STORM WATER REPORT
THE RESIDENCES AT DARWIN COMMON
PROPOSED 28 UNIT MULTI FAMILY
RESIDENTIAL DEVELOPMENT
A COMPREHENSIVE PERMIT M.G.L. c. 40B
WALPOLE, MA
AUGUST 28, 2023
REVISED DECEMBER 7, 2023
REVISED 2/5/2024

OWNER: JOHN HASENJAEGER
P.O. BOX 661
NORWOOD, MA 02062

APPLICANT: WALL STREET DEVELOPMENT CORP.
P.0. BOX 272
WESTWOOD, MA 02090

ENGINEER: GLOSSA ENGINEERING INC
46 EAST STREET
EAST WALPOLE, MA 02032

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APPENDIX 1

CHECKLIST FOR STORMWATER REPORT

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

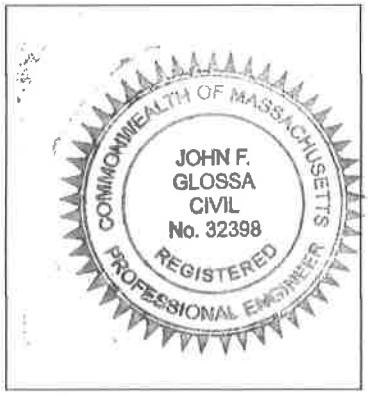
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



John F Glossa 2/5/2024
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.

APPENDIX 2

NARRATIVE AND SUMMARY

NARRATIVE

The proposal is for a 28 unit multi family residential development to be constructed on 3.44 acres of vacant land in Walpole, MA.

The property is located at the end of Darwin Lane which is a public street running off of Common Street. The vacant property is mostly wooded, natural ground cover exists at all areas of the site. The property slopes essentially from north to south at a slope of approximately 10 percent. The landform appears to be the side of an esker. Soils at the site were found to be glacial outwash made up of coarse sand and gravel. Soils at the site are classified as Merrimac sand and gravel. Two drainage watersheds were identified at the site. One watershed is the stormwater management system for the existing subdivision. This watershed consists of roadways, driveways, rooftops, lawns and natural wooded areas. The runoff from this watershed is collected in catch basins and delivered to a stormwater infiltration basin behind the homes at #27 and #31 Darwin Lane. The stormwater infiltration basin when overtopped would discharge to the subject property. The second watershed at the site is the bulk of the undisturbed land found at the site which discharges overland toward School Meadow Brook.

The proposal is to construct 28 residential units in 6 buildings. Each unit will have a garage and one parking stall in front of the garage. There will be a 24 foot wide access driveway with two 82 foot diameter cul de sacs to allow for turning and reversing direction. Storm water will be managed in accordance with MA DEP Stormwater management regulations. The system consists of deep sump catch basins with hooded outlet pipes, stormceptor water quality units, an infiltration basin and an infiltration trench.

STANDARD #2 – PEAK RATE ATTENUATION:

EXISTING CONDITIONS:

		Stormwater Runoff Summary			
Subarea		Storm Event			
Pre-development.	2-yr	10-yr	25-yr	50-yr	100-yr
EX-1 (cfs)	0.0	0.0	0.06	0.25	1.18
EX -1 (ac-ft.)	0.0	0.001	0.040	0.119	0.262
EX-2 (cfs)	0.0	0.0	0.0	0.0	0.02
EX -2 (ac-ft.)	0.0	0.0	0.0	0.001	0.003
EX-3 (cfs)	0.0	0.0	0.0	0.0	0.02
EX -3 (ac-ft.)	0.0	0.0	0.001	0.002	0.004
OS -1 (cfs)	2.27	7.85	13.19	18.68	25.75
OS -1 (ac-ft.)	0.255	0.688	1.104	1.535	2.095
Total to the South (cfs)	0.0	0.0	1.41	8.80	19.72
Total to the South (ac-ft.)	0.0	0.001	0.124	0.516	1.094
Existing Basin					
Infiltrated (cfs)	0.42	0.85	1.11	1.18	1.27
Infiltrated (ac-ft.)	0.184	0.617	0.948	1.066	1.193
Outflow (cfs)	0.0	0.0	1.41	8.72	19.15
Outflow (as-ft.)	0.0	0.0	0.085	0.398	0.832
Elevation	220.76	223.63	225.14	225.44	225.70
Total Area 10.207 acres					

PROPOSED CONDITIONS:

		Stormwater Runoff Summary			
Subarea		Storm Event			
Post-development.	2-yr	10-yr	25-yr	50-yr	100-yr
P-1 (cfs)	0.12	0.25	0.35	0.45	0.57
P-1 (ac-ft.)	0.009	0.017	0.025	0.032	0.041
P-2 (cfs)	0.12	0.19	0.25	0.31	0.37
P-2 (ac-ft.)	0.008	0.014	0.019	0.023	0.029
P-3 (cfs)	0.48	0.85	1.14	1.41	1.74
P-3 (ac-ft.)	0.035	0.062	0.084	0.105	0.131
OS-1 (cfs)	2.27	7.85	13.19	18.68	25.75
OS 1 (ac-ft.)	0.255	0.688	1.104	1.535	2.095
OS-2 (cfs)	0.0	0.0	0.01	0.06	0.28
OS 2 (ac-ft.)	0.0	0.0	0.009	0.028	0.061
P-4 (cfs)	0.59	1.24	1.78	2.31	2.95
P-4 (ac-ft.)	0.043	0.088	0.127	0.165	0.231

P-5 (cfs)	0.19	0.40	0.58	0.75	0.96
P-5 (ac-ft.)	0.014	0.029	0.041	0.054	0.069
P-6 (cfs)	0.31	0.71	1.07	1.41	1.83
P-6 (ac-ft.)	0.023	0.051	0.076	0.10	0.131
P-7 (cfs)	0.0	0.0	0.04	0.11	0.30
P-7 (ac-ft.)	0.0	0.003	0.009	0.019	0.034
P-8 (cfs)	0.0	0.02	0.12	0.34	0.75
P-8 (ac-ft.)	0.0	0.008	0.023	0.042	0.070
P-9 (cfs)	2.01	3.08	3.91	4.69	5.65
P-9 (ac-ft.)	0.161	0.250	0.320	0.386	0.466
P-9A (cfs)	0.44	0.67	0.85	1.02	1.23
P-9A (ac-ft.)	0.035	0.054	0.069	0.084	0.101
P-10 (cfs)	0.0	0.0	0.03	0.10	0.27
P-10 (ac-ft.)	0.0	0.002	0.009	0.019	0.035
P-10A (cfs)	0.0	0.02	0.11	0.33	0.72
P-10A (ac-ft.)	0.0	0.008	0.022	0.040	0.067
Headwall 1st segment (cfs)	0.0	0.0	1.41	8.74	19.28
Headwall 2nd segment (cfs)	0.0	0.0	1.40	8.73	19.27
Total to the South (cfs)	0.0	0.0	1.42	8.83	19.51
Total to the South (ac-ft.)	0.0	0.003	0.103	0.445	0.928
Existing Basin					
Infiltrated (cfs)	0.42	0.85	1.11	1.18	1.27
Infiltrated (ac-ft.)	0.184	0.617	0.948	1.066	1.193
Outflow (cfs)	0.0	0.0	1.41	8.72	19.15
Outflow (as-ft.)	0.0	0.0	0.085	0.398	0.832
Elevation	220.76	223.63	225.14	225.44	225.70
Proposed Galleys					
Infiltrated (cfs)	1.21	1.21	1.21	1.21	1.21
Infiltrated (ac-ft.)	0.292	0.522	0.724	0.926	1.184
Outflow (cfs)	0.0	0.0	0.0	0.0	0.0
Outflow (as-ft.)	0.0	0.0	0.0	0.0	0.0
Elevation	209.67	210.48	211.27	212.14	213.93
Proposed Infiltration Trench					
Infiltrated (cfs)	0.18	0.18	0.18	0.18	0.18
Infiltrated (ac-ft.)	0.035	0.062	0.091	0.124	0.168
Outflow (cfs)	0.0	0.0	0.0	0.0	0.0
Outflow (as-ft.)	0.0	0.0	0.0	0.0	0.0
Elevation	195.43	196.10	196.76	197.52	199.92
Total Area = 10.207 acres					

APPENDIX 3

CONSTRUCTION PERIOD PLAN

OPERATION AND MAINTENANCE PLAN

STORMCEPTOR MANUAL

CONSTRUCTION PERIOD
POLLUTION PREVENTION PLAN

Given the proximity of the municipal drain system, care shall be taken to assure that eroded soil will not be deposited into the nearby drain system. Care shall be taken also to assure that eroded soil will not be deposited onto abutting properties.

The entity for the construction period pollution prevention and erosion and sedimentation control plan is Wall Street Development Corp., their successors and assigns, P.O. Box 272, Westwood, MA 02090. Construction period pollution control measures shall include a siltation barrier (compost filled sock). A designated materials stockpile area and a construction staging area have also been depicted on the plans. Construction sequencing shall be as follows:

1) The limit of work shall be clearly marked in the field by the design engineer.
2) Designate the material stockpile areas in the field.
3) Install silt controls as shown on the plan.
4) Install stabilized construction entrances.
5) Install silt sacks in all existing nearby catch basins.
6) Remove and stockpile top and sub soils from all areas to be disturbed.
   This will require the temporary stockpiling of about 14,000 c.y. of material. Any material to be deemed as not suitable shall be removed from the site. Material to remain on site shall be stockpiled in the location of Building 6-9 and Building 10-12. During construction, once an area is finished and will not need to be regraded, that area shall be covered with stockpiled loam and covered with seed or sod.
7) Bring the site to sub grade. Note that the construction of all 2:1 slopes at the site shall be observed and documented by a Massachusetts Licensed Geotechnical Engineer who shall certify the stability and long term viability of the slope. Documentation shall be provided to the Walpole Zoning Board of Appeals and their Agent. Install temporary sedimentation basins while bringing the site to subgrade. All stormwater runoff shall remain on the site.
8) Install retaining walls.
9) Install the infiltration basin in including the isolator areas.
10) Bring roadway to sub grade with bank gravel.
11) Install sewer, water and other underground utilities.
12) Use silt sacks for silt control, bring roadway to gravel grade and pave with binder course.
13) Construct buildings.
14) Install curbing, sidewalks and loam strips.
15 Install the infiltration trench.
16) Loam and seed all side slopes and other disturbed areas that have not been stabilized.
17) Install final pavement
18) Remove siltation controls and clean up areas including catch basin sumps.

CONSTRUCTION NOTES

1) All areas to be altered shall be brought to sub grade or final grade at the start of construction.
2) Areas once brought to grade that will not be altered again shall be loamed and seeded and protected with Straw Guard as needed. Slopes of 2:1 at the site shall be observed and documented by a Massachusetts Licensed Geotechnical Engineer who shall certify the stability and long term viability of the slope. Any slopes found to be unstable shall be corrected and reinspected until the slope is found to be stable.
3) Infiltration basins as shown shall not become operational until the site is finished and swept of all debris.

4) Temporary sediment basins shall be used and maintained until all proposed paved areas are complete and swept of all debris.
5) Catch basins shall be protected from sediments at all times until construction is complete.
6) Install silt sacks in all existing and proposed catch basins.
7) The developer shall maintain erosion / sedimentation controls during construction and until the sale of the units.
8) Erosion / sedimentation controls shall be inspected weekly and immediately after rainfall events greater than ½".
9) Temporary ground cover or erosion / siltation control shall be established on any unbuilt units or buildings where required by the Zoning Board.

VEGETATION PLANNING

Vegetation shall be installed per the approved plans in accordance with the construction sequencing plan. No plants shall be planted in the drainage easements except as shown on the approved plans.

EROSION AND SEDIMENTATION CONTROLS

The operation and maintenance of the erosion and sedimentation controls shall be the responsibility of the site contractor, who will report to Wall Street Development Corp. their successors and assigns. The erosion and sedimentation controls shall be inspected daily by the site contractor. Repairs as needed shall be made immediately. The inspection of erosion and sedimentation controls shall also be done weekly and after every 1/2" or more rain event by an independent person trained in erosion control practices at construction sites. This independent person shall file weekly reports with Wall Street Development Corp., their successors and assigns. These reports shall be made available to the Zoning Board, Conservation Commission, Mass DEP and the EPA.

PROPOSED 28 UNIT
RESIDENTAIL DEVELOPMENT
DARWIN LANE
WALPOLE, MA

OPERATION AND MAINTENANCE PLANSTORM WATER CONTROL AND MITIGATION SYSTEM

The entity responsible for the implementation of the operation and maintenance plan for the storm water management system is:

Darwin Commons Home Owners Association
Address to be determined
Walpole, MA 02081

The storm water system is shown on an as built plan on file with the with the Walpole Zoning Board. The system consists of the following components:

1) Catch Basins (8)
2) Drain Manholes (11)
3) Headwalls (2)
4) Stormceptor water quality units (2)
5) Drainage infiltration basin (1)
6) Drainage infiltration basin isolator units (4)
7) Drainage infiltration trench (1)
8) Retaining walls (3)
9) Slopes of 2:1 behind Units 6 thru 12
10) Slopes of 2:1 behind Units 13 thru 22

INSPECTIONS

1) Storm water system components shall be inspected every three months during the first year of operation. Inspection reports shall be submitted to the Zoning Board within 30 days of the inspection. These inspections shall be conducted by a qualified civil engineering firm and/or an environmental firm to be commissioned by the Darwin Commons Home Owners Association.

2) The drainage infiltration basins including isolator areas and the infiltration trench shall be inspected once per year by a qualified civil engineering firm and/or a qualified environment firm commissioned by the Darwin Commons Home Owners Association. Any repairs shall be made within 30 days of the inspection. The Association shall consult with a Registered Professional Engineer regarding any anticipated repairs. They shall notify the Walpole Zoning Board prior to the undertaking of any repairs.

3) Catch basins and Stormceptor units shall be cleaned and inspected every year.

4) Drainage manholes, drainage piping, headwalls and the flared end section shall be inspected every year.

5) Retaining walls and 2:1 slopes shall be inspected every year.

6) Any repairs deemed to be critical shall be made immediately. Any other repairs shall be made within 30 days of the inspection.

7) Any proposed changes to the storm water management system shall be approved in writing by the Walpole Zoning Board.

8) The Association shall have on hand at all times $5,000.00 (2023 dollar value) for inspections and emergency repairs.

MAINTENANCE

1) Paved areas shall be swept twice per year, once in the Spring and once in the Fall by the Association.

2) Mowing of the grass and care of any planned shrubs within the site shall be routinely done by the Association. Care should be taken to not allow mowed grass to wash into the catch basins in the lawn areas.

3) Trash and other debris shall be routinely picked up and removed from the access driveway and parking areas by the Association.

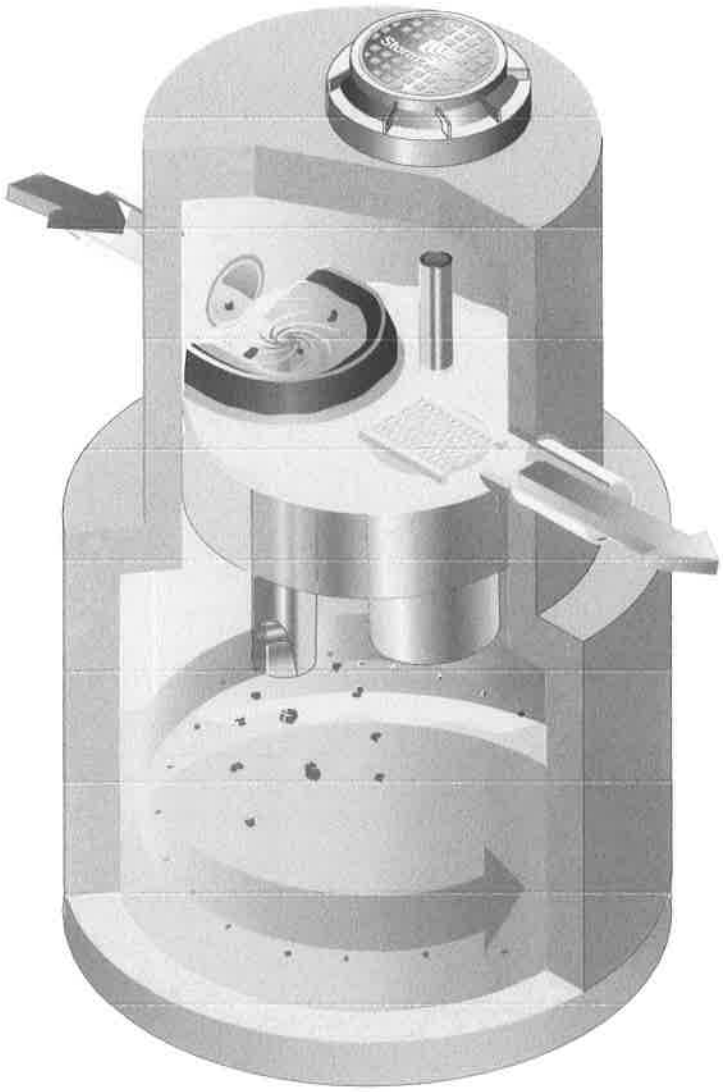
4) The Association shall have a revolving fund with money on hand at all times to perform their required tasks.

REPLACEMENT

1) The Association shall have a replacement fund for the infiltration basin and infiltration trench. The amount of money needs to be $100,000 (in 2023 value) within 50 years of the start of construction.

Stormceptor®

Owner's Manual



Stormceptor is protected by one or more of the following patents:

Canadian Patent No. 2,137,942
Canadian Patent No. 2,175,277
Canadian Patent No. 2,180,305
Canadian Patent No. 2,180,338
Canadian Patent No. 2,206,338
Canadian Patent No. 2,327,768
U.S. Patent No. 5,753,115
U.S. Patent No. 5,849,181
U.S. Patent No. 6,068,765
U.S. Patent No. 6,371,690
U.S. Patent No. 7,582,216
U.S. Patent No. 7,666,303
Australia Patent No. 693.164
Australia Patent No. 707,133
Australia Patent No. 729,096
Australia Patent No. 779,401
Australia Patent No. 2008,279,378
Australia Patent No. 2008,288,900
Indonesia Patent No. 0007058
Japan Patent No. 3581233
Japan Patent No. 9-11476
Korean Patent No. 0519212
Malaysia Patent No. 118987
New Zealand Patent No. 314,646
New Zealand Patent No. 583,008
New Zealand Patent No. 583,583
South African Patent No. 2010/00682
South African Patent No. 2010/01796
Other Patents Pending

Table of Contents

Congratulations!

Your selection of a Stormceptor® means that you have chosen the most recognized and efficient stormwater oil/sediment separator available for protecting the environment. Stormceptor is a pollution control device often referred to as a "Hydrodynamic Separator (HDS)" or an "Oil Grit Separator (OGS)", engineered to remove and retain pollutants from stormwater runoff to protect our lakes, rivers and streams from the harmful effects of non-point source pollution.

1 – Stormceptor Overview

Stormceptor is a patented stormwater quality structure most often utilized as a treatment component of the underground storm drain network for stormwater pollution prevention. Stormceptor is designed to remove sediment, total suspended solids (TSS), other pollutants attached to sediment, hydrocarbons and free oil from stormwater runoff. Collectively the Stormceptor provides spill protection and prevents non-point source pollution from entering downstream waterways.

Key benefits of Stormceptor include:

- Removes sediment, suspended solids, debris, nutrients, heavy metals, and hydrocarbons (oil and grease) from runoff and snowmelt.
- Will not scour or re-suspend trapped pollutants.
- Provides sediment and oil storage.
- Provides spill control for accidents, commercial and industrial developments.
- Easy to inspect and maintain (vacuum truck).
- "STORMCEPTOR" is *clearly* marked on the access cover (excluding inlet designs).
- Relatively small footprint.
- 3rd Party tested and independently verified.
- Dedicated team of experts available to provide support.

Model Types:

- STC (Standard)
- STF (Fiberglass)
- EOS (Extended Oil Storage)
- OSR (Oil and Sand Removal)
- MAX (Custom designed unit, specific to site)

Configuration Types:

- Inlet unit (accommodates inlet flow entry, and multi-pipe entry)
- In-Line (accommodates multi-pipe entry)
- Submerged Unit (accommodates the site's tailwater conditions)
- Series Unit (combines treatment in two systems)

Please Maintain Your Stormceptor

To ensure long-term environmental protection through continued performance as originally designed for your site, **Stormceptor must be maintained**, as any stormwater treatment practice does. The need for maintenance is determined through inspection of the Stormceptor. Procedures for inspection are provided within this document. Maintenance of the Stormceptor is performed from the surface via vacuum truck.

If you require information about Stormceptor, or assistance in finding resources to facilitate inspections or maintenance of your Stormceptor please call your local Stormceptor Licensee or Imbrium® Systems.

2 – Stormceptor Operation & Components

Stormceptor is a flexibly designed underground stormwater quality treatment device that is unparalleled in its effectiveness for pollutant capture and retention using patented flow separation technology.

Stormceptor creates a non-turbulent treatment environment below the insert platform within the system. The insert diverts water into the lower chamber, allowing free oils and debris to rise, and sediment to settle under relatively low velocity conditions. These pollutants are trapped and stored below the insert and protected from large runoff events for later removal during the maintenance procedure.

With thousands of units operating worldwide, Stormceptor delivers reliable protection every day, in every storm. The patented Stormceptor design prohibits the scour and release of captured pollutants, ensuring superior water quality treatment and protection during even the most extreme storm events. Stormceptor's proven performance is backed by the longest record of lab and field verification in the industry.

Stormceptor Schematic and Component Functions

Below are schematics of two common Stormceptor configurations with key components identified and their functions briefly described.

Figure 1.

Inline Stormceptor

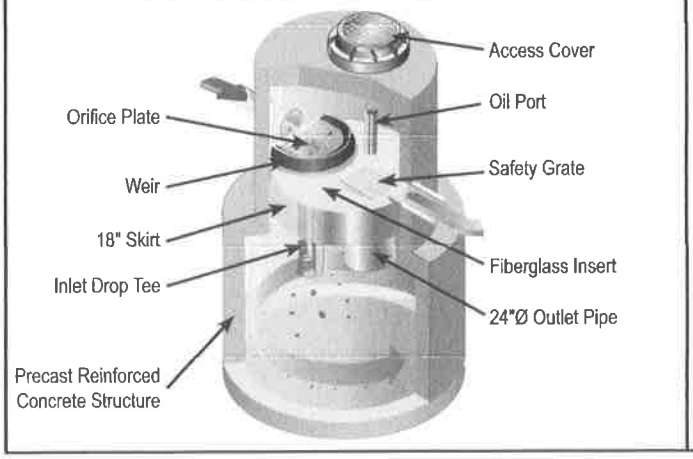
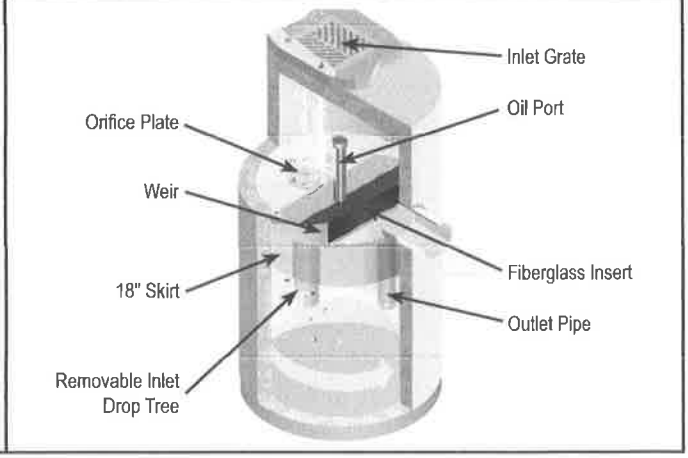


Figure 2.

