



ENGINEERING A BETTER TOMORROW  
ENGINEERING | SITE WORK | LAND SURVEYING

# STORMWATER REPORT

## SITE PLAN

ASSESSORS MAP 129 – LOTS 41  
781 CHURCH STREET  
NEW BEDFORD, MASSACHUSETTS



PREPARED FOR:

Tim Cusson  
Parallel Products Solar Energy  
401 Industry Road  
Louisville, KY 40208

# TABLE OF CONTENTS

## SECTIONS:

1. PROJECT SUMMARY
2. METHODOLOGY
3. EXISTING CONDITIONS
4. STORMWATER MANAGEMENT OVERVIEW
5. STORMWATER MANAGEMENT STANDARDS

## EXHIBITS:

NRCS SOIL MAP  
HYDROLOGIC CALCULATIONS  
ILLICIT DISCHARGE STATEMENT  
WATERSHED PLANS



# STORMWATER MANAGEMENT REPORT AND HYDROLOGIC ANALYSIS

## SECTION 1: Project Summary

The project area associated with the proposed solar canopy is located at 781 Church Street. The site is identified as Assessors Map 129 Lot 41 and is located between Church Street and Route 140. The total area of the proposed site is approximately 943,993 square feet (21.6 acres). The site is located entirely within the Industrial C (IC) zoning district.

The site is currently used by Frades Disposal waste management operations and roll off dumpsters. Bordering Vegetated Wetlands encompass the property on all sides. To the north and south there is vacant wooded land. Route 140 borders on the west and commercial properties along Church Street border to the east. 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 site is not located within a mapped FEMA Special Flood Hazard Area Zone.

The applicant is seeking permission to construct two large solar canopies above the existing developed areas of the site as shown on Definitive Site Plans dated June 20, 2022. The roof of the proposed canopies are designed with spaces between the panels allowing stormwater to pass through freely. Therefore no stormwater improvements are proposed and no impacts to the existing hydrology occur.

## 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, therefore, 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 site are identified in the Natural Resources Conservation Service (NRCS) Soil Survey of Bristol County (*see Exhibit D*). The site soils are classified as Hydrologic Soils Group "D".



**SECTION 4: Stormwater Management Overview**

Existing Conditions:

Two design points have been analyzed for this project: (1) the limit of the bordering vegetated wetlands in the northwest portion of the site. The design point receives runoff from subcatchment area (S-1). (2) the southwest portion of the site at the limit of bordering vegetated wetlands. The design point receives runoff from subcatchment area (S-2). There are no existing stormwater attenuation structures on-site designed to capture and detain on-site runoff. Stormwater runoff from the site flows either overland northwesterly toward the wetlands.

Proposed Conditions:

Under proposed conditions, the same design points have been analyzed. The same 2 subcatchment areas contribute runoff to the design points in proposed conditions as existing conditions.

The development has no impacts to the hydrology, therefore no stormwater improvements are proposed. The stormwater flows through the solar canopies therefore the proposed and existing conditions will be equal.

**SECTION 5: Stormwater Management Standards**

**Standard 1:**

- Under proposed conditions, there will be no new untreated discharges or erosion in wetland areas. Stormwater discharges have been held below erodible velocities. This standard has been met.

**Standard 2:**

- 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.

<b>Table 1 - Comparison of Pre- versus Post-Development Offsite Runoff</b>				
<b>Storm Frequency</b>	<b>Pre-Development</b>		<b>Post-Development</b>	
	<b>Rate (cfs)</b>	<b>Volume (af)</b>	<b>Rate (cfs)</b>	<b>Volume (af)</b>
<b>2-Year Storm</b>				
To NW Wetlands	15.37	1.054	15.37	1.054
To SW Wetlands	24.75	1.727	24.75	1.727
<b>10-Year Storm</b>				
To NW Wetlands	25.87	1.817	25.87	1.817
To SW Wetlands	40.01	2.873	40.01	2.873

<b>100-Year Storm</b>				
To NW Wetlands	50.22	3.681	50.22	3.681
To SW Wetlands	75.01	5.621	75.01	5.621

**Standard 3:**

- The site is comprised entirely of soils belonging to Hydrologic Soils Groups "D" per on site soil testing and is therefore eliminating the need for recharge. No new impervious areas are proposed. This standard has been met.

**Standard 4:**

- The development has no impacts to the hydrology; therefore no stormwater improvements are proposed. The stormwater flows through the solar canopies therefore existing and proposed conditions will be equal.

**Standard 5:**

- The use associated with this project is not classified as a Land Use with Higher Potential Pollutant Load (LUHPPL); therefore, this standard does not apply.

**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:**

- The project is a redevelopment project with no increase in impervious area. The applicant should only meet the Standards to the maximum extent practicable.

**Standard 8:**

- There will be less than 1 acre of disturbance.

**Standard 9:**

- A long-term operation and maintenance plan will be prepared prior to start of construction.

**Standard 10:**

- We are not proposing any illicit discharges as defined in the Stormwater Management Regulations.





# 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.<sup>1</sup> 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<sup>2</sup>
- 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.

<sup>1</sup> 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.

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





# Checklist for Stormwater Report

## B. Stormwater Checklist and Certification

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

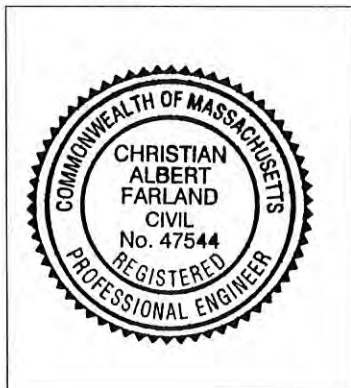
*Note:* Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that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

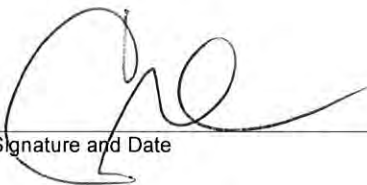
A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

### Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



 6/20/22  
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<sup>1</sup>
- 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.

<sup>1</sup> 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 proprietary 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.



