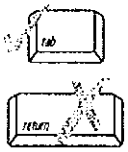
Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

Massachusetts Department of Environmental Protection
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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

12-15-17

Signature and Date

Checklist

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

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☐ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☐ Static ☒ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

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

☒ An Illicit Discharge Compliance Statement is attached;

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

FARLAND CORP.

ENGINEERING A BETTER TOMORROW

ENGINEERING | SITE WORK | LAND SURVEYING

STORMWATER REPORT

December 15, 2017

SITE PLAN

ASSESSORS PLOT 133 LOT 21 AND PORTION OF LOT 12
127 DUCHAINE BOULEVARD
NEW BEDFORD, MASSACHUSETTS

PREPARED FOR:

Heike Milhench
Milhench Supply Co.
127 Duchaine Boulevard
New Bedford, MA 02745

(MAIN OFFICE) 401 COUNTY STREET, NEW BEDFORD, MA 02740 P 508.717.3479 F 508.717.3481
ADDITIONAL OFFICES IN: TAUNTON • MARLBOROUGH • WARWICK, RI

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STORMWATER MANAGEMENT REPORT AND HYDROLOGIC ANALYSIS

SECTION 1: Project Summary

The project area associated with this proposed development is located on the west side of Duchaine Boulevard, south of Samuel Barnet Boulevard in the New Bedford Business Park. The site is comprised of one existing parcel and a portion of another parcel, identified as Assessors Plot 133, Lot 21 and a portion of Assessors Plot 133, Lot 12, which combined consist of approximately 7.0 acres. The site is located entirely within the Industrial C Zoning District.

The site is partially developed, and consists of a 29,600+/- square foot industrial warehouse style building, with associated parking areas to the north and south of the building, and loading areas on the north side of the building. Access to the site is gained from three entrance driveways off of Duchaine Boulevard. Two entrance driveways serve the parking area north of the building, and one entrance driveway serves the parking area to the south of the building. Enclosed utility areas consisting of radio communications towers are located north of the northern parking area. A bordering vegetated wetland abuts the developed site to the north and west of the existing building and parking areas. That portion of the proposed site located on a portion of the parcel identified as Assessors Plot 133, Lot 12 consists of high tension electric wires and utility poles. The site is located entirely in Zone X, areas determined to be outside the 0.2% annual chance floodplain. The site is not located within an area identified by the Natural Heritage and Endangered Species Program as a Priority Habitat of Rare Species or an Estimated Habitat of Rare Wildlife.

The applicant is seeking permission construct an 18,000 s.f. (90 ft. x 200 ft.) addition on the north side of the building, install new paved parking areas on the north and south side of the building, and install loading dock bays along the structure's southern wall, and install a new entrance driveway and loading area to service the new loading dock bays. The proposed addition will result in an alteration of approximately 2,300 s.f. of bordering vegetated wetland. The disturbed resource area will be replicated on-site.

In order to attenuate the increased stormwater runoff generated by the proposed increase of impervious site coverage and to provide the appropriate level of water quality treatment, stormwater management practices have been proposed. Proposed structural BMP's include sediment forebays, bio-retention areas, vegetated filter strips, and infiltration basins.

SECTION 2: Methodology

Drainage computations were performed using the Natural Resources Conservation Services (NRCS) TR-20 method and HydroCAD® Drainage Calculation Software to determine the change in the existing and post-development runoff rates from each drainage area for the 2-, 10-, and 100-year 24 hour storm events. The limits of the work proposed to complete the project fall within an area subject to protection by the Wetlands Protection Act, therefor, compliance with DEP Stormwater Management Standards is required. Sketches of the existing and proposed watershed areas, HydroCAD® Report, and copies of the calculation sheets are included as appendices to this report.

SECTION 3: Existing Conditions

The soils underlying the proposed development site are identified in the Natural Resources Conservation Service (NRCS) Soil Survey of Bristol County, Southern Part ***(see Exhibit D)***. The site soils are classified as 602 (Urban Land), 38A (Pipestone loamy sand, [HSG "A/D"]), 39A (Scarboro mucky fine sandy loam, [HSG "A/D"]), 52A (Freetown muck, [HSG "B/D"]), and 260A (Sudbury fine sandy loam, [HSG "B"]).

Soils identified as 602 are not assigned a Hydrologic Soils Group by the NRCS. For the purposes of performing hydrologic calculations, a hydrologic soil group "A" was assumed for these soils, based on on-site soil testing.

Soil testing was performed by Farland Corp. under the direction of Stevie Carvalho, on October 18, 2017 (Test Holes 1-3) to confirm the soil survey and determine the soil suitability for on-site stormwater and wastewater management purposes. The locations of the test holes are shown on the Site Plans.

The deep test-holes were performed to depths or approximately 10 feet to determine the estimated seasonal high groundwater elevation. Mottling was encountered at depths varying from 46" to 48", and standing water was encountered at depths varying from 73" to 77". The soil texture of the underlying parent material encountered in test holes consisted of medium sand.

SECTION 4: Stormwater Management Overview

Existing Conditions:

Two design points have been chosen for this project: (1) the limit of the bordering vegetated wetlands along the northern and western limits of the developed site, and (2) the southern property boundary. Each design point receives stormwater runoff flows from one subcatchment area Areas which will not be altered as a result of the proposed construction have not been included in this analysis.

The existing building roof area and those areas of upland directly north and west of the building shed runoff towards the bordering vegetated wetland. Areas to the south and east of the building shed runoff towards the southern property line and towards the ditch running along Duchaine Boulevard in a southerly flow direction.

Proposed Conditions:
Under proposed conditions, seven subcatchment areas have been included in the drainage model for the same two design points. Three subcatchment area sheds runoff and eventually discharge toward the Bordering Vegetated Wetland design point. Of those three subcatchment areas, one sheds runoff from the new paved parking area towards a bio-retention area prior to discharging toward the wetland. Another subcatchment sheds runoff from a portion of the roof area to a stormwater infiltration basin designed to capture and infiltrate the 100 –year 24-hour storm event. This basin is designed to overflow towards the wetland. The third subcatchment area discharges runoff toward the wetland without prior treatment or attenuation by a structural BMP.

Four subcatchment areas shed runoff towards the southern property boundary. Of those four, two shed runoff from the proposed parking areas toward 2 separate bio-retention areas. Each bio-retention is provided with a sediment forebay pre-treatment device, and each bio-retention area discharges to the same infiltration basin. One of the four subacatchment areas consists of direct runoff into the infiltration basin. This subcatchment area does not contain any impervious pavement or roof area. The final subacatchment area sheds untreated, un-attenuated runoff towards the southern property boundary.

SECTION 5: Stormwater Management Standards

Standard 1:

- Under proposed conditions, there will be no new untreated discharges or erosion in wetland areas. Of the three subcatchment areas which discharge towards the BVW, two contain stormwater BMPs which treat, temporarily store, and discharge towards the resource area. The drainage outfall from the bio-retention area is provided with rip-rap outlet protection (6" max. graded rock size) to help control velocity and erosion at the outlet. The drainage outfall from the infiltration basin is intended to convey runoff from storms only in excess of the 100-year storm event, and is intended to serve as an emergency overflow. It is also provided with rip-rap outlet protection. The remaining clean runoff is shed overland towards the BVW following existing drainage patterns. This standard has been met.

Standard 2:

- The design of the stormwater system was designed for the post-development conditions to handle all storms' peak discharges and runoff volume to include the 2, 10, and 100-year storm events. The site drainage system was designed in consideration of the structural standards and techniques of the Best Management Practices (BMP) and Low Impact Development (LID) outlined in the "Stormwater Management Handbook".

The results of site drainage calculations are presented in the following Table. The results are based upon evaluation of Pre-development conditions and the design of proposed surface drainage systems for the Post-development condition. These results show the Post-Development offsite runoff rates are reduced to less than the Pre-development conditions, thus meeting the BMP guidelines for this site development. This standard has been met.

Table 1 - Comparison of Pre- versus Post-Development Offsite Runoff

	Pre-Development		Post-Development	
Storm Frequency	**Rate (cfs)**	**Volume (af)**	**Rate (cfs)**	**Volume (af)**
2-Year Storm				
To Northern Property Boundary	2.88	0.210	1.76	0.165
To Southern Property Boundary	0.03	0.017	0.00	0.000
10-Year Storm				
To Northern Property Boundary	5.41	0.386	4.82	0.328
To Southern Property Boundary	0.45	0.084	0.04	0.010
100-Year Storm				
To Northern Property Boundary	9.72	0.692	8.94	0.618
To Southern Property Boundary	2.88	0.261	1.10	0.115

Standard 3:

- The proposed infiltration basins have been designed to recharge runoff from additional impervious area resulting from the proposed development. Because the project is a partial redevelopment project, required recharge calculations have been provided based on the increased impervious area, and not the total site impervious area. The required Recharge Volume has been calculated using the Simple Dynamic Method and calculations are provided in ***Exhibit F***. We note that the required Recharge Volume was calculated for the entire impervious area on-site, including existing paved and roof areas which are proposed to remain unaltered during construction. As a partial re-development project, this Standard is required to be met to the maximum extent practicable for these existing areas. The proposed design, however, provides the required recharge volume within the proposed basins. Drawdown Calculations have also been provided in ***Exhibit G***. This standard has been met.

Standard 4:

- The proposed stormwater management systems for this project have been designed to remove 80% of the average annual post construction load of Total Suspended Solids in accordance with this standard, as shown in calculations provided in ***Exhibit I***. Suitable practices for source control and pollution prevention have been identified in a long-term pollution prevention plan in ***Exhibit J***. Structural BMPs have been designed to capture the required water

quality volume (***Exhibit H***) determined in accordance with the Stormwater Handbook. This standard has been met.

Standard 5:

- The use associated with this project is classified as a Land Use with Higher Potential Pollutant Load (LUHPPL); therefore, Standard 5 is applicable to this project. Stormwater runoff from the parking areas have been designed to flow to surface infiltration basins. This standard has been met.

Standard 6:

- The site does not discharge within the Zone II or IWPA of a public water supply, nor does it discharge near or to any critical areas. This standard does not apply.

Standard 7:

- This project is a partial re-development project. Much of the site is currently paved or covered with impervious cover. Those areas where new impervious coverage is proposed, as well as much of the existing impervious areas, have been designed to meet all of the required Stormwater Standards. The remaining existing impervious area, consisting of mainly existing roof areas and areas within the communication tower areas, will follow existing drainage patterns. Due to the water table present on-site and limited separation between developed areas and bordering vegetated wetlands, it is not feasible to fully meet all Standards for the existing impervious conditions.

Standard 8:

- Where there will be over one acre of disturbance, an EPA Construction General Permit must be obtained and a Storm Water Pollution Prevention Plan (SWPPP) is required. A construction period sedimentation and erosion control plan has been incorporated in the Site Plans. Safeguards have been incorporated into the construction period sedimentation and erosion control plans to ensure proper operation and maintenance and to prevent negative impacts to the on-site wetland resource areas. Additional erosion controls and pollutant source controls will be provided in the Stormwater Pollution Prevention Plan that will be completed prior to land disturbance. This standard will be met upon submittal of the final SWPPP and Construction General Permit filing.

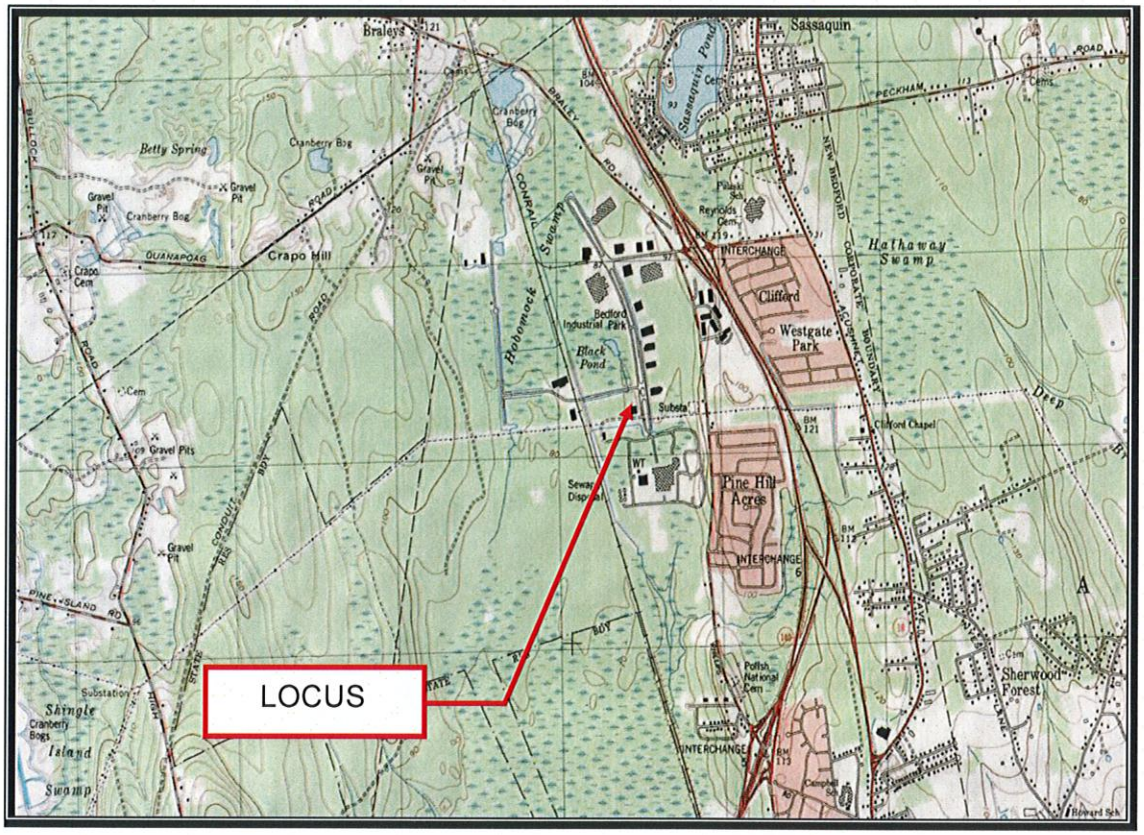
Standard 9:

- A long-term operation and maintenance plan has been prepared to ensure that stormwater management systems function as designed. ***(Exhibit K)***

Standard 10:

- We are not proposing any illicit discharges as defined in the Stormwater Management Regulations. See attached letter in ***Exhibit L***

USGS MAP
TOPO! VERSION 2.1.0



FIRM MAP
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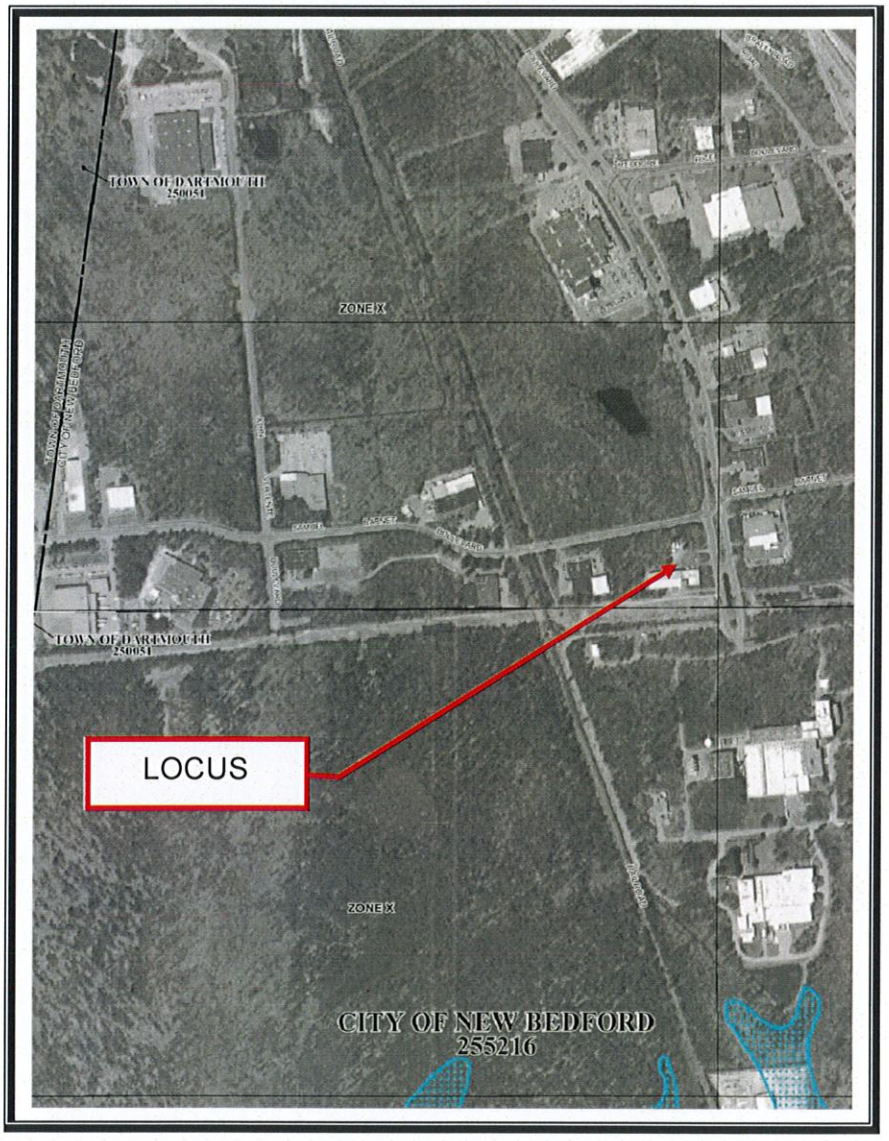

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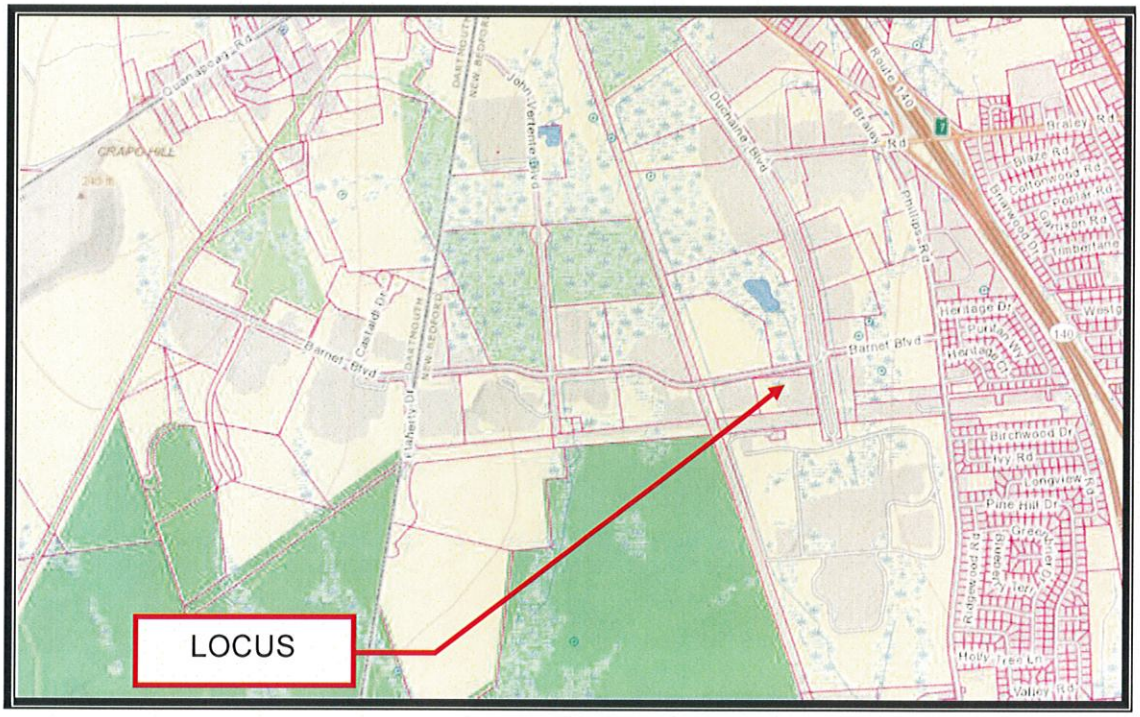
NHESP PRIORITY & ESTIMATED HABITAT MAP, 2008



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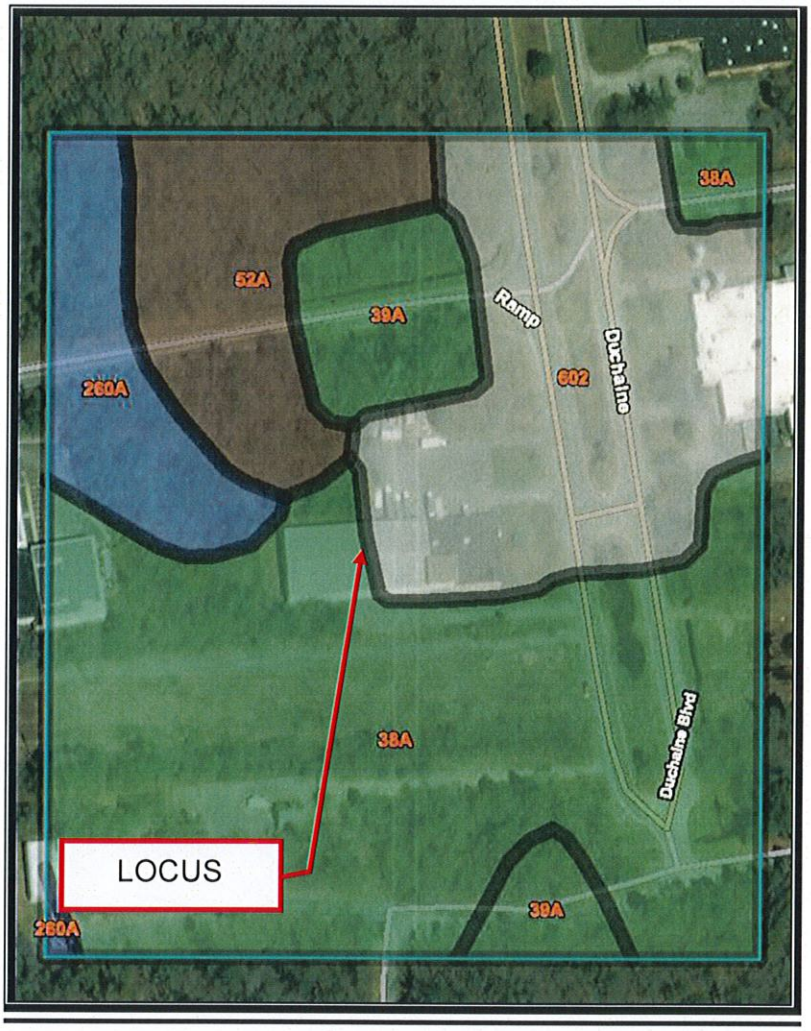
NRCS SOIL MAP



(MAIN OFFICE) 401 COUNTY STREET, NEW BEDFORD, MA 02740 P 508.717.3479 F 508.717.3481
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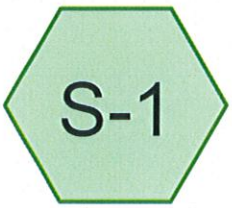
HYDROLOGIC CALCULATIONS
(STANDARD #2)

Tributary to South



Tributary to North

Subcat Reach Pond Link

Drainage Diagram for 151077PRE
Prepared by Farland Corp.

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
54,556	35	Brush, Fair, HSG A (S-1,S-2)
27,665	36	Woods, Fair, HSG A (S-1,S-2)
25,292	39	>75% Grass cover, Good, HSG A (S-2)
7,720	49	50-75% Grass cover, Fair, HSG A (S-1)
5,699	76	Gravel roads, HSG A (S-2)
3,527	91	Gravel roads, HSG D (S-1)
63,976	98	Paved parking & roofs (S-1,S-2)
188,435		**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Goup	Subcatchment Numbers
120,932	HSG A	S-1, S-2
0	HSG B	
0	HSG C	
3,527	HSG D	S-1
63,976	Other	S-1, S-2
188,435		**TOTAL AREA**

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S-1: Tributary to North Runoff Area=84,991 sf 59.59% Impervious Runoff Depth=1.29"
Flow Length=160' Tc=6.0 min CN=76 Runoff=2.88 cfs 9,159 cf

Subcatchment S-2: Tributary to South Runoff Area=103,444 sf 12.89% Impervious Runoff Depth=0.09"
Tc=6.0 min CN=46 Runoff=0.03 cfs 746 cf

Total Runoff Area = 188,435 sf Runoff Volume = 9,906 cf Average Runoff Depth = 0.63"
66.05% Pervious = 124,459 sf 33.95% Impervious = 63,976 sf

Summary for Subcatchment S-1: Tributary to North

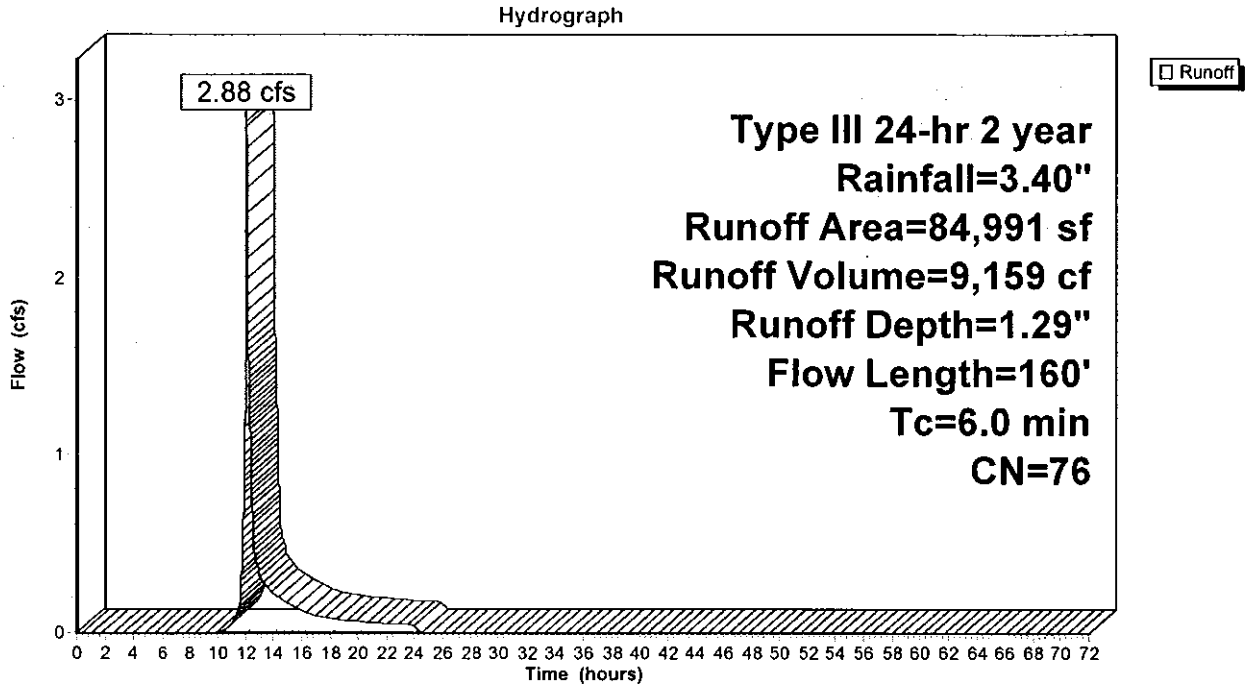
Runoff = 2.88 cfs @ 12.09 hrs, Volume= 9,159 cf, Depth= 1.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.40"

Area (sf)	CN	Description
29,608	98	Paved parking & roofs
21,039	98	Paved parking & roofs
2,006	35	Brush, Fair, HSG A
7,720	49	50-75% Grass cover, Fair, HSG A
21,091	36	Woods, Fair, HSG A
3,527	91	Gravel roads, HSG D
84,991	76	Weighted Average
34,344		Pervious Area
50,647		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	160		0.44		**Direct Entry, pave to woods**

Subcatchment S-1: Tributary to North



Summary for Subcatchment S-2: Tributary to South

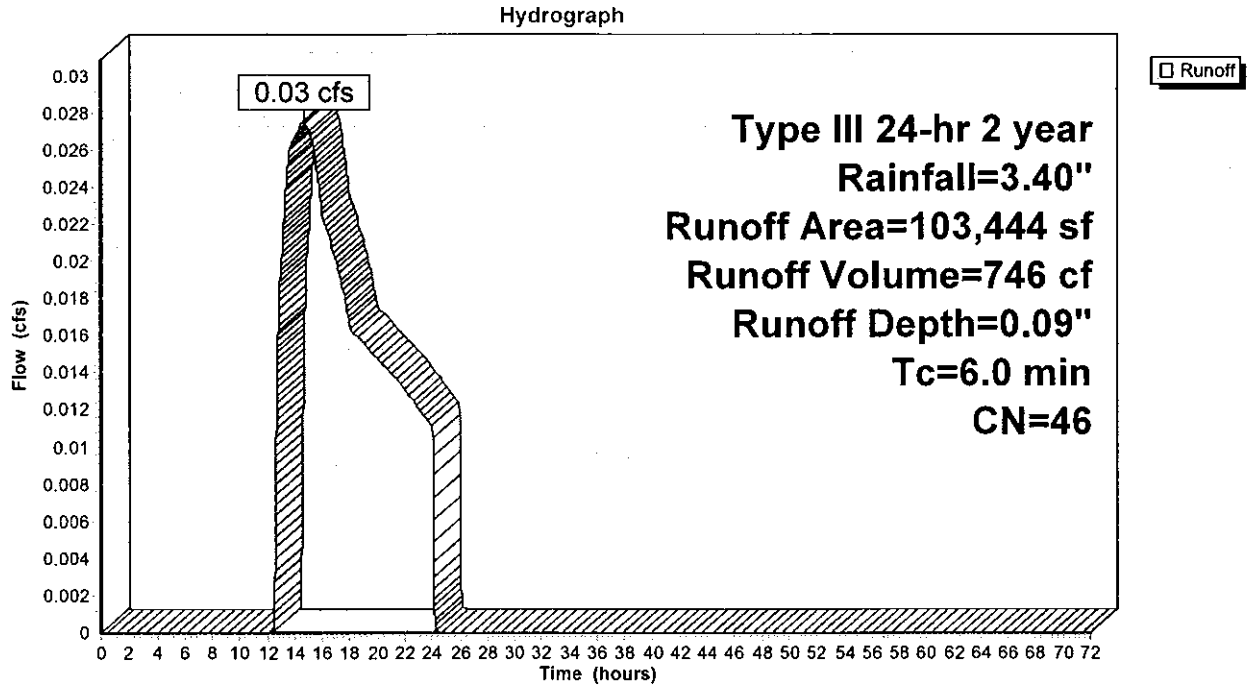
Runoff = 0.03 cfs @ 14.66 hrs, Volume= 746 cf, Depth= 0.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.40"

Area (sf)	CN	Description
52,550	35	Brush, Fair, HSG A
5,699	76	Gravel roads, HSG A
6,574	36	Woods, Fair, HSG A
25,292	39	>75% Grass cover, Good, HSG A
13,329	98	Paved parking & roofs
103,444	46	Weighted Average
90,115		Pervious Area
13,329		Impervious Area

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

Subcatchment S-2: Tributary to South



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S-1: Tributary to North Runoff Area=84,991 sf 59.59% Impervious Runoff Depth=2.37"
Flow Length=160' Tc=6.0 min CN=76 Runoff=5.42 cfs 16,798 cf

