ZB2024-03
Case #

TOWN OF HARWICH

732 Main Street, Harwich, Massachusetts 02645

ZONING BOARD OF APPEALS

Notice of Appeal/Application and Petition for Public Hearing, ("APPLICATION")

This Application *does not* apply to Comprehensive Permits.
Please refer to the Rules and Regulations ot the Town of Harwich Board of Appeals for documentation requirements.

This original completed and signed notice ("Application"), along with a certified abutters list and twelve (12) copies of all plans, sketches, statements, site plans or other supporting documents per the attached checklist must be presented to the Building Department prior to being filed with the Town Clerk. The required documentation, ***ALL*** of which must be submitted on the date of filing, is listed on this Application. **THE RULES AND REGULATIONS ("RULES") OF THE TOWN OF HARWICH BOARD OF APPEALS APPLY TO ALL APPEALS AND APPLICATIONS AND SHOULD BE CONSULTED BEFORE FILING AN APPEAL OR APPLICATION TO ENSURE COMPLIANCE WITH THEM.**

To the Zoning Board of Appeals, Harwich, MA:

(We, I) hereby petition your Board for a public hearing on the request for action checked below:

- (✓) Appeal from decision of or refusal of permit application by the Building Inspector, Selectmen or Planning Board or other administrative officer or officers.
- (✓) Application for a Variance from requirements of the Harwich Zoning By-Law.
- ( ) Application for a Special Permit that is subject to Board of Appeals approval.

I/we am/are the owner[s]/agent of the property involved in this petition, which is located in Harwich, MA at the following address: 0 Depot Rd. Said property is further described on

Assessor's Map # 64 and Parcel # S-1 located in the R-R Zoning District as shown on the attached plan.

Describe Petition/Appeal: See attached

Relief requested - Cite specific Bylaw Section(s): See attached correspondence from Bldg. Comm.

Signature of Owner (or Agent) Daniel Serber Date 12-29-23

(Written authorization by the owner must accompany an Application signed by agent.)

Owner Name Stephen Clark, President DFN Inc. Phone No. 508-432-1643

Mailing Address: 160 Mill Hill Rd, South Chatham, MA 02659

Agent Name: NextGrid Inc. Phone No. _____

Mailing Address: 177 Huntington Ave, Ste 1703 #73069, Boston, MA 02115

Has a petition previously been submitted for this property (Y/N) Y

If yes, the date of original hearing 8/26/20 Petition No. 2020-34 Decision Granted

For Appeal Only:

Reason for Denial: _____

Denial From: _____ Date of Denial: _____

Within 14 days following any Board decision, the Board will file its decision with the Town Clerk. A building permit will not be issued during the appeals period, until 21 days after the Board of Appeals decision has been filed with the Town Clerk or if an appeal to that decision has been filed during that time. It is the **applicant's responsibility** to have the decision recorded at the Barnstable County Registry of Deeds or Land Court, whichever may be applicable, and to present copies of that recording to the Town Clerk and to the Building Department with all Building Permit application requirements.

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Please be advised that an incomplete Application may result in a delay in processing your Application and **may result in a denial by the Board** without consideration of the merits of the Application. **IT IS YOUR RESPONSIBILITY TO REVIEW THE RULES THAT APPLY TO YOUR APPEAL/APPLICATION AND TO MAKE SURE BEFORE FILING THAT YOUR APPLICATION/APPEAL COMPLIES WITH THOSE RULES.** The burden of proof is on the petitioner, not on the Town. If you do not understand the criteria, legal counsel should be sought. Either the petitioner or his/her agent is required to appear at the hearing to present the Application.

All applicants for hearing before the Board of Appeals must complete the Application and submit along with it the supporting documentation listed herein to the Building Department for review and subsequent filing with the Town Clerk. The Building Department accepts Applications during posted hours. You are strongly encouraged to submit your Application to the Building Department well in advance of the filing deadline to allow adequate time for staff review for completeness. **All information, including the applicable fee made payable to the Town of Harwich, must be submitted with the Application.**

Please submit the following, sorted and grouped into **twelve (12) packets along with one (1) Certified Abutters List** (Available from the Assessors Department. A separate application and fee is required):

✓ **The original Application (additional stamped copies can be provided at a nominal fee):**
- Signed by the owner or agent.
- If signed by an agent, a letter of authorization signed by the owner must also be included.

✓ **A typewritten narrative to explain the project , the purpose for this Application and the relief requested, with citations to the applicable provisions of the MGL and the Harwich Zoning Bylaw.**

✓ **The original and eleven (11) copies of a Certified Plot Plan with topographical information plan (not septic plans) not more than five (5) years old (total of 12 copies):**
- 8½" x 11" or larger. *Larger plans must be folded.*
- Scale no greater than 1" = 50'
- Original stamped and signed by a Professional Engineer (as allowed by law), or a Professional Land Surveyor.
- Certified Plot Plan **must** indicate:
  - the locus;
  - the parcel or parcels of land involved;
  - the existing building or buildings;
  - the proposed building or buildings and/or additions to, or alterations of existing buildings with all dimensions set forth;
  - the location of the septic;
  - the Town of Harwich zoning requirements applicable to the property, as well as existing and proposed dimensions for: frontage, front, sides, and rear setback distances, building height(s), building stories, building and site coverage and parking requirements (if any);
  - all perimeter dimensions (existing and proposed);
  - location and width of abutting and on-site street and drives, parking, existing topography;
  - a grading plan, areas of proposed and retained vegetation, distinction between upland and wetland.
- Building Plans drawn to scale:
  - Floor layout (for existing structure and proposed additions and/or alterations)
  - Proposed front, side, and rear elevations

✓ **Certified Abutters List**

✓ **Check made payable to "Town of Harwich" for $315.00.**

Name of Applicant: NextGrid Inc.

Address of Property: 0 Depot Rd

Zoning District: R-R

Is the property Located in any Special District(s)/Overlay District(s) established by the Town of Harwich or the State of Massachusetts: Yes ✔ No ____

If Yes, specify District(s): WR

Year Structure(s) Built: n/a (No structure onsite)

Name/Address of Engineer/Architect: BSC Group, 349 Main ST - Rt 28, W. Yarmouth, MA 02673

Name/Address of Attorney: William D. Crowell, Esq, PO Box 185, Harwich Port, MA 02646

Subject	Existing	Required	Proposed
Lot Area (square feet)			
Frontage (linear feet)			
Front Yard Setback (feet)			
Side yard Setback (feet)			
Rear Yard Setback (feet)			
Any Yard Setback - **Specify which:**			
Building Coverage (%)			
Site Coverage (%) (see 325-2)		N/A	
Building Height (see 325-2 & 325-108)*			
If this is an Application for an Accessory Apartment, in addition to the above:			
A. Net Floor Area of the Principal Dwelling			
B. Net Floor Area of the proposed Accessory Apartment			
* Building height calculation(s) must be shown on plan for all zones per the Harwich Zoning By-laws Section 325-2. See Article XVII - Floodplain Regulations Section 325-108.			

Form of Relief Requested: Use Variance

If the Applicant is requesting a Variance, state the hardship which the Applicant believes justifies this form of relief in accordance with MGL Chapter 40 and the Harwich Zoning Bylaw:

See attached narrative

By signing and submitting this Application, you hereby authorize the members of the Board of Appeals, or its agent, to conduct a site visit of the exterior of your property for an inspection of the property involved in this petition, should they deem it appropriate.

The Board of Appeals is entitled to rely on the information contained in this Application. Therefore, the undersigned certifies that the information provided in this Application, and all submitted plans and other documentation, is true and accurate to the best of my knowledge and belief.

Agent's Signature: Daniel Serber Date: 12-29-23

Owner's Signature: _____ Date: _____

July 30, 2020

Steven Clark, President
DFN, Inc.
160 Mill Hill Road
South Chatham, MA 02659

Re: 0 Depot Road, Harwich – Assessor's Map 64-Parcel S1: RR Zoning District, WR Zoning District

Dear Mr. Clark:

Please be informed that we must deny your request to change a pre-existing, non-conforming sand-pit/construction use at the subject property to a solar/photovoltaic facility.

This project is being denied based upon the plans and information provided by you concerning said proposed solar/photovoltaic facility as it is not an allowed use in the RR and WR Zoning Districts. **§325;54, Sub-Paragraph B. Non-Conforming Uses.,** Sub Paragraph (2) states that "in no case shall a non-conforming use be changed to another non-conforming use."

Consequently, a Variance is required from the Zoning Board of Appeals in order to proceed with this project. In accordance with the provisions of the Zoning By-Laws you may apply to the Zoning Board of Appeals for the above noted relief within thirty (30) days of receipt of this letter.

Respectfully,

Raymond G. Chesley
Building Commissioner

Cc:File

DFN, Inc./Next Grid

The Petitioner seeks to install a solar/photovoltaic facility by Next Grid, Inc. on the subject Parcel. The site has been operating as a grand-fathered, non-conforming use as a sand and gravel pit for many years. The current grade of the Parcel makes it unsuitable for most uses including residential or commercial and to bring the Parcel to grade and make it suitable for residential standards of the By-Law and desirable to a developer would constitute a hardship for the property owner. Outside of its current use as a sand pit a ground-mounted solar facility remains one of the only viable options for this property. The use will be silent, not generate traffic and not affect school districts or infrastructure. Consequently, there are unique soil conditions and topography on the subject property and a literal enforcement of the By-Law would involve a substantial hardship, financial or otherwise, to the Petitioner.

Desirable relief may be granted by means of a Variance without substantial detriment to the public good and without nullifying or substantially derogating from the intent or the purpose of the By-Law as there will be no perceived detriment to the public good to allow for a photovoltaic/renewable energy facility on the property. The current use as a sand pit with heavy equipment vehicles using the same creates noise, numerous trips by construction vehicles when in use and has an effect on the surrounding properties. The proposed use would be less intense, would have less of an impact on the surrounding properties and would not constitute a substantial change.

Finally, the Town of Harwich at its May 7, 2018 Annual Town Meeting added Section 325-138 Et Seq., to allow for Large-Scale Ground-Mounted Photovoltaic Arrays in certain zones. The subject Parcel is not located in one of the said zones but in all other respects would meet the criteria of said new By-Law provisions which were adopted to "promote the creation of new Large-Scale Ground-Mounted Solar Photovoltaic Installations." The subject Parcel would appear to be well- suited as a site for the same due to the fact that it consists of over seventeen (17) acres and it is a sand pit with very little vegetation on it and has been largely excavated to the maximum extent.

Steve Clark

NextGrid

Memorandum

To: Town of Harwich ZBA
From: Steven Clark
CC: Rachel Lohr, Harwich Planning Board

Town of Harwich,

My name is Steven Clark, and I am the owner of 0 Depot Road (Map 64 Page S1). I am giving my permission to NextGrid Inc and their representatives to submit variances, special permit applications, extensions of existing permits, and anything else necessary for the in regards to the proposed solar development on my property

I am also informing The Town of Harwich that Invaleon Technologies Corp. (26 Parkridge Rd, Suite 1B Haverhill, MA 01835) acting as NextGrid Inc's Engineering, Procurement, and Construction (EPC) company has my permission to obtain a building permit do work on my land in connection with the construction of the proposed solar facility.

Please feel free to reach out to me directly with any questions.

Thank you for attention to this matter,

12/28/23

508-776-3758

Steven Clark – 12/28/2023

DECOMMISSIONING PLAN

Ground-Mounted Solar Photovoltaic System
0 Depot Road
Harwich, Massachusetts

Applicant & Responsible Party

NextGrid, Inc.
P.O. Box 7775 #73069
San Francisco, CA 94120
(559) 731-4645
daniel@nextgrid.com

1/5/21

I. FACILITY DESCRIPTION

This Decommissioning Plan has been prepared for the proposed solar photovoltaic facility to be constructed at the property located at 0 Depot Road, Harwich, Massachusetts. This plan describes the process for decommissioning the facility in accordance with State requirements and the Town of Harwich Site Plan review process. The facility will consist of a ±3.15 MW (DC) solar array and accompanying equipment secured within a 7-foot high chain-link fence and accessed via a 20-foot wide locked swing gate off of Mill Hill Rd, Chatham, MA which is the means of site access.

The Facility will include the following site features which will require decommissioning at the end of the life of the project:

- An approximate 12-acre array of photovoltaic (PV) modules and racking system;
- Screw anchor or driven pile foundations supporting the PV modules and racking system;
- Transformers and electrical equipment cabinets and concrete pads
- 7-foot chain-link security fence;
- Underground conduit and wires;
- Underground wires;
- A 20' wide locking chain link security gate at the site entrance.

II. DECOMMISSIONING PLAN

The decommissioning of the facility will be a two-stage process consisting of Dismantling, Demolition and Disposal/Recycling followed by Site Restoration. The following is a description of each process.

Dismantlement, Demolition, and Disposal or Recycling

A significant portion of the components that comprise the facility will include recyclable or re-sealable components including copper, aluminum, galvanized steel, and the modules. Due to their re-sale monetary value, these components will be dismantled, disassembled, and recycled rather than being demolished and disposed of.

All electrical connections to the system will be disconnected and all connections will be tested locally to confirm that no electric current is running through them before proceeding. The facility will be dismantled following coordination with the utility company regarding timing and required procedures for disconnecting the facility from the utility distribution network. All electrical connections to the PV modules will be severed at each module, and the modules will then be removed from their framework by cutting or dismantling the connections to the supports. Modules will be removed and sold to a purchaser or recycler. In the event of a total fracture of any modules, the interior materials are silicon-based and are not hazardous. Disposal of these materials at a landfill is permissible.

The PV mounting system framework will be dismantled and recycled. The foundation system will be removed and recycled if feasible. All other associated structures will be demolished and removed from

the site for recycling or disposal. This will include the site fence and gates, which will likely be reclaimed or recycled.

Concrete equipment slabs will be broken and removed to a depth of one foot below grade and clean concrete will be crushed and disposed of off-site or recycled (reused either on or off-site). The paved driveway will remain in place.

Aboveground utility poles owned by the project operator will be completely removed and disposed of off-site in accordance with utility best practices. Any overhead wires will be removed from the facility and will terminate at the utility-owned connections off Mill Hill Rd (Chatham). The utility company (currently Eversource) will be responsible for dismantling the overhead wires and poles under its ownership. The decommissioning contractor will coordinate with the utility company personnel to facilitate the utility company's removal of any poles and overhead wires located on the site.

Disposal of all solid and hazardous waste shall be in accordance with local, state, and federal waste disposal regulations.

The concrete drywells for site drainage will remain in place.

Site Restoration

Immediately following the complete dismantlement, demolition & disposal or recycling of the PV and accessory equipment, as described above, a final walkthrough inspection will be conducted to ensure that all debris and/or trash generated during the decommissioning process has been removed. Any debris that may have been wind-blown to areas outside the immediate footprint of the facility. Sanitary facilities will be provided on site for the workers performing the decommissioning of the facility. Areas of the parcel that are disturbed during decommissioning will be re-seeded, as necessary, with 4" loam and seed or hydro-seed, using a fast-growing seed mix.

Permitting Requirements

Several approvals will be obtained prior to initiation of the decommissioning process. Permitting requirements will be determined at the time of decommissioning and updated based on then current local, state, and federal regulations. The decommissioning process is anticipated to take approximately six to eight weeks and is intended to occur outside of the winter season. The owner/operator of the facility shall notify the Planning Board by certified mail of the proposed date of discontinued operations and the decommissioning will be completed no more than 150-days after the date of discontinued operation. Absent notice of a proposed date of decommissioning or written notice of extenuating circumstances, the solar photovoltaic installation shall be considered abandoned when is fails to operate for more than one year without the written consent of the Planning Board. Based upon current regulations, a building/demolition permit will be required from the Town of Harwich Building Department for the decommissioning of this site because a building/demolition permit must be obtained for any demolition or change to the use of a structure.

III. DECOMMISSIONING COST ESTIMATE

BSC has prepared the following detailed cost estimate of the decommissioning cost for the Depot Road Solar Project as follows:

Removal Cost Estimate				
Item	**Quantity**	**Rate/ea.**	**Days**	**Amount**
Laborers	8	$200	27	$42,764.00
Heavy Equipment & Operator	3	$1,200	14	$41,236.00
Debris Container/Disposal*	35	$850		$29,750.00
Site Repair (re-seed as necessary)	1			$1,500.00
Mobilize/Demobilize	1			$5,000.00
Sub-Total				**$120,250.00**
20-Year Total (assuming 2% Inflation)				**$178,685.00**

*Cost of trucking included

In summary, for the proposed 3.15± MW Depot Road Solar Project, we have **estimated a net present value decommissioning cost of $120,250.00**. Assuming a 2% yearly inflation for the 20-year project life span, **the proposed financial surety amount is $178,685.00**.

OPERATION AND MAINTENANCE PLAN

Depot Road Solar Project
Harwich, Massachusetts

July 2020

Project Owner/Responsible Party:

NextGrid, Inc.
P.O. Box 7775 #73069
San Francisco, CA 94120-7775
(559) 731-4645
daniel@nextgrid.com

Daniel Serber
Signature

7/17/2020
Date

The above designated party is responsible (financially and otherwise) for the operation and maintenance, including emergency repairs of the Depot Road Solar Project, including the arrays, the land occupied within and outside the fenced area, the access roads leading into the fenced-in area, the utility lines serving the array, and the stormwater facilities associated with the project, as shown on the Site Plans. This area is herein referred to as the Solar O&M Area.

The project owner/responsible party agrees to the following:

A. At all times, the solar photovoltaic installation will be maintained in good working condition and regular maintenance will be performed in accordance with this approved operation and maintenance schedule. A record shall be kept of all maintenance performed, and said maintenance record will be provided to Town officials whenever requested to verify maintenance or status.

B. A copy of the site plan and emergency shutdown procedures will be provided to the Police Chief and Fire Chief prior to issuance of an occupancy permit. The project owner/responsible party will cooperate with local emergency services in developing an emergency response plan.

C. Contact information for a person responsible for responding to public inquiries and complaints throughout the life of the project will be provided to the Building Inspector and this information will be posted in a visible location at the installation. This contact information will be updated as necessary.

D. The Town will be notified of changes in project ownership or assignment of operation and maintenance financial responsibility.

E. The maintenance schedule in this operation and maintenance (O&M) Plan will only be amended by mutual agreement of the Town and the responsible party. Amendments will be made in writing and signed by the responsible party.

1.0 Service Visits

An O&M contractor that specializes in commercial scale solar farms will be contracted to provide service visits two times per calendar year, occurring approximately six (6) months apart. The service visits will incorporate the inspection and maintenance procedures outlined in Section 2.0 (Preventative Maintenance), Section 4.0 (Equipment Inspections), Section 5.0 (Vegetation Maintenance), Section 6.0 (Access Roadways, Perimeter Fences, and Access Gates), and Section 7.0 (Stormwater and Erosion Control Facilities). Note that Item 7.0 (Stormwater and Erosion Control Facilities) will require additional visits during certain rainfall events. After each service visit, the O&M contractor will issue a report to the project developer/owner. The report will summarize all maintenance and inspection activities conducted, identify any issues encountered, and provide recommendations to correct any of the issues. After review and any clarifications requested by the project developer/owner, the report will be forwarded to the Town, as required.

In addition to the Service Visits outlined above, the O&M contractor will be responsible for plowing the solar field access drive from Mill Hill Road (Chatham) to the electrical cabinet turnaround area sufficiently to provide emergency vehicle access at all times.

2.0 Preventative Maintenance

The following Preventative Maintenance (PM) services will be performed during each service visit:

(a) Ensure the site is clean, secure and any site management such as cutting grass (see below) or cleaning of modules is performed as needed.

(b) Ensure the proper structure and operation of all racking, modules, wiring, electrical boxes, conduit, string, inverters and sensors.

(c) Visual checks of each module for broken glass, debris, or other causes of low performance.

(d) Ensure that the racking system (posts, crossbeams, brackets, bolts, clips, etc.) that support the panels are free of major rust or corrosion.

(e) Ensure that all signs/labels for inverters, disconnects, and safety warnings are intact and legible.

(f) Ensure that all enclosures, fences, and facilities that are part of installation are maintained to retain original appearance, aside from reasonable wear and tear, including but not limited to paint, roadways, gates and access panels.

3.0 Continuous Monitoring

The following will be performed continuously for the duration of the project, by either the project developer/owner or a company that specializes in solar monitoring:

(a) Monitoring of system production.

(b) A monthly report will be produced comparing system output to expected production taking into account actual climatic conditions. The project developer/owner or the O&M contractor shall summarize this information.

(c) Responding to alerts from the array's automated alert system(s) regarding potential system malfunction(s), and if necessary a service visit by an O&M contractor.

4.0 Equipment Maintenance

The project developer/owner and/or an O&M contractor will conduct regular, scheduled equipment maintenance biannually, including but not limited to the following:

Panels

(a) Should panel washing be determined to be necessary, panels will be washed utilizing only water. Use of a squeegee is permitted for solar modules. Soap or any detergents are not required to clean the panels and are not allowed.

(b) Conditions such as snow and ice will be removed as necessary.

(c) Damaged or inoperative array panels observed during service visits will be investigated to determine the cause of the damage or inoperability with the plan to prevent, repair and/or replace as soon as possible.

(d) Array panels that have deteriorated in efficiency in excess of the manufacturer's warranty will be reported to the manufacturer for repair or replacement as soon as possible.

String Inverters

Inverters will be checked for the following during inspections:

(a) Power capacitors for any sign of damage.

(b) Any visible discoloration.

(c) Voltage and current readings.

(d) Corrosion, dust and water ingress on terminals and cables.

(e) Condition of both the AC and DC surge suppressors.

(e) Operation of all safety devices.

(f) Cleaning and replacement of air filters.

Racking

(a) Racking system components that have major rust or corrosion will be repaired or replaced as soon as possible.

(b) Visual inspections will be completed of the equipment, including sub-assemblies, wiring harnesses, contacts and major components.

Other Components

The following will also be checked during semi-annual inspections:

(a) Visual inspection of all feeder terminations for corrosion and proper attachment.

(b) Inspection and testing of surge arrestor and lightning protection operation.

(c) Ground continuity testing, lightning protection and overall system safety inspection, to include correction of any unsafe or abnormal issues.

(d) Inspection/survey of all combiner boxes, disconnects (AC&DC), switchgear, and inverters with an infrared camera, with the purpose of detecting hotspots, bad connections, and related issues.

(e) Mechanical and structural integrity of the system, and correction of issues.

(f) Modules for excessive dirt and debris.

(g) Replacement of unserviceable or degraded system labeling.

(h) Testing of voltage and amperage of all source conductors.

(i) Documentation and inspections reporting to include:

i. PV System Quality Assurance and Quality Control Plan;
ii. PV System Commissioning Form; and
iii. System Component Torque Specifications Form.

5.0 Vegetation Maintenance

(a) The Solar O&M area will be mowed to maintain a maximum grass height of approximately 12 inches. Use of a weed whacker is recommended underneath the panels and around the posts of the racking system. Woody seedlings may also be

removed by hand. No pesticides, fertilizers, herbicides or chemicals will be used to manage vegetation.

(b) An O&M contractor shall monitor the ground cover growth rate and system performance to determine whether vegetation maintenance frequency requires modifications.

(c) An O&M contractor should be aware of the locations of any wiring associated with the system. The project developer/owner shall complete a site walk of the Solar O&M area with any new O&M contractor before scheduling the first vegetation maintenance event.

(d) The state of vegetation will be monitored during normal maintenance visits and, as appropriate, a landscape professional will be contracted to repair any areas of concern.

(e) A landscape professional will be contracted to perform the following adjustments if areas of topsoil are observed within the solar array limit:

i. Adjust the seed mix that is appropriate to the current vegetative cover and the season in which seed is spread.
ii. Manually rake topsoil to prepare for seeding.
iii. Spread seed atop raked area at an appropriate density.
iv. Implement temporary precautions within the seeded area to help the restoration process.
v. Monitor the vegetative cover to restoration completion.

(f) The state of vegetation outside of the fenced in solar development area will be monitored during normal maintenance visits to confirm that excessive growth which will result in shading of the solar panels has not occurred. If shading is visible, a landscape professional will be contacted to trim/cut the vegetation as necessary.

(g) The use of herbicides, pesticides, fertilizers or chemicals for maintenance of vegetation throughout the array and outside the fence is prohibited.

6.0 Access Roadways, Perimeter Fences, and Access Gates

(a) As part of the bi-annual service visit, the gravel surface of the access road shall be inspected. This inspection will cover the following areas at a minimum: settlement, rutting, erosion/barren spots, vegetation/tree growth, wash boarding, and

potholes. A roadway maintenance firm, to be hired by the developer, shall immediately repair any deficiencies encountered during the inspection to the extent it cannot be handled by the O&M contractor.

(b) During the bi-annual service visit, the perimeter fencing and access gates shall be inspected for workable locks and knox boxes, settlement, erosion around post footings, significant corrosion, and signs of vandalism (i.e. holes cut in the wire, removed wooden panels, project ID signs damaged/stolen). A fence maintenance firm, to be hired by the developer, shall immediately repair any deficiencies encountered during the inspection to the extent it cannot be handled by the O&M contractor.

(c) Plow the access drive from Mill Hill Road to the electrical cabinet turnaround area sufficiently to provide emergency vehicle access at all times.

7.0 Stormwater and Erosion Control Facilities

(a) Erosion control barriers (straw wattles, silt sacks, etc.) should be inspected immediately after each run-off producing rainfall event and at least daily during prolonged rainfall. Sediment deposits must be removed when the level of deposition reaches approximately one-half the height of the barrier. Sediment shall be disposed of in a suitable area and protected from erosion by either structural or vegetative means.

(b) Inspect subsurface infiltration system after every major storm event (2" or greater) for the first few months after construction to ensure proper stabilization and function, thereafter inspect semi-annually to ensure the system is draining properly. Check for accumulation of sediment and ponding of water. If ponding water is visible inside the inspection port for several days after a storm event, notify the engineer for possible remedial measures, clogging and trash, and remove organic matter, trash and debris as necessary. Remove sediment as necessary during construction, while the system is dry, and at least every 5 years after construction.

(c) Inspect area drains after every major storm event (2" or greater) for the first few months after construction, and semi-annually thereafter. Check for accumulation of sediment. Remove organic matter, trash and debris as necessary to ensure grates are not obscured or blocked.

(d) Inspect all slopes, panel drip edges, and graded areas throughout the project on a quarterly basis for the first two years after completion of construction. Thereafter, inspect twice per year. Look for formation of eroded channels, particularly at panel drip edges and on newly constructed slopes. Repair and/or re-seed any areas that are eroded or not stabilized.

STORMWATER REPORT

PHOTOVOLTAIC SYSTEM

0 DEPOT ROAD, HARWICH, MA

JULY 2020

Owner/Applicant:

NEXTGRID, INC.
P.O. BOX 7775 #73069
SAN FRANCISCO, CA 94120

BSC Job Number: 50416.00

Prepared by:

BSC GROUP

349 Main Street
West Yarmouth, MA 02673

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SECTION 1.0

PROJECT INFORMATION

1.01 PROJECT DESCRIPTION

The project site is located at 0 Depot Road in Harwich, MA. The project consists of the redevelopment of the 17.1± acre parcel of land, where the current use of the site is a sand/gravel pit. The site has one means of access which is through Mill Hill Rd in Chatham, MA located to the east of the locus property. The site is bordered by vacant/ wooded land on all sides. With the existing use of the site being a pit, there are slopes around the perimeter of the site. The existing site does not have any permanent structures on site.

The applicant is seeking to redevelop the site for use as a solar field (photovoltaic system). The redevelopment will entail re-grading the site, equipment pads, utility work, and stormwater management facilities.

1.02 PRE-DEVELOPMENT CONDITIONS

The pre-development conditions include the existing property, Depot Rd, currently being operated as a sand and gravel pit off of Mill Hill Rd, Chatham (site access). Much of the site is already dug out due to the sand/gravel mining efforts, therefore the side slopes that exist are up to 33%. There are fill piles on the site ranging in stature, but in general, the lower area/floor is relatively flat, with slopes ranging from 0-8%. There are a few low points on the site where existing stormwater is collected on site. Additionally, there is a wetland area located to the south of the site, which has been delineated by BSC Group and can be seen on the existing conditions plan.

NRCS Web Soil Survey has identified three primary soil classifications underlying the project site:

- 1.9% - Map Unit 252B – Carver coarse sand, 3 to 8 percent slopes
- 4.4% - Map Unit 252C – Carver coarse sand, 8 to 15 percent slopes
- 93.7% - Map Unit 600 – Pits, sand and gravel

Due to the sandy and gravelly nature of these types of soils, the site has been modeled as Hydrological Soil Group A, which is consistent with the NRCS Web Soil Survey report that can be found in Appendix C.

The Pre-Development HydroCAD model was developed with two (2) subcatchments. Subcatchment 1S contains all the areas that drain offsite, towards the wetland resource area. The summary of offsite flow is represented by Reach 1R. Subcatchment 2S represents all areas of the site that drain internally and does not flow off-site. Stormwater runoff that is generated in this area naturally infiltrates on site. This is modeled as Reach 2R.

In July 2020, BSC Group conducted exploratory test pits on the site to confirm the NRCS soil classification. A total of two test pits we conducted. The test pits were spread out throughout the site in potential areas for drainage areas. Due to the various fill piles on-site and on-going sand mining, test pits were conducted in locations to best limit disturbance. The parent material was found to me a medium-fine sand which was consistent with the NRCS web soil mapping. Groundwater was observed in all holes, and the results of the test pits, including groundwater adjustment (Cape Cod Commission method) can be found in Appendix D.

1.03 POST-DEVELOPMENT CONDITIONS

The proposed stormwater management system has been designed in a manner that will meet or exceed the provisions of the Massachusetts Department of Environmental Protection (MassDEP) Stormwater

Management Standards for new construction. The design also complies fully with the Town of Harwich Zoning Bylaws.

The site grading has been designed in a manner to best minimize the amount of fill that would be needed to be removed or added to the site to meet the design. In order to achieve this goal, the low points of the site were strategically located to best create a site balance. The proposed floor of the solar field is graded between 1% and 2%. There are three collection areas located in the north-east, north-west and south-west corners of the site. All perimeter boundaries will maintain the existing drainage pattern, and flow into the floor of the photovoltaic field, and the areas that currently flow to the wetland resource area will not be altered.

Each of the three proposed low points contain 500-gallon precast concrete leaching systems of varying size depending on the amount flow being directed to it. There are a total of 33 leaching chambers proposed for this site. Each of the chambers will have a grated inlet for the collection of stormwater runoff. These leaching chambers will be laid within a bed of crushed stone. Each of the drainage systems have been designed using a hydraulic conductivity of 8.270 in/hr with the capacity for a 100-year storm event.

These infiltration systems have been modeled as Ponds 2P – 5P in the proposed HydroCAD model (Section 6.04). Summary node 1R (off-site flow) will remain to compare with the Pre-Development node. Please see Section 2.02 Stormwater Runoff Rates for a further detailed analysis of the peak runoff rates for both the Pre- and Post- Development scenarios for this site. The Proposed Watershed Plan can be seen in Section 6.03 and the Proposed Hydrology Calculations can be seen in Section 6.04.

Specifics of the project's compliance with the MassDEP Stormwater Management Standards are discussed in detail in the following sections.

SECTION 2.0

DRAINAGE SUMMARY

2.01 Stormwater Standard 1 – New Stormwater Conveyances

Per MassDEP Stormwater Management Standard #1, no new outfalls may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth. There are no known stormwater outfalls in this development and no new outfalls are proposed.

2.02 Stormwater Standard 2 – Stormwater Runoff Rates

Watershed modeling was performed using HydroCAD Stormwater Modeling Software version 10.0, a computer aided design program that combines SCS runoff methodology with standard hydraulic calculations. A model of the site's hydrology was developed for both pre- and post-development conditions to assess the effects of the proposed development on the resource areas to the northwest of the site.

The stormwater management systems for the project has been designed such that the post-development conditions do not increase the peak runoff rates for the 2-year, 10-year, 25-year and 100-year, 24-hour storm events, as detailed in the table below.

Peak Flow Discharge Rates

Node 1R – Off-site South

Storm Event	Pre-Development Peak Discharge Rate (cfs)	Post-Development Peak Discharge Rate (cfs)	Change in Peak Discharge Rate (cfs)
2-Year	0.00	0.00	0.00
10-Year	0.00	0.00	0.00
25-Year	0.03	0.03	0.00
100-Year	0.25	0.25	0.00

2.03 Stormwater Standard 3 – Groundwater Recharge

The ground water recharge is estimated based on the Massachusetts Stormwater Management Standard #3, as follows:

Rv = F x impervious area

Rv = Required Recharge Volume, expressed in cubic feet
F = Target Depth Factor associated with each Hydrologic Soil Group
Impervious Area = pavement and rooftop area on site

Recharge Target Depth by Hydrologic Soil Group

NRCS HYDROLOGIC SOIL TYPE	APPROX. SOIL TEXTURE	TARGET DEPTH FACTOR (F)
A	sand	**0.60-inch**
B	loam	**0.35-inch**
C	silty loam	**0.25-inch**
D	clay	**0.10-inch**

The Natural Resources Conservation Service (NRCS) has classified the soils underlying the project site as a combination of soil groups 252B (1.9%), 252C (4.4%), and 600 (93.7%). The proposed infiltration

drywell system is located in Soil Group 600 – Pits, sand and gravel. Based on this location and the information from the test pits, the site has been modeled as Hydraulic Group A.

To determine the recharge volume provided in the recharge system, the *Static Method* was used as described in the DEP's Massachusetts Stormwater Handbook, Volume 3. A drawdown calculation was performed in accordance with the DEP's Massachusetts Stormwater Handbook, Volume 3, to verify that the proposed recharge systems would drain completely within 72-hours. This drawdown calculation along with calculations to determine the recharge required are provided in Section 7.0 of this report.

2.04 Stormwater Standard 4 – TSS Removal

The project stormwater management system will achieve a TSS removal greater than 80%. The proposed stormwater management system has been designed to provide treatment of runoff in order to reduce suspended solids prior to discharge off-site through the implementation of the following best management practices:

- Dry Well - (80% TSS Removal when combined with one or more pretreatment BMPs)

The water quality volume is defined as the runoff volume requiring TSS Removal for the site and is equal to 1-inch of runoff (rapid infiltration rate) over the total impervious area of the post-development site. The required water quality volume required for the project is calculated below based on the post-development impervious area:

$$WQV = 1.0\ \cancel{in}\ x\ \frac{1\ ft}{12\ \cancel{in}} x\ 0.098\ ac\ x\ 43{,}560\ ft^2 = \mathbf{356\ ft^3}$$

∴ Water Quality Volume = 356 cubic feet

The infiltration systems have been sized to treat the required water quality volume and calculation are included in Section 7.0 of this Report.

A long-term pollution prevention plan complying with the requirements of Standard 4 is included in Section 5.0 of this Report.

2.05 Stormwater Standard 5 – Land Uses with Higher Potential Pollutant Loads

The Project is not a land use with higher potential pollutant loads, therefore this Standard does not apply.

2.06 Stormwater Standard 6 – Stormwater Discharges to a Critical Area

The project is not subject to Standard 6. There are no discharges to any Critical Area, as defined by the Massachusetts Stormwater Handbook.

2.07 Stormwater Standard 7 – Redevelopment Projects

This project is a new development, and as such, has been designed to fully comply with the MassDEP Stormwater Management Standards.

2.08 Stormwater Standard 8 – Sedimentation and Erosion Control Plan

Erosion and sedimentation controls are shown on the Project Site Plan set (page 7 of 8). Additionally, a Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan is included in Section 4.0 of this Report.

2.09 Stormwater Standard 9 – Long Term Operation and Maintenance Plan

A Long-Term Operation and Maintenance Plan is included in Section 5.0 of this Report.

2.10 Stormwater Standard 10 – Illicit Discharges

There are no known illicit discharges on the project site and none are proposed. A signed, illicit discharge compliance statement will be submitted prior to the start of construction.

2.11 Conclusion

The Project has been designed to meet the applicable provisions of the Stormwater Management Standards. Site grading in concert with implementation of dry wells, will serve to attenuate peak runoff rates, provide treatment to stormwater prior to discharge, and promote infiltration to groundwater. The project will not cause flooding to off-site and downgradient properties, will meet or exceed the requirements of the MassDEP Stormwater Management Standards and the Town of Harwich Zoning Bylaws.

SECTION 3.0

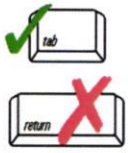
MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION CHECKLIST FOR STORMWATER REPORT

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

7/21/2020

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.

SECTION 4.0

CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN

4.0 CONSTRUCTION PERIOD POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL PLAN

This Section specifies requirements and suggestions for implementation of a Stormwater Pollution Prevention Plan (SWPPP) for the proposed photovoltaic system located at 0 Freemans Way, Brewster, Massachusetts. The SWPPP shall be provided and maintained on-site by the Contractor(s) during all construction activities. The SWPPP shall be updated as required to reflect changes to construction activity.

The stormwater pollution prevention measures contained in the SWPPP shall be at least the minimum required by Local Regulations. The Contractor shall provide additional measures to prevent pollution from stormwater discharges in compliance with the National Pollution Discharge Elimination System (NPDES) Phase II permit requirements and all other local, state and federal requirements.

The SWPPP shall include provisions for, but not be limited to, the following:

1. Construction Trailers
2. Lay-down Areas
3. Equipment Storage Areas
4. Stockpile Areas
5. Disturbed Areas

The Contractor shall NOT begin construction without submitting evidence that a NPDES Notice of Intent (NOI) governing the discharge of stormwater from the construction site for the entire construction period has been filed **at least fourteen (14) days prior to construction**. It is the Contractor's responsibility to complete and file the NOI, unless otherwise determined by the project team.