Inlet Stormceptor



- **Manhole access cover** – provides access to the subsurface components
- **Precast reinforced concrete structure** – provides the vessel's watertight structural support
- **Fiberglass insert** – separates vessel into upper and lower chambers
- **Weir** – directs incoming stormwater and oil spills into the lower chamber
- **Orifice plate** – prevents scour of accumulated pollutants
- **Inlet drop tee** – conveys stormwater into the lower chamber
- **Fiberglass skirt** – provides double-wall containment of hydrocarbons
- **Outlet riser pipe** – conveys treated water to the upper chamber; primary vacuum line access port for sediment removal
- **Oil inspection port** – primary access for measuring oil depth and oil removal
- **Safety grate** – safety measure to cover riser pipe in the event of manned entry into vessel

3 – Stormceptor Identification

Stormceptor is available in both precast concrete and fiberglass vessels, with precast concrete often being the dominant material of construction.

In the Stormceptor, a patented, engineered fiberglass insert separates the structure into an upper chamber and lower chamber. The lower chamber will remain full of water, as this is where the pollutants are sequestered for later removal. Multiple Stormceptor model (STC, OSR, EOS, MAX and STF) configurations exist, each to be inspected and maintained in a similar fashion.

Each unit is easily identifiable as a Stormceptor by the trade name "Stormceptor" embossed on each access cover at the surface. To determine the location of "inlet" Stormceptor units with horizontal catch basin inlet, look down into the grate as the Stormceptor insert will be visible. The name "Stormceptor" is not embossed on inlet models due to the variability of inlet grates used/ approved across North America.

Once the location of the Stormceptor is determined, the model number may be identified by comparing the measured depth from the fiberglass insert level at the outlet pipe's invert (water level) to the bottom of the tank using **Table 1**.

In addition, starting in 1996 a metal serial number tag containing the model number has been affixed to the inside of the unit, on the fiberglass insert. If the unit does not have a serial number, or if there is any uncertainty regarding the size of the unit using depth measurements, please contact your local Stormceptor Representative for assistance.

Sizes/Models

Typical general dimensions and capacities of the standard precast STC, EOS & OSR Stormceptor models in both USA and Canada/International (excluding South East Asia and Australia) are provided in **Tables 1 and 2**. Typical rim to invert measurements are provided later in this document. The total depth for cleaning will be the sum of the depth from outlet pipe invert (generally the water level) to rim (grade) and the depth from outlet pipe invert to the precast bottom of the unit. Note that depths and capacities may vary slightly between regions.

Table 1A. (US) Stormceptor Dimensions – Insert to Base of Structure

STC Model	Insert to Base (in.)	EOS Model	Insert to Base (in.)	OSR Model	Insert to Base (in.)	Typical STFm (in.)
450	60	4-175	60	65	60	1.5 (60)
900	55	9-365	55	140	55	1.5 (61)
1200	71	12-590	71			1.8 (73)
1800	105	18-1000	105			2.9 (115)
2400	94	24-1400	94	250	94	2.3 (89)
3600	134	36-1700	134			3.2 (127)
4800	128	48-2000	128	390	128	2.9 (113)
6000	150	60-2500	150			3.5 (138)
7200	134	72-3400	134	560	134	3.3 (128)
11000*	128	110-5000*	128	780*	128	
13000*	150	130-6000*	150			
16000*	134	160-7800*	134	1125*	134	

Notes:

1. *Depth Below Pipe Inlet Invert to the Bottom of Base Slab can vary slightly by manufacturing facility, and can be modified to accommodate specific site designs, pollutant loads or site conditions. Contact your local representative for assistance.*

**Consist of two chamber structures in series.*

Table 1B. (CA & Int'l) Stormceptor Dimensions – Insert to Base of Structure

STC Model	Insert to Base (m)
300	1.5
750	1.5
1000	1.8
1500	2.8
2000	2.8
3000	3.7
4000	3.4
5000	4.0
6000	3.7
9000*	3.4
11000*	4.0
14000*	3.7

EOS Model	Insert to Base (m)
300	1.5
750	1.5
1000	1.8
2000	2.8
3000	3.7
4000	3.4
5000	4.0
6000	3.7
9000*	3.4
10000*	4.0
14000*	3.7

OSR Model	Insert to Base (m)
300	1.7
750	1.6
2000	2.6
4000	3.6
6000	3.7
9000*	3.6
14000*	3.7

Typical STF m (in.)
1.5 (60)
1.5 (61)
1.8 (73)
2.9 (115)
2.3 (89)
3.2 (127)
2.9 (113)
3.5 (138)
3.3 (128)

Notes:

1. *Depth Below Pipe Inlet Invert to the Bottom of Base Slab can vary slightly by manufacturing facility, and can be modified to accommodate specific site designs, pollutant loads or site conditions. Contact your local representative for assistance.*

**Consist of two chamber structures in series.*

Table 2A. (US) Storage Capacities

STC Model	Hydrocarbon Storage Capacity gal	Sediment Capacity ft^3	**EOS Model**	Hydrocarbon Storage Capacity gal	**OSR Model**	Hydrocarbon Storage Capacity gal	Sediment Capacity ft^3
450	86	46	**4-175**	175	**065**	115	46
900	251	89	**9-365**	365	**140**	233	58
1200	251	127	**12-590**	591			
1800	251	207	**18-1000**	1198			
2400	840	205	**24-1400**	1457	**250**	792	156
3600	840	373	**36-1700**	1773			
4800	909	543	**48-2000**	2005	**390**	1233	465
6000	909	687	**60-2500**	2514			
7200	1059	839	**72-3400**	3418	**560**	1384	690
11000*	2797	1089	**110-5000***	5023	**780***	2430	930
13000*	2797	1374	**130-6000***	6041			
16000*	3055	1677	**160-7800***	7850	**1125***	2689	1378

Notes:

1. *Hydrocarbon & Sediment capacities can be modified to accommodate specific site design requirements, contact your local representative for assistance.*

**Consist of two chamber structures in series.*

Table 2B. (CA & Int'l) Storage Capacities

STC Model	Hydrocarbon Storage Capacity L	Sediment Capacity L	EOS Model	Hydrocarbon Storage Capacity L	OSR Model	Hydrocarbon Storage Capacity L	Sediment Capacity L
300	300	1450	**300**	662	**300**	300	1500
750	915	3000	**750**	1380	**750**	900	3000
1000	915	3800	**1000**	2235			
1500	915	6205					
2000	2890	7700	**2000**	5515	**2000**	2790	7700
3000	2890	11965	**3000**	6710			
4000	3360	16490	**4000**	7585	**4000**	4700	22200
5000	3360	20940	**5000**	9515			
6000	3930	26945	**6000**	12940	**6000**	5200	26900
9000*	10555	32980	**9000***	19010	**9000***	9300	33000
11000*	10555	37415	**10000***	22865			
14000*	11700	53890	**14000***	29715	**14000***	10500	53900

Notes:

1. *Hydrocarbon & Sediment capacities can be modified to accommodate specific site design requirements, contact your local representative for assistance.*

**Consist of two chamber structures in series.*

4 – Stormceptor Inspection & Maintenance

Regular inspection and maintenance is a proven, cost-effective way to maximize water resource protection for all stormwater pollution control practices, and is required to insure proper functioning of the Stormceptor. Both inspection and maintenance of the Stormceptor is easily performed from the surface. Stormceptor's patented technology has no moving parts, simplifying the inspection and maintenance process.

Please refer to the following information and guidelines before conducting inspection and maintenance activities.

When is inspection needed?

- Post-construction inspection is required prior to putting the Stormceptor into service.
- Routine inspections are recommended during the first year of operation to accurately assess the sediment accumulation.
- Inspection frequency in subsequent years is based on the maintenance plan developed in the first year.
- Inspections should also be performed immediately after oil, fuel, or other chemical spills.

When is maintenance cleaning needed?

- For optimum performance, the unit should be cleaned out once the sediment depth reaches the recommended maintenance sediment depth, which is approximately 15% of the unit's total storage capacity (see **Table 2**). The frequency should be adjusted based on historical inspection results due to variable site pollutant loading.

- Sediment removal is easier when removed on a regular basis at or prior to the recommended maintenance sediment depths, as sediment build-up can compact making removal more difficult.
- The unit should be cleaned out immediately after an oil, fuel or chemical spill.

What conditions can compromise Stormceptor performance?

- If construction sediment and debris is not removed prior to activating the Stormceptor unit, maintenance frequency may be reduced.
- If the system is not maintained regularly and fills with sediment and debris beyond the capacity as indicated in **Table 2**, pollutant removal efficiency may be reduced.
- If an oil spill(s) exceeds the oil capacity of the system, subsequent spills may not be captured.
- If debris clogs the inlet of the system, removal efficiency of sediment and hydrocarbons may be reduced.
- If a downstream blockage occurs, a backwater condition may occur for the Stormceptor and removal efficiency of sediment and hydrocarbons may be reduced.

What training is required?

The Stormceptor is to be inspected and maintained by professional vacuum cleaning service providers with experience in the maintenance of underground tanks, sewers and catch basins. For typical inspection and maintenance activities, no specific supplemental training is required for the Stormceptor. Information provided within this Manual (provided to the site owner) contains sufficient guidance to maintain the system properly.

In unusual circumstances, such as if a damaged component needs replacement or some other condition requires manned entry into the vessel, confined space entry procedures must be followed. Only professional maintenance service providers trained in these procedures should enter the vessel. Service provider companies typically have personnel who are trained and certified in confined space entry procedures according to local, state, and federal standards.

What equipment is typically required for inspection?

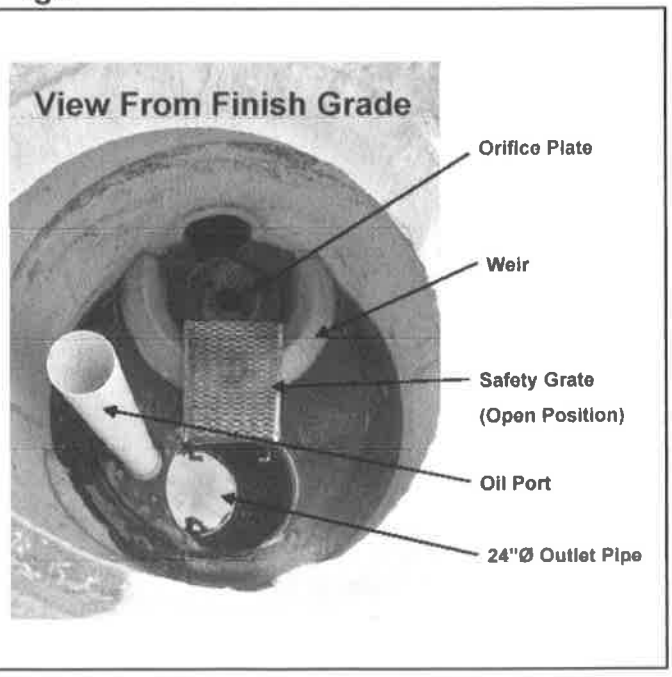
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

Recommended Stormceptor Inspection Procedure:

- Stormceptor is to be inspected from grade through a standard surface manhole access cover.
- Sediment and oil depth inspections are performed with a sediment probe and oil dipstick.
- Oil depth is measured through the oil inspection port, either a 4-inch (100 mm) or 6-inch (150 mm) diameter port.
- Sediment depth can be measured through the oil inspection port or the 24-inch (610 mm) diameter outlet riser pipe.
- Inspections also involve a visual inspection of the internal components of the system.

Figure 3.

Figure 4.



What equipment is typically required for maintenance?

- Vacuum truck equipped with water hose and jet nozzle
- Small pump and tubing for oil removal
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Gas analyzer, respiratory gear, and safety harness for specially trained personnel if confined space entry is required

Recommended Stormceptor Maintenance Procedure

Maintenance of Stormceptor is performed using a vacuum truck.

No entry into the unit is required for maintenance. ***DO NOT ENTER THE STORMCEPTOR CHAMBER*** unless you have the proper personal safety equipment, have been trained and are qualified to enter a confined space, as identified by local Occupational Safety and Health Regulations (e.g. 29 CFR 1910.146 or Canada Occupational Safety and Health Regulations – SOR/86-304). Without the proper equipment, training and permit, entry into confined spaces can result in serious bodily harm and potentially death. Consult local, provincial, and/or state regulations to determine the requirements for confined space entry. Be aware, and take precaution that the Stormceptor fiberglass insert may be slippery. In addition, be aware that some units do not have a safety grate to cover the outlet riser pipe that leads to the submerged, lower chamber.

- Ideally maintenance should be conducted during dry weather conditions when no flow is entering the unit.
- Stormceptor is to be maintained through a standard surface manhole access cover.
- Insert the oil dipstick into the oil inspection port. If oil is present, pump off the oil layer into separate containment using a small pump and tubing.
- Maintenance cleaning of accumulated sediment is performed with a vacuum truck.
    - For 6-ft (1800 mm) diameter models and larger, the vacuum hose is inserted into the lower chamber via the 24-inch (610 mm) outlet riser pipe.
    - For 4-ft (1200 mm) diameter model, the removable drop tee is lifted out, and the vacuum hose is inserted into the lower chamber via the 12-inch (305 mm) drop tee hole.

Figure 5.

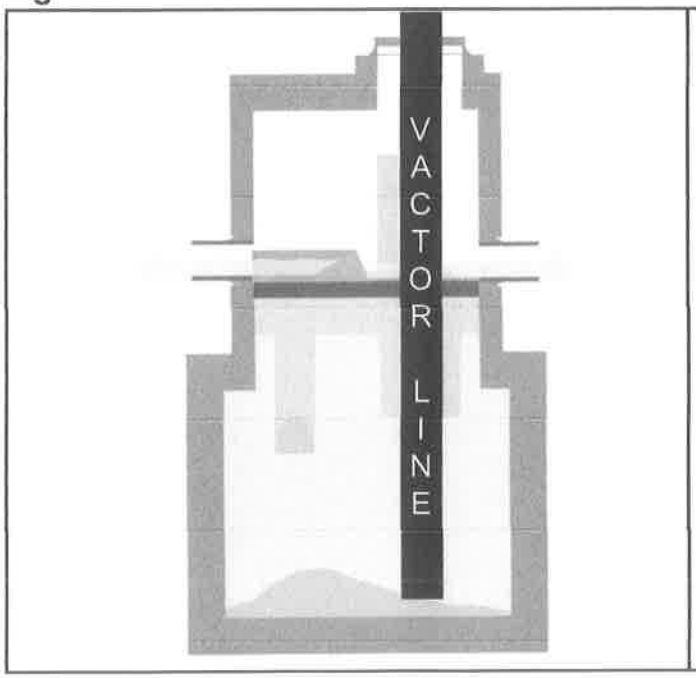
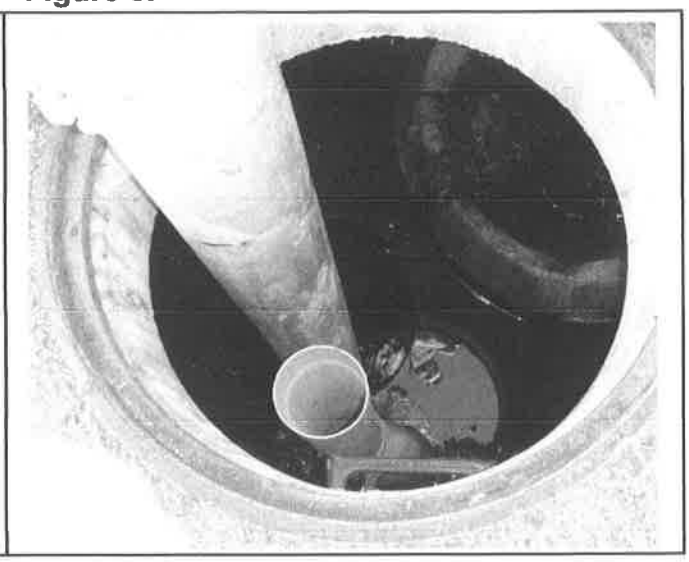


Figure 6.

- Using the vacuum hose, decant the water from the lower chamber into a separate containment tank or to the sanitary sewer, if permitted by the local regulating authority.
- Remove the sediment sludge from the bottom of the unit using the vacuum hose. For large Stormceptor units, a flexible hose is often connected to the primary vacuum line for ease of movement in the lower chamber.
- Units that have not been maintained regularly, have surpassed the maximum recommended sediment capacity, or contain damaged components may require manned entry by trained personnel using safe and proper confined space entry procedures.

Figure 7.

Figure 8.



A maintenance worker stationed at the above ground surface uses a vacuum hose to evacuate water, sediment, and debris from the system.

What is required for proper disposal?

The requirements for the disposal of material removed from Stormceptor units are similar to that of any other stormwater treatment Best Management Practices (BMP). Local guidelines should be consulted prior to disposal of the separator contents. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste. This could be site and pollutant dependent. In some cases, approval from the disposal facility operator/agency may be required.

What about oil spills?

Stormceptor is often implemented in areas where there is high potential for oil, fuel or other hydrocarbon or chemical spills. Stormceptor units should be cleaned immediately after a spill occurs by a licensed liquid waste hauler. You should also notify the appropriate regulatory agencies as required in the event of a spill.

What if I see an oil rainbow or sheen at the Stormceptor outlet?

With a steady influx of water with high concentrations of oil, a sheen may be noticeable at the Stormceptor outlet. This may occur because a hydrocarbon rainbow or sheen can be seen at

very small oil concentrations (< 10 ppm). Stormceptor is effective at removing 95% of free oil, and the appearance of a sheen at the outlet with high influent oil concentrations does not mean that the unit is not working to this level of removal. In addition, if the influent oil is emulsified, the Stormceptor will not be able to remove it. The Stormceptor is designed for free oil removal and not emulsified or dissolved oil conditions.

What factors affect the costs involved with inspection/maintenance?

The Vacuum Service Industry for stormwater drainage and sewer systems is a well-established sector of the service industry that cleans underground tanks, sewers and catch basins. Costs to clean Stormceptor units will vary. Inspection and maintenance costs are most often based on unit size, the number of units on a site, sediment/oil/hazardous material loads, transportation distances, tipping fees, disposal requirements and other local regulations.

What factors predict maintenance frequency?

Maintenance frequency will vary with the amount of pollution on your site (number of hydrocarbon spills, amount of sediment, site activity and use, etc.). It is recommended that the frequency of maintenance be increased or reduced based on local conditions. If the sediment load is high from an unstable site or sediment loads transported from upstream catchments, maintenance may be required semi-annually. Conversely once a site has stabilized, maintenance may be required less frequently (for example: two to seven year, site and situation dependent). Maintenance should be performed immediately after an oil spill or once the sediment depth in Stormceptor reaches the value specified in **Table 3** based on the unit size.

Table 3A. (US) Recommended Sediment Depths Indicating Maintenance

STC Model	Maintenance Sediment depth (in)	EOS Model	Maintenance Sediment depth (in)	Oil Storage Depth (in)	OSR Model	Maintenance Sediment depth (in)
450	8	**4-175**	9	24	**065**	8
900	8	**9-365**	9	24	**140**	8
1200	10	**12-590**	11	39		
1800	15					
2400	12	**24-1400**	14	68	**250**	12
3600	17	**36-1700**	19	79		
4800	15	**48-2000**	16	68	**390**	17
6000	18	**60-2500**	20	79		
7200	15	**72-3400**	17	79	**560**	17
11000*	17	**110-5000***	16	68	**780***	17
13000*	20	**130-6000***	20	79		
16000*	17	**160-7800***	17	79	**1125***	17

Note:

1. *The values above are for typical standard units.*

**Per structure.*

Table 3B. (CA & Int'l) Recommended Sediment Depths Indicating Maintenance

STC Model	Maintenance Sediment depth (mm)	EOS Model	Maintenance Sediment depth (mm)	Oil Storage Depth (mm)	OSR Model	Maintenance Sediment depth (mm)
300	225	**300**	225	610	**300**	200
750	230	**750**	230	610	**750**	200
1000	275	**1000**	275	990		
1500	400					
2000	350	**2000**	350	1727	**2000**	300
3000	475	**3000**	475	2006		
4000	400	**4000**	400	1727	**4000**	375
5000	500	**5000**	500	2006		
6000	425	**6000**	425	2006	**6000**	375
9000*	400	**9000***	400	1727	**9000***	425
11000*	500	**10000***	500	2006		
14000*	425	**14000***	425	2006	**14000***	425

Note:

1. *The values above are for typical standard units.*

**Per structure.*

Replacement parts

Since there are no moving parts during operation in a Stormceptor, broken, damaged, or worn parts are not typically encountered. Therefore, inspection and maintenance activities are generally focused on pollutant removal. However, if replacements parts are necessary, they may be purchased by contacting your local Stormceptor Representative, or Imbrium Systems.

The benefits of regular inspection and maintenance are many – from ensuring maximum operation efficiency, to keeping maintenance costs low, to the continued protection of natural waterways – and provide the key to Stormceptor's long and effective service life.

Stormceptor Inspection and Maintenance Log

Stormceptor Model No: _____

Allowable Sediment Depth: _____

Serial Number: _____

Installation Date: _____

Location Description of Unit: _____

Other Comments: _____

Contact Information

Questions regarding the Stormceptor can be addressed by contacting your area Stormceptor Licensee, Imbrium Systems, or visit our website at www.stormceptor.com.

Stormceptor Licensees:

CANADA

Lafarge Canada Inc.	
www.lafargepipe.com	
403-292-9502 / 1-888-422-4022	Calgary, AB
780-468-5910	Edmonton, AB
204-958-6348	Winnipeg, MB, NW. ON, SK
Langley Concrete Group	
www.langleyconcretegroup.com	
604-502-5236	BC
Hanson Pipe & Precast Inc.	
www.hansonpipeandprecast.com	
519-622-7574 / 1-888-888-3222	ON
Lécuyer et Fils Ltée.	
www.lecuyerbeton.com	
450-454-3928 / 1-800-561-0970	QC
Strescon Limited	
www.strescon.com	
902-494-7400	NS, NF
506-633-8877	NB, PE

UNITED STATES

Rinker Materials
www.rinkerstormceptor.com
1-800-909-7763

AUSTRALIA & SOUTHEAST ASIA, including New Zealand & Japan

Humes Water Solutions
www.humes.com.au
+61 7 3364 2894

Imbrium Systems Inc. & Imbrium Systems LLC

Canada	1-416-960-9900 / 1-800-565-4801
United States	1-301-279-8827 / 1-888-279-8826
International	+1-416-960-9900 / +1-301-279-8827
Email	info@imbriumsystems.com

www.imbriumsystems.com
www.stormceptor.com

APPENDIX 4

_ONG TERM POLLUTION PLAN

DRAINAGE WORKS COMPONENETS INSPECTION FORM

LONG TERM POLLUTION PREVENTION PLAN

The use of the property and the responsibility of the owners to implement and carry out a Long Term Pollution Prevention Plan will be subject to this document and shall include the following provisions:

1) Good housekeeping practices shall be implemented at all times. There shall be no debris of any kind including landscaping debris deposited within the site. Any debris found to be dumped or deposited within the site shall be immediately picked up and removed.

2) Storage of materials shall be done in a manner that will prevent the migration of loose soil, silt or clay or other unwanted material, in order to prevent such material from entering the storm water management system. There shall be no outdoor storage of waste products at that site at any time accept as allowed by the permitting authorities for such storage.

3) Outdoor storage of materials shall be done in designated areas and storage bins as needed to prevent any unwanted materials from entering the storm water management system.

4) Routine inspections and maintenance of Storm water best management practices shall be carried out in compliance with the Operation and Maintenance plan.

5) Permitted lawns, gardens and other landscaped areas within the site shall be maintained by the Association.