Subcatchment S-2: Tributary to South Runoff Area=103,444 sf 12.89% Impervious Runoff Depth=0.42"
Tc=6.0 min CN=46 Runoff=0.45 cfs 3,653 cf

Total Runoff Area = 188,435 sf Runoff Volume = 20,450 cf Average Runoff Depth = 1.30"
66.05% Pervious = 124,459 sf 33.95% Impervious = 63,976 sf

Summary for Subcatchment S-1: Tributary to North

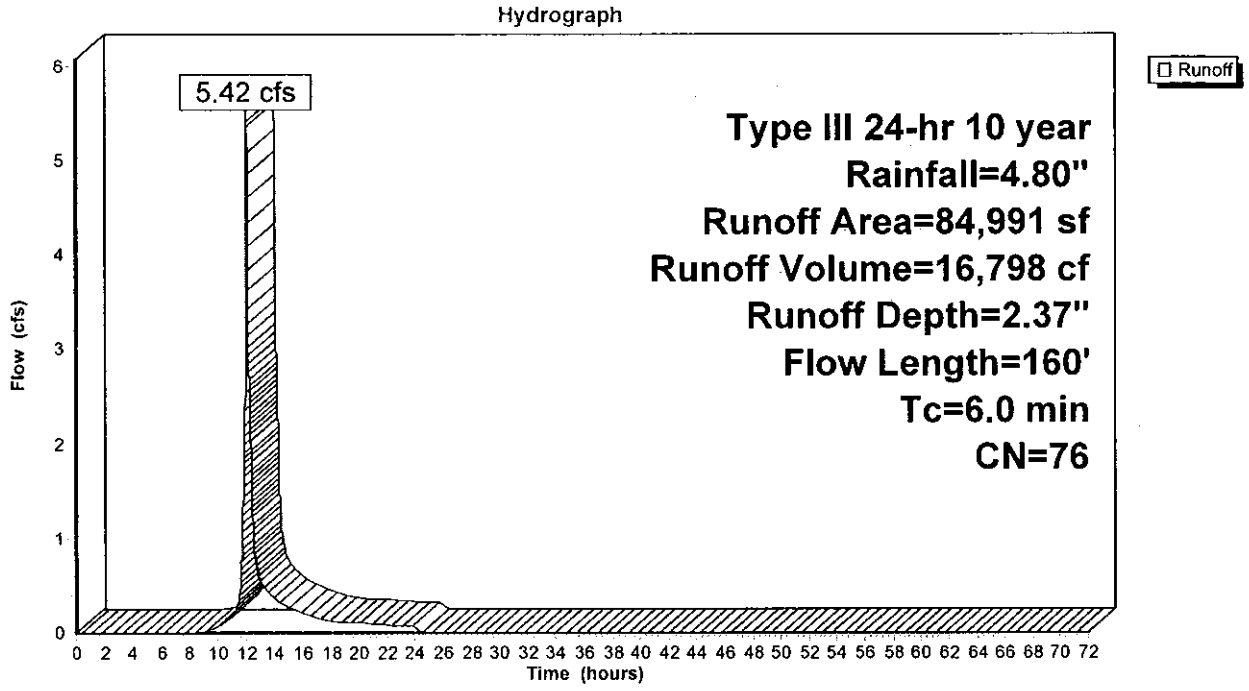
Runoff = 5.42 cfs @ 12.09 hrs, Volume= 16,798 cf, Depth= 2.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=4.80"

Area (sf)	CN	Description
29,608	98	Paved parking & roofs
21,039	98	Paved parking & roofs
2,006	35	Brush, Fair, HSG A
7,720	49	50-75% Grass cover, Fair, HSG A
21,091	36	Woods, Fair, HSG A
3,527	91	Gravel roads, HSG D
84,991	76	Weighted Average
34,344		Pervious Area
50,647		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	160		0.44		**Direct Entry, pave to woods**

Subcatchment S-1: Tributary to North



Summary for Subcatchment S-2: Tributary to South

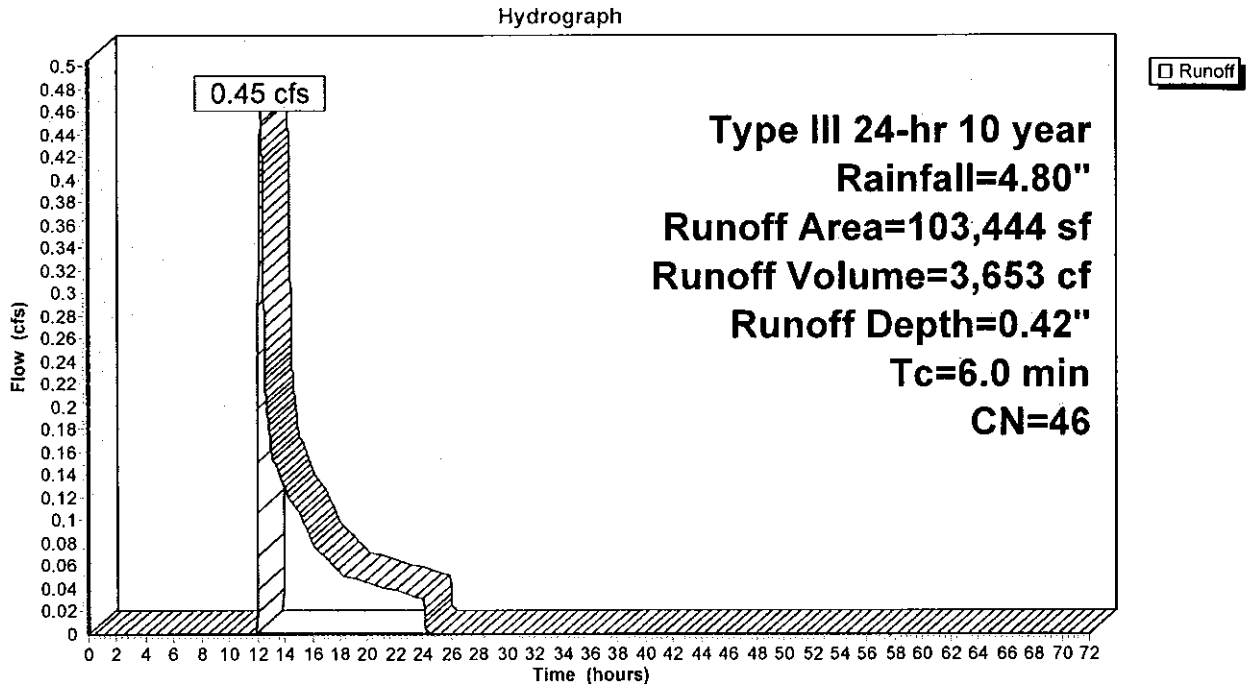
Runoff = 0.45 cfs @ 12.30 hrs, Volume= 3,653 cf, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=4.80"

Area (sf)	CN	Description
52,550	35	Brush, Fair, HSG A
5,699	76	Gravel roads, HSG A
6,574	36	Woods, Fair, HSG A
25,292	39	>75% Grass cover, Good, HSG A
13,329	98	Paved parking & roofs
103,444	46	Weighted Average
90,115		Pervious Area
13,329		Impervious Area

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

Subcatchment S-2: Tributary to South



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S-1: Tributary to North Runoff Area=84,991 sf 59.59% Impervious Runoff Depth=4.26"
Flow Length=160' Tc=6.0 min CN=76 Runoff=9.72 cfs 30,153 cf

Subcatchment S-2: Tributary to South Runoff Area=103,444 sf 12.89% Impervious Runoff Depth=1.32"
Tc=6.0 min CN=46 Runoff=2.88 cfs 11,382 cf

Total Runoff Area = 188,435 sf Runoff Volume = 41,535 cf Average Runoff Depth = 2.65"
66.05% Pervious = 124,459 sf 33.95% Impervious = 63,976 sf

Summary for Subcatchment S-1: Tributary to North

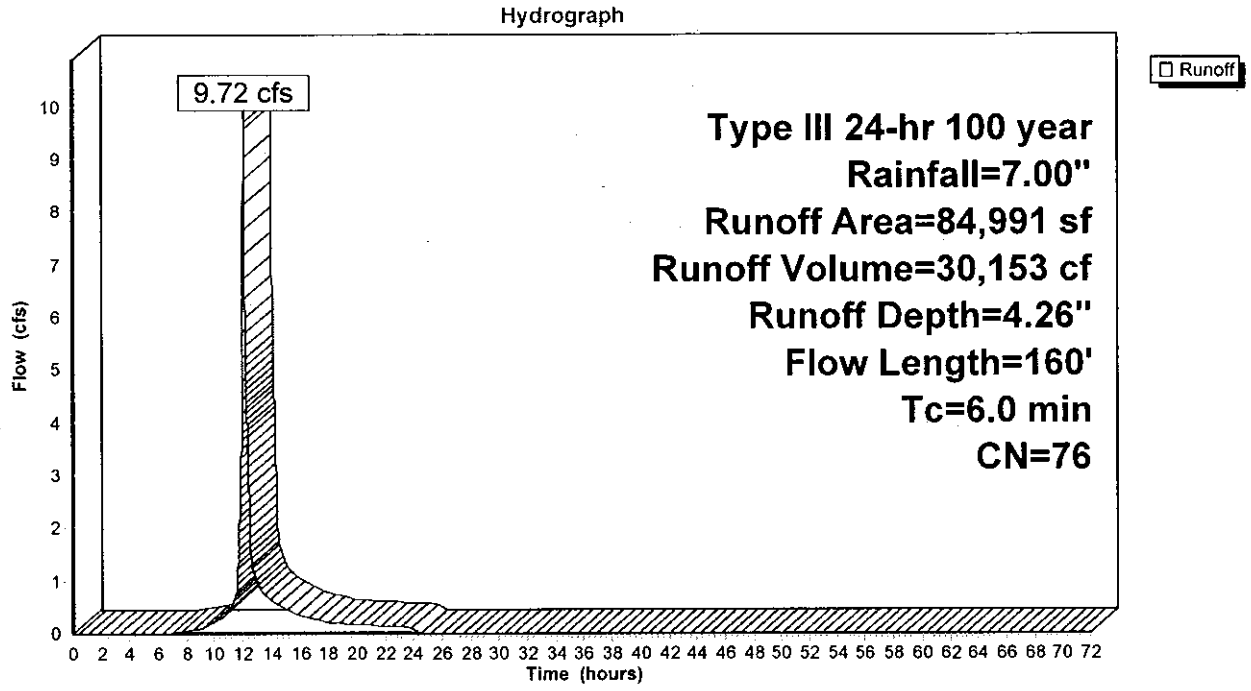
Runoff = 9.72 cfs @ 12.09 hrs, Volume= 30,153 cf, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.00"

Area (sf)	CN	Description
29,608	98	Paved parking & roofs
21,039	98	Paved parking & roofs
2,006	35	Brush, Fair, HSG A
7,720	49	50-75% Grass cover, Fair, HSG A
21,091	36	Woods, Fair, HSG A
3,527	91	Gravel roads, HSG D
84,991	76	Weighted Average
34,344		Pervious Area
50,647		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	160		0.44		**Direct Entry, pave to woods**

Subcatchment S-1: Tributary to North



Summary for Subcatchment S-2: Tributary to South

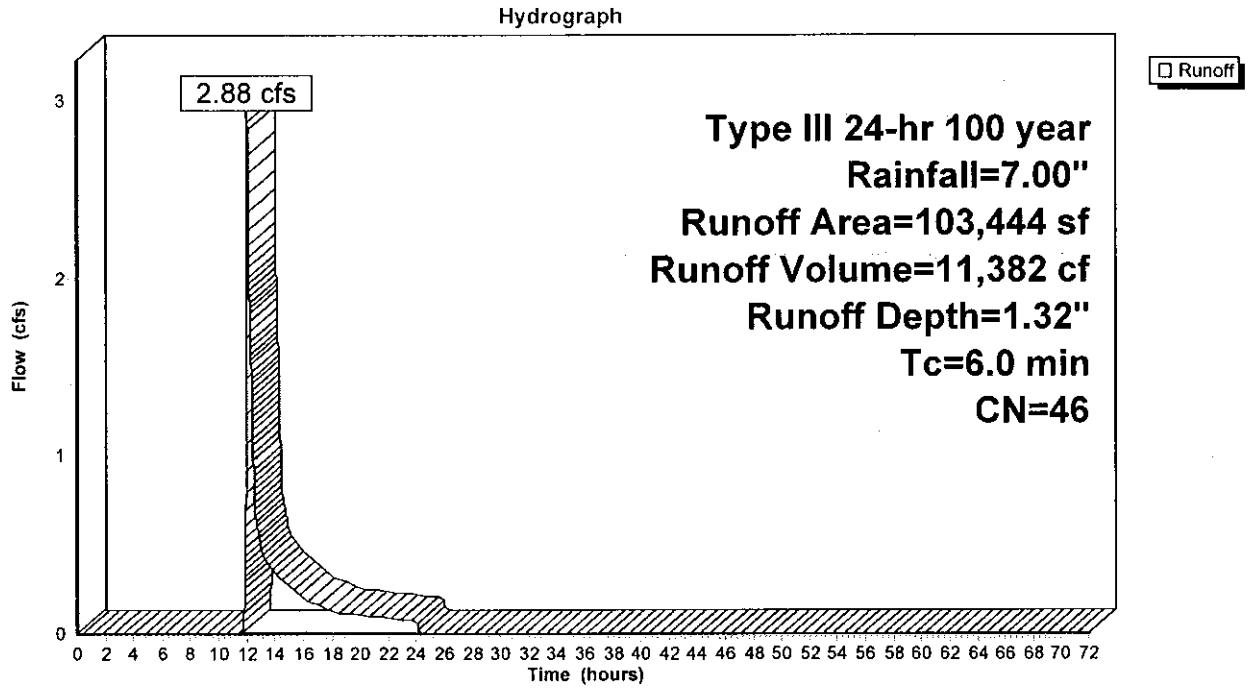
Runoff = 2.88 cfs @ 12.11 hrs, Volume= 11,382 cf, Depth= 1.32"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.00"

Area (sf)	CN	Description
52,550	35	Brush, Fair, HSG A
5,699	76	Gravel roads, HSG A
6,574	36	Woods, Fair, HSG A
25,292	39	>75% Grass cover, Good, HSG A
13,329	98	Paved parking & roofs
103,444	46	Weighted Average
90,115		Pervious Area
13,329		Impervious Area

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

Subcatchment S-2: Tributary to South

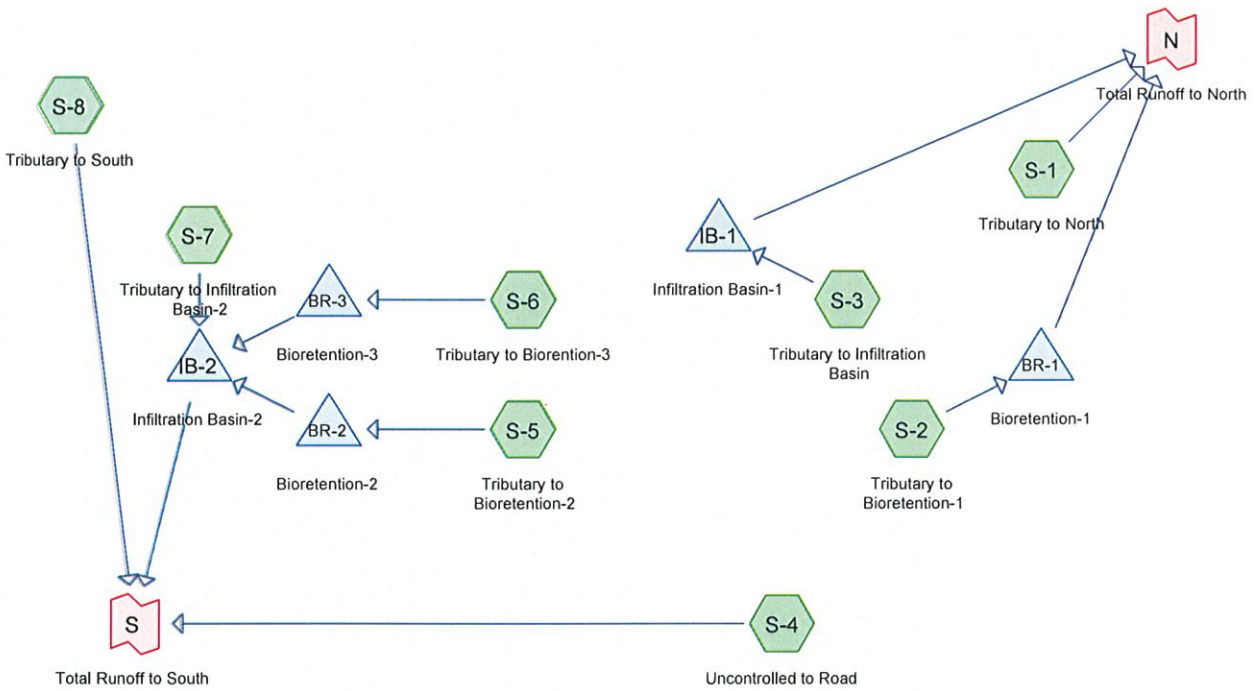


Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
19,933	35	Brush, Fair, HSG A (S-1,S-8)
6,122	36	Woods, Fair, HSG A (S-1)
58,684	39	>75% Grass cover, Good, HSG A (S-1,S-2,S-3,S-4,S-5,S-6,S-7,S-8)
5,143	76	Gravel roads, HSG A (S-1,S-8)
94,702	98	Paved parking & roofs (S-1,S-2,S-3,S-4,S-5,S-6)
3,839	98	Water Surface (S-5,S-6)
188,423		**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Goup	Subcatchment Numbers
89,882	HSG A	S-1, S-2, S-3, S-4, S-5, S-6, S-7, S-8
0	HSG B	
0	HSG C	
0	HSG D	
98,541	Other	S-1, S-2, S-3, S-4, S-5, S-6
188,423		**TOTAL AREA**



Subcat Reach Pond Link

Drainage Diagram for 151077POST
Prepared by Farland Corp.
HydroCAD® 8.50 s/n 002159 © 2007 HydroCAD Software Solutions LLC

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S-1: Tributary to North Runoff Area=65,900 sf 53.90% Impervious Runoff Depth=1.06"
Flow Length=160' Tc=6.0 min CN=72 Runoff=1.76 cfs 5,799 cf

Subcatchment S-2: Tributary to Runoff Area=16,403 sf 77.07% Impervious Runoff Depth=1.85"
Tc=6.0 min CN=84 Runoff=0.82 cfs 2,530 cf

Subcatchment S-3: Tributary to Infiltration Runoff Area=20,592 sf 71.90% Impervious Runoff Depth=1.63"
Tc=6.0 min CN=81 Runoff=0.90 cfs 2,794 cf

Subcatchment S-4: Uncontrolled to Road Runoff Area=8,042 sf 4.40% Impervious Runoff Depth=0.03"
Tc=6.0 min CN=42 Runoff=0.00 cfs 19 cf

Subcatchment S-5: Tributary to Runoff Area=26,381 sf 57.12% Impervious Runoff Depth=1.11"
Tc=6.0 min CN=73 Runoff=0.75 cfs 2,447 cf

Subcatchment S-6: Tributary to Runoff Area=22,875 sf 88.09% Impervious Runoff Depth=2.45"
Tc=6.0 min CN=91 Runoff=1.48 cfs 4,664 cf

Subcatchment S-7: Tributary to Infiltration Runoff Area=6,157 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 2 cf

Subcatchment S-8: Tributary to South Runoff Area=22,073 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=38 Runoff=0.00 cfs 2 cf

Pond BR-1: Bioretention-1 Peak Elev=80.75' Storage=1,190 cf Inflow=0.82 cfs 2,530 cf
Outflow=0.28 cfs 1,388 cf

Pond BR-2: Bioretention-2 Peak Elev=79.37' Storage=1,254 cf Inflow=0.75 cfs 2,447 cf
Outflow=0.08 cfs 1,236 cf

Pond BR-3: Bioretention-3 Peak Elev=79.52' Storage=1,827 cf Inflow=1.48 cfs 4,664 cf
Outflow=1.02 cfs 3,127 cf

Pond IB-1: Infiltration Basin-1 Peak Elev=80.19' Storage=346 cf Inflow=0.90 cfs 2,794 cf
Discarded=0.36 cfs 2,796 cf Primary=0.00 cfs 0 cf Outflow=0.36 cfs 2,796 cf

Pond IB-2: Infiltration Basin-2 Peak Elev=78.06' Storage=186 cf Inflow=1.02 cfs 4,365 cf
Discarded=0.64 cfs 4,370 cf Primary=0.00 cfs 0 cf Outflow=0.64 cfs 4,370 cf

Link N: Total Runoff to North Inflow=1.76 cfs 7,188 cf
Primary=1.76 cfs 7,188 cf

Link S: Total Runoff to South Inflow=0.00 cfs 21 cf
Primary=0.00 cfs 21 cf

Total Runoff Area = 188,423 sf Runoff Volume = 18,257 cf Average Runoff Depth = 1.16"
47.70% Pervious = 89,882 sf 52.30% Impervious = 98,541 sf

Summary for Subcatchment S-1: Tributary to North

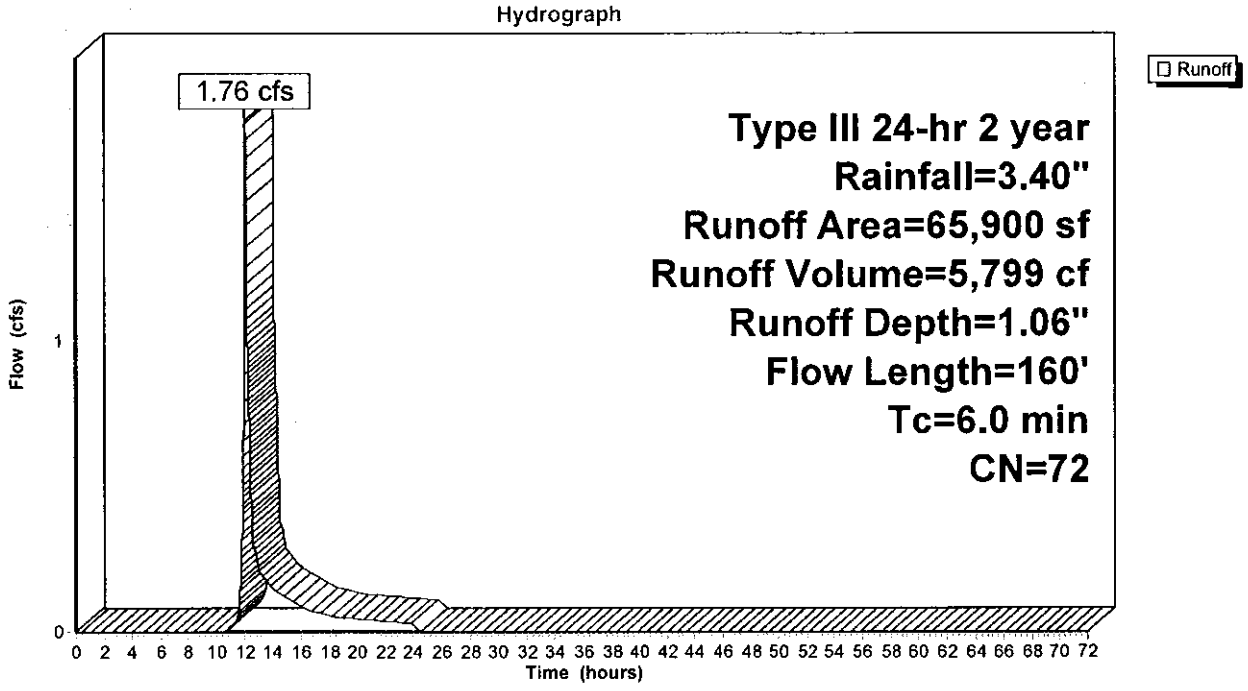
Runoff = 1.76 cfs @ 12.10 hrs, Volume= 5,799 cf, Depth= 1.06"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.40"

Area (sf)	CN	Description
32,803	98	Paved parking & roofs
2,718	98	Paved parking & roofs
2,006	35	Brush, Fair, HSG A
3,527	76	Gravel roads, HSG A
6,122	36	Woods, Fair, HSG A
18,724	39	>75% Grass cover, Good, HSG A
65,900	72	Weighted Average
30,379		Pervious Area
35,521		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	160		0.44		**Direct Entry, pave to woods**

Subcatchment S-1: Tributary to North



Summary for Subcatchment S-2: Tributary to Bioretention-1

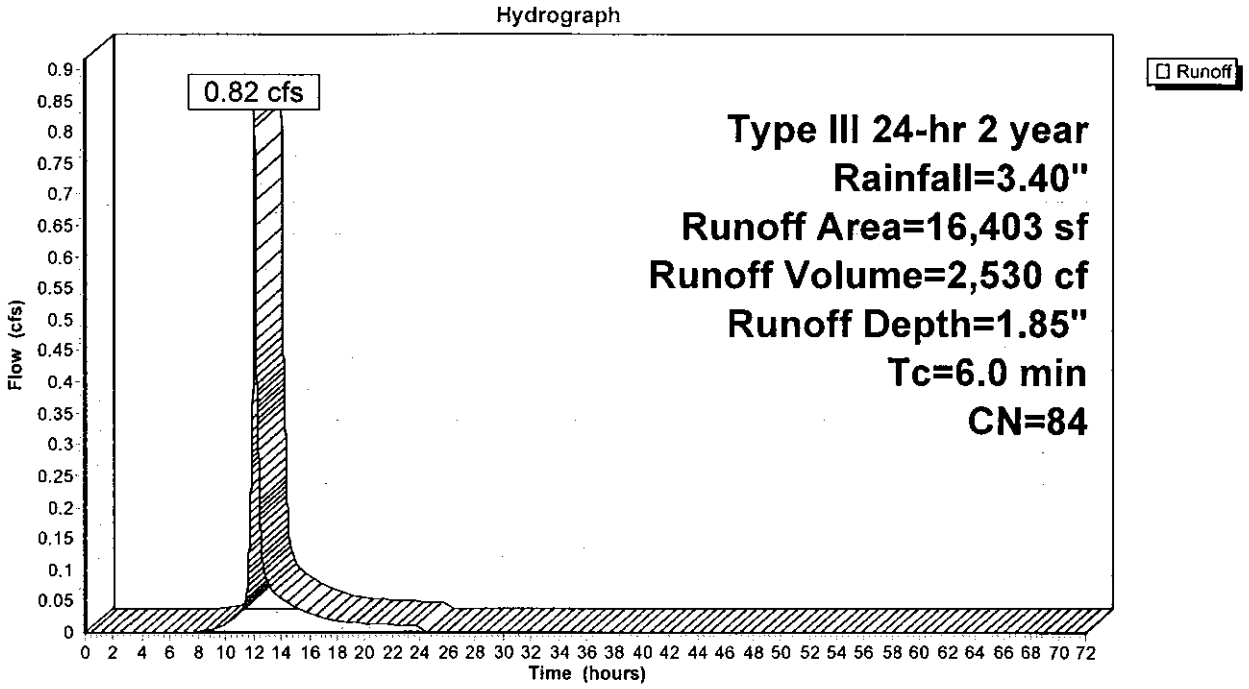
Runoff = 0.82 cfs @ 12.09 hrs, Volume= 2,530 cf, Depth= 1.85"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.40"

Area (sf)	CN	Description
12,642	98	Paved parking & roofs
3,761	39	>75% Grass cover, Good, HSG A
16,403	84	Weighted Average
3,761		Pervious Area
12,642		Impervious Area

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

Subcatchment S-2: Tributary to Bioretention-1



Summary for Subcatchment S-3: Tributary to Infiltration Basin

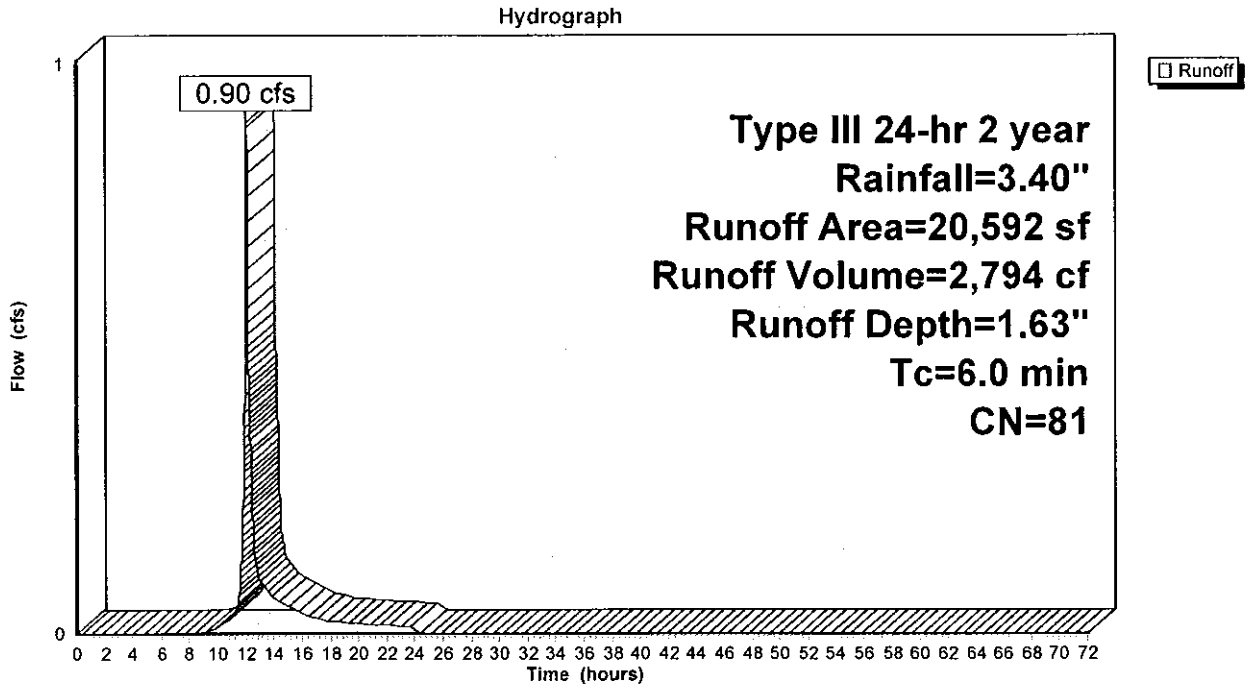
Runoff = 0.90 cfs @ 12.09 hrs, Volume= 2,794 cf, Depth= 1.63"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.40"

Area (sf)	CN	Description
14,805	98	Paved parking & roofs
5,787	39	>75% Grass cover, Good, HSG A
20,592	81	Weighted Average
5,787		Pervious Area
14,805		Impervious Area