*ENGINEERING A BETTER TOMORROW*  
*ENGINEERING | SITE WORK | LAND SURVEYING*

# NRCS SOIL MAP




































Hydrologic Soil Group—Bristol County, Massachusetts, Southern Part  
(718 Church St)





## MAP LEGEND

 Area of Interest (AOI)	 C
 Area of Interest (AOI)	 C/D
<b>Soils</b>	 D
<b>Soil Rating Polygons</b>	 Not rated or not available
 A	<b>Water Features</b>
 A/D	 Streams and Canals
 B	<b>Transportation</b>
 B/D	 Rails
 C	 Interstate Highways
 C/D	 US Routes
 D	 Major Roads
 Not rated or not available	 Local Roads
<b>Soil Rating Lines</b>	<b>Background</b>
 A	 Aerial Photography
 A/D	
 B	
 B/D	
 C	
 C/D	
 D	
 Not rated or not available	
<b>Soil Rating Points</b>	
 A	
 A/D	
 B	
 B/D	

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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

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

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

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

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

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

Soil Survey Area: Bristol County, Massachusetts, Southern Part  
Survey Area Data: Version 15, Sep 2, 2021

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

Date(s) aerial images were photographed: Sep 26, 2020—Oct 15, 2020

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



## Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
73A	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	D	47.9	54.3%
307B	Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony	C	32.1	36.4%
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	C/D	4.1	4.7%
602	Urban land		3.9	4.4%
706C	Charlton-Rock outcrop-Paxton complex, 3 to 15 percent slopes	B	0.1	0.2%
<b>Totals for Area of Interest</b>			<b>88.2</b>	<b>100.0%</b>

## Description

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

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

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

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

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

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

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

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Higher



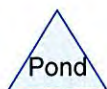
# HYDROLOGIC CALCULATIONS



Tributary to NW  
Wetlands



Tributary to SW  
Wetlands





Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment S-1: Tributary to NW**      Runoff Area=275,271 sf   57.50% Impervious   Runoff Depth>2.00"  
Tc=6.0 min   CN=87   Runoff=15.37 cfs   1.054 af

**Subcatchment S-2: Tributary to SW**      Runoff Area=399,700 sf   66.55% Impervious   Runoff Depth>2.26"  
Tc=6.0 min   CN=90   Runoff=24.75 cfs   1.727 af

**Total Runoff Area = 15.495 ac   Runoff Volume = 2.781 af   Average Runoff Depth = 2.15"**  
**37.14% Pervious = 5.755 ac   62.86% Impervious = 9.740 ac**

### Summary for Subcatchment S-1: Tributary to NW Wetlands

Runoff = 15.37 cfs @ 12.13 hrs, Volume= 1.054 af, Depth> 2.00"

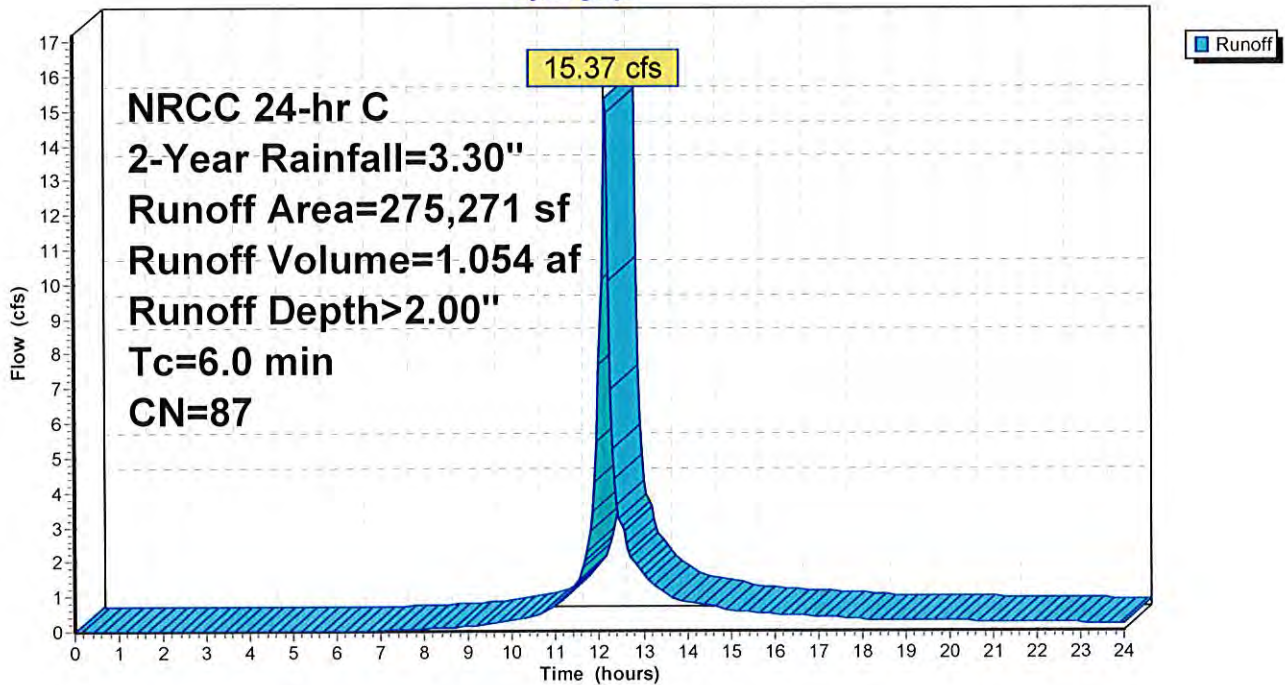
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 NRCC 24-hr C 2-Year Rainfall=3.30"

Area (sf)	CN	Description
60,270	73	Woods, Fair, HSG C
202,578	91	Urban industrial, 72% imp, HSG C
12,423	98	Roofs, HSG D
275,271	87	Weighted Average
116,992		42.50% Pervious Area
158,279		57.50% Impervious Area

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

### Subcatchment S-1: Tributary to NW Wetlands

Hydrograph





**Summary for Subcatchment S-2: Tributary to SW Wetlands**

Runoff = 24.75 cfs @ 12.13 hrs, Volume= 1.727 af, Depth> 2.26"

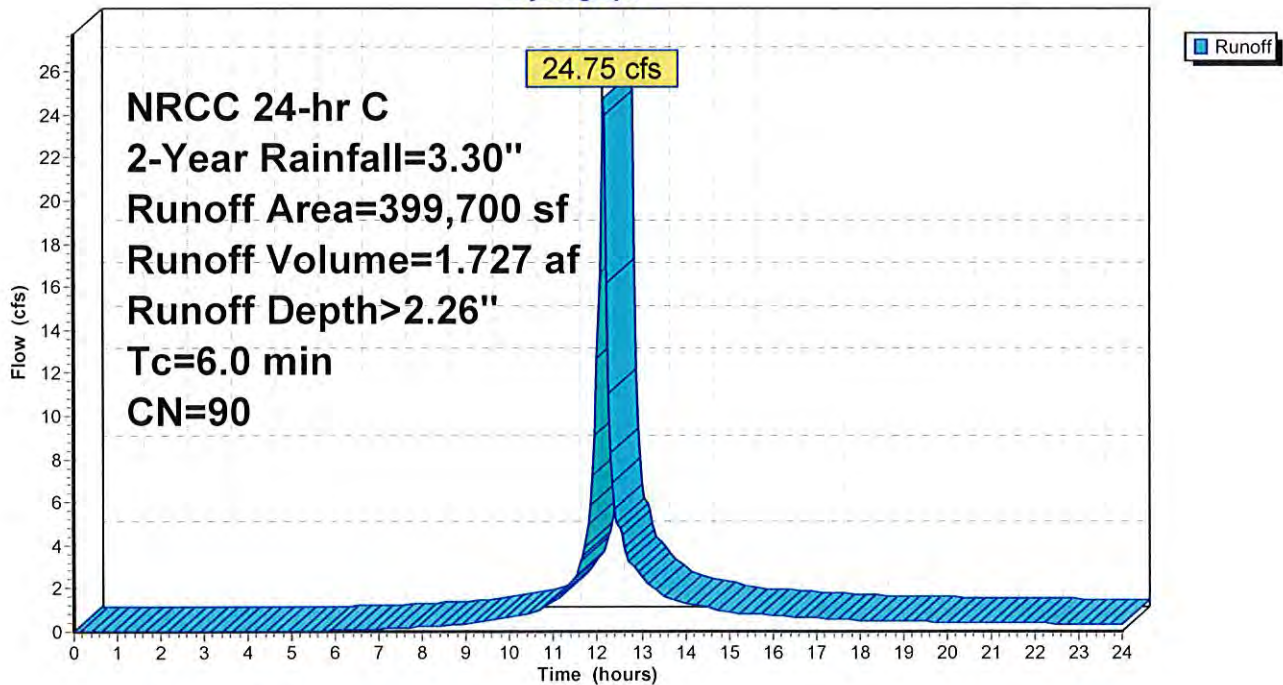
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 NRCC 24-hr C 2-Year Rainfall=3.30"