6) There shall be no outdoor storage of fertilizers, herbicides, and/or pesticides at the site. Indoor storage of fertilizers, herbicides and/or pesticides shall be done in a safe and dry location. Any spill of these materials shall be cleaned up immediately. The use of fertilizers, herbicides, and pesticides at the site shall be limited to amounts allowed by regulations issued by the Walpole Zoning Board and / or other governing bodies. Pet waste deposited at the site shall be immediately picked up and removed. Pet waste shall be disposed of through solid waste containers.

7) There shall be no on-site septic systems installed at the site unless allowed by other governing bodies.

8) Solid waste (trash) shall be stored in closed containers and removed by a licensed hauler at least once per week. Any solid waste not in closed containers found at that site shall be removed immediately by the Association.

9) Snow shall be plowed in wind rows at the edge of the paved areas and deposited in the snow storage areas. Excess snow shall be removed from the site and deposited in approved snow farms. Calculations show that snow storage areas at the site can store 3 ½ inches of snow. The Homeowners Association shall have in there snow plowing contract a clause that the contractor shall be available during any storm to remove snow from the site as needed so as to not allow the storage up of snow on any areas not designated as snow storage areas.

10) Road salt and sand shall be used in accordance with rules, regulations and laws in force at that time. There shall be no outdoor storage of sand or salt at the site except as may be allowed by other governing bodies.

11) There shall be no repairing of vehicles, construction equipment or otherwise at the site.

12) There shall be no illicit discharges to the storm water system.

13) The Owners shall become familiar with the rules and regulations and restrictions of this document.

14) In case of an emergency, the owner shall notify the following organizations

1) Walpole Fire Dept.
2) Walpole Zoning Board
3) Walpole Planning Board
4) Walpole Board of Health
5) Walpole Conservation Commission
6) Walpole Building Department
7) Walpole Dept. Of Public Works
8) Massachusetts DEP

DARWIN COMMONS, WALPOLE, MA - DRAINAGE WORKS COMPONENTS- ANNUAL INSPECTION FORM						
Date:						
Inspector Name:						
Inspector Address:						
Inspector Phone Number:						
Inspector Registration Number:						
STORMWATER MAINTENANCE						
COMPONENT	**DATE OF LAST INSPECTION**	**DATE OF LAST CLEANING**	**CONDTION OF STRUCTURE**	**SEDIMENT PRESENT**	**POTENTIAL FOR CLOGGING**	**RECOMMENDATIONS / NOTES**
CB-1						
CB-2						
CB-3						
CB-4						
CB-5						
CB-6						
CB-7						
CB-8						

	INDICATE: yes,no,n/a	**COMMENTS**
Are outside areas kept clean and orderly?		
Are garbage can, waste bins, or dumpsters covered?		
Are stormwater drain paths clear?		
Are there any hazardous wastes stored on-site?		
Other comments:		
Signature:		

Inspection of all Stormwater management system components shall be conducted annually and a report provided to the Planning Board, no later than Dec. 31

DARWIN COMMONS, WALPOLE, MA - DRAINAGE WORKS COMPONENTS- ANNUAL INSPECTION FORM						
Date:						
Inspector Name:						
Inspector Address:						
Inspector Phone Number:						
Inspector Registration Number:						
STORMWATER MAINTENANCE						
COMPONENT	**DATE OF LAST INSPECTION**	**DATE OF LAST CLEANING**	**CONDTION OF STRUCTURE**	**SEDIMENT PRESENT**	**POTENTIAL FOR CLOGGING**	**RECOMMENDATIONS / NOTES**
STORMCEPTOR- 1						
STORMCEPTOR-2						
INFIL. BASIN						
INFIL. TRENCH						
ISO AREA 1						
ISO AREA 2						
ISO AREA 3						
ISO AREA 4						
DMH 1						
DMH 2						
DMH 3						
			INDICATE: yes,no,n/a		**COMMENTS**	
Are outside areas kept clean and orderly?						
Are garbage can, waste bins, or dumpsters covered?						
Are stormwater drain paths clear?						
Are there any hazardous wastes stored on-site?						
Other comments:						
Signature:						

Inspection of all Stormwater management system components shall be conducted annually and a report provided to the Conservation Commission, no later than Dec. 31

DARWIN COMMONS , WALPOLE, MA - DRAINAGE WORKKS COMPONENTS-ANNUAL INSPECTION FORM						
Date:						
Inspector Name:						
Inspector Address:						
Inspector Phone Number:						
Inspector Registration Number:						
COMPONENT	**DATE OF LAST INSPECTION**	**DATE OF LAST CLEANING**	**CONDTION OF STRUCTURE**	**SEDIMENT PRESENT**	**POTENTIAL FOR CLOGGING**	**RECOMMENDATIONS / NOTES**
DMH 4						
DMH 5						
DMH 5						
DMH 6						
DHH 7						
DMH 8						
DMH 9						
DMH 10						
HW 1						
HW 2						

	INDICATE: yes,no,n/a	**COMMENTS**
Are outside areas kept clean and orderly?		
Are garbage can, waste bins, or dumpsters covered?		
Are stormwater drain paths clear?		
Are there any hazardous wastes stored on-site?		

Other comments:	
Signature:	

Inspection of all Stormwater management system components shall be conducted annually and a report provided to the Conservation Commission, no later than Dec. 31

DARWIN COMMONS, WALPOLE,MA - DRAINAGE WORKS COMPONENTS -ANNUAL INSPECTION FORM						
Date:						
Inspector Name:						
Inspector Address:						
Inspector Phone Number:						
Inspector Registration Number:						
COMPONENT	**DATE OF LAST INSPECTION**	**DATE OF LAST CLEANING**	**CONDTION OF STRUCTURE**	**SEDIMENT PRESENT**	**POTENTIAL FOR CLOGGING**	**RECOMMENDATIONS / NOTES**
RETAIN WALL 1						
RETAIN WALL 2						
RETAIN WALL 3						
2:1 SLOPE AREA 1						
2:1 SLOPE AREA 2						
			INDICATE: yes,no,n/a		**COMMENTS**	
Are outside areas kept clean and orderly?						
Are garbage can, waste bins, or dumpsters covered?						
Are stormwater drain paths clear?						
Are there any hazardous wastes stored on-site?						
Other comments:						
Signature:						

Inspection of all Stormwater management system components shall be conducted annually and a report provided to the Conservation Commission, no later than Dec. 31

APPENDIX 5

STORMWATER RECHARGE CALCULATION

DRAWDOWN CALCULATION

TSS REMOVAL WORKSHEET

PIPE FLOW COMPUTATIONS

SNOW STORAGE CALCULATION

STANDARD 3
STORM WATER RECHARGE

HYDROLOGIC GROUP A SOIL

AREA 1 (TOTAL IMPERVIOUS AREA TO INFILTRATION BASIN)

ACCESS DRIVEWAY, PARKING AREA, WALKWAYS, AND ROOFTOP DISCHARGING TO THE INFILTRATION BASIN

TOTAL IMPERVIOUS AREA OF AREA 1 = 35,405 S.F. PAVEMENT + 27,600 S.F. ROOFTOP = 63,005 S.F.

REQUIRED RECHARGE VOLUME

63,005 S.F. X .60/12 = 3,150.25 C.F. REQUIRED

PER DRAIN CALCS, THE VOLUME OF STORED STORMWATER BELOW THE OUTLET IS .464 AC FT = 20,211.84 C.F.

20,211.84 > 3,150.25 **OK**

AREA 2 (TOTAL IMPERVIOUS AREA TO INFILTRATION TRENCH AT REAR)

REAR PORTION OF BUILDING ROOFTOPS UNITS 13 – 22 ONLY

TOTAL IMPERVIOUS AREA OF AREA 2 = 6,000 S.F.

REQUIRED RECGARGE VOLUME = 6,000 S.F. X .6/12 = 300.0 C.F. REQUIRED

PER DRAIN CALCS, THE VOLUME OF INFILTRATION TRENCH AT REAR BELOW THE OUTLET = 1,290 C.F.

1,290 C.F. > 300.0 C.F. **OK**

DRAWDOWN

AREA 1

The volume in leaching basin = 20,211.84 c.f.

The bottom area of the leaching trench is 6,272 s.f.

Using an infiltration rate of 8.27 in/hr = 0.6891 ft/hr = 0.6891 cf/hr

0.6891 cf/hr x 6,272 s.f. = 4,322.45 cf/hr/leaching trench bottom

20,211.84 c.f. / 4,322.45 cf/hr = 4.68 hrs **OK**

AREA 2

The volume in the leaching trench is 1,290.00 c.f.

The bottom of the leaching trench is 880.0 s.f.

Using an infiltration rate of 8.27 in/hr = 0.6891 ft/hr = 0.6891 cf/hr

0.6891 cf/hr x 880.0 s.f. = 606.40 cf/hr/leaching trench bottom

1,290.00 c.f / 606.40 cf/hr = 2.13 hrs **OK**

STANDARD 4
WATER OUALITY VOLUME

ZONE II WELLHEAD PROTECTION AREA
HYDROLOGIC GROUP A SOIL

AREA 1 (TOTAL IMPERVIOUS AREA TO INFILTRATION BASIN)

ACCESS DRIVEWAY, PARKING AREA, WALKWAYS, AND ROOFTOP DISCHARGING TO THE INFILTRATION BASIN

TOTAL IMPERVIOUS AREA OF AREA 1 = 35,405 S.F. PAVEMENT + 27,600 S.F. ROOFTOP = 63,005 S.F.

REQUIRED WATER QUALITY VOLUME

63,005 S.F. X 1.0/12 = 5,250.42 C.F. REQUIRED

PER DRAIN CALCS, THE VOLUME OF STORED STORMWATER BELOW THE OUTLET IS .464 AC FT = 20,211.84 C.F.

20,211.84 > 5,250.42 **OK**

AREA 2 (TOTAL IMPERVIOUS AREA TO INFILTRATION TRENCH AT REAR)

REAR PORTION OF BUILDING ROOFTOPS UNITS 13 – 22 ONLY

TOTAL IMPERVIOUS AREA OF AREA 2 = 6,000 S.F.

REQUIRED WATER QUALITY VOLUME = 6,000 S.F. X 1.0/12 = 500.0 C.F. REQUIRED

PER DRAIN CALCS, THE VOLUME OF INFILTRATION TRENCH AT REAR BELOW THE OUTLET = 1,290 C.F.

1,290 C.F. > 500.0 C.F. **OK**

ISOLATOR VOLUMES

CB 7 LAWN AND WOODS, SIZE FOR ½" OF RAINFALL
13,474 S.F. X .5/12 = 561.4 C.F. REQUIRED
GALLEY VOLUME AT 2 FEET DEPTH
3.5' X 3.5' X 2' = 24.5 C.F. PER GALLEY
24 GALLEYS X 24.5 C.F. = 588 C.F. > 561.4 C.F.

CB 8 LAWN, SIZE FOR ½ " OF RAINFALL
22,491 S.F. X .5/12 = 937.1 C.F. REQUIRED
GALLEY VOLUME AT 2 FEET DEPTH
3.5' X 3.5' X 2' = 24.5 C.F. PER GALLEY
40 GALLEYS X 24.5 C.F. = 980 C.F. > 937.1 C.F.

PAVEMENT SIZE FOR 1" OF RAINFALL
32,847 S.F. X 1/12 = 2,375,2 C.F.
GALLEY DEPTH AT 2 FEET DEPTH
3.5' X 3.5' X 2' = 24.5 C.F. PER GALLEY
56 GALLEYS X 24.5 C.F. = 1,372 C.F.
USE 2 ISOLATOR AREAS 1 TO THE EAST AND 1 TO THE WEST
SO 1372 C.F. + 1,372 C.F. = 2,744 C.F. > 2,375.2 C.F.

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

Version 1, Automated: Mar. 4, 2008

Location: Darwin Commons, Walpole, MA

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Street Sweeping - 0%	0.00	1.00	0.00	1.00
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Oil Grit Separator	0.25	0.75	0.19	0.56
Infiltration Basin	0.80	0.56	0.45	0.11
	0.00	0.11	0.00	0.11

Total TSS Removal = 89%

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

Project: DARWIN COMMONS, WALPOLE, MA
Prepared By: John F. Glossa P.E.
Date: 8/28/2023

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

DRAINAGE COMPUTATIONS

COMP. BY: | CHKD. BY: | PROJECT: DARWIN COMMON | JOB NO. | DESIGN PERIOD: 10 YEAR

DATE: | DATE:

LOCATION		ROADWAY			OTHER			SUM		SUM		Q					Q	V	Length	Total
FROM	TO	A	C	CA	A	C	CA	CA	Tc	Tc	I	IxCA	D	S	n		full	full	of	Fall
		(Ac)			(Ac)				(Min)	(Min)	in/hr	(cfs)	(in)	(ft/ft)			(cfs)	(fps)	Run (ft)	(ft)
CB-1		0.05	0.9	0.045	0.03	0.45	0.014	0.059	5		5.4	0.32								
CB-1	DMH-1							0.059	5		5.4	0.32	12	0.030	0.009		8.91	11.35	10	0.30
CB-2		0.03	0.9	0.027	0.02	0.45	0.009	0.036	5		5.4	0.19								
CB-2	DMH-1							0.036	5		5.4	0.19	12	0.019	0.009		7.09	9.03	18	0.34
DMH-1	DMH-2							0.095	5		5.4	0.51	12	0.100	0.009		16.27	20.72	80	8.00
CB-3		0.16	0.9	0.144	0.06	0.45	0.027	0.171	5		5.4	0.92								
CB-3	DMH-2							0.171	5		5.4	0.92	12	0.020	0.009		7.28	9.27	18	0.36
CB-4		0.23	0.9	0.207	0.16	0.45	0.072	0.279	5		5.4	1.51								
CB-4	DMH-2							0.279	5		5.4	1.51	12	0.050	0.009		11.51	14.65	49	2.45
DMH-2	STC-1							0.545	5		5.4	2.94	12	0.028	0.009		8.61	10.96	7	0.20
CB-5		0.17	0.9	0.153	0.10	0.45	0.045	0.198	5		5.4	1.07								
CB-5	DMH-3							0.198	5		5.4	1.07	12	0.010	0.009		5.15	6.55	40	0.40
CB-6		0.19	0.9	0.171	0.04	0.45	0.018	0.189	5		5.4	1.02								
CB-6	DMH-3							0.189	5		5.4	1.02	12	0.010	0.009		5.15	6.55	40	0.40
DMH-3	STC-2							0.387	5		5.4	2.09	12	0.023	0.009		7.80	9.94	7	0.16

GLOSSA ENGINEERING INC
46 EAST STREET
EAST WALPOLE,MA 02032
PHONE 508-668-4401
FAX 508-668-4406
EMAIL glossaeng@AOL.com

December 7, 2023

The Residences at Darwin Common
Proposed 28 Unit Residential Development

On site snow storage volumetric calculation

Proposed paved area = 32,847 s.f.

3.5 inches of snowfall on the paved area = 9,580 c.f. of snow.

The three snow storage areas are:

Near building 22 – 3' high x 22' wide x 58 ' long = 3,828 c.f.
Near building 23 – 3' high x 16' wide x 40' long = 1,920 c.f.
Near building 5 – 3' high x 34' wide x 40' long = 4,080 c.f.

Total = 9,828 c.f.

The Home Owners Association will need to have snow removed from the site and deposited in approved snow farms for any snow storms that are more than 3 ½ inches of snow.

APPENDIX 6

SOILS REPORT

Commonwealth of Massachusetts
City/Town of Walpole

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

A. Facility Information

John Hasenjaeger
Owner Name

P.O. Box 661
Street Address

42/ 240 and 227-13
Map/Lot #

Norwood
City

MA
State

02062
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey — MA GIS (Source); MmC (Soil Map Unit); Merrimac (Soil Series)
   Terrace or Esker (Landform); Poor filter (Soil Limitations)
   Glacial outwash (Soil Parent material)

3. Surficial Geological Report — 1987 (Year Published/Source); Qsg (Map Unit)
   Glacial outwash (Description of Geologic Map Unit:)

4. Flood Rate Insurance Map — Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No — If yes, MassGIS Wetland Data Layer: ____ (Wetland Type)

7. Current Water Resource Conditions (USGS): 6/08/23 (Month/Day/ Year) — Range: ☒ Above Normal ☐ Normal ☐ Below Normal

8. Other references reviewed:
   (Zone II, IWPA, Zone A, EEA Data Portal, etc.)

Commonwealth of Massachusetts
City/Town of Walpole

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

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

Deep Observation Hole Number: #1 (Hole #) | 6/8/23 (Date) | 7:30 AM (Time) | Cldy 55 deg (Weather) | 42.12625 (Latitude) | 71.24272 (Longitude)

1. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) | Hardwoods, pines (Vegetation) | Few (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 10-12 (Slope (%))

Description of Location: Vacant land at the end of Darwin Lane, a deadend street

2. Soil Parent Material: Merrimac | Terrace or esker (Landform) | SH (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body 100 + feet | Drainage Way 100+ feet | Wetlands 100+ feet | Property Line 100+ feet | Drinking Water Well 100+ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

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

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-10	A	SL	10YR 3/2	None	Cnc : Dpl:		5%	5%	Massive	loose	
10-29	B	LS	10yr 5/8	None	Cnc : Dpl:		5%	5%	Massive	loose	
29-120	C	S	2.5Y5/4	None	Cnc : Dpl:		40%	5%	Single grain	loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Commonwealth of Massachusetts
City/Town of Walpole

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

Additional Notes:

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

Deep Observation Hole Number: #2 (Hole #) | 6/8/23 (Date) | 7:45 AM (Time) | Cldy 55 deg (Weather) | 42.12640 (Latitude) | 71.24309 (Longitude)

1. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) | Hardwoods, Pines (Vegetation) | Few (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 10-12 (Slope (%))

Description of Location: Vacant land at the end of Darwin Lane

2. Soil Parent Material: Merrimac | Terrace or esker (Landform) | SH (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body 100+ feet | Drainage Way 100+ feet | Wetlands 100+ feet | Property Line 100+ feet | Drinking Water Well 100+ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

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

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-10	A	SL	10YR 3/2	None	Cnc : Dpl:		5%	5%	Massive	loose	
10-27	B	Ls	10YR5/8	None	Cnc : Dpl:		5%	5%	Massive	loose	
27-132	C	S	2.5Y5/4	None	Cnc : Dpl:		30%	5%	Single grain	loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Commonwealth of Massachusetts
City/Town of Walpole

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

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

Deep Observation Hole Number: #3 (Hole #) | 6/8/23 (Date) | 8:00 AM (Time) | Cldy 50 deg (Weather) | 42.12657 (Latitude) | 71.24348 (Longitude)

1. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) | Hardwoods, pines (Vegetation) | Few (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 10-12 (Slope (%))

Description of Location: Vacant land at the end of Darwin Lane, a deadend street

2. Soil Parent Material: Merrimac | Terrace or esker (Landform) | SH (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body 100 + feet | Drainage Way 100+ feet | Wetlands 100+ feet | Property Line 100+ feet | Drinking Water Well 100+ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

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

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-8	A	SL	10YR 3/2	None	Cnc : Dpl:		5%	5%	Massive	loose	
8-27	B	LS	10yr 5/8	None	Cnc : Dpl:		5%	5%	Massive	loose	
27-132	C	S	2.5Y5/4	None	Cnc : Dpl:		10%	5%	Single grain	loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Commonwealth of Massachusetts
City/Town of Walpole

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

Additional Notes:

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

Deep Observation Hole Number: #4 (Hole #) | 6/8/23 (Date) | 8:15 AM (Time) | Cldy 50 deg (Weather) | 42.12652 (Latitude) | 71.24334 (Longitude)

1. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) | Hardwoods, Pines (Vegetation) | Few (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 10-12 (Slope (%))

   Description of Location: Vacant land at the end of Darwin Lane

2. Soil Parent Material: Merrimac | Terrace or esker (Landform) | SH (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body 100+ feet | Drainage Way 100+ feet | Wetlands 100+ feet
   Property Line 100+ feet | Drinking Water Well 100+ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

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

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-10	A	SL	10YR 3/2	None	Cnc : Dpl:	0	5%	5%	Massive	loose	
10-27	B	Ls	10YR5/8	None	Cnc : Dpl:	0	5%	5%	Massive	loose	
27-132	C	S	2.5Y5/4	96"	Cnc :7.5YR Dpl: 5/8	5	30%	5%	Single grain	loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Commonwealth of Massachusetts
City/Town of Walpole

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

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

Deep Observation Hole Number: #5 (Hole #) | 11/13/23 (Date) | 7:30 AM (Time) | Sun 35 deg (Weather) | 42.12625 (Latitude) | 71.24272 (Longitude)

1. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) | Hardwoods, pines (Vegetation) | Few (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 10-12 (Slope (%))

Description of Location: Vacant land at the end of Darwin Lane, a deadend street

2. Soil Parent Material: Merrimac | Terrace or esker (Landform) | SH (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body 100 + feet | Drainage Way 100+ feet | Wetlands 100+ feet | Property Line 100+ feet | Drinking Water Well 100+ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

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

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-8	A	SL	10YR 3/2	None	Cnc : Dpl:		5%	5%	Massive	loose	
8-24	B	SL	10yr 5/8	None	Cnc : Dpl:		5%	5%	Massive	loose	
24-185	C	S	2.5Y5/4	None	Cnc : Dpl:		30%	5%	Single grain	loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Commonwealth of Massachusetts
City/Town of Walpole

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

Additional Notes:

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

Deep Observation Hole Number: #6 (Hole #) | 11/13/23 (Date) | 8:00 AM (Time) | Sun 35 deg (Weather) | 42.12640 (Latitude) | 71.24309 (Longitude)

1. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) | Hardwoods, Pines (Vegetation) | Few (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 10-12 (Slope (%))

Description of Location: Vacant land at the end of Darwin Lane

2. Soil Parent Material: Merrimac | Terrace or esker (Landform) | SH (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body 100+ feet | Drainage Way 100+ feet | Wetlands 100+ feet | Property Line 100+ feet | Drinking Water Well 100+ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

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

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-11	A	SL	10YR 3/2	None	Cnc : Dpl:		5%	5%	Massive	loose	
11-40	B	SL	10YR5/8	None	Cnc : Dpl:		5%	5%	Massive	loose	
40-168	C	S	2.5Y5/4	None	Cnc : Dpl:		5%	5%	Single grain	loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Commonwealth of Massachusetts
City/Town of Walpole

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

Additional Notes:

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

Deep Observation Hole Number: #7 (Hole #) | 11/13/23 (Date) | 8:30 AM (Time) | Sun 35 deg (Weather) | 42.12640 (Latitude) | 71.24309 (Longitude)

1. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) | Hardwoods, Pines (Vegetation) | Few (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 10-12 (Slope (%))

Description of Location: Vacant land at the end of Darwin Lane

2. Soil Parent Material: Merrimac | Terrace or esker (Landform) | SH (Position on Landscape (SU, SH, BS, FS, TS, Plain))

3. Distances from: Open Water Body 100+ feet | Drainage Way 100+ feet | Wetlands 100+ feet | Property Line 100+ feet | Drinking Water Well 100+ feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

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

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-12	A	SL	10YR 3/2	None	Cnc : Dpl:		5%	5%	Massive	loose	
12-33	B	SL	10YR5/8	None	Cnc : Dpl:		5%	5%	Massive	loose	
33-132	C	S	2.5Y5/4	None	Cnc : Dpl:		5%	5%	Single grain	loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Norfolk and Suffolk Counties, Massachusetts

August 30, 2023

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Map Scale: 1:1,260 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 15 30 60 90

Feet
0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 18, Sep 9, 2022

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
253D	Hinckley loamy sand, 15 to 35 percent slopes	0.0	0.6%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	0.8	19.3%
254C	Merrimac fine sandy loam, 8 to 15 percent slopes	3.1	80.2%
Totals for Area of Interest		**3.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Norfolk and Suffolk Counties, Massachusetts