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

Subcatchment S-3: Tributary to Infiltration Basin



Summary for Subcatchment S-4: Uncontrolled to Road

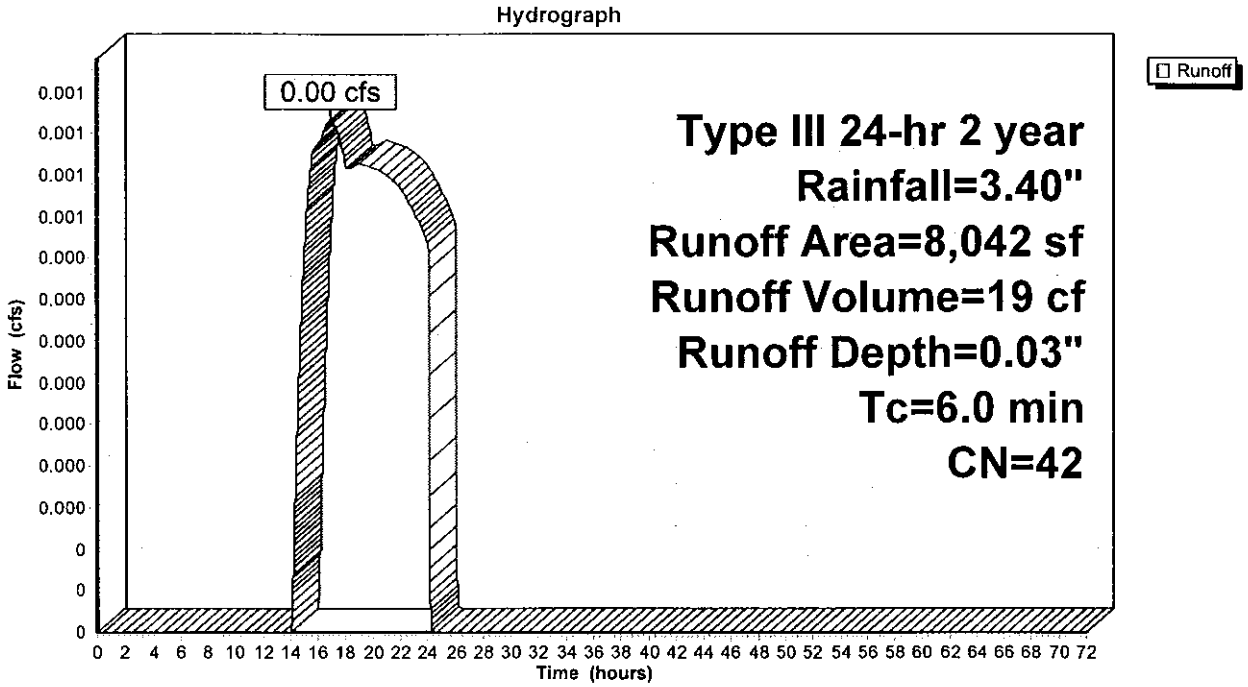
Runoff = 0.00 cfs @ 16.90 hrs, Volume= 19 cf, Depth= 0.03"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.40"

Area (sf)	CN	Description
354	98	Paved parking & roofs
7,688	39	>75% Grass cover, Good, HSG A
8,042	42	Weighted Average
7,688		Pervious Area
354		Impervious Area

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

Subcatchment S-4: Uncontrolled to Road



Summary for Subcatchment S-5: Tributary to Bioretention-2

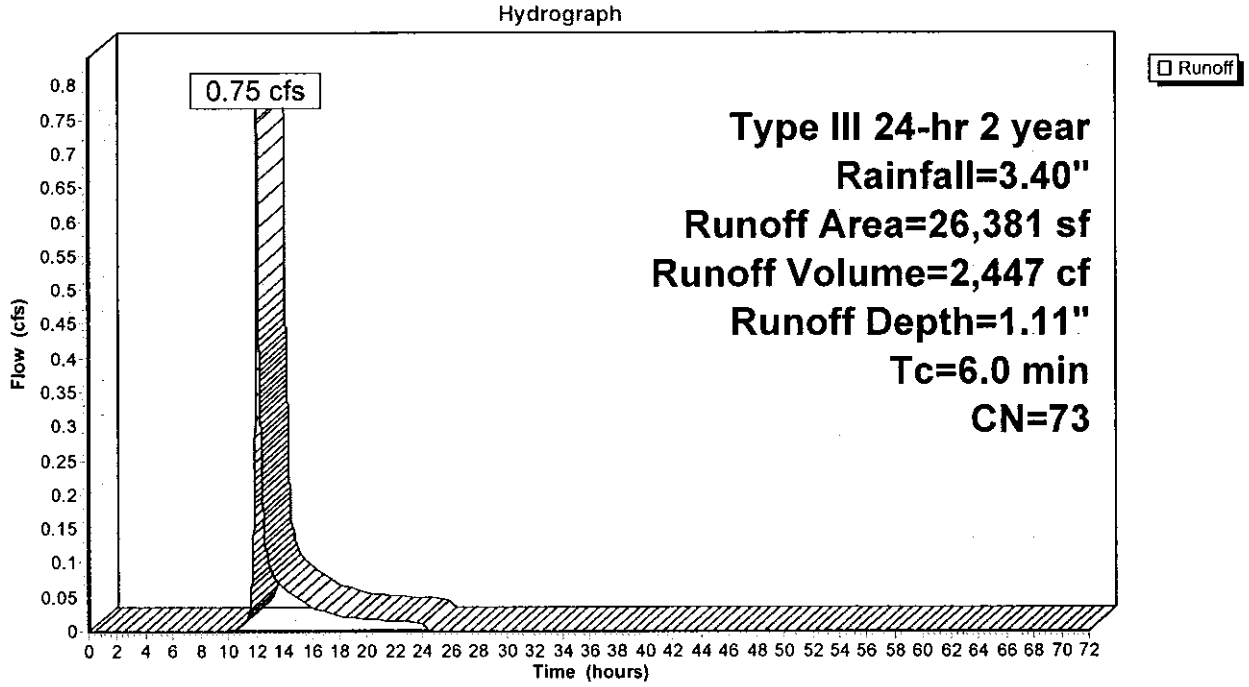
Runoff = 0.75 cfs @ 12.10 hrs, Volume= 2,447 cf, Depth= 1.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.40"

Area (sf)	CN	Description
14,191	98	Paved parking & roofs
877	98	Water Surface
11,313	39	>75% Grass cover, Good, HSG A
26,381	73	Weighted Average
11,313		Pervious Area
15,068		Impervious Area

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

Subcatchment S-5: Tributary to Bioretention-2



Summary for Subcatchment S-6: Tributary to Biorention-3

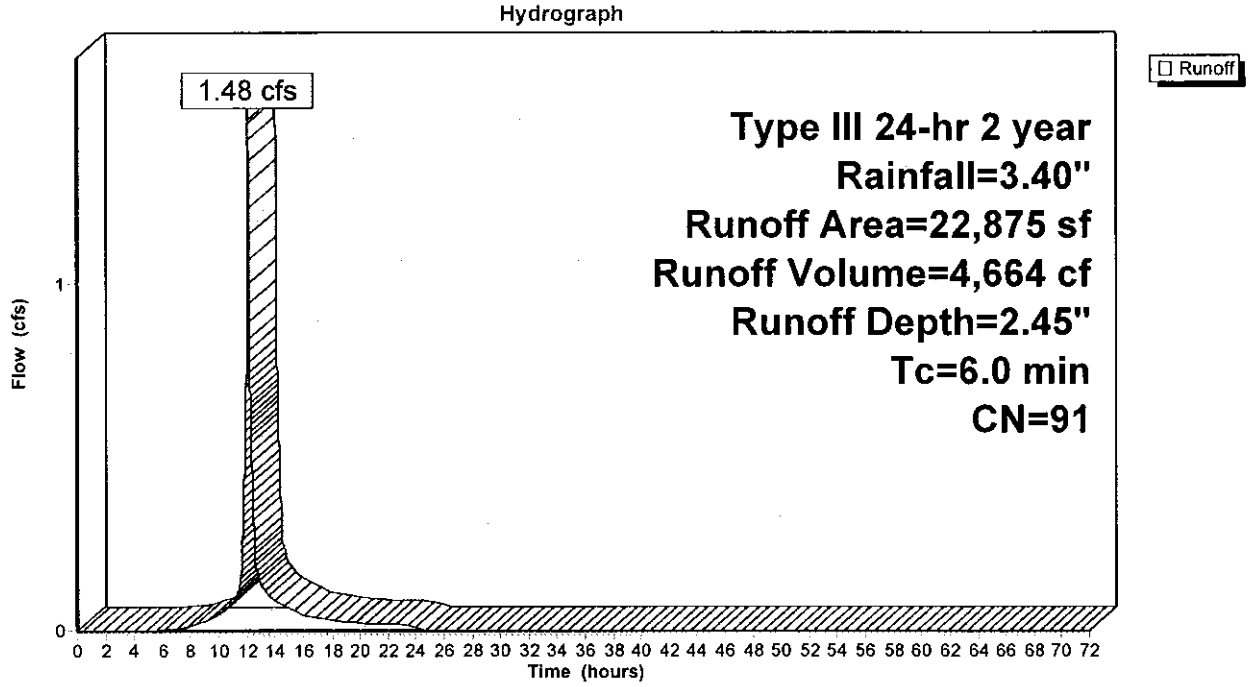
Runoff = 1.48 cfs @ 12.09 hrs, Volume= 4,664 cf, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.40"

Area (sf)	CN	Description
17,189	98	Paved parking & roofs
2,724	39	>75% Grass cover, Good, HSG A
2,962	98	Water Surface
22,875	91	Weighted Average
2,724		Pervious Area
20,151		Impervious Area

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

Subcatchment S-6: Tributary to Biorention-3



Summary for Subcatchment S-7: Tributary to Infiltration Basin-2

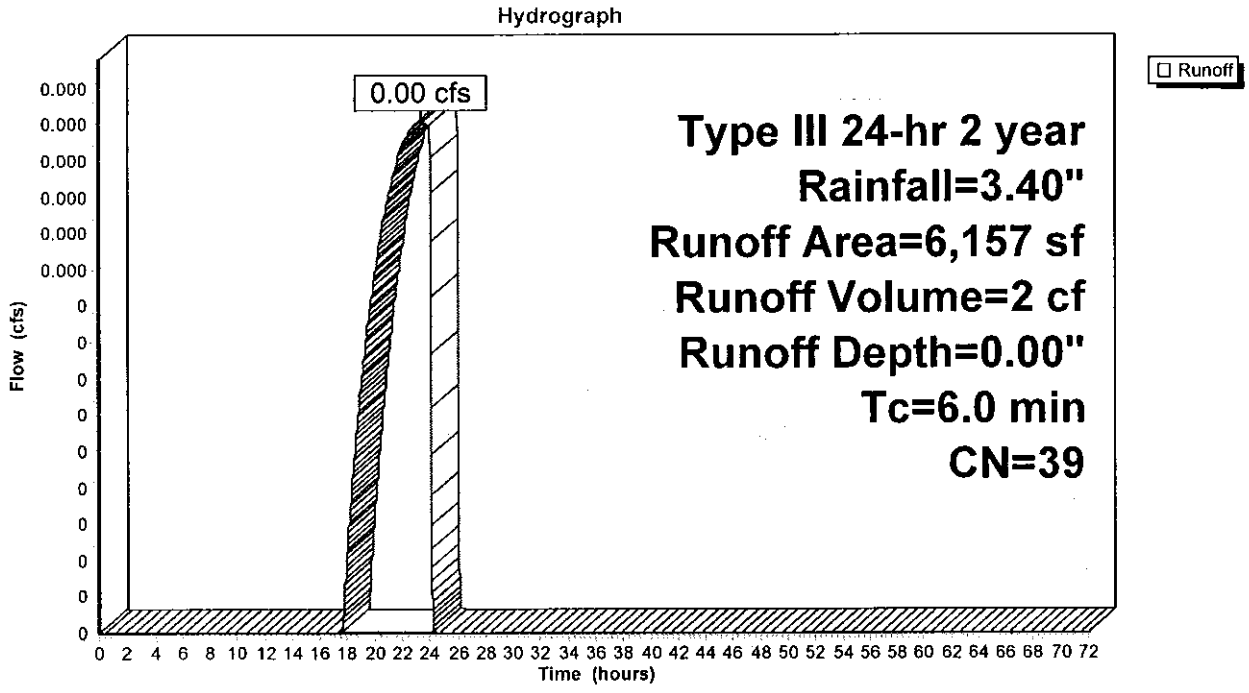
Runoff = 0.00 cfs @ 23.42 hrs, Volume= 2 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.40"

Area (sf)	CN	Description
6,157	39	>75% Grass cover, Good, HSG A
6,157		Pervious Area

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

Subcatchment S-7: Tributary to Infiltration Basin-2



Summary for Subcatchment S-8: Tributary to South

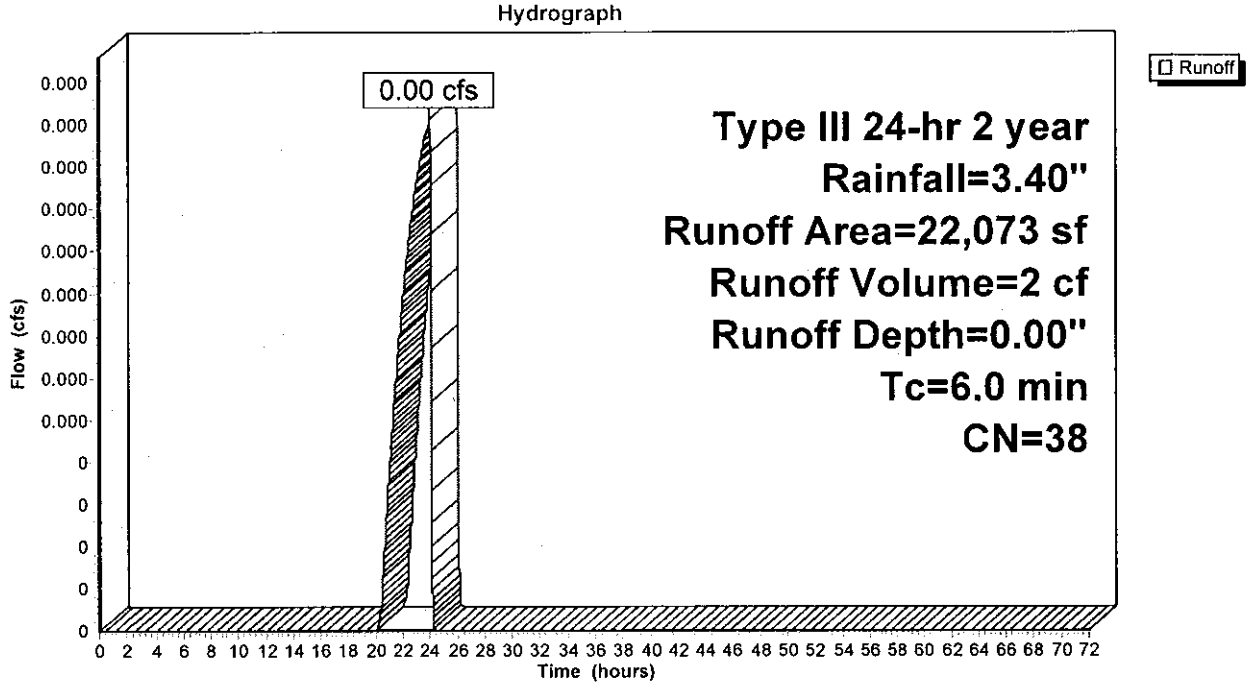
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 2 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 year Rainfall=3.40"

Area (sf)	CN	Description
17,927	35	Brush, Fair, HSG A
1,616	76	Gravel roads, HSG A
2,530	39	>75% Grass cover, Good, HSG A
22,073	38	Weighted Average
22,073		Pervious Area

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

Subcatchment S-8: Tributary to South



Summary for Pond BR-1: Bioretention-1

Inflow Area = 16,403 sf, 77.07% Impervious, Inflow Depth = 1.85" for 2 year event
Inflow = 0.82 cfs @ 12.09 hrs, Volume= 2,530 cf
Outflow = 0.28 cfs @ 12.39 hrs, Volume= 1,388 cf, Atten= 65%, Lag= 18.3 min
Primary = 0.28 cfs @ 12.39 hrs, Volume= 1,388 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 80.75' @ 12.39 hrs Surf.Area= 957 sf Storage= 1,190 cf

Plug-Flow detention time= 216.3 min calculated for 1,388 cf (55% of inflow)
Center-of-Mass det. time= 103.6 min (930.4 - 826.8)

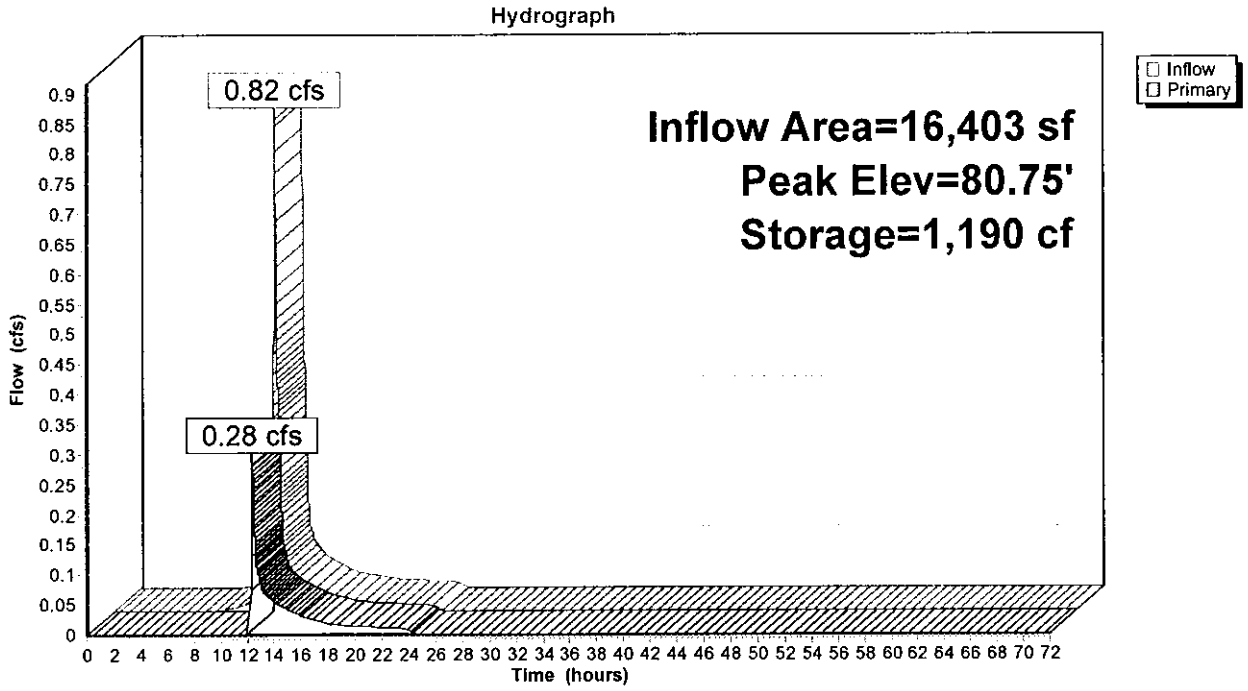
Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	1,440 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
79.00	433	83.5	0	0	433
80.00	711	102.3	566	566	726
81.00	1,047	121.2	874	1,440	1,080

Device	Routing	Invert	Outlet Devices
#1	Primary	80.70'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.28 cfs @ 12.39 hrs HW=80.75' TW=0.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.28 cfs @ 0.56 fps)

Pond BR-1: Bioretention-1



Summary for Pond BR-2: Bioretention-2

Inflow Area = 26,381 sf, 57.12% Impervious, Inflow Depth = 1.11" for 2 year event
Inflow = 0.75 cfs @ 12.10 hrs, Volume= 2,447 cf
Outflow = 0.08 cfs @ 13.14 hrs, Volume= 1,236 cf, Atten= 89%, Lag= 62.4 min
Primary = 0.08 cfs @ 13.14 hrs, Volume= 1,236 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 79.37' @ 13.14 hrs Surf.Area= 1,180 sf Storage= 1,254 cf

Plug-Flow detention time= 270.5 min calculated for 1,236 cf (51% of inflow)
Center-of-Mass det. time= 140.2 min (1,001.7 - 861.5)

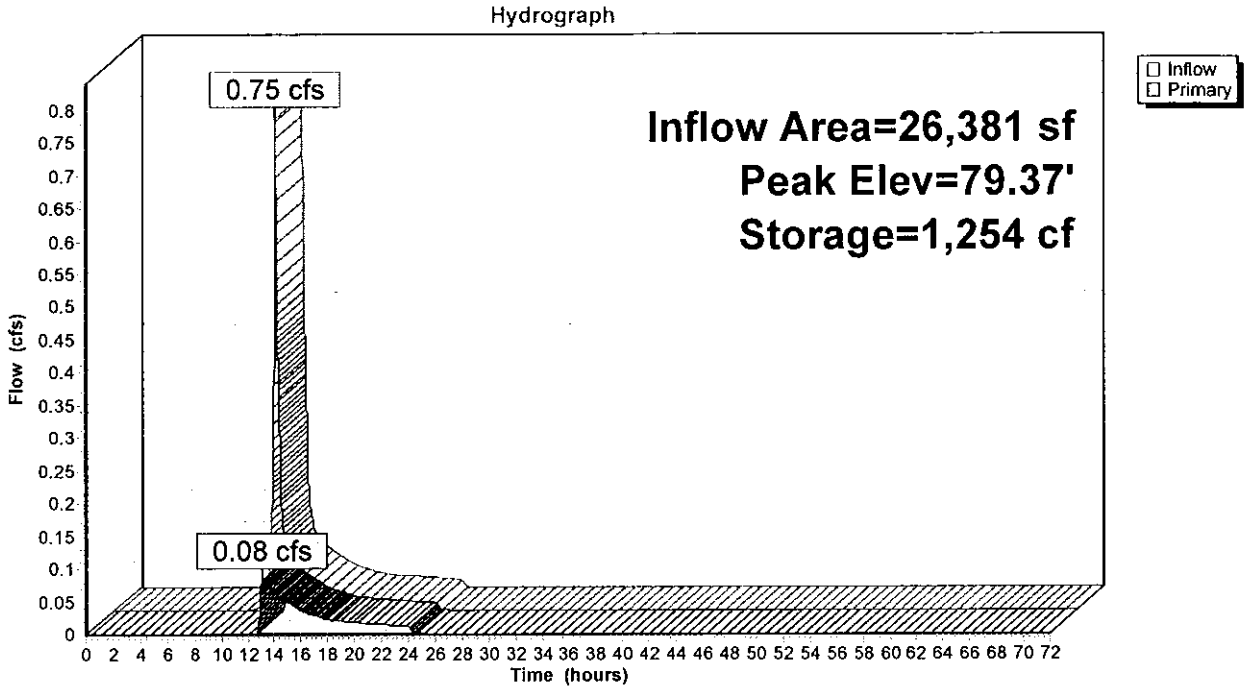
Volume	Invert	Avail.Storage	Storage Description
#1	78.00'	2,086 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
78.00	674	110.9	0	0	674
79.00	1,035	129.7	848	848	1,054
80.00	1,453	148.6	1,238	2,086	1,495

Device	Routing	Invert	Outlet Devices
#1	Primary	79.33'	**5.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.08 cfs @ 13.14 hrs HW=79.37' TW=78.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.08 cfs @ 0.45 fps)

Pond BR-2: Bioretention-2



Summary for Pond BR-3: Bioretention-3

Inflow Area = 22,875 sf, 88.09% Impervious, Inflow Depth = 2.45" for 2 year event
Inflow = 1.48 cfs @ 12.09 hrs, Volume= 4,664 cf
Outflow = 1.02 cfs @ 12.17 hrs, Volume= 3,127 cf, Atten= 31%, Lag= 5.0 min
Primary = 1.02 cfs @ 12.17 hrs, Volume= 3,127 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 79.52' @ 12.17 hrs Surf.Area= 1,538 sf Storage= 1,827 cf

Plug-Flow detention time= 172.0 min calculated for 3,127 cf (67% of inflow)
Center-of-Mass det. time= 75.5 min (875.7 - 800.2)

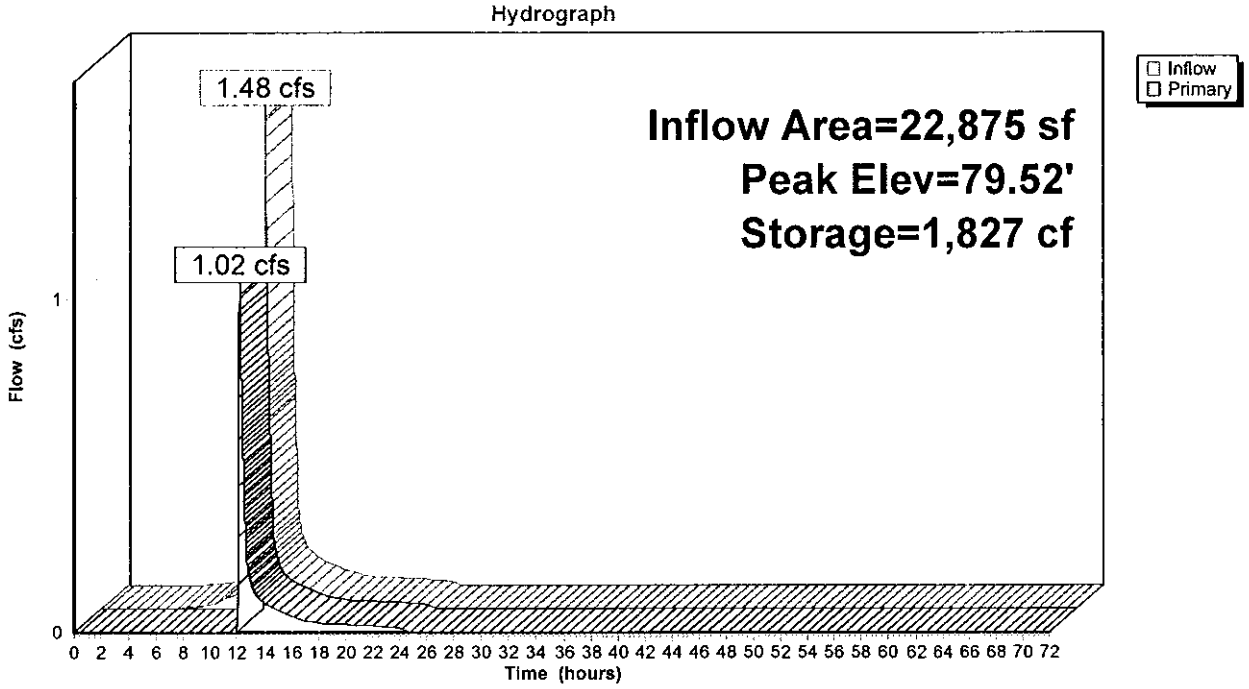
Volume	Invert	Avail.Storage	Storage Description
#1	78.00'	2,614 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
78.00	883	129.3	0	0	883
79.00	1,299	148.2	1,084	1,084	1,323
80.00	1,772	167.0	1,529	2,614	1,820

Device	Routing	Invert	Outlet Devices
#1	Primary	79.33'	**5.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=1.02 cfs @ 12.17 hrs HW=79.52' TW=78.02' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.02 cfs @ 1.04 fps)

Pond BR-3: Bioretention-3



Summary for Pond IB-1: Infiltration Basin-1

Inflow Area = 20,592 sf, 71.90% Impervious, Inflow Depth = 1.63" for 2 year event
Inflow = 0.90 cfs @ 12.09 hrs, Volume= 2,794 cf
Outflow = 0.36 cfs @ 12.35 hrs, Volume= 2,796 cf, Atten= 60%, Lag= 15.8 min
Discarded = 0.36 cfs @ 12.35 hrs, Volume= 2,796 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 80.19' @ 12.35 hrs Surf.Area= 1,869 sf Storage= 346 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 4.4 min (840.9 - 836.5)

Volume	Invert	Avail.Storage	Storage Description
#1	80.00'	6,411 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

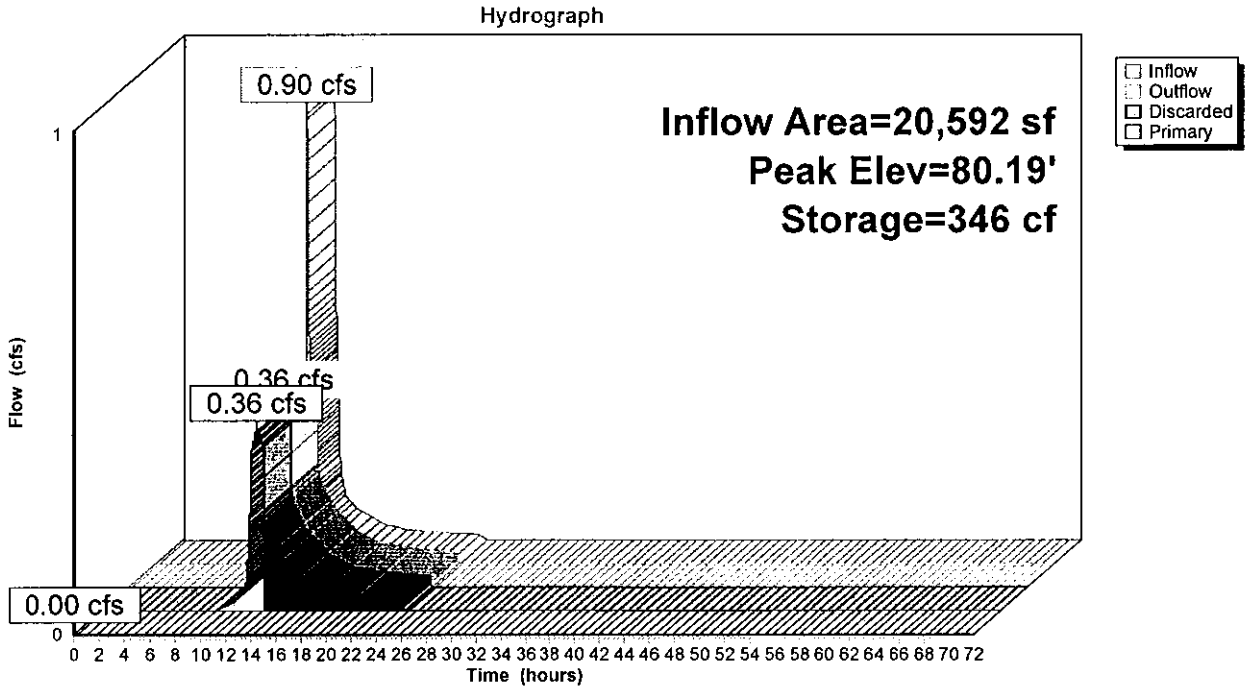
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
80.00	1,710	163.6	0	0	1,710
81.00	2,607	195.0	2,143	2,143	2,624
82.00	3,660	226.4	3,119	5,261	3,698
82.30	4,007	235.9	1,150	6,411	4,054

Device	Routing	Invert	Outlet Devices
#1	Primary	81.30'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	80.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.36 cfs @ 12.35 hrs HW=80.19' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.36 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=80.00' TW=0.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IB-1: Infiltration Basin-1



Summary for Pond IB-2: Infiltration Basin-2

Inflow Area = 55,413 sf, 63.56% Impervious, Inflow Depth = 0.95" for 2 year event
Inflow = 1.02 cfs @ 12.17 hrs, Volume= 4,365 cf
Outflow = 0.64 cfs @ 12.35 hrs, Volume= 4,370 cf, Atten= 37%, Lag= 10.9 min
Discarded = 0.64 cfs @ 12.35 hrs, Volume= 4,370 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 78.06' @ 12.35 hrs Surf.Area= 3,346 sf Storage= 186 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.9 min (912.5 - 911.6)

Volume	Invert	Avail.Storage	Storage Description
#1	78.00'	8,209 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

