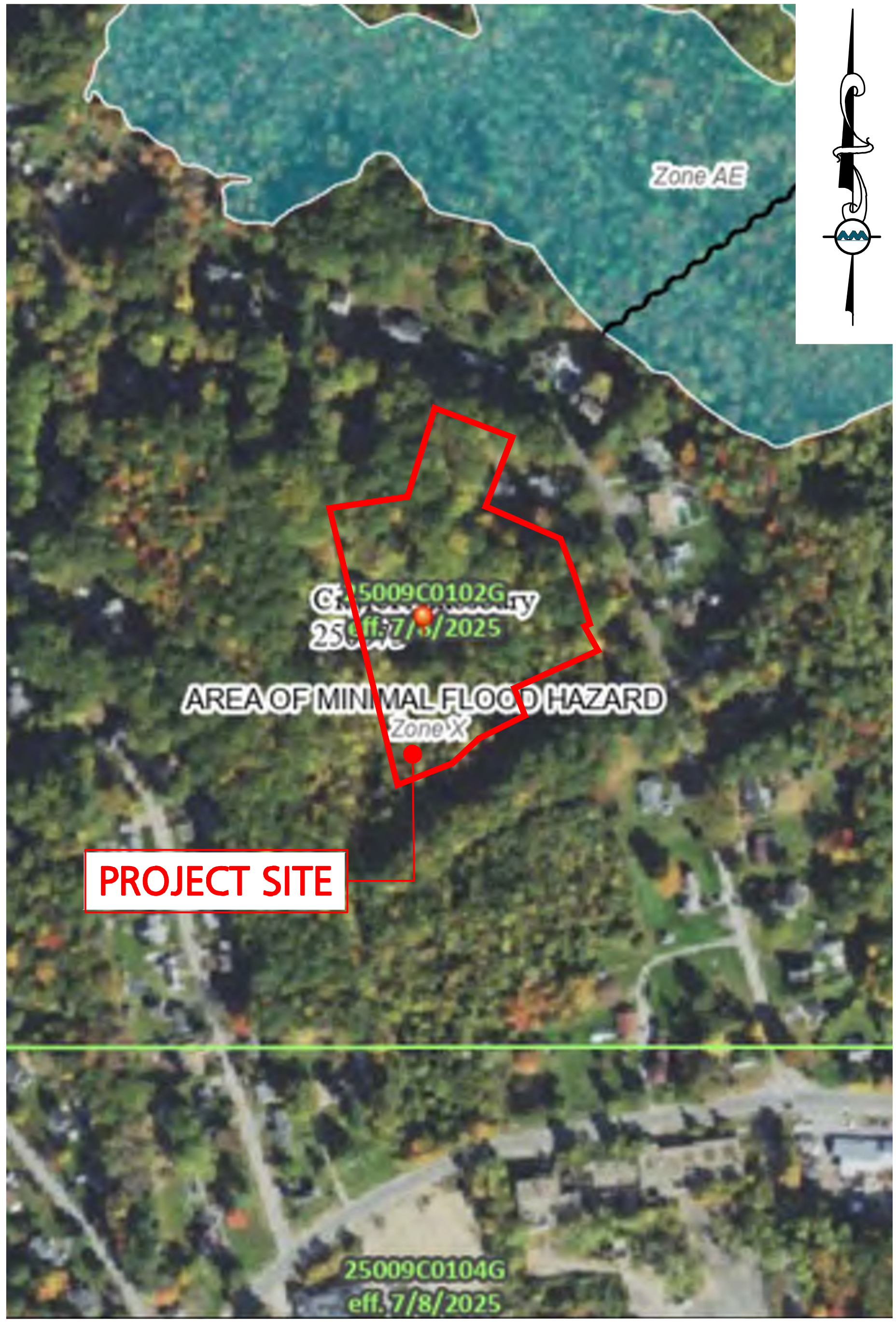
SPECIAL FLOOD HAZARD AREAS	Without Base Flood Elevation (BFE) Zone A, V, A99
	With BFE or Depth Zone AE, AO, AH, VE, AR
	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
	Future Conditions 1% Annual Chance Flood Hazard Zone X
	Area with Reduced Flood Risk due to Levee. See Notes. Zone X
	Area with Flood Risk due to Levee Zone D
OTHER AREAS	NO SCREEN Area of Minimal Flood Hazard Zone X
	Effective LOMRs
	Area of Undetermined Flood Hazard Zone D
GENERAL STRUCTURES	Channel, Culvert, or Storm Sewer
	Levee, Dike, or Floodwall
OTHER FEATURES	20.2 Cross Sections with 1% Annual Chance
	17.5 Water Surface Elevation
	Coastal Transect
	Base Flood Elevation Line (BFE)
	Limit of Study
	Jurisdiction Boundary
	Coastal Transect Baseline
	Profile Baseline
	Hydrographic Feature
MAP PANELS	Digital Data Available
	No Digital Data Available
	Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 12/31/2025 at 6:23 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.



FEMA FLOOD INSURANCE RATE MAP
MAP NUMBER 25009C0102G
EFFECTIVE DATE: JULY 8, 2025

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PROJECT:

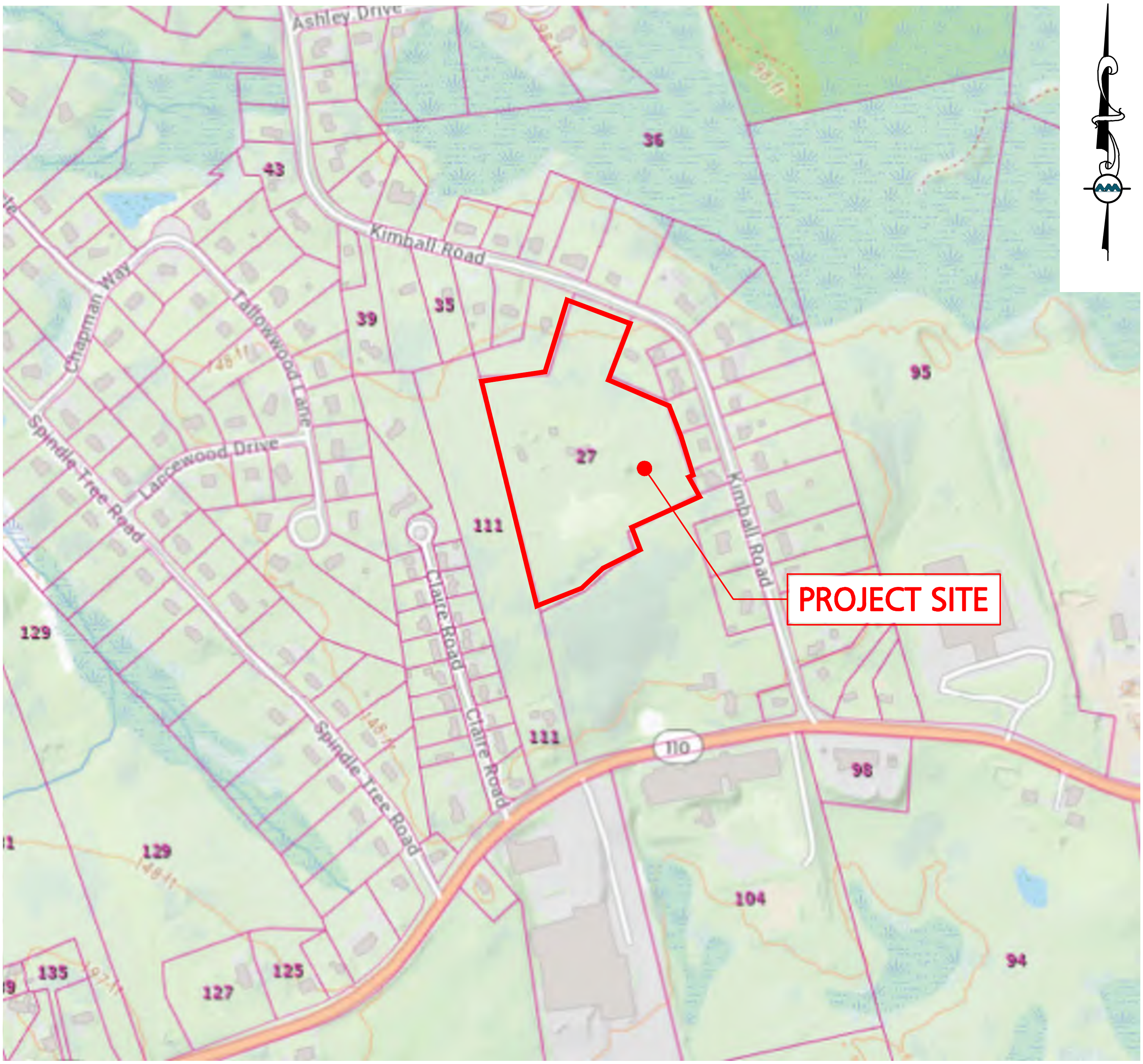
27 KIMBALL ROAD
AMESBURY, MA

FEMA FIRM MAP

PROJECT NO.	3410-03	DATE:	TBD
SCALE:	1"=500'	DWG. NAME:	EXHIBITS
DESIGNED BY:	BDP	CHECKED BY:	CMQ

SHEET No.

EX-4



LEGEND

- NHESP Priority Habitats of Rare Species
- NHESP Estimated Habitats of Rare Wildlife
- Property Tax Parcels

MA MAPPER PRIORITY & ESTIMATED HABITATS

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PROJECT:

27 KIMBALL ROAD
AMESBURY, MA

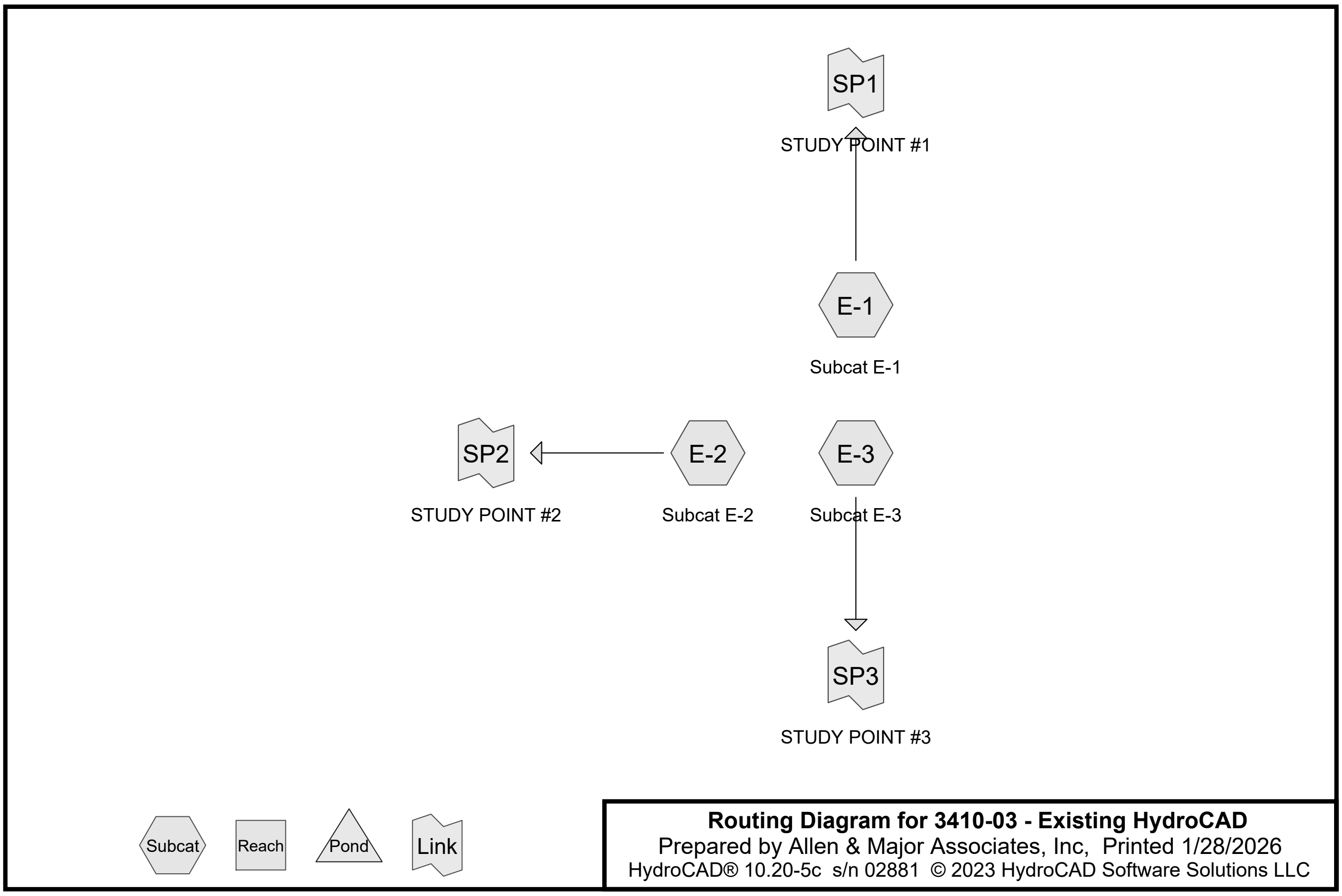
PRIORITY & ESTIMATED HABITATS

PROJECT NO.	3410-03	DATE:	TBD
SCALE:	1"=500'	DWG. NAME:	EXHIBITS
DESIGNED BY:	BDP	CHECKED BY:	CMQ

SHEET No.

EX-5

SECTION 4.0 - EXISTING DRAINAGE ANALYSIS



Routing Diagram for 3410-03 - Existing HydroCAD
Prepared by Allen & Major Associates, Inc, Printed 1/28/2026

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NOAA10 24-hr	D	Default	24.00	1	3.24	2
2	10-Year	NOAA10 24-hr	D	Default	24.00	1	5.12	2
3	25-Year	NOAA10 24-hr	D	Default	24.00	1	6.30	2
4	100-Year	NOAA10 24-hr	D	Default	24.00	1	8.11	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
16,661	61	>75% Grass cover, Good, HSG B (E-1, E-2)
3,844	82	Dirt roads, HSG B (E-2, E-3)
7,940	85	Gravel roads, HSG B (E-1)
710	98	Paved parking, HSG B (E-1, E-2)
3,037	98	Roofs, HSG B (E-1, E-2)
4,417	98	Water Surface, HSG B (E-3)
373,138	55	Woods, Good, HSG B (E-1, E-2, E-3)
409,748	**57**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
409,748	HSG B	E-1, E-2, E-3
0	HSG C	
0	HSG D	
0	Other	
409,748		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
0	16,661	0	0	0	16,661	>75% Grass cover, Good	E-1, E-2
0	3,844	0	0	0	3,844	Dirt roads	E-2, E-3
0	7,940	0	0	0	7,940	Gravel roads	E-1
0	710	0	0	0	710	Paved parking	E-1, E-2
0	3,037	0	0	0	3,037	Roofs	E-1, E-2
0	4,417	0	0	0	4,417	Water Surface	E-3
0	373,138	0	0	0	373,138	Woods, Good	E-1, E-2, E-3
0	**409,748**	**0**	**0**	**0**	**409,748**	**TOTAL AREA**	

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Subcat E-1
Runoff Area=215,540 sf 0.86% Impervious Runoff Depth=0.32"
Flow Length=530' Tc=26.9 min CN=57 Runoff=0.43 cfs 5,804 cf

Subcatchment E-2: Subcat E-2
Runoff Area=163,475 sf 1.16% Impervious Runoff Depth=0.29"
Flow Length=520' Tc=15.9 min CN=56 Runoff=0.32 cfs 3,982 cf

Subcatchment E-3: Subcat E-3
Runoff Area=30,732 sf 14.37% Impervious Runoff Depth=0.50"
Flow Length=75' Tc=17.3 min CN=62 Runoff=0.19 cfs 1,276 cf

Link SP1: STUDY POINT #1
Inflow=0.43 cfs 5,804 cf
Primary=0.43 cfs 5,804 cf

Link SP2: STUDY POINT #2
Inflow=0.32 cfs 3,982 cf
Primary=0.32 cfs 3,982 cf

Link SP3: STUDY POINT #3
Inflow=0.19 cfs 1,276 cf
Primary=0.19 cfs 1,276 cf

Total Runoff Area = 409,748 sf Runoff Volume = 11,062 cf Average Runoff Depth = 0.32"
98.01% Pervious = 401,584 sf 1.99% Impervious = 8,164 sf

Summary for Subcatchment E-1: Subcat E-1

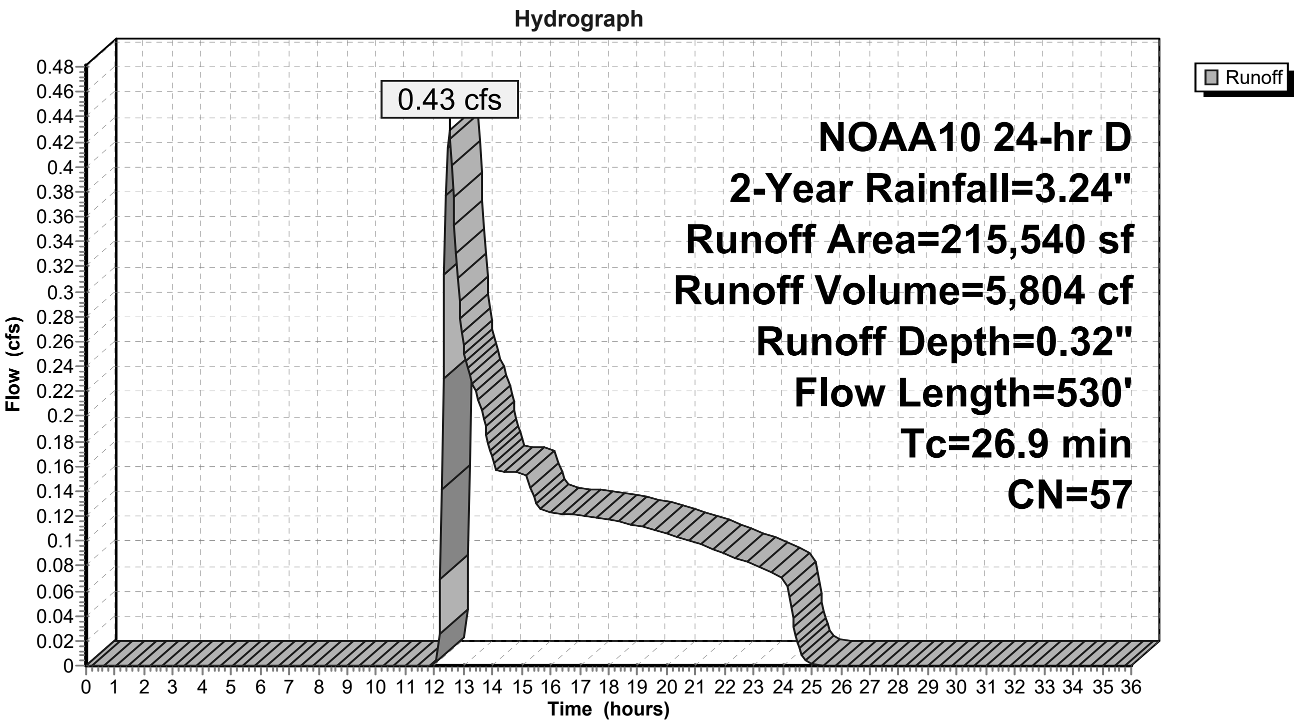
Runoff = 0.43 cfs @ 12.51 hrs, Volume= 5,804 cf, Depth= 0.32"
Routed to Link SP1 : STUDY POINT #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
16,069	61	>75% Grass cover, Good, HSG B
7,940	85	Gravel roads, HSG B
545	98	Paved parking, HSG B
1,308	98	Roofs, HSG B
189,678	55	Woods, Good, HSG B
215,540	57	Weighted Average
213,687		99.14% Pervious Area
1,854		0.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.2	50	0.0230	0.04		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.24"
6.7	480	0.0570	1.19		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
26.9	530	Total			

Subcatchment E-1: Subcat E-1



Summary for Subcatchment E-2: Subcat E-2

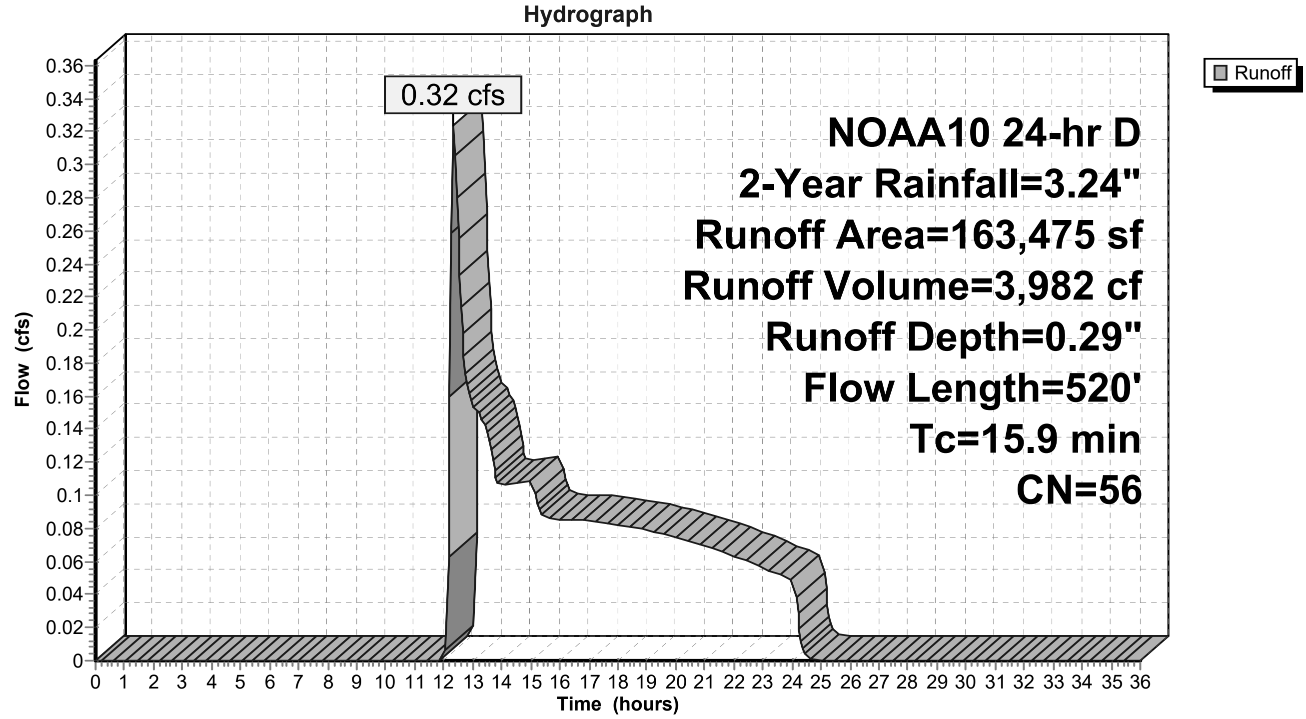
Runoff = 0.32 cfs @ 12.34 hrs, Volume= 3,982 cf, Depth= 0.29"
Routed to Link SP2 : STUDY POINT #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
592	61	>75% Grass cover, Good, HSG B
3,038	82	Dirt roads, HSG B
165	98	Paved parking, HSG B
1,729	98	Roofs, HSG B
157,952	55	Woods, Good, HSG B
163,475	56	Weighted Average
161,582		98.84% Pervious Area
1,893		1.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.2100	0.10		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.24"
7.6	470	0.0420	1.02		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
15.9	520	Total			

Subcatchment E-2: Subcat E-2



Summary for Subcatchment E-3: Subcat E-3

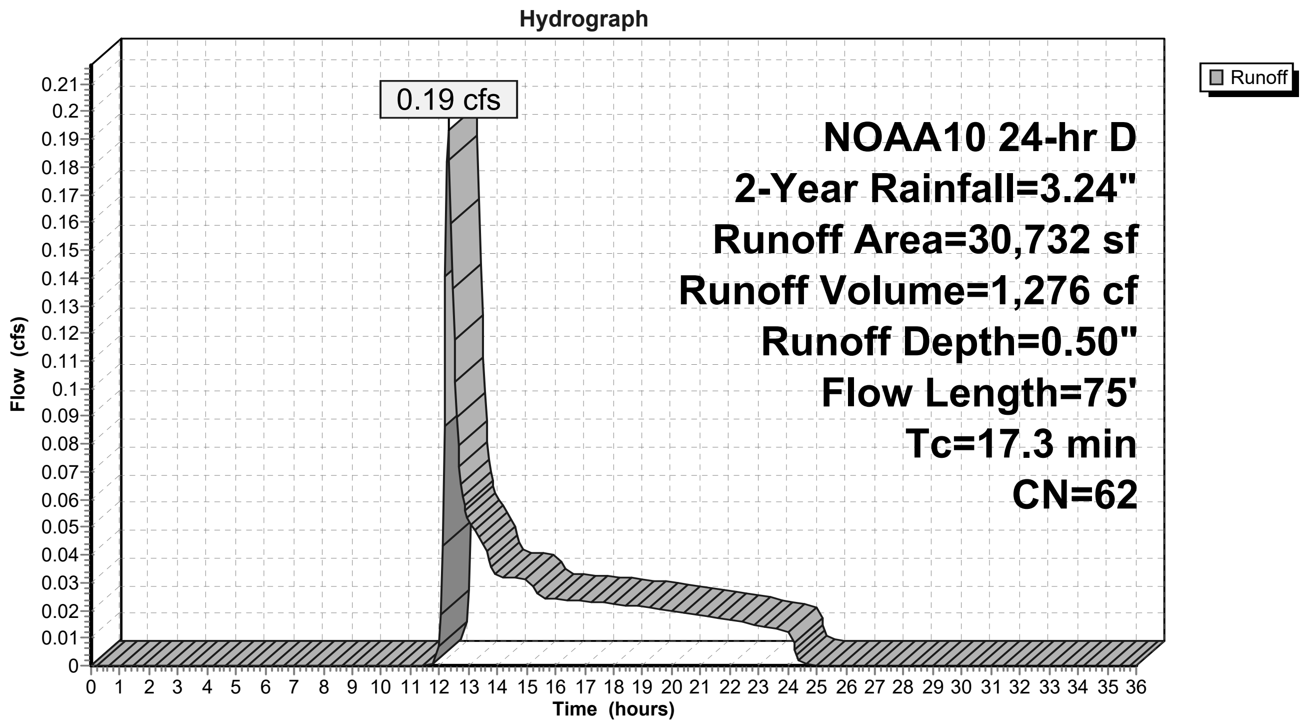
Runoff = 0.19 cfs @ 12.30 hrs, Volume= 1,276 cf, Depth= 0.50"
Routed to Link SP3 : STUDY POINT #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
807	82	Dirt roads, HSG B
4,417	98	Water Surface, HSG B
25,508	55	Woods, Good, HSG B
30,732	62	Weighted Average
26,315		85.63% Pervious Area
4,417		14.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.1	50	0.0350	0.05		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.24"
0.2	25	0.2200	2.35		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
17.3	75	Total			

Subcatchment E-3: Subcat E-3

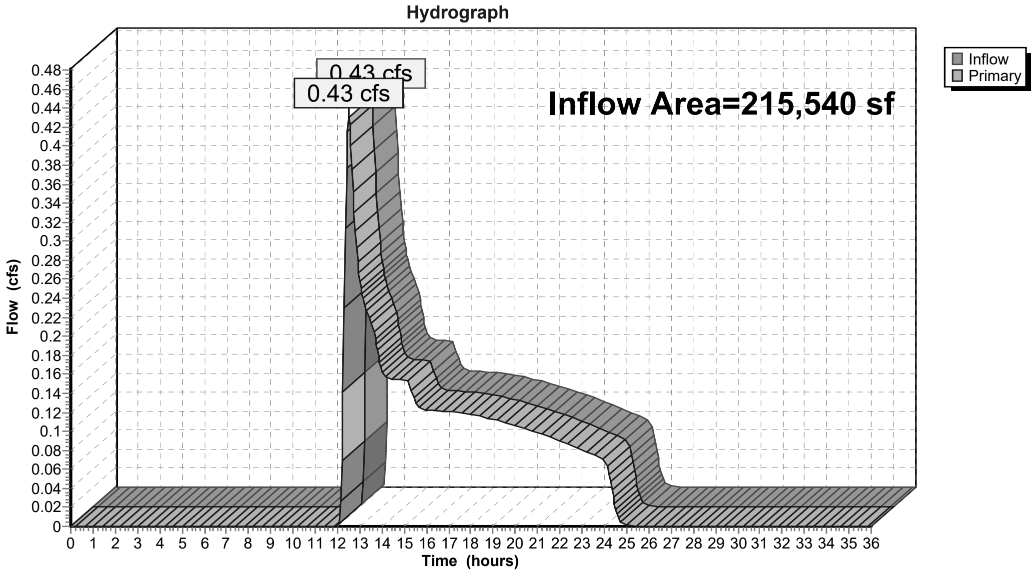


Summary for Link SP1: STUDY POINT #1

Inflow Area = 215,540 sf, 0.86% Impervious, Inflow Depth = 0.32" for 2-Year event
Inflow = 0.43 cfs @ 12.51 hrs, Volume= 5,804 cf
Primary = 0.43 cfs @ 12.51 hrs, Volume= 5,804 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link SP1: STUDY POINT #1

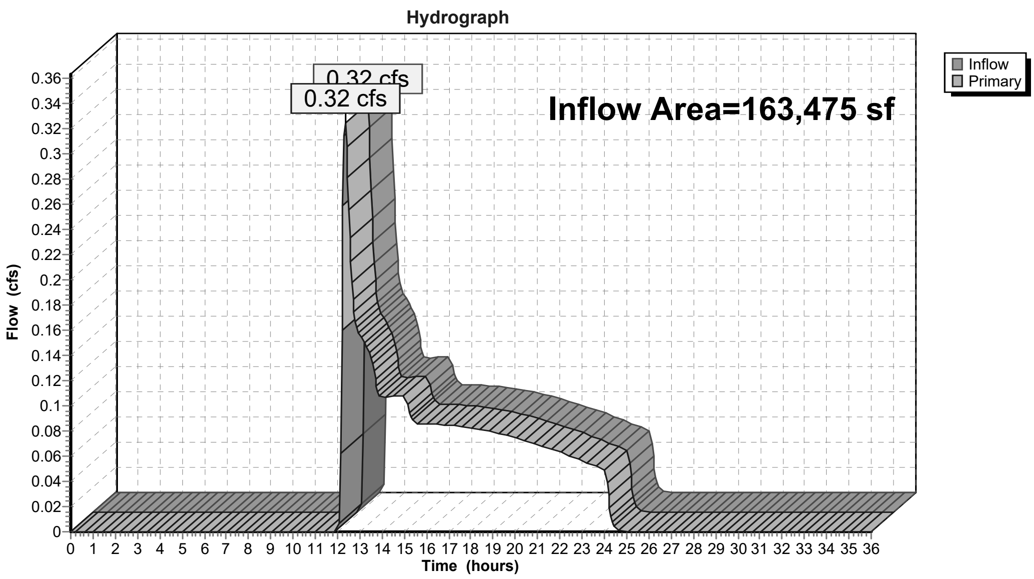


Summary for Link SP2: STUDY POINT #2

Inflow Area = 163,475 sf, 1.16% Impervious, Inflow Depth = 0.29" for 2-Year event
Inflow = 0.32 cfs @ 12.34 hrs, Volume= 3,982 cf
Primary = 0.32 cfs @ 12.34 hrs, Volume= 3,982 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link SP2: STUDY POINT #2

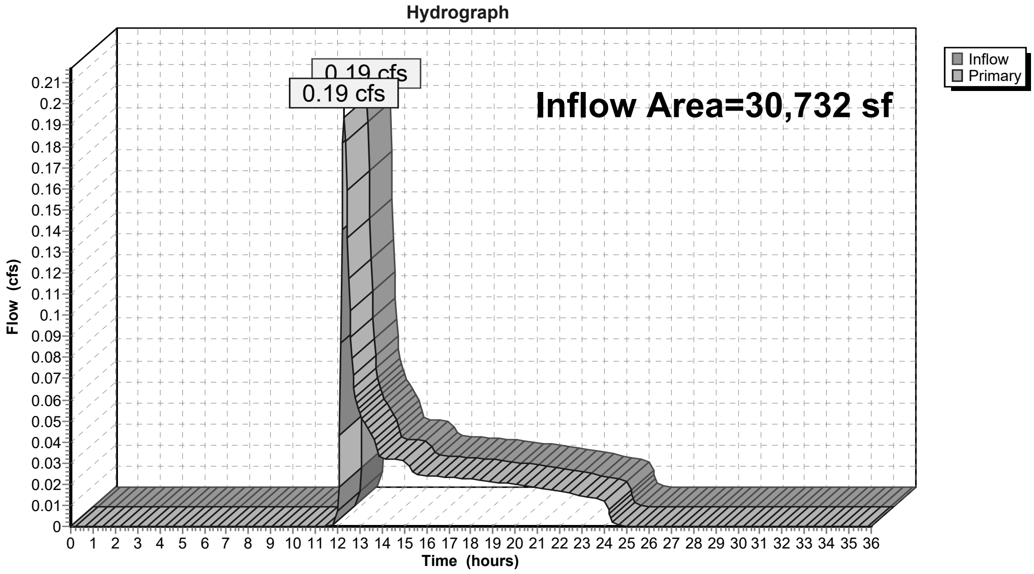


Summary for Link SP3: STUDY POINT #3

Inflow Area = 30,732 sf, 14.37% Impervious, Inflow Depth = 0.50" for 2-Year event
Inflow = 0.19 cfs @ 12.30 hrs, Volume= 1,276 cf
Primary = 0.19 cfs @ 12.30 hrs, Volume= 1,276 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link SP3: STUDY POINT #3



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Subcat E-1 Runoff Area=215,540 sf 0.86% Impervious Runoff Depth=1.17"
Flow Length=530' Tc=26.9 min CN=57 Runoff=3.12 cfs 20,998 cf

Subcatchment E-2: Subcat E-2 Runoff Area=163,475 sf 1.16% Impervious Runoff Depth=1.10"
Flow Length=520' Tc=15.9 min CN=56 Runoff=2.93 cfs 15,040 cf

Subcatchment E-3: Subcat E-3 Runoff Area=30,732 sf 14.37% Impervious Runoff Depth=1.51"
Flow Length=75' Tc=17.3 min CN=62 Runoff=0.80 cfs 3,875 cf

Link SP1: STUDY POINT #1 Inflow=3.12 cfs 20,998 cf
Primary=3.12 cfs 20,998 cf

Link SP2: STUDY POINT #2 Inflow=2.93 cfs 15,040 cf
Primary=2.93 cfs 15,040 cf

Link SP3: STUDY POINT #3 Inflow=0.80 cfs 3,875 cf
Primary=0.80 cfs 3,875 cf

Total Runoff Area = 409,748 sf Runoff Volume = 39,913 cf Average Runoff Depth = 1.17"
98.01% Pervious = 401,584 sf 1.99% Impervious = 8,164 sf

Summary for Subcatchment E-1: Subcat E-1

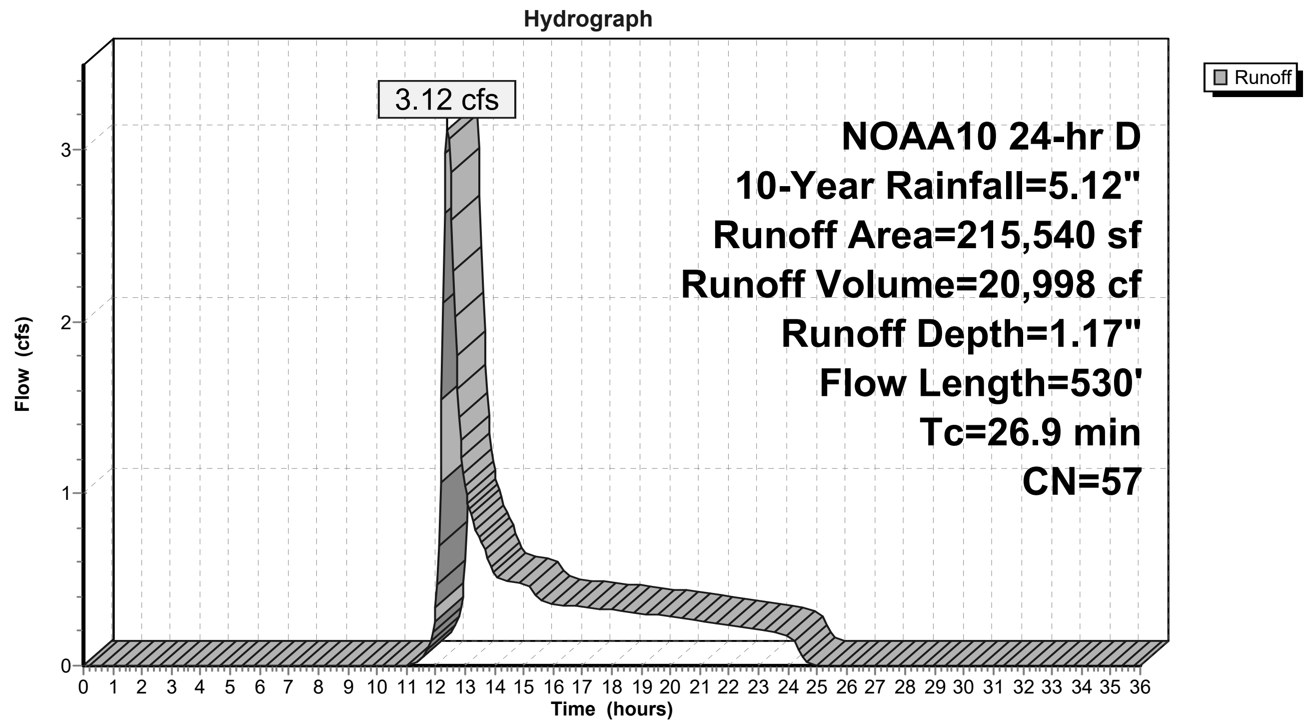
Runoff = 3.12 cfs @ 12.41 hrs, Volume= 20,998 cf, Depth= 1.17"
Routed to Link SP1 : STUDY POINT #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
16,069	61	>75% Grass cover, Good, HSG B
7,940	85	Gravel roads, HSG B
545	98	Paved parking, HSG B
1,308	98	Roofs, HSG B
189,678	55	Woods, Good, HSG B
215,540	57	Weighted Average
213,687		99.14% Pervious Area
1,854		0.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.2	50	0.0230	0.04		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.24"
6.7	480	0.0570	1.19		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
26.9	530	Total			

Subcatchment E-1: Subcat E-1



Summary for Subcatchment E-2: Subcat E-2

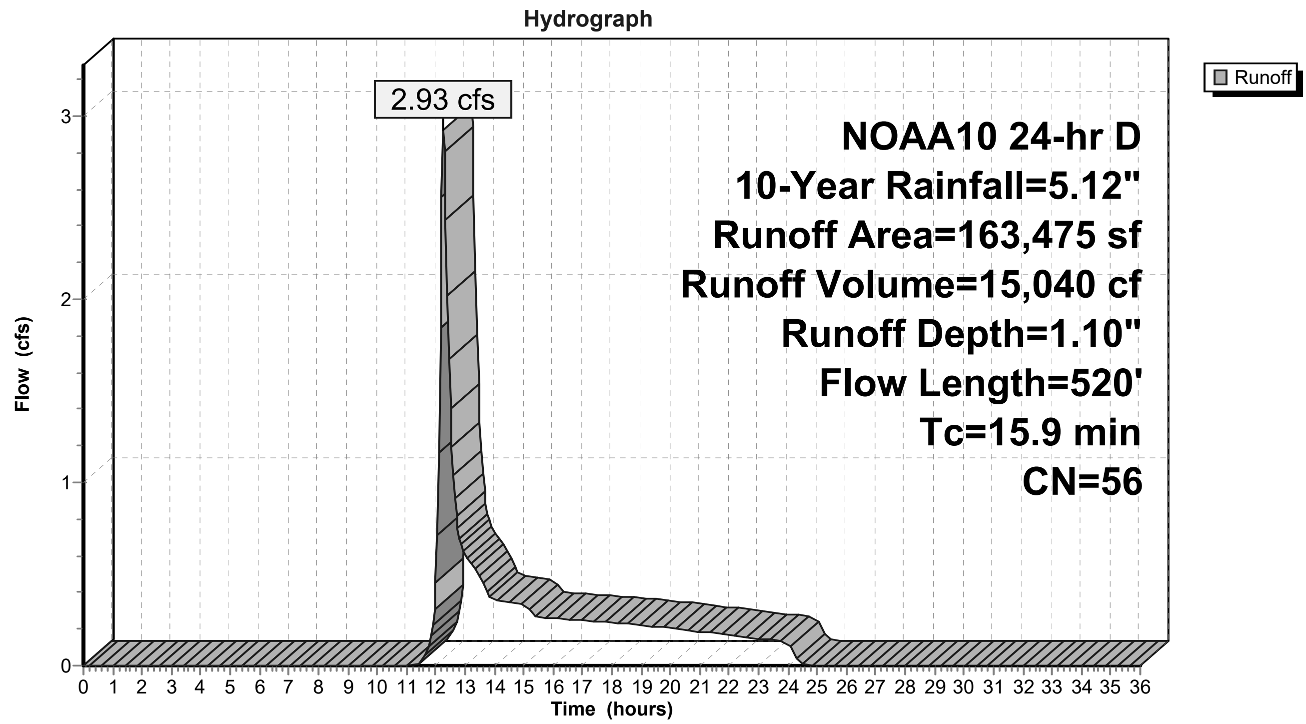
Runoff = 2.93 cfs @ 12.26 hrs, Volume= 15,040 cf, Depth= 1.10"
Routed to Link SP2 : STUDY POINT #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
592	61	>75% Grass cover, Good, HSG B
3,038	82	Dirt roads, HSG B
165	98	Paved parking, HSG B
1,729	98	Roofs, HSG B
157,952	55	Woods, Good, HSG B
163,475	56	Weighted Average
161,582		98.84% Pervious Area
1,893		1.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.2100	0.10		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.24"
7.6	470	0.0420	1.02		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
15.9	520	Total			

Subcatchment E-2: Subcat E-2



Summary for Subcatchment E-3: Subcat E-3

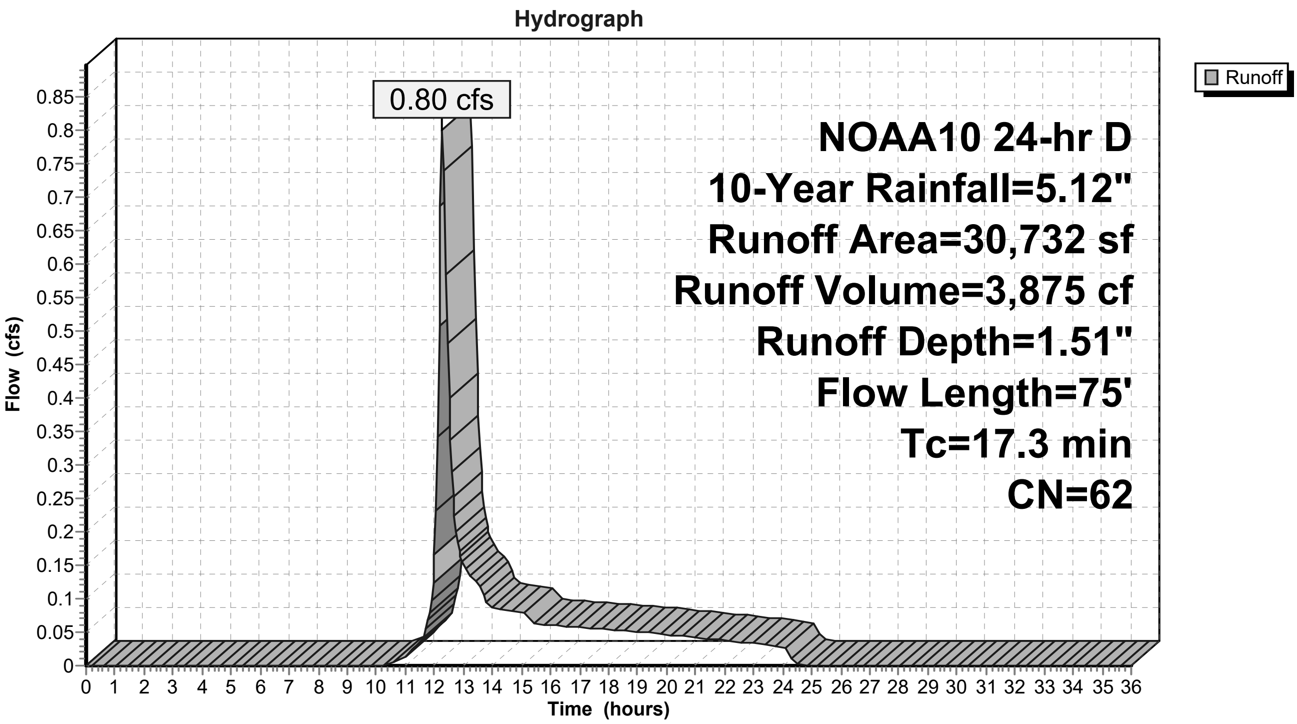
Runoff = 0.80 cfs @ 12.27 hrs, Volume= 3,875 cf, Depth= 1.51"
Routed to Link SP3 : STUDY POINT #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
807	82	Dirt roads, HSG B
4,417	98	Water Surface, HSG B
25,508	55	Woods, Good, HSG B
30,732	62	Weighted Average
26,315		85.63% Pervious Area
4,417		14.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.1	50	0.0350	0.05		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.24"
0.2	25	0.2200	2.35		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
17.3	75	Total			

Subcatchment E-3: Subcat E-3

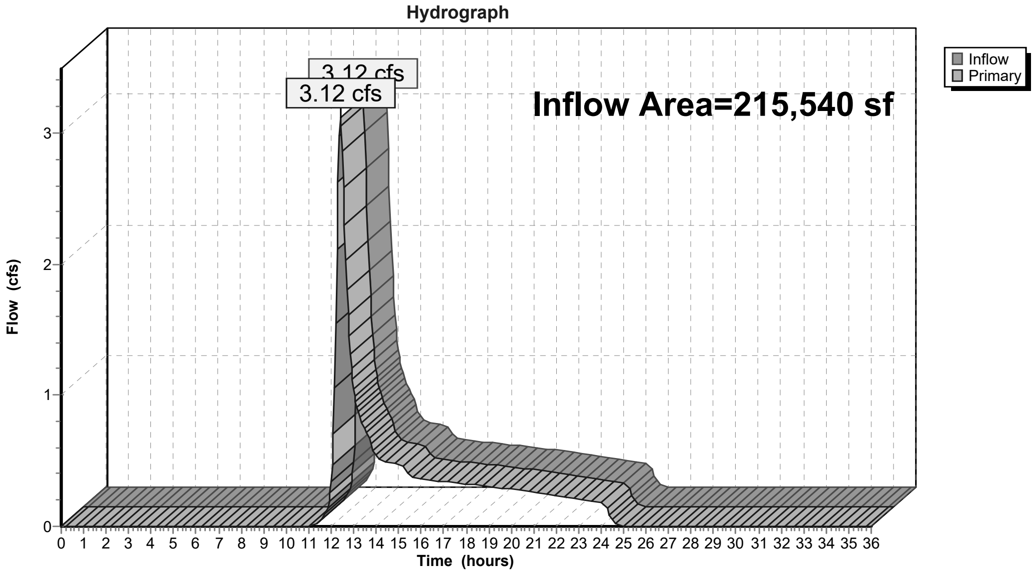


Summary for Link SP1: STUDY POINT #1

Inflow Area = 215,540 sf, 0.86% Impervious, Inflow Depth = 1.17" for 10-Year event
Inflow = 3.12 cfs @ 12.41 hrs, Volume= 20,998 cf
Primary = 3.12 cfs @ 12.41 hrs, Volume= 20,998 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link SP1: STUDY POINT #1

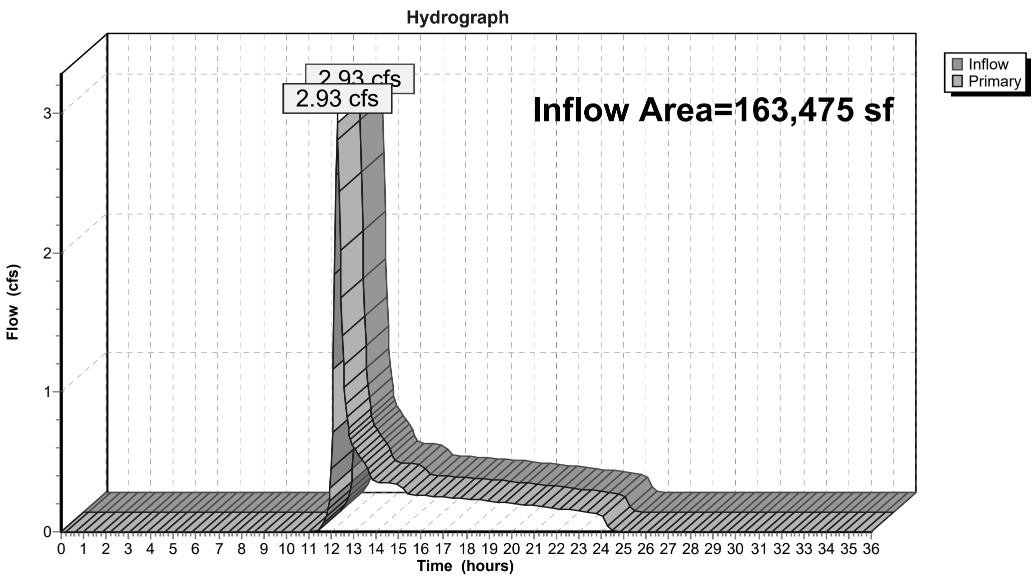


Summary for Link SP2: STUDY POINT #2

Inflow Area = 163,475 sf, 1.16% Impervious, Inflow Depth = 1.10" for 10-Year event
Inflow = 2.93 cfs @ 12.26 hrs, Volume= 15,040 cf
Primary = 2.93 cfs @ 12.26 hrs, Volume= 15,040 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link SP2: STUDY POINT #2

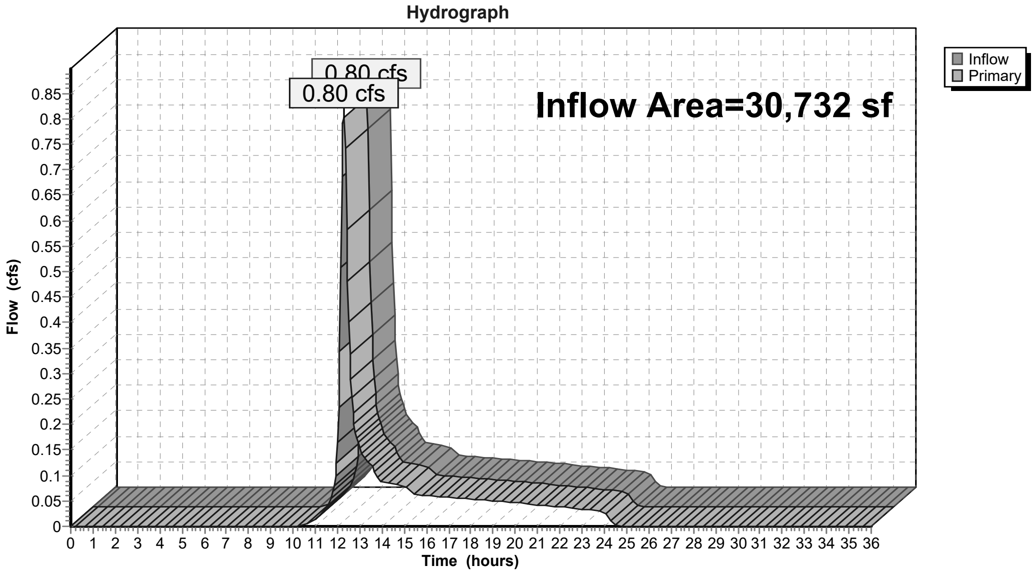


Summary for Link SP3: STUDY POINT #3

Inflow Area = 30,732 sf, 14.37% Impervious, Inflow Depth = 1.51" for 10-Year event
Inflow = 0.80 cfs @ 12.27 hrs, Volume= 3,875 cf
Primary = 0.80 cfs @ 12.27 hrs, Volume= 3,875 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link SP3: STUDY POINT #3



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Subcat E-1 Runoff Area=215,540 sf 0.86% Impervious Runoff Depth=1.86"
Flow Length=530' Tc=26.9 min CN=57 Runoff=5.39 cfs 33,427 cf

Subcatchment E-2: Subcat E-2 Runoff Area=163,475 sf 1.16% Impervious Runoff Depth=1.78"
Flow Length=520' Tc=15.9 min CN=56 Runoff=5.16 cfs 24,202 cf

Subcatchment E-3: Subcat E-3 Runoff Area=30,732 sf 14.37% Impervious Runoff Depth=2.30"
Flow Length=75' Tc=17.3 min CN=62 Runoff=1.27 cfs 5,886 cf

Link SP1: STUDY POINT #1 Inflow=5.39 cfs 33,427 cf
Primary=5.39 cfs 33,427 cf

Link SP2: STUDY POINT #2 Inflow=5.16 cfs 24,202 cf
Primary=5.16 cfs 24,202 cf

Link SP3: STUDY POINT #3 Inflow=1.27 cfs 5,886 cf
Primary=1.27 cfs 5,886 cf

Total Runoff Area = 409,748 sf Runoff Volume = 63,515 cf Average Runoff Depth = 1.86"
98.01% Pervious = 401,584 sf 1.99% Impervious = 8,164 sf

Summary for Subcatchment E-1: Subcat E-1

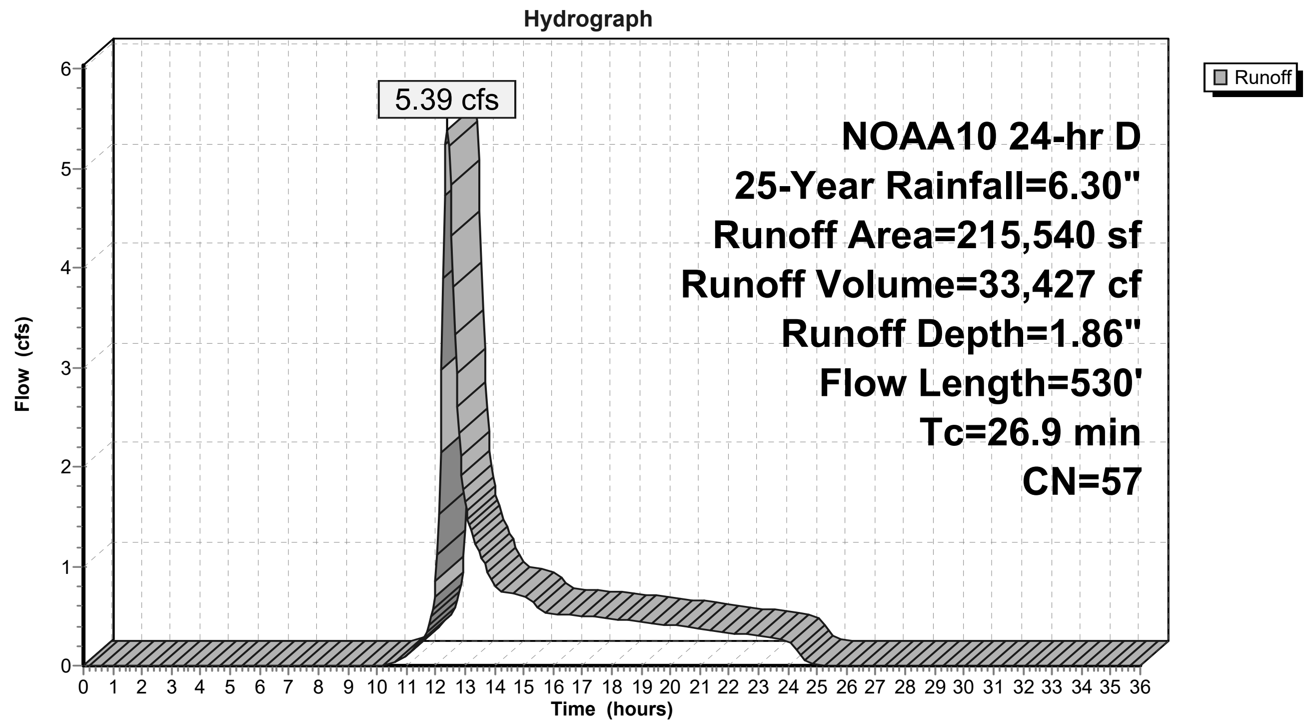
Runoff = 5.39 cfs @ 12.40 hrs, Volume= 33,427 cf, Depth= 1.86"
Routed to Link SP1 : STUDY POINT #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
16,069	61	>75% Grass cover, Good, HSG B
7,940	85	Gravel roads, HSG B
545	98	Paved parking, HSG B
1,308	98	Roofs, HSG B
189,678	55	Woods, Good, HSG B
215,540	57	Weighted Average
213,687		99.14% Pervious Area
1,854		0.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.2	50	0.0230	0.04		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.24"
6.7	480	0.0570	1.19		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
26.9	530	Total			

Subcatchment E-1: Subcat E-1



Summary for Subcatchment E-2: Subcat E-2

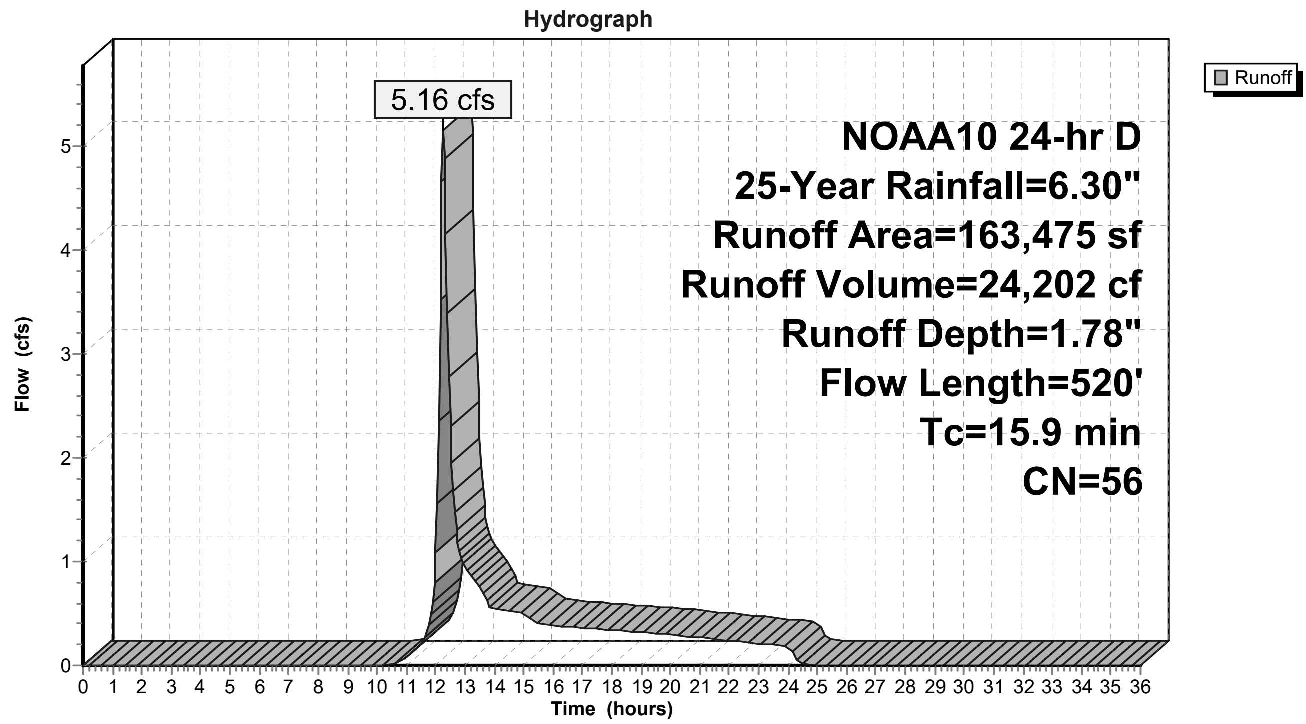
Runoff = 5.16 cfs @ 12.26 hrs, Volume= 24,202 cf, Depth= 1.78"
Routed to Link SP2 : STUDY POINT #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
592	61	>75% Grass cover, Good, HSG B
3,038	82	Dirt roads, HSG B
165	98	Paved parking, HSG B
1,729	98	Roofs, HSG B
157,952	55	Woods, Good, HSG B
163,475	56	Weighted Average
161,582		98.84% Pervious Area
1,893		1.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.2100	0.10		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.24"
7.6	470	0.0420	1.02		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
15.9	520	Total			

Subcatchment E-2: Subcat E-2



Summary for Subcatchment E-3: Subcat E-3

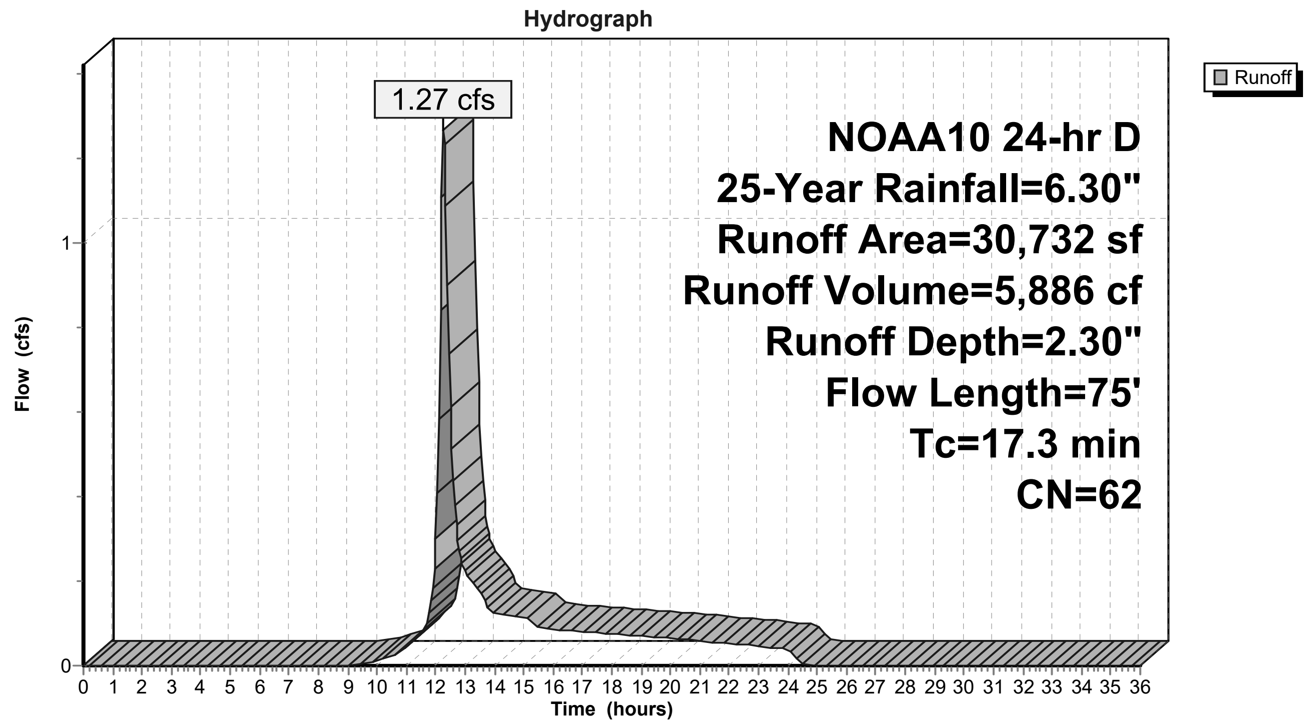
Runoff = 1.27 cfs @ 12.27 hrs, Volume= 5,886 cf, Depth= 2.30"
Routed to Link SP3 : STUDY POINT #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
807	82	Dirt roads, HSG B
4,417	98	Water Surface, HSG B
25,508	55	Woods, Good, HSG B
30,732	62	Weighted Average
26,315		85.63% Pervious Area
4,417		14.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.1	50	0.0350	0.05		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.24"
0.2	25	0.2200	2.35		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
17.3	75	Total			

Subcatchment E-3: Subcat E-3

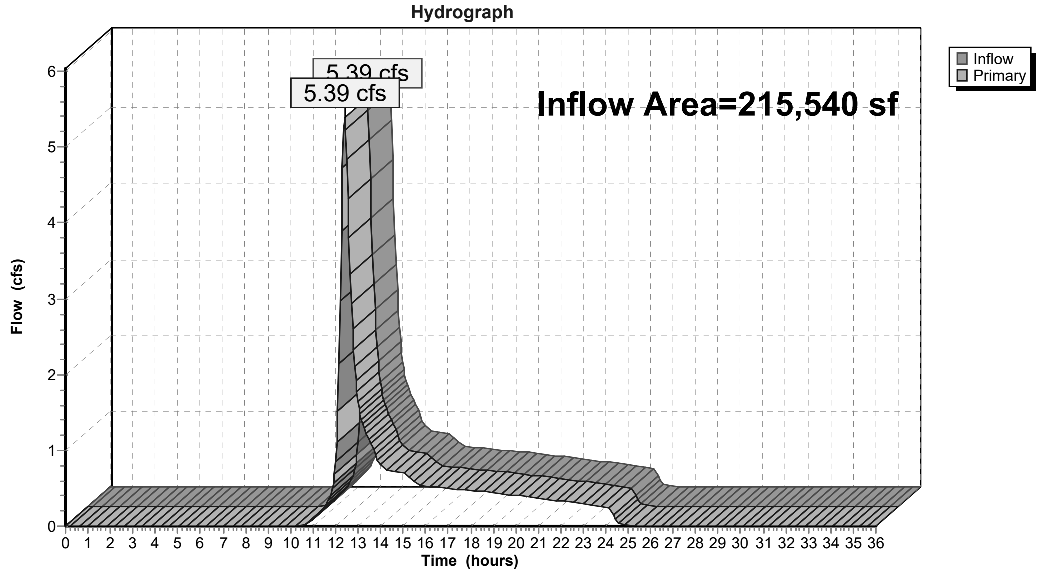


Summary for Link SP1: STUDY POINT #1

Inflow Area = 215,540 sf, 0.86% Impervious, Inflow Depth = 1.86" for 25-Year event
Inflow = 5.39 cfs @ 12.40 hrs, Volume= 33,427 cf
Primary = 5.39 cfs @ 12.40 hrs, Volume= 33,427 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link SP1: STUDY POINT #1

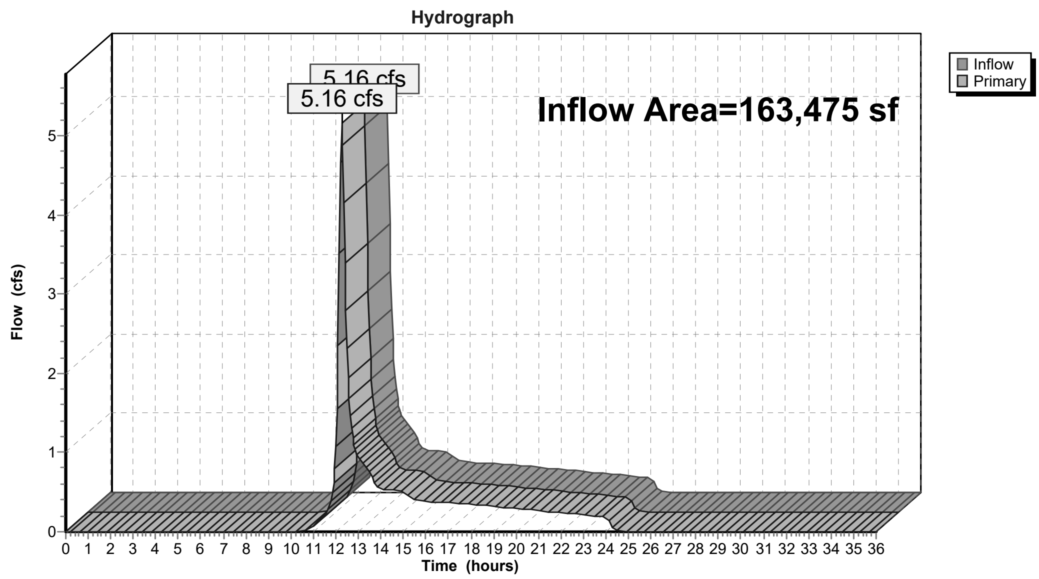


Summary for Link SP2: STUDY POINT #2

Inflow Area = 163,475 sf, 1.16% Impervious, Inflow Depth = 1.78" for 25-Year event
Inflow = 5.16 cfs @ 12.26 hrs, Volume= 24,202 cf
Primary = 5.16 cfs @ 12.26 hrs, Volume= 24,202 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link SP2: STUDY POINT #2

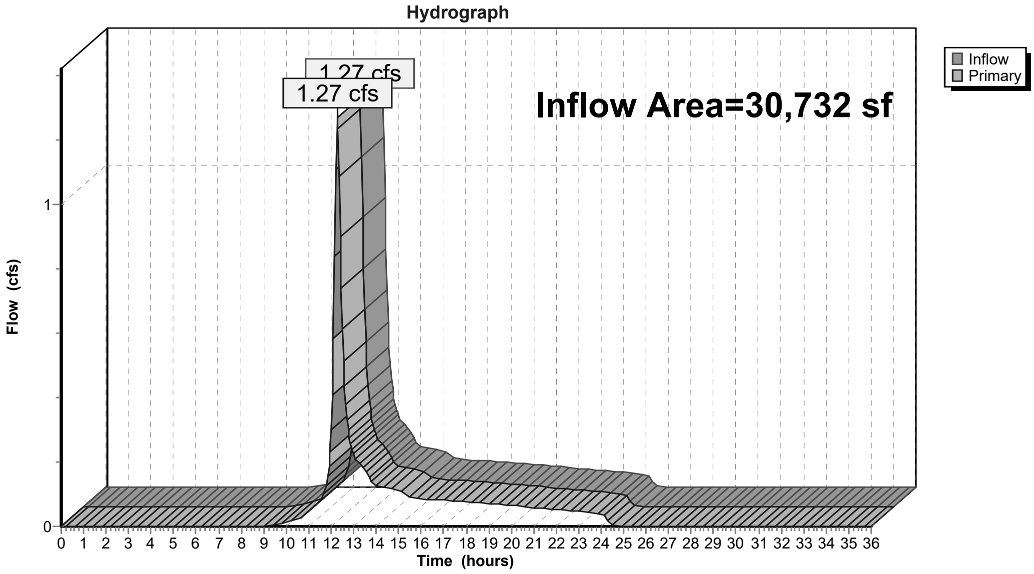


Summary for Link SP3: STUDY POINT #3

Inflow Area = 30,732 sf, 14.37% Impervious, Inflow Depth = 2.30" for 25-Year event
Inflow = 1.27 cfs @ 12.27 hrs, Volume= 5,886 cf
Primary = 1.27 cfs @ 12.27 hrs, Volume= 5,886 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link SP3: STUDY POINT #3



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E-1: Subcat E-1
Runoff Area=215,540 sf 0.86% Impervious Runoff Depth=3.08"
Flow Length=530' Tc=26.9 min CN=57 Runoff=9.38 cfs 55,334 cf

Subcatchment E-2: Subcat E-2
Runoff Area=163,475 sf 1.16% Impervious Runoff Depth=2.97"
Flow Length=520' Tc=15.9 min CN=56 Runoff=9.07 cfs 40,458 cf

Subcatchment E-3: Subcat E-3
Runoff Area=30,732 sf 14.37% Impervious Runoff Depth=3.64"
Flow Length=75' Tc=17.3 min CN=62 Runoff=2.06 cfs 9,327 cf

Link SP1: STUDY POINT #1
Inflow=9.38 cfs 55,334 cf
Primary=9.38 cfs 55,334 cf

Link SP2: STUDY POINT #2
Inflow=9.07 cfs 40,458 cf
Primary=9.07 cfs 40,458 cf

Link SP3: STUDY POINT #3
Inflow=2.06 cfs 9,327 cf
Primary=2.06 cfs 9,327 cf

Total Runoff Area = 409,748 sf Runoff Volume = 105,119 cf Average Runoff Depth = 3.08"
98.01% Pervious = 401,584 sf 1.99% Impervious = 8,164 sf

Summary for Subcatchment E-1: Subcat E-1

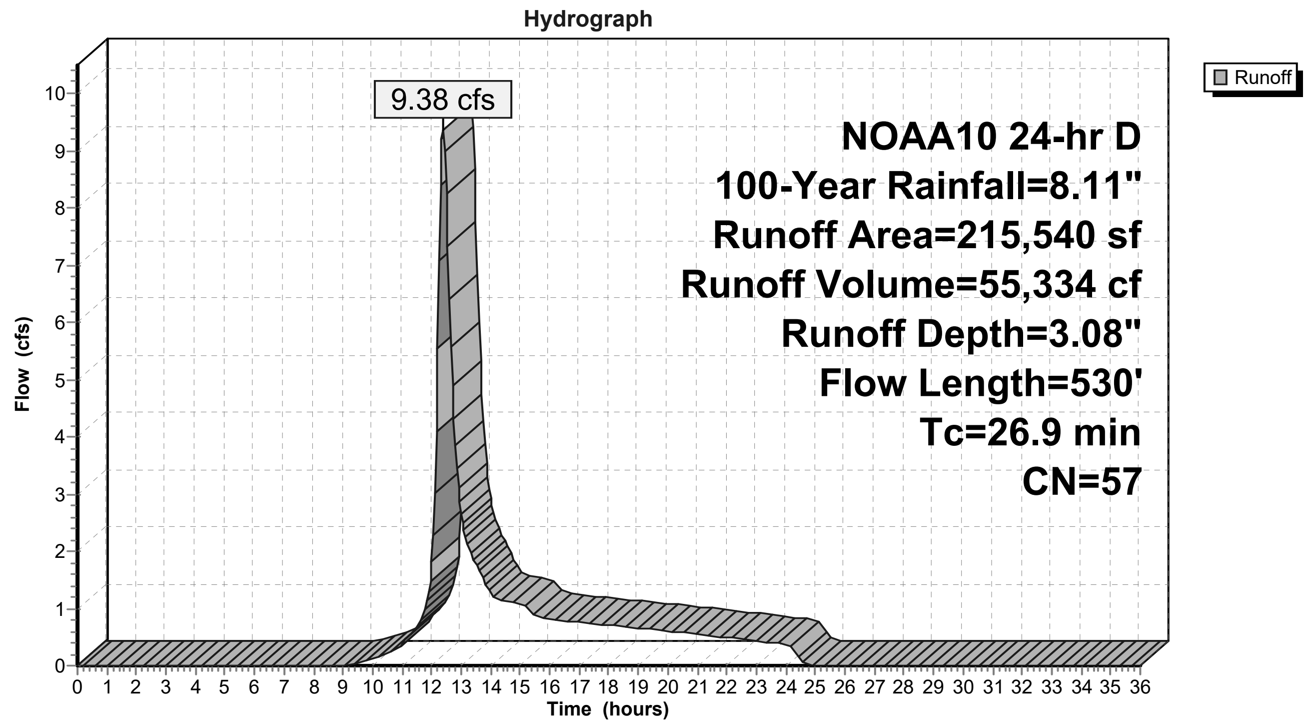
Runoff = 9.38 cfs @ 12.39 hrs, Volume= 55,334 cf, Depth= 3.08"
Routed to Link SP1 : STUDY POINT #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
16,069	61	>75% Grass cover, Good, HSG B
7,940	85	Gravel roads, HSG B
545	98	Paved parking, HSG B
1,308	98	Roofs, HSG B
189,678	55	Woods, Good, HSG B
215,540	57	Weighted Average
213,687		99.14% Pervious Area
1,854		0.86% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.2	50	0.0230	0.04		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.24"
6.7	480	0.0570	1.19		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
26.9	530	Total			

Subcatchment E-1: Subcat E-1



Summary for Subcatchment E-2: Subcat E-2

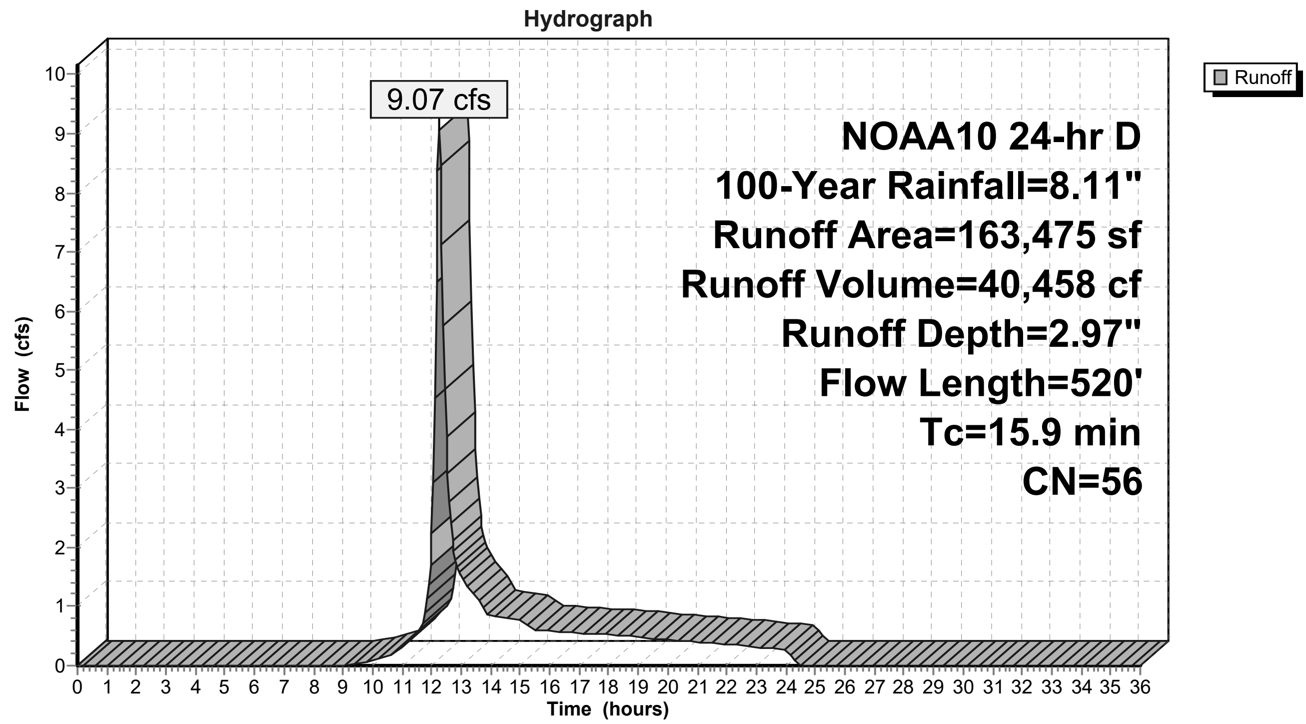
Runoff = 9.07 cfs @ 12.25 hrs, Volume= 40,458 cf, Depth= 2.97"
Routed to Link SP2 : STUDY POINT #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
592	61	>75% Grass cover, Good, HSG B
3,038	82	Dirt roads, HSG B
165	98	Paved parking, HSG B
1,729	98	Roofs, HSG B
157,952	55	Woods, Good, HSG B
163,475	56	Weighted Average
161,582		98.84% Pervious Area
1,893		1.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.2100	0.10		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.24"
7.6	470	0.0420	1.02		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
15.9	520	Total			

Subcatchment E-2: Subcat E-2



Summary for Subcatchment E-3: Subcat E-3

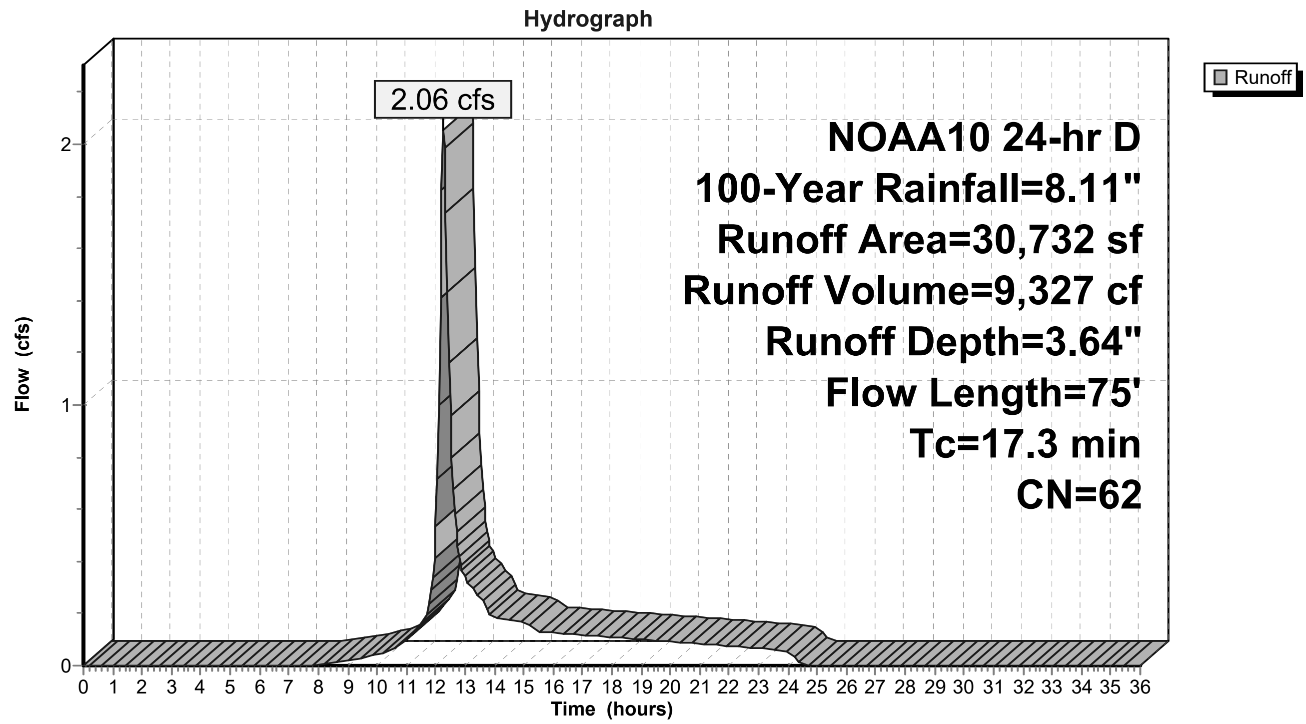
Runoff = 2.06 cfs @ 12.26 hrs, Volume= 9,327 cf, Depth= 3.64"
Routed to Link SP3 : STUDY POINT #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
807	82	Dirt roads, HSG B
4,417	98	Water Surface, HSG B
25,508	55	Woods, Good, HSG B
30,732	62	Weighted Average
26,315		85.63% Pervious Area
4,417		14.37% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.1	50	0.0350	0.05		**Sheet Flow, A-B** Woods: Dense underbrush n= 0.800 P2= 3.24"
0.2	25	0.2200	2.35		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
17.3	75	Total			

Subcatchment E-3: Subcat E-3

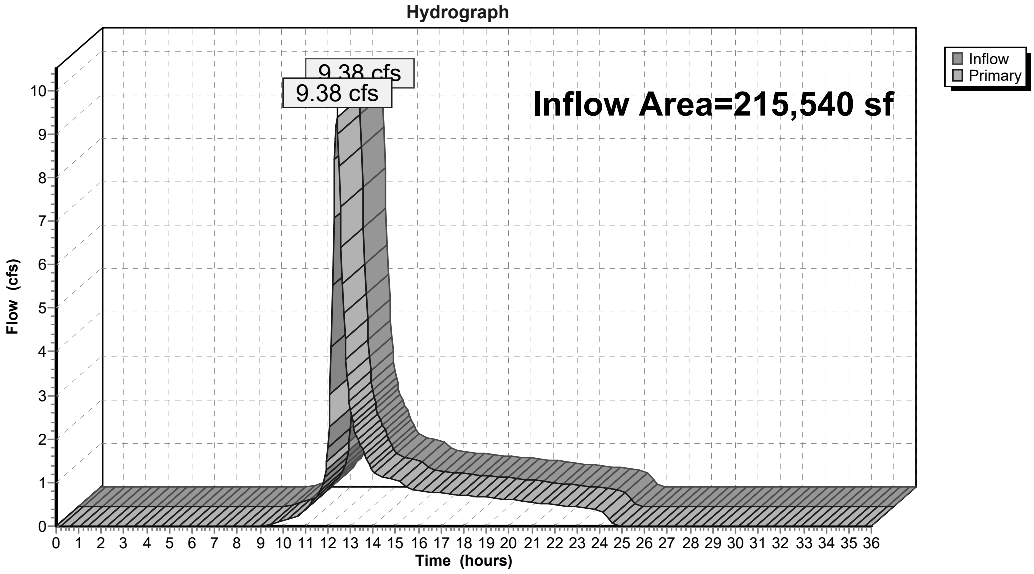


Summary for Link SP1: STUDY POINT #1

Inflow Area = 215,540 sf, 0.86% Impervious, Inflow Depth = 3.08" for 100-Year event
Inflow = 9.38 cfs @ 12.39 hrs, Volume= 55,334 cf
Primary = 9.38 cfs @ 12.39 hrs, Volume= 55,334 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link SP1: STUDY POINT #1

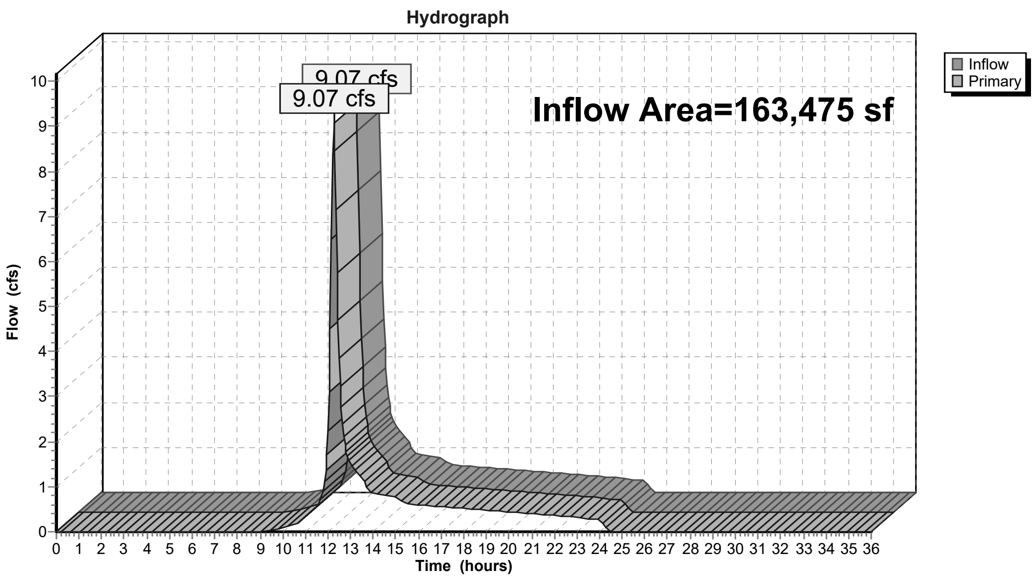


Summary for Link SP2: STUDY POINT #2

Inflow Area = 163,475 sf, 1.16% Impervious, Inflow Depth = 2.97" for 100-Year event
Inflow = 9.07 cfs @ 12.25 hrs, Volume= 40,458 cf
Primary = 9.07 cfs @ 12.25 hrs, Volume= 40,458 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link SP2: STUDY POINT #2

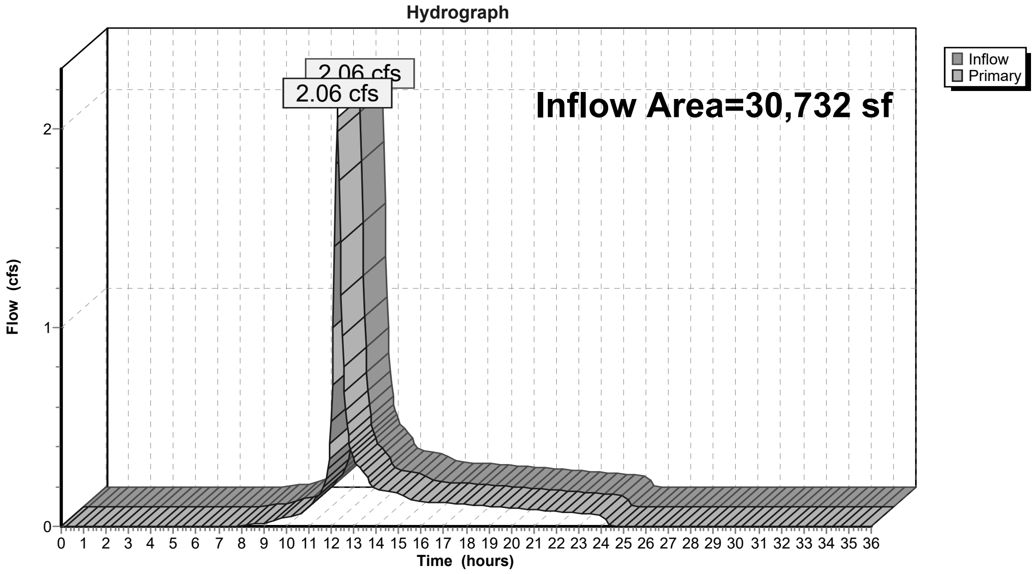


Summary for Link SP3: STUDY POINT #3

Inflow Area = 30,732 sf, 14.37% Impervious, Inflow Depth = 3.64" for 100-Year event
Inflow = 2.06 cfs @ 12.26 hrs, Volume= 9,327 cf
Primary = 2.06 cfs @ 12.26 hrs, Volume= 9,327 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link SP3: STUDY POINT #3



Events for Subcatchment E-1: Subcat E-1

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.24	0.43	5,804	0.32
10-Year	5.12	3.12	20,998	1.17
25-Year	6.30	5.39	33,427	1.86
100-Year	**8.11**	**9.38**	**55,334**	**3.08**

Events for Subcatchment E-2: Subcat E-2

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.24	0.32	3,982	0.29
10-Year	5.12	2.93	15,040	1.10
25-Year	6.30	5.16	24,202	1.78
100-Year	**8.11**	**9.07**	**40,458**	**2.97**

Events for Subcatchment E-3: Subcat E-3

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.24	0.19	1,276	0.50
10-Year	5.12	0.80	3,875	1.51
25-Year	6.30	1.27	5,886	2.30
100-Year	**8.11**	**2.06**	**9,327**	**3.64**

Events for Link SP1: STUDY POINT #1

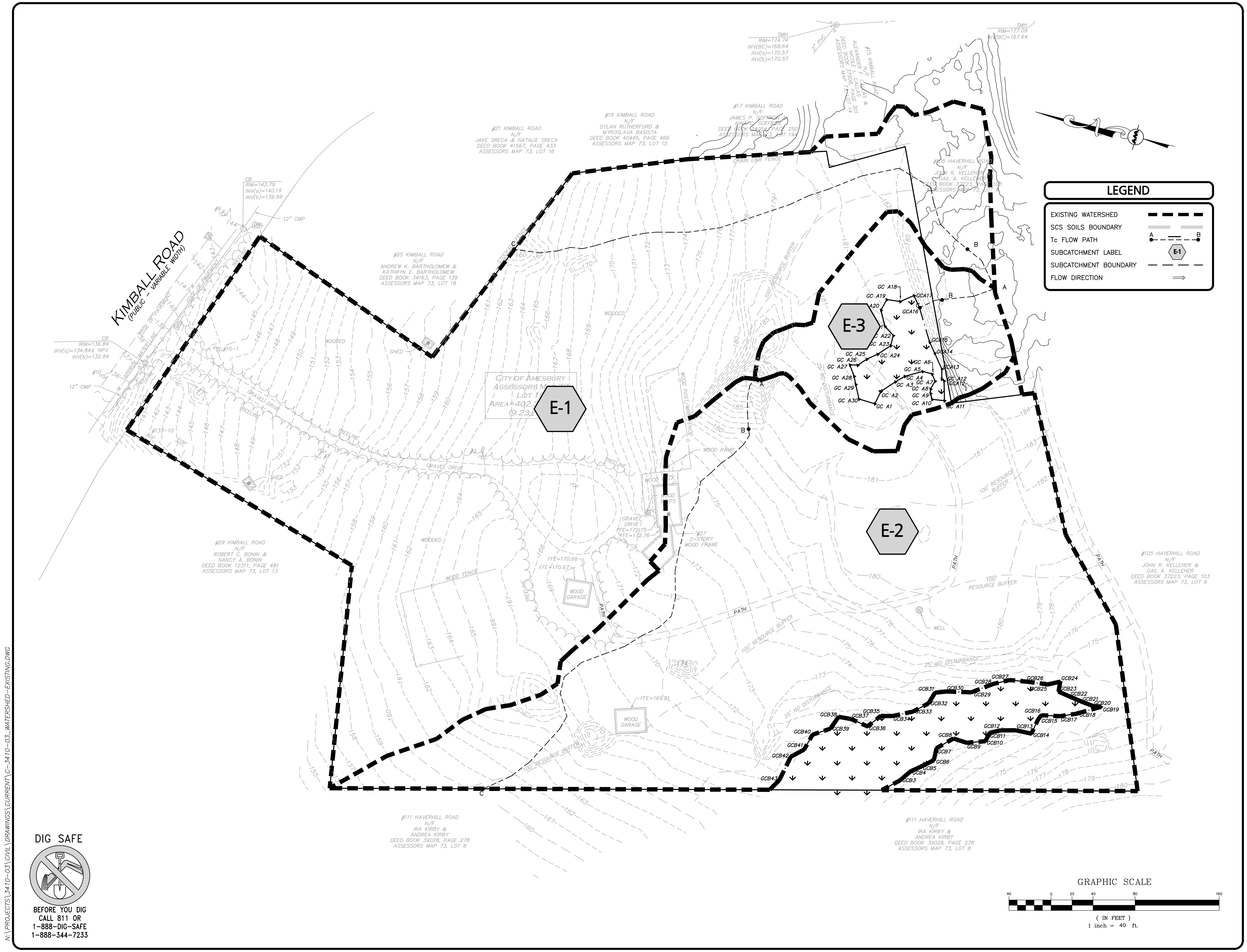
Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)
2-Year	0.43	0.43	**0.00**
10-Year	3.12	3.12	0.00
25-Year	5.39	5.39	0.00
100-Year	**9.38**	**9.38**	0.00