253D—Hinckley loamy sand, 15 to 35 percent slopes

Map Unit Setting

National map unit symbol: 2svmd
Elevation: 0 to 860 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Hinckley and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hinckley

Setting

Landform: Outwash deltas, outwash terraces, moraines, eskers, kames, outwash plains, kame terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 15 to 35 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A

Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 10 percent
Landform: Moraines, eskers, kames, outwash deltas, outwash terraces, outwash plains, kame terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Merrimac

Percent of map unit: 3 percent
Landform: Kame terraces, outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, riser
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Sudbury

Percent of map unit: 2 percent
Landform: Outwash deltas, outwash plains, kame terraces, outwash terraces, moraines
Landform position (two-dimensional): Backslope, footslope, toeslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: No

254B—Merrimac fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyqs
Elevation: 0 to 1,290 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Merrimac and similar soils: 85 percent
Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

Landform: Outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Side slope, crest, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Sudbury

Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hinckley

Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope

Landform position (three-dimensional): Head slope, nose slope, side slope, crest, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Windsor

Percent of map unit: 3 percent
Landform: Outwash plains, outwash terraces, dunes, deltas
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Agawam

Percent of map unit: 2 percent
Landform: Outwash plains, outwash terraces, moraines, stream terraces, eskers, kames
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

254C—Merrimac fine sandy loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2tyqt
Elevation: 0 to 1,030 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Merrimac and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

Landform: Eskers, outwash plains, moraines, kames, outwash terraces
Landform position (two-dimensional): Backslope, footslope, summit, shoulder
Landform position (three-dimensional): Side slope, crest, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Hinckley

Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Windsor

Percent of map unit: 5 percent
Landform: Outwash plains, dunes, deltas, outwash terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex

Hydric soil rating: No

References

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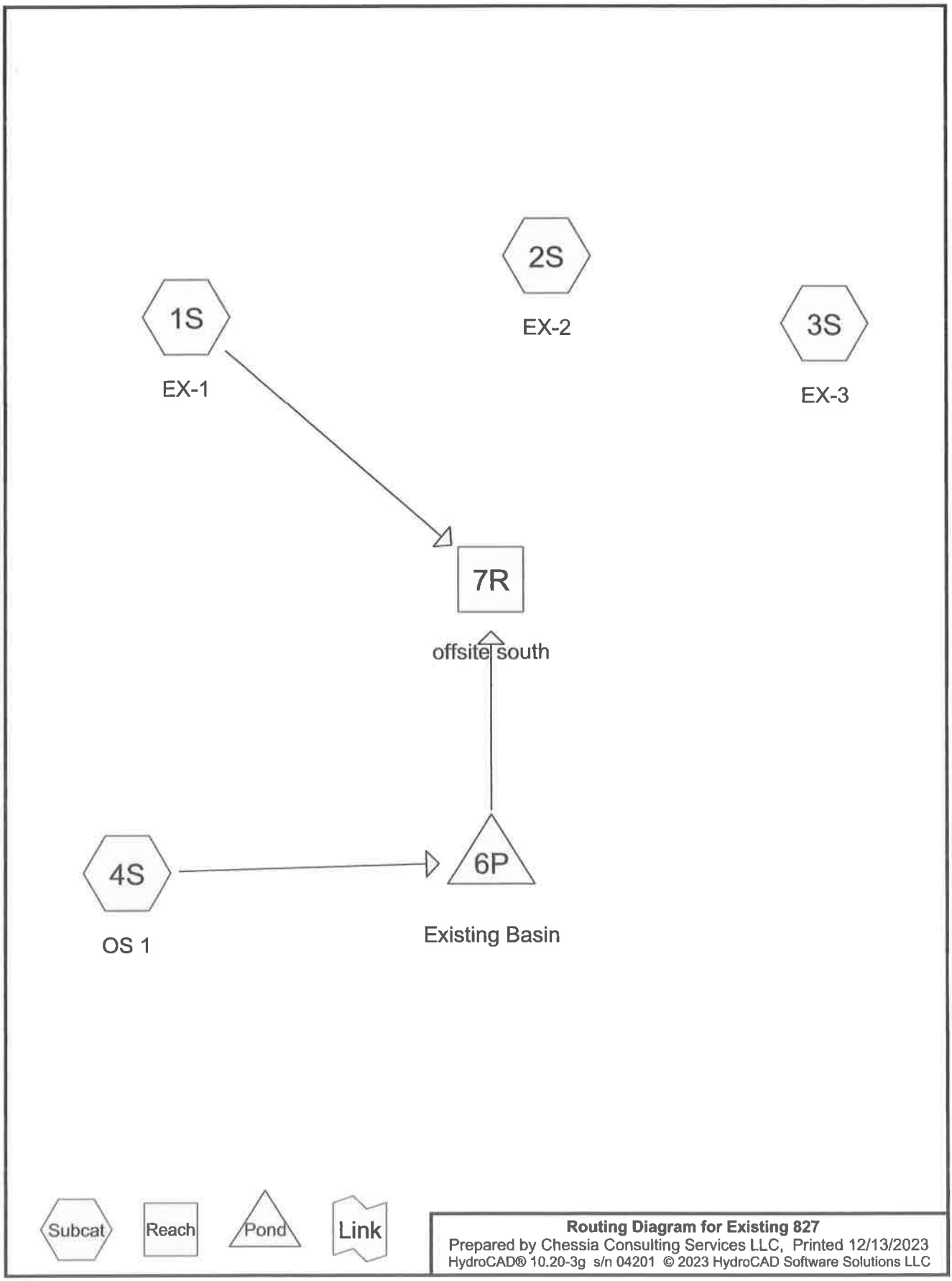
APPENDIX 7

EXISTING CONDITIONS

HYDROCAD MODEL



Routing Diagram for Existing 827

Prepared by Chessia Consulting Services LLC, Printed 12/13/2023

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr	Type III 24-hr		Default	24.00	1	3.27	2
2	10-yr	Type III 24-hr		Default	24.00	1	4.96	2
3	25-yr	Type III 24-hr		Default	24.00	1	6.29	2
4	50-yr	Type III 24-hr		Default	24.00	1	7.54	2
5	100-yr	Type III 24-hr		Default	24.00	1	9.06	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.934	39	>75% Grass cover, Good, HSG A (4S)
1.636	98	Paved parking, HSG A (4S)
0.493	98	Roofs, HSG A (4S)
0.143	98	Water Surface, HSG A Basin (4S)
5.001	30	Woods, Good, HSG A (1S, 2S, 3S, 4S)
10.207	**48**	**TOTAL AREA**

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 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 1S: EX-1 Runoff Area=196,713 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=682' Tc=13.7 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 2S: EX-2 Runoff Area=2,312 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 3S: EX-3 Runoff Area=3,273 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 4S: OS 1 Runoff Area=242,335 sf 40.85% Impervious Runoff Depth=0.55"
Flow Length=855' Tc=9.9 min CN=63 Runoff=2.27 cfs 0.255 af

Reach 7R: offsite south Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 6P: Existing Basin Peak Elev=220.76' Storage=3,654 cf Inflow=2.27 cfs 0.255 af
Discarded=0.42 cfs 0.184 af Primary=0.00 cfs 0.000 af Outflow=0.42 cfs 0.184 af

Total Runoff Area = 10.207 ac Runoff Volume = 0.255 af Average Runoff Depth = 0.30"
77.73% Pervious = 7.935 ac 22.27% Impervious = 2.273 ac

Summary for Subcatchment 1S: EX-1

[45] Hint: Runoff=Zero

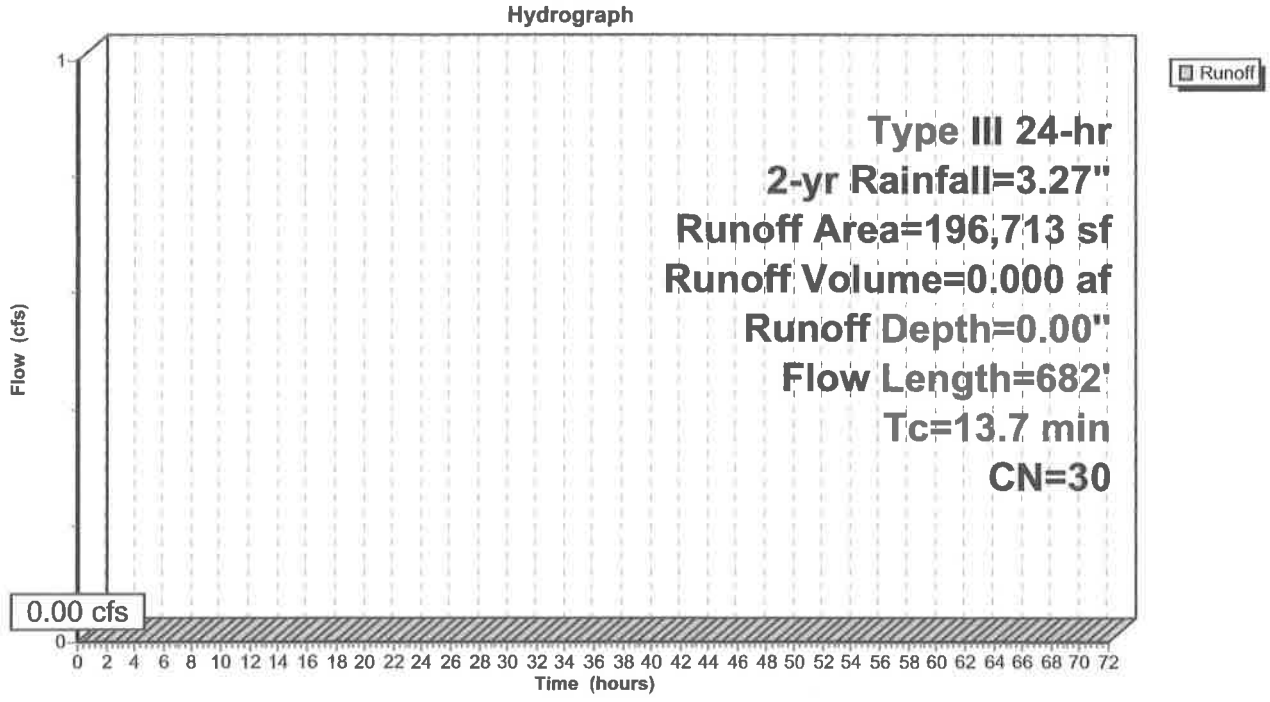
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach 7R : offsite south

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.27"

Area (sf)	CN	Description
196,713	30	Woods, Good, HSG A
196,713		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0830	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
6.7	632	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.7	682	Total			

Subcatchment 1S: EX-1



Summary for Subcatchment 2S: EX-2

[45] Hint: Runoff=Zero

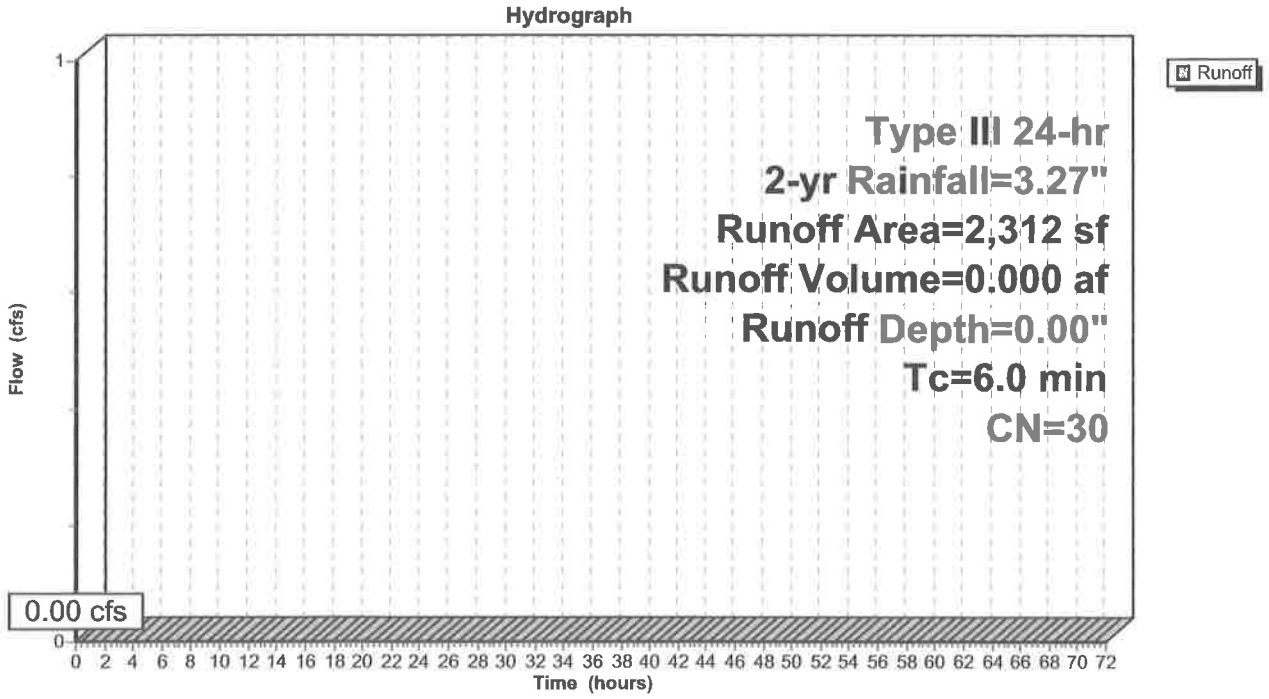
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.27"

Area (sf)	CN	Description
2,312	30	Woods, Good, HSG A
2,312		100.00% Pervious Area

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

Subcatchment 2S: EX-2



Summary for Subcatchment 3S: EX-3

[45] Hint: Runoff=Zero

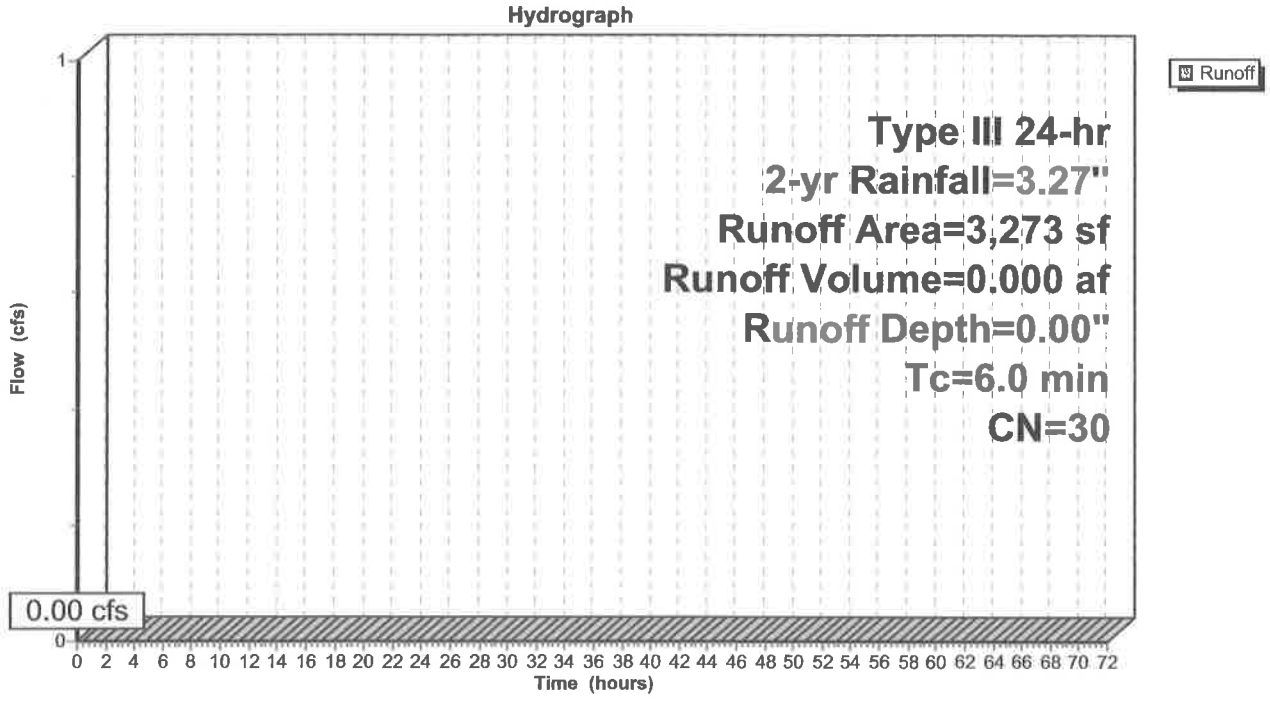
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.27"

Area (sf)	CN	Description
3,273	30	Woods, Good, HSG A
3,273		100.00% Pervious Area

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

Subcatchment 3S: EX-3



Summary for Subcatchment 4S: OS 1

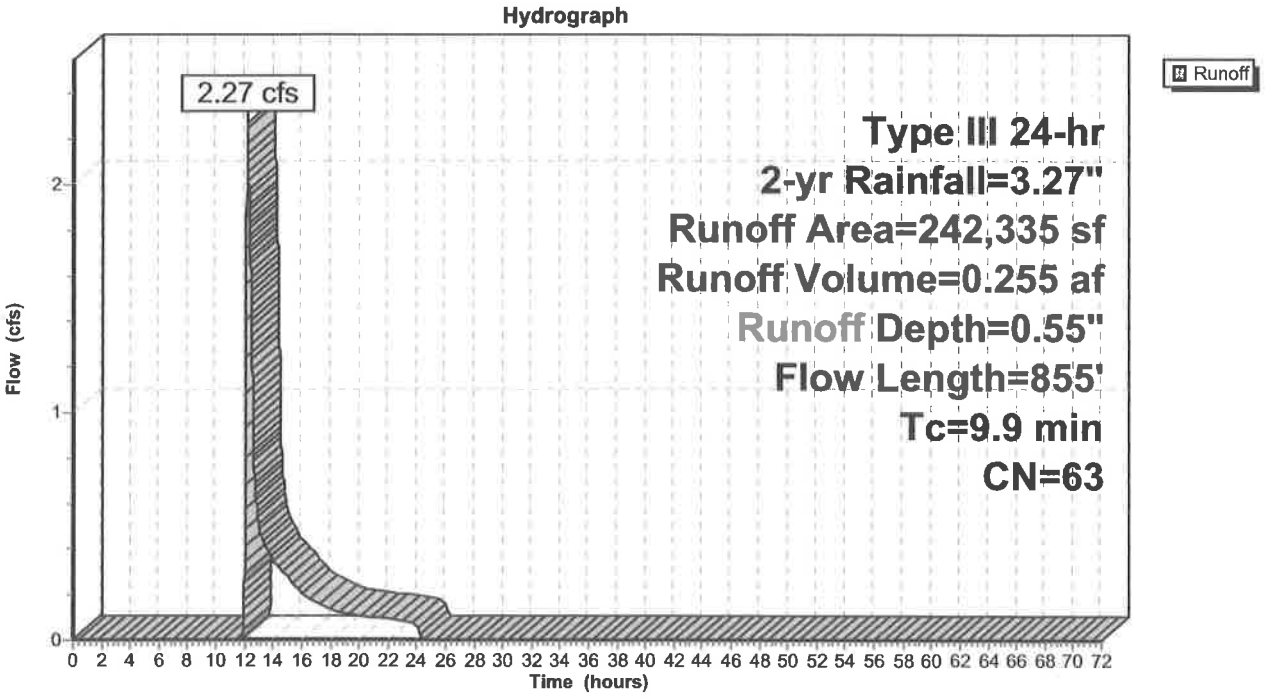
Runoff = 2.27 cfs @ 12.17 hrs, Volume= 0.255 af, Depth= 0.55"
Routed to Pond 6P : Existing Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.27"

	Area (sf)	CN	Description
	21,486	98	Roofs, HSG A
	15,524	30	Woods, Good, HSG A
	127,810	39	>75% Grass cover, Good, HSG A
*	6,241	98	Water Surface, HSG A Basin
	71,274	98	Paved parking, HSG A
	242,335	63	Weighted Average
	143,334		59.15% Pervious Area
	99,001		40.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0300	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
1.1	150	0.0120	2.22		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.5	475	0.0100	5.26	6.46	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
0.3	180	0.0290	10.12	17.89	**Pipe Channel, RCP_Round 18"** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
9.9	855	Total			

Subcatchment 4S: OS 1



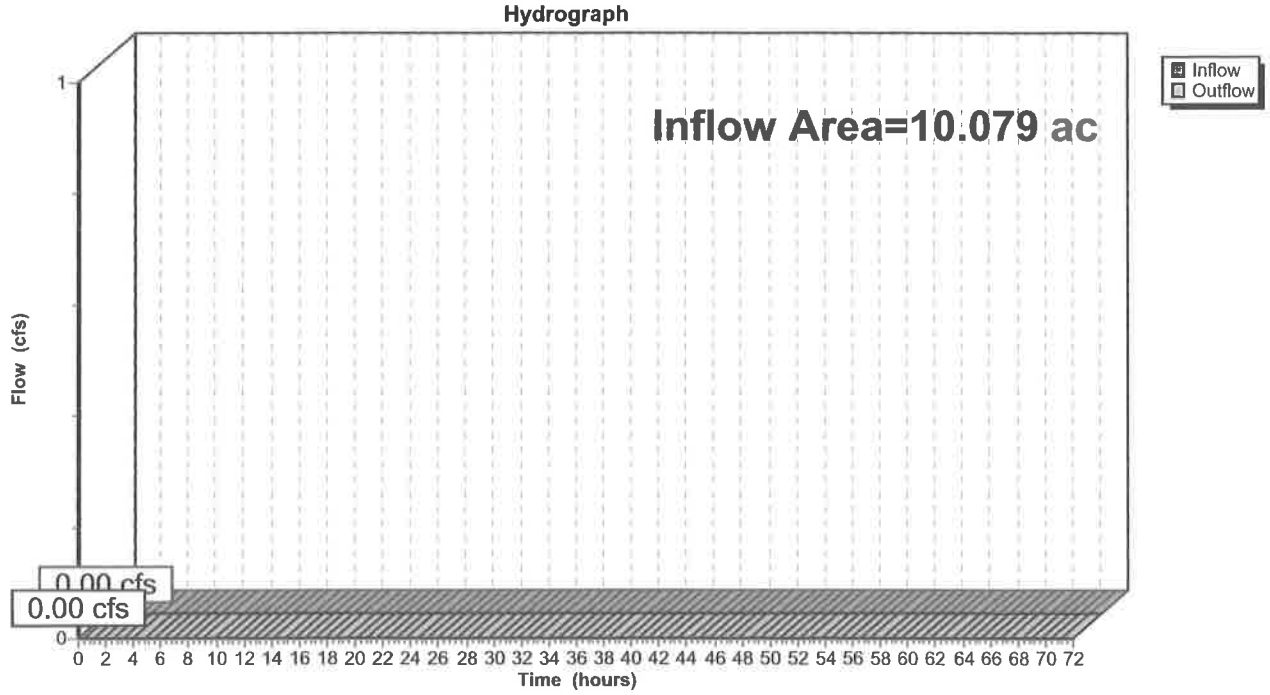
Summary for Reach 7R: offsite south

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 10.079 ac, 22.55% Impervious, Inflow Depth = 0.00" for 2-yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 7R: offsite south



Summary for Pond 6P: Existing Basin

Inflow Area = 5.563 ac, 40.85% Impervious, Inflow Depth = 0.55" for 2-yr event
Inflow = 2.27 cfs @ 12.17 hrs, Volume= 0.255 af
Outflow = 0.42 cfs @ 13.31 hrs, Volume= 0.184 af, Atten= 81%, Lag= 68.5 min
Discarded = 0.42 cfs @ 13.31 hrs, Volume= 0.184 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 7R : offsite south

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 220.76' @ 13.31 hrs Surf.Area= 2,649 sf Storage= 3,654 cf