Area (sf)	CN	Description
45,600	73	Woods, Fair, HSG C
314,645	91	Urban industrial, 72% imp, HSG C
39,455	98	Roofs, HSG D
399,700	90	Weighted Average
133,701		33.45% Pervious Area
265,999		66.55% Impervious Area

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

**Subcatchment S-2: Tributary to SW Wetlands**

Hydrograph



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment S-1: Tributary to NW**      Runoff Area=275,271 sf   57.50% Impervious   Runoff Depth>3.45"  
Tc=6.0 min   CN=87   Runoff=25.87 cfs   1.817 af

**Subcatchment S-2: Tributary to SW**      Runoff Area=399,700 sf   66.55% Impervious   Runoff Depth>3.76"  
Tc=6.0 min   CN=90   Runoff=40.01 cfs   2.873 af

**Total Runoff Area = 15.495 ac   Runoff Volume = 4.690 af   Average Runoff Depth = 3.63"**  
**37.14% Pervious = 5.755 ac   62.86% Impervious = 9.740 ac**



### Summary for Subcatchment S-1: Tributary to NW Wetlands

Runoff = 25.87 cfs @ 12.13 hrs, Volume= 1.817 af, Depth> 3.45"

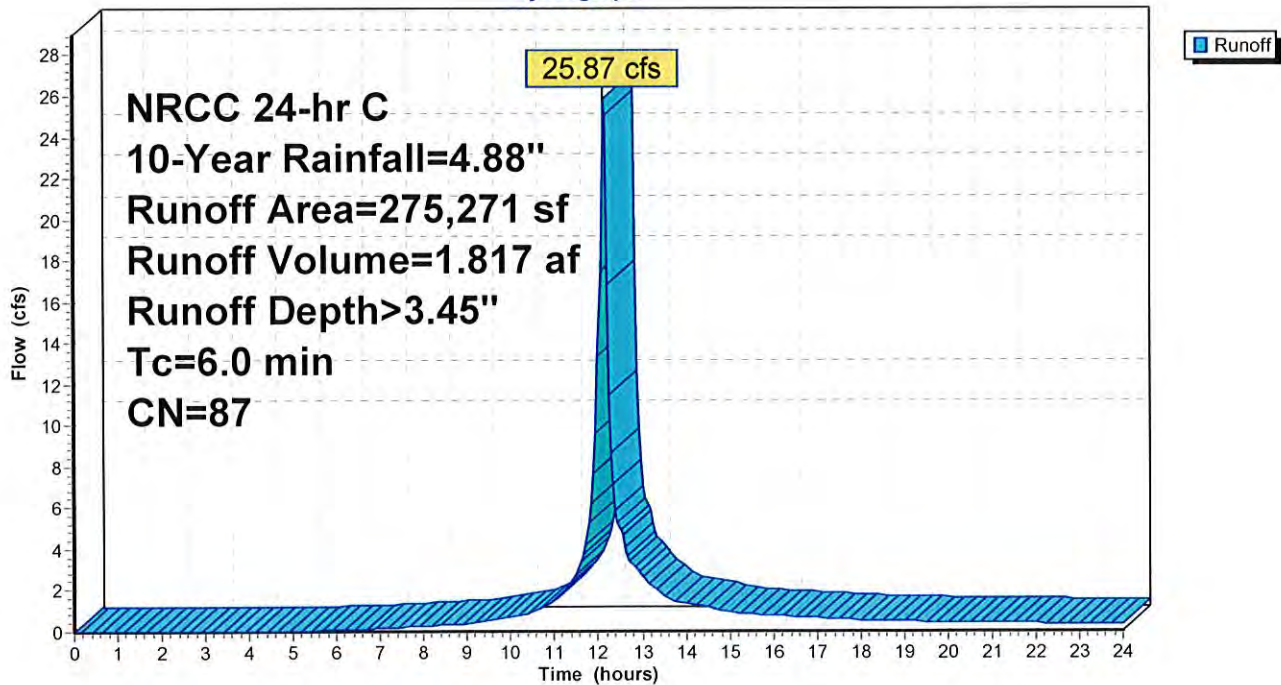
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
NRCC 24-hr C 10-Year Rainfall=4.88"

Area (sf)	CN	Description
60,270	73	Woods, Fair, HSG C
202,578	91	Urban industrial, 72% imp, HSG C
12,423	98	Roofs, HSG D
275,271	87	Weighted Average
116,992		42.50% Pervious Area
158,279		57.50% Impervious Area

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

### Subcatchment S-1: Tributary to NW Wetlands

Hydrograph



**Summary for Subcatchment S-2: Tributary to SW Wetlands**

Runoff = 40.01 cfs @ 12.13 hrs, Volume= 2.873 af, Depth> 3.76"