Events for Link SP2: STUDY POINT #2

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)
2-Year	0.32	0.32	**0.00**
10-Year	2.93	2.93	0.00
25-Year	5.16	5.16	0.00
100-Year	**9.07**	**9.07**	0.00

Events for Link SP3: STUDY POINT #3

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)
2-Year	0.19	0.19	**0.00**
10-Year	0.80	0.80	0.00
25-Year	1.27	1.27	0.00
100-Year	**2.06**	**2.06**	0.00



PROFESSIONAL ENGINEER FOR
ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION

APPLICANT:

MP PROPERTIES IV, LLC
201 WASHINGTON STREET, SUITE 2100
BOSTON, MA 02108

PROJECT:

27 KIMBALL ROAD
AMESBURY, MA

PROJECT NO.	3410-03	DATE:	01-26-2026
SCALE:	1" = 40'	DWG. NAME:	C-3410-03
DESIGNED BY:	BDP/CB	CHECKED BY:	CMQ

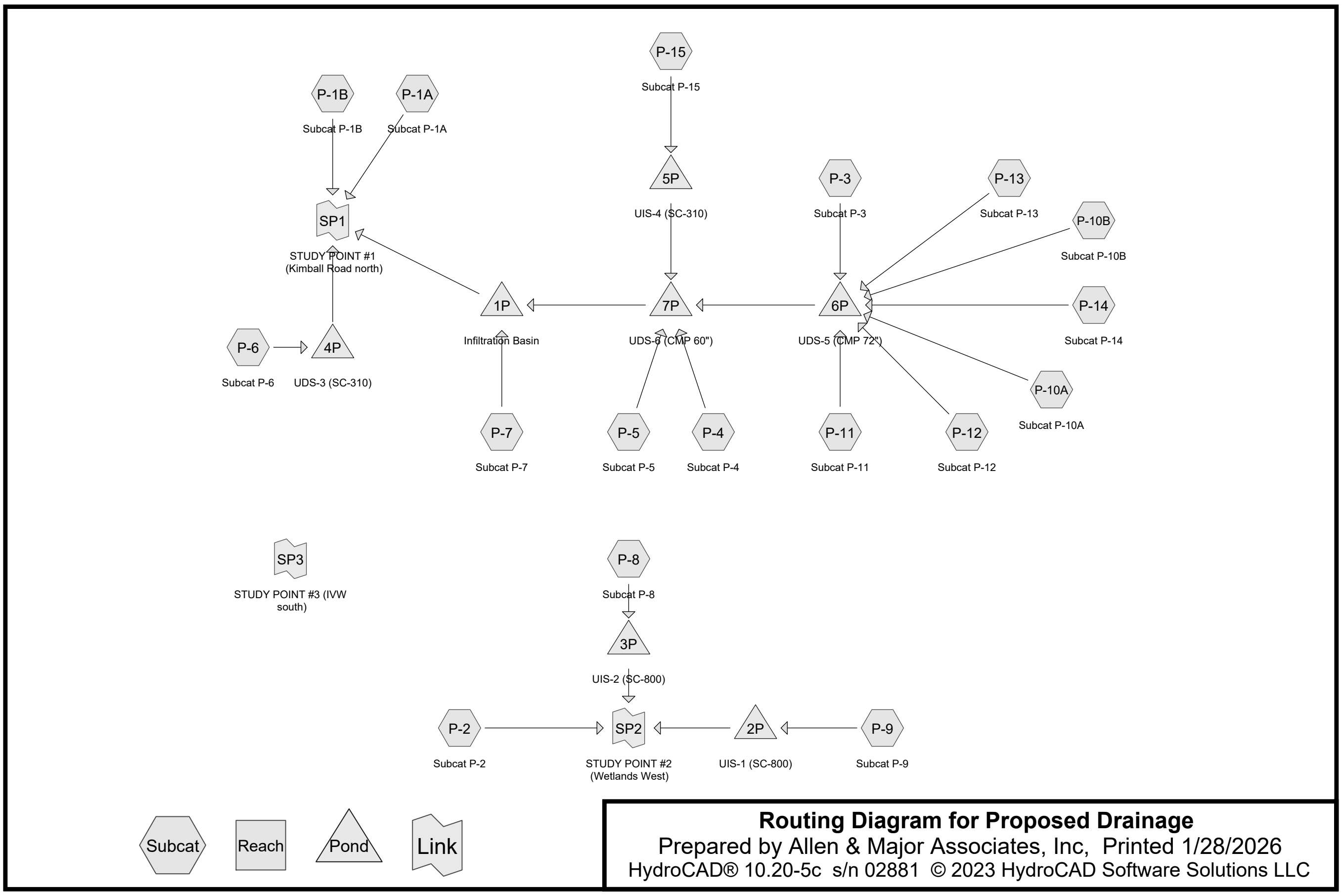
PREPARED BY:

ALLEN & MAJOR ASSOCIATES, INC.
civil engineering ♦ land surveying
environmental consulting ♦ landscape architecture
www.allenmajor.com
100 COMMERCE WAY, SUITE 5
WOBURN MA 01801
TEL: (781) 935-6889
FAX: (781) 935-2896

WOBURN, MA ♦ LAKEVILLE, MA ♦ MANCHESTER, NH

DRAWING TITLE:	SHEET No.
EXISTING WATERSHED PLAN	EWS

SECTION 5.0 -
PROPOSED DRAINAGE ANALYSIS



Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NOAA10 24-hr	D	Default	24.00	1	3.24	2
2	10-Year	NOAA10 24-hr	D	Default	24.00	1	5.12	2
3	25-Year	NOAA10 24-hr	D	Default	24.00	1	6.30	2
4	100-Year	NOAA10 24-hr	D	Default	24.00	1	8.11	2

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
139,200	61	>75% Grass cover, Good, HSG B (P-10A, P-10B, P-11, P-12, P-13, P-14, P-15, P-1A, P-1B, P-2, P-3, P-4, P-5, P-7, P-8, P-9)
114,582	98	Paved parking, HSG B (P-10A, P-10B, P-11, P-12, P-13, P-14, P-15, P-1A, P-1B, P-2, P-3, P-4, P-5, P-6, P-7, P-8, P-9)
78,873	98	Roofs, HSG B (P-10A, P-10B, P-11, P-13, P-14, P-2, P-3, P-4, P-5, P-7, P-8, P-9)
77,092	55	Woods, Good, HSG B (P-13, P-14, P-1A, P-1B, P-2, P-4, P-5, P-7, P-9)
409,748	**77**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
409,748	HSG B	P-10A, P-10B, P-11, P-12, P-13, P-14, P-15, P-1A, P-1B, P-2, P-3, P-4, P-5, P-6, P-7, P-8, P-9
0	HSG C	
0	HSG D	
0	Other	
409,748		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
0	139,200	0	0	0	139,200	>75% Grass cover, Good	P-10A, P-10B, P-11, P-12, P-13, P-14, P-15, P-1A, P-1B, P-2, P-3, P-4, P-5, P-7, P-8, P-9
0	114,582	0	0	0	114,582	Paved parking	P-10A, P-10B, P-11, P-12, P-13, P-14, P-15, P-1A, P-1B, P-2, P-3, P-4, P-5, P-6, P-7, P-8, P-9
0	78,873	0	0	0	78,873	Roofs	P-10A, P-10B, P-11, P-13, P-14, P-2, P-3, P-4, P-5, P-7, P-8, P-9
0	77,092	0	0	0	77,092	Woods, Good	P-13, P-14, P-1A, P-1B, P-2, P-4, P-5, P-7, P-9
0	**409,748**	**0**	**0**	**0**	**409,748**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	1P	141.50	138.30	64.0	0.0500	0.013	0.0	12.0	0.0	Infiltration Basin
2	2P	166.80	165.00	158.0	0.0114	0.013	0.0	12.0	0.0	UIS-1 (SC-800)
3	3P	160.78	160.00	78.0	0.0100	0.013	0.0	12.0	0.0	UIS-2 (SC-800)
4	4P	133.50	132.84	33.0	0.0200	0.013	0.0	12.0	0.0	UDS-3 (SC-310)
5	5P	164.50	163.00	25.0	0.0600	0.013	0.0	15.0	0.0	UIS-4 (SC-310)
6	6P	161.50	161.00	10.0	0.0500	0.013	0.0	12.0	0.0	UDS-5 (CMP 72")
7	7P	152.00	150.00	250.0	0.0080	0.013	0.0	15.0	0.0	UDS-6 (CMP 60")

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-10A: Subcat P-10A	Runoff Area=16,553 sf 57.69% Impervious Runoff Depth=1.57" Tc=6.0 min CN=82 Runoff=0.72 cfs 2,166 cf
Subcatchment P-10B: Subcat P-10B	Runoff Area=15,645 sf 50.07% Impervious Runoff Depth=1.43" Tc=6.0 min CN=80 Runoff=0.62 cfs 1,868 cf
Subcatchment P-11: Subcat P-11	Runoff Area=32,948 sf 54.95% Impervious Runoff Depth=1.50" Tc=6.0 min CN=81 Runoff=1.37 cfs 4,120 cf
Subcatchment P-12: Subcat P-12	Runoff Area=8,298 sf 24.91% Impervious Runoff Depth=0.85" Tc=6.0 min CN=70 Runoff=0.18 cfs 589 cf
Subcatchment P-13: Subcat P-13	Runoff Area=52,463 sf 36.14% Impervious Runoff Depth=0.95" Tc=6.0 min CN=72 Runoff=1.33 cfs 4,173 cf
Subcatchment P-14: Subcat P-14	Runoff Area=24,855 sf 59.92% Impervious Runoff Depth=1.64" Tc=6.0 min CN=83 Runoff=1.13 cfs 3,401 cf
Subcatchment P-15: Subcat P-15	Runoff Area=9,184 sf 88.68% Impervious Runoff Depth=2.58" Tc=6.0 min CN=94 Runoff=0.61 cfs 1,977 cf
Subcatchment P-1A: Subcat P-1A	Runoff Area=13,439 sf 0.30% Impervious Runoff Depth=0.32" Tc=6.0 min CN=57 Runoff=0.06 cfs 362 cf
Subcatchment P-1B: Subcat P-1B	Runoff Area=21,569 sf 3.33% Impervious Runoff Depth=0.46" Tc=6.0 min CN=61 Runoff=0.19 cfs 828 cf
Subcatchment P-2: Subcat P-2	Runoff Area=46,203 sf 1.61% Impervious Runoff Depth=0.32" Tc=6.0 min CN=57 Runoff=0.19 cfs 1,244 cf
Subcatchment P-3: Subcat P-3	Runoff Area=9,286 sf 95.37% Impervious Runoff Depth=2.79" Tc=6.0 min CN=96 Runoff=0.65 cfs 2,158 cf

Subcatchment P-4: Subcat P-4	Runoff Area=24,255 sf 64.29% Impervious Runoff Depth=1.79" Tc=6.0 min CN=85 Runoff=1.20 cfs 3,622 cf
Subcatchment P-5: Subcat P-5	Runoff Area=25,326 sf 68.66% Impervious Runoff Depth=1.87" Tc=6.0 min CN=86 Runoff=1.30 cfs 3,947 cf
Subcatchment P-6: Subcat P-6	Runoff Area=5,351 sf 100.00% Impervious Runoff Depth=3.01" Tc=6.0 min CN=98 Runoff=0.39 cfs 1,341 cf
Subcatchment P-7: Subcat P-7	Runoff Area=17,094 sf 32.66% Impervious Runoff Depth=1.01" Tc=6.0 min CN=73 Runoff=0.46 cfs 1,437 cf
Subcatchment P-8: Subcat P-8	Runoff Area=26,823 sf 72.08% Impervious Runoff Depth=2.03" Tc=6.0 min CN=88 Runoff=1.49 cfs 4,544 cf
Subcatchment P-9: Subcat P-9	Runoff Area=60,455 sf 66.65% Impervious Runoff Depth=1.79" Tc=6.0 min CN=85 Runoff=2.99 cfs 9,027 cf
Pond 1P: Infiltration Basin	Peak Elev=145.34' Storage=12,230 cf Inflow=0.73 cfs 27,480 cf Discarded=0.10 cfs 18,111 cf Primary=0.29 cfs 8,707 cf Outflow=0.39 cfs 26,818 cf
Pond 2P: UIS-1 (SC-800)	Peak Elev=167.37' Storage=3,757 cf Inflow=2.99 cfs 9,027 cf Discarded=0.13 cfs 9,027 cf Primary=0.00 cfs 0 cf Outflow=0.13 cfs 9,027 cf
Pond 3P: UIS-2 (SC-800)	Peak Elev=159.62' Storage=2,076 cf Inflow=1.49 cfs 4,544 cf Discarded=0.05 cfs 4,544 cf Primary=0.00 cfs 0 cf Outflow=0.05 cfs 4,544 cf
Pond 4P: UDS-3 (SC-310)	Peak Elev=134.30' Storage=156 cf Inflow=0.39 cfs 1,341 cf Outflow=0.19 cfs 1,341 cf
Pond 5P: UIS-4 (SC-310)	Peak Elev=164.50' Storage=523 cf Inflow=0.61 cfs 1,977 cf Discarded=0.06 cfs 1,977 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 1,977 cf
Pond 6P: UDS-5 (CMP 72")	Peak Elev=163.20' Storage=4,742 cf Inflow=5.99 cfs 18,475 cf Outflow=1.14 cfs 18,475 cf

Pond 7P: UDS-6 (CMP 60") Peak Elev=155.68' Storage=11,376 cf Inflow=3.44 cfs 26,043 cf
Outflow=0.45 cfs 26,043 cf

Link SP1: STUDY POINT #1 (Kimball Road north) Inflow=0.43 cfs 11,238 cf
Primary=0.43 cfs 11,238 cf

Link SP2: STUDY POINT #2 (Wetlands West) Inflow=0.19 cfs 1,244 cf
Primary=0.19 cfs 1,244 cf

Link SP3: STUDY POINT #3 (IVW south)
Primary=0.00 cfs 0 cf

Total Runoff Area = 409,748 sf Runoff Volume = 46,803 cf Average Runoff Depth = 1.37"
52.79% Pervious = 216,292 sf 47.21% Impervious = 193,456 sf

Summary for Subcatchment P-10A: Subcat P-10A

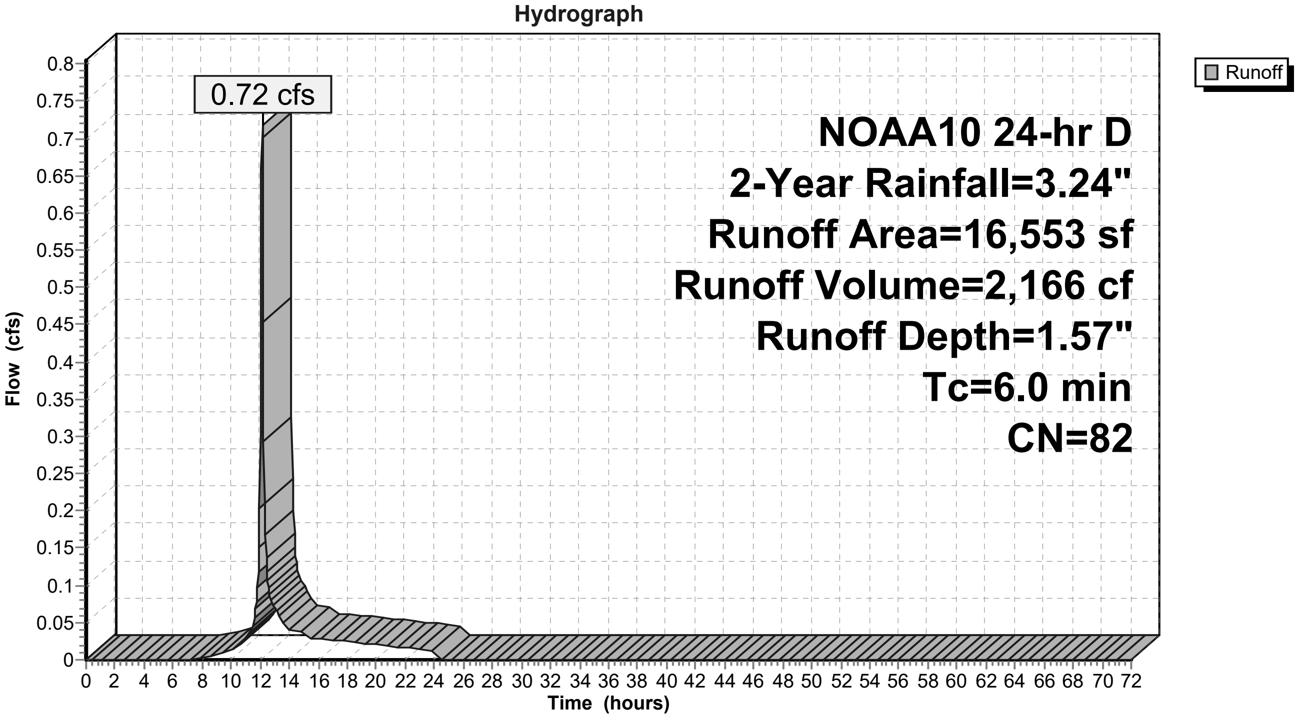
Runoff = 0.72 cfs @ 12.13 hrs, Volume= 2,166 cf, Depth= 1.57"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
7,004	61	>75% Grass cover, Good, HSG B
2,341	98	Paved parking, HSG B
7,208	98	Roofs, HSG B
16,553	82	Weighted Average
7,004		42.31% Pervious Area
9,549		57.69% Impervious Area

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

Subcatchment P-10A: Subcat P-10A



Summary for Subcatchment P-10B: Subcat P-10B

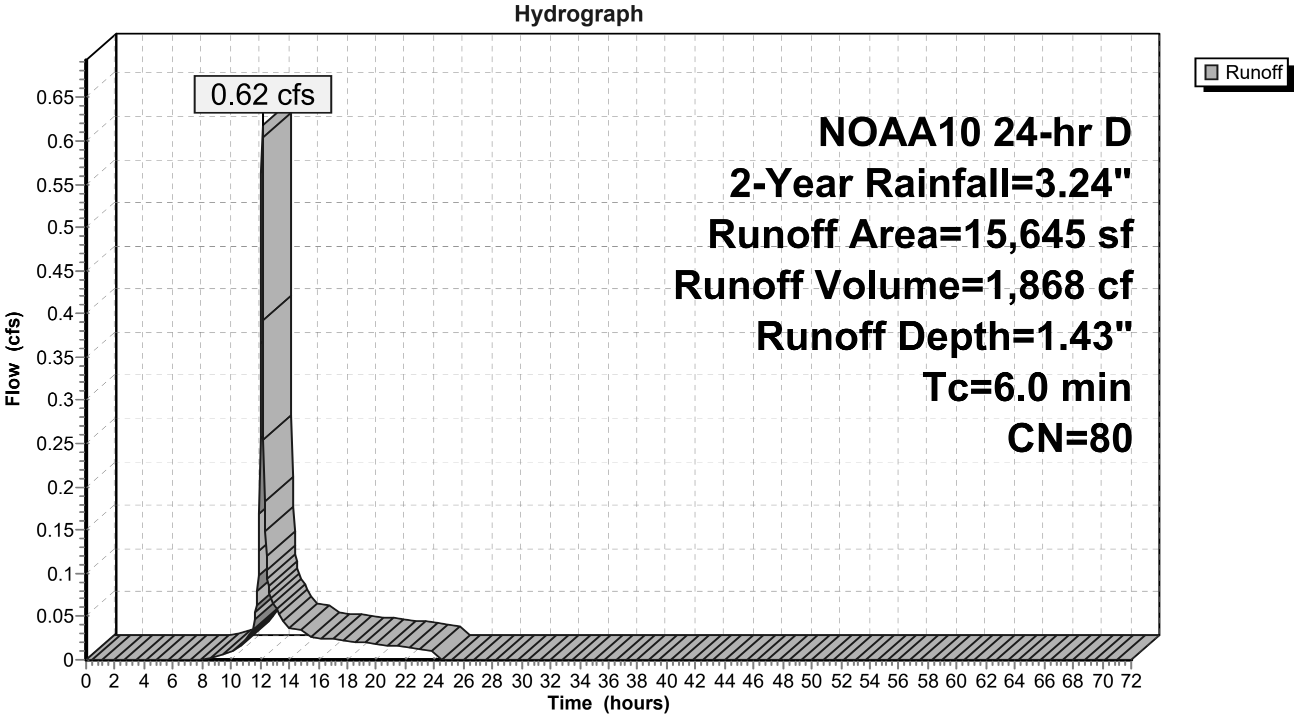
Runoff = 0.62 cfs @ 12.13 hrs, Volume= 1,868 cf, Depth= 1.43"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
7,811	61	>75% Grass cover, Good, HSG B
1,108	98	Paved parking, HSG B
6,726	98	Roofs, HSG B
15,645	80	Weighted Average
7,811		49.93% Pervious Area
7,834		50.07% Impervious Area

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

Subcatchment P-10B: Subcat P-10B



Summary for Subcatchment P-11: Subcat P-11

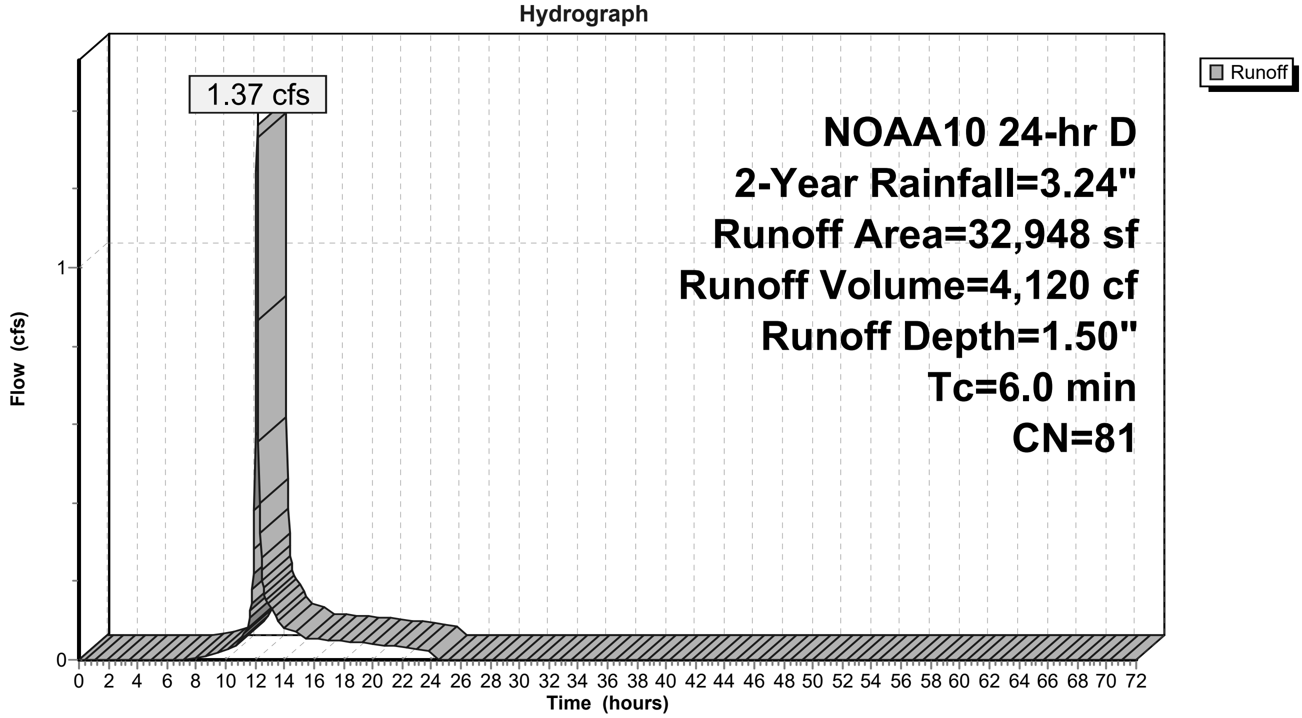
Runoff = 1.37 cfs @ 12.13 hrs, Volume= 4,120 cf, Depth= 1.50"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
14,844	61	>75% Grass cover, Good, HSG B
4,669	98	Paved parking, HSG B
13,435	98	Roofs, HSG B
32,948	81	Weighted Average
14,844		45.05% Pervious Area
18,105		54.95% Impervious Area

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

Subcatchment P-11: Subcat P-11



Summary for Subcatchment P-12: Subcat P-12

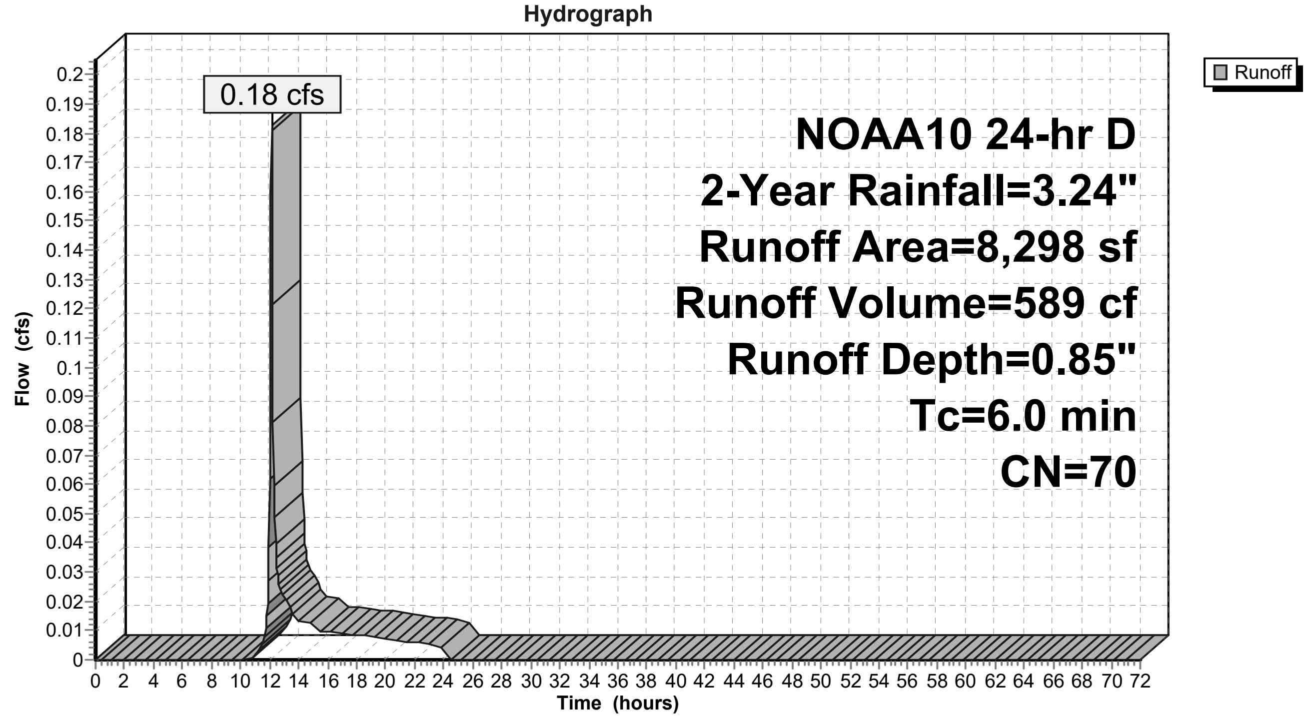
Runoff = 0.18 cfs @ 12.14 hrs, Volume= 589 cf, Depth= 0.85"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
6,231	61	>75% Grass cover, Good, HSG B
2,067	98	Paved parking, HSG B
8,298	70	Weighted Average
6,231		75.09% Pervious Area
2,067		24.91% Impervious Area

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

Subcatchment P-12: Subcat P-12



Summary for Subcatchment P-13: Subcat P-13

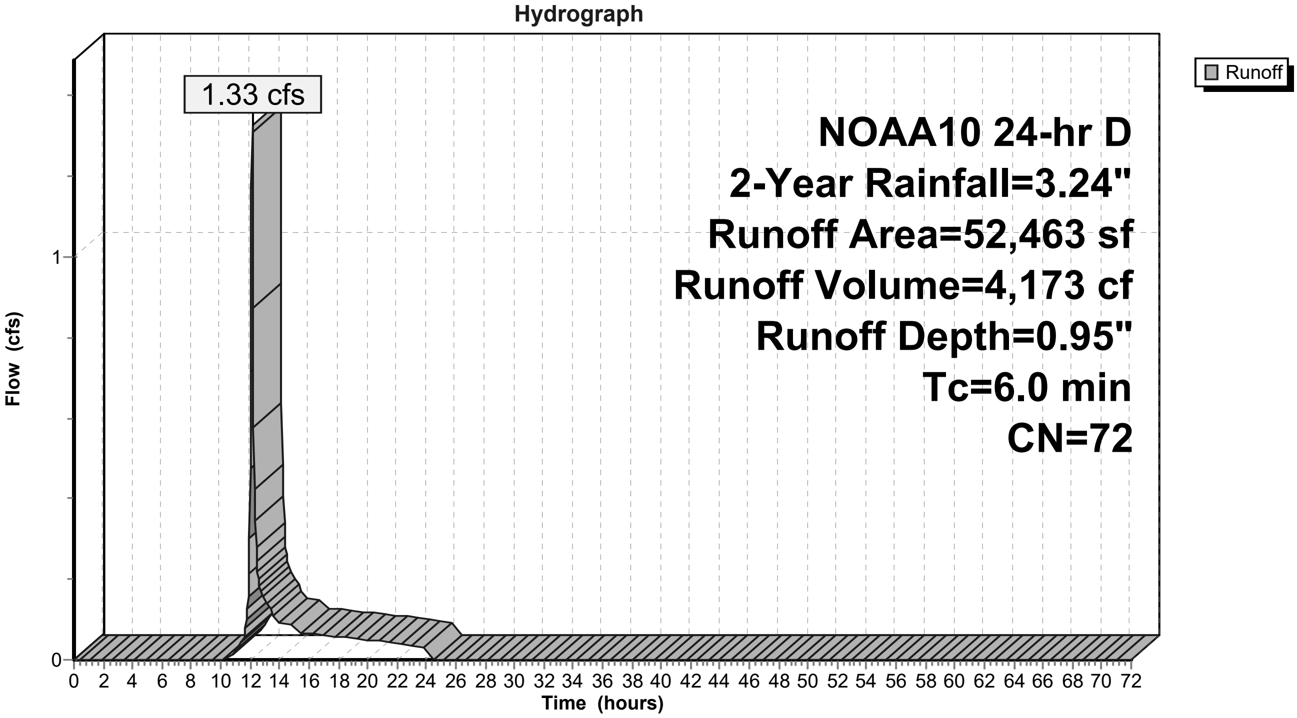
Runoff = 1.33 cfs @ 12.14 hrs, Volume= 4,173 cf, Depth= 0.95"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
10,162	61	>75% Grass cover, Good, HSG B
12,922	98	Paved parking, HSG B
6,037	98	Roofs, HSG B
23,343	55	Woods, Good, HSG B
52,463	72	Weighted Average
33,504		63.86% Pervious Area
18,959		36.14% Impervious Area

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

Subcatchment P-13: Subcat P-13



Summary for Subcatchment P-14: Subcat P-14

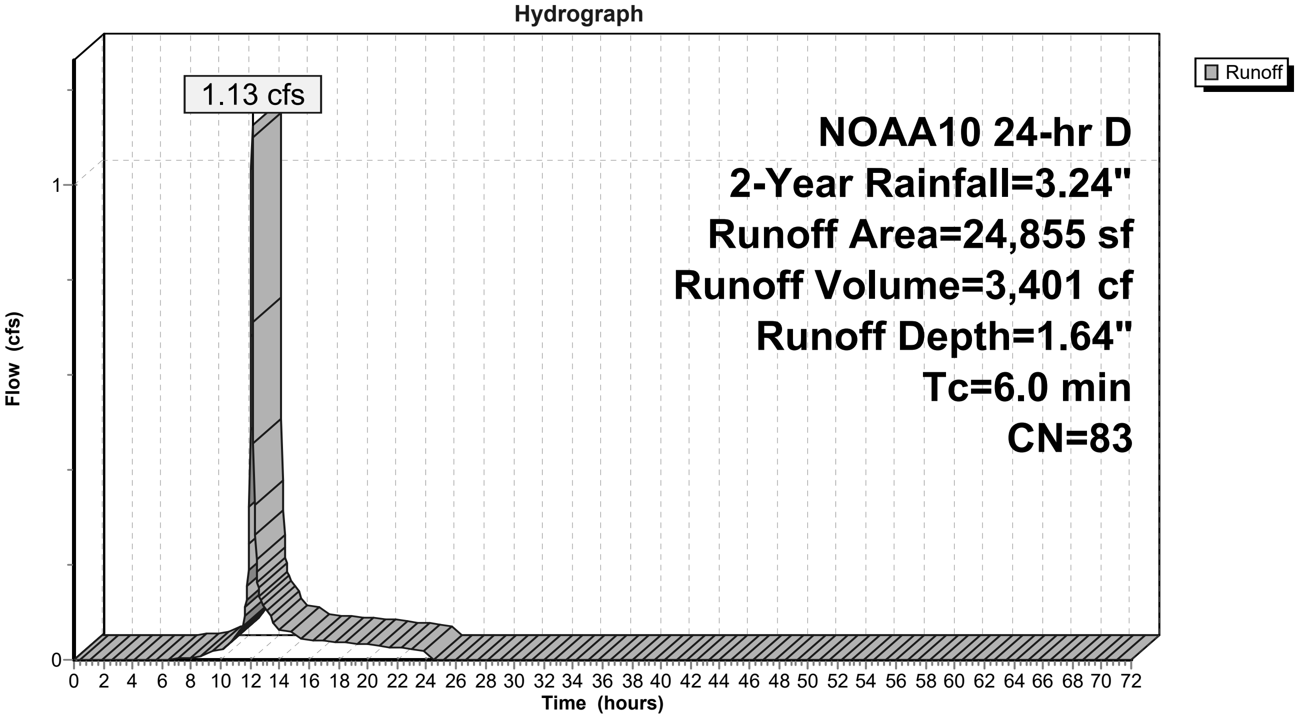
Runoff = 1.13 cfs @ 12.13 hrs, Volume= 3,401 cf, Depth= 1.64"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
9,959	61	>75% Grass cover, Good, HSG B
2,548	98	Paved parking, HSG B
12,345	98	Roofs, HSG B
2	55	Woods, Good, HSG B
24,855	83	Weighted Average
9,961		40.08% Pervious Area
14,893		59.92% Impervious Area

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

Subcatchment P-14: Subcat P-14



Summary for Subcatchment P-15: Subcat P-15

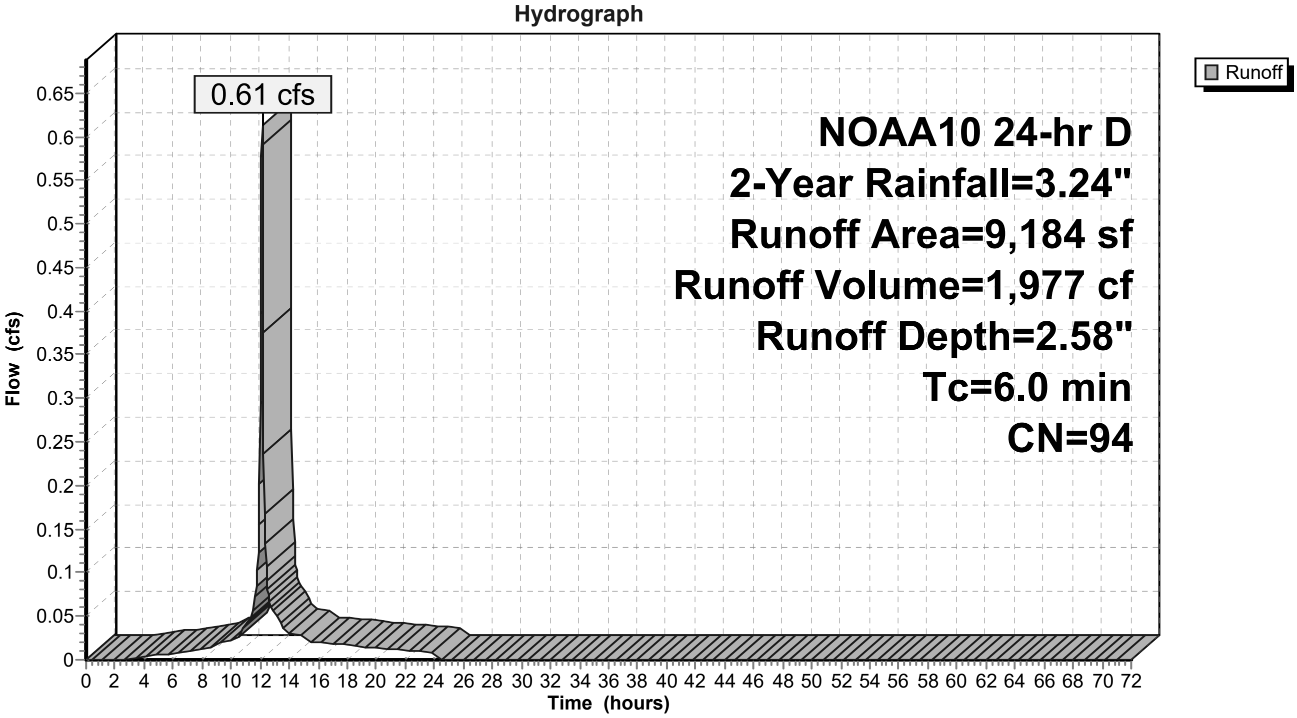
Runoff = 0.61 cfs @ 12.13 hrs, Volume= 1,977 cf, Depth= 2.58"
Routed to Pond 5P : UIS-4 (SC-310)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
1,039	61	>75% Grass cover, Good, HSG B
8,145	98	Paved parking, HSG B
9,184	94	Weighted Average
1,039		11.32% Pervious Area
8,145		88.68% Impervious Area

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

Subcatchment P-15: Subcat P-15



Summary for Subcatchment P-1A: Subcat P-1A

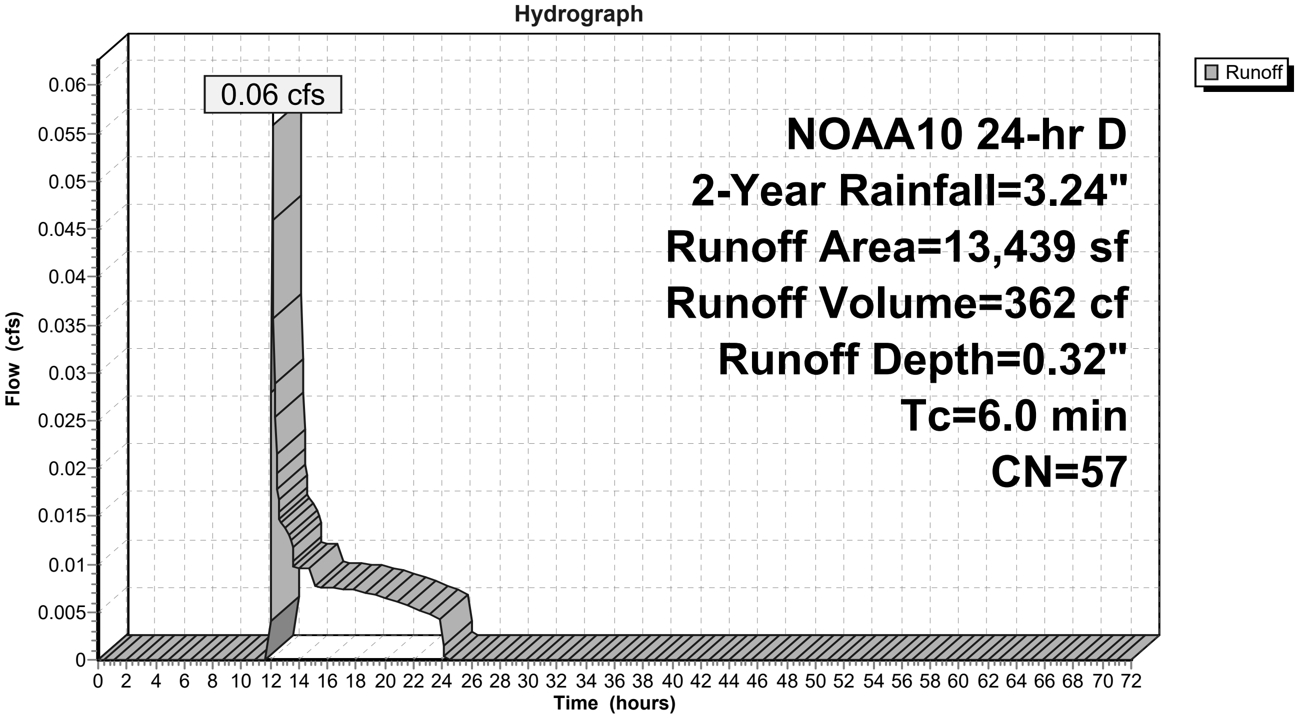
Runoff = 0.06 cfs @ 12.16 hrs, Volume= 362 cf, Depth= 0.32"
Routed to Link SP1 : STUDY POINT #1 (Kimball Road north)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
3,544	61	>75% Grass cover, Good, HSG B
40	98	Paved parking, HSG B
9,854	55	Woods, Good, HSG B
13,439	57	Weighted Average
13,398		99.70% Pervious Area
40		0.30% Impervious Area

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

Subcatchment P-1A: Subcat P-1A



Summary for Subcatchment P-1B: Subcat P-1B

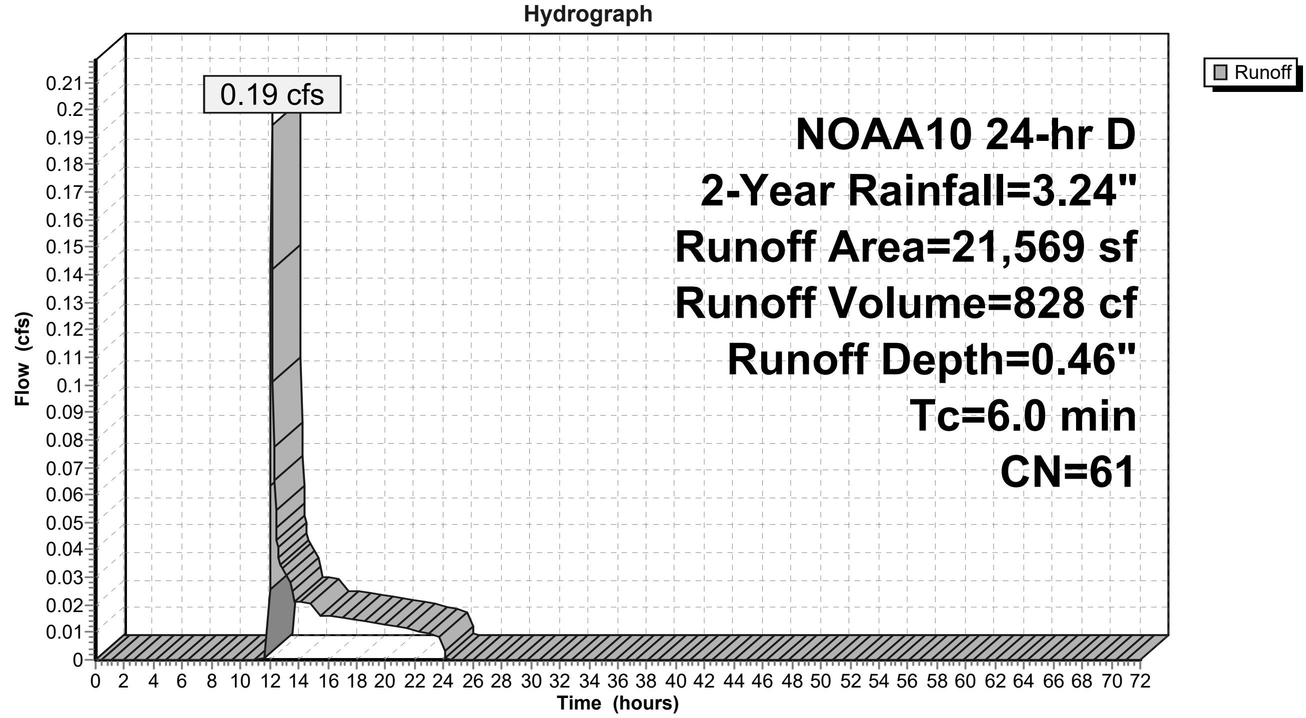
Runoff = 0.19 cfs @ 12.15 hrs, Volume= 828 cf, Depth= 0.46"
Routed to Link SP1 : STUDY POINT #1 (Kimball Road north)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
15,923	61	>75% Grass cover, Good, HSG B
718	98	Paved parking, HSG B
4,928	55	Woods, Good, HSG B
21,569	61	Weighted Average
20,851		96.67% Pervious Area
718		3.33% Impervious Area

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

Subcatchment P-1B: Subcat P-1B



Summary for Subcatchment P-2: Subcat P-2

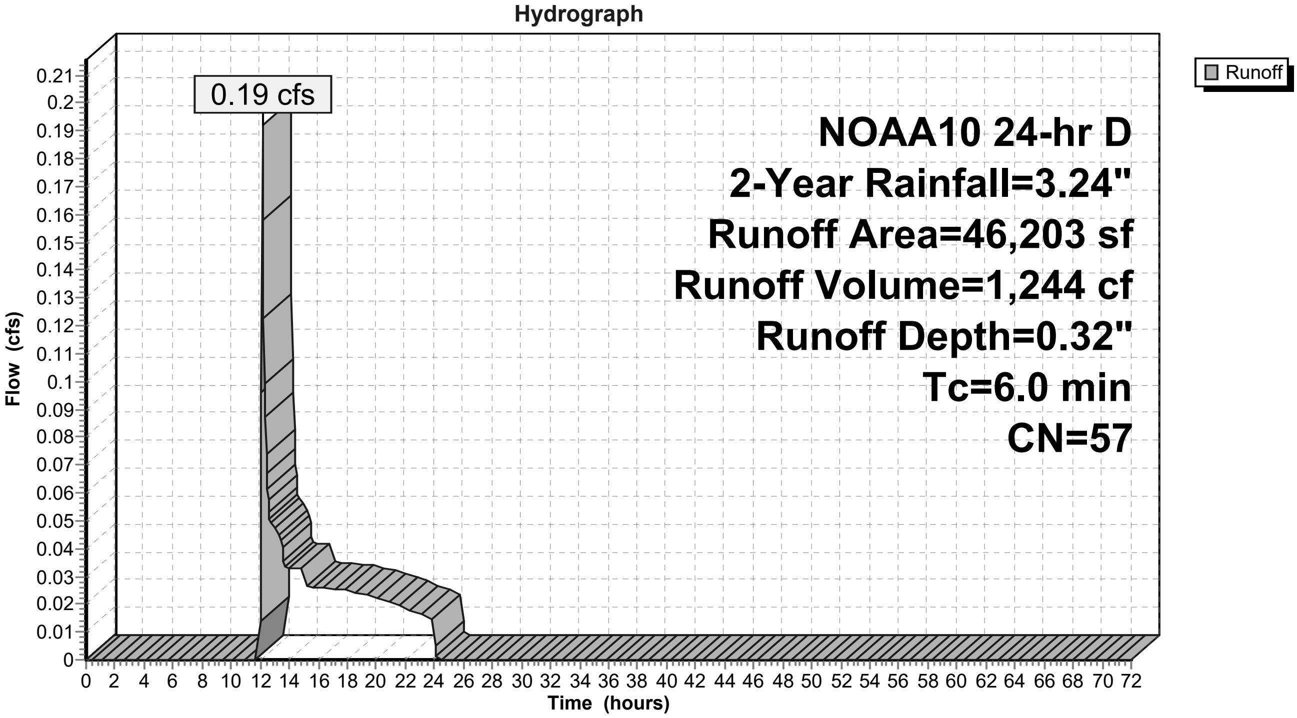
Runoff = 0.19 cfs @ 12.16 hrs, Volume= 1,244 cf, Depth= 0.32"
Routed to Link SP2 : STUDY POINT #2 (Wetlands West)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
8,701	61	>75% Grass cover, Good, HSG B
535	98	Paved parking, HSG B
209	98	Roofs, HSG B
36,759	55	Woods, Good, HSG B
46,203	57	Weighted Average
45,460		98.39% Pervious Area
743		1.61% Impervious Area

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

Subcatchment P-2: Subcat P-2



Summary for Subcatchment P-3: Subcat P-3

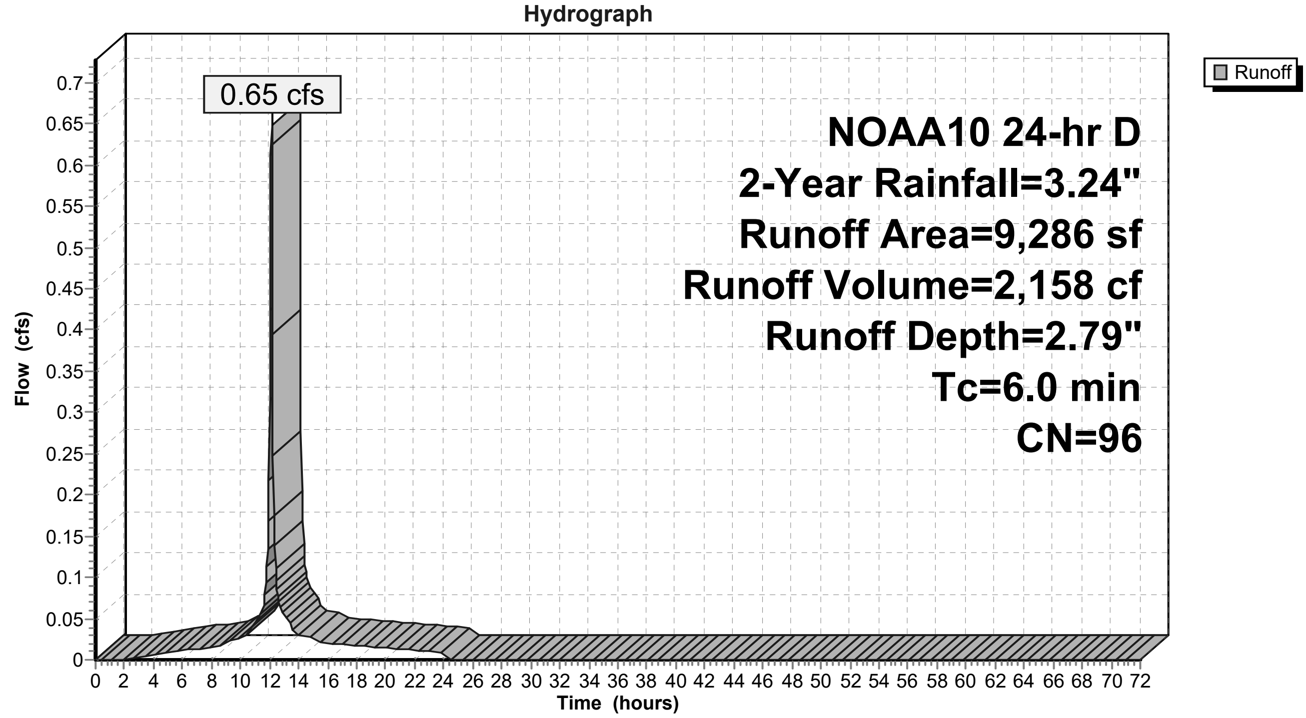
Runoff = 0.65 cfs @ 12.13 hrs, Volume= 2,158 cf, Depth= 2.79"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
430	61	>75% Grass cover, Good, HSG B
8,855	98	Paved parking, HSG B
1	98	Roofs, HSG B
9,286	96	Weighted Average
430		4.63% Pervious Area
8,856		95.37% Impervious Area

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

Subcatchment P-3: Subcat P-3



Summary for Subcatchment P-4: Subcat P-4

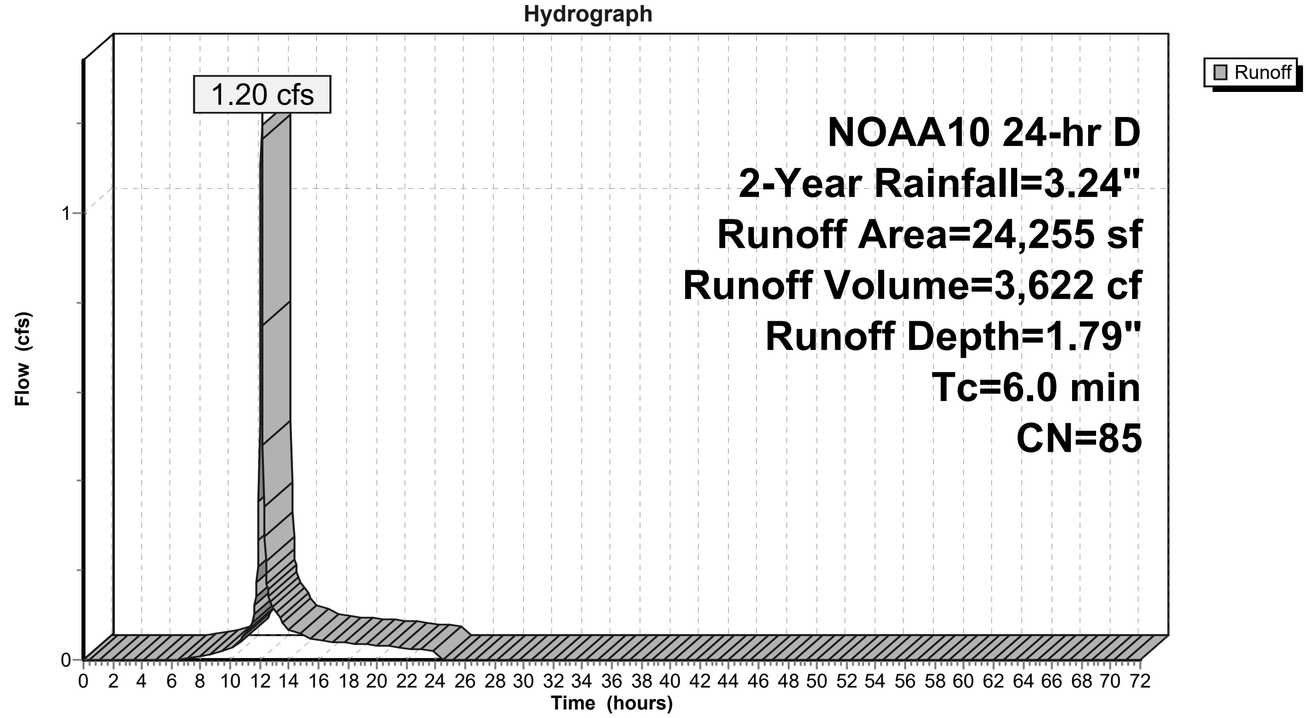
Runoff = 1.20 cfs @ 12.13 hrs, Volume= 3,622 cf, Depth= 1.79"
Routed to Pond 7P : UDS-6 (CMP 60")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
8,655	61	>75% Grass cover, Good, HSG B
14,992	98	Paved parking, HSG B
602	98	Roofs, HSG B
6	55	Woods, Good, HSG B
24,255	85	Weighted Average
8,661		35.71% Pervious Area
15,594		64.29% Impervious Area

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

Subcatchment P-4: Subcat P-4



Summary for Subcatchment P-5: Subcat P-5

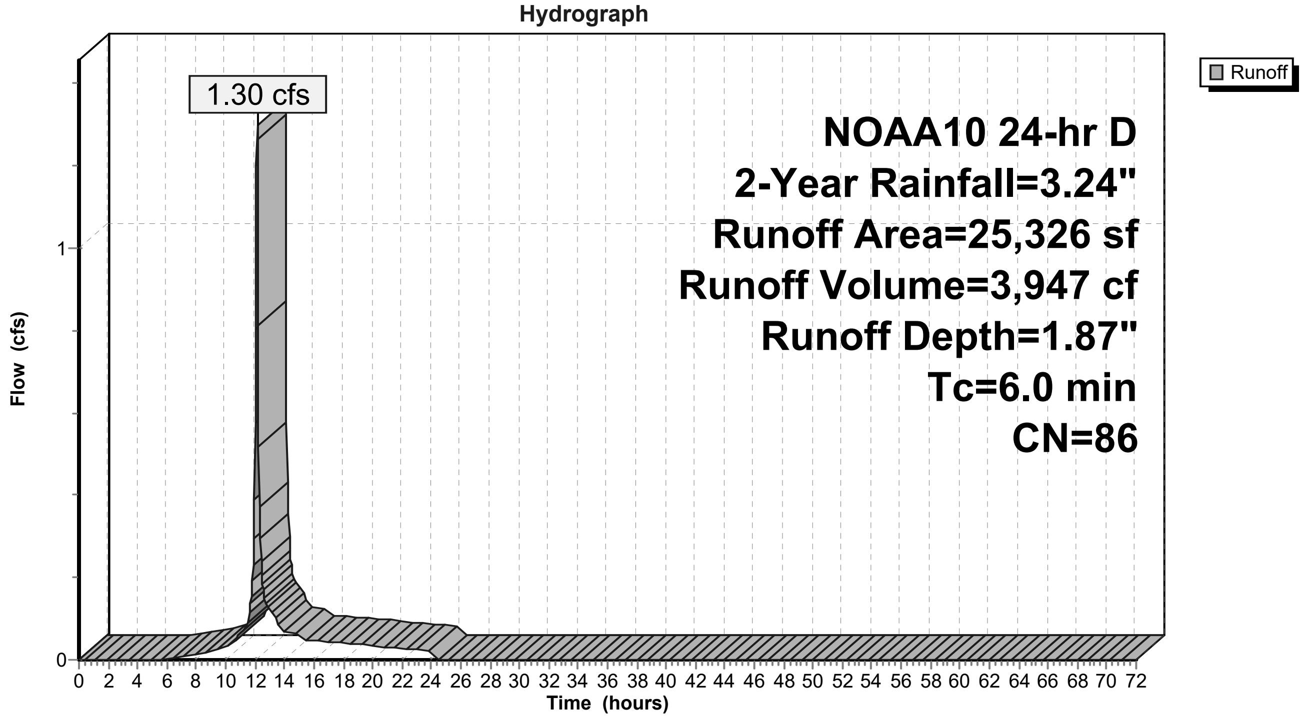
Runoff = 1.30 cfs @ 12.13 hrs, Volume= 3,947 cf, Depth= 1.87"
Routed to Pond 7P : UDS-6 (CMP 60")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
7,931	61	>75% Grass cover, Good, HSG B
8,801	98	Paved parking, HSG B
8,589	98	Roofs, HSG B
6	55	Woods, Good, HSG B
25,326	86	Weighted Average
7,937		31.34% Pervious Area
17,389		68.66% Impervious Area

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

Subcatchment P-5: Subcat P-5



Summary for Subcatchment P-6: Subcat P-6

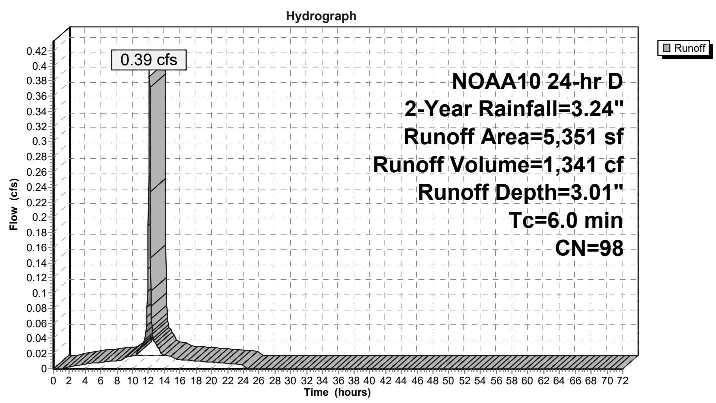
Runoff = 0.39 cfs @ 12.13 hrs, Volume= 1,341 cf, Depth= 3.01"
Routed to Pond 4P : UDS-3 (SC-310)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
5,351	98	Paved parking, HSG B
5,351		100.00% Impervious Area

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

Subcatchment P-6: Subcat P-6



Summary for Subcatchment P-7: Subcat P-7

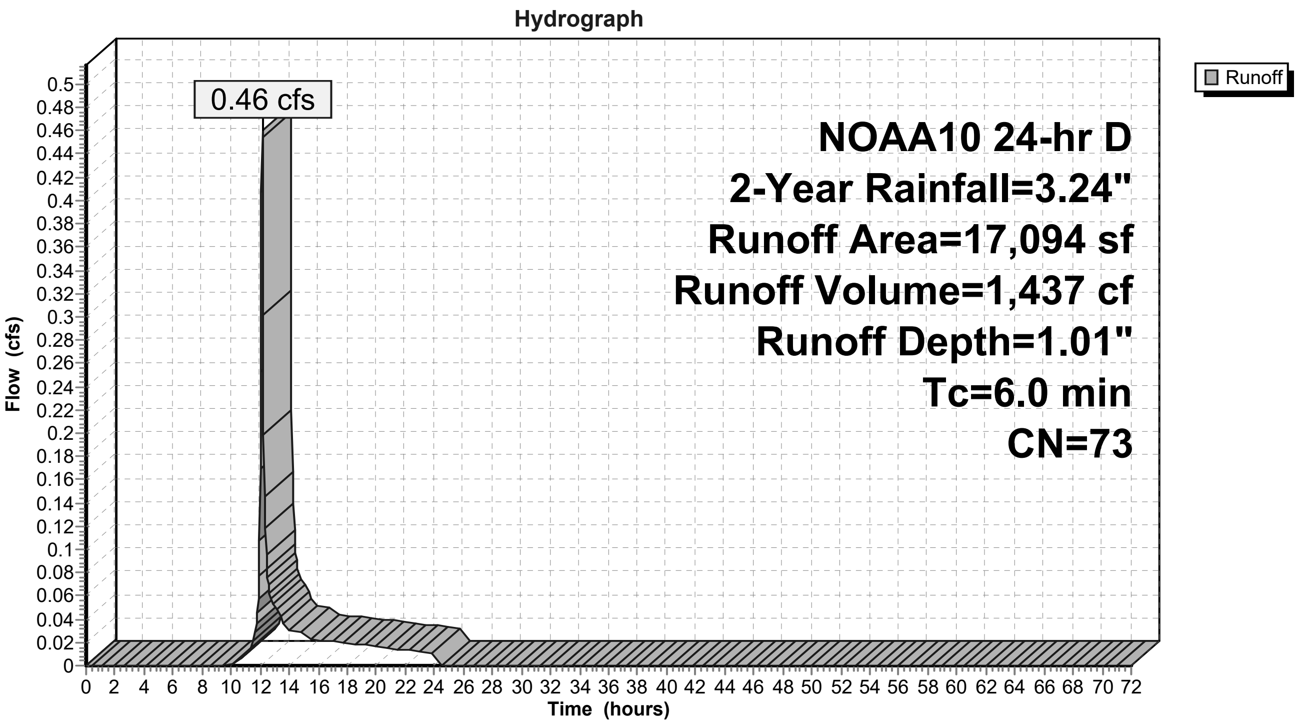
Runoff = 0.46 cfs @ 12.14 hrs, Volume= 1,437 cf, Depth= 1.01"
Routed to Pond 1P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
11,506	61	>75% Grass cover, Good, HSG B
1,073	98	Paved parking, HSG B
4,510	98	Roofs, HSG B
4	55	Woods, Good, HSG B
17,094	73	Weighted Average
11,510		67.34% Pervious Area
5,584		32.66% Impervious Area

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

Subcatchment P-7: Subcat P-7



Summary for Subcatchment P-8: Subcat P-8

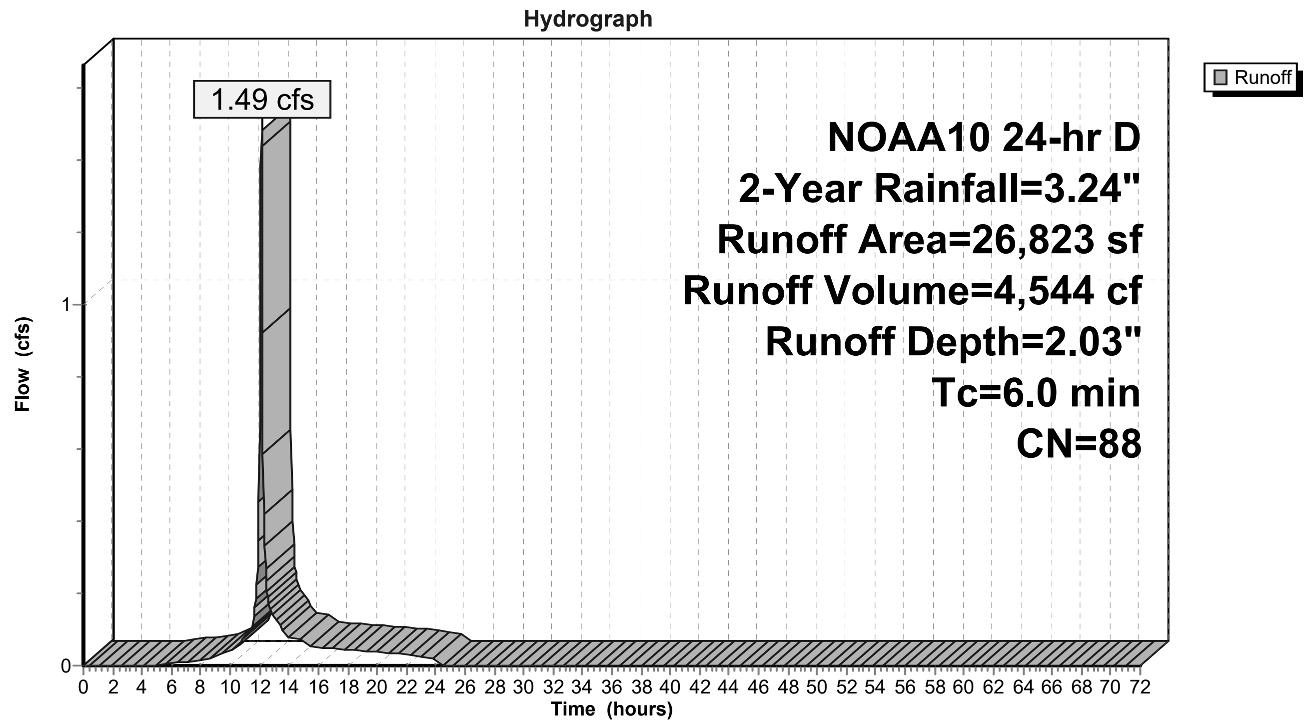
Runoff = 1.49 cfs @ 12.13 hrs, Volume= 4,544 cf, Depth= 2.03"
Routed to Pond 3P : UIS-2 (SC-800)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
7,489	61	>75% Grass cover, Good, HSG B
13,141	98	Paved parking, HSG B
6,193	98	Roofs, HSG B
26,823	88	Weighted Average
7,489		27.92% Pervious Area
19,334		72.08% Impervious Area

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

Subcatchment P-8: Subcat P-8



Summary for Subcatchment P-9: Subcat P-9

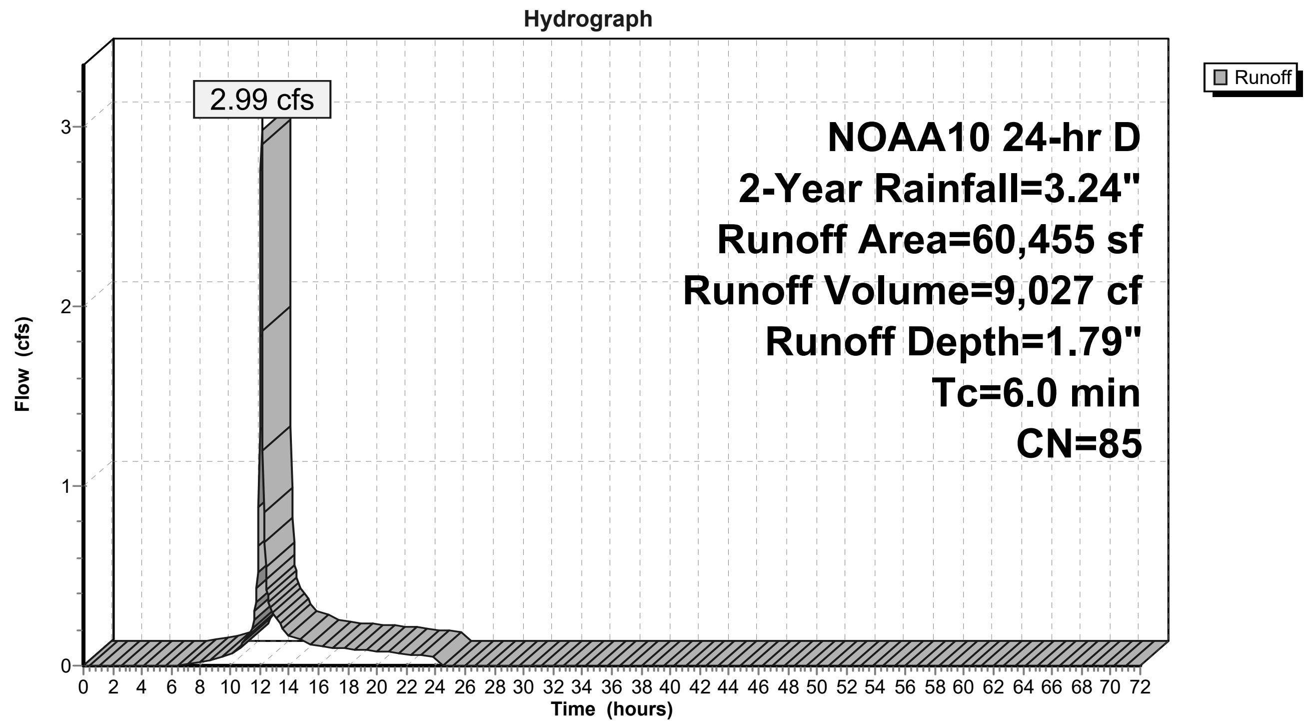
Runoff = 2.99 cfs @ 12.13 hrs, Volume= 9,027 cf, Depth= 1.79"
Routed to Pond 2P : UIS-1 (SC-800)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 2-Year Rainfall=3.24"

Area (sf)	CN	Description
17,971	61	>75% Grass cover, Good, HSG B
27,276	98	Paved parking, HSG B
13,018	98	Roofs, HSG B
2,190	55	Woods, Good, HSG B
60,455	85	Weighted Average
20,161		33.35% Pervious Area
40,294		66.65% Impervious Area

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

Subcatchment P-9: Subcat P-9



Summary for Pond 1P: Infiltration Basin

Inflow Area = 235,908 sf, 53.82% Impervious, Inflow Depth = 1.40" for 2-Year event
Inflow = 0.73 cfs @ 12.14 hrs, Volume= 27,480 cf
Outflow = 0.39 cfs @ 22.80 hrs, Volume= 26,818 cf, Atten= 46%, Lag= 639.7 min
Discarded = 0.10 cfs @ 22.80 hrs, Volume= 18,111 cf
Primary = 0.29 cfs @ 22.80 hrs, Volume= 8,707 cf
Routed to Link SP1 : STUDY POINT #1 (Kimball Road north)

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 145.34' @ 22.80 hrs Surf.Area= 4,300 sf Storage= 12,230 cf
Flood Elev= 146.50' Surf.Area= 5,034 sf Storage= 17,623 cf

Plug-Flow detention time= 876.0 min calculated for 26,818 cf (98% of inflow)
Center-of-Mass det. time= 856.0 min (2,063.1 - 1,207.0)

Volume	Invert	Avail.Storage	Storage Description
#1	141.50'	21,155 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
141.50	2,137	224.8	0	0	2,137
142.00	2,394	232.9	1,132	1,132	2,453
143.00	2,930	249.4	2,657	3,790	3,131
144.00	3,496	266.1	3,209	6,998	3,863
145.00	4,090	282.0	3,789	10,788	4,609
146.00	4,714	297.5	4,398	15,186	5,380
147.00	5,365	312.9	5,036	20,222	6,188
147.15	7,117	351.5	933	21,155	8,229

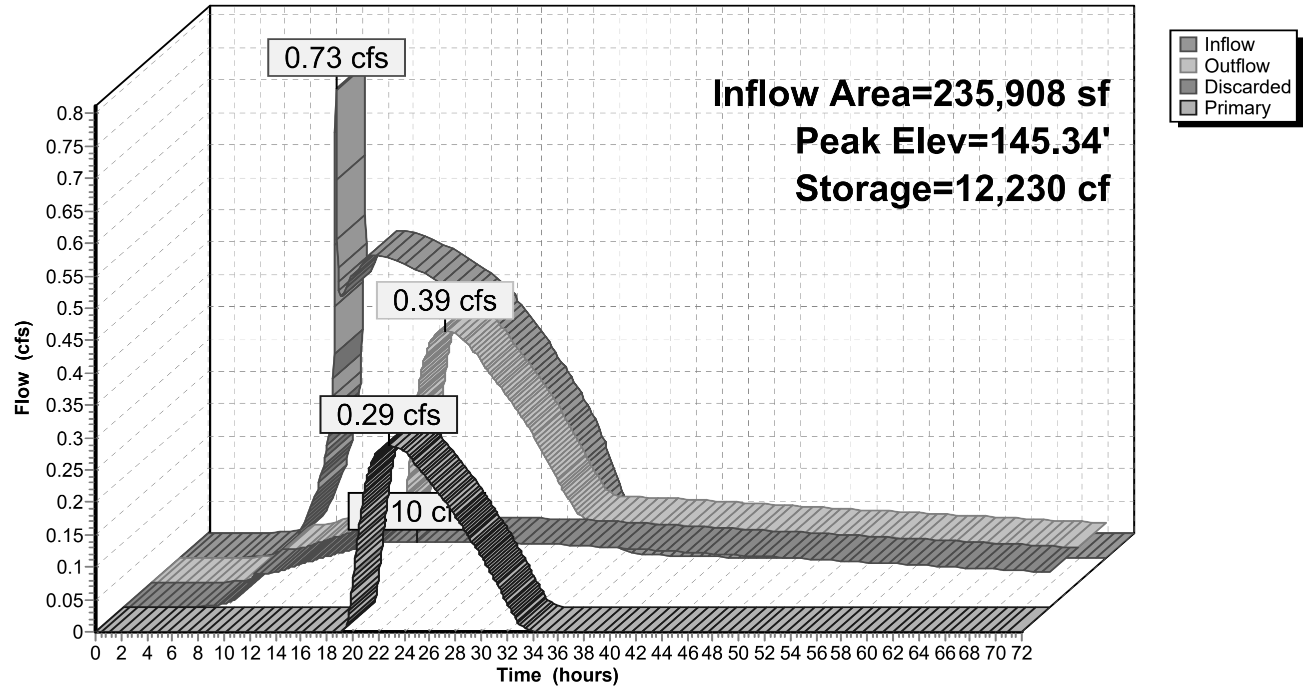
Device	Routing	Invert	Outlet Devices
#1	Discarded	141.50'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	141.50'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 141.50' / 138.30' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	145.00'	**6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 2	145.90'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Primary	146.50'	**20.0' long x 18.0' breadth Overflow Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.10 cfs @ 22.80 hrs HW=145.34' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=0.29 cfs @ 22.80 hrs HW=145.34' (Free Discharge)
├─**2=Culvert** (Passes 0.29 cfs of 5.46 cfs potential flow)
│ ├─**3=6" Orifice** (Orifice Controls 0.29 cfs @ 2.00 fps)
│ └─**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└─**5=Overflow Weir** (Controls 0.00 cfs)

Pond 1P: Infiltration Basin

Hydrograph



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

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
141.50	2,137	0
141.60	2,187	216
141.70	2,238	437
141.80	2,289	664
141.90	2,341	895
142.00	2,394	1,132
142.10	2,445	1,374
142.20	2,497	1,621
142.30	2,549	1,873
142.40	2,602	2,131
142.50	2,655	2,394
142.60	2,709	2,662
142.70	2,764	2,936
142.80	2,818	3,215
142.90	2,874	3,499
143.00	2,930	3,790
143.10	2,984	4,085
143.20	3,039	4,387
143.30	3,095	4,693
143.40	3,150	5,005
143.50	3,207	5,323
143.60	3,264	5,647
143.70	3,321	5,976
143.80	3,379	6,311
143.90	3,437	6,652
144.00	3,496	6,998
144.10	3,553	7,351
144.20	3,611	7,709
144.30	3,669	8,073
144.40	3,728	8,443
144.50	3,787	8,819
144.60	3,847	9,200
144.70	3,907	9,588
144.80	3,967	9,982
144.90	4,029	10,382
145.00	4,090	10,788
145.10	4,150	11,200
145.20	4,211	11,618
145.30	4,273	12,042
145.40	4,334	12,472
145.50	4,396	12,909
145.60	4,459	13,352
145.70	4,522	13,801
145.80	4,586	14,256
145.90	4,650	14,718
146.00	4,714	15,186
146.10	4,777	15,660
146.20	4,841	16,141
146.30	4,905	16,629
146.40	4,969	17,122
146.50	5,034	17,623
146.60	5,100	18,129
146.70	5,165	18,642
146.80	5,231	19,162
146.90	5,298	19,689
147.00	5,365	20,222
147.10	**6,506**	**20,815**

Summary for Pond 2P: UIS-1 (SC-800)

Inflow Area = 60,455 sf, 66.65% Impervious, Inflow Depth = 1.79" for 2-Year event
Inflow = 2.99 cfs @ 12.13 hrs, Volume= 9,027 cf
Outflow = 0.13 cfs @ 11.10 hrs, Volume= 9,027 cf, Atten= 96%, Lag= 0.0 min
Discarded = 0.13 cfs @ 11.10 hrs, Volume= 9,027 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP2 : STUDY POINT #2 (Wetlands West)

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 167.37' @ 15.09 hrs Surf.Area= 5,572 sf Storage= 3,757 cf
Flood Elev= 170.05' Surf.Area= 5,572 sf Storage= 13,061 cf

Plug-Flow detention time= 293.2 min calculated for 9,021 cf (100% of inflow)
Center-of-Mass det. time= 293.2 min (1,146.5 - 853.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	166.30'	5,222 cf	**34.75'W x 160.33'L x 3.75'H Field A** 20,893 cf Overall - 7,839 cf Embedded = 13,054 cf x 40.0% Voids
#2A	166.80'	7,839 cf	**ADS_StormTech SC-800 +Cap** x 154 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 154 Chambers in 7 Rows Cap Storage= 3.4 cf x 2 x 7 rows = 47.9 cf
		13,061 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	166.30'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	166.80'	**12.0" Round Culvert** L= 158.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 166.80' / 165.00' S= 0.0114 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	169.50'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Device 2	168.30'	**6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.13 cfs @ 11.10 hrs HW=166.34' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=166.30' (Free Discharge)
└─**2=Culvert** (Controls 0.00 cfs)
  ├─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**4=6" Orifice** (Controls 0.00 cfs)

Pond 2P: UIS-1 (SC-800) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-800 +Cap (ADS StormTech® SC-800 with cap volume)
Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf
Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap
Cap Storage= 3.4 cf x 2 x 7 rows = 47.9 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

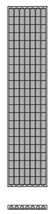
22 Chambers/Row x 7.12' Long +0.88' Cap Length x 2 = 158.33' Row Length +12.0" End Stone x 2 = 160.33' Base Length
7 Rows x 51.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 34.75' Base Width
6.0" Stone Base + 33.0" Chamber Height + 6.0" Stone Cover = 3.75' Field Height

154 Chambers x 50.6 cf + 3.4 cf Cap Volume x 2 x 7 Rows = 7,839.1 cf Chamber Storage

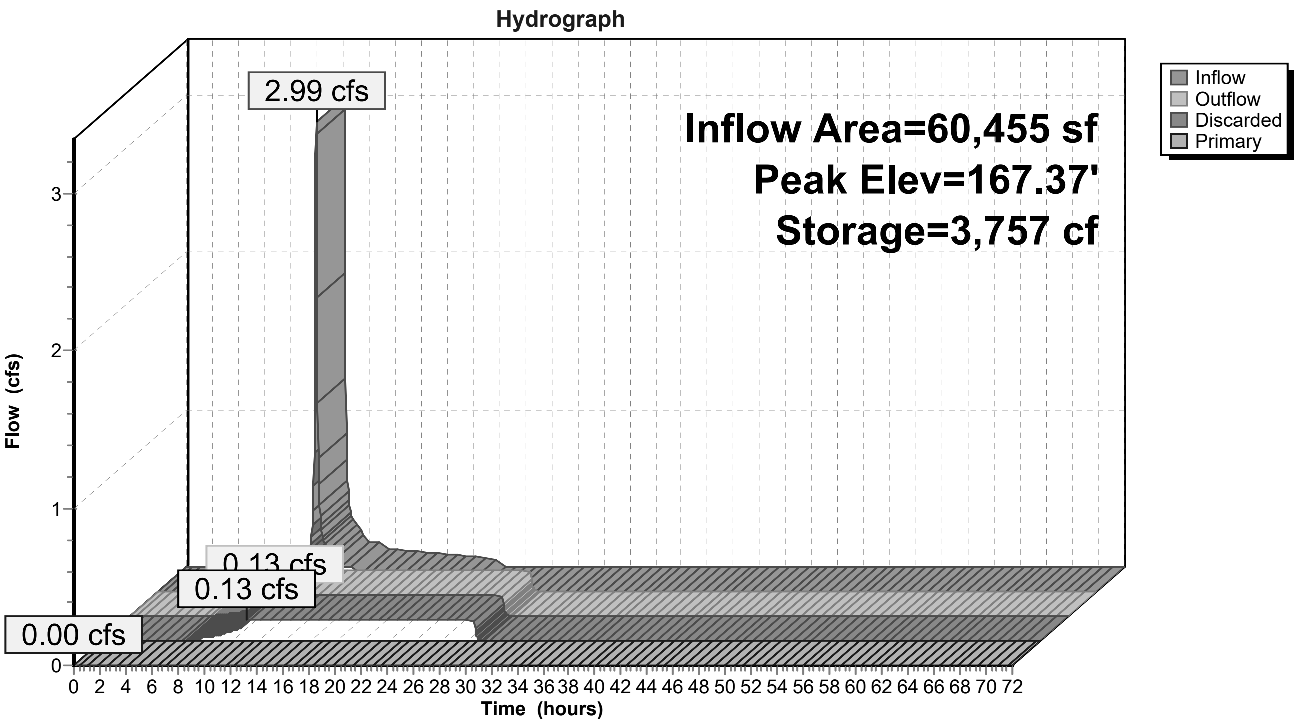
20,893.4 cf Field - 7,839.1 cf Chambers = 13,054.3 cf Stone x 40.0% Voids = 5,221.7 cf Stone Storage

Chamber Storage + Stone Storage = 13,060.8 cf = 0.300 af
Overall Storage Efficiency = 62.5%
Overall System Size = 160.33' x 34.75' x 3.75'

154 Chambers
773.8 cy Field
483.5 cy Stone



Pond 2P: UIS-1 (SC-800)



Stage-Area-Storage for Pond 2P: UIS-1 (SC-800)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
166.30	**5,572**	0	168.05	5,572	6,745	169.80	5,572	12,504
166.35	5,572	111	168.10	5,572	6,956	169.85	5,572	12,615
166.40	5,572	223	168.15	5,572	7,165	169.90	5,572	12,727
166.45	5,572	334	168.20	5,572	7,372	169.95	5,572	12,838
166.50	5,572	446	168.25	5,572	7,578	170.00	5,572	12,949
166.55	5,572	557	168.30	5,572	7,782	170.05	5,572	**13,061**
166.60	5,572	669	168.35	5,572	7,985			
166.65	5,572	780	168.40	5,572	8,185			
166.70	5,572	891	168.45	5,572	8,384			
166.75	5,572	1,003	168.50	5,572	8,581			
166.80	5,572	1,114	168.55	5,572	8,775			
166.85	5,572	1,350	168.60	5,572	8,968			
166.90	5,572	1,584	168.65	5,572	9,158			
166.95	5,572	1,819	168.70	5,572	9,346			
167.00	5,572	2,052	168.75	5,572	9,531			
167.05	5,572	2,285	168.80	5,572	9,714			
167.10	5,572	2,517	168.85	5,572	9,894			
167.15	5,572	2,748	168.90	5,572	10,071			
167.20	5,572	2,979	168.95	5,572	10,245			
167.25	5,572	3,208	169.00	5,572	10,415			
167.30	5,572	3,437	169.05	5,572	10,582			
167.35	5,572	3,665	169.10	5,572	10,744			
167.40	5,572	3,892	169.15	5,572	10,902			
167.45	5,572	4,118	169.20	5,572	11,053			
167.50	5,572	4,343	169.25	5,572	11,198			
167.55	5,572	4,567	169.30	5,572	11,335			
167.60	5,572	4,790	169.35	5,572	11,466			
167.65	5,572	5,012	169.40	5,572	11,592			
167.70	5,572	5,233	169.45	5,572	11,714			
167.75	5,572	5,453	169.50	5,572	11,832			
167.80	5,572	5,672	169.55	5,572	11,947			
167.85	5,572	5,889	169.60	5,572	12,058			
167.90	5,572	6,105	169.65	5,572	12,169			
167.95	5,572	6,320	169.70	5,572	12,281			
168.00	5,572	6,533	169.75	5,572	12,392			

Summary for Pond 3P: UIS-2 (SC-800)

Inflow Area = 26,823 sf, 72.08% Impervious, Inflow Depth = 2.03" for 2-Year event
Inflow = 1.49 cfs @ 12.13 hrs, Volume= 4,544 cf
Outflow = 0.05 cfs @ 10.75 hrs, Volume= 4,544 cf, Atten= 96%, Lag= 0.0 min
Discarded = 0.05 cfs @ 10.75 hrs, Volume= 4,544 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP2 : STUDY POINT #2 (Wetlands West)

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 159.62' @ 15.71 hrs Surf.Area= 2,248 sf Storage= 2,076 cf
Flood Elev= 162.35' Surf.Area= 2,248 sf Storage= 5,668 cf

Plug-Flow detention time= 397.9 min calculated for 4,544 cf (100% of inflow)
Center-of-Mass det. time= 397.8 min (1,235.9 - 838.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	158.10'	2,591 cf	**30.00'W x 74.93'L x 4.25'H Field A** 9,554 cf Overall - 3,077 cf Embedded = 6,477 cf x 40.0% Voids
#2A	158.85'	3,077 cf	**ADS_StormTech SC-800 +Cap** x 60 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 60 Chambers in 6 Rows Cap Storage= 3.4 cf x 2 x 6 rows = 41.0 cf
		5,668 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	158.10'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	160.78'	**12.0" Round Culvert** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 160.78' / 160.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	161.80'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00

Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4 Device 2 160.78' **6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.05 cfs @ 10.75 hrs HW=158.14' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=158.10' (Free Discharge)
└─**2=Culvert** (Controls 0.00 cfs)
  ├─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**4=6" Orifice** (Controls 0.00 cfs)

Pond 3P: UIS-2 (SC-800) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-800 +Cap (ADS StormTech® SC-800 with cap volume)
Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf
Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap
Cap Storage= 3.4 cf x 2 x 6 rows = 41.0 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

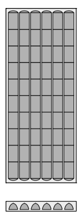
10 Chambers/Row x 7.12' Long +0.88' Cap Length x 2 = 72.93' Row Length +12.0" End Stone x 2 = 74.93' Base Length
6 Rows x 51.0" Wide + 6.0" Spacing x 5 + 12.0" Side Stone x 2 = 30.00' Base Width
9.0" Stone Base + 33.0" Chamber Height + 9.0" Stone Cover = 4.25' Field Height

60 Chambers x 50.6 cf + 3.4 cf Cap Volume x 2 x 6 Rows = 3,076.6 cf Chamber Storage

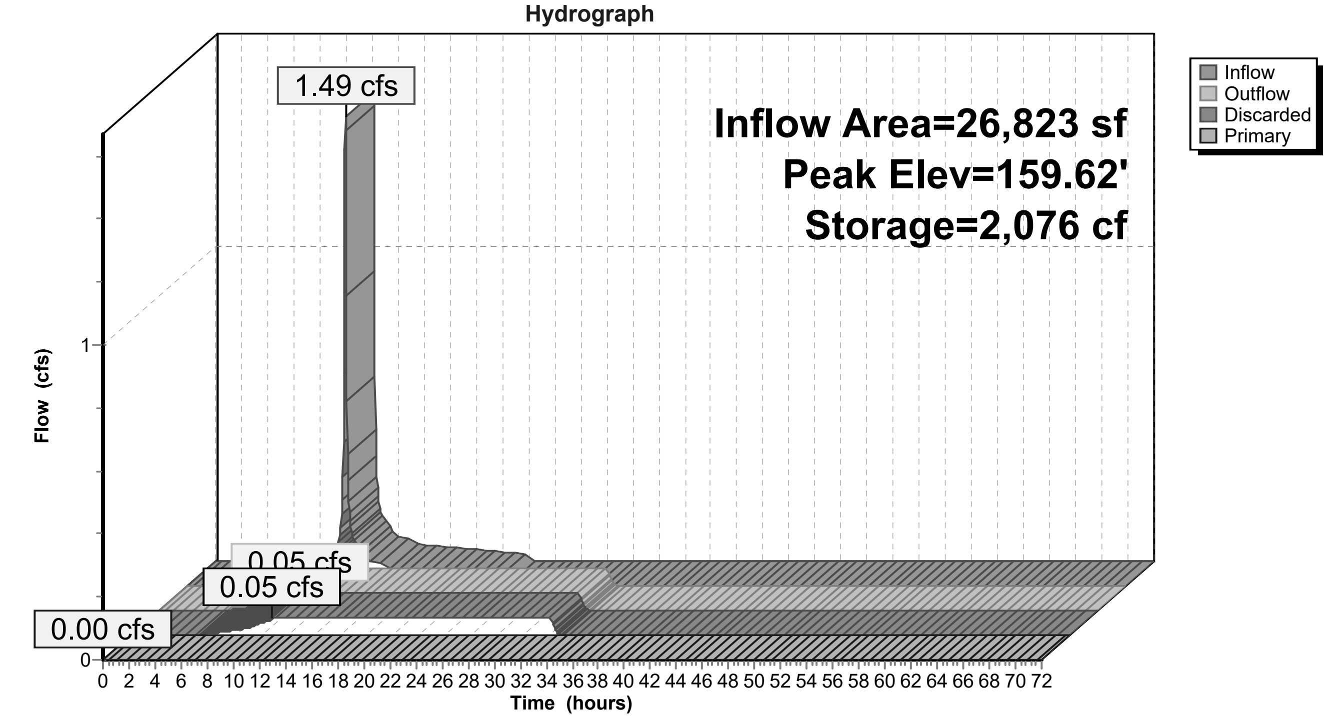
9,554.0 cf Field - 3,076.6 cf Chambers = 6,477.4 cf Stone x 40.0% Voids = 2,591.0 cf Stone Storage

Chamber Storage + Stone Storage = 5,667.5 cf = 0.130 af
Overall Storage Efficiency = 59.3%
Overall System Size = 74.93' x 30.00' x 4.25'

60 Chambers
353.9 cy Field
239.9 cy Stone



Pond 3P: UIS-2 (SC-800)



Stage-Area-Storage for Pond 3P: UIS-2 (SC-800)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
158.10	**2,248**	0	159.85	2,248	2,488	161.60	2,248	4,993
158.15	2,248	45	159.90	2,248	2,574	161.65	2,248	5,038
158.20	2,248	90	159.95	2,248	2,660	161.70	2,248	5,083
158.25	2,248	135	160.00	2,248	2,746	161.75	2,248	5,128
158.30	2,248	180	160.05	2,248	2,831	161.80	2,248	5,173
158.35	2,248	225	160.10	2,248	2,915	161.85	2,248	5,218
158.40	2,248	270	160.15	2,248	2,999	161.90	2,248	5,263
158.45	2,248	315	160.20	2,248	3,082	161.95	2,248	5,308
158.50	2,248	360	160.25	2,248	3,165	162.00	2,248	5,353
158.55	2,248	405	160.30	2,248	3,247	162.05	2,248	5,398
158.60	2,248	450	160.35	2,248	3,328	162.10	2,248	5,443
158.65	2,248	495	160.40	2,248	3,409	162.15	2,248	5,488
158.70	2,248	540	160.45	2,248	3,489	162.20	2,248	5,533
158.75	2,248	584	160.50	2,248	3,568	162.25	2,248	5,578
158.80	2,248	629	160.55	2,248	3,646	162.30	2,248	5,623
158.85	2,248	674	160.60	2,248	3,724	162.35	2,248	**5,668**
158.90	2,248	768	160.65	2,248	3,801			
158.95	2,248	861	160.70	2,248	3,877			
159.00	2,248	954	160.75	2,248	3,952			
159.05	2,248	1,047	160.80	2,248	4,026			
159.10	2,248	1,140	160.85	2,248	4,099			
159.15	2,248	1,232	160.90	2,248	4,170			
159.20	2,248	1,324	160.95	2,248	4,241			
159.25	2,248	1,416	161.00	2,248	4,311			
159.30	2,248	1,507	161.05	2,248	4,379			
159.35	2,248	1,598	161.10	2,248	4,445			
159.40	2,248	1,689	161.15	2,248	4,510			
159.45	2,248	1,779	161.20	2,248	4,573			
159.50	2,248	1,869	161.25	2,248	4,634			
159.55	2,248	1,959	161.30	2,248	4,692			
159.60	2,248	2,048	161.35	2,248	4,747			
159.65	2,248	2,137	161.40	2,248	4,800			
159.70	2,248	2,225	161.45	2,248	4,850			
159.75	2,248	2,313	161.50	2,248	4,899			
159.80	2,248	2,401	161.55	2,248	4,947			

Summary for Pond 4P: UDS-3 (SC-310)