Plug-Flow detention time= 179.8 min calculated for 0.184 af (72% of inflow)
Center-of-Mass det. time= 73.4 min (979.1 - 905.8)

Volume	Invert	Avail.Storage	Storage Description
#1	211.00'	111 cf	**10.00'D x 9.50'H Vertical Cone/Cylinder** 746 cf Overall - 467 cf Embedded = 279 cf x 40.0% Voids
#2	211.20'	467 cf	**8.00'D x 9.30'H Vertical Cone/Cylinder** Inside #1
#3	211.00'	117 cf	**10.00'D x 9.50'H Vertical Cone/Cylinder** 746 cf Overall - 452 cf Embedded = 294 cf x 40.0% Voids
#4	211.50'	452 cf	**8.00'D x 9.00'H Vertical Cone/Cylinder** Inside #3
#5	210.50'	107 cf	**10.00'D x 9.50'H Vertical Cone/Cylinder** 746 cf Overall - 478 cf Embedded = 269 cf x 40.0% Voids
#6	210.50'	478 cf	**8.00'D x 9.50'H Vertical Cone/Cylinder** Inside #5
#7	210.50'	123 cf	**10.00'D x 10.00'H Vertical Cone/Cylinder** 785 cf Overall - 478 cf Embedded = 308 cf x 40.0% Voids
#8	210.70'	478 cf	**8.00'D x 9.50'H Vertical Cone/Cylinder** Inside #7
#9	211.00'	298 cf	**10.00'D x 9.50'H Vertical Cone/Cylinder** 746 cf Overall x 40.0% Voids
#10	211.20'	467 cf	**8.00'D x 9.30'H Vertical Cone/Cylinder**
#11	220.50'	23,070 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		26,170 cf	Total Available Storage

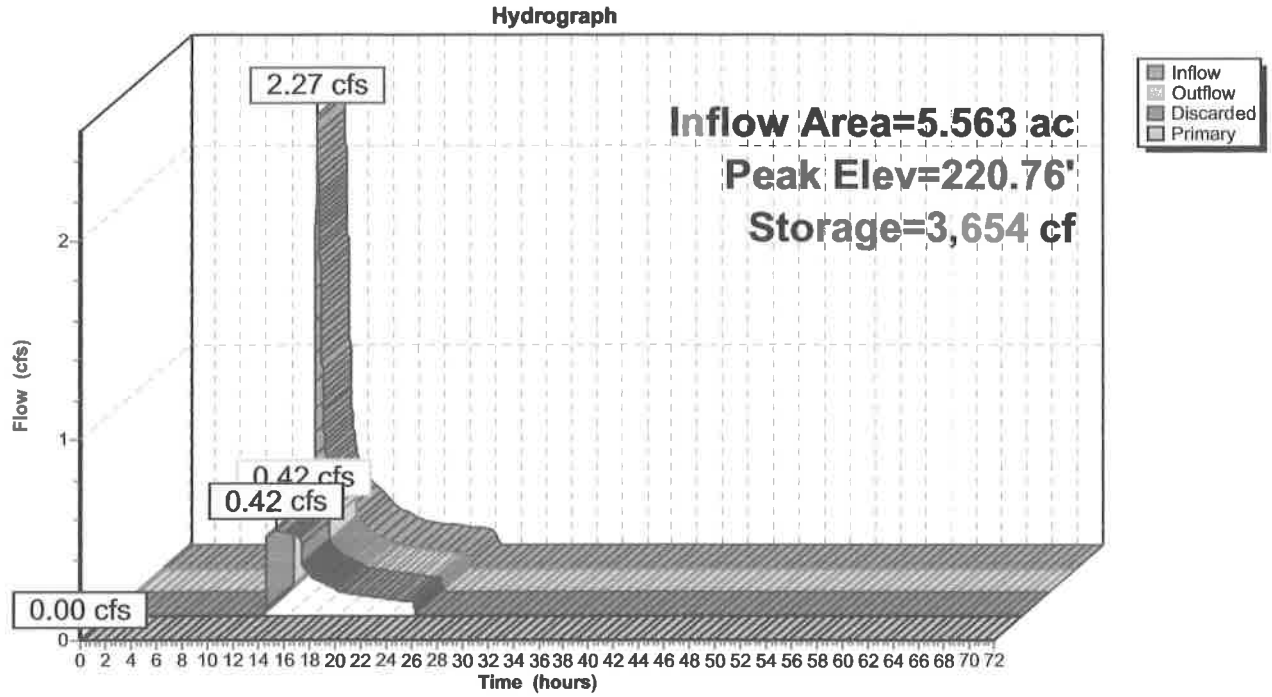
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
220.50	2,038	0	0
222.00	3,006	3,783	3,783
224.00	4,743	7,749	11,532
225.00	5,659	5,201	16,733
225.50	6,241	2,975	19,708
226.00	7,205	3,362	23,070

Device	Routing	Invert	Outlet Devices
#1	Discarded	220.49'	**8.270 in/hr Exfiltration over Surface area above 220.49'** Excluded Surface area = 443 sf
#2	Primary	225.00'	**10.0' long + 4.0 '/' SideZ x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.42 cfs @ 13.31 hrs HW=220.76' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.42 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=210.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Existing Basin



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 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 1S: EX-1 Runoff Area=196,713 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=682' Tc=13.7 min CN=30 Runoff=0.00 cfs 0.001 af

Subcatchment 2S: EX-2 Runoff Area=2,312 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 3S: EX-3 Runoff Area=3,273 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 4S: OS 1 Runoff Area=242,335 sf 40.85% Impervious Runoff Depth=1.48"
Flow Length=855' Tc=9.9 min CN=63 Runoff=7.85 cfs 0.688 af

Reach 7R: offsite south Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Pond 6P: Existing Basin Peak Elev=223.63' Storage=12,947 cf Inflow=7.85 cfs 0.688 af
Discarded=0.85 cfs 0.617 af Primary=0.00 cfs 0.000 af Outflow=0.85 cfs 0.617 af

Total Runoff Area = 10.207 ac Runoff Volume = 0.689 af Average Runoff Depth = 0.81"
77.73% Pervious = 7.935 ac 22.27% Impervious = 2.273 ac

Summary for Subcatchment 1S: EX-1

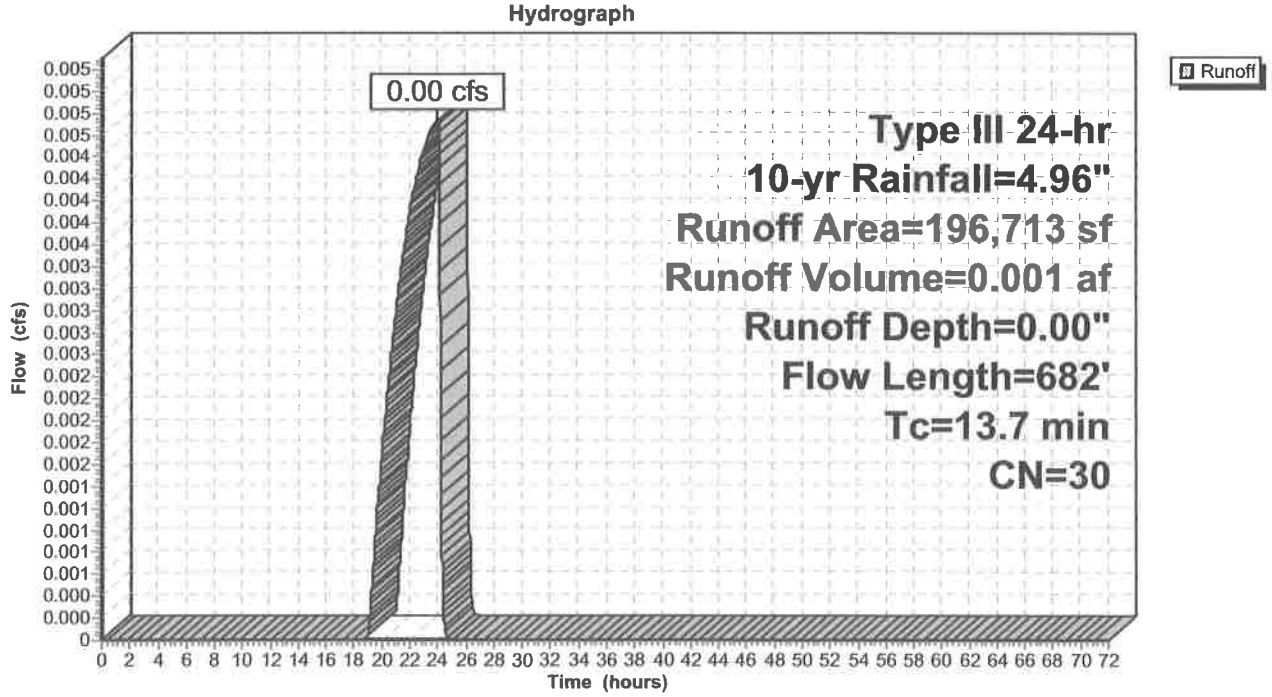
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.001 af, Depth= 0.00"
Routed to Reach 7R : offsite south

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.96"

Area (sf)	CN	Description
196,713	30	Woods, Good, HSG A
196,713		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0830	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
6.7	632	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.7	682	Total			

Subcatchment 1S: EX-1



Summary for Subcatchment 2S: EX-2

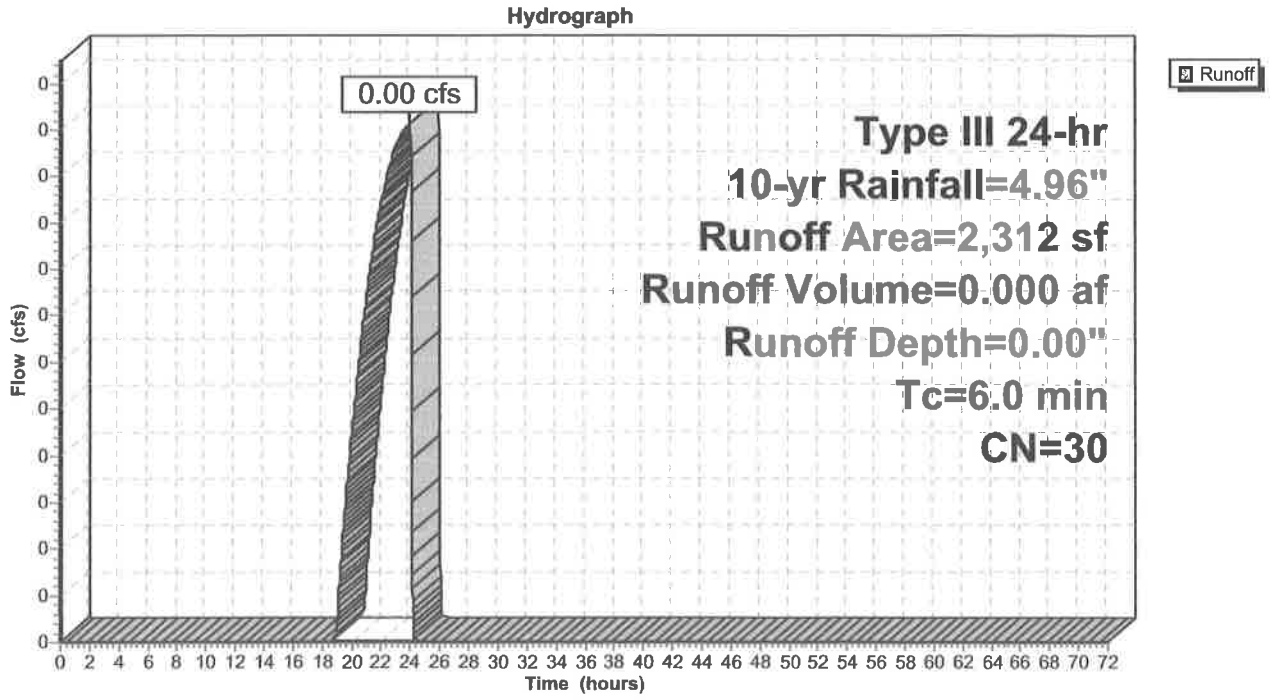
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.96"

Area (sf)	CN	Description
2,312	30	Woods, Good, HSG A
2,312		100.00% Pervious Area

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

Subcatchment 2S: EX-2



Summary for Subcatchment 3S: EX-3

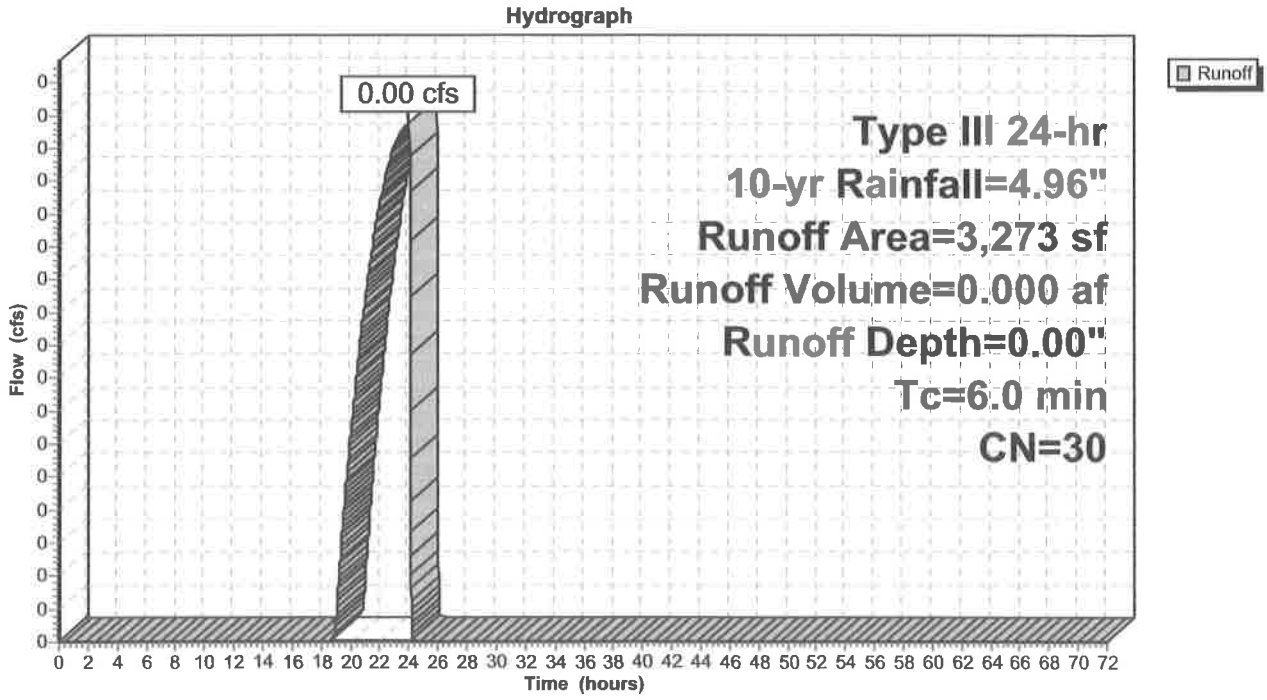
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.96"

Area (sf)	CN	Description
3,273	30	Woods, Good, HSG A
3,273		100.00% Pervious Area

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

Subcatchment 3S: EX-3



Summary for Subcatchment 4S: OS 1

[47] Hint: Peak is 121% of capacity of segment #3

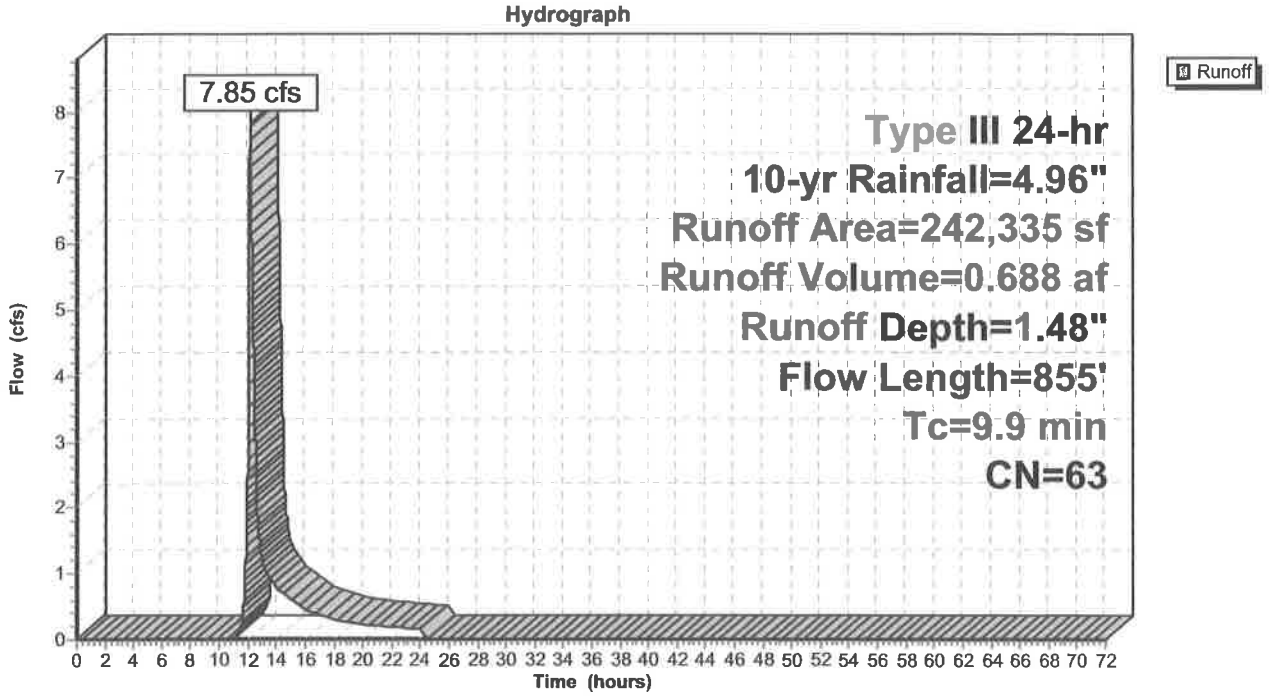
Runoff = 7.85 cfs @ 12.15 hrs, Volume= 0.688 af, Depth= 1.48"
Routed to Pond 6P : Existing Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=4.96"

	Area (sf)	CN	Description
	21,486	98	Roofs, HSG A
	15,524	30	Woods, Good, HSG A
	127,810	39	>75% Grass cover, Good, HSG A
*	6,241	98	Water Surface, HSG A Basin
	71,274	98	Paved parking, HSG A
	242,335	63	Weighted Average
	143,334		59.15% Pervious Area
	99,001		40.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0300	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
1.1	150	0.0120	2.22		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.5	475	0.0100	5.26	6.46	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
0.3	180	0.0290	10.12	17.89	**Pipe Channel, RCP_Round 18"** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
9.9	855	Total			

Subcatchment 4S: OS 1



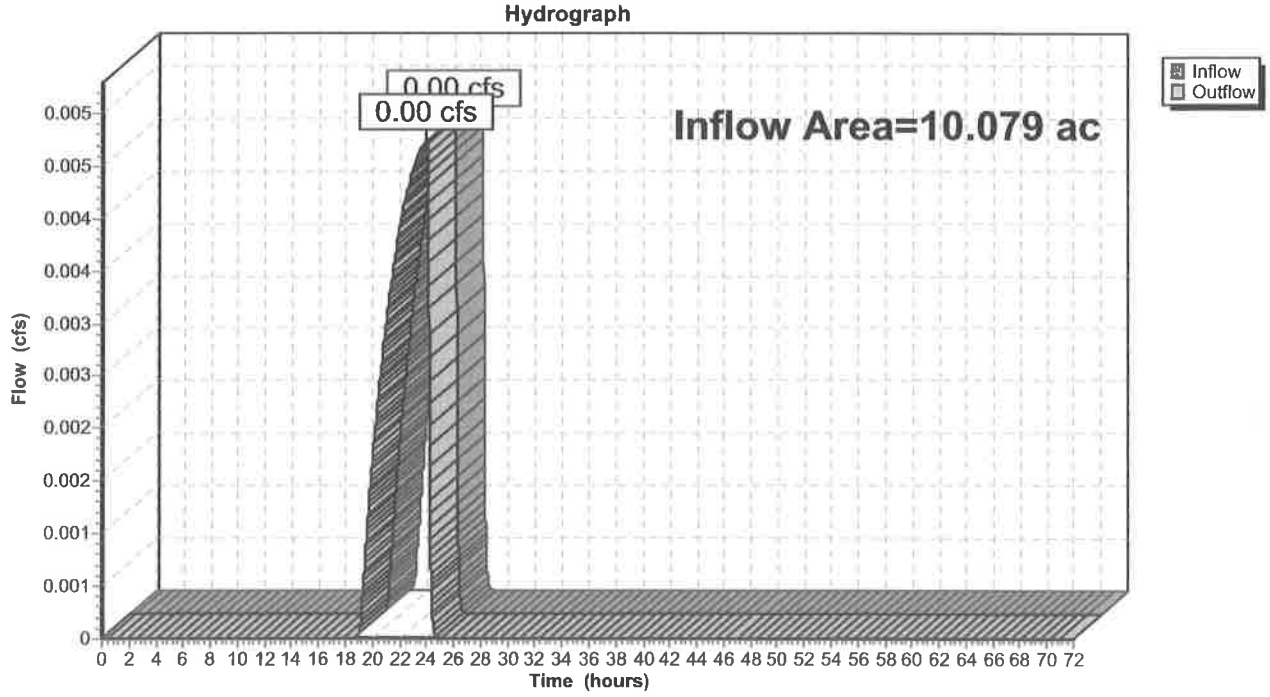
Summary for Reach 7R: offsite south

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 10.079 ac, 22.55% Impervious, Inflow Depth = 0.00" for 10-yr event
Inflow = 0.00 cfs @ 24.01 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 24.01 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 7R: offsite south



Summary for Pond 6P: Existing Basin

Inflow Area = 5.563 ac, 40.85% Impervious, Inflow Depth = 1.48" for 10-yr event
Inflow = 7.85 cfs @ 12.15 hrs, Volume= 0.688 af
Outflow = 0.85 cfs @ 13.84 hrs, Volume= 0.617 af, Atten= 89%, Lag= 101.1 min
Discarded = 0.85 cfs @ 13.84 hrs, Volume= 0.617 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach 7R : offsite south

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 223.63' @ 13.84 hrs Surf.Area= 4,867 sf Storage= 12,947 cf

Plug-Flow detention time= 206.1 min calculated for 0.617 af (90% of inflow)
Center-of-Mass det. time= 156.1 min (1,026.7 - 870.6)

Volume	Invert	Avail.Storage	Storage Description
#1	211.00'	111 cf	**10.00'D x 9.50'H Vertical Cone/Cylinder** 746 cf Overall - 467 cf Embedded = 279 cf x 40.0% Voids
#2	211.20'	467 cf	**8.00'D x 9.30'H Vertical Cone/Cylinder** Inside #1
#3	211.00'	117 cf	**10.00'D x 9.50'H Vertical Cone/Cylinder** 746 cf Overall - 452 cf Embedded = 294 cf x 40.0% Voids
#4	211.50'	452 cf	**8.00'D x 9.00'H Vertical Cone/Cylinder** Inside #3
#5	210.50'	107 cf	**10.00'D x 9.50'H Vertical Cone/Cylinder** 746 cf Overall - 478 cf Embedded = 269 cf x 40.0% Voids
#6	210.50'	478 cf	**8.00'D x 9.50'H Vertical Cone/Cylinder** Inside #5
#7	210.50'	123 cf	**10.00'D x 10.00'H Vertical Cone/Cylinder** 785 cf Overall - 478 cf Embedded = 308 cf x 40.0% Voids
#8	210.70'	478 cf	**8.00'D x 9.50'H Vertical Cone/Cylinder** Inside #7
#9	211.00'	298 cf	**10.00'D x 9.50'H Vertical Cone/Cylinder** 746 cf Overall x 40.0% Voids
#10	211.20'	467 cf	**8.00'D x 9.30'H Vertical Cone/Cylinder**
#11	220.50'	23,070 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		26,170 cf	Total Available Storage