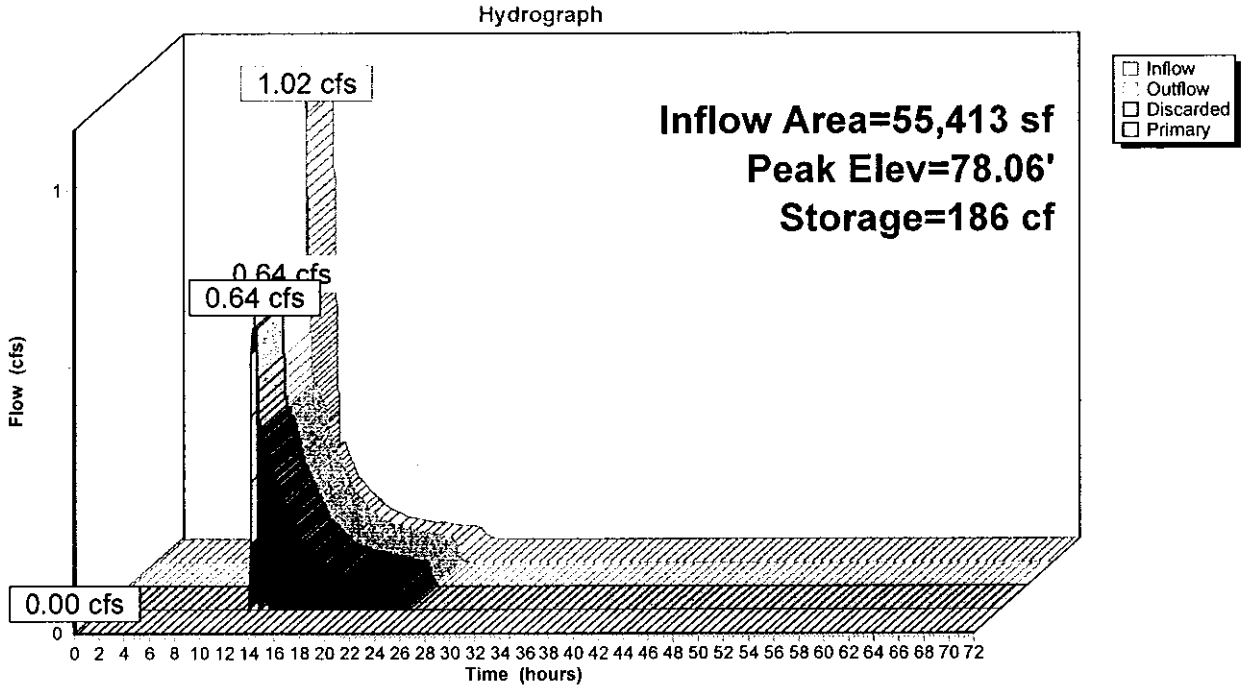
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
78.00	3,304	254.9	0	0	3,304
79.00	4,097	273.7	3,693	3,693	4,138
80.00	4,947	292.6	4,515	8,209	5,035

Device	Routing	Invert	Outlet Devices
#1	Primary	78.50'	**8.0" x 60.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 78.00' S= 0.0083 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#2	Discarded	78.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.64 cfs @ 12.35 hrs HW=78.06' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.64 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=78.00' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Controls 0.00 cfs)

Pond IB-2: Infiltration Basin-2

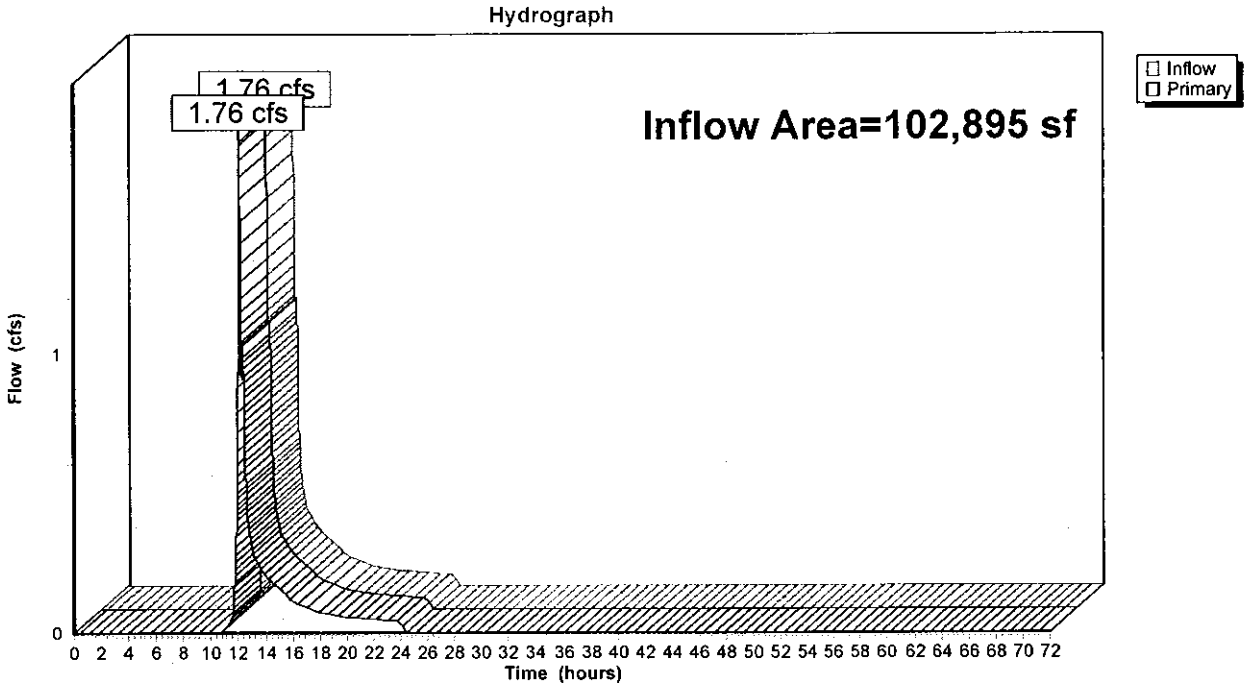


Summary for Link N: Total Runoff to North

Inflow Area = 102,895 sf, 61.20% Impervious, Inflow Depth = 0.84" for 2 year event
Inflow = 1.76 cfs @ 12.10 hrs, Volume= 7,188 cf
Primary = 1.76 cfs @ 12.10 hrs, Volume= 7,188 cf, Atten= 0%, Lag= 0.0 min

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

Link N: Total Runoff to North

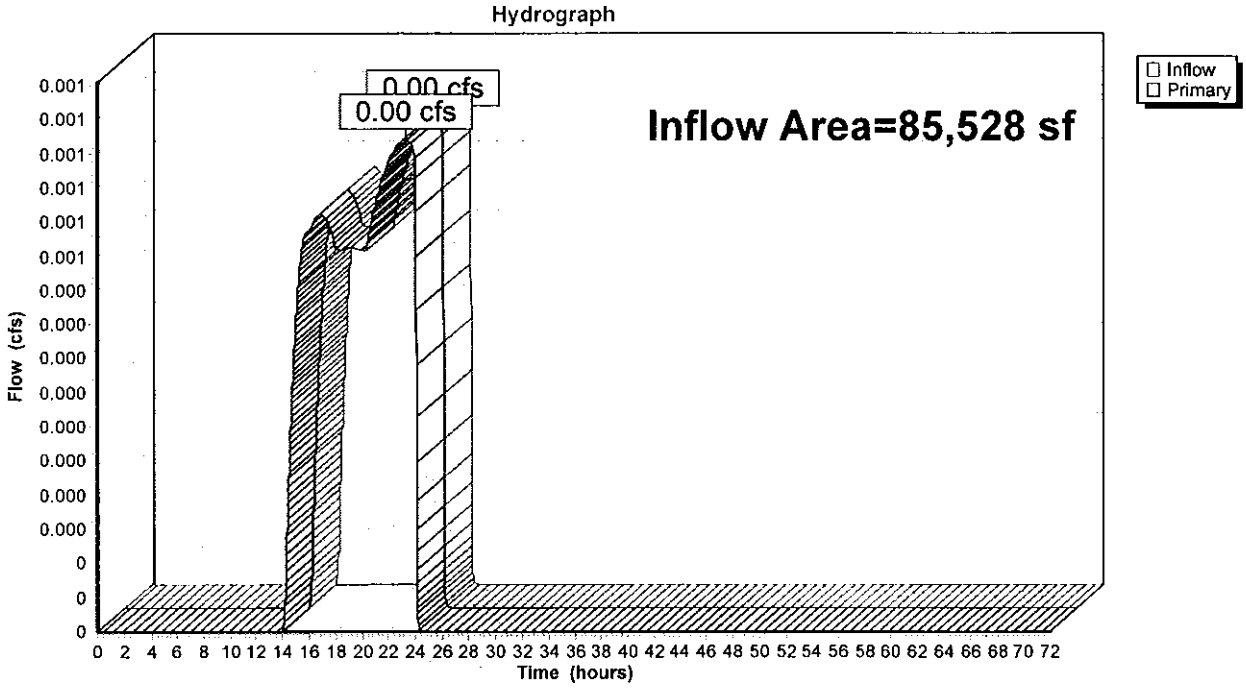


Summary for Link S: Total Runoff to South

Inflow Area = 85,528 sf, 41.59% Impervious, Inflow Depth = 0.00" for 2 year event
Inflow = 0.00 cfs @ 23.30 hrs, Volume= 21 cf
Primary = 0.00 cfs @ 23.30 hrs, Volume= 21 cf, Atten= 0%, Lag= 0.0 min

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

Link S: Total Runoff to South



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S-1: Tributary to North Runoff Area=65,900 sf 53.90% Impervious Runoff Depth=2.05"
Flow Length=160' Tc=6.0 min CN=72 Runoff=3.58 cfs 11,230 cf

Subcatchment S-2: Tributary to Runoff Area=16,403 sf 77.07% Impervious Runoff Depth=3.09"
Tc=6.0 min CN=84 Runoff=1.36 cfs 4,221 cf

Subcatchment S-3: Tributary to Infiltration Runoff Area=20,592 sf 71.90% Impervious Runoff Depth=2.81"
Tc=6.0 min CN=81 Runoff=1.56 cfs 4,821 cf

Subcatchment S-4: Uncontrolled to Road Runoff Area=8,042 sf 4.40% Impervious Runoff Depth=0.26"
Tc=6.0 min CN=42 Runoff=0.01 cfs 176 cf

Subcatchment S-5: Tributary to Runoff Area=26,381 sf 57.12% Impervious Runoff Depth=2.12"
Tc=6.0 min CN=73 Runoff=1.49 cfs 4,671 cf

Subcatchment S-6: Tributary to Runoff Area=22,875 sf 88.09% Impervious Runoff Depth=3.79"
Tc=6.0 min CN=91 Runoff=2.24 cfs 7,221 cf

Subcatchment S-7: Tributary to Infiltration Runoff Area=6,157 sf 0.00% Impervious Runoff Depth=0.16"
Tc=6.0 min CN=39 Runoff=0.00 cfs 83 cf

Subcatchment S-8: Tributary to South Runoff Area=22,073 sf 0.00% Impervious Runoff Depth=0.13"
Tc=6.0 min CN=38 Runoff=0.01 cfs 243 cf

Pond BR-1: Bioretention-1 Peak Elev=80.84' Storage=1,276 cf Inflow=1.36 cfs 4,221 cf
Outflow=1.29 cfs 3,079 cf

Pond BR-2: Bioretention-2 Peak Elev=79.51' Storage=1,426 cf Inflow=1.49 cfs 4,671 cf
Outflow=0.90 cfs 3,460 cf

Pond BR-3: Bioretention-3 Peak Elev=79.63' Storage=1,997 cf Inflow=2.24 cfs 7,221 cf
Outflow=2.03 cfs 5,684 cf

Pond IB-1: Infiltration Basin-1 Peak Elev=80.53' Storage=1,034 cf Inflow=1.56 cfs 4,821 cf
Discarded=0.41 cfs 4,822 cf Primary=0.00 cfs 0 cf Outflow=0.41 cfs 4,822 cf

Pond IB-2: Infiltration Basin-2 Peak Elev=78.60' Storage=2,117 cf Inflow=2.64 cfs 9,227 cf
Discarded=0.72 cfs 9,199 cf Primary=0.03 cfs 33 cf Outflow=0.75 cfs 9,231 cf

Link N: Total Runoff to North Inflow=4.82 cfs 14,309 cf
Primary=4.82 cfs 14,309 cf

Link S: Total Runoff to South Inflow=0.04 cfs 452 cf
Primary=0.04 cfs 452 cf

Total Runoff Area = 188,423 sf Runoff Volume = 32,666 cf Average Runoff Depth = 2.08"
47.70% Pervious = 89,882 sf 52.30% Impervious = 98,541 sf

Summary for Subcatchment S-1: Tributary to North

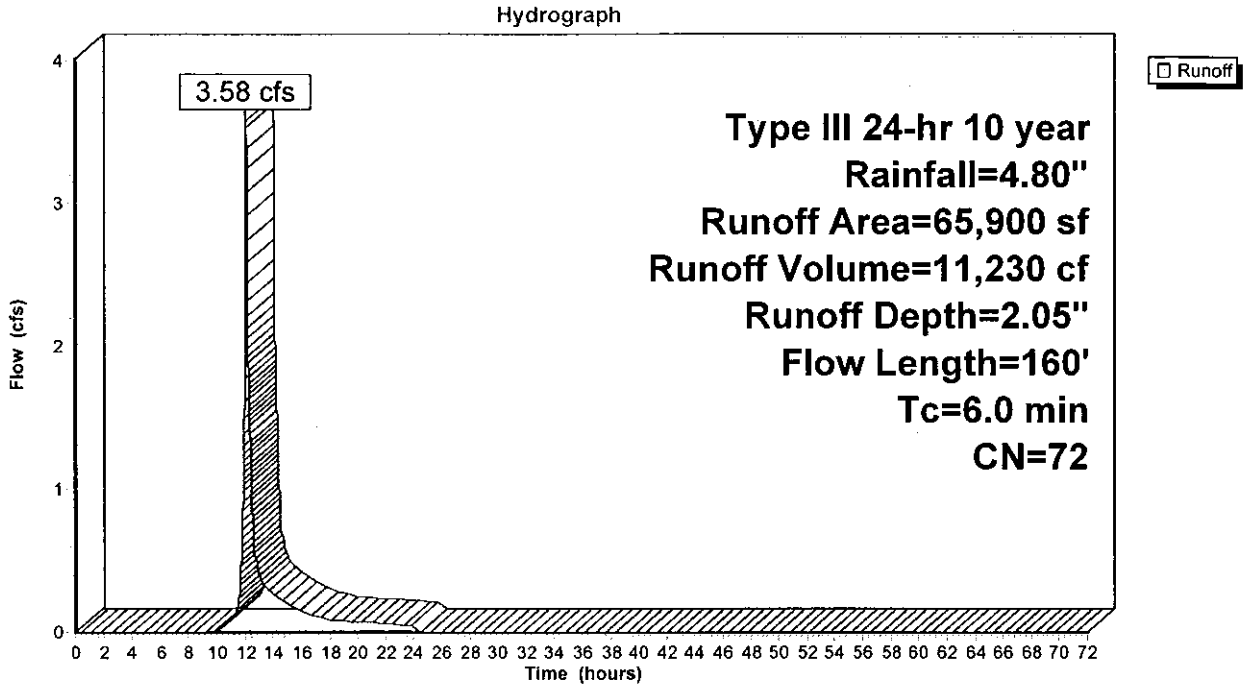
Runoff = 3.58 cfs @ 12.09 hrs, Volume= 11,230 cf, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=4.80"

Area (sf)	CN	Description
32,803	98	Paved parking & roofs
2,718	98	Paved parking & roofs
2,006	35	Brush, Fair, HSG A
3,527	76	Gravel roads, HSG A
6,122	36	Woods, Fair, HSG A
18,724	39	>75% Grass cover, Good, HSG A
65,900	72	Weighted Average
30,379		Pervious Area
35,521		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	160		0.44		**Direct Entry, pave to woods**

Subcatchment S-1: Tributary to North



Summary for Subcatchment S-2: Tributary to Bioretention-1

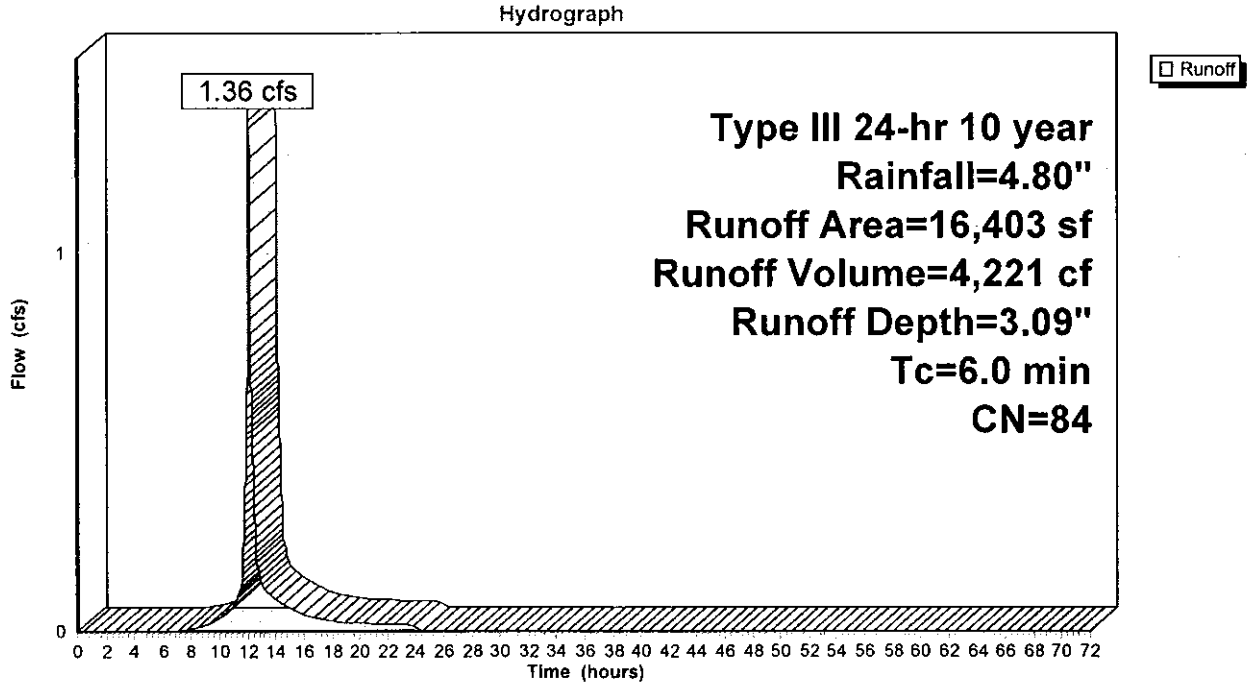
Runoff = 1.36 cfs @ 12.09 hrs, Volume= 4,221 cf, Depth= 3.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=4.80"

Area (sf)	CN	Description
12,642	98	Paved parking & roofs
3,761	39	>75% Grass cover, Good, HSG A
16,403	84	Weighted Average
3,761		Pervious Area
12,642		Impervious Area

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

Subcatchment S-2: Tributary to Bioretention-1



Summary for Subcatchment S-3: Tributary to Infiltration Basin

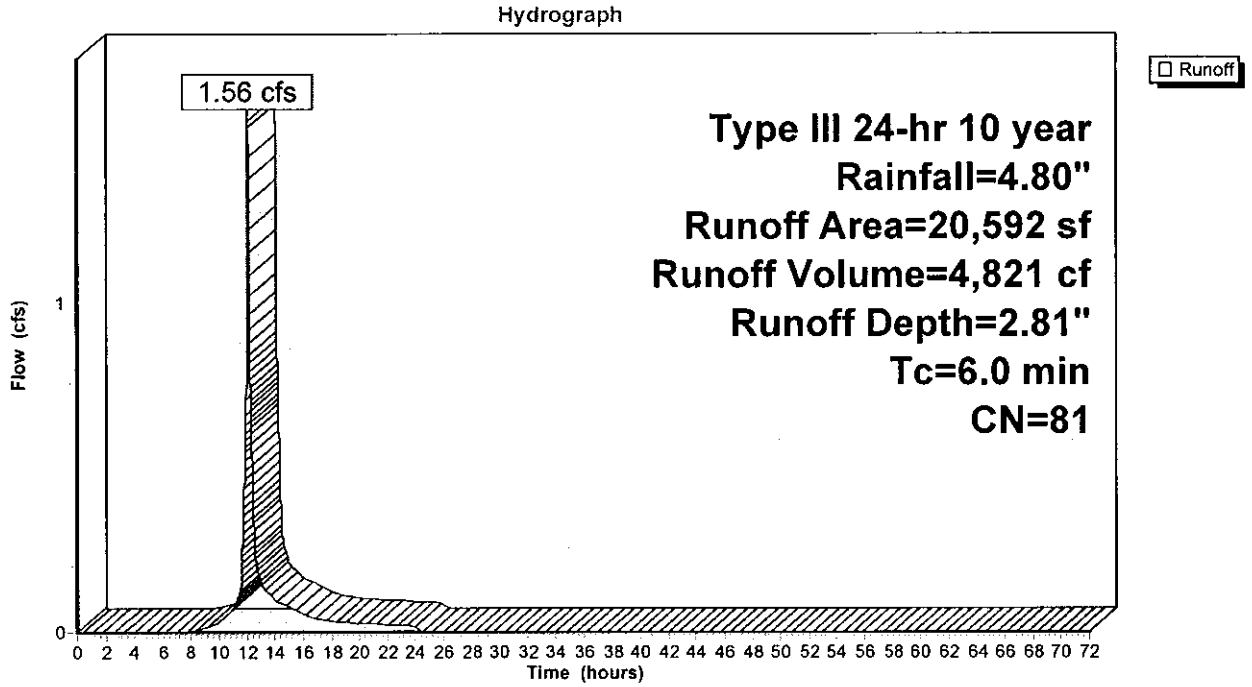
Runoff = 1.56 cfs @ 12.09 hrs, Volume= 4,821 cf, Depth= 2.81"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=4.80"

Area (sf)	CN	Description
14,805	98	Paved parking & roofs
5,787	39	>75% Grass cover, Good, HSG A
20,592	81	Weighted Average
5,787		Pervious Area
14,805		Impervious Area

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

Subcatchment S-3: Tributary to Infiltration Basin



Summary for Subcatchment S-4: Uncontrolled to Road

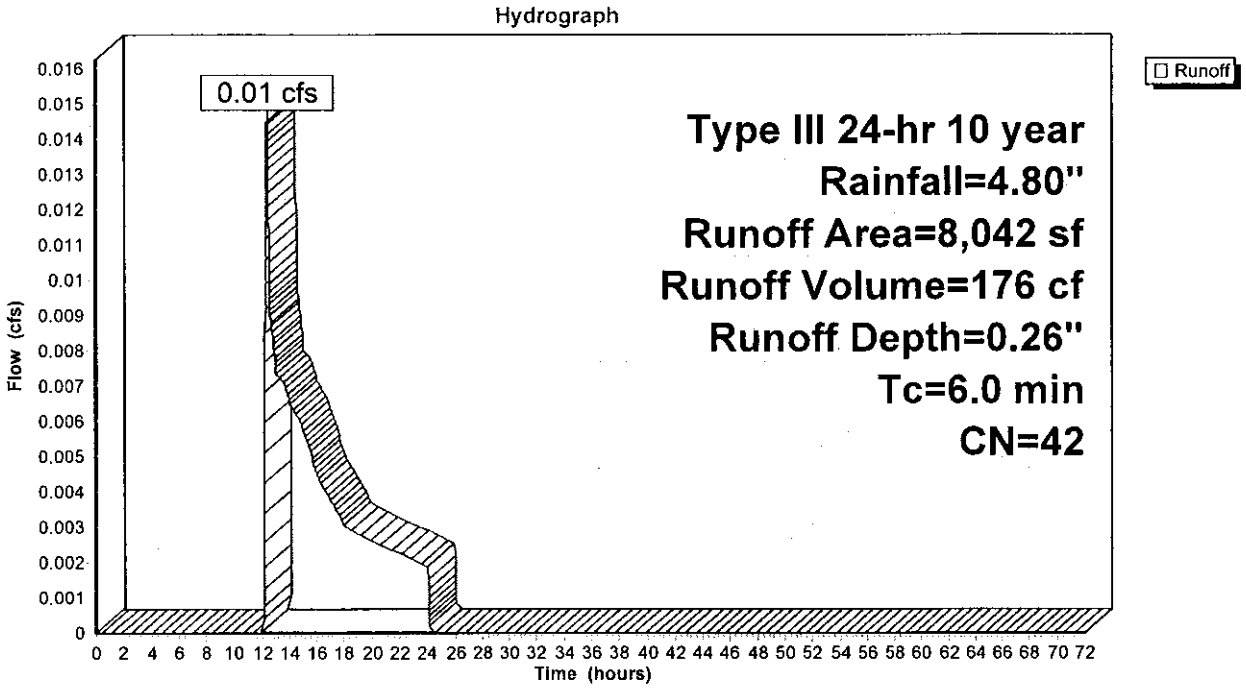
Runoff = 0.01 cfs @ 12.41 hrs, Volume= 176 cf, Depth= 0.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=4.80"

Area (sf)	CN	Description
354	98	Paved parking & roofs
7,688	39	>75% Grass cover, Good, HSG A
8,042	42	Weighted Average
7,688		Pervious Area
354		Impervious Area

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

Subcatchment S-4: Uncontrolled to Road



Summary for Subcatchment S-5: Tributary to Bioretention-2

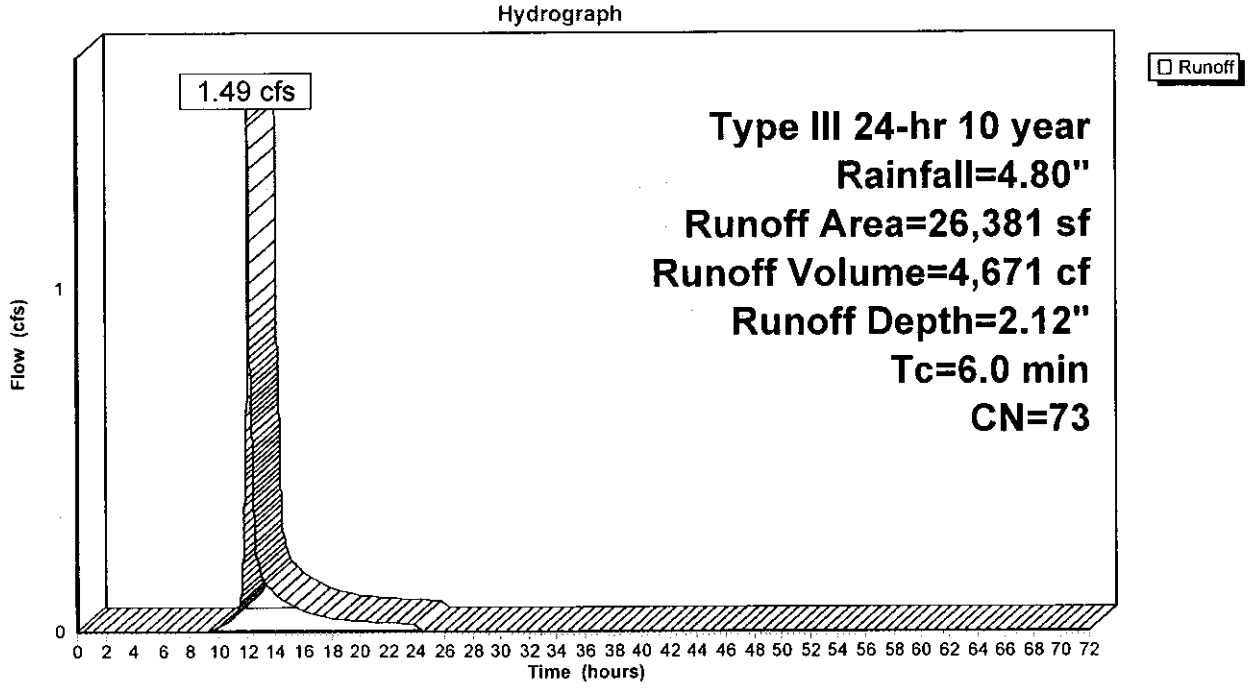
Runoff = 1.49 cfs @ 12.09 hrs, Volume= 4,671 cf, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=4.80"

Area (sf)	CN	Description
14,191	98	Paved parking & roofs
877	98	Water Surface
11,313	39	>75% Grass cover, Good, HSG A
26,381	73	Weighted Average
11,313		Pervious Area
15,068		Impervious Area

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

Subcatchment S-5: Tributary to Bioretention-2



Summary for Subcatchment S-6: Tributary to Biorention-3

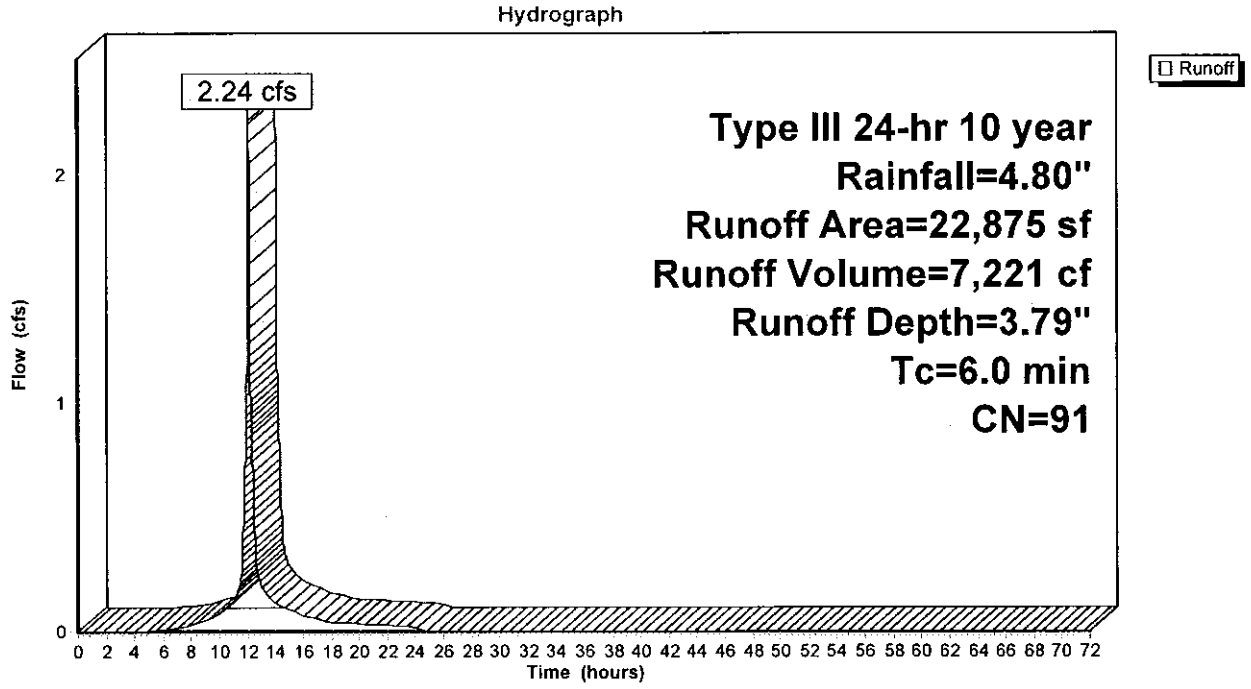
Runoff = 2.24 cfs @ 12.08 hrs, Volume= 7,221 cf, Depth= 3.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=4.80"

Area (sf)	CN	Description
17,189	98	Paved parking & roofs
2,724	39	>75% Grass cover, Good, HSG A
2,962	98	Water Surface
22,875	91	Weighted Average
2,724		Pervious Area
20,151		Impervious Area