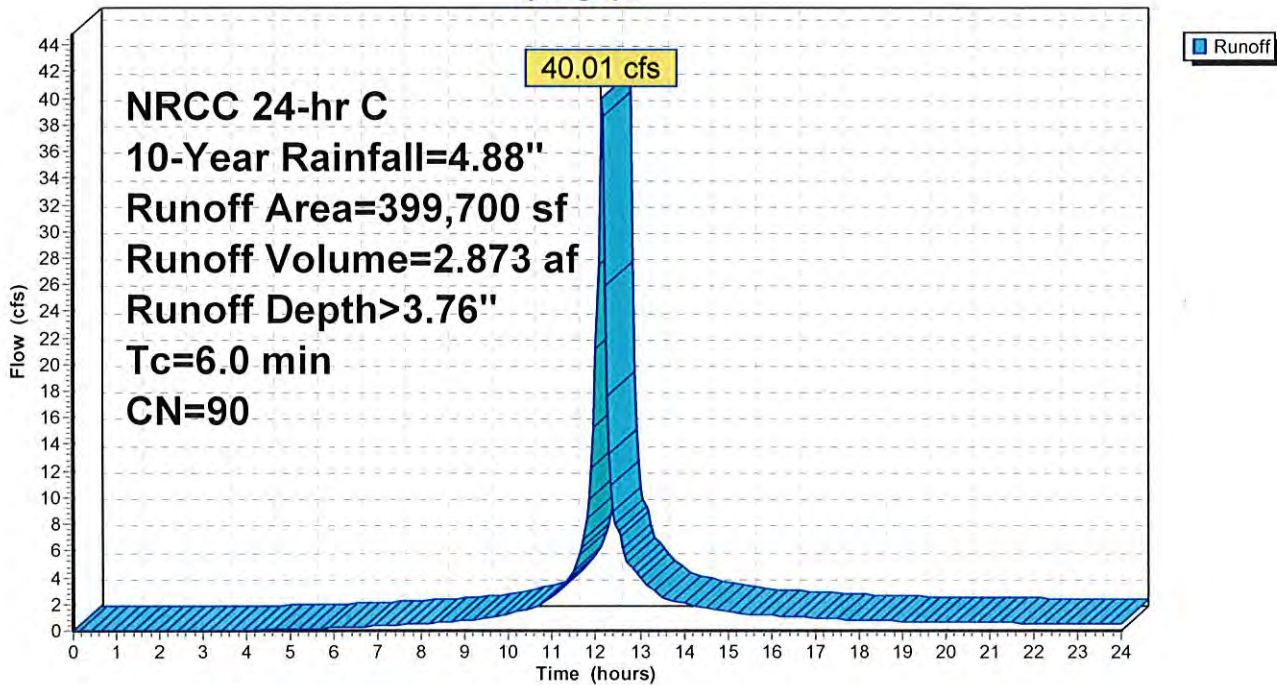
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 NRCC 24-hr C 10-Year Rainfall=4.88"

Area (sf)	CN	Description
45,600	73	Woods, Fair, HSG C
314,645	91	Urban industrial, 72% imp, HSG C
39,455	98	Roofs, HSG D
399,700	90	Weighted Average
133,701		33.45% Pervious Area
265,999		66.55% Impervious Area

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

**Subcatchment S-2: Tributary to SW Wetlands**

Hydrograph





Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment S-1: Tributary to NW**      Runoff Area=275,271 sf   57.50% Impervious   Runoff Depth>6.99"  
Tc=6.0 min   CN=87   Runoff=50.22 cfs   3.681 af

**Subcatchment S-2: Tributary to SW**      Runoff Area=399,700 sf   66.55% Impervious   Runoff Depth>7.35"  
Tc=6.0 min   CN=90   Runoff=75.01 cfs   5.621 af

**Total Runoff Area = 15.495 ac   Runoff Volume = 9.302 af   Average Runoff Depth = 7.20"**  
**37.14% Pervious = 5.755 ac   62.86% Impervious = 9.740 ac**

### Summary for Subcatchment S-1: Tributary to NW Wetlands

Runoff = 50.22 cfs @ 12.13 hrs, Volume= 3.681 af, Depth> 6.99"

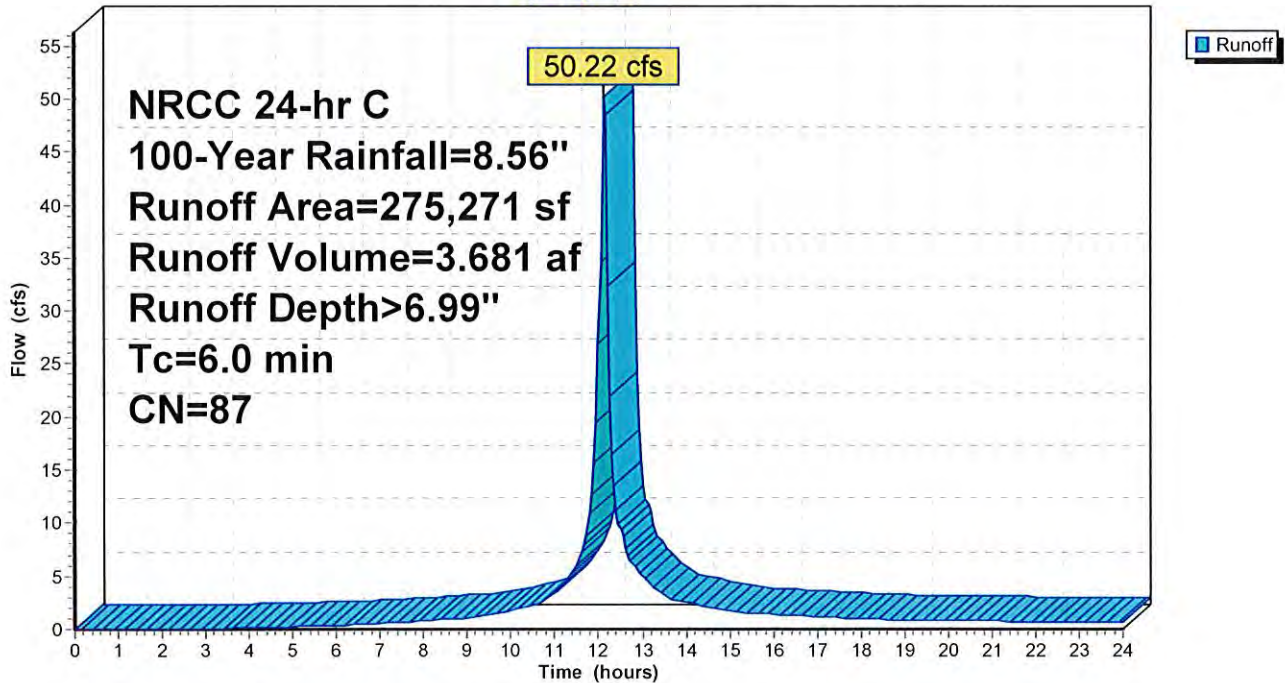
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
NRCC 24-hr C 100-Year Rainfall=8.56"

Area (sf)	CN	Description
60,270	73	Woods, Fair, HSG C
202,578	91	Urban industrial, 72% imp, HSG C
12,423	98	Roofs, HSG D
275,271	87	Weighted Average
116,992		42.50% Pervious Area
158,279		57.50% Impervious Area

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

### Subcatchment S-1: Tributary to NW Wetlands

Hydrograph





**Summary for Subcatchment S-2: Tributary to SW Wetlands**

Runoff = 75.01 cfs @ 12.13 hrs, Volume= 5.621 af, Depth> 7.35"