Inflow Area = 5,351 sf,100.00% Impervious, Inflow Depth = 3.01" for 2-Year event
Inflow = 0.39 cfs @ 12.13 hrs, Volume= 1,341 cf
Outflow = 0.19 cfs @ 12.22 hrs, Volume= 1,341 cf, Atten= 50%, Lag= 5.8 min
Primary = 0.19 cfs @ 12.22 hrs, Volume= 1,341 cf
Routed to Link SP1 : STUDY POINT #1 (Kimball Road north)

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 134.30' @ 12.22 hrs Surf.Area= 375 sf Storage= 156 cf
Flood Elev= 135.83' Surf.Area= 375 sf Storage= 456 cf

Plug-Flow detention time= 13.7 min calculated for 1,340 cf (100% of inflow)
Center-of-Mass det. time= 13.8 min (774.2 - 760.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	133.50'	279 cf	**8.17'W x 45.92'L x 2.33'H Field A** 875 cf Overall - 177 cf Embedded = 698 cf x 40.0% Voids
#2A	134.00'	177 cf	**ADS_StormTech SC-310 +Cap** x 12 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 12 Chambers in 2 Rows
		456 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	133.50'	**12.0" Round Culvert** L= 33.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 133.50' / 132.84' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	135.50'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Device 1	133.50'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.19 cfs @ 12.22 hrs HW=134.29' (Free Discharge)
└─**1=Culvert** (Passes 0.19 cfs of 1.60 cfs potential flow)
  ├─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**3=Orifice/Grate** (Orifice Controls 0.19 cfs @ 3.93 fps)

Pond 4P: UDS-3 (SC-310) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-310 +Cap (ADS StormTech® SC-310 with cap length)
Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

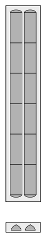
6 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 43.92' Row Length +12.0" End Stone x 2 = 45.92' Base Length
2 Rows x 34.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 8.17' Base Width
6.0" Stone Base + 16.0" Chamber Height + 6.0" Stone Cover = 2.33' Field Height

12 Chambers x 14.7 cf = 176.9 cf Chamber Storage

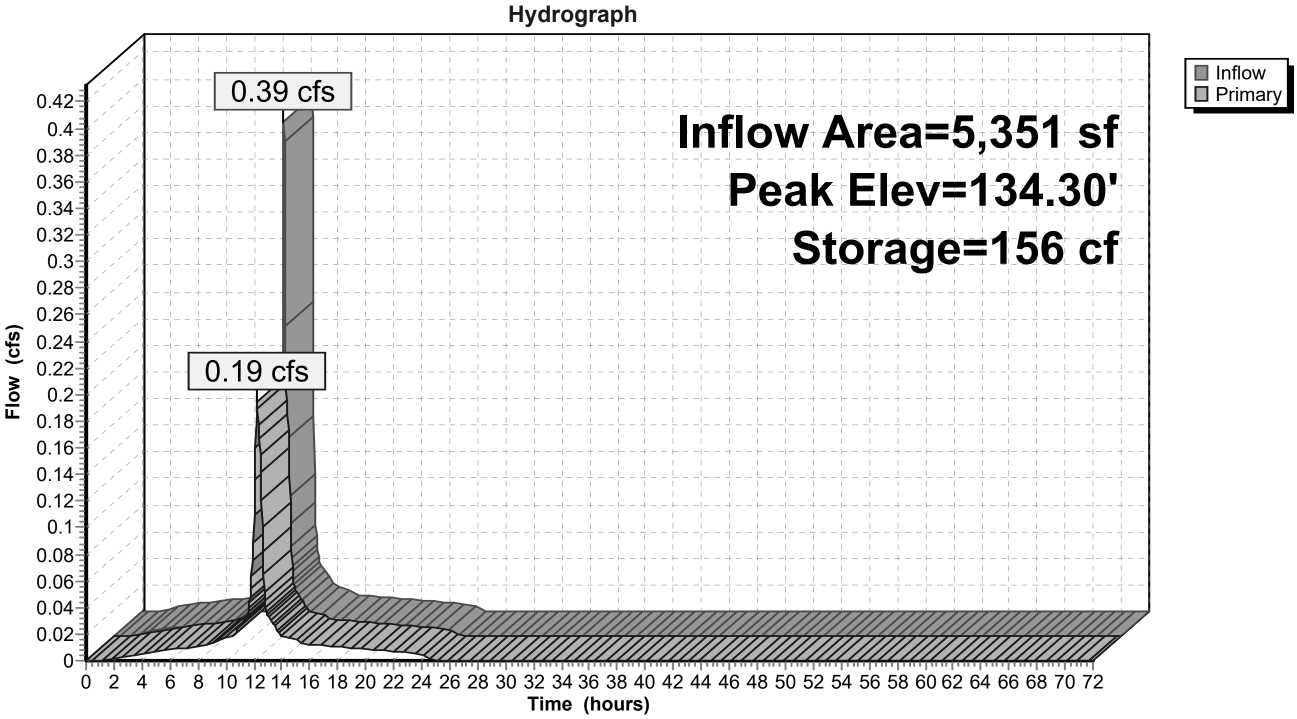
875.0 cf Field - 176.9 cf Chambers = 698.1 cf Stone x 40.0% Voids = 279.3 cf Stone Storage

Chamber Storage + Stone Storage = 456.2 cf = 0.010 af
Overall Storage Efficiency = 52.1%
Overall System Size = 45.92' x 8.17' x 2.33'

12 Chambers
32.4 cy Field
25.9 cy Stone



Pond 4P: UDS-3 (SC-310)



Stage-Area-Storage for Pond 4P: UDS-3 (SC-310)

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
133.50	0	134.20	129	134.90	303	135.60	421
133.52	3	134.22	135	134.92	307	135.62	424
133.54	6	134.24	140	134.94	311	135.64	427
133.56	9	134.26	145	134.96	315	135.66	430
133.58	12	134.28	151	134.98	320	135.68	433
133.60	15	134.30	156	135.00	324	135.70	436
133.62	18	134.32	161	135.02	328	135.72	439
133.64	21	134.34	166	135.04	332	135.74	442
133.66	24	134.36	172	135.06	336	135.76	445
133.68	27	134.38	177	135.08	339	135.78	448
133.70	30	134.40	182	135.10	343	135.80	451
133.72	33	134.42	187	135.12	347	135.82	**454**
133.74	36	134.44	192	135.14	350		
133.76	39	134.46	197	135.16	353		
133.78	42	134.48	203	135.18	357		
133.80	45	134.50	208	135.20	360		
133.82	48	134.52	213	135.22	363		
133.84	51	134.54	218	135.24	367		
133.86	54	134.56	223	135.26	370		
133.88	57	134.58	228	135.28	373		
133.90	60	134.60	233	135.30	376		
133.92	63	134.62	237	135.32	379		
133.94	66	134.64	242	135.34	382		
133.96	69	134.66	247	135.36	385		
133.98	72	134.68	252	135.38	388		
134.00	75	134.70	257	135.40	391		
134.02	80	134.72	262	135.42	394		
134.04	86	134.74	266	135.44	397		
134.06	91	134.76	271	135.46	400		
134.08	97	134.78	276	135.48	403		
134.10	102	134.80	280	135.50	406		
134.12	108	134.82	285	135.52	409		
134.14	113	134.84	289	135.54	412		
134.16	119	134.86	294	135.56	415		
134.18	124	134.88	298	135.58	418		

Summary for Pond 5P: UIS-4 (SC-310)

Inflow Area = 9,184 sf, 88.68% Impervious, Inflow Depth = 2.58" for 2-Year event
Inflow = 0.61 cfs @ 12.13 hrs, Volume= 1,977 cf
Outflow = 0.06 cfs @ 11.70 hrs, Volume= 1,977 cf, Atten= 90%, Lag= 0.0 min
Discarded = 0.06 cfs @ 11.70 hrs, Volume= 1,977 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond 7P : UDS-6 (CMP 60")

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 164.50' @ 12.67 hrs Surf.Area= 2,592 sf Storage= 523 cf
Flood Elev= 166.33' Surf.Area= 2,592 sf Storage= 3,300 cf

Plug-Flow detention time= 53.8 min calculated for 1,975 cf (100% of inflow)
Center-of-Mass det. time= 53.8 min (853.7 - 799.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	164.00'	1,829 cf	**34.83'W x 74.40'L x 2.33'H Field A** 6,047 cf Overall - 1,474 cf Embedded = 4,573 cf x 40.0% Voids
#2A	164.50'	1,474 cf	**ADS_StormTech SC-310 +Cap** x 100 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 100 Chambers in 10 Rows
		3,303 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	164.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	164.50'	**15.0" Round Culvert** L= 25.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 164.50' / 163.00' S= 0.0600 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#3	Device 2	165.45'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.06 cfs @ 11.70 hrs HW=164.02' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=164.00' (Free Discharge)
└─**2=Culvert** (Controls 0.00 cfs)
  └─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: UIS-4 (SC-310) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-310 +Cap (ADS StormTech® SC-310 with cap length)
Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

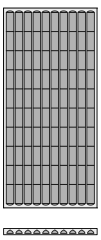
10 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 72.40' Row Length +12.0" End Stone x 2 = 74.40' Base Length
10 Rows x 34.0" Wide + 6.0" Spacing x 9 + 12.0" Side Stone x 2 = 34.83' Base Width
6.0" Stone Base + 16.0" Chamber Height + 6.0" Stone Cover = 2.33' Field Height

100 Chambers x 14.7 cf = 1,474.2 cf Chamber Storage

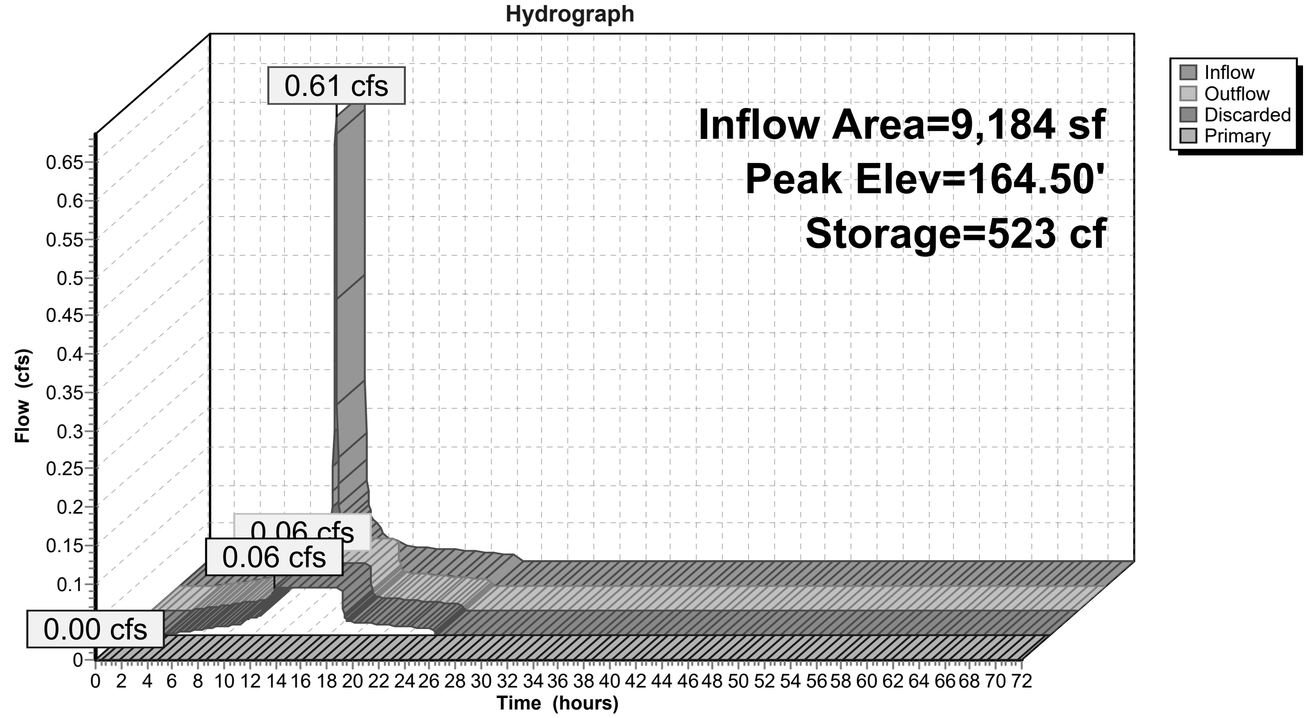
6,047.1 cf Field - 1,474.2 cf Chambers = 4,572.9 cf Stone x 40.0% Voids = 1,829.1 cf Stone Storage

Chamber Storage + Stone Storage = 3,303.3 cf = 0.076 af
Overall Storage Efficiency = 54.6%
Overall System Size = 74.40' x 34.83' x 2.33'

100 Chambers
224.0 cy Field
169.4 cy Stone



Pond 5P: UIS-4 (SC-310)



Stage-Area-Storage for Pond 5P: UIS-4 (SC-310)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
164.00	**2,592**	0	165.75	2,592	2,695
164.05	2,592	52	165.80	2,592	2,750
164.10	2,592	104	165.85	2,592	2,802
164.15	2,592	155	165.90	2,592	2,854
164.20	2,592	207	165.95	2,592	2,906
164.25	2,592	259	166.00	2,592	2,958
164.30	2,592	311	166.05	2,592	3,010
164.35	2,592	363	166.10	2,592	3,061
164.40	2,592	415	166.15	2,592	3,113
164.45	2,592	466	166.20	2,592	3,165
164.50	2,592	518	166.25	2,592	3,217
164.55	2,592	622	166.30	2,592	**3,269**
164.60	2,592	724			
164.65	2,592	827			
164.70	2,592	928			
164.75	2,592	1,029			
164.80	2,592	1,129			
164.85	2,592	1,227			
164.90	2,592	1,325			
164.95	2,592	1,422			
165.00	2,592	1,517			
165.05	2,592	1,611			
165.10	2,592	1,703			
165.15	2,592	1,794			
165.20	2,592	1,884			
165.25	2,592	1,972			
165.30	2,592	2,057			
165.35	2,592	2,141			
165.40	2,592	2,222			
165.45	2,592	2,301			
165.50	2,592	2,377			
165.55	2,592	2,449			
165.60	2,592	2,516			
165.65	2,592	2,579			
165.70	2,592	2,638			

Summary for Pond 6P: UDS-5 (CMP 72")

Inflow Area = 160,048 sf, 50.15% Impervious, Inflow Depth = 1.39" for 2-Year event
Inflow = 5.99 cfs @ 12.13 hrs, Volume= 18,475 cf
Outflow = 1.14 cfs @ 12.41 hrs, Volume= 18,475 cf, Atten= 81%, Lag= 16.7 min
Primary = 1.14 cfs @ 12.41 hrs, Volume= 18,475 cf
Routed to Pond 7P : UDS-6 (CMP 60")

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 163.20' @ 12.41 hrs Surf.Area= 4,970 sf Storage= 4,742 cf
Flood Elev= 168.50' Surf.Area= 4,970 sf Storage= 23,416 cf

Plug-Flow detention time= 53.7 min calculated for 18,475 cf (100% of inflow)
Center-of-Mass det. time= 53.0 min (922.8 - 869.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	161.50'	7,583 cf	**35.00'W x 142.00'L x 7.00'H Field A** 34,790 cf Overall - 15,834 cf Embedded = 18,956 cf x 40.0% Voids
#2A	162.00'	15,834 cf	**CMP Round 72** x 28 Inside #1 Effective Size= 72.0"W x 72.0"H => 28.27 sf x 20.00'L = 565.5 cf Overall Size= 72.0"W x 72.0"H x 20.00'L 28 Chambers in 4 Rows
		23,416 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	161.50'	**12.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 161.50' / 161.00' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	168.00'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Device 1	161.50'	**6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.14 cfs @ 12.41 hrs HW=163.20' (Free Discharge)
└─**1=Culvert** (Passes 1.14 cfs of 3.27 cfs potential flow)
  ├─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**3=6" Orifice** (Orifice Controls 1.14 cfs @ 5.80 fps)

Pond 6P: UDS-5 (CMP 72") - Chamber Wizard Field A

Chamber Model = CMP Round 72 (Round Corrugated Metal Pipe)
Effective Size= 72.0"W x 72.0"H => 28.27 sf x 20.00'L = 565.5 cf
Overall Size= 72.0"W x 72.0"H x 20.00'L

72.0" Wide + 36.0" Spacing = 108.0" C-C Row Spacing

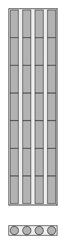
7 Chambers/Row x 20.00' Long = 140.00' Row Length +12.0" End Stone x 2 = 142.00' Base Length
4 Rows x 72.0" Wide + 36.0" Spacing x 3 + 12.0" Side Stone x 2 = 35.00' Base Width
6.0" Stone Base + 72.0" Chamber Height + 6.0" Stone Cover = 7.00' Field Height

28 Chambers x 565.5 cf = 15,833.6 cf Chamber Storage

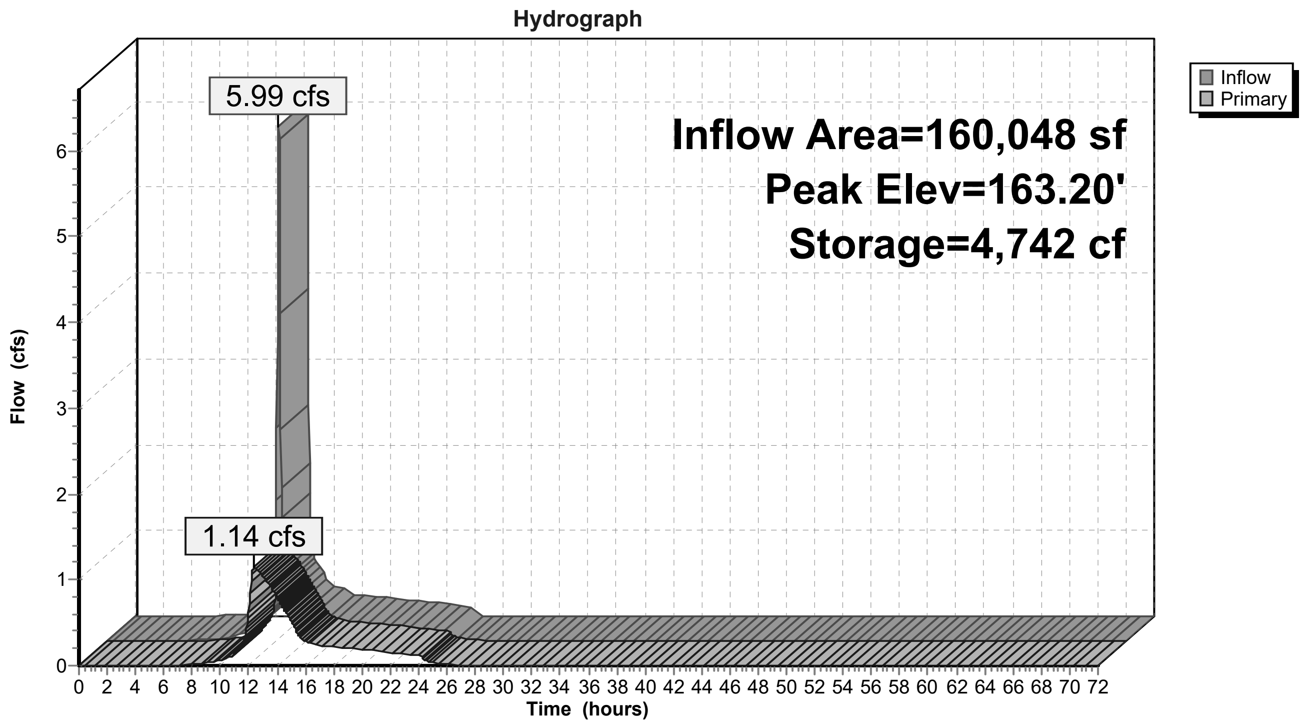
34,790.0 cf Field - 15,833.6 cf Chambers = 18,956.4 cf Stone x 40.0% Voids = 7,582.5 cf Stone Storage

Chamber Storage + Stone Storage = 23,416.2 cf = 0.538 af
Overall Storage Efficiency = 67.3%
Overall System Size = 142.00' x 35.00' x 7.00'

28 Chambers
1,288.5 cy Field
702.1 cy Stone



Pond 6P: UDS-5 (CMP 72")



Stage-Area-Storage for Pond 6P: UDS-5 (CMP 72")

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
161.50	0	163.25	4,913	165.00	11,708	166.75	18,503	168.50	**23,416**
161.55	99	163.30	5,095	165.05	11,908	166.80	18,684		
161.60	199	163.35	5,278	165.10	12,108	166.85	18,863		
161.65	298	163.40	5,462	165.15	12,309	166.90	19,041		
161.70	398	163.45	5,647	165.20	12,509	166.95	19,218		
161.75	497	163.50	5,833	165.25	12,709	167.00	19,393		
161.80	596	163.55	6,020	165.30	12,908	167.05	19,567		
161.85	696	163.60	6,209	165.35	13,108	167.10	19,739		
161.90	795	163.65	6,398	165.40	13,307	167.15	19,910		
161.95	895	163.70	6,587	165.45	13,506	167.20	20,079		
162.00	994	163.75	6,778	165.50	13,705	167.25	20,246		
162.05	1,102	163.80	6,969	165.55	13,904	167.30	20,411		
162.10	1,227	163.85	7,162	165.60	14,102	167.35	20,574		
162.15	1,355	163.90	7,354	165.65	14,300	167.40	20,735		
162.20	1,489	163.95	7,548	165.70	14,498	167.45	20,894		
162.25	1,626	164.00	7,742	165.75	14,695	167.50	21,050		
162.30	1,768	164.05	7,937	165.80	14,892	167.55	21,204		
162.35	1,913	164.10	8,132	165.85	15,088	167.60	21,355		
162.40	2,061	164.15	8,328	165.90	15,284	167.65	21,503		
162.45	2,212	164.20	8,524	165.95	15,479	167.70	21,648		
162.50	2,366	164.25	8,721	166.00	15,674	167.75	21,790		
162.55	2,522	164.30	8,918	166.05	15,868	167.80	21,927		
162.60	2,681	164.35	9,116	166.10	16,062	167.85	22,061		
162.65	2,842	164.40	9,314	166.15	16,255	167.90	22,189		
162.70	3,005	164.45	9,512	166.20	16,447	167.95	22,310		
162.75	3,170	164.50	9,711	166.25	16,638	168.00	22,422		
162.80	3,337	164.55	9,910	166.30	16,829	168.05	22,522		
162.85	3,506	164.60	10,109	166.35	17,019	168.10	22,621		
162.90	3,677	164.65	10,308	166.40	17,208	168.15	22,720		
162.95	3,849	164.70	10,508	166.45	17,396	168.20	22,820		
163.00	4,023	164.75	10,708	166.50	17,583	168.25	22,919		
163.05	4,198	164.80	10,908	166.55	17,769	168.30	23,019		
163.10	4,375	164.85	11,108	166.60	17,954	168.35	23,118		
163.15	4,553	164.90	11,308	166.65	18,138	168.40	23,217		
163.20	4,732	164.95	11,508	166.70	18,321	168.45	23,317		

Summary for Pond 7P: UDS-6 (CMP 60")

Inflow Area = 218,814 sf, 55.48% Impervious, Inflow Depth = 1.43" for 2-Year event
Inflow = 3.44 cfs @ 12.14 hrs, Volume= 26,043 cf
Outflow = 0.45 cfs @ 15.55 hrs, Volume= 26,043 cf, Atten= 87%, Lag= 205.0 min
Primary = 0.45 cfs @ 15.55 hrs, Volume= 26,043 cf
Routed to Pond 1P : Infiltration Basin

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 155.68' @ 15.55 hrs Surf.Area= 4,514 sf Storage= 11,376 cf
Flood Elev= 158.00' Surf.Area= 4,514 sf Storage= 17,902 cf

Plug-Flow detention time= 321.4 min calculated for 26,025 cf (100% of inflow)
Center-of-Mass det. time= 321.8 min (1,223.6 - 901.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	152.00'	6,121 cf	**37.00'W x 122.00'L x 6.00'H Field A** 27,084 cf Overall - 11,781 cf Embedded = 15,303 cf x 40.0% Voids
#2A	152.50'	11,781 cf	**CMP Round 60** x 30 Inside #1 Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf Overall Size= 60.0"W x 60.0"H x 20.00'L 30 Chambers in 5 Rows
		17,902 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	152.00'	**15.0" Round Culvert** L= 250.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 152.00' / 150.00' S= 0.0080 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	157.25'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Device 1	152.00'	**3.0" Vert. 3" Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.45 cfs @ 15.55 hrs HW=155.68' (Free Discharge)
└─**1=Culvert** (Passes 0.45 cfs of 7.45 cfs potential flow)
  ├─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**3=3" Orifice** (Orifice Controls 0.45 cfs @ 9.07 fps)

Pond 7P: UDS-6 (CMP 60") - Chamber Wizard Field A

Chamber Model = CMP Round 60 (Round Corrugated Metal Pipe)
Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf
Overall Size= 60.0"W x 60.0"H x 20.00'L

60.0" Wide + 30.0" Spacing = 90.0" C-C Row Spacing

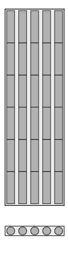
6 Chambers/Row x 20.00' Long = 120.00' Row Length +12.0" End Stone x 2 = 122.00' Base Length
5 Rows x 60.0" Wide + 30.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.00' Base Width
6.0" Stone Base + 60.0" Chamber Height + 6.0" Stone Cover = 6.00' Field Height

30 Chambers x 392.7 cf = 11,781.0 cf Chamber Storage

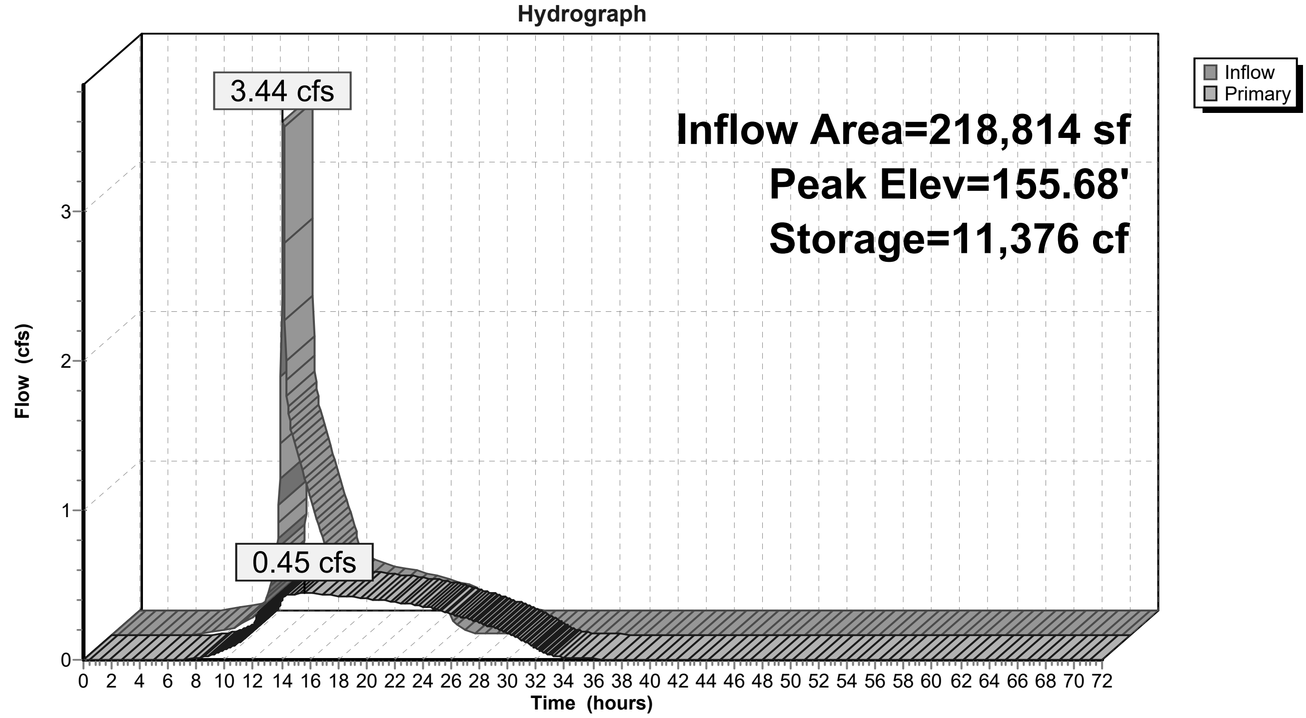
27,084.0 cf Field - 11,781.0 cf Chambers = 15,303.0 cf Stone x 40.0% Voids = 6,121.2 cf Stone Storage

Chamber Storage + Stone Storage = 17,902.2 cf = 0.411 af
Overall Storage Efficiency = 66.1%
Overall System Size = 122.00' x 37.00' x 6.00'

30 Chambers
1,003.1 cy Field
566.8 cy Stone



Pond 7P: UDS-6 (CMP 60")



Stage-Area-Storage for Pond 7P: UDS-6 (CMP 60")

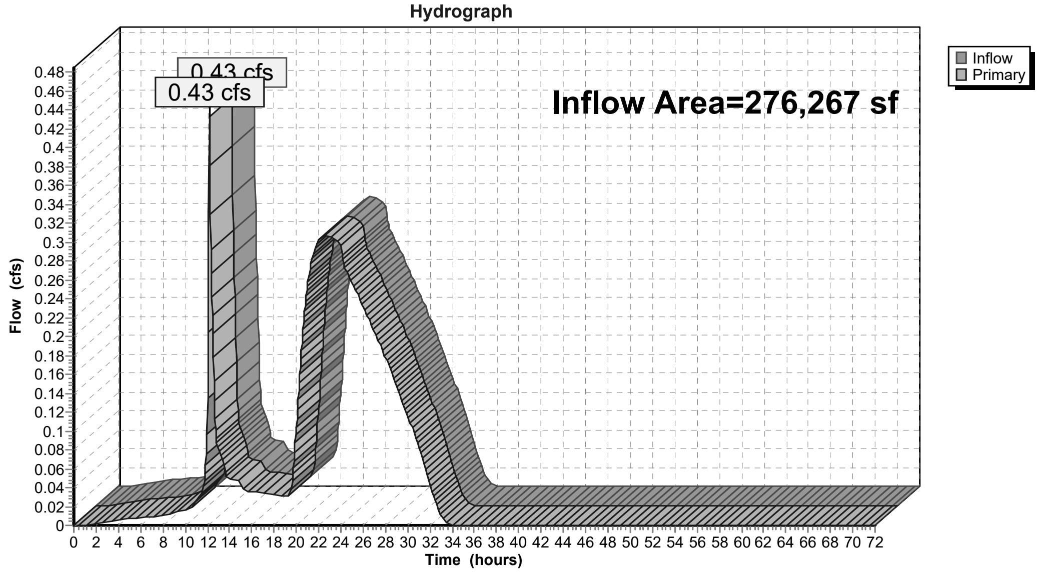
Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
152.00	0	153.75	4,542	155.50	10,748	157.25	16,416
152.05	90	153.80	4,710	155.55	10,926	157.30	16,543
152.10	181	153.85	4,880	155.60	11,104	157.35	16,667
152.15	271	153.90	5,051	155.65	11,281	157.40	16,785
152.20	361	153.95	5,222	155.70	11,458	157.45	16,897
152.25	451	154.00	5,395	155.75	11,635	157.50	16,999
152.30	542	154.05	5,568	155.80	11,811	157.55	17,090
152.35	632	154.10	5,742	155.85	11,986	157.60	17,180
152.40	722	154.15	5,916	155.90	12,160	157.65	17,270
152.45	813	154.20	6,092	155.95	12,334	157.70	17,361
152.50	903	154.25	6,267	156.00	12,507	157.75	17,451
152.55	1,005	154.30	6,444	156.05	12,680	157.80	17,541
152.60	1,117	154.35	6,621	156.10	12,851	157.85	17,631
152.65	1,235	154.40	6,798	156.15	13,022	157.90	17,722
152.70	1,359	154.45	6,976	156.20	13,192	157.95	17,812
152.75	1,486	154.50	7,154	156.25	13,360	158.00	**17,902**
152.80	1,618	154.55	7,333	156.30	13,528		
152.85	1,752	154.60	7,512	156.35	13,695		
152.90	1,890	154.65	7,691	156.40	13,860		
152.95	2,030	154.70	7,871	156.45	14,024		
153.00	2,173	154.75	8,050	156.50	14,187		
153.05	2,319	154.80	8,230	156.55	14,349		
153.10	2,467	154.85	8,410	156.60	14,509		
153.15	2,616	154.90	8,591	156.65	14,668		
153.20	2,768	154.95	8,771	156.70	14,825		
153.25	2,922	155.00	8,951	156.75	14,980		
153.30	3,077	155.05	9,131	156.80	15,134		
153.35	3,234	155.10	9,312	156.85	15,286		
153.40	3,393	155.15	9,492	156.90	15,436		
153.45	3,553	155.20	9,672	156.95	15,583		
153.50	3,715	155.25	9,852	157.00	15,729		
153.55	3,878	155.30	10,031	157.05	15,872		
153.60	4,042	155.35	10,211	157.10	16,012		
153.65	4,207	155.40	10,390	157.15	16,150		
153.70	4,374	155.45	10,569	157.20	16,285		

Summary for Link SP1: STUDY POINT #1 (Kimball Road north)

Inflow Area = 276,267 sf, 48.17% Impervious, Inflow Depth = 0.49" for 2-Year event
Inflow = 0.43 cfs @ 12.16 hrs, Volume= 11,238 cf
Primary = 0.43 cfs @ 12.16 hrs, Volume= 11,238 cf, Atten= 0%, Lag= 0.0 min

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

Link SP1: STUDY POINT #1 (Kimball Road north)

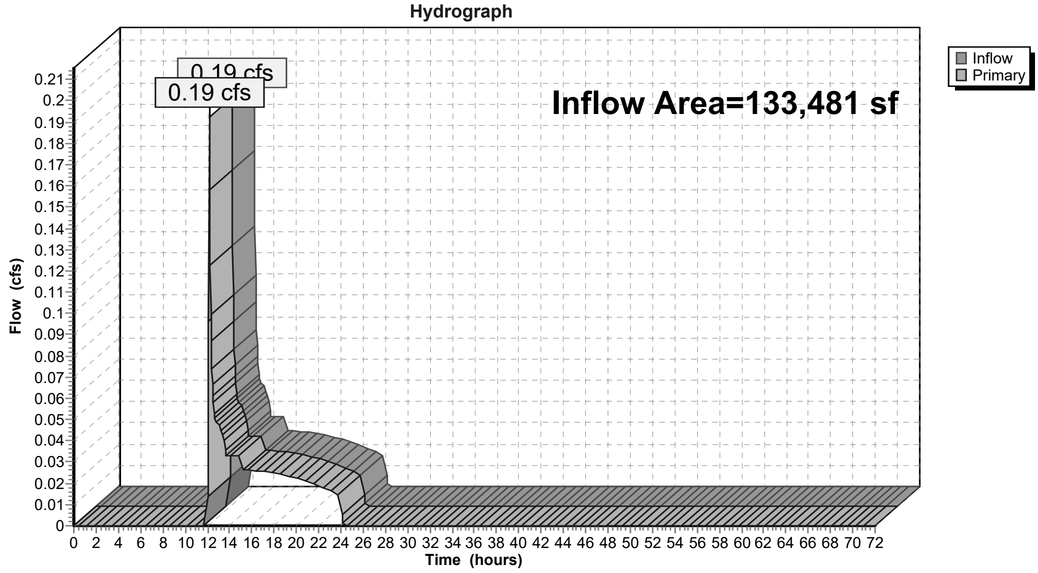


Summary for Link SP2: STUDY POINT #2 (Wetlands West)

Inflow Area = 133,481 sf, 45.23% Impervious, Inflow Depth = 0.11" for 2-Year event
Inflow = 0.19 cfs @ 12.16 hrs, Volume= 1,244 cf
Primary = 0.19 cfs @ 12.16 hrs, Volume= 1,244 cf, Atten= 0%, Lag= 0.0 min

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

Link SP2: STUDY POINT #2 (Wetlands West)



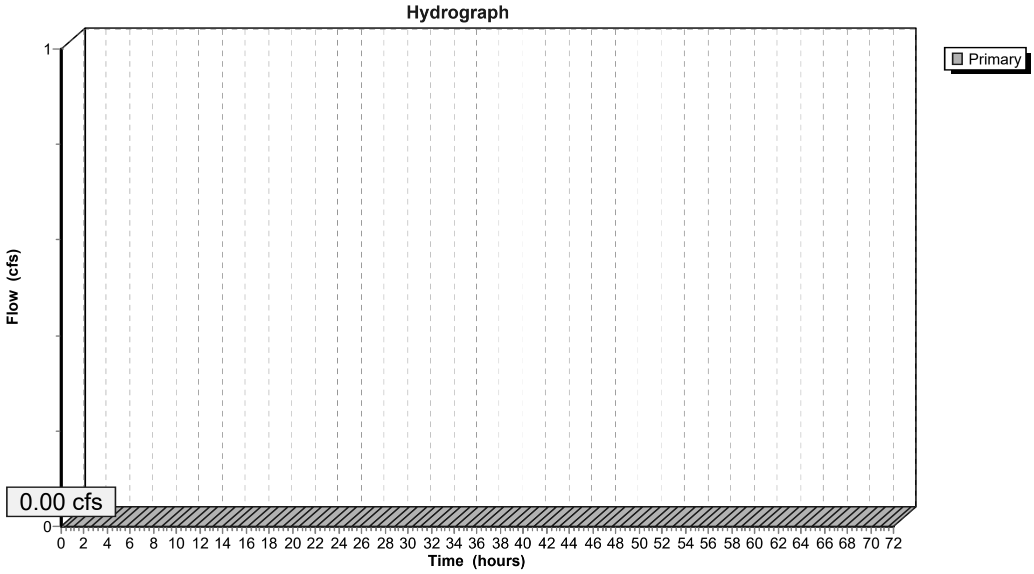
Summary for Link SP3: STUDY POINT #3 (IVW south)

[43] Hint: Has no inflow (Outflow=Zero)

Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

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

Link SP3: STUDY POINT #3 (IVW south)



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-10A: Subcat P-10A Runoff Area=16,553 sf 57.69% Impervious Runoff Depth=3.19"
Tc=6.0 min CN=82 Runoff=1.44 cfs 4,396 cf

Subcatchment P-10B: Subcat P-10B Runoff Area=15,645 sf 50.07% Impervious Runoff Depth=3.00"
Tc=6.0 min CN=80 Runoff=1.29 cfs 3,908 cf

Subcatchment P-11: Subcat P-11 Runoff Area=32,948 sf 54.95% Impervious Runoff Depth=3.09"
Tc=6.0 min CN=81 Runoff=2.79 cfs 8,489 cf

Subcatchment P-12: Subcat P-12 Runoff Area=8,298 sf 24.91% Impervious Runoff Depth=2.13"
Tc=6.0 min CN=70 Runoff=0.49 cfs 1,470 cf

Subcatchment P-13: Subcat P-13 Runoff Area=52,463 sf 36.14% Impervious Runoff Depth=2.29"
Tc=6.0 min CN=72 Runoff=3.32 cfs 10,015 cf

Subcatchment P-14: Subcat P-14 Runoff Area=24,855 sf 59.92% Impervious Runoff Depth=3.28"
Tc=6.0 min CN=83 Runoff=2.22 cfs 6,800 cf

Subcatchment P-15: Subcat P-15 Runoff Area=9,184 sf 88.68% Impervious Runoff Depth=4.43"
Tc=6.0 min CN=94 Runoff=1.02 cfs 3,388 cf

Subcatchment P-1A: Subcat P-1A Runoff Area=13,439 sf 0.30% Impervious Runoff Depth=1.17"
Tc=6.0 min CN=57 Runoff=0.39 cfs 1,309 cf

Subcatchment P-1B: Subcat P-1B Runoff Area=21,569 sf 3.33% Impervious Runoff Depth=1.44"
Tc=6.0 min CN=61 Runoff=0.82 cfs 2,591 cf

Subcatchment P-2: Subcat P-2 Runoff Area=46,203 sf 1.61% Impervious Runoff Depth=1.17"
Tc=6.0 min CN=57 Runoff=1.35 cfs 4,501 cf

Subcatchment P-3: Subcat P-3 Runoff Area=9,286 sf 95.37% Impervious Runoff Depth=4.65"
Tc=6.0 min CN=96 Runoff=1.05 cfs 3,600 cf

Subcatchment P-4: Subcat P-4
Runoff Area=24,255 sf 64.29% Impervious Runoff Depth=3.48"
Tc=6.0 min CN=85 Runoff=2.28 cfs 7,032 cf

Subcatchment P-5: Subcat P-5
Runoff Area=25,326 sf 68.66% Impervious Runoff Depth=3.58"
Tc=6.0 min CN=86 Runoff=2.43 cfs 7,554 cf

Subcatchment P-6: Subcat P-6
Runoff Area=5,351 sf 100.00% Impervious Runoff Depth=4.88"
Tc=6.0 min CN=98 Runoff=0.61 cfs 2,178 cf

Subcatchment P-7: Subcat P-7
Runoff Area=17,094 sf 32.66% Impervious Runoff Depth=2.37"
Tc=6.0 min CN=73 Runoff=1.12 cfs 3,383 cf

Subcatchment P-8: Subcat P-8
Runoff Area=26,823 sf 72.08% Impervious Runoff Depth=3.78"
Tc=6.0 min CN=88 Runoff=2.69 cfs 8,456 cf

Subcatchment P-9: Subcat P-9
Runoff Area=60,455 sf 66.65% Impervious Runoff Depth=3.48"
Tc=6.0 min CN=85 Runoff=5.67 cfs 17,528 cf

Pond 1P: Infiltration Basin
Peak Elev=146.00' Storage=15,185 cf Inflow=1.92 cfs 56,646 cf
Discarded=0.11 cfs 20,048 cf Primary=1.17 cfs 34,972 cf Outflow=1.28 cfs 55,020 cf

Pond 2P: UIS-1 (SC-800)
Peak Elev=168.51' Storage=8,618 cf Inflow=5.67 cfs 17,528 cf
Discarded=0.13 cfs 15,615 cf Primary=0.12 cfs 1,912 cf Outflow=0.25 cfs 17,528 cf

Pond 3P: UIS-2 (SC-800)
Peak Elev=160.94' Storage=4,228 cf Inflow=2.69 cfs 8,456 cf
Discarded=0.05 cfs 7,364 cf Primary=0.07 cfs 1,092 cf Outflow=0.13 cfs 8,456 cf

Pond 4P: UDS-3 (SC-310)
Peak Elev=134.84' Storage=289 cf Inflow=0.61 cfs 2,178 cf
Outflow=0.26 cfs 2,178 cf

Pond 5P: UIS-4 (SC-310)
Peak Elev=164.80' Storage=1,129 cf Inflow=1.02 cfs 3,388 cf
Discarded=0.06 cfs 3,388 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 3,388 cf

Pond 6P: UDS-5 (CMP 72")
Peak Elev=164.96' Storage=11,529 cf Inflow=12.59 cfs 38,677 cf
Outflow=1.69 cfs 38,677 cf

Pond 7P: UDS-6 (CMP 60")
Peak Elev=157.49' Storage=16,970 cf Inflow=6.10 cfs 53,263 cf
Outflow=1.84 cfs 53,263 cf

Link SP1: STUDY POINT #1 (Kimball Road north)
Inflow=1.44 cfs 41,050 cf
Primary=1.44 cfs 41,050 cf

Link SP2: STUDY POINT #2 (Wetlands West)
Inflow=1.35 cfs 7,505 cf
Primary=1.35 cfs 7,505 cf

Link SP3: STUDY POINT #3 (IVW south)
Primary=0.00 cfs 0 cf

Total Runoff Area = 409,748 sf Runoff Volume = 96,597 cf Average Runoff Depth = 2.83"
52.79% Pervious = 216,292 sf 47.21% Impervious = 193,456 sf

Summary for Subcatchment P-10A: Subcat P-10A

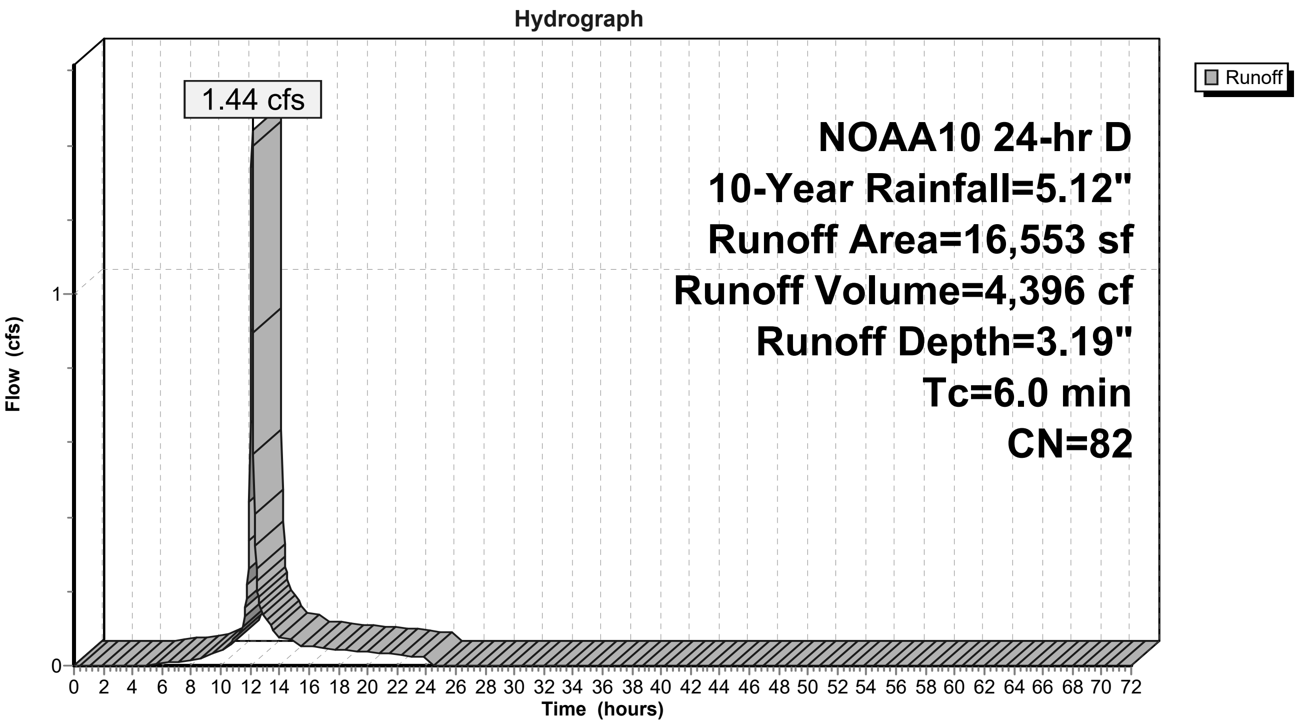
Runoff = 1.44 cfs @ 12.13 hrs, Volume= 4,396 cf, Depth= 3.19"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
7,004	61	>75% Grass cover, Good, HSG B
2,341	98	Paved parking, HSG B
7,208	98	Roofs, HSG B
16,553	82	Weighted Average
7,004		42.31% Pervious Area
9,549		57.69% Impervious Area

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

Subcatchment P-10A: Subcat P-10A



Summary for Subcatchment P-10B: Subcat P-10B

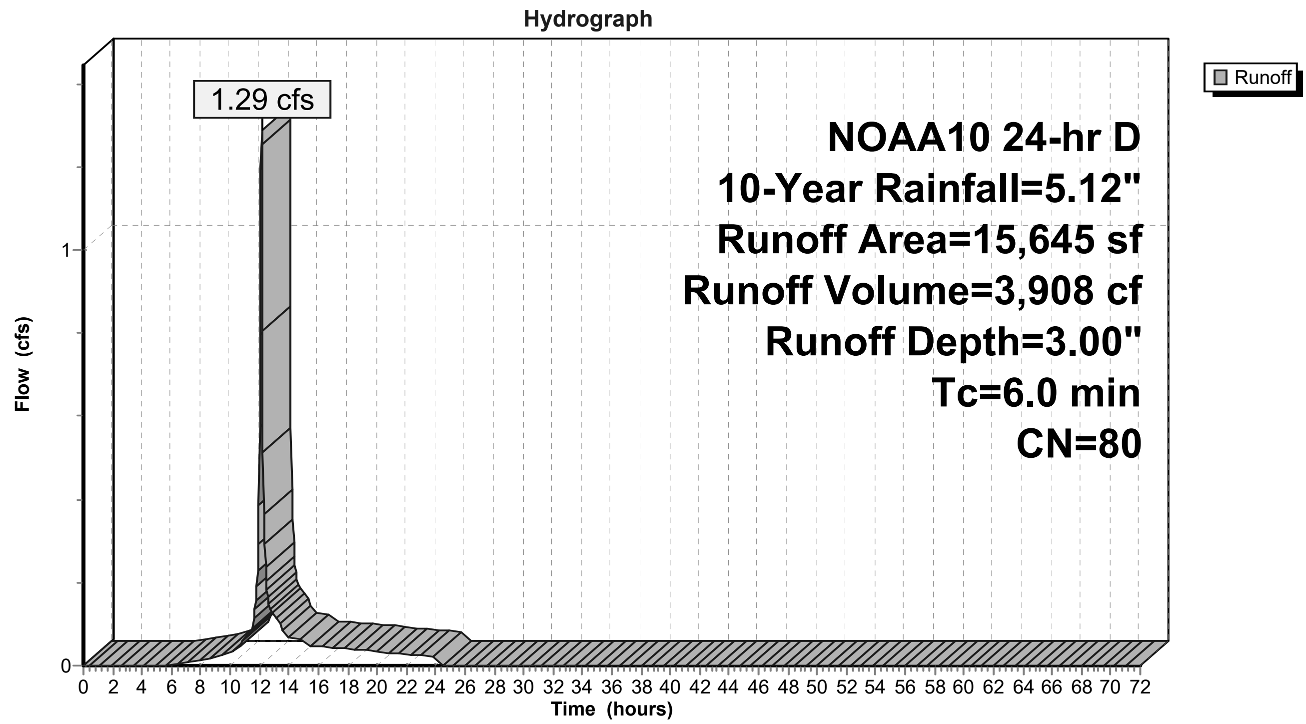
Runoff = 1.29 cfs @ 12.13 hrs, Volume= 3,908 cf, Depth= 3.00"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
7,811	61	>75% Grass cover, Good, HSG B
1,108	98	Paved parking, HSG B
6,726	98	Roofs, HSG B
15,645	80	Weighted Average
7,811		49.93% Pervious Area
7,834		50.07% Impervious Area

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

Subcatchment P-10B: Subcat P-10B



Summary for Subcatchment P-11: Subcat P-11

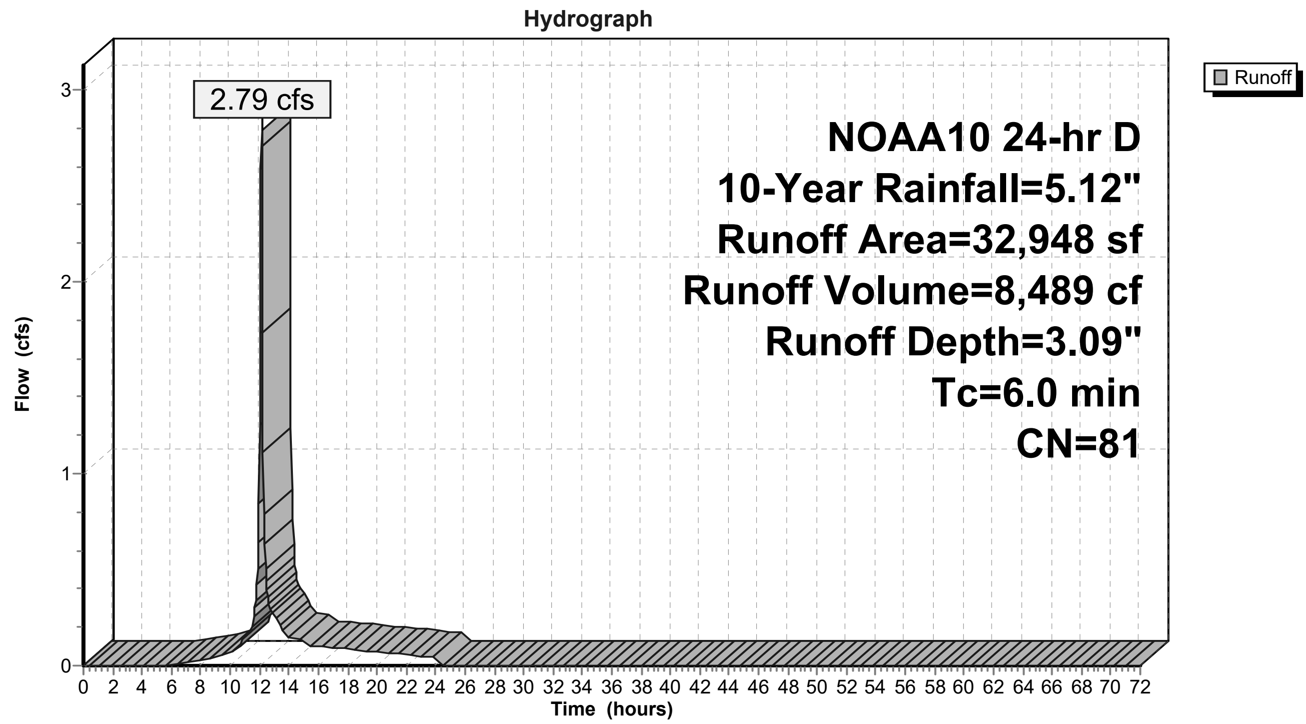
Runoff = 2.79 cfs @ 12.13 hrs, Volume= 8,489 cf, Depth= 3.09"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
14,844	61	>75% Grass cover, Good, HSG B
4,669	98	Paved parking, HSG B
13,435	98	Roofs, HSG B
32,948	81	Weighted Average
14,844		45.05% Pervious Area
18,105		54.95% Impervious Area

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

Subcatchment P-11: Subcat P-11



Summary for Subcatchment P-12: Subcat P-12

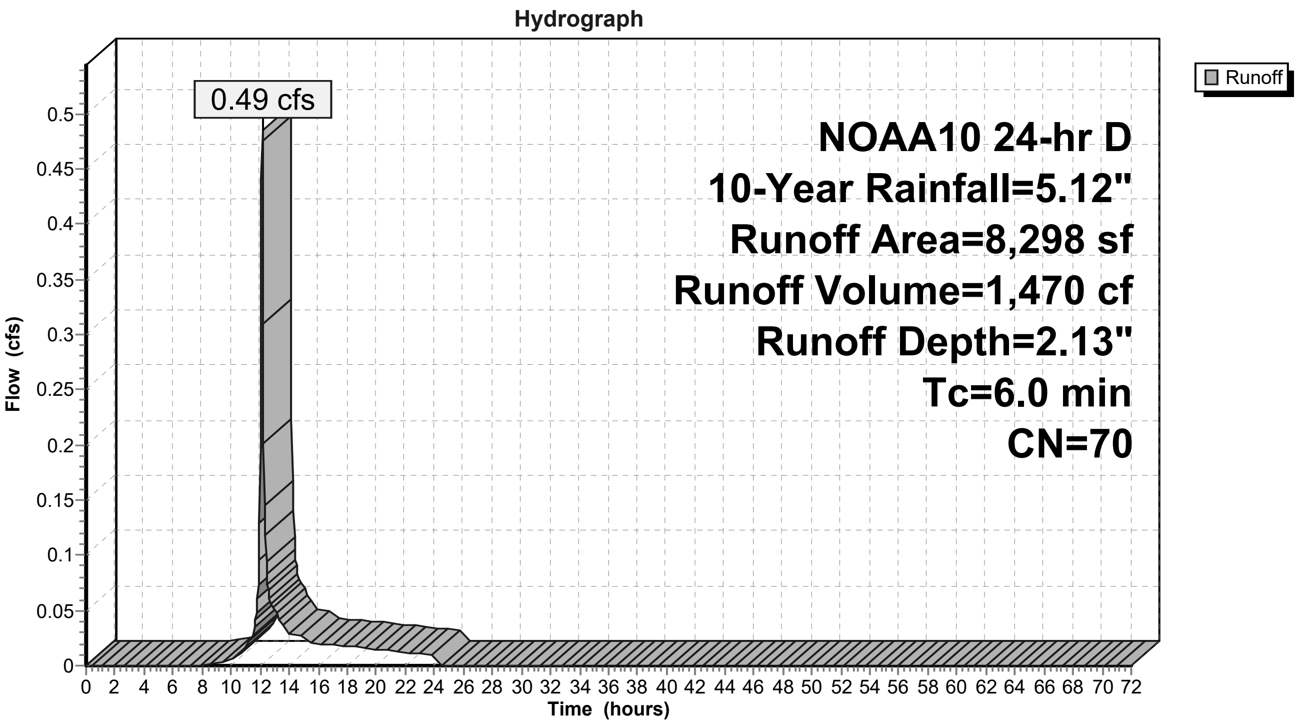
Runoff = 0.49 cfs @ 12.13 hrs, Volume= 1,470 cf, Depth= 2.13"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
6,231	61	>75% Grass cover, Good, HSG B
2,067	98	Paved parking, HSG B
8,298	70	Weighted Average
6,231		75.09% Pervious Area
2,067		24.91% Impervious Area

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

Subcatchment P-12: Subcat P-12



Summary for Subcatchment P-13: Subcat P-13

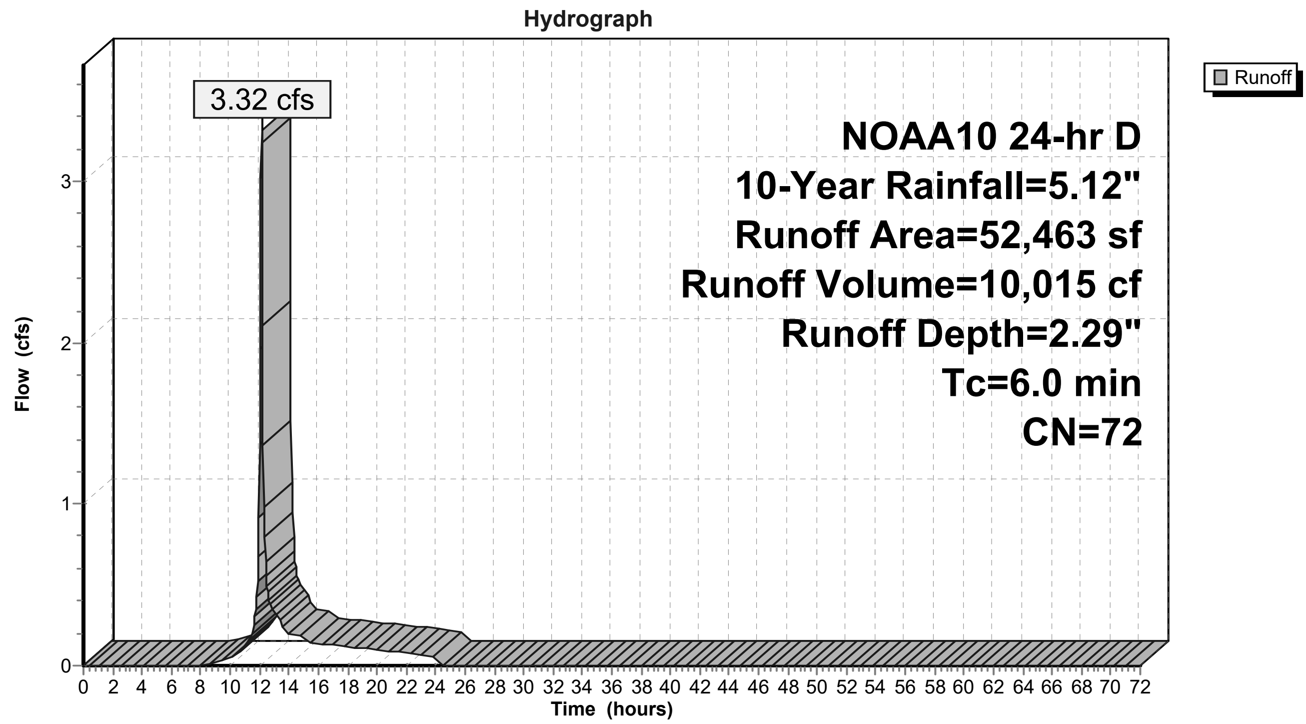
Runoff = 3.32 cfs @ 12.13 hrs, Volume= 10,015 cf, Depth= 2.29"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
10,162	61	>75% Grass cover, Good, HSG B
12,922	98	Paved parking, HSG B
6,037	98	Roofs, HSG B
23,343	55	Woods, Good, HSG B
52,463	72	Weighted Average
33,504		63.86% Pervious Area
18,959		36.14% Impervious Area

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

Subcatchment P-13: Subcat P-13



Summary for Subcatchment P-14: Subcat P-14

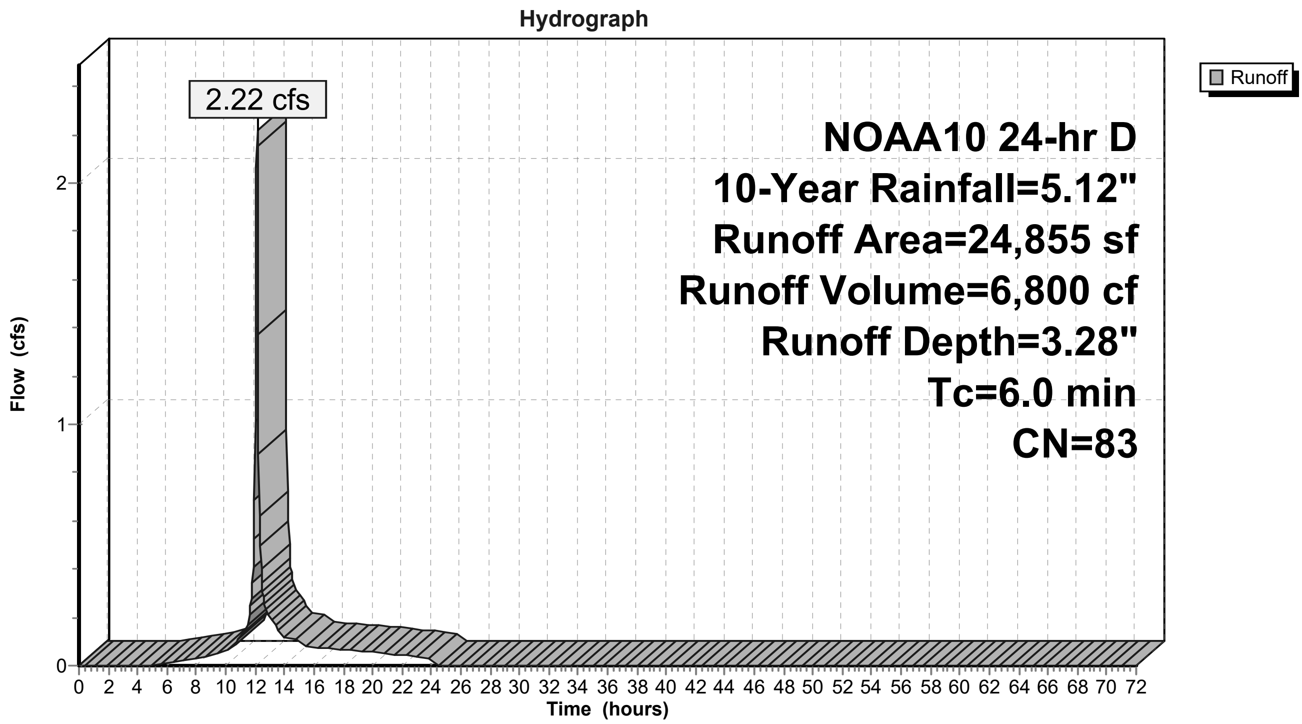
Runoff = 2.22 cfs @ 12.13 hrs, Volume= 6,800 cf, Depth= 3.28"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
9,959	61	>75% Grass cover, Good, HSG B
2,548	98	Paved parking, HSG B
12,345	98	Roofs, HSG B
2	55	Woods, Good, HSG B
24,855	83	Weighted Average
9,961		40.08% Pervious Area
14,893		59.92% Impervious Area

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

Subcatchment P-14: Subcat P-14



Summary for Subcatchment P-15: Subcat P-15

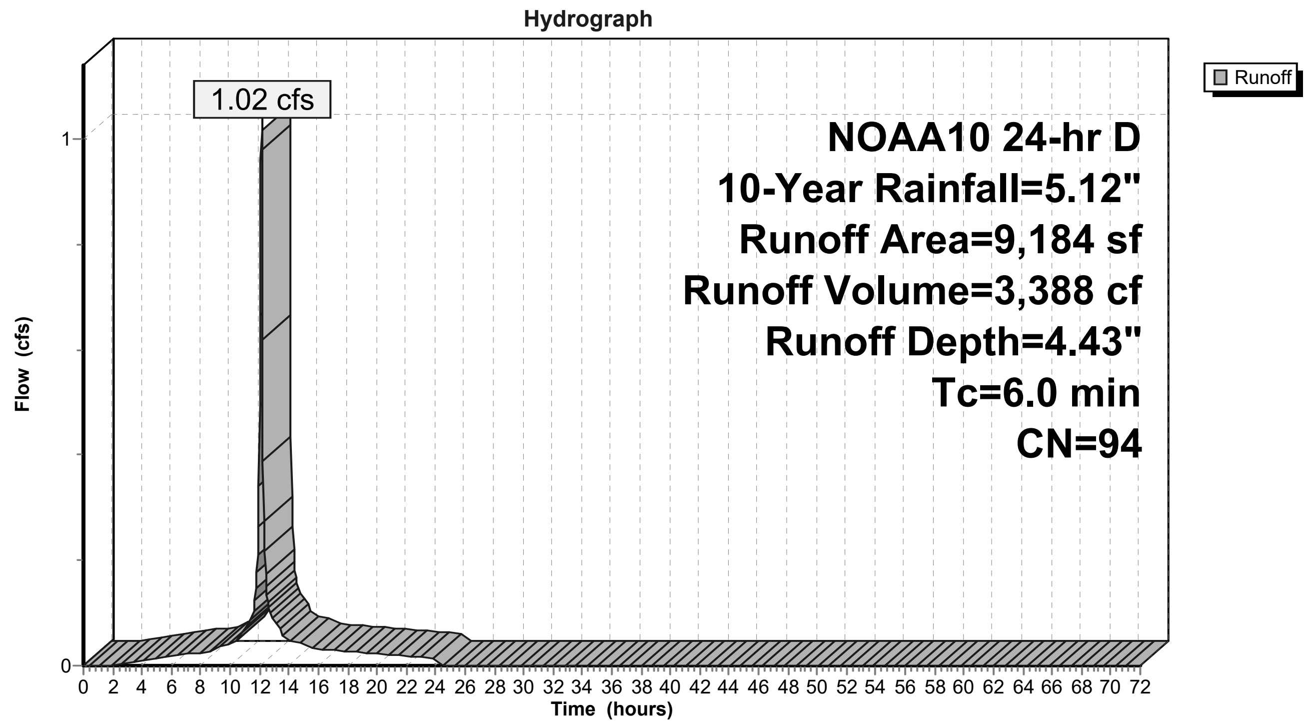
Runoff = 1.02 cfs @ 12.13 hrs, Volume= 3,388 cf, Depth= 4.43"
Routed to Pond 5P : UIS-4 (SC-310)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
1,039	61	>75% Grass cover, Good, HSG B
8,145	98	Paved parking, HSG B
9,184	94	Weighted Average
1,039		11.32% Pervious Area
8,145		88.68% Impervious Area

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

Subcatchment P-15: Subcat P-15



Summary for Subcatchment P-1A: Subcat P-1A

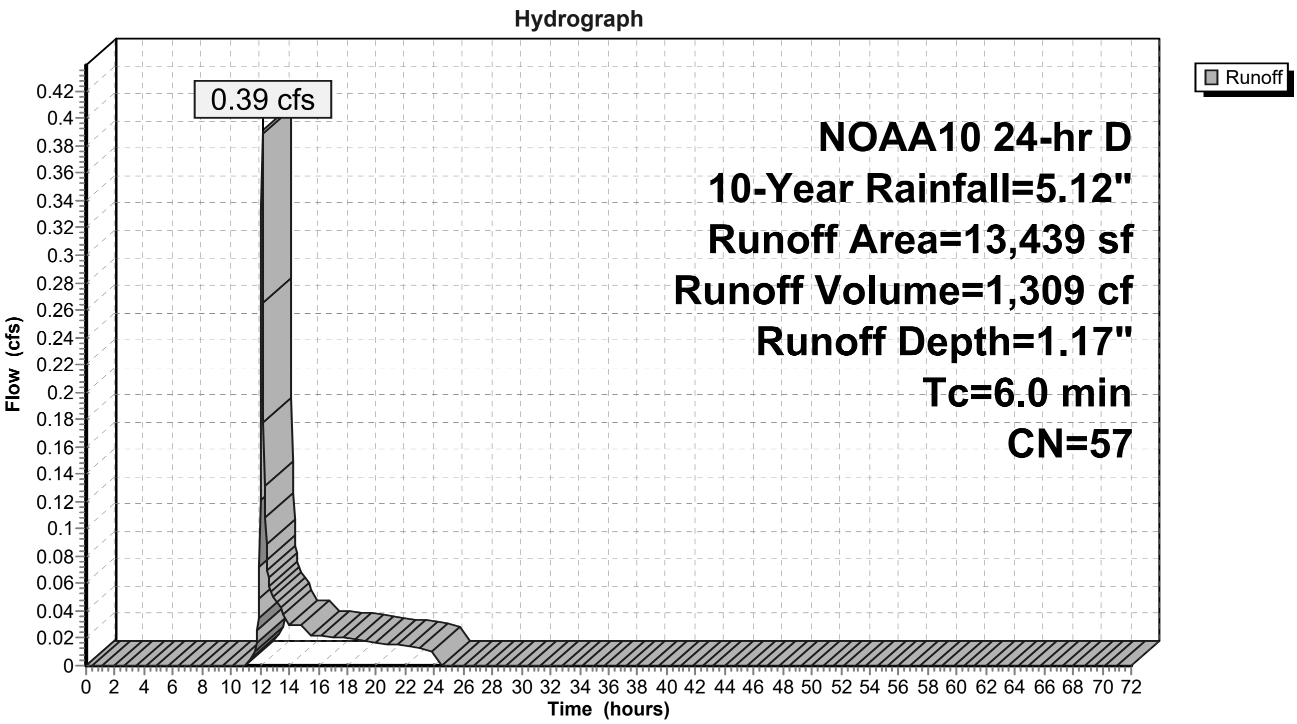
Runoff = 0.39 cfs @ 12.14 hrs, Volume= 1,309 cf, Depth= 1.17"
Routed to Link SP1 : STUDY POINT #1 (Kimball Road north)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
3,544	61	>75% Grass cover, Good, HSG B
40	98	Paved parking, HSG B
9,854	55	Woods, Good, HSG B
13,439	57	Weighted Average
13,398		99.70% Pervious Area
40		0.30% Impervious Area

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

Subcatchment P-1A: Subcat P-1A



Summary for Subcatchment P-1B: Subcat P-1B

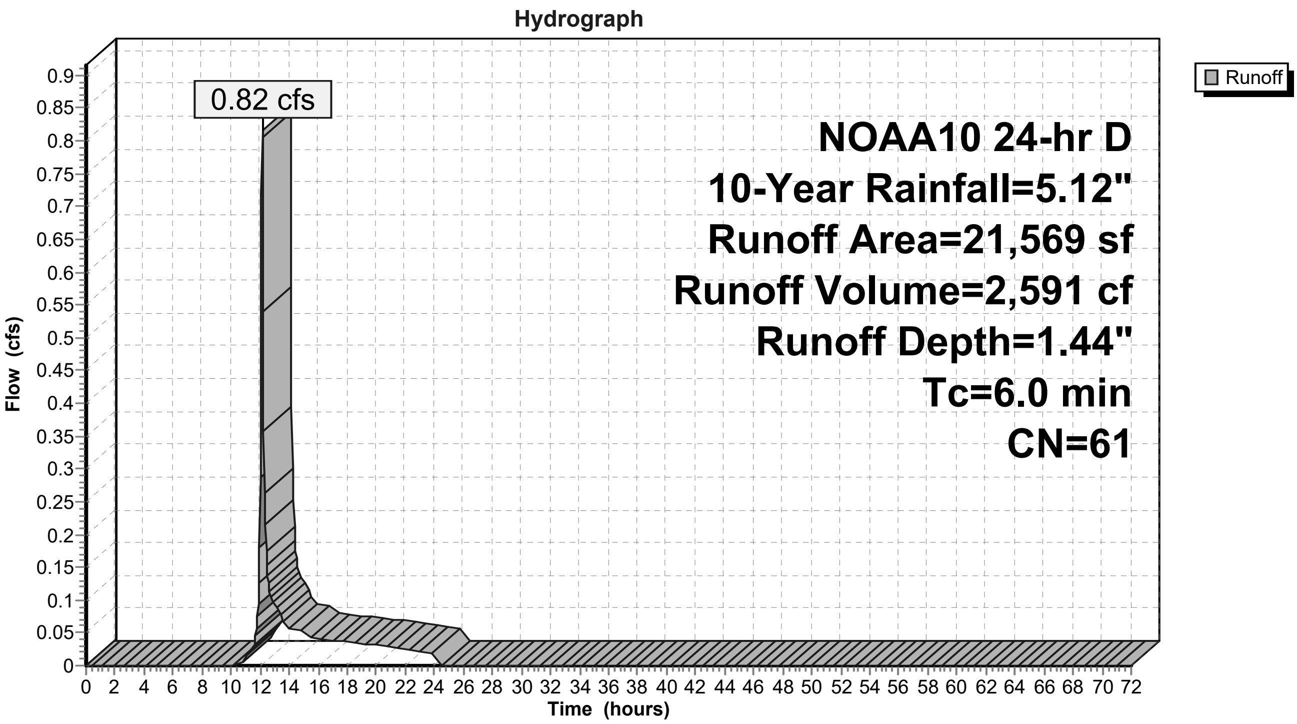
Runoff = 0.82 cfs @ 12.14 hrs, Volume= 2,591 cf, Depth= 1.44"
Routed to Link SP1 : STUDY POINT #1 (Kimball Road north)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
15,923	61	>75% Grass cover, Good, HSG B
718	98	Paved parking, HSG B
4,928	55	Woods, Good, HSG B
21,569	61	Weighted Average
20,851		96.67% Pervious Area
718		3.33% Impervious Area

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

Subcatchment P-1B: Subcat P-1B



Summary for Subcatchment P-2: Subcat P-2

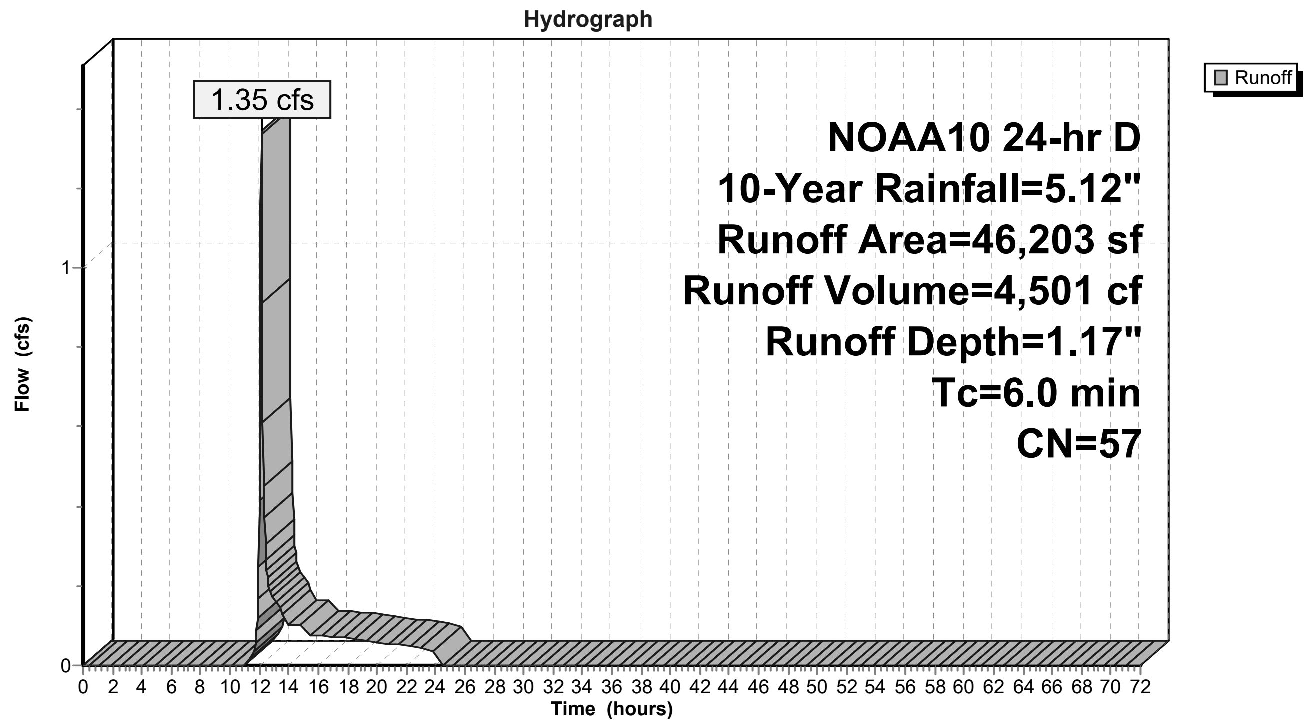
Runoff = 1.35 cfs @ 12.14 hrs, Volume= 4,501 cf, Depth= 1.17"
Routed to Link SP2 : STUDY POINT #2 (Wetlands West)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
8,701	61	>75% Grass cover, Good, HSG B
535	98	Paved parking, HSG B
209	98	Roofs, HSG B
36,759	55	Woods, Good, HSG B
46,203	57	Weighted Average
45,460		98.39% Pervious Area
743		1.61% Impervious Area

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

Subcatchment P-2: Subcat P-2



Summary for Subcatchment P-3: Subcat P-3

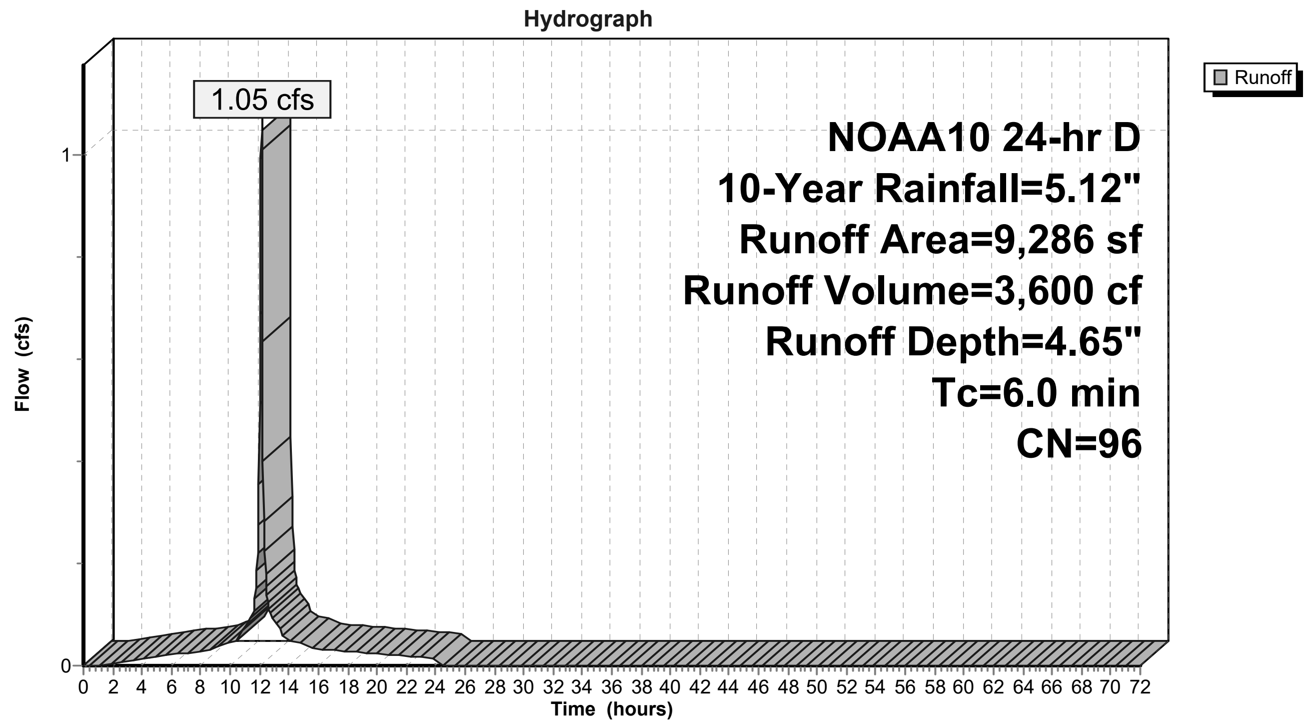
Runoff = 1.05 cfs @ 12.13 hrs, Volume= 3,600 cf, Depth= 4.65"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
430	61	>75% Grass cover, Good, HSG B
8,855	98	Paved parking, HSG B
1	98	Roofs, HSG B
9,286	96	Weighted Average
430		4.63% Pervious Area
8,856		95.37% Impervious Area

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

Subcatchment P-3: Subcat P-3



Summary for Subcatchment P-4: Subcat P-4

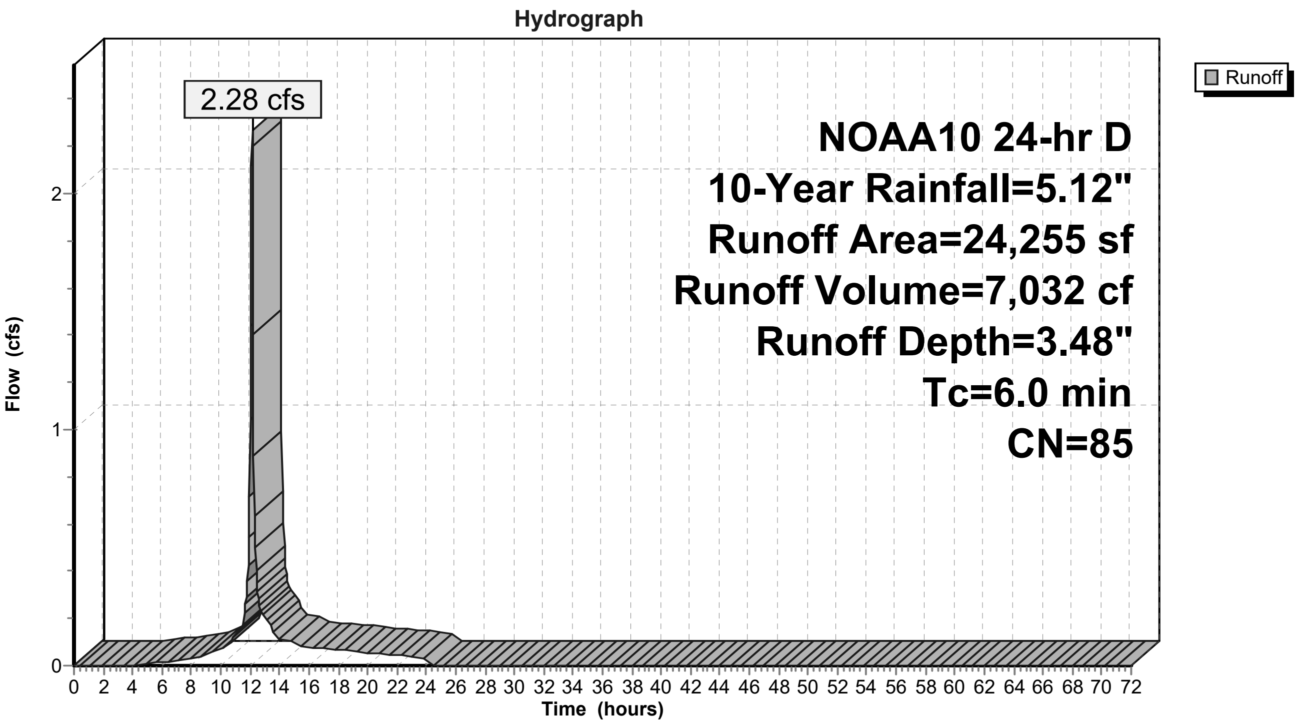
Runoff = 2.28 cfs @ 12.13 hrs, Volume= 7,032 cf, Depth= 3.48"
Routed to Pond 7P : UDS-6 (CMP 60")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
8,655	61	>75% Grass cover, Good, HSG B
14,992	98	Paved parking, HSG B
602	98	Roofs, HSG B
6	55	Woods, Good, HSG B
24,255	85	Weighted Average
8,661		35.71% Pervious Area
15,594		64.29% Impervious Area

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

Subcatchment P-4: Subcat P-4



Summary for Subcatchment P-5: Subcat P-5

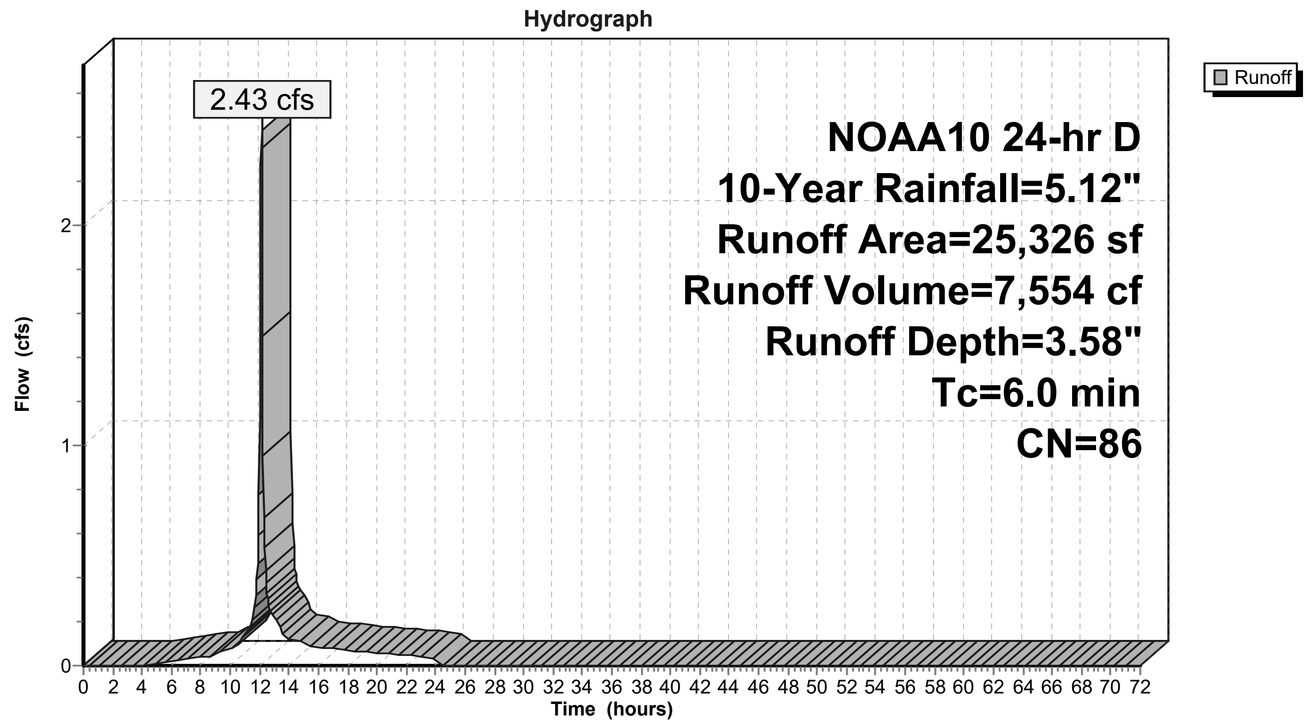
Runoff = 2.43 cfs @ 12.13 hrs, Volume= 7,554 cf, Depth= 3.58"
Routed to Pond 7P : UDS-6 (CMP 60")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
7,931	61	>75% Grass cover, Good, HSG B
8,801	98	Paved parking, HSG B
8,589	98	Roofs, HSG B
6	55	Woods, Good, HSG B
25,326	86	Weighted Average
7,937		31.34% Pervious Area
17,389		68.66% Impervious Area

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

Subcatchment P-5: Subcat P-5



Summary for Subcatchment P-6: Subcat P-6

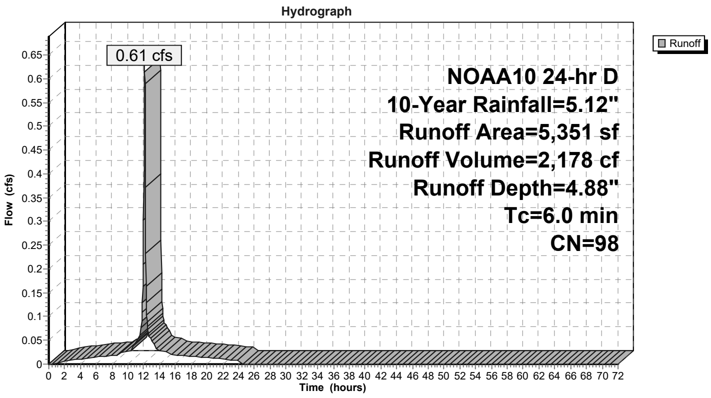
Runoff = 0.61 cfs @ 12.13 hrs, Volume= 2,178 cf, Depth= 4.88"
Routed to Pond 4P : UDS-3 (SC-310)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
5,351	98	Paved parking, HSG B
5,351		100.00% Impervious Area

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

Subcatchment P-6: Subcat P-6



Summary for Subcatchment P-7: Subcat P-7

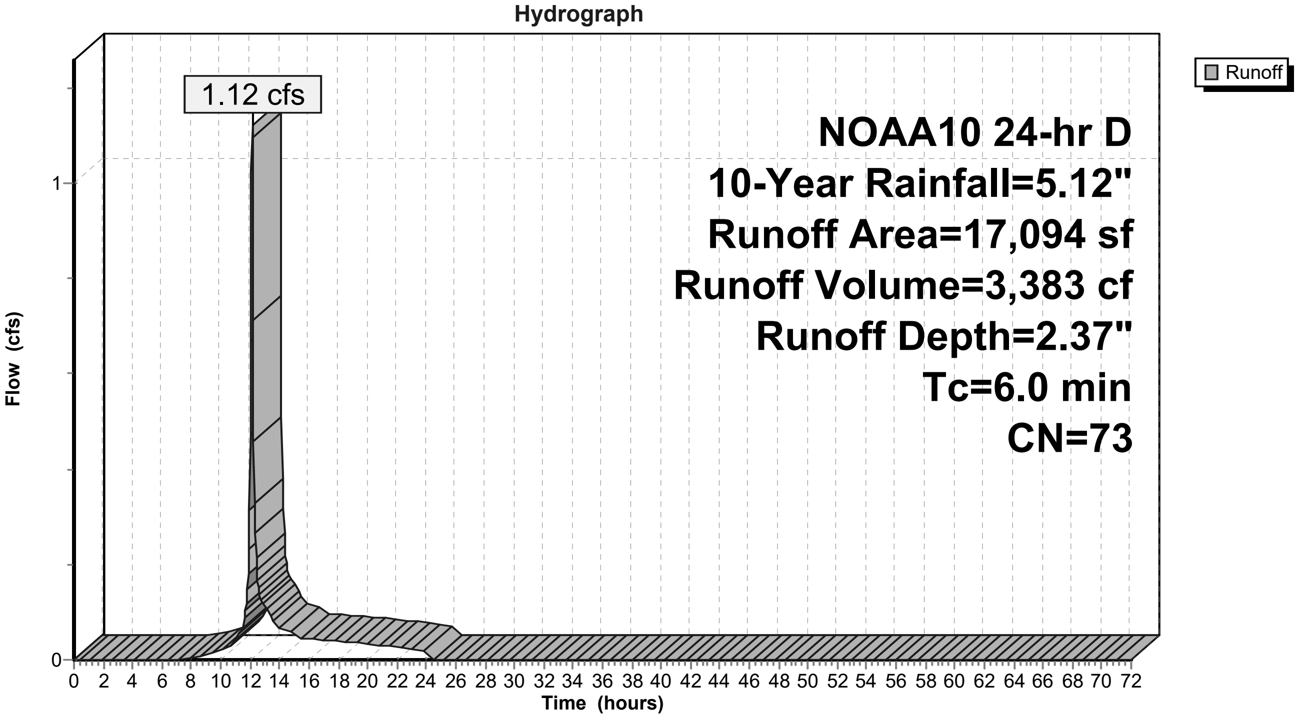
Runoff = 1.12 cfs @ 12.13 hrs, Volume= 3,383 cf, Depth= 2.37"
Routed to Pond 1P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
11,506	61	>75% Grass cover, Good, HSG B
1,073	98	Paved parking, HSG B
4,510	98	Roofs, HSG B
4	55	Woods, Good, HSG B
17,094	73	Weighted Average
11,510		67.34% Pervious Area
5,584		32.66% Impervious Area