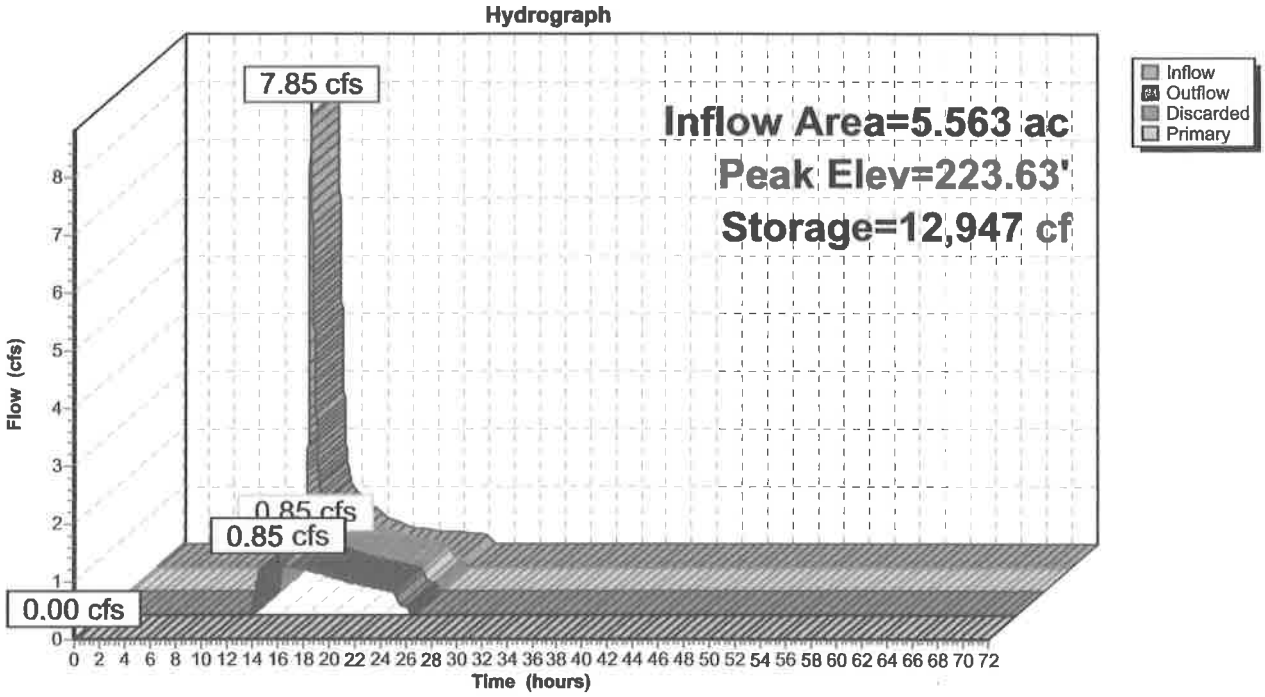
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
220.50	2,038	0	0
222.00	3,006	3,783	3,783
224.00	4,743	7,749	11,532
225.00	5,659	5,201	16,733
225.50	6,241	2,975	19,708
226.00	7,205	3,362	23,070

Device	Routing	Invert	Outlet Devices
#1	Discarded	220.49'	**8.270 in/hr Exfiltration over Surface area above 220.49'** Excluded Surface area = 443 sf
#2	Primary	225.00'	**10.0' long + 4.0 '/' SideZ x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.85 cfs @ 13.84 hrs HW=223.63' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.85 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=210.50' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 6P: Existing Basin



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 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 1S: EX-1 Runoff Area=196,713 sf 0.00% Impervious Runoff Depth=0.11"
Flow Length=682' Tc=13.7 min CN=30 Runoff=0.06 cfs 0.040 af

Subcatchment 2S: EX-2 Runoff Area=2,312 sf 0.00% Impervious Runoff Depth=0.11"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment 3S: EX-3 Runoff Area=3,273 sf 0.00% Impervious Runoff Depth=0.11"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0.001 af

Subcatchment 4S: OS 1 Runoff Area=242,335 sf 40.85% Impervious Runoff Depth=2.38"
Flow Length=855' Tc=9.9 min CN=63 Runoff=13.19 cfs 1.104 af

Reach 7R: offsite south Inflow=1.41 cfs 0.124 af
Outflow=1.41 cfs 0.124 af

Pond 6P: Existing Basin Peak Elev=225.14' Storage=20,614 cf Inflow=13.19 cfs 1.104 af
Discarded=1.11 cfs 0.948 af Primary=1.41 cfs 0.085 af Outflow=2.52 cfs 1.033 af

Total Runoff Area = 10.207 ac Runoff Volume = 1.145 af Average Runoff Depth = 1.35"
77.73% Pervious = 7.935 ac 22.27% Impervious = 2.273 ac

Summary for Subcatchment 1S: EX-1

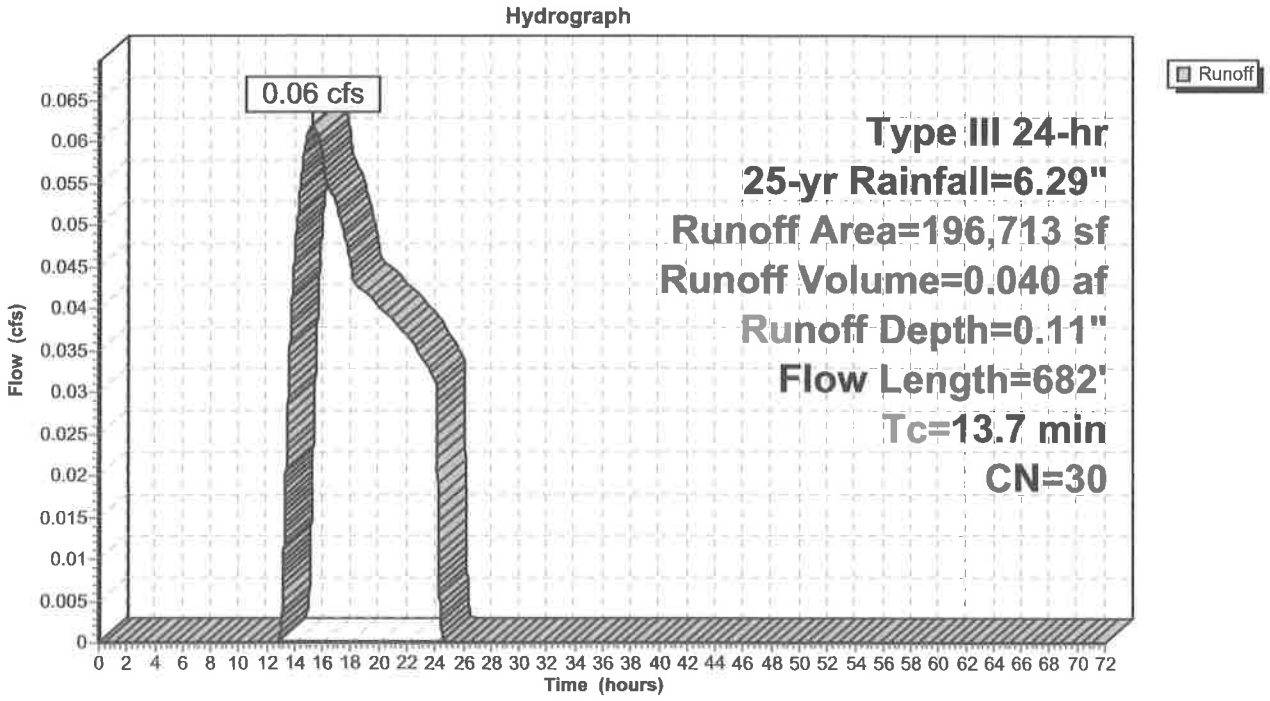
Runoff = 0.06 cfs @ 15.27 hrs, Volume= 0.040 af, Depth= 0.11"
Routed to Reach 7R : offsite south

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=6.29"

Area (sf)	CN	Description
196,713	30	Woods, Good, HSG A
196,713		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0830	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
6.7	632	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.7	682	Total			

Subcatchment 1S: EX-1



Summary for Subcatchment 2S: EX-2

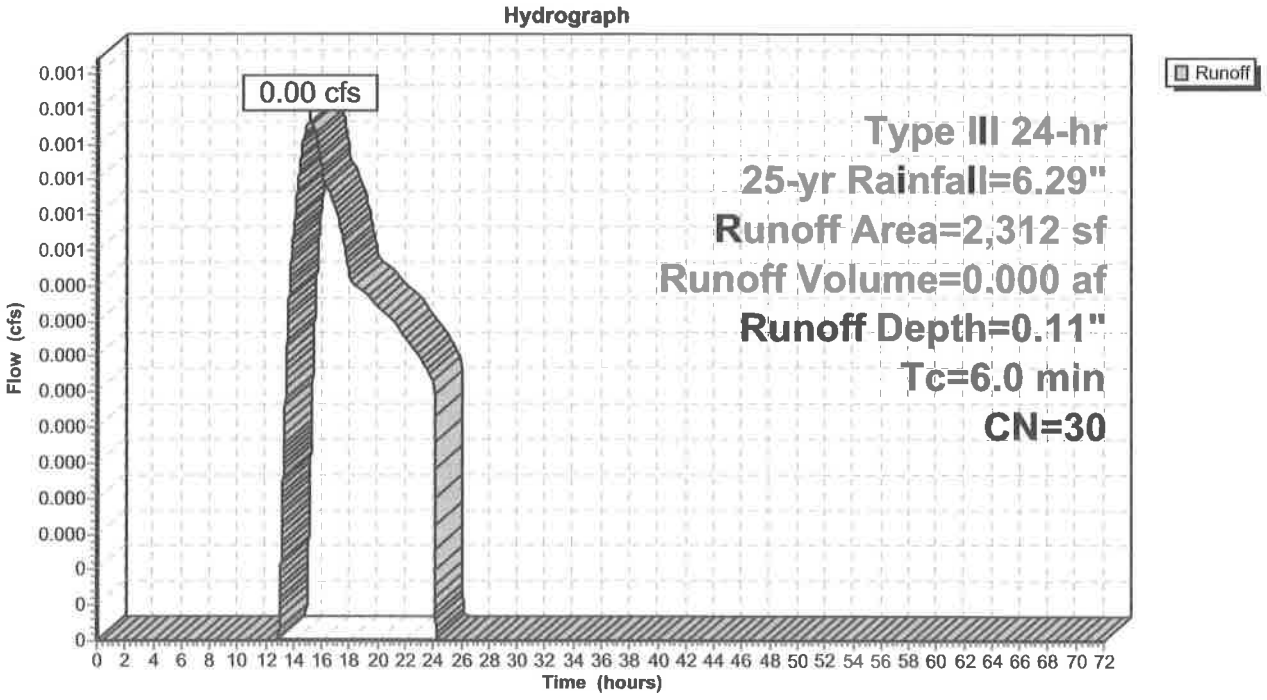
Runoff = 0.00 cfs @ 15.14 hrs, Volume= 0.000 af, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=6.29"

Area (sf)	CN	Description
2,312	30	Woods, Good, HSG A
2,312		100.00% Pervious Area

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

Subcatchment 2S: EX-2



Summary for Subcatchment 3S: EX-3

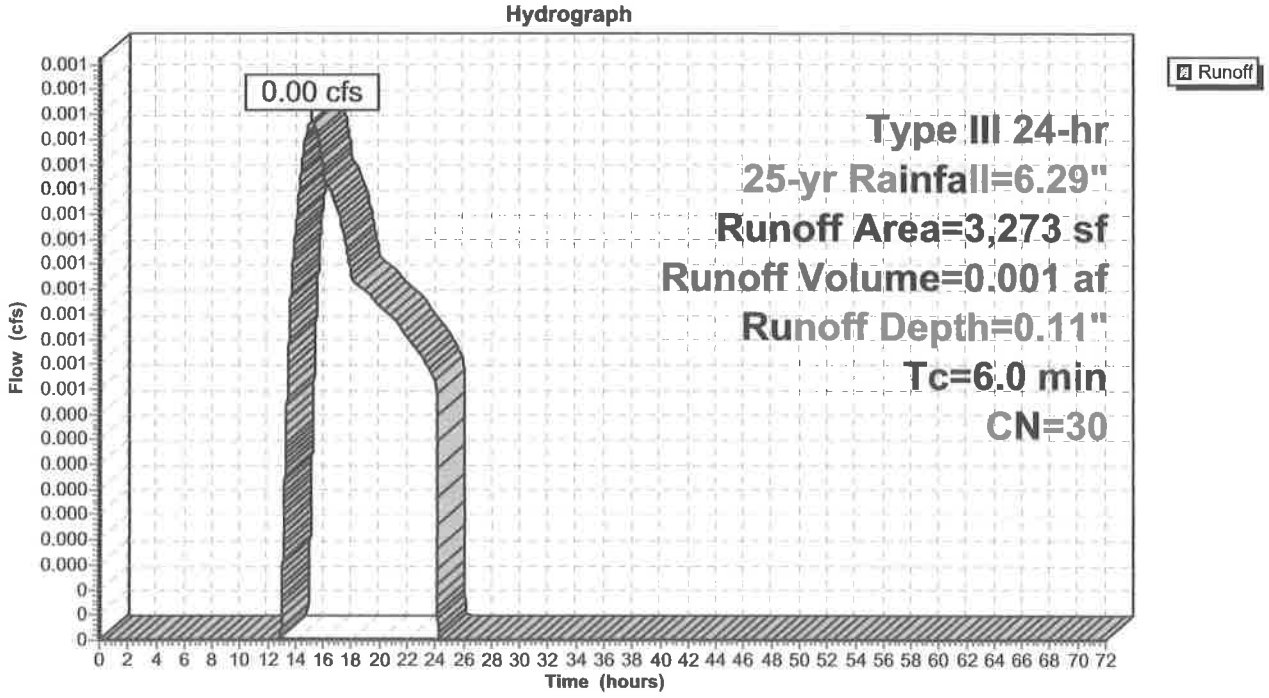
Runoff = 0.00 cfs @ 15.14 hrs, Volume= 0.001 af, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=6.29"

Area (sf)	CN	Description
3,273	30	Woods, Good, HSG A
3,273		100.00% Pervious Area

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

Subcatchment 3S: EX-3



Summary for Subcatchment 4S: OS 1

[47] Hint: Peak is 204% of capacity of segment #3

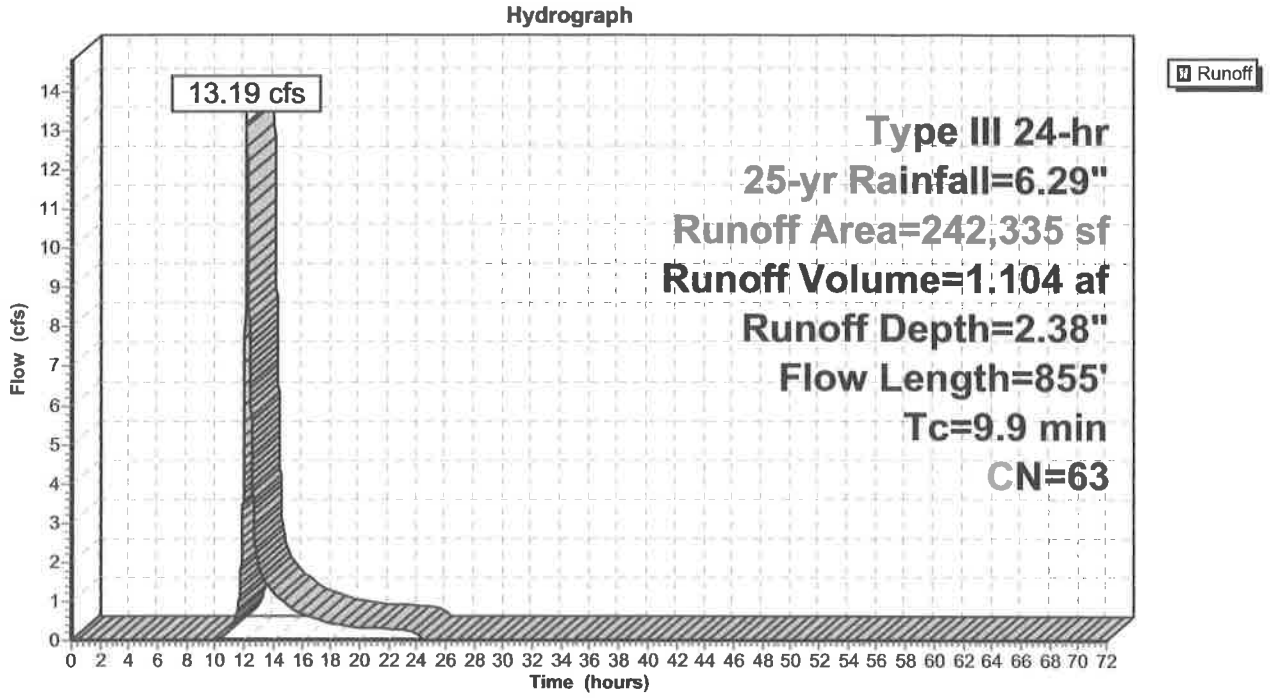
Runoff = 13.19 cfs @ 12.15 hrs, Volume= 1.104 af, Depth= 2.38"
Routed to Pond 6P : Existing Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-yr Rainfall=6.29"

	Area (sf)	CN	Description
	21,486	98	Roofs, HSG A
	15,524	30	Woods, Good, HSG A
	127,810	39	>75% Grass cover, Good, HSG A
*	6,241	98	Water Surface, HSG A Basin
	71,274	98	Paved parking, HSG A
	242,335	63	Weighted Average
	143,334		59.15% Pervious Area
	99,001		40.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0300	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
1.1	150	0.0120	2.22		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.5	475	0.0100	5.26	6.46	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
0.3	180	0.0290	10.12	17.89	**Pipe Channel, RCP_Round 18"** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
9.9	855	Total			

Subcatchment 4S: OS 1



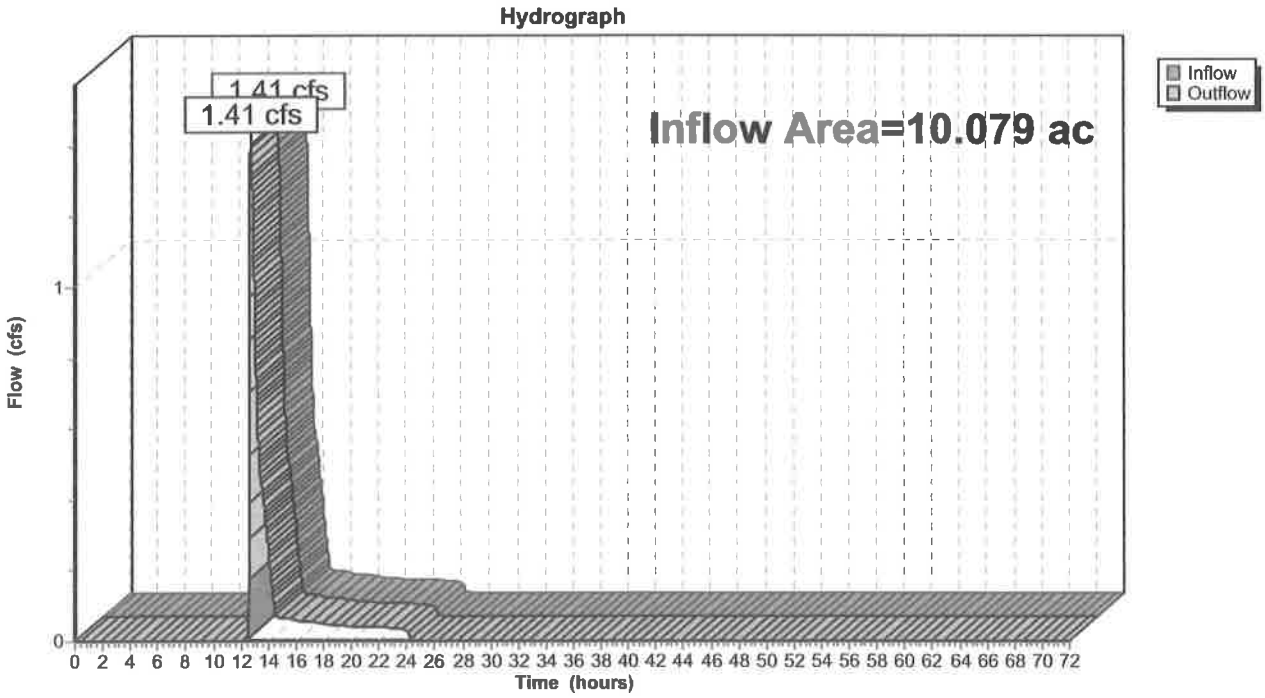
Summary for Reach 7R: offsite south

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 10.079 ac, 22.55% Impervious, Inflow Depth = 0.15" for 25-yr event
Inflow = 1.41 cfs @ 12.72 hrs, Volume= 0.124 af
Outflow = 1.41 cfs @ 12.72 hrs, Volume= 0.124 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 7R: offsite south



Summary for Pond 6P: Existing Basin

Inflow Area = 5.563 ac, 40.85% Impervious, Inflow Depth = 2.38" for 25-yr event
Inflow = 13.19 cfs @ 12.15 hrs, Volume= 1.104 af
Outflow = 2.52 cfs @ 12.72 hrs, Volume= 1.033 af, Atten= 81%, Lag= 34.2 min
Discarded = 1.11 cfs @ 12.72 hrs, Volume= 0.948 af
Primary = 1.41 cfs @ 12.72 hrs, Volume= 0.085 af
Routed to Reach 7R : offsite south

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 225.14' @ 12.72 hrs Surf.Area= 6,260 sf Storage= 20,614 cf

Plug-Flow detention time= 227.5 min calculated for 1.033 af (94% of inflow)
Center-of-Mass det. time= 194.0 min (1,050.0 - 856.0)

Volume	Invert	Avail.Storage	Storage Description
#1	211.00'	111 cf	**10.00'D x 9.50'H Vertical Cone/Cylinder** 746 cf Overall - 467 cf Embedded = 279 cf x 40.0% Voids
#2	211.20'	467 cf	**8.00'D x 9.30'H Vertical Cone/Cylinder** Inside #1
#3	211.00'	117 cf	**10.00'D x 9.50'H Vertical Cone/Cylinder** 746 cf Overall - 452 cf Embedded = 294 cf x 40.0% Voids
#4	211.50'	452 cf	**8.00'D x 9.00'H Vertical Cone/Cylinder** Inside #3
#5	210.50'	107 cf	**10.00'D x 9.50'H Vertical Cone/Cylinder** 746 cf Overall - 478 cf Embedded = 269 cf x 40.0% Voids
#6	210.50'	478 cf	**8.00'D x 9.50'H Vertical Cone/Cylinder** Inside #5
#7	210.50'	123 cf	**10.00'D x 10.00'H Vertical Cone/Cylinder** 785 cf Overall - 478 cf Embedded = 308 cf x 40.0% Voids
#8	210.70'	478 cf	**8.00'D x 9.50'H Vertical Cone/Cylinder** Inside #7
#9	211.00'	298 cf	**10.00'D x 9.50'H Vertical Cone/Cylinder** 746 cf Overall x 40.0% Voids
#10	211.20'	467 cf	**8.00'D x 9.30'H Vertical Cone/Cylinder**
#11	220.50'	23,070 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		26,170 cf	Total Available Storage