The cost of any fines, construction delays and remedial actions resulting from the Contractor's failure to comply with all provisions of local regulations and Federal NPDES permit requirements shall be paid for by the Contractor at no additional cost to the Owner.

As a requirement of the EPA's NPDES permitting program, each Contractor and Subcontractor responsible for implementing and maintaining stormwater Best Management Practices shall execute a Contractor's Certification form.

Erosion and Sedimentation Control

The Contractor shall be solely responsible for erosion and sedimentation control at the site. The Contractor shall utilize a system of operations and all necessary erosion and sedimentation control measures, even if not specified herein or elsewhere, to minimize erosion damage at the site to prevent the migration of sediment into environmentally sensitive areas. Environmentally sensitive areas include all wetland resource areas within, and downstream of, the site, and those areas of the site that are not being altered.

Erosion and sedimentation control shall be in accordance with this Section, the design drawings, and the following:

- "National Pollutant Discharge Elimination System General Permit for Discharges from Construction Activities (EPA Construction General Permit February 16, 2017).
- Massachusetts Stormwater Management Policy Handbook issued by the Massachusetts Department of Environmental Protection, January 2008.
- Massachusetts Erosion and Sediment Control Guidelines for Urban and Suburban Areas, A Guide for Planners, Designers and Municipal Officials, March 1997.

The BMP's presented herein should be used as a guide for erosion and sedimentation control and are not intended to be considered specifications for construction. The most important BMP is maintaining a rapid construction process, resulting in prompt stabilization of surfaces, thereby reducing erosion potential. Given

the primacy of rapid construction, these guidelines have been designed to allow construction to progress with essentially no hindrance by the erosion control methods prescribed. These guidelines have also been designed with sufficient flexibility to allow the Contractor to modify the suggested methods as required to suit seasonal, atmospheric, and site-specific physical constraints.

Another important BMP is the prevention of concentrated water flow. Sheet flow does not have the erosive potential of a concentrated rivulet. These guidelines recommend construction methods that allow localized erosion control and a system of construction, which inhibits the development of shallow concentrated flow. These BMP's shall be maintained throughout the construction process.

CONTACT INFORMATION AND RESPONSIBLE PARTIES

The following is a list of all project-associated parties:

Owner
NextGrid, Inc.
P.O. Box 7775 #73069
San Francisco, CA, 94120

Contractor
To be determined

Environmental Consultant
BSC Group, Inc.
349 Route 28, Unit D
West Yarmouth, MA 02673

Contact: Brian G. Yergatian, P.E., LEED AP
Phone: (617) 896–4590
Email: byergatian@bscgroup.com

Qualified SWPPP Inspectors
To Be Determined

4.1 Procedural Conditions of the Construction General Permit (CGP)

The following list outlines the stormwater responsibilities for all construction operators working on the Project. The operators below agree through a cooperative agreement to abide by the following conditions throughout the duration of the construction project, effective the date of signature of the required SWPPP. These conditions apply to all operators on the project site.

The project is subject to EPA's NPDES General Permit through the CGP. The goal of this permit is to prevent the discharge of pollutants associated with construction activity from entering the existing and proposed storm drain system or surface waters.

All contractors/operators involved in clearing, grading and excavation construction activities must sign the appropriate certification statement required, which will remain with the SWPPP. The owner must also sign a certification, which is to remain with the SWPPP in accordance with the signatory requirements of the SWPPP.

Once the SWPPP is finalized, a signed copy, plus supporting documents, must be held at the project site during construction. A copy must remain available to EPA, State and Local agencies, and other interested parties during normal business hours.

The following items associated with this SWPPP must be posted in a prominent place at the construction site until final stabilization has been achieved:

- The completed/submitted NOI form
- Location where the public can view the SWPPP during normal business hours
- A copy of the signed/submitted NOI, permit number issued by the EPA and a copy of the current CGP.

Project specific SWPPP documents are not submitted to the US EPA unless the agency specifically requests a copy for review. SWPPP documents requested by a permitting authority, the permitee(s) will submit it in a timely manner.

EPA inspectors will be allowed free and unrestricted access to the project site and all related documentation and records kept under the conditions of the permit.

The permitee is expected to keep all BMP's and Stormwater controls operating correctly and maintained regularly.

Any additions to the project which will significantly change the anticipated discharges of pollutants, must be reported to the EPA. The EPA should also be notified in advance of any anticipated events of noncompliance. The permitee must also orally inform the EPA of any discharge, which may endanger health or the environment within 24 hours, with a written report following within 5 days.

In maintaining the SWPPP, all records and supporting documents will be compiled together in an orderly fashion. Inspection reports and amendments to the SWPPP must remain with the document. Federal regulations require permitee(s) to keep their Project Specific SWPPP and all reports and documents for at least three (3) years after the project is complete.

4.2 Project Description and Intended Construction Sequence

The site is currently an existing sand and gravel pit. The proposed activities will include the following major components:

- The construction of an access road.
- Site grading
- The construction of stormwater management facilities.
- Installation of photovoltaic system and landscape areas.

The installation of the photovoltaic system will disturb 13.29± acres.

Soil disturbing activities will include site demolition, clearing and grubbing, installing stabilized construction exits, installation of erosion and sedimentation controls, grading, stormwater management systems, utilities, building foundations, construction of site driveways and preparation for final landscaping. Please refer to Table 1 for the projects anticipated construction timetable. A description of BMP's associated with project timetable and construction-phasing elements is provided in this Erosion and Sediment Control Plan.

Table 1 – Anticipated Construction Timetable

Construction Phasing Activity	Anticipated Timetable
Demolition, Grubbing and Stripping of Limits of Construction Phase	To be determined
Rough Site Grading and Site Utilities	To be determined
Utility Plan Construction	To be determined
Landscaping	To be determined

4.3 Potential Sources of Pollution

Any project site activities that have the potential to add pollutants to runoff are subject to the requirements of the SWPPP. Listed below are a description of potential sources of pollution from both sedimentation to Stormwater runoff, and pollutants from sources other than sedimentation.

Table 2 – Potential Sources of Sediment to Stormwater Runoff

Potential Source	Activities/Comments
Construction Site Entrance and Site Vehicles	Vehicles leaving the site can track soils onto public roadways. Site Vehicles can readily transport exposed soils throughout the site and off-site areas.
Grading Operations	Exposed soils have the potential for erosion and discharge of sediment to off-site areas.
Material Excavation, Relocation, and Stockpiling	Stockpiling of materials during excavation and relocation of soils can contribute to erosion and sedimentation. In addition, fugitive dust from stockpiled material, vehicle transport and site grading can be deposited in wetlands and waterway.
Landscaping Operations	Landscaping operations specifically associated with exposed soils can contribute to erosion and sedimentation. Hydro seeding, if not properly applied, can runoff to adjacent wetlands and waterways.

Table 3 – Potential Pollutants and Sources, other than Sediment to Stormwater Runoff

Potential Source	Activities/Comments
Staging Areas and Construction Vehicles	Vehicle refueling, minor equipment maintenance, sanitary facilities and hazardous waste storage
Materials Storage Area	General building materials, solvents, adhesives, paving materials, paints, aggregates, trash, etc.
Construction Activities	Construction, paving, curb/gutter installation, concrete pouring/mortar/stucco

4.4 Erosion and Sedimentation Control Best Management Practices

The project site is characterized by primarily pervious surface. All construction activities will implement Best Management Practices (BMP's) in order to minimize overall site disturbance and impacts to the sites natural features. Please refer to the following sections for a detailed description of site specific BMP's. In addition, an Erosion and Sedimentation Control Plan is provided in the Site Plans.

4.5 Timetable and Construction Phasing

This section provides the Owner and Contractor with a suggested order of construction that shall minimize erosion and the transport of sediments. The individual objectives of the construction techniques described herein shall be considered an integral component of the project design intent of each project phase. The construction sequence is not intended to prescribe definitive construction methods and should not be interpreted as a construction specification document. However, the Contractor shall follow the general construction phase principles provided below:

- Protect and maintain existing vegetation wherever possible.
- Minimize the area of disturbance.
- To the extent possible, route unpolluted flows around disturbed areas.
- Install mitigation devices as early as possible.
- Minimize the time disturbed areas are left un-stabilized.
- Maintain siltation control devices in proper condition.
- The contractor should use the suggested sequence and techniques as a general guide and modify the suggested methods and procedures as required to best suit seasonal, atmospheric, and site specific physical constraints for minimizing the environmental impact of construction.

Demolition, Grubbing and Stripping of Limits of Construction Phase

- Install Temporary Erosion Control (TEC) devices as required to prevent sediment transport into resource areas.
- Place a ring of silt socks and/or haybales around stockpiles.
- Stabilize all exposed surfaces that will not be under immediate construction.
- Store and/or dispose all pavement and building demolition debris as indicated in accordance with all applicable local, state, and federal regulations.

Driveway Area Sub-Base Construction

- Install temporary culverts and diversion ditches and additional TEC devices as required by individual construction area constraints to direct potential runoff toward detention areas designated for the current construction phase.
- Compact gravel as work progresses to control erosion potential.
- Apply water to control air suspension of dust.
- Avoid creating an erosive condition due to over-watering.
- Install piped utility systems as required as work progresses, keeping all inlets sealed until all downstream drainage system components are functional.

Binder Construction

- Fine grade gravel base and install processed gravel to the design grades.
- Compact pavement base as work progresses.
- Install pavement binder coat starting from the downhill end of the site and work toward the top.

Finish Paving

- Repair and stabilize damaged side slopes.
- Clean inverts of drainage structures.
- Install final top coat of pavement.

Final Clean-up

- Clean inverts of culverts and catch basins.
- Remove sediment and debris from rip-rap outlet areas.

- Remove TEC devices only after permanent vegetation and erosion control has been fully established.

4.6 Site Stabilization

Grubbing Stripping and Grading

- Erosion control devices shall be in place as shown on the design plans before grading commences.
- Stripping shall be done in a manner, which will not concentrate runoff. If precipitation is expected, earthen berms shall be constructed around the area being stripped, with a silt sock, silt fence or haybale dike situated in an arc at the low point of the berm.
- If intense precipitation is anticipated, silt socks, haybales, dikes and /or silt fences shall be used as required to prevent erosion and sediment transport. The materials required shall be stored on site at all time.
- If water is required for soil compaction, it shall be added in a uniform manner that does not allow excess water to flow off the area being compacted.
- Dust shall be held at a minimum by sprinkling exposed soil with an appropriate amount of water.

Maintenance of Disturbed Surfaces

- Runoff shall be diverted from disturbed side slopes in both cut and fill.
- Mulching may be used for temporary stabilization.
- Silt sock, haybale or silt fences shall be set where required to trap products of erosion and shall be maintained on a continuing basis during the construction process.

Loaming and Seeding

- Loam shall not be placed unless it is to be seeded directly thereafter.
- All disturbed areas shall have a minimum of 4" of loam placed before seeded and mulched.
- Consideration shall be given to hydro-mulching, especially on slopes in excess of 3 to 1.
- Loamed and seeded slopes shall be protected from washout by mulching or other acceptable slope protection until vegetation begins to grow.

Stormwater Collection System Installation

- The Stormwater drainage system shall be installed from the downstream end up and in a manner which will not allow runoff from disturbed areas to enter pipes.
- Excavation for the drainage system shall not be left open when rainfall is expected overnight. If left open under other circumstances, pipe ends shall be closed by a staked board or by an equivalent method.
- All catch basin openings shall be covered by a silt bag between the grate and the frame or protected from sediment by silt fence surrounding the catch basin grate.

Completion of Paved Areas

- During the placement of sub-base and pavement, the entrance to the Stormwater drainage systems shall be sealed when rain is expected. When these entrances are closed, consideration must be given to the direction of run-off and measures shall be undertaken to minimize erosion and to provide for the collection of sediment.
- In some situations, it may be necessary to keep catch basins open.
- Appropriate arrangements shall be made downstream to remove all sediment deposition.

Stabilization of Surfaces

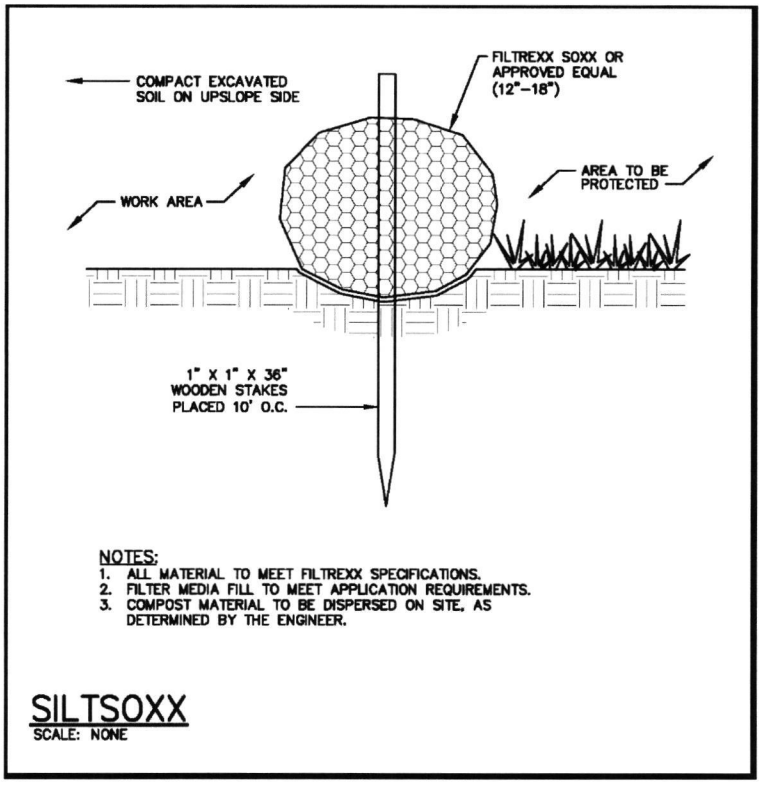
- Stabilization of surfaces includes the placement of pavement, rip-rap, wood bark mulch and the establishment of vegetated surfaces.
- Upon completion of construction, all surfaces shall be stabilized even though it is apparent that future construction efforts will cause their disturbance.
- Vegetated cover shall be established during the proper growing season and shall be enhanced by soil adjustment for proper pH, nutrients and moisture content.
- Surfaces that are disturbed by erosion processes or vandalism shall be stabilized as soon as possible.
- Areas where construction activities have permanently or temporarily ceased shall be stabilized within 14 days from the last construction activity, except when construction activity will resume within 21 days (e.g., the total time period that construction activity is temporarily ceased is less than 21 days).
- Hydro-mulching of grass surfaces is recommended, especially if seeding of the surfaces is required outside the normal growing season.
- Hay mulch is an effective method of temporarily stabilizing surfaces, but only if it is properly secured by branches, weighted snow fences or weighted chicken wire.

4.7 Temporary Structural Erosion Control Measures

Temporary erosion control measures serve to minimize construction-associated impacts to undisturbed areas. Please refer to the following sections for a description of temporary erosion control measures implemented as part of the project and this sample SWPPP.

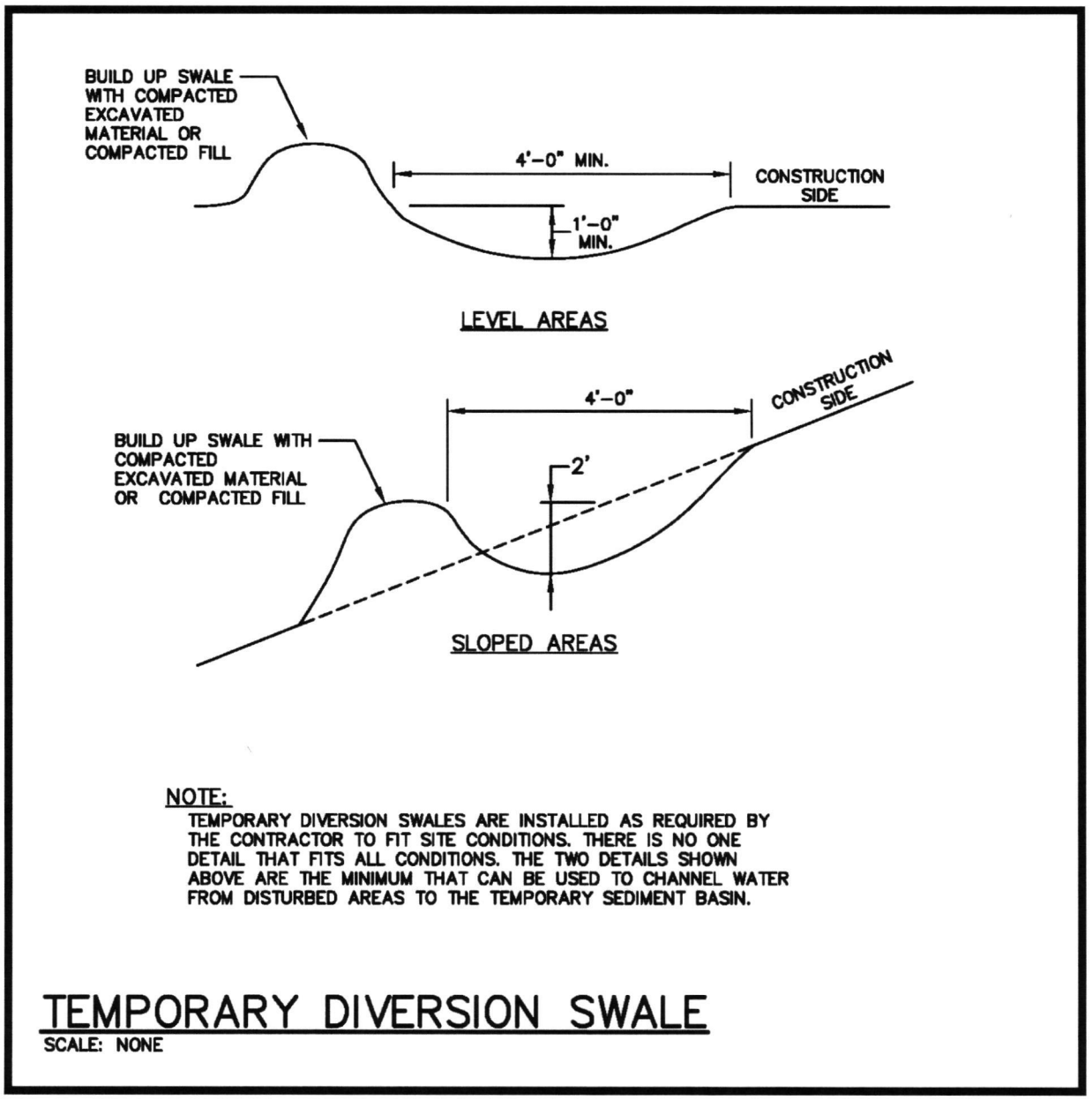
4.7.1 Staked Erosion Control Barrier

The siltation barriers will demarcate the limit of work, form a work envelope and provide additional assurance that construction equipment will not enter the undisturbed portions of the site. All barriers will remain in place until disturbed areas are stabilized.



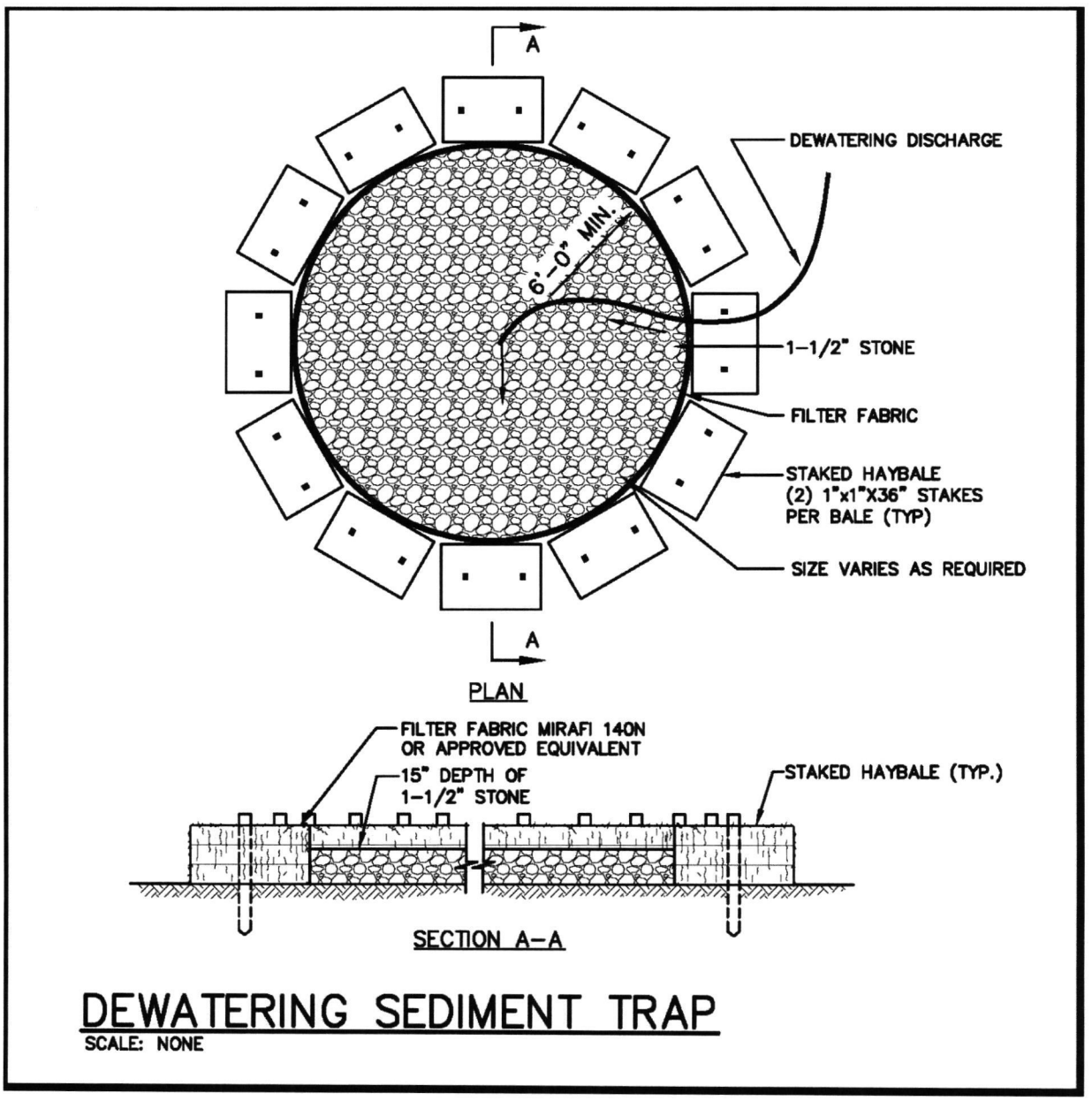
4.7.2 Temporary Stormwater Diversion Swale

A temporary diversion swale is an effective practice for temporarily diverting stormwater flows and to reduce stormwater runoff velocities during storm events. The swale channel can be installed before infrastructure construction begins at the site, or as needed throughout the construction process. The diversion swale should be routinely compacted or seeded to minimize the amount of exposed soil.



4.7.3 Dewatering Basins

Dewatering may be required during stormwater system, foundation construction and utility installation. Should the need for dewatering arise, groundwater will be pumped directly into a temporary settling basin, which will act as a sediment trap during construction. All temporary settling basins will be located within close proximity of daily work activities. Prior to discharge, all groundwater will be treated by means of the settling basin or acceptable substitute. Discharges from sediment basins will be free of visible floating, suspended and settleable solids that would impair the functions of a wetland or degrade the chemical composition of the wetland resource area receiving ground or surface water flows and will be to the combined system.



4.7.4 Material Stockpiling Locations

Piping and trench excavate associated with the subsurface utility work will be contained with a single row of silt socks and/or haybales.

4.8 Permanent Structural Erosion Control Measures

Permanent erosion control measures serve to minimize post-construction impacts to undisturbed areas. Please refer to the following sections for a description of permanent erosion control measures implemented as part of the project and this SWPPP.

4.9 Good Housekeeping Best Management Practices

4.9.1 Material Handling and Waste Management

Solid waste generation during the construction period will be primarily construction debris. The debris will include scrap lumber (used forming and shoring pallets and other shipping containers), waste packaging materials (plastic sheeting and cardboard), scrap cable and wire, roll-off containers (or dumpsters) and will be removed by a contract hauler to a properly licensed landfill. The roll-off containers will be covered with a properly secured tarp before the hauler exits the site. In addition to construction debris, the construction work force will generate some amount of household-type wastes (food packing, soft drink containers, and other paper). Trash containers for these wastes will be located around the site and will be emptied regularly to prevent wind-blown litter. This waste will also be removed by a contract hauler.

All hazardous waste material such as oil filters, petroleum products, paint and equipment maintenance fluids will be stored in structurally sound and sealed shipping containers in the hazardous-materials storage area and segregated from other non-waste materials. Secondary containment will be provided for all materials in the hazardous materials storage area and will consist of commercially available spill pallets. Additionally, all hazardous materials will be disposed of in accordance with federal, state and municipal regulations.

Two temporary sanitary facilities (portable toilets) will be provided at the site in the combined staging area. The toilets will be away from a concentrated flow path and traffic flow and will have collection pans underneath as secondary treatment. All sanitary waste will be collected from an approved party at a minimum of three times per week.

4.9.2 Building Material Staging Areas

Construction equipment and maintenance materials will be stored at the combined staging area and materials storage areas. Silt fence will be installed around the perimeter to designate the staging and materials storage area. A watertight shipping container will be used to store hand tools, small parts and other construction materials.

Non-hazardous building materials such as packaging material (wood, plastic and glass) and construction scrap material (brick, wood, steel, metal scraps, and pine cuttings) will be stored in a separate covered storage facility adjacent to other stored materials. All hazardous-waste materials such as oil filters, petroleum products, paint and equipment maintenance fluids will be stored in structurally sound and sealed containers under cover within the hazardous materials storage area.

Large items such as framing materials and stockpiled lumber will be stored in the open storage area. Such materials will be elevated on wood blocks to minimize contact with runoff.

The combined storage areas are expected to remain clean, well-organized and equipped with ample cleaning supplies as appropriate for the materials being stored. Perimeter controls such as containment structures, covers and liners will be repaired or replaced as necessary to maintain proper function.

4.9.3 Designated Washout Areas

Designated temporary, below-ground concrete washout areas will be constructed, as required, to minimize the pollution potential associated with concrete, paint, stucco, mixers etc. Signs will, if required, be posted marking the location of the washout area to ensure that concrete equipment operators use the proper facility. Concrete pours will not be conducted during or before an anticipated precipitation event. All excess concrete and concrete washout slurries from the concrete mixer trucks and chutes will be discharged to the washout area or hauled off-site for disposal.

4.9.4 Equipment/Vehicle Maintenance and Fueling Areas

Several types of vehicles and equipment will be used on-site throughout the project including graders, scrapers, excavators, loaders, paving equipment, rollers, trucks and trailers, backhoes and forklifts. All major equipment/vehicle fueling and maintenance will be performed off-site. A small, 20-gallon pickup bed fuel tank will be kept on-site in the combined staging area. When vehicle fueling must occur on-site, the fueling activity will occur in the staging area. Only minor equipment maintenance will occur on-site. All equipment fluids generated from maintenance activities will be disposed of into designated drums stored on spill pallets. Absorbent, spill-cleanup materials and spill kits will be available at the combined staging and materials storage area. Drip pans will be placed under all equipment receiving maintenance and vehicles and equipment parked overnight.

4.9.5 Equipment/Vehicle Wash down Area

All equipment and vehicle washing will be performed off-site.

4.9.6 Spill Prevention Plan

A spill containment kit will be kept on-site in the Contractor's trailer and/or the designated staging area throughout the duration of construction. Should there be an accidental release of petroleum product into a resource area, the appropriate agencies will be immediately notified.

4.9.7 Inspections

Maintenance of existing and proposed BMP's to address stormwater management facilities during construction is an on-going process. The purpose of the inspections is to observe all sources of stormwater or non-stormwater discharge as identified in the SWPPP as well as the status of the receiving waters and fulfill the requirements of the Order of Conditions. The following sections describe the appropriate inspection measures to adequately implement the project's SWPPP. A blank inspection form is provided at the end of this section. Completed inspection forms are to be maintained on site.

Inspection Personnel

The owner's appointed representative will be responsible for performing regular inspections of erosion controls and ordering repairs as necessary.

Inspection Frequency

Inspections will be performed by qualified personnel once every 7 days and within 24-hours after a storm event of greater than one-quarter inch, in accordance with the CGP. The inspections must be documented on the inspection form provided at the end of this section, and completed forms will be provided to the on-site supervisor and maintained at the Owner's office throughout the entire duration of construction.

Inspection Reporting

Each inspection report will summarize the scope of the inspection, name(s) and qualifications of personnel making the inspection, and major observations relating to the implementation of the SWPPP, including compliance and non-compliance items. Completed inspection reports will remain with the completed SWPPP on site.

4.9.8 Amendment Requirements

The final SWPPP is intended to be a working document that is utilized regularly on the construction site, and provides guidance to the Contractor. It must reflect changes made to the originally proposed plan and will be updated to include project specific activities and ensure that they are in compliance with the NPDES General Permit and state and local laws and regulations. It should be amended whenever there is a change in design, construction, operation or maintenance that affects discharge of pollutants. The following items should be addressed should an amendment to the SWPPP occur:

- Dates of certain construction activities such as major grading activities, clearing and initiation of and completion of stabilization measures should be recorded.
- Future amendments to the SWPPP will be recorded as required. As this SWPPP is amended, all amendments will be kept on site and made part of the SWPPP.
- Upon completion of site stabilization (completed as designed and/or 70% background vegetative cover), it can be documented and marked on the plans. Inspections are no longer required at this time.
- Inspections often identify areas not included in the original SWPPP, which will require the SWPPP to be amended. These updates should be made within seven days of being recognized by the inspector.

4.10 SWPPP Inspection and Maintenance Report

The following form is an example to be used for SWPPP Inspection Reporting.

Stormwater Construction Site Inspection and Maintenance Report

TO BE COMPLETED AT LEAST EVERY 7 DAYS AND WITHIN 24 HOURS OF A STORM EVENT OF AT LEAST 0.25 INCHES. AFTER SITE STABILIZATION, TO BE COMPLETED AT LEAST ONCE PER MONTH FOR THREE YEARS OR UNTIL A NOTICE OF TERMINATION IS FILED (IF APPLICABLE).

General Information			
Project Name	Photovoltaic System		
NPDES Tracking No. (if applicable)		**Location**	0 Depot Road, Harwich, MA 02645
Date of Inspection		**Start/End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Inspector's Qualifications			
Describe present phase of construction			
Type of Inspection: ❑ Regular ❑ Pre-storm event ❑ During storm event ❑ Post-storm event			
Weather Information			
Has there been a storm event since the last inspection? ❑Yes ❑No **If yes, provide:** Storm Start Date & Time: Storm Duration (hrs): Approximate Amount of Precipitation (in):			
Weather at time of this inspection? ❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snowing ❑ High Winds ❑ Other: Temperature:			
Have any discharges occurred since the last inspection? ❑Yes ❑No **If yes, describe:**			
Are there any discharges at the time of inspection? ❑Yes ❑No **If yes, describe:**			

Site-specific BMPs

- *Number the structural and non-structural BMPs identified in your SWPPP on your site map and list them below (add as many BMPs as necessary). Carry a copy of the numbered site map with you during your inspections. This list will ensure that you are inspecting all required BMPs at your site.*
- *Describe corrective actions initiated, date completed, and note the person that completed the work in the Corrective Action Log.*

	BMP	**BMP Installed?**	**BMP Maintenance Required?**	**Corrective Action Needed and Notes Action required by whom and when**
1	Catch Basin Protection	❑Yes ❑No	❑Yes ❑No	
2	Haybale & Silt Fencing	❑Yes ❑No	❑Yes ❑No	
3	Straw Wattles	❑Yes ❑No	❑Yes ❑No	
4	Construction Entrance	❑Yes ❑No	❑Yes ❑No	
5	Sediment Basins	❑Yes ❑No	❑Yes ❑No	
6	Dewatering Pit	❑Yes ❑No	❑Yes ❑No	

Overall Site Issues

Below are some general site issues that should be assessed during inspections. Customize this list as needed for conditions at your site.

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes Action required by whom and when
1	Are all slopes and disturbed areas not actively being worked properly stabilized?	❑Yes ❑No	❑Yes ❑No	
2	Are natural resource areas (e.g., streams, wetlands, mature trees, etc.) protected with barriers or similar BMPs?	❑Yes ❑No	❑Yes ❑No	
3	Are perimeter controls and sediment barriers adequately installed (keyed into substrate) and maintained?	❑Yes ❑No	❑Yes ❑No	
4	Are discharge points and receiving waters free of any sediment deposits?	❑Yes ❑No	❑Yes ❑No	
5	Are storm drain inlets properly protected?	❑Yes ❑No	❑Yes ❑No	
6	Is the construction exit preventing sediment from being tracked into the street?	❑Yes ❑No	❑Yes ❑No	
7	Is trash/litter from work areas collected and placed in covered dumpsters?	❑Yes ❑No	❑Yes ❑No	
8	Are washout facilities (e.g., paint, stucco, concrete) available, clearly marked, and maintained?	❑Yes ❑No	❑Yes ❑No	
9	Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	❑Yes ❑No	❑Yes ❑No	Vehicle Maintenance not allowed on site
10	Are materials that are potential stormwater	❑Yes ❑No	❑Yes ❑No	

	contaminants stored inside or under cover?			
11	Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	❑Yes ❑No	❑Yes ❑No	
12	(Other)	❑Yes ❑No	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance not described above:

CERTIFICATION STATEMENT

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

Print name and title: _____.
(Qualified Person Performing the Inspection)

Signature:_____ **Date:** _____.

Print name and title: _____
(Contractor/Operator)

Signature:_____ **Date:**_____

SECTION 5.0

LONG-TERM POLLUTION PREVENTION & OPERATION AND MAINTENANCE PLAN

5.0 Long-Term Pollution Prevention & Operation and Maintenance Plan

As required by Standard #4 of the Stormwater Management Policy, this Long-Term Pollution Prevention Plan has been developed for source control and pollution prevention at the site after construction.

Maintenance Responsibility

Ensuring that the provisions of the Long-Term Pollution Prevention Plan are followed will be the responsibility of The Applicant.

Good Housekeeping Practices

The site to be kept clean of trash and debris at all times. Trash, junk, etc. is not to be left outside.

Vehicle Washing Controls

The following BMP's, or equivalent measures, methods or practices are required if you are engaged in vehicle washing and/or steam cleaning:

It is allowable to rinse down the body or a vehicle, including the bed of a truck, with just water without doing any wash water control BMP's.

If you wash (with mild detergents) on an area that infiltrates water, such as gravel, grass, or loose soil, it is acceptable to let the wash water infiltrate as long as you only wash the body of vehicles.

However, if you wash on a paved area and use detergents or other cleansers, or if you wash/rinse the engine compartment or the underside of vehicles, you must take the vehicles to a commercial vehicle wash.

Requirements for Routine Inspections and Maintenance of Stormwater BMPs

All stormwater BMPs are to be inspected and maintain as follows;

Siltsoxx, Silt Fence, and other temporary measures

The temporary erosion control measures will be installed up gradient of any area where any disturbance or alteration might otherwise allow for erosion or sedimentation. They will be regularly inspected to ensure that they are functioning adequately. Additional supplies of these temporary measures will be stockpiled on site for any immediate needs or routine replacement.

Leaching Chambers

Leaching chambers may be prone to clogging. Chambers should be inspected after every major storm in the first few months after construction to ensure proper stabilization, and after proper stabilization, inspect annually.

Provisions for Maintenance of Lawns, Gardens and other Landscape Areas

Suggested Maintenance Operations

A. Trees and Shrubs

Disease and Pest Management - Prevention of disease or infestation is the first step of Pest Management. A plant that is in overall good health is far less susceptible to disease. Good general landscape maintenance can reduce problems from disease.

Inspections of plant materials for signs of disease or infestation are to be performed monthly by the Landscape Maintenance Contractor's Certified Arborist. This is a critical step for early diagnosis. Trees and Shrubs that have been

diagnosed to have a plant disease or an infestation of insect pests are to be treated promptly with an appropriate material by a licensed applicator.

Fertilization - Trees and shrubs live outside their natural environment and should be given proper care to maintain health and vigor. Fertilizing trees and shrubs provides the plants with nutrients needed to resist insect attack, to resist drought and to grow thicker foliage. Fertilizing of new and old trees may be done in one of three ways, in either the early spring or the late fall.

- Systemic Injection of new and existing trees on trees 2 inches or greater in diameter. You must be licensed to apply this method.
- Soil Injection – a liquid fertilizer with a product such as Arbor Green or Rapid Grow injected into the soil under the drip zone of a tree or shrub. Material must be used according to manufacturers' specifications to be effective. Outside contracting is recommended.
- Punch Bar Method – a dry fertilizer such as 10-10-10, may be used by punched holes in the drip zone of the tree 12-18" deep, two feet apart around the circumference, to the edge of the drip line. Three pounds of fertilizer should be used per diameter inch for trees with trunks six inches or more in diameter.
- Fertilizer of shrubs – use a fertilizer such as 10-10-10, broadcast over the planting area according to the manufacturers' rate and water in.
- All fertilization must be noted on daily maintenance log.

Watering - Trees and Shrubs will need supplemental watering to remain in vigorous health. All new plants need to be watered once a week in cool weather, twice a week during warm weather, and up to three times in a week during periods of extreme heat and drought. Trees and shrubs should be watered in such a manner as to totally saturate the soil in the root zone area. Over-watering or constant saturation of the soil must be avoided as this could lead to root rot and other disease problems. The use of a soil moisture meter can help you monitor the soil's water intake.