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

Subcatchment P-7: Subcat P-7



Summary for Subcatchment P-8: Subcat P-8

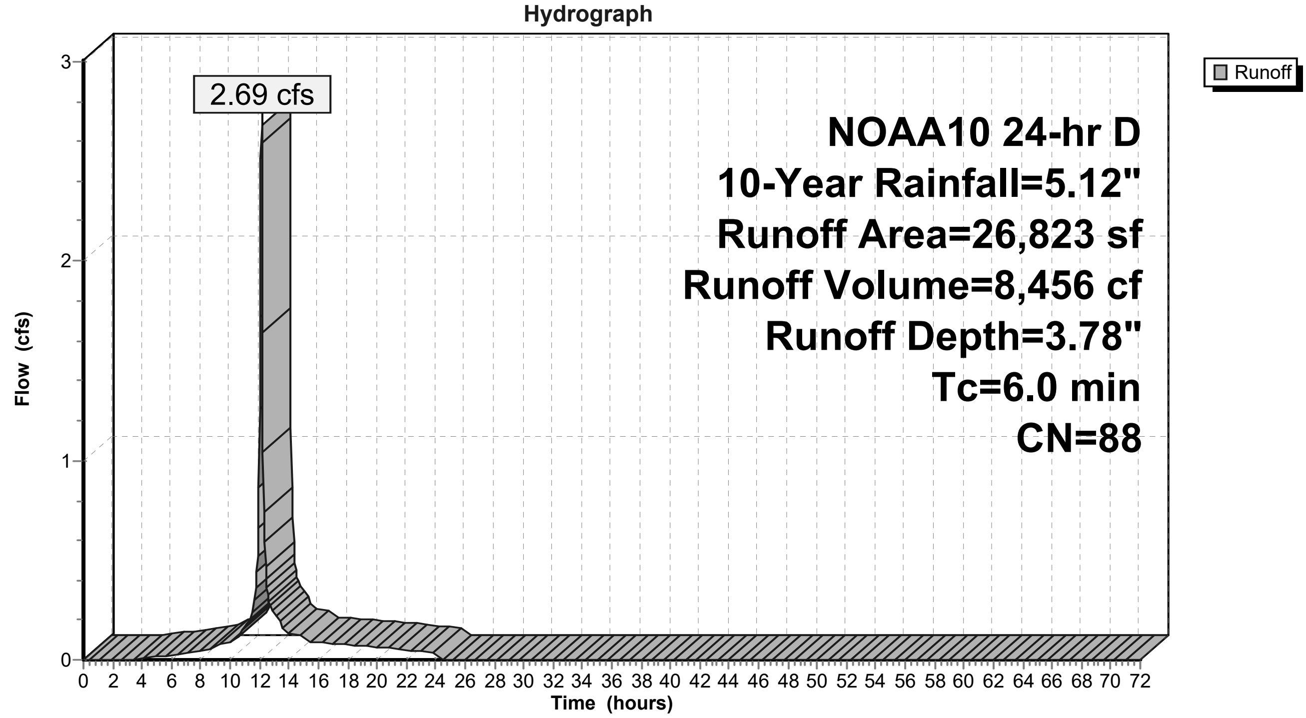
Runoff = 2.69 cfs @ 12.13 hrs, Volume= 8,456 cf, Depth= 3.78"
Routed to Pond 3P : UIS-2 (SC-800)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
7,489	61	>75% Grass cover, Good, HSG B
13,141	98	Paved parking, HSG B
6,193	98	Roofs, HSG B
26,823	88	Weighted Average
7,489		27.92% Pervious Area
19,334		72.08% Impervious Area

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

Subcatchment P-8: Subcat P-8



Summary for Subcatchment P-9: Subcat P-9

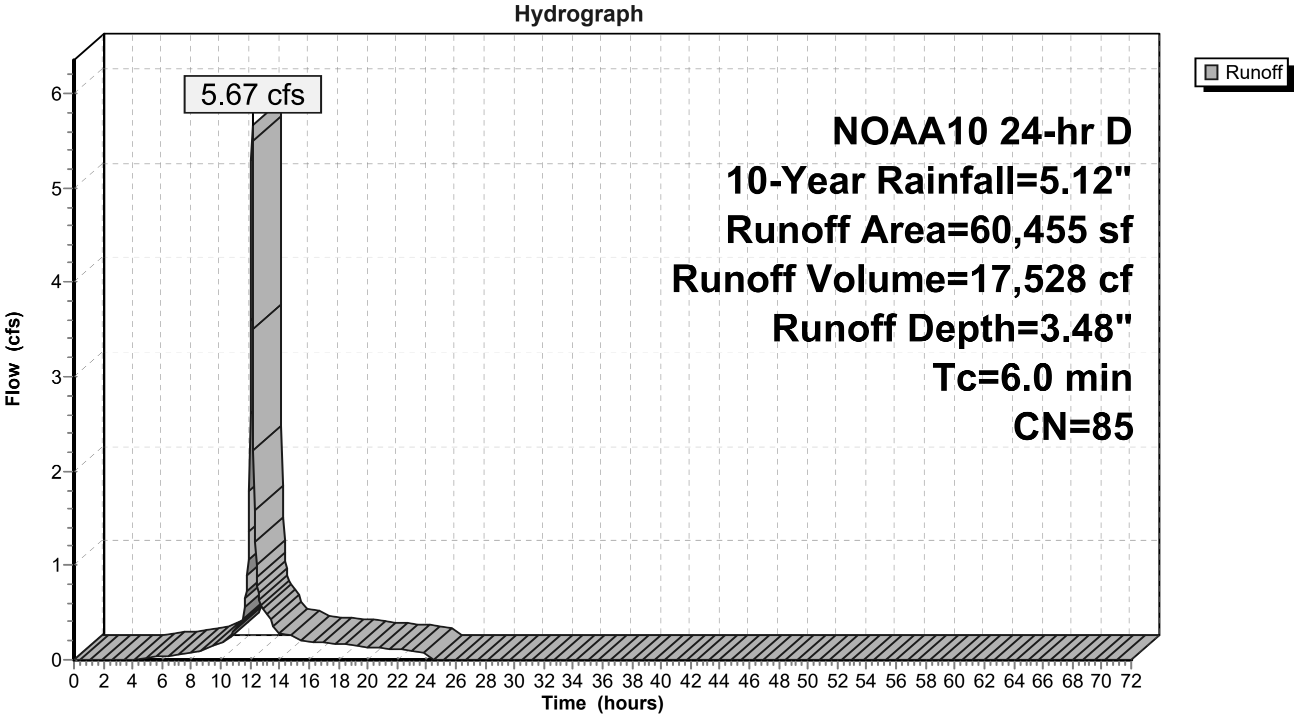
Runoff = 5.67 cfs @ 12.13 hrs, Volume= 17,528 cf, Depth= 3.48"
Routed to Pond 2P : UIS-1 (SC-800)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 10-Year Rainfall=5.12"

Area (sf)	CN	Description
17,971	61	>75% Grass cover, Good, HSG B
27,276	98	Paved parking, HSG B
13,018	98	Roofs, HSG B
2,190	55	Woods, Good, HSG B
60,455	85	Weighted Average
20,161		33.35% Pervious Area
40,294		66.65% Impervious Area

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

Subcatchment P-9: Subcat P-9



Summary for Pond 1P: Infiltration Basin

Inflow Area = 235,908 sf, 53.82% Impervious, Inflow Depth = 2.88" for 10-Year event
Inflow = 1.92 cfs @ 13.58 hrs, Volume= 56,646 cf
Outflow = 1.28 cfs @ 15.79 hrs, Volume= 55,020 cf, Atten= 33%, Lag= 132.6 min
Discarded = 0.11 cfs @ 15.79 hrs, Volume= 20,048 cf
Primary = 1.17 cfs @ 15.79 hrs, Volume= 34,972 cf
Routed to Link SP1 : STUDY POINT #1 (Kimball Road north)

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 146.00' @ 15.79 hrs Surf.Area= 4,714 sf Storage= 15,185 cf
Flood Elev= 146.50' Surf.Area= 5,034 sf Storage= 17,623 cf

Plug-Flow detention time= 508.6 min calculated for 55,020 cf (97% of inflow)
Center-of-Mass det. time= 478.9 min (1,660.7 - 1,181.8)

Volume	Invert	Avail.Storage	Storage Description
#1	141.50'	21,155 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

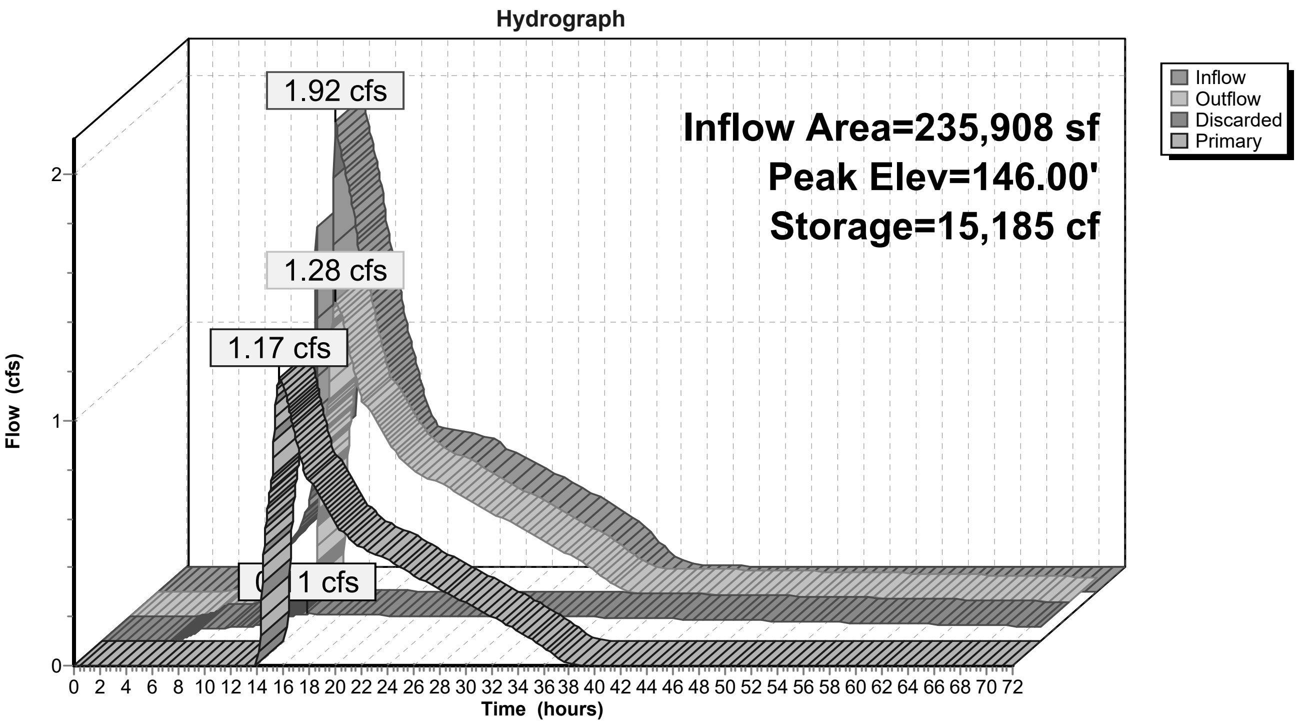
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
141.50	2,137	224.8	0	0	2,137
142.00	2,394	232.9	1,132	1,132	2,453
143.00	2,930	249.4	2,657	3,790	3,131
144.00	3,496	266.1	3,209	6,998	3,863
145.00	4,090	282.0	3,789	10,788	4,609
146.00	4,714	297.5	4,398	15,186	5,380
147.00	5,365	312.9	5,036	20,222	6,188
147.15	7,117	351.5	933	21,155	8,229

Device	Routing	Invert	Outlet Devices
#1	Discarded	141.50'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	141.50'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 141.50' / 138.30' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	145.00'	**6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 2	145.90'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Primary	146.50'	**20.0' long x 18.0' breadth Overflow Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.11 cfs @ 15.79 hrs HW=146.00' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=1.17 cfs @ 15.79 hrs HW=146.00' (Free Discharge)
2=Culvert (Passes 1.17 cfs of 5.97 cfs potential flow)
3=6" Orifice (Orifice Controls 0.82 cfs @ 4.17 fps)
4=Broad-Crested Rectangular Weir (Weir Controls 0.35 cfs @ 0.88 fps)
5=Overflow Weir (Controls 0.00 cfs)

Pond 1P: Infiltration Basin



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

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
141.50	2,137	0	145.00	4,090	10,788
141.60	2,187	216	145.10	4,150	11,200
141.70	2,238	437	145.20	4,211	11,618
141.80	2,289	664	145.30	4,273	12,042
141.90	2,341	895	145.40	4,334	12,472
142.00	2,394	1,132	145.50	4,396	12,909
142.10	2,445	1,374	145.60	4,459	13,352
142.20	2,497	1,621	145.70	4,522	13,801
142.30	2,549	1,873	145.80	4,586	14,256
142.40	2,602	2,131	145.90	4,650	14,718
142.50	2,655	2,394	146.00	4,714	15,186
142.60	2,709	2,662	146.10	4,777	15,660
142.70	2,764	2,936	146.20	4,841	16,141
142.80	2,818	3,215	146.30	4,905	16,629
142.90	2,874	3,499	146.40	4,969	17,122
143.00	2,930	3,790	146.50	5,034	17,623
143.10	2,984	4,085	146.60	5,100	18,129
143.20	3,039	4,387	146.70	5,165	18,642
143.30	3,095	4,693	146.80	5,231	19,162
143.40	3,150	5,005	146.90	5,298	19,689
143.50	3,207	5,323	147.00	5,365	20,222
143.60	3,264	5,647	147.10	**6,506**	**20,815**
143.70	3,321	5,976			
143.80	3,379	6,311			
143.90	3,437	6,652			
144.00	3,496	6,998			
144.10	3,553	7,351			
144.20	3,611	7,709			
144.30	3,669	8,073			
144.40	3,728	8,443			
144.50	3,787	8,819			
144.60	3,847	9,200			
144.70	3,907	9,588			
144.80	3,967	9,982			
144.90	4,029	10,382			

Summary for Pond 2P: UIS-1 (SC-800)

Inflow Area = 60,455 sf, 66.65% Impervious, Inflow Depth = 3.48" for 10-Year event
Inflow = 5.67 cfs @ 12.13 hrs, Volume= 17,528 cf
Outflow = 0.25 cfs @ 15.04 hrs, Volume= 17,528 cf, Atten= 96%, Lag= 174.6 min
Discarded = 0.13 cfs @ 9.35 hrs, Volume= 15,615 cf
Primary = 0.12 cfs @ 15.04 hrs, Volume= 1,912 cf
Routed to Link SP2 : STUDY POINT #2 (Wetlands West)

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 168.51' @ 15.04 hrs Surf.Area= 5,572 sf Storage= 8,618 cf
Flood Elev= 170.05' Surf.Area= 5,572 sf Storage= 13,061 cf

Plug-Flow detention time= 553.9 min calculated for 17,528 cf (100% of inflow)
Center-of-Mass det. time= 553.9 min (1,380.9 - 827.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	166.30'	5,222 cf	**34.75'W x 160.33'L x 3.75'H Field A** 20,893 cf Overall - 7,839 cf Embedded = 13,054 cf x 40.0% Voids
#2A	166.80'	7,839 cf	**ADS_StormTech SC-800 +Cap** x 154 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 154 Chambers in 7 Rows Cap Storage= 3.4 cf x 2 x 7 rows = 47.9 cf
		13,061 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	166.30'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	166.80'	**12.0" Round Culvert** L= 158.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 166.80' / 165.00' S= 0.0114 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	169.50'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00

			Coef. (English) 2.80 2.92 3.08 3.30 3.32	
#4	Device 2	168.30'	**6.0" Vert. 6" Orifice**	C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.13 cfs @ 9.35 hrs HW=166.34' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.12 cfs @ 15.04 hrs HW=168.51' (Free Discharge)
└─**2=Culvert** (Passes 0.12 cfs of 3.28 cfs potential flow)
  ├─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**4=6" Orifice** (Orifice Controls 0.12 cfs @ 1.56 fps)

Pond 2P: UIS-1 (SC-800) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-800 +Cap (ADS StormTech® SC-800 with cap volume)
Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf
Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap
Cap Storage= 3.4 cf x 2 x 7 rows = 47.9 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

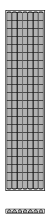
22 Chambers/Row x 7.12' Long +0.88' Cap Length x 2 = 158.33' Row Length +12.0" End Stone x 2 = 160.33' Base Length
7 Rows x 51.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 34.75' Base Width
6.0" Stone Base + 33.0" Chamber Height + 6.0" Stone Cover = 3.75' Field Height

154 Chambers x 50.6 cf + 3.4 cf Cap Volume x 2 x 7 Rows = 7,839.1 cf Chamber Storage

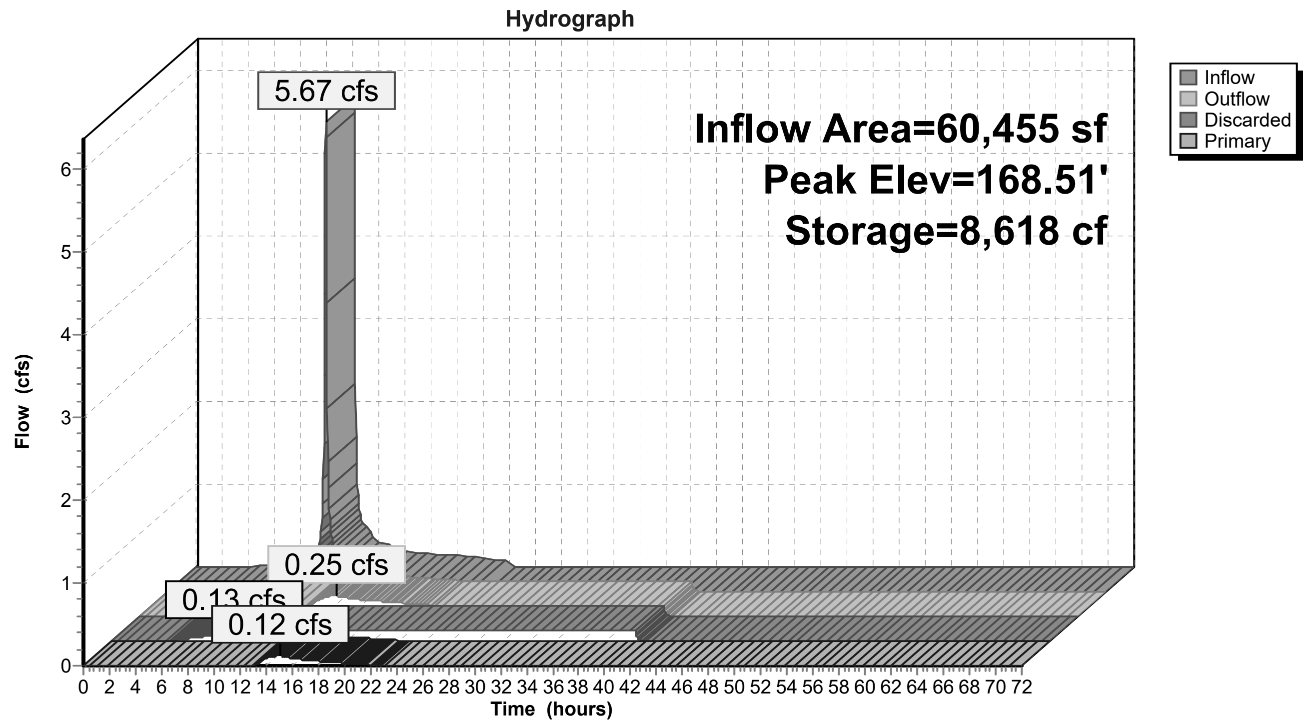
20,893.4 cf Field - 7,839.1 cf Chambers = 13,054.3 cf Stone x 40.0% Voids = 5,221.7 cf Stone Storage

Chamber Storage + Stone Storage = 13,060.8 cf = 0.300 af
Overall Storage Efficiency = 62.5%
Overall System Size = 160.33' x 34.75' x 3.75'

154 Chambers
773.8 cy Field
483.5 cy Stone



Pond 2P: UIS-1 (SC-800)



Stage-Area-Storage for Pond 2P: UIS-1 (SC-800)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
166.30	**5,572**	0	168.05	5,572	6,745	169.80	5,572	12,504
166.35	5,572	111	168.10	5,572	6,956	169.85	5,572	12,615
166.40	5,572	223	168.15	5,572	7,165	169.90	5,572	12,727
166.45	5,572	334	168.20	5,572	7,372	169.95	5,572	12,838
166.50	5,572	446	168.25	5,572	7,578	170.00	5,572	12,949
166.55	5,572	557	168.30	5,572	7,782	170.05	5,572	**13,061**
166.60	5,572	669	168.35	5,572	7,985			
166.65	5,572	780	168.40	5,572	8,185			
166.70	5,572	891	168.45	5,572	8,384			
166.75	5,572	1,003	168.50	5,572	8,581			
166.80	5,572	1,114	168.55	5,572	8,775			
166.85	5,572	1,350	168.60	5,572	8,968			
166.90	5,572	1,584	168.65	5,572	9,158			
166.95	5,572	1,819	168.70	5,572	9,346			
167.00	5,572	2,052	168.75	5,572	9,531			
167.05	5,572	2,285	168.80	5,572	9,714			
167.10	5,572	2,517	168.85	5,572	9,894			
167.15	5,572	2,748	168.90	5,572	10,071			
167.20	5,572	2,979	168.95	5,572	10,245			
167.25	5,572	3,208	169.00	5,572	10,415			
167.30	5,572	3,437	169.05	5,572	10,582			
167.35	5,572	3,665	169.10	5,572	10,744			
167.40	5,572	3,892	169.15	5,572	10,902			
167.45	5,572	4,118	169.20	5,572	11,053			
167.50	5,572	4,343	169.25	5,572	11,198			
167.55	5,572	4,567	169.30	5,572	11,335			
167.60	5,572	4,790	169.35	5,572	11,466			
167.65	5,572	5,012	169.40	5,572	11,592			
167.70	5,572	5,233	169.45	5,572	11,714			
167.75	5,572	5,453	169.50	5,572	11,832			
167.80	5,572	5,672	169.55	5,572	11,947			
167.85	5,572	5,889	169.60	5,572	12,058			
167.90	5,572	6,105	169.65	5,572	12,169			
167.95	5,572	6,320	169.70	5,572	12,281			
168.00	5,572	6,533	169.75	5,572	12,392			

Summary for Pond 3P: UIS-2 (SC-800)

Inflow Area = 26,823 sf, 72.08% Impervious, Inflow Depth = 3.78" for 10-Year event
Inflow = 2.69 cfs @ 12.13 hrs, Volume= 8,456 cf
Outflow = 0.13 cfs @ 14.43 hrs, Volume= 8,456 cf, Atten= 95%, Lag= 138.4 min
Discarded = 0.05 cfs @ 8.80 hrs, Volume= 7,364 cf
Primary = 0.07 cfs @ 14.43 hrs, Volume= 1,092 cf
Routed to Link SP2 : STUDY POINT #2 (Wetlands West)

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 160.94' @ 14.43 hrs Surf.Area= 2,248 sf Storage= 4,228 cf
Flood Elev= 162.35' Surf.Area= 2,248 sf Storage= 5,668 cf

Plug-Flow detention time= 646.2 min calculated for 8,450 cf (100% of inflow)
Center-of-Mass det. time= 646.6 min (1,460.5 - 813.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	158.10'	2,591 cf	**30.00'W x 74.93'L x 4.25'H Field A** 9,554 cf Overall - 3,077 cf Embedded = 6,477 cf x 40.0% Voids
#2A	158.85'	3,077 cf	**ADS_StormTech SC-800 +Cap** x 60 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 60 Chambers in 6 Rows Cap Storage= 3.4 cf x 2 x 6 rows = 41.0 cf
		5,668 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	158.10'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	160.78'	**12.0" Round Culvert** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 160.78' / 160.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	161.80'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Device 2	160.78'	**6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.05 cfs @ 8.80 hrs HW=158.14' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.07 cfs @ 14.43 hrs HW=160.94' (Free Discharge)
└─**2=Culvert** (Passes 0.07 cfs of 0.09 cfs potential flow)
  ├─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**4=6" Orifice** (Orifice Controls 0.07 cfs @ 1.37 fps)

Pond 3P: UIS-2 (SC-800) - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-800 +Cap (ADS StormTech®SC-800 with cap volume)
Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf
Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap
Cap Storage= 3.4 cf x 2 x 6 rows = 41.0 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

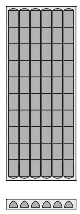
10 Chambers/Row x 7.12' Long +0.88' Cap Length x 2 = 72.93' Row Length +12.0" End Stone x 2 = 74.93' Base Length
6 Rows x 51.0" Wide + 6.0" Spacing x 5 + 12.0" Side Stone x 2 = 30.00' Base Width
9.0" Stone Base + 33.0" Chamber Height + 9.0" Stone Cover = 4.25' Field Height

60 Chambers x 50.6 cf + 3.4 cf Cap Volume x 2 x 6 Rows = 3,076.6 cf Chamber Storage

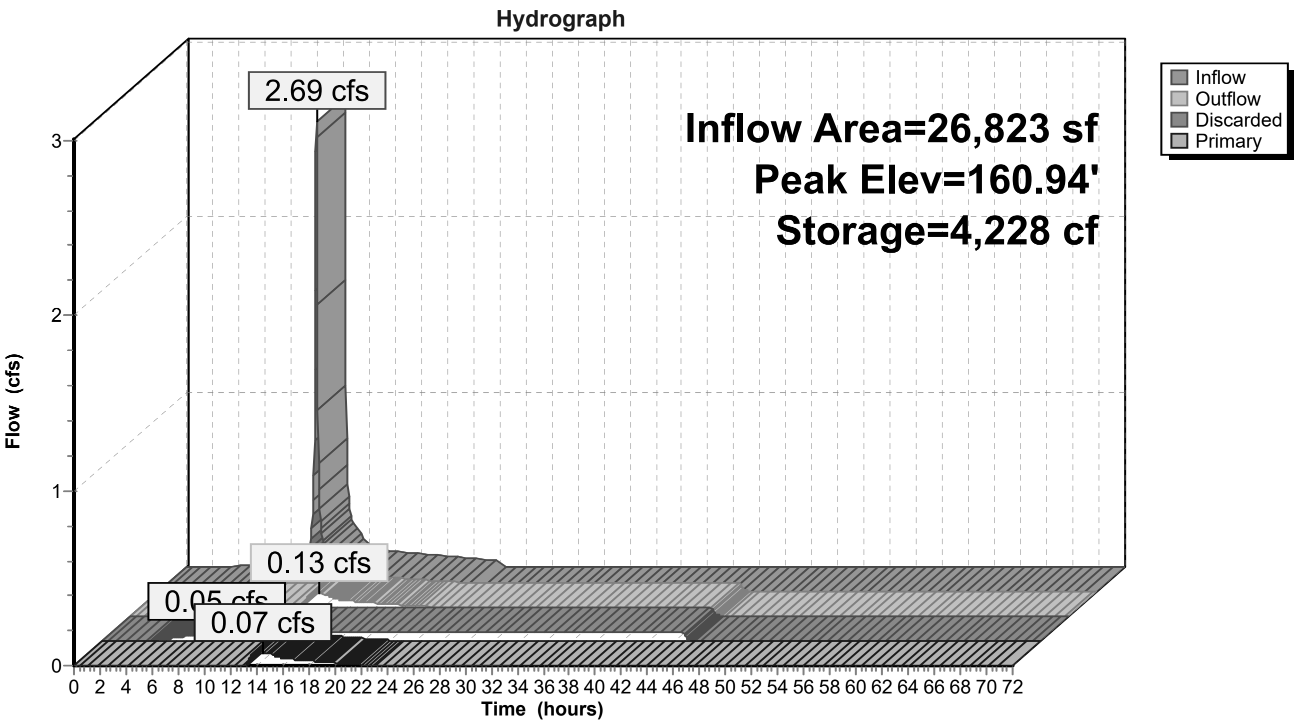
9,554.0 cf Field - 3,076.6 cf Chambers = 6,477.4 cf Stone x 40.0% Voids = 2,591.0 cf Stone Storage

Chamber Storage + Stone Storage = 5,667.5 cf = 0.130 af
Overall Storage Efficiency = 59.3%
Overall System Size = 74.93' x 30.00' x 4.25'

60 Chambers
353.9 cy Field
239.9 cy Stone



Pond 3P: UIS-2 (SC-800)



Stage-Area-Storage for Pond 3P: UIS-2 (SC-800)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
158.10	**2,248**	0	159.85	2,248	2,488	161.60	2,248	4,993
158.15	2,248	45	159.90	2,248	2,574	161.65	2,248	5,038
158.20	2,248	90	159.95	2,248	2,660	161.70	2,248	5,083
158.25	2,248	135	160.00	2,248	2,746	161.75	2,248	5,128
158.30	2,248	180	160.05	2,248	2,831	161.80	2,248	5,173
158.35	2,248	225	160.10	2,248	2,915	161.85	2,248	5,218
158.40	2,248	270	160.15	2,248	2,999	161.90	2,248	5,263
158.45	2,248	315	160.20	2,248	3,082	161.95	2,248	5,308
158.50	2,248	360	160.25	2,248	3,165	162.00	2,248	5,353
158.55	2,248	405	160.30	2,248	3,247	162.05	2,248	5,398
158.60	2,248	450	160.35	2,248	3,328	162.10	2,248	5,443
158.65	2,248	495	160.40	2,248	3,409	162.15	2,248	5,488
158.70	2,248	540	160.45	2,248	3,489	162.20	2,248	5,533
158.75	2,248	584	160.50	2,248	3,568	162.25	2,248	5,578
158.80	2,248	629	160.55	2,248	3,646	162.30	2,248	5,623
158.85	2,248	674	160.60	2,248	3,724	162.35	2,248	**5,668**
158.90	2,248	768	160.65	2,248	3,801			
158.95	2,248	861	160.70	2,248	3,877			
159.00	2,248	954	160.75	2,248	3,952			
159.05	2,248	1,047	160.80	2,248	4,026			
159.10	2,248	1,140	160.85	2,248	4,099			
159.15	2,248	1,232	160.90	2,248	4,170			
159.20	2,248	1,324	160.95	2,248	4,241			
159.25	2,248	1,416	161.00	2,248	4,311			
159.30	2,248	1,507	161.05	2,248	4,379			
159.35	2,248	1,598	161.10	2,248	4,445			
159.40	2,248	1,689	161.15	2,248	4,510			
159.45	2,248	1,779	161.20	2,248	4,573			
159.50	2,248	1,869	161.25	2,248	4,634			
159.55	2,248	1,959	161.30	2,248	4,692			
159.60	2,248	2,048	161.35	2,248	4,747			
159.65	2,248	2,137	161.40	2,248	4,800			
159.70	2,248	2,225	161.45	2,248	4,850			
159.75	2,248	2,313	161.50	2,248	4,899			
159.80	2,248	2,401	161.55	2,248	4,947			

Summary for Pond 4P: UDS-3 (SC-310)

Inflow Area = 5,351 sf,100.00% Impervious, Inflow Depth = 4.88" for 10-Year event
Inflow = 0.61 cfs @ 12.13 hrs, Volume= 2,178 cf
Outflow = 0.26 cfs @ 12.25 hrs, Volume= 2,178 cf, Atten= 58%, Lag= 7.1 min
Primary = 0.26 cfs @ 12.25 hrs, Volume= 2,178 cf
Routed to Link SP1 : STUDY POINT #1 (Kimball Road north)

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 134.84' @ 12.25 hrs Surf.Area= 375 sf Storage= 289 cf
Flood Elev= 135.83' Surf.Area= 375 sf Storage= 456 cf

Plug-Flow detention time= 13.0 min calculated for 2,176 cf (100% of inflow)
Center-of-Mass det. time= 13.0 min (763.2 - 750.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	133.50'	279 cf	**8.17'W x 45.92'L x 2.33'H Field A** 875 cf Overall - 177 cf Embedded = 698 cf x 40.0% Voids
#2A	134.00'	177 cf	**ADS_StormTech SC-310 +Cap** x 12 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 12 Chambers in 2 Rows
		456 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	133.50'	**12.0" Round Culvert** L= 33.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 133.50' / 132.84' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	135.50'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Device 1	133.50'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.26 cfs @ 12.25 hrs HW=134.84' (Free Discharge)
1=Culvert (Passes 0.26 cfs of 2.73 cfs potential flow)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
3=Orifice/Grate (Orifice Controls 0.26 cfs @ 5.30 fps)

Pond 4P: UDS-3 (SC-310) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-310 +Cap (ADS StormTech® SC-310 with cap length)
Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

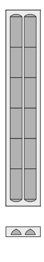
6 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 43.92' Row Length +12.0" End Stone x 2 = 45.92' Base Length
2 Rows x 34.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 8.17' Base Width
6.0" Stone Base + 16.0" Chamber Height + 6.0" Stone Cover = 2.33' Field Height

12 Chambers x 14.7 cf = 176.9 cf Chamber Storage

875.0 cf Field - 176.9 cf Chambers = 698.1 cf Stone x 40.0% Voids = 279.3 cf Stone Storage

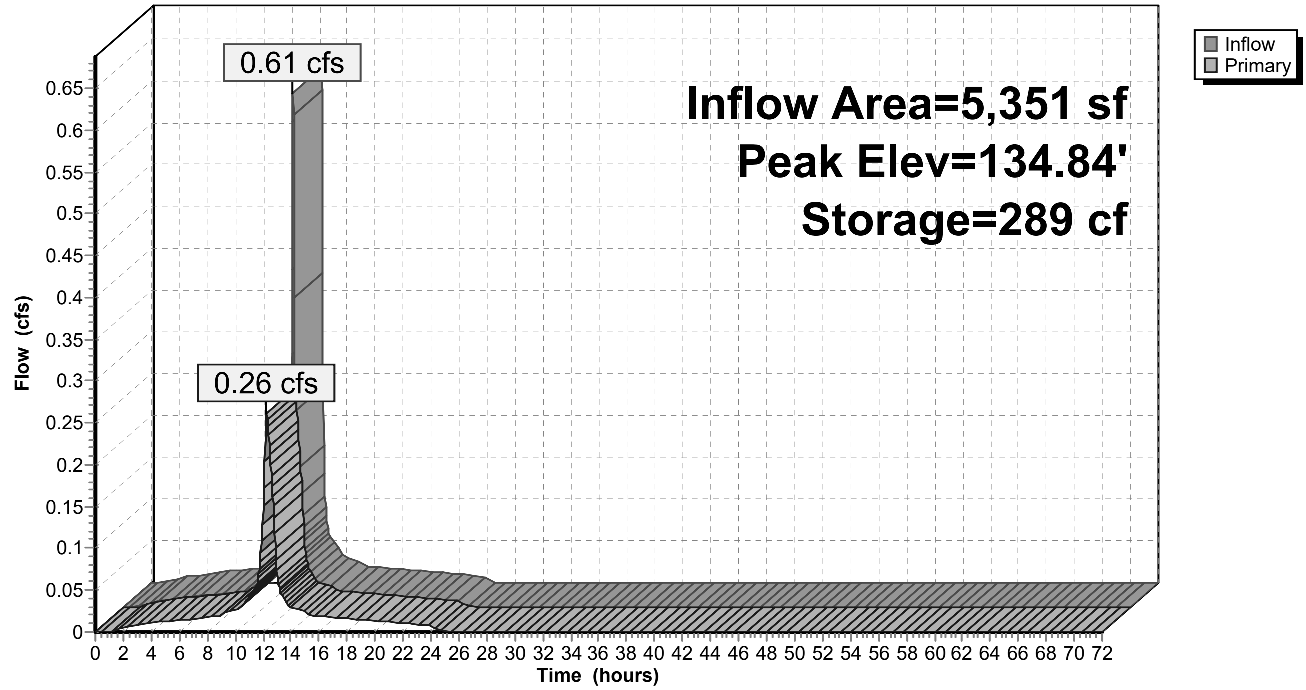
Chamber Storage + Stone Storage = 456.2 cf = 0.010 af
Overall Storage Efficiency = 52.1%
Overall System Size = 45.92' x 8.17' x 2.33'

12 Chambers
32.4 cy Field
25.9 cy Stone



Pond 4P: UDS-3 (SC-310)

Hydrograph



Stage-Area-Storage for Pond 4P: UDS-3 (SC-310)

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
133.50	0	134.20	129	134.90	303	135.60	421
133.52	3	134.22	135	134.92	307	135.62	424
133.54	6	134.24	140	134.94	311	135.64	427
133.56	9	134.26	145	134.96	315	135.66	430
133.58	12	134.28	151	134.98	320	135.68	433
133.60	15	134.30	156	135.00	324	135.70	436
133.62	18	134.32	161	135.02	328	135.72	439
133.64	21	134.34	166	135.04	332	135.74	442
133.66	24	134.36	172	135.06	336	135.76	445
133.68	27	134.38	177	135.08	339	135.78	448
133.70	30	134.40	182	135.10	343	135.80	451
133.72	33	134.42	187	135.12	347	135.82	**454**
133.74	36	134.44	192	135.14	350		
133.76	39	134.46	197	135.16	353		
133.78	42	134.48	203	135.18	357		
133.80	45	134.50	208	135.20	360		
133.82	48	134.52	213	135.22	363		
133.84	51	134.54	218	135.24	367		
133.86	54	134.56	223	135.26	370		
133.88	57	134.58	228	135.28	373		
133.90	60	134.60	233	135.30	376		
133.92	63	134.62	237	135.32	379		
133.94	66	134.64	242	135.34	382		
133.96	69	134.66	247	135.36	385		
133.98	72	134.68	252	135.38	388		
134.00	75	134.70	257	135.40	391		
134.02	80	134.72	262	135.42	394		
134.04	86	134.74	266	135.44	397		
134.06	91	134.76	271	135.46	400		
134.08	97	134.78	276	135.48	403		
134.10	102	134.80	280	135.50	406		
134.12	108	134.82	285	135.52	409		
134.14	113	134.84	289	135.54	412		
134.16	119	134.86	294	135.56	415		
134.18	124	134.88	298	135.58	418		

Summary for Pond 5P: UIS-4 (SC-310)

Inflow Area = 9,184 sf, 88.68% Impervious, Inflow Depth = 4.43" for 10-Year event
Inflow = 1.02 cfs @ 12.13 hrs, Volume= 3,388 cf
Outflow = 0.06 cfs @ 10.90 hrs, Volume= 3,388 cf, Atten= 94%, Lag= 0.0 min
Discarded = 0.06 cfs @ 10.90 hrs, Volume= 3,388 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond 7P : UDS-6 (CMP 60")

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 164.80' @ 13.54 hrs Surf.Area= 2,592 sf Storage= 1,129 cf
Flood Elev= 166.33' Surf.Area= 2,592 sf Storage= 3,300 cf

Plug-Flow detention time= 141.1 min calculated for 3,385 cf (100% of inflow)
Center-of-Mass det. time= 141.0 min (922.5 - 781.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	164.00'	1,829 cf	**34.83'W x 74.40'L x 2.33'H Field A** 6,047 cf Overall - 1,474 cf Embedded = 4,573 cf x 40.0% Voids
#2A	164.50'	1,474 cf	**ADS_StormTech SC-310 +Cap** x 100 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 100 Chambers in 10 Rows
		3,303 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	164.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	164.50'	**15.0" Round Culvert** L= 25.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 164.50' / 163.00' S= 0.0600 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#3	Device 2	165.45'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.06 cfs @ 10.90 hrs HW=164.02' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=164.00' (Free Discharge)
└─**2=Culvert** (Controls 0.00 cfs)
  └─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: UIS-4 (SC-310) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-310 +Cap (ADS StormTech® SC-310 with cap length)
Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

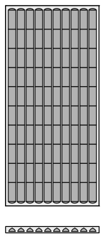
10 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 72.40' Row Length +12.0" End Stone x 2 = 74.40' Base Length
10 Rows x 34.0" Wide + 6.0" Spacing x 9 + 12.0" Side Stone x 2 = 34.83' Base Width
6.0" Stone Base + 16.0" Chamber Height + 6.0" Stone Cover = 2.33' Field Height

100 Chambers x 14.7 cf = 1,474.2 cf Chamber Storage

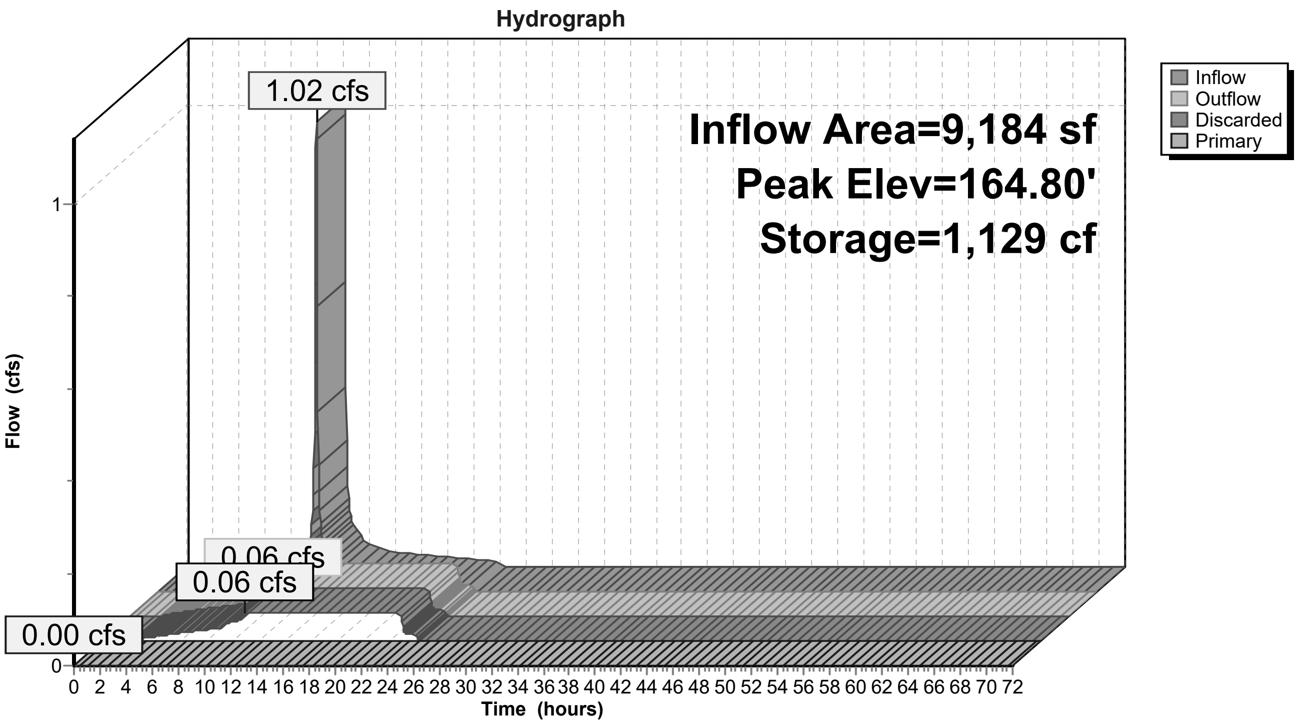
6,047.1 cf Field - 1,474.2 cf Chambers = 4,572.9 cf Stone x 40.0% Voids = 1,829.1 cf Stone Storage

Chamber Storage + Stone Storage = 3,303.3 cf = 0.076 af
Overall Storage Efficiency = 54.6%
Overall System Size = 74.40' x 34.83' x 2.33'

100 Chambers
224.0 cy Field
169.4 cy Stone



Pond 5P: UIS-4 (SC-310)



Stage-Area-Storage for Pond 5P: UIS-4 (SC-310)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
164.00	**2,592**	0	165.75	2,592	2,695
164.05	2,592	52	165.80	2,592	2,750
164.10	2,592	104	165.85	2,592	2,802
164.15	2,592	155	165.90	2,592	2,854
164.20	2,592	207	165.95	2,592	2,906
164.25	2,592	259	166.00	2,592	2,958
164.30	2,592	311	166.05	2,592	3,010
164.35	2,592	363	166.10	2,592	3,061
164.40	2,592	415	166.15	2,592	3,113
164.45	2,592	466	166.20	2,592	3,165
164.50	2,592	518	166.25	2,592	3,217
164.55	2,592	622	166.30	2,592	**3,269**
164.60	2,592	724			
164.65	2,592	827			
164.70	2,592	928			
164.75	2,592	1,029			
164.80	2,592	1,129			
164.85	2,592	1,227			
164.90	2,592	1,325			
164.95	2,592	1,422			
165.00	2,592	1,517			
165.05	2,592	1,611			
165.10	2,592	1,703			
165.15	2,592	1,794			
165.20	2,592	1,884			
165.25	2,592	1,972			
165.30	2,592	2,057			
165.35	2,592	2,141			
165.40	2,592	2,222			
165.45	2,592	2,301			
165.50	2,592	2,377			
165.55	2,592	2,449			
165.60	2,592	2,516			
165.65	2,592	2,579			
165.70	2,592	2,638			

Summary for Pond 6P: UDS-5 (CMP 72")

Inflow Area = 160,048 sf, 50.15% Impervious, Inflow Depth = 2.90" for 10-Year event
Inflow = 12.59 cfs @ 12.13 hrs, Volume= 38,677 cf
Outflow = 1.69 cfs @ 12.53 hrs, Volume= 38,677 cf, Atten= 87%, Lag= 24.0 min
Primary = 1.69 cfs @ 12.53 hrs, Volume= 38,677 cf
Routed to Pond 7P : UDS-6 (CMP 60")

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 164.96' @ 12.53 hrs Surf.Area= 4,970 sf Storage= 11,529 cf
Flood Elev= 168.50' Surf.Area= 4,970 sf Storage= 23,416 cf

Plug-Flow detention time= 71.4 min calculated for 38,677 cf (100% of inflow)
Center-of-Mass det. time= 70.7 min (914.9 - 844.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	161.50'	7,583 cf	**35.00'W x 142.00'L x 7.00'H Field A** 34,790 cf Overall - 15,834 cf Embedded = 18,956 cf x 40.0% Voids
#2A	162.00'	15,834 cf	**CMP Round 72** x 28 Inside #1 Effective Size= 72.0"W x 72.0"H => 28.27 sf x 20.00'L = 565.5 cf Overall Size= 72.0"W x 72.0"H x 20.00'L 28 Chambers in 4 Rows
		23,416 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	161.50'	**12.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 161.50' / 161.00' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	168.00'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Device 1	161.50'	**6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.69 cfs @ 12.53 hrs HW=164.95' (Free Discharge)
└─**1=Culvert** (Passes 1.69 cfs of 5.13 cfs potential flow)
  ├─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**3=6" Orifice** (Orifice Controls 1.69 cfs @ 8.62 fps)

Pond 6P: UDS-5 (CMP 72") - Chamber Wizard Field A

Chamber Model = CMP Round 72 (Round Corrugated Metal Pipe)
Effective Size= 72.0"W x 72.0"H => 28.27 sf x 20.00'L = 565.5 cf
Overall Size= 72.0"W x 72.0"H x 20.00'L

72.0" Wide + 36.0" Spacing = 108.0" C-C Row Spacing

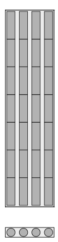
7 Chambers/Row x 20.00' Long = 140.00' Row Length +12.0" End Stone x 2 = 142.00' Base Length
4 Rows x 72.0" Wide + 36.0" Spacing x 3 + 12.0" Side Stone x 2 = 35.00' Base Width
6.0" Stone Base + 72.0" Chamber Height + 6.0" Stone Cover = 7.00' Field Height

28 Chambers x 565.5 cf = 15,833.6 cf Chamber Storage

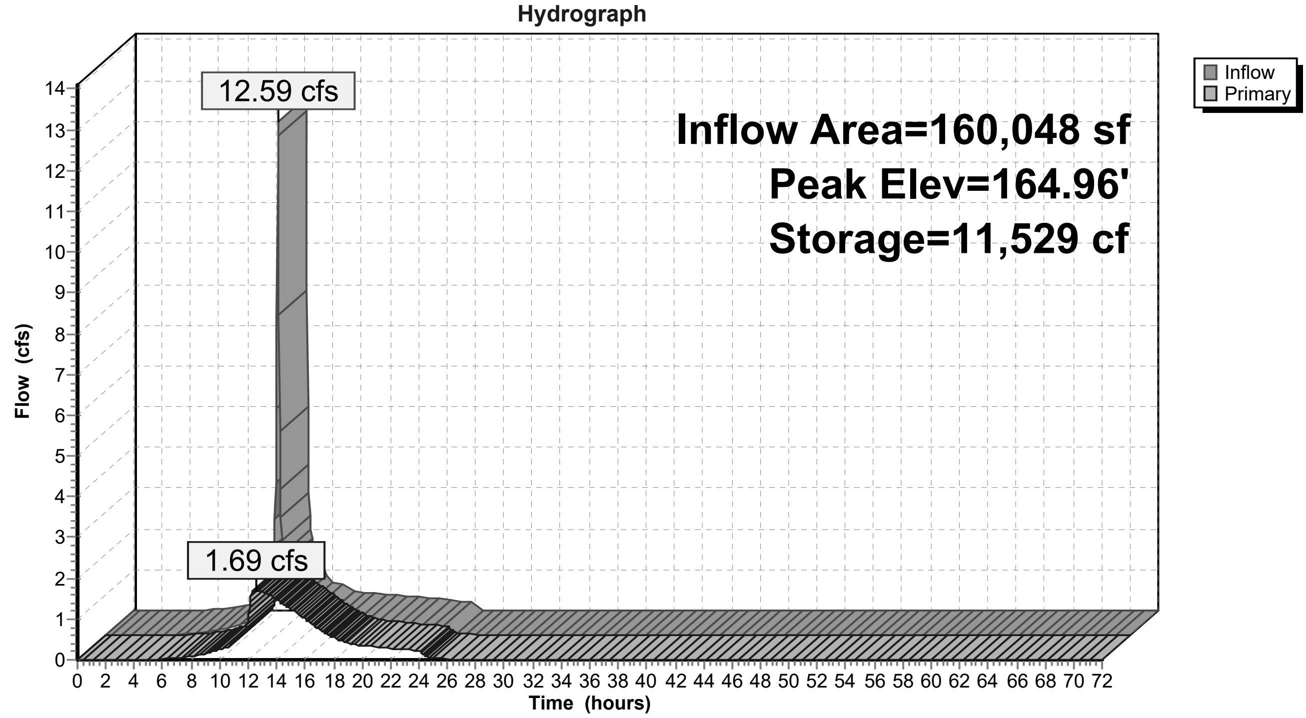
34,790.0 cf Field - 15,833.6 cf Chambers = 18,956.4 cf Stone x 40.0% Voids = 7,582.5 cf Stone Storage

Chamber Storage + Stone Storage = 23,416.2 cf = 0.538 af
Overall Storage Efficiency = 67.3%
Overall System Size = 142.00' x 35.00' x 7.00'

28 Chambers
1,288.5 cy Field
702.1 cy Stone



Pond 6P: UDS-5 (CMP 72")



Stage-Area-Storage for Pond 6P: UDS-5 (CMP 72")

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
161.50	0	163.25	4,913	165.00	11,708	166.75	18,503	168.50	**23,416**
161.55	99	163.30	5,095	165.05	11,908	166.80	18,684		
161.60	199	163.35	5,278	165.10	12,108	166.85	18,863		
161.65	298	163.40	5,462	165.15	12,309	166.90	19,041		
161.70	398	163.45	5,647	165.20	12,509	166.95	19,218		
161.75	497	163.50	5,833	165.25	12,709	167.00	19,393		
161.80	596	163.55	6,020	165.30	12,908	167.05	19,567		
161.85	696	163.60	6,209	165.35	13,108	167.10	19,739		
161.90	795	163.65	6,398	165.40	13,307	167.15	19,910		
161.95	895	163.70	6,587	165.45	13,506	167.20	20,079		
162.00	994	163.75	6,778	165.50	13,705	167.25	20,246		
162.05	1,102	163.80	6,969	165.55	13,904	167.30	20,411		
162.10	1,227	163.85	7,162	165.60	14,102	167.35	20,574		
162.15	1,355	163.90	7,354	165.65	14,300	167.40	20,735		
162.20	1,489	163.95	7,548	165.70	14,498	167.45	20,894		
162.25	1,626	164.00	7,742	165.75	14,695	167.50	21,050		
162.30	1,768	164.05	7,937	165.80	14,892	167.55	21,204		
162.35	1,913	164.10	8,132	165.85	15,088	167.60	21,355		
162.40	2,061	164.15	8,328	165.90	15,284	167.65	21,503		
162.45	2,212	164.20	8,524	165.95	15,479	167.70	21,648		
162.50	2,366	164.25	8,721	166.00	15,674	167.75	21,790		
162.55	2,522	164.30	8,918	166.05	15,868	167.80	21,927		
162.60	2,681	164.35	9,116	166.10	16,062	167.85	22,061		
162.65	2,842	164.40	9,314	166.15	16,255	167.90	22,189		
162.70	3,005	164.45	9,512	166.20	16,447	167.95	22,310		
162.75	3,170	164.50	9,711	166.25	16,638	168.00	22,422		
162.80	3,337	164.55	9,910	166.30	16,829	168.05	22,522		
162.85	3,506	164.60	10,109	166.35	17,019	168.10	22,621		
162.90	3,677	164.65	10,308	166.40	17,208	168.15	22,720		
162.95	3,849	164.70	10,508	166.45	17,396	168.20	22,820		
163.00	4,023	164.75	10,708	166.50	17,583	168.25	22,919		
163.05	4,198	164.80	10,908	166.55	17,769	168.30	23,019		
163.10	4,375	164.85	11,108	166.60	17,954	168.35	23,118		
163.15	4,553	164.90	11,308	166.65	18,138	168.40	23,217		
163.20	4,732	164.95	11,508	166.70	18,321	168.45	23,317		

Summary for Pond 7P: UDS-6 (CMP 60")

Inflow Area = 218,814 sf, 55.48% Impervious, Inflow Depth = 2.92" for 10-Year event
Inflow = 6.10 cfs @ 12.13 hrs, Volume= 53,263 cf
Outflow = 1.84 cfs @ 13.60 hrs, Volume= 53,263 cf, Atten= 70%, Lag= 87.8 min
Primary = 1.84 cfs @ 13.60 hrs, Volume= 53,263 cf
Routed to Pond 1P : Infiltration Basin

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 157.49' @ 13.60 hrs Surf.Area= 4,514 sf Storage= 16,970 cf
Flood Elev= 158.00' Surf.Area= 4,514 sf Storage= 17,902 cf

Plug-Flow detention time= 310.8 min calculated for 53,226 cf (100% of inflow)
Center-of-Mass det. time= 311.3 min (1,201.5 - 890.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	152.00'	6,121 cf	**37.00'W x 122.00'L x 6.00'H Field A** 27,084 cf Overall - 11,781 cf Embedded = 15,303 cf x 40.0% Voids
#2A	152.50'	11,781 cf	**CMP Round 60** x 30 Inside #1 Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf Overall Size= 60.0"W x 60.0"H x 20.00'L 30 Chambers in 5 Rows
		17,902 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	152.00'	**15.0" Round Culvert** L= 250.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 152.00' / 150.00' S= 0.0080 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	157.25'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Device 1	152.00'	**3.0" Vert. 3" Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.84 cfs @ 13.60 hrs HW=157.49' (Free Discharge)
└─**1=Culvert** (Passes 1.84 cfs of 8.85 cfs potential flow)
  ├─**2=Broad-Crested Rectangular Weir** (Weir Controls 1.29 cfs @ 1.37 fps)
  └─**3=3" Orifice** (Orifice Controls 0.55 cfs @ 11.15 fps)

Pond 7P: UDS-6 (CMP 60") - Chamber Wizard Field A

Chamber Model = CMP Round 60 (Round Corrugated Metal Pipe)
Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf
Overall Size= 60.0"W x 60.0"H x 20.00'L

60.0" Wide + 30.0" Spacing = 90.0" C-C Row Spacing

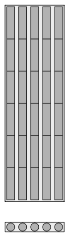
6 Chambers/Row x 20.00' Long = 120.00' Row Length +12.0" End Stone x 2 = 122.00' Base Length
5 Rows x 60.0" Wide + 30.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.00' Base Width
6.0" Stone Base + 60.0" Chamber Height + 6.0" Stone Cover = 6.00' Field Height

30 Chambers x 392.7 cf = 11,781.0 cf Chamber Storage

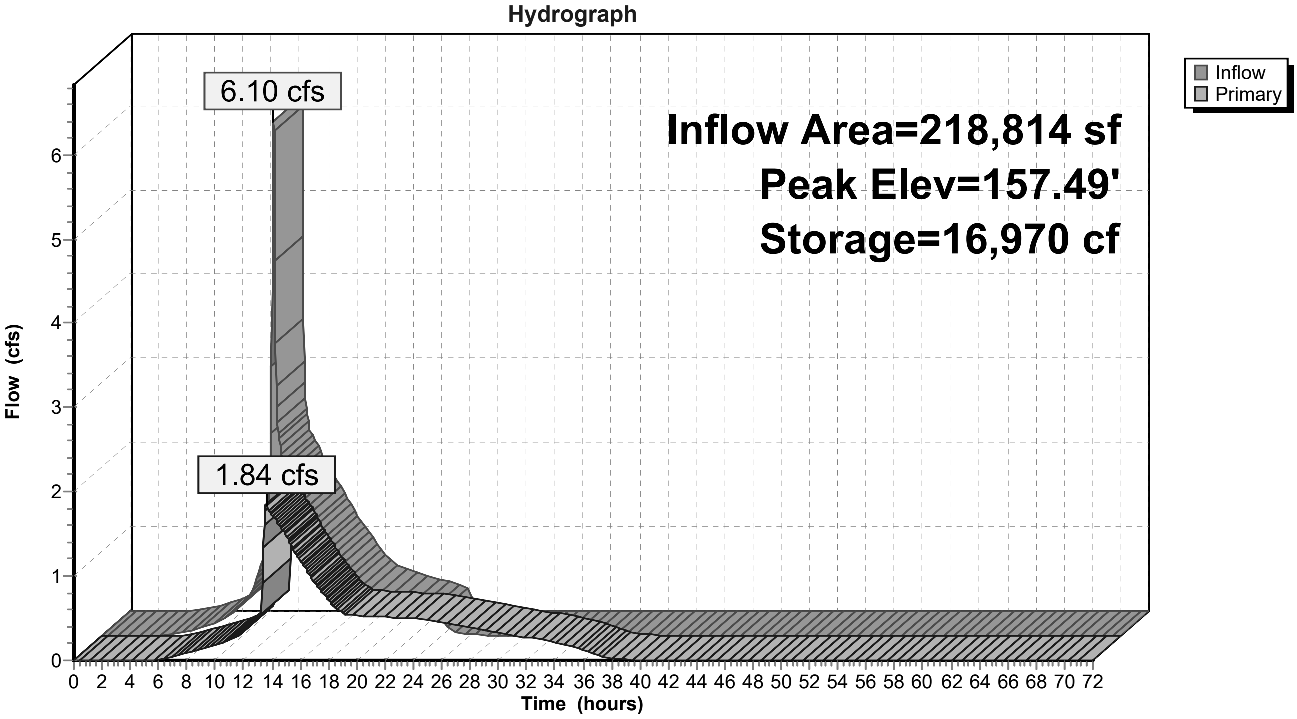
27,084.0 cf Field - 11,781.0 cf Chambers = 15,303.0 cf Stone x 40.0% Voids = 6,121.2 cf Stone Storage

Chamber Storage + Stone Storage = 17,902.2 cf = 0.411 af
Overall Storage Efficiency = 66.1%
Overall System Size = 122.00' x 37.00' x 6.00'

30 Chambers
1,003.1 cy Field
566.8 cy Stone



Pond 7P: UDS-6 (CMP 60")



Stage-Area-Storage for Pond 7P: UDS-6 (CMP 60")

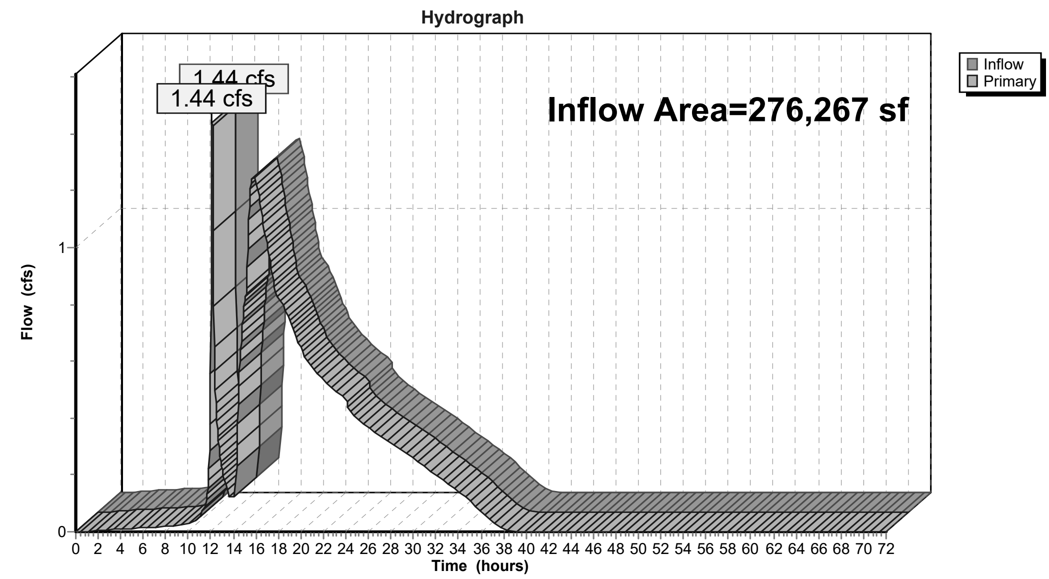
Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
152.00	0	153.75	4,542	155.50	10,748	157.25	16,416
152.05	90	153.80	4,710	155.55	10,926	157.30	16,543
152.10	181	153.85	4,880	155.60	11,104	157.35	16,667
152.15	271	153.90	5,051	155.65	11,281	157.40	16,785
152.20	361	153.95	5,222	155.70	11,458	157.45	16,897
152.25	451	154.00	5,395	155.75	11,635	157.50	16,999
152.30	542	154.05	5,568	155.80	11,811	157.55	17,090
152.35	632	154.10	5,742	155.85	11,986	157.60	17,180
152.40	722	154.15	5,916	155.90	12,160	157.65	17,270
152.45	813	154.20	6,092	155.95	12,334	157.70	17,361
152.50	903	154.25	6,267	156.00	12,507	157.75	17,451
152.55	1,005	154.30	6,444	156.05	12,680	157.80	17,541
152.60	1,117	154.35	6,621	156.10	12,851	157.85	17,631
152.65	1,235	154.40	6,798	156.15	13,022	157.90	17,722
152.70	1,359	154.45	6,976	156.20	13,192	157.95	17,812
152.75	1,486	154.50	7,154	156.25	13,360	158.00	**17,902**
152.80	1,618	154.55	7,333	156.30	13,528		
152.85	1,752	154.60	7,512	156.35	13,695		
152.90	1,890	154.65	7,691	156.40	13,860		
152.95	2,030	154.70	7,871	156.45	14,024		
153.00	2,173	154.75	8,050	156.50	14,187		
153.05	2,319	154.80	8,230	156.55	14,349		
153.10	2,467	154.85	8,410	156.60	14,509		
153.15	2,616	154.90	8,591	156.65	14,668		
153.20	2,768	154.95	8,771	156.70	14,825		
153.25	2,922	155.00	8,951	156.75	14,980		
153.30	3,077	155.05	9,131	156.80	15,134		
153.35	3,234	155.10	9,312	156.85	15,286		
153.40	3,393	155.15	9,492	156.90	15,436		
153.45	3,553	155.20	9,672	156.95	15,583		
153.50	3,715	155.25	9,852	157.00	15,729		
153.55	3,878	155.30	10,031	157.05	15,872		
153.60	4,042	155.35	10,211	157.10	16,012		
153.65	4,207	155.40	10,390	157.15	16,150		
153.70	4,374	155.45	10,569	157.20	16,285		

Summary for Link SP1: STUDY POINT #1 (Kimball Road north)

Inflow Area = 276,267 sf, 48.17% Impervious, Inflow Depth = 1.78" for 10-Year event
Inflow = 1.44 cfs @ 12.14 hrs, Volume= 41,050 cf
Primary = 1.44 cfs @ 12.14 hrs, Volume= 41,050 cf, Atten= 0%, Lag= 0.0 min

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

Link SP1: STUDY POINT #1 (Kimball Road north)

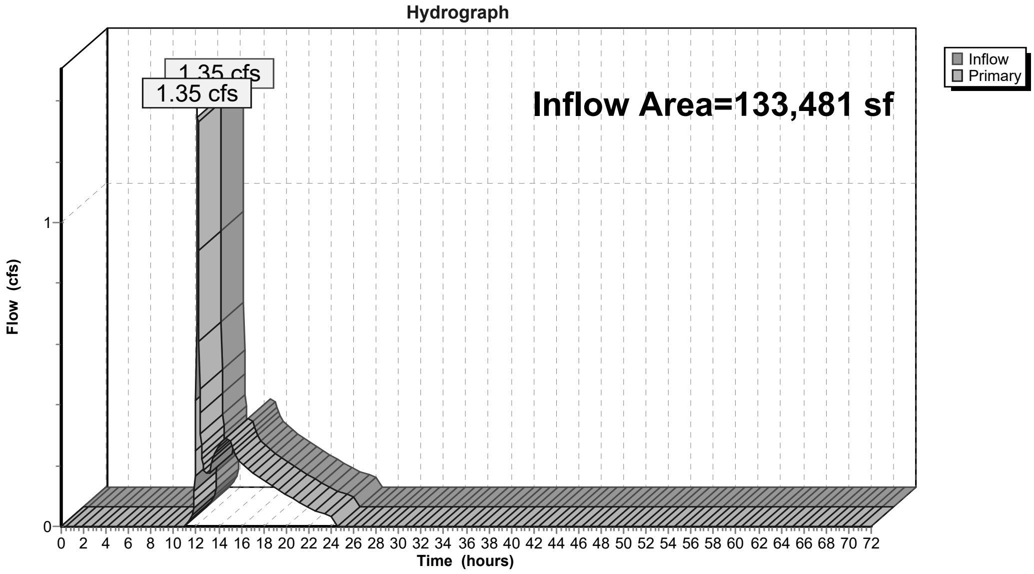


Summary for Link SP2: STUDY POINT #2 (Wetlands West)

Inflow Area = 133,481 sf, 45.23% Impervious, Inflow Depth = 0.67" for 10-Year event
Inflow = 1.35 cfs @ 12.14 hrs, Volume= 7,505 cf
Primary = 1.35 cfs @ 12.14 hrs, Volume= 7,505 cf, Atten= 0%, Lag= 0.0 min

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

Link SP2: STUDY POINT #2 (Wetlands West)



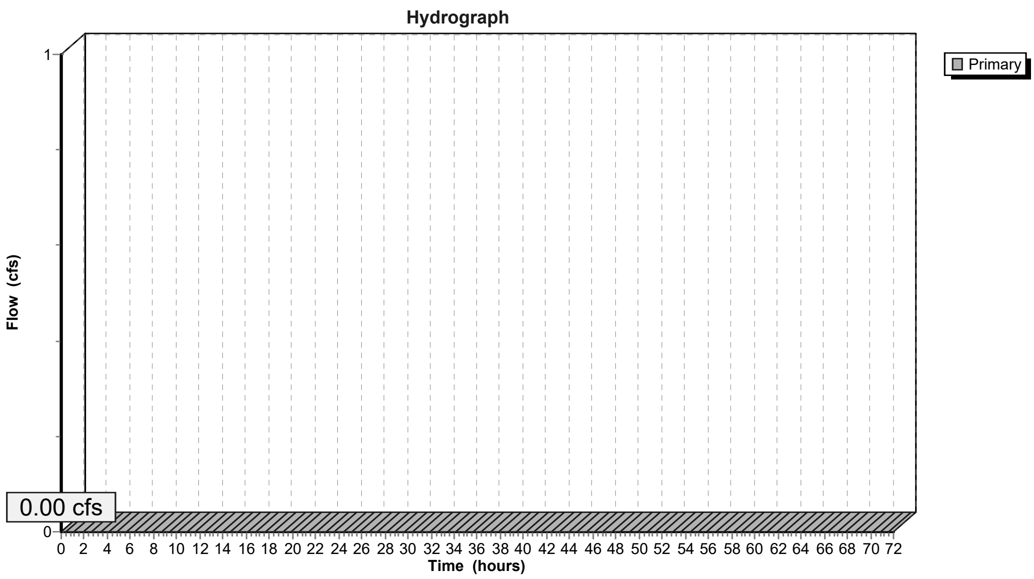
Summary for Link SP3: STUDY POINT #3 (IVW south)

[43] Hint: Has no inflow (Outflow=Zero)

Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

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

Link SP3: STUDY POINT #3 (IVW south)



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-10A: Subcat P-10A Runoff Area=16,553 sf 57.69% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=82 Runoff=1.90 cfs 5,882 cf

Subcatchment P-10B: Subcat P-10B Runoff Area=15,645 sf 50.07% Impervious Runoff Depth=4.05"
Tc=6.0 min CN=80 Runoff=1.72 cfs 5,284 cf

Subcatchment P-11: Subcat P-11 Runoff Area=32,948 sf 54.95% Impervious Runoff Depth=4.16"
Tc=6.0 min CN=81 Runoff=3.71 cfs 11,417 cf

Subcatchment P-12: Subcat P-12 Runoff Area=8,298 sf 24.91% Impervious Runoff Depth=3.05"
Tc=6.0 min CN=70 Runoff=0.70 cfs 2,106 cf

Subcatchment P-13: Subcat P-13 Runoff Area=52,463 sf 36.14% Impervious Runoff Depth=3.24"
Tc=6.0 min CN=72 Runoff=4.70 cfs 14,166 cf

Subcatchment P-14: Subcat P-14 Runoff Area=24,855 sf 59.92% Impervious Runoff Depth=4.37"
Tc=6.0 min CN=83 Runoff=2.92 cfs 9,053 cf

Subcatchment P-15: Subcat P-15 Runoff Area=9,184 sf 88.68% Impervious Runoff Depth=5.59"
Tc=6.0 min CN=94 Runoff=1.27 cfs 4,281 cf

Subcatchment P-1A: Subcat P-1A Runoff Area=13,439 sf 0.30% Impervious Runoff Depth=1.86"
Tc=6.0 min CN=57 Runoff=0.66 cfs 2,084 cf

Subcatchment P-1B: Subcat P-1B Runoff Area=21,569 sf 3.33% Impervious Runoff Depth=2.21"
Tc=6.0 min CN=61 Runoff=1.29 cfs 3,970 cf

Subcatchment P-2: Subcat P-2 Runoff Area=46,203 sf 1.61% Impervious Runoff Depth=1.86"
Tc=6.0 min CN=57 Runoff=2.28 cfs 7,165 cf

Subcatchment P-3: Subcat P-3 Runoff Area=9,286 sf 95.37% Impervious Runoff Depth=5.83"
Tc=6.0 min CN=96 Runoff=1.30 cfs 4,508 cf

Subcatchment P-4: Subcat P-4 Runoff Area=24,255 sf 64.29% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=85 Runoff=2.96 cfs 9,270 cf

Subcatchment P-5: Subcat P-5 Runoff Area=25,326 sf 68.66% Impervious Runoff Depth=4.70"
Tc=6.0 min CN=86 Runoff=3.14 cfs 9,909 cf

Subcatchment P-6: Subcat P-6 Runoff Area=5,351 sf 100.00% Impervious Runoff Depth=6.06"
Tc=6.0 min CN=98 Runoff=0.76 cfs 2,703 cf

Subcatchment P-7: Subcat P-7 Runoff Area=17,094 sf 32.66% Impervious Runoff Depth=3.34"
Tc=6.0 min CN=73 Runoff=1.58 cfs 4,757 cf

Subcatchment P-8: Subcat P-8 Runoff Area=26,823 sf 72.08% Impervious Runoff Depth=4.92"
Tc=6.0 min CN=88 Runoff=3.44 cfs 10,987 cf

Subcatchment P-9: Subcat P-9 Runoff Area=60,455 sf 66.65% Impervious Runoff Depth=4.59"
Tc=6.0 min CN=85 Runoff=7.37 cfs 23,105 cf

Pond 1P: Infiltration Basin Peak Elev=146.12' Storage=15,747 cf Inflow=2.73 cfs 76,351 cf
Discarded=0.11 cfs 20,624 cf Primary=2.03 cfs 53,933 cf Outflow=2.15 cfs 74,558 cf

Pond 2P: UIS-1 (SC-800) Peak Elev=168.82' Storage=9,792 cf Inflow=7.37 cfs 23,105 cf
Discarded=0.13 cfs 16,446 cf Primary=0.49 cfs 6,659 cf Outflow=0.62 cfs 23,105 cf

Pond 3P: UIS-2 (SC-800) Peak Elev=161.22' Storage=4,594 cf Inflow=3.44 cfs 10,987 cf
Discarded=0.05 cfs 7,652 cf Primary=0.41 cfs 3,335 cf Outflow=0.46 cfs 10,987 cf

Pond 4P: UDS-3 (SC-310) Peak Elev=135.32' Storage=379 cf Inflow=0.76 cfs 2,703 cf
Outflow=0.31 cfs 2,703 cf

Pond 5P: UIS-4 (SC-310) Peak Elev=165.03' Storage=1,569 cf Inflow=1.27 cfs 4,281 cf
Discarded=0.06 cfs 4,281 cf Primary=0.00 cfs 0 cf Outflow=0.06 cfs 4,281 cf

Pond 6P: UDS-5 (CMP 72") Peak Elev=166.24' Storage=16,586 cf Inflow=16.96 cfs 52,416 cf
Outflow=2.00 cfs 52,416 cf

Pond 7P: UDS-6 (CMP 60") Peak Elev=157.56' Storage=17,113 cf Inflow=7.73 cfs 71,595 cf
Outflow=2.57 cfs 71,595 cf

Link SP1: STUDY POINT #1 (Kimball Road north) Inflow=2.22 cfs 62,691 cf
Primary=2.22 cfs 62,691 cf

Link SP2: STUDY POINT #2 (Wetlands West) Inflow=2.28 cfs 17,159 cf
Primary=2.28 cfs 17,159 cf

Link SP3: STUDY POINT #3 (IVW south)
Primary=0.00 cfs 0 cf

Total Runoff Area = 409,748 sf Runoff Volume = 130,647 cf Average Runoff Depth = 3.83"
52.79% Pervious = 216,292 sf 47.21% Impervious = 193,456 sf

Summary for Subcatchment P-10A: Subcat P-10A

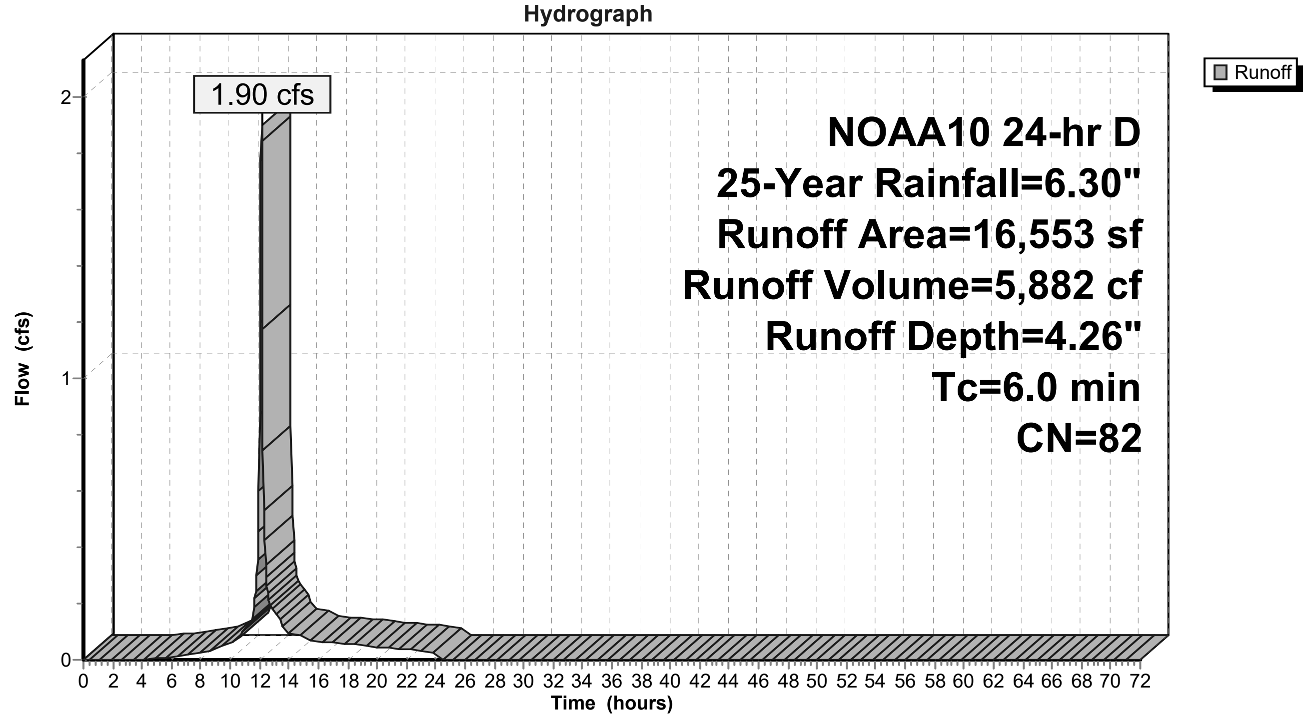
Runoff = 1.90 cfs @ 12.13 hrs, Volume= 5,882 cf, Depth= 4.26"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
7,004	61	>75% Grass cover, Good, HSG B
2,341	98	Paved parking, HSG B
7,208	98	Roofs, HSG B
16,553	82	Weighted Average
7,004		42.31% Pervious Area
9,549		57.69% Impervious Area

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

Subcatchment P-10A: Subcat P-10A



Summary for Subcatchment P-10B: Subcat P-10B

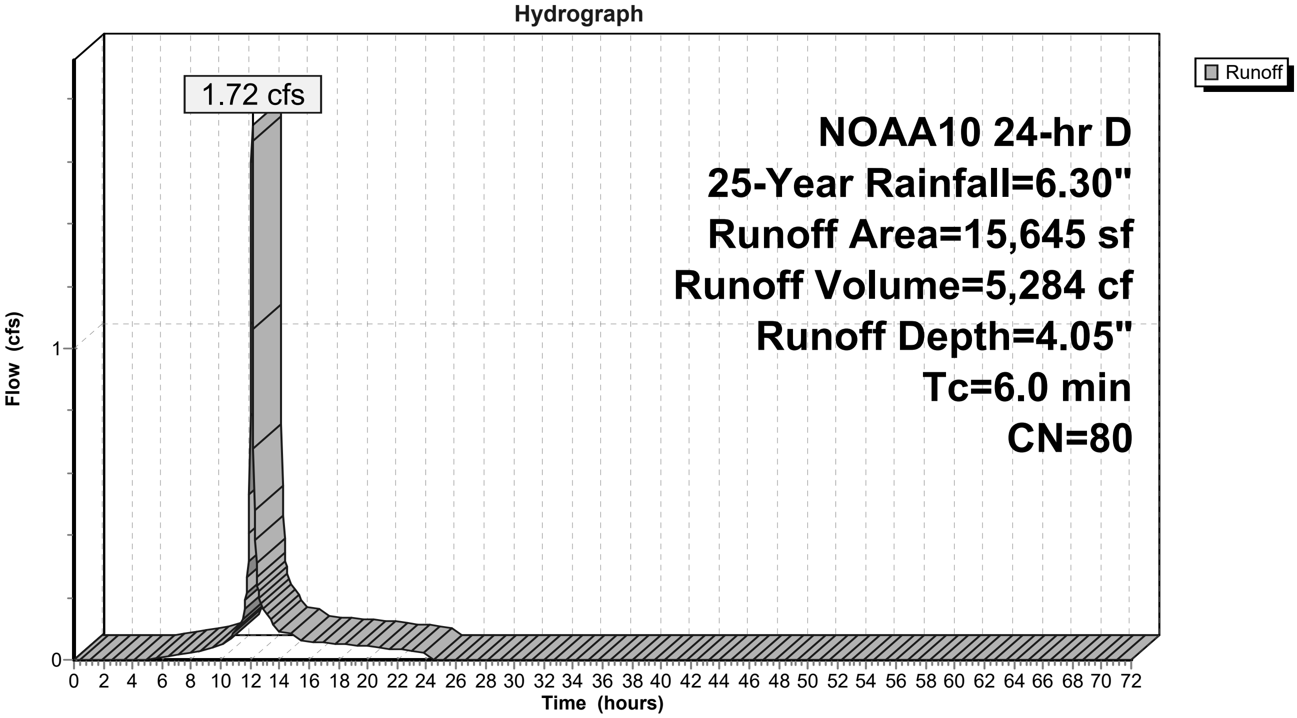
Runoff = 1.72 cfs @ 12.13 hrs, Volume= 5,284 cf, Depth= 4.05"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
7,811	61	>75% Grass cover, Good, HSG B
1,108	98	Paved parking, HSG B
6,726	98	Roofs, HSG B
15,645	80	Weighted Average
7,811		49.93% Pervious Area
7,834		50.07% Impervious Area

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

Subcatchment P-10B: Subcat P-10B



Summary for Subcatchment P-11: Subcat P-11

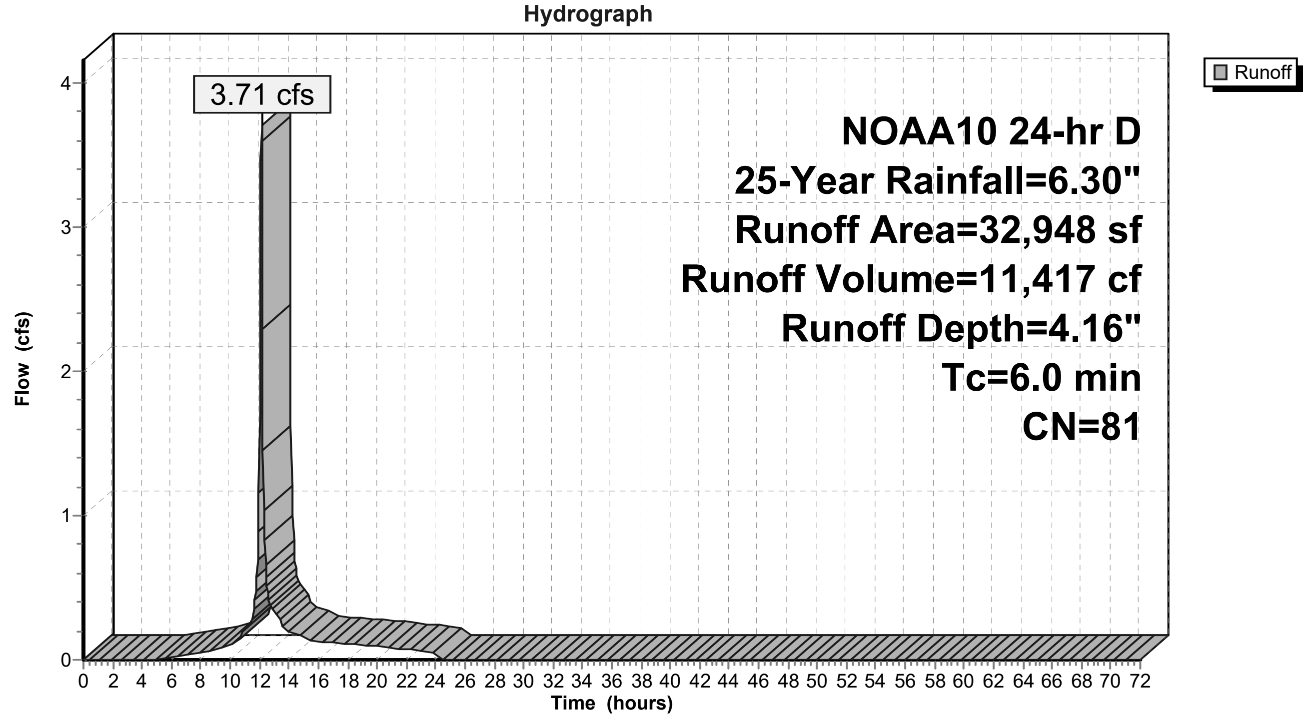
Runoff = 3.71 cfs @ 12.13 hrs, Volume= 11,417 cf, Depth= 4.16"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
14,844	61	>75% Grass cover, Good, HSG B
4,669	98	Paved parking, HSG B
13,435	98	Roofs, HSG B
32,948	81	Weighted Average
14,844		45.05% Pervious Area
18,105		54.95% Impervious Area

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

Subcatchment P-11: Subcat P-11



Summary for Subcatchment P-12: Subcat P-12

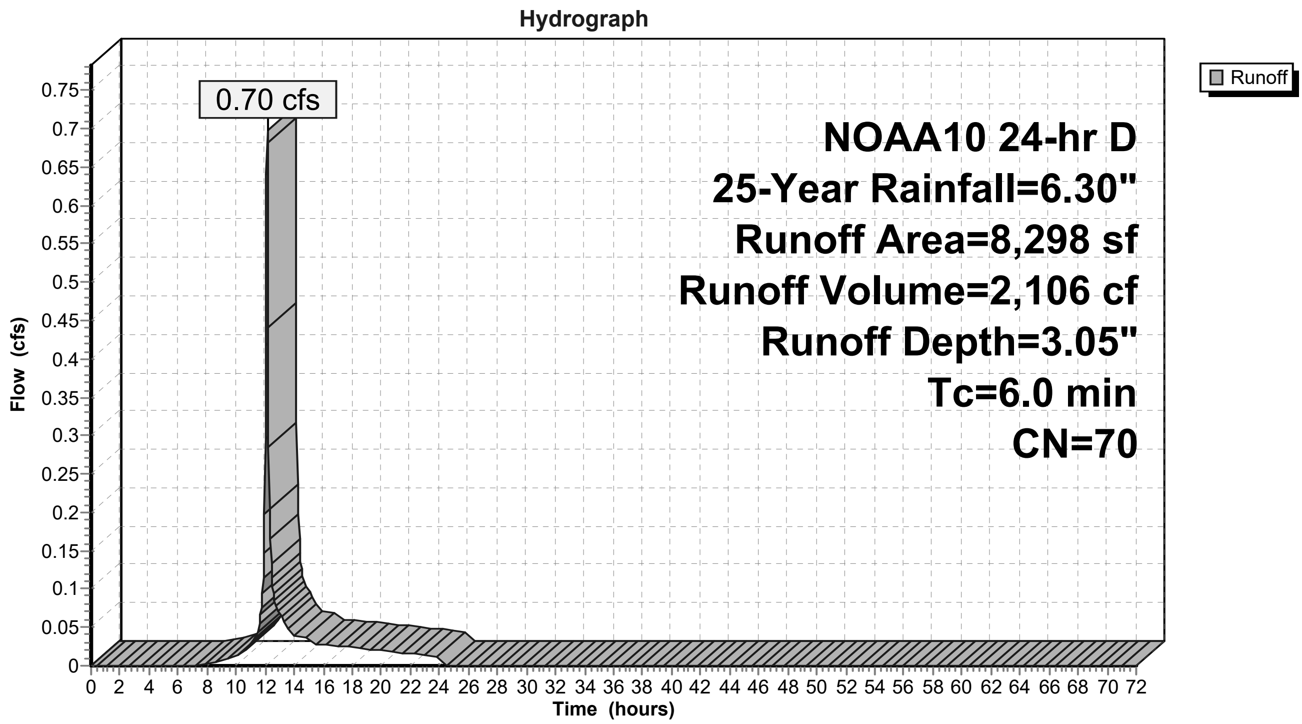
Runoff = 0.70 cfs @ 12.13 hrs, Volume= 2,106 cf, Depth= 3.05"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
6,231	61	>75% Grass cover, Good, HSG B
2,067	98	Paved parking, HSG B
8,298	70	Weighted Average
6,231		75.09% Pervious Area
2,067		24.91% Impervious Area

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

Subcatchment P-12: Subcat P-12



Summary for Subcatchment P-13: Subcat P-13

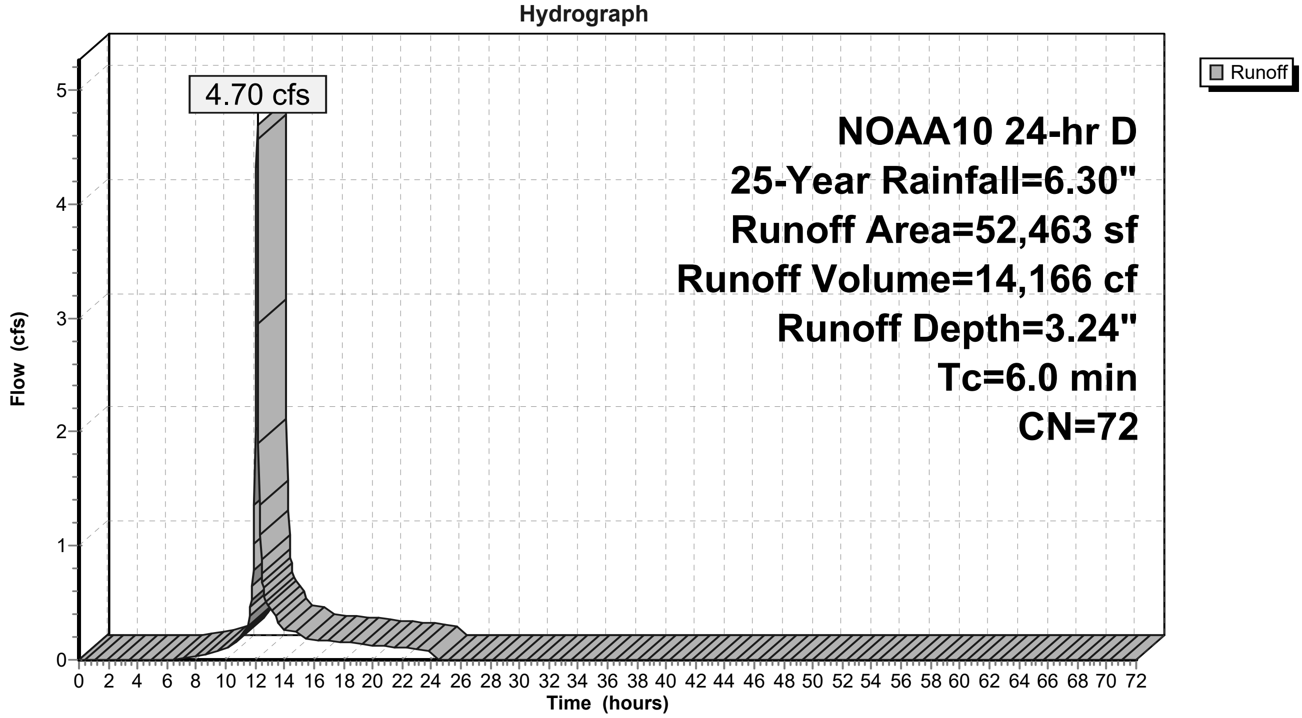
Runoff = 4.70 cfs @ 12.13 hrs, Volume= 14,166 cf, Depth= 3.24"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
10,162	61	>75% Grass cover, Good, HSG B
12,922	98	Paved parking, HSG B
6,037	98	Roofs, HSG B
23,343	55	Woods, Good, HSG B
52,463	72	Weighted Average
33,504		63.86% Pervious Area
18,959		36.14% Impervious Area

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

Subcatchment P-13: Subcat P-13



Summary for Subcatchment P-14: Subcat P-14

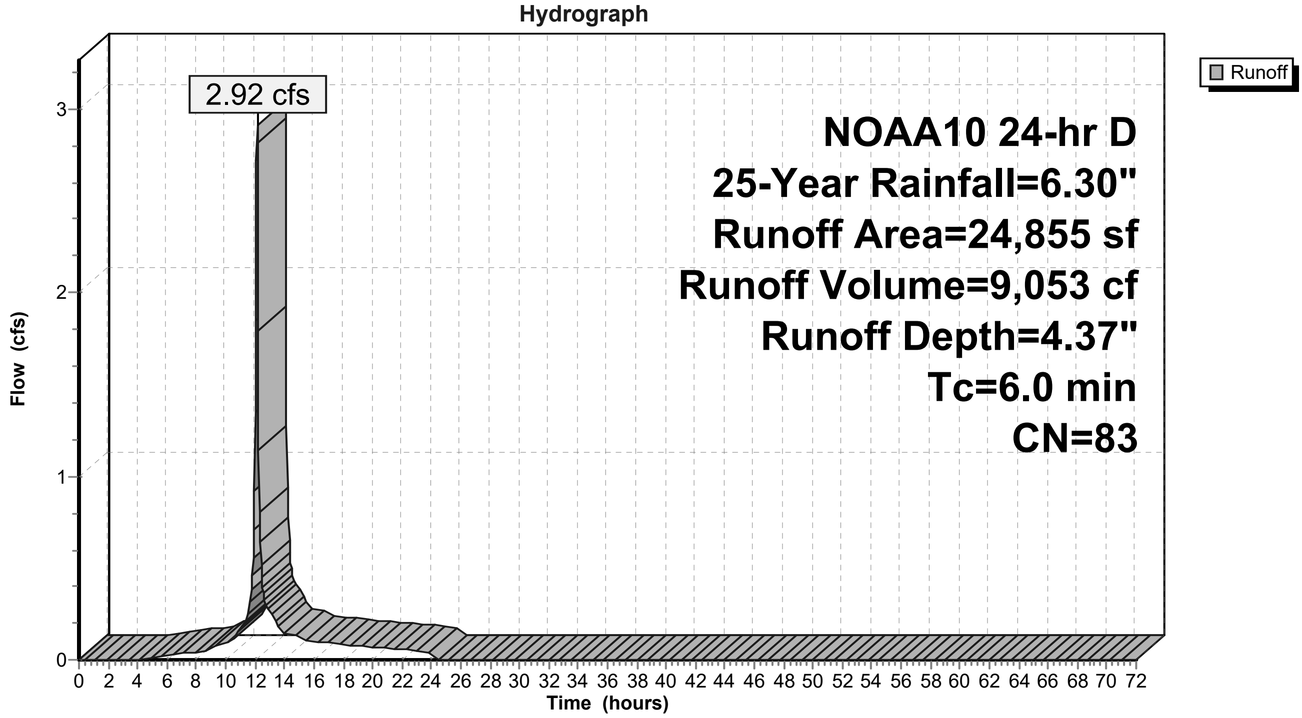
Runoff = 2.92 cfs @ 12.13 hrs, Volume= 9,053 cf, Depth= 4.37"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
9,959	61	>75% Grass cover, Good, HSG B
2,548	98	Paved parking, HSG B
12,345	98	Roofs, HSG B
2	55	Woods, Good, HSG B
24,855	83	Weighted Average
9,961		40.08% Pervious Area
14,893		59.92% Impervious Area

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

Subcatchment P-14: Subcat P-14



Summary for Subcatchment P-15: Subcat P-15

Runoff = 1.27 cfs @ 12.13 hrs, Volume= 4,281 cf, Depth= 5.59"
Routed to Pond 5P : UIS-4 (SC-310)