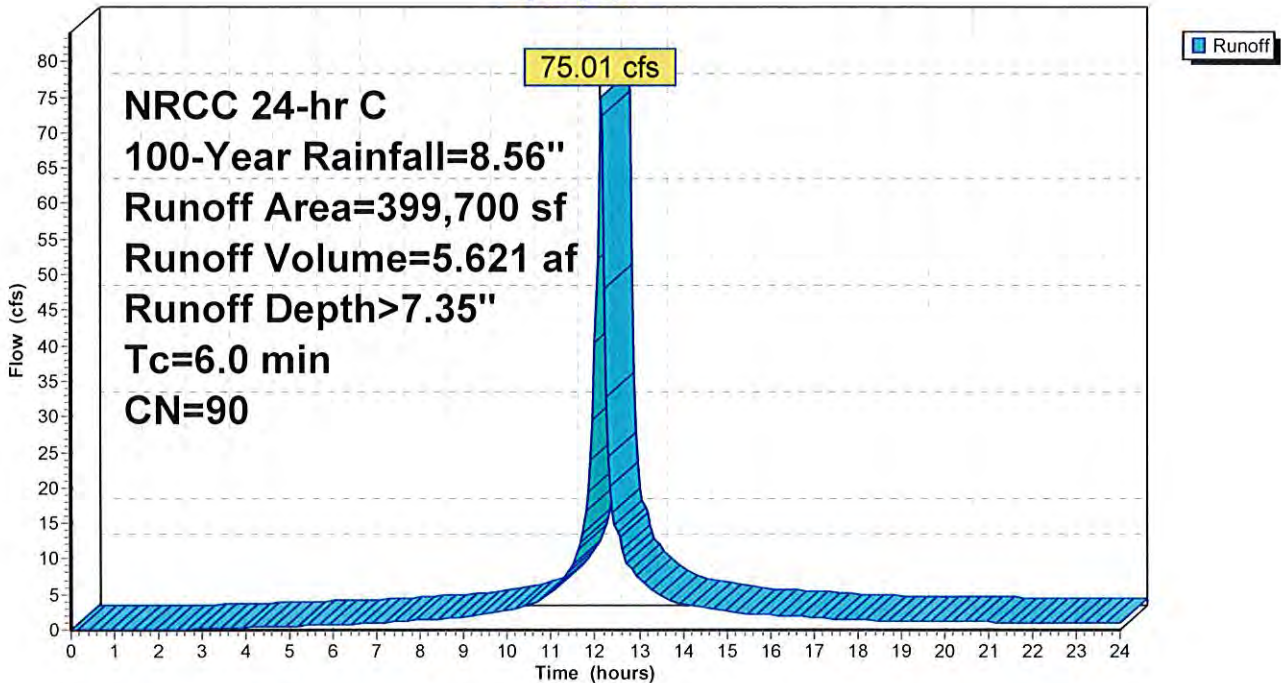
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 NRCC 24-hr C 100-Year Rainfall=8.56"

Area (sf)	CN	Description
45,600	73	Woods, Fair, HSG C
314,645	91	Urban industrial, 72% imp, HSG C
39,455	98	Roofs, HSG D
399,700	90	Weighted Average
133,701		33.45% Pervious Area
265,999		66.55% Impervious Area

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

**Subcatchment S-2: Tributary to SW Wetlands**

Hydrograph





Tributary to NW  
Wetlands



Tributary to SW  
Wetlands





**22069POST**

NRCC 24-hr C 2-Year Rainfall=3.30"

Prepared by Microsoft

Printed 6/21/2022

HydroCAD® 10.00-24 s/n 02085 © 2018 HydroCAD Software Solutions LLC

Page 2

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment S-1: Tributary to NW**

Runoff Area=275,271 sf 57.50% Impervious Runoff Depth>2.00"  
Tc=6.0 min CN=87 Runoff=15.37 cfs 1.054 af

**Subcatchment S-2: Tributary to SW**

Runoff Area=399,700 sf 66.55% Impervious Runoff Depth>2.26"  
Tc=6.0 min CN=90 Runoff=24.75 cfs 1.727 af

**Total Runoff Area = 15.495 ac Runoff Volume = 2.781 af Average Runoff Depth = 2.15"**  
**37.14% Pervious = 5.755 ac 62.86% Impervious = 9.740 ac**

### Summary for Subcatchment S-1: Tributary to NW Wetlands

Runoff = 15.37 cfs @ 12.13 hrs, Volume= 1.054 af, Depth> 2.00"

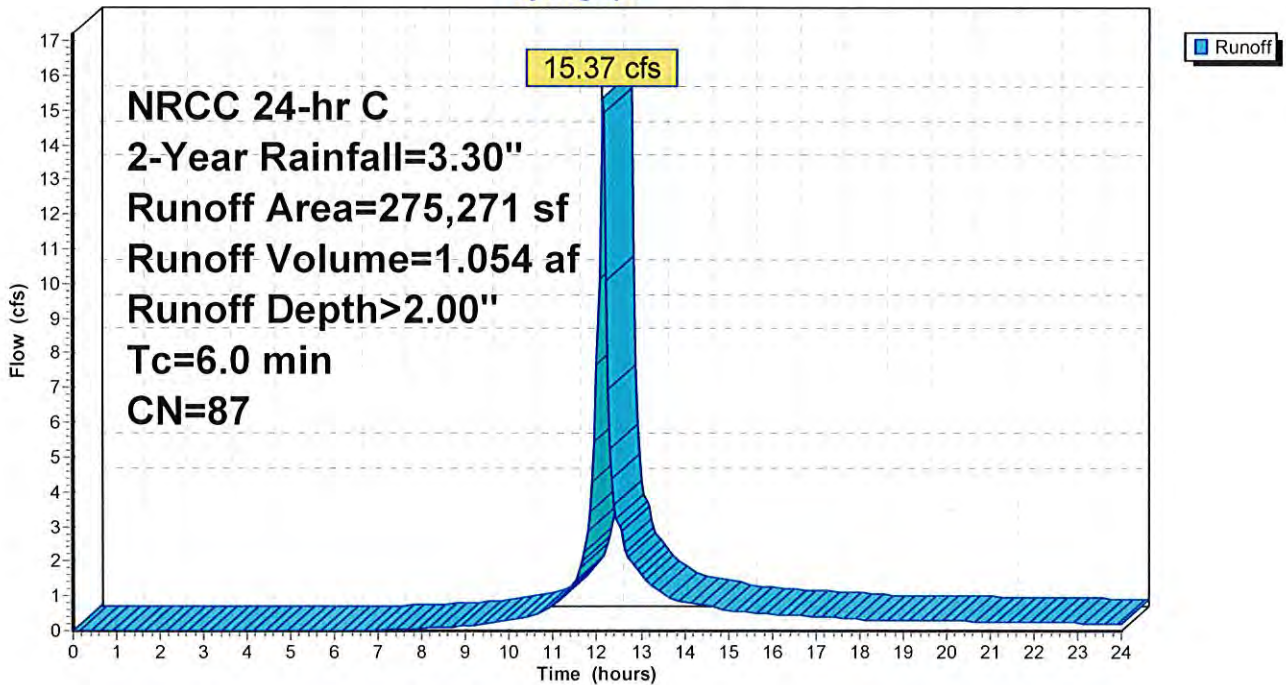
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
NRCC 24-hr C 2-Year Rainfall=3.30"