Plant Replacement - Unhealthy plants that may cause widespread infestation of other nearby plants shall be immediately removed from the site. Any vegetation removed from the site must be recorded and submitted with the daily maintenance log. The area shall be treated to prevent further infestation. The plant shall then be replaced with a healthy specimen of the same species and size. This work shall have a pre-established budget allowance for the year.

A spring inspection of all plant materials shall be performed to identify those plant materials that are not in vigorously healthy condition. Unhealthy plant materials shall be evaluated. If the problem is determined to be minor the plant material shall be given appropriate restorative care in accordance with this maintenance guideline until it is restored to a vigorously healthy condition. Unhealthy plant materials that do not respond to restorative care or are determined to be beyond saving shall be replaced with a healthy specimen of the same species and size. In the case of the necessity of replacing extremely large plant materials the Landscape Architect shall determine the size of the replacement plant.

Pruning - Proper pruning is the selective removal of branches without changing the plant's natural appearance, or habit of growth. All tree pruning is to be performed by a licensed Arborist. All branches that are dead, broken, scared or crossing should be removed. All cuts should be made at the collar and not cut flush with the base.

Pruning on the site shall be done for the following purposes;

- To maintain or reduce the size of a tree or shrub
- To remove dead, diseased or damaged branches
- To rejuvenate old shrubs and encourage new growth
- To stimulate future flower and fruit development
- To maximize the visibility of twig color
- To prevent damage and reduce hazards to people and properties

All shrubs are recommended to be pruned on an annual basis to prevent the shrub from becoming overgrown and eliminate the need for drastic pruning. There are several types of pruning for deciduous shrubs. Hand snips should be used to maintain a more natural look or hand shears can be used for a more formal appearance.

Winter Protection - All trees and shrubs are to be watered, fertilized, and mulched before the first frost. All stakes should be checked and ties adjusted. Damaged branches should be pruned.

Broadleaf and Coniferous Evergreen plant materials are to be sprayed with an anti-desiccant product to prevent winter burn. The application shall be repeated during a suitable mid-winter thaw.

Shrubs located in areas likely to be piled with snow during snow removal (but not designated as Snow Storage Areas) shall be marked by six-foot high poles with bright green banner flags. Stockpiles of snow are not to be located in these areas due to potential damage to the plant materials from both the weight of the snow and the snow melting chemicals.

At the fall landscape maintenance conference parameters will be discussed between the Landscape Maintenance Contractor and the snow removal contractor to assure minimal damage and loss of landscape amenities during the winter season.

Seasonal Clean Up - A thorough spring cleanup is to be performed. This includes the removal and replacement of dead or unhealthy plant materials and the cleanup of plant debris and any general debris that has accumulated over the winter season. Mulch is to be lightly raked to clean debris from the surface without removing any mulch. Twigs and debris are to be removed from the planting beds throughout the growing season.

Mulching - Planting beds shall be mulched with a treated shredded hardwood mulch free from dirt, debris, and insects. A sample of this mulch shall be given to the Owner for approval prior to installation.

Maintain a 2-3" maximum depth and keep free of weeds either by hand weeding or by the use of a pre-emergent weed control such as Treflan or Serfian. Seasonal re-mulching shall occur as necessary in the spring and the fall to maintain this minimum depth. When new mulch is added to the planting bed it shall be spread to create a total depth of no more than three inches. Edges should be maintained in a cleanly edged fashion.

Mulch shall not be placed directly against the trunk of any tree or shrub.

B. Groundcover and Perennials

Disease and Pest Management – Pesticides and herbicides should be applied only as problems occur, with the proper chemical applied only by a trained professional or in the case of pesticide, a Certified Pesticide Applicator. Plants should be monitored weekly and treated accordingly.

Fertilizer – The health of the plants can be maintained or improved, and their growth encouraged by an application of complete fertilizer. Apply a fertilizer such as 4-12-4 as growth becomes apparent and before mulching. Apply to all groundcover and perennial planting areas by hand and avoid letting the fertilizer come in contact with the foliage, or use a liquid fertilizer and apply by soaking the soil. Apply according to the manufacturers' specifications.

Fertilization shall stop at the end of July.

Water – Groundcovers and Perennials will need supplemental watering in order to become established, healthy plants. All new plants need to be watered once a week in cool weather, twice a week during warm weather, and up to three times in a week during periods of extreme heat and drought. Until established, groundcovers and perennials should be watered in such a manner as to totally saturate the soil in the root zone area, to a depth of 6 inches. Once established, perennials shall continue to be watered as necessary to maintain them in a vigorous healthy condition. Over-watering or constant saturation of the soil must be avoided as this could lead to root rot and other disease problems. The use of a soil moisture meter can help you monitor the soil's water intake.

On-site water shall be furnished by the Owner. Hose and other watering equipment shall be furnished by the Landscape Maintenance Contractor.

Replacement – Any unhealthy plant/s that may cause widespread infestation of other nearby plants shall be immediately removed from the site. Any vegetation removed from the site must be recorded and submitted with the landscape maintenance log. The area shall be treated to prevent further infestation. The plant/s shall then be replaced with healthy

specimen/s of the same species and size. Old Forge shall have a pre-established budget allowance for this type of replacement, each year.

Plant material that is damaged as a result of other landscape maintenance activities, such as mowing, shall be replaced with healthy specimens of the same species and size, at no additional cost to the owner.

Deadheading – Perennials shall be checked on a weekly basis and dead-headed once flowers have faded or as necessary based on plant type and duration of flower. Spent flowers can be pinched off with the thumb and forefinger. Continue to remove all faded flowers until Fall. All associated debris shall be removed from site daily.

Staking – Upright-growing perennials need support especially when in flower. Use of bamboo stakes, galvanized wire hoops or mesh may be necessary for their support. Supports should be put in place before they have become too difficult to handle. The supports should not be taller than the mature height of the perennial plant.

Division of Perennials – Two or three-year-old perennials are easily divided in the spring if more plants are needed. To divide, cut out the entire section of plant to be divided, including roots. The larger divisions (those with three or more shoots), can be set out immediately in their permanent location, where they can be expected to bloom the same season. Smaller divisions are best planted in an out-of-the-way planting bed until the following autumn or spring, when they can be moved to their permanent location.

Weeding – All planting beds should be kept weed-free. Weed either by hand or with a pre-emergent herbicide such as Treflen used according to manufacturers' specifications. Manual weeding is to be used in combination with the use of spot applications of herbicides. Both live and dead weeds are to be pulled and removed from the site.

All herbicide applications shall be documented in the Landscape Maintenance Log. The actual product label or the manufacturer's product specification sheet for the specific product shall also be included in the Log.

Only personnel with appropriate applicator licenses shall supervise and/or perform the application of pesticide products requiring a license.

Winterizing – Perennial gardens should be cleaned-up when growth ceases in the fall. Remove foliage of plants that normally die down to the ground. Divide and replant over-grown clumps.

C. Grass Areas (Meadow)

Mowing – Meadow grasses should be maintained at a maximum height of 12 inches. Maintaining grasses no higher than this is critical to prevent tall grass from casting shadows onto the solar panels, lowering their efficiency.

Mowing frequency – Typically, a solar field will need to be mowed once every month. Mowing frequency will vary with the growing season and should be set by the plant height and not a set date. Mowing frequency should be reduced during periods of stress.

When mowing any area, try to alternate mowing patterns. This tends to keep grass blades more erect and assures an even cut. A dull mower will cause color loss due to tearing of the turf plant, and since mowing will ultimately determine the appearance of any turf area there is an absolute necessity for a clean sharp cut.

Weed & Pest Control and Fertilizing- Not needed.

Weed Control – Not needed.

Pest Control – Not needed.

Lime – Not needed.

Lawn Maintenance Task Schedule

MARCH (Weather permitting)
- Clean up winter debris, sand, leaves, trash etc.
- Re-edge mulch beds, maintain at 2-3" maximum.
- Fertilize plants

APRIL
- Reseed or sod all areas needing attention.
- Start mowing when meadow grasses reach 12", mow to 6"

MAY
- Mow meadow grasses to height of 6"
- Check for disease and pest problems in both turf and plants.

JUNE
- Mow meadow grasses to height of 6"
- Check for disease and pest problems in both turf and plants, treat as necessary.

PROVISIONS FOR SOLID WASTE MANAGEMENT (SITE TRASH)

Trash will not be generated at this site and there will be no dumpsters or receptacles provided for solid waste.

SNOW DISPOSAL AND PLOWING PLANS

The purpose of the snow and snowmelt management plan is to provide guidelines regarding snow disposal site selection, site preparation and maintenance that are acceptable to the Department of Environmental Protection. For the areas that require snow removal, snow storage onsite will largely be accomplished by using pervious areas along the shoulder of the roadway and development as windrowed by plows.

- Avoid dumping of snow into any water body, including rivers, ponds, or wetlands. In addition to water quality impacts and flooding, snow disposed of in open water can cause navigational hazards when it freezes into ice blocks.
- Avoid disposing of snow on top of storm drain catch basins or in stormwater basins. Snow combined with sand and debris may block a storm drainage system, causing localized flooding. A high volume of sand, sediment, and litter released from melting snow also may be quickly transported through the system into surface water.

WINTER ROAD SALT AND/OR SAND USE AND STORAGE RESTRICTIONS

The applicant will be responsible for sanding and salting the site. No storage on site.

STREET SWEEPING SCHEDULES

Not applicable.

This project has not included street sweeping as part of the TSS removal calculations. However, if sand accumulates on site from the adjacent roadway, a street sweeping may be required. This would likely occur after the spring snow melt.

Reuse and Disposal of Street Sweepings

Once removed from paved surfaces, the sweepings must be handled and disposed of properly. Mass DEP's Bureau of Waste Prevention has issued a written policy regarding the reuse and disposal of street sweepings. These sweepings are regulated as a solid waste, and can be used in three ways:

- In one of the ways already approved by Mass DEP (e.g., daily cover in a landfill, additive to compost, fill in a public way)

- If approved under a Beneficial Use Determination
- Disposed in a landfill

TRAINING OF STAFF OR PERSONNEL INVOLVED WITH IMPLEMENTING LONG-TERM POLLUTION PREVENTION PLAN

The Long-Term Pollution Prevention Plan is to be implemented by property owner of the site. Trained and, if required, licensed Professionals are to be hired by the owner as applicable to implement the Long-Term Pollution Prevention Plan.

LIST OF EMERGENCY CONTACTS FOR IMPLEMENTING LONG-TERM POLLUTION PREVENTION PLAN

The applicant will be required to implement the Long-Term Pollution Prevention Plan and will create and maintain a list of emergency contacts.

POST CONSTRUCTION PHASE INSPECTION SCHEDULE AND EVALUATION CHECKLIST

Inspection Date	Inspector	BMP Inspected	Inspection Frequency Requirements	Comments	Recommendation	Follow-up Inspection Required (yes/no)
		Leaching Pits	Twice a year			

1. Refer to the Massachusetts Stormwater Handbook Volume Two: Stormwater Technical Handbook (February 2008) for recommendations regarding frequency for inspections and maintenance of specific BMP's

2. Inspections to be conducted by a qualified professional such as an environmental scientist or civil engineer.

3. Limited or no use of sodium chloride salts, fertilizers or pesticides recommended.

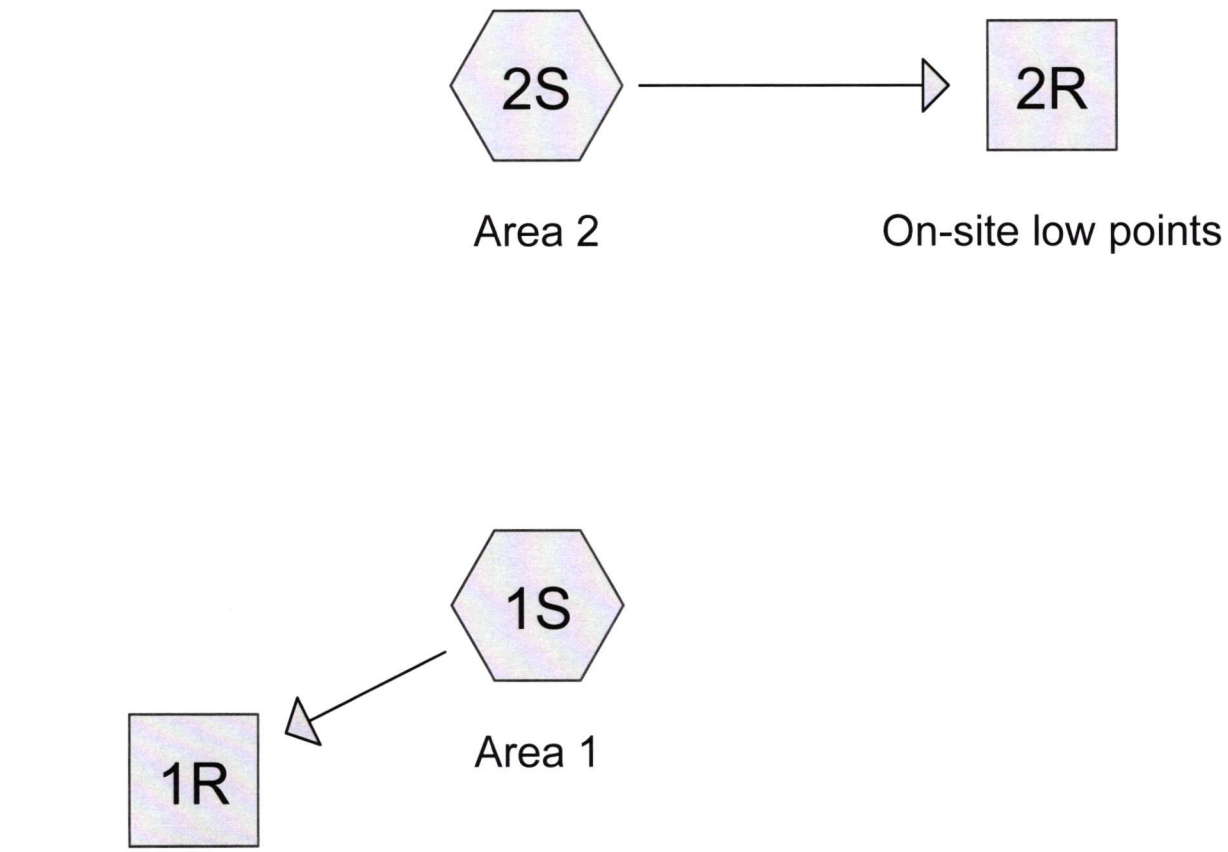
4. Other Notes: (Include deviations from Conservation Commission Approvals, Planning Board Approvals and Approved Plans)

SECTION 6.0

HYDROLOGY CALCULATIONS

6.01 EXISTING WATERSHED PLAN

6.02 EXISTING HYDROLOGY CALCULATIONS (HYDROCAD™ PRINTOUTS)



Subcat Reach Pond Link

Routing Diagram for 5041600-Pre
Prepared by BSC Group, Inc., Printed 7/21/2020

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
15.681	39	>75% Grass cover, Good, HSG A (1S, 2S)
0.627	98	Paved parking, HSG A (2S)
1.077	30	Woods, Good, HSG A (2S)
17.385	**41**	**TOTAL AREA**

Summary for Subcatchment 1S: Area 1

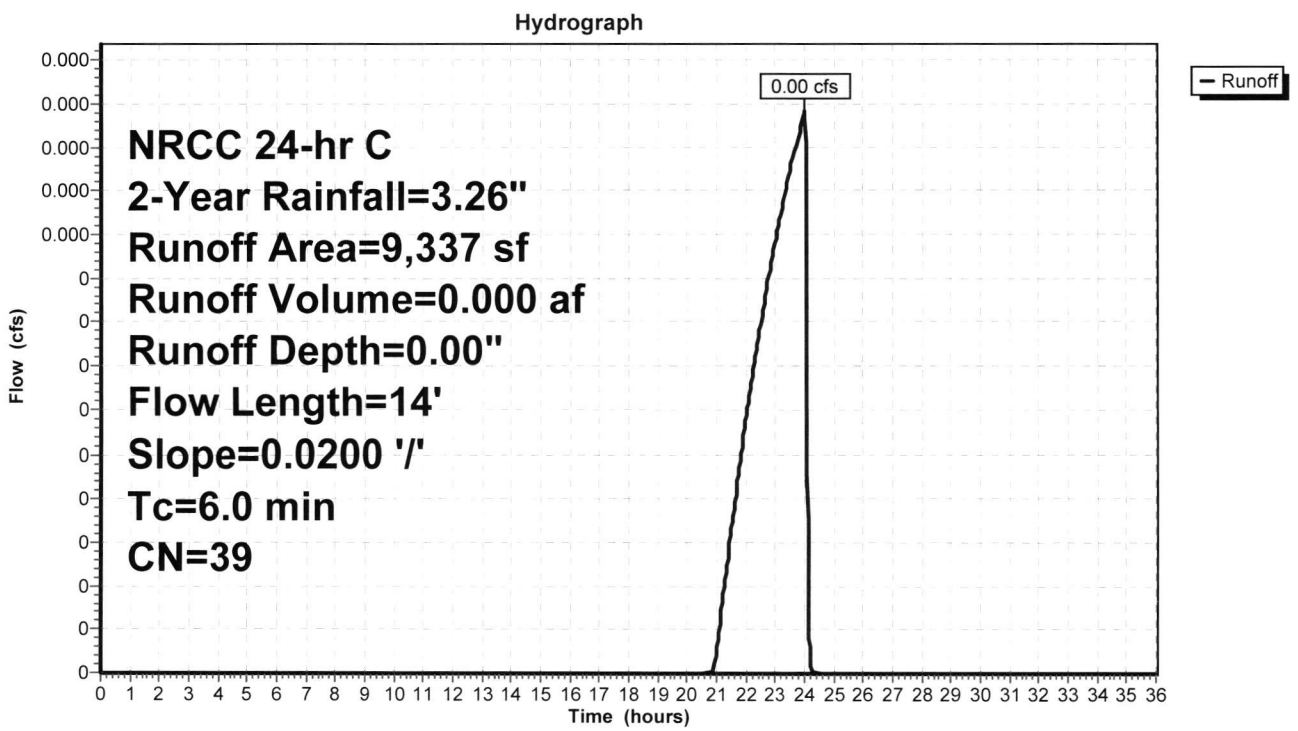
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 2-Year Rainfall=3.26"

Area (sf)	CN	Description
9,337	39	>75% Grass cover, Good, HSG A
9,337		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	14	0.0200	0.98		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
0.2	14	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1S: Area 1



Summary for Subcatchment 2S: Area 2

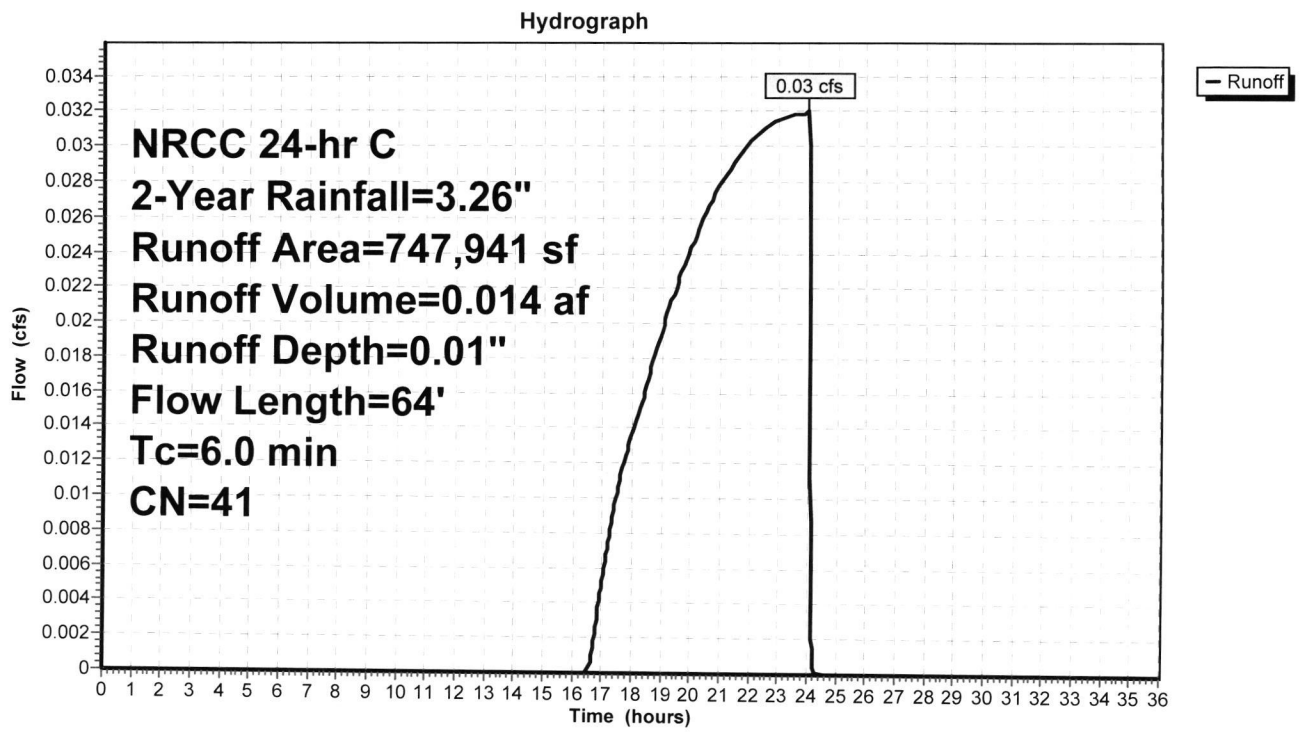
Runoff = 0.03 cfs @ 24.01 hrs, Volume= 0.014 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 2-Year Rainfall=3.26"

Area (sf)	CN	Description
27,327	98	Paved parking, HSG A
46,895	30	Woods, Good, HSG A
673,719	39	>75% Grass cover, Good, HSG A
747,941	41	Weighted Average
720,614		96.35% Pervious Area
27,327		3.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	39	0.0150	1.08		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
0.1	25	0.2500	8.05		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.7	64	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: Area 2

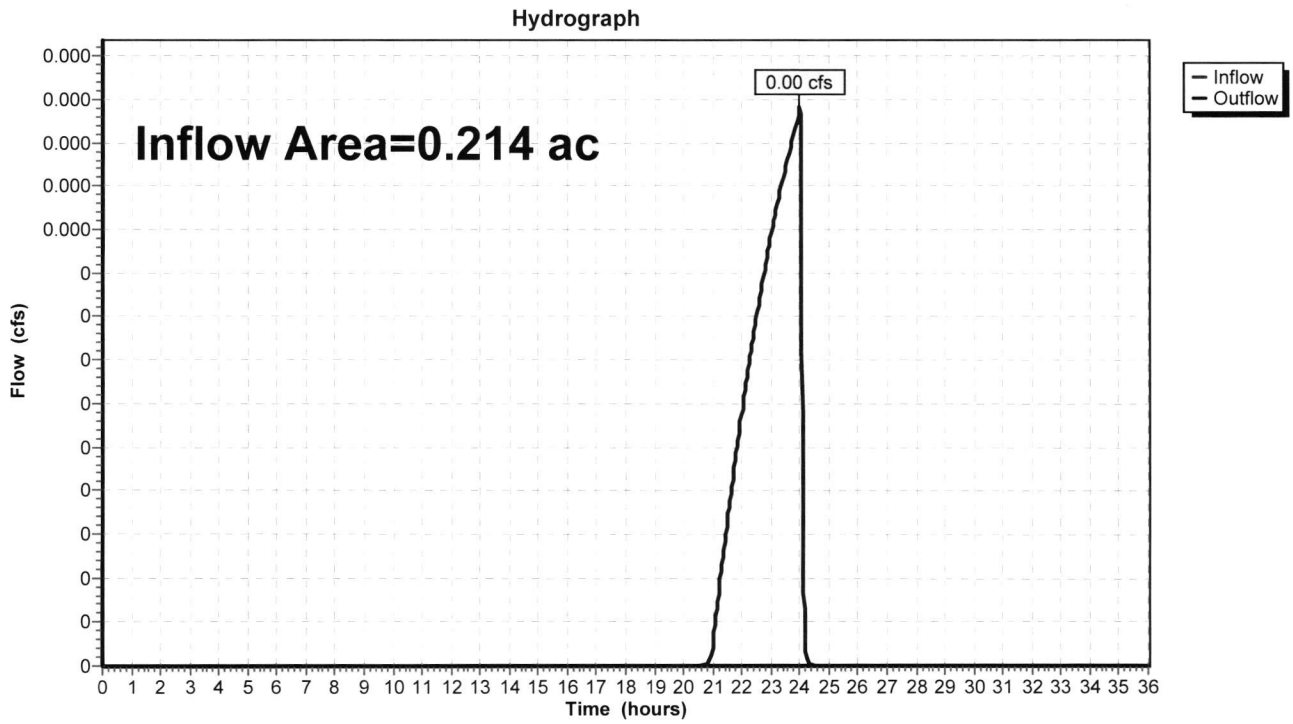


Summary for Reach 1R: Offsite Flow - South

Inflow Area = 0.214 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 1R: Offsite Flow - South

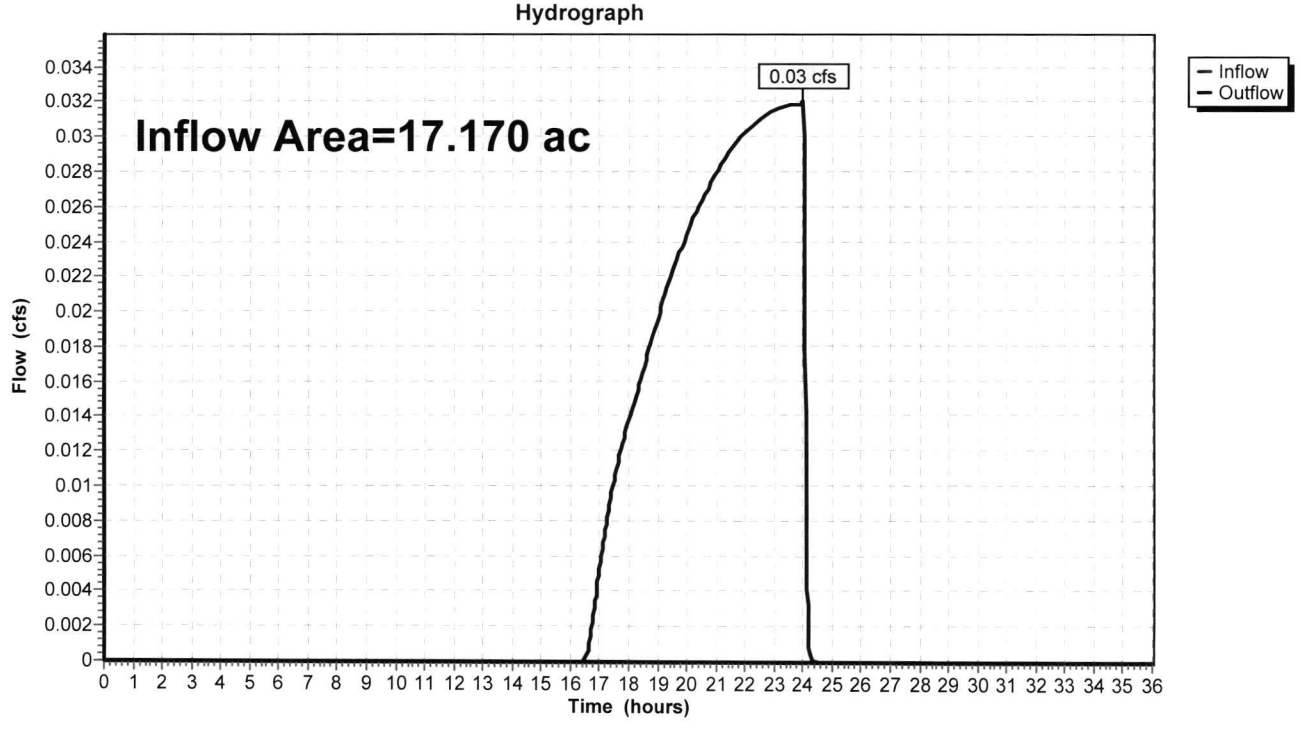


Summary for Reach 2R: On-site low points

Inflow Area = 17.170 ac, 3.65% Impervious, Inflow Depth = 0.01" for 2-Year event
Inflow = 0.03 cfs @ 24.01 hrs, Volume= 0.014 af
Outflow = 0.03 cfs @ 24.01 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 2R: On-site low points



Summary for Subcatchment 1S: Area 1

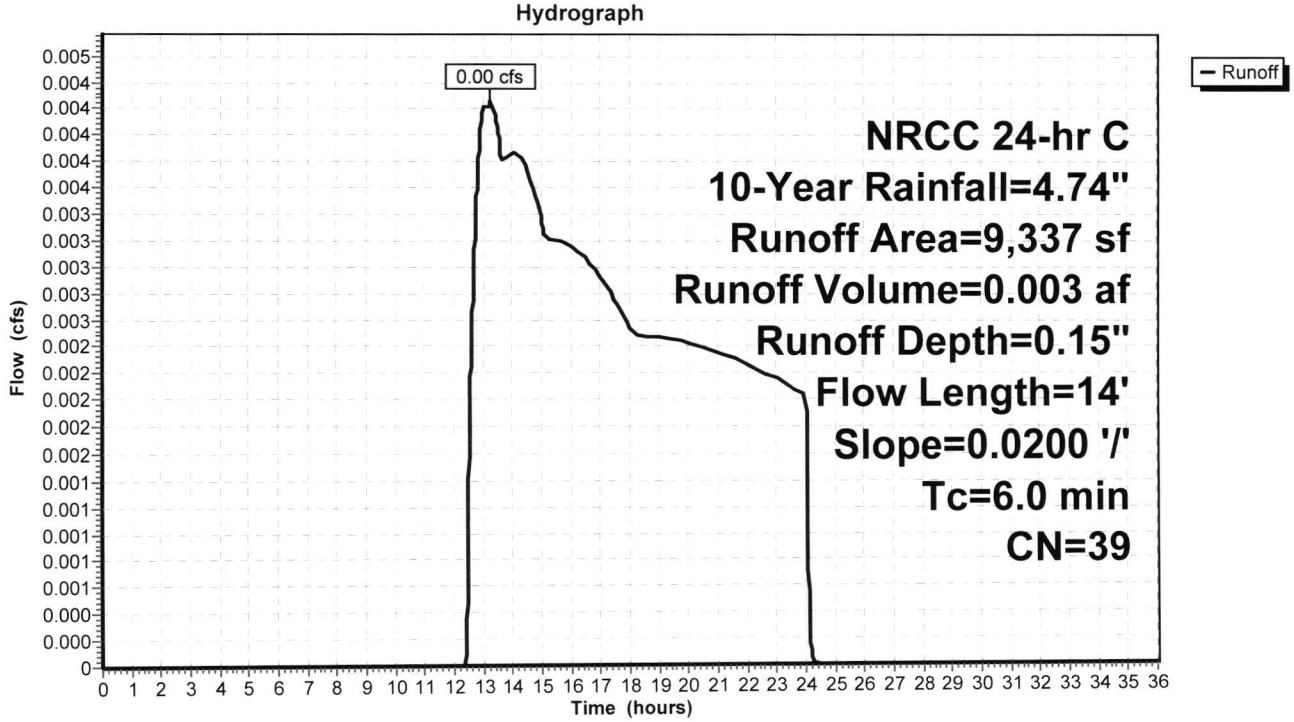
Runoff = 0.00 cfs @ 13.25 hrs, Volume= 0.003 af, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 10-Year Rainfall=4.74"

Area (sf)	CN	Description
9,337	39	>75% Grass cover, Good, HSG A
9,337		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	14	0.0200	0.98		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
0.2	14	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1S: Area 1



Summary for Subcatchment 2S: Area 2

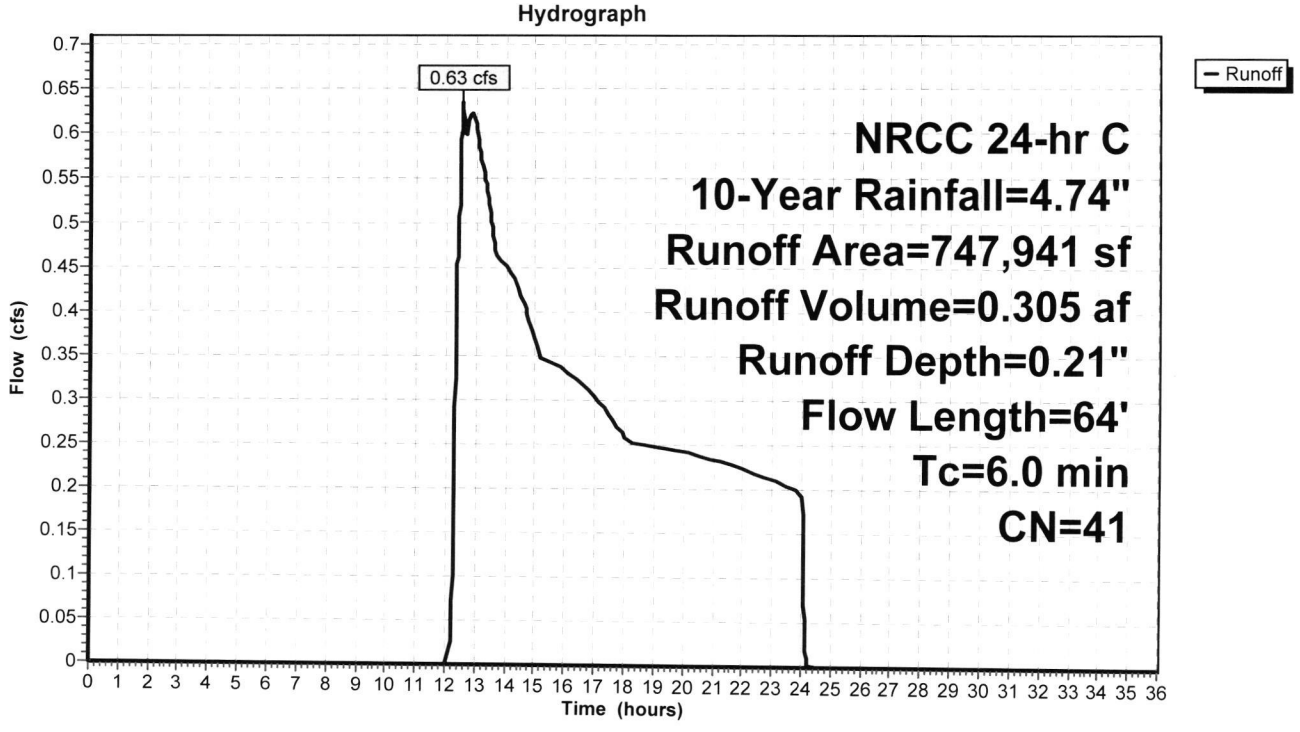
Runoff = 0.63 cfs @ 12.55 hrs, Volume= 0.305 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 10-Year Rainfall=4.74"

Area (sf)	CN	Description
27,327	98	Paved parking, HSG A
46,895	30	Woods, Good, HSG A
673,719	39	>75% Grass cover, Good, HSG A
747,941	41	Weighted Average
720,614		96.35% Pervious Area
27,327		3.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	39	0.0150	1.08		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
0.1	25	0.2500	8.05		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.7	64	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: Area 2

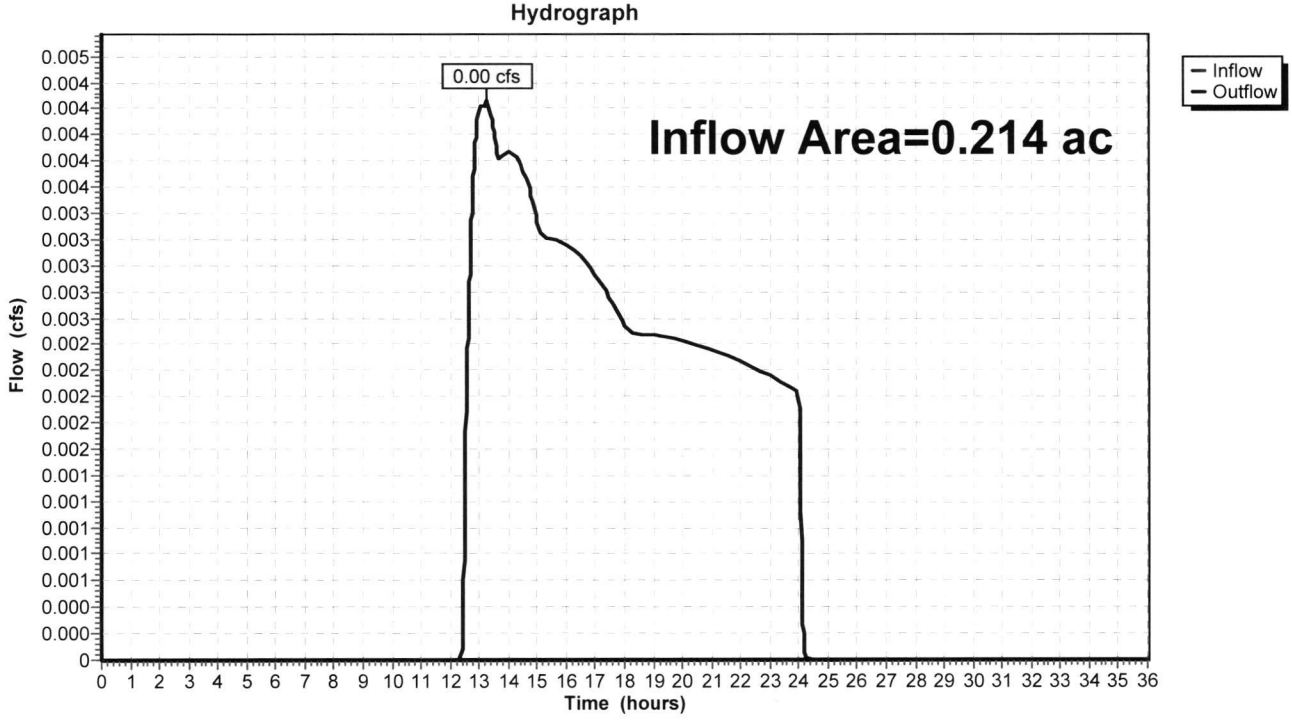


Summary for Reach 1R: Offsite Flow - South

Inflow Area = 0.214 ac, 0.00% Impervious, Inflow Depth = 0.15" for 10-Year event
Inflow = 0.00 cfs @ 13.25 hrs, Volume= 0.003 af
Outflow = 0.00 cfs @ 13.25 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 1R: Offsite Flow - South