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

Subcatchment S-6: Tributary to Biorention-3



Summary for Subcatchment S-7: Tributary to Infiltration Basin-2

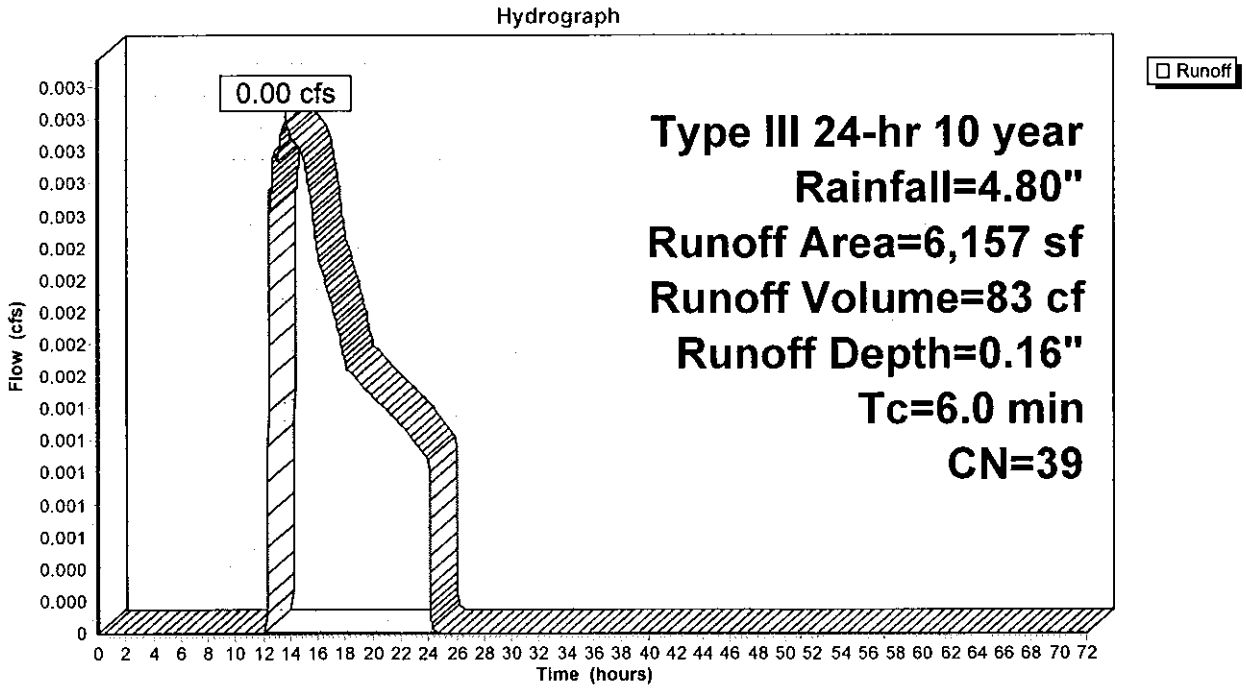
Runoff = 0.00 cfs @ 13.66 hrs, Volume= 83 cf, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=4.80"

Area (sf)	CN	Description
6,157	39	>75% Grass cover, Good, HSG A
6,157		Pervious Area

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

Subcatchment S-7: Tributary to Infiltration Basin-2



Summary for Subcatchment S-8: Tributary to South

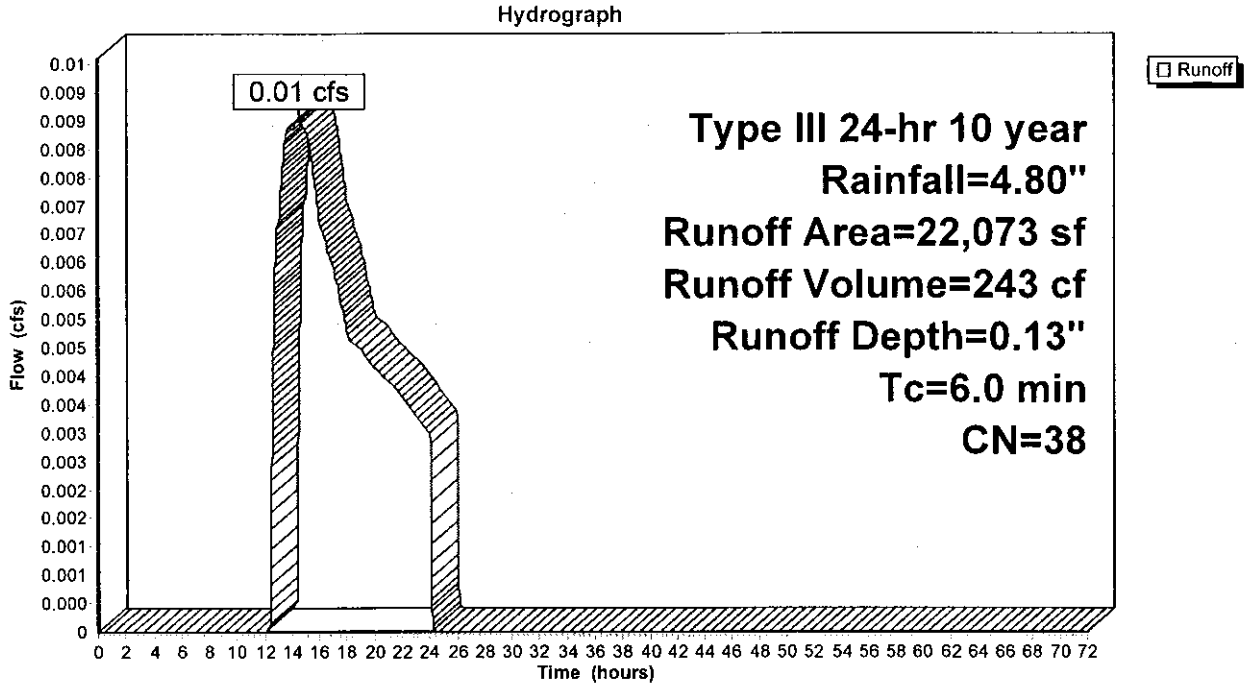
Runoff = 0.01 cfs @ 14.58 hrs, Volume= 243 cf, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 year Rainfall=4.80"

Area (sf)	CN	Description
17,927	35	Brush, Fair, HSG A
1,616	76	Gravel roads, HSG A
2,530	39	>75% Grass cover, Good, HSG A
22,073	38	Weighted Average
22,073		Pervious Area

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

Subcatchment S-8: Tributary to South



Summary for Pond BR-1: Bioretention-1

Inflow Area = 16,403 sf, 77.07% Impervious, Inflow Depth = 3.09" for 10 year event
Inflow = 1.36 cfs @ 12.09 hrs, Volume= 4,221 cf
Outflow = 1.29 cfs @ 12.11 hrs, Volume= 3,079 cf, Atten= 5%, Lag= 1.6 min
Primary = 1.29 cfs @ 12.11 hrs, Volume= 3,079 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 80.84' @ 12.11 hrs Surf.Area= 988 sf Storage= 1,276 cf

Plug-Flow detention time= 145.1 min calculated for 3,079 cf (73% of inflow)
Center-of-Mass det. time= 55.2 min (867.3 - 812.2)

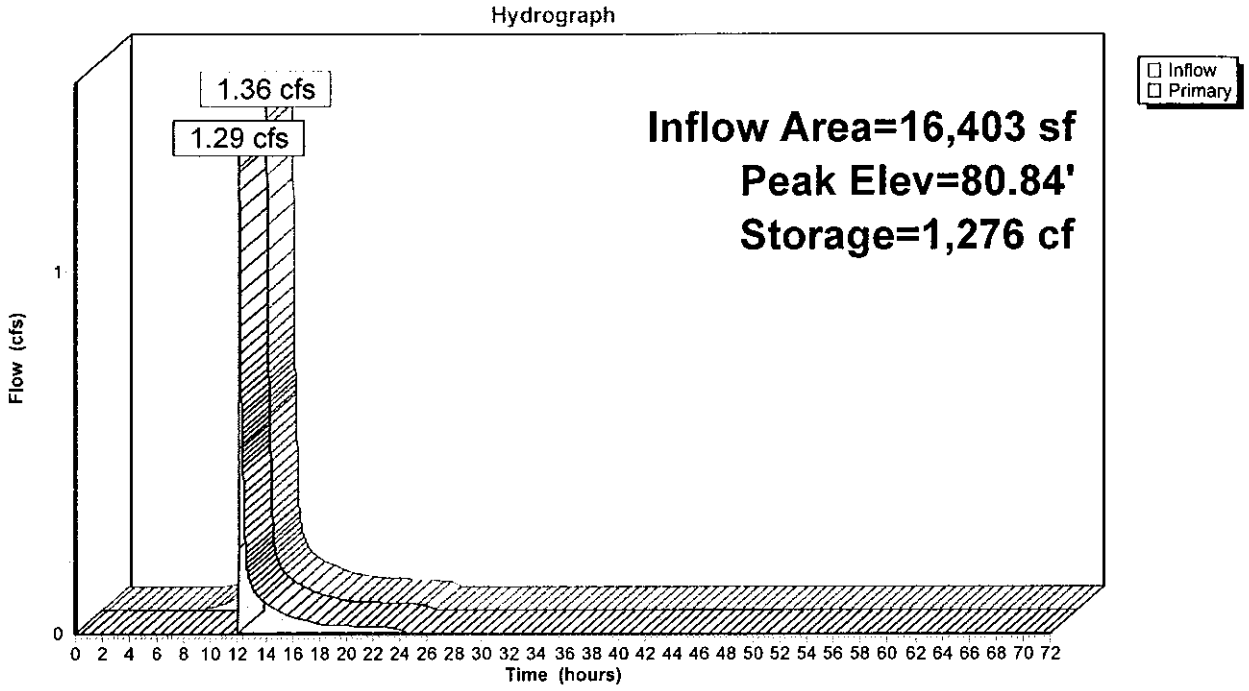
Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	1,440 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
79.00	433	83.5	0	0	433
80.00	711	102.3	566	566	726
81.00	1,047	121.2	874	1,440	1,080

Device	Routing	Invert	Outlet Devices
#1	Primary	80.70'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=1.28 cfs @ 12.11 hrs HW=80.84' TW=0.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.28 cfs @ 0.93 fps)

Pond BR-1: Bioretention-1



Summary for Pond BR-2: Bioretention-2

Inflow Area = 26,381 sf, 57.12% Impervious, Inflow Depth = 2.12" for 10 year event
Inflow = 1.49 cfs @ 12.09 hrs, Volume= 4,671 cf
Outflow = 0.90 cfs @ 12.21 hrs, Volume= 3,460 cf, Atten= 40%, Lag= 6.9 min
Primary = 0.90 cfs @ 12.21 hrs, Volume= 3,460 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 79.51' @ 12.21 hrs Surf.Area= 1,239 sf Storage= 1,426 cf

Plug-Flow detention time= 148.0 min calculated for 3,460 cf (74% of inflow)
Center-of-Mass det. time= 55.5 min (897.5 - 842.1)

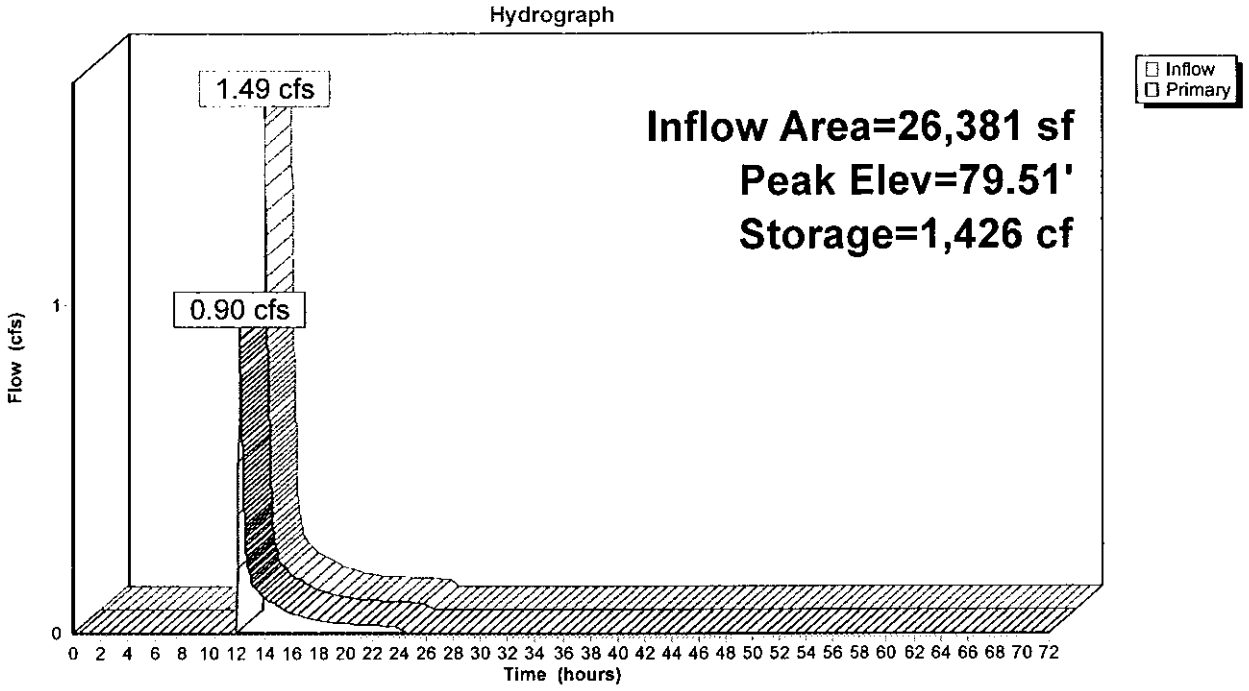
Volume	Invert	Avail.Storage	Storage Description
#1	78.00'	2,086 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
78.00	674	110.9	0	0	674
79.00	1,035	129.7	848	848	1,054
80.00	1,453	148.6	1,238	2,086	1,495

Device	Routing	Invert	Outlet Devices
#1	Primary	79.33'	**5.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.90 cfs @ 12.21 hrs HW=79.51' TW=78.31' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 0.90 cfs @ 1.00 fps)

Pond BR-2: Bioretention-2



Summary for Pond BR-3: Bioretention-3

Inflow Area = 22,875 sf, 88.09% Impervious, Inflow Depth = 3.79" for 10 year event
Inflow = 2.24 cfs @ 12.08 hrs, Volume= 7,221 cf
Outflow = 2.03 cfs @ 12.12 hrs, Volume= 5,684 cf, Atten= 9%, Lag= 2.2 min
Primary = 2.03 cfs @ 12.12 hrs, Volume= 5,684 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 79.63' @ 12.12 hrs Surf.Area= 1,590 sf Storage= 1,997 cf

Plug-Flow detention time= 133.8 min calculated for 5,684 cf (79% of inflow)
Center-of-Mass det. time= 55.7 min (843.9 - 788.2)

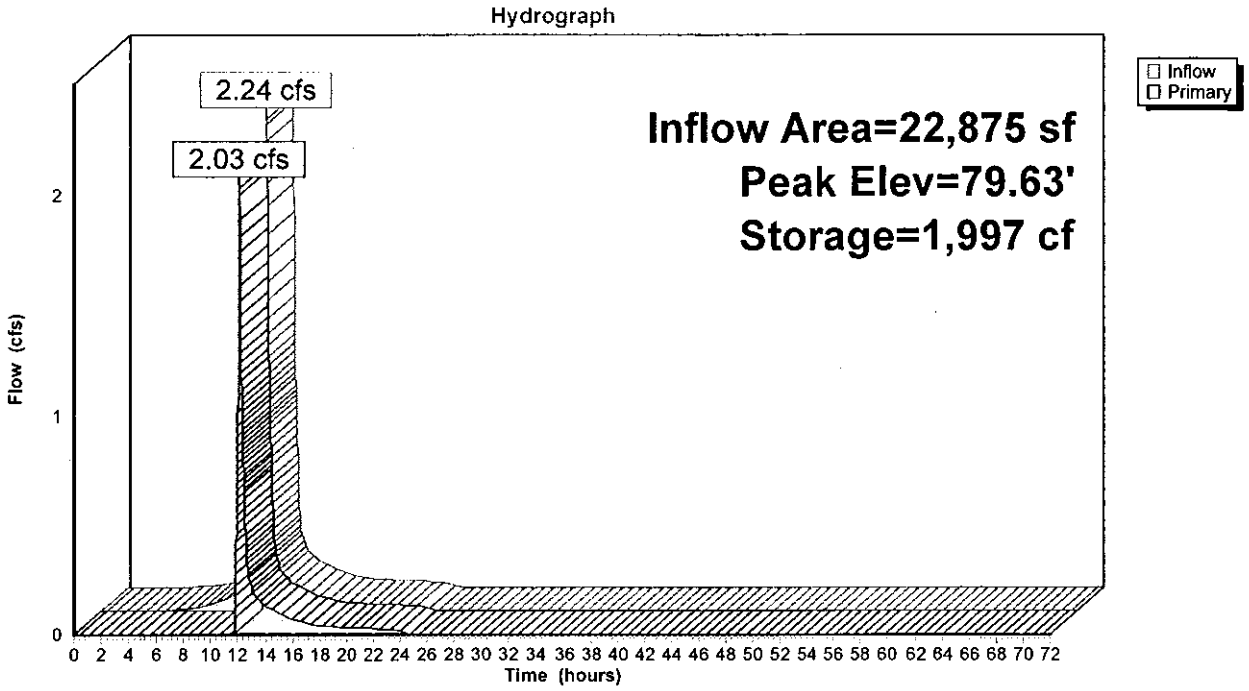
Volume	Invert	Avail.Storage	Storage Description
#1	78.00'	2,614 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
78.00	883	129.3	0	0	883
79.00	1,299	148.2	1,084	1,084	1,323
80.00	1,772	167.0	1,529	2,614	1,820

Device	Routing	Invert	Outlet Devices
#1	Primary	79.33'	**5.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=2.03 cfs @ 12.12 hrs HW=79.63' TW=78.14' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 2.03 cfs @ 1.34 fps)

Pond BR-3: Bioretention-3



Summary for Pond IB-1: Infiltration Basin-1

Inflow Area = 20,592 sf, 71.90% Impervious, Inflow Depth = 2.81" for 10 year event
Inflow = 1.56 cfs @ 12.09 hrs, Volume= 4,821 cf
Outflow = 0.41 cfs @ 12.47 hrs, Volume= 4,822 cf, Atten= 73%, Lag= 22.8 min
Discarded = 0.41 cfs @ 12.47 hrs, Volume= 4,822 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 80.53' @ 12.47 hrs Surf.Area= 2,166 sf Storage= 1,034 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 14.0 min (834.8 - 820.8)

Volume	Invert	Avail.Storage	Storage Description
#1	80.00'	6,411 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

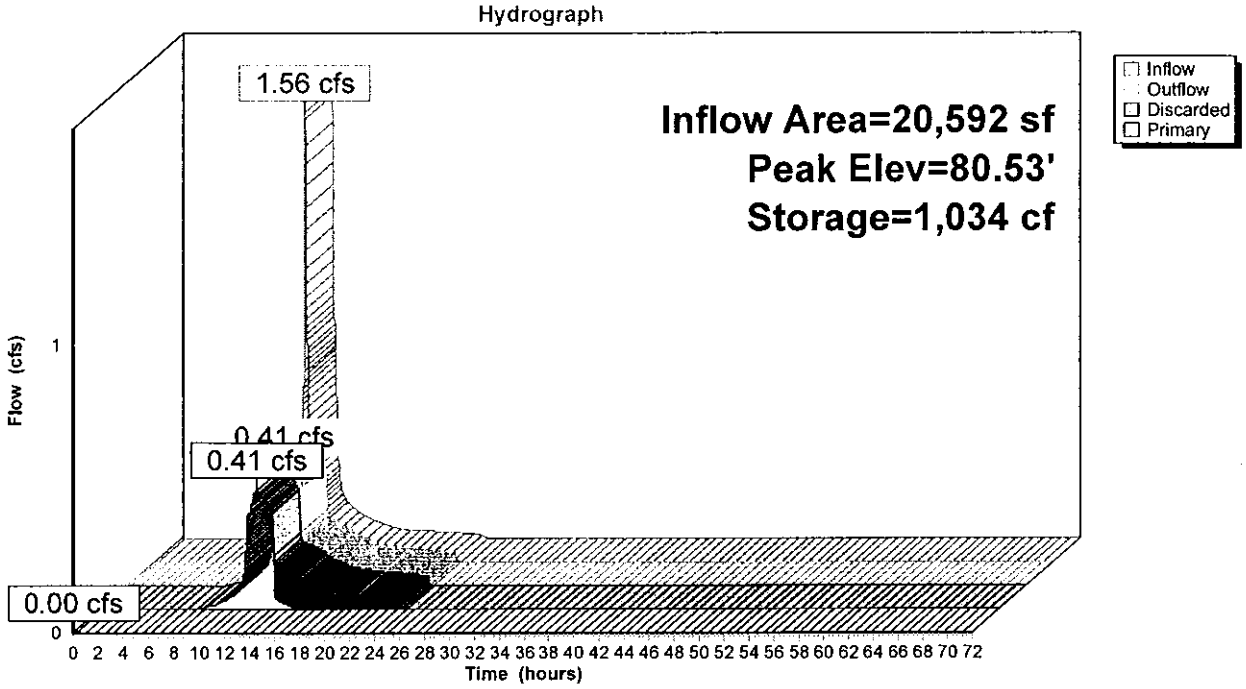
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
80.00	1,710	163.6	0	0	1,710
81.00	2,607	195.0	2,143	2,143	2,624
82.00	3,660	226.4	3,119	5,261	3,698
82.30	4,007	235.9	1,150	6,411	4,054

Device	Routing	Invert	Outlet Devices
#1	Primary	81.30'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	80.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.41 cfs @ 12.47 hrs HW=80.53' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.41 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=80.00' TW=0.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IB-1: Infiltration Basin-1



Summary for Pond IB-2: Infiltration Basin-2

Inflow Area = 55,413 sf, 63.56% Impervious, Inflow Depth = 2.00" for 10 year event
Inflow = 2.64 cfs @ 12.16 hrs, Volume= 9,227 cf
Outflow = 0.75 cfs @ 12.60 hrs, Volume= 9,231 cf, Atten= 72%, Lag= 26.0 min
Discarded = 0.72 cfs @ 12.60 hrs, Volume= 9,199 cf
Primary = 0.03 cfs @ 12.60 hrs, Volume= 33 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 78.60' @ 12.60 hrs Surf.Area= 3,769 sf Storage= 2,117 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 18.2 min (883.8 - 865.6)

Volume	Invert	Avail.Storage	Storage Description
#1	78.00'	8,209 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

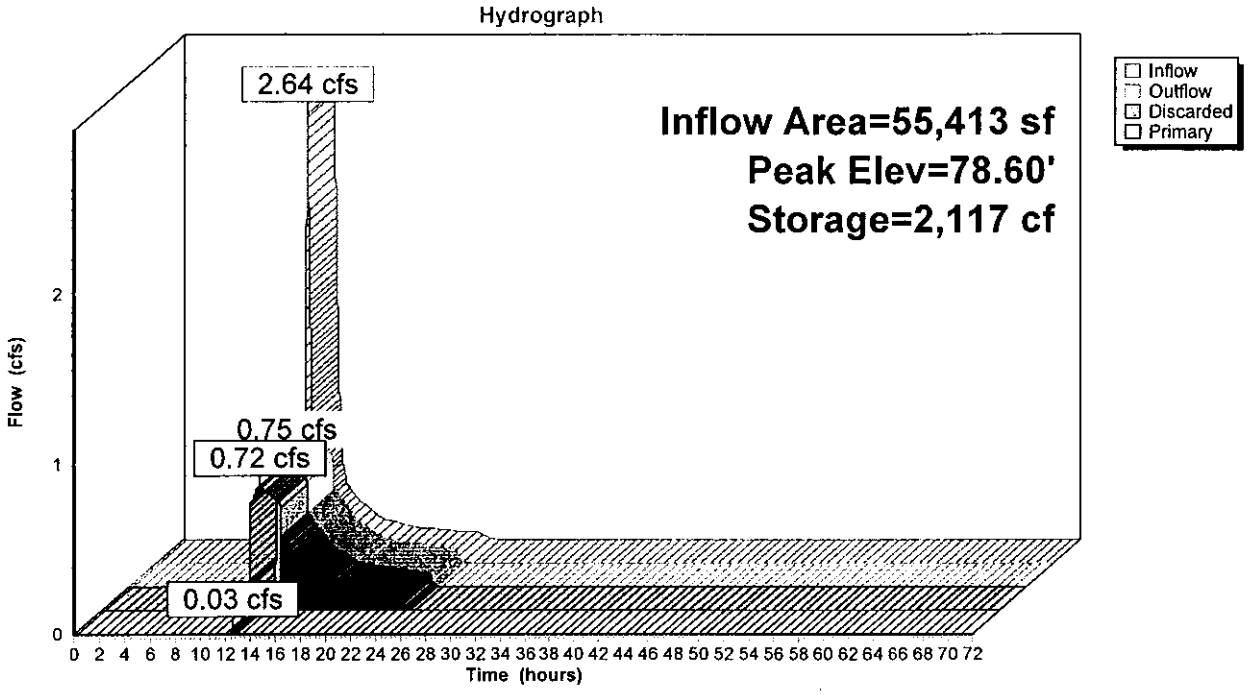
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
78.00	3,304	254.9	0	0	3,304
79.00	4,097	273.7	3,693	3,693	4,138
80.00	4,947	292.6	4,515	8,209	5,035

Device	Routing	Invert	Outlet Devices
#1	Primary	78.50'	**8.0" x 60.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 78.00' S= 0.0083 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#2	Discarded	78.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.72 cfs @ 12.60 hrs HW=78.60' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.72 cfs)

Primary OutFlow Max=0.03 cfs @ 12.60 hrs HW=78.60' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.03 cfs @ 0.85 fps)

Pond IB-2: Infiltration Basin-2

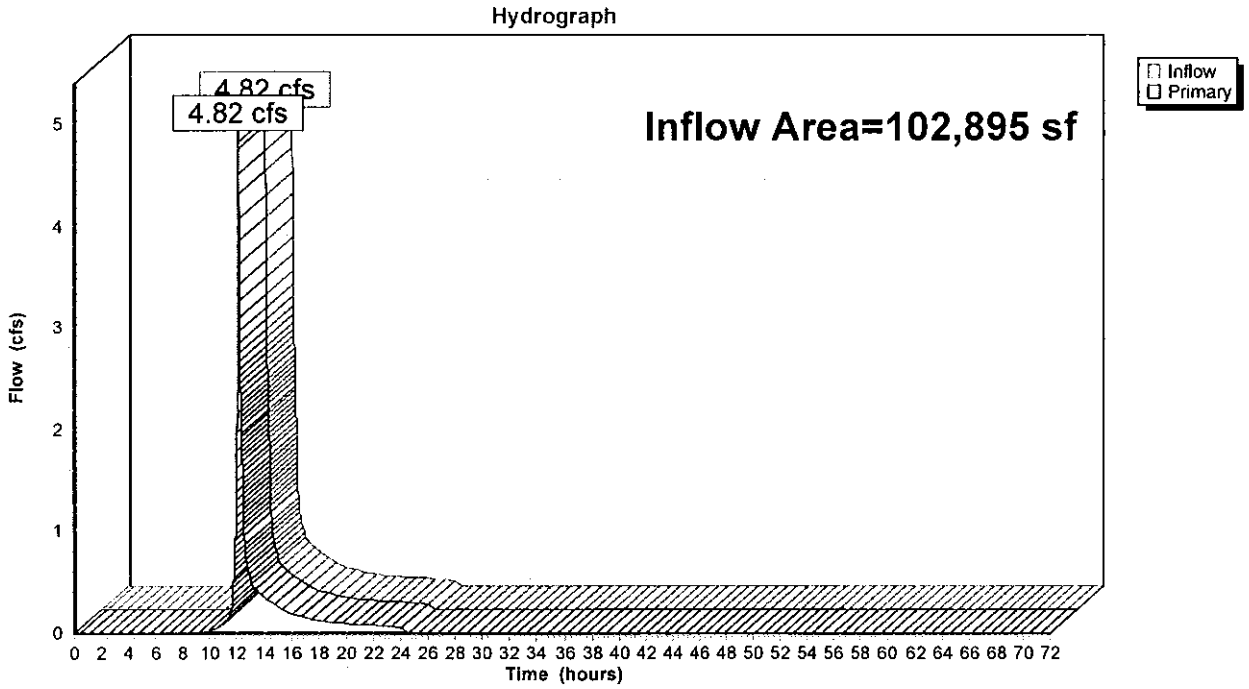


Summary for Link N: Total Runoff to North

Inflow Area = 102,895 sf, 61.20% Impervious, Inflow Depth = 1.67" for 10 year event
Inflow = 4.82 cfs @ 12.10 hrs, Volume= 14,309 cf
Primary = 4.82 cfs @ 12.10 hrs, Volume= 14,309 cf, Atten= 0%, Lag= 0.0 min

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

Link N: Total Runoff to North

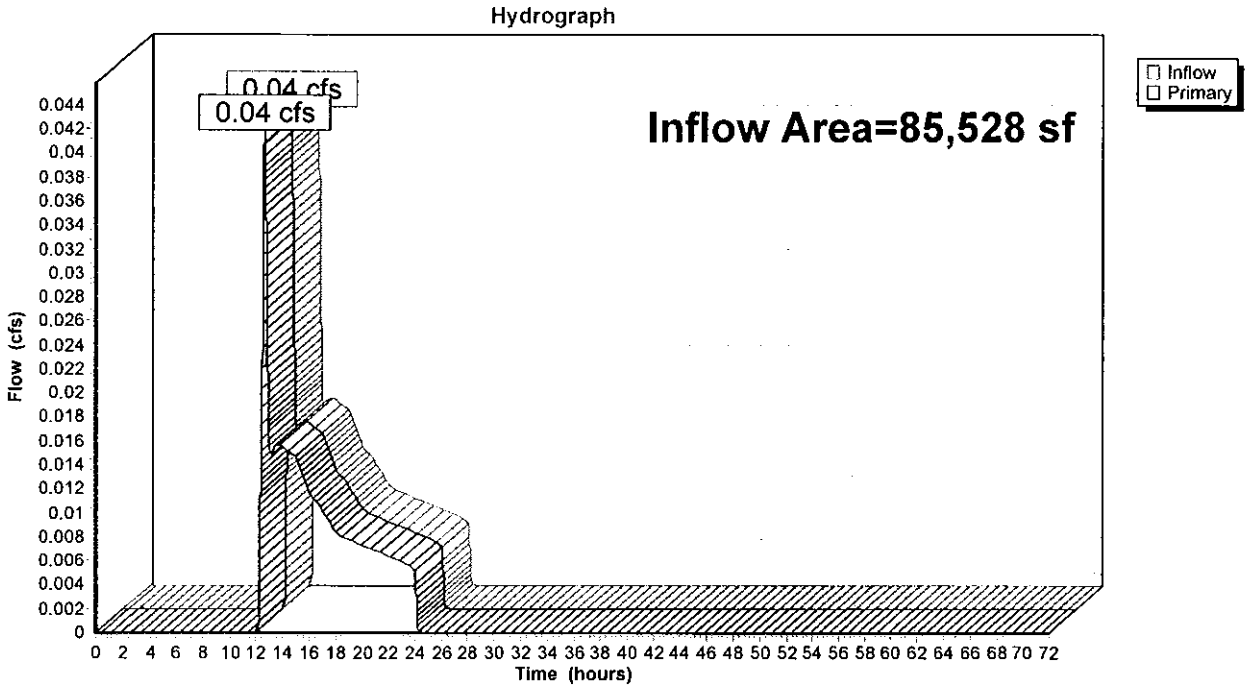


Summary for Link S: Total Runoff to South

Inflow Area = 85,528 sf, 41.59% Impervious, Inflow Depth = 0.06" for 10 year event
Inflow = 0.04 cfs @ 12.59 hrs, Volume= 452 cf
Primary = 0.04 cfs @ 12.59 hrs, Volume= 452 cf, Atten= 0%, Lag= 0.0 min