Area (sf)	CN	Description
60,270	73	Woods, Fair, HSG C
202,578	91	Urban industrial, 72% imp, HSG C
12,423	98	Roofs, HSG D
275,271	87	Weighted Average
116,992		42.50% Pervious Area
158,279		57.50% Impervious Area

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

### Subcatchment S-1: Tributary to NW Wetlands

Hydrograph





### Summary for Subcatchment S-2: Tributary to SW Wetlands

Runoff = 24.75 cfs @ 12.13 hrs, Volume= 1.727 af, Depth> 2.26"

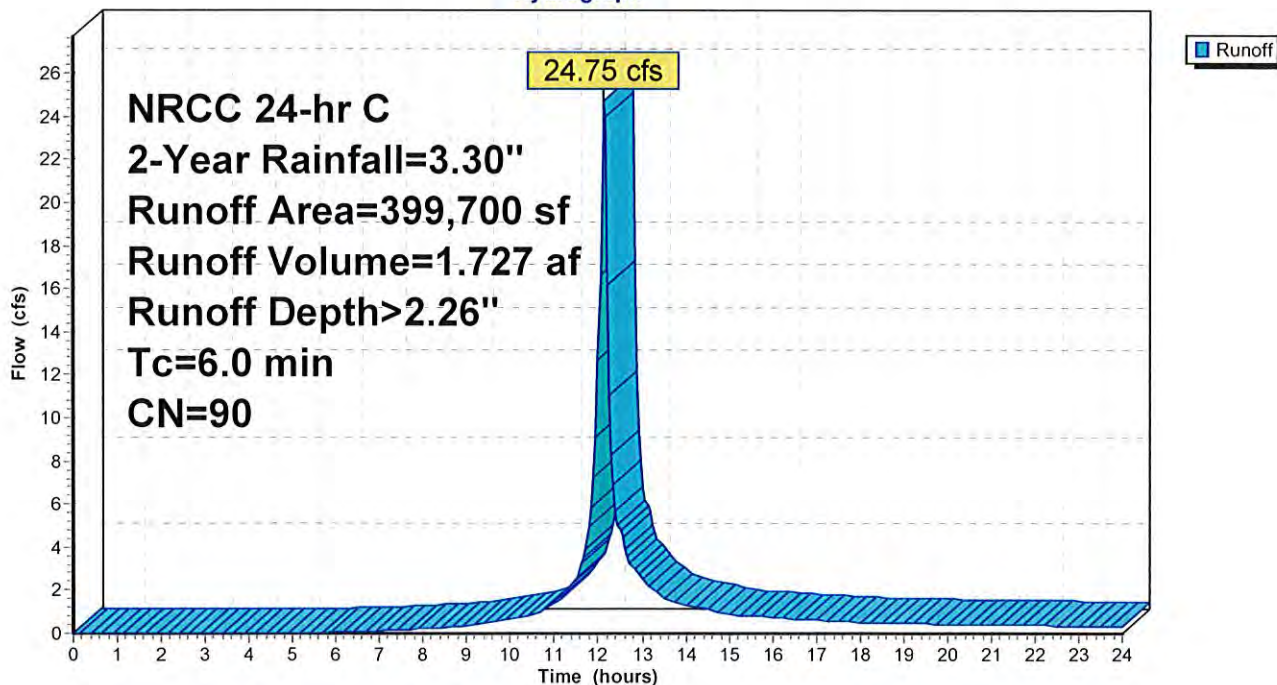
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 NRCC 24-hr C 2-Year Rainfall=3.30"

Area (sf)	CN	Description
45,600	73	Woods, Fair, HSG C
314,645	91	Urban industrial, 72% imp, HSG C
39,455	98	Roofs, HSG D
399,700	90	Weighted Average
133,701		33.45% Pervious Area
265,999		66.55% Impervious Area

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

### Subcatchment S-2: Tributary to SW Wetlands

Hydrograph



**22069POST**

NRCC 24-hr C 10-Year Rainfall=4.88"

Prepared by Microsoft

Printed 6/21/2022

HydroCAD® 10.00-24 s/n 02085 © 2018 HydroCAD Software Solutions LLC

Page 5

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment S-1: Tributary to NW**

Runoff Area=275,271 sf 57.50% Impervious Runoff Depth>3.45"  
Tc=6.0 min CN=87 Runoff=25.87 cfs 1.817 af

**Subcatchment S-2: Tributary to SW**

Runoff Area=399,700 sf 66.55% Impervious Runoff Depth>3.76"  
Tc=6.0 min CN=90 Runoff=40.01 cfs 2.873 af

**Total Runoff Area = 15.495 ac Runoff Volume = 4.690 af Average Runoff Depth = 3.63"**  
**37.14% Pervious = 5.755 ac 62.86% Impervious = 9.740 ac**



### Summary for Subcatchment S-1: Tributary to NW Wetlands

Runoff = 25.87 cfs @ 12.13 hrs, Volume= 1.817 af, Depth> 3.45"