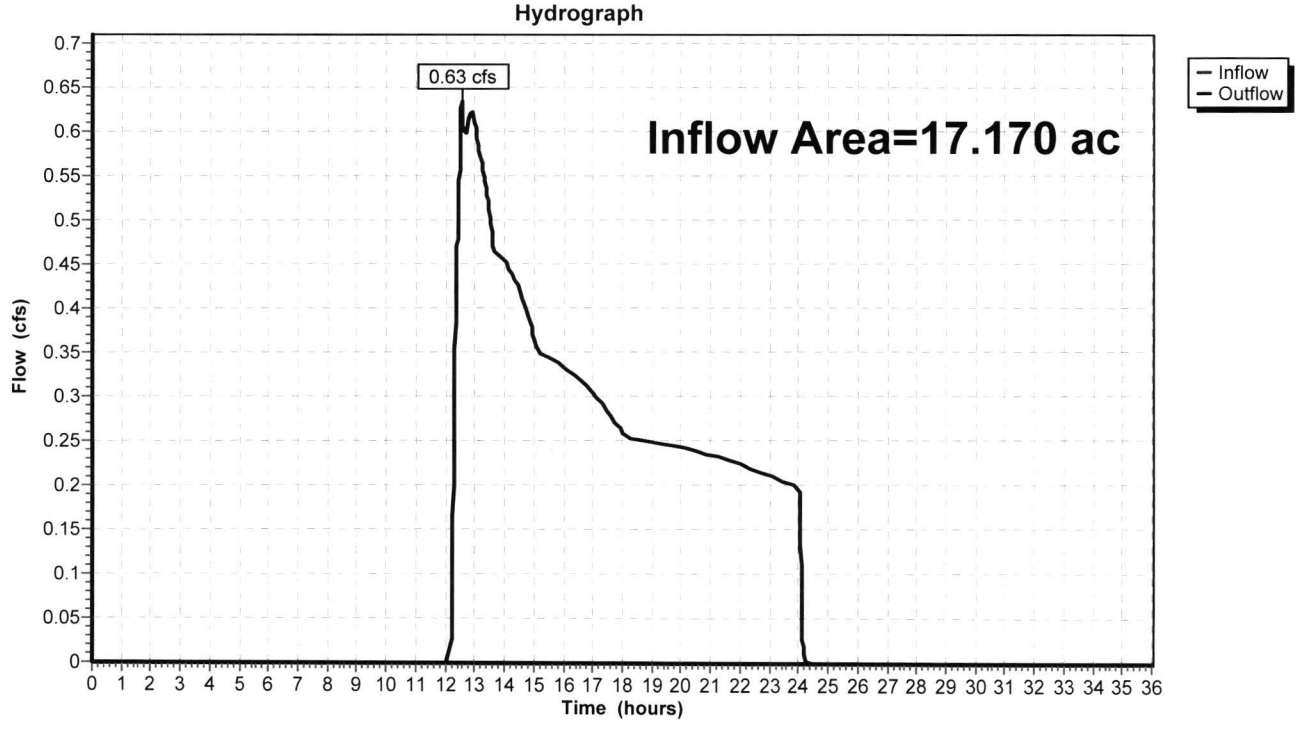


Summary for Reach 2R: On-site low points

Inflow Area = 17.170 ac, 3.65% Impervious, Inflow Depth = 0.21" for 10-Year event
Inflow = 0.63 cfs @ 12.55 hrs, Volume= 0.305 af
Outflow = 0.63 cfs @ 12.55 hrs, Volume= 0.305 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 2R: On-site low points



Summary for Subcatchment 1S: Area 1

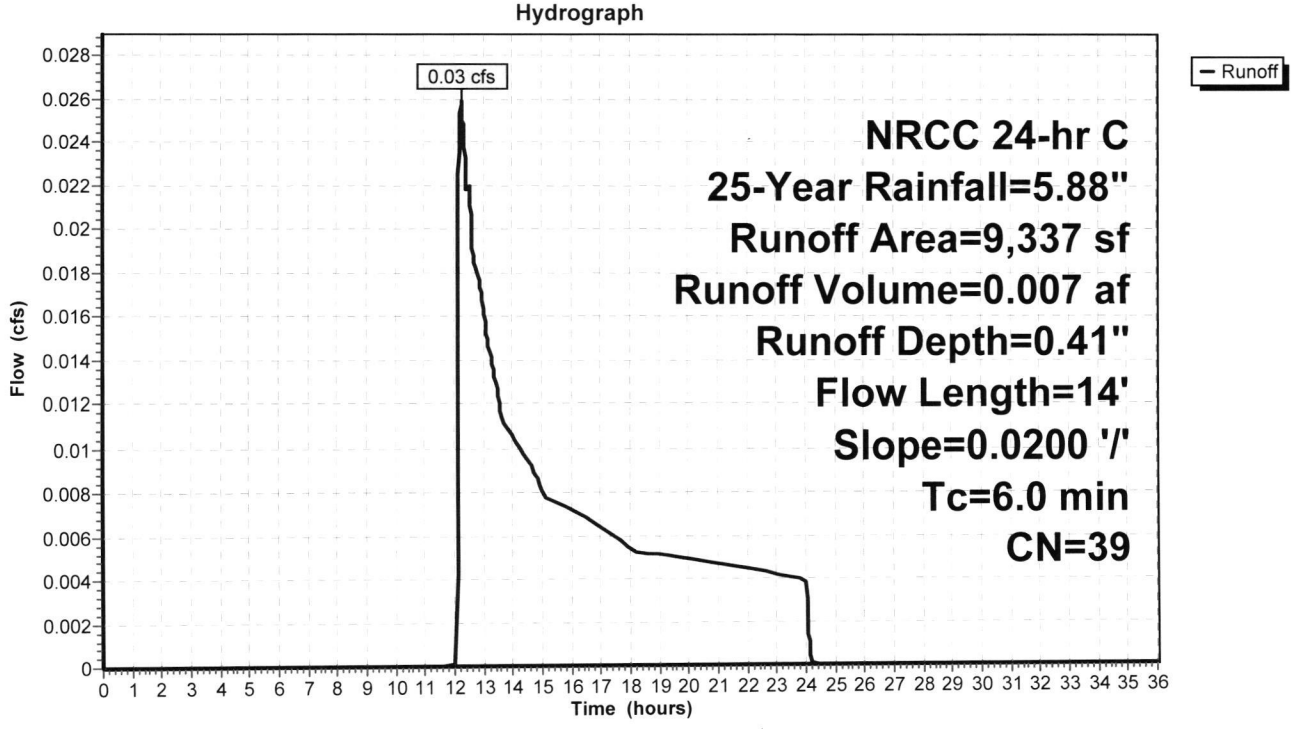
Runoff = 0.03 cfs @ 12.25 hrs, Volume= 0.007 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 25-Year Rainfall=5.88"

Area (sf)	CN	Description
9,337	39	>75% Grass cover, Good, HSG A
9,337		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	14	0.0200	0.98		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
0.2	14	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1S: Area 1



Summary for Subcatchment 2S: Area 2

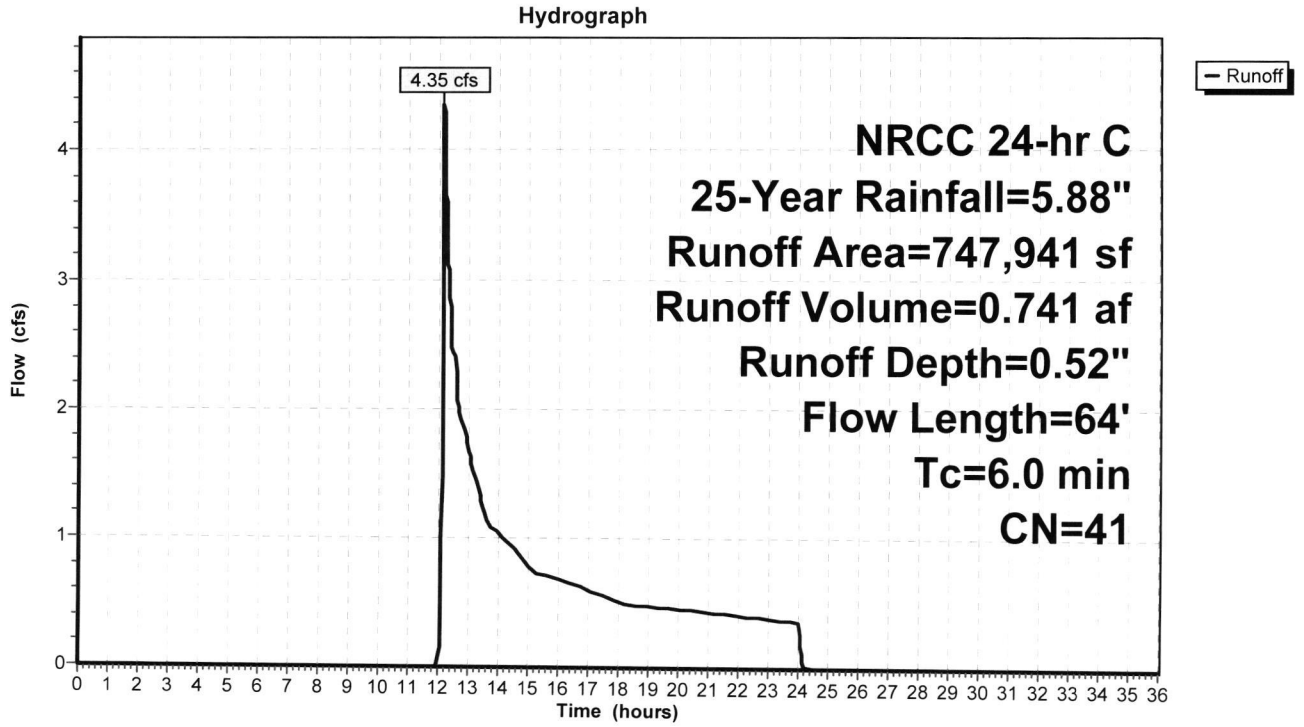
Runoff = 4.35 cfs @ 12.17 hrs, Volume= 0.741 af, Depth= 0.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 25-Year Rainfall=5.88"

Area (sf)	CN	Description
27,327	98	Paved parking, HSG A
46,895	30	Woods, Good, HSG A
673,719	39	>75% Grass cover, Good, HSG A
747,941	41	Weighted Average
720,614		96.35% Pervious Area
27,327		3.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	39	0.0150	1.08		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
0.1	25	0.2500	8.05		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.7	64	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: Area 2

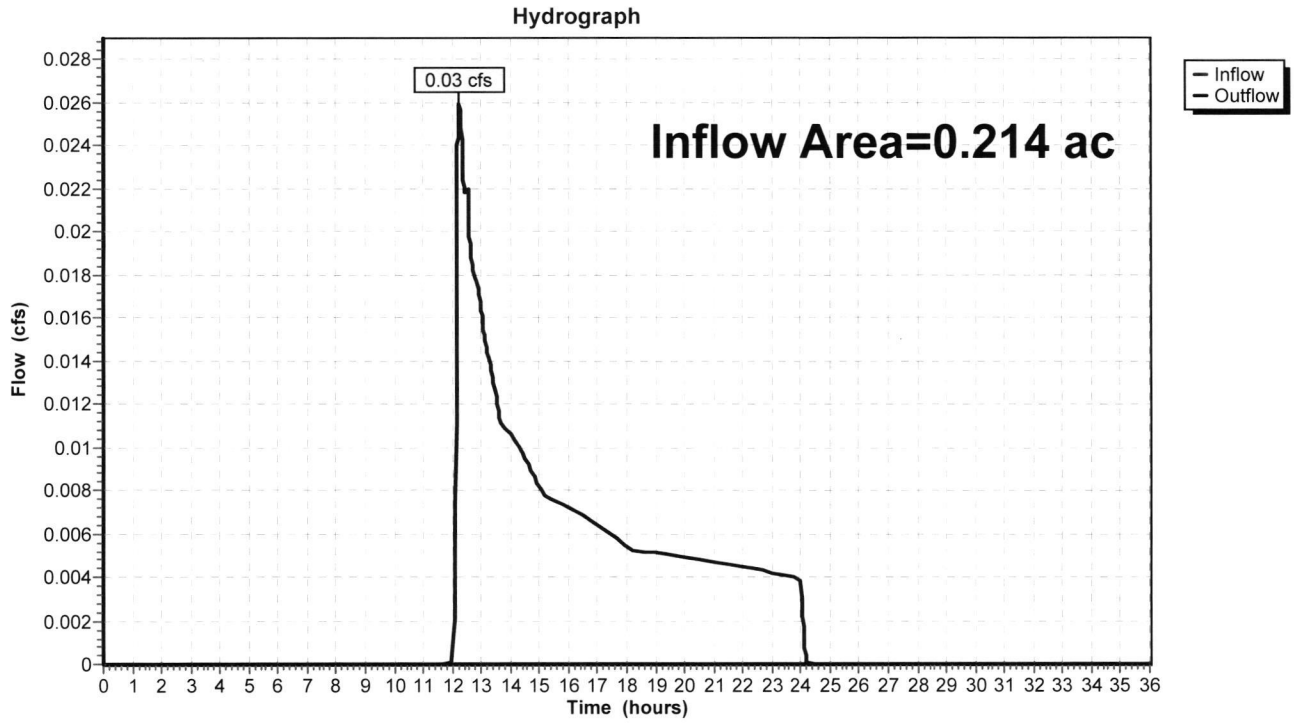


Summary for Reach 1R: Offsite Flow - South

Inflow Area = 0.214 ac, 0.00% Impervious, Inflow Depth = 0.41" for 25-Year event
Inflow = 0.03 cfs @ 12.25 hrs, Volume= 0.007 af
Outflow = 0.03 cfs @ 12.25 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 1R: Offsite Flow - South

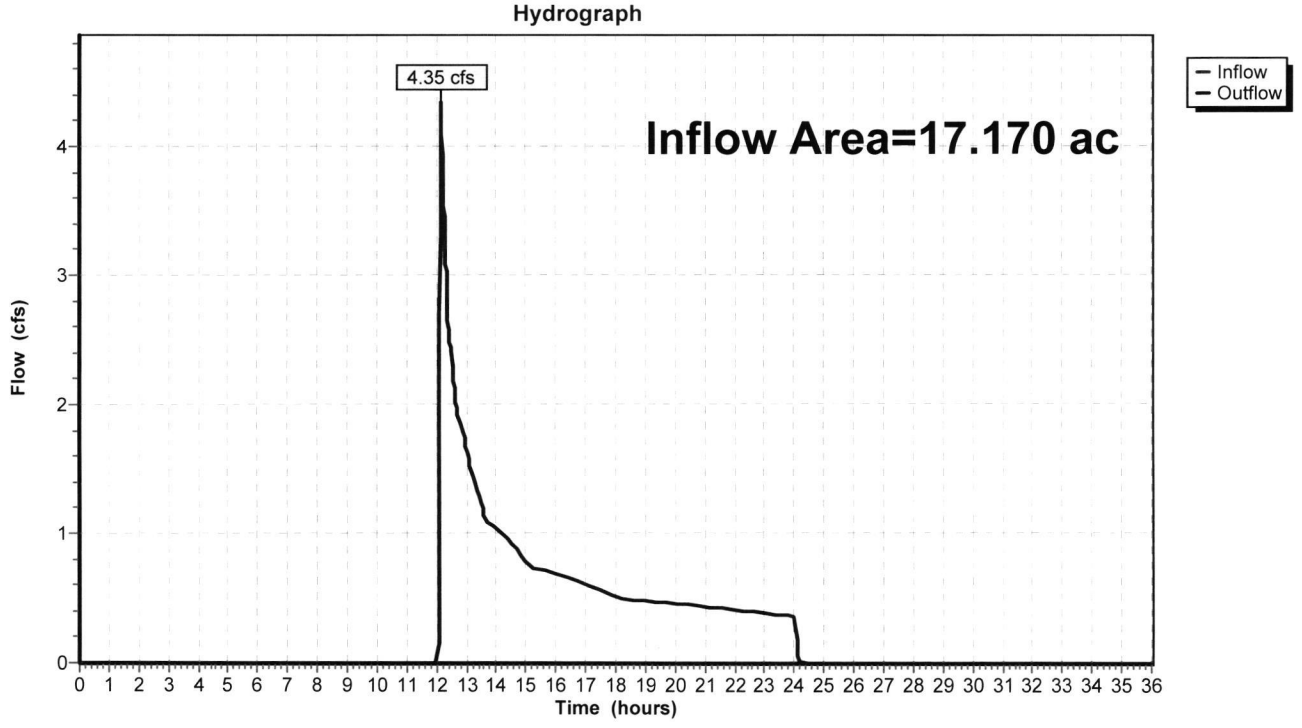


Summary for Reach 2R: On-site low points

Inflow Area = 17.170 ac, 3.65% Impervious, Inflow Depth = 0.52" for 25-Year event
Inflow = 4.35 cfs @ 12.17 hrs, Volume= 0.741 af
Outflow = 4.35 cfs @ 12.17 hrs, Volume= 0.741 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 2R: On-site low points



Summary for Subcatchment 1S: Area 1

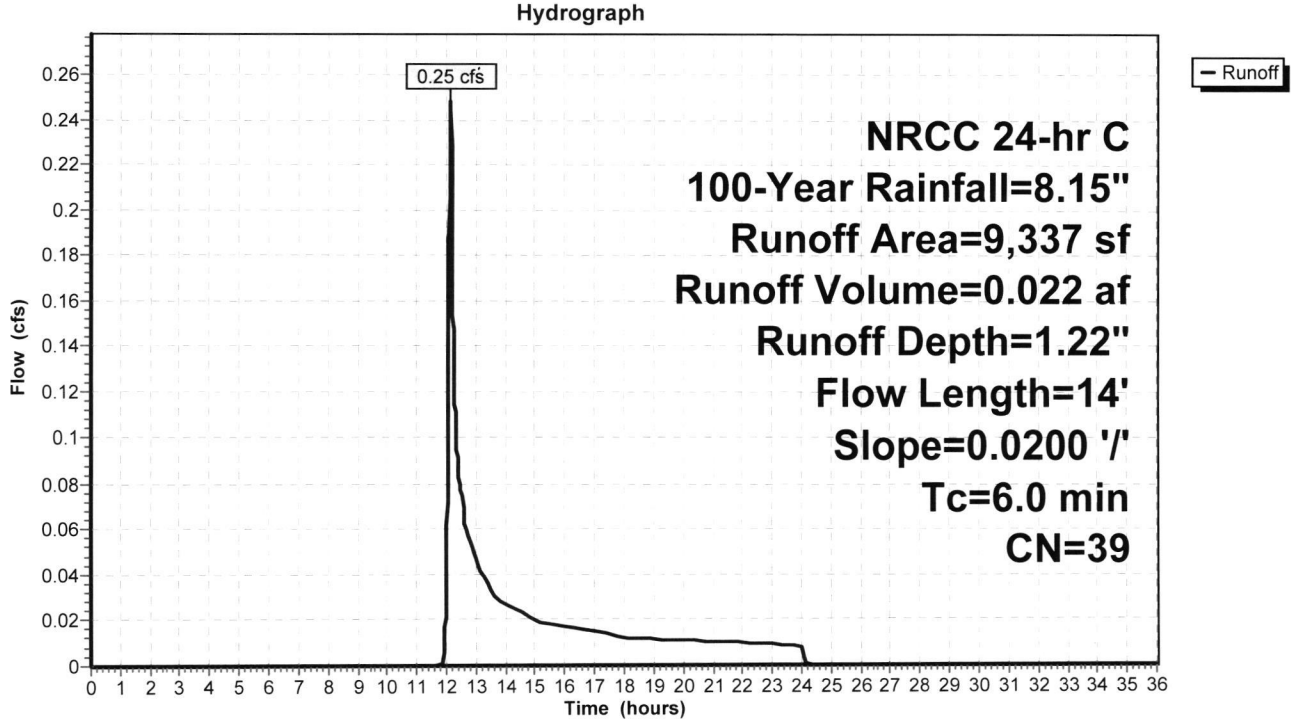
Runoff = 0.25 cfs @ 12.15 hrs, Volume= 0.022 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 100-Year Rainfall=8.15"

Area (sf)	CN	Description
9,337	39	>75% Grass cover, Good, HSG A
9,337		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	14	0.0200	0.98		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
0.2	14	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1S: Area 1



Summary for Subcatchment 2S: Area 2

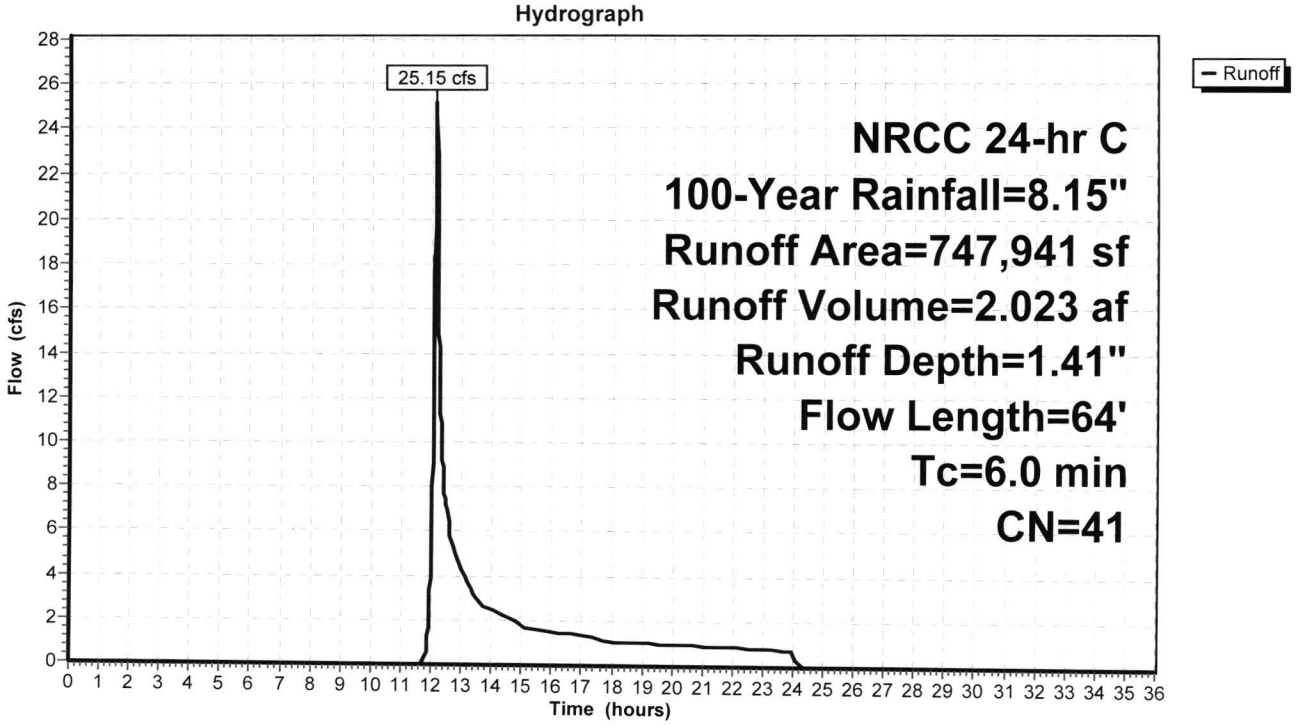
Runoff = 25.15 cfs @ 12.14 hrs, Volume= 2.023 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 100-Year Rainfall=8.15"

Area (sf)	CN	Description
27,327	98	Paved parking, HSG A
46,895	30	Woods, Good, HSG A
673,719	39	>75% Grass cover, Good, HSG A
747,941	41	Weighted Average
720,614		96.35% Pervious Area
27,327		3.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	39	0.0150	1.08		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
0.1	25	0.2500	8.05		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.7	64	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 2S: Area 2

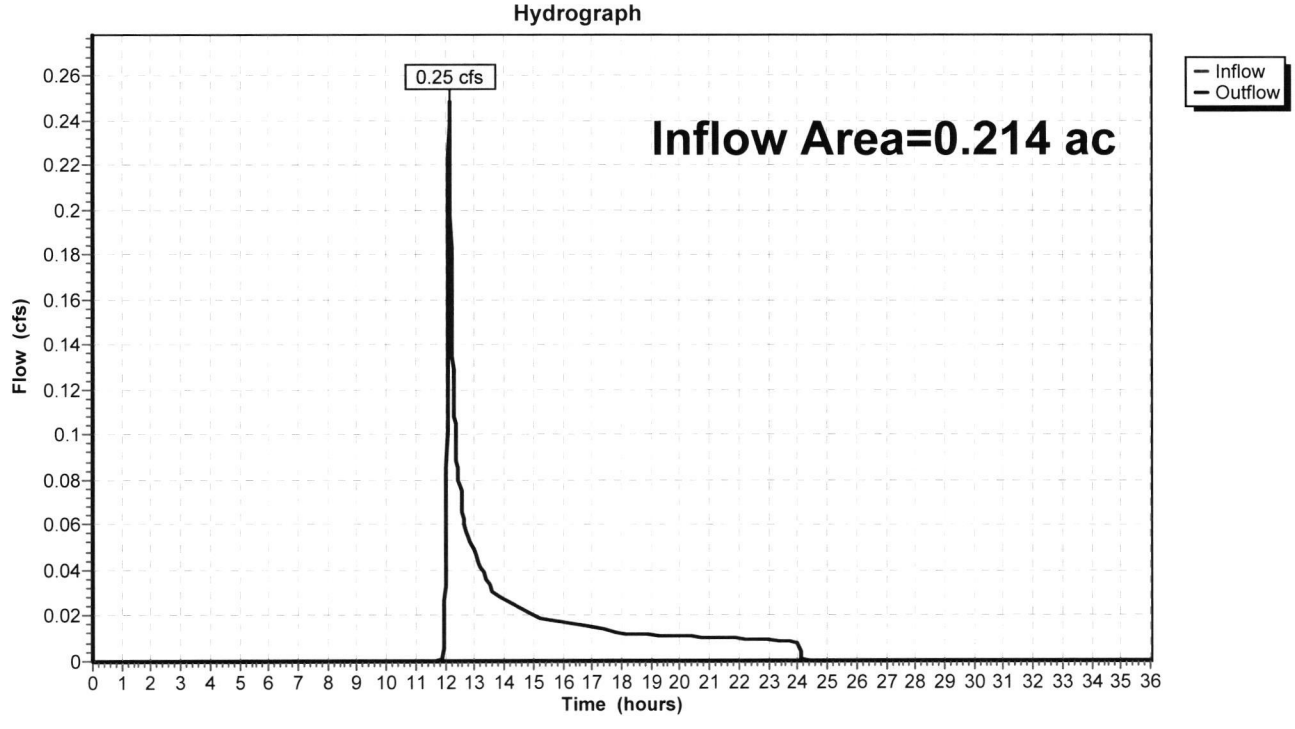


Summary for Reach 1R: Offsite Flow - South

Inflow Area = 0.214 ac, 0.00% Impervious, Inflow Depth = 1.22" for 100-Year event
Inflow = 0.25 cfs @ 12.15 hrs, Volume= 0.022 af
Outflow = 0.25 cfs @ 12.15 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 1R: Offsite Flow - South

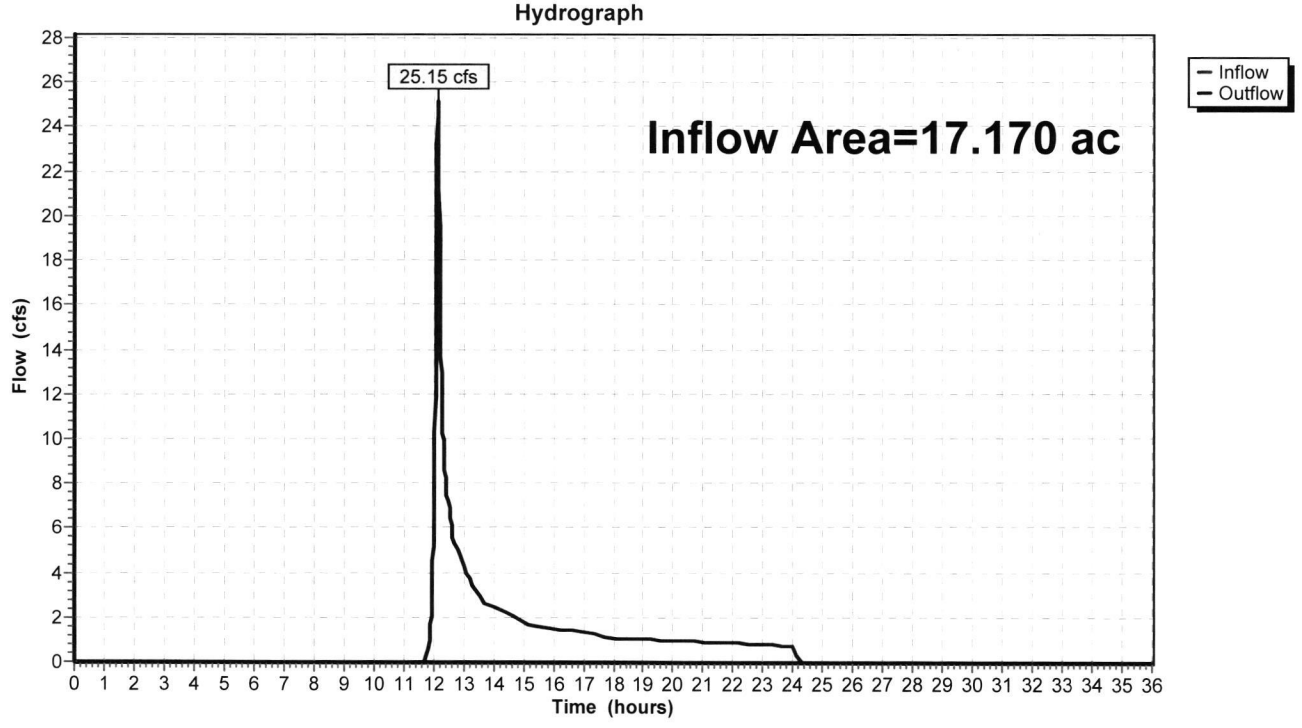


Summary for Reach 2R: On-site low points

Inflow Area = 17.170 ac, 3.65% Impervious, Inflow Depth = 1.41" for 100-Year event
Inflow = 25.15 cfs @ 12.14 hrs, Volume= 2.023 af
Outflow = 25.15 cfs @ 12.14 hrs, Volume= 2.023 af, Atten= 0%, Lag= 0.0 min

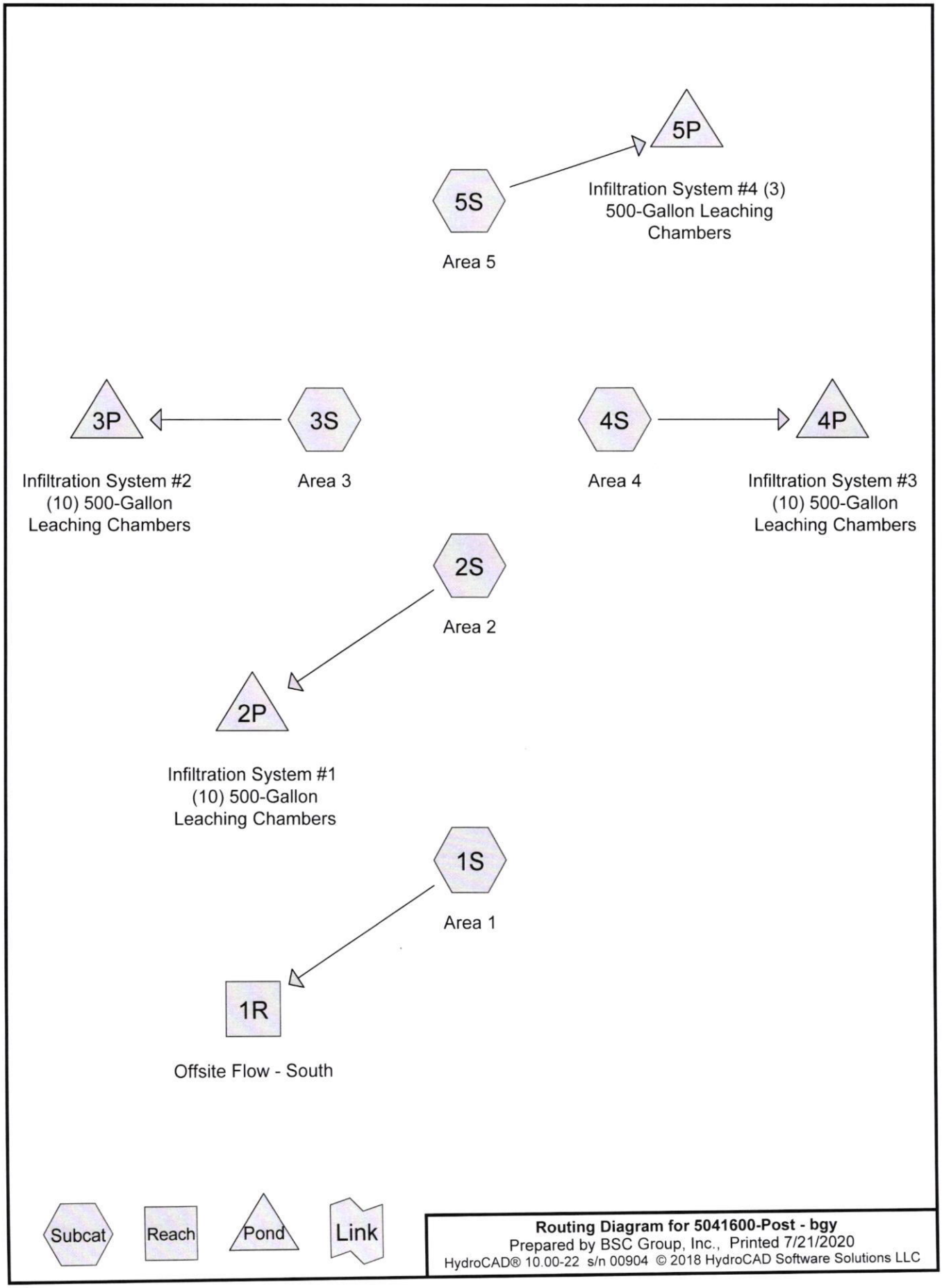
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 2R: On-site low points



6.03 PROPOSED WATERSHED PLAN

6.04 PROPOSED HYDROLOGY CALCULATIONS (HYDROCAD™ PRINTOUTS)


5P
5S
Infiltration System #4 (3)
500-Gallon Leaching
Chambers
Area 5
3P
3S
Infiltration System #2
(10) 500-Gallon
Leaching Chambers
Area 3
4S
4P
Area 4
Infiltration System #3
(10) 500-Gallon
Leaching Chambers
2S
Area 2
2P
Infiltration System #1
(10) 500-Gallon
Leaching Chambers
1S
Area 1
1R
Offsite Flow - South
Subcat
Reach
Pond
Link
Routing Diagram for 5041600-Post - bgy
Prepared by BSC Group, Inc., Printed 7/21/2020
HydroCAD® 10.00-22 s/n 00904 © 2018 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.214	39	>75% Grass cover, Good, HSG A (1S)
15.627	30	Meadow, non-grazed, HSG A (2S, 3S, 4S, 5S)
1.541	30	Woods, Good, HSG A (2S, 3S, 4S, 5S)
17.382	**30**	**TOTAL AREA**

Summary for Subcatchment 1S: Area 1

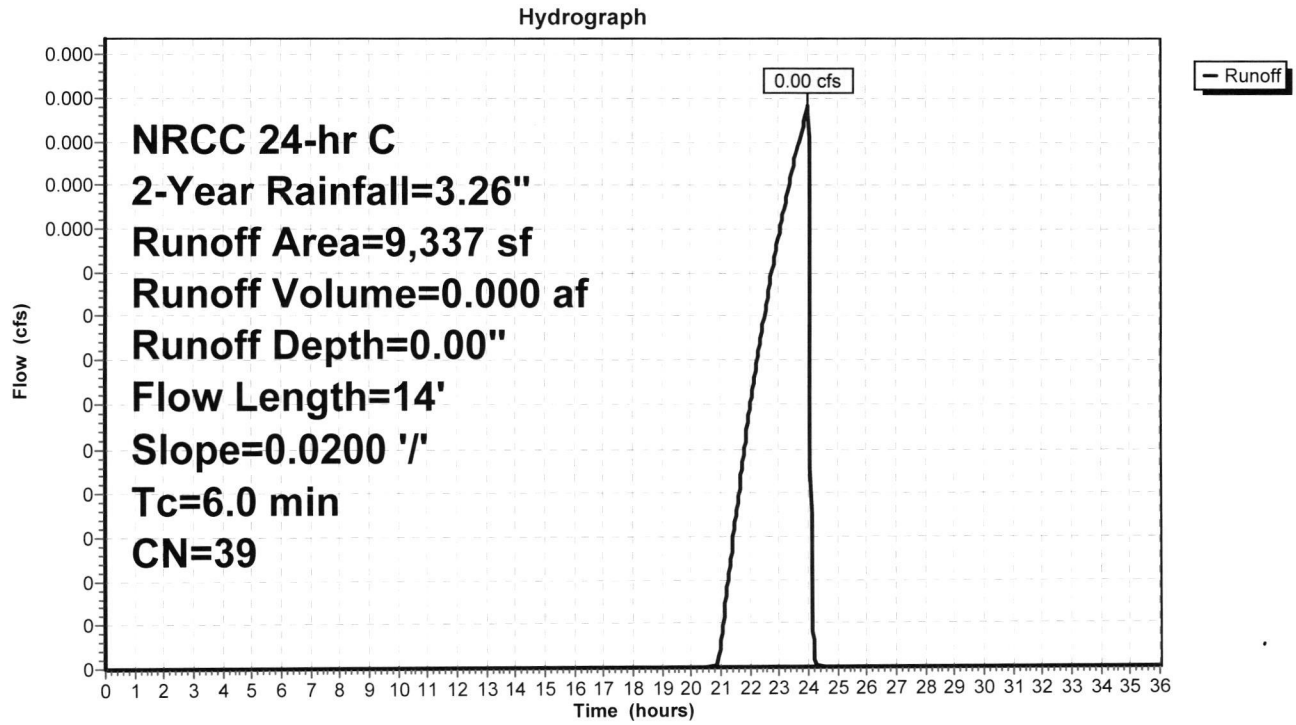
Runoff = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 2-Year Rainfall=3.26"