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

Link S: Total Runoff to South



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S-1: Tributary to North Runoff Area=65,900 sf 53.90% Impervious Runoff Depth=3.83"
Flow Length=160' Tc=6.0 min CN=72 Runoff=6.80 cfs 21,028 cf

Subcatchment S-2: Tributary to Runoff Area=16,403 sf 77.07% Impervious Runoff Depth=5.14"
Tc=6.0 min CN=84 Runoff=2.22 cfs 7,026 cf

Subcatchment S-3: Tributary to Infiltration Runoff Area=20,592 sf 71.90% Impervious Runoff Depth=4.81"
Tc=6.0 min CN=81 Runoff=2.63 cfs 8,245 cf

Subcatchment S-4: Uncontrolled to Road Runoff Area=8,042 sf 4.40% Impervious Runoff Depth=1.00"
Tc=6.0 min CN=42 Runoff=0.14 cfs 667 cf

Subcatchment S-5: Tributary to Runoff Area=26,381 sf 57.12% Impervious Runoff Depth=3.94"
Tc=6.0 min CN=73 Runoff=2.80 cfs 8,651 cf

Subcatchment S-6: Tributary to Runoff Area=22,875 sf 88.09% Impervious Runoff Depth=5.94"
Tc=6.0 min CN=91 Runoff=3.42 cfs 11,321 cf

Subcatchment S-7: Tributary to Infiltration Runoff Area=6,157 sf 0.00% Impervious Runoff Depth=0.77"
Tc=6.0 min CN=39 Runoff=0.06 cfs 394 cf

Subcatchment S-8: Tributary to South Runoff Area=22,073 sf 0.00% Impervious Runoff Depth=0.70"
Tc=6.0 min CN=38 Runoff=0.17 cfs 1,281 cf

Pond BR-1: Bioretention-1 Peak Elev=80.90' Storage=1,334 cf Inflow=2.22 cfs 7,026 cf
Outflow=2.17 cfs 5,884 cf

Pond BR-2: Bioretention-2 Peak Elev=79.69' Storage=1,651 cf Inflow=2.80 cfs 8,651 cf
Outflow=2.62 cfs 7,440 cf

Pond BR-3: Bioretention-3 Peak Elev=79.73' Storage=2,154 cf Inflow=3.42 cfs 11,321 cf
Outflow=3.17 cfs 9,784 cf

Pond IB-1: Infiltration Basin-1 Peak Elev=81.08' Storage=2,347 cf Inflow=2.63 cfs 8,245 cf
Discarded=0.51 cfs 8,249 cf Primary=0.00 cfs 0 cf Outflow=0.51 cfs 8,249 cf

Pond IB-2: Infiltration Basin-2 Peak Elev=79.28' Storage=4,887 cf Inflow=5.86 cfs 17,618 cf
Discarded=0.83 cfs 14,548 cf Primary=0.89 cfs 3,071 cf Outflow=1.72 cfs 17,619 cf

Link N: Total Runoff to North Inflow=8.94 cfs 26,912 cf
Primary=8.94 cfs 26,912 cf

Link S: Total Runoff to South Inflow=1.10 cfs 5,019 cf
Primary=1.10 cfs 5,019 cf

Total Runoff Area = 188,423 sf Runoff Volume = 58,613 cf Average Runoff Depth = 3.73"
47.70% Pervious = 89,882 sf 52.30% Impervious = 98,541 sf

Summary for Subcatchment S-1: Tributary to North

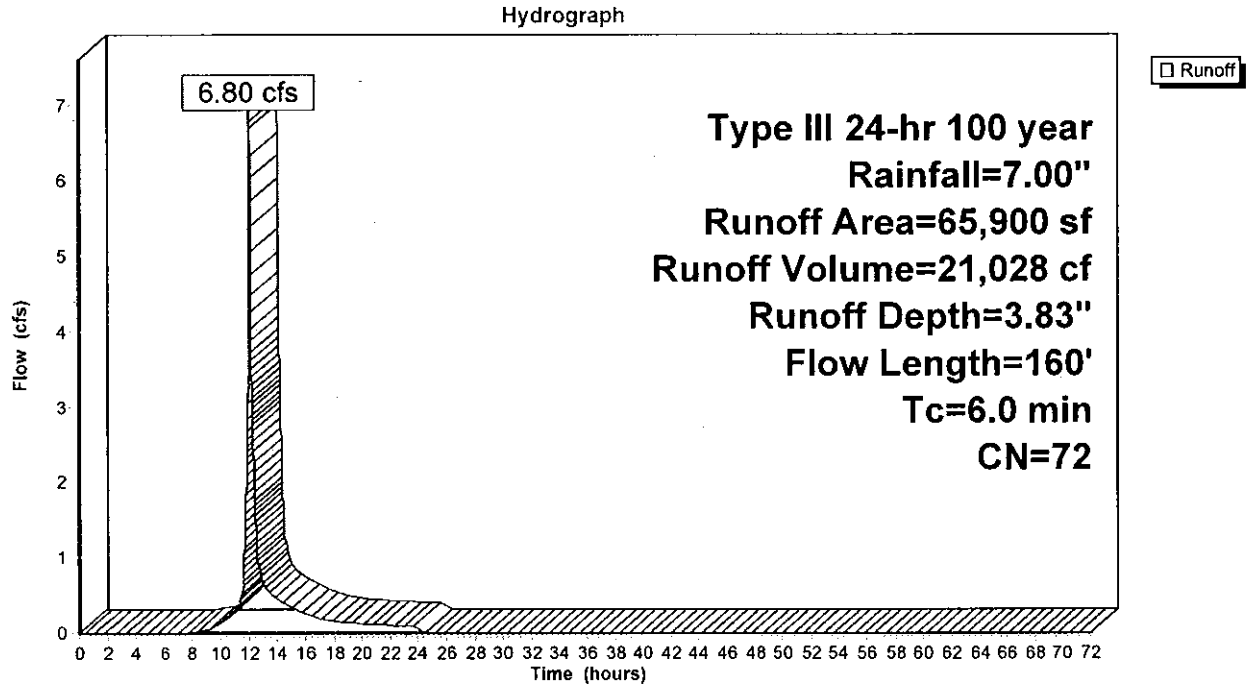
Runoff = 6.80 cfs @ 12.09 hrs, Volume= 21,028 cf, Depth= 3.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.00"

Area (sf)	CN	Description
32,803	98	Paved parking & roofs
2,718	98	Paved parking & roofs
2,006	35	Brush, Fair, HSG A
3,527	76	Gravel roads, HSG A
6,122	36	Woods, Fair, HSG A
18,724	39	>75% Grass cover, Good, HSG A
65,900	72	Weighted Average
30,379		Pervious Area
35,521		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	160		0.44		**Direct Entry, pave to woods**

Subcatchment S-1: Tributary to North



Summary for Subcatchment S-2: Tributary to Bioretention-1

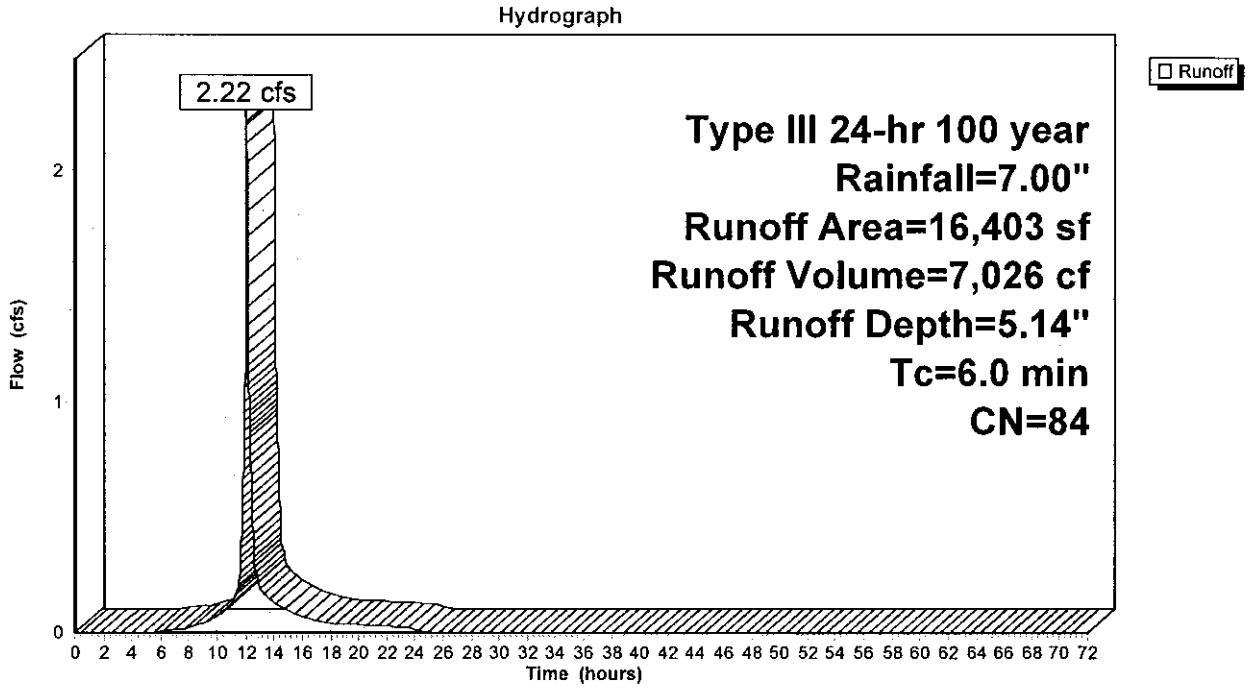
Runoff = 2.22 cfs @ 12.09 hrs, Volume= 7,026 cf, Depth= 5.14"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.00"

Area (sf)	CN	Description
12,642	98	Paved parking & roofs
3,761	39	>75% Grass cover, Good, HSG A
16,403	84	Weighted Average
3,761		Pervious Area
12,642		Impervious Area

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

Subcatchment S-2: Tributary to Bioretention-1



Summary for Subcatchment S-3: Tributary to Infiltration Basin

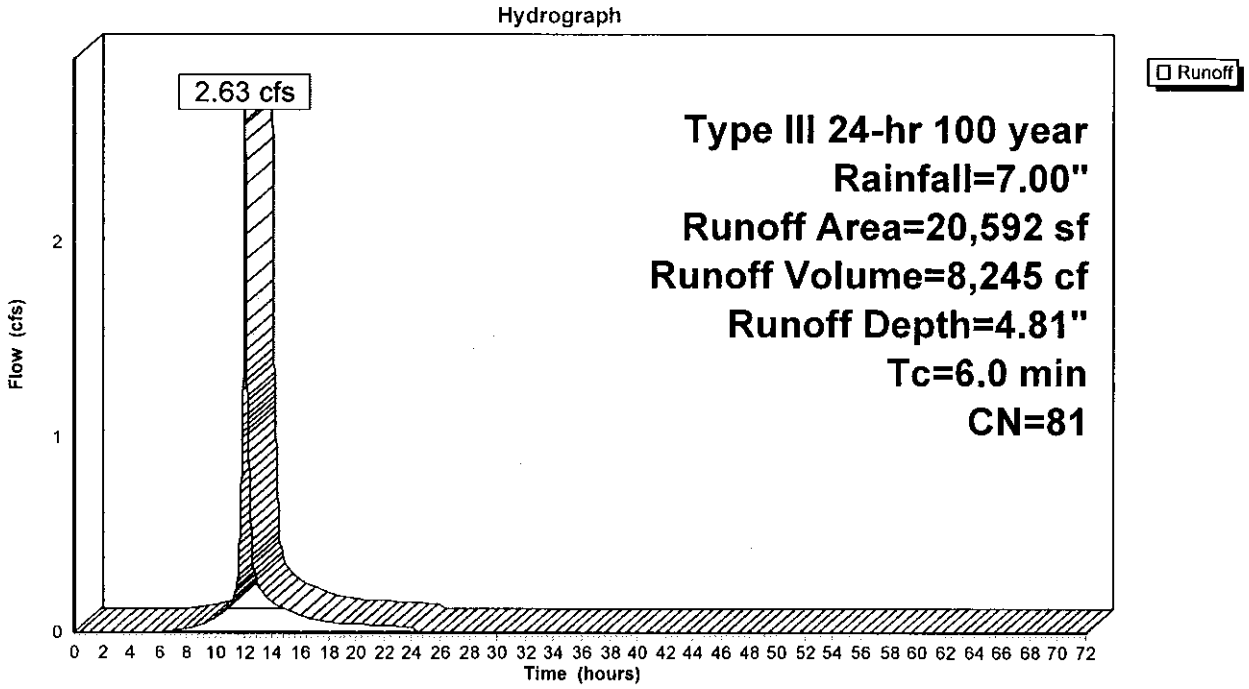
Runoff = 2.63 cfs @ 12.09 hrs, Volume= 8,245 cf, Depth= 4.81"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.00"

Area (sf)	CN	Description
14,805	98	Paved parking & roofs
5,787	39	>75% Grass cover, Good, HSG A
20,592	81	Weighted Average
5,787		Pervious Area
14,805		Impervious Area

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

Subcatchment S-3: Tributary to Infiltration Basin



Summary for Subcatchment S-4: Uncontrolled to Road

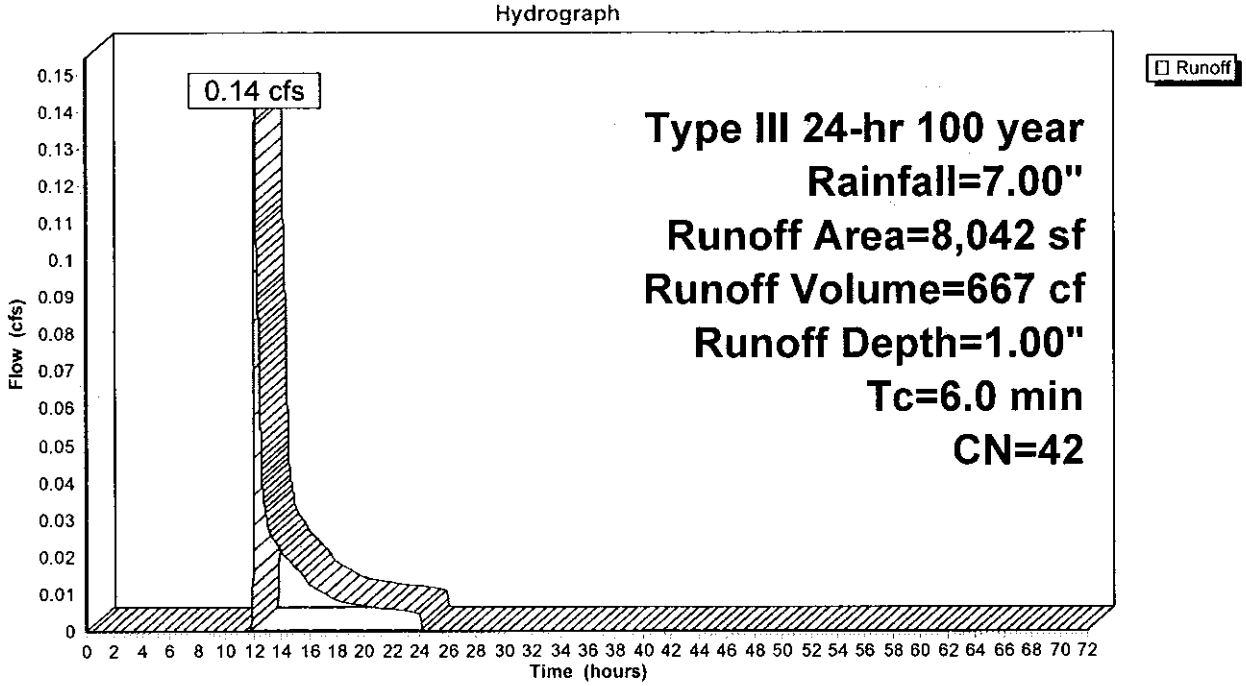
Runoff = 0.14 cfs @ 12.12 hrs, Volume= 667 cf, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.00"

Area (sf)	CN	Description
354	98	Paved parking & roofs
7,688	39	>75% Grass cover, Good, HSG A
8,042	42	Weighted Average
7,688		Pervious Area
354		Impervious Area

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

Subcatchment S-4: Uncontrolled to Road



Summary for Subcatchment S-5: Tributary to Bioretention-2

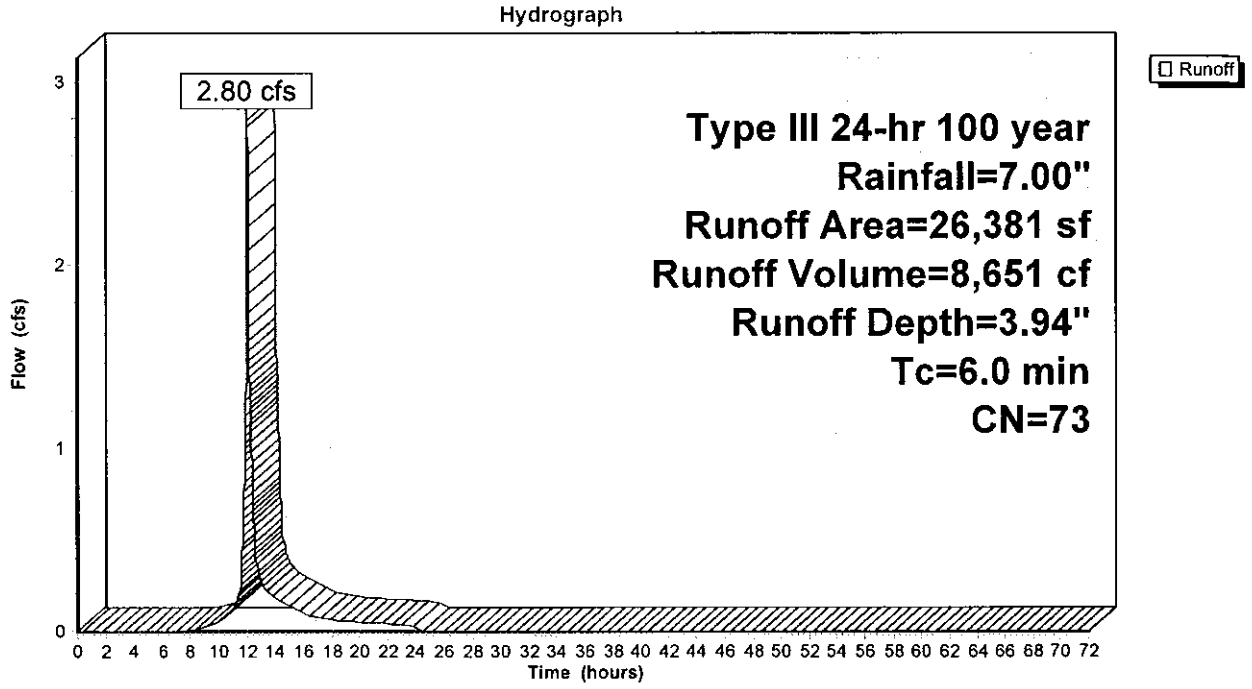
Runoff = 2.80 cfs @ 12.09 hrs, Volume= 8,651 cf, Depth= 3.94"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.00"

Area (sf)	CN	Description
14,191	98	Paved parking & roofs
877	98	Water Surface
11,313	39	>75% Grass cover, Good, HSG A
26,381	73	Weighted Average
11,313		Pervious Area
15,068		Impervious Area

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

Subcatchment S-5: Tributary to Bioretention-2



Summary for Subcatchment S-6: Tributary to Biorention-3

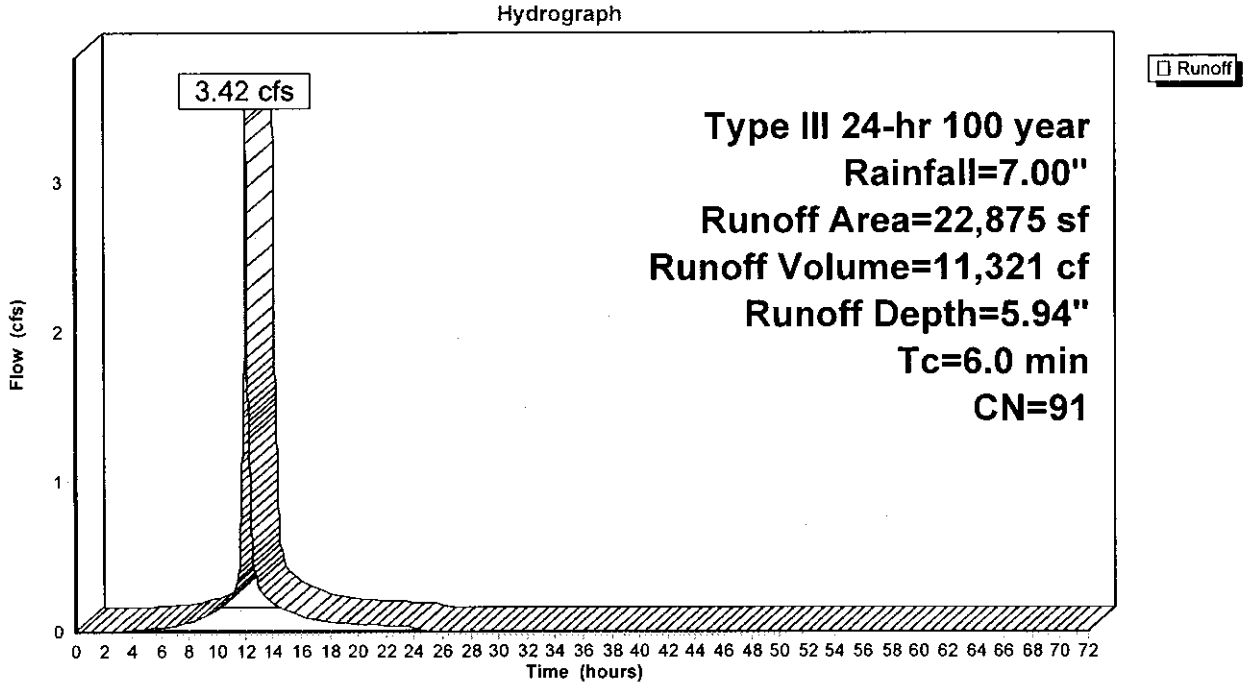
Runoff = 3.42 cfs @ 12.08 hrs, Volume= 11,321 cf, Depth= 5.94"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.00"

Area (sf)	CN	Description
17,189	98	Paved parking & roofs
2,724	39	>75% Grass cover, Good, HSG A
2,962	98	Water Surface
22,875	91	Weighted Average
2,724		Pervious Area
20,151		Impervious Area

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

Subcatchment S-6: Tributary to Biorention-3



Summary for Subcatchment S-7: Tributary to Infiltration Basin-2

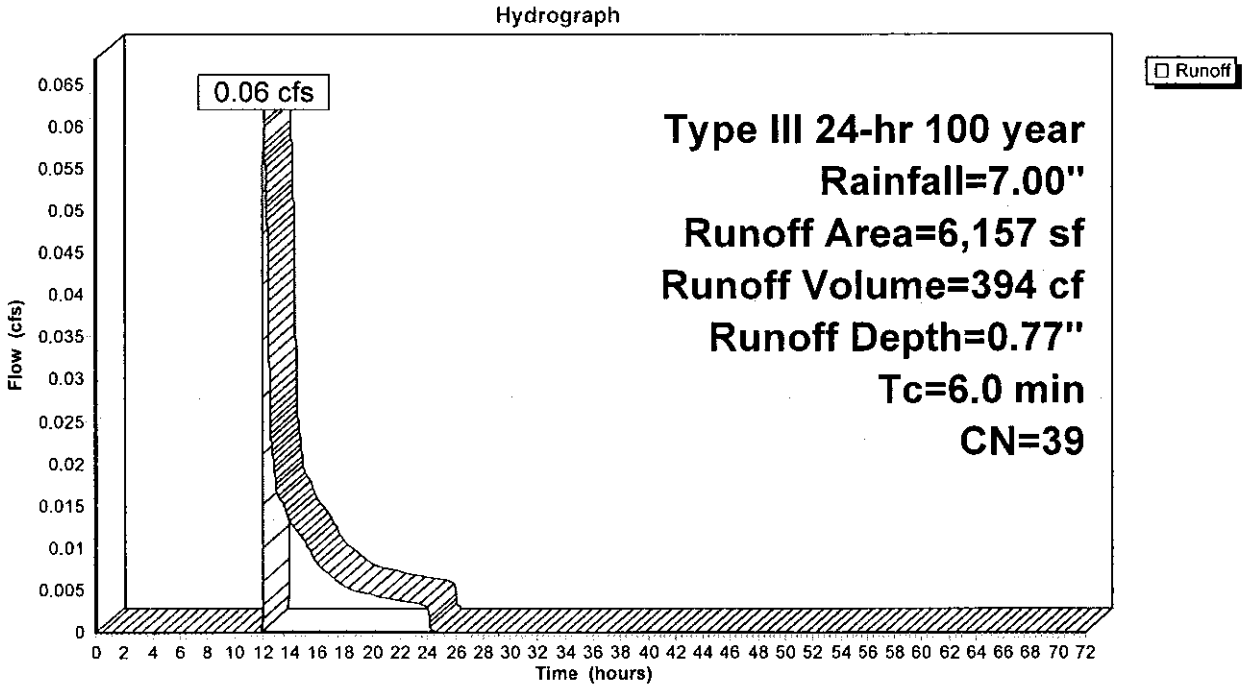
Runoff = 0.06 cfs @ 12.14 hrs, Volume= 394 cf, Depth= 0.77"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.00"

Area (sf)	CN	Description
6,157	39	>75% Grass cover, Good, HSG A
6,157		Pervious Area

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

Subcatchment S-7: Tributary to Infiltration Basin-2



Summary for Subcatchment S-8: Tributary to South

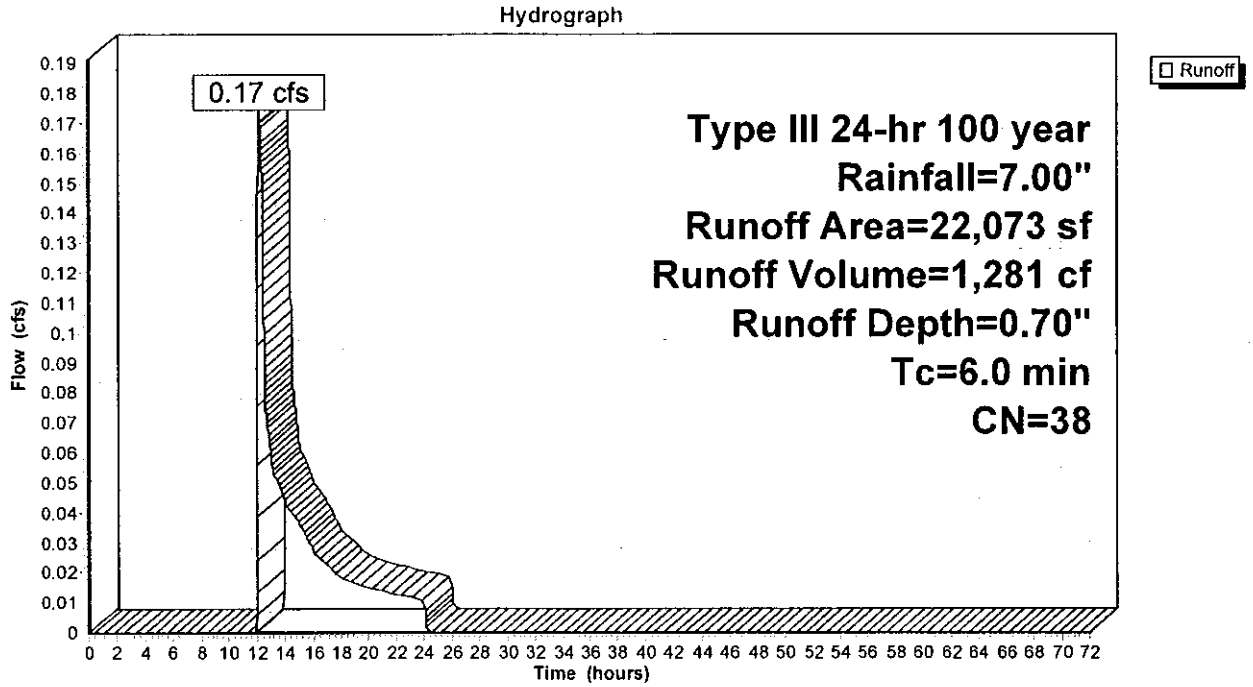
Runoff = 0.17 cfs @ 12.16 hrs, Volume= 1,281 cf, Depth= 0.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=7.00"

Area (sf)	CN	Description
17,927	35	Brush, Fair, HSG A
1,616	76	Gravel roads, HSG A
2,530	39	>75% Grass cover, Good, HSG A
22,073	38	Weighted Average
22,073		Pervious Area

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

Subcatchment S-8: Tributary to South



Summary for Pond BR-1: Bioretention-1

Inflow Area = 16,403 sf, 77.07% Impervious, Inflow Depth = 5.14" for 100 year event
Inflow = 2.22 cfs @ 12.09 hrs, Volume= 7,026 cf
Outflow = 2.17 cfs @ 12.10 hrs, Volume= 5,884 cf, Atten= 2%, Lag= 1.0 min
Primary = 2.17 cfs @ 12.10 hrs, Volume= 5,884 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 80.90' @ 12.10 hrs Surf.Area= 1,009 sf Storage= 1,334 cf

Plug-Flow detention time= 106.4 min calculated for 5,884 cf (84% of inflow)
Center-of-Mass det. time= 39.3 min (837.1 - 797.8)