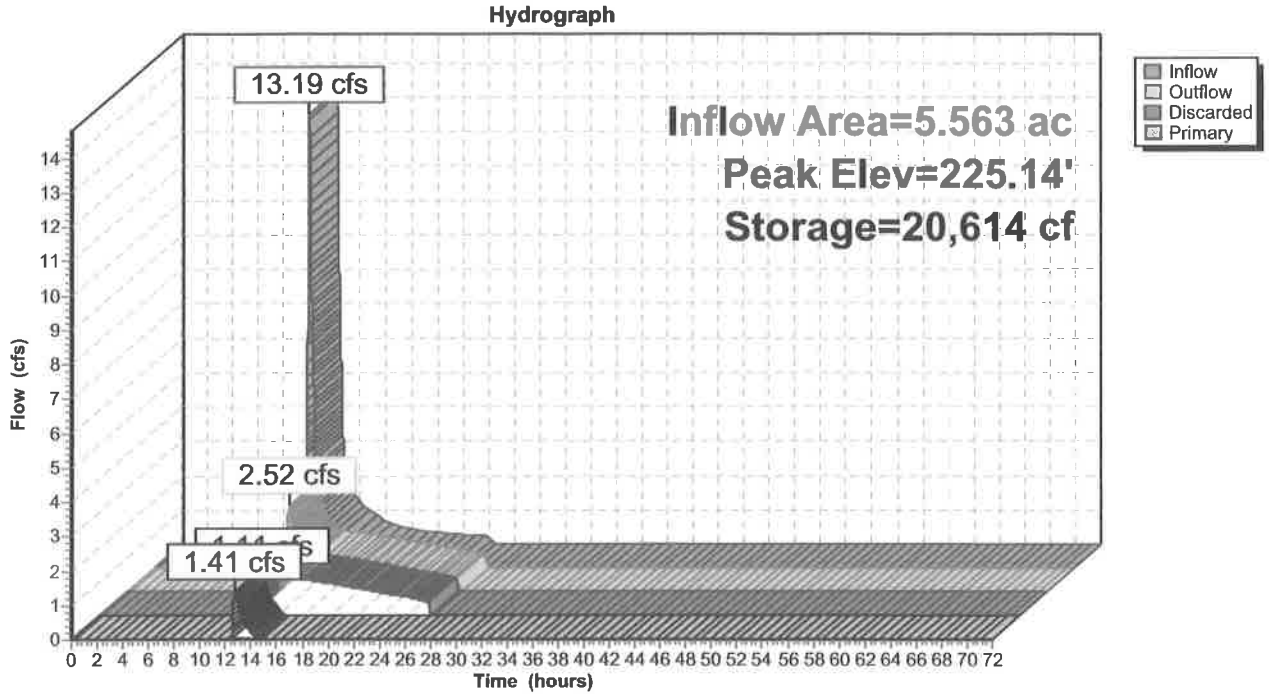
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
220.50	2,038	0	0
222.00	3,006	3,783	3,783
224.00	4,743	7,749	11,532
225.00	5,659	5,201	16,733
225.50	6,241	2,975	19,708
226.00	7,205	3,362	23,070

Device	Routing	Invert	Outlet Devices
#1	Discarded	220.49'	**8.270 in/hr Exfiltration over Surface area above 220.49'** Excluded Surface area = 443 sf
#2	Primary	225.00'	**10.0' long + 4.0 '/' SideZ x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=1.11 cfs @ 12.72 hrs HW=225.14' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 1.11 cfs)

Primary OutFlow Max=1.23 cfs @ 12.72 hrs HW=225.14' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 1.23 cfs @ 0.85 fps)

Pond 6P: Existing Basin



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 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 1S: EX-1 Runoff Area=196,713 sf 0.00% Impervious Runoff Depth=0.32"
Flow Length=682' Tc=13.7 min CN=30 Runoff=0.25 cfs 0.119 af

Subcatchment 2S: EX-2 Runoff Area=2,312 sf 0.00% Impervious Runoff Depth=0.32"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0.001 af

Subcatchment 3S: EX-3 Runoff Area=3,273 sf 0.00% Impervious Runoff Depth=0.32"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0.002 af

Subcatchment 4S: OS 1 Runoff Area=242,335 sf 40.85% Impervious Runoff Depth=3.31"
Flow Length=855' Tc=9.9 min CN=63 Runoff=18.68 cfs 1.535 af

Reach 7R: offsite south Inflow=8.80 cfs 0.516 af
Outflow=8.80 cfs 0.516 af

Pond 6P: Existing Basin Peak Elev=225.44' Storage=22,459 cf Inflow=18.68 cfs 1.535 af
Discarded=1.18 cfs 1.066 af Primary=8.72 cfs 0.398 af Outflow=9.91 cfs 1.464 af

Total Runoff Area = 10.207 ac Runoff Volume = 1.657 af Average Runoff Depth = 1.95"
77.73% Pervious = 7.935 ac 22.27% Impervious = 2.273 ac

Summary for Subcatchment 1S: EX-1

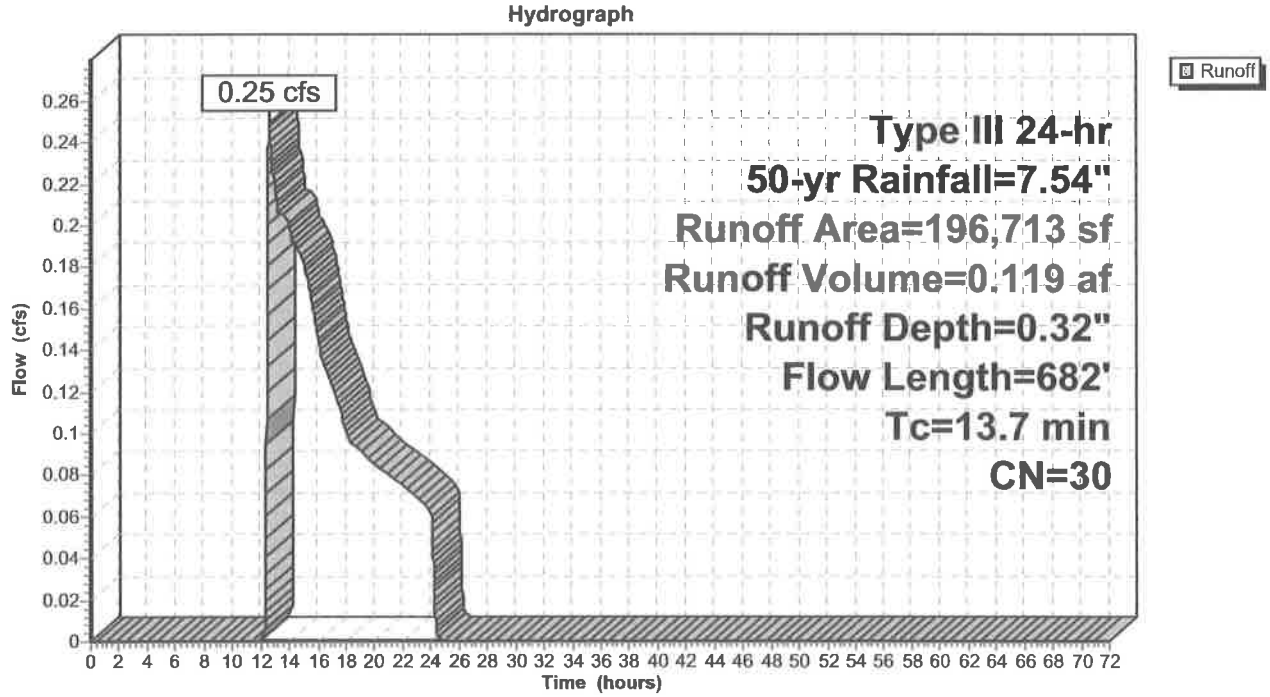
Runoff = 0.25 cfs @ 12.59 hrs, Volume= 0.119 af, Depth= 0.32"
Routed to Reach 7R : offsite south

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-yr Rainfall=7.54"

Area (sf)	CN	Description
196,713	30	Woods, Good, HSG A
196,713		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0830	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
6.7	632	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.7	682	Total			

Subcatchment 1S: EX-1



Summary for Subcatchment 2S: EX-2

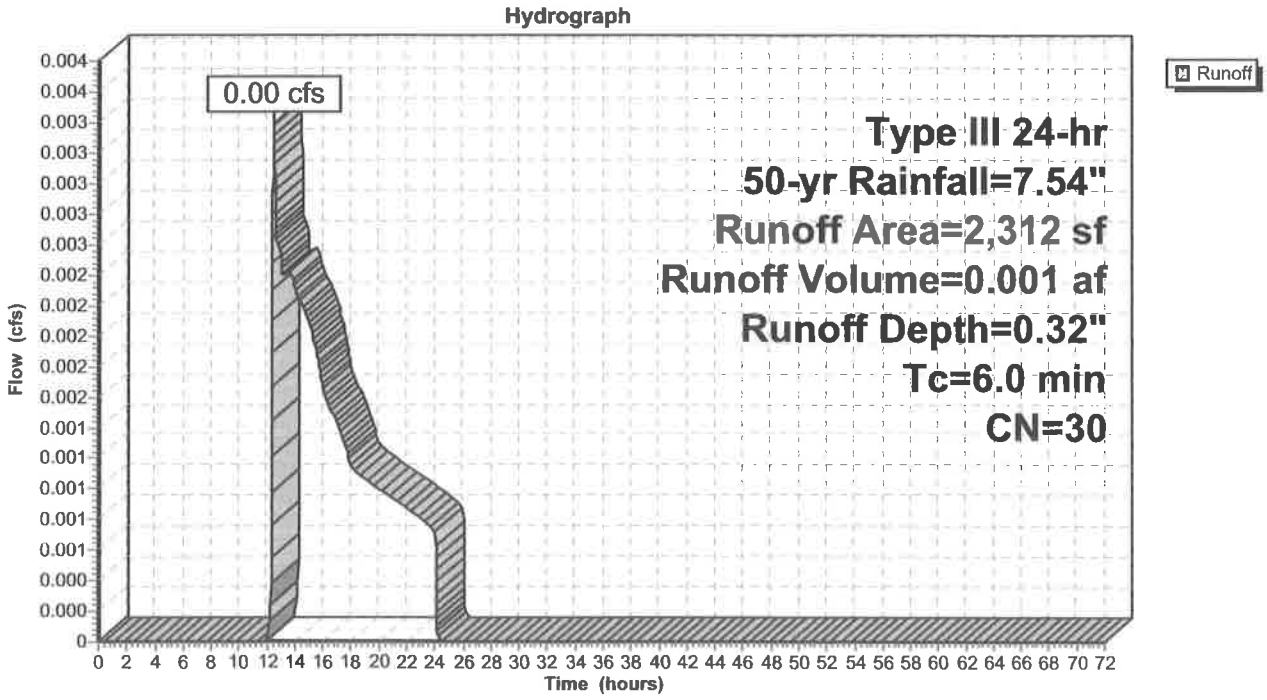
Runoff = 0.00 cfs @ 12.47 hrs, Volume= 0.001 af, Depth= 0.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-yr Rainfall=7.54"

Area (sf)	CN	Description
2,312	30	Woods, Good, HSG A
2,312		100.00% Pervious Area

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

Subcatchment 2S: EX-2



Summary for Subcatchment 3S: EX-3

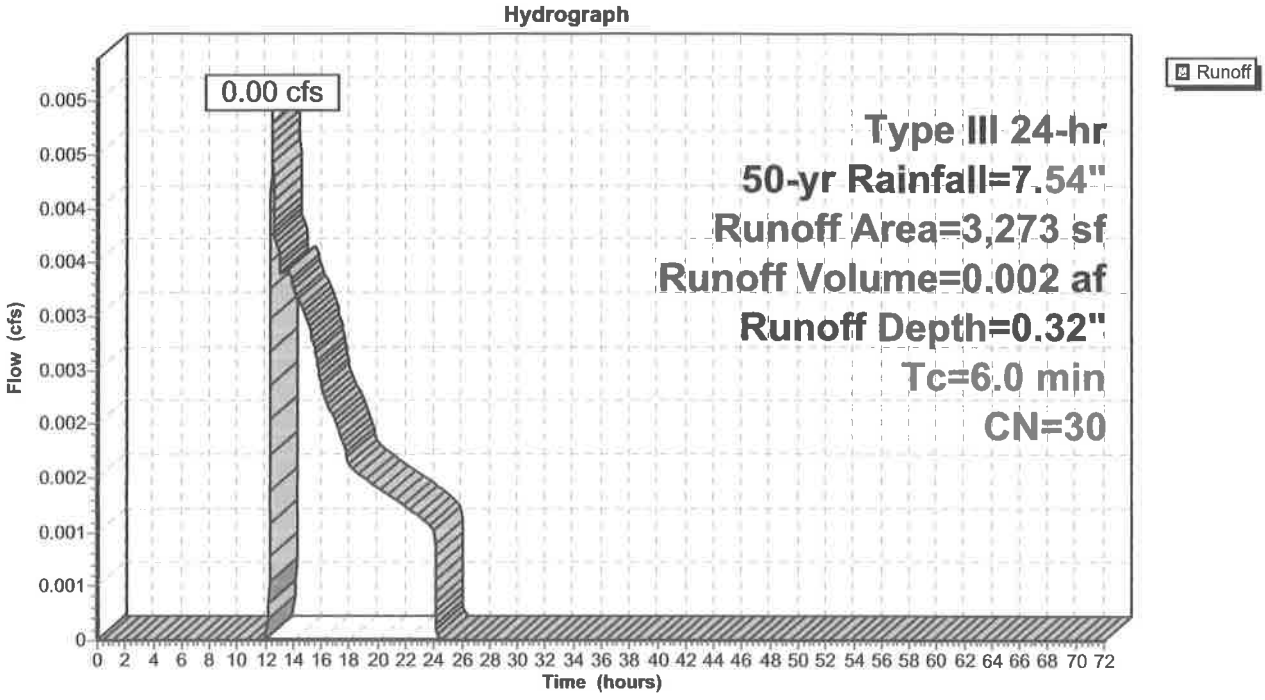
Runoff = 0.00 cfs @ 12.47 hrs, Volume= 0.002 af, Depth= 0.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-yr Rainfall=7.54"

Area (sf)	CN	Description
3,273	30	Woods, Good, HSG A
3,273		100.00% Pervious Area

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

Subcatchment 3S: EX-3



Summary for Subcatchment 4S: OS 1

[47] Hint: Peak is 289% of capacity of segment #3
[47] Hint: Peak is 104% of capacity of segment #4

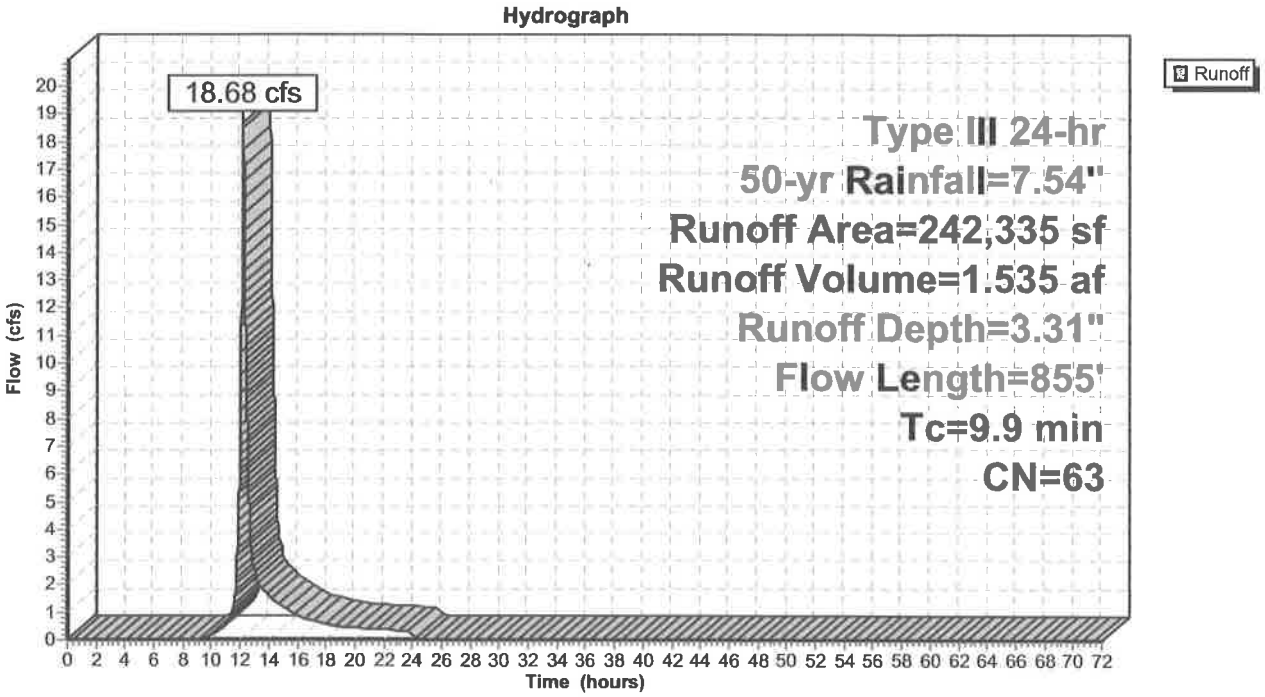
Runoff = 18.68 cfs @ 12.14 hrs, Volume= 1.535 af, Depth= 3.31"
Routed to Pond 6P : Existing Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-yr Rainfall=7.54"

	Area (sf)	CN	Description
	21,486	98	Roofs, HSG A
	15,524	30	Woods, Good, HSG A
	127,810	39	>75% Grass cover, Good, HSG A
*	6,241	98	Water Surface, HSG A Basin
	71,274	98	Paved parking, HSG A
	242,335	63	Weighted Average
	143,334		59.15% Pervious Area
	99,001		40.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0300	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
1.1	150	0.0120	2.22		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.5	475	0.0100	5.26	6.46	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
0.3	180	0.0290	10.12	17.89	**Pipe Channel, RCP_Round 18"** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
9.9	855	Total			

Subcatchment 4S: OS 1



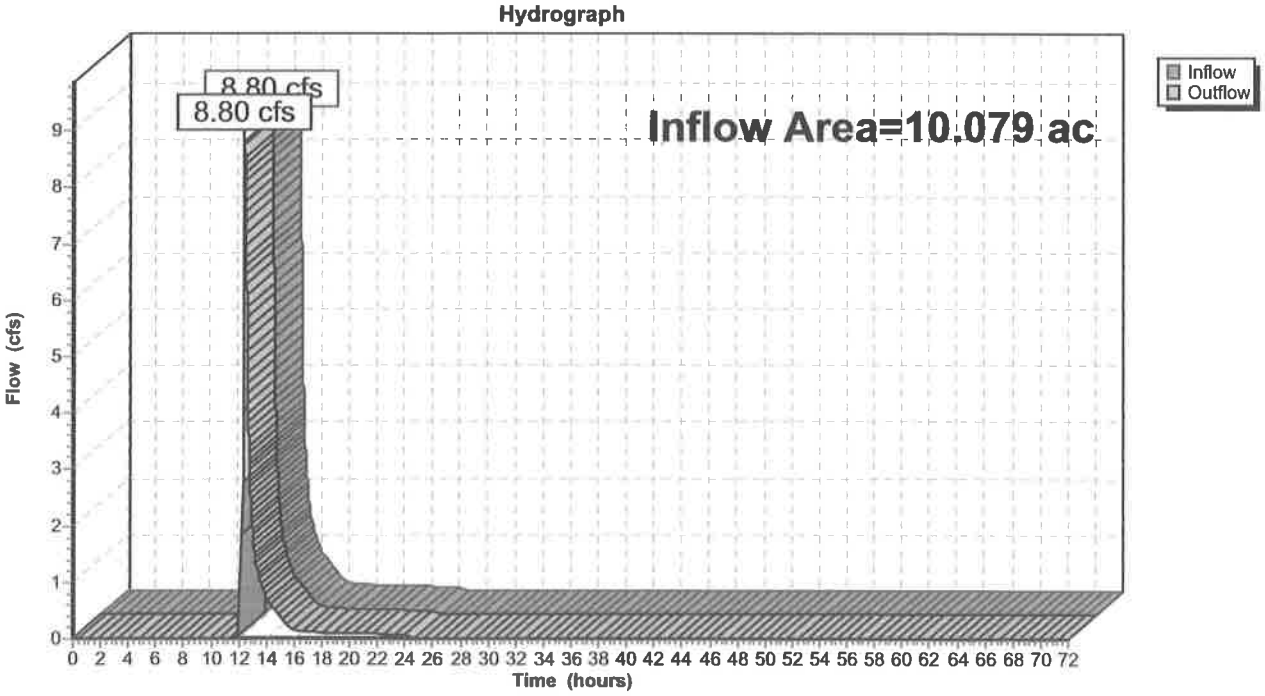
Summary for Reach 7R: offsite south

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 10.079 ac, 22.55% Impervious, Inflow Depth = 0.61" for 50-yr event
Inflow = 8.80 cfs @ 12.37 hrs, Volume= 0.516 af
Outflow = 8.80 cfs @ 12.37 hrs, Volume= 0.516 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 7R: offsite south



Summary for Pond 6P: Existing Basin

Inflow Area = 5.563 ac, 40.85% Impervious, Inflow Depth = 3.31" for 50-yr event
Inflow = 18.68 cfs @ 12.14 hrs, Volume= 1.535 af
Outflow = 9.91 cfs @ 12.37 hrs, Volume= 1.464 af, Atten= 47%, Lag= 13.6 min
Discarded = 1.18 cfs @ 12.37 hrs, Volume= 1.066 af
Primary = 8.72 cfs @ 12.37 hrs, Volume= 0.398 af
Routed to Reach 7R : offsite south

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 225.44' @ 12.37 hrs Surf.Area= 6,618 sf Storage= 22,459 cf

Plug-Flow detention time= 184.9 min calculated for 1.464 af (95% of inflow)
Center-of-Mass det. time= 159.7 min (1,005.9 - 846.2)

Volume	Invert	Avail.Storage	Storage Description
#1	211.00'	111 cf	**10.00'D x 9.50'H Vertical Cone/Cylinder** 746 cf Overall - 467 cf Embedded = 279 cf x 40.0% Voids
#2	211.20'	467 cf	**8.00'D x 9.30'H Vertical Cone/Cylinder** Inside #1
#3	211.00'	117 cf	**10.00'D x 9.50'H Vertical Cone/Cylinder** 746 cf Overall - 452 cf Embedded = 294 cf x 40.0% Voids
#4	211.50'	452 cf	**8.00'D x 9.00'H Vertical Cone/Cylinder** Inside #3
#5	210.50'	107 cf	**10.00'D x 9.50'H Vertical Cone/Cylinder** 746 cf Overall - 478 cf Embedded = 269 cf x 40.0% Voids
#6	210.50'	478 cf	**8.00'D x 9.50'H Vertical Cone/Cylinder** Inside #5
#7	210.50'	123 cf	**10.00'D x 10.00'H Vertical Cone/Cylinder** 785 cf Overall - 478 cf Embedded = 308 cf x 40.0% Voids
#8	210.70'	478 cf	**8.00'D x 9.50'H Vertical Cone/Cylinder** Inside #7
#9	211.00'	298 cf	**10.00'D x 9.50'H Vertical Cone/Cylinder** 746 cf Overall x 40.0% Voids
#10	211.20'	467 cf	**8.00'D x 9.30'H Vertical Cone/Cylinder**
#11	220.50'	23,070 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
		26,170 cf	Total Available Storage