Area (sf)	CN	Description
9,337	39	>75% Grass cover, Good, HSG A
9,337		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	14	0.0200	0.98		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
0.2	14	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1S: Area 1



Summary for Subcatchment 2S: Area 2

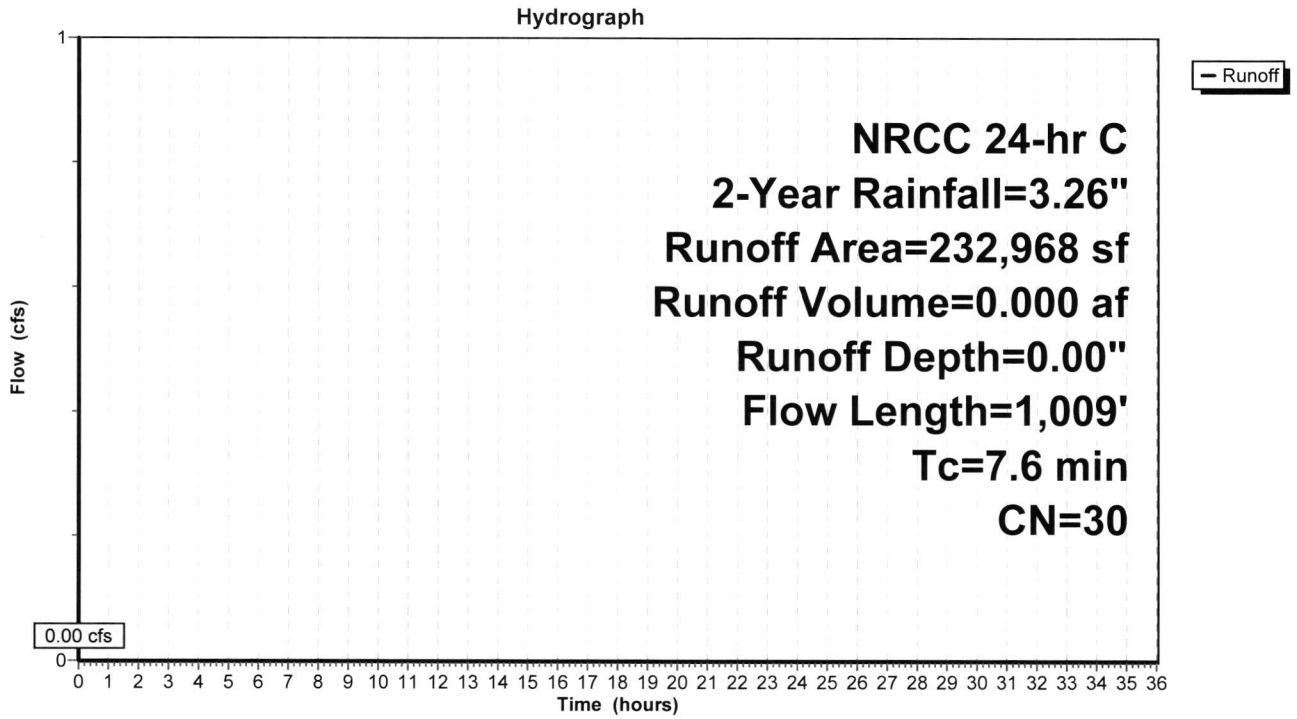
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 2-Year Rainfall=3.26"

Area (sf)	CN	Description
15,293	30	Woods, Good, HSG A
217,675	30	Meadow, non-grazed, HSG A
232,968	30	Weighted Average
232,968		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	50	0.5000	4.60		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
0.1	35	0.5000	11.38		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
3.0	411	0.0200	2.28		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
1.7	163	0.0100	1.61		**Shallow Concentrated Flow, D-E** Unpaved Kv= 16.1 fps
2.6	350	0.0200	2.28		**Shallow Concentrated Flow, E-F** Unpaved Kv= 16.1 fps
7.6	1,009	Total			

Subcatchment 2S: Area 2



Summary for Subcatchment 3S: Area 3

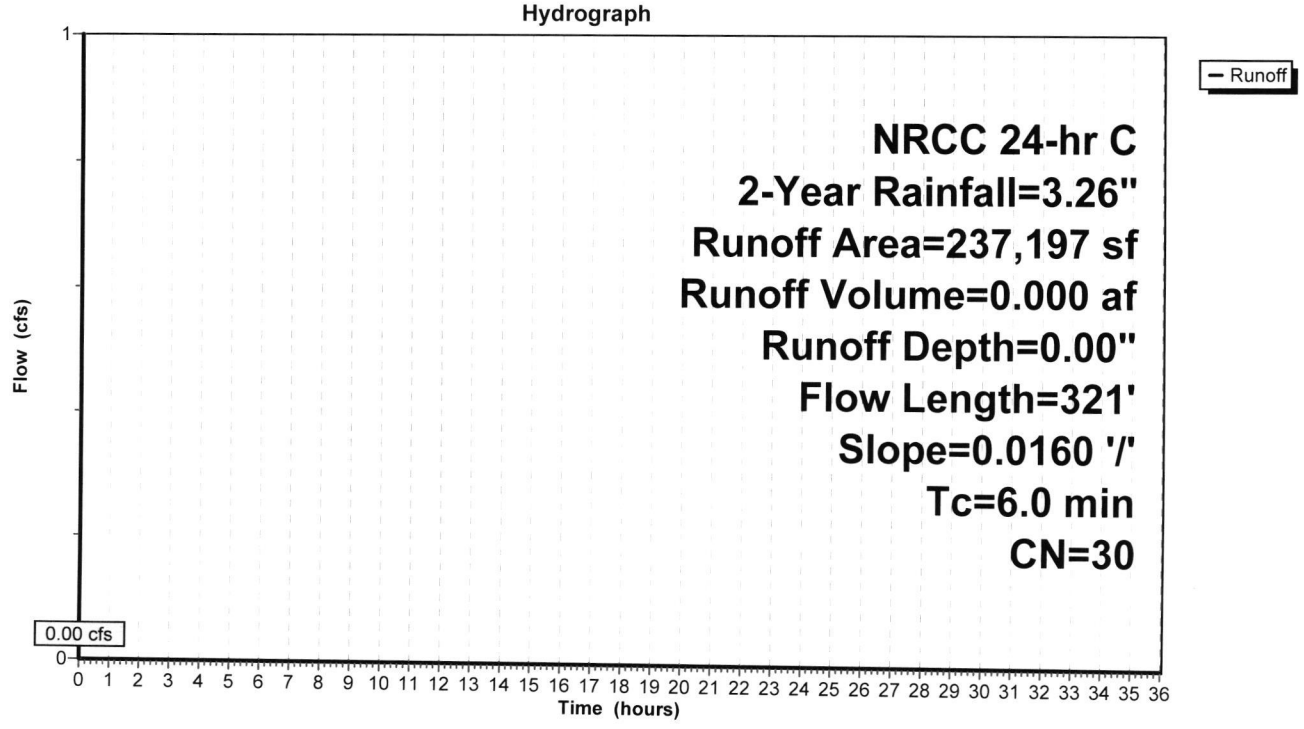
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 2-Year Rainfall=3.26"

Area (sf)	CN	Description
16,010	30	Woods, Good, HSG A
221,187	30	Meadow, non-grazed, HSG A
237,197	30	Weighted Average
237,197		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0160	1.16		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
1.5	184	0.0160	2.04		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.7	87	0.0160	2.04		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
3.1					**Direct Entry,**
6.0	321	Total			

Subcatchment 3S: Area 3



Summary for Subcatchment 4S: Area 4

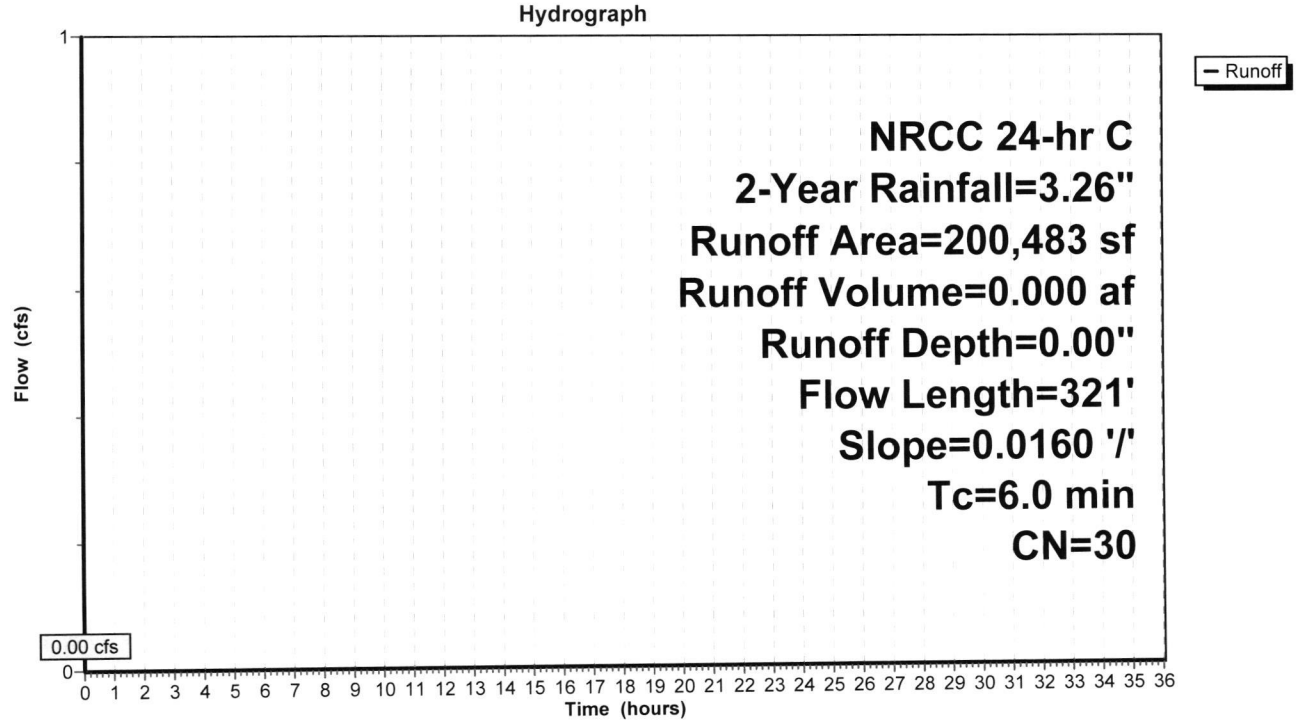
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 2-Year Rainfall=3.26"

Area (sf)	CN	Description
16,010	30	Woods, Good, HSG A
184,473	30	Meadow, non-grazed, HSG A
200,483	30	Weighted Average
200,483		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0160	1.16		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
1.5	184	0.0160	2.04		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.7	87	0.0160	2.04		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
3.1					**Direct Entry,**
6.0	321	Total			

Subcatchment 4S: Area 4



Summary for Subcatchment 5S: Area 5

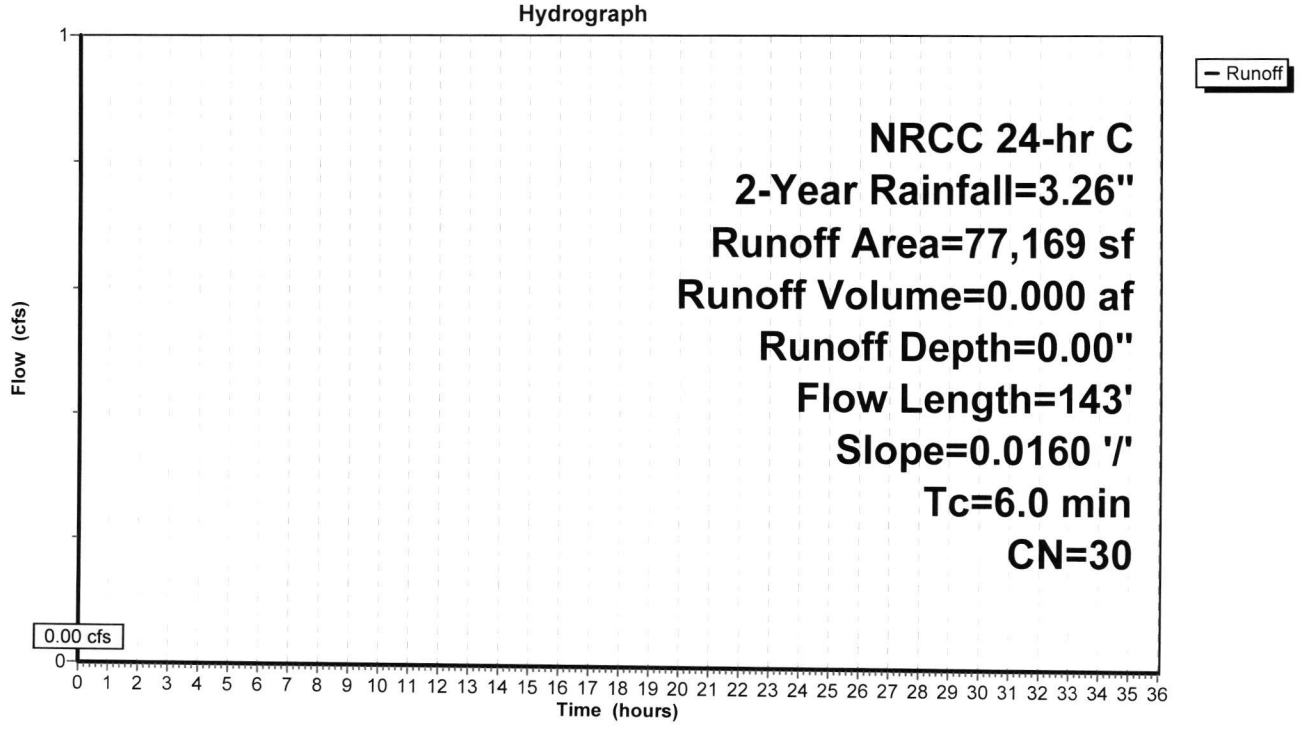
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 2-Year Rainfall=3.26"

Area (sf)	CN	Description
19,805	30	Woods, Good, HSG A
57,364	30	Meadow, non-grazed, HSG A
77,169	30	Weighted Average
77,169		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0160	1.16		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
0.8	93	0.0160	2.04		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
4.5					**Direct Entry,**
6.0	143	Total			

Subcatchment 5S: Area 5

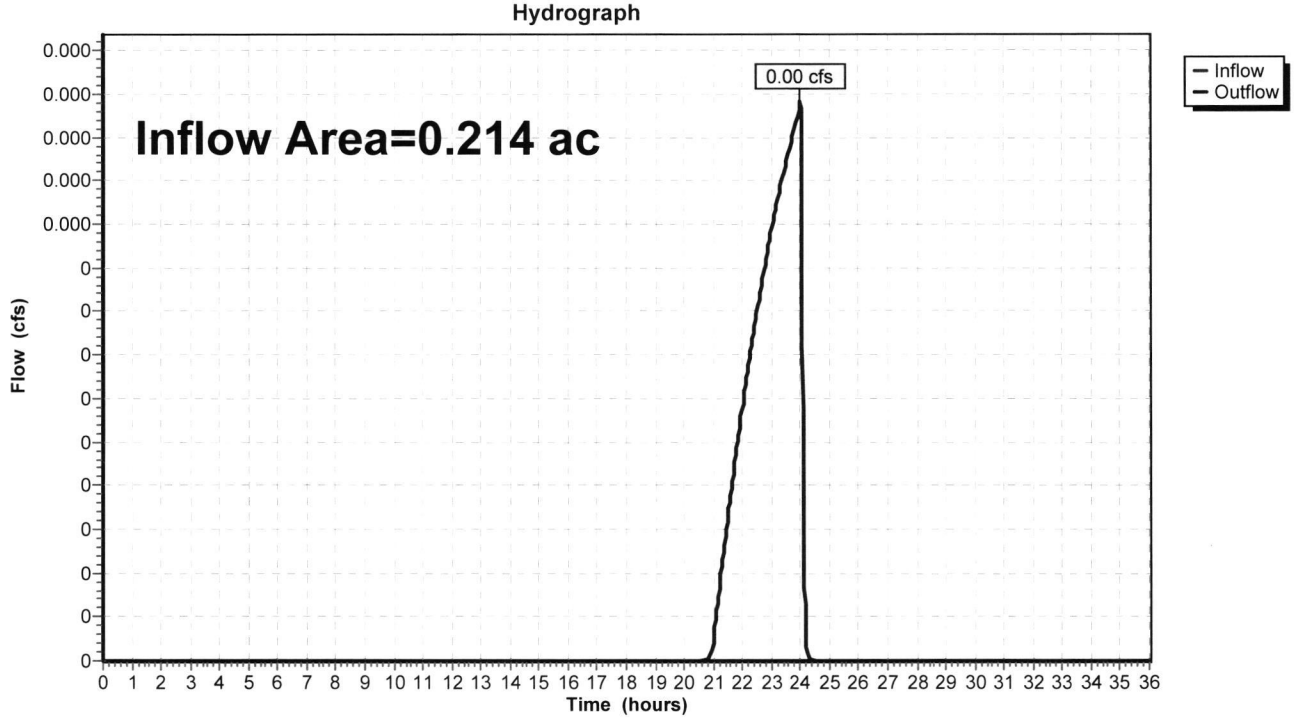


Summary for Reach 1R: Offsite Flow - South

Inflow Area = 0.214 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.01 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 1R: Offsite Flow - South



Summary for Pond 2P: Infiltration System #1 (10) 500-Gallon Leaching Chambers

Inflow Area = 5.348 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year 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
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 17.00' @ 0.00 hrs Surf.Area= 651 sf Storage= 0 cf

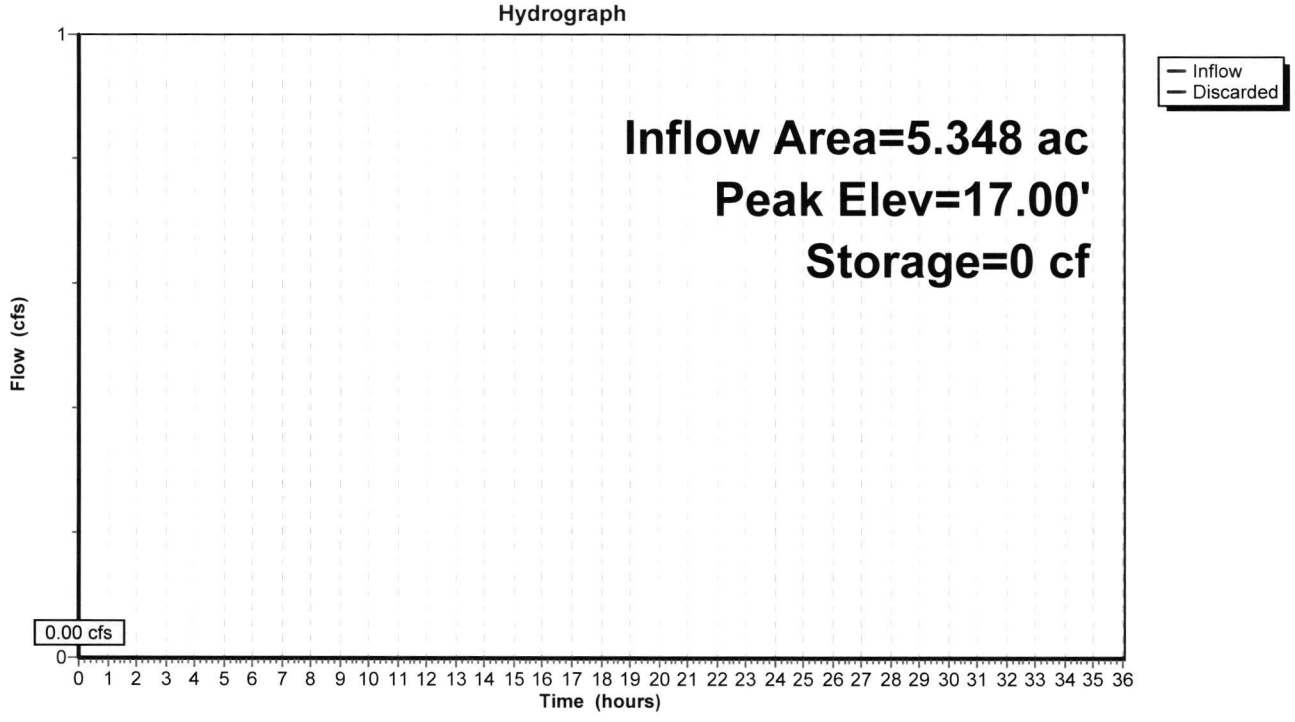
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	915 cf	**46.50'W x 14.00'L x 4.00'H Prismatoid** 2,604 cf Overall - 317 cf Embedded = 2,287 cf x 40.0% Voids
#2	18.00'	227 cf	**Concrete Galley 4x8x2 @ 4.00' L** x 10 Inside #1 Inside= 42.0"W x 21.0"H => 6.04 sf x 3.75'L = 22.6 cf Outside= 48.0"W x 24.0"H => 7.92 sf x 4.00'L = 31.7 cf 2 Rows of 5 Chambers
		1,141 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 14.70'

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=17.00' (Free Discharge)
↑**1=Exfiltration** (Passes 0.00 cfs of 0.12 cfs potential flow)

Pond 2P: Infiltration System #1 (10) 500-Gallon Leaching Chambers



Summary for Pond 3P: Infiltration System #2 (10) 500-Gallon Leaching Chambers

Inflow Area = 5.445 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year 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
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 17.00' @ 0.00 hrs Surf.Area= 651 sf Storage= 0 cf

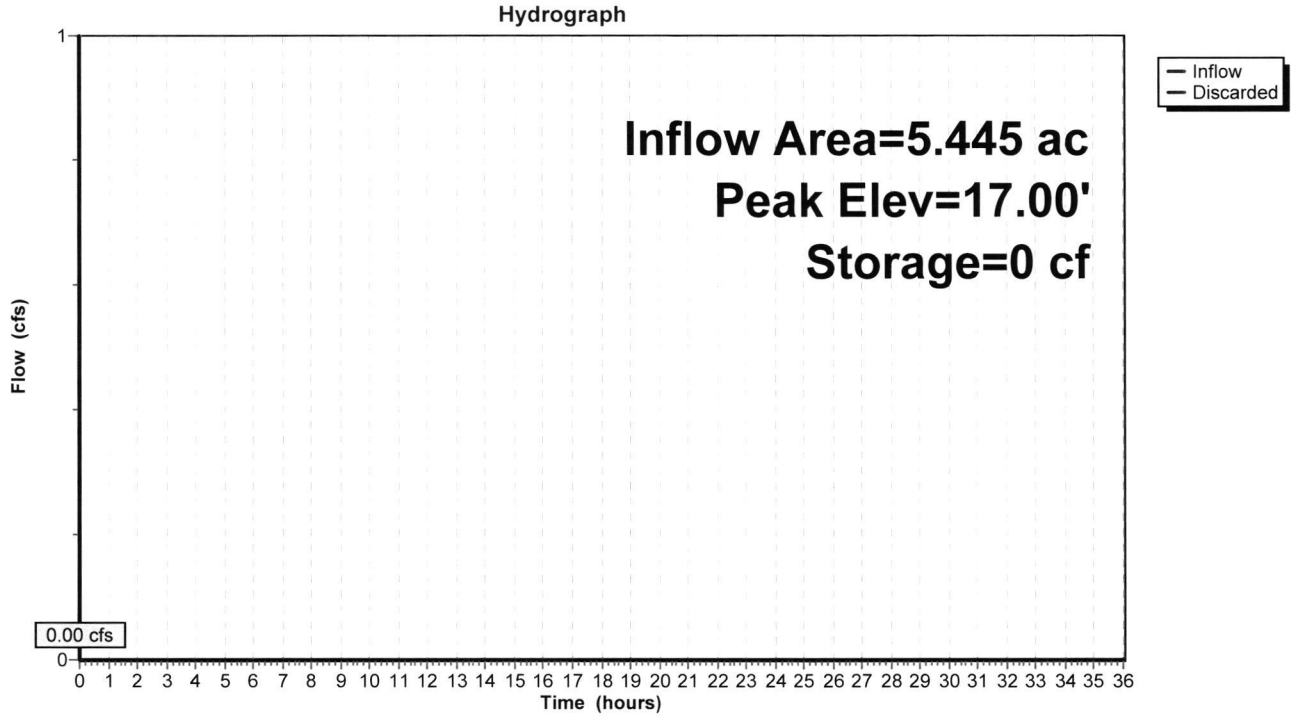
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	871 cf	**46.50'W x 14.00'L x 3.83'H Prismatoid** 2,493 cf Overall - 317 cf Embedded = 2,177 cf x 40.0% Voids
#2	18.00'	227 cf	**Concrete Galley 4x8x2 @ 4.00' L** x 10 Inside #1 Inside= 42.0"W x 21.0"H => 6.04 sf x 3.75'L = 22.6 cf Outside= 48.0"W x 24.0"H => 7.92 sf x 4.00'L = 31.7 cf 2 Rows of 5 Chambers
		1,097 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 14.70'

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=17.00' (Free Discharge)
↑**1=Exfiltration** (Passes 0.00 cfs of 0.12 cfs potential flow)

Pond 3P: Infiltration System #2 (10) 500-Gallon Leaching Chambers



Summary for Pond 4P: Infiltration System #3 (10) 500-Gallon Leaching Chambers

Inflow Area = 4.602 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year 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
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 17.00' @ 0.00 hrs Surf.Area= 651 sf Storage= 0 cf

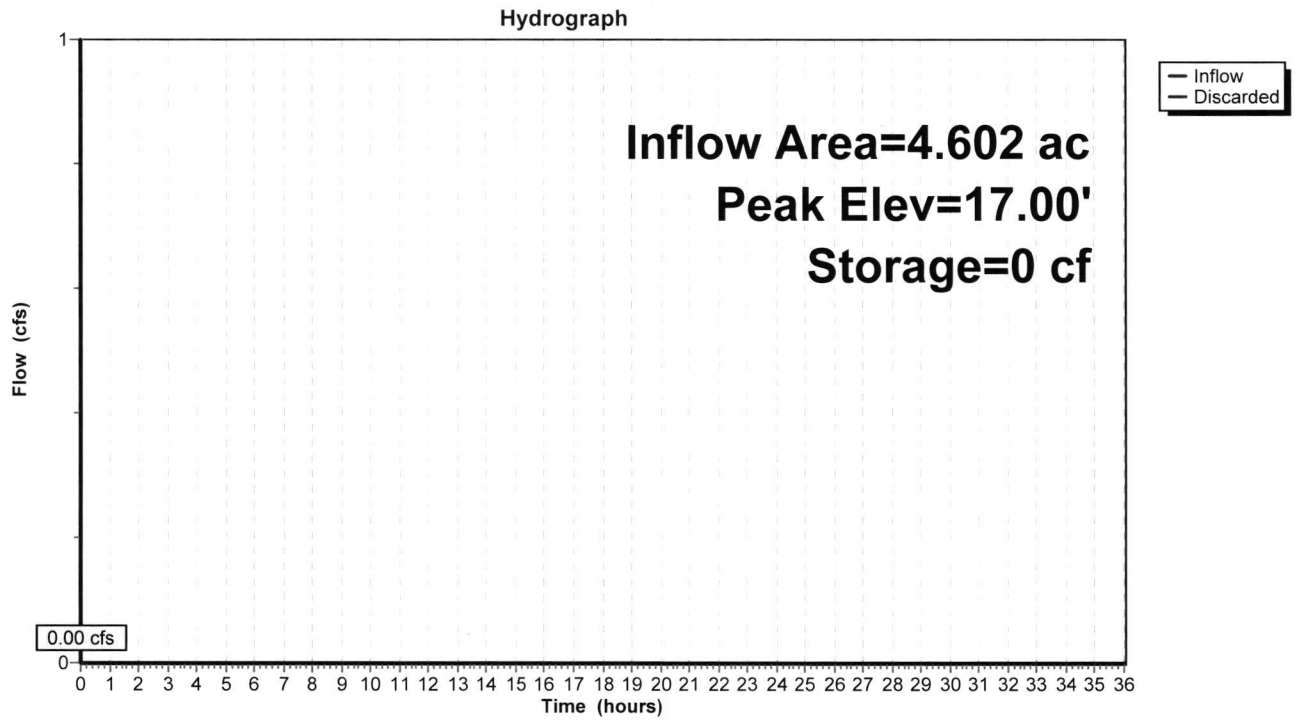
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	871 cf	**46.50'W x 14.00'L x 3.83'H Prismatoid** 2,493 cf Overall - 317 cf Embedded = 2,177 cf x 40.0% Voids
#2	18.00'	227 cf	**Concrete Galley 4x8x2 @ 4.00' L** x 10 Inside #1 Inside= 42.0"W x 21.0"H => 6.04 sf x 3.75'L = 22.6 cf Outside= 48.0"W x 24.0"H => 7.92 sf x 4.00'L = 31.7 cf 2 Rows of 5 Chambers
		1,097 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 14.70'

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=17.00' (Free Discharge)
↑**1=Exfiltration** (Passes 0.00 cfs of 0.12 cfs potential flow)

Pond 4P: Infiltration System #3 (10) 500-Gallon Leaching Chambers



Summary for Pond 5P: Infiltration System #4 (3) 500-Gallon Leaching Chambers

Inflow Area = 1.772 ac, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year 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
Discarded = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 17.00' @ 0.00 hrs Surf.Area= 266 sf Storage= 0 cf

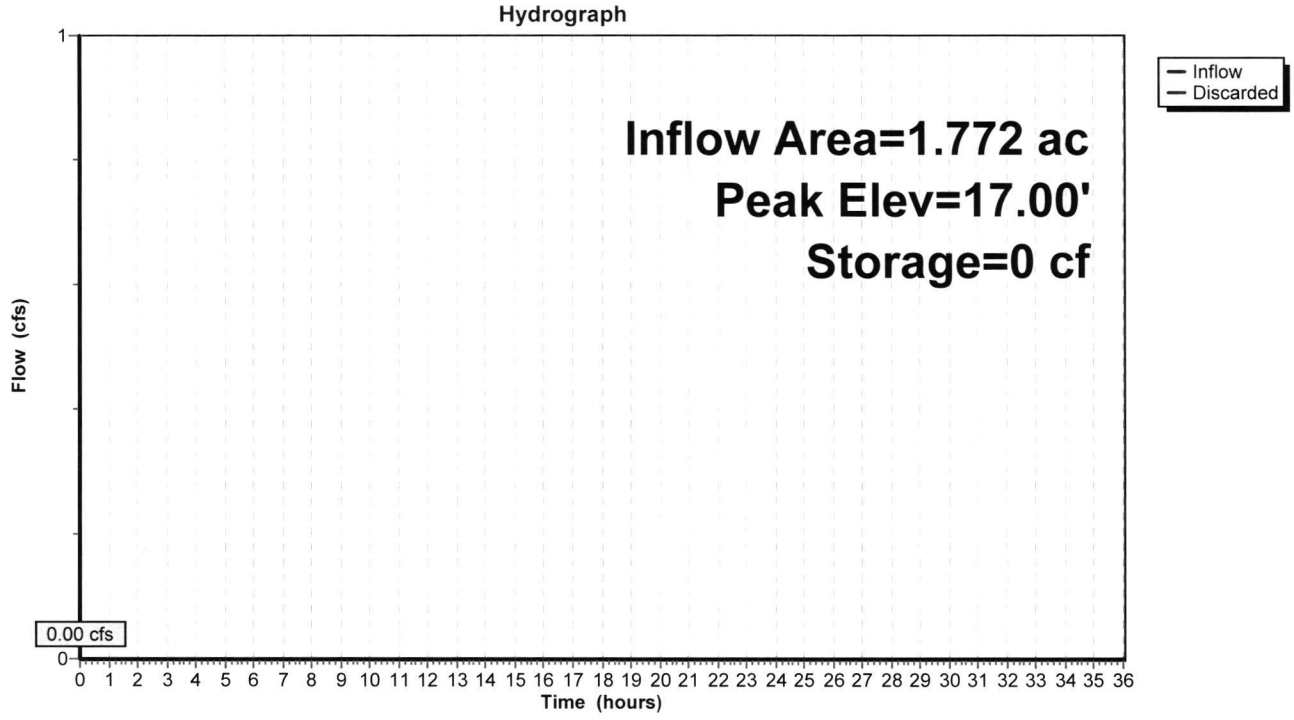
Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	387 cf	**29.50'W x 9.00'L x 4.00'H Prismatoid** 1,062 cf Overall - 95 cf Embedded = 967 cf x 40.0% Voids
#2	18.00'	68 cf	**Concrete Galley 4x8x2 @ 4.00' L** x 3 Inside #1 Inside= 42.0"W x 21.0"H => 6.04 sf x 3.75'L = 22.6 cf Outside= 48.0"W x 24.0"H => 7.92 sf x 4.00'L = 31.7 cf
		455 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 14.70'

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=17.00' (Free Discharge)
1=Exfiltration (Passes 0.00 cfs of 0.05 cfs potential flow)

Pond 5P: Infiltration System #4 (3) 500-Gallon Leaching Chambers



Summary for Subcatchment 1S: Area 1

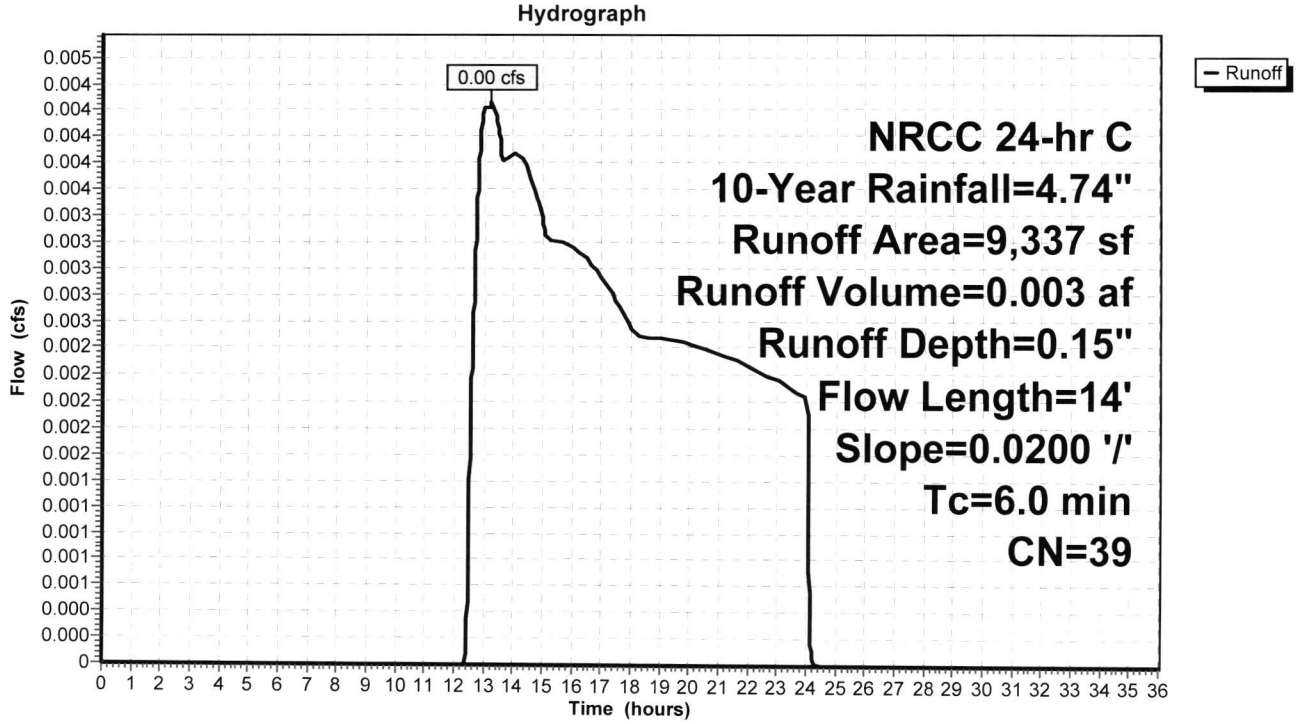
Runoff = 0.00 cfs @ 13.25 hrs, Volume= 0.003 af, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 10-Year Rainfall=4.74"

Area (sf)	CN	Description
9,337	39	>75% Grass cover, Good, HSG A
9,337		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	14	0.0200	0.98		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
0.2	14	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1S: Area 1