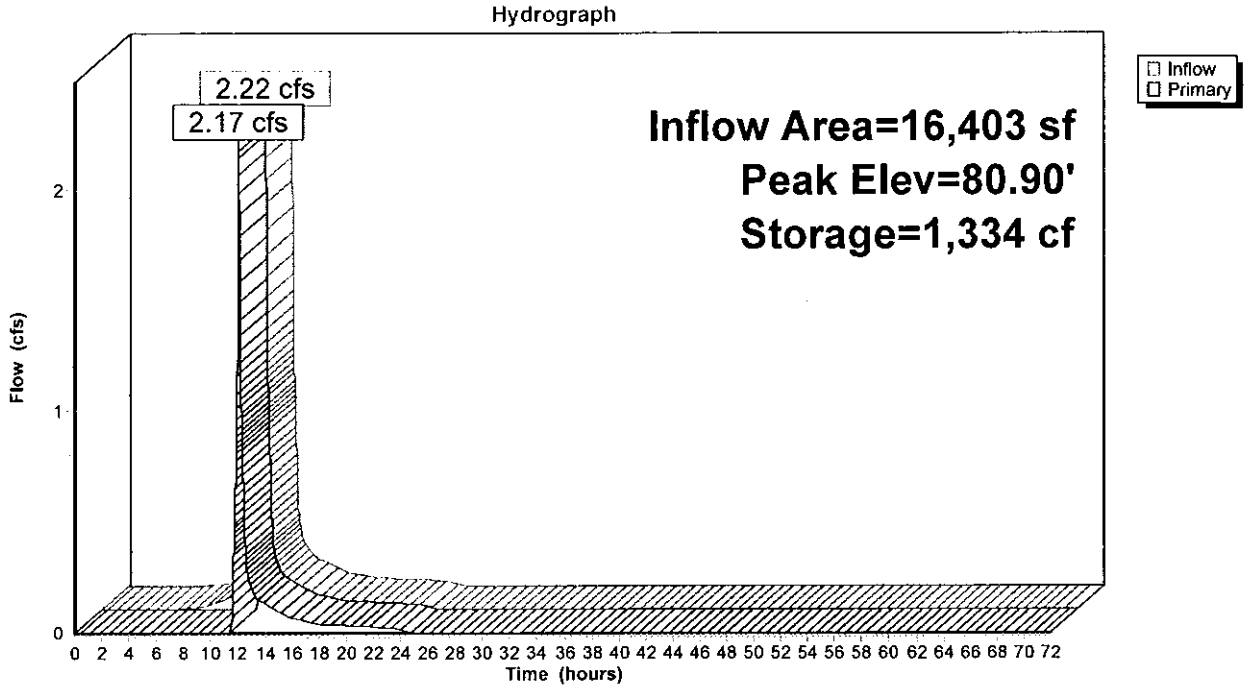
Volume	Invert	Avail.Storage	Storage Description
#1	79.00'	1,440 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
79.00	433	83.5	0	0	433
80.00	711	102.3	566	566	726
81.00	1,047	121.2	874	1,440	1,080

Device	Routing	Invert	Outlet Devices
#1	Primary	80.70'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=2.17 cfs @ 12.10 hrs HW=80.90' TW=0.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 2.17 cfs @ 1.10 fps)

Pond BR-1: Bioretention-1



Summary for Pond BR-2: Bioretention-2

Inflow Area = 26,381 sf, 57.12% Impervious, Inflow Depth = 3.94" for 100 year event
Inflow = 2.80 cfs @ 12.09 hrs, Volume= 8,651 cf
Outflow = 2.62 cfs @ 12.12 hrs, Volume= 7,440 cf, Atten= 6%, Lag= 1.8 min
Primary = 2.62 cfs @ 12.12 hrs, Volume= 7,440 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 79.69' @ 12.12 hrs Surf.Area= 1,314 sf Storage= 1,651 cf

Plug-Flow detention time= 94.2 min calculated for 7,440 cf (86% of inflow)
Center-of-Mass det. time= 32.1 min (856.3 - 824.2)

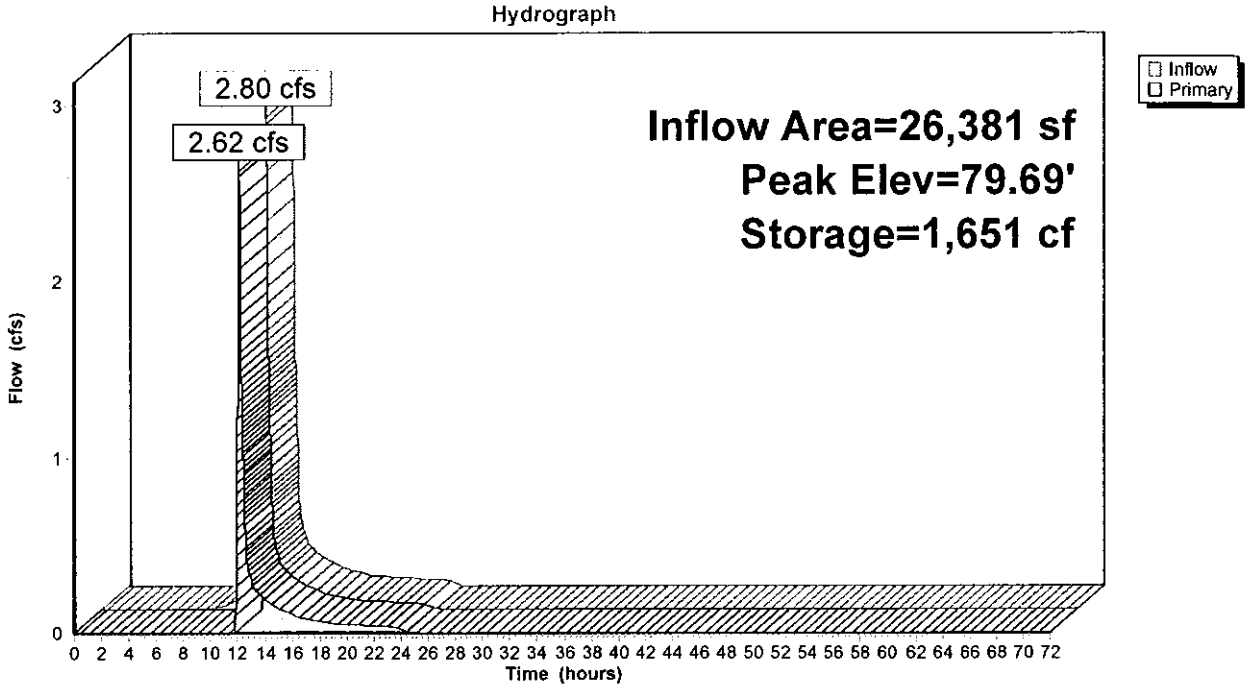
Volume	Invert	Avail.Storage	Storage Description
#1	78.00'	2,086 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
78.00	674	110.9	0	0	674
79.00	1,035	129.7	848	848	1,054
80.00	1,453	148.6	1,238	2,086	1,495

Device	Routing	Invert	Outlet Devices
#1	Primary	79.33'	**5.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=2.62 cfs @ 12.12 hrs HW=79.69' TW=78.68' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 2.62 cfs @ 1.48 fps)

Pond BR-2: Bioretention-2



Summary for Pond BR-3: Bioretention-3

Inflow Area = 22,875 sf, 88.09% Impervious, Inflow Depth = 5.94" for 100 year event
Inflow = 3.42 cfs @ 12.08 hrs, Volume= 11,321 cf
Outflow = 3.17 cfs @ 12.12 hrs, Volume= 9,784 cf, Atten= 7%, Lag= 1.9 min
Primary = 3.17 cfs @ 12.12 hrs, Volume= 9,784 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 79.73' @ 12.12 hrs Surf.Area= 1,637 sf Storage= 2,154 cf

Plug-Flow detention time= 105.9 min calculated for 9,784 cf (86% of inflow)
Center-of-Mass det. time= 45.9 min (822.3 - 776.4)

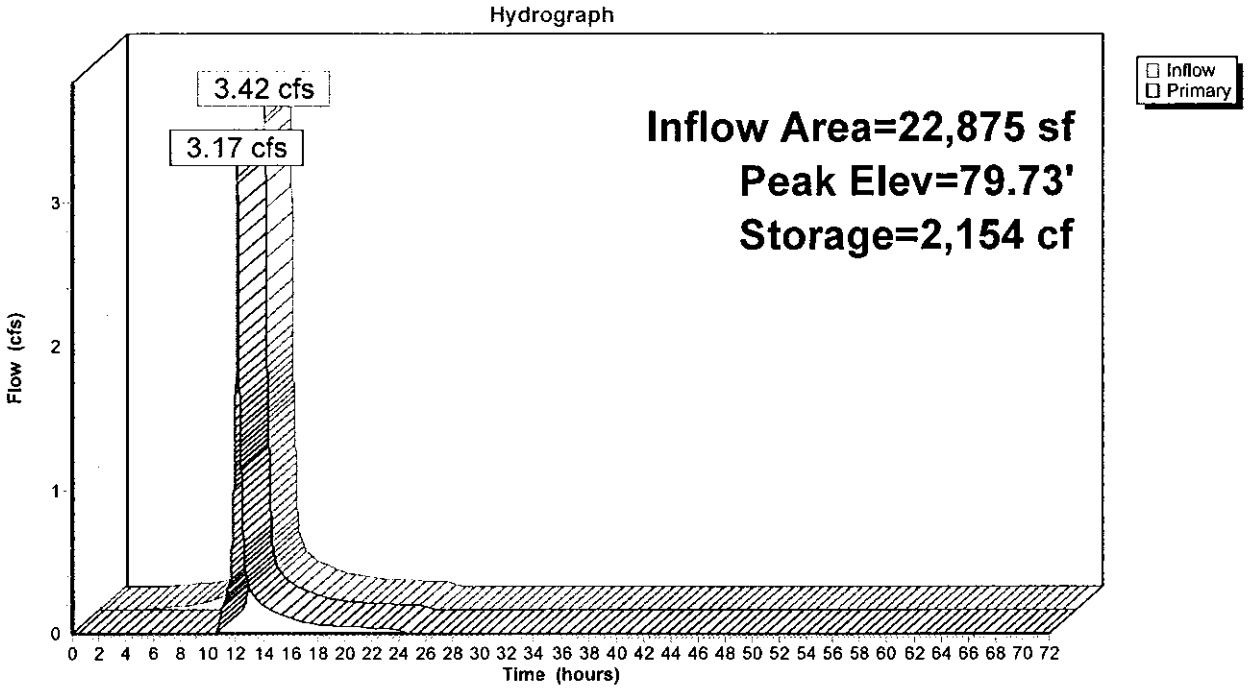
Volume	Invert	Avail.Storage	Storage Description
#1	78.00'	2,614 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
78.00	883	129.3	0	0	883
79.00	1,299	148.2	1,084	1,084	1,323
80.00	1,772	167.0	1,529	2,614	1,820

Device	Routing	Invert	Outlet Devices
#1	Primary	79.33'	**5.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=3.17 cfs @ 12.12 hrs HW=79.73' TW=78.67' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 3.17 cfs @ 1.59 fps)

Pond BR-3: Bioretention-3



Summary for Pond IB-1: Infiltration Basin-1

Inflow Area = 20,592 sf, 71.90% Impervious, Inflow Depth = 4.81" for 100 year event
Inflow = 2.63 cfs @ 12.09 hrs, Volume= 8,245 cf
Outflow = 0.51 cfs @ 12.53 hrs, Volume= 8,249 cf, Atten= 80%, Lag= 26.5 min
Discarded = 0.51 cfs @ 12.53 hrs, Volume= 8,249 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 81.08' @ 12.53 hrs Surf.Area= 2,682 sf Storage= 2,347 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 31.2 min (836.7 - 805.5)

Volume	Invert	Avail.Storage	Storage Description
#1	80.00'	6,411 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

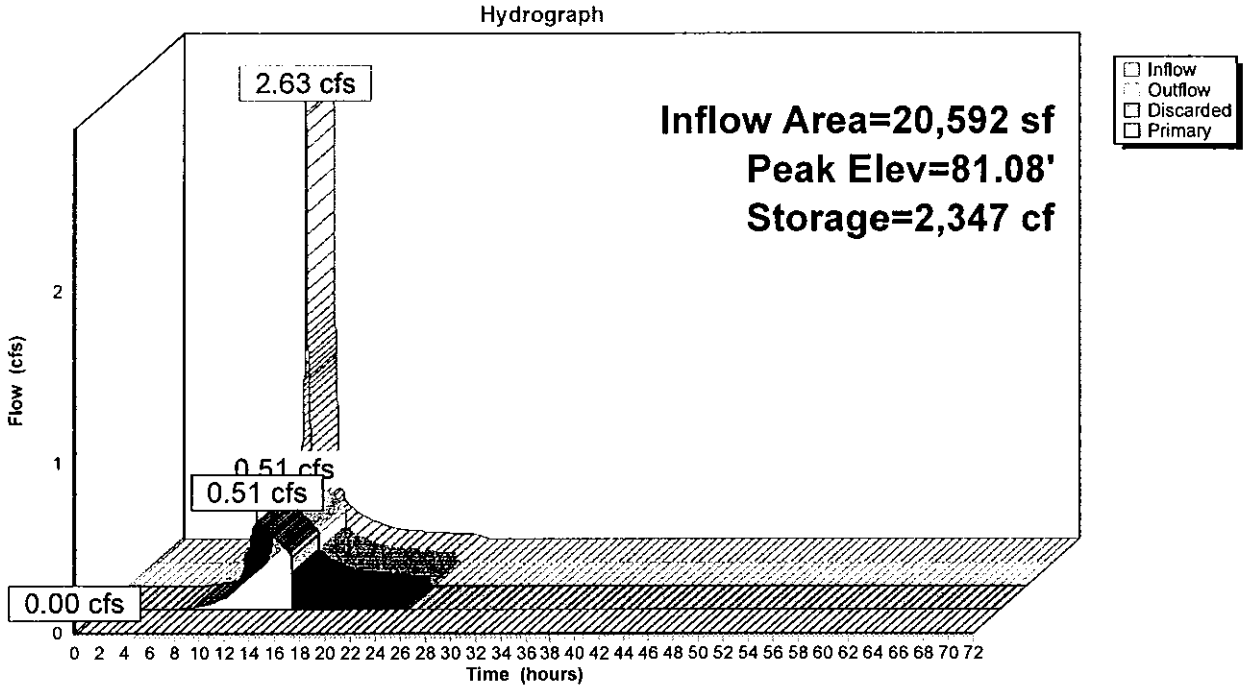
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
80.00	1,710	163.6	0	0	1,710
81.00	2,607	195.0	2,143	2,143	2,624
82.00	3,660	226.4	3,119	5,261	3,698
82.30	4,007	235.9	1,150	6,411	4,054

Device	Routing	Invert	Outlet Devices
#1	Primary	81.30'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	80.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.51 cfs @ 12.53 hrs HW=81.08' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.51 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=80.00' TW=0.00' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IB-1: Infiltration Basin-1



Summary for Pond IB-2: Infiltration Basin-2

Inflow Area = 55,413 sf, 63.56% Impervious, Inflow Depth = 3.82" for 100 year event
Inflow = 5.86 cfs @ 12.12 hrs, Volume= 17,618 cf
Outflow = 1.72 cfs @ 12.50 hrs, Volume= 17,619 cf, Atten= 71%, Lag= 22.9 min
Discarded = 0.83 cfs @ 12.50 hrs, Volume= 14,548 cf
Primary = 0.89 cfs @ 12.50 hrs, Volume= 3,071 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 79.28' @ 12.50 hrs Surf.Area= 4,330 sf Storage= 4,887 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 28.7 min (867.8 - 839.1)

Volume	Invert	Avail.Storage	Storage Description
#1	78.00'	8,209 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

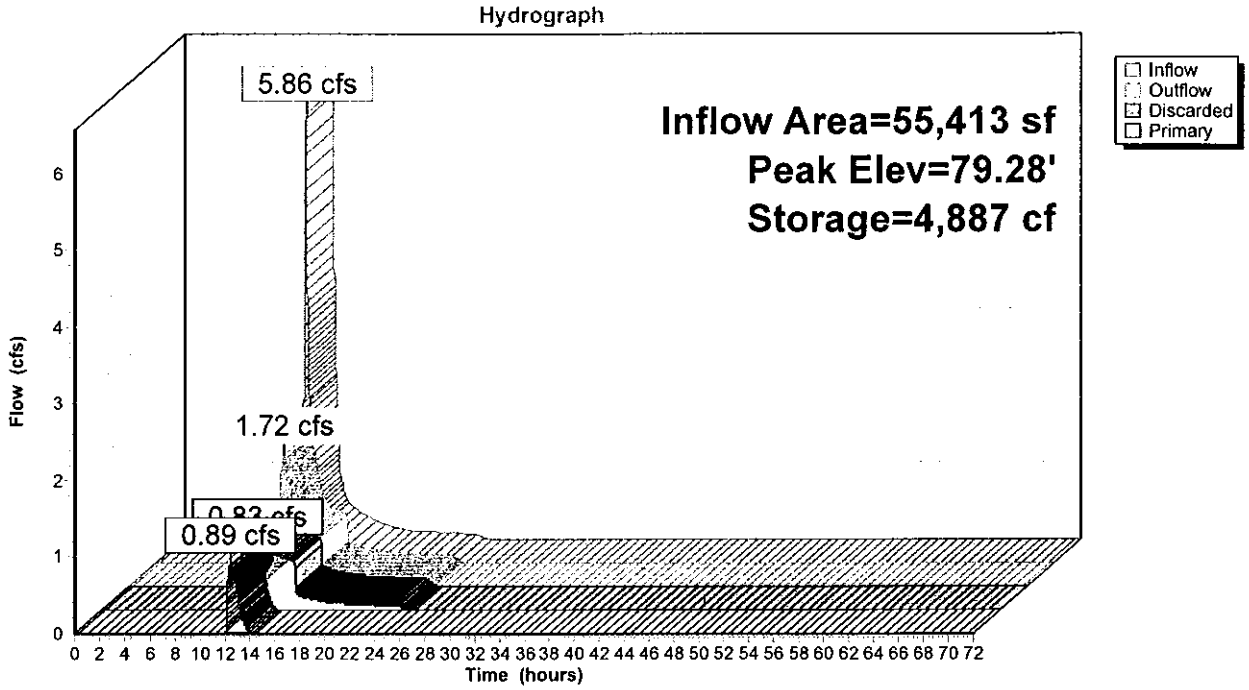
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
78.00	3,304	254.9	0	0	3,304
79.00	4,097	273.7	3,693	3,693	4,138
80.00	4,947	292.6	4,515	8,209	5,035

Device	Routing	Invert	Outlet Devices
#1	Primary	78.50'	**8.0" x 60.0' long Culvert** CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 78.00' S= 0.0083 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior
#2	Discarded	78.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.83 cfs @ 12.50 hrs HW=79.28' (Free Discharge)
↑—**2=Exfiltration** (Exfiltration Controls 0.83 cfs)

Primary OutFlow Max=0.89 cfs @ 12.50 hrs HW=79.28' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 0.89 cfs @ 2.55 fps)

Pond IB-2: Infiltration Basin-2

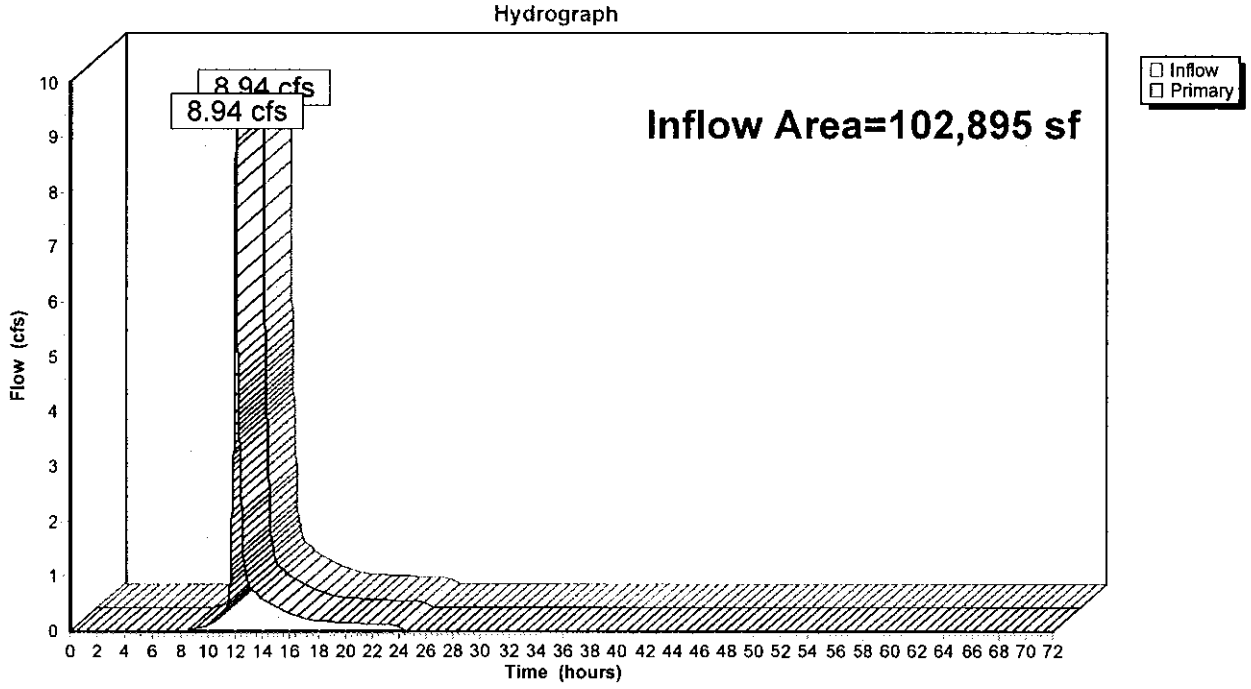


Summary for Link N: Total Runoff to North

Inflow Area = 102,895 sf, 61.20% Impervious, Inflow Depth = 3.14" for 100 year event
Inflow = 8.94 cfs @ 12.09 hrs, Volume= 26,912 cf
Primary = 8.94 cfs @ 12.09 hrs, Volume= 26,912 cf, Atten= 0%, Lag= 0.0 min

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

Link N: Total Runoff to North

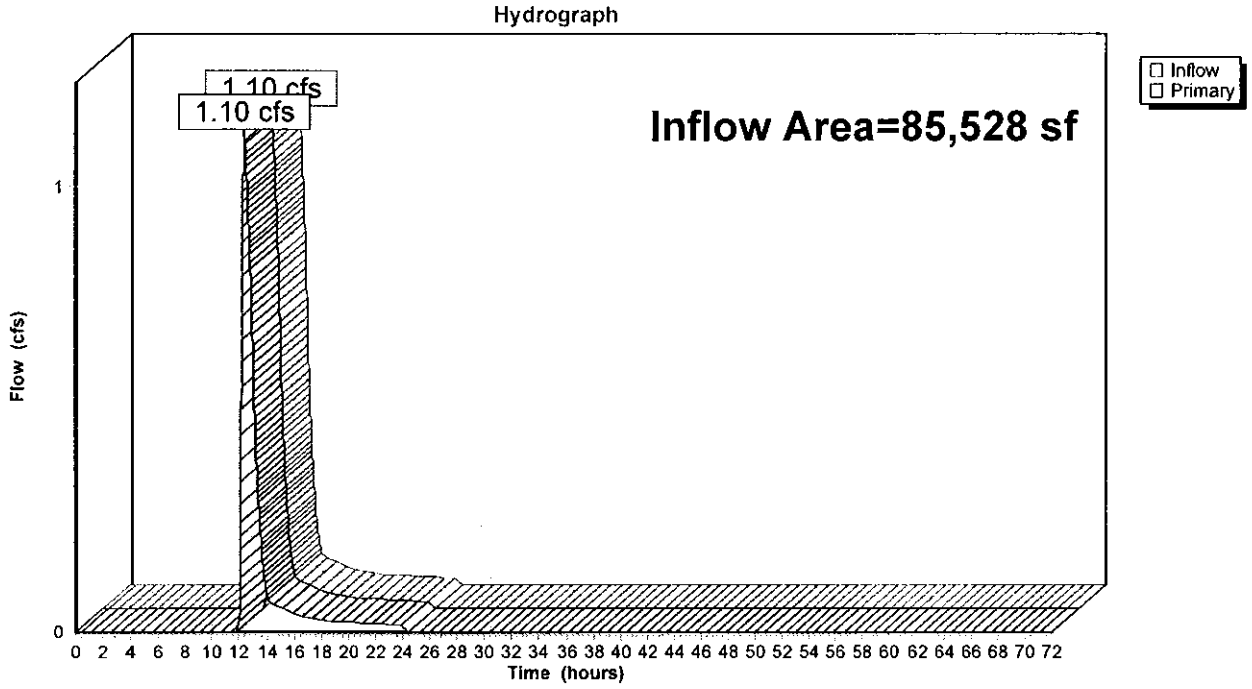


Summary for Link S: Total Runoff to South

Inflow Area = 85,528 sf, 41.59% Impervious, Inflow Depth = 0.70" for 100 year event
Inflow = 1.10 cfs @ 12.41 hrs, Volume= 5,019 cf
Primary = 1.10 cfs @ 12.41 hrs, Volume= 5,019 cf, Atten= 0%, Lag= 0.0 min

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

Link S: Total Runoff to South



RECHARGE CALCULATIONS (STANDARD #3)

STANDARD 3: RECHARGE CALCULATIONS

REQUIRED:

Recharge Volume Required ("A" Soils) = [Impervious Area x (Recharge Depth inches/12)]
= [94,702 sf x (0.60"/12)]
= 4,375 cf (Required Volume)

Recharge Volume Required ("B" Soils) = [Impervious Area x (Recharge Depth inches/12)]
= [0 sf x (0.35"/12)]
= 0 cf (Required Volume)

Recharge Volume Required ("C" Soils) = [Impervious Area x (Recharge Depth inches/12)]
= [40,013 sf x (0.25"/12)]
= 834 cf (Required Volume)

Recharge Volume Required ("D" Soils) = [Impervious Area x (Recharge Depth inches/12)]
= [0 sf x (0.10"/12)]
=0 cf (Required Volume)

Total Required Recharge Volume = 4,735 cf

CAPTURE AREA ADUSTMENT:

Total On-Site Impervious Area		= 2.17 acres
Total On-Site Impervious Area Directed to Infiltration BMP		= 1.06 acres
Adjustment Ratio	(2.17ac. / 01.06 ac.)	= 2.05
Adjusted Required Recharge Volume	(4,735 c.f. x 2.05)	= 9,707 cf
		= 0.223 acre-feet

SIMPLE DYNAMIC METHOD:

- Recharge is provided through exfiltration in Infiltration Basins
- 2.53" Rainfall event is required to produce the adjusted required recharge volume*
  *Storm start time of 11 hours and end time of 13 hours (see attached hydrograph)
- Required Recharge Volume, assuming 8.27 in/hr. exfiltration rate = 4,513 c.f.
  = 0.104 a.f.

PROVIDED:

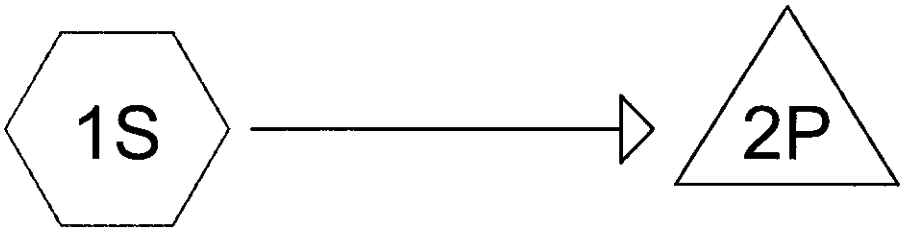
Infiltration Basin #1:

- Cumulative Volume below the lowest outlet (Elev.=81.30) = 2,969 c.f.

Infiltration Basin #2:

- Cumulative Volume below the lowest outlet (Elev.=78.50) = 1,748 c.f.

Total Recharge Volume Provided = 4,717c.f. (0.108 acre-feet)



Total on-site impervious

Infiltration Basin

Subcat Reach Pond Link

Drainage Diagram for RECHARGE
Prepared by Farland Corp.

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.174	98	Total Site Impervious (1S)
2.174		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Goup	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
2.174	Other	1S
2.174		**TOTAL AREA**

Time span=11.00-13.00 hrs, dt=0.01 hrs, 201 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Total on-site Runoff Area=94,702 sf 100.00% Impervious Runoff Depth>1.23"
Tc=6.0 min CN=98 Runoff=5.30 cfs 0.223 af

Pond 2P: Infiltration Basin Peak Elev=100.89' Storage=4,468 cf Inflow=5.30 cfs 0.223 af
Outflow=0.96 cfs 0.135 af

Total Runoff Area = 2.174 ac Runoff Volume = 0.223 af Average Runoff Depth = 1.23"
0.00% Pervious = 0.000 ac 100.00% Impervious = 2.174 ac

Summary for Subcatchment 1S: Total on-site impervious

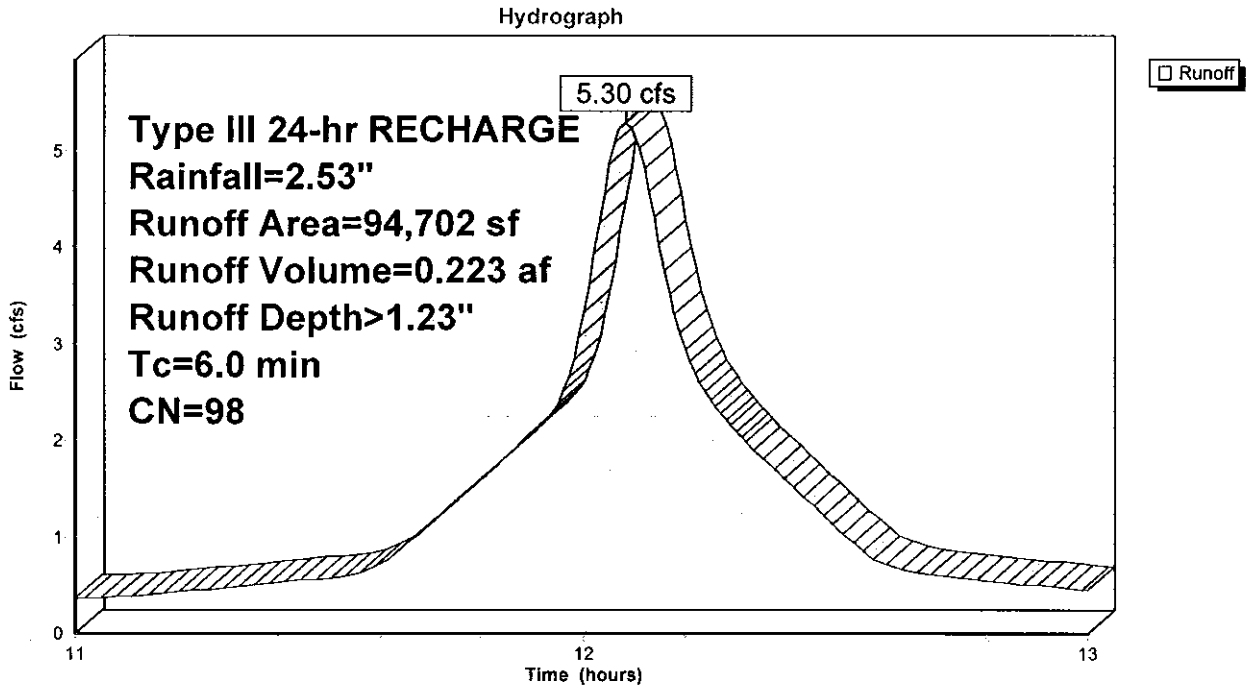
Runoff = 5.30 cfs @ 12.08 hrs, Volume= 0.223 af, Depth> 1.23"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 11.00-13.00 hrs, dt= 0.01 hrs
Type III 24-hr RECHARGE Rainfall=2.53"

	Area (sf)	CN	Description
*	94,702	98	Total Site Impervious
	94,702		Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TR-55 Minimum**

Subcatchment 1S: Total on-site impervious



Summary for Pond 2P: Infiltration Basin

Inflow Area = 2.174 ac,100.00% Impervious, Inflow Depth > 1.23" for RECHARGE event
Inflow = 5.30 cfs @ 12.08 hrs, Volume= 0.223 af
Outflow = 0.96 cfs @ 11.74 hrs, Volume= 0.135 af, Atten= 82%, Lag= 0.0 min
Discarded = 0.96 cfs @ 11.74 hrs, Volume= 0.135 af

Routing by Dyn-Stor-Ind method, Time Span= 11.00-13.00 hrs, dt= 0.01 hrs
Peak Elev= 100.89' @ 12.53 hrs Surf.Area= 5,014 sf Storage= 4,468 cf

Plug-Flow detention time= 17.0 min calculated for 0.135 af (61% of inflow)
Center-of-Mass det. time= 3.6 min (727.8 - 724.2)

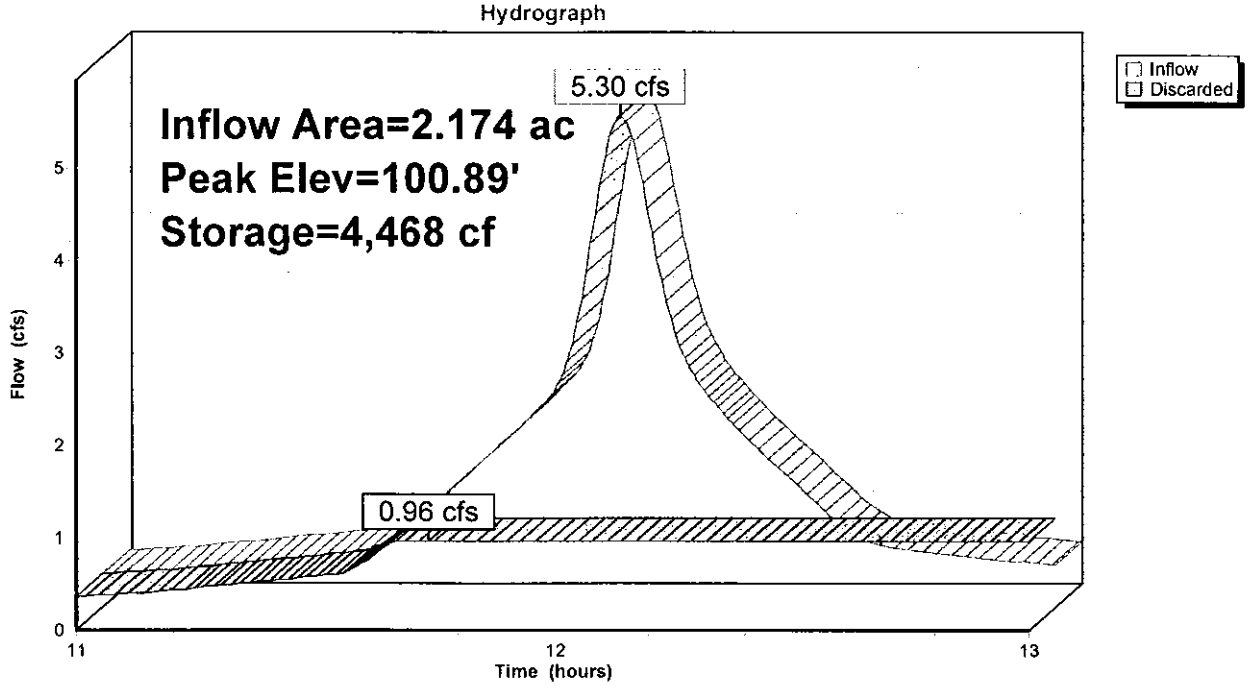
Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	4,513 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.00	5,014	0	0
100.90	5,014	4,513	4,513

Device	Routing	Invert	Outlet Devices
#1	Discarded	100.00'	**8.270 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.96 cfs @ 11.74 hrs HW=100.01' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.96 cfs)

Pond 2P: Infiltration Basin



DRAWDOWN CALCULATIONS (STANDARD #3)

STANDARD 3: DRAWDOWN CALCULATIONS

$$Time_{drawdown} = \frac{Rv}{(K)(Bottom\ Area)}$$

Where:

Rv = Required Storage Volume = (F)(impervious area)

K = Saturated Hydraulic Conductivity

For "Static" and "Simple Dynamic" Methods, use Rawls Rate (see Table 2.3.3).