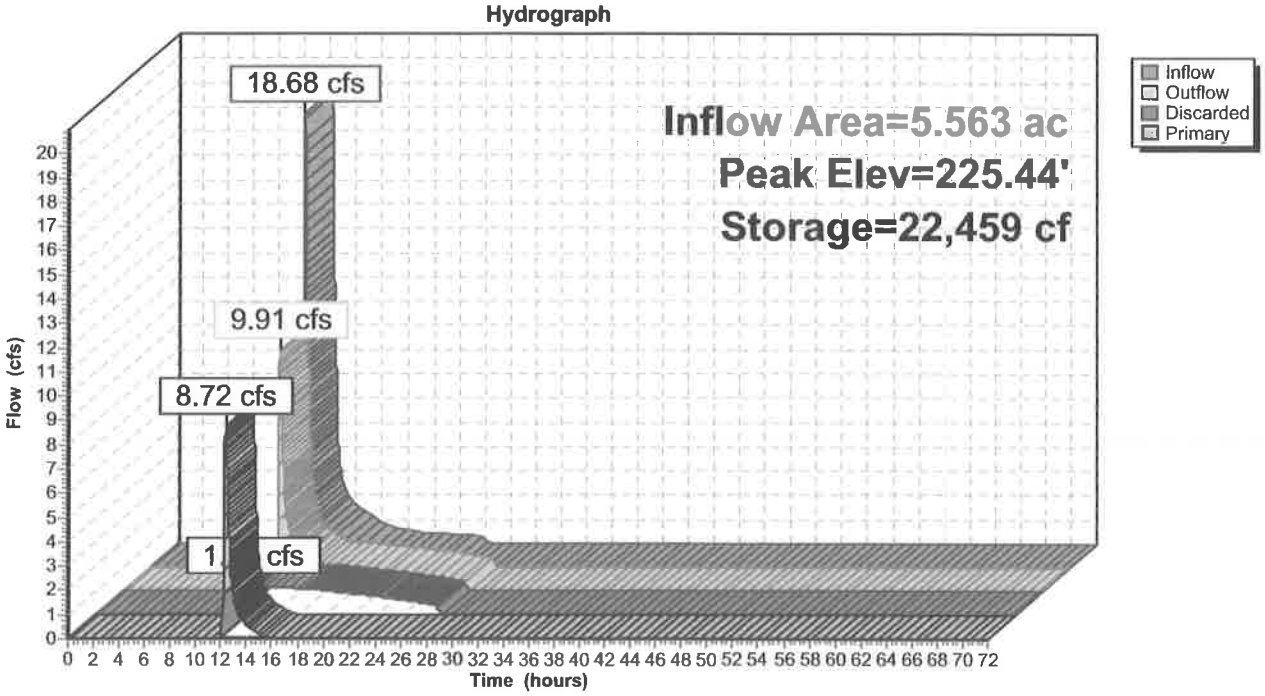
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
220.50	2,038	0	0
222.00	3,006	3,783	3,783
224.00	4,743	7,749	11,532
225.00	5,659	5,201	16,733
225.50	6,241	2,975	19,708
226.00	7,205	3,362	23,070

Device	Routing	Invert	Outlet Devices
#1	Discarded	220.49'	**8.270 in/hr Exfiltration over Surface area above 220.49'** Excluded Surface area = 443 sf
#2	Primary	225.00'	**10.0' long + 4.0 '/' SideZ x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=1.18 cfs @ 12.37 hrs HW=225.44' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 1.18 cfs)

Primary OutFlow Max=8.59 cfs @ 12.37 hrs HW=225.44' (Free Discharge)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 8.59 cfs @ 1.64 fps)

Pond 6P: Existing Basin



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 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 1S: EX-1 Runoff Area=196,713 sf 0.00% Impervious Runoff Depth=0.70"
Flow Length=682' Tc=13.7 min CN=30 Runoff=1.18 cfs 0.262 af

Subcatchment 2S: EX-2 Runoff Area=2,312 sf 0.00% Impervious Runoff Depth=0.70"
Tc=6.0 min CN=30 Runoff=0.02 cfs 0.003 af

Subcatchment 3S: EX-3 Runoff Area=3,273 sf 0.00% Impervious Runoff Depth=0.70"
Tc=6.0 min CN=30 Runoff=0.02 cfs 0.004 af

Subcatchment 4S: OS 1 Runoff Area=242,335 sf 40.85% Impervious Runoff Depth=4.52"
Flow Length=855' Tc=9.9 min CN=63 Runoff=25.75 cfs 2.095 af

Reach 7R: offsite south Inflow=19.72 cfs 1.094 af
Outflow=19.72 cfs 1.094 af

Pond 6P: Existing Basin Peak Elev=225.70' Storage=24,073 cf Inflow=25.75 cfs 2.095 af
Discarded=1.27 cfs 1.193 af Primary=19.15 cfs 0.832 af Outflow=20.42 cfs 2.024 af

Total Runoff Area = 10.207 ac Runoff Volume = 2.365 af Average Runoff Depth = 2.78"
77.73% Pervious = 7.935 ac 22.27% Impervious = 2.273 ac

Summary for Subcatchment 1S: EX-1

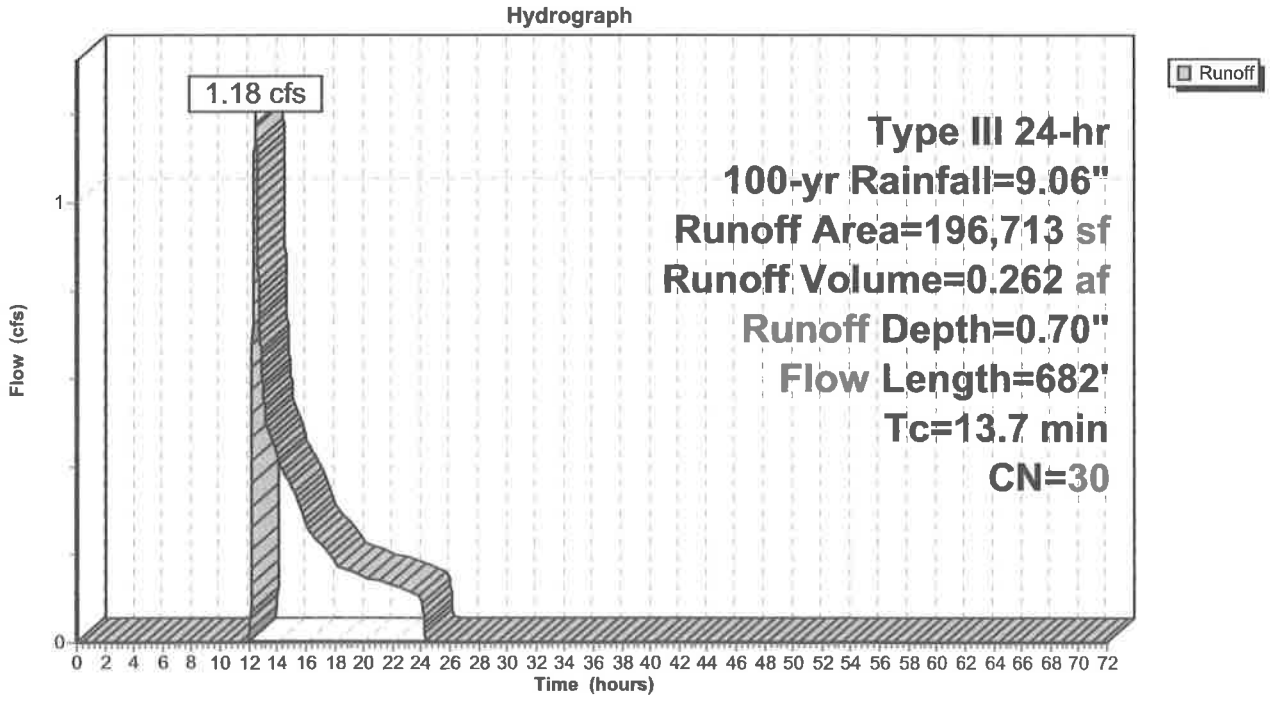
Runoff = 1.18 cfs @ 12.46 hrs, Volume= 0.262 af, Depth= 0.70"
Routed to Reach 7R : offsite south

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=9.06"

Area (sf)	CN	Description
196,713	30	Woods, Good, HSG A
196,713		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0830	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
6.7	632	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.7	682	Total			

Subcatchment 1S: EX-1



Summary for Subcatchment 2S: EX-2

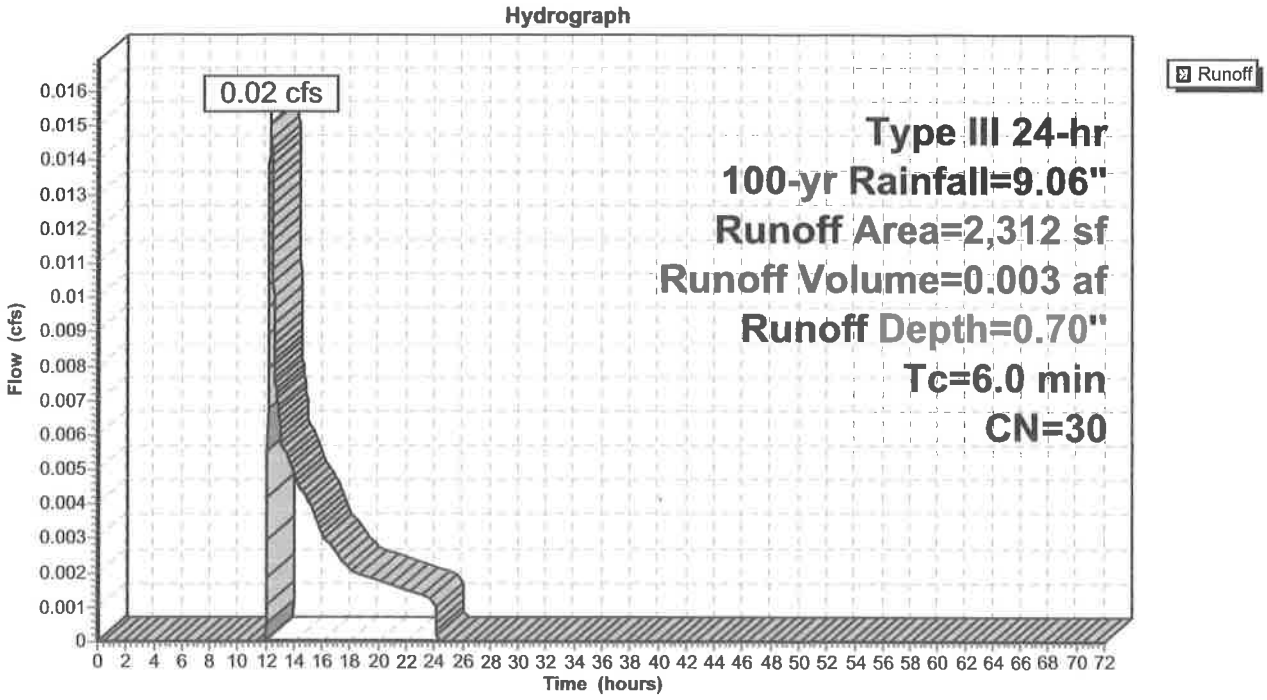
Runoff = 0.02 cfs @ 12.34 hrs, Volume= 0.003 af, Depth= 0.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=9.06"

Area (sf)	CN	Description
2,312	30	Woods, Good, HSG A
2,312		100.00% Pervious Area

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

Subcatchment 2S: EX-2



Summary for Subcatchment 3S: EX-3

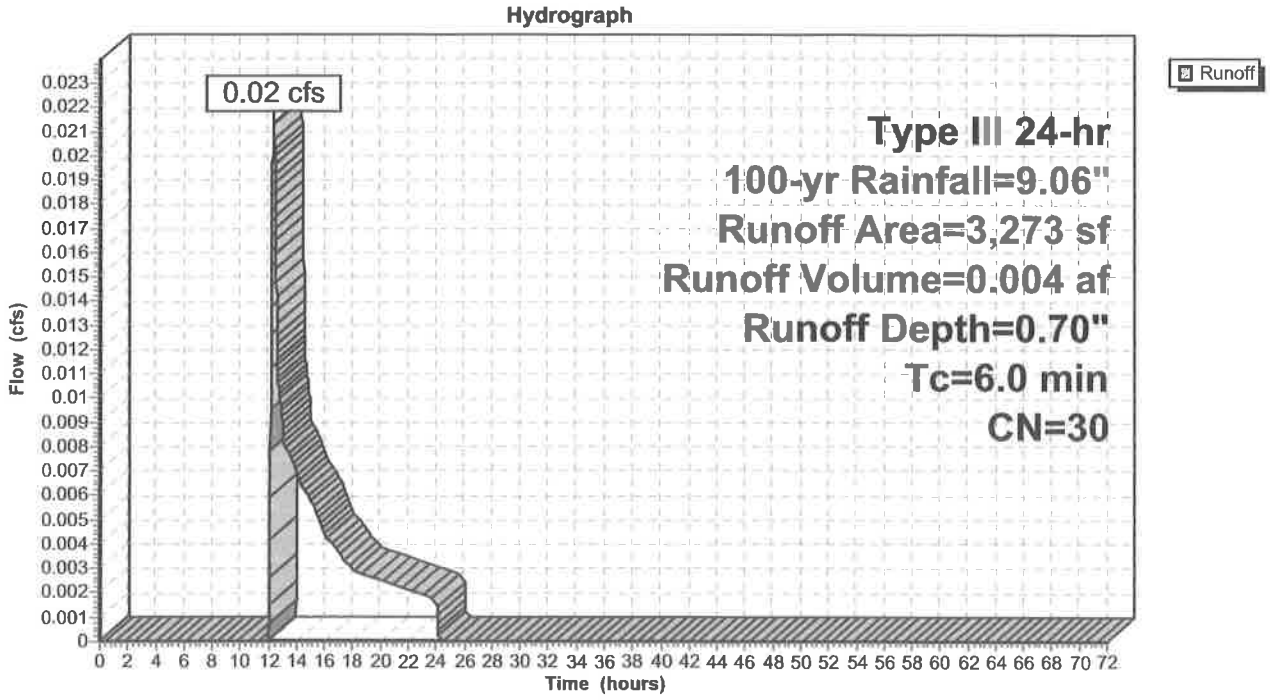
Runoff = 0.02 cfs @ 12.34 hrs, Volume= 0.004 af, Depth= 0.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=9.06"

Area (sf)	CN	Description
3,273	30	Woods, Good, HSG A
3,273		100.00% Pervious Area

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

Subcatchment 3S: EX-3



Summary for Subcatchment 4S: OS 1

[47] Hint: Peak is 399% of capacity of segment #3
[47] Hint: Peak is 144% of capacity of segment #4

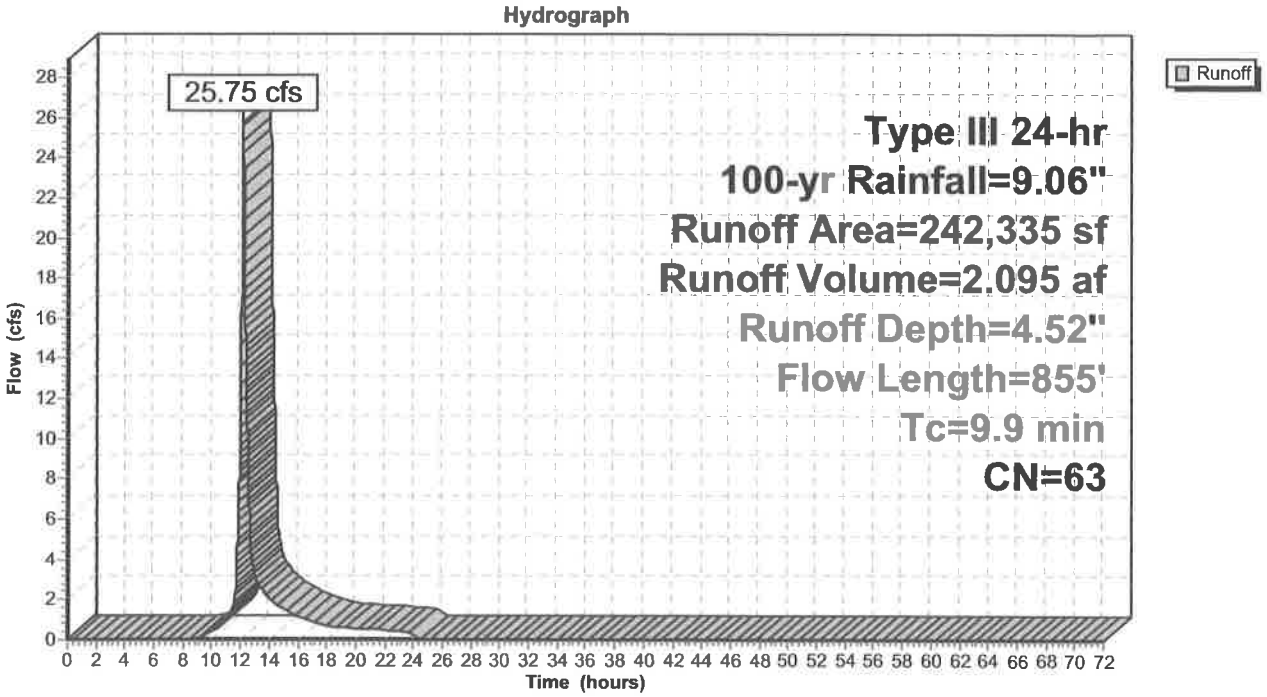
Runoff = 25.75 cfs @ 12.14 hrs, Volume= 2.095 af, Depth= 4.52"
Routed to Pond 6P : Existing Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=9.06"

	Area (sf)	CN	Description
	21,486	98	Roofs, HSG A
	15,524	30	Woods, Good, HSG A
	127,810	39	>75% Grass cover, Good, HSG A
*	6,241	98	Water Surface, HSG A Basin
	71,274	98	Paved parking, HSG A
	242,335	63	Weighted Average
	143,334		59.15% Pervious Area
	99,001		40.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	50	0.0300	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.20"
1.1	150	0.0120	2.22		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.5	475	0.0100	5.26	6.46	**Pipe Channel, RCP_Round 15"** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.013 Concrete pipe, bends & connections
0.3	180	0.0290	10.12	17.89	**Pipe Channel, RCP_Round 18"** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.013 Concrete pipe, bends & connections
9.9	855	Total			

Subcatchment 4S: OS 1



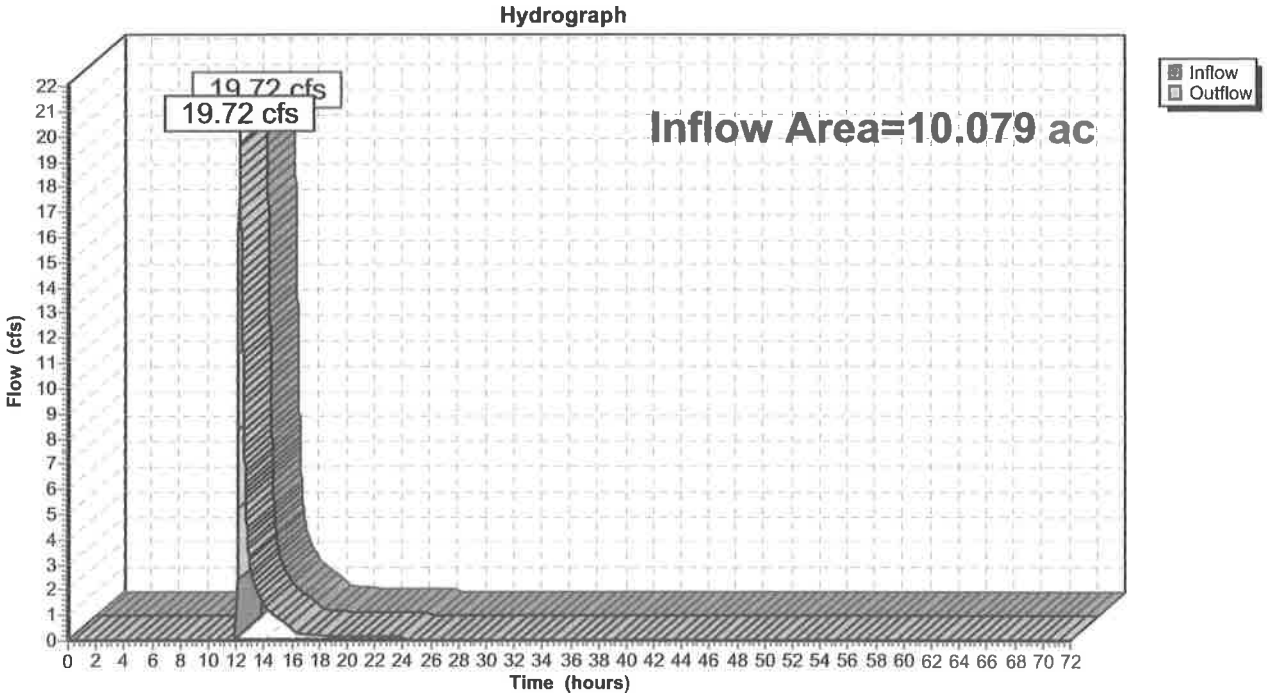
Summary for Reach 7R: offsite south

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 10.079 ac, 22.55% Impervious, Inflow Depth = 1.30" for 100-yr event
Inflow = 19.72 cfs @ 12.23 hrs, Volume= 1.094 af
Outflow = 19.72 cfs @ 12.23 hrs, Volume= 1.094 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach 7R: offsite south



Summary for Pond 6P: Existing Basin

Inflow Area = 5.563 ac, 40.85% Impervious, Inflow Depth = 4.52" for 100-yr event
Inflow = 25.75 cfs @ 12.14 hrs, Volume= 2.095 af
Outflow = 20.42 cfs @ 12.23 hrs, Volume= 2.024 af, Atten= 21%, Lag= 5.2 min
Discarded = 1.27 cfs @ 12.23 hrs, Volume= 1.193 af
Primary = 19.15 cfs @ 12.23 hrs, Volume= 0.832 af
Routed to Reach 7R : offsite south

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 225.70' @ 12.23 hrs Surf.Area= 7,063 sf Storage= 24,073 cf

Plug-Flow detention time= 151.6 min calculated for 2.024 af (97% of inflow)
Center-of-Mass det. time= 132.5 min (969.6 - 837.2)

Volume	Invert	Avail.Storage	Storage Description
#1	211.00'	111 cf	**10.00'D x 9.50'H Vertical Cone/Cylinder** 746 cf Overall - 467 cf Embedded = 279 cf x 40.0% Voids
#2	211.20'	467 cf	**8.00'D x 9.30'H Vertical Cone/Cylinder** Inside #1
#3	211.00'	117 cf	**10.00'D x 9.50'H Vertical Cone/Cylinder** 746 cf Overall - 452 cf Embedded = 294 cf x 40.0% Voids
#4	211.50'	452 cf	**8.00'D x 9.00'H Vertical Cone/Cylinder** Inside #3
#5	210.50'	107 cf	**10.00'D x 9.50'H Vertical Cone/Cylinder** 746 cf Overall - 478 cf Embedded = 269 cf x 40.0% Voids
#6	210.50'	478 cf	**8.00'D x 9.50'H Vertical Cone/Cylinder** Inside #5
#7	210.50'	123 cf	**10.00'D x 10.00'H Vertical Cone/Cylinder** 785 cf Overall - 478 cf Embedded = 308 cf x 40.0% Voids
#8	210.70'	478 cf	**8.00'D x 9.50'H Vertical Cone/Cylinder** Inside #7
#9	211.00'	298 cf	**10.00'D x 9.50'H Vertical Cone/Cylinder** 746 cf Overall x 40.0% Voids
#10	211.20'	467 cf	**8.00'D x 9.30'H Vertical Cone/Cylinder**
#11	220.50'	23,070 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)
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Discarded OutFlow Max=1.27 cfs @ 12.23 hrs HW=225.70' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 1.27 cfs)

Primary OutFlow Max=19.11 cfs @ 12.23 hrs HW=225.70' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 19.11 cfs @ 2.15 fps)

Pond 6P: Existing Basin