Summary for Subcatchment 2S: Area 2

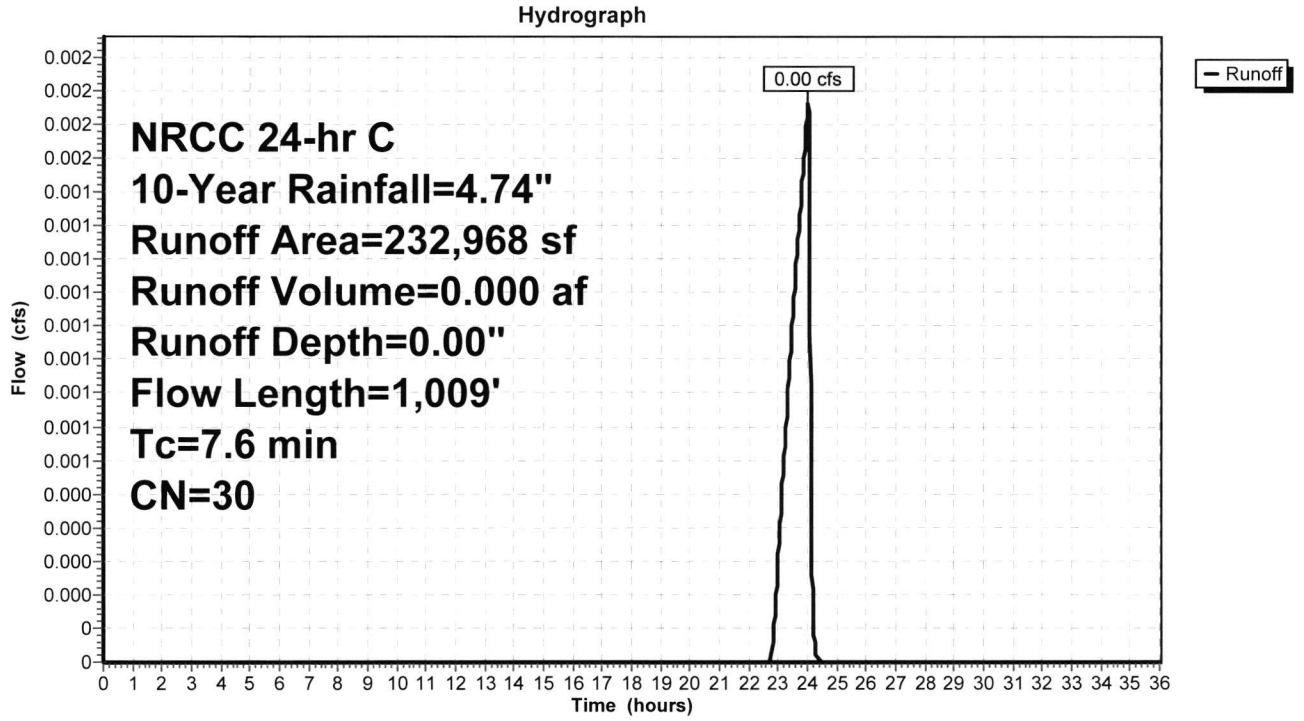
Runoff = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 10-Year Rainfall=4.74"

Area (sf)	CN	Description
15,293	30	Woods, Good, HSG A
217,675	30	Meadow, non-grazed, HSG A
232,968	30	Weighted Average
232,968		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	50	0.5000	4.60		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
0.1	35	0.5000	11.38		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
3.0	411	0.0200	2.28		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
1.7	163	0.0100	1.61		**Shallow Concentrated Flow, D-E** Unpaved Kv= 16.1 fps
2.6	350	0.0200	2.28		**Shallow Concentrated Flow, E-F** Unpaved Kv= 16.1 fps
7.6	1,009	Total			

Subcatchment 2S: Area 2



Summary for Subcatchment 3S: Area 3

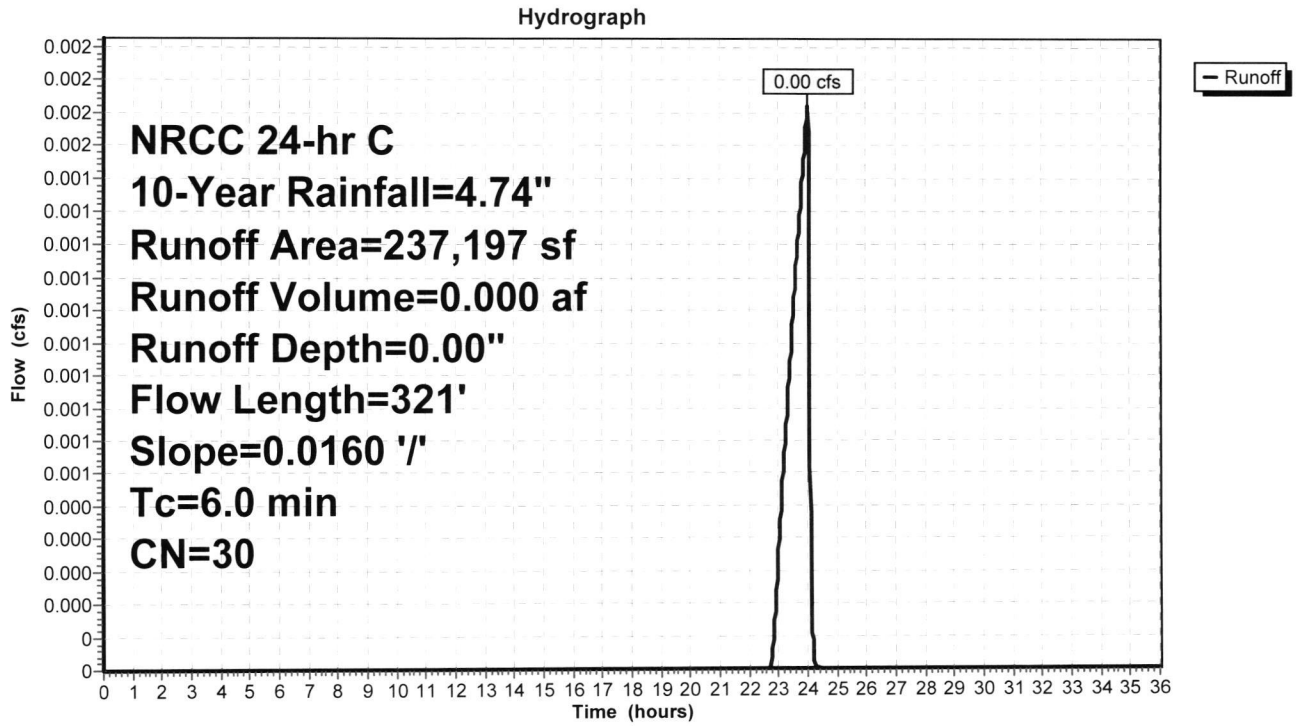
Runoff = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 10-Year Rainfall=4.74"

Area (sf)	CN	Description
16,010	30	Woods, Good, HSG A
221,187	30	Meadow, non-grazed, HSG A
237,197	30	Weighted Average
237,197		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0160	1.16		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
1.5	184	0.0160	2.04		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.7	87	0.0160	2.04		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
3.1					**Direct Entry,**
6.0	321	Total			

Subcatchment 3S: Area 3



Summary for Subcatchment 4S: Area 4

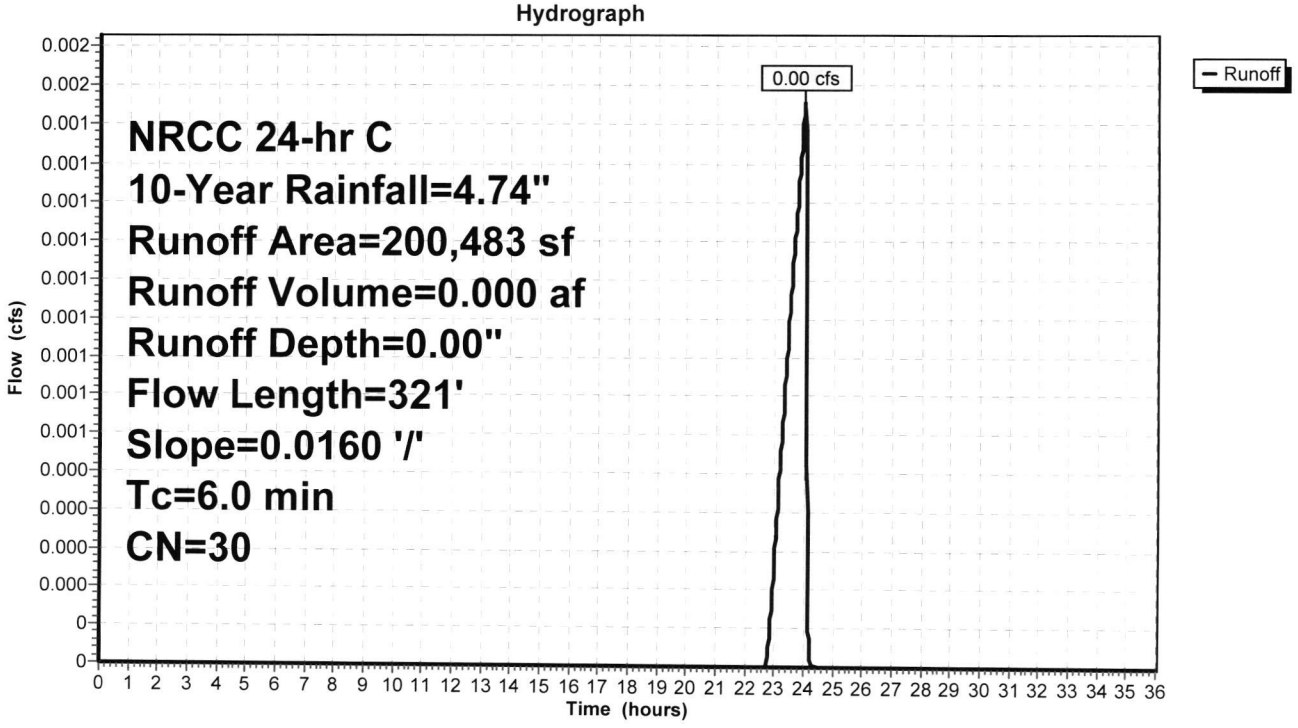
Runoff = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 10-Year Rainfall=4.74"

Area (sf)	CN	Description
16,010	30	Woods, Good, HSG A
184,473	30	Meadow, non-grazed, HSG A
200,483	30	Weighted Average
200,483		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0160	1.16		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
1.5	184	0.0160	2.04		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.7	87	0.0160	2.04		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
3.1					**Direct Entry,**
6.0	321	Total			

Subcatchment 4S: Area 4



Summary for Subcatchment 5S: Area 5

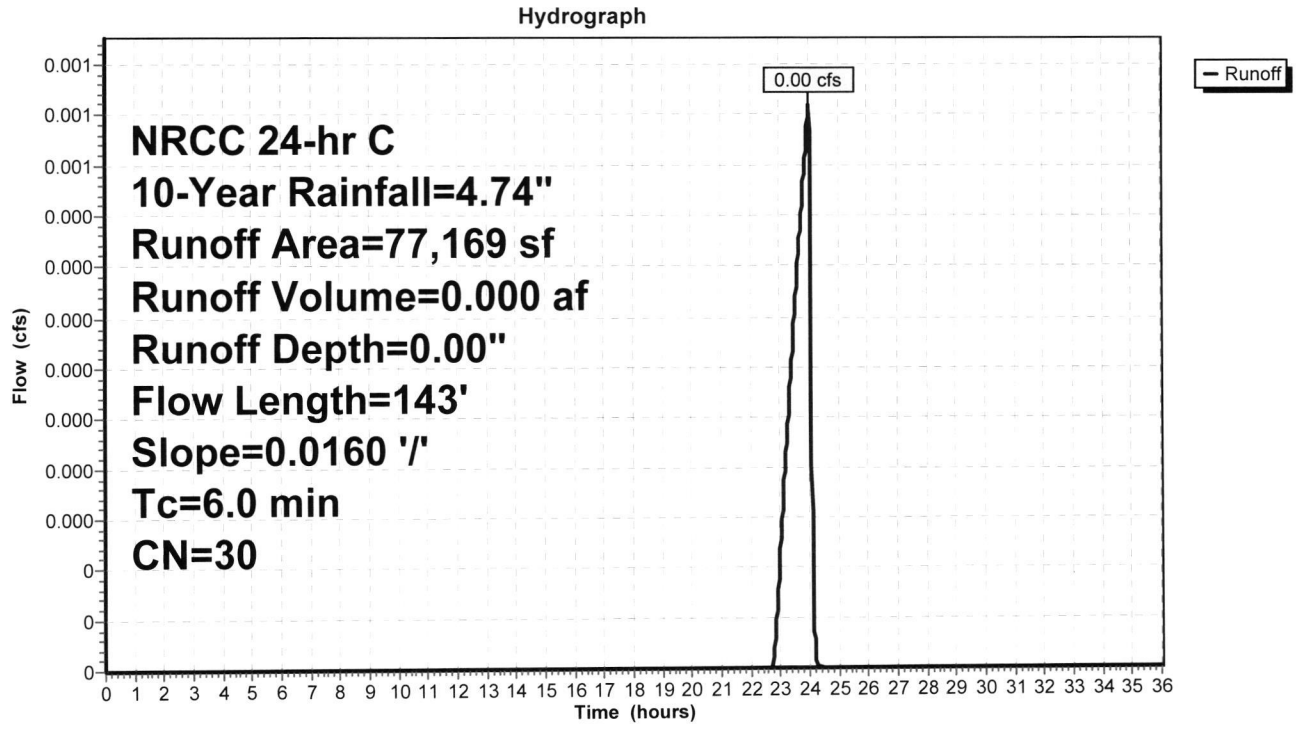
Runoff = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 10-Year Rainfall=4.74"

Area (sf)	CN	Description
19,805	30	Woods, Good, HSG A
57,364	30	Meadow, non-grazed, HSG A
77,169	30	Weighted Average
77,169		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0160	1.16		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
0.8	93	0.0160	2.04		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
4.5					**Direct Entry,**
6.0	143	Total			

Subcatchment 5S: Area 5

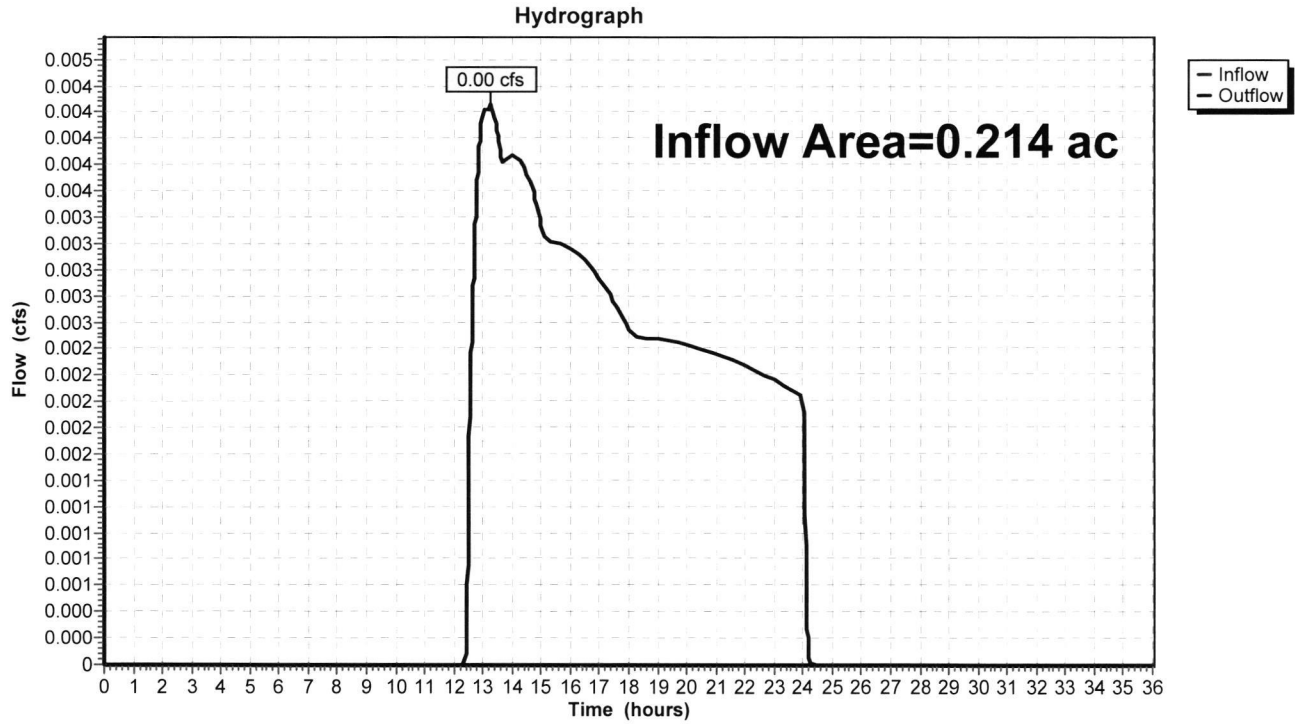


Summary for Reach 1R: Offsite Flow - South

Inflow Area = 0.214 ac, 0.00% Impervious, Inflow Depth = 0.15" for 10-Year event
Inflow = 0.00 cfs @ 13.25 hrs, Volume= 0.003 af
Outflow = 0.00 cfs @ 13.25 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 1R: Offsite Flow - South



Summary for Pond 2P: Infiltration System #1 (10) 500-Gallon Leaching Chambers

Inflow Area = 5.348 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 17.00' @ 0.00 hrs Surf.Area= 651 sf Storage= 0 cf

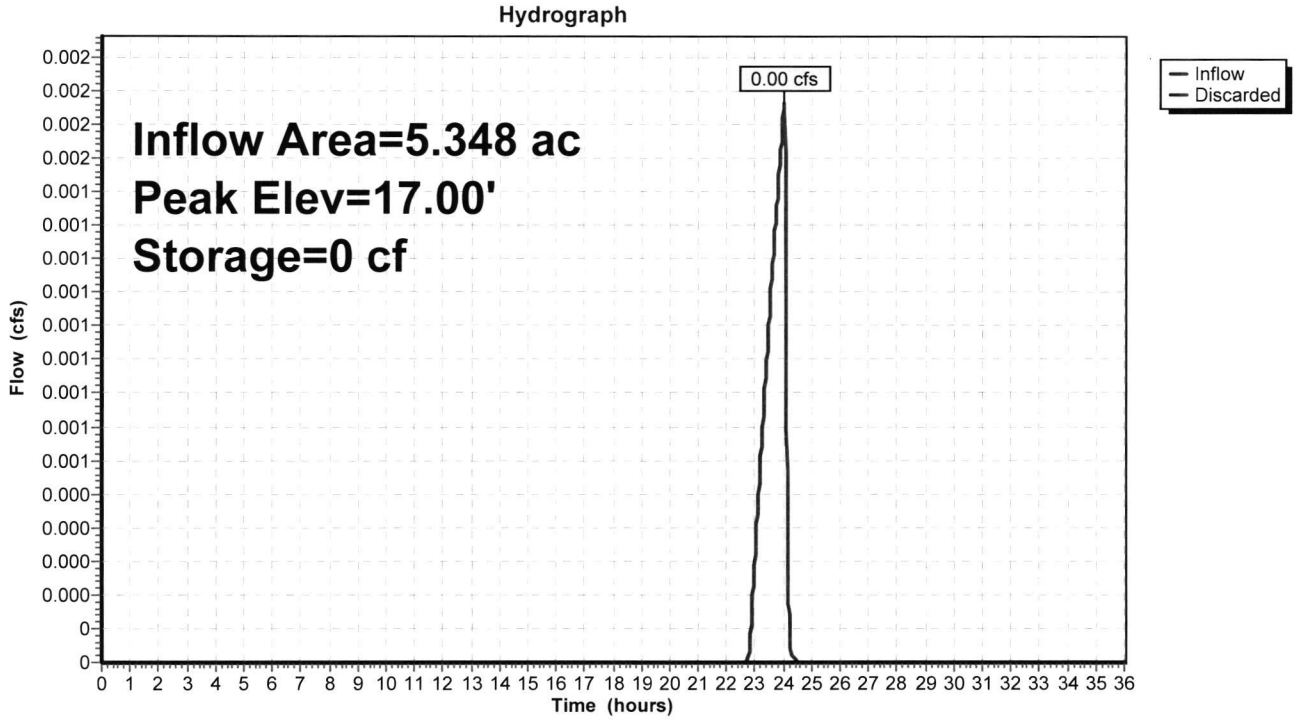
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (1,419.9 - 1,419.9)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	915 cf	**46.50'W x 14.00'L x 4.00'H Prismatoid** 2,604 cf Overall - 317 cf Embedded = 2,287 cf x 40.0% Voids
#2	18.00'	227 cf	**Concrete Galley 4x8x2 @ 4.00' L** x 10 Inside #1 Inside= 42.0"W x 21.0"H => 6.04 sf x 3.75'L = 22.6 cf Outside= 48.0"W x 24.0"H => 7.92 sf x 4.00'L = 31.7 cf 2 Rows of 5 Chambers
		1,141 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 14.70'

Discarded OutFlow Max=0.00 cfs @ 24.02 hrs HW=17.00' (Free Discharge)
↑**1=Exfiltration** (Passes 0.00 cfs of 0.12 cfs potential flow)

Pond 2P: Infiltration System #1 (10) 500-Gallon Leaching Chambers



Summary for Pond 3P: Infiltration System #2 (10) 500-Gallon Leaching Chambers

Inflow Area = 5.445 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 17.00' @ 0.00 hrs Surf.Area= 651 sf Storage= 0 cf

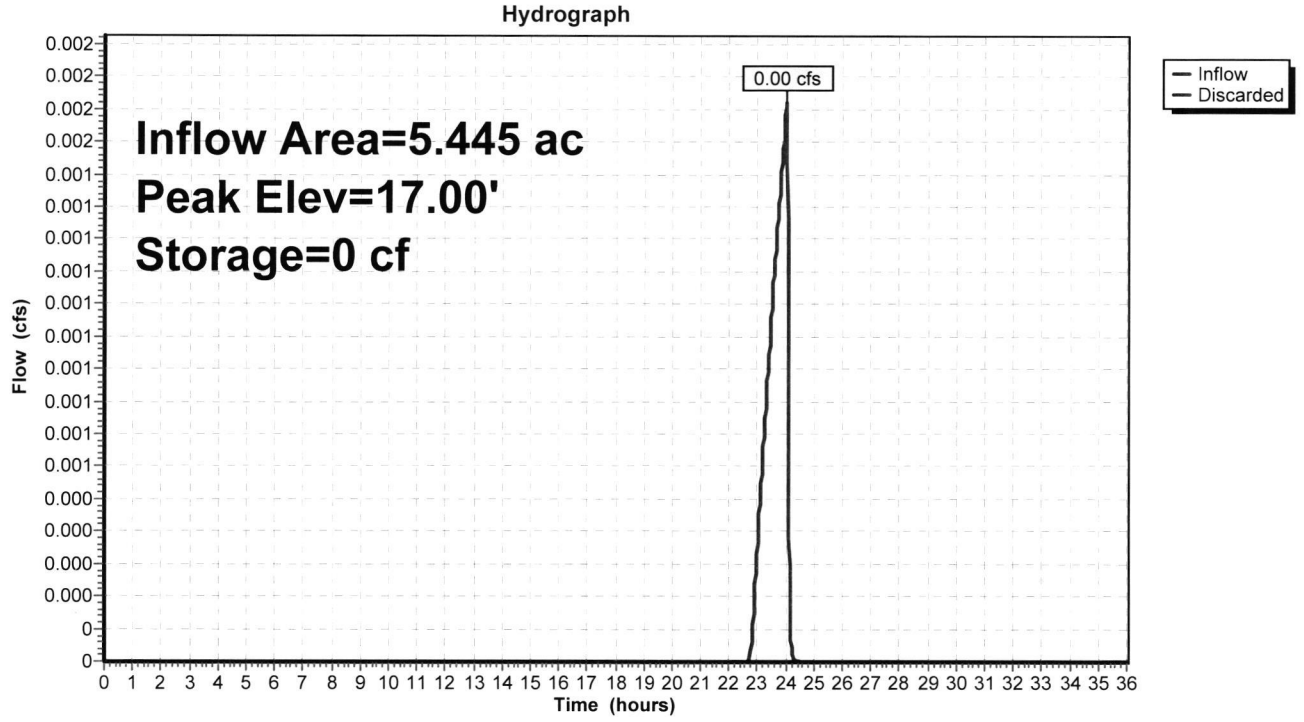
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (1,418.5 - 1,418.5)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	871 cf	**46.50'W x 14.00'L x 3.83'H Prismatoid** 2,493 cf Overall - 317 cf Embedded = 2,177 cf x 40.0% Voids
#2	18.00'	227 cf	**Concrete Galley 4x8x2 @ 4.00' L** x 10 Inside #1 Inside= 42.0"W x 21.0"H => 6.04 sf x 3.75'L = 22.6 cf Outside= 48.0"W x 24.0"H => 7.92 sf x 4.00'L = 31.7 cf 2 Rows of 5 Chambers
		1,097 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 14.70'

Discarded OutFlow Max=0.00 cfs @ 24.02 hrs HW=17.00' (Free Discharge)
1=Exfiltration (Passes 0.00 cfs of 0.12 cfs potential flow)

Pond 3P: Infiltration System #2 (10) 500-Gallon Leaching Chambers



Summary for Pond 4P: Infiltration System #3 (10) 500-Gallon Leaching Chambers

Inflow Area = 4.602 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 17.00' @ 0.00 hrs Surf.Area= 651 sf Storage= 0 cf

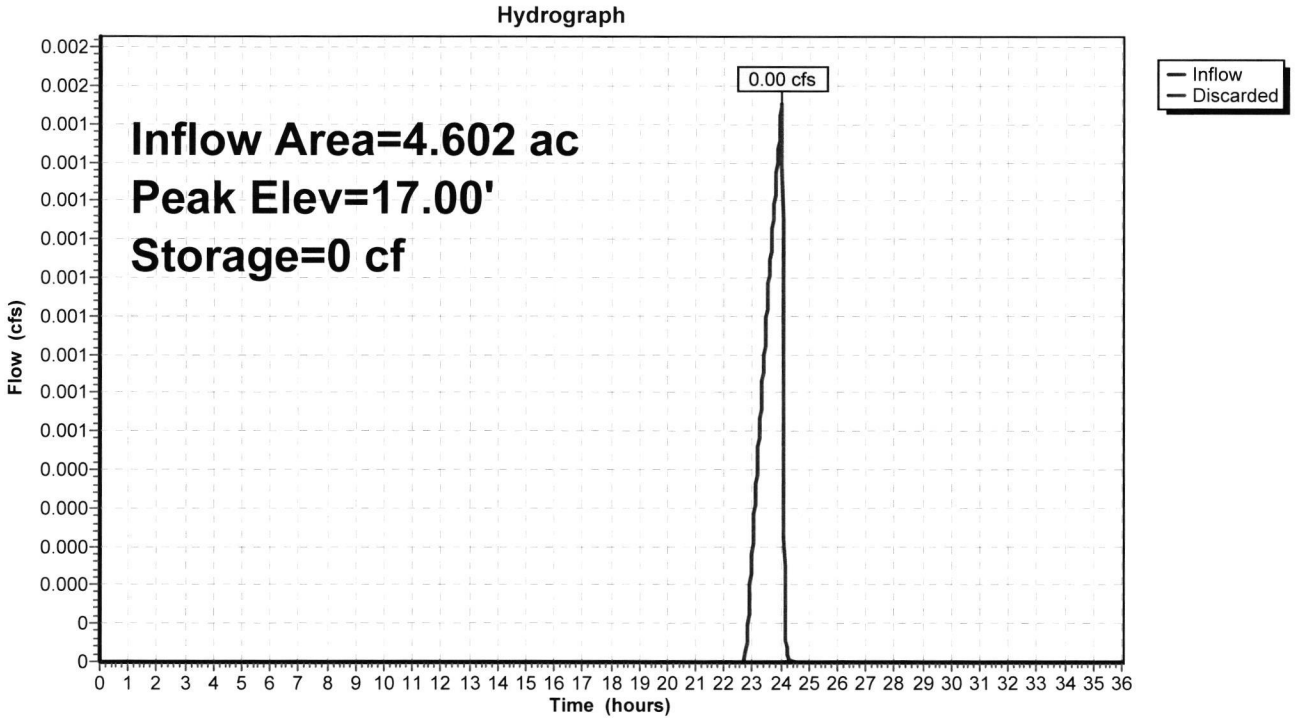
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (1,418.5 - 1,418.5)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	871 cf	**46.50'W x 14.00'L x 3.83'H Prismatoid** 2,493 cf Overall - 317 cf Embedded = 2,177 cf x 40.0% Voids
#2	18.00'	227 cf	**Concrete Galley 4x8x2 @ 4.00' L** x 10 Inside #1 Inside= 42.0"W x 21.0"H => 6.04 sf x 3.75'L = 22.6 cf Outside= 48.0"W x 24.0"H => 7.92 sf x 4.00'L = 31.7 cf 2 Rows of 5 Chambers
		1,097 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 14.70'

Discarded OutFlow Max=0.00 cfs @ 24.02 hrs HW=17.00' (Free Discharge)
↑**1=Exfiltration** (Passes 0.00 cfs of 0.12 cfs potential flow)

Pond 4P: Infiltration System #3 (10) 500-Gallon Leaching Chambers



Summary for Pond 5P: Infiltration System #4 (3) 500-Gallon Leaching Chambers

Inflow Area = 1.772 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 17.00' @ 0.00 hrs Surf.Area= 266 sf Storage= 0 cf

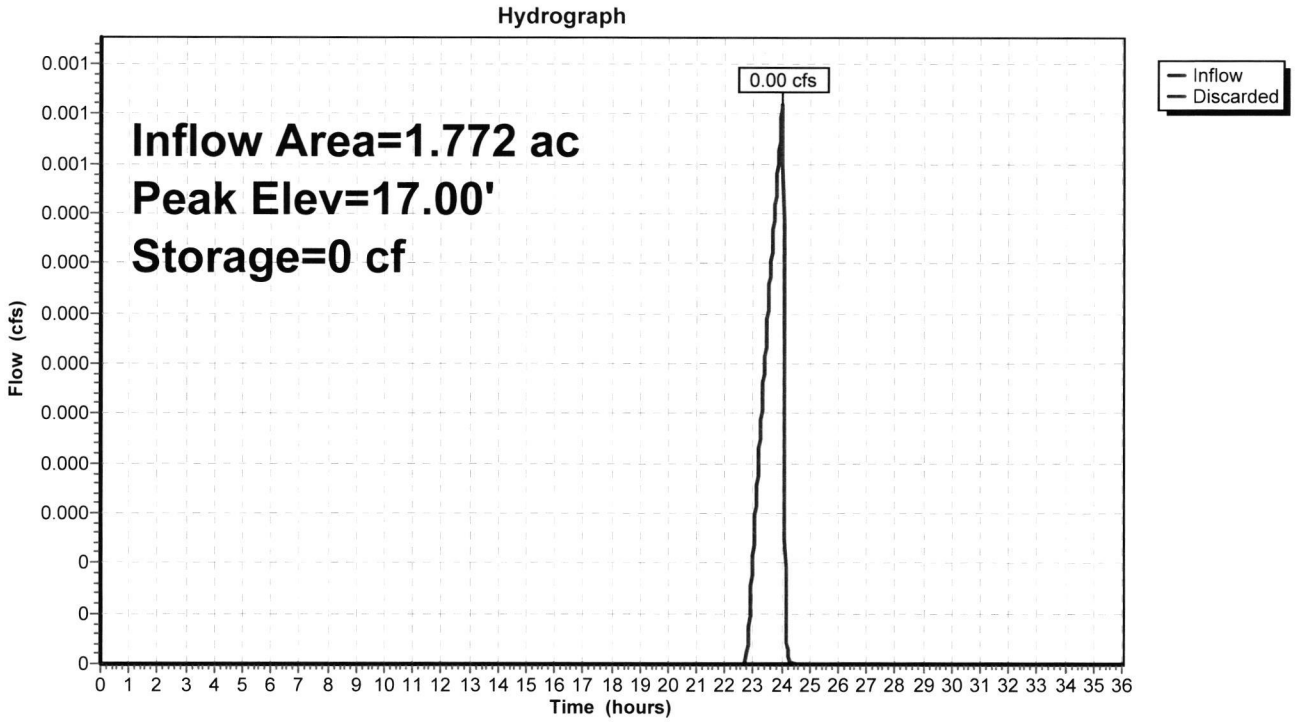
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (1,418.5 - 1,418.5)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	387 cf	**29.50'W x 9.00'L x 4.00'H Prismatoid** 1,062 cf Overall - 95 cf Embedded = 967 cf x 40.0% Voids
#2	18.00'	68 cf	**Concrete Galley 4x8x2 @ 4.00' L** x 3 Inside #1 Inside= 42.0"W x 21.0"H => 6.04 sf x 3.75'L = 22.6 cf Outside= 48.0"W x 24.0"H => 7.92 sf x 4.00'L = 31.7 cf
		455 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 14.70'

Discarded OutFlow Max=0.00 cfs @ 24.02 hrs HW=17.00' (Free Discharge)
↑**1=Exfiltration** (Passes 0.00 cfs of 0.05 cfs potential flow)

Pond 5P: Infiltration System #4 (3) 500-Gallon Leaching Chambers



Summary for Subcatchment 1S: Area 1

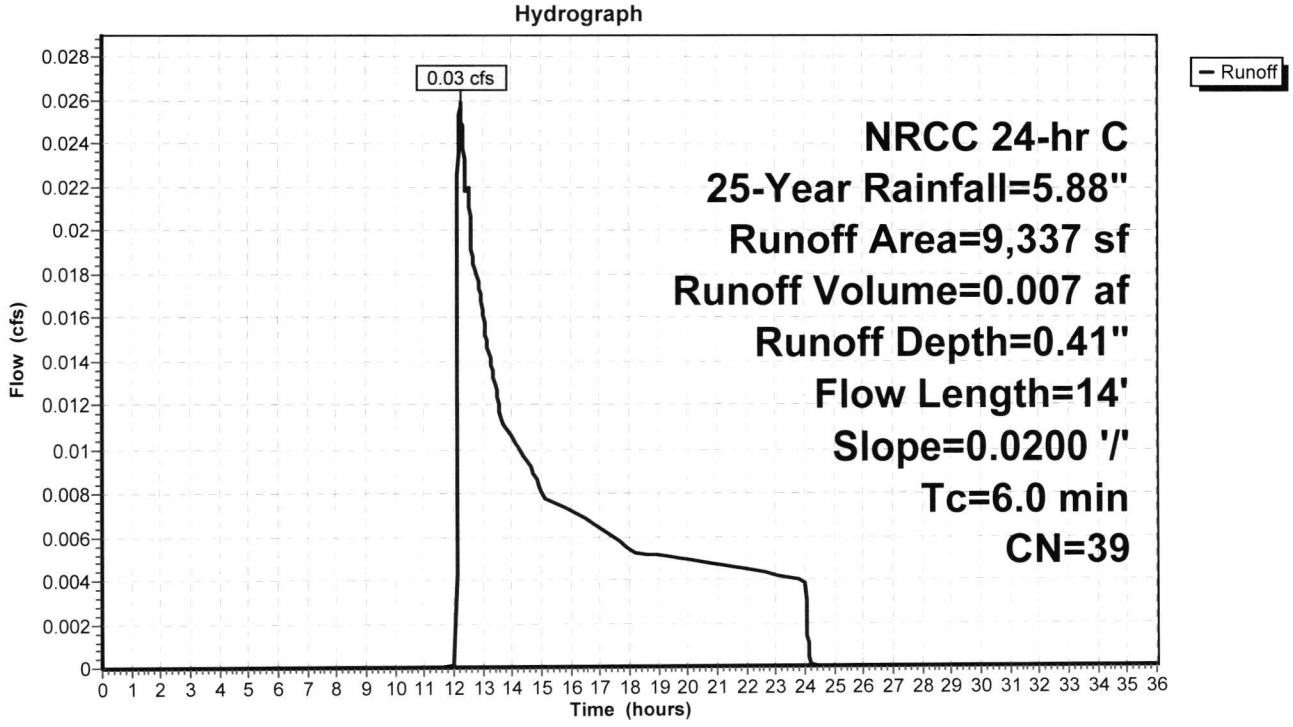
Runoff = 0.03 cfs @ 12.25 hrs, Volume= 0.007 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 25-Year Rainfall=5.88"

Area (sf)	CN	Description
9,337	39	>75% Grass cover, Good, HSG A
9,337		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	14	0.0200	0.98		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
0.2	14	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1S: Area 1