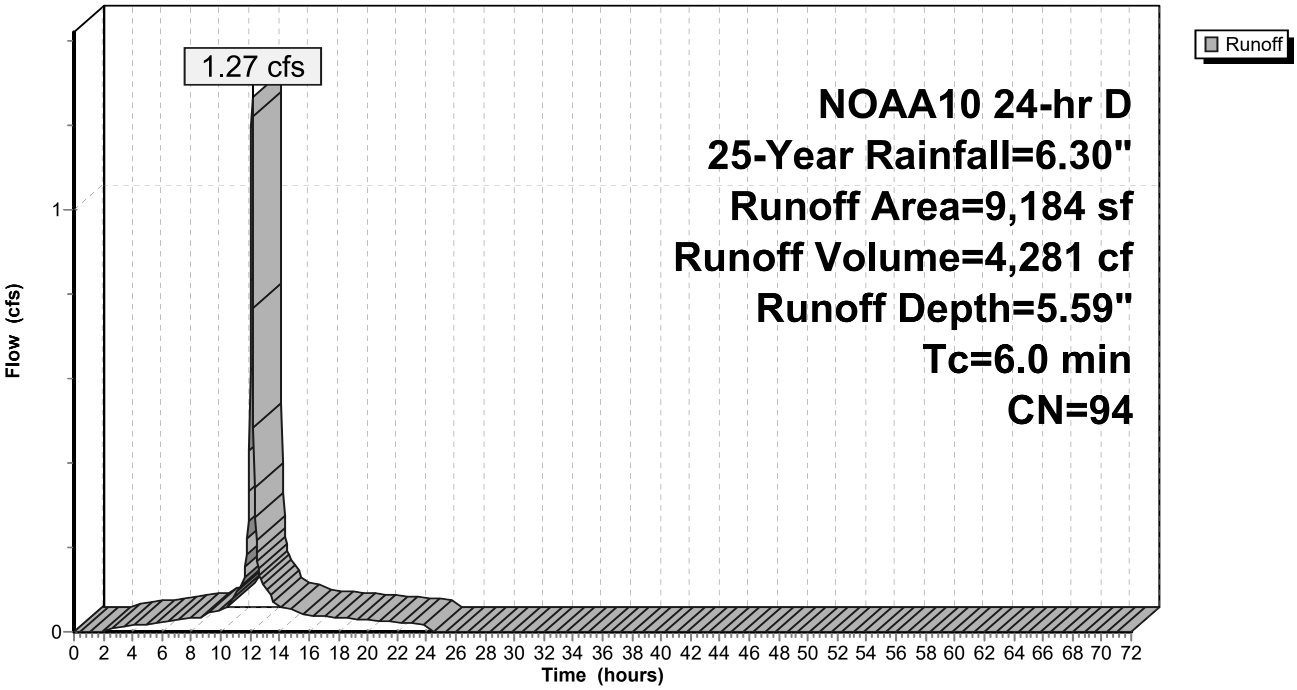
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
1,039	61	>75% Grass cover, Good, HSG B
8,145	98	Paved parking, HSG B
9,184	94	Weighted Average
1,039		11.32% Pervious Area
8,145		88.68% Impervious Area

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

Subcatchment P-15: Subcat P-15

Hydrograph



Summary for Subcatchment P-1A: Subcat P-1A

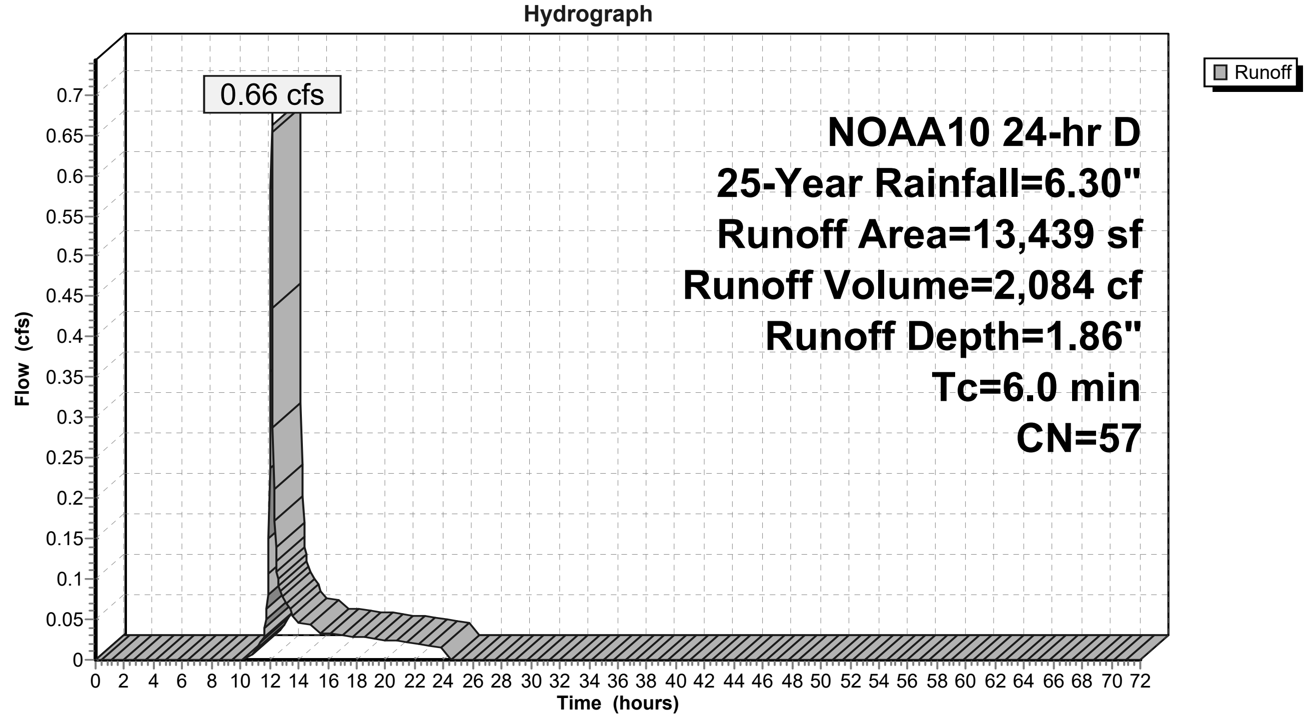
Runoff = 0.66 cfs @ 12.14 hrs, Volume= 2,084 cf, Depth= 1.86"
Routed to Link SP1 : STUDY POINT #1 (Kimball Road north)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
3,544	61	>75% Grass cover, Good, HSG B
40	98	Paved parking, HSG B
9,854	55	Woods, Good, HSG B
13,439	57	Weighted Average
13,398		99.70% Pervious Area
40		0.30% Impervious Area

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

Subcatchment P-1A: Subcat P-1A



Summary for Subcatchment P-1B: Subcat P-1B

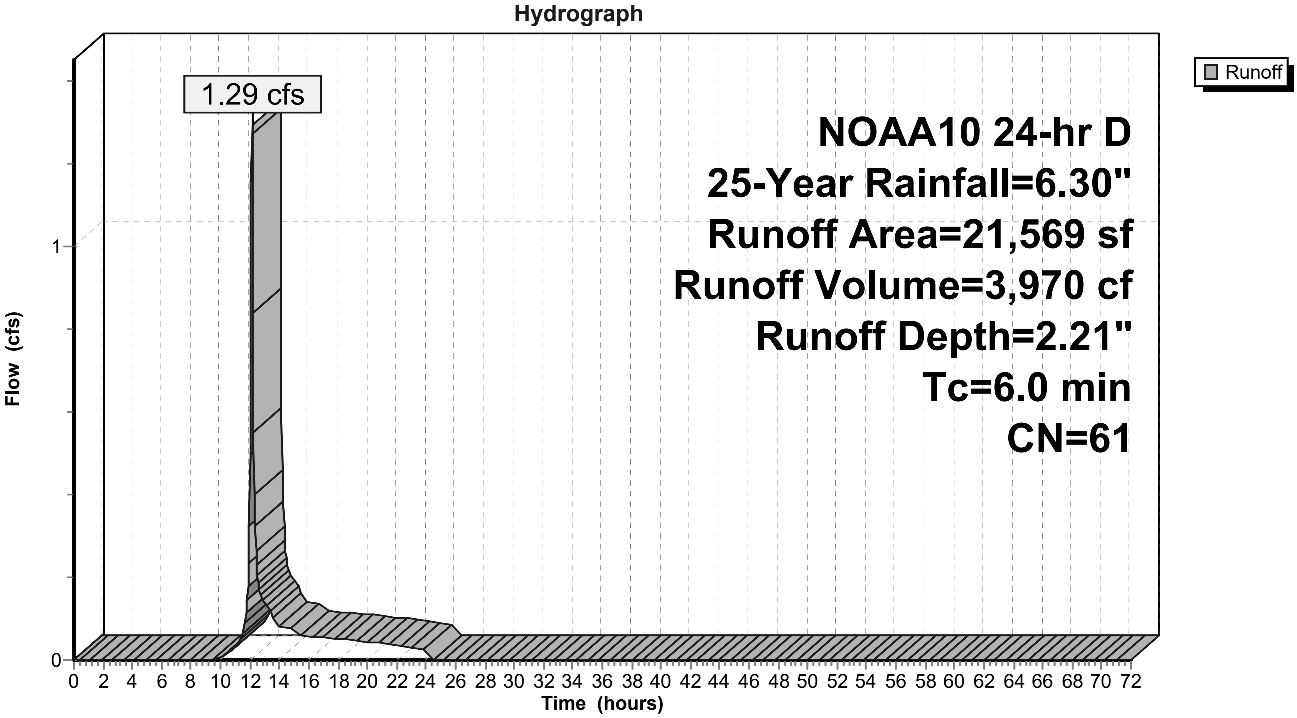
Runoff = 1.29 cfs @ 12.14 hrs, Volume= 3,970 cf, Depth= 2.21"
Routed to Link SP1 : STUDY POINT #1 (Kimball Road north)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
15,923	61	>75% Grass cover, Good, HSG B
718	98	Paved parking, HSG B
4,928	55	Woods, Good, HSG B
21,569	61	Weighted Average
20,851		96.67% Pervious Area
718		3.33% Impervious Area

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

Subcatchment P-1B: Subcat P-1B



Summary for Subcatchment P-2: Subcat P-2

Runoff = 2.28 cfs @ 12.14 hrs, Volume= 7,165 cf, Depth= 1.86"
Routed to Link SP2 : STUDY POINT #2 (Wetlands West)

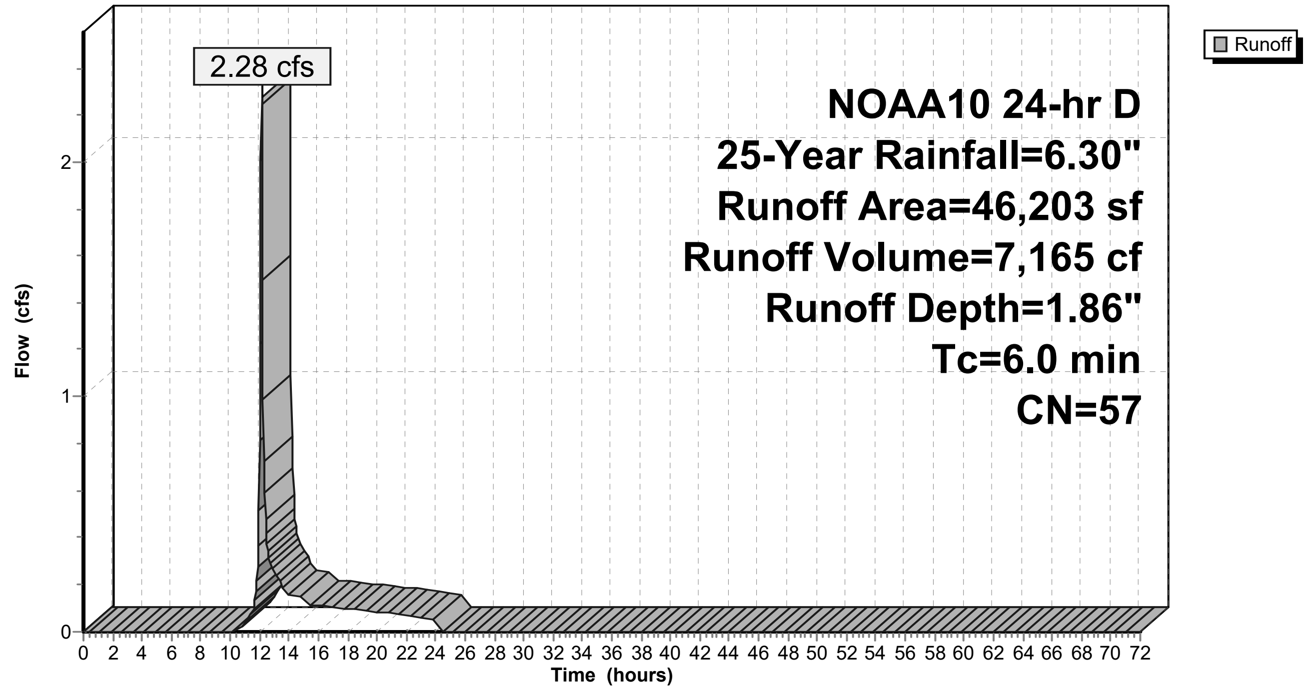
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
8,701	61	>75% Grass cover, Good, HSG B
535	98	Paved parking, HSG B
209	98	Roofs, HSG B
36,759	55	Woods, Good, HSG B
46,203	57	Weighted Average
45,460		98.39% Pervious Area
743		1.61% Impervious Area

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

Subcatchment P-2: Subcat P-2

Hydrograph



Summary for Subcatchment P-3: Subcat P-3

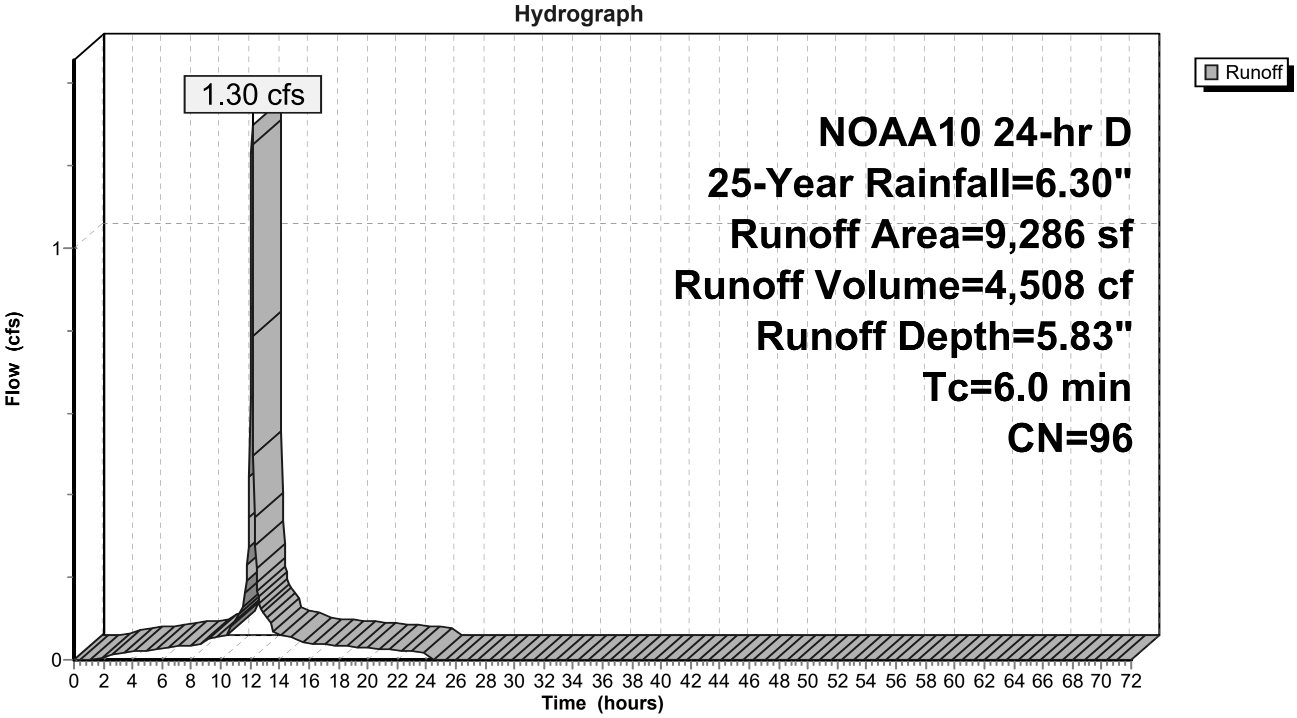
Runoff = 1.30 cfs @ 12.13 hrs, Volume= 4,508 cf, Depth= 5.83"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
430	61	>75% Grass cover, Good, HSG B
8,855	98	Paved parking, HSG B
1	98	Roofs, HSG B
9,286	96	Weighted Average
430		4.63% Pervious Area
8,856		95.37% Impervious Area

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

Subcatchment P-3: Subcat P-3



Summary for Subcatchment P-4: Subcat P-4

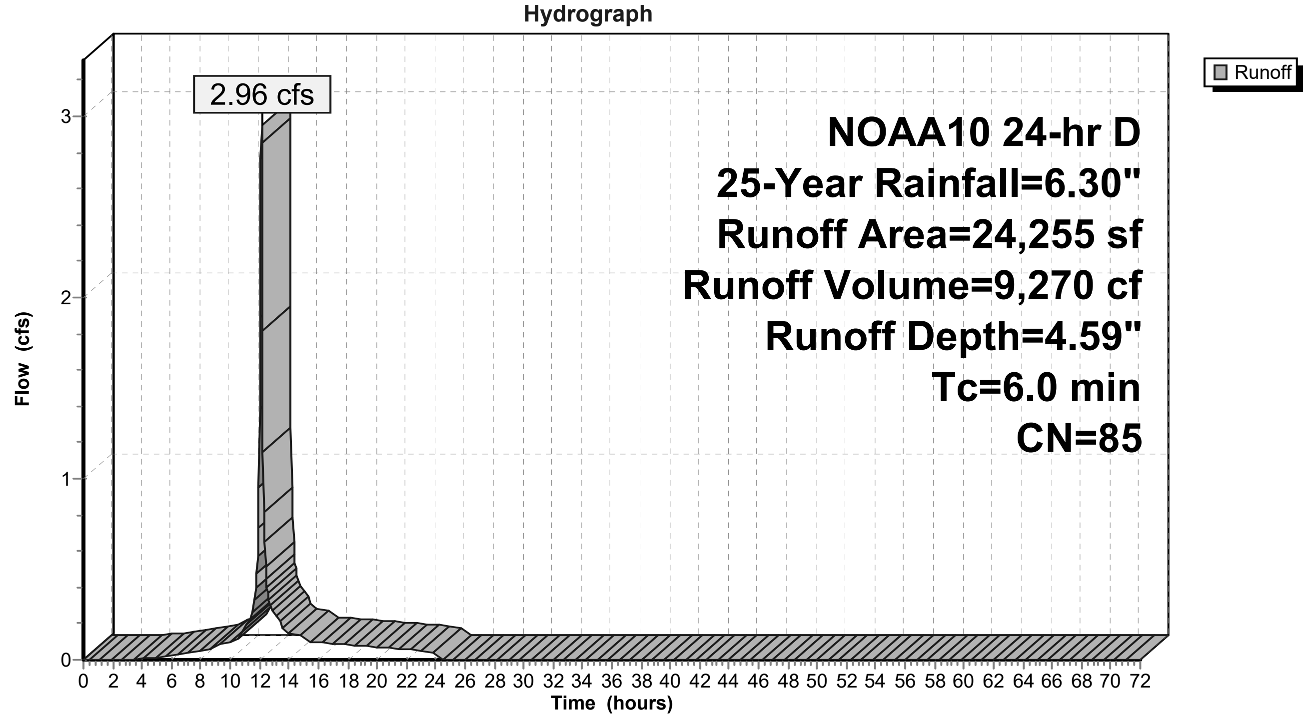
Runoff = 2.96 cfs @ 12.13 hrs, Volume= 9,270 cf, Depth= 4.59"
Routed to Pond 7P : UDS-6 (CMP 60")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
8,655	61	>75% Grass cover, Good, HSG B
14,992	98	Paved parking, HSG B
602	98	Roofs, HSG B
6	55	Woods, Good, HSG B
24,255	85	Weighted Average
8,661		35.71% Pervious Area
15,594		64.29% Impervious Area

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

Subcatchment P-4: Subcat P-4



Summary for Subcatchment P-5: Subcat P-5

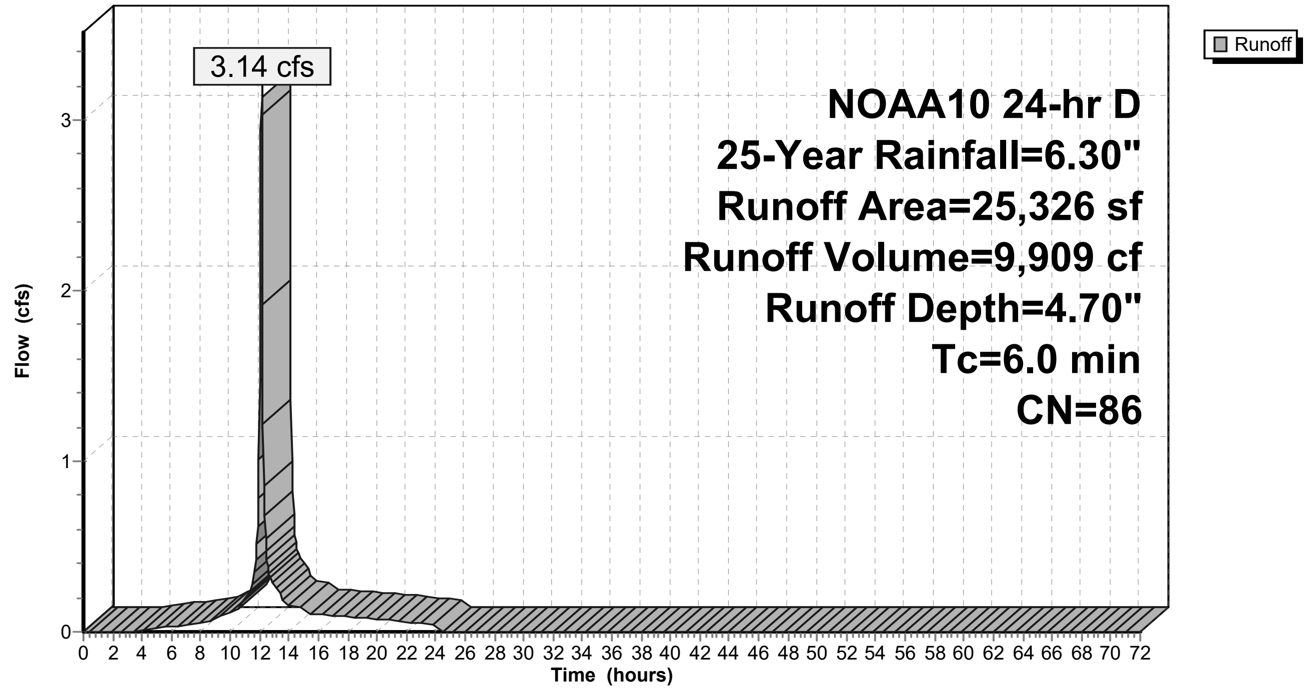
Runoff = 3.14 cfs @ 12.13 hrs, Volume= 9,909 cf, Depth= 4.70"
Routed to Pond 7P : UDS-6 (CMP 60")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
7,931	61	>75% Grass cover, Good, HSG B
8,801	98	Paved parking, HSG B
8,589	98	Roofs, HSG B
6	55	Woods, Good, HSG B
25,326	86	Weighted Average
7,937		31.34% Pervious Area
17,389		68.66% Impervious Area

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

Subcatchment P-5: Subcat P-5



Summary for Subcatchment P-6: Subcat P-6

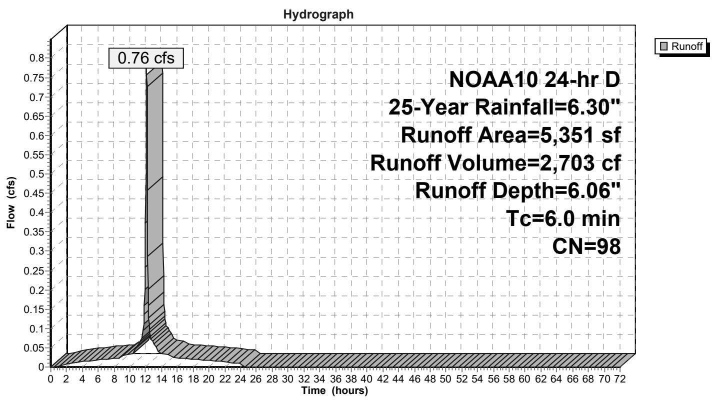
Runoff = 0.76 cfs @ 12.13 hrs, Volume= 2,703 cf, Depth= 6.06"
Routed to Pond 4P : UDS-3 (SC-310)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
5,351	98	Paved parking, HSG B
5,351		100.00% Impervious Area

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

Subcatchment P-6: Subcat P-6



Summary for Subcatchment P-7: Subcat P-7

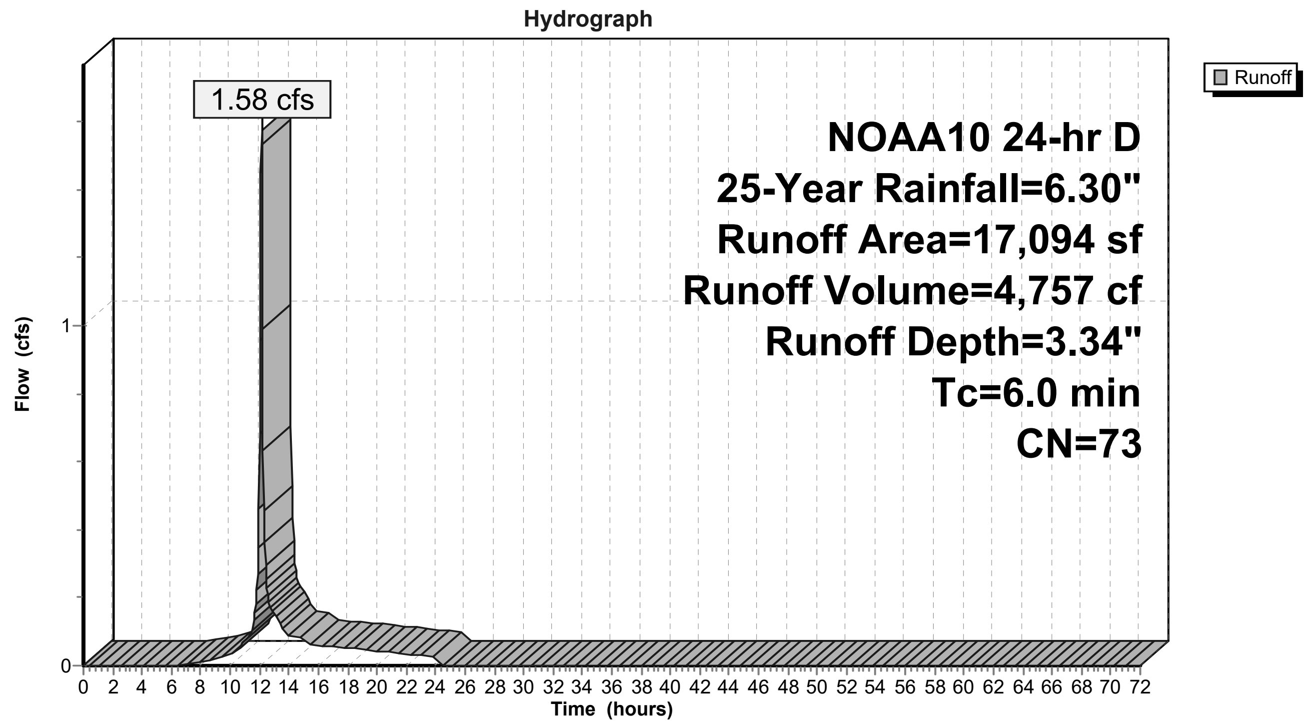
Runoff = 1.58 cfs @ 12.13 hrs, Volume= 4,757 cf, Depth= 3.34"
Routed to Pond 1P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
11,506	61	>75% Grass cover, Good, HSG B
1,073	98	Paved parking, HSG B
4,510	98	Roofs, HSG B
4	55	Woods, Good, HSG B
17,094	73	Weighted Average
11,510		67.34% Pervious Area
5,584		32.66% Impervious Area

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

Subcatchment P-7: Subcat P-7



Summary for Subcatchment P-8: Subcat P-8

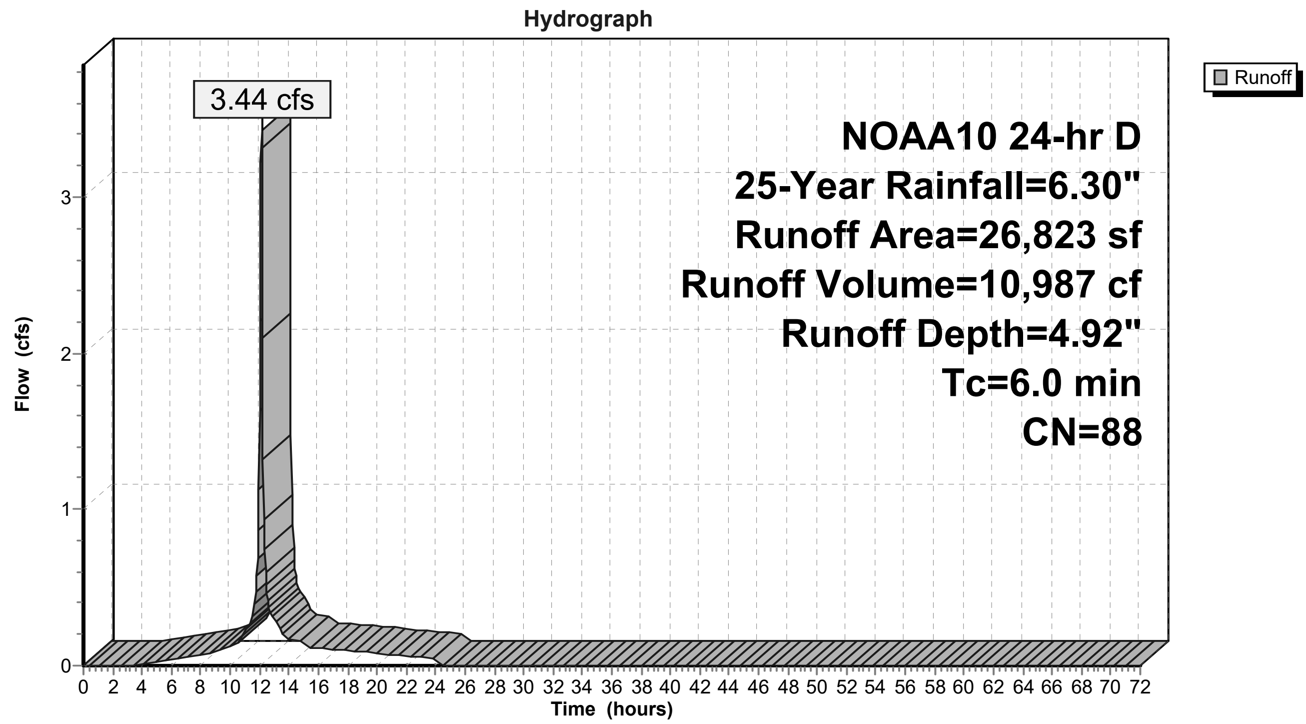
Runoff = 3.44 cfs @ 12.13 hrs, Volume= 10,987 cf, Depth= 4.92"
Routed to Pond 3P : UIS-2 (SC-800)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
7,489	61	>75% Grass cover, Good, HSG B
13,141	98	Paved parking, HSG B
6,193	98	Roofs, HSG B
26,823	88	Weighted Average
7,489		27.92% Pervious Area
19,334		72.08% Impervious Area

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

Subcatchment P-8: Subcat P-8



Summary for Subcatchment P-9: Subcat P-9

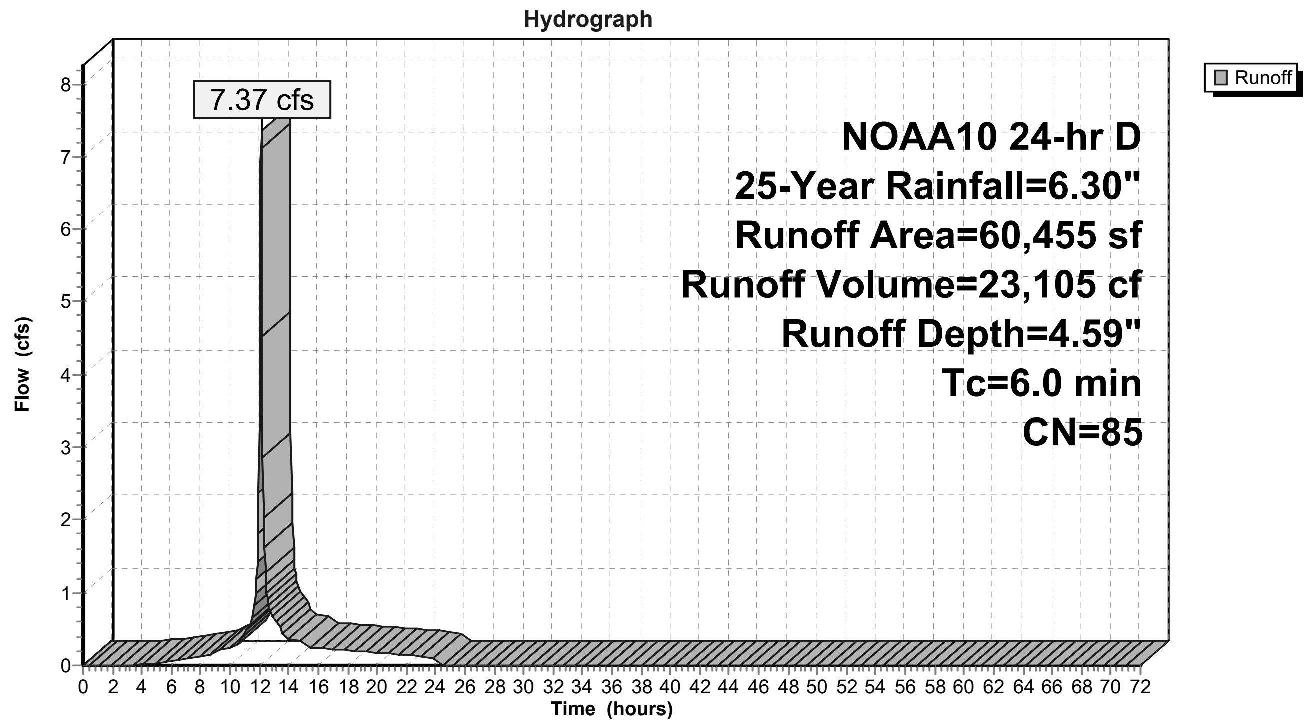
Runoff = 7.37 cfs @ 12.13 hrs, Volume= 23,105 cf, Depth= 4.59"
Routed to Pond 2P : UIS-1 (SC-800)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 25-Year Rainfall=6.30"

Area (sf)	CN	Description
17,971	61	>75% Grass cover, Good, HSG B
27,276	98	Paved parking, HSG B
13,018	98	Roofs, HSG B
2,190	55	Woods, Good, HSG B
60,455	85	Weighted Average
20,161		33.35% Pervious Area
40,294		66.65% Impervious Area

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

Subcatchment P-9: Subcat P-9



Summary for Pond 1P: Infiltration Basin

Inflow Area = 235,908 sf, 53.82% Impervious, Inflow Depth = 3.88" for 25-Year event
Inflow = 2.73 cfs @ 12.81 hrs, Volume= 76,351 cf
Outflow = 2.15 cfs @ 14.28 hrs, Volume= 74,558 cf, Atten= 21%, Lag= 88.3 min
Discarded = 0.11 cfs @ 14.28 hrs, Volume= 20,624 cf
Primary = 2.03 cfs @ 14.28 hrs, Volume= 53,933 cf
Routed to Link SP1 : STUDY POINT #1 (Kimball Road north)

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 146.12' @ 14.28 hrs Surf.Area= 4,789 sf Storage= 15,747 cf
Flood Elev= 146.50' Surf.Area= 5,034 sf Storage= 17,623 cf

Plug-Flow detention time= 395.7 min calculated for 74,558 cf (98% of inflow)
Center-of-Mass det. time= 369.3 min (1,495.9 - 1,126.5)

Volume	Invert	Avail.Storage	Storage Description
#1	141.50'	21,155 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
141.50	2,137	224.8	0	0	2,137
142.00	2,394	232.9	1,132	1,132	2,453
143.00	2,930	249.4	2,657	3,790	3,131
144.00	3,496	266.1	3,209	6,998	3,863
145.00	4,090	282.0	3,789	10,788	4,609
146.00	4,714	297.5	4,398	15,186	5,380
147.00	5,365	312.9	5,036	20,222	6,188
147.15	7,117	351.5	933	21,155	8,229

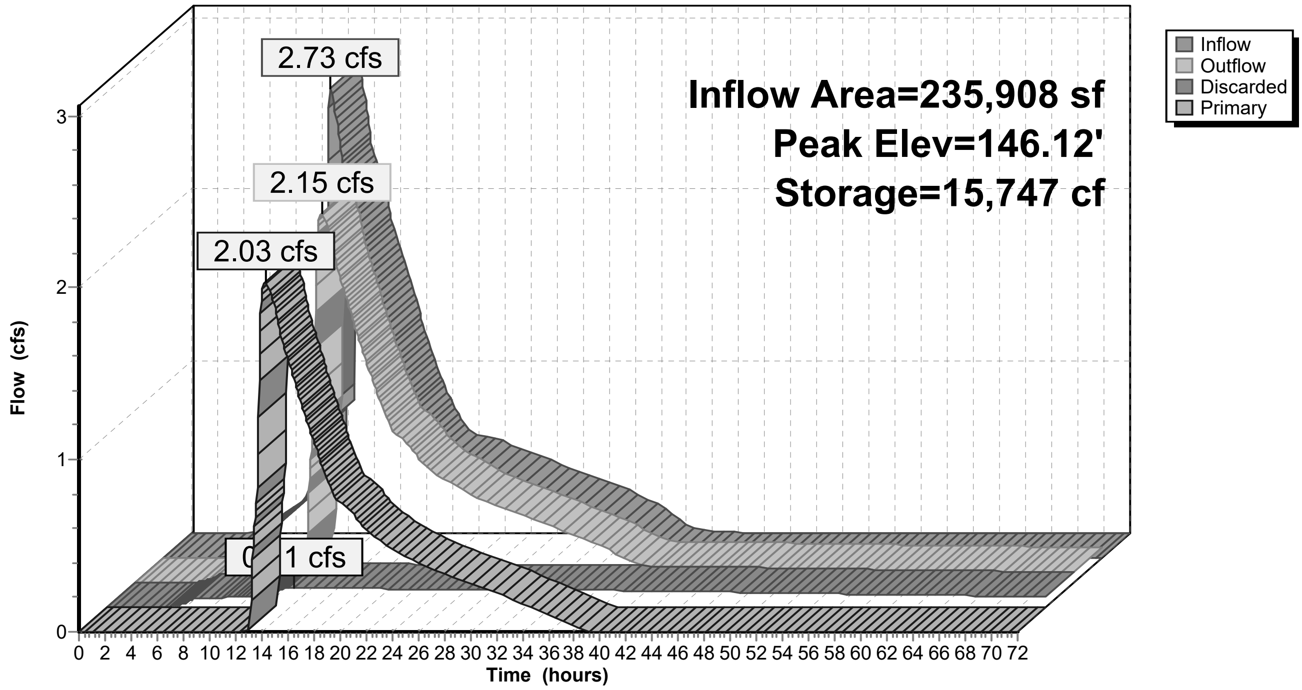
Device	Routing	Invert	Outlet Devices
#1	Discarded	141.50'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	141.50'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 141.50' / 138.30' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	145.00'	**6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 2	145.90'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Primary	146.50'	**20.0' long x 18.0' breadth Overflow Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.11 cfs @ 14.28 hrs HW=146.12' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=2.03 cfs @ 14.28 hrs HW=146.12' (Free Discharge)
2=Culvert (Passes 2.03 cfs of 6.06 cfs potential flow)
3=6" Orifice (Orifice Controls 0.88 cfs @ 4.49 fps)
4=Broad-Crested Rectangular Weir (Weir Controls 1.15 cfs @ 1.31 fps)
5=Overflow Weir (Controls 0.00 cfs)

Pond 1P: Infiltration Basin

Hydrograph



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

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
141.50	2,137	0
141.60	2,187	216
141.70	2,238	437
141.80	2,289	664
141.90	2,341	895
142.00	2,394	1,132
142.10	2,445	1,374
142.20	2,497	1,621
142.30	2,549	1,873
142.40	2,602	2,131
142.50	2,655	2,394
142.60	2,709	2,662
142.70	2,764	2,936
142.80	2,818	3,215
142.90	2,874	3,499
143.00	2,930	3,790
143.10	2,984	4,085
143.20	3,039	4,387
143.30	3,095	4,693
143.40	3,150	5,005
143.50	3,207	5,323
143.60	3,264	5,647
143.70	3,321	5,976
143.80	3,379	6,311
143.90	3,437	6,652
144.00	3,496	6,998
144.10	3,553	7,351
144.20	3,611	7,709
144.30	3,669	8,073
144.40	3,728	8,443
144.50	3,787	8,819
144.60	3,847	9,200
144.70	3,907	9,588
144.80	3,967	9,982
144.90	4,029	10,382
145.00	4,090	10,788
145.10	4,150	11,200
145.20	4,211	11,618
145.30	4,273	12,042
145.40	4,334	12,472
145.50	4,396	12,909
145.60	4,459	13,352
145.70	4,522	13,801
145.80	4,586	14,256
145.90	4,650	14,718
146.00	4,714	15,186
146.10	4,777	15,660
146.20	4,841	16,141
146.30	4,905	16,629
146.40	4,969	17,122
146.50	5,034	17,623
146.60	5,100	18,129
146.70	5,165	18,642
146.80	5,231	19,162
146.90	5,298	19,689
147.00	5,365	20,222
147.10	**6,506**	**20,815**

Summary for Pond 2P: UIS-1 (SC-800)

Inflow Area = 60,455 sf, 66.65% Impervious, Inflow Depth = 4.59" for 25-Year event
Inflow = 7.37 cfs @ 12.13 hrs, Volume= 23,105 cf
Outflow = 0.62 cfs @ 13.06 hrs, Volume= 23,105 cf, Atten= 92%, Lag= 55.7 min
Discarded = 0.13 cfs @ 8.45 hrs, Volume= 16,446 cf
Primary = 0.49 cfs @ 13.06 hrs, Volume= 6,659 cf
Routed to Link SP2 : STUDY POINT #2 (Wetlands West)

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 168.82' @ 13.06 hrs Surf.Area= 5,572 sf Storage= 9,792 cf
Flood Elev= 170.05' Surf.Area= 5,572 sf Storage= 13,061 cf

Plug-Flow detention time= 452.1 min calculated for 23,089 cf (100% of inflow)
Center-of-Mass det. time= 452.5 min (1,268.9 - 816.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	166.30'	5,222 cf	**34.75'W x 160.33'L x 3.75'H Field A** 20,893 cf Overall - 7,839 cf Embedded = 13,054 cf x 40.0% Voids
#2A	166.80'	7,839 cf	**ADS_StormTech SC-800 +Cap** x 154 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 154 Chambers in 7 Rows Cap Storage= 3.4 cf x 2 x 7 rows = 47.9 cf
		13,061 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	166.30'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	166.80'	**12.0" Round Culvert** L= 158.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 166.80' / 165.00' S= 0.0114 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	169.50'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Device 2	168.30'	**6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.13 cfs @ 8.45 hrs HW=166.34' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.49 cfs @ 13.06 hrs HW=168.82' (Free Discharge)
└─**2=Culvert** (Passes 0.49 cfs of 3.68 cfs potential flow)
 ├─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
 └─**4=6" Orifice** (Orifice Controls 0.49 cfs @ 2.51 fps)

Pond 2P: UIS-1 (SC-800) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-800 +Cap (ADS StormTech® SC-800 with cap volume)
Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf
Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap
Cap Storage= 3.4 cf x 2 x 7 rows = 47.9 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

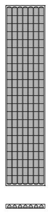
22 Chambers/Row x 7.12' Long +0.88' Cap Length x 2 = 158.33' Row Length +12.0" End Stone x 2 = 160.33' Base Length
7 Rows x 51.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 34.75' Base Width
6.0" Stone Base + 33.0" Chamber Height + 6.0" Stone Cover = 3.75' Field Height

154 Chambers x 50.6 cf + 3.4 cf Cap Volume x 2 x 7 Rows = 7,839.1 cf Chamber Storage

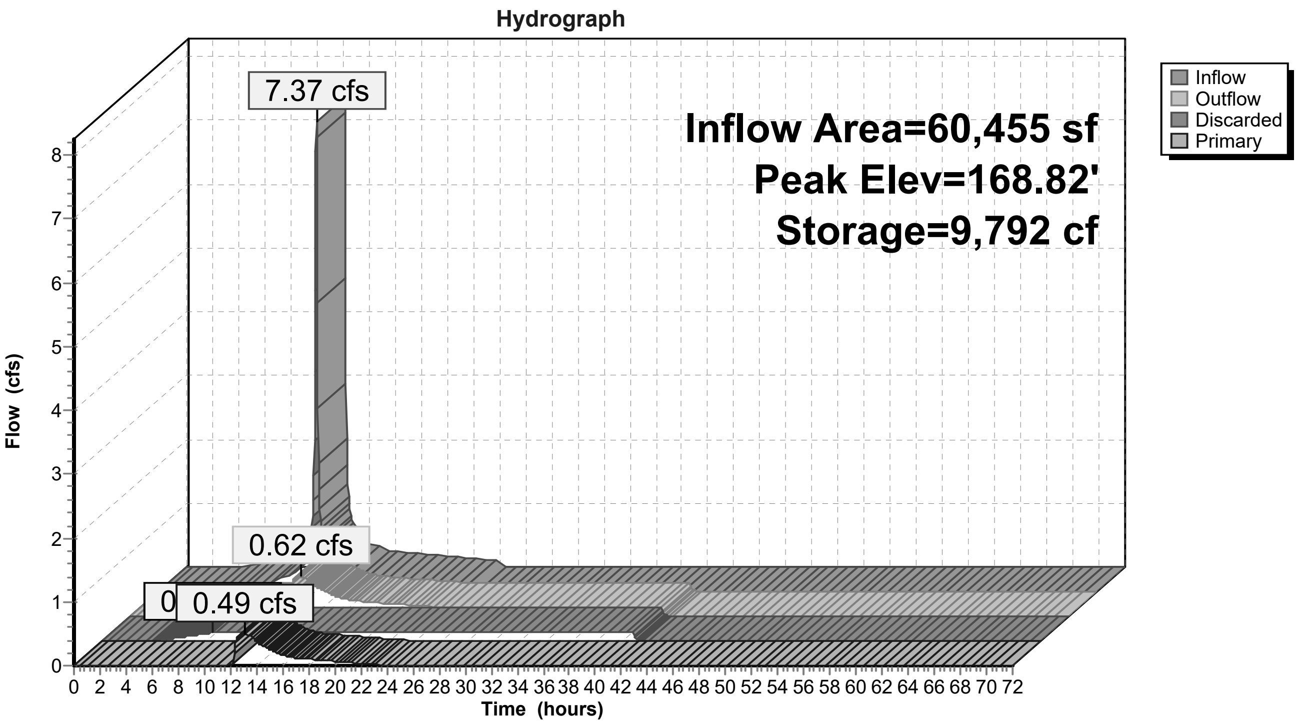
20,893.4 cf Field - 7,839.1 cf Chambers = 13,054.3 cf Stone x 40.0% Voids = 5,221.7 cf Stone Storage

Chamber Storage + Stone Storage = 13,060.8 cf = 0.300 af
Overall Storage Efficiency = 62.5%
Overall System Size = 160.33' x 34.75' x 3.75'

154 Chambers
773.8 cy Field
483.5 cy Stone



Pond 2P: UIS-1 (SC-800)



Stage-Area-Storage for Pond 2P: UIS-1 (SC-800)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
166.30	**5,572**	0	168.05	5,572	6,745	169.80	5,572	12,504
166.35	5,572	111	168.10	5,572	6,956	169.85	5,572	12,615
166.40	5,572	223	168.15	5,572	7,165	169.90	5,572	12,727
166.45	5,572	334	168.20	5,572	7,372	169.95	5,572	12,838
166.50	5,572	446	168.25	5,572	7,578	170.00	5,572	12,949
166.55	5,572	557	168.30	5,572	7,782	170.05	5,572	**13,061**
166.60	5,572	669	168.35	5,572	7,985			
166.65	5,572	780	168.40	5,572	8,185			
166.70	5,572	891	168.45	5,572	8,384			
166.75	5,572	1,003	168.50	5,572	8,581			
166.80	5,572	1,114	168.55	5,572	8,775			
166.85	5,572	1,350	168.60	5,572	8,968			
166.90	5,572	1,584	168.65	5,572	9,158			
166.95	5,572	1,819	168.70	5,572	9,346			
167.00	5,572	2,052	168.75	5,572	9,531			
167.05	5,572	2,285	168.80	5,572	9,714			
167.10	5,572	2,517	168.85	5,572	9,894			
167.15	5,572	2,748	168.90	5,572	10,071			
167.20	5,572	2,979	168.95	5,572	10,245			
167.25	5,572	3,208	169.00	5,572	10,415			
167.30	5,572	3,437	169.05	5,572	10,582			
167.35	5,572	3,665	169.10	5,572	10,744			
167.40	5,572	3,892	169.15	5,572	10,902			
167.45	5,572	4,118	169.20	5,572	11,053			
167.50	5,572	4,343	169.25	5,572	11,198			
167.55	5,572	4,567	169.30	5,572	11,335			
167.60	5,572	4,790	169.35	5,572	11,466			
167.65	5,572	5,012	169.40	5,572	11,592			
167.70	5,572	5,233	169.45	5,572	11,714			
167.75	5,572	5,453	169.50	5,572	11,832			
167.80	5,572	5,672	169.55	5,572	11,947			
167.85	5,572	5,889	169.60	5,572	12,058			
167.90	5,572	6,105	169.65	5,572	12,169			
167.95	5,572	6,320	169.70	5,572	12,281			
168.00	5,572	6,533	169.75	5,572	12,392			

Summary for Pond 3P: UIS-2 (SC-800)

Inflow Area = 26,823 sf, 72.08% Impervious, Inflow Depth = 4.92" for 25-Year event
Inflow = 3.44 cfs @ 12.13 hrs, Volume= 10,987 cf
Outflow = 0.46 cfs @ 12.50 hrs, Volume= 10,987 cf, Atten= 87%, Lag= 22.5 min
Discarded = 0.05 cfs @ 7.15 hrs, Volume= 7,652 cf
Primary = 0.41 cfs @ 12.50 hrs, Volume= 3,335 cf
Routed to Link SP2 : STUDY POINT #2 (Wetlands West)

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 161.22' @ 12.50 hrs Surf.Area= 2,248 sf Storage= 4,594 cf
Flood Elev= 162.35' Surf.Area= 2,248 sf Storage= 5,668 cf

Plug-Flow detention time= 520.4 min calculated for 10,979 cf (100% of inflow)
Center-of-Mass det. time= 520.9 min (1,325.0 - 804.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	158.10'	2,591 cf	**30.00'W x 74.93'L x 4.25'H Field A** 9,554 cf Overall - 3,077 cf Embedded = 6,477 cf x 40.0% Voids
#2A	158.85'	3,077 cf	**ADS_StormTech SC-800 +Cap** x 60 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 60 Chambers in 6 Rows Cap Storage= 3.4 cf x 2 x 6 rows = 41.0 cf
		5,668 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	158.10'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	160.78'	**12.0" Round Culvert** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 160.78' / 160.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	161.80'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00

Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4 Device 2 160.78' **6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.05 cfs @ 7.15 hrs HW=158.14' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.41 cfs @ 12.50 hrs HW=161.22' (Free Discharge)
└─**2=Culvert** (Passes 0.41 cfs of 0.58 cfs potential flow)
  ├─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**4=6" Orifice** (Orifice Controls 0.41 cfs @ 2.25 fps)

Pond 3P: UIS-2 (SC-800) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-800 +Cap (ADS StormTech® SC-800 with cap volume)
Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf
Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap
Cap Storage= 3.4 cf x 2 x 6 rows = 41.0 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

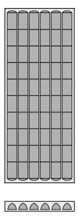
10 Chambers/Row x 7.12' Long +0.88' Cap Length x 2 = 72.93' Row Length +12.0" End Stone x 2 = 74.93' Base Length
6 Rows x 51.0" Wide + 6.0" Spacing x 5 + 12.0" Side Stone x 2 = 30.00' Base Width
9.0" Stone Base + 33.0" Chamber Height + 9.0" Stone Cover = 4.25' Field Height

60 Chambers x 50.6 cf + 3.4 cf Cap Volume x 2 x 6 Rows = 3,076.6 cf Chamber Storage

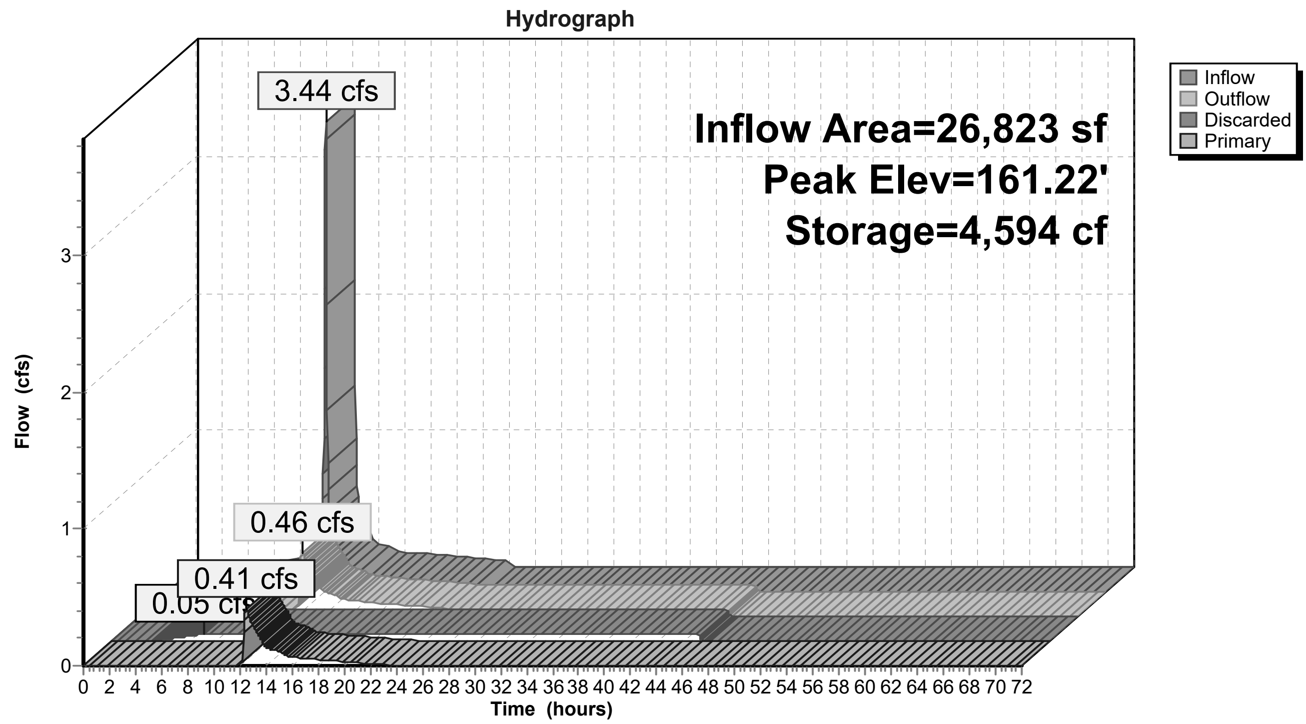
9,554.0 cf Field - 3,076.6 cf Chambers = 6,477.4 cf Stone x 40.0% Voids = 2,591.0 cf Stone Storage

Chamber Storage + Stone Storage = 5,667.5 cf = 0.130 af
Overall Storage Efficiency = 59.3%
Overall System Size = 74.93' x 30.00' x 4.25'

60 Chambers
353.9 cy Field
239.9 cy Stone



Pond 3P: UIS-2 (SC-800)



Stage-Area-Storage for Pond 3P: UIS-2 (SC-800)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
158.10	**2,248**	0	159.85	2,248	2,488	161.60	2,248	4,993
158.15	2,248	45	159.90	2,248	2,574	161.65	2,248	5,038
158.20	2,248	90	159.95	2,248	2,660	161.70	2,248	5,083
158.25	2,248	135	160.00	2,248	2,746	161.75	2,248	5,128
158.30	2,248	180	160.05	2,248	2,831	161.80	2,248	5,173
158.35	2,248	225	160.10	2,248	2,915	161.85	2,248	5,218
158.40	2,248	270	160.15	2,248	2,999	161.90	2,248	5,263
158.45	2,248	315	160.20	2,248	3,082	161.95	2,248	5,308
158.50	2,248	360	160.25	2,248	3,165	162.00	2,248	5,353
158.55	2,248	405	160.30	2,248	3,247	162.05	2,248	5,398
158.60	2,248	450	160.35	2,248	3,328	162.10	2,248	5,443
158.65	2,248	495	160.40	2,248	3,409	162.15	2,248	5,488
158.70	2,248	540	160.45	2,248	3,489	162.20	2,248	5,533
158.75	2,248	584	160.50	2,248	3,568	162.25	2,248	5,578
158.80	2,248	629	160.55	2,248	3,646	162.30	2,248	5,623
158.85	2,248	674	160.60	2,248	3,724	162.35	2,248	**5,668**
158.90	2,248	768	160.65	2,248	3,801			
158.95	2,248	861	160.70	2,248	3,877			
159.00	2,248	954	160.75	2,248	3,952			
159.05	2,248	1,047	160.80	2,248	4,026			
159.10	2,248	1,140	160.85	2,248	4,099			
159.15	2,248	1,232	160.90	2,248	4,170			
159.20	2,248	1,324	160.95	2,248	4,241			
159.25	2,248	1,416	161.00	2,248	4,311			
159.30	2,248	1,507	161.05	2,248	4,379			
159.35	2,248	1,598	161.10	2,248	4,445			
159.40	2,248	1,689	161.15	2,248	4,510			
159.45	2,248	1,779	161.20	2,248	4,573			
159.50	2,248	1,869	161.25	2,248	4,634			
159.55	2,248	1,959	161.30	2,248	4,692			
159.60	2,248	2,048	161.35	2,248	4,747			
159.65	2,248	2,137	161.40	2,248	4,800			
159.70	2,248	2,225	161.45	2,248	4,850			
159.75	2,248	2,313	161.50	2,248	4,899			
159.80	2,248	2,401	161.55	2,248	4,947			

Summary for Pond 4P: UDS-3 (SC-310)

Inflow Area = 5,351 sf,100.00% Impervious, Inflow Depth = 6.06" for 25-Year event
Inflow = 0.76 cfs @ 12.13 hrs, Volume= 2,703 cf
Outflow = 0.31 cfs @ 12.25 hrs, Volume= 2,703 cf, Atten= 59%, Lag= 7.5 min
Primary = 0.31 cfs @ 12.25 hrs, Volume= 2,703 cf
Routed to Link SP1 : STUDY POINT #1 (Kimball Road north)

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 135.32' @ 12.25 hrs Surf.Area= 375 sf Storage= 379 cf
Flood Elev= 135.83' Surf.Area= 375 sf Storage= 456 cf

Plug-Flow detention time= 13.4 min calculated for 2,703 cf (100% of inflow)
Center-of-Mass det. time= 13.0 min (759.4 - 746.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	133.50'	279 cf	**8.17'W x 45.92'L x 2.33'H Field A** 875 cf Overall - 177 cf Embedded = 698 cf x 40.0% Voids
#2A	134.00'	177 cf	**ADS_StormTech SC-310 +Cap** x 12 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 12 Chambers in 2 Rows
		456 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	133.50'	**12.0" Round Culvert** L= 33.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 133.50' / 132.84' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	135.50'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Device 1	133.50'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.31 cfs @ 12.25 hrs HW=135.32' (Free Discharge)
└─**1=Culvert** (Passes 0.31 cfs of 3.42 cfs potential flow)
  ├─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**3=Orifice/Grate** (Orifice Controls 0.31 cfs @ 6.26 fps)

Pond 4P: UDS-3 (SC-310) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-310 +Cap (ADS StormTech® SC-310 with cap length)
Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

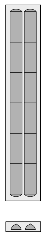
6 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 43.92' Row Length +12.0" End Stone x 2 = 45.92' Base Length
2 Rows x 34.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 8.17' Base Width
6.0" Stone Base + 16.0" Chamber Height + 6.0" Stone Cover = 2.33' Field Height

12 Chambers x 14.7 cf = 176.9 cf Chamber Storage

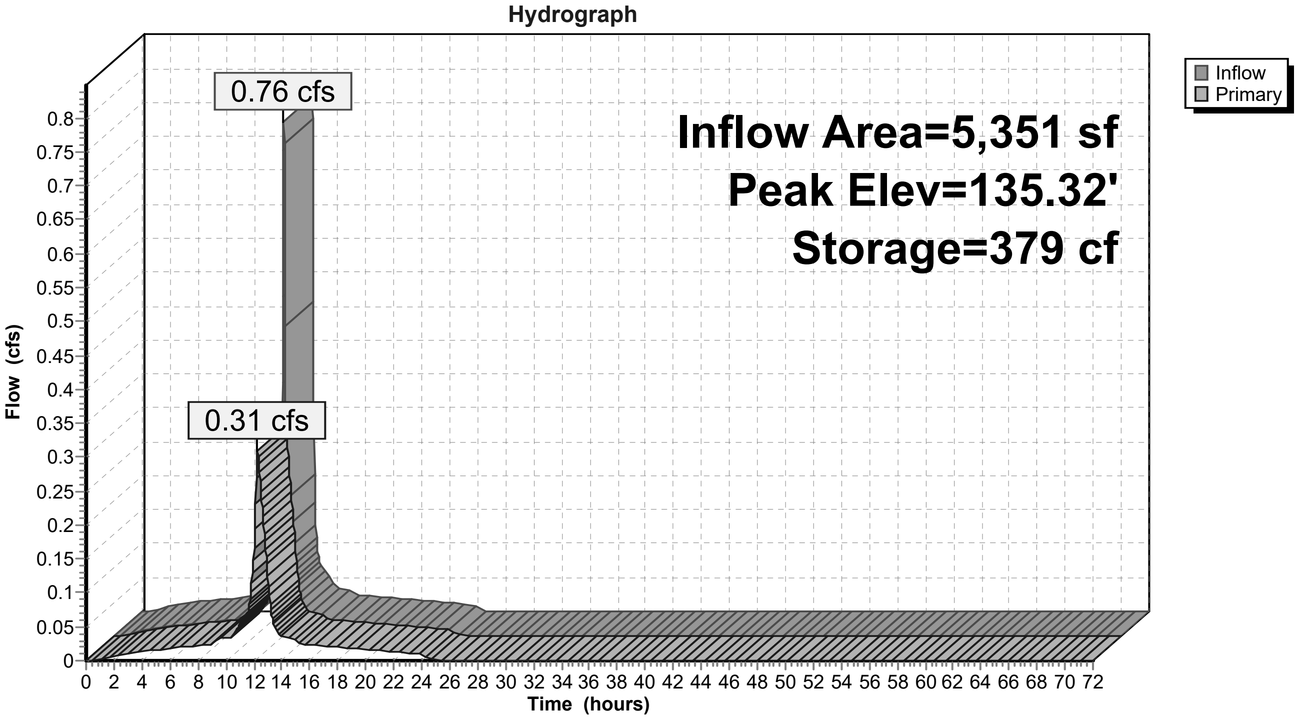
875.0 cf Field - 176.9 cf Chambers = 698.1 cf Stone x 40.0% Voids = 279.3 cf Stone Storage

Chamber Storage + Stone Storage = 456.2 cf = 0.010 af
Overall Storage Efficiency = 52.1%
Overall System Size = 45.92' x 8.17' x 2.33'

12 Chambers
32.4 cy Field
25.9 cy Stone



Pond 4P: UDS-3 (SC-310)



Stage-Area-Storage for Pond 4P: UDS-3 (SC-310)

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
133.50	0	134.20	129	134.90	303	135.60	421
133.52	3	134.22	135	134.92	307	135.62	424
133.54	6	134.24	140	134.94	311	135.64	427
133.56	9	134.26	145	134.96	315	135.66	430
133.58	12	134.28	151	134.98	320	135.68	433
133.60	15	134.30	156	135.00	324	135.70	436
133.62	18	134.32	161	135.02	328	135.72	439
133.64	21	134.34	166	135.04	332	135.74	442
133.66	24	134.36	172	135.06	336	135.76	445
133.68	27	134.38	177	135.08	339	135.78	448
133.70	30	134.40	182	135.10	343	135.80	451
133.72	33	134.42	187	135.12	347	135.82	**454**
133.74	36	134.44	192	135.14	350		
133.76	39	134.46	197	135.16	353		
133.78	42	134.48	203	135.18	357		
133.80	45	134.50	208	135.20	360		
133.82	48	134.52	213	135.22	363		
133.84	51	134.54	218	135.24	367		
133.86	54	134.56	223	135.26	370		
133.88	57	134.58	228	135.28	373		
133.90	60	134.60	233	135.30	376		
133.92	63	134.62	237	135.32	379		
133.94	66	134.64	242	135.34	382		
133.96	69	134.66	247	135.36	385		
133.98	72	134.68	252	135.38	388		
134.00	75	134.70	257	135.40	391		
134.02	80	134.72	262	135.42	394		
134.04	86	134.74	266	135.44	397		
134.06	91	134.76	271	135.46	400		
134.08	97	134.78	276	135.48	403		
134.10	102	134.80	280	135.50	406		
134.12	108	134.82	285	135.52	409		
134.14	113	134.84	289	135.54	412		
134.16	119	134.86	294	135.56	415		
134.18	124	134.88	298	135.58	418		

Summary for Pond 5P: UIS-4 (SC-310)

Inflow Area = 9,184 sf, 88.68% Impervious, Inflow Depth = 5.59" for 25-Year event
Inflow = 1.27 cfs @ 12.13 hrs, Volume= 4,281 cf
Outflow = 0.06 cfs @ 10.65 hrs, Volume= 4,281 cf, Atten= 95%, Lag= 0.0 min
Discarded = 0.06 cfs @ 10.65 hrs, Volume= 4,281 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond 7P : UDS-6 (CMP 60")

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 165.03' @ 13.73 hrs Surf.Area= 2,592 sf Storage= 1,569 cf
Flood Elev= 166.33' Surf.Area= 2,592 sf Storage= 3,300 cf

Plug-Flow detention time= 213.8 min calculated for 4,278 cf (100% of inflow)
Center-of-Mass det. time= 213.7 min (988.1 - 774.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	164.00'	1,829 cf	**34.83'W x 74.40'L x 2.33'H Field A** 6,047 cf Overall - 1,474 cf Embedded = 4,573 cf x 40.0% Voids
#2A	164.50'	1,474 cf	**ADS_StormTech SC-310 +Cap** x 100 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 100 Chambers in 10 Rows
		3,303 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	164.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	164.50'	**15.0" Round Culvert** L= 25.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 164.50' / 163.00' S= 0.0600 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#3	Device 2	165.45'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.06 cfs @ 10.65 hrs HW=164.02' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=164.00' (Free Discharge)
└─**2=Culvert** (Controls 0.00 cfs)
  └─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: UIS-4 (SC-310) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-310 +Cap (ADS StormTech® SC-310 with cap length)
Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

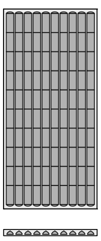
10 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 72.40' Row Length +12.0" End Stone x 2 = 74.40' Base Length
10 Rows x 34.0" Wide + 6.0" Spacing x 9 + 12.0" Side Stone x 2 = 34.83' Base Width
6.0" Stone Base + 16.0" Chamber Height + 6.0" Stone Cover = 2.33' Field Height

100 Chambers x 14.7 cf = 1,474.2 cf Chamber Storage

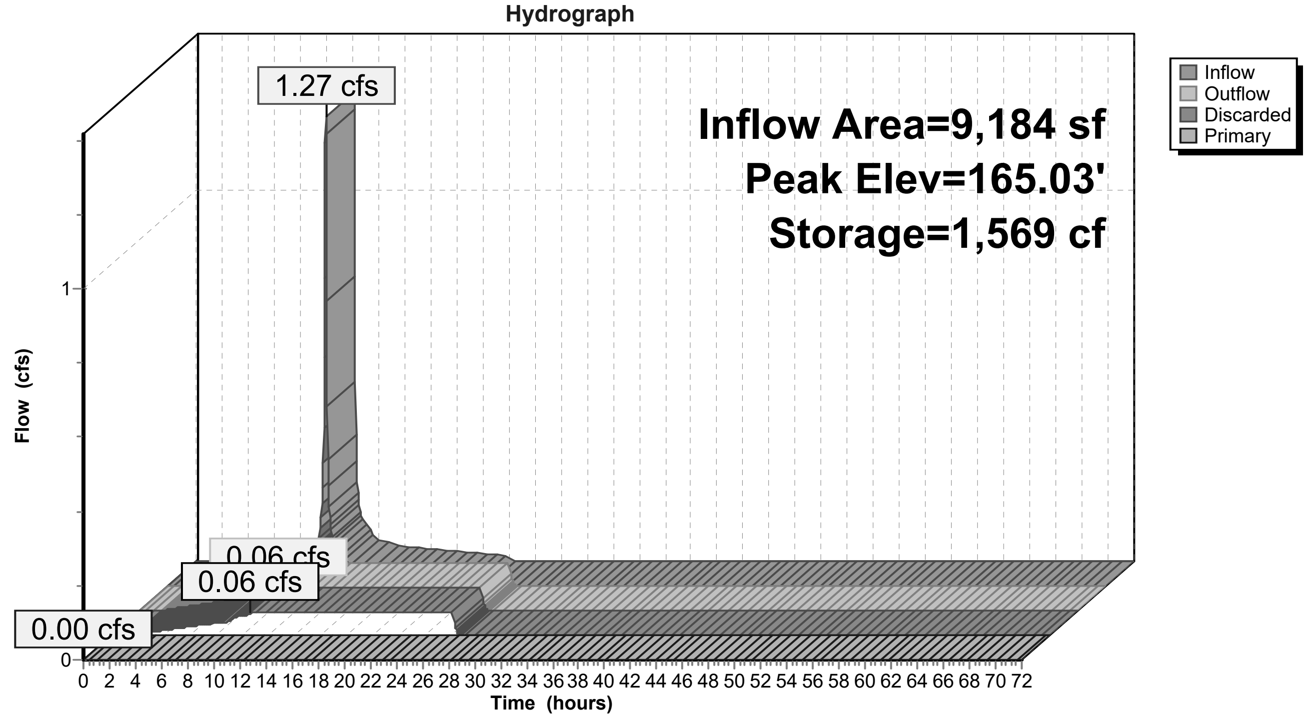
6,047.1 cf Field - 1,474.2 cf Chambers = 4,572.9 cf Stone x 40.0% Voids = 1,829.1 cf Stone Storage

Chamber Storage + Stone Storage = 3,303.3 cf = 0.076 af
Overall Storage Efficiency = 54.6%
Overall System Size = 74.40' x 34.83' x 2.33'

100 Chambers
224.0 cy Field
169.4 cy Stone



Pond 5P: UIS-4 (SC-310)



Stage-Area-Storage for Pond 5P: UIS-4 (SC-310)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
164.00	**2,592**	0	165.75	2,592	2,695
164.05	2,592	52	165.80	2,592	2,750
164.10	2,592	104	165.85	2,592	2,802
164.15	2,592	155	165.90	2,592	2,854
164.20	2,592	207	165.95	2,592	2,906
164.25	2,592	259	166.00	2,592	2,958
164.30	2,592	311	166.05	2,592	3,010
164.35	2,592	363	166.10	2,592	3,061
164.40	2,592	415	166.15	2,592	3,113
164.45	2,592	466	166.20	2,592	3,165
164.50	2,592	518	166.25	2,592	3,217
164.55	2,592	622	166.30	2,592	**3,269**
164.60	2,592	724			
164.65	2,592	827			
164.70	2,592	928			
164.75	2,592	1,029			
164.80	2,592	1,129			
164.85	2,592	1,227			
164.90	2,592	1,325			
164.95	2,592	1,422			
165.00	2,592	1,517			
165.05	2,592	1,611			
165.10	2,592	1,703			
165.15	2,592	1,794			
165.20	2,592	1,884			
165.25	2,592	1,972			
165.30	2,592	2,057			
165.35	2,592	2,141			
165.40	2,592	2,222			
165.45	2,592	2,301			
165.50	2,592	2,377			
165.55	2,592	2,449			
165.60	2,592	2,516			
165.65	2,592	2,579			
165.70	2,592	2,638			

Summary for Pond 6P: UDS-5 (CMP 72")

Inflow Area = 160,048 sf, 50.15% Impervious, Inflow Depth = 3.93" for 25-Year event
Inflow = 16.96 cfs @ 12.13 hrs, Volume= 52,416 cf
Outflow = 2.00 cfs @ 12.59 hrs, Volume= 52,416 cf, Atten= 88%, Lag= 27.5 min
Primary = 2.00 cfs @ 12.59 hrs, Volume= 52,416 cf
Routed to Pond 7P : UDS-6 (CMP 60")

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 166.24' @ 12.59 hrs Surf.Area= 4,970 sf Storage= 16,586 cf
Flood Elev= 168.50' Surf.Area= 4,970 sf Storage= 23,416 cf

Plug-Flow detention time= 84.6 min calculated for 52,379 cf (100% of inflow)
Center-of-Mass det. time= 84.9 min (918.4 - 833.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	161.50'	7,583 cf	**35.00'W x 142.00'L x 7.00'H Field A** 34,790 cf Overall - 15,834 cf Embedded = 18,956 cf x 40.0% Voids
#2A	162.00'	15,834 cf	**CMP Round 72** x 28 Inside #1 Effective Size= 72.0"W x 72.0"H => 28.27 sf x 20.00'L = 565.5 cf Overall Size= 72.0"W x 72.0"H x 20.00'L 28 Chambers in 4 Rows
		23,416 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	161.50'	**12.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 161.50' / 161.00' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	168.00'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Device 1	161.50'	**6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.00 cfs @ 12.59 hrs HW=166.24' (Free Discharge)
└─**1=Culvert** (Passes 2.00 cfs of 6.14 cfs potential flow)
 ├─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
 └─**3=6" Orifice** (Orifice Controls 2.00 cfs @ 10.20 fps)

Pond 6P: UDS-5 (CMP 72") - Chamber Wizard Field A

Chamber Model = CMP Round 72 (Round Corrugated Metal Pipe)
Effective Size= 72.0"W x 72.0"H => 28.27 sf x 20.00'L = 565.5 cf
Overall Size= 72.0"W x 72.0"H x 20.00'L

72.0" Wide + 36.0" Spacing = 108.0" C-C Row Spacing

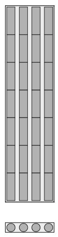
7 Chambers/Row x 20.00' Long = 140.00' Row Length +12.0" End Stone x 2 = 142.00' Base Length
4 Rows x 72.0" Wide + 36.0" Spacing x 3 + 12.0" Side Stone x 2 = 35.00' Base Width
6.0" Stone Base + 72.0" Chamber Height + 6.0" Stone Cover = 7.00' Field Height

28 Chambers x 565.5 cf = 15,833.6 cf Chamber Storage

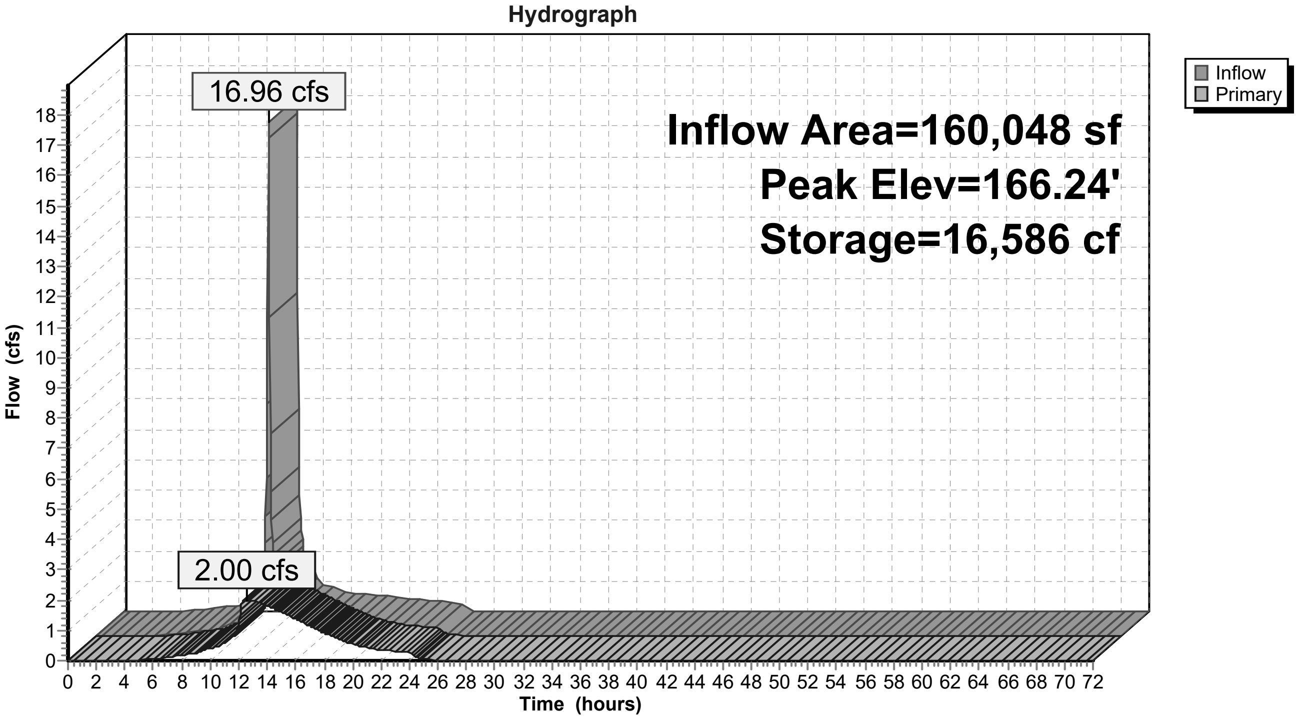
34,790.0 cf Field - 15,833.6 cf Chambers = 18,956.4 cf Stone x 40.0% Voids = 7,582.5 cf Stone Storage

Chamber Storage + Stone Storage = 23,416.2 cf = 0.538 af
Overall Storage Efficiency = 67.3%
Overall System Size = 142.00' x 35.00' x 7.00'

28 Chambers
1,288.5 cy Field
702.1 cy Stone



Pond 6P: UDS-5 (CMP 72")



Stage-Area-Storage for Pond 6P: UDS-5 (CMP 72")

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
161.50	0	163.25	4,913	165.00	11,708	166.75	18,503	168.50	**23,416**
161.55	99	163.30	5,095	165.05	11,908	166.80	18,684		
161.60	199	163.35	5,278	165.10	12,108	166.85	18,863		
161.65	298	163.40	5,462	165.15	12,309	166.90	19,041		
161.70	398	163.45	5,647	165.20	12,509	166.95	19,218		
161.75	497	163.50	5,833	165.25	12,709	167.00	19,393		
161.80	596	163.55	6,020	165.30	12,908	167.05	19,567		
161.85	696	163.60	6,209	165.35	13,108	167.10	19,739		
161.90	795	163.65	6,398	165.40	13,307	167.15	19,910		
161.95	895	163.70	6,587	165.45	13,506	167.20	20,079		
162.00	994	163.75	6,778	165.50	13,705	167.25	20,246		
162.05	1,102	163.80	6,969	165.55	13,904	167.30	20,411		
162.10	1,227	163.85	7,162	165.60	14,102	167.35	20,574		
162.15	1,355	163.90	7,354	165.65	14,300	167.40	20,735		
162.20	1,489	163.95	7,548	165.70	14,498	167.45	20,894		
162.25	1,626	164.00	7,742	165.75	14,695	167.50	21,050		
162.30	1,768	164.05	7,937	165.80	14,892	167.55	21,204		
162.35	1,913	164.10	8,132	165.85	15,088	167.60	21,355		
162.40	2,061	164.15	8,328	165.90	15,284	167.65	21,503		
162.45	2,212	164.20	8,524	165.95	15,479	167.70	21,648		
162.50	2,366	164.25	8,721	166.00	15,674	167.75	21,790		
162.55	2,522	164.30	8,918	166.05	15,868	167.80	21,927		
162.60	2,681	164.35	9,116	166.10	16,062	167.85	22,061		
162.65	2,842	164.40	9,314	166.15	16,255	167.90	22,189		
162.70	3,005	164.45	9,512	166.20	16,447	167.95	22,310		
162.75	3,170	164.50	9,711	166.25	16,638	168.00	22,422		
162.80	3,337	164.55	9,910	166.30	16,829	168.05	22,522		
162.85	3,506	164.60	10,109	166.35	17,019	168.10	22,621		
162.90	3,677	164.65	10,308	166.40	17,208	168.15	22,720		
162.95	3,849	164.70	10,508	166.45	17,396	168.20	22,820		
163.00	4,023	164.75	10,708	166.50	17,583	168.25	22,919		
163.05	4,198	164.80	10,908	166.55	17,769	168.30	23,019		
163.10	4,375	164.85	11,108	166.60	17,954	168.35	23,118		
163.15	4,553	164.90	11,308	166.65	18,138	168.40	23,217		
163.20	4,732	164.95	11,508	166.70	18,321	168.45	23,317		

Summary for Pond 7P: UDS-6 (CMP 60")

Inflow Area = 218,814 sf, 55.48% Impervious, Inflow Depth = 3.93" for 25-Year event
Inflow = 7.73 cfs @ 12.13 hrs, Volume= 71,595 cf
Outflow = 2.57 cfs @ 12.82 hrs, Volume= 71,595 cf, Atten= 67%, Lag= 41.2 min
Primary = 2.57 cfs @ 12.82 hrs, Volume= 71,595 cf
Routed to Pond 1P : Infiltration Basin

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 157.56' @ 12.82 hrs Surf.Area= 4,514 sf Storage= 17,113 cf
Flood Elev= 158.00' Surf.Area= 4,514 sf Storage= 17,902 cf

Plug-Flow detention time= 253.3 min calculated for 71,545 cf (100% of inflow)
Center-of-Mass det. time= 253.8 min (1,144.4 - 890.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	152.00'	6,121 cf	**37.00'W x 122.00'L x 6.00'H Field A** 27,084 cf Overall - 11,781 cf Embedded = 15,303 cf x 40.0% Voids
#2A	152.50'	11,781 cf	**CMP Round 60** x 30 Inside #1 Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf Overall Size= 60.0"W x 60.0"H x 20.00'L 30 Chambers in 5 Rows
		17,902 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	152.00'	**15.0" Round Culvert** L= 250.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 152.00' / 150.00' S= 0.0080 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	157.25'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Device 1	152.00'	**3.0" Vert. 3" Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.56 cfs @ 12.82 hrs HW=157.56' (Free Discharge)
└─**1=Culvert** (Passes 2.56 cfs of 8.90 cfs potential flow)
  ├─**2=Broad-Crested Rectangular Weir** (Weir Controls 2.01 cfs @ 1.60 fps)
  └─**3=3" Orifice** (Orifice Controls 0.55 cfs @ 11.23 fps)

Pond 7P: UDS-6 (CMP 60") - Chamber Wizard Field A

Chamber Model = CMP Round 60 (Round Corrugated Metal Pipe)
Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf
Overall Size= 60.0"W x 60.0"H x 20.00'L

60.0" Wide + 30.0" Spacing = 90.0" C-C Row Spacing

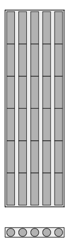
6 Chambers/Row x 20.00' Long = 120.00' Row Length +12.0" End Stone x 2 = 122.00' Base Length
5 Rows x 60.0" Wide + 30.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.00' Base Width
6.0" Stone Base + 60.0" Chamber Height + 6.0" Stone Cover = 6.00' Field Height

30 Chambers x 392.7 cf = 11,781.0 cf Chamber Storage

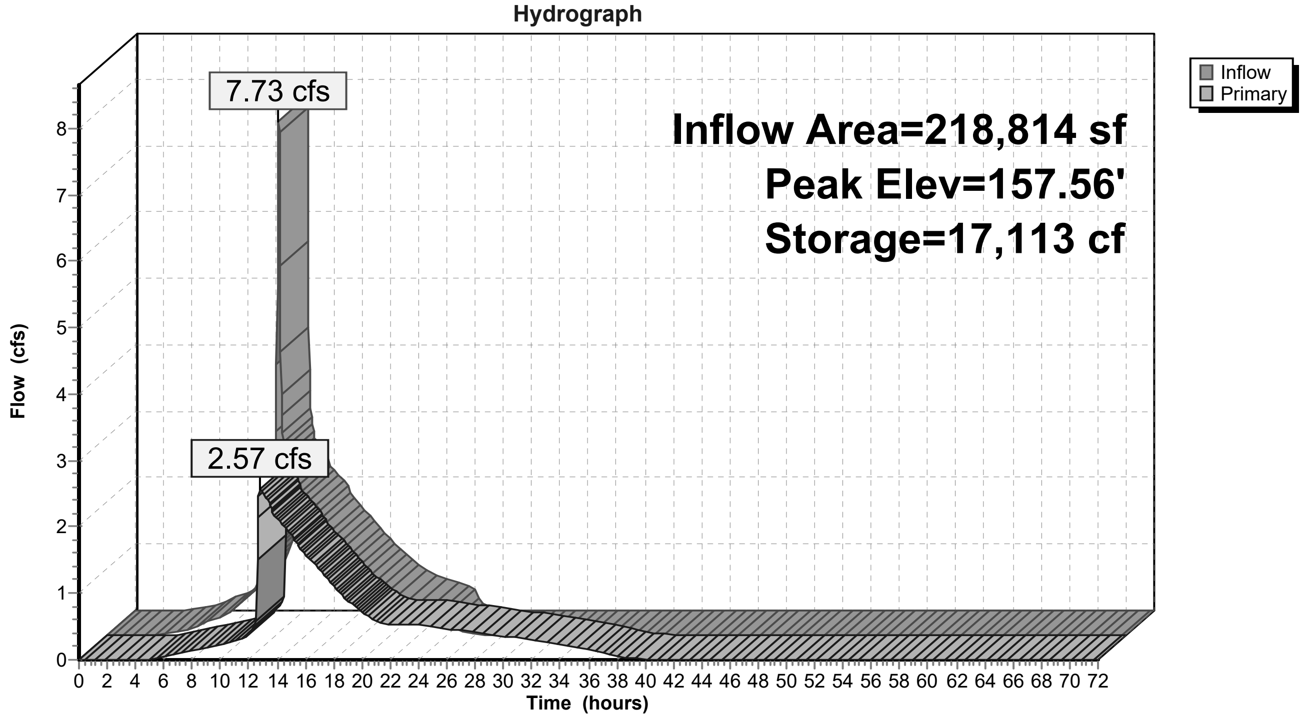
27,084.0 cf Field - 11,781.0 cf Chambers = 15,303.0 cf Stone x 40.0% Voids = 6,121.2 cf Stone Storage

Chamber Storage + Stone Storage = 17,902.2 cf = 0.411 af
Overall Storage Efficiency = 66.1%
Overall System Size = 122.00' x 37.00' x 6.00'

30 Chambers
1,003.1 cy Field
566.8 cy Stone



Pond 7P: UDS-6 (CMP 60")



Stage-Area-Storage for Pond 7P: UDS-6 (CMP 60")

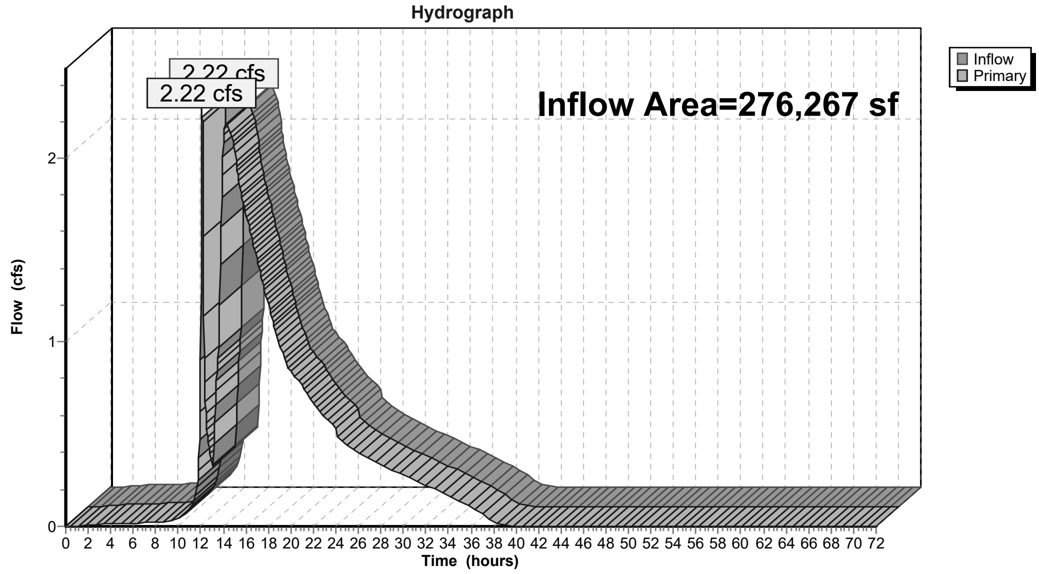
Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
152.00	0	153.75	4,542	155.50	10,748	157.25	16,416
152.05	90	153.80	4,710	155.55	10,926	157.30	16,543
152.10	181	153.85	4,880	155.60	11,104	157.35	16,667
152.15	271	153.90	5,051	155.65	11,281	157.40	16,785
152.20	361	153.95	5,222	155.70	11,458	157.45	16,897
152.25	451	154.00	5,395	155.75	11,635	157.50	16,999
152.30	542	154.05	5,568	155.80	11,811	157.55	17,090
152.35	632	154.10	5,742	155.85	11,986	157.60	17,180
152.40	722	154.15	5,916	155.90	12,160	157.65	17,270
152.45	813	154.20	6,092	155.95	12,334	157.70	17,361
152.50	903	154.25	6,267	156.00	12,507	157.75	17,451
152.55	1,005	154.30	6,444	156.05	12,680	157.80	17,541
152.60	1,117	154.35	6,621	156.10	12,851	157.85	17,631
152.65	1,235	154.40	6,798	156.15	13,022	157.90	17,722
152.70	1,359	154.45	6,976	156.20	13,192	157.95	17,812
152.75	1,486	154.50	7,154	156.25	13,360	158.00	**17,902**
152.80	1,618	154.55	7,333	156.30	13,528		
152.85	1,752	154.60	7,512	156.35	13,695		
152.90	1,890	154.65	7,691	156.40	13,860		
152.95	2,030	154.70	7,871	156.45	14,024		
153.00	2,173	154.75	8,050	156.50	14,187		
153.05	2,319	154.80	8,230	156.55	14,349		
153.10	2,467	154.85	8,410	156.60	14,509		
153.15	2,616	154.90	8,591	156.65	14,668		
153.20	2,768	154.95	8,771	156.70	14,825		
153.25	2,922	155.00	8,951	156.75	14,980		
153.30	3,077	155.05	9,131	156.80	15,134		
153.35	3,234	155.10	9,312	156.85	15,286		
153.40	3,393	155.15	9,492	156.90	15,436		
153.45	3,553	155.20	9,672	156.95	15,583		
153.50	3,715	155.25	9,852	157.00	15,729		
153.55	3,878	155.30	10,031	157.05	15,872		
153.60	4,042	155.35	10,211	157.10	16,012		
153.65	4,207	155.40	10,390	157.15	16,150		
153.70	4,374	155.45	10,569	157.20	16,285		

Summary for Link SP1: STUDY POINT #1 (Kimball Road north)

Inflow Area = 276,267 sf, 48.17% Impervious, Inflow Depth = 2.72" for 25-Year event
Inflow = 2.22 cfs @ 12.14 hrs, Volume= 62,691 cf
Primary = 2.22 cfs @ 12.14 hrs, Volume= 62,691 cf, Atten= 0%, Lag= 0.0 min

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

Link SP1: STUDY POINT #1 (Kimball Road north)

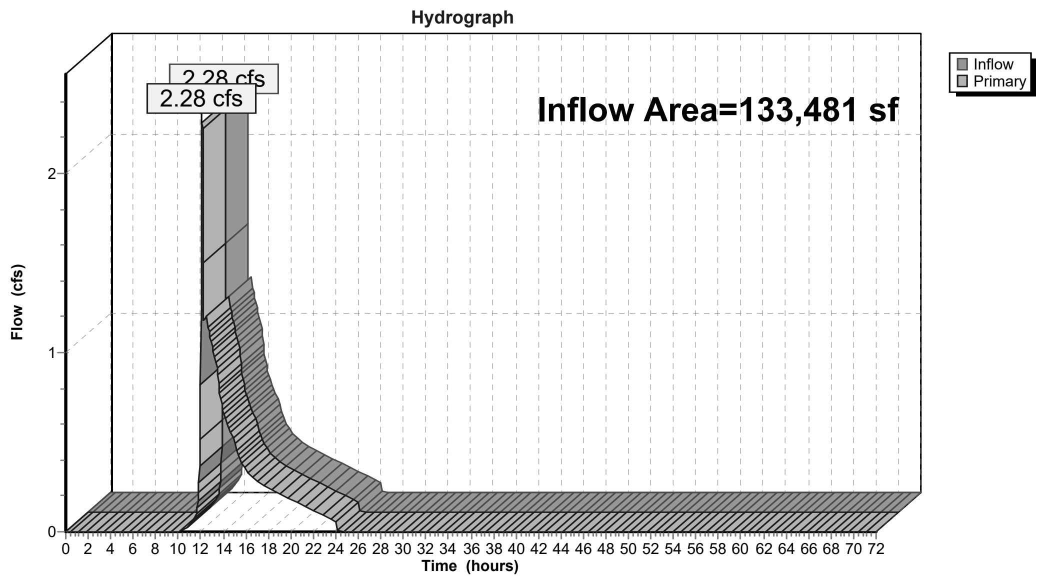


Summary for Link SP2: STUDY POINT #2 (Wetlands West)