For "Dynamic Field" Method, use 50% of the in-situ saturated hydraulic conductivity.

INFILTRATION BASIN #1

$$Time_{drawdown} = \frac{Rv}{(K)(Bottom\ Area)} = 2.52 \text{ hours}$$

Rv = 2,969 C.F. (Recharge Volume Provided)

K = 8.27 inch/hr.

BA = 1,710 S.F.

INFILTRATION BASIN #2

$$Time_{drawdown} = \frac{Rv}{(K)(Bottom\ Area)} = 0.77 \text{ hours}$$

Rv = 1,748 C.F. (Recharge Volume Provided)

K = 8.27 inch/hr.

BA = 3,304 S.F.

TABLE 2.3.3

Texture Class	NRCS Hydrologic Soil Group (HSG)	Infiltration Rate Inches/Hour
Sand	A	8.27
Loamy Sand	A	2.41
Sandy Loam	B	1.02
Loam	B	0.52
Silt Loam	C	0.27
Sandy Clay	C	0.17
Clay Loam	D	0.09
Silty Clay Loam	D	0.06
Sandy Clay	D	0.05
Silty Clay	D	0.04
Clay	D	0.02

WATER QUALITY VOLUME CALCULATIONS (STANDARD #4)

(MAIN OFFICE) 401 COUNTY STREET, NEW BEDFORD, MA 02740 P 508.717.3479 F 508.717.3481 WWW.FARLANDCORP.COM
ADDITIONAL OFFICES IN: TAUNTON • MARLBOROUGH • WARWICK, RI

FARLAND CORP.

ENGINEERING A BETTER TOMORROW

ENGINEERING | SITE WORK | LAND SURVEYING

LOCATION: 127 Duchaine Boulevard - New Bedford PROJECT #: 15-1077 DATE: 12/15/17 REV:

STANDARD 4: WATER QUALITY VOLUME:

Water Quality Treament Volume Formula:

$V_{WQ} = D_{WQ} X (1 ft. / 12 in.) X A_{IMP}$

Where,

V_{WQ} = *Required Water Quality Volume* (in cubic feet)

D_{WQ} = Water Quality Depth: one-inch for discharges within a Zone II or IWPA, to or near another critical area, runoff from a LUHPPL, or exfiltration to soils with infiltration rate greater than 2.4 inches/hour; 1/2 -inch for discharges near or to other areas

A_{IMP} = Impervious Area (in cubic feet)

STORM WATER OUTFALL: OUTLET FROM INFILTRATION BASIN #1

CONTRIBUTING IMPERVIOUS AREA (A_{IMP}) = 14,805 S.F.

V_{WQ}	=	1.0	inch	X	1 ft/ 12 in.	X	14,805	s.f.	=	1,234 c.f.

STRUCTURAL BMP TREATMENT TRAIN:

Infiltration Basin #1 (Below lowest outlet invert)

*Refer to Groundwater Recharge Calculations = 2,969 c.f.

TOTAL WATER QUALITY VOLUME PROVIDED IN BMP TREATMENT TRAIN = 2,969 c.f.

STORM WATER OUTFALL: OUTLET FROM BIO-RETENTION AREA #1

CONTRIBUTING IMPERVIOUS AREA (A_{IMP}) = 12,642 S.F.

V_{WQ}	=	1.0	inch	X	1 ft/ 12 in.	X	12,642	s.f.	=	1,054 c.f.

STRUCTURAL BMP TREATMENT TRAIN:

Bio-Retention Area #1 (Below lowest outlet invert)

*Refer to Post-Development Hydrologic Calculations = 1,440 c.f.

TOTAL WATER QUALITY VOLUME PROVIDED IN BMP TREATMENT TRAIN = 1,440 c.f.

STORM WATER OUTFALL: OUTLET FROM BIO-RETENTION AREA #2

CONTRIBUTING IMPERVIOUS AREA (A_{IMP}) = 14,191 S.F.

V_{WQ}	=	1.0	inch	X	1 ft/ 12 in.	X	14,191	s.f.	=	1,183 c.f.

STRUCTURAL BMP TREATMENT TRAIN:

Bio-Retention Area #1 (Below lowest outlet invert)

*Refer to Post-Development Hydrologic Calculations = 1,211 c.f.

TOTAL WATER QUALITY VOLUME PROVIDED IN BMP TREATMENT TRAIN = 1,211 c.f.

STORM WATER OUTFALL: OUTLET FROM BIO-RETENTION AREA #3

CONTRIBUTING IMPERVIOUS AREA (A_{IMP}) = 17,189 S.F.

V_{WQ}	=	1.0	inch	X	1 ft/ 12 in.	X	17,189	s.f.	=	1,432 c.f.

STRUCTURAL BMP TREATMENT TRAIN:

Bio-Retention Area #1 (Below lowest outlet invert)

*Refer to Post-Development Hydrologic Calculations = 1,537 c.f.

TOTAL WATER QUALITY VOLUME PROVIDED IN BMP TREATMENT TRAIN = 1,537 c.f.

STORM WATER OUTFALL: INFILTRATION BASIN #2

CONTRIBUTING IMPERVIOUS AREA (A_{IMP}) = 31,380 S.F.

V_{WQ}	=	1.0	inch	X	1 ft/ 12 in.	X	31,380	s.f.	=	2,615 c.f.

STRUCTURAL BMP TREATMENT TRAIN:

Infiltration Basin #2 (Below lowest outlet invert)

*Refer to Groundwater Recharge Calculations = 1,748 c.f.

TOTAL WATER QUALITY VOLUME PROVIDED IN BMP TREATMENT TRAIN = 1,748 c.f.

* NOTE: Water Quality Volume provided in Infiltration Basin #2 is less than required, therefore, no TSS removal credit is sought from it.

TSS REMOVAL CALCULATIONS (STANDARD #4)

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LOCATION: 127 Duchaine Boulevard - New Bedford PROJECT #: 15-1077 DATE: 12/15/17 REV:

STANDARD 4: TSS REMOVAL CALCULATIONS:

STORM WATER OUTFALL: OUTLET FROM INFILTRATION BASIN #1

Runoff to Infiltration Basin #1 is from Roof Area only. No Pre-treatment is provided

TREATMENT

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (BXC)	E Remaining Load (C-D)
Infiltration Basin (with adequate pre-treatment)	80%	1.00	0.80	0.20
		Total TSS Removal=	0.80	

STORM WATER OUTFALL: OUTLET FROM BIO-RETENTION AREA #1

PRETREATMENT

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (BXC)	E Remaining Load (C-D)
Pea-diaphram / Vegetated Filter Strip	25%	1.00	0.25	0.75
		Total TSS Removal=	0.25	

TREATMENT

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (BXC)	E Remaining Load (C-D)
Bio-Retention Area (with adequate pre-treatment)	90%	1.00	0.90	0.10
		Total TSS Removal=	0.90	

STORM WATER OUTFALL: OUTLET FROM BIO-RETENTION AREA #2

PRETREATMENT

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (BXC)	E Remaining Load (C-D)
Sediment Forebay	25%	1.00	0.25	0.75
		Total TSS Removal=	0.25	

TREATMENT

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (BXC)	E Remaining Load (C-D)
Bio-Retention Area (with adequate pre-treatment)	90%	1.00	0.90	0.10
		Total TSS Removal=	0.90	

FARLAND CORP.

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LOCATION: 127 Duchaine Boulevard - New Bedford

PROJECT #: 15-1077

DATE: 12/15/17

REV:

STORM WATER OUTFALL: OUTLET FROM BIO-RETENTION AREA #3

PRETREATMENT

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (BXC)	E Remaining Load (C-D)
Sediment Forebay	25%	1.00	0.25	0.75
		Total TSS Removal=	0.25	

TREATMENT

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (BXC)	E Remaining Load (C-D)
Bio-Retention Area (with adequate pre-treatment)	90%	1.00	0.90	0.10
		Total TSS Removal=	0.90	

LONG TERM POLLUTION PREVENTION PLAN (STANDARD #4)

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ENGINEERING | SITE WORK | LAND SURVEYING

Long Term Pollution Prevention Plan

Site Plan
127 Duchaine Boulevard
New Bedford, MA 02745

December 15, 2017

Record Owner(s):

Assessor's Map 133 Lot 21:
Arthur L. Milhench, Trustee
127 Duchaine Boulevard
New Bedford, MA 02745

Prepared For:

Heike Milhench
Milhench Supply Co.
121 Duchaine Boulevard
New Bedford, MA 02745

Prepared By:

Farland Corp.
Project No. 15-1077

Long Term Pollution Prevention Plan

This Long Term Pollution Prevention Plan serves to outline good housekeeping practices in order to prevent pollution of the wetland resource areas and surrounding environment. The Long Term Operation & Maintenance Plan shall be taken as part of this document as it is a critical part of this plan and shall be adhered to. Proper operation and maintenance records shall be kept on file at all times.

Snow disposal shall be carried out by the owner. The owner should follow DEP guideline #BWR G2015-01 for all snow removal requirements. For this site, it is anticipated that snow will be plowed from the impervious parking and driveway areas and piled along the shoulders of the driveway areas. Snow along the building is anticipated to be removed by shovel or snow blower.

Snow disposal in the following areas are prohibited:

- Dumping snow in the bordering vegetated wetlands is prohibited.
- Dumping of snow stormwater drainage basins and bio-retention areas is prohibited. Snow combined with sand and debris may block a storm 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.

Illicit discharges to the stormwater management system are prohibited. Illicit discharges are those that are not entirely comprised of stormwater. Notwithstanding the foregoing, an illicit discharge does not include discharges from the following activities or facilities; firefighting, water line flushing, landscape irrigation, uncontaminated groundwater, potable water sources, foundation drains, air conditioning condensation, footing drains, individual residence car washing, flows from riparian habitats and wetlands, de-chlorinated water from swimming pools, water used for street washing, and water used to clean residential buildings without detergents. Measures are provided below to prevent illicit discharges to the stormwater management system.

In order to prevent or minimize the potential for a spill of hazardous substances or oils to contaminate stormwater, a spill control and containment kit, including spill berm, absorbent materials, rags, gloves, and trash containers, shall be readily available. All product manufacturers recommended spill cleanup methods shall be known by maintenance personnel, who shall be trained regarding these procedures and the location of the cleanup procedure information and supplies. In the event of oil, gasoline or other hazardous waste spill on-site, the New Bedford Fire Department, DEP and the Conservation Agent shall be notified immediately. For spills of less than ¼ gallon, clean-up with absorbent materials or other appropriate means, unless circumstances dictate that the spill should be treated by a professional emergency response contractor. Spills which exceed the reportable quantities of substances mentioned in 40 CFR 110, 40 CFR 117, or 40 CFG 302 must be immediately reported to the EPA National Response Center (800) 242-8802. Any drainage inlet that may be affected by the spill shall be

covered immediately with a spill protector drain cover or similar product, or a spill berm placed around the perimeter of the opening to prevent any contamination into the drainage system. Proper cleanup and disposal of hazardous wastes must follow all applicable local and state regulations and must be carried out by a qualified contractor.

The maintenance of all lawns, gardens and landscaped areas shall be performed by the owner. Good housekeeping practices should include proper storage and minimal use of cleaning products and fertilizers. Facility owner should consult with a professional landscaper for proper maintenance of lawns and landscaped areas.

OPERATION & MAINTENANCE PLAN & LOGS (STANDARD #9)

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Long Term Operation and Maintenance Plan

Site Plan
127 Duchaine Boulevard
New Bedford, MA 02745

December 15, 2017

Record Owner(s):

Assessor's Map 133 Lot 21:
Arthur L. Milhench, Trustee
127 Duchaine Boulevard
New Bedford, MA 02745

Prepared For:

Heike Milhench
Milhench Supply Co.
121 Duchaine Boulevard
New Bedford, MA 02745

Prepared By:

Farland Corp.
Project No. 15-1077

The Operator, Owner, and Party Responsible for Operation and Maintenance of the Stormwater BMP's will be the landowner of the property on which the BMP is located. The responsible party shall:

a) Maintain an operation and maintenance log for at least three years, including inspections, repairs, replacement and disposal (for disposal, the log shall indicate the type of material and disposal location);
b) Make this log available to MassDEP and the Conservation Commission upon request during normal business hours; and
c) Allow members and agents of the MassDEP and the Conservation Commission to enter and inspect the premises to evaluate and ensure that the responsible party complies with the Operation and Maintenance Plan requirements for each BMP.

Street Sweeping

It shall be the responsibility of the owner to:

Inspections:

Inspect sediment deposit accumulations on the parking lots quarterly.

Maintenance:

Sweep parking lots at least twice annually, during March or April before spring rains wash residual sand from winter applications into stormwater systems, and in the fall after leaf drop.

Dispose of the accumulated sediment and hydrocarbons in accordance with local, state, and federal guidelines and regulations.

Stone/ Rip Rap Areas

The rip rap areas are to be inspected and maintained by the owner.

It shall be the responsibility of the owner to:

Inspections:

Inspect the rip rapped areas quarterly.

Maintenance:

Remove accumulated sediment, trash, leaves and debris at least annually. Check for signs of erosion and repair as need. Replace any damaged areas with new rip rap of the same size.

Dispose of the accumulated sediment and hydrocarbons in accordance with local, state, and federal guidelines and regulations.

Bio-retention Areas

The bio-retention areas are to be inspected and maintained by the property owner.

It shall be the responsibility of the owner to:

Inspections:

Inspect the areas monthly.

Inspect pretreatment devices and bio-retention areas regularly for sediment build-up, structural damage, and standing water.

Inspect soil and repair eroded areas monthly

Maintenance:

Re-mulch void areas as needed

Remove litter and debris monthly

Treat diseased vegetation as needed

Remove and replace dead vegetation twice per year (spring and fall)

Prune once per year.

Do not snow store in basin area.

Check for signs of erosion and repair as need. After removing sediment, replace any vegetation damaged during clean-out by either reseeding or re-sodding.

Infiltration Basin

The basin is to be inspected and maintained by the owner.

It shall be the responsibility of the owner to:

Inspections:

Inspect to basins quarterly and after major storms (>3.2" of rain in 24 hours)

Inspect forebay quarterly.

Inspect basins for settlement, subsidence, erosion, cracking or tree growth on the embankment, condition of stone; sediment accumulation around the outlet or within the basin; and erosion within the basin and banks.

Inspect outlet for evidence of clogging, sediment deposits or signs of erosion around the structure.

Ensure that the basins are operating as designed. If inspection shows that a basin fails to fully drain within 72 hours following a storm event, then the responsible party shall retain a Registered Professional Civil Engineer licensed in the state of Massachusetts to assess the reason for infiltration/ detention failure and recommend corrective action for restoring the intended functions. For an infiltration basin, fully drained means that there is no ponding occurring in the infiltration basin.

Maintenance:

When mowing the basin and forebay, mow the buffer area, side slopes, and basin bottom. Remove grass clippings and accumulated debris. Mow three times per year in May, July and September.

Remove accumulated trash, leaves, debris in basin and forebay every month between April and November of each year. Inspect areas in February of each year, if possible, to determine whether the aforementioned services are required.

If the infiltration basin is ponding in areas or not infiltrating as designed, use deep tilling to break up clogged surfaces, and re-vegetate immediately.

Replace stone in forebay and at all pipe ends once every five (5) years or when sediment depth is excessive.

Do not store snow in basin area.

Remove sediment from the basin and forebay as necessary and at least once every 5 years but wait until the floor of the basin is thoroughly dry. After removing sediment, replace any vegetation damaged during clean-out by either re-seeding or re-sodding.

Dispose of the accumulated sediment and hydrocarbons in accordance with local, state, and federal guidelines and regulations.

Drain Lines

After construction, the drain lines shall be inspected after every major storm for the first few months to ensure proper functions. Presence of accumulated sand and silt would indicate more frequent maintenance of the pre-treatment devices is required.

Thereafter, the drain lines shall be inspected at least once per year. Accumulated silt shall be removed by a vactor truck or other method preferred.

Access Ways & Parking Areas

Inspections:

- Inspect Daily
- Clear any debris daily
- Sweep bi-annually
- Repair cracks and potholes as needed
- Maintain painted lines as necessary for visibility

Fences/Walls

Inspections:

- Inspect Monthly
- Remove debris and litter daily
- Repair as necessary

Landscaping

Inspections:

- Inspect weekly
- Remove debris and litter as necessary
- Prune and fertilize bi-annually
- Mow lawn as necessary
- Fertilize quarterly

"127 Duchaine Boulevard"
Operation & Maintenance Log Form

STRUCTURAL SEDIMENT CONTROL BMPS

BMP	DATE INSPECTED	SEDIMENT BUILDUP (YES/NO)	IF SEDIMENT BUILDUP, DATE CLEANED
Bio-Retention Area #1			
Bio-Retention Area #2			
Bio-Retention Area #3			
Infiltration Basin #1			
Infiltration Basin #2			
OTHER:			

Maintenance Notes:

_____

_____

_____

TO BE PERFORMED BY:_____ON OR BEFORE:_____

ILLICIT DISCHARGE STATEMENT (STANDARD #10)

Illicit Discharge Compliance Statement (IDCS)

This Illicit Discharge Compliance Statement is intended to verify that no illicit discharges exist on the site or are proposed. We have included, in the pollution prevention plan, measures to prevent illicit discharges to the stormwater management system, including wastewater discharges and discharges of stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, hazardous substances, oil, or grease.

The site plan identifies the location of any systems for conveying wastewater and/or groundwater on the site and show that there are no connections between the stormwater and wastewater management systems and the location of any measures taken to prevent the entry of illicit discharges into the stormwater management system.

Farland Corp.

Christian A. Farland, P.E., LEED AP
Principal Engineer and President

SEDIMENT FOREBAY SIZING CALCULATIONS

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SEDIMENT FOREBAY SIZING CALCULATIONS

CONTRIBUTING AREA TO FOREBAY #1 AT BIO-RETENTION AREA #2

Impervious Area = 14,191 s.f.

REQUIRED VOLUME OF SEDIMENT FOREBAY = VOLUME PRODUCED BY 0.25" RUNOFF/IMPERVIOUS ACRE

= 0.25 "/ACRE x 1 ACRE / 43,560 S.F. X 14,191 S.F.

= 0.081 INCHES OF RUNOFF

TOTAL VOLUME PRODUCED = 0.081 INCHES X 1 FT / 12 IN X 14,191 S.F.

= 96 C.F.

PROVIDED VOLUME OF SEDIMENT FOREBAY

BOTTOM FOREBAY EL. = 78.00 AREA = 178 S.F.
FOREBAY BERM EL. = 79.00 AREA = 426 S.F.

VOLUME PROVIDED = 302 C.F.

CONTRIBUTING AREA TO FOREBAY #1 AT BIO-RETENTION AREA #3

Impervious Area = 17,189 s.f.

REQUIRED VOLUME OF SEDIMENT FOREBAY = VOLUME PRODUCED BY 0.25" RUNOFF/IMPERVIOUS ACRE

= 0.25 "/ACRE x 1 ACRE / 43,560 S.F. X 17,189 S.F.

= 0.099 INCHES OF RUNOFF

TOTAL VOLUME PRODUCED = 0.099 INCHES X 1 FT / 12 IN X 17,189 S.F.

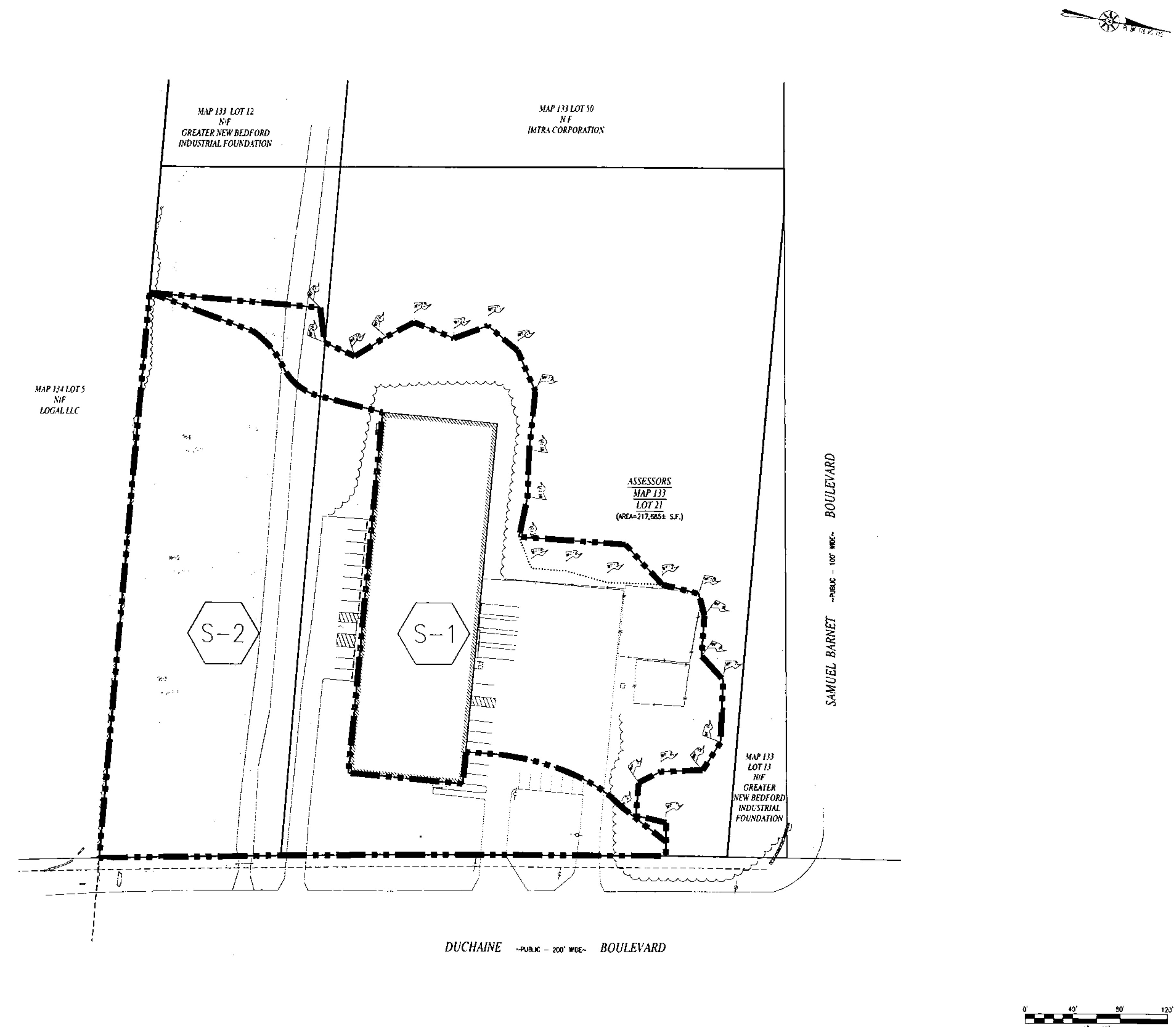
= 141 C.F.

PROVIDED VOLUME OF SEDIMENT FOREBAY

BOTTOM FOREBAY EL. = 78.00 AREA = 1,158 S.F.
FOREBAY BERM EL. = 79.00 AREA = 1,795 S.F.

VOLUME PROVIDED = 1,477 C.F.

WATERSHED PLANS



REVISIONS

www.FarlandCorp.com

401 COUNTY STREET
NEW BEDFORD, MA 02740
P.508.717.3479
OFFICES IN:
• TAUNTON
• MARLBOROUGH
• WARWICK, RI

DRAWN BY: SC
DESIGNED BY: SC
CHECKED BY: CAF

SITE PLAN

— 127 DUCHAINE BOULEVARD —
ASSESSORS MAP 133 LOT 21 & PORTION OF LOT 12
NEW BEDFORD, MASSACHUSETTS

PREPARED FOR: MILHENCH SUPPLY COMPANY
121 DUCHAINE BOULEVARD
NEW BEDFORD, MA 02745

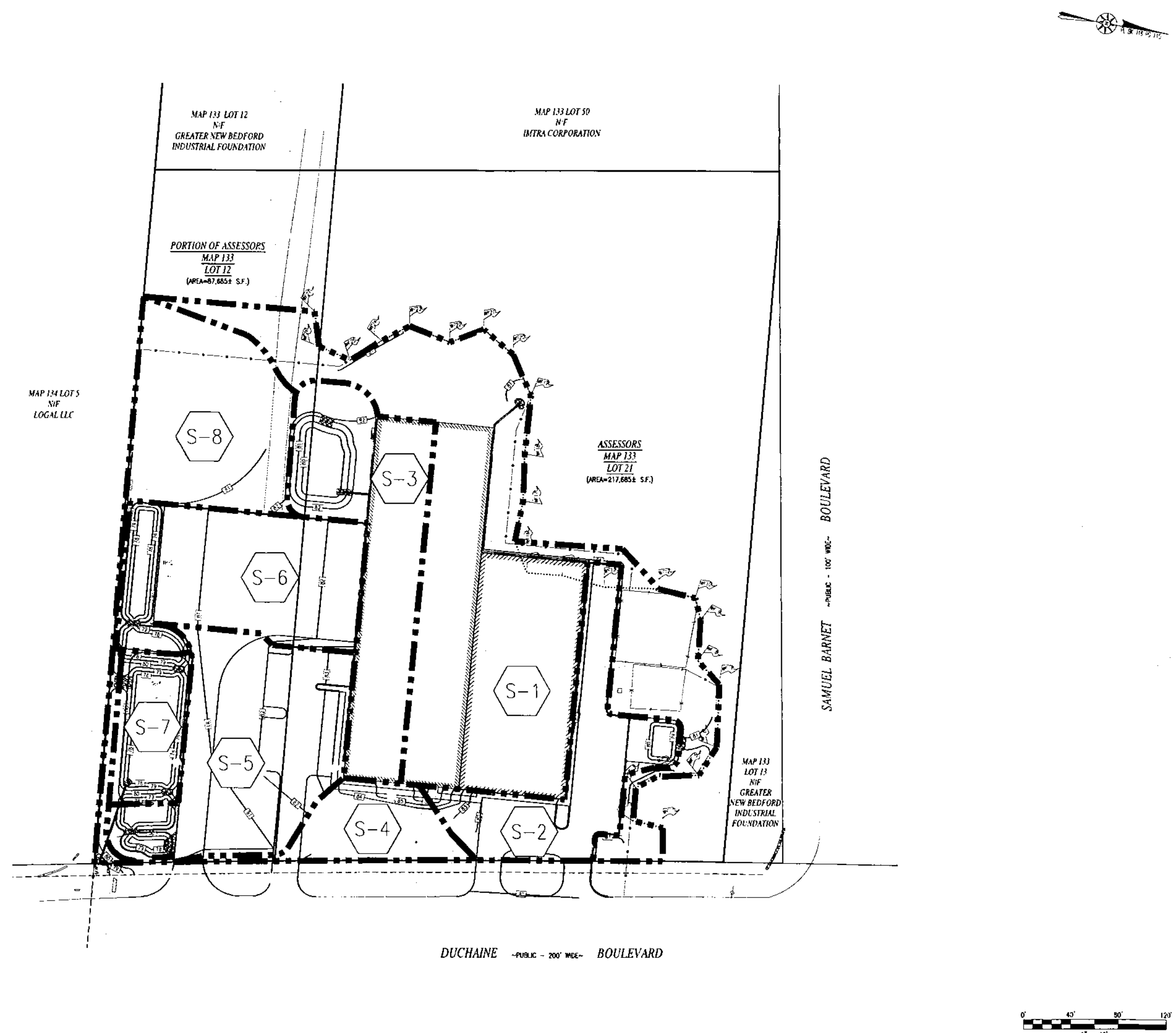
DECEMBER 15, 2017

SCALE: 1"=40'

JOB NO. 15-1077

LATEST REVISION:

PRE-DEVELOPMENT WATERSHED PLAN



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SITE PLAN

— 127 DUCHAINE BOULEVARD —
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LATEST REVISION:

POST-DEVELOPMENT WATERSHED PLAN