Summary for Subcatchment 2S: Area 2

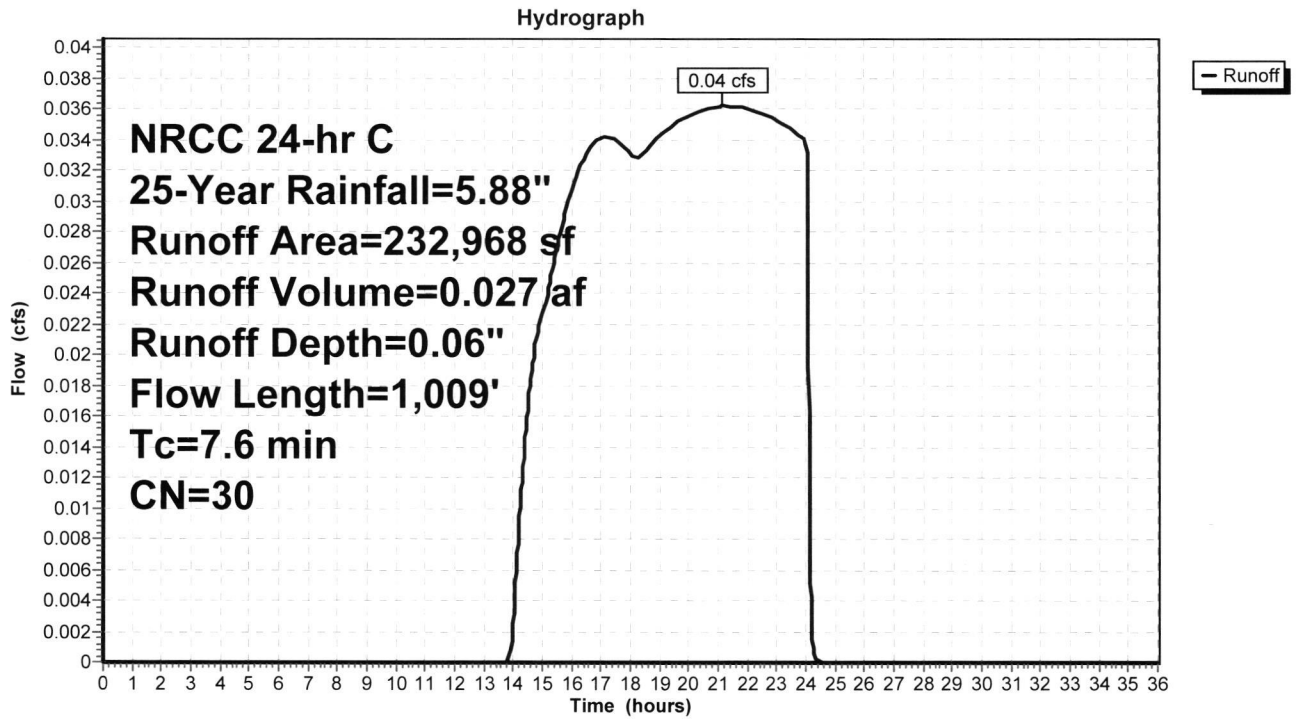
Runoff = 0.04 cfs @ 21.15 hrs, Volume= 0.027 af, Depth= 0.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 25-Year Rainfall=5.88"

Area (sf)	CN	Description
15,293	30	Woods, Good, HSG A
217,675	30	Meadow, non-grazed, HSG A
232,968	30	Weighted Average
232,968		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	50	0.5000	4.60		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
0.1	35	0.5000	11.38		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
3.0	411	0.0200	2.28		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
1.7	163	0.0100	1.61		**Shallow Concentrated Flow, D-E** Unpaved Kv= 16.1 fps
2.6	350	0.0200	2.28		**Shallow Concentrated Flow, E-F** Unpaved Kv= 16.1 fps
7.6	1,009	Total			

Subcatchment 2S: Area 2



Summary for Subcatchment 3S: Area 3

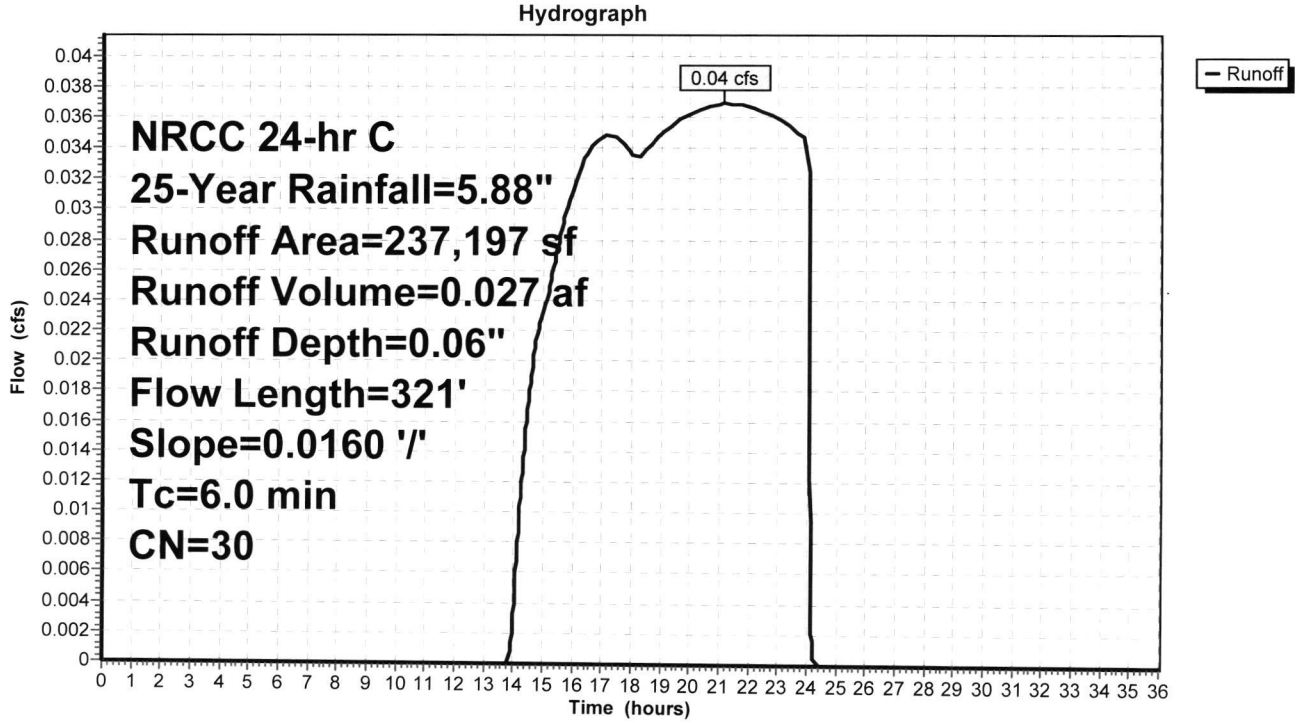
Runoff = 0.04 cfs @ 21.14 hrs, Volume= 0.027 af, Depth= 0.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 25-Year Rainfall=5.88"

Area (sf)	CN	Description
16,010	30	Woods, Good, HSG A
221,187	30	Meadow, non-grazed, HSG A
237,197	30	Weighted Average
237,197		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0160	1.16		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
1.5	184	0.0160	2.04		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.7	87	0.0160	2.04		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
3.1					**Direct Entry,**
6.0	321	Total			

Subcatchment 3S: Area 3



Summary for Subcatchment 4S: Area 4

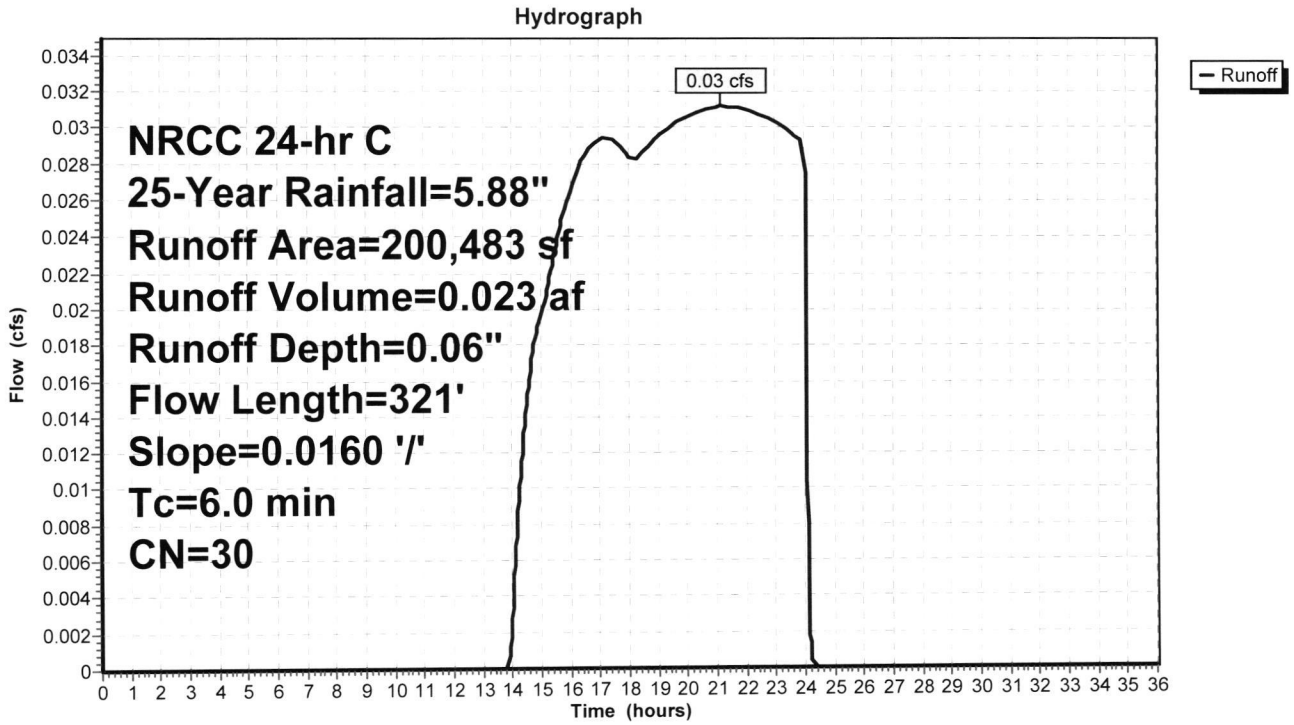
Runoff = 0.03 cfs @ 21.14 hrs, Volume= 0.023 af, Depth= 0.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 25-Year Rainfall=5.88"

Area (sf)	CN	Description
16,010	30	Woods, Good, HSG A
184,473	30	Meadow, non-grazed, HSG A
200,483	30	Weighted Average
200,483		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0160	1.16		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
1.5	184	0.0160	2.04		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.7	87	0.0160	2.04		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
3.1					**Direct Entry,**
6.0	321	Total			

Subcatchment 4S: Area 4



Summary for Subcatchment 5S: Area 5

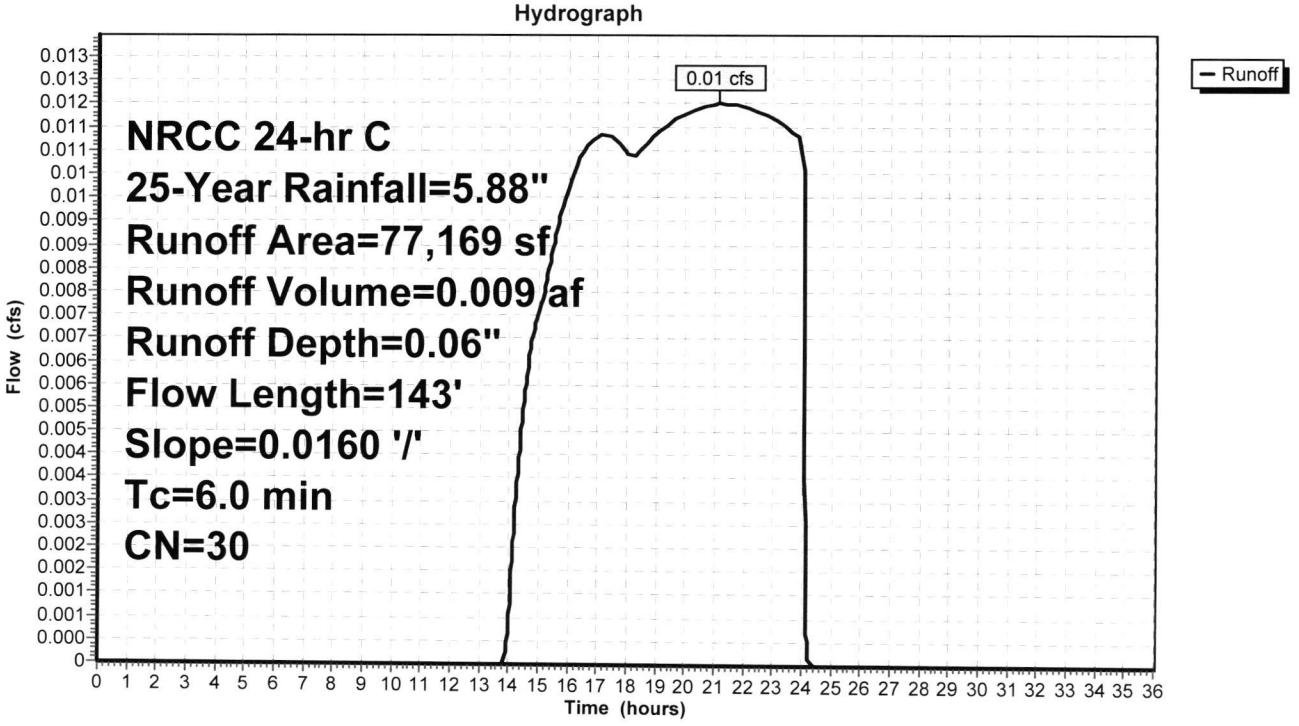
Runoff = 0.01 cfs @ 21.14 hrs, Volume= 0.009 af, Depth= 0.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 25-Year Rainfall=5.88"

Area (sf)	CN	Description
19,805	30	Woods, Good, HSG A
57,364	30	Meadow, non-grazed, HSG A
77,169	30	Weighted Average
77,169		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0160	1.16		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
0.8	93	0.0160	2.04		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
4.5					**Direct Entry,**
6.0	143	Total			

Subcatchment 5S: Area 5

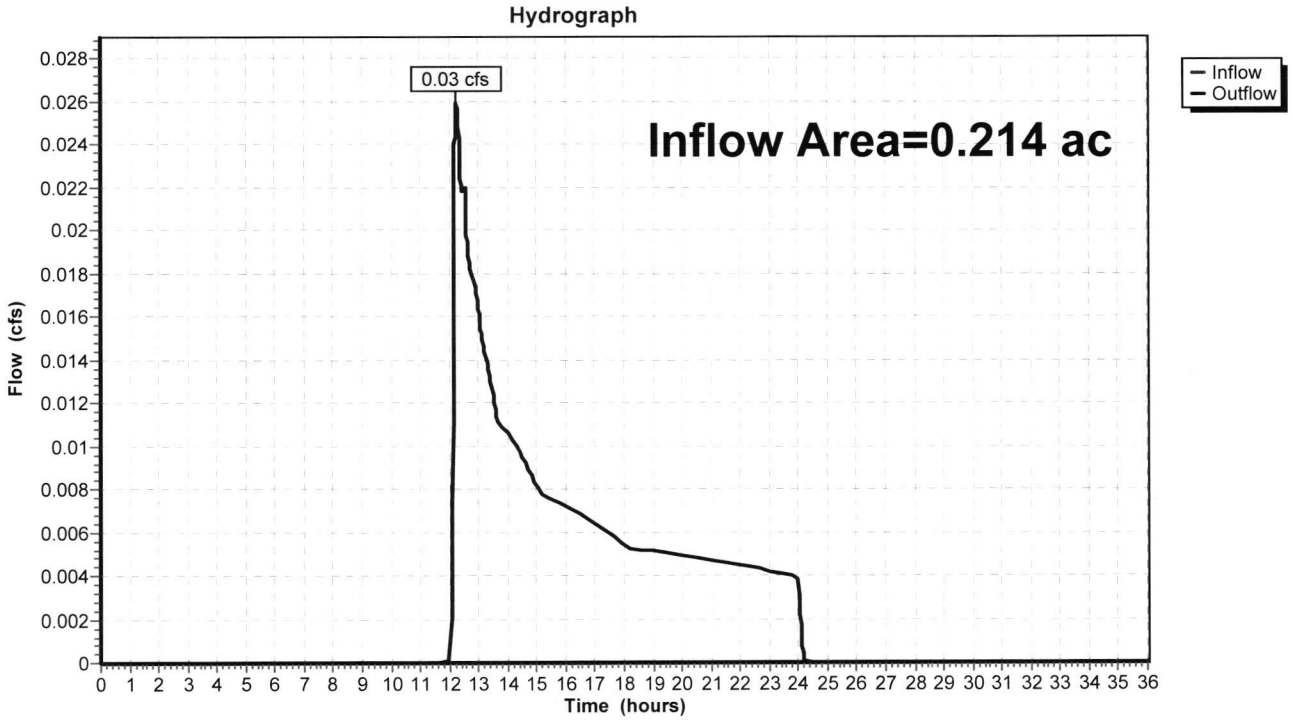


Summary for Reach 1R: Offsite Flow - South

Inflow Area = 0.214 ac, 0.00% Impervious, Inflow Depth = 0.41" for 25-Year event
Inflow = 0.03 cfs @ 12.25 hrs, Volume= 0.007 af
Outflow = 0.03 cfs @ 12.25 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 1R: Offsite Flow - South



Summary for Pond 2P: Infiltration System #1 (10) 500-Gallon Leaching Chambers

Inflow Area = 5.348 ac, 0.00% Impervious, Inflow Depth = 0.06" for 25-Year event
Inflow = 0.04 cfs @ 21.15 hrs, Volume= 0.027 af
Outflow = 0.04 cfs @ 21.15 hrs, Volume= 0.027 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.04 cfs @ 21.15 hrs, Volume= 0.027 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 17.00' @ 0.00 hrs Surf.Area= 651 sf Storage= 0 cf

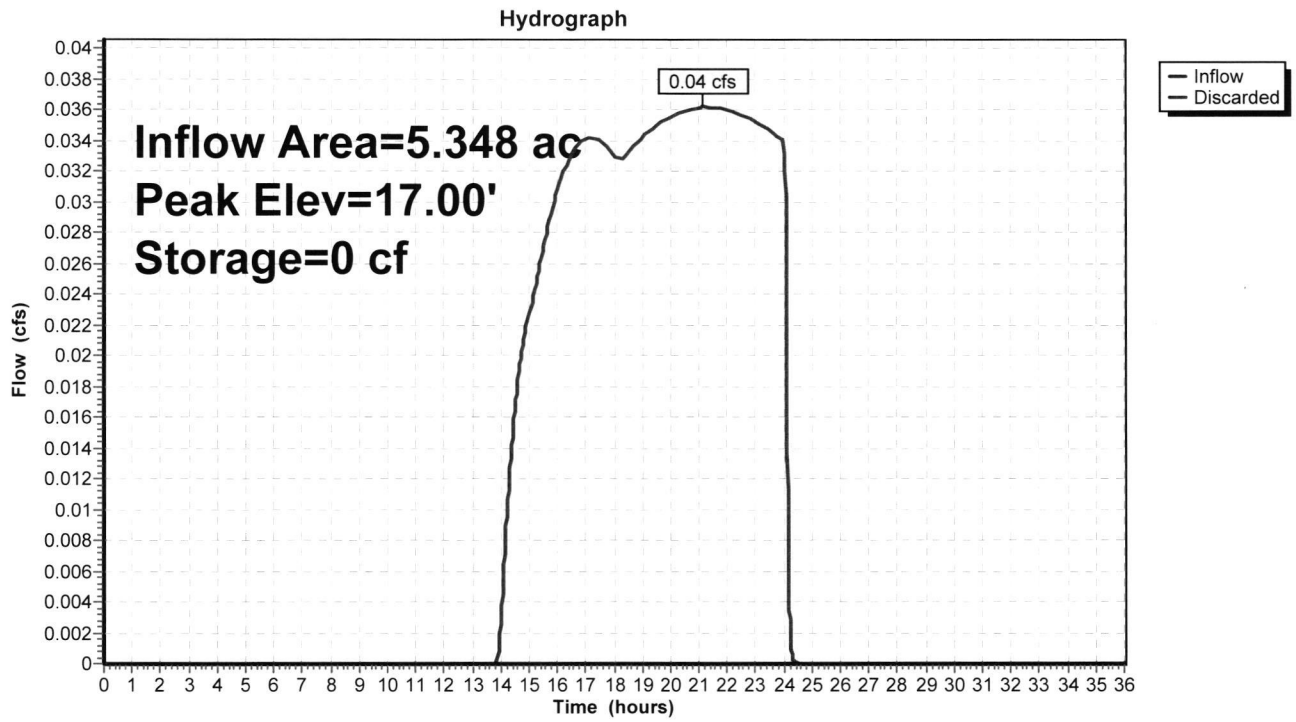
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	915 cf	**46.50'W x 14.00'L x 4.00'H Prismatoid** 2,604 cf Overall - 317 cf Embedded = 2,287 cf x 40.0% Voids
#2	18.00'	227 cf	**Concrete Galley 4x8x2 @ 4.00' L** x 10 Inside #1 Inside= 42.0"W x 21.0"H => 6.04 sf x 3.75'L = 22.6 cf Outside= 48.0"W x 24.0"H => 7.92 sf x 4.00'L = 31.7 cf 2 Rows of 5 Chambers
		1,141 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 14.70'

Discarded OutFlow Max=0.00 cfs @ 21.15 hrs HW=17.00' (Free Discharge)
↑**1=Exfiltration** (Passes 0.00 cfs of 0.12 cfs potential flow)

Pond 2P: Infiltration System #1 (10) 500-Gallon Leaching Chambers



Summary for Pond 3P: Infiltration System #2 (10) 500-Gallon Leaching Chambers

Inflow Area = 5.445 ac, 0.00% Impervious, Inflow Depth = 0.06" for 25-Year event
Inflow = 0.04 cfs @ 21.14 hrs, Volume= 0.027 af
Outflow = 0.04 cfs @ 21.14 hrs, Volume= 0.027 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.04 cfs @ 21.14 hrs, Volume= 0.027 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 17.00' @ 0.00 hrs Surf.Area= 651 sf Storage= 0 cf

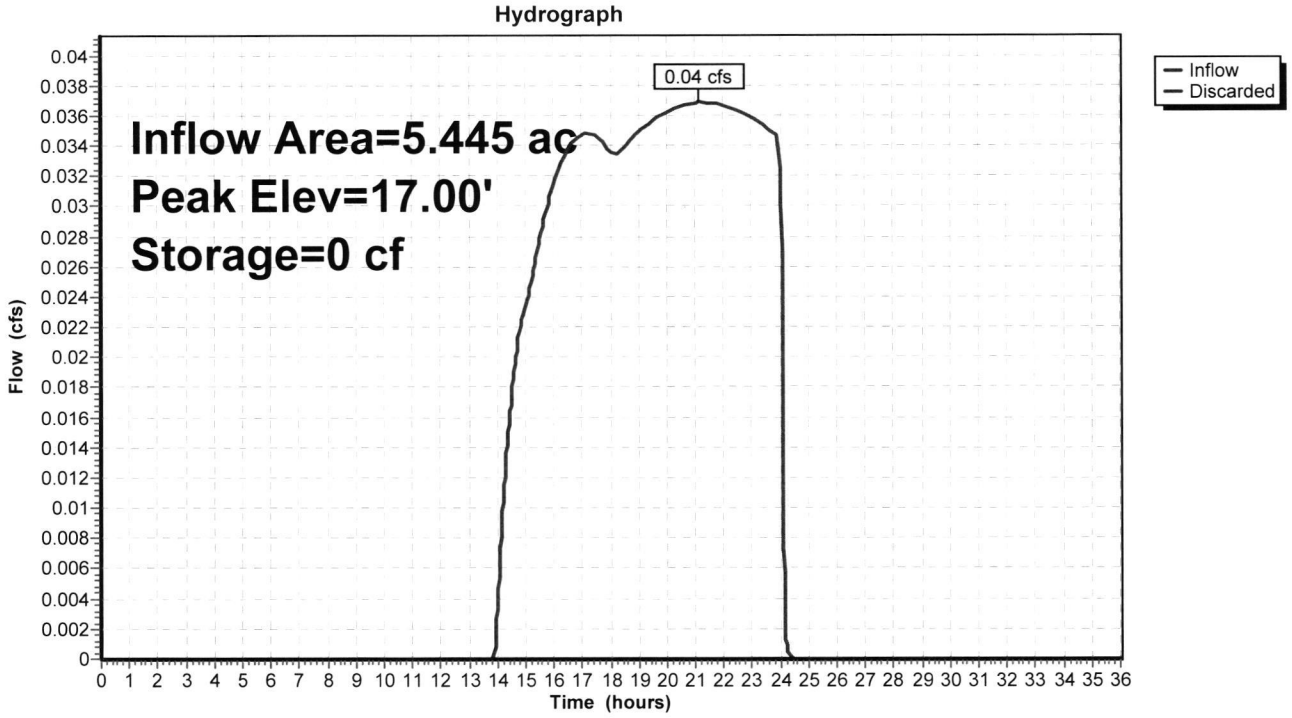
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	871 cf	**46.50'W x 14.00'L x 3.83'H Prismatoid** 2,493 cf Overall - 317 cf Embedded = 2,177 cf x 40.0% Voids
#2	18.00'	227 cf	**Concrete Galley 4x8x2 @ 4.00' L** x 10 Inside #1 Inside= 42.0"W x 21.0"H => 6.04 sf x 3.75'L = 22.6 cf Outside= 48.0"W x 24.0"H => 7.92 sf x 4.00'L = 31.7 cf 2 Rows of 5 Chambers
		1,097 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 14.70'

Discarded OutFlow Max=0.00 cfs @ 21.14 hrs HW=17.00' (Free Discharge)
↑**1=Exfiltration** (Passes 0.00 cfs of 0.12 cfs potential flow)

Pond 3P: Infiltration System #2 (10) 500-Gallon Leaching Chambers



Summary for Pond 4P: Infiltration System #3 (10) 500-Gallon Leaching Chambers

Inflow Area = 4.602 ac, 0.00% Impervious, Inflow Depth = 0.06" for 25-Year event
Inflow = 0.03 cfs @ 21.14 hrs, Volume= 0.023 af
Outflow = 0.03 cfs @ 21.14 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.03 cfs @ 21.14 hrs, Volume= 0.023 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 17.00' @ 0.00 hrs Surf.Area= 651 sf Storage= 0 cf

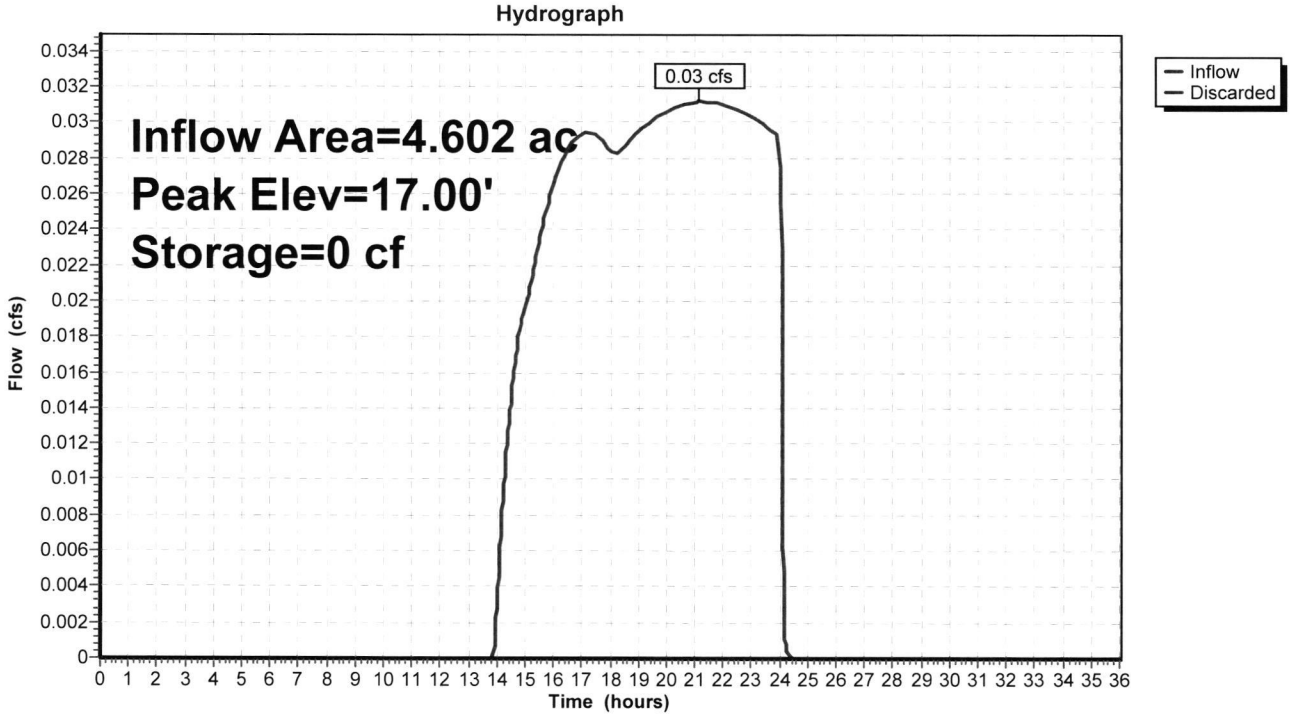
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= (not calculated: outflow precedes inflow)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	871 cf	**46.50'W x 14.00'L x 3.83'H Prismatoid** 2,493 cf Overall - 317 cf Embedded = 2,177 cf x 40.0% Voids
#2	18.00'	227 cf	**Concrete Galley 4x8x2 @ 4.00' L** x 10 Inside #1 Inside= 42.0"W x 21.0"H => 6.04 sf x 3.75'L = 22.6 cf Outside= 48.0"W x 24.0"H => 7.92 sf x 4.00'L = 31.7 cf 2 Rows of 5 Chambers
		1,097 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 14.70'

Discarded OutFlow Max=0.00 cfs @ 21.14 hrs HW=17.00' (Free Discharge)
↑**1=Exfiltration** (Passes 0.00 cfs of 0.12 cfs potential flow)

Pond 4P: Infiltration System #3 (10) 500-Gallon Leaching Chambers



Summary for Pond 5P: Infiltration System #4 (3) 500-Gallon Leaching Chambers

Inflow Area = 1.772 ac, 0.00% Impervious, Inflow Depth = 0.06" for 25-Year event
Inflow = 0.01 cfs @ 21.14 hrs, Volume= 0.009 af
Outflow = 0.01 cfs @ 21.14 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.01 cfs @ 21.14 hrs, Volume= 0.009 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 17.00' @ 0.00 hrs Surf.Area= 266 sf Storage= 0 cf

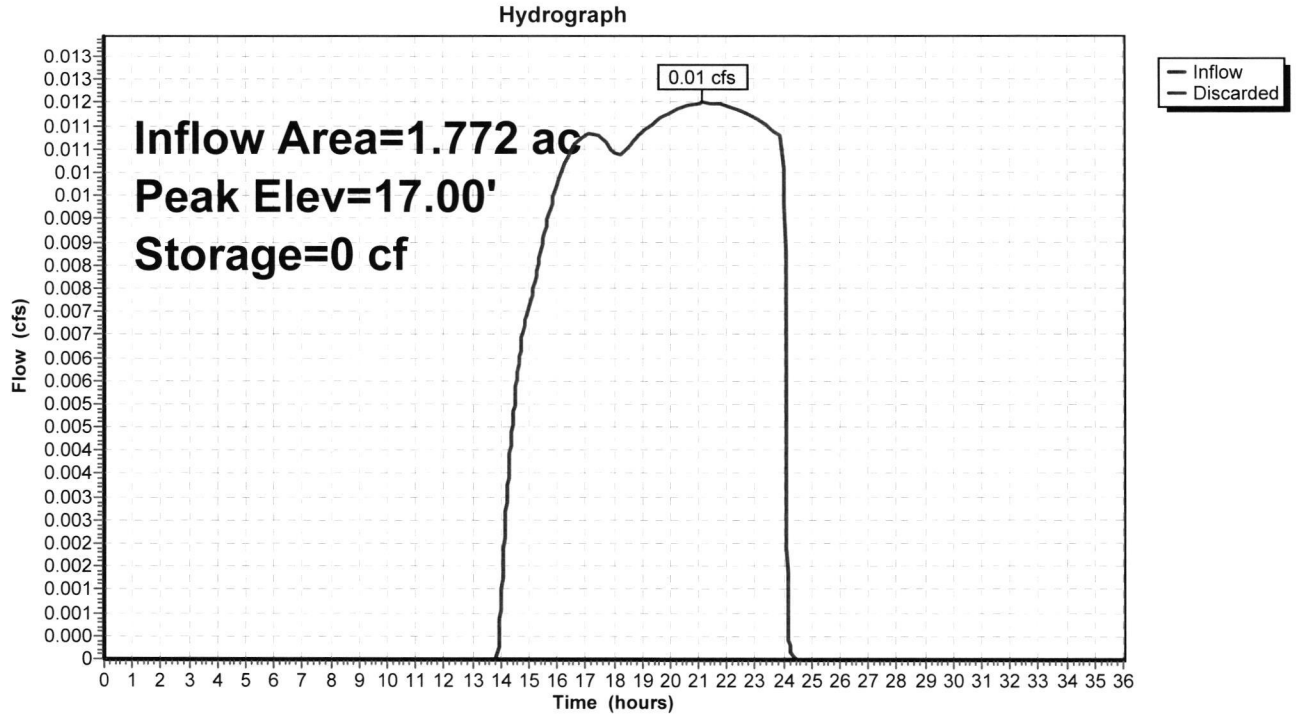
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (1,166.9 - 1,166.9)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	387 cf	**29.50'W x 9.00'L x 4.00'H Prismatoid** 1,062 cf Overall - 95 cf Embedded = 967 cf x 40.0% Voids
#2	18.00'	68 cf	**Concrete Galley 4x8x2 @ 4.00' L** x 3 Inside #1 Inside= 42.0"W x 21.0"H => 6.04 sf x 3.75'L = 22.6 cf Outside= 48.0"W x 24.0"H => 7.92 sf x 4.00'L = 31.7 cf
		455 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 14.70'

Discarded OutFlow Max=0.00 cfs @ 21.14 hrs HW=17.00' (Free Discharge)
↑**1=Exfiltration** (Passes 0.00 cfs of 0.05 cfs potential flow)

Pond 5P: Infiltration System #4 (3) 500-Gallon Leaching Chambers



Summary for Subcatchment 1S: Area 1

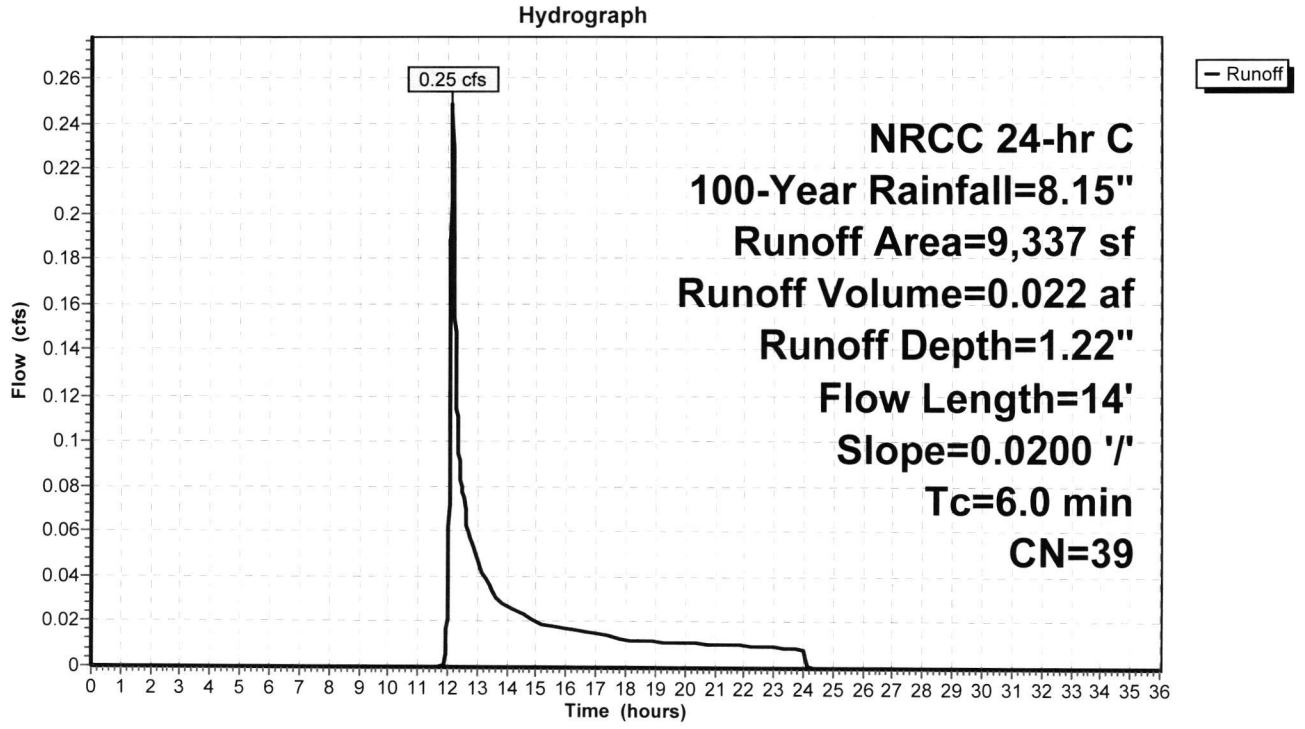
Runoff = 0.25 cfs @ 12.15 hrs, Volume= 0.022 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 100-Year Rainfall=8.15"

Area (sf)	CN	Description
9,337	39	>75% Grass cover, Good, HSG A
9,337		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	14	0.0200	0.98		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
0.2	14	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 1S: Area 1