Inflow Area = 133,481 sf, 45.23% Impervious, Inflow Depth = 1.54" for 25-Year event
Inflow = 2.28 cfs @ 12.14 hrs, Volume= 17,159 cf
Primary = 2.28 cfs @ 12.14 hrs, Volume= 17,159 cf, Atten= 0%, Lag= 0.0 min

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

Link SP2: STUDY POINT #2 (Wetlands West)



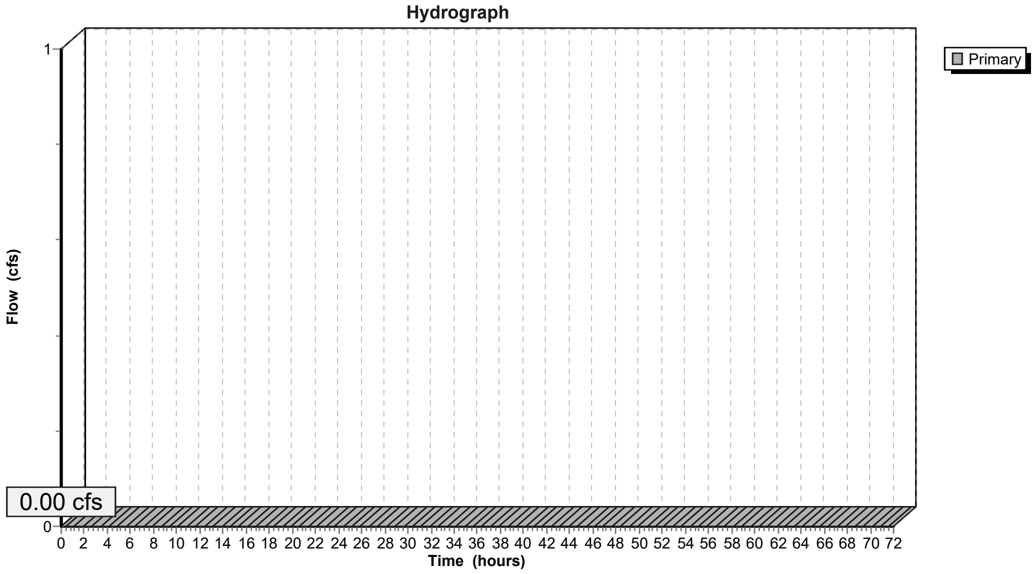
Summary for Link SP3: STUDY POINT #3 (IVW south)

[43] Hint: Has no inflow (Outflow=Zero)

Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

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

Link SP3: STUDY POINT #3 (IVW south)



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P-10A: Subcat P-10A Runoff Area=16,553 sf 57.69% Impervious Runoff Depth=5.96"
Tc=6.0 min CN=82 Runoff=2.62 cfs 8,227 cf

Subcatchment P-10B: Subcat P-10B Runoff Area=15,645 sf 50.07% Impervious Runoff Depth=5.73"
Tc=6.0 min CN=80 Runoff=2.40 cfs 7,468 cf

Subcatchment P-11: Subcat P-11 Runoff Area=32,948 sf 54.95% Impervious Runoff Depth=5.85"
Tc=6.0 min CN=81 Runoff=5.13 cfs 16,052 cf

Subcatchment P-12: Subcat P-12 Runoff Area=8,298 sf 24.91% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=70 Runoff=1.04 cfs 3,152 cf

Subcatchment P-13: Subcat P-13 Runoff Area=52,463 sf 36.14% Impervious Runoff Depth=4.79"
Tc=6.0 min CN=72 Runoff=6.90 cfs 20,946 cf

Subcatchment P-14: Subcat P-14 Runoff Area=24,855 sf 59.92% Impervious Runoff Depth=6.08"
Tc=6.0 min CN=83 Runoff=3.99 cfs 12,598 cf

Subcatchment P-15: Subcat P-15 Runoff Area=9,184 sf 88.68% Impervious Runoff Depth=7.39"
Tc=6.0 min CN=94 Runoff=1.65 cfs 5,657 cf

Subcatchment P-1A: Subcat P-1A Runoff Area=13,439 sf 0.30% Impervious Runoff Depth=3.08"
Tc=6.0 min CN=57 Runoff=1.13 cfs 3,450 cf

Subcatchment P-1B: Subcat P-1B Runoff Area=21,569 sf 3.33% Impervious Runoff Depth=3.53"
Tc=6.0 min CN=61 Runoff=2.10 cfs 6,343 cf

Subcatchment P-2: Subcat P-2 Runoff Area=46,203 sf 1.61% Impervious Runoff Depth=3.08"
Tc=6.0 min CN=57 Runoff=3.90 cfs 11,861 cf

Subcatchment P-3: Subcat P-3 Runoff Area=9,286 sf 95.37% Impervious Runoff Depth=7.63"
Tc=6.0 min CN=96 Runoff=1.68 cfs 5,905 cf

Subcatchment P-4: Subcat P-4 Runoff Area=24,255 sf 64.29% Impervious Runoff Depth=6.32"
Tc=6.0 min CN=85 Runoff=4.00 cfs 12,773 cf

Subcatchment P-5: Subcat P-5 Runoff Area=25,326 sf 68.66% Impervious Runoff Depth=6.44"
Tc=6.0 min CN=86 Runoff=4.23 cfs 13,588 cf

Subcatchment P-6: Subcat P-6 Runoff Area=5,351 sf 100.00% Impervious Runoff Depth=7.87"
Tc=6.0 min CN=98 Runoff=0.98 cfs 3,510 cf

Subcatchment P-7: Subcat P-7 Runoff Area=17,094 sf 32.66% Impervious Runoff Depth=4.91"
Tc=6.0 min CN=73 Runoff=2.30 cfs 6,991 cf

Subcatchment P-8: Subcat P-8 Runoff Area=26,823 sf 72.08% Impervious Runoff Depth=6.68"
Tc=6.0 min CN=88 Runoff=4.58 cfs 14,922 cf

Subcatchment P-9: Subcat P-9 Runoff Area=60,455 sf 66.65% Impervious Runoff Depth=6.32"
Tc=6.0 min CN=85 Runoff=9.97 cfs 31,837 cf

Pond 1P: Infiltration Basin Peak Elev=146.32' Storage=16,706 cf Inflow=9.55 cfs 107,752 cf
Discarded=0.12 cfs 21,185 cf Primary=4.13 cfs 84,660 cf Outflow=4.24 cfs 105,845 cf

Pond 2P: UIS-1 (SC-800) Peak Elev=169.78' Storage=12,451 cf Inflow=9.97 cfs 31,837 cf
Discarded=0.13 cfs 17,275 cf Primary=2.70 cfs 14,562 cf Outflow=2.83 cfs 31,837 cf

Pond 3P: UIS-2 (SC-800) Peak Elev=162.16' Storage=5,500 cf Inflow=4.58 cfs 14,922 cf
Discarded=0.05 cfs 7,917 cf Primary=2.92 cfs 7,005 cf Outflow=2.97 cfs 14,922 cf

Pond 4P: UDS-3 (SC-310) Peak Elev=135.64' Storage=428 cf Inflow=0.98 cfs 3,510 cf
Outflow=0.92 cfs 3,510 cf

Pond 5P: UIS-4 (SC-310) Peak Elev=165.46' Storage=2,314 cf Inflow=1.65 cfs 5,657 cf
Discarded=0.06 cfs 5,605 cf Primary=0.01 cfs 52 cf Outflow=0.07 cfs 5,657 cf

Pond 6P: UDS-5 (CMP 72") Peak Elev=168.42' Storage=23,256 cf Inflow=23.76 cfs 74,349 cf
Outflow=5.64 cfs 74,349 cf

Pond 7P: UDS-6 (CMP 60") Peak Elev=157.96' Storage=17,833 cf Inflow=10.21 cfs 100,762 cf
Outflow=8.22 cfs 100,762 cf

Link SP1: STUDY POINT #1 (Kimball Road north) Inflow=4.74 cfs 97,962 cf
Primary=4.74 cfs 97,962 cf

Link SP2: STUDY POINT #2 (Wetlands West) Inflow=6.31 cfs 33,429 cf
Primary=6.31 cfs 33,429 cf

Link SP3: STUDY POINT #3 (IVW south)
Primary=0.00 cfs 0 cf

Total Runoff Area = 409,748 sf Runoff Volume = 185,280 cf Average Runoff Depth = 5.43"
52.79% Pervious = 216,292 sf 47.21% Impervious = 193,456 sf

Summary for Subcatchment P-10A: Subcat P-10A

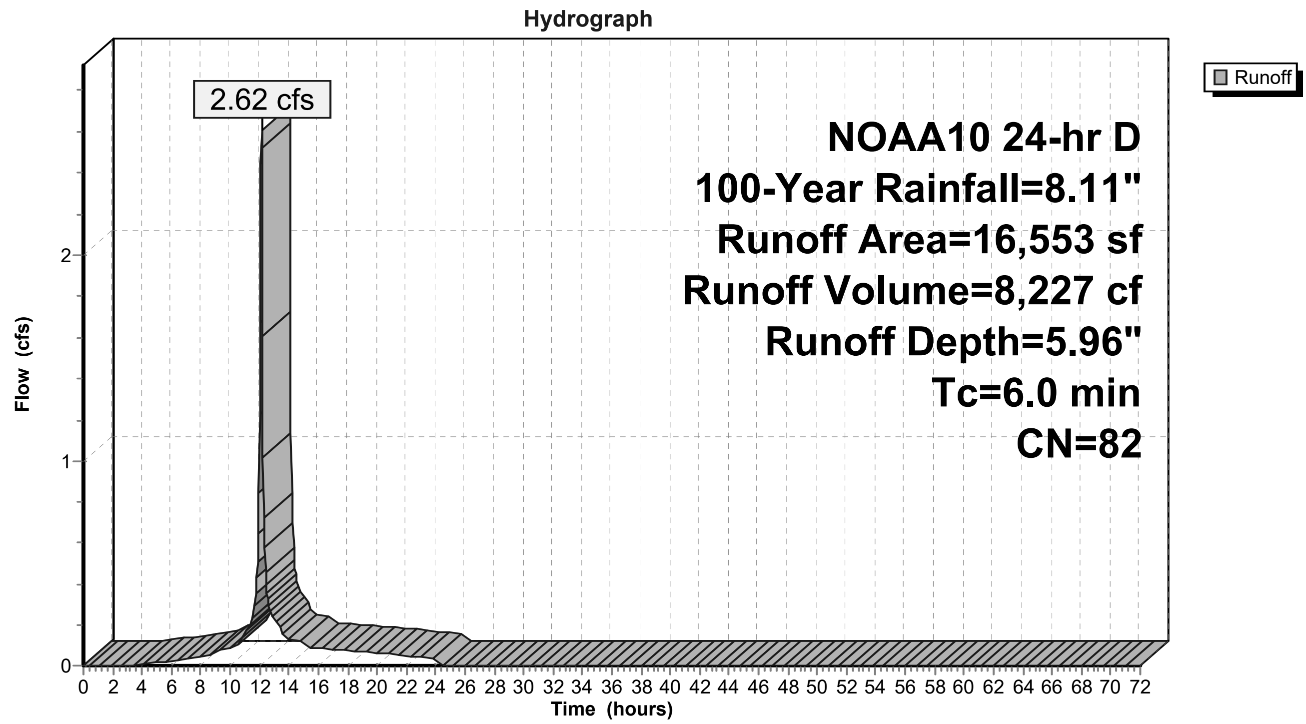
Runoff = 2.62 cfs @ 12.13 hrs, Volume= 8,227 cf, Depth= 5.96"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
7,004	61	>75% Grass cover, Good, HSG B
2,341	98	Paved parking, HSG B
7,208	98	Roofs, HSG B
16,553	82	Weighted Average
7,004		42.31% Pervious Area
9,549		57.69% Impervious Area

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

Subcatchment P-10A: Subcat P-10A



Summary for Subcatchment P-10B: Subcat P-10B

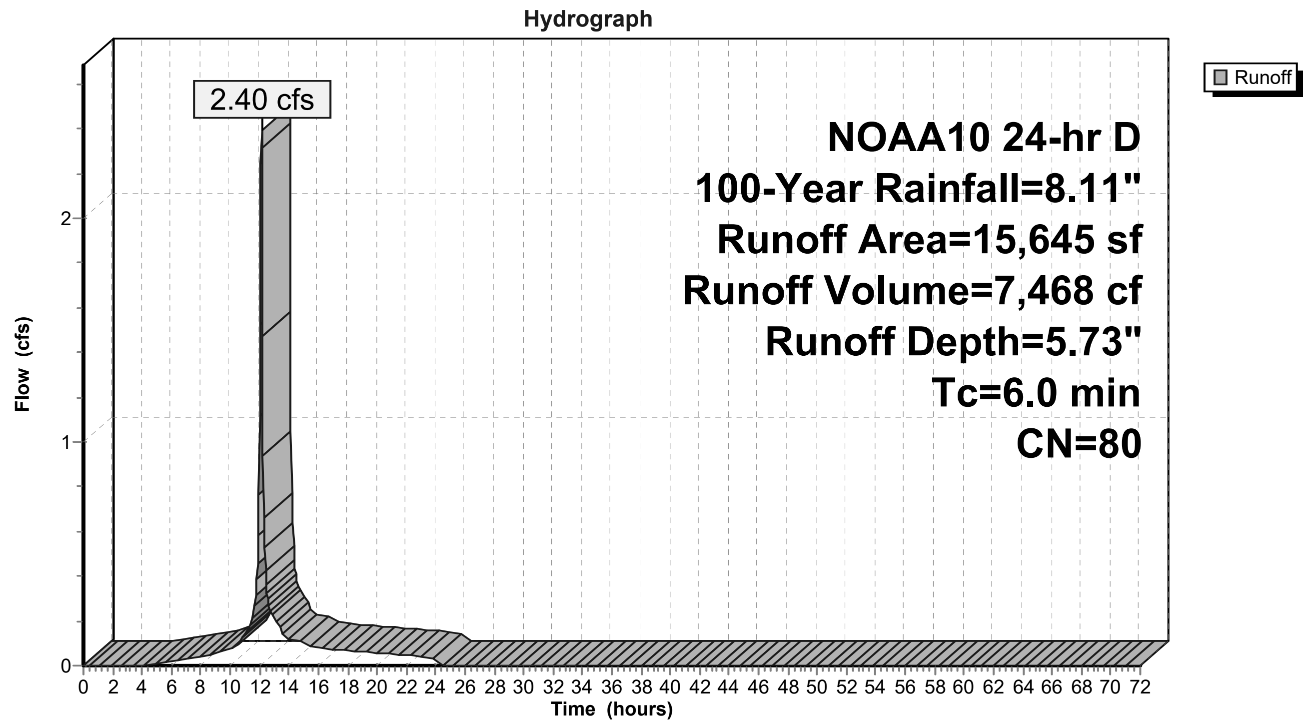
Runoff = 2.40 cfs @ 12.13 hrs, Volume= 7,468 cf, Depth= 5.73"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
7,811	61	>75% Grass cover, Good, HSG B
1,108	98	Paved parking, HSG B
6,726	98	Roofs, HSG B
15,645	80	Weighted Average
7,811		49.93% Pervious Area
7,834		50.07% Impervious Area

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

Subcatchment P-10B: Subcat P-10B



Summary for Subcatchment P-11: Subcat P-11

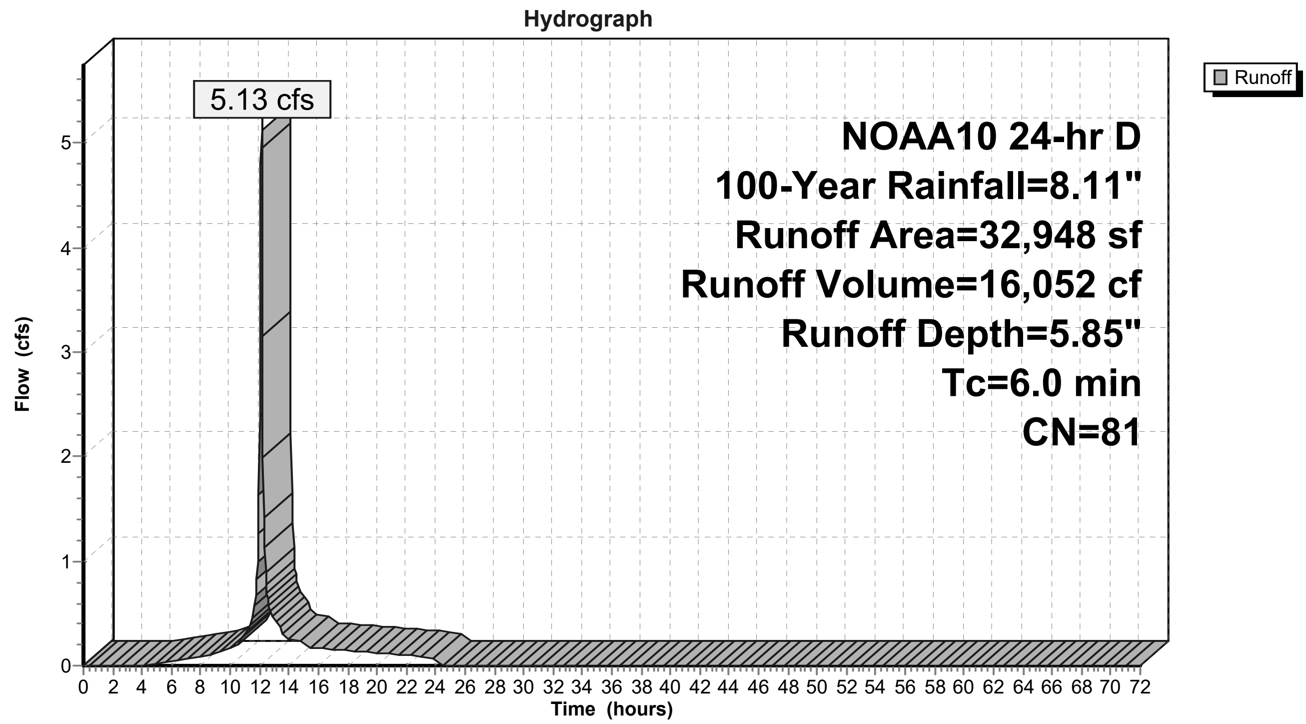
Runoff = 5.13 cfs @ 12.13 hrs, Volume= 16,052 cf, Depth= 5.85"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
14,844	61	>75% Grass cover, Good, HSG B
4,669	98	Paved parking, HSG B
13,435	98	Roofs, HSG B
32,948	81	Weighted Average
14,844		45.05% Pervious Area
18,105		54.95% Impervious Area

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

Subcatchment P-11: Subcat P-11



Summary for Subcatchment P-12: Subcat P-12

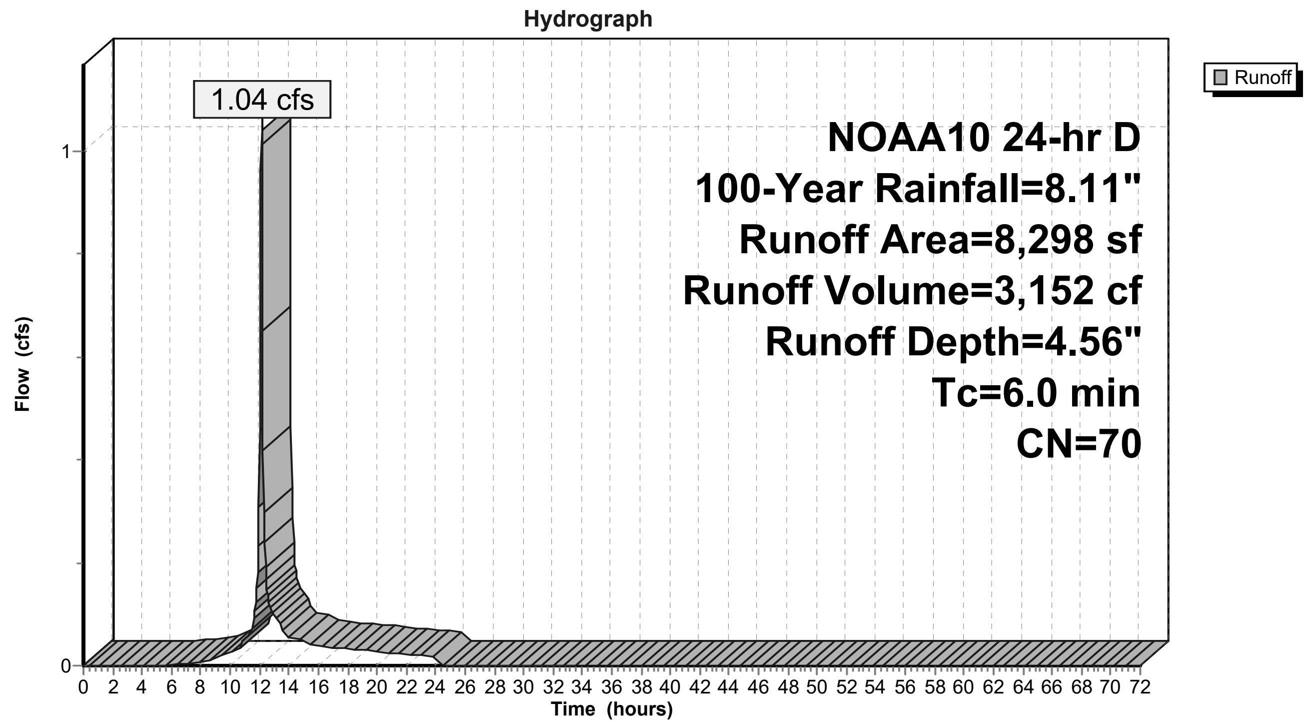
Runoff = 1.04 cfs @ 12.13 hrs, Volume= 3,152 cf, Depth= 4.56"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
6,231	61	>75% Grass cover, Good, HSG B
2,067	98	Paved parking, HSG B
8,298	70	Weighted Average
6,231		75.09% Pervious Area
2,067		24.91% Impervious Area

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

Subcatchment P-12: Subcat P-12



Summary for Subcatchment P-13: Subcat P-13

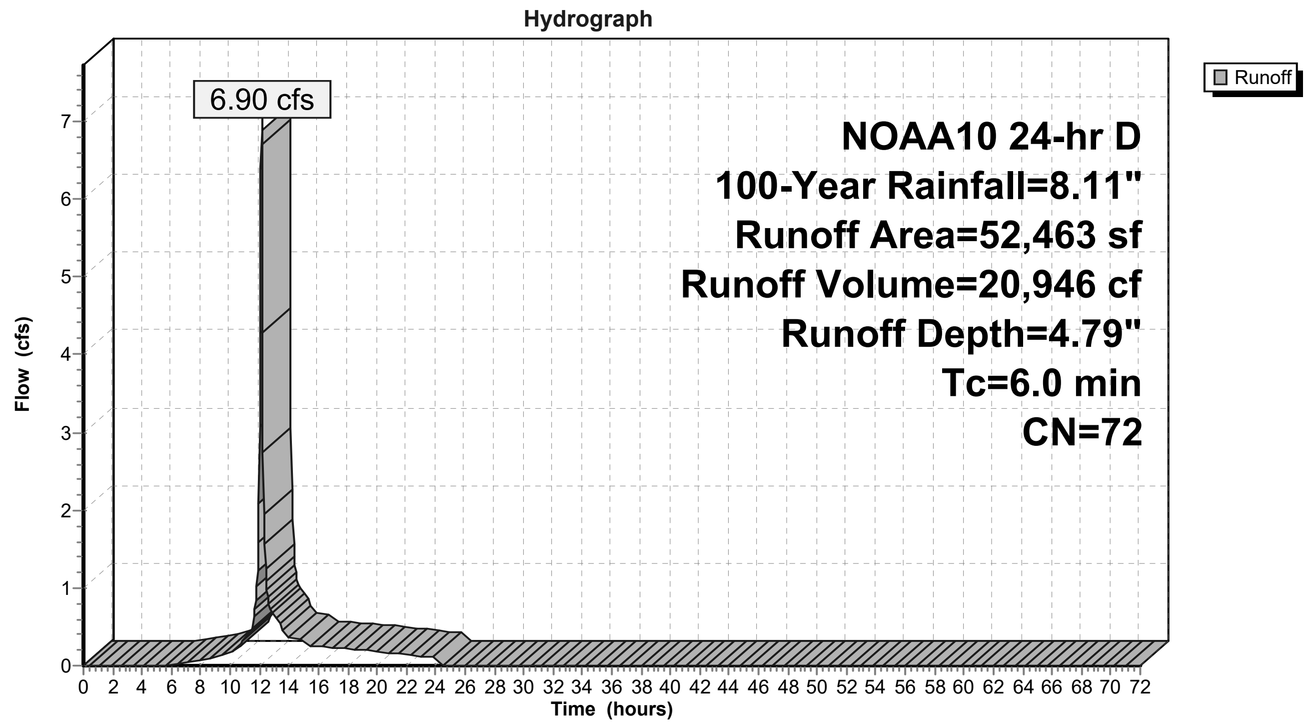
Runoff = 6.90 cfs @ 12.13 hrs, Volume= 20,946 cf, Depth= 4.79"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
10,162	61	>75% Grass cover, Good, HSG B
12,922	98	Paved parking, HSG B
6,037	98	Roofs, HSG B
23,343	55	Woods, Good, HSG B
52,463	72	Weighted Average
33,504		63.86% Pervious Area
18,959		36.14% Impervious Area

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

Subcatchment P-13: Subcat P-13



Summary for Subcatchment P-14: Subcat P-14

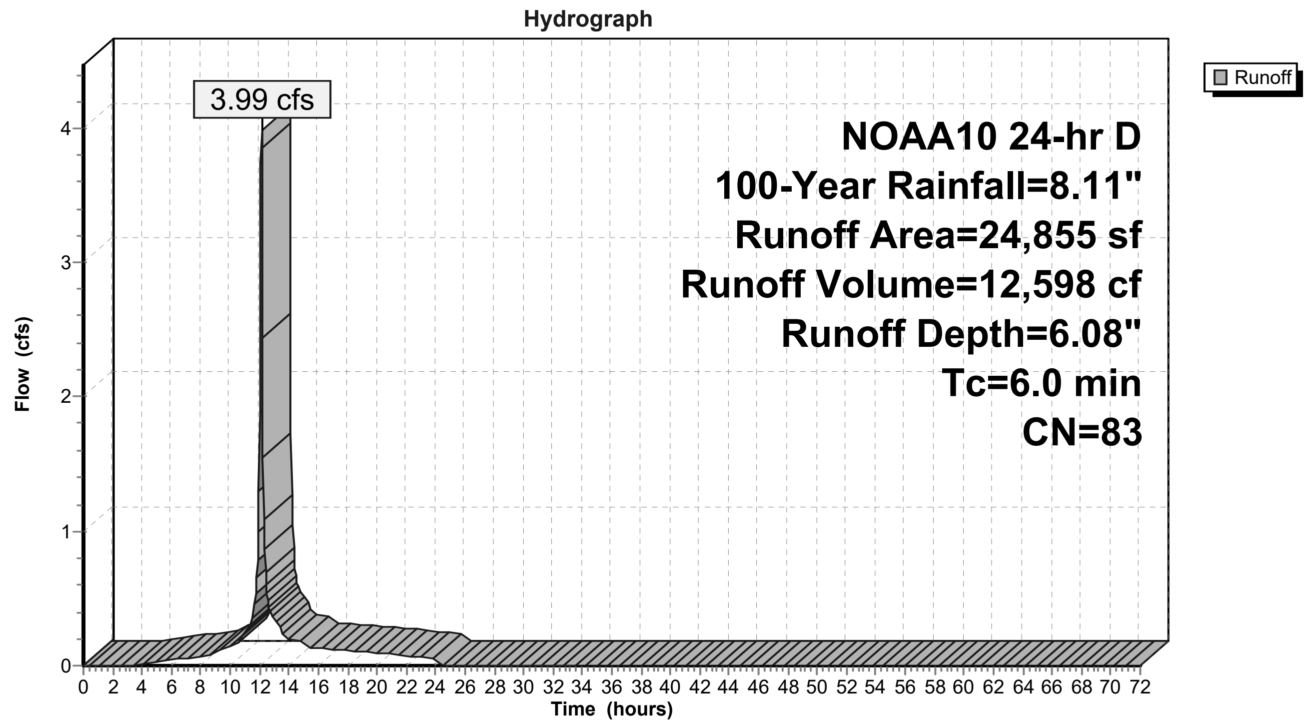
Runoff = 3.99 cfs @ 12.13 hrs, Volume= 12,598 cf, Depth= 6.08"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
9,959	61	>75% Grass cover, Good, HSG B
2,548	98	Paved parking, HSG B
12,345	98	Roofs, HSG B
2	55	Woods, Good, HSG B
24,855	83	Weighted Average
9,961		40.08% Pervious Area
14,893		59.92% Impervious Area

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

Subcatchment P-14: Subcat P-14



Summary for Subcatchment P-15: Subcat P-15

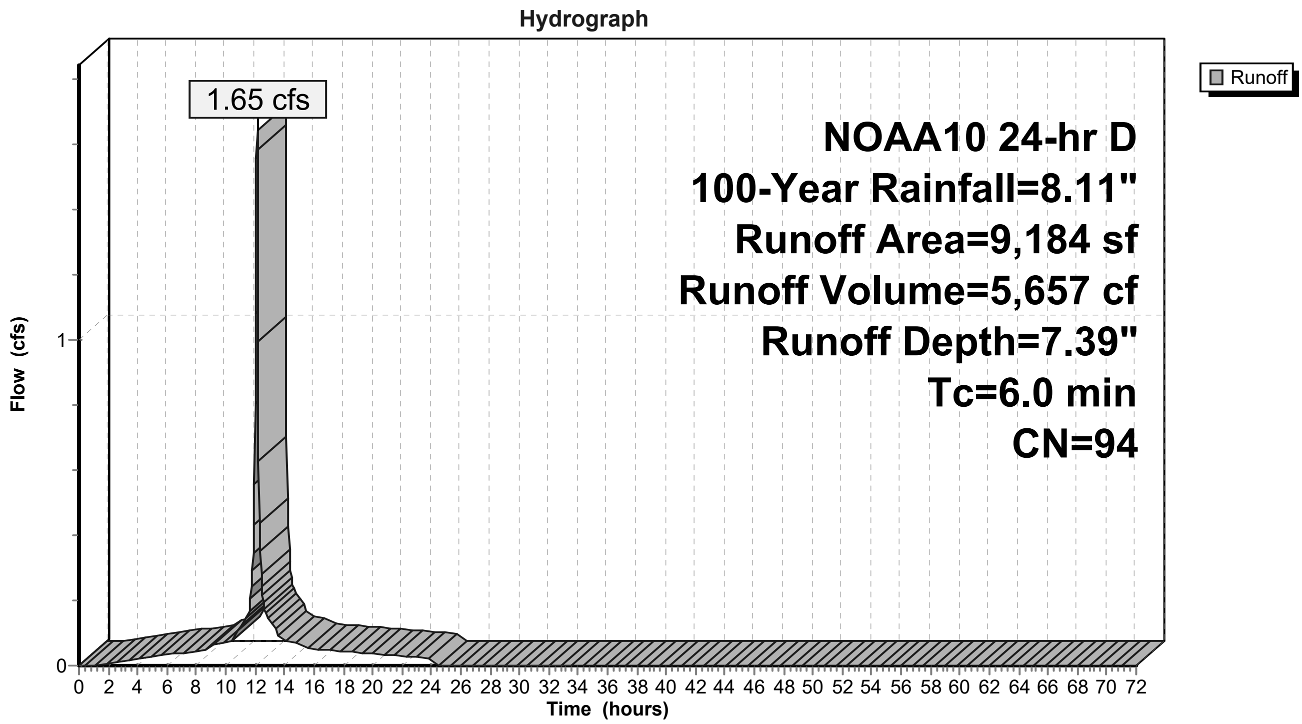
Runoff = 1.65 cfs @ 12.13 hrs, Volume= 5,657 cf, Depth= 7.39"
Routed to Pond 5P : UIS-4 (SC-310)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
1,039	61	>75% Grass cover, Good, HSG B
8,145	98	Paved parking, HSG B
9,184	94	Weighted Average
1,039		11.32% Pervious Area
8,145		88.68% Impervious Area

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

Subcatchment P-15: Subcat P-15



Summary for Subcatchment P-1A: Subcat P-1A

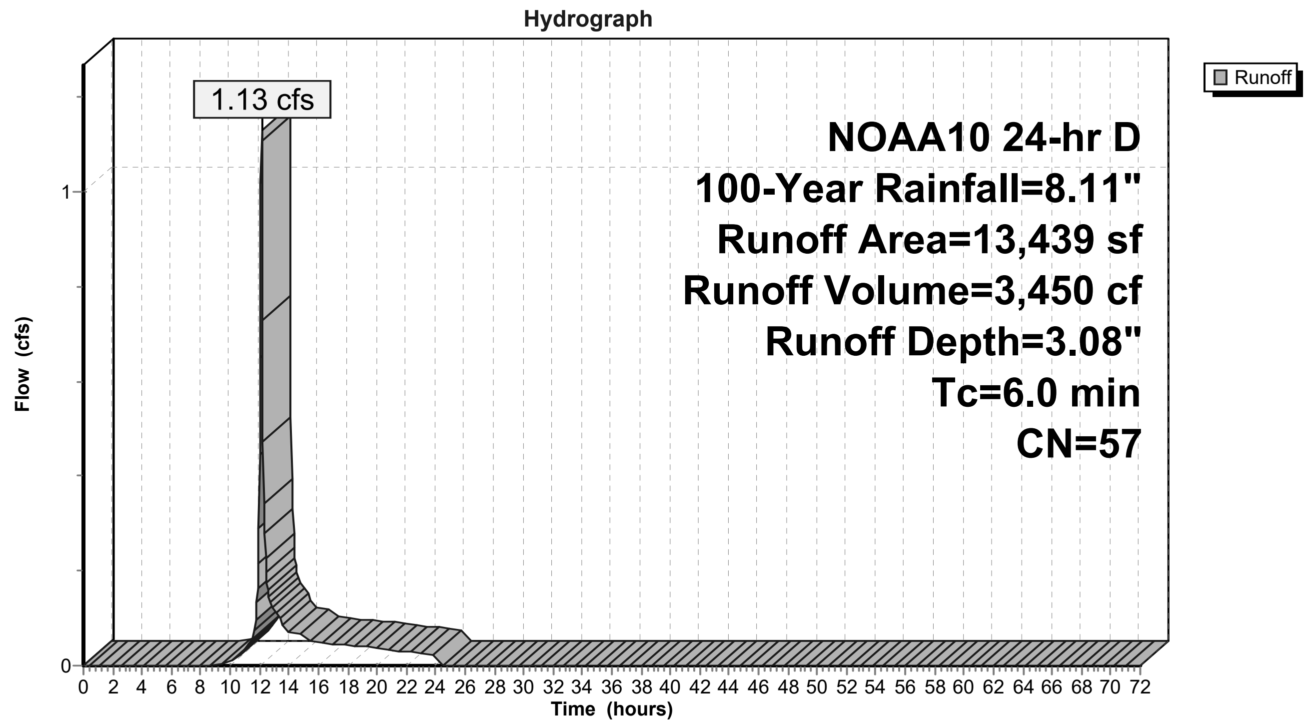
Runoff = 1.13 cfs @ 12.13 hrs, Volume= 3,450 cf, Depth= 3.08"
Routed to Link SP1 : STUDY POINT #1 (Kimball Road north)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
3,544	61	>75% Grass cover, Good, HSG B
40	98	Paved parking, HSG B
9,854	55	Woods, Good, HSG B
13,439	57	Weighted Average
13,398		99.70% Pervious Area
40		0.30% Impervious Area

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

Subcatchment P-1A: Subcat P-1A



Summary for Subcatchment P-1B: Subcat P-1B

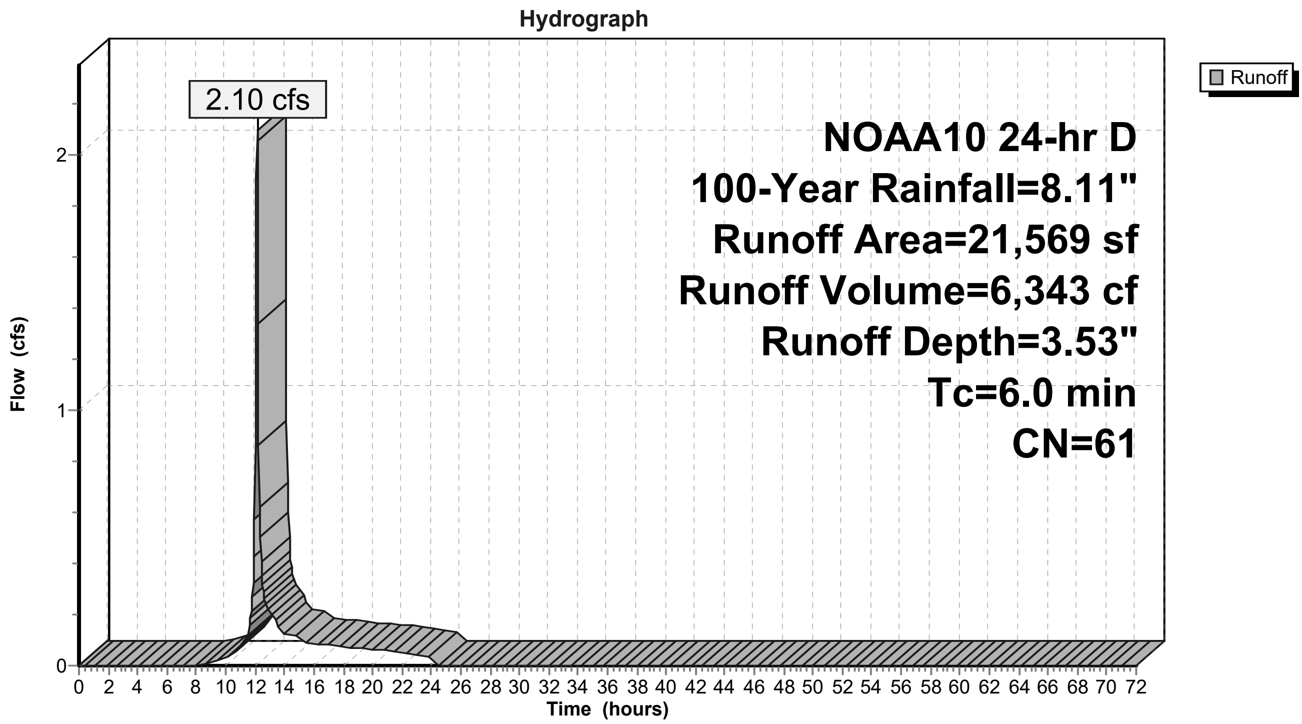
Runoff = 2.10 cfs @ 12.13 hrs, Volume= 6,343 cf, Depth= 3.53"
Routed to Link SP1 : STUDY POINT #1 (Kimball Road north)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
15,923	61	>75% Grass cover, Good, HSG B
718	98	Paved parking, HSG B
4,928	55	Woods, Good, HSG B
21,569	61	Weighted Average
20,851		96.67% Pervious Area
718		3.33% Impervious Area

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

Subcatchment P-1B: Subcat P-1B



Summary for Subcatchment P-2: Subcat P-2

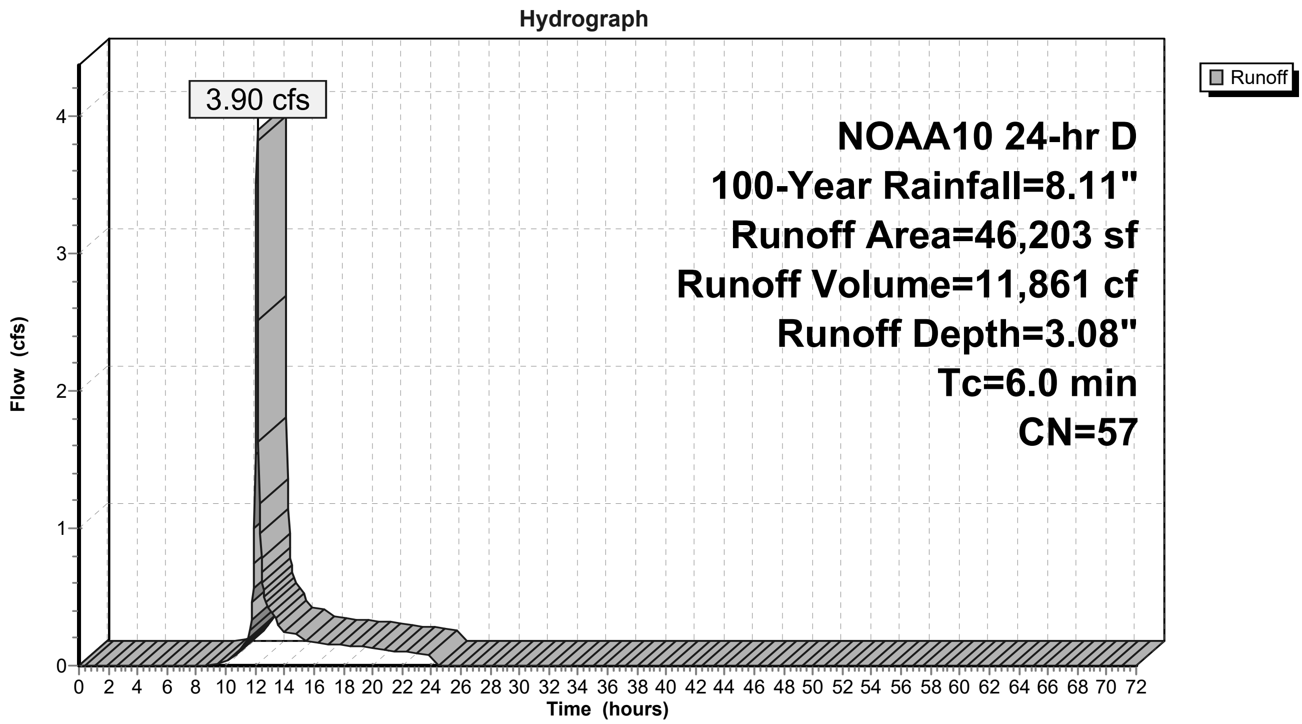
Runoff = 3.90 cfs @ 12.13 hrs, Volume= 11,861 cf, Depth= 3.08"
Routed to Link SP2 : STUDY POINT #2 (Wetlands West)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
8,701	61	>75% Grass cover, Good, HSG B
535	98	Paved parking, HSG B
209	98	Roofs, HSG B
36,759	55	Woods, Good, HSG B
46,203	57	Weighted Average
45,460		98.39% Pervious Area
743		1.61% Impervious Area

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

Subcatchment P-2: Subcat P-2



Summary for Subcatchment P-3: Subcat P-3

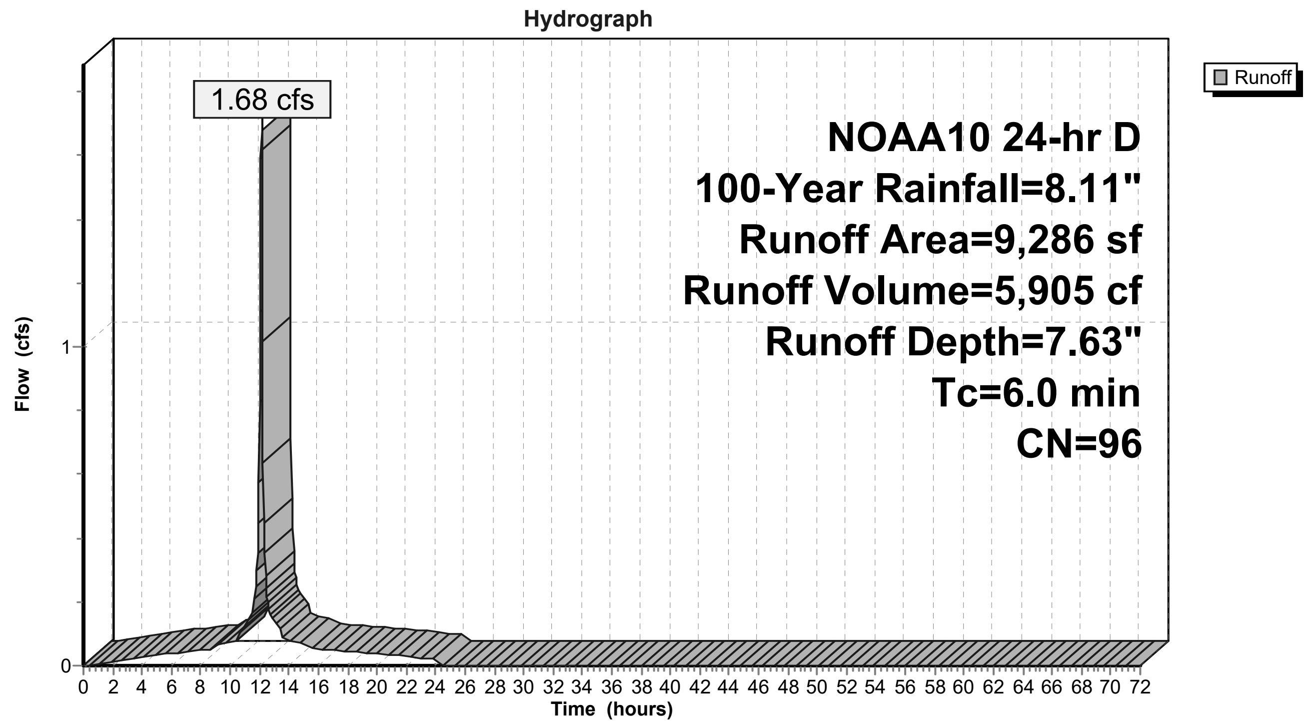
Runoff = 1.68 cfs @ 12.13 hrs, Volume= 5,905 cf, Depth= 7.63"
Routed to Pond 6P : UDS-5 (CMP 72")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
430	61	>75% Grass cover, Good, HSG B
8,855	98	Paved parking, HSG B
1	98	Roofs, HSG B
9,286	96	Weighted Average
430		4.63% Pervious Area
8,856		95.37% Impervious Area

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

Subcatchment P-3: Subcat P-3



Summary for Subcatchment P-4: Subcat P-4

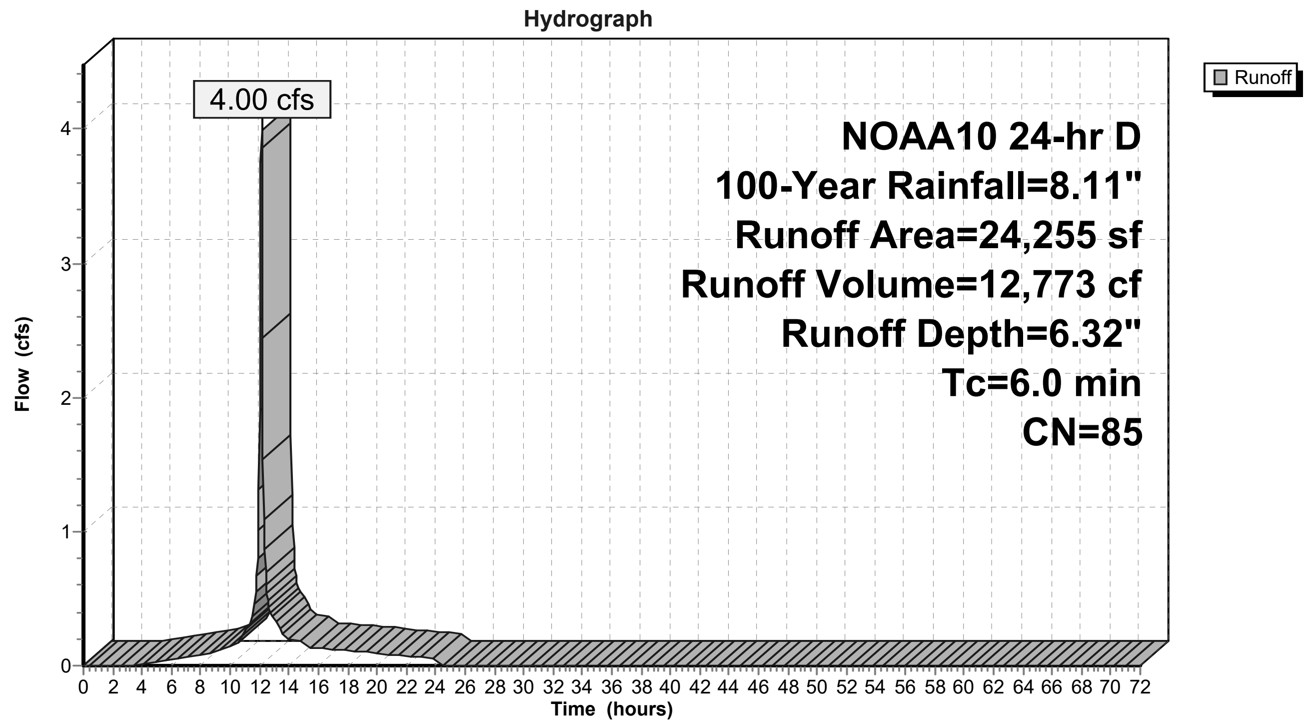
Runoff = 4.00 cfs @ 12.13 hrs, Volume= 12,773 cf, Depth= 6.32"
Routed to Pond 7P : UDS-6 (CMP 60")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
8,655	61	>75% Grass cover, Good, HSG B
14,992	98	Paved parking, HSG B
602	98	Roofs, HSG B
6	55	Woods, Good, HSG B
24,255	85	Weighted Average
8,661		35.71% Pervious Area
15,594		64.29% Impervious Area

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

Subcatchment P-4: Subcat P-4



Summary for Subcatchment P-5: Subcat P-5

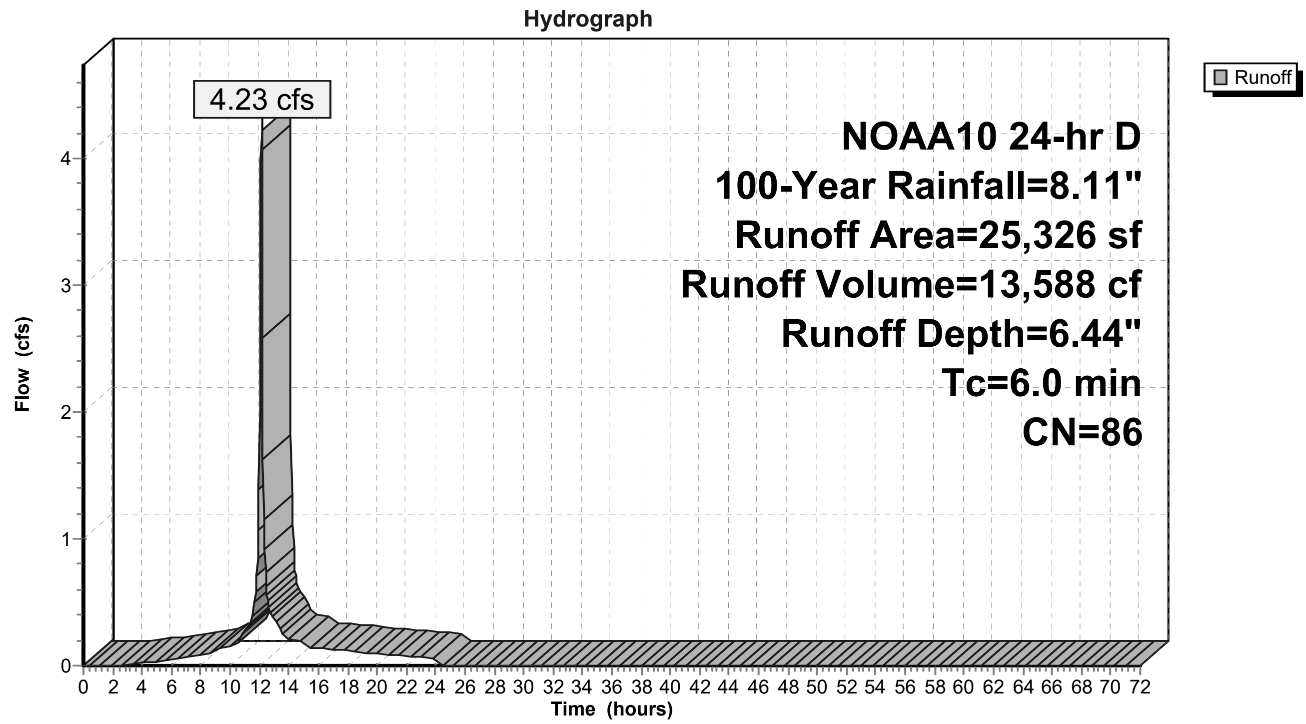
Runoff = 4.23 cfs @ 12.13 hrs, Volume= 13,588 cf, Depth= 6.44"
Routed to Pond 7P : UDS-6 (CMP 60")

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
7,931	61	>75% Grass cover, Good, HSG B
8,801	98	Paved parking, HSG B
8,589	98	Roofs, HSG B
6	55	Woods, Good, HSG B
25,326	86	Weighted Average
7,937		31.34% Pervious Area
17,389		68.66% Impervious Area

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

Subcatchment P-5: Subcat P-5



Summary for Subcatchment P-6: Subcat P-6

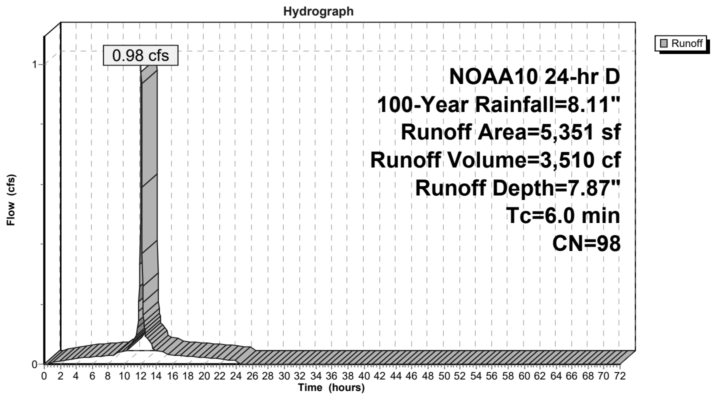
Runoff = 0.98 cfs @ 12.13 hrs, Volume= 3,510 cf, Depth= 7.87"
Routed to Pond 4P : UDS-3 (SC-310)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
5,351	98	Paved parking, HSG B
5,351		100.00% Impervious Area

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

Subcatchment P-6: Subcat P-6



Summary for Subcatchment P-7: Subcat P-7

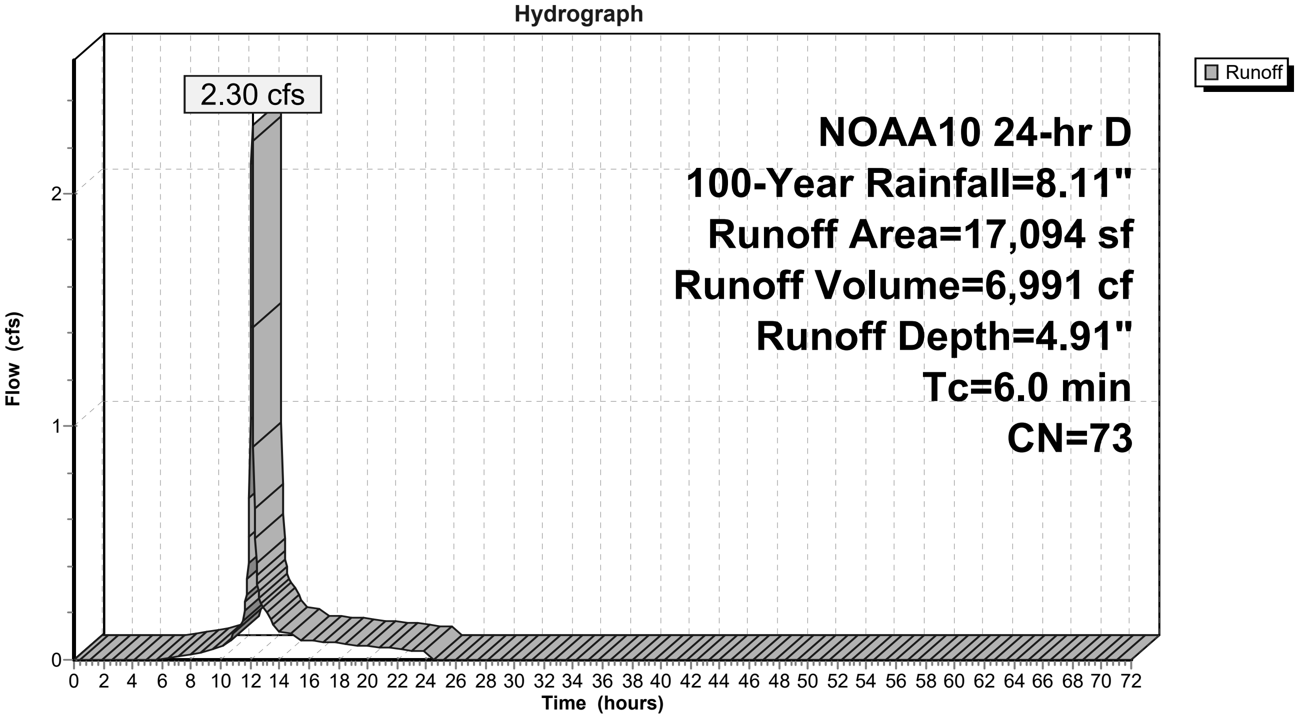
Runoff = 2.30 cfs @ 12.13 hrs, Volume= 6,991 cf, Depth= 4.91"
Routed to Pond 1P : Infiltration Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
11,506	61	>75% Grass cover, Good, HSG B
1,073	98	Paved parking, HSG B
4,510	98	Roofs, HSG B
4	55	Woods, Good, HSG B
17,094	73	Weighted Average
11,510		67.34% Pervious Area
5,584		32.66% Impervious Area

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

Subcatchment P-7: Subcat P-7



Summary for Subcatchment P-8: Subcat P-8

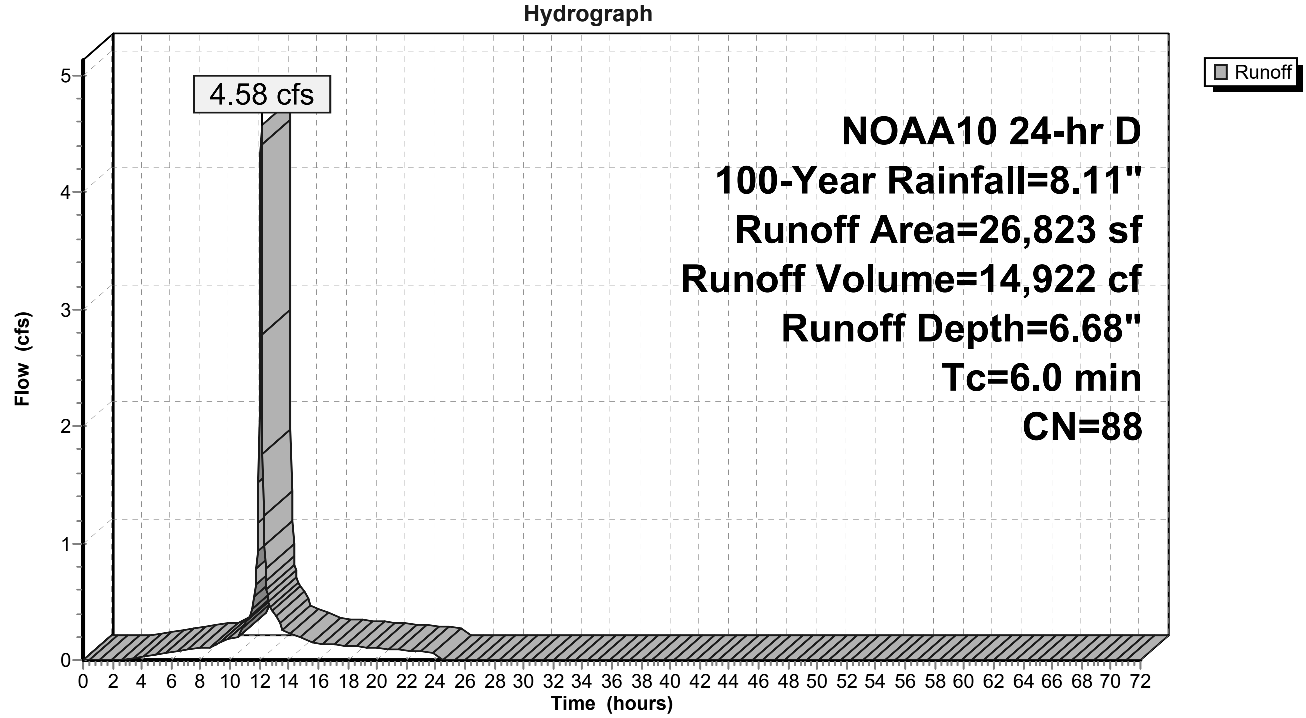
Runoff = 4.58 cfs @ 12.13 hrs, Volume= 14,922 cf, Depth= 6.68"
Routed to Pond 3P : UIS-2 (SC-800)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
7,489	61	>75% Grass cover, Good, HSG B
13,141	98	Paved parking, HSG B
6,193	98	Roofs, HSG B
26,823	88	Weighted Average
7,489		27.92% Pervious Area
19,334		72.08% Impervious Area

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

Subcatchment P-8: Subcat P-8



Summary for Subcatchment P-9: Subcat P-9

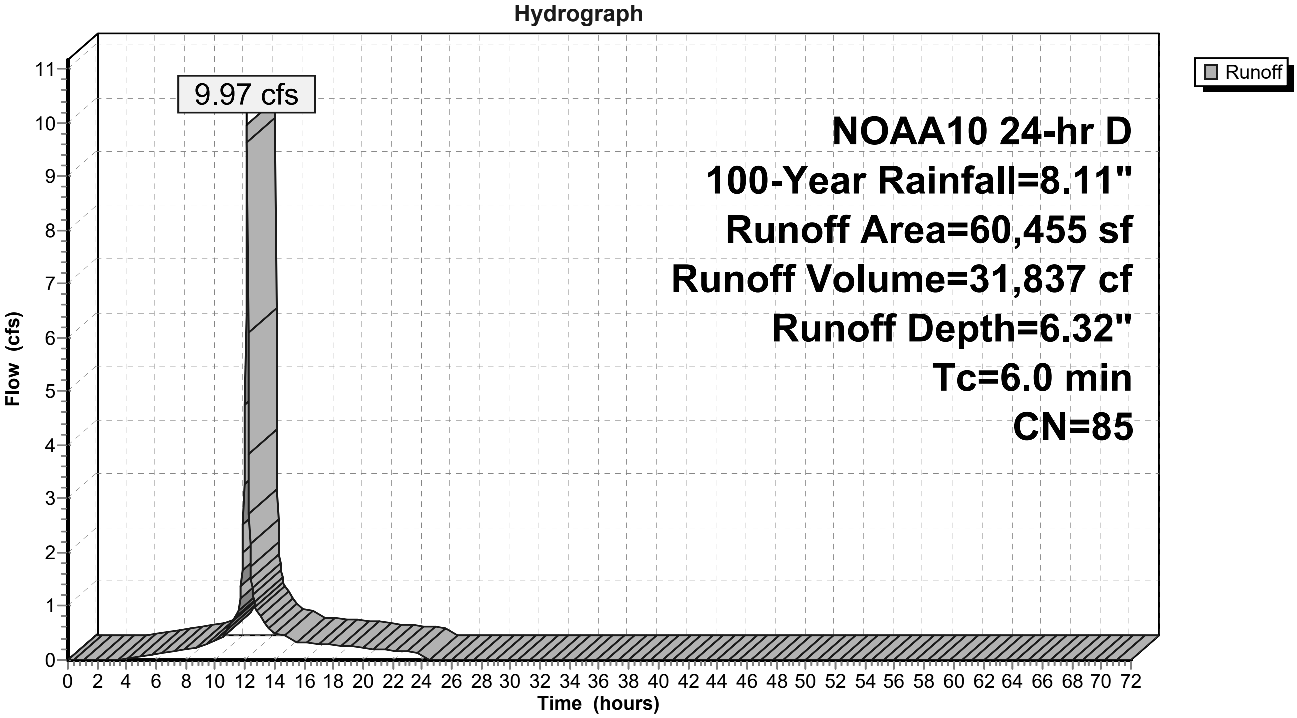
Runoff = 9.97 cfs @ 12.13 hrs, Volume= 31,837 cf, Depth= 6.32"
Routed to Pond 2P : UIS-1 (SC-800)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
17,971	61	>75% Grass cover, Good, HSG B
27,276	98	Paved parking, HSG B
13,018	98	Roofs, HSG B
2,190	55	Woods, Good, HSG B
60,455	85	Weighted Average
20,161		33.35% Pervious Area
40,294		66.65% Impervious Area

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

Subcatchment P-9: Subcat P-9



Summary for Pond 1P: Infiltration Basin

Inflow Area = 235,908 sf, 53.82% Impervious, Inflow Depth = 5.48" for 100-Year event
Inflow = 9.55 cfs @ 12.20 hrs, Volume= 107,752 cf
Outflow = 4.24 cfs @ 12.65 hrs, Volume= 105,845 cf, Atten= 56%, Lag= 27.0 min
Discarded = 0.12 cfs @ 12.65 hrs, Volume= 21,185 cf
Primary = 4.13 cfs @ 12.65 hrs, Volume= 84,660 cf
Routed to Link SP1 : STUDY POINT #1 (Kimball Road north)

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 146.32' @ 12.65 hrs Surf.Area= 4,915 sf Storage= 16,706 cf
Flood Elev= 146.50' Surf.Area= 5,034 sf Storage= 17,623 cf

Plug-Flow detention time= 291.7 min calculated for 105,772 cf (98% of inflow)
Center-of-Mass det. time= 271.8 min (1,339.7 - 1,067.9)

Volume	Invert	Avail.Storage	Storage Description
#1	141.50'	21,155 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

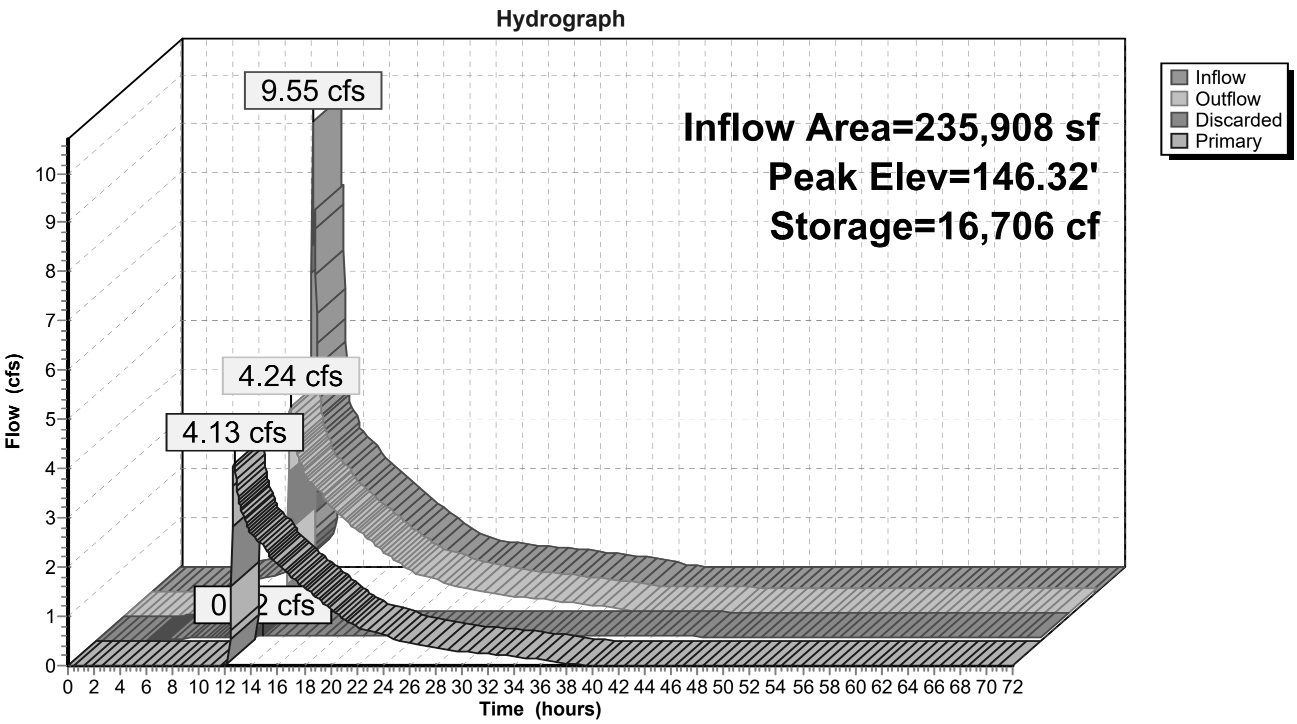
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
141.50	2,137	224.8	0	0	2,137
142.00	2,394	232.9	1,132	1,132	2,453
143.00	2,930	249.4	2,657	3,790	3,131
144.00	3,496	266.1	3,209	6,998	3,863
145.00	4,090	282.0	3,789	10,788	4,609
146.00	4,714	297.5	4,398	15,186	5,380
147.00	5,365	312.9	5,036	20,222	6,188
147.15	7,117	351.5	933	21,155	8,229

Device	Routing	Invert	Outlet Devices
#1	Discarded	141.50'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	141.50'	**12.0" Round Culvert** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 141.50' / 138.30' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	145.00'	**6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 2	145.90'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Primary	146.50'	**20.0' long x 18.0' breadth Overflow Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.12 cfs @ 12.65 hrs HW=146.32' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=4.12 cfs @ 12.65 hrs HW=146.32' (Free Discharge)
├─**2=Culvert** (Passes 4.12 cfs of 6.20 cfs potential flow)
│ ├─**3=6" Orifice** (Orifice Controls 0.98 cfs @ 4.97 fps)
│ └─**4=Broad-Crested Rectangular Weir** (Weir Controls 3.14 cfs @ 1.89 fps)
└─**5=Overflow Weir** (Controls 0.00 cfs)

Pond 1P: Infiltration Basin



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

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
141.50	2,137	0	145.00	4,090	10,788
141.60	2,187	216	145.10	4,150	11,200
141.70	2,238	437	145.20	4,211	11,618
141.80	2,289	664	145.30	4,273	12,042
141.90	2,341	895	145.40	4,334	12,472
142.00	2,394	1,132	145.50	4,396	12,909
142.10	2,445	1,374	145.60	4,459	13,352
142.20	2,497	1,621	145.70	4,522	13,801
142.30	2,549	1,873	145.80	4,586	14,256
142.40	2,602	2,131	145.90	4,650	14,718
142.50	2,655	2,394	146.00	4,714	15,186
142.60	2,709	2,662	146.10	4,777	15,660
142.70	2,764	2,936	146.20	4,841	16,141
142.80	2,818	3,215	146.30	4,905	16,629
142.90	2,874	3,499	146.40	4,969	17,122
143.00	2,930	3,790	146.50	5,034	17,623
143.10	2,984	4,085	146.60	5,100	18,129
143.20	3,039	4,387	146.70	5,165	18,642
143.30	3,095	4,693	146.80	5,231	19,162
143.40	3,150	5,005	146.90	5,298	19,689
143.50	3,207	5,323	147.00	5,365	20,222
143.60	3,264	5,647	147.10	**6,506**	**20,815**
143.70	3,321	5,976			
143.80	3,379	6,311			
143.90	3,437	6,652			
144.00	3,496	6,998			
144.10	3,553	7,351			
144.20	3,611	7,709			
144.30	3,669	8,073			
144.40	3,728	8,443			
144.50	3,787	8,819			
144.60	3,847	9,200			
144.70	3,907	9,588			
144.80	3,967	9,982			
144.90	4,029	10,382			

Summary for Pond 2P: UIS-1 (SC-800)

Inflow Area = 60,455 sf, 66.65% Impervious, Inflow Depth = 6.32" for 100-Year event
Inflow = 9.97 cfs @ 12.13 hrs, Volume= 31,837 cf
Outflow = 2.83 cfs @ 12.31 hrs, Volume= 31,837 cf, Atten= 72%, Lag= 11.0 min
Discarded = 0.13 cfs @ 6.60 hrs, Volume= 17,275 cf
Primary = 2.70 cfs @ 12.31 hrs, Volume= 14,562 cf
Routed to Link SP2 : STUDY POINT #2 (Wetlands West)

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 169.78' @ 12.31 hrs Surf.Area= 5,572 sf Storage= 12,451 cf
Flood Elev= 170.05' Surf.Area= 5,572 sf Storage= 13,061 cf

Plug-Flow detention time= 357.7 min calculated for 31,837 cf (100% of inflow)
Center-of-Mass det. time= 357.6 min (1,162.0 - 804.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	166.30'	5,222 cf	**34.75'W x 160.33'L x 3.75'H Field A** 20,893 cf Overall - 7,839 cf Embedded = 13,054 cf x 40.0% Voids
#2A	166.80'	7,839 cf	**ADS_StormTech SC-800 +Cap** x 154 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 154 Chambers in 7 Rows Cap Storage= 3.4 cf x 2 x 7 rows = 47.9 cf
		13,061 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	166.30'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	166.80'	**12.0" Round Culvert** L= 158.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 166.80' / 165.00' S= 0.0114 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	169.50'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00

Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4 Device 2 168.30' **6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.13 cfs @ 6.60 hrs HW=166.34' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=2.63 cfs @ 12.31 hrs HW=169.77' (Free Discharge)
└─**2=Culvert** (Passes 2.63 cfs of 4.67 cfs potential flow)
  ├─**3=Broad-Crested Rectangular Weir** (Weir Controls 1.59 cfs @ 1.47 fps)
  └─**4=6" Orifice** (Orifice Controls 1.04 cfs @ 5.32 fps)

Pond 2P: UIS-1 (SC-800) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-800 +Cap (ADS StormTech® SC-800 with cap volume)
Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf
Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap
Cap Storage= 3.4 cf x 2 x 7 rows = 47.9 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

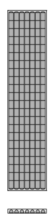
22 Chambers/Row x 7.12' Long +0.88' Cap Length x 2 = 158.33' Row Length +12.0" End Stone x 2 = 160.33' Base Length
7 Rows x 51.0" Wide + 6.0" Spacing x 6 + 12.0" Side Stone x 2 = 34.75' Base Width
6.0" Stone Base + 33.0" Chamber Height + 6.0" Stone Cover = 3.75' Field Height

154 Chambers x 50.6 cf + 3.4 cf Cap Volume x 2 x 7 Rows = 7,839.1 cf Chamber Storage

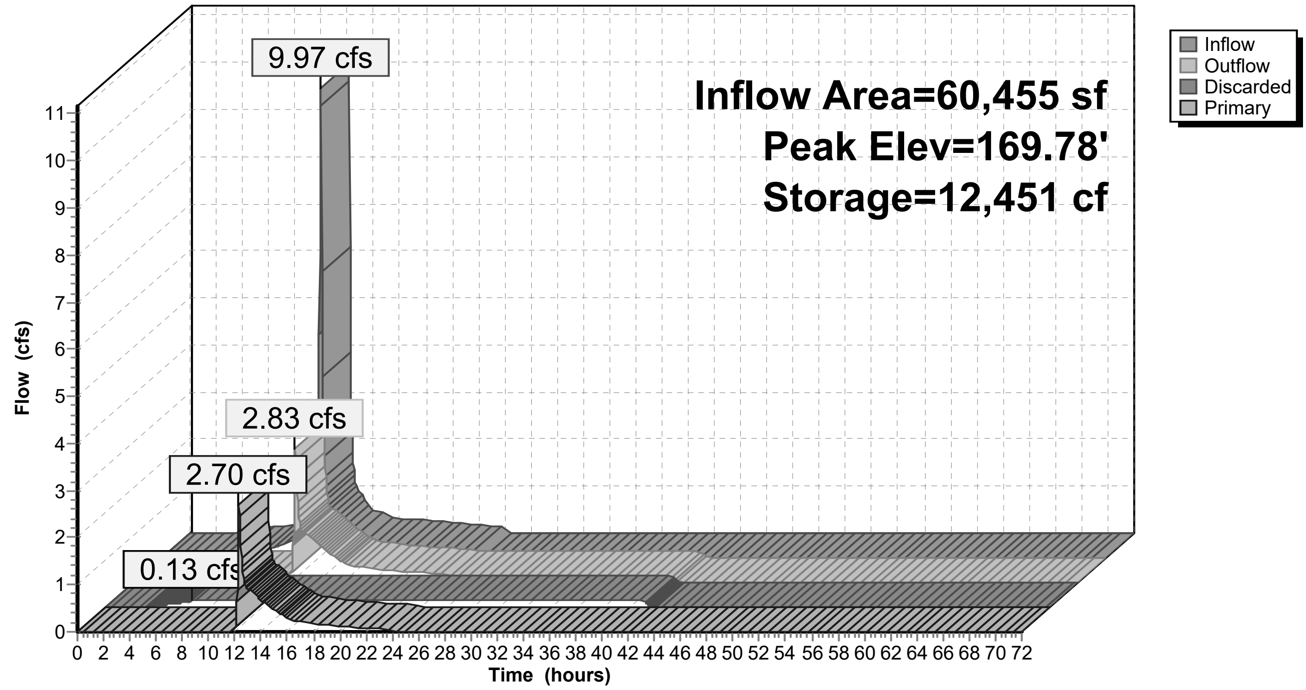
20,893.4 cf Field - 7,839.1 cf Chambers = 13,054.3 cf Stone x 40.0% Voids = 5,221.7 cf Stone Storage

Chamber Storage + Stone Storage = 13,060.8 cf = 0.300 af
Overall Storage Efficiency = 62.5%
Overall System Size = 160.33' x 34.75' x 3.75'

154 Chambers
773.8 cy Field
483.5 cy Stone



Pond 2P: UIS-1 (SC-800)



Stage-Area-Storage for Pond 2P: UIS-1 (SC-800)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
166.30	**5,572**	0	168.05	5,572	6,745	169.80	5,572	12,504
166.35	5,572	111	168.10	5,572	6,956	169.85	5,572	12,615
166.40	5,572	223	168.15	5,572	7,165	169.90	5,572	12,727
166.45	5,572	334	168.20	5,572	7,372	169.95	5,572	12,838
166.50	5,572	446	168.25	5,572	7,578	170.00	5,572	12,949
166.55	5,572	557	168.30	5,572	7,782	170.05	5,572	**13,061**
166.60	5,572	669	168.35	5,572	7,985			
166.65	5,572	780	168.40	5,572	8,185			
166.70	5,572	891	168.45	5,572	8,384			
166.75	5,572	1,003	168.50	5,572	8,581			
166.80	5,572	1,114	168.55	5,572	8,775			
166.85	5,572	1,350	168.60	5,572	8,968			
166.90	5,572	1,584	168.65	5,572	9,158			
166.95	5,572	1,819	168.70	5,572	9,346			
167.00	5,572	2,052	168.75	5,572	9,531			
167.05	5,572	2,285	168.80	5,572	9,714			
167.10	5,572	2,517	168.85	5,572	9,894			
167.15	5,572	2,748	168.90	5,572	10,071			
167.20	5,572	2,979	168.95	5,572	10,245			
167.25	5,572	3,208	169.00	5,572	10,415			
167.30	5,572	3,437	169.05	5,572	10,582			
167.35	5,572	3,665	169.10	5,572	10,744			
167.40	5,572	3,892	169.15	5,572	10,902			
167.45	5,572	4,118	169.20	5,572	11,053			
167.50	5,572	4,343	169.25	5,572	11,198			
167.55	5,572	4,567	169.30	5,572	11,335			
167.60	5,572	4,790	169.35	5,572	11,466			
167.65	5,572	5,012	169.40	5,572	11,592			
167.70	5,572	5,233	169.45	5,572	11,714			
167.75	5,572	5,453	169.50	5,572	11,832			
167.80	5,572	5,672	169.55	5,572	11,947			
167.85	5,572	5,889	169.60	5,572	12,058			
167.90	5,572	6,105	169.65	5,572	12,169			
167.95	5,572	6,320	169.70	5,572	12,281			
168.00	5,572	6,533	169.75	5,572	12,392			

Summary for Pond 3P: UIS-2 (SC-800)

Inflow Area = 26,823 sf, 72.08% Impervious, Inflow Depth = 6.68" for 100-Year event
Inflow = 4.58 cfs @ 12.13 hrs, Volume= 14,922 cf
Outflow = 2.97 cfs @ 12.22 hrs, Volume= 14,922 cf, Atten= 35%, Lag= 5.4 min
Discarded = 0.05 cfs @ 5.50 hrs, Volume= 7,917 cf
Primary = 2.92 cfs @ 12.22 hrs, Volume= 7,005 cf
Routed to Link SP2 : STUDY POINT #2 (Wetlands West)

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 162.16' @ 12.22 hrs Surf.Area= 2,248 sf Storage= 5,500 cf
Flood Elev= 162.35' Surf.Area= 2,248 sf Storage= 5,668 cf

Plug-Flow detention time= 402.8 min calculated for 14,912 cf (100% of inflow)
Center-of-Mass det. time= 403.4 min (1,196.6 - 793.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	158.10'	2,591 cf	**30.00'W x 74.93'L x 4.25'H Field A** 9,554 cf Overall - 3,077 cf Embedded = 6,477 cf x 40.0% Voids
#2A	158.85'	3,077 cf	**ADS_StormTech SC-800 +Cap** x 60 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 60 Chambers in 6 Rows Cap Storage= 3.4 cf x 2 x 6 rows = 41.0 cf
		5,668 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	158.10'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	160.78'	**12.0" Round Culvert** L= 78.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 160.78' / 160.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	161.80'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Device 2	160.78'	**6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.05 cfs @ 5.50 hrs HW=158.14' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=2.73 cfs @ 12.22 hrs HW=162.11' (Free Discharge)
└─**2=Culvert** (Inlet Controls 2.73 cfs @ 3.47 fps)
  ├─**3=Broad-Crested Rectangular Weir** (Passes < 2.02 cfs potential flow)
  └─**4=6" Orifice** (Passes < 0.98 cfs potential flow)

Pond 3P: UIS-2 (SC-800) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-800 +Cap (ADS StormTech® SC-800 with cap volume)
Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf
Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap
Cap Storage= 3.4 cf x 2 x 6 rows = 41.0 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

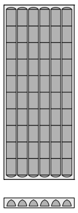
10 Chambers/Row x 7.12' Long +0.88' Cap Length x 2 = 72.93' Row Length +12.0" End Stone x 2 = 74.93' Base Length
6 Rows x 51.0" Wide + 6.0" Spacing x 5 + 12.0" Side Stone x 2 = 30.00' Base Width
9.0" Stone Base + 33.0" Chamber Height + 9.0" Stone Cover = 4.25' Field Height

60 Chambers x 50.6 cf + 3.4 cf Cap Volume x 2 x 6 Rows = 3,076.6 cf Chamber Storage

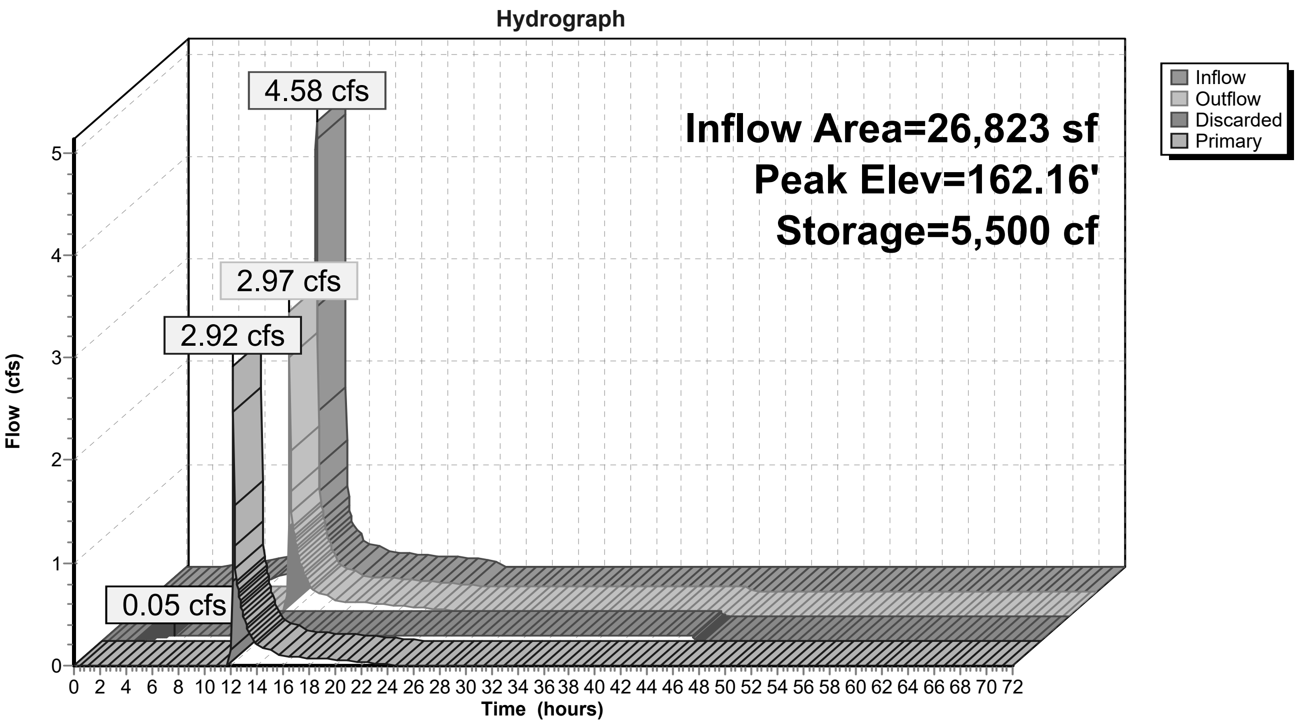
9,554.0 cf Field - 3,076.6 cf Chambers = 6,477.4 cf Stone x 40.0% Voids = 2,591.0 cf Stone Storage

Chamber Storage + Stone Storage = 5,667.5 cf = 0.130 af
Overall Storage Efficiency = 59.3%
Overall System Size = 74.93' x 30.00' x 4.25'

60 Chambers
353.9 cy Field
239.9 cy Stone



Pond 3P: UIS-2 (SC-800)



Stage-Area-Storage for Pond 3P: UIS-2 (SC-800)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
158.10	**2,248**	0	159.85	2,248	2,488	161.60	2,248	4,993
158.15	2,248	45	159.90	2,248	2,574	161.65	2,248	5,038
158.20	2,248	90	159.95	2,248	2,660	161.70	2,248	5,083
158.25	2,248	135	160.00	2,248	2,746	161.75	2,248	5,128
158.30	2,248	180	160.05	2,248	2,831	161.80	2,248	5,173
158.35	2,248	225	160.10	2,248	2,915	161.85	2,248	5,218
158.40	2,248	270	160.15	2,248	2,999	161.90	2,248	5,263
158.45	2,248	315	160.20	2,248	3,082	161.95	2,248	5,308
158.50	2,248	360	160.25	2,248	3,165	162.00	2,248	5,353
158.55	2,248	405	160.30	2,248	3,247	162.05	2,248	5,398
158.60	2,248	450	160.35	2,248	3,328	162.10	2,248	5,443
158.65	2,248	495	160.40	2,248	3,409	162.15	2,248	5,488
158.70	2,248	540	160.45	2,248	3,489	162.20	2,248	5,533
158.75	2,248	584	160.50	2,248	3,568	162.25	2,248	5,578
158.80	2,248	629	160.55	2,248	3,646	162.30	2,248	5,623
158.85	2,248	674	160.60	2,248	3,724	162.35	2,248	**5,668**
158.90	2,248	768	160.65	2,248	3,801			
158.95	2,248	861	160.70	2,248	3,877			
159.00	2,248	954	160.75	2,248	3,952			
159.05	2,248	1,047	160.80	2,248	4,026			
159.10	2,248	1,140	160.85	2,248	4,099			
159.15	2,248	1,232	160.90	2,248	4,170			
159.20	2,248	1,324	160.95	2,248	4,241			
159.25	2,248	1,416	161.00	2,248	4,311			
159.30	2,248	1,507	161.05	2,248	4,379			
159.35	2,248	1,598	161.10	2,248	4,445			
159.40	2,248	1,689	161.15	2,248	4,510			
159.45	2,248	1,779	161.20	2,248	4,573			
159.50	2,248	1,869	161.25	2,248	4,634			
159.55	2,248	1,959	161.30	2,248	4,692			
159.60	2,248	2,048	161.35	2,248	4,747			
159.65	2,248	2,137	161.40	2,248	4,800			
159.70	2,248	2,225	161.45	2,248	4,850			
159.75	2,248	2,313	161.50	2,248	4,899			
159.80	2,248	2,401	161.55	2,248	4,947			

Summary for Pond 4P: UDS-3 (SC-310)

Inflow Area = 5,351 sf,100.00% Impervious, Inflow Depth = 7.87" for 100-Year event
Inflow = 0.98 cfs @ 12.13 hrs, Volume= 3,510 cf
Outflow = 0.92 cfs @ 12.20 hrs, Volume= 3,510 cf, Atten= 6%, Lag= 4.2 min
Primary = 0.92 cfs @ 12.20 hrs, Volume= 3,510 cf
Routed to Link SP1 : STUDY POINT #1 (Kimball Road north)

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 135.64' @ 12.19 hrs Surf.Area= 375 sf Storage= 428 cf
Flood Elev= 135.83' Surf.Area= 375 sf Storage= 456 cf

Plug-Flow detention time= 12.4 min calculated for 3,510 cf (100% of inflow)
Center-of-Mass det. time= 12.1 min (754.6 - 742.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	133.50'	279 cf	**8.17'W x 45.92'L x 2.33'H Field A** 875 cf Overall - 177 cf Embedded = 698 cf x 40.0% Voids
#2A	134.00'	177 cf	**ADS_StormTech SC-310 +Cap** x 12 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 12 Chambers in 2 Rows
		456 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	133.50'	**12.0" Round Culvert** L= 33.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 133.50' / 132.84' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	135.50'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Device 1	133.50'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.88 cfs @ 12.20 hrs HW=135.63' (Free Discharge)
└─**1=Culvert** (Passes 0.88 cfs of 3.82 cfs potential flow)
  ├─**2=Broad-Crested Rectangular Weir** (Weir Controls 0.55 cfs @ 1.02 fps)
  └─**3=Orifice/Grate** (Orifice Controls 0.33 cfs @ 6.82 fps)

Pond 4P: UDS-3 (SC-310) - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-310 +Cap (ADS StormTech® SC-310 with cap length)
Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

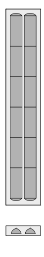
6 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 43.92' Row Length +12.0" End Stone x 2 = 45.92' Base Length
2 Rows x 34.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 8.17' Base Width
6.0" Stone Base + 16.0" Chamber Height + 6.0" Stone Cover = 2.33' Field Height

12 Chambers x 14.7 cf = 176.9 cf Chamber Storage

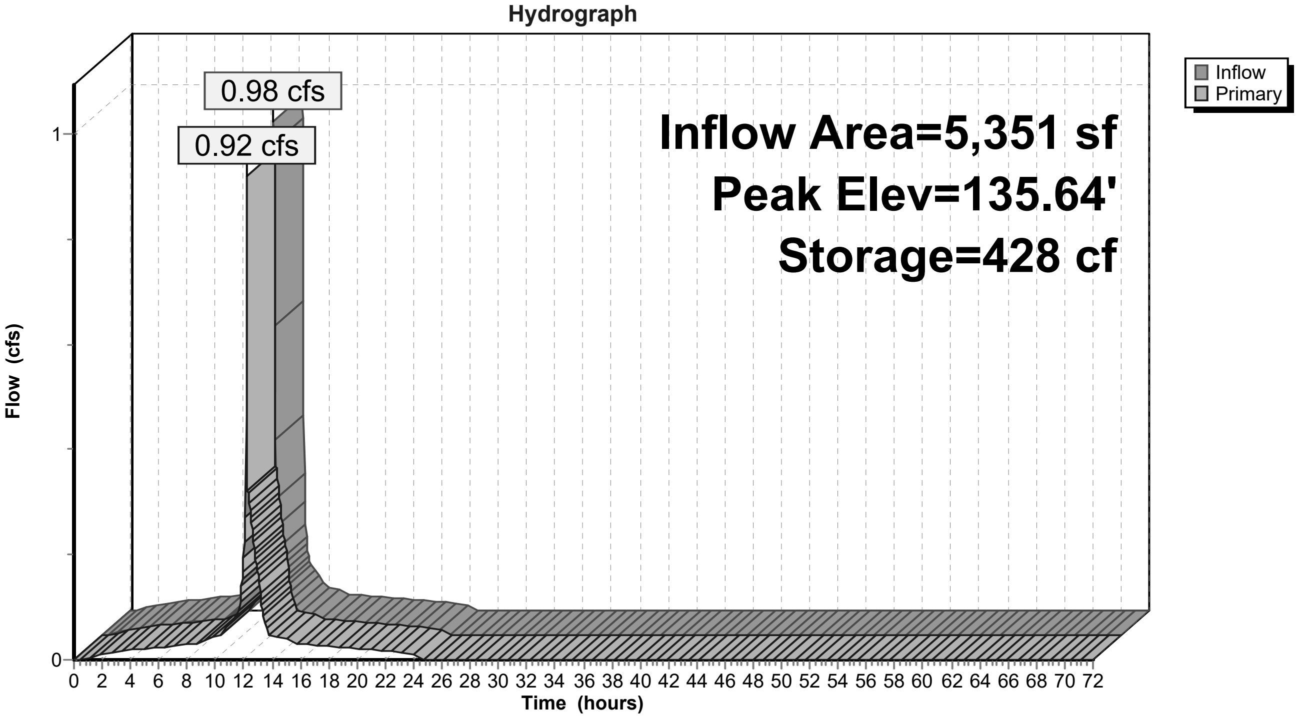
875.0 cf Field - 176.9 cf Chambers = 698.1 cf Stone x 40.0% Voids = 279.3 cf Stone Storage