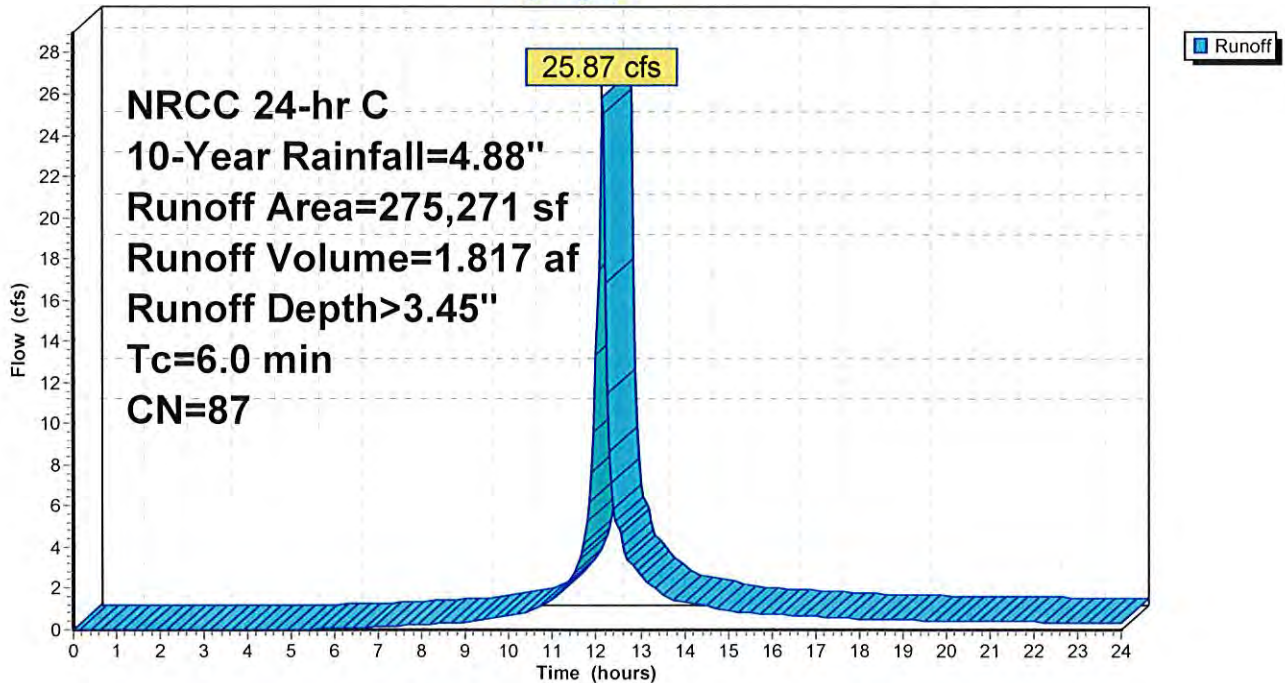
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
NRCC 24-hr C 10-Year Rainfall=4.88"

Area (sf)	CN	Description
60,270	73	Woods, Fair, HSG C
202,578	91	Urban industrial, 72% imp, HSG C
12,423	98	Roofs, HSG D
275,271	87	Weighted Average
116,992		42.50% Pervious Area
158,279		57.50% Impervious Area

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

### Subcatchment S-1: Tributary to NW Wetlands

Hydrograph



**Summary for Subcatchment S-2: Tributary to SW Wetlands**

Runoff = 40.01 cfs @ 12.13 hrs, Volume= 2.873 af, Depth> 3.76"

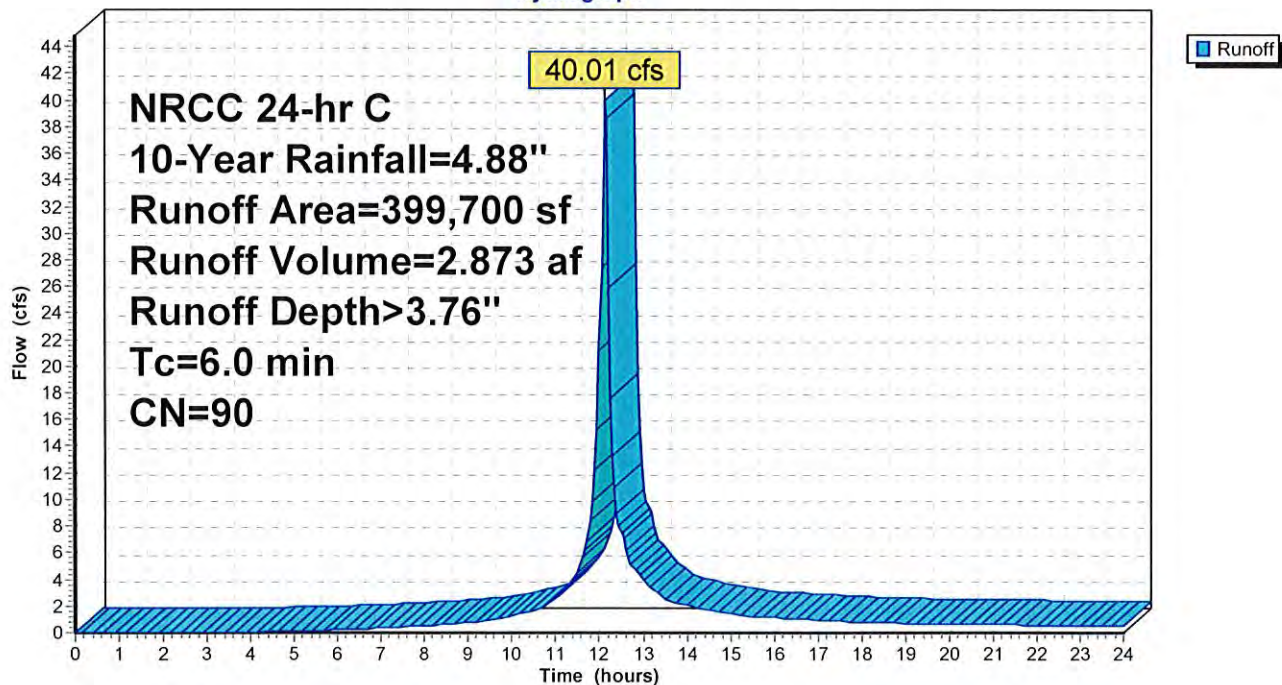
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 NRCC 24-hr C 10-Year Rainfall=4.88"

Area (sf)	CN	Description
45,600	73	Woods, Fair, HSG C
314,645	91	Urban industrial, 72% imp, HSG C
39,455	98	Roofs, HSG D
399,700	90	Weighted Average
133,701		33.45% Pervious Area
265,999		66.55% Impervious Area

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

**Subcatchment S-2: Tributary to SW Wetlands**

Hydrograph



**22069POST**

NRCC 24-hr C 100-Year Rainfall=8.56"

Prepared by Microsoft

Printed 6/21/2022

HydroCAD® 10.00-24 s/n 02085 © 2018 HydroCAD Software Solutions LLC

Page 8

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment S-1: Tributary to NW**

Runoff Area=275,271 sf 57.50% Impervious Runoff Depth>6.99"  
Tc=6.0 min CN=87 Runoff=50.22 cfs 3.681 af

**Subcatchment S-2: Tributary to SW**

Runoff Area=399,700 sf 66.55% Impervious Runoff Depth>7.35"  
Tc=6.0 min CN=90 Runoff=75.01 cfs 5.621 af

**Total Runoff Area = 15.495 ac Runoff Volume = 9.302 af Average Runoff Depth = 7.20"**  
**37.14% Pervious = 5.755 ac 62.86% Impervious = 9.740 ac**