Summary for Subcatchment 2S: Area 2

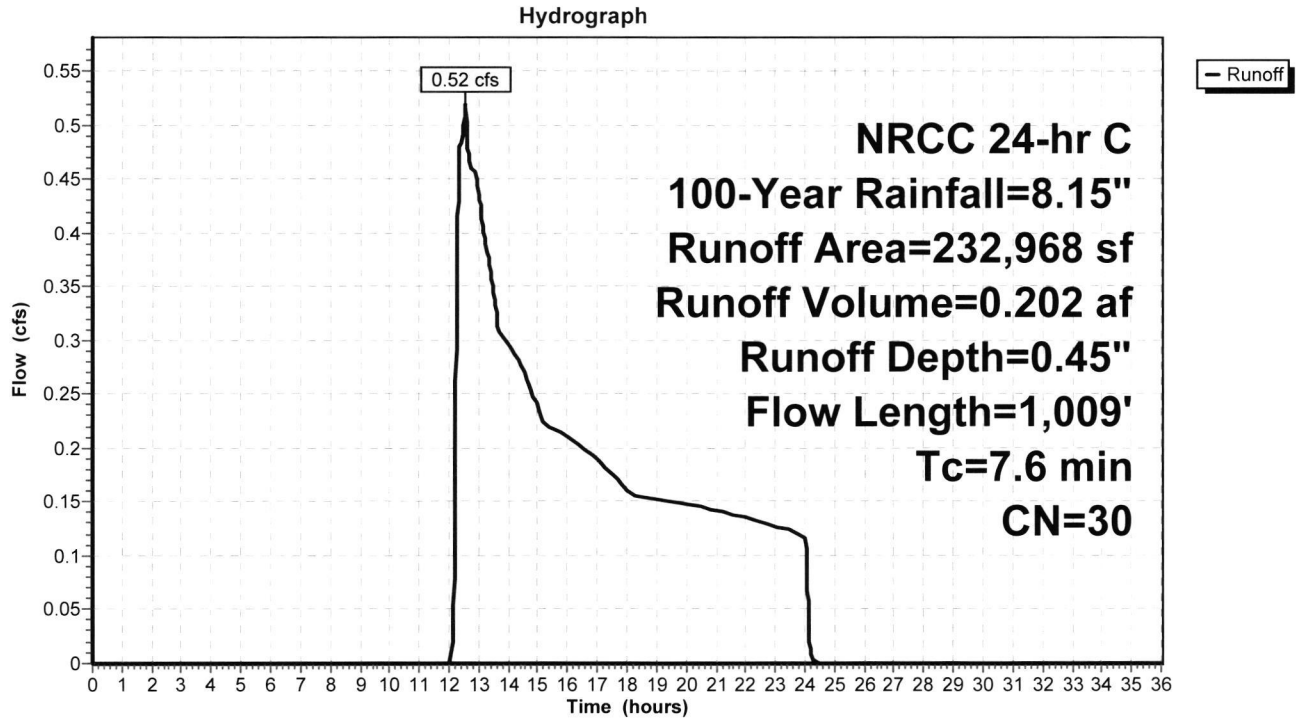
Runoff = 0.52 cfs @ 12.55 hrs, Volume= 0.202 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 100-Year Rainfall=8.15"

Area (sf)	CN	Description
15,293	30	Woods, Good, HSG A
217,675	30	Meadow, non-grazed, HSG A
232,968	30	Weighted Average
232,968		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	50	0.5000	4.60		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
0.1	35	0.5000	11.38		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
3.0	411	0.0200	2.28		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
1.7	163	0.0100	1.61		**Shallow Concentrated Flow, D-E** Unpaved Kv= 16.1 fps
2.6	350	0.0200	2.28		**Shallow Concentrated Flow, E-F** Unpaved Kv= 16.1 fps
7.6	1,009	Total			

Subcatchment 2S: Area 2



Summary for Subcatchment 3S: Area 3

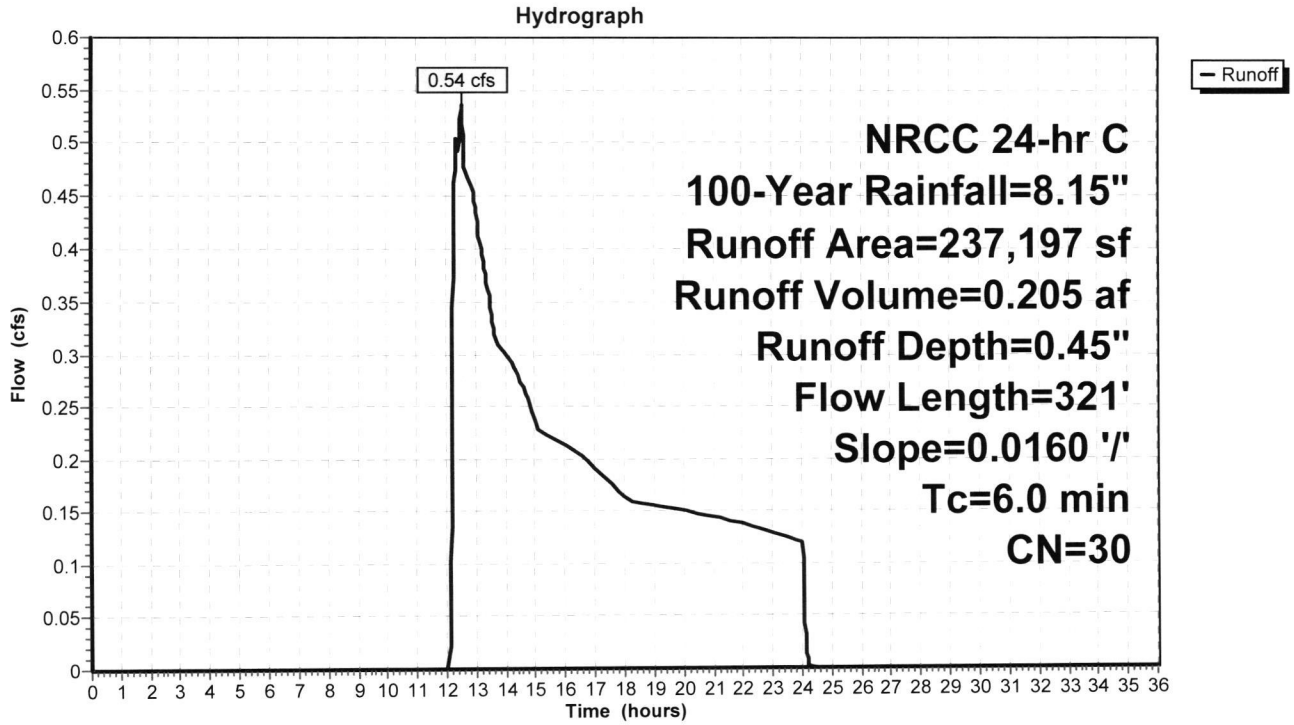
Runoff = 0.54 cfs @ 12.54 hrs, Volume= 0.205 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 100-Year Rainfall=8.15"

Area (sf)	CN	Description
16,010	30	Woods, Good, HSG A
221,187	30	Meadow, non-grazed, HSG A
237,197	30	Weighted Average
237,197		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0160	1.16		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
1.5	184	0.0160	2.04		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.7	87	0.0160	2.04		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
3.1					**Direct Entry,**
6.0	321	Total			

Subcatchment 3S: Area 3



Summary for Subcatchment 4S: Area 4

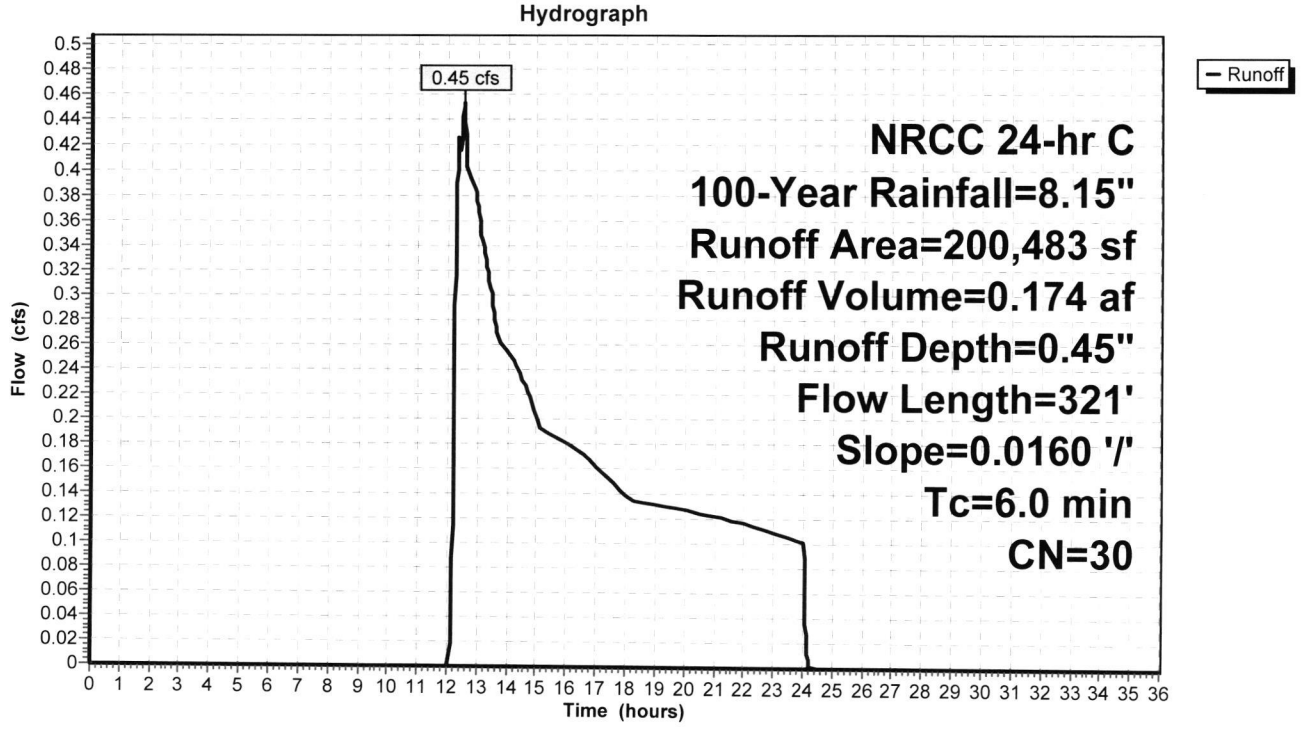
Runoff = 0.45 cfs @ 12.54 hrs, Volume= 0.174 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 100-Year Rainfall=8.15"

Area (sf)	CN	Description
16,010	30	Woods, Good, HSG A
184,473	30	Meadow, non-grazed, HSG A
200,483	30	Weighted Average
200,483		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0160	1.16		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
1.5	184	0.0160	2.04		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
0.7	87	0.0160	2.04		**Shallow Concentrated Flow, C-D** Unpaved Kv= 16.1 fps
3.1					**Direct Entry,**
6.0	321	Total			

Subcatchment 4S: Area 4



Summary for Subcatchment 5S: Area 5

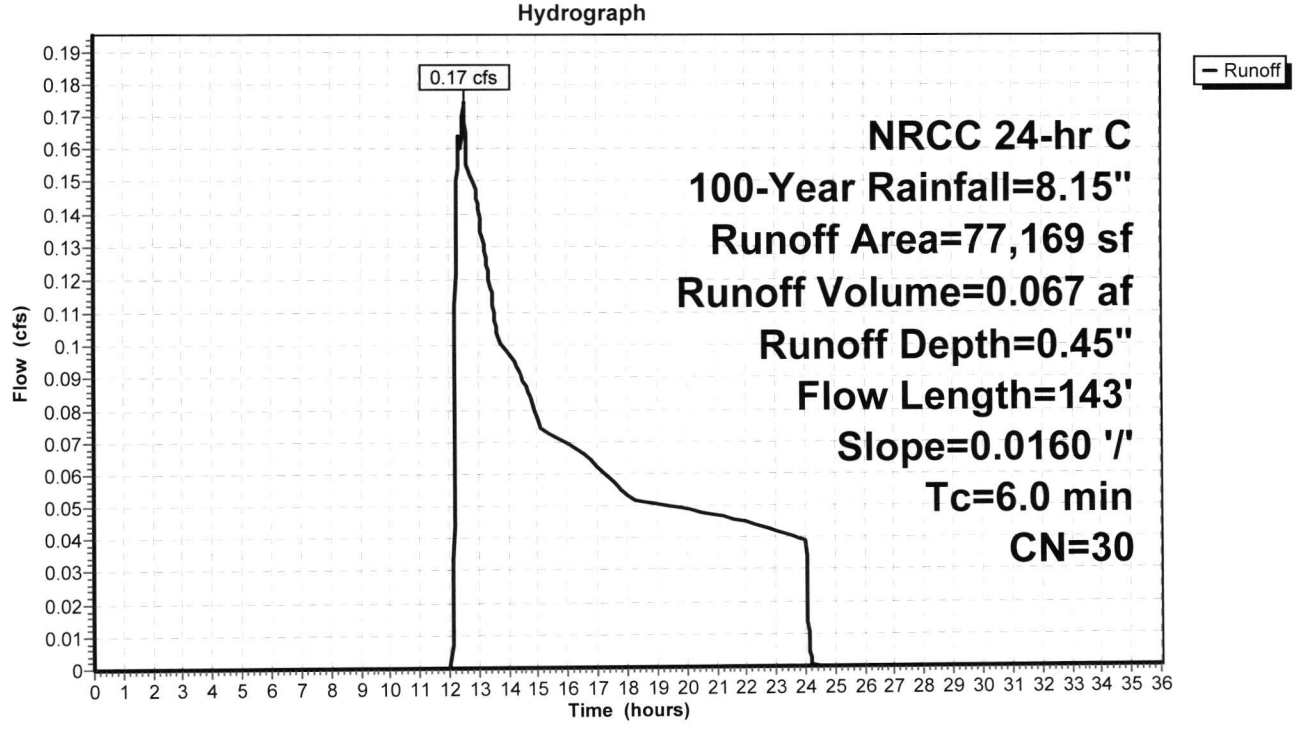
Runoff = 0.17 cfs @ 12.54 hrs, Volume= 0.067 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
NRCC 24-hr C 100-Year Rainfall=8.15"

Area (sf)	CN	Description
19,805	30	Woods, Good, HSG A
57,364	30	Meadow, non-grazed, HSG A
77,169	30	Weighted Average
77,169		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0160	1.16		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.60"
0.8	93	0.0160	2.04		**Shallow Concentrated Flow, B-C** Unpaved Kv= 16.1 fps
4.5					**Direct Entry,**
6.0	143	Total			

Subcatchment 5S: Area 5

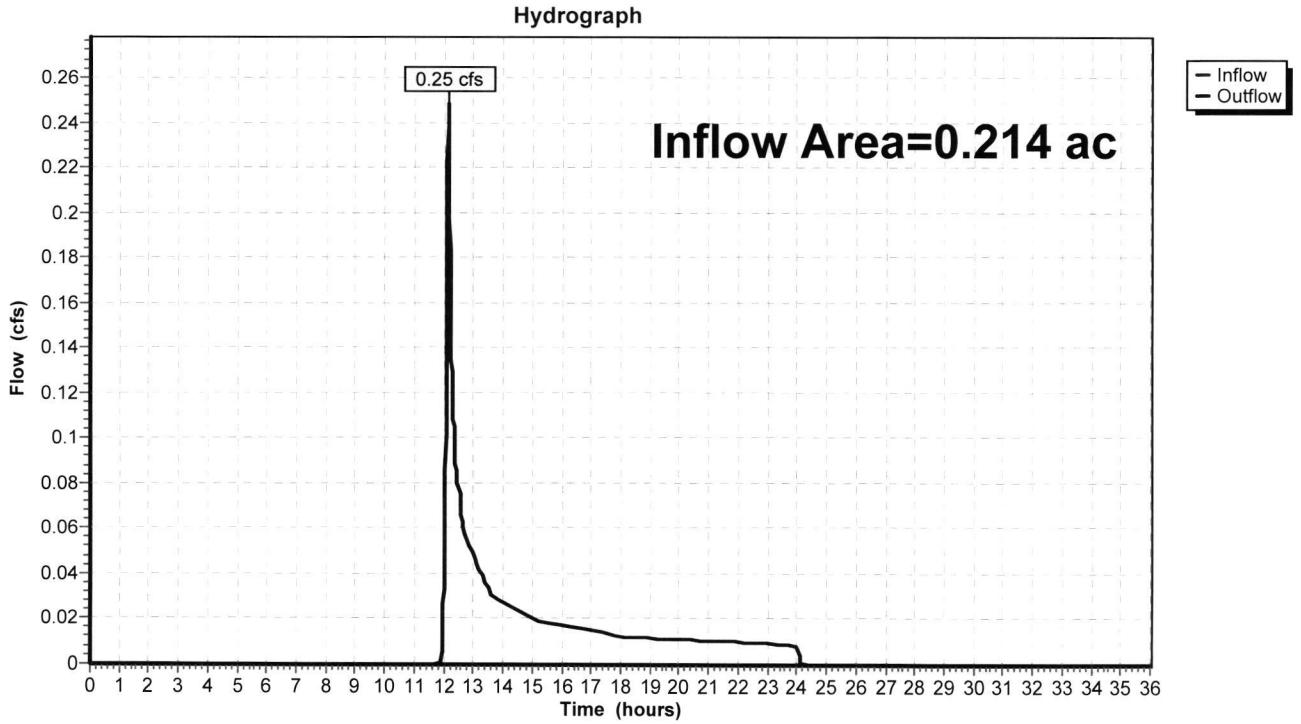


Summary for Reach 1R: Offsite Flow - South

Inflow Area = 0.214 ac, 0.00% Impervious, Inflow Depth = 1.22" for 100-Year event
Inflow = 0.25 cfs @ 12.15 hrs, Volume= 0.022 af
Outflow = 0.25 cfs @ 12.15 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

Reach 1R: Offsite Flow - South



Summary for Pond 2P: Infiltration System #1 (10) 500-Gallon Leaching Chambers

Inflow Area = 5.348 ac, 0.00% Impervious, Inflow Depth = 0.45" for 100-Year event
Inflow = 0.52 cfs @ 12.55 hrs, Volume= 0.202 af
Outflow = 0.30 cfs @ 13.90 hrs, Volume= 0.202 af, Atten= 42%, Lag= 80.7 min
Discarded = 0.30 cfs @ 13.90 hrs, Volume= 0.202 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 20.26' @ 13.90 hrs Surf.Area= 651 sf Storage= 949 cf

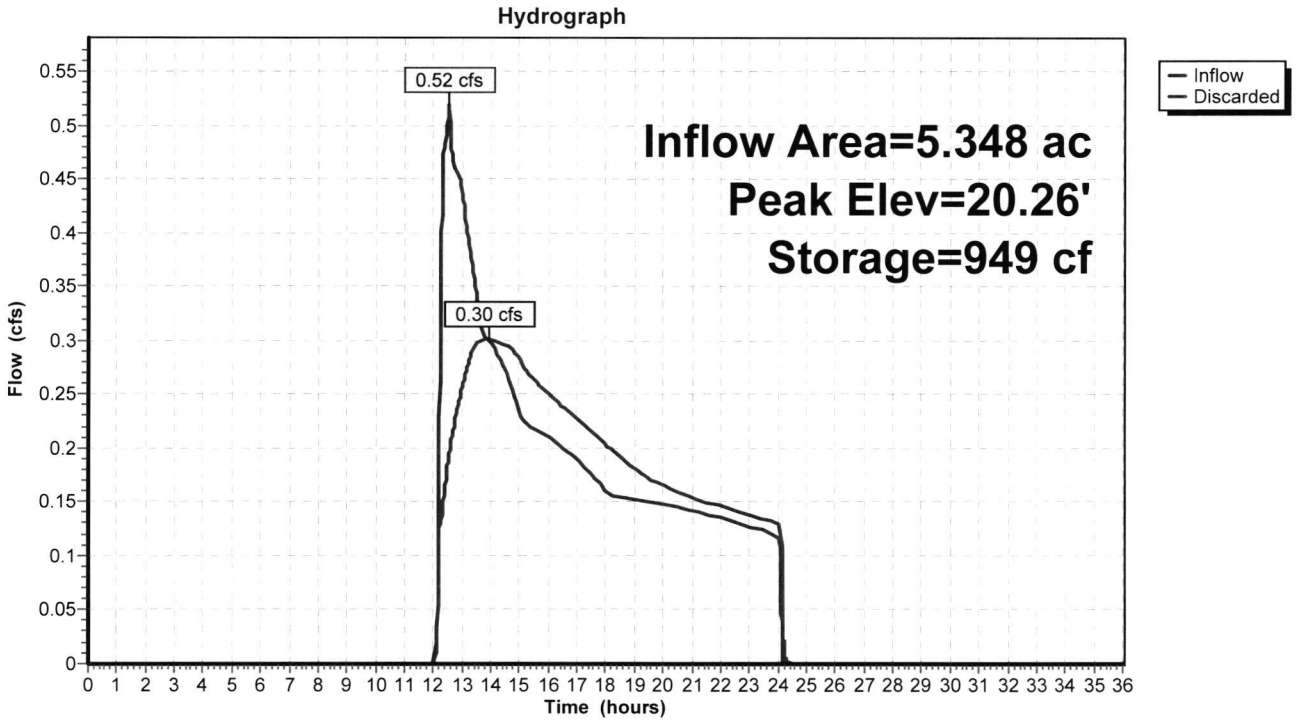
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 34.3 min (1,041.6 - 1,007.4)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	915 cf	**46.50'W x 14.00'L x 4.00'H Prismatoid** 2,604 cf Overall - 317 cf Embedded = 2,287 cf x 40.0% Voids
#2	18.00'	227 cf	**Concrete Galley 4x8x2 @ 4.00' L** x 10 Inside #1 Inside= 42.0"W x 21.0"H => 6.04 sf x 3.75'L = 22.6 cf Outside= 48.0"W x 24.0"H => 7.92 sf x 4.00'L = 31.7 cf 2 Rows of 5 Chambers
		1,141 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 14.70'

Discarded OutFlow Max=0.30 cfs @ 13.90 hrs HW=20.26' (Free Discharge)
↑**1=Exfiltration** (Controls 0.30 cfs)

Pond 2P: Infiltration System #1 (10) 500-Gallon Leaching Chambers



Summary for Pond 3P: Infiltration System #2 (10) 500-Gallon Leaching Chambers

Inflow Area = 5.445 ac, 0.00% Impervious, Inflow Depth = 0.45" for 100-Year event
Inflow = 0.54 cfs @ 12.54 hrs, Volume= 0.205 af
Outflow = 0.31 cfs @ 13.87 hrs, Volume= 0.205 af, Atten= 43%, Lag= 80.3 min
Discarded = 0.31 cfs @ 13.87 hrs, Volume= 0.205 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 20.36' @ 13.87 hrs Surf.Area= 651 sf Storage= 975 cf

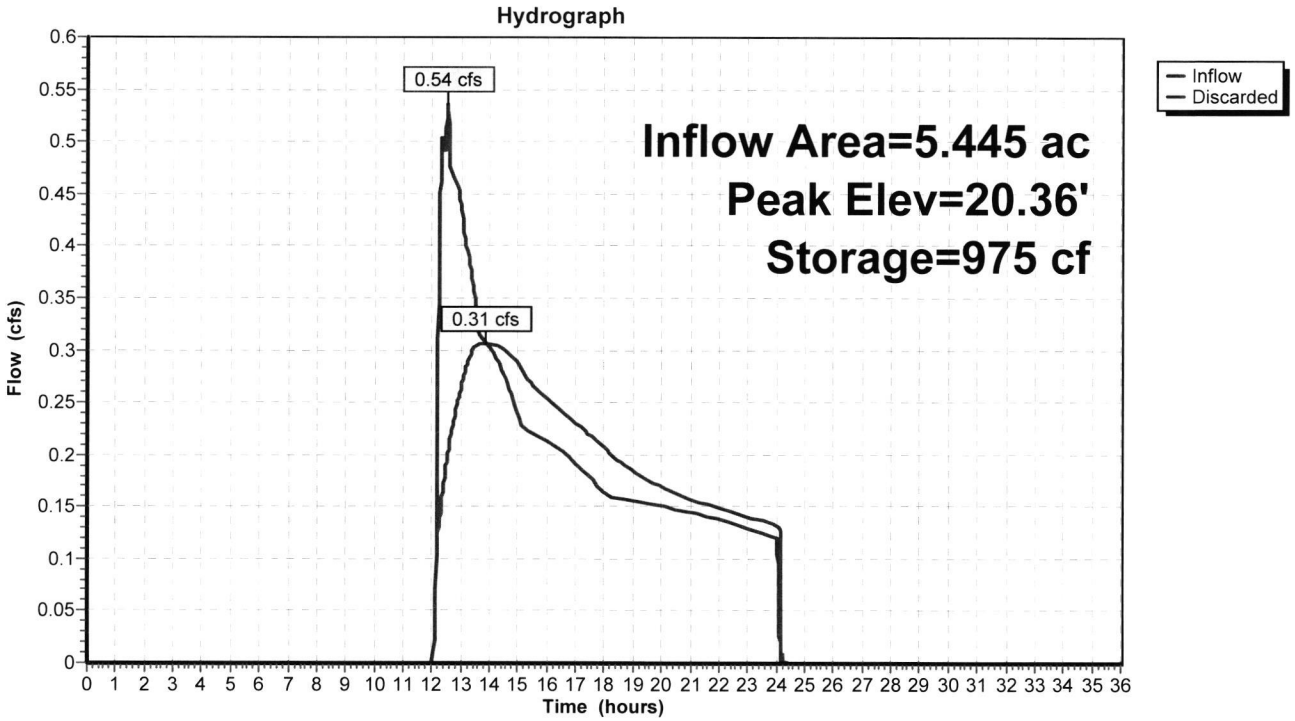
Plug-Flow detention time= 35.1 min calculated for 0.205 af (100% of inflow)
Center-of-Mass det. time= 35.1 min (1,041.0 - 1,005.9)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	871 cf	**46.50'W x 14.00'L x 3.83'H Prismatoid** 2,493 cf Overall - 317 cf Embedded = 2,177 cf x 40.0% Voids
#2	18.00'	227 cf	**Concrete Galley 4x8x2 @ 4.00' L** x 10 Inside #1 Inside= 42.0"W x 21.0"H => 6.04 sf x 3.75'L = 22.6 cf Outside= 48.0"W x 24.0"H => 7.92 sf x 4.00'L = 31.7 cf 2 Rows of 5 Chambers
		1,097 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 14.70'

Discarded OutFlow Max=0.31 cfs @ 13.87 hrs HW=20.36' (Free Discharge)
↑**1=Exfiltration** (Controls 0.31 cfs)

Pond 3P: Infiltration System #2 (10) 500-Gallon Leaching Chambers



Summary for Pond 4P: Infiltration System #3 (10) 500-Gallon Leaching Chambers

Inflow Area = 4.602 ac, 0.00% Impervious, Inflow Depth = 0.45" for 100-Year event
Inflow = 0.45 cfs @ 12.54 hrs, Volume= 0.174 af
Outflow = 0.26 cfs @ 13.78 hrs, Volume= 0.174 af, Atten= 42%, Lag= 74.8 min
Discarded = 0.26 cfs @ 13.78 hrs, Volume= 0.174 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 19.52' @ 13.78 hrs Surf.Area= 651 sf Storage= 760 cf

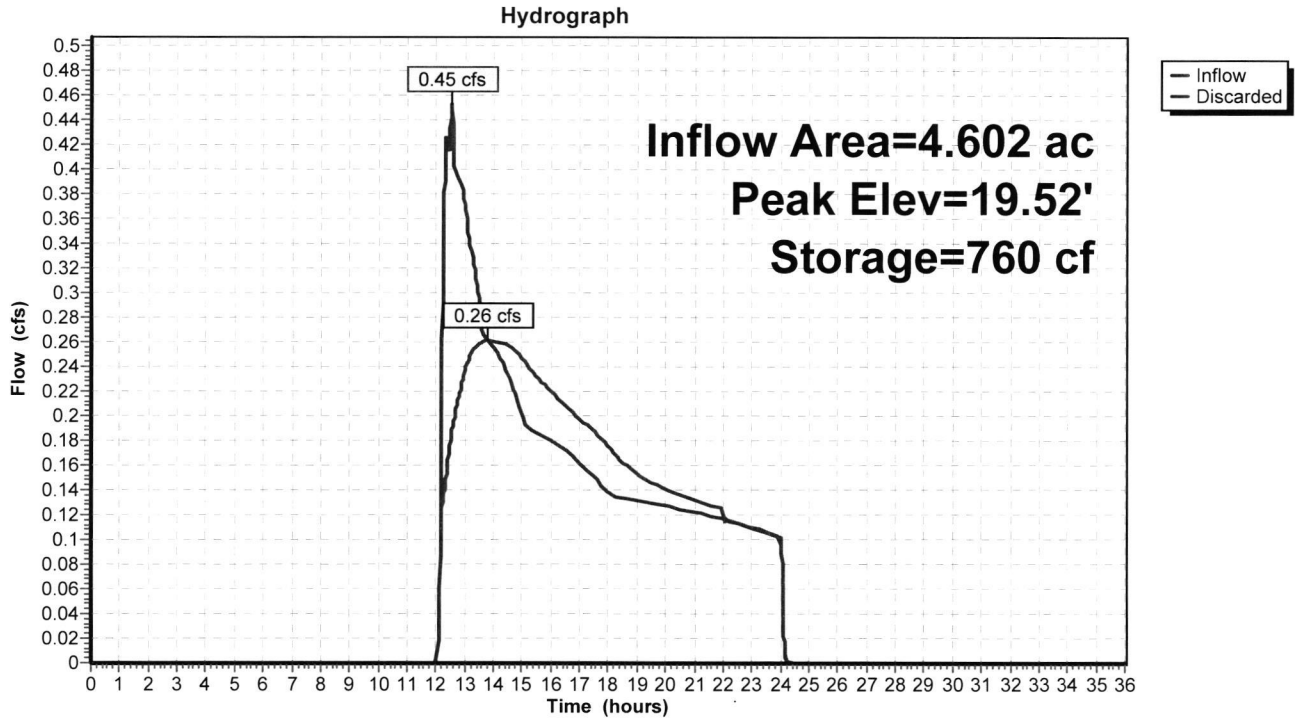
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 27.1 min (1,033.0 - 1,005.9)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	871 cf	**46.50'W x 14.00'L x 3.83'H Prismatoid** 2,493 cf Overall - 317 cf Embedded = 2,177 cf x 40.0% Voids
#2	18.00'	227 cf	**Concrete Galley 4x8x2 @ 4.00' L** x 10 Inside #1 Inside= 42.0"W x 21.0"H => 6.04 sf x 3.75'L = 22.6 cf Outside= 48.0"W x 24.0"H => 7.92 sf x 4.00'L = 31.7 cf 2 Rows of 5 Chambers
		1,097 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 14.70'

Discarded OutFlow Max=0.26 cfs @ 13.78 hrs HW=19.52' (Free Discharge)
↑**1=Exfiltration** (Controls 0.26 cfs)

Pond 4P: Infiltration System #3 (10) 500-Gallon Leaching Chambers



Summary for Pond 5P: Infiltration System #4 (3) 500-Gallon Leaching Chambers

Inflow Area = 1.772 ac, 0.00% Impervious, Inflow Depth = 0.45" for 100-Year event
Inflow = 0.17 cfs @ 12.54 hrs, Volume= 0.067 af
Outflow = 0.10 cfs @ 13.64 hrs, Volume= 0.067 af, Atten= 41%, Lag= 66.0 min
Discarded = 0.10 cfs @ 13.64 hrs, Volume= 0.067 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Peak Elev= 19.36' @ 13.64 hrs Surf.Area= 266 sf Storage= 278 cf

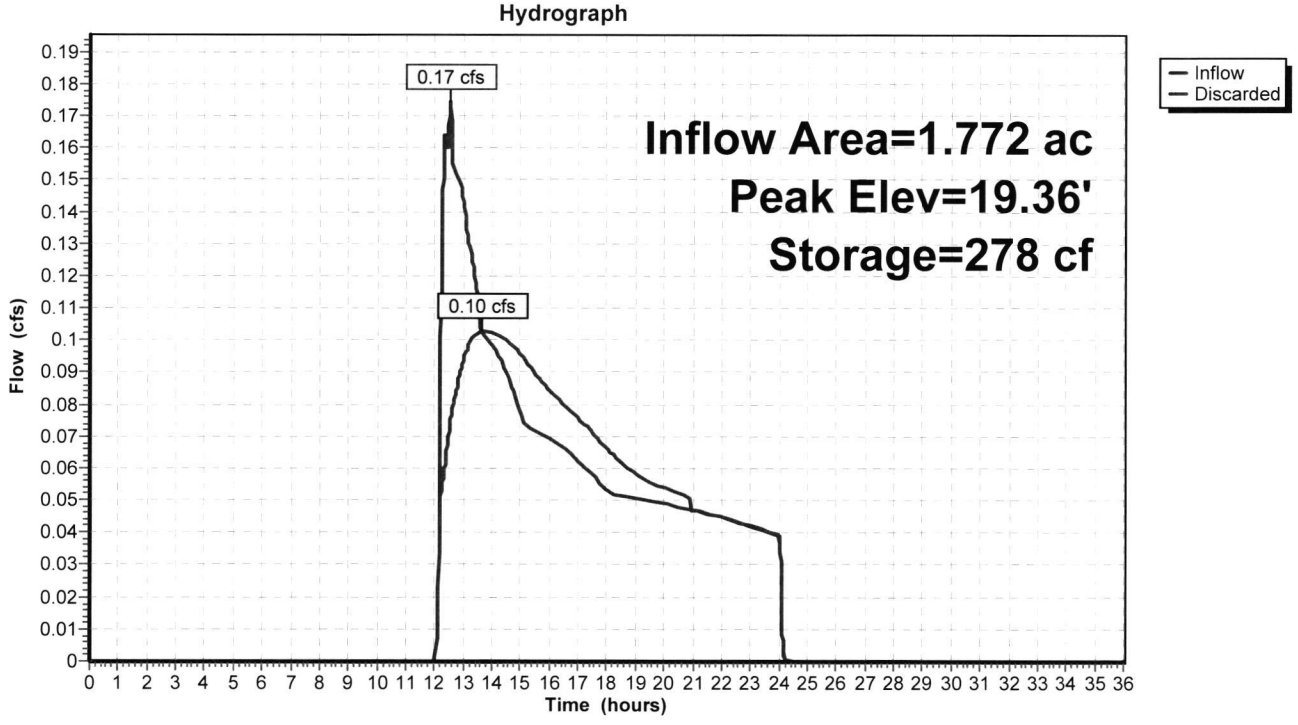
Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 23.9 min (1,029.8 - 1,005.9)

Volume	Invert	Avail.Storage	Storage Description
#1	17.00'	387 cf	**29.50'W x 9.00'L x 4.00'H Prismatoid** 1,062 cf Overall - 95 cf Embedded = 967 cf x 40.0% Voids
#2	18.00'	68 cf	**Concrete Galley 4x8x2 @ 4.00' L** x 3 Inside #1 Inside= 42.0"W x 21.0"H => 6.04 sf x 3.75'L = 22.6 cf Outside= 48.0"W x 24.0"H => 7.92 sf x 4.00'L = 31.7 cf
		455 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	17.00'	**8.270 in/hr Exfiltration over Horizontal area** Conductivity to Groundwater Elevation = 14.70'

Discarded OutFlow Max=0.10 cfs @ 13.64 hrs HW=19.36' (Free Discharge)
1=Exfiltration (Controls 0.10 cfs)

Pond 5P: Infiltration System #4 (3) 500-Gallon Leaching Chambers



SECTION 7.0

ADDITIONAL DRAINAGE CALCULATIONS

7.01 TSS REMOVAL CALCULATIONS

TSS Removal Calculation Worksheet

BSC GROUP

Location: 0 Depot Road, Harwich, MA
Project: 50416.00

Prepared By: B. Yergatian
Date: 07/21/20

A	B	C	D	E
BMP	TSS Removal Rate	Starting TSS Load*	Amount Removed (BxC)	Remaining Load (C-D)
Dry Wells	0.80	1.00	0.80	0.20

TSS Removal = 0.80

*Equals remaining load from previous BMP (E)

7.02 GROUNDWATER RECHARGE VOLUME CALCULATIONS

Required Recharge Volume

Rv = F x Impervious Area

Where:

Rv = Recharge Volume

F=Target Depth Factor associated with each Hydrologic Soil Group

(F=0.60-inch for Soil Type A)

Impervious Area = Proposed Pavement area on-site

$$Rv = \left(\frac{0.60\ in}{12\ in/ft}\right)(0.098\ ac)\left(43{,}560\frac{sf}{ac}\right) = 213\ cf$$

Rv = 213 cf (required recharge volume)

Structural Storage Provided:

- Infiltration Basin = 8,480 cubic feet provided.
  Refer to the HydroCAD calculations for more information.

Drawdown Time

The following formula must be used to demonstrate that each proposed infiltration BMP will drain within 72 hours:

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

R_v = Storage Volume (Required Recharge Volume)
K = Saturated Hydraulic Conductivity For "Static" and "Simple Dynamic" Methods, use Rawls Rate
Bottom Area = Bottom Area of Recharge Structure

Infiltration Systems #1-3

$$Time_{\ drawdown} = \frac{1{,}097\ ft^3}{(8.270\ in/hr)(1\ ft/12\ in)(651\ ft^2)}$$

$$Time_{\ drawdown} = 2.45\ hours$$

Infiltration System #4

$$Time_{drawdown} = \frac{455\ ft^3}{(8.270\ in/hr)(1\ ft/12\ in)(265.5\ ft^2)}$$

$$Time_{drawdown} = 2.49\ hours$$

7.03 WATER QUALITY VOLUME CALCULATIONS

Water Quality Volume Calculation

$V_{WQ} = (D_{WQ}/12 \text{ inches/foot}) * (A_{IMP} \text{ square feet})$

V_{WQ} = Required Water Quality Volume (in cubic feet)
D_{WQ} = Water Quality Depth: **0.5-inch** used (1-inch for rapid infiltration rates, greater than 2.4 inches per hour & 0.5-inch for other areas)
A_{IMP} = Total Impervious Area (in acres) used for driveways, parking, etc.

Infiltration System