Chamber Storage + Stone Storage = 456.2 cf = 0.010 af
Overall Storage Efficiency = 52.1%
Overall System Size = 45.92' x 8.17' x 2.33'

12 Chambers
32.4 cy Field
25.9 cy Stone



Pond 4P: UDS-3 (SC-310)



Stage-Area-Storage for Pond 4P: UDS-3 (SC-310)

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
133.50	0	134.20	129	134.90	303	135.60	421
133.52	3	134.22	135	134.92	307	135.62	424
133.54	6	134.24	140	134.94	311	135.64	427
133.56	9	134.26	145	134.96	315	135.66	430
133.58	12	134.28	151	134.98	320	135.68	433
133.60	15	134.30	156	135.00	324	135.70	436
133.62	18	134.32	161	135.02	328	135.72	439
133.64	21	134.34	166	135.04	332	135.74	442
133.66	24	134.36	172	135.06	336	135.76	445
133.68	27	134.38	177	135.08	339	135.78	448
133.70	30	134.40	182	135.10	343	135.80	451
133.72	33	134.42	187	135.12	347	135.82	**454**
133.74	36	134.44	192	135.14	350		
133.76	39	134.46	197	135.16	353		
133.78	42	134.48	203	135.18	357		
133.80	45	134.50	208	135.20	360		
133.82	48	134.52	213	135.22	363		
133.84	51	134.54	218	135.24	367		
133.86	54	134.56	223	135.26	370		
133.88	57	134.58	228	135.28	373		
133.90	60	134.60	233	135.30	376		
133.92	63	134.62	237	135.32	379		
133.94	66	134.64	242	135.34	382		
133.96	69	134.66	247	135.36	385		
133.98	72	134.68	252	135.38	388		
134.00	75	134.70	257	135.40	391		
134.02	80	134.72	262	135.42	394		
134.04	86	134.74	266	135.44	397		
134.06	91	134.76	271	135.46	400		
134.08	97	134.78	276	135.48	403		
134.10	102	134.80	280	135.50	406		
134.12	108	134.82	285	135.52	409		
134.14	113	134.84	289	135.54	412		
134.16	119	134.86	294	135.56	415		
134.18	124	134.88	298	135.58	418		

Summary for Pond 5P: UIS-4 (SC-310)

Inflow Area = 9,184 sf, 88.68% Impervious, Inflow Depth = 7.39" for 100-Year event
Inflow = 1.65 cfs @ 12.13 hrs, Volume= 5,657 cf
Outflow = 0.07 cfs @ 14.45 hrs, Volume= 5,657 cf, Atten= 96%, Lag= 139.1 min
Discarded = 0.06 cfs @ 9.30 hrs, Volume= 5,605 cf
Primary = 0.01 cfs @ 14.45 hrs, Volume= 52 cf
Routed to Pond 7P : UDS-6 (CMP 60")

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 165.46' @ 14.45 hrs Surf.Area= 2,592 sf Storage= 2,314 cf
Flood Elev= 166.33' Surf.Area= 2,592 sf Storage= 3,300 cf

Plug-Flow detention time= 324.6 min calculated for 5,653 cf (100% of inflow)
Center-of-Mass det. time= 324.6 min (1,091.1 - 766.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	164.00'	1,829 cf	**34.83'W x 74.40'L x 2.33'H Field A** 6,047 cf Overall - 1,474 cf Embedded = 4,573 cf x 40.0% Voids
#2A	164.50'	1,474 cf	**ADS_StormTech SC-310 +Cap** x 100 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 100 Chambers in 10 Rows
		3,303 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	164.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	164.50'	**15.0" Round Culvert** L= 25.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 164.50' / 163.00' S= 0.0600 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#3	Device 2	165.45'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.06 cfs @ 9.30 hrs HW=164.02' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.01 cfs @ 14.45 hrs HW=165.46' (Free Discharge)
└─**2=Culvert** (Passes 0.01 cfs of 2.66 cfs potential flow)
  └─**3=Broad-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.25 fps)

Pond 5P: UIS-4 (SC-310) - Chamber Wizard Field A

Chamber Model = ADS_StormTechSC-310 +Cap (ADS StormTech®SC-310 with cap length)
Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

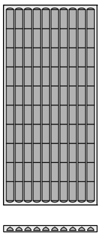
10 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 72.40' Row Length +12.0" End Stone x 2 = 74.40' Base Length
10 Rows x 34.0" Wide + 6.0" Spacing x 9 + 12.0" Side Stone x 2 = 34.83' Base Width
6.0" Stone Base + 16.0" Chamber Height + 6.0" Stone Cover = 2.33' Field Height

100 Chambers x 14.7 cf = 1,474.2 cf Chamber Storage

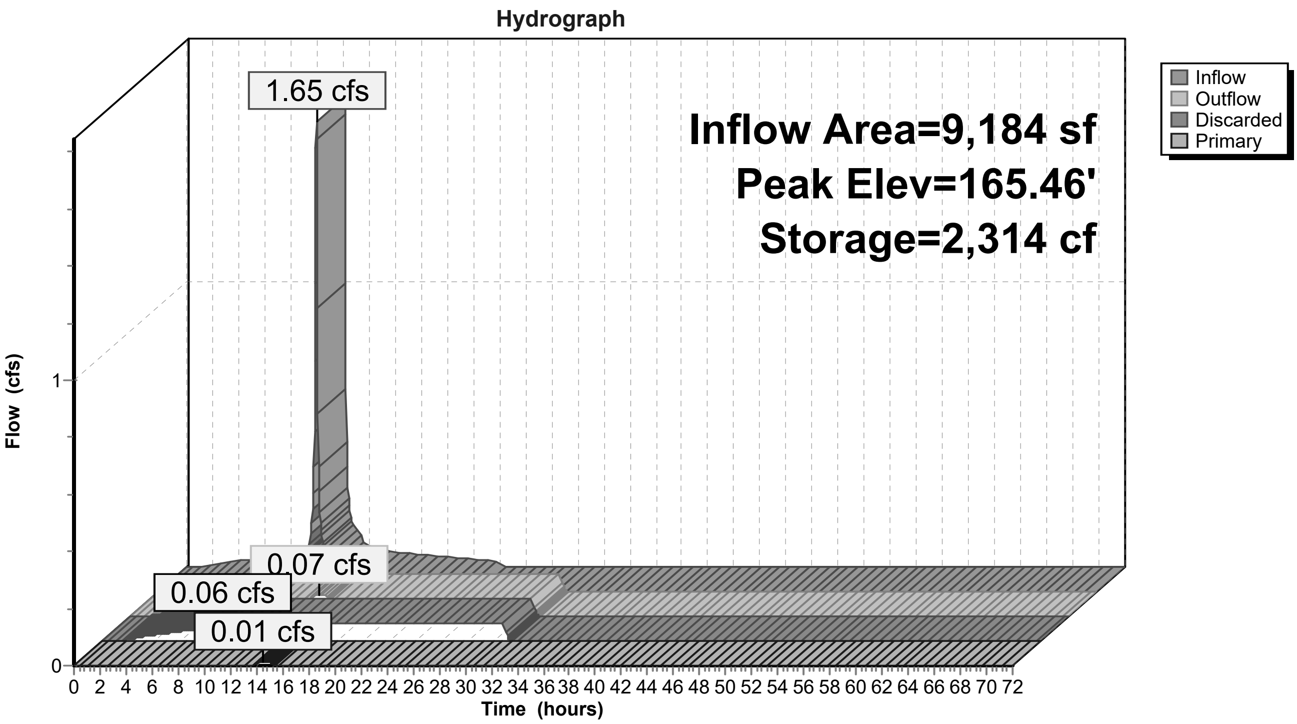
6,047.1 cf Field - 1,474.2 cf Chambers = 4,572.9 cf Stone x 40.0% Voids = 1,829.1 cf Stone Storage

Chamber Storage + Stone Storage = 3,303.3 cf = 0.076 af
Overall Storage Efficiency = 54.6%
Overall System Size = 74.40' x 34.83' x 2.33'

100 Chambers
224.0 cy Field
169.4 cy Stone



Pond 5P: UIS-4 (SC-310)



Stage-Area-Storage for Pond 5P: UIS-4 (SC-310)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
164.00	**2,592**	0	165.75	2,592	2,695
164.05	2,592	52	165.80	2,592	2,750
164.10	2,592	104	165.85	2,592	2,802
164.15	2,592	155	165.90	2,592	2,854
164.20	2,592	207	165.95	2,592	2,906
164.25	2,592	259	166.00	2,592	2,958
164.30	2,592	311	166.05	2,592	3,010
164.35	2,592	363	166.10	2,592	3,061
164.40	2,592	415	166.15	2,592	3,113
164.45	2,592	466	166.20	2,592	3,165
164.50	2,592	518	166.25	2,592	3,217
164.55	2,592	622	166.30	2,592	**3,269**
164.60	2,592	724			
164.65	2,592	827			
164.70	2,592	928			
164.75	2,592	1,029			
164.80	2,592	1,129			
164.85	2,592	1,227			
164.90	2,592	1,325			
164.95	2,592	1,422			
165.00	2,592	1,517			
165.05	2,592	1,611			
165.10	2,592	1,703			
165.15	2,592	1,794			
165.20	2,592	1,884			
165.25	2,592	1,972			
165.30	2,592	2,057			
165.35	2,592	2,141			
165.40	2,592	2,222			
165.45	2,592	2,301			
165.50	2,592	2,377			
165.55	2,592	2,449			
165.60	2,592	2,516			
165.65	2,592	2,579			
165.70	2,592	2,638			

Summary for Pond 6P: UDS-5 (CMP 72")

Inflow Area = 160,048 sf, 50.15% Impervious, Inflow Depth = 5.57" for 100-Year event
Inflow = 23.76 cfs @ 12.13 hrs, Volume= 74,349 cf
Outflow = 5.64 cfs @ 12.35 hrs, Volume= 74,349 cf, Atten= 76%, Lag= 13.3 min
Primary = 5.64 cfs @ 12.35 hrs, Volume= 74,349 cf
Routed to Pond 7P : UDS-6 (CMP 60")

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 168.42' @ 12.35 hrs Surf.Area= 4,970 sf Storage= 23,256 cf
Flood Elev= 168.50' Surf.Area= 4,970 sf Storage= 23,416 cf

Plug-Flow detention time= 98.5 min calculated for 74,349 cf (100% of inflow)
Center-of-Mass det. time= 97.8 min (918.8 - 821.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	161.50'	7,583 cf	**35.00'W x 142.00'L x 7.00'H Field A** 34,790 cf Overall - 15,834 cf Embedded = 18,956 cf x 40.0% Voids
#2A	162.00'	15,834 cf	**CMP Round 72** x 28 Inside #1 Effective Size= 72.0"W x 72.0"H => 28.27 sf x 20.00'L = 565.5 cf Overall Size= 72.0"W x 72.0"H x 20.00'L 28 Chambers in 4 Rows
		23,416 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	161.50'	**12.0" Round Culvert** L= 10.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 161.50' / 161.00' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	168.00'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Device 1	161.50'	**6.0" Vert. 6" Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=5.62 cfs @ 12.35 hrs HW=168.42' (Free Discharge)
└─**1=Culvert** (Passes 5.62 cfs of 7.56 cfs potential flow)
  ├─**2=Broad-Crested Rectangular Weir** (Weir Controls 3.18 cfs @ 1.90 fps)
  └─**3=6" Orifice** (Orifice Controls 2.44 cfs @ 12.43 fps)

Pond 6P: UDS-5 (CMP 72") - Chamber Wizard Field A

Chamber Model = CMP Round 72 (Round Corrugated Metal Pipe)
Effective Size= 72.0"W x 72.0"H => 28.27 sf x 20.00'L = 565.5 cf
Overall Size= 72.0"W x 72.0"H x 20.00'L

72.0" Wide + 36.0" Spacing = 108.0" C-C Row Spacing

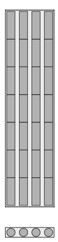
7 Chambers/Row x 20.00' Long = 140.00' Row Length +12.0" End Stone x 2 = 142.00' Base Length
4 Rows x 72.0" Wide + 36.0" Spacing x 3 + 12.0" Side Stone x 2 = 35.00' Base Width
6.0" Stone Base + 72.0" Chamber Height + 6.0" Stone Cover = 7.00' Field Height

28 Chambers x 565.5 cf = 15,833.6 cf Chamber Storage

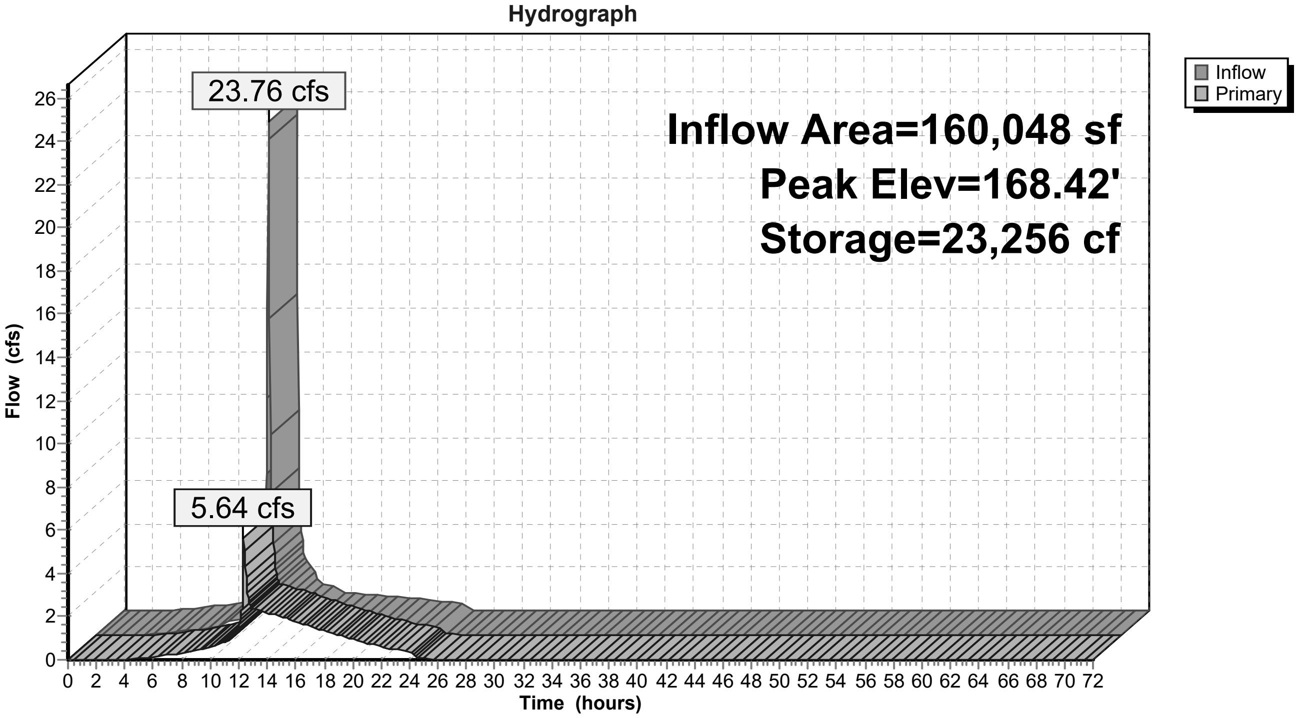
34,790.0 cf Field - 15,833.6 cf Chambers = 18,956.4 cf Stone x 40.0% Voids = 7,582.5 cf Stone Storage

Chamber Storage + Stone Storage = 23,416.2 cf = 0.538 af
Overall Storage Efficiency = 67.3%
Overall System Size = 142.00' x 35.00' x 7.00'

28 Chambers
1,288.5 cy Field
702.1 cy Stone



Pond 6P: UDS-5 (CMP 72")



Stage-Area-Storage for Pond 6P: UDS-5 (CMP 72")

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
161.50	0	163.25	4,913	165.00	11,708	166.75	18,503	168.50	**23,416**
161.55	99	163.30	5,095	165.05	11,908	166.80	18,684		
161.60	199	163.35	5,278	165.10	12,108	166.85	18,863		
161.65	298	163.40	5,462	165.15	12,309	166.90	19,041		
161.70	398	163.45	5,647	165.20	12,509	166.95	19,218		
161.75	497	163.50	5,833	165.25	12,709	167.00	19,393		
161.80	596	163.55	6,020	165.30	12,908	167.05	19,567		
161.85	696	163.60	6,209	165.35	13,108	167.10	19,739		
161.90	795	163.65	6,398	165.40	13,307	167.15	19,910		
161.95	895	163.70	6,587	165.45	13,506	167.20	20,079		
162.00	994	163.75	6,778	165.50	13,705	167.25	20,246		
162.05	1,102	163.80	6,969	165.55	13,904	167.30	20,411		
162.10	1,227	163.85	7,162	165.60	14,102	167.35	20,574		
162.15	1,355	163.90	7,354	165.65	14,300	167.40	20,735		
162.20	1,489	163.95	7,548	165.70	14,498	167.45	20,894		
162.25	1,626	164.00	7,742	165.75	14,695	167.50	21,050		
162.30	1,768	164.05	7,937	165.80	14,892	167.55	21,204		
162.35	1,913	164.10	8,132	165.85	15,088	167.60	21,355		
162.40	2,061	164.15	8,328	165.90	15,284	167.65	21,503		
162.45	2,212	164.20	8,524	165.95	15,479	167.70	21,648		
162.50	2,366	164.25	8,721	166.00	15,674	167.75	21,790		
162.55	2,522	164.30	8,918	166.05	15,868	167.80	21,927		
162.60	2,681	164.35	9,116	166.10	16,062	167.85	22,061		
162.65	2,842	164.40	9,314	166.15	16,255	167.90	22,189		
162.70	3,005	164.45	9,512	166.20	16,447	167.95	22,310		
162.75	3,170	164.50	9,711	166.25	16,638	168.00	22,422		
162.80	3,337	164.55	9,910	166.30	16,829	168.05	22,522		
162.85	3,506	164.60	10,109	166.35	17,019	168.10	22,621		
162.90	3,677	164.65	10,308	166.40	17,208	168.15	22,720		
162.95	3,849	164.70	10,508	166.45	17,396	168.20	22,820		
163.00	4,023	164.75	10,708	166.50	17,583	168.25	22,919		
163.05	4,198	164.80	10,908	166.55	17,769	168.30	23,019		
163.10	4,375	164.85	11,108	166.60	17,954	168.35	23,118		
163.15	4,553	164.90	11,308	166.65	18,138	168.40	23,217		
163.20	4,732	164.95	11,508	166.70	18,321	168.45	23,317		

Summary for Pond 7P: UDS-6 (CMP 60")

Inflow Area = 218,814 sf, 55.48% Impervious, Inflow Depth = 5.53" for 100-Year event
Inflow = 10.21 cfs @ 12.13 hrs, Volume= 100,762 cf
Outflow = 8.22 cfs @ 12.21 hrs, Volume= 100,762 cf, Atten= 19%, Lag= 4.7 min
Primary = 8.22 cfs @ 12.21 hrs, Volume= 100,762 cf
Routed to Pond 1P : Infiltration Basin

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 157.96' @ 12.21 hrs Surf.Area= 4,514 sf Storage= 17,833 cf
Flood Elev= 158.00' Surf.Area= 4,514 sf Storage= 17,902 cf

Plug-Flow detention time= 194.6 min calculated for 100,692 cf (100% of inflow)
Center-of-Mass det. time= 195.2 min (1,083.5 - 888.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	152.00'	6,121 cf	**37.00'W x 122.00'L x 6.00'H Field A** 27,084 cf Overall - 11,781 cf Embedded = 15,303 cf x 40.0% Voids
#2A	152.50'	11,781 cf	**CMP Round 60** x 30 Inside #1 Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf Overall Size= 60.0"W x 60.0"H x 20.00'L 30 Chambers in 5 Rows
		17,902 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	152.00'	**15.0" Round Culvert** L= 250.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 152.00' / 150.00' S= 0.0080 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	157.25'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Device 1	152.00'	**3.0" Vert. 3" Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=7.75 cfs @ 12.21 hrs HW=157.93' (Free Discharge)
└─**1=Culvert** (Passes 7.75 cfs of 9.16 cfs potential flow)
  ├─**2=Broad-Crested Rectangular Weir** (Weir Controls 7.18 cfs @ 2.62 fps)
  └─**3=3" Orifice** (Orifice Controls 0.57 cfs @ 11.61 fps)

Pond 7P: UDS-6 (CMP 60") - Chamber Wizard Field A

Chamber Model = CMP Round 60 (Round Corrugated Metal Pipe)
Effective Size= 60.0"W x 60.0"H => 19.63 sf x 20.00'L = 392.7 cf
Overall Size= 60.0"W x 60.0"H x 20.00'L

60.0" Wide + 30.0" Spacing = 90.0" C-C Row Spacing

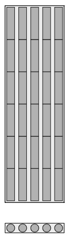
6 Chambers/Row x 20.00' Long = 120.00' Row Length +12.0" End Stone x 2 = 122.00' Base Length
5 Rows x 60.0" Wide + 30.0" Spacing x 4 + 12.0" Side Stone x 2 = 37.00' Base Width
6.0" Stone Base + 60.0" Chamber Height + 6.0" Stone Cover = 6.00' Field Height

30 Chambers x 392.7 cf = 11,781.0 cf Chamber Storage

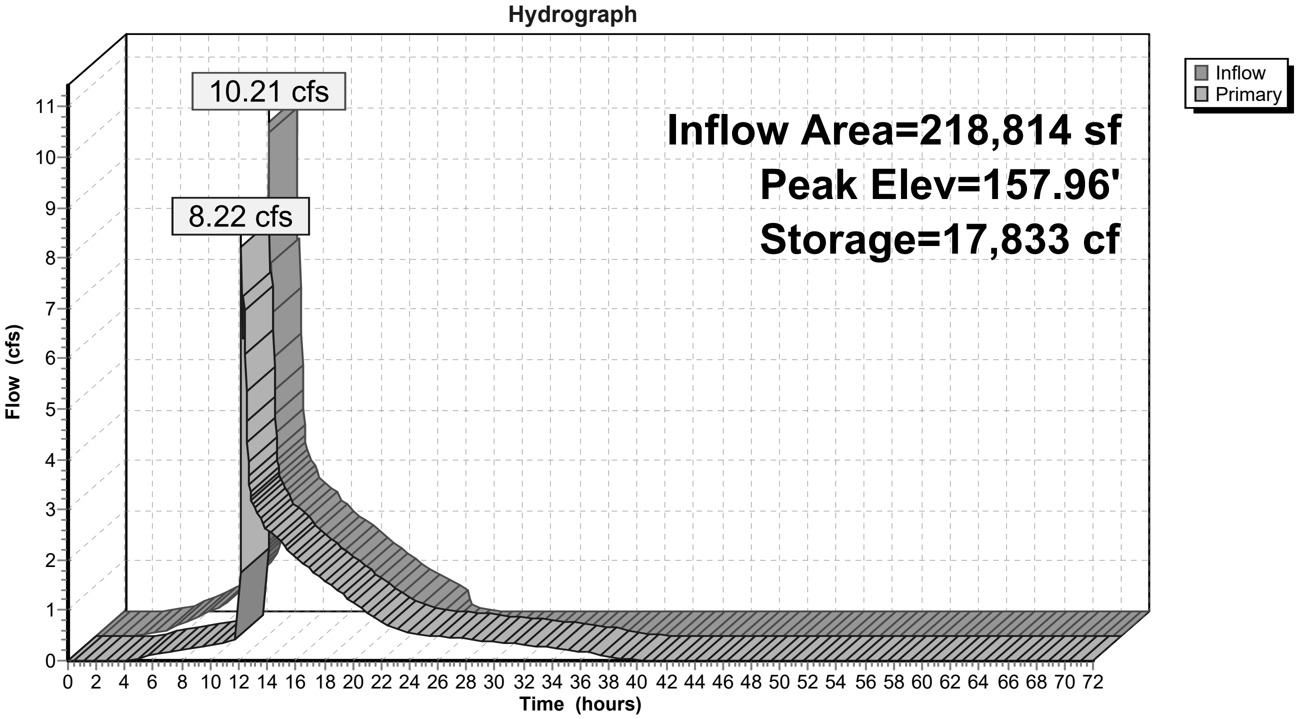
27,084.0 cf Field - 11,781.0 cf Chambers = 15,303.0 cf Stone x 40.0% Voids = 6,121.2 cf Stone Storage

Chamber Storage + Stone Storage = 17,902.2 cf = 0.411 af
Overall Storage Efficiency = 66.1%
Overall System Size = 122.00' x 37.00' x 6.00'

30 Chambers
1,003.1 cy Field
566.8 cy Stone



Pond 7P: UDS-6 (CMP 60")



Stage-Area-Storage for Pond 7P: UDS-6 (CMP 60")

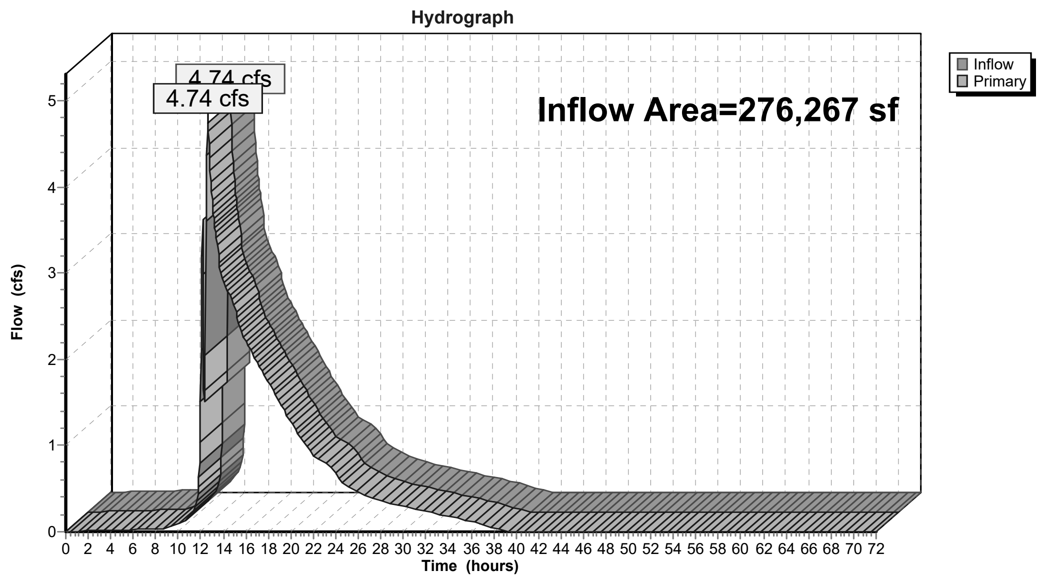
Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
152.00	0	153.75	4,542	155.50	10,748	157.25	16,416
152.05	90	153.80	4,710	155.55	10,926	157.30	16,543
152.10	181	153.85	4,880	155.60	11,104	157.35	16,667
152.15	271	153.90	5,051	155.65	11,281	157.40	16,785
152.20	361	153.95	5,222	155.70	11,458	157.45	16,897
152.25	451	154.00	5,395	155.75	11,635	157.50	16,999
152.30	542	154.05	5,568	155.80	11,811	157.55	17,090
152.35	632	154.10	5,742	155.85	11,986	157.60	17,180
152.40	722	154.15	5,916	155.90	12,160	157.65	17,270
152.45	813	154.20	6,092	155.95	12,334	157.70	17,361
152.50	903	154.25	6,267	156.00	12,507	157.75	17,451
152.55	1,005	154.30	6,444	156.05	12,680	157.80	17,541
152.60	1,117	154.35	6,621	156.10	12,851	157.85	17,631
152.65	1,235	154.40	6,798	156.15	13,022	157.90	17,722
152.70	1,359	154.45	6,976	156.20	13,192	157.95	17,812
152.75	1,486	154.50	7,154	156.25	13,360	158.00	**17,902**
152.80	1,618	154.55	7,333	156.30	13,528		
152.85	1,752	154.60	7,512	156.35	13,695		
152.90	1,890	154.65	7,691	156.40	13,860		
152.95	2,030	154.70	7,871	156.45	14,024		
153.00	2,173	154.75	8,050	156.50	14,187		
153.05	2,319	154.80	8,230	156.55	14,349		
153.10	2,467	154.85	8,410	156.60	14,509		
153.15	2,616	154.90	8,591	156.65	14,668		
153.20	2,768	154.95	8,771	156.70	14,825		
153.25	2,922	155.00	8,951	156.75	14,980		
153.30	3,077	155.05	9,131	156.80	15,134		
153.35	3,234	155.10	9,312	156.85	15,286		
153.40	3,393	155.15	9,492	156.90	15,436		
153.45	3,553	155.20	9,672	156.95	15,583		
153.50	3,715	155.25	9,852	157.00	15,729		
153.55	3,878	155.30	10,031	157.05	15,872		
153.60	4,042	155.35	10,211	157.10	16,012		
153.65	4,207	155.40	10,390	157.15	16,150		
153.70	4,374	155.45	10,569	157.20	16,285		

Summary for Link SP1: STUDY POINT #1 (Kimball Road north)

Inflow Area = 276,267 sf, 48.17% Impervious, Inflow Depth = 4.26" for 100-Year event
Inflow = 4.74 cfs @ 12.64 hrs, Volume= 97,962 cf
Primary = 4.74 cfs @ 12.64 hrs, Volume= 97,962 cf, Atten= 0%, Lag= 0.0 min

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

Link SP1: STUDY POINT #1 (Kimball Road north)

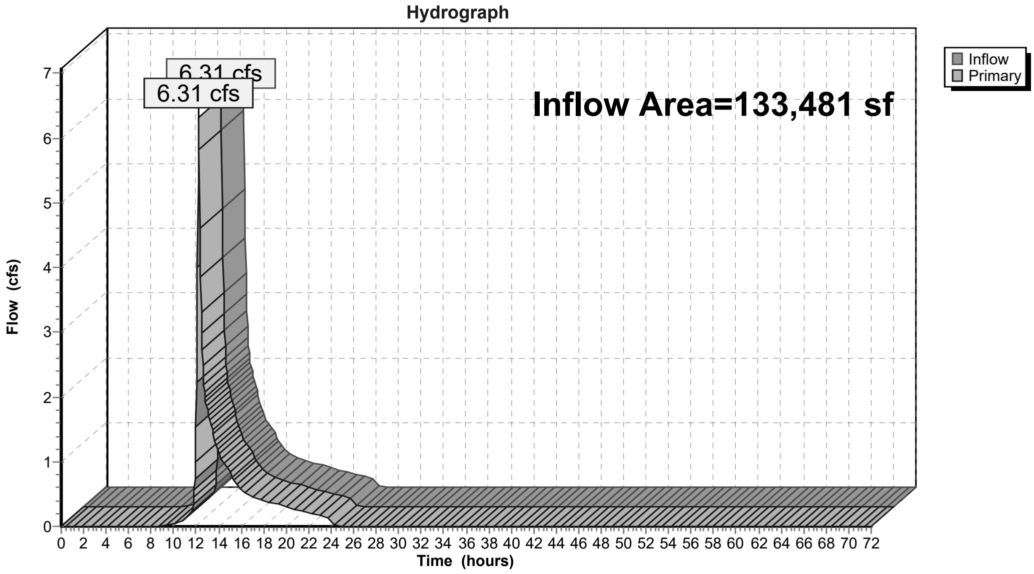


Summary for Link SP2: STUDY POINT #2 (Wetlands West)

Inflow Area = 133,481 sf, 45.23% Impervious, Inflow Depth = 3.01" for 100-Year event
Inflow = 6.31 cfs @ 12.23 hrs, Volume= 33,429 cf
Primary = 6.31 cfs @ 12.23 hrs, Volume= 33,429 cf, Atten= 0%, Lag= 0.0 min

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

Link SP2: STUDY POINT #2 (Wetlands West)



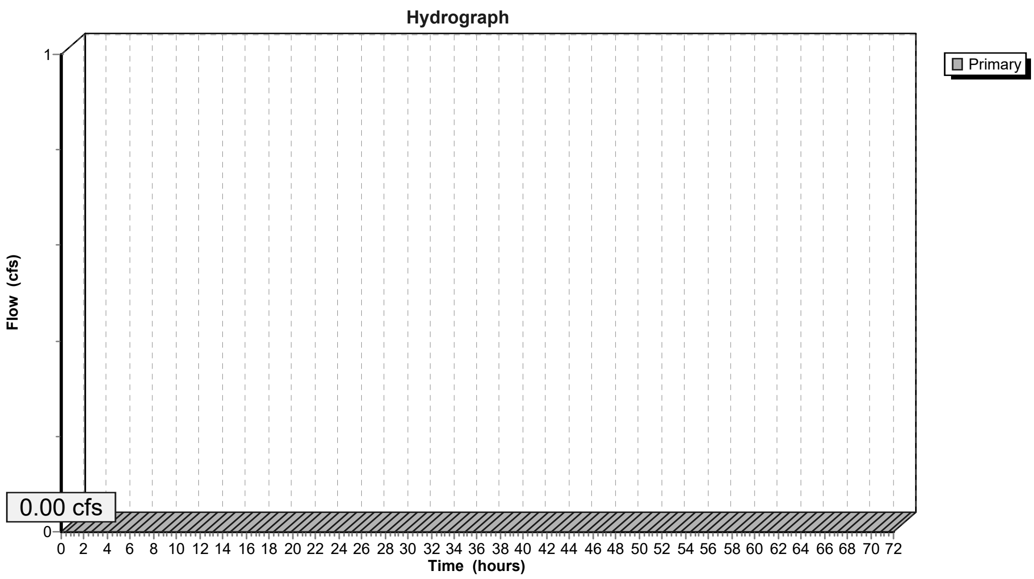
Summary for Link SP3: STUDY POINT #3 (IVW south)

[43] Hint: Has no inflow (Outflow=Zero)

Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

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

Link SP3: STUDY POINT #3 (IVW south)



Events for Subcatchment P-10A: Subcat P-10A

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.24	0.72	2,166	1.57
10-Year	5.12	1.44	4,396	3.19
25-Year	6.30	1.90	5,882	4.26
100-Year	**8.11**	**2.62**	**8,227**	**5.96**

Events for Subcatchment P-10B: Subcat P-10B

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.24	0.62	1,868	1.43
10-Year	5.12	1.29	3,908	3.00
25-Year	6.30	1.72	5,284	4.05
100-Year	**8.11**	**2.40**	**7,468**	**5.73**

Events for Subcatchment P-11: Subcat P-11

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.24	1.37	4,120	1.50
10-Year	5.12	2.79	8,489	3.09
25-Year	6.30	3.71	11,417	4.16
100-Year	**8.11**	**5.13**	**16,052**	**5.85**

Events for Subcatchment P-12: Subcat P-12

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.24	0.18	589	0.85
10-Year	5.12	0.49	1,470	2.13
25-Year	6.30	0.70	2,106	3.05
100-Year	**8.11**	**1.04**	**3,152**	**4.56**

Events for Subcatchment P-13: Subcat P-13

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.24	1.33	4,173	0.95
10-Year	5.12	3.32	10,015	2.29
25-Year	6.30	4.70	14,166	3.24
100-Year	**8.11**	**6.90**	**20,946**	**4.79**

Events for Subcatchment P-14: Subcat P-14

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.24	1.13	3,401	1.64
10-Year	5.12	2.22	6,800	3.28
25-Year	6.30	2.92	9,053	4.37
100-Year	**8.11**	**3.99**	**12,598**	**6.08**

Events for Subcatchment P-15: Subcat P-15

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.24	0.61	1,977	2.58
10-Year	5.12	1.02	3,388	4.43
25-Year	6.30	1.27	4,281	5.59
100-Year	**8.11**	**1.65**	**5,657**	**7.39**

Events for Subcatchment P-1A: Subcat P-1A

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.24	0.06	362	0.32
10-Year	5.12	0.39	1,309	1.17
25-Year	6.30	0.66	2,084	1.86
100-Year	**8.11**	**1.13**	**3,450**	**3.08**

Events for Subcatchment P-1B: Subcat P-1B

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.24	0.19	828	0.46
10-Year	5.12	0.82	2,591	1.44
25-Year	6.30	1.29	3,970	2.21
100-Year	**8.11**	**2.10**	**6,343**	**3.53**

Events for Subcatchment P-2: Subcat P-2

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.24	0.19	1,244	0.32
10-Year	5.12	1.35	4,501	1.17
25-Year	6.30	2.28	7,165	1.86
100-Year	**8.11**	**3.90**	**11,861**	**3.08**

Events for Subcatchment P-3: Subcat P-3

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.24	0.65	2,158	2.79
10-Year	5.12	1.05	3,600	4.65
25-Year	6.30	1.30	4,508	5.83
100-Year	**8.11**	**1.68**	**5,905**	**7.63**

Events for Subcatchment P-4: Subcat P-4

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.24	1.20	3,622	1.79
10-Year	5.12	2.28	7,032	3.48
25-Year	6.30	2.96	9,270	4.59
100-Year	**8.11**	**4.00**	**12,773**	**6.32**

Events for Subcatchment P-5: Subcat P-5

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.24	1.30	3,947	1.87
10-Year	5.12	2.43	7,554	3.58
25-Year	6.30	3.14	9,909	4.70
100-Year	**8.11**	**4.23**	**13,588**	**6.44**

Events for Subcatchment P-6: Subcat P-6

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.24	0.39	1,341	3.01
10-Year	5.12	0.61	2,178	4.88
25-Year	6.30	0.76	2,703	6.06
100-Year	**8.11**	**0.98**	**3,510**	**7.87**

Events for Subcatchment P-7: Subcat P-7

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.24	0.46	1,437	1.01
10-Year	5.12	1.12	3,383	2.37
25-Year	6.30	1.58	4,757	3.34
100-Year	**8.11**	**2.30**	**6,991**	**4.91**

Events for Subcatchment P-8: Subcat P-8

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.24	1.49	4,544	2.03
10-Year	5.12	2.69	8,456	3.78
25-Year	6.30	3.44	10,987	4.92
100-Year	**8.11**	**4.58**	**14,922**	**6.68**

Events for Subcatchment P-9: Subcat P-9

Event	Rainfall (inches)	Runoff (cfs)	Volume (cubic-feet)	Depth (inches)
2-Year	3.24	2.99	9,027	1.79
10-Year	5.12	5.67	17,528	3.48
25-Year	6.30	7.37	23,105	4.59
100-Year	**8.11**	**9.97**	**31,837**	**6.32**

Events for Pond 1P: Infiltration Basin

Event	Inflow (cfs)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
2-Year	0.73	0.39	0.10	0.29	145.34	12,230
10-Year	1.92	1.28	0.11	1.17	146.00	15,185
25-Year	2.73	2.15	0.11	2.03	146.12	15,747
100-Year	**9.55**	**4.24**	**0.12**	**4.13**	**146.32**	**16,706**

Events for Pond 2P: UIS-1 (SC-800)

Event	Inflow (cfs)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
2-Year	2.99	0.13	**0.13**	0.00	167.37	3,757
10-Year	5.67	0.25	0.13	0.12	168.51	8,618
25-Year	7.37	0.62	0.13	0.49	168.82	9,792
100-Year	**9.97**	**2.83**	0.13	**2.70**	**169.78**	**12,451**

Events for Pond 3P: UIS-2 (SC-800)

Event	Inflow (cfs)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
2-Year	1.49	0.05	**0.05**	0.00	159.62	2,076
10-Year	2.69	0.13	0.05	0.07	160.94	4,228
25-Year	3.44	0.46	0.05	0.41	161.22	4,594
100-Year	**4.58**	**2.97**	0.05	**2.92**	**162.16**	**5,500**

Events for Pond 4P: UDS-3 (SC-310)

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
2-Year	0.39	0.19	134.30	156
10-Year	0.61	0.26	134.84	289
25-Year	0.76	0.31	135.32	379
100-Year	**0.98**	**0.92**	**135.64**	**428**

Events for Pond 5P: UIS-4 (SC-310)

Event	Inflow (cfs)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
2-Year	0.61	0.06	**0.06**	0.00	164.50	523
10-Year	1.02	0.06	0.06	0.00	164.80	1,129
25-Year	1.27	0.06	0.06	0.00	165.03	1,569
100-Year	**1.65**	**0.07**	0.06	**0.01**	**165.46**	**2,314**

Events for Pond 6P: UDS-5 (CMP 72")

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
2-Year	5.99	1.14	163.20	4,742
10-Year	12.59	1.69	164.96	11,529
25-Year	16.96	2.00	166.24	16,586
100-Year	**23.76**	**5.64**	**168.42**	**23,256**

Events for Pond 7P: UDS-6 (CMP 60")

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)	Storage (cubic-feet)
2-Year	3.44	0.45	155.68	11,376
10-Year	6.10	1.84	157.49	16,970
25-Year	7.73	2.57	157.56	17,113
100-Year	**10.21**	**8.22**	**157.96**	**17,833**

Events for Link SP1: STUDY POINT #1 (Kimball Road north)

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)
2-Year	0.43	0.43	**0.00**
10-Year	1.44	1.44	0.00
25-Year	2.22	2.22	0.00
100-Year	**4.74**	**4.74**	0.00

Events for Link SP2: STUDY POINT #2 (Wetlands West)

Event	Inflow (cfs)	Primary (cfs)	Elevation (feet)
2-Year	0.19	0.19	**0.00**
10-Year	1.35	1.35	0.00
25-Year	2.28	2.28	0.00
100-Year	**6.31**	**6.31**	0.00

Events for Link SP3: STUDY POINT #3 (IVW south)

Event	Primary (cfs)	Elevation (feet)
2-Year	**0.00**	**0.00**
10-Year	0.00	0.00
25-Year	0.00	0.00
100-Year	0.00	0.00

LEGEND

EXISTING WATERSHED	
PROPOSED WATERSHED	
SCS SOILS BOUNDARY	
Tc FLOW PATH	A — B
SUBCATCHMENT LABEL	P-1
SUBCATCHMENT BOUNDARY	
FLOW DIRECTION	

GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

DIG SAFE

BEFORE YOU DIG
CALL 811 OR
1-888-DIG-SAFE
1-888-344-7233

N:\PROJECTS\3410-03\CIVIL\DRAWINGS\CURRENT\C-3410-03_WATERSHED-PROPOSED.DWG

PROFESSIONAL ENGINEER FOR
ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION

APPLICANT:

MP PROPERTIES IV, LLC
201 WASHINGTON STREET, SUITE 2100
BOSTON, MA 02108

PROJECT:

27 KIMBALL ROAD
AMESBURY, MA

PROJECT NO.	3410-03	DATE:	01-26-2026
SCALE:	1" = 40'	DWG. NAME:	C-3410-03
DESIGNED BY:	BDP/CB	CHECKED BY:	CMQ

PREPARED BY:

ALLEN & MAJOR ASSOCIATES, INC.
civil engineering ♦ land surveying
environmental consulting ♦ landscape architecture
www.allenmajor.com
100 COMMERCE WAY, SUITE 5
WOBURN MA 01801
TEL: (781) 935-6889
FAX: (781) 935-2896

WOBURN, MA ♦ LAKEVILLE, MA ♦ MANCHESTER, NH

DRAWING TITLE:	SHEET No.
PROPOSED WATERSHED PLAN	PWS

SECTION 6.0 -
APPENDIX

Manning's Roughness Coefficients ("n")

Conduit	Manning's Coefficients
Closed Conduits	
Asbestos-Cement Pipe	0.011 to 0.015
Brick	0.013 to 0.017
Cast Iron Pipe	
Cement-lined and seal-coated	0.011 to 0.015
Concrete (Monolithic)	
Smooth forms	0.012 to 0.014
Rough forms	0.015 to 0.017
Concrete Pipe	0.011 to 0.015
Corrugated-Metal Pipe (1/2 - STUL 34470 2 1/2-inch corrgtn.)	
Plain	0.022 to 0.026
Paved invert	0.018 to 0.022
Spun asphalt-lined	0.011 to 0.015
Plastic Pipe (Smooth)	0.011 to 0.015
Vitrified Clay	
Pipes	0.011 to 0.015
Liner channels	0.013 to 0.017
Open Channels	
Lined Channels	
Asphalt	0.013 to 0.017
Brick	0.012 to 0.018
Concrete	0.011 to 0.020
Rubble or riprap	0.020 to 0.035
Vegetal	0.030 to 0.040
Excavated or Dredged	
Earth, straight and uniform	0.020 to 0.030
Earth, winding, fairly uniform	0.025 to 0.040
Rock	0.030 to 0.045
Unmaintained	0.050 to 0.140
Natural Channels (minor streams, top width at flood state < 100 feet)	
Fairly regular section	0.030 to 0.070
Irregular section with pools	0.040 to 0.100

Source: Design and Construction of Sanitary and Storm Sewers, American Society of Civil Engineers and the Water Pollution Control Federation, 1969.

Hydrologic Soil Group—Essex County, Massachusetts, Northern Part
(72 Kimball Road)

Map Scale: 1:1,850 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 25, 50, 100, 150

Feet: 0, 50, 100, 200, 300

N

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 21, Sep 5, 2025

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

Date(s) aerial images were photographed: May 22, 2022—Sep 1, 2023

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
305C	Paxton fine sandy loam, 8 to 15 percent slopes	C	0.0	0.3%
306B	Paxton fine sandy loam, 0 to 8 percent slopes, very stony	C	3.4	37.3%
311B	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	C/D	5.7	62.4%
Totals for Area of Interest			**9.2**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Essex County, Massachusetts, Northern Part

311B—Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2t2qr
Elevation: 0 to 1,440 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Woodbridge, very stony, and similar soils: 82 percent
Minor components: 18 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodbridge, Very Stony

Setting

Landform: Ground moraines, drumlins, hills
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 9 inches: fine sandy loam
Bw1 - 9 to 20 inches: fine sandy loam
Bw2 - 20 to 32 inches: fine sandy loam
Cd - 32 to 67 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Surface area covered with cobbles, stones or boulders: 1.6 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 19 to 27 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C/D
Ecological site: F144AY037MA - Moist Dense Till Uplands
Hydric soil rating: No

Minor Components

Paxton, very stony

Percent of map unit: 10 percent
Landform: Ground moraines, drumlins, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Ridgebury, very stony

Percent of map unit: 8 percent
Landform: Drainageways, depressions, ground moraines, drumlins, hills
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 21, Sep 5, 2025

HALEY & ALDRICH, INC.
465 Medford St.
Suite 2200
Boston, MA 02129
617.886.7400

TECHNICAL MEMORANDUM

22 December 2025
File No. 0213708-001

TO:	MP Properties IV, LLC Andrew Mackin
C:	Allen & Major Associates, Inc. Carlton Quinn, Chirs Broyles
FROM:	Haley & Aldrich, Inc. Youhanna Bebawy, Staff Civil Engineer Mark H. Balfe, Principal
SUBJECT:	Subsurface Data Memorandum Proposed Development 27 Kimball Road Amesbury, Massachusetts

The purpose of this memorandum is to summarize the results of recent subsurface exploration program, in-situ field infiltration testing, and geotechnical lab testing conducted to aid in the evaluation and design of a stormwater infiltration system for the proposed development at 27 Kimball Rd, Amesbury, Massachusetts. The investigations and testing included herein were performed in accordance with our proposal dated 17 November 2025 and your subsequent authorization. The lab and field data included herein is intended to aid the civil engineer in the design of stormwater infiltration systems in accordance with the best management practices included in the Massachusetts Stormwater Handbook.

PROPOSED DEVELOPMENT

We understand that MP Properties IV, LLC is considering development of the 9.4-acre property at 27 Kimball Rd, Amesbury into 91 residential units. The development will be supported by municipal water and sewer and will include stormwater management and infiltration. Refer to Figure 1 – Project Locus for the location of the project site.

EXISTING SITE CONDITIONS

The Site is currently developed with an approximately 1,832 square foot (ft), single family home constructed in approximately 1982, with two detached garages and a shed. The house is reportedly heated by oil and likely has an above- or below-ground storage tank. The majority of the property is undeveloped and wooded, with cleared areas surrounding and south of the residence, with grades rising to the southeast and a wetland to the southwest.

The property fronts on Kimball Road to the northeast, with a combination of residential properties and wooded lots to the north, east, west, and south. A Christmas tree farm is located along Haverhill Road to the South, with industrial properties further south beyond Haverhill Road/Route 110.

SUBSURFACE EXPLORATION PROGRAMS

A subsurface exploration program was recently conducted at the site in November 2025. The program consisted of fifteen (15) test pits (designated HA23-TP1 through HA23-TP15). The test pits were advanced to depths ranging from 6 to 8.8 feet below ground surface (ft bgs) by LDR Excavation from 21 to 25 November 2025 and were observed by Haley & Aldrich.

Generally, test pits were terminated when the limit of the excavator's reach was accomplished; however, test pit HA25-TP13 was terminated at 6 ft bgs when several large boulders were encountered and unable to be excavated. Boulders were also encountered in the Glacial Till soil at HA25-TP3, HA25-TP4, HA25-TP7, HA25-TP10, HA25-TP11, HA25-TP12, HA25-TP14, but did not interfere with test pit excavation.

Refer to Figure 2 – Site and Subsurface Exploration Location Plan for the designation and approximate location of test pit explorations. Logs of the test pits explorations are included in Appendix A – Exploration Logs. Approximate ground surface elevations were collected using a handheld, global navigation satellite system (GNSS) receiver.

SUBSURFACE SOIL CONDITIONS

The subsurface conditions encountered at the site generally consist of Topsoil overlying Loess and Glacial Till soils. A fill layer consisting of reworked Loess soils was encountered between two layers of Topsoil in two test pit locations, HA25-TP6 and HA25-TP8.

Soil Gradation Testing

Soil samples collected during the subsurface exploration program were submitted to GeoTesting Express of Acton, Massachusetts for laboratory testing.

Fifteen (15) grain size distribution analyses were done though both separation by mechanical sieve and timed sedimentation testing, hydrometer analysis, (ASTM D6913/ASTM D7928). The timed sedimentation testing quantifies the constitutive clay and silt fractions of a soil used in textural classification. A mechanical sieve test combines the constitutive silt and clay fractions as a percentage of total fines (fines passing the #200 sieve material). A summary of the samples submitted for grain size testing are included below Table 1: Summary of Laboratory Testing and the results are included in Appendix B – Geotechnical Lab Testing Results.

Table 1: Summary of Laboratory Testing Depths	
Exploration Designation	**Sample Depth (ft)**
HA22-TP1	3.0 – 6.3
HA22-TP2	3.0 – 7.0
HA22-TP3	3.0 – 7.0
HA22-TP4	3.0 – 7.5
HA22-TP5	4.3 – 4.8
HA22-TP6	3.0 – 8.0
HA22-TP7	3.0 – 7.0
HA22-TP8	5.5 – 6.0
HA22-TP9	4.0 – 5.0
HA22-TP10	3.0 – 7.0
HA22-TP11	3.0 – 8.0
HA22-TP12	3.0 – 8.0
HA23-TP13	3.0 – 6.0
HA23-TP14	3.0 – 6.5
HA23-TP15	3.0 – 8.0

Soil Texture

To assist stormwater design for the project, laboratory grain-size results were gravel corrected values for sand, silt, and clay, in accordance with U.S. Department of Agriculture (USDA) soil physical analyses and plotted on the National Resource Conservation Service (NRCS) soil textural triangle. Refer to Figure 3 – NCRS Soil Texture Triangle for the gravel corrected values. The soil fractions are classified as sandy loam and loamy sand.

Test Pit Groundwater Conditions

The only observable indicator of groundwater conditions encountered in the test pits were redoximorphic features (including mottling and oxidation). No water levels, seepage, or standing water were observed during test pit excavation.

Redoximorphic features, commonly referred to as soil mottling and oxidation of soil, indicate evidence of past groundwater levels, were observed in three of the completed test pits as indicated on the attached logs. Discontinuous and weak redoximorphic features were encountered in HA25-TP10 at 5 ft bgs (approx. El. 162.2[1]), in HA25-TP11 at 4.5 ft bgs (approx. El. 176.8), and in HA25-TP14 at 6.0 ft bgs (approx. El. 150.4).

In-Situ Permeability Testing

Five Guelph permeameter tests were performed by Haley & Aldrich at test pits HA25-TP1, HA25-TP5, HA25-TP8, HA25-TP12, and HA25-TP15 to determine in-situ hydraulic conductivity rates. The Guelph Permeameter test simulates a wetting front moving through the soil and provides measurement of field saturated hydraulic conductivity. This test is one of the acceptable test methods identified in the

[1] Elevations are in feet and referenced to the National Vertical Datum of 1988 (NAVD88).

Massachusetts Stormwater Handbook. Each test was run until steady state of recharge was established by the Guelph Permeameter at two different heads (5 cm and 10 cm of water within the test hole). The results of the infiltration testing are provided below in Table 2: Summary of Field Infiltration Testing.

This testing provides an order of magnitude estimate of hydraulic conductivity at the discrete test pit location and at the discrete elevation range tested. Hydraulic conductivity will vary, both laterally and vertically according to changes in density, grain size, and gradation. Infiltration rates will decline if soils become saturated above groundwater levels. In addition, infiltration rates in the area of storm water infiltration system may result in a reduction of hydraulic conductivity due to siltation caused by suspended solids in the infiltrating storm water, piping of fines by infiltrating precipitation, or a combination of these factors.

Table 2: Summary of Field Infiltration Testing

Test Pit ID	Approx. Ground Surface Elevation (ft, NAVD88)	Depth Range of Test (ft)	Elevation Range of Test (ft)	Tested Soil Stratum	Calculated Field Saturated Hydraulic Conductivity[1] (in./hr)
HA25-TP1	155.4	4.5 – 5	150.4 – 150.9	Glacial Till	21.33
HA25-TP5	178.9	4.3 – 4.8	174.1 – 174.6	Glacial Till	0.22
HA25-TP8	186.7	5.5 – 6	180.7 – 181.2	Glacial Till	1.95
HA25-TP12	183.4	5.5 – 6	177.4 – 177.9	Glacial Till	0.82
HA25-TP15	153.2	4.1 – 4.6	148.6 – 149.1	Glacial Till	0.41

Note:

1) *Hydraulic conductivity values indicated are the measured field values and have not been reduced for stormwater design calculations, as detailed in the Massachusetts Stormwater Handbook.*

GEOTECHNICAL GUIDANCE

We understand that the proposed redevelopment will include lightly loaded single story units. Based on the subsurface conditions observed, following removal of the vegetation, Topsoil/Loess. and any man-made structures, for planning purposes you should assume the new units can be supported on conventional reinforced concrete footings with an allowable bearing pressure of 4 kips per square foot (ksf). Footings should bear a minimum of 4 ft below grade (frost protection) or insulated to an equivalent R-value of 4 ft of soil. Ground floor slabs should be designed as conventional slab-on-grade.

We note that the fines content of the on-site materials is generally between 40 to 50 percent, which makes reuse (placement and compaction) challenging, especially during periods of inclement weather (rain/snow) or extended cold temperatures (Nov to Apr). Additionally, soil subgrades for foundations, utilities, driveways, etc. will need to be effectively managed (protected, covered, or other means) to prevent disturbance due to moisture or equipment during construction.

LIMITATIONS

This memorandum was prepared in accordance with our proposal dated 17 November 2025 and your subsequent authorization. This memorandum has been prepared for specific application to the proposed 27 Kimball Rd development in Amesbury, Massachusetts as described herein.

We appreciate the opportunity to provide services for this project and look forward to our continued association with you and the project team through completion of design and construction. Please contact us with any questions.

Attachments:

Figure 1	Project Locus
Figure 2	Site and Subsurface Exploration Plan
Figure 3	NCRS Soil Texture Triangle
Appendix A	Exploration Logs
Appendix B	Geotechnical Lab Test Results

FIGURES

SITE COORDINATES: 42°50'45"N, 70°57'39"W

MA

N

MAP SOURCE: USGS

HALEY ALDRICH

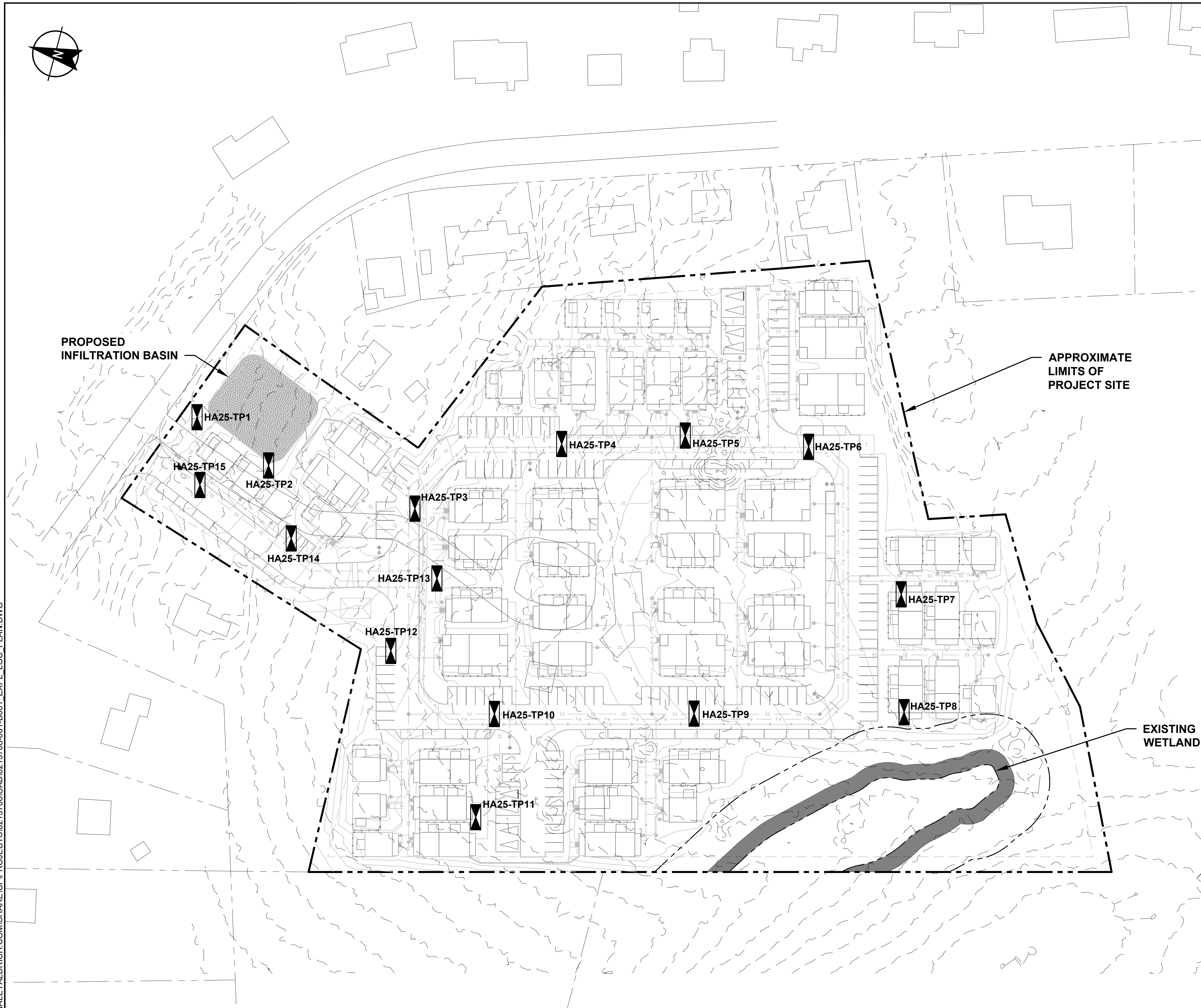
27 KIMBALL RD
27 KIMBALL ROAD
AMESBURY, MASSACHUSETTS

PROJECT LOCUS

APPROXIMATE SCALE: 1 INCH = 2,000 FEET
DECEMBER 2025

FIGURE 1

0213708_001_LOCUS HALEYALDRICH\YBEBAWY



LEGEND

HA25-TP1 — DESIGNATION AND APPROXIMATE LOCATION OF TEST PIT CONDUCTED BY LDR EXCAVATION BETWEEN 21 AND 25 NOVEMBER 2025 AND MONITORED BY HALEY & ALDRICH, INC.

NOTE

1. BASE PLAN CREATED FROM ELECTRONIC FILE TITLED "27 Kimball Rad-X-Site (3).dwg" PROVIDED BY MARCUS PARTNERS, LLC ON 12 NOVEMBER 2025.

0 100 200
SCALE IN FEET

HALEY ALDRICH

PROPOSED DEVELOPMENT
27 KIMBALL ROAD
AMESBURY, MASSACHUSETTS

SITE AND SUBSURFACE EXPLORATION LOCATION PLAN

SCALE: AS SHOWN
DECEMBER 2025

FIGURE 2

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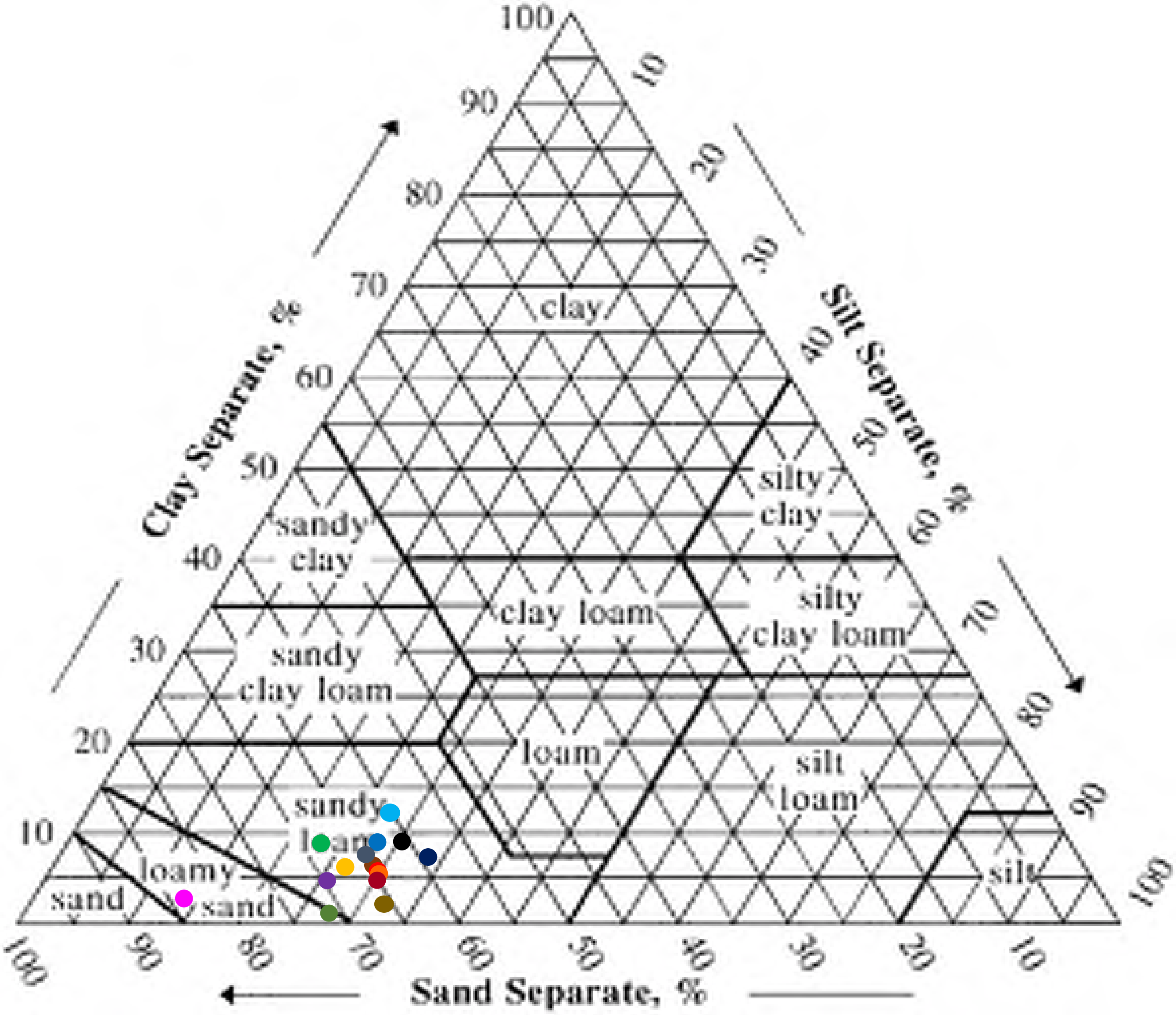

Sample Legend	Sample I.D.	NCRS Classification
●	HA25-TP1_3.0-6.3	Sandy Loam
●	HA25-TP2_3.0-7.0	Sandy Loam
●	HA25-TP3_3.0-7.0	Sandy Loam
●	HA25-TP4_3.0-7.5	Sandy Loam
●	HA25-TP5_4.3-4.8	Sandy Loam
●	HA25-TP6_3.0-8.0	Sandy Loam
●	HA25-TP7_3.0-7.0	Sandy Loam
●	HA25-TP8_5.5-6.0	Loamy Sand

Sample Legend	Sample I.D.	NCRS Classification
●	HA25-TP9_4.0-5.0	Loamy Sand
●	HA25-TP10_3.0-7.0	Sandy Loam
●	HA25-TP11_3.0-8.0	Sandy Loam
●	HA25-TP12_3.0-8.0	Sandy Loam
●	HA25-TP13_3.0-6.0	Sandy Loam
●	HA25-TP14_3.0-6.5	Sandy Loam
●	HA25-TP15_3.0-8.0	Sandy Loam

Notes:
1. Guidance Document: USDA, 2022 National Soil Survey Handbook, Section 618.87 (Texture Class, Texture Modifier, and Terms Used in Lieu of Texture.)
2. Composite sample depth range detailed in "Sample I.D."

HALEY ALDRICH

Proposed Development
27 Kimball Rd
Amesbury, Massachusetts

FIGURE 3
NRCS SOIL TEXTURE TRIANGLE

UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

FILE NO. 0213708-001 December 2025

APPENDIX A
Exploration Logs

IDENTIFICATION AND DESCRIPTION OF SUBSURFACE MATERIALS

SOIL

Soil description on logs of subsurface explorations are based on Standard Penetration Test results, visual-manual examination of exposed soil and soil samples, and the results of laboratory tests on selected samples. The criteria, descriptive terms and definitions are as follows:

DENSITY OR CONSISTENCY

Density of Cohesionless Soils	Penetration Resistance (Blows per ft.)	Consistency of Cohesive Soils	Penetration Resistance (Blows per ft.)
Very Loose	0-4	Very Soft	0-2
Loose	5-10	Soft	3-4
Medium	11-30	Medium	5-8
Dense	31-50	Stiff	9-15
Very Dense	over 50	Very Stiff	16-30
		Hard	over 30

PENETRATION RESISTANCE

Standard Penetration Test (ASTM D-1586) - Number of blows required to drive a standard 2 in. O.D. split spoon sampler 1 ft. with a 140 lb. weight falling freely through 30 in.

COLOR: Basic colors and combinations: black, brown, gray, yellow-brown, etc.

SUPPLEMENTAL SOIL TERMINOLOGY:

Laminae	- 0 to 1/16 in. thick (cohesive)
Parting	- 0 to 1/16 in. thick (granular)
Seam	- 1/16 to 1/2 in. thick
Layer	- 1/2 to 12 in. thick
Stratum	- > 12 in. thick
Pocket	- Small, erratic deposit less than 12 in. size
Lens	- Lenticular deposit larger than a pocket
Occasional	- One or less per 12 in. of thickness
Frequent	- More than one per 12 in. of thickness
Interbedded	- Alternating soil layers of differing composition
Varved	- Alternating thin seams of silt and clay
Mottled	- Variation of color

GEOLOGIC INTERPRETATION

Deposit type - GLACIAL TILL, ALLUVIUM, FILL.....

The natural soils are identified by criteria of Unified Soil Classification System (USCS), with appropriate group symbol in parenthesis for each soil description. Fill materials may not be classified by USCS criteria.

U.S. Standard Series Seive — Clear Square Sieve Openings

12"		3"		3/4"		4		10		40		200

Boulders	Cobbles	Gravel		Sand			Silts and Clays
		Coarse	Fine	Coarse	Medium	Fine	
305 mm	76 mm	19 mm	4.75 mm	2.00 mm	0.43 mm	0.074 mm	

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			Group Symbol	Graphic Symbol	TYPICAL NAMES
Coarse grained soils: more than half is larger than number 200 sieve	Gravels — More than half of coarse fraction is larger than number 4 sieve	Gravels with little or no fines	GW		Well graded gravels, gravel-sand mixtures
			GP		Poorly graded gravels, gravel-sand mixtures
		Gravels with over 12% fines	GM		Silty gravels, poorly graded gravel-sand-silt mixtures
			GC		Clayey gravels, poorly graded gravel-sand-clay mixtures
	Sands — More than half of coarse fraction is smaller than number 4 sieve	Sands with little or no fines	SW		Well graded sands, gravelly sands
			SP		Poorly graded sands, gravelly sands
		Sands with over 12% fines	SM		Silty sands, poorly graded sand-silt mixtures
			SC		Clayey sands, poorly graded sand-clay mixtures
Fined-grained soils: more than half smaller than number 200 sieve	Silts and Clays — Liquid limit 50% or less		ML		Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL		Organic clays and organic silty clays of low plasticity
	Silts and Clays — Liquid limit greater than 50%		MH		Inorganic silty, micaceous or diatomaceous fine sandy or silty soils, elastic silts
			CH		Inorganic clays of high plasticity, fat clays
			OH		Organic clays of medium to high plasticity, organic silts
Highly organic soils			PT		Peat and other highly organic soils

GENERAL NOTES

1. Logs of subsurface explorations depict soil, rock and groundwater conditions only at the locations specified on the dates indicated. Subsurface conditions may vary at other locations and at other times.
2. Water levels noted on the logs were measured at the times and under the conditions indicated. During test borings, these water levels could have been affected by the introduction of water into the borehole, extraction of tools on other procedures and thus may not reflect actual groundwater level at the test boring location. Groundwater level fluctuations may also occur as a result of variations in precipitation, temperature, season, tides, adjacent construction activities and pumping of water supply wells and construction dewatering systems.

ROCK

Rock descriptions noted on logs of subsurface explorations are based on visual-manual examination of exposed rock outcrops and core samples. The criteria, descriptive terms and definitions used are as follows:

FIELD HARDNESS: A measure of resistance to scratching.

Very Hard	Cannot be scratched with a knife point or sharp pick.
Hard	Can be scratched with a knife point or sharp pick, only with difficulty.
Moderately Hard	Can be readily scratched with a knife point or pick.
Medium Hard	Can be grooved or gouged 1/16 in. deep with firm pressure on a knife point or sharp pick.
Soft	Can be grooved or gouged easily with a knife point or pick.
Very Soft	Can be carved with a knife and excavated with a pick point.

WEATHERING: The action of organic and inorganic and chemical and physical processes resulting in alteration of color, texture and composition.

Fresh-FR	No visible sign of alteration, except perhaps slight discoloration on major discontinuity surfaces.
Slight-SL	Discoloration of rock material and discontinuity surfaces. All rock may be discolored and/or somewhat weaker than in its fresh condition.
Moderate-MOD	Less than half the rock material is decomposed and/or disintegrated to a soil. Some fresh or discolored rock is present as either a continuous framework or as corestones.
High-HIGH	More than half the rock material is decomposed and/or disintegrated to a soil. Fresh or discolored rock is present as either a discontinuous framework or as corestones.
Complete-COMP	All rock material is decomposed and/or disintegrated to soil. The original mass structure is largely intact.
Residual Soil	All rock material is converted to soil. The mass structure and material fabric are destroyed. There has been a large change of volume, but the material has not been significantly transported.

COLOR: Basic colors and combinations: gray, light gray, brown, red-brown.

TEXTURE: Size, shape and arrangements of constituents.

Term	Size: Igneous	Size: Sedimentary
Coarse-grained	> 5 mm	> 2 mm
Medium-grained	1 - 5 mm	0.625 - 2 mm
Fine-grained	< 1 mm	< 0.625 mm
Aphanitic	Individual grains invisible to the unaided eye.	

LITHOLOGY: Rock classification and modifiers; accepted formation names.

DISCONTINUITIES:

Type	Definition
Joint	A natural fracture along which no displacement has occurred. May occur in parallel groups called sets.
Shear	A natural fracture along which displacement has occurred. Surface may be slickensided or striated.
Fault	A natural fracture along which displacement has occurred. Usually lined with gouge and slickensides.
Shear or Fault Zone	Zone of fractured rock and gouge bordering the displacement plane.

ORIENTATION/ATTITUDE:

Term	Angle (degrees)
Horizontal	0-5
Low Angle	6-35
Moderately Dipping	36-55
High Angle	56-85
Vertical	86-100

SPACING:

Discontinuity Term	Bedding Term	Inches
Extremely Close	Extremely Thin	< 3/4
Very Close	Very Thin	3/4 - 2.5
Close	Thin	2.5 - 8
Moderate	Medium	8 - 24
Wide	Thick	24 - 80
Very Wide	Very Thick	80 - 240
Extremely Wide	Extremely Thick	> 240

PERSISTENCE/CONTINUITY:

Term	Feet
Very Low	0-3
Low	3-10
Medium	10-35
High	35-65
Very High	> 65

APERTURE/GAP:

Term	Distance
Very Tight	< 0.1mm
Tight	0.1mm-0.25mm
Partly Open	0.25mm-0.5mm
Open	0.5mm-2.5mm
Moderately Wide	2.5mm-1cm
Wide	> 1cm
Very Wide	1cm-10cm
Extremely Wide	10cm-1m
Cavernous	> 1m

POROSITY:

Type

Primary:
Pre-depositional and depositional inter- and intra- granular, particle, or crystalline pores.

Secondary:
Solution features including pits, vugs, caverns, molds, and channels.
Fracture features including joints, shears, faults, shrinkage and breccia fabrics.

Term	Size
Micro	< 0.0625 mm
Meso	0.0625-4.0 mm
Mega	4.0-256 mm

HALEY ALDRICH

SUBSURFACE EXPLORATION KEY

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TEST PIT LOG

HALEY ALDRICH

Test Pit No. HA25-TP1

Project	27 KIMBALL RD	**File No.**	0213708-001
Location	AMESBURY, MA	**H&A Rep**	A. Balogh
Client	MP PROPERTIES IV, LLC	**Date**	11/24/2025
Contractor	LDR EXCAVATION		
Equipment Used	DEERE 35G TRACK-MOUNTED EXCAVATOR	**Weather**	Cloudy, 30s-40s

Ground El.: 155.4
El. Datum: NAVD88
Location: See Plan
Groundwater depths/entry rates (in./min.): Not encountered

Depth (ft)	Sample Data/ PID Readings (ppm)	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0	0.0		OL/ OH	Brown sandy ORGANIC SOIL (OL/OH), organic odor, moist, 25% roots -TOPSOIL-	0	5	10	15	35	35				
		154.9 0.5	SM	Loose light brown to brown silty SAND with gravel (SM), no odor, moist, 10% cobbles, 10% roots -LOESS-	10	5	10	10	40	25				
1	0.0													
		153.6 1.8	SM	Medium dense to dense tan to light brown silty SAND with gravel (SM), bonded, no odor, moist, 15% cobbles -GLACIAL TILL-	10	5	10	15	45	15				
2														
3	0.0													
4														
5	0.0													
6														
		149.1 6.3		BOTTOM OF EXPLORATION AT 6.3 FT Note: Test pit backfilled with excavated soil.										

Obstructions: Not encountered

Remarks: In-situ permeability test performed from 4.5 to 5.0 ft below ground surface.

Field Tests

Dilatancy	R - Rapid S - Slow N - None
Toughness	L - Low M - Medium H - High
Plasticity	N - Nonplastic L - Low M - Medium H - High
Dry Strength	N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit
at depth Not encountered ft
measured after hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24		=
over 24		=

Test Pit Dimensions (ft)
Pit Length x Width (ft) 5 x 9
Pit Depth (ft) 6.3

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

TEST PIT LOG

Test Pit No. HA25-TP2

Project	27 KIMBALL RD	**File No.**	0213708-001
Location	AMESBURY, MA	**H&A Rep**	A. Balogh
Client	MP PROPERTIES IV, LLC	**Date**	11/24/2025
Contractor	LDR EXCAVATION	**Weather**	Cloudy, 30s-40s
Equipment Used	DEERE 35G TRACK-MOUNTED EXCAVATOR		

Ground El.: 166.2
El. Datum: NAVD88
Location: See Plan
Groundwater depths/entry rates (in./min.): Not encountered

Depth (ft)	Sample Data/ PID Readings (ppm)	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Field Tests Toughness	Field Tests Plasticity	Field Tests Strength
0	0.0		OL/ OH	Loose brown sandy ORGANIC SOIL (OL/OH), organic odor, moist, 25% roots -TOPSOIL-	0	5	10	15	35	35				
		165.7 0.5	SM	Loose light brown to brown silty SAND with gravel (SM), no odor, moist, 10%, roots -LOESS-	10	5	10	10	40	25				
1	0.0													
		164.7 1.5	SM	Medium dense to dense tan to light brown silty SAND with gravel (SM), bonded, no odor, moist, 15% cobbles -GLACIAL TILL-	10	5	10	10	50	15				
2														
3	0.0													
4														
5	0.0													
6														
7	0.0	159.2 7.0		BOTTOM OF EXPLORATION AT 7.0 FT Note: Test pit backfilled with excavated soil.										

Obstructions: Not encountered

Remarks:

Field Tests

Dilatancy	R - Rapid S - Slow N - None
Toughness	L - Low M - Medium H - High
Plasticity	N - Nonplastic L - Low M - Medium H - High
Dry Strength	N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth Not encountered ft
measured after hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24		=
over 24		=

Test Pit Dimensions (ft)

Pit Length x Width (ft) 8 x 2.5
Pit Depth (ft) 7.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

TEST PIT LOG

Test Pit No. HA25-TP3

Project	27 KIMBALL RD	**File No.**	0213708-001
Location	AMESBURY, MA	**H&A Rep**	A. Balogh
Client	MP PROPERTIES IV, LLC	**Date**	11/24/2025
Contractor	LDR EXCAVATION	**Weather**	Cloudy, 30s-40s
Equipment Used	DEERE 35G TRACK-MOUNTED EXCAVATOR		

Ground El.: 169.9 **El. Datum:** NAVD88 | **Location:** See Plan | **Groundwater depths/entry rates (in./min.):** Not encountered

Depth (ft)	Sample Data/ PID Readings (ppm)	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0	0.0		OL/ OH	Brown sandy ORGANIC SOIL (OL/OH), organic odor, moist, 25% roots -TOPSOIL-	0	5	10	15	35	35				
		169.3 0.6	SM	Loose light brown to brown silty SAND with gravel (SM), no odor, moist, 10% cobbles, 10% roots -LOESS-	10	5	10	10	35	30				
1	0.0	168.5 1.4												
2			SM	Medium dense tan to light brown silty SAND with gravel (SM), bonded, no odor, moist, 15% cobbles, trace cobbles -GLACIAL TILL-	10	5	10	15	40	20				
3	0.0													
			SM	Similar to above, except 10% cobbles, trace boulders, visible stratification on sidewalls of test pit	10	5	10	15	25	35				
4														
5	0.0													
6														
7		162.9 7.0		BOTTOM OF EXPLORATION AT 7.0 FT Note: Test pit backfilled with excavated soil.										

Obstructions: Not encountered

Remarks:

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit
at depth Not encountered ft
measured after hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24		=
over 24		=

Test Pit Dimensions (ft)
Pit Length x Width (ft) 8.5 x 2.5
Pit Depth (ft) 7.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

HA TESTPIT-09-W PID PLOG-HA-LIB09-BOS STANDARD ONLY-MARCH 2024.GLB HA-TP09+FENCE.GDT C:\USERS\KBUBEL\ONEDRIVE - HALEYALDRICH.COM\MARCUS PARTNERS - GINT\0213708-001\0213708-001_GINT.GPJ Dec 16, 25

TEST PIT LOG

Test Pit No. HA25-TP4

Project	27 KIMBALL RD	**File No.**	0213708-001
Location	AMESBURY, MA	**H&A Rep**	A. Balogh
Client	MP PROPERTIES IV, LLC	**Date**	11/24/2025
Contractor	LDR EXCAVATION	**Weather**	Cloudy, 30s-40s
Equipment Used	DEERE 35G TRACK-MOUNTED EXCAVATOR		

Ground El.: 180.0
El. Datum: NAVD88
Location: See Plan
Groundwater depths/entry rates (in./min.): Not encountered

Depth (ft)	Sample Data/ PID Readings (ppm)	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0	0.0		OL/OH	Loose brown sandy ORGANIC SOIL (OL/OH), organic odor, moist, 25% roots -TOPSOIL-	5	5	10	15	35	30				
		179.4 0.6	SM	Loose light-brown to brown silty SAND with gravel (SM), no odor, moist, 15% cobbles, 10% roots -LOESS-	10	5	10	10	40	25				
2	0.0	178.0 2.0	SM	Medium dense yellow-brown to light-brown silty SAND with gravel (SM), bonded, no odor, moist, 15% cobbles -GLACIAL TILL-	15	10	10	10	35	20				
	0.0													
4	0.0		SM	Similar to above, except dense, trace boulders	15	10	10	10	30	25				
6	0.0													
		172.5 7.5		BOTTOM OF EXPLORATION AT 7.5 FT Note: Test pit backfilled with excavated soil.										

Obstructions: Not encountered

Remarks:

Field Tests

Dilatancy	R - Rapid S - Slow N - None
Toughness	L - Low M - Medium H - High
Plasticity	N - Nonplastic L - Low M - Medium H - High
Dry Strength	N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit
at depth Not encountered ft
measured after hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24		=
over 24		=

Test Pit Dimensions (ft)
Pit Length x Width (ft) 3 x 10
Pit Depth (ft) 7.5

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

TEST PIT LOG

Test Pit No. HA25-TP5

Project	27 KIMBALL RD	**File No.**	0213708-001
Location	AMESBURY, MA	**H&A Rep**	M. Dodson
Client	MP PROPERTIES IV, LLC	**Date**	11/21/2025
Contractor	LDR EXCAVATION		
Equipment Used	DEERE 35G TRACK-MOUNTED EXCAVATOR	**Weather**	Cloudy, 20s-40s

Ground El.: 178.9
El. Datum: NAVD88
Location: See Plan
Groundwater depths/entry rates (in./min.): Not encountered

Depth (ft)	Sample Data/ PID Readings (ppm)	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel		Sand				Field Tests			
					% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0		178.3 0.6	OL/OH	Black to dark brown sandy ORGANIC SOIL (OL/OH), no structure, organic odor, moist, 35% roots -TOPSOIL-	5	0	5	10	15	65				
	0.0	177.4 1.5	SM	Yellow to yellow-brown silty SAND (SM), no structure, no odor, moist, 10% roots -LOESS-	0	5	5	5	40	45				
2	0.0 0.0 0.0		SM	Yellow to light brown silty SAND (SM), no structure, no odor, moist, 5% cobbles, weakly to unbonded, variable silt content in weak layers, 15-30% silt content -GLACIAL TILL-	5	5	10	10	45	25				
4 6 8	0.0 0.0 0.0	170.1 8.8	SM	Similar to above, except trace gravel, yellow to yellow-brown, moderately bonded, 20-40% silt content	5	5	5	5	50	30				
				BOTTOM OF EXPLORATION AT 8.8 FT Note: Test pit backfilled with excavated soil.										

Obstructions: Not encountered

Remarks: In-situ permeability test performed from 4.3 to 4.8 ft below ground surface.

Field Tests

Dilatancy	R - Rapid S - Slow N - None
Toughness	L - Low M - Medium H - High
Plasticity	N - Nonplastic L - Low M - Medium H - High
Dry Strength	N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit

at depth Not encountered ft
measured after hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24		=
over 24		=

Test Pit Dimensions (ft)

Pit Length x Width (ft)
Pit Depth (ft) 8.8

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

HA TESTPIT-09-W PID PLOG-HA-LIB09-BOS STANDARD ONLY-MARCH 2024.GLB HA-TP09+FENCE.GDT C:\USERS\KBUBEL\ONEDRIVE - HALEYALDRICH.COM\MARCUS PARTNERS - GINT\0213708-001\0213708-001_GINT.GPJ Dec 16, 25

TEST PIT LOG

Test Pit No. HA25-TP6

Project	27 KIMBALL RD	**File No.**	0213708-001
Location	AMESBURY, MA	**H&A Rep**	M. Dodson
Client	MP PROPERTIES IV, LLC	**Date**	11/21/2025
Contractor	LDR EXCAVATION	**Weather**	Cloudy, 20s-40s
Equipment Used	DEERE 35G TRACK-MOUNTED EXCAVATOR		

Ground El.: 180.9 **El. Datum:** NAVD88 | **Location:** See Plan | **Groundwater depths/entry rates (in./min.):** Not encountered

Depth (ft)	Sample Data/PID Readings (ppm)	Stratum Change Elev./Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0			OL/OH	Brown to light-brown sandy ORGANIC SOIL (OL/OH), no structure, organic odor, moist, 35% roots -TOPSOIL-	5	0	5	10	15	65				
		180.5 0.4	SM	Yellow-brown to brown silty SAND (SM), intermixed, no odor, moist, 10% pockets of former subsoil, likely reworked loess -FILL-	5	5	10	10	45	25				
	0.0	180.1 0.8	SM	Yellow to tan silty SAND (SM), no structure, no odor, moist, 5% cobbles, no boulders, weakly to unbonded -GLACIAL TILL-	5	0	10	15	45	25				
2	0.0													
	0.0													
4	0.0													
	0.0		SM	Yellow to yellow-brown silty SAND with gravel (SM), no structure, no odor, moist, 15% cobbles, no boulders, moderately bonded	10	5	5	5	35	40				
6	0.0													
	0.0													
8		172.9 8.0		BOTTOM OF EXPLORATION AT 8.0 FT Note: Test pit backfilled with excavated soil.										

Obstructions: Not encountered

Remarks:

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit
at depth Not encountered ft
measured after hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24		=
over 24		=

Test Pit Dimensions (ft)
Pit Length x Width (ft)
Pit Depth (ft) 8.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

TEST PIT LOG

Test Pit No. HA25-TP7

Project	27 KIMBALL RD	**File No.**	0213708-001
Location	AMESBURY, MA	**H&A Rep**	A. Balogh
Client	MP PROPERTIES IV, LLC	**Date**	11/24/2025
Contractor	LDR EXCAVATION	**Weather**	Cloudy, 30s-40s
Equipment Used	DEERE 35G TRACK-MOUNTED EXCAVATOR		

Ground El.: 179.8
El. Datum: NAVD88
Location: See Plan
Groundwater depths/entry rates (in./min.): Not encountered

Depth (ft)	Sample Data/ PID Readings (ppm)	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0			SM	Loose brown silty SAND (SM), organic odor, moist, 25% roots -TOPSOIL-	5	5	10	15	40	25				
		179.2 0.6	SM	Loose light brown to brown silty SAND with gravel (SM), no odor, moist, 10% cobbles, 10% roots -LOESS-	10	5	10	10	40	25				
1	0.0													
		178.3 1.5	SM	Medium dense yellow-brown to light brown silty SAND with gravel (SM), bonded, no odor, moist, 15% cobbles -GLACIAL TILL-	10	5	10	10	45	20				
2	0.0													
3	0.0													
4	0.0		SM	Similar to above, except trace boulders and cobbles	15	10	10	10	40	15				
5														
6	0.0													
7		172.8 7.0		BOTTOM OF EXPLORATION AT 7.0 FT Note: Test pit backfilled with excavated soil.										

Obstructions: Not encountered

Remarks:

Field Tests

Dilatancy	R - Rapid S - Slow N - None
Toughness	L - Low M - Medium H - High
Plasticity	N - Nonplastic L - Low M - Medium H - High
Dry Strength	N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit
at depth Not encountered ft
measured after hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24		=
over 24		=

Test Pit Dimensions (ft)
Pit Length x Width (ft) 2.5 x 9
Pit Depth (ft) 7.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

TEST PIT LOG

Test Pit No. HA25-TP8

Project	27 KIMBALL RD	**File No.**	0213708-001
Location	AMESBURY, MA	**H&A Rep**	M. Dodson
Client	MP PROPERTIES IV, LLC	**Date**	11/21/2025
Contractor	LDR EXCAVATION	**Weather**	Cloudy, 20s-40s
Equipment Used	DEERE 35G TRACK-MOUNTED EXCAVATOR		

Ground El.: 186.7
El. Datum: NAVD88
Location: See Plan
Groundwater depths/entry rates (in./min.): Not encountered

Depth (ft)	Sample Data/ PID Readings (ppm)	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0		186.4 0.3	OL/OH	Dark brown sandy ORGANIC SOIL (OL/OH), no structure, organic odor, moist, 35% roots -TOPSOIL-	5	0	5	10	15	65				
	0.0		SM	Yellow-brown brown silty SAND (SM), intermixed, no odor, moist, contains lenses and layers of former topsoil and subsoil, likely reworked loess -FILL-	5	0	10	5	45	35				
2	0.0													
	0.0	183.1 3.6												
4	0.0		OL/OH	Black to dark brown sandy ORGANIC SOIL (OL/OH), no structure, organic odor, moist, 35% roots -TOPSOIL-	5	0	5	10	15	65				
	0.0	181.8 4.9	SM	Yellow to yellow-brown silty SAND (SM), no structure, no odor, moist, 10% roots -LOESS-	0	5	5	5	40	45				
		181.3 5.4	SM	Yellow to yellow-brown silty SAND with gravel (SM), no structure, no odor, moist, slightly bonded -GLACIAL TILL-	10	10	10	5	40	25				
6	0.0													
	0.0		SM	Similar to above, except moderately bonded	10	10	10	5	40	25				
8		178.4 8.3		BOTTOM OF EXPLORATION AT 8.3 FT Note: Test pit backfilled with excavated soil.										

Obstructions: Not encountered

Remarks: In-situ permeability test performed from 5.5 to 6.0 ft below ground surface.

Field Tests

Dilatancy	R - Rapid S - Slow N - None
Toughness	L - Low M - Medium H - High
Plasticity	N - Nonplastic L - Low M - Medium H - High
Dry Strength	N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit
at depth Not encountered ft
measured after hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24		=
over 24		=

Test Pit Dimensions (ft)
Pit Length x Width (ft)
Pit Depth (ft) 8.3

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

TEST PIT LOG

Test Pit No. HA25-TP9

Project	27 KIMBALL RD	**File No.**	0213708-001
Location	AMESBURY, MA	**H&A Rep**	M. Dodson
Client	MP PROPERTIES IV, LLC	**Date**	11/21/2025
Contractor	LDR EXCAVATION		
Equipment Used	DEERE 35G TRACK-MOUNTED EXCAVATOR	**Weather**	Cloudy, 20s-40s

Ground El.: 179.5
El. Datum: NAVD88
Location: See Plan
Groundwater depths/entry rates (in./min.): Not encountered

Depth (ft)	Sample Data/ PID Readings (ppm)	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Field Tests Toughness	Field Tests Plasticity	Field Tests Strength
0			OL/OH	Black to dark brown sandy ORGANIC SOIL (OL/OH), no structure, organic odor, moist, 35% roots -TOPSOIL-	5	0	5	10	15	65				
	0.0	178.8 0.7	SM	Yellow to yellow-brown silty SAND (SM), no structure, no odor, moist, 10% roots -LOESS-	0	5	5	5	40	45				
		178.1 1.4	SM	Yellow to tan silty SAND (SM), no structure, no odor, moist, weakly to unbonded -GLACIAL TILL-	5	0	10	5	50	30				
2	0.0													
	0.0													
4	0.0													
			SM	Yellow to yellow-brown silty SAND with gravel (SM), no structure, no odor, moist, moderately bonded	10	10	10	5	40	25				
	0.0													
6	0.0													
	0.0													
8														
		170.7 8.8		BOTTOM OF EXPLORATION AT 8.8 FT Note: Test pit backfilled with excavated soil.										

Obstructions: Not encountered

Remarks:

Field Tests

Dilatancy	R - Rapid S - Slow N - None
Toughness	L - Low M - Medium H - High
Plasticity	N - Nonplastic L - Low M - Medium H - High
Dry Strength	N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit
at depth Not encountered ft
measured after hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24		=
over 24		=

Test Pit Dimensions (ft)
Pit Length x Width (ft)
Pit Depth (ft) 8.8

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

TEST PIT LOG

Test Pit No. HA25-TP10

Project	27 KIMBALL RD	**File No.**	0213708-001
Location	AMESBURY, MA	**H&A Rep**	A. Balogh
Client	MP PROPERTIES IV, LLC	**Date**	11/25/2025
Contractor	LDR EXCAVATION	**Weather**	Cloudy, 30s-40s
Equipment Used	DEERE 35G TRACK-MOUNTED EXCAVATOR		

Ground El.: 167.2
El. Datum: NAVD88
Location: See Plan
Groundwater depths/entry rates (in./min.): Not encountered

Depth (ft)	Sample Data/ PID Readings (ppm)	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0	0.0		OL/OH	Loose brown sandy ORGANIC SOIL (OL/OH), organic odor, moist, 25% roots -TOPSOIL-	0	5	10	15	45	25				
1	0.0	166.5 0.7	SM	Loose light-brown to brown silty SAND (SM), no structure, no odor, moist, 20% roots -LOESS-	5	5	10	10	40	30				
2		165.5 1.7	SM	Medium dense tan to light-brown silty SAND with gravel (SM), stratified, no odor, moist, 10% cobbles, visible stratification on pit sidewall -GLACIAL TILL-	5	10	10	15	35	25				
3	0.0													
4														
5	0.0		SM	Dense brown to light-brown mottled silty SAND (SM), bonded, no odor, moist, 15% cobbles, trace boulders Note: Mottling observed at 5.0 ft.	5	5	10	10	35	35				
6														
7	0.0	160.2 7.0		BOTTOM OF EXPLORATION AT 7.0 FT Note: Test pit backfilled with excavated soil.										