**Summary for Subcatchment S-1: Tributary to NW Wetlands**

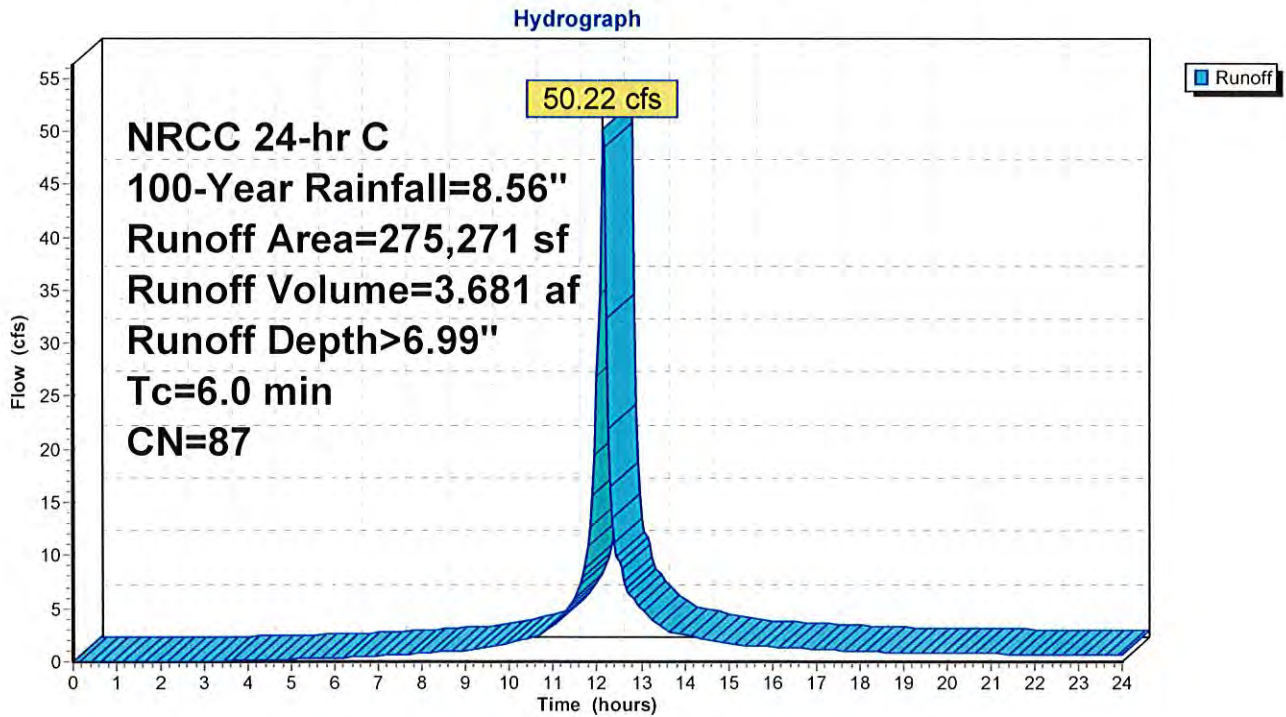
Runoff = 50.22 cfs @ 12.13 hrs, Volume= 3.681 af, Depth> 6.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 NRCC 24-hr C 100-Year Rainfall=8.56"

Area (sf)	CN	Description
60,270	73	Woods, Fair, HSG C
202,578	91	Urban industrial, 72% imp, HSG C
12,423	98	Roofs, HSG D
275,271	87	Weighted Average
116,992		42.50% Pervious Area
158,279		57.50% Impervious Area

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

**Subcatchment S-1: Tributary to NW Wetlands**



**Summary for Subcatchment S-2: Tributary to SW Wetlands**

Runoff = 75.01 cfs @ 12.13 hrs, Volume= 5.621 af, Depth> 7.35"

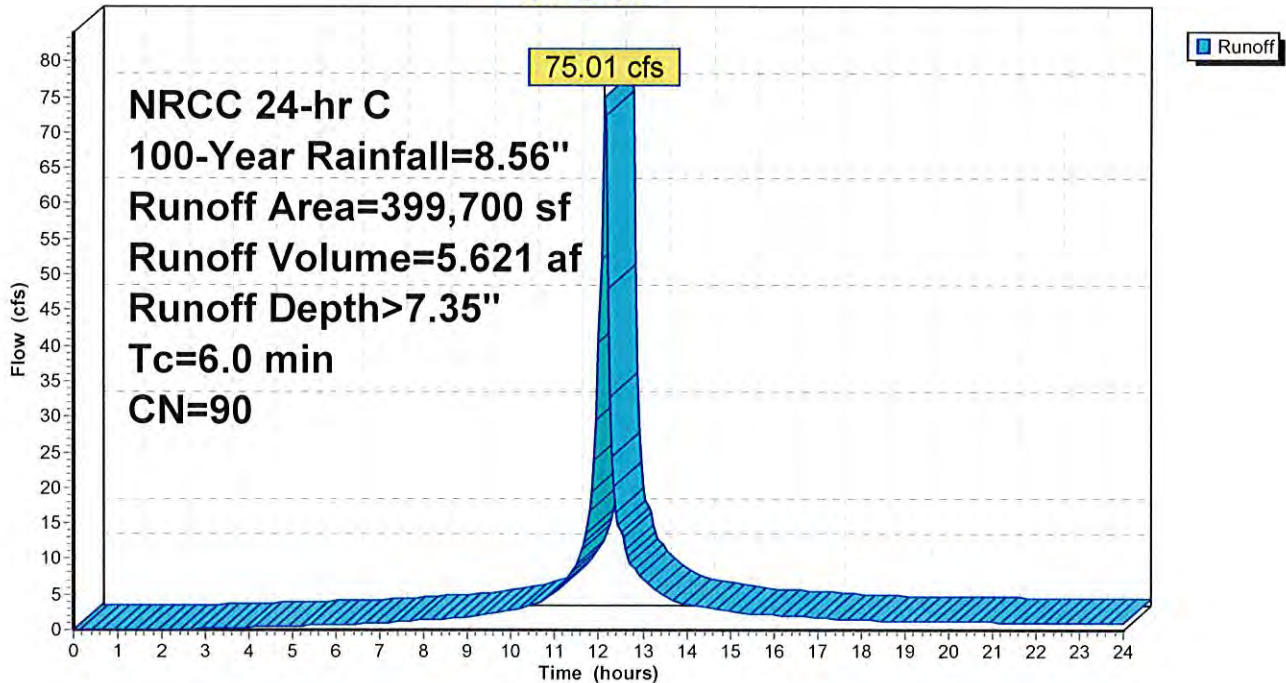
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs  
 NRCC 24-hr C 100-Year Rainfall=8.56"

Area (sf)	CN	Description
45,600	73	Woods, Fair, HSG C
314,645	91	Urban industrial, 72% imp, HSG C
39,455	98	Roofs, HSG D
399,700	90	Weighted Average
133,701		33.45% Pervious Area
265,999		66.55% Impervious Area

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

**Subcatchment S-2: Tributary to SW Wetlands**

Hydrograph







## 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. 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 resident car washing, flows from riparian habitats and wetlands, dechlorinated water from swimming pools, water used for street washing and water used to clean residential buildings without detergents.

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 Corporation, Inc.

A handwritten signature in black ink, appearing to read "CF", is written over a horizontal line.

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