Obstructions: Not encountered

Remarks:

Field Tests

Dilatancy: R - Rapid S - Slow N - None
Toughness: L - Low M - Medium H - High
Plasticity: N - Nonplastic L - Low M - Medium H - High
Dry Strength: N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit
at depth Not encountered ft
measured after hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24		=
over 24		=

Test Pit Dimensions (ft)
Pit Length x Width (ft) 3 x 9
Pit Depth (ft) 7.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

TEST PIT LOG

HALEY ALDRICH

Test Pit No. HA25-TP11

Project	27 KIMBALL RD	**File No.**	0213708-001
Location	AMESBURY, MA	**H&A Rep**	A. Balogh
Client	MP PROPERTIES IV, LLC		
Contractor	LDR EXCAVATION	**Date**	11/25/2025
Equipment Used	DEERE 35G TRACK-MOUNTED EXCAVATOR	**Weather**	Cloudy, 30s-40s

Ground El.: 184.3
El. Datum: NAVD88
Location: See Plan
Groundwater depths/entry rates (in./min.): Not encountered

Depth (ft)	Sample Data/ PID Readings (ppm)	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Field Tests Toughness	Field Tests Plasticity	Field Tests Strength
0	0.0		OL/OH	Loose brown sandy ORGANIC SOIL (OL/OH), organic odor, moist, 25% roots -TOPSOIL-	0	5	5	10	40	40				
	0.0	183.6 0.7	SM	Loose light-brown to brown silty SAND (SM), no structure, no odor, moist, 20% roots, trace cobbles -LOESS-	5	5	10	5	40	35				
2	0.0 0.0 0.0	182.4 1.9	SM	Medium dense to dense tan to light-brown silty SAND with gravel (SM), weakly to moderately bonded, no odor, moist, 15% cobbles, 5% boulders -GLACIAL TILL- Note: Mottling observed at 7.5 ft.	5	10	10	10	35	30				
8		176.3 8.0		BOTTOM OF EXPLORATION AT 8.0 FT Note: Test pit backfilled with excavated soil.										

Obstructions: Not encountered

Remarks:

Field Tests

Dilatancy	R - Rapid S - Slow N - None
Toughness	L - Low M - Medium H - High
Plasticity	N - Nonplastic L - Low M - Medium H - High
Dry Strength	N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit
at depth Not encountered ft
measured after hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24		=
over 24		=

Test Pit Dimensions (ft)
Pit Length x Width (ft) 3 x 9
Pit Depth (ft) 8.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

HA TESTPIT-09-W PID PLOG-HA-LIB09-BOS STANDARD ONLY-MARCH 2024.GLB HA-TP09+FENCE.GDT C:\USERS\KBUBEL\ONEDRIVE - HALEYALDRICH.COM\MARCUS PARTNERS - GINT\0213708-001\0213708-001_GINT.GPJ Dec 16, 25

TEST PIT LOG

Test Pit No. HA25-TP12

Project	27 KIMBALL RD	**File No.**	0213708-001
Location	AMESBURY, MA	**H&A Rep**	A. Balogh
Client	MP PROPERTIES IV, LLC	**Date**	11/25/2025
Contractor	LDR EXCAVATION		
Equipment Used	DEERE 35G TRACK-MOUNTED EXCAVATOR	**Weather**	Cloudy, 30s-40s

Ground El.: 183.3
El. Datum: NAVD88
Location: See Plan
Groundwater depths/entry rates (in./min.): Not encountered

Depth (ft)	Sample Data/ PID Readings (ppm)	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0	0.0		OL/OH	Loose brown sandy ORGANIC SOIL (OL/OH), organic odor, moist, 25% roots -TOPSOIL-	0	5	10	15	35	35				
	0.0	182.3 1.0	SM	Loose light-brown to brown silty SAND (SM), no structure, no odor, moist, 20% roots -LOESS-	5	5	10	10	35	35				
2		181.6 1.7	SM	Medium dense tan to light-brown silty SAND with gravel (SM), bonded, no odor, moist, 15% cobbles, 5% boulders -GLACIAL TILL-	5	10	10	15	40	20				
	0.0													
4														
	0.0													
6														
	0.0													
8		175.3 8.0		BOTTOM OF EXPLORATION AT 8.0 FT Note: Test pit backfilled with excavated soil.										

Obstructions: Not encountered

Remarks: In-situ permeability test performed from 5.5 to 6.0 ft below ground surface.

Field Tests

Dilatancy	R - Rapid S - Slow N - None
Toughness	L - Low M - Medium H - High
Plasticity	N - Nonplastic L - Low M - Medium H - High
Dry Strength	N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit
at depth Not encountered ft
measured after hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24		=
over 24		=

Test Pit Dimensions (ft)
Pit Length x Width (ft) 5 x 15
Pit Depth (ft) 8.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

TEST PIT LOG

Test Pit No. HA25-TP13

Project	27 KIMBALL RD
Location	AMESBURY, MA
Client	MP PROPERTIES IV, LLC
Contractor	LDR EXCAVATION
Equipment Used	DEERE 35G TRACK-MOUNTED EXCAVATOR
File No.	0213708-001
H&A Rep	A. Balogh
Date	11/24/2025
Weather	Cloudy, 30s-40s

Ground El.: 169.1
El. Datum: NAVD88
Location: See Plan
Groundwater depths/entry rates (in./min.): Not encountered

Depth (ft)	Sample Data/ PID Readings (ppm)	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
0	0.0		SM	Loose brown silty SAND (SM), organic odor, moist, 25% roots -TOPSOIL-	0	5	10	15	35	35				
		168.7 0.4	SM	Loose light brown to brown silty SAND with gravel (SM), no structure, no odor, moist, 10% cobbles, 10% roots -LOESS-	10	5	10	10	35	30				
1	0.0	168.1 1.0	SM	Medium dense tan to light brown silty SAND with gravel (SM), bonded, no odor, moist, 15% cobbles -GLACIAL TILL-	5	10	5	15	35	30				
2														
3	0.0													
4			SM	Similar to above, except dense, brown to light brown, 10% cobbles, 20% boulders	10	5	10	10	30	35				
5	0.0			Note: Several large boulders at 6 ft. Unable to excavate further.										
6		163.1 6.0		BOTTOM OF EXPLORATION AT 6.0 FT Note: Test pit backfilled with excavated soil.										

Obstructions: Boulders encountered at 6 ft below ground surface.

Remarks:

Field Tests

Dilatancy	R - Rapid S - Slow N - None
Toughness	L - Low M - Medium H - High
Plasticity	N - Nonplastic L - Low M - Medium H - High
Dry Strength	N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit
at depth Not encountered ft
measured after hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24		=
over 24		=

Test Pit Dimensions (ft)
Pit Length x Width (ft) 3 x 11
Pit Depth (ft) 6.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

HALEY ALDRICH

TEST PIT LOG

Test Pit No. HA25-TP14

Project 27 KIMBALL RD
Location AMESBURY, MA
Client MP PROPERTIES IV, LLC
Contractor LDR EXCAVATION
Equipment Used DEERE 35G TRACK-MOUNTED EXCAVATOR

File No. 0213708-001
H&A Rep A. Balogh
Date 11/24/2025
Weather Cloudy, 30s-40s

Ground El.: 156.4
El. Datum: NAVD88
Location: See Plan
Groundwater depths/entry rates (in./min.): Not encountered

Depth (ft)	Sample Data/ PID Readings (ppm)	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0	0.0		SM	Loose brown silty SAND (SM), organic odor, moist, 25% roots -TOPSOIL-	0	5	10	15	35	35				
1	0.0	155.6 0.8	SM	Loose light brown to brown silty SAND with gravel (SM), no odor, moist, 10% cobbles, 10% roots -LOESS-	10	5	10	10	40	25				
2		154.5 1.9	SM	Medium dense tan to light brown silty SAND with gravel (SM), bonded, no odor, moist, 15% cobbles -GLACIAL TILL-	10	5	10	10	45	20				
3	0.0													
4			SM	Similar to above, except dense, brown to light brown, trace boulders	10	5	10	10	35	30				
5	0.0													
6				Note: Mottling observed at 6 ft.										
		149.9 6.5		BOTTOM OF EXPLORATION AT 6.5 FT Note: Test pit backfilled with excavated soil.										

Obstructions: Not encountered

Remarks:

Field Tests

Dilatancy R - Rapid S - Slow N - None
Toughness L - Low M - Medium H - High
Plasticity N - Nonplastic L - Low M - Medium H - High
Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit
at depth Not encountered ft
measured after hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24		=
over 24		=

Test Pit Dimensions (ft)
Pit Length x Width (ft)
Pit Depth (ft) 6.5

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

TEST PIT LOG

Test Pit No. HA25-TP15

Project	27 KIMBALL RD	**File No.**	0213708-001
Location	AMESBURY, MA	**H&A Rep**	A. Balogh
Client	MP PROPERTIES IV, LLC	**Date**	11/24/2025
Contractor	LDR EXCAVATION	**Weather**	Cloudy, 30s-40s
Equipment Used	DEERE 35G TRACK-MOUNTED EXCAVATOR		

Ground El.: 153.2
El. Datum: NAVD88
Location: See Plan
Groundwater depths/entry rates (in./min.): Not encountered

Depth (ft)	Sample Data/ PID Readings (ppm)	Stratum Change Elev./ Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel % Coarse	Gravel % Fine	Sand % Coarse	Sand % Medium	Sand % Fine	% Fines	Field Tests Dilatancy	Toughness	Plasticity	Strength
0	0.0		SM	Brown silty SAND (SM), organic odor, moist, 25% roots -TOPSOIL-	0	5	10	15	35	35				
	0.0	152.2 1.0	SM	Light brown to brown silty SAND with gravel (SM), no odor, moist, 10% cobbles, 10% roots -LOESS-	10	5	10	10	40	25				
2		151.2 2.0	SM	Tan to light brown silty SAND with gravel (SM), bonded, no odor, moist, 15% cobbles, variable silt content -GLACIAL TILL-	10	5	10	15	35	25				
	0.0													
4			SM	Dense tan to light brown silty SAND (SM), bonded, no odor, moist, 15% cobbles	5	5	10	10	35	35				
	0.0													
6														
	0.0													
8		145.2 8.0		BOTTOM OF EXPLORATION AT 8.0 FT Note: Test pit backfilled with excavated soil.										

Obstructions: Not encountered

Remarks: In-situ permeability test performed from 4.1 to 4.6 ft below ground surface.

Field Tests

Dilatancy	R - Rapid S - Slow N - None
Toughness	L - Low M - Medium H - High
Plasticity	N - Nonplastic L - Low M - Medium H - High
Dry Strength	N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit
at depth Not encountered ft
measured after hours elapsed

Boulders

Diameter (in.)	Number	Approx. Vol. (cu.ft)
12 to 24		=
over 24		=

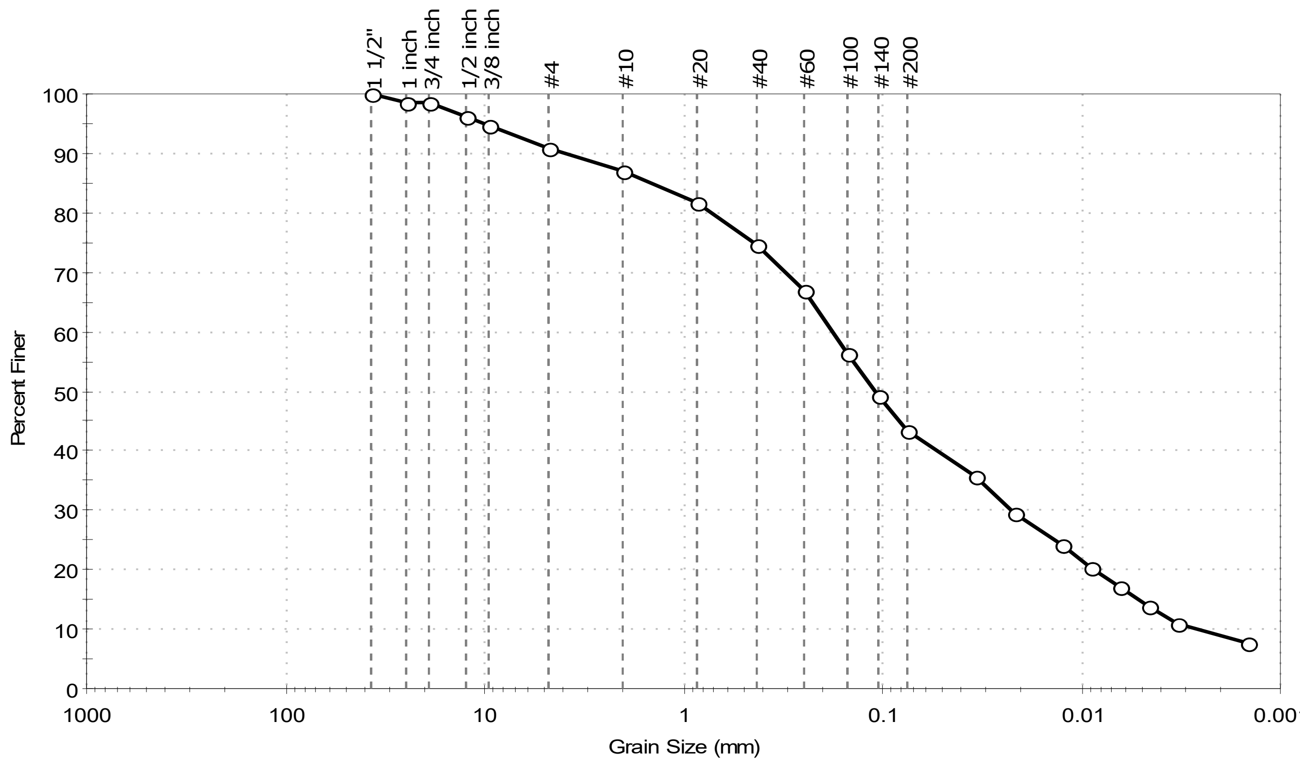
Test Pit Dimensions (ft)
Pit Length x Width (ft)
Pit Depth (ft) 8.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

APPENDIX B
Geotechnical Lab Test Results

Client:	Haley & Aldrich, Inc.				
Project:	27 Kimball Rd				
Location:	Amesbury			Project No:	GTX-322317
Boring ID:	---	Sample Type:	Bag	Tested By:	ajl
Sample ID:	HA25-TP1_3.0-6.3	Test Date:	12/16/25	Checked By:	ank
Depth :	3-6.3	Test Id:	847393		
Test Comment:	---				
Visual Description:	Moist, yellowish brown silty sand				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	9.0	47.5	43.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 1/2"	37.50	100		
1 inch	25.00	98		
3/4 inch	19.00	98		
1/2 inch	12.50	96		
3/8 inch	9.50	95		
#4	4.75	91		
#10	2.00	87		
#20	0.85	82		
#40	0.42	75		
#60	0.25	67		
#100	0.15	56		
#140	0.11	49		
#200	0.075	43		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0339	36		
---	0.0216	30		
---	0.0127	24		
---	0.0091	20		
---	0.0065	17		
---	0.0046	14		
---	0.0033	11		
---	0.0015	8		

Coefficients

D_{85} =1.4433 mm	D_{30} =0.0223 mm
D_{60} =0.1781 mm	D_{15} =0.0052 mm
D_{50} =0.1096 mm	D_{10} =0.0026 mm
C_u =68.500	C_c =1.074

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

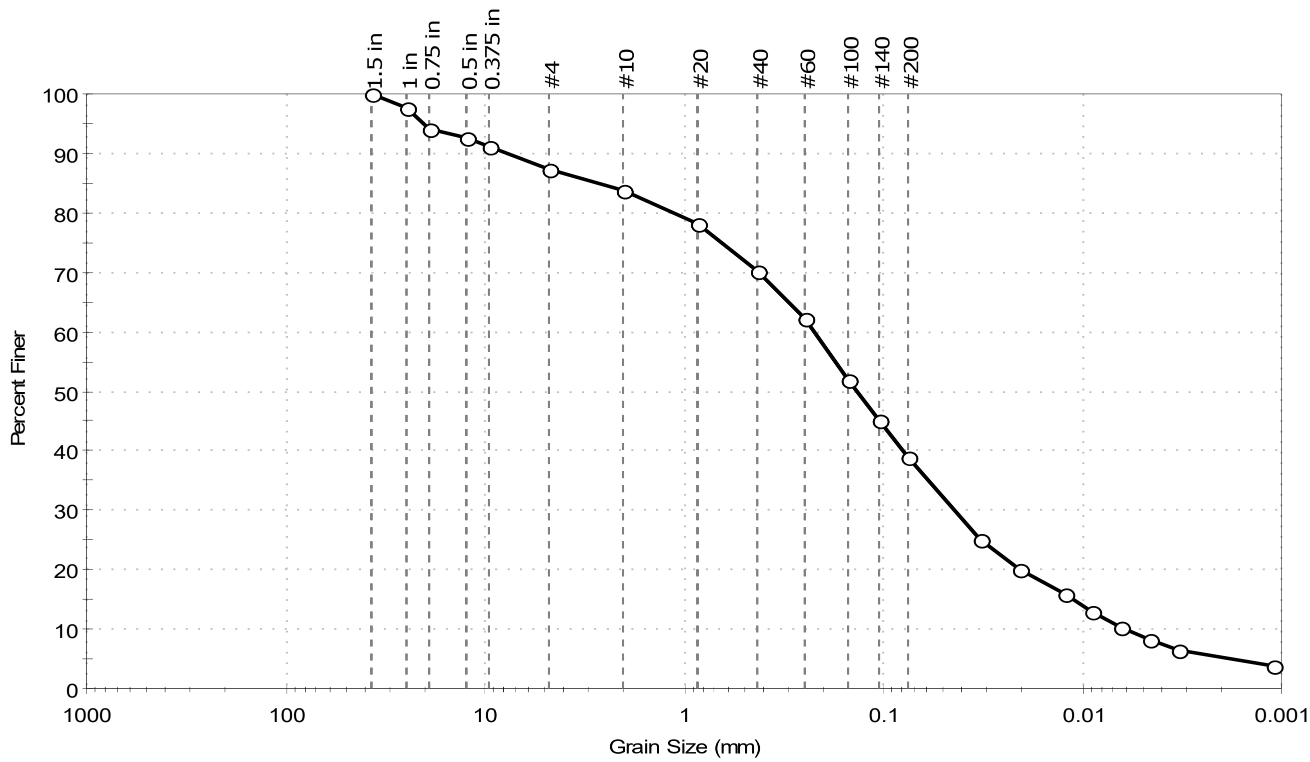
Separation of Sample: #200 Sieve

printed 12/16/2025 11:50:32 AM

Client:	Haley & Aldrich, Inc.				
Project:	27 Kimball Rd				
Location:	Amesbury			Project No:	GTX-322317
Boring ID:	---	Sample Type:	Bag	Tested By:	ajl
Sample ID:	HA25-TP2_3.0-7.0	Test Date:	12/15/25	Checked By:	ank
Depth :	3-7	Test Id:	847392		

Test Comment: ---
Visual Description: Moist, yellowish brown silty sand
Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	12.6	48.3	39.1

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	98		
0.75 in	19.00	94		
0.5 in	12.50	93		
0.375 in	9.50	91		
#4	4.75	87		
#10	2.00	84		
#20	0.85	78		
#40	0.42	70		
#60	0.25	62		
#100	0.15	52		
#140	0.11	45		
#200	0.075	39		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0325	25		
---	0.0207	20		
---	0.0124	16		
---	0.0089	13		
---	0.0064	10		
---	0.0046	8		
---	0.0033	7		
---	0.0011	4		

Coefficients

D_{85} =2.7293 mm | D_{30} =0.0436 mm
D_{60} =0.2222 mm | D_{15} =0.0113 mm
D_{50} =0.1354 mm | D_{10} =0.0062 mm
C_u =35.839 | C_c =1.380

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

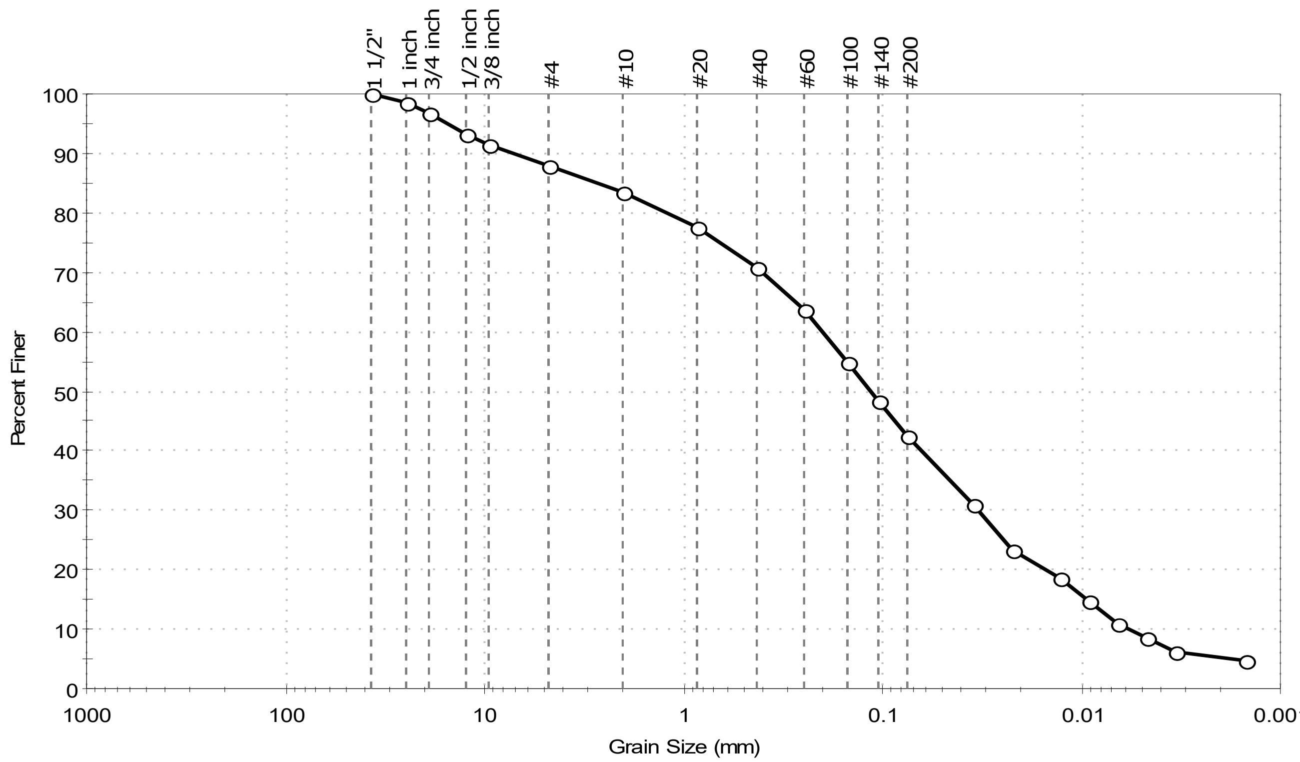
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR
Sand/Gravel Hardness : HARD
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

printed 12/16/2025 11:50:34 AM

Client: Haley & Aldrich, Inc.			
Project: 27 Kimball Rd			
Location: Amesbury		Project No:	GTX-322317
Boring ID: ---	Sample Type: Bag	Tested By:	ajl
Sample ID: HA25-TP3_3.0-7.0	Test Date: 12/16/25	Checked By:	ank
Depth : 3-7	Test Id: 847391		
Test Comment: ---			
Visual Description: Moist, yellowish brown silty sand			
Sample Comment: ---			

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	12.1	45.3	42.6

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 1/2"	37.50	100		
1 inch	25.00	98		
3/4 inch	19.00	97		
1/2 inch	12.50	93		
3/8 inch	9.50	91		
#4	4.75	88		
#10	2.00	84		
#20	0.85	78		
#40	0.42	71		
#60	0.25	64		
#100	0.15	55		
#140	0.11	48		
#200	0.075	43		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0348	31		
---	0.0221	23		
---	0.0129	19		
---	0.0093	15		
---	0.0066	11		
---	0.0047	9		
---	0.0034	6		
---	0.0015	5		

Coefficients

D_{85} =2.6681 mm | D_{30} =0.0329 mm
D_{60} =0.2015 mm | D_{15} =0.0095 mm
D_{50} =0.1154 mm | D_{10} =0.0059 mm
C_u =34.153 | C_c =0.910

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

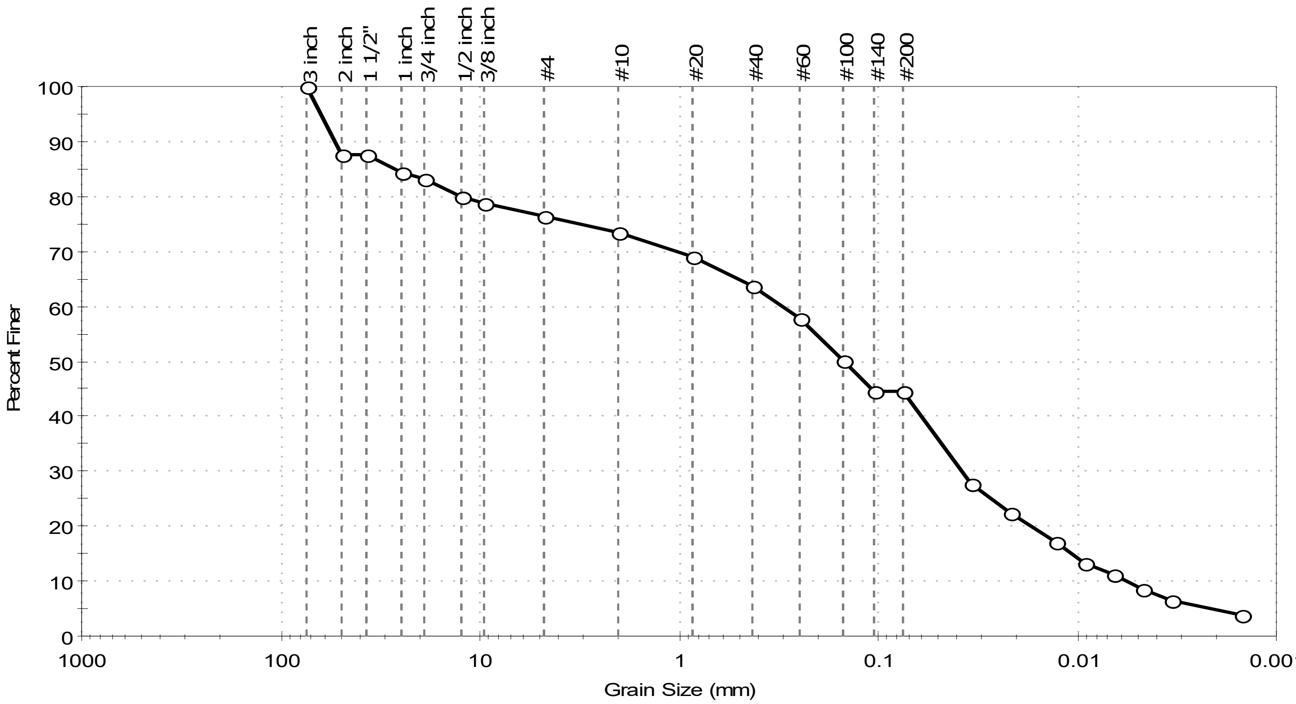
Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Client:	Haley & Aldrich, Inc.
Project:	27 Kimball Rd
Location:	Amesbury
Project No:	GTX-322317
Boring ID:	---
Sample Type:	Bag
Tested By:	ajl
Sample ID:	HA25-TP4_3.0-7.5
Test Date:	12/16/25
Checked By:	ank
Depth :	3-7.5
Test Id:	847390
Test Comment:	---
Visual Description:	Moist, yellowish brown silty sand with gravel
Sample Comment:	---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	23.7	31.8	44.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 inch	75.00	100		
2 inch	50.00	88		
1 1/2"	37.50	88		
1 inch	25.00	85		
3/4 inch	19.00	83		
1/2 inch	12.50	80		
3/8 inch	9.50	79		
#4	4.75	76		
#10	2.00	73		
#20	0.85	69		
#40	0.42	64		
#60	0.25	58		
#100	0.15	50		
#140	0.11	45		
#200	0.075	44		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0344	28		
---	0.0216	22		
---	0.0128	17		
---	0.0092	13		
---	0.0066	11		
---	0.0047	9		
---	0.0033	7		
---	0.0015	4		

Coefficients

D_{85} =26.6927 mm
D_{30} =0.0383 mm
D_{60} =0.3026 mm
D_{15} =0.0107 mm
D_{50} =0.1486 mm
D_{10} =0.0056 mm
C_u =54.036
C_c =0.866

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

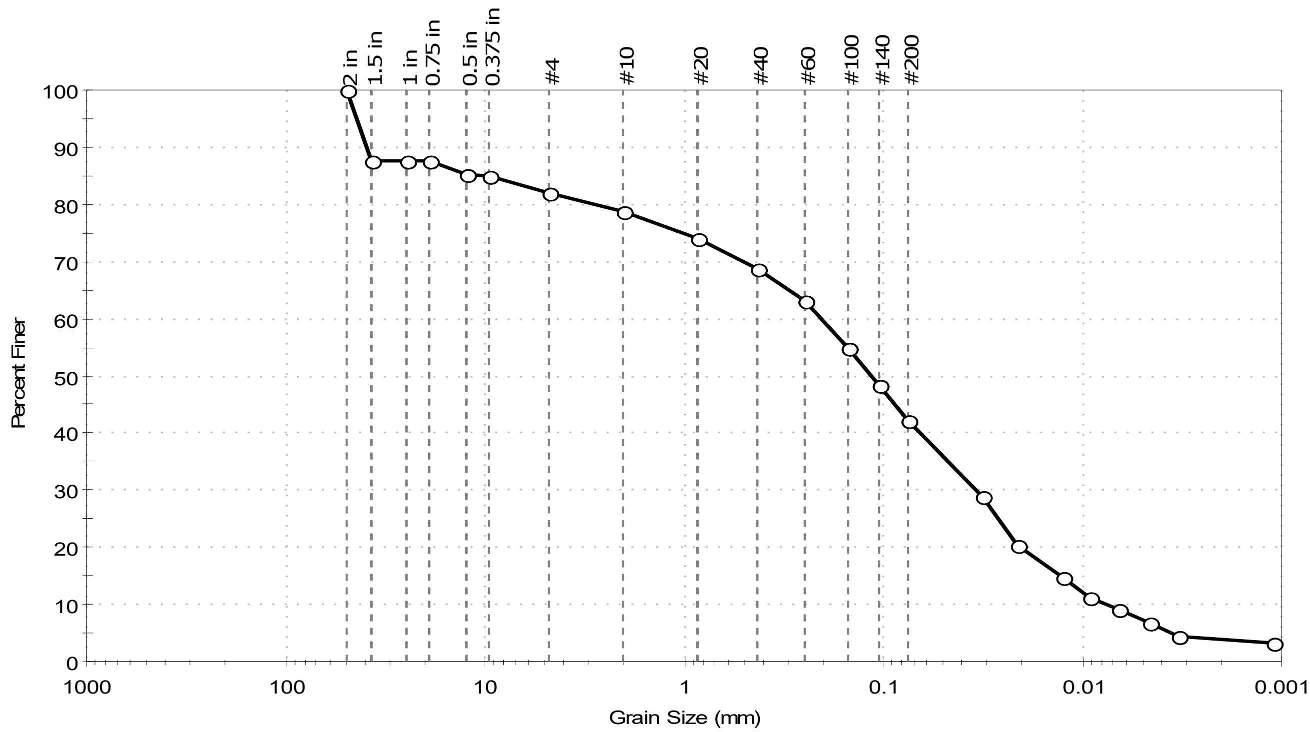
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Client:	Haley & Aldrich, Inc.			
Project:	27 Kimball Rd			
Location:	Amesbury		Project No:	GTX-322317
Boring ID:	---	Sample Type: Bag	Tested By:	ajl
Sample ID:	HA25-TP5_4.3-4.8	Test Date: 12/15/25	Checked By:	ank
Depth :	4.3-4.8	Test Id: 847389		

Test Comment: ---
Visual Description: Moist, yellowish brown silty sand with gravel
Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	18.1	39.6	42.3

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
2 in	50.00	100		
1.5 in	37.50	88		
1 in	25.00	88		
0.75 in	19.00	88		
0.5 in	12.50	85		
0.375 in	9.50	85		
#4	4.75	82		
#10	2.00	79		
#20	0.85	74		
#40	0.42	69		
#60	0.25	63		
#100	0.15	55		
#140	0.11	48		
#200	0.075	42		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0321	29		
---	0.0214	20		
---	0.0127	15		
---	0.0091	11		
---	0.0065	9		
---	0.0047	7		
---	0.0033	5		
---	0.0011	3		

Coefficients

D_{85} =10.2275 mm — D_{30} =0.0346 mm
D_{60} =0.2071 mm — D_{15} =0.0131 mm
D_{50} =0.1164 mm — D_{10} =0.0075 mm
C_u =27.613 — C_c =0.771

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

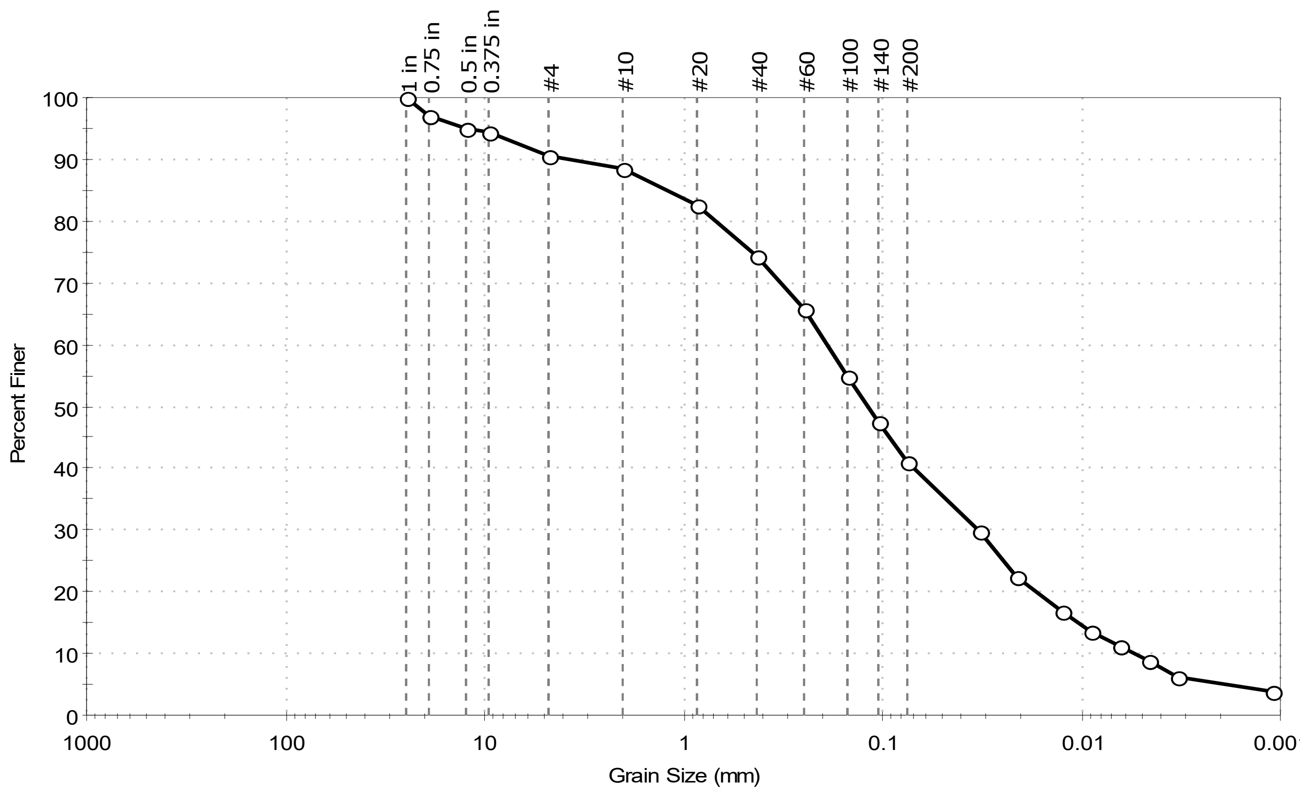
Sand/Gravel Particle Shape : ANGULAR
Sand/Gravel Hardness : HARD
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

printed 12/16/2025 11:50:38 AM

Client: Haley & Aldrich, Inc.			
Project: 27 Kimball Rd			
Location: Amesbury		Project No:	GTX-322317
Boring ID: ---	Sample Type: Bag	Tested By:	ajl
Sample ID: HA25-TP6_3.0-8.0	Test Date: 12/15/25	Checked By:	ank
Depth : 3-8	Test Id: 847388		

Test Comment: ---
Visual Description: Moist, yellowish brown silty sand
Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	9.4	49.6	41.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 in	25.00	100		
0.75 in	19.00	97		
0.5 in	12.50	95		
0.375 in	9.50	94		
#4	4.75	91		
#10	2.00	89		
#20	0.85	83		
#40	0.42	74		
#60	0.25	66		
#100	0.15	55		
#140	0.11	47		
#200	0.075	41		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0328	30		
---	0.0215	22		
---	0.0127	17		
---	0.0091	14		
---	0.0065	11		
---	0.0046	9		
---	0.0033	6		
---	0.0011	4		

Coefficients

D_{85} =1.2077 mm D_{30} =0.0331 mm
D_{60} =0.1902 mm D_{15} =0.0104 mm
D_{50} =0.1193 mm D_{10} =0.0055 mm
C_u =34.582 C_c =1.047

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

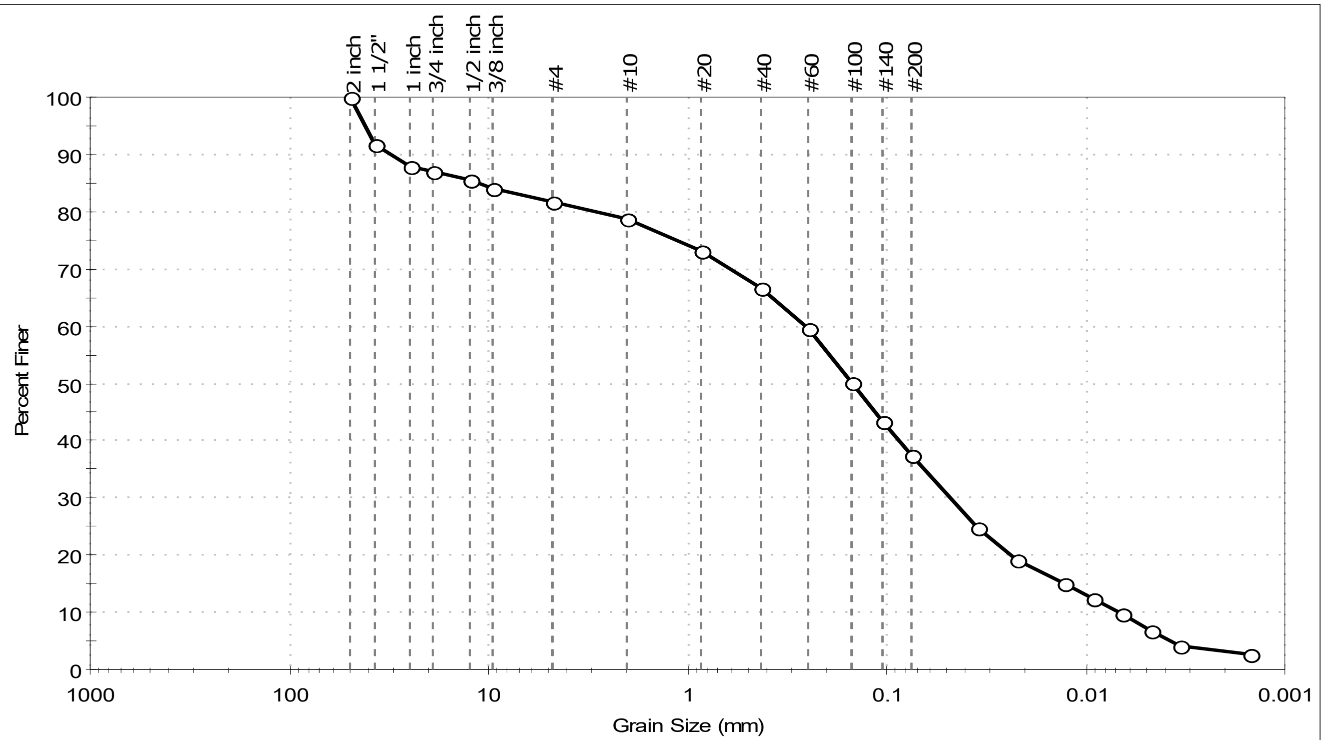
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR
Sand/Gravel Hardness : HARD
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

printed 12/16/2025 11:50:39 AM

Client:	Haley & Aldrich, Inc.		
Project:	27 Kimball Rd		
Location:	Amesbury	Project No:	GTX-322317
Boring ID: ---	Sample Type: Bag	Tested By:	ajl
Sample ID: HA25-TP7_3.0-7.0	Test Date: 12/16/25	Checked By:	ank
Depth : 3-7	Test Id: 847387		
Test Comment:	---		
Visual Description:	Moist, yellowish brown silty sand with gravel		
Sample Comment:	---		

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	18.2	44.3	37.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
2 inch	50.00	100		
1 1/2"	37.50	92		
1 inch	25.00	88		
3/4 inch	19.00	87		
1/2 inch	12.50	85		
3/8 inch	9.50	84		
#4	4.75	82		
#10	2.00	79		
#20	0.85	73		
#40	0.42	67		
#60	0.25	60		
#100	0.15	50		
#140	0.11	43		
#200	0.075	37		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0351	25		
---	0.0221	19		
---	0.0130	15		
---	0.0093	12		
---	0.0066	10		
---	0.0047	7		
---	0.0034	4		
---	0.0015	3		

Coefficients

D_{85} =11.3583 mm D_{30} =0.0480 mm

D_{60} =0.2587 mm D_{15} =0.0128 mm

D_{50} =0.1497 mm D_{10} =0.0069 mm

C_u =37.493 C_c =1.291

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

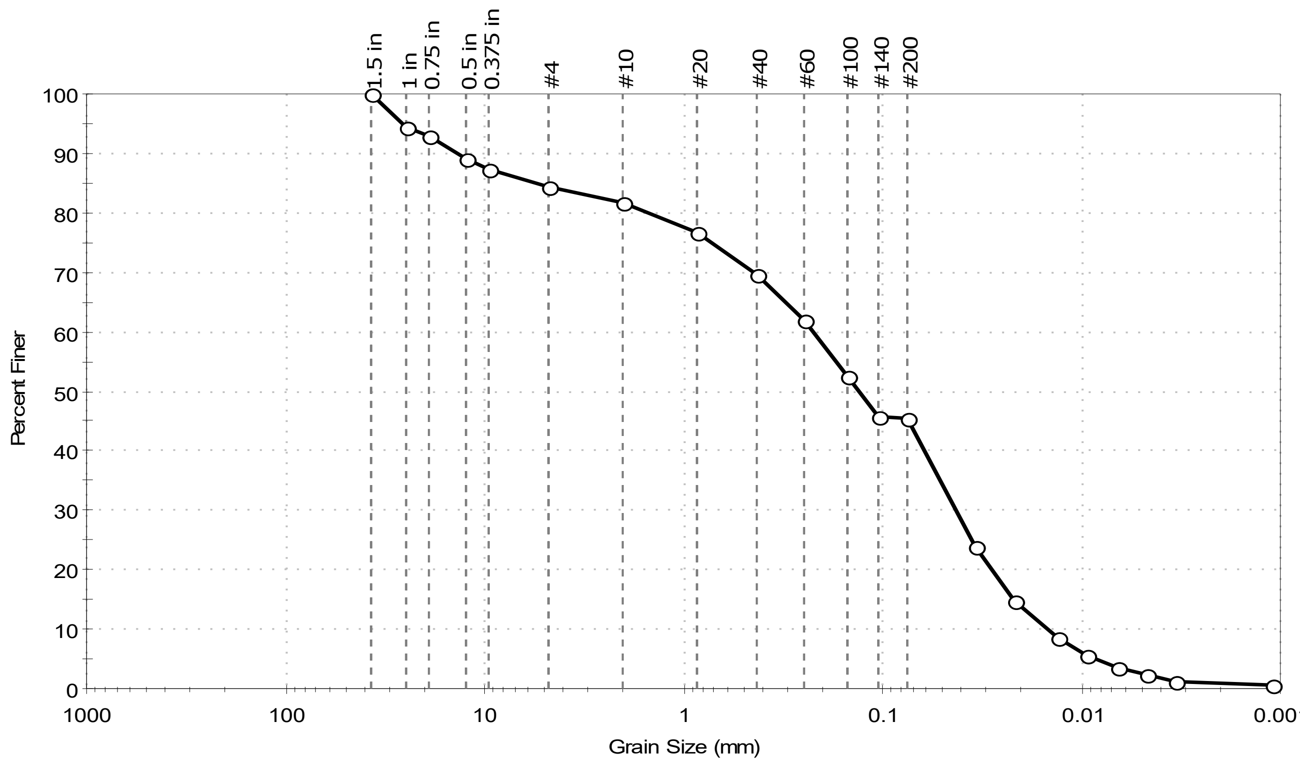
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Client:	Haley & Aldrich, Inc.				
Project:	27 Kimball Rd				
Location:	Amesbury			Project No:	GTX-322317
Boring ID:	---	Sample Type:	Bag	Tested By:	ajl
Sample ID:	HA25-TP8_5.5-6.0	Test Date:	12/15/25	Checked By:	ank
Depth :	5.5-6	Test Id:	847386		

Test Comment: ---
Visual Description: Moist, yellowish brown silty sand with gravel
Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	15.5	39.1	45.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	95		
0.75 in	19.00	93		
0.5 in	12.50	89		
0.375 in	9.50	87		
#4	4.75	84		
#10	2.00	82		
#20	0.85	77		
#40	0.42	70		
#60	0.25	62		
#100	0.15	52		
#140	0.11	46		
#200	0.075	45		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0339	24		
---	0.0220	15		
---	0.0131	9		
---	0.0094	6		
---	0.0067	3		
---	0.0048	2		
---	0.0034	1		
---	0.0011	1		

Coefficients

D_{85} =5.3595 mm	D_{30} =0.0424 mm
D_{60} =0.2239 mm	D_{15} =0.0221 mm
D_{50} =0.1321 mm	D_{10} =0.0148 mm
C_u =15.128	C_c =0.543

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

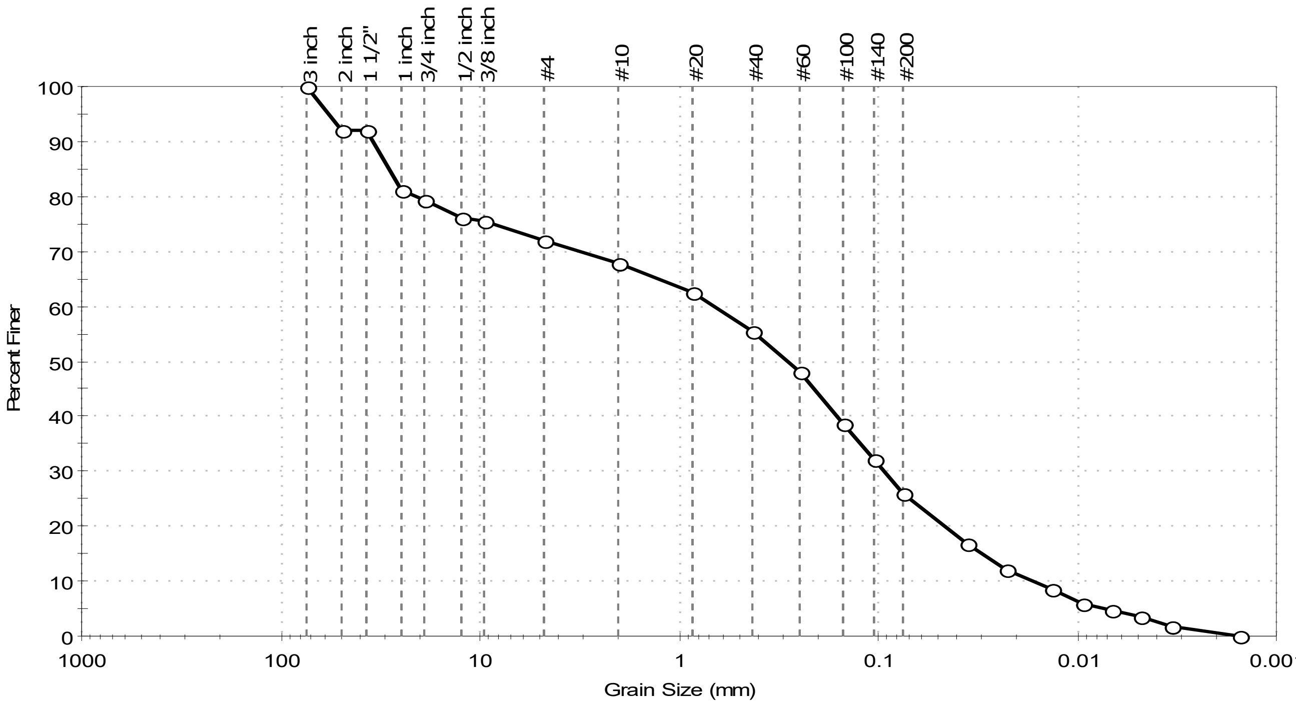
Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR
Sand/Gravel Hardness : HARD
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

printed 12/16/2025 11:50:41 AM

Client:	Haley & Aldrich, Inc.				
Project:	27 Kimball Rd				
Location:	Amesbury			Project No:	GTX-322317
Boring ID:	---	Sample Type:	Bag	Tested By:	ajl
Sample ID:	HA25-TP9_4.0-5.0	Test Date:	12/16/25	Checked By:	ank
Depth :	4-5	Test Id:	847385		
Test Comment:	---				
Visual Description:	Moist, yellowish brown silty sand with gravel				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	28.1	45.9	26.0

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 inch	75.00	100		
2 inch	50.00	92		
1 1/2"	37.50	92		
1 inch	25.00	81		
3/4 inch	19.00	79		
1/2 inch	12.50	76		
3/8 inch	9.50	76		
#4	4.75	72		
#10	2.00	68		
#20	0.85	62		
#40	0.42	56		
#60	0.25	48		
#100	0.15	39		
#140	0.11	32		
#200	0.075	26		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0360	17		
---	0.0229	12		
---	0.0133	8		
---	0.0095	6		
---	0.0067	5		
---	0.0048	4		
---	0.0034	2		
---	0.0015	0		

Coefficients

D_{85} =28.8813 mm | D_{30} =0.0935 mm

D_{60} =0.6672 mm | D_{15} =0.0302 mm

D_{50} =0.2868 mm | D_{10} =0.0168 mm

C_u =39.714 | C_c =0.780

Classification

ASTM N/A

AASHTO Silty Gravel and Sand (A-2-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

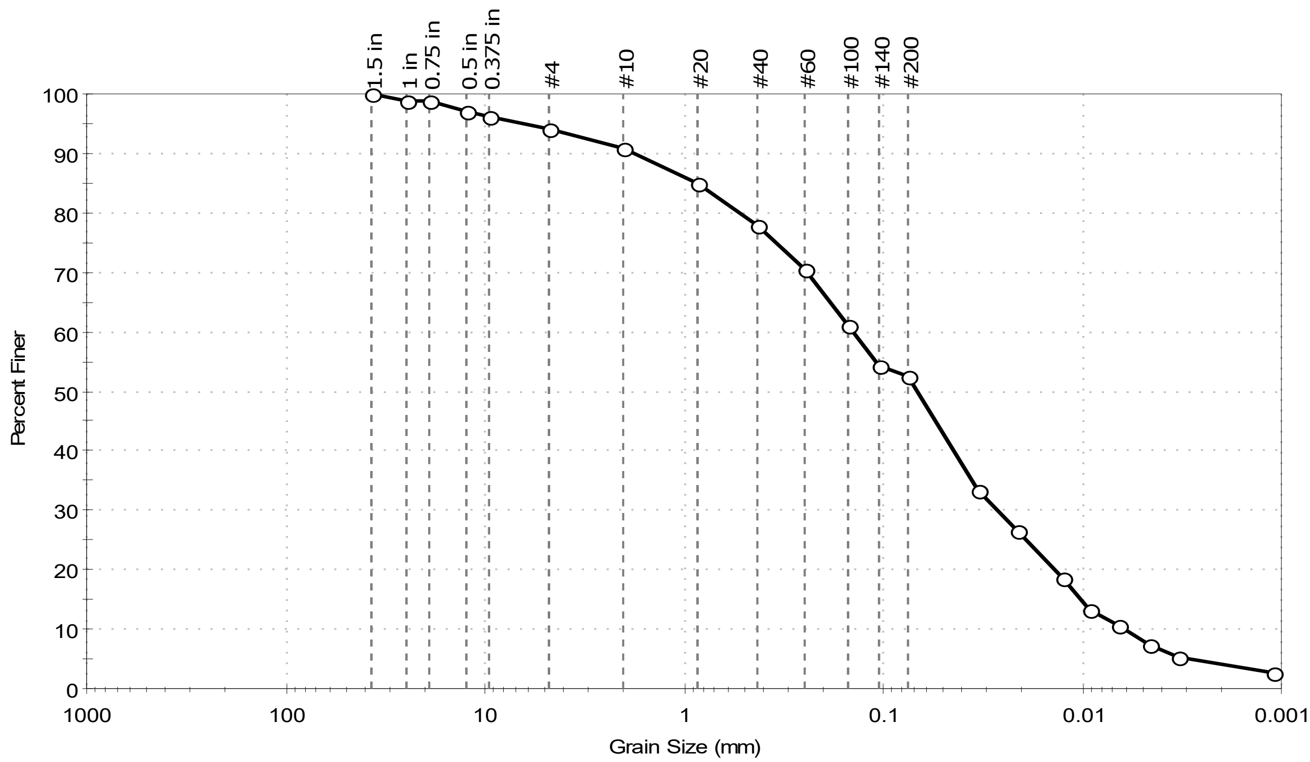
Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 12/16/2025 11:50:42 AM

Client:	Haley & Aldrich, Inc.				
Project:	27 Kimball Rd				
Location:	Amesbury			Project No:	GTX-322317
Boring ID:	---	Sample Type:	Bag	Tested By:	ajl
Sample ID:	HA25-TP10_3.0-7.0	Test Date:	12/15/25	Checked By:	ank
Depth :	3-7	Test Id:	847384		
Test Comment:	---				
Visual Description:	Moist, yellowish brown sandy silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	5.9	41.7	52.4

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	99		
0.75 in	19.00	99		
0.5 in	12.50	97		
0.375 in	9.50	96		
#4	4.75	94		
#10	2.00	91		
#20	0.85	85		
#40	0.42	78		
#60	0.25	71		
#100	0.15	61		
#140	0.11	54		
#200	0.075	52		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0332	33		
---	0.0212	27		
---	0.0126	19		
---	0.0091	13		
---	0.0065	11		
---	0.0047	7		
---	0.0033	5		
---	0.0011	3		

Coefficients

D_{85} =0.8441 mm	D_{30} =0.0267 mm
D_{60} =0.1416 mm	D_{15} =0.0101 mm
D_{50} =0.0677 mm	D_{10} =0.0061 mm
C_u =23.213	C_c =0.825

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Client:	Haley & Aldrich, Inc.		
Project:	27 Kimball Rd		
Location:	Amesbury	Project No:	GTX-322317

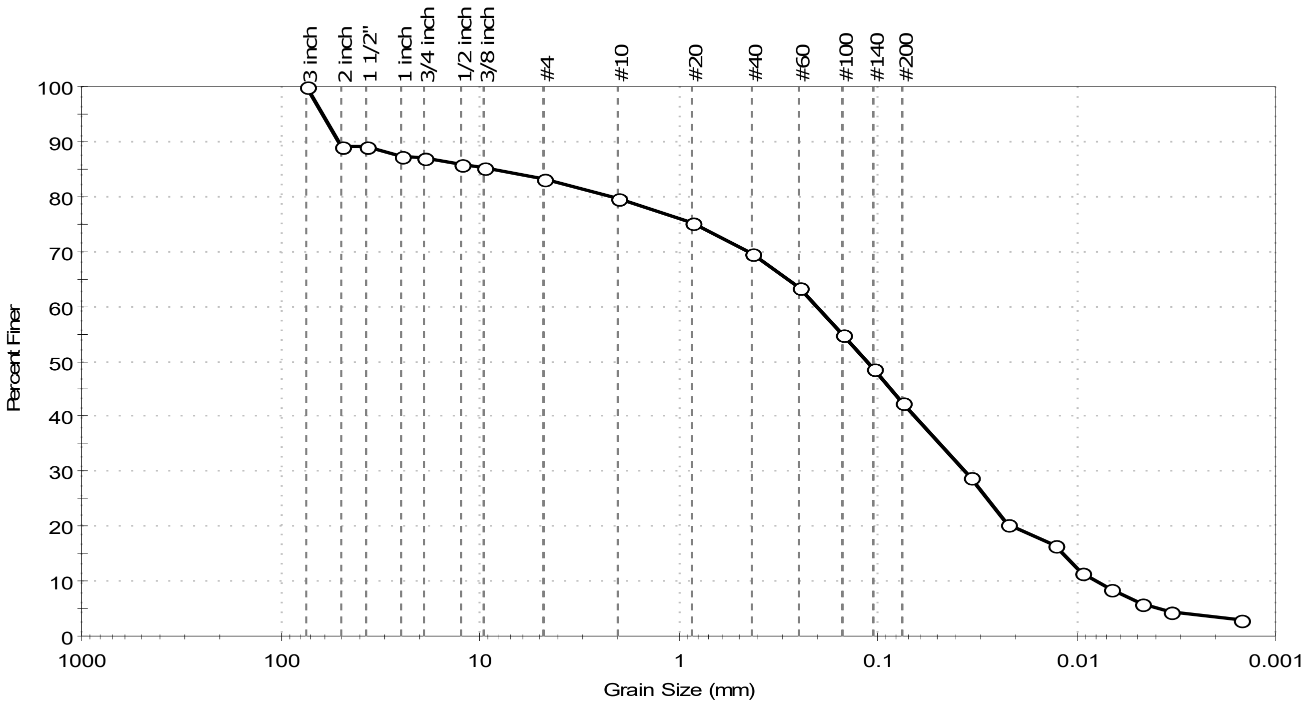
Boring ID:	---	Sample Type:	Bag	Tested By:	ajl
Sample ID:	HA25-TP11_3.0-8.0	Test Date:	12/16/25	Checked By:	ank
Depth :	3-8	Test Id:	847383		

Test Comment: ---

Visual Description: Moist, yellowish brown silty sand with gravel

Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
---	16.9	40.6	42.5

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3 inch	75.00	100		
2 inch	50.00	89		
1 1/2"	37.50	89		
1 inch	25.00	87		
3/4 inch	19.00	87		
1/2 inch	12.50	86		
3/8 inch	9.50	85		
#4	4.75	83		
#10	2.00	80		
#20	0.85	75		
#40	0.42	70		
#60	0.25	63		
#100	0.15	55		
#140	0.11	49		
#200	0.075	43		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0345	29		
---	0.0223	20		
---	0.0130	17		
---	0.0093	12		
---	0.0067	9		
---	0.0048	6		
---	0.0034	4		
---	0.0015	3		

Coefficients

D_{85} =8.4388 mm	D_{30} =0.0368 mm
D_{60} =0.2041 mm	D_{15} =0.0117 mm
D_{50} =0.1133 mm	D_{10} =0.0078 mm
C_u =26.167	C_c =0.851

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

printed 12/16/2025 11:50:45 AM

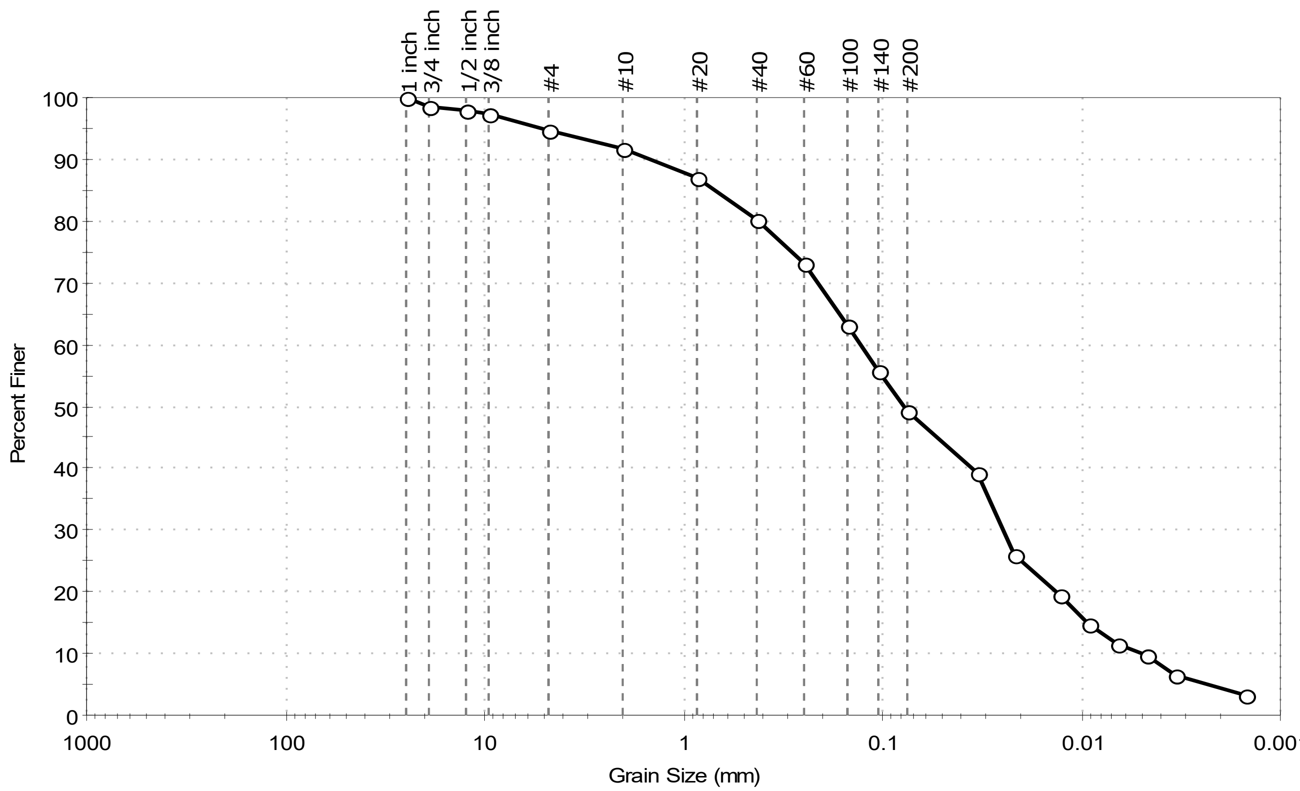
Client:	Haley & Aldrich, Inc.		
Project:	27 Kimball Rd		
Location:	Amesbury	Project No:	GTX-322317
Boring ID: ---	Sample Type: Bag	Tested By:	ajl
Sample ID: HA25-TP12_3.0-8.0	Test Date: 12/16/25	Checked By:	ank
Depth : 3-8	Test Id: 847382		

Test Comment: ---

Visual Description: Moist, yellowish brown silty sand

Sample Comment: ---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	5.3	45.5	49.2

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1 inch	25.00	100		
3/4 inch	19.00	99		
1/2 inch	12.50	98		
3/8 inch	9.50	97		
#4	4.75	95		
#10	2.00	92		
#20	0.85	87		
#40	0.42	80		
#60	0.25	73		
#100	0.15	63		
#140	0.11	56		
#200	0.075	49		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0332	39		
---	0.0218	26		
---	0.0129	20		
---	0.0093	15		
---	0.0066	11		
---	0.0047	10		
---	0.0034	7		
---	0.0015	3		

Coefficients

D_{85} =0.6966 mm	D_{30} =0.0248 mm
D_{60} =0.1299 mm	D_{15} =0.0095 mm
D_{50} =0.0783 mm	D_{10} =0.0049 mm
C_u =26.510	C_c =0.966

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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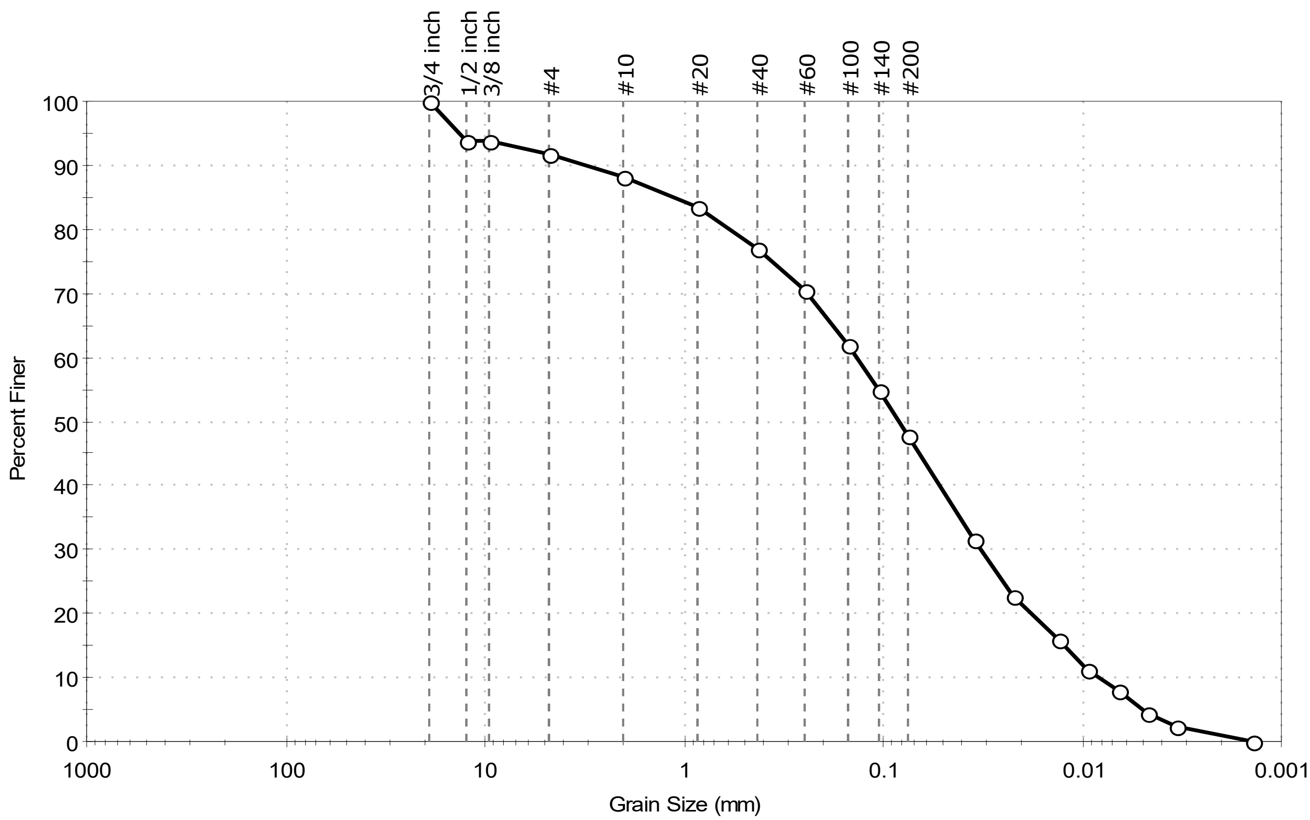
Client:	Haley & Aldrich, Inc.				
Project:	27 Kimball Rd				
Location:	Amesbury			Project No:	GTX-322317
Boring ID:	---	Sample Type:	Bag	Tested By:	ajl
Sample ID:	HA25-TP13_3.0-6.0	Test Date:	12/12/25	Checked By:	ank
Depth :	3-6	Test Id:	847381		
Test Comment:	---				
Visual Description:	Moist, yellowish brown sandy silt				
Sample Comment:	---				

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	8.1	44.0	47.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3/4 inch	19.00	100		
1/2 inch	12.50	94		
3/8 inch	9.50	94		
#4	4.75	92		
#10	2.00	88		
#20	0.85	83		
#40	0.42	77		
#60	0.25	70		
#100	0.15	62		
#140	0.11	55		
#200	0.075	48		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0349	32		
---	0.0224	23		
---	0.0131	16		
---	0.0093	11		
---	0.0066	8		
---	0.0047	5		
---	0.0034	2		
---	0.0014	0		

Coefficients

D_{85} =1.1312 mm	D_{30} =0.0322 mm
D_{60} =0.1367 mm	D_{15} =0.0123 mm
D_{50} =0.0831 mm	D_{10} =0.0082 mm
C_u =16.671	C_c =0.925

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR

Sand/Gravel Hardness : HARD

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

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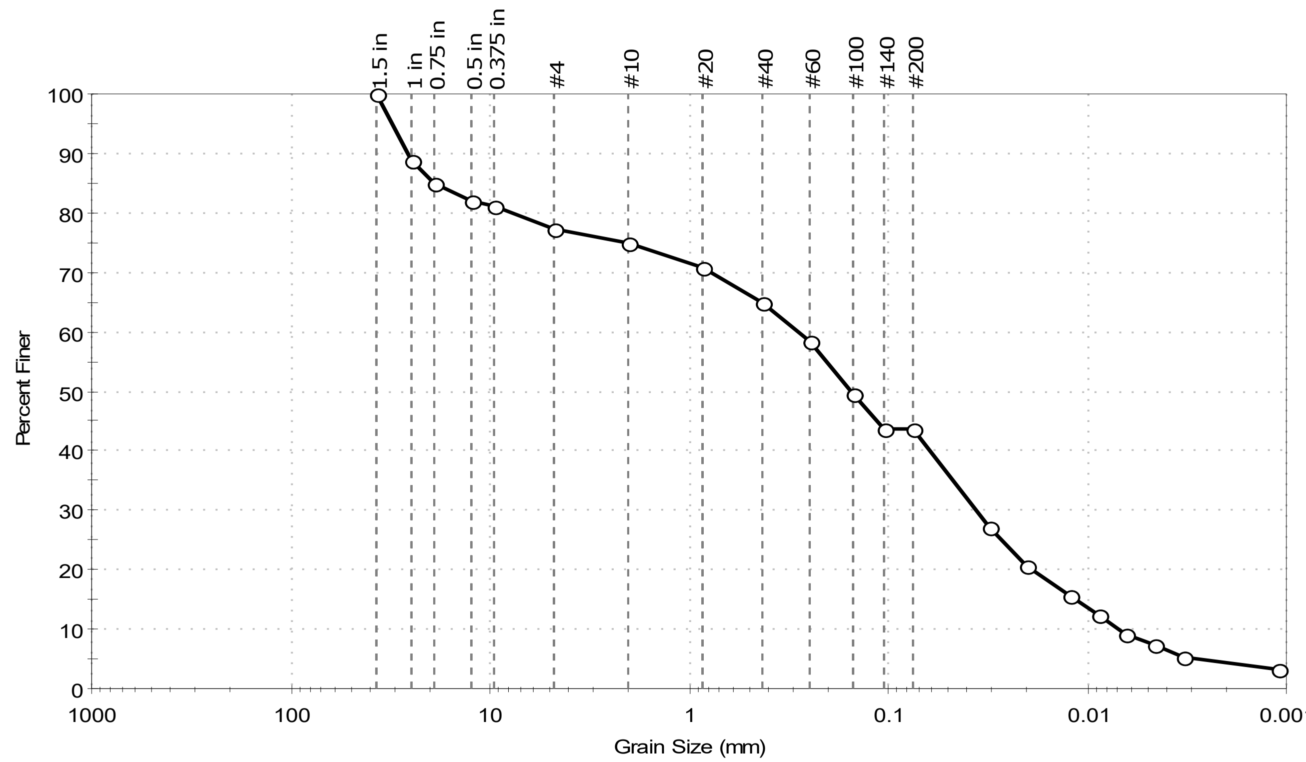
Client:	Haley & Aldrich, Inc.			
Project:	27 Kimball Rd			
Location:	Amesbury		Project No:	GTX-322317
Boring ID:	---	Sample Type: Bag	Tested By:	ajl
Sample ID:	HA25-TP14_3.0-6.5	Test Date: 12/15/25	Checked By:	ank
Depth :	3-6.5	Test Id: 847380		
Test Comment:	---			
Visual Description:	Moist, dark yellowish brown silty sand with gravel			
Sample Comment:	---			

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	22.6	33.7	43.7

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
1.5 in	37.50	100		
1 in	25.00	89		
0.75 in	19.00	85		
0.5 in	12.50	82		
0.375 in	9.50	81		
#4	4.75	77		
#10	2.00	75		
#20	0.85	71		
#40	0.42	65		
#60	0.25	58		
#100	0.15	50		
#140	0.11	44		
#200	0.075	44		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0310	27		
---	0.0201	21		
---	0.0122	16		
---	0.0088	12		
---	0.0064	9		
---	0.0046	7		
---	0.0033	5		
---	0.0011	3		

Coefficients

D_{85} =19.1630 mm
D_{30} =0.0362 mm
D_{60} =0.2829 mm
D_{15} =0.0115 mm
D_{50} =0.1541 mm
D_{10} =0.0070 mm
C_u =40.414
C_c =0.662

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ANGULAR
Sand/Gravel Hardness : HARD
Dispersion Device : Apparatus A - Mech Mixer
Dispersion Period : 1 minute
Est. Specific Gravity : 2.65
Separation of Sample: #200 Sieve

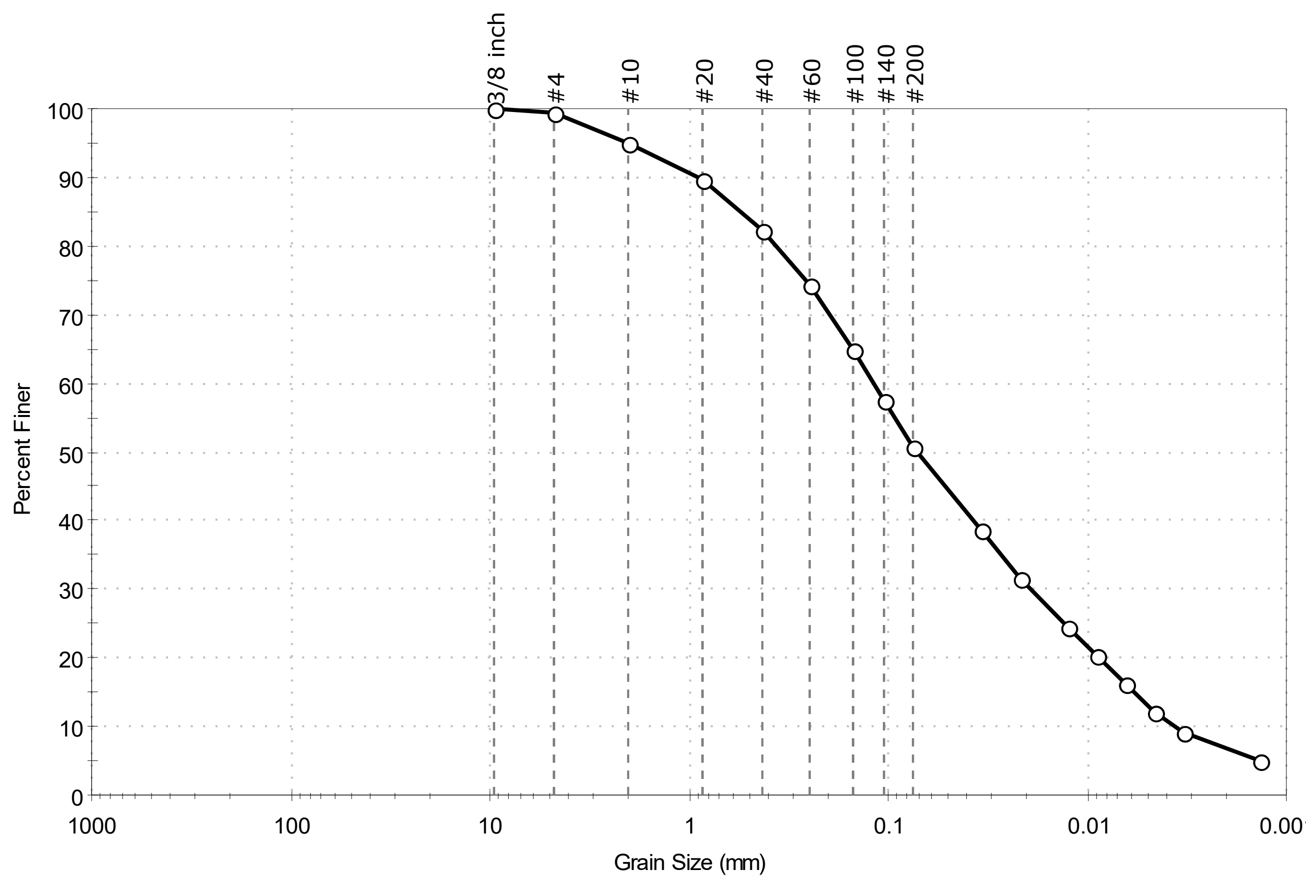
Client:	Haley & Aldrich, Inc.
Project:	27 Kimball Rd
Location:	Amesbury

Project No: GTX-322317

Boring ID:	---	Sample Type:	Bag	Tested By:	ajl
Sample ID:	HA25-TP15_3.0-8.0	Test Date:	12/12/25	Checked By:	ank
Depth :	3-8	Test Id:	847379		

Test Comment:	---
Visual Description:	Moist, yellowish brown sandy silt
Sample Comment:	---

Particle Size Analysis - ASTM D6913/D7928



% Cobble	% Gravel	% Sand	% Silt & Clay Size
—	0.6	48.5	50.9

Sieve Name	Sieve Size, mm	Percent Finer	Spec. Percent	Complies
3/8 inch	9.50	100		
#4	4.75	99		
#10	2.00	95		
#20	0.85	90		
#40	0.42	82		
#60	0.25	74		
#100	0.15	65		
#140	0.11	58		
#200	0.075	51		
Hydrometer	Particle Size (mm)	Percent Finer	Spec. Percent	Complies
---	0.0341	39		
---	0.0215	32		
---	0.0127	24		
---	0.0091	20		
---	0.0065	16		
---	0.0046	12		
---	0.0033	9		
---	0.0014	5		

Coefficients

D_{85} =0.5450 mm	D_{30} =0.0192 mm
D_{60} =0.1188 mm	D_{15} =0.0058 mm
D_{50} =0.0710 mm	D_{10} =0.0036 mm
C_u =33.000	C_c =0.862

Classification

ASTM N/A

AASHTO Silty Soils (A-4 (0))

Sample/Test Description

Sand/Gravel Particle Shape : ---

Sand/Gravel Hardness : ---

Dispersion Device : Apparatus A - Mech Mixer

Dispersion Period : 1 minute

Est. Specific Gravity : 2.65

Separation of Sample: #200 Sieve

Allen & Major Associates, Inc. Computation Sheet

Title	Pipe Sizing Table	Minimum Slope:	0.91%	By	BDP
Project	27 Kimball Road	Minimum Pipe Size:	12	Chk'd	CMQ
Issued	1/26/2026	Rainfall Intensity (in/hr):	8.14 (25 year storm)	Apprv'd	CMQ
Revised		Manning's n:	0.013 HDPE		
A&M Project Number: 3410-03		Minimum Pipe Cover:	1.14		

Line						Req'd. Capac.	Pipe Size	Slope	Design Capacity		Drop	Invert Elevation		Rim Elev.	
From	To	Length	Area	wgt. C	CA	Qd	D	s	Q_{full}	V_{full}		Upper	Lower	Upper	Cover
Upper	Lower	(feet)	(acres)			(cfs)	(in)	(%)	(cfs)	(fps)	(feet)	(ft)	(ft)	(ft)	(ft)
CB-1	DMH-1	43	0.278	0.75	0.208	1.69	12	4.42%	7.5	9.54	1.90	174.50	172.60	178.10	2.47
CB-2	DMH-1	15	0.278	0.75	0.208	1.69	12	2.60%	5.8	7.31	0.40	173.00	172.60	177.10	2.97
DMH-1	WQU-1	106				3.39	12	4.41%	7.5	9.53	4.70	172.50	167.80	177.50	3.88
CB-3	WQU-1	6	0.278	0.75	0.208	1.69	12	1.71%	4.7	5.94	0.10	167.90	167.80	176.00	6.97
AD-1	WQU-1	21	0.278	0.75	0.208	1.69	12	4.67%	7.7	9.80	1.00	168.80	167.80	176.00	6.07
WQU-1	UIS-1	11				6.78	15	1.81%	8.7	7.09	0.20	167.70	167.50	176.00	6.93
CB-4	UIS-1	27	0.278	0.75	0.208	1.69	12	1.11%	3.8	4.78	0.30	167.20	166.90	170.00	1.68
OCS-1	DMH-2	155	HydroCAD 25YR Storm			0.49	12	2.71%	5.9	7.46	4.20	166.80	162.60	171.04	3.11
DMH-2	DMH-3	103				0.49	12	1.26%	4.0	5.09	1.30	162.50	161.20	165.78	2.16
DMH-3	DMH-4	28				0.49	12	1.06%	3.7	4.66	0.30	161.10	160.80	163.37	1.14
CB-5	UIS-2	41	0.205	0.78	0.161	1.31	12	1.57%	4.5	5.68	0.65	159.50	158.85	164.90	4.28
AD-2	WQU-3	50	0.205	0.78	0.161	1.31	12	4.77%	7.8	9.90	2.40	163.00	160.60	168.57	4.44
CB-6	WQU-3	8	0.205	0.78	0.161	1.31	12	2.36%	5.5	6.97	0.20	160.80	160.60	164.00	2.07
WQU-3	UIS-2	8				3.92	12	1.26%	4.0	5.10	0.10	160.60	160.50	164.06	2.34
OCS-2	DMH-4	9	HydroCAD 25YR Storm			0.41	12	0.91%	3.4	4.32	0.08	160.78	160.70	164.37	2.46
DMH-4	FES-1	94				0.90	12	1.06%	3.7	4.68	1.00	160.70	159.70	163.15	1.32
CB-9	UIS-4	6	0.211	0.88	0.186	1.51	12	1.82%	4.8	6.12	0.10	164.60	164.50	170.24	4.51
OCS-4	DMH-8	55	HydroCAD 25YR Storm			0.00	12	4.35%	7.4	9.46	2.40	164.50	162.10	167.92	2.30

Allen & Major Associates, Inc. Computation Sheet

Title: Pipe Sizing Table
Project: 27 Kimball Road
Issued: 1/26/2026
Revised
A&M Project Number: 3410-03

Minimum Slope: 0.91%
Minimum Pipe Size: 12
Rainfall Intensity (in/hr): 8.14 (25 year storm)
Manning's n: 0.013 HDPE
Minimum Pipe Cover: 1.14

By: BDP
Chk'd: CMQ
Apprv'd: CMQ

Line						Req'd. Capac.	Pipe Size	Slope	Design Capacity		Drop	Invert Elevation		Rim Elev.	
From	To	Length	Area	wgt. C	CA	Qd	D	s	Q_{full}	V_{full}		Upper	Lower	Upper	Cover
Upper	Lower	(feet)	(acres)			(cfs)	(in)	(%)	(cfs)	(fps)	(feet)	(ft)	(ft)	(ft)	(ft)
CB-8	WQU-5	122	1.204	0.57	0.683	5.56	12	4.80%	7.8	9.94	5.83	168.73	162.90	175.81	5.95
AD-5	DMH-5	121	0.285	0.71	0.202	1.65	12	2.10%	5.2	6.57	2.53	166.80	164.27	175.48	7.55
AD-6	DMH-5	69	0.285	0.71	0.202	1.65	12	1.02%	3.6	4.58	0.70	166.50	165.80	170.19	2.57
DMH-5	WQU-5	58				3.30	12	2.18%	5.3	6.69	1.26	164.16	162.90	170.94	5.65
WQU-5	UDS-5	52				8.85	18	1.55%	13.1	7.40	0.80	162.80	162.00	172.38	7.95
CB-15	UDS-5	17	0.380	0.70	0.265	2.15	12	2.97%	6.2	7.82	0.50	168.00	167.50	172.43	3.31
CB-13	UDS-5	90	0.190	0.50	0.095	0.77	12	2.21%	5.3	6.75	2.00	164.00	162.00	167.98	2.85
CB-14	UDS-5	32	0.359	0.65	0.234	1.90	12	4.62%	7.7	9.75	1.50	164.50	163.00	169.80	4.18
OCS-3	DMH-7	47	HydroCAD 25YR Storm			2.00	12	4.25%	7.4	9.35	2.00	162.00	160.00	170.42	7.29
DMH-7	UDS-6	197				2.00	12	3.75%	6.9	8.79	7.40	159.90	152.50	169.32	8.29
AD-3	WQU-4	111	0.194	0.76	0.148	1.20	12	4.40%	7.5	9.52	4.90	157.00	152.10	160.54	2.41
AD-4	WQU-4	72	0.194	0.76	0.148	1.20	12	2.10%	5.2	6.57	1.50	156.00	154.50	160.07	2.95
CB-7	WQU-4	12	0.194	0.76	0.148	1.20	12	2.59%	5.8	7.31	0.30	152.40	152.10	160.98	7.46
WQU-4	UDS-6	6				3.61	15	1.57%	8.1	6.60	0.10	152.10	152.00	160.99	7.52
CB-10	DMH-8	12	0.213	0.92	0.197	1.60	12	1.74%	4.7	5.98	0.20	162.30	162.10	165.95	2.52
DMH-8	DMH-9	79				1.60	12	5.67%	8.5	10.80	4.50	162.00	157.50	165.79	2.66
AD-9	DMH-9	47	0.252	0.68	0.171	1.39	12	4.26%	7.4	9.36	2.00	159.50	157.50	165.97	5.35
DMH-9	WQU-6	75				3.00	12	3.34%	6.5	8.28	2.50	156.50	154.00	161.10	3.47
AD-11	DMH-6	99	0.252	0.68	0.171	1.39	12	4.05%	7.2	9.13	4.00	160.00	156.00	164.76	3.63
AD-10	DMH-6	14	0.252	0.68	0.171	1.39	12	4.43%	7.5	9.55	0.60	159.60	159.00	165.50	4.78
DMH-6	WQU-6	23				2.79	12	6.40%	9.0	11.48	1.50	155.50	154.00	164.08	7.46
CB-12	DMH-10	15	0.278	0.74	0.205	1.67	12	3.38%	6.6	8.34	0.50	155.00	154.50	159.07	2.94
CB-11	DMH-10	22	0.278	0.74	0.205	1.67	12	2.31%	5.4	6.90	0.50	155.00	154.50	159.12	2.99
DMH-10	WQU-6	18				3.33	12	2.23%	5.3	6.78	0.40	154.40	154.00	159.13	3.60
WQU-6	UDS-6	27				9.12	15	2.95%	11.1	9.05	0.80	154.00	153.20	159.66	4.29
OCS-5	DMH-11	166	HydroCAD 25YR Storm			2.57	18	5.83%	25.4	14.35	9.70	152.00	142.30	158.98	5.35
DMH-11	BASIN	61				2.57	18	1.15%	11.3	6.37	0.70	142.20	141.50	146.29	2.46
OCS-6	DMH-12	64	HydroCAD 25YR Storm			2.03	12	5.00%	8.0	10.15	3.20	141.50	138.30	146.00	3.38
TD	WQU-7	15	0.123	0.95	0.117	0.95	8	2.76%	2.0	5.75	0.40	134.00	133.60	137.30	2.51
WQU-7	UDS-3	4				0.95	8	2.34%	1.9	5.29	0.10	133.60	133.50	138.51	4.12
OCS-7	DMH-13	42	HydroCAD 25YR Storm			0.31	12	1.66%	4.6	5.84	0.70	133.50	132.80	138.33	3.71

Allen & Major Associates, Inc.		Computation Sheet	
Title	*MA DEP Standard Calculations*	By	BDP
Project	27 Kimball Road	Chk'd	CMQ
Location	27 Kimball Road, Amesbury, MA	Apprv'd	CMQ
Date	1/26/2026		
Revised			

Stormwater Recharge/Water Quality Volume Table

Rv = F * Impervious Area

Rv *= Required Recharge Volume, expressed in* ft^3*, cubic yards or acre-feet*

F *= Target Depth Factor associated with each Hydraulic Soil Group*

Impervious Area *= pavement & rooftop area on site*

A_{WQ} *= Required Water Quality Treatment Volume, expressed in* ft^3

D_{WQ} *= Water Quality Depth*

A_{IMP} *= Impervious Area (excluding non-metal roofs)*

					Recharge Required			*Water Quality Volume Required*	
Watershed	Area (Sq. Ft.)	Landscaped	Impervious Area (Square Feet) HSG A (F=.6)	HSG B (F=.35)	*F Avg. (Inches)*	*Impervious Area (Feet)*	*Rv* (ft^3)	D_{WQ} *(Inch)*	A_{WQ}
P-3	9,286	430	0	8,856	0.35	8,856	258	1.0	738
P-13	52,463	33,504	0	18,959	0.35	18,959	553	1.0	1,580
P-10B	15,645	7,811	0	7,834	0.35	7,834	228	1.0	653
P-14	24,855	9,961	0	14,894	0.35	14,894	434	1.0	1,241
P-10A	16,553	7,004	0	9,549	0.35	9,549	279	1.0	796
P-12	8,298	6,231	0	2,067	0.35	2,067	60	1.0	172
P-11	32,948	14,844	0	18,104	0.35	18,104	528	1.0	1,509
P-15	9,184	1,039	0	8,145	0.35	8,145	238	1.0	679
P-5	25,326	7,937	0	17,389	0.35	17,389	507	1.0	1,449
P-4	24,255	8,661	0	15,594	0.35	15,594	455	1.0	1,300
P-7	17,094	11,510	0	5,584	0.35	5,584	163	1.0	465
P-6	5,351	0	0	5,351	0.35	5,351	156	1.0	446
P-1A	13,439	13,398	0	41	0.35	41	1	1.0	3
P-1B	21,569	20,851	0	718	0.35	718	21	1.0	60
P-9	60,455	20,161	0	40,294	0.35	40,294	1,175	1.0	3,358
P-8	26,823	7,489	0	19,334	0.35	19,334	564	1.0	1,611
P-2	46,203	45,460	0	743	0.35	743	22	1.0	62
Total	**409,747**	**216,291**	**0**	**193,456**		**193,456**	**5,642**		**16,121**

Stormwater Recharge Summary

Rv = F * Impervious Area

Rv *= Required Recharge Volume, expressed in* ft^3*, cubic yards or acre-feet*

F *= Target Depth Factor associated with each Hydraulic Soil Group*

Impervious Area *= pavement & rooftop area on site*

	Required (cf)	***Provided (cf)***	
ARv =	***3,466***	***10,788***	***Infiltration Basin***
ARv =	***238***	***2,301***	***UIS-4***
ARv =	***564***	***3,996***	***UIS-2***
ARv =	***1,175***	***7,782***	***UIS-1***
ARv =	***5,642***	***24,867***	***TOTAL***
Capture Area Adjustment * =	***5,850***		

*Capture Area Adjustment	
Total Impervious Area	193,456
Site Impervious area draining to Recharge BMPs	186,603
Ratio	1.04
Adjusted ARv	5,850

Water Quality Volume

A_{WQ} *= Required Water Quality Treatment Volume, expressed in* ft^3

D_{WQ} *= Water Quality Depth*

A_{IMP} *= Impervious Area (excluding non-metal roofs)*

	Required (cf)	***Provided (cf)***	
A_{WQ} =	***9,903***	***10,788***	***Infiltration Basin***
A_{WQ} =	***679***	***2,301***	***UIS-4***
A_{WQ} =	***1,611***	***3,996***	***UIS-2***
A_{WQ} =	***3,358***	***7,782***	***UIS-1***
A_{WQ} =	***16,121***	***24,867***	***TOTAL***
Capture Area Adjustment * =	***16,713***		

*Capture Area Adjustment	
Total Impervious Area	193,456
Site Impervious area draining to Recharge BMPs	186,603
Ratio	1.04
Adjusted Awq	16,713

Allen & Major Associates, Inc.		Computation Sheet	
Title	*MA DEP Standard Calculations*	By	BDP
Project	27 Kimball Road	Chk'd	CMQ
Location	27 Kimball Road, Amesbury, MA	Apprv'd	CMQ
Date	1/26/2026		

Draindown Within 72 Hours

$Time_{drawdown}$=(Rv) (1/Design Infiltration Rate in inches per hour) (Conversion for inches to feet) (1/bottom area in feet)

Infiltration Basin (Sandy Loam)	
Infiltration Rate (in/Hr)=	1.02
Bottom Area (ft^2) =	4,090
Infiltration Volume (ft^3) =	10,788
$Time_{drawdown}$ (Hours)=	31.03

$Time_{drawdown}$=(Rv) (1/Design Infiltration Rate in inches per hour) (Conversion for inches to feet) (1/bottom area in feet)

UIS-1 (Sandy Loam)	
Infiltration Rate (in/Hr)=	1.02
Bottom Area (ft^2) =	5,572
Infiltration Volume (ft^3) =	7,782
$Time_{drawdown}$ (Hours)=	16.43

$Time_{drawdown}$=(Rv) (1/Design Infiltration Rate in inches per hour) (Conversion for inches to feet) (1/bottom area in feet)

UIS-2 (Sandy Loam)	
Infiltration Rate (in/Hr)=	1.02
Bottom Area (ft^2) =	2,248
Infiltration Volume (ft^3) =	3,996
$Time_{drawdown}$ (Hours)=	20.91

$Time_{drawdown}$=(Rv) (1/Design Infiltration Rate in inches per hour) (Conversion for inches to feet) (1/bottom area in feet)

UIS-4 (Sandy Loam)	
Infiltration Rate (in/Hr)=	1.02
Bottom Area (ft^2) =	2,592
Infiltration Volume (ft^3) =	2,301
$Time_{drawdown}$ (Hours)=	10.44

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (C*D)	E Remaining Load (D-E)
Deep Sump Catch Basins	0.25	1.00	0.25	0.75
Water Quality Unit	0.50	0.75	0.38	0.38
Sub-Surface Infiltration System (or Infiltration Basin) w/ Outlet Control	0.80	0.38	0.30	0.08
Total TSS Removal =			0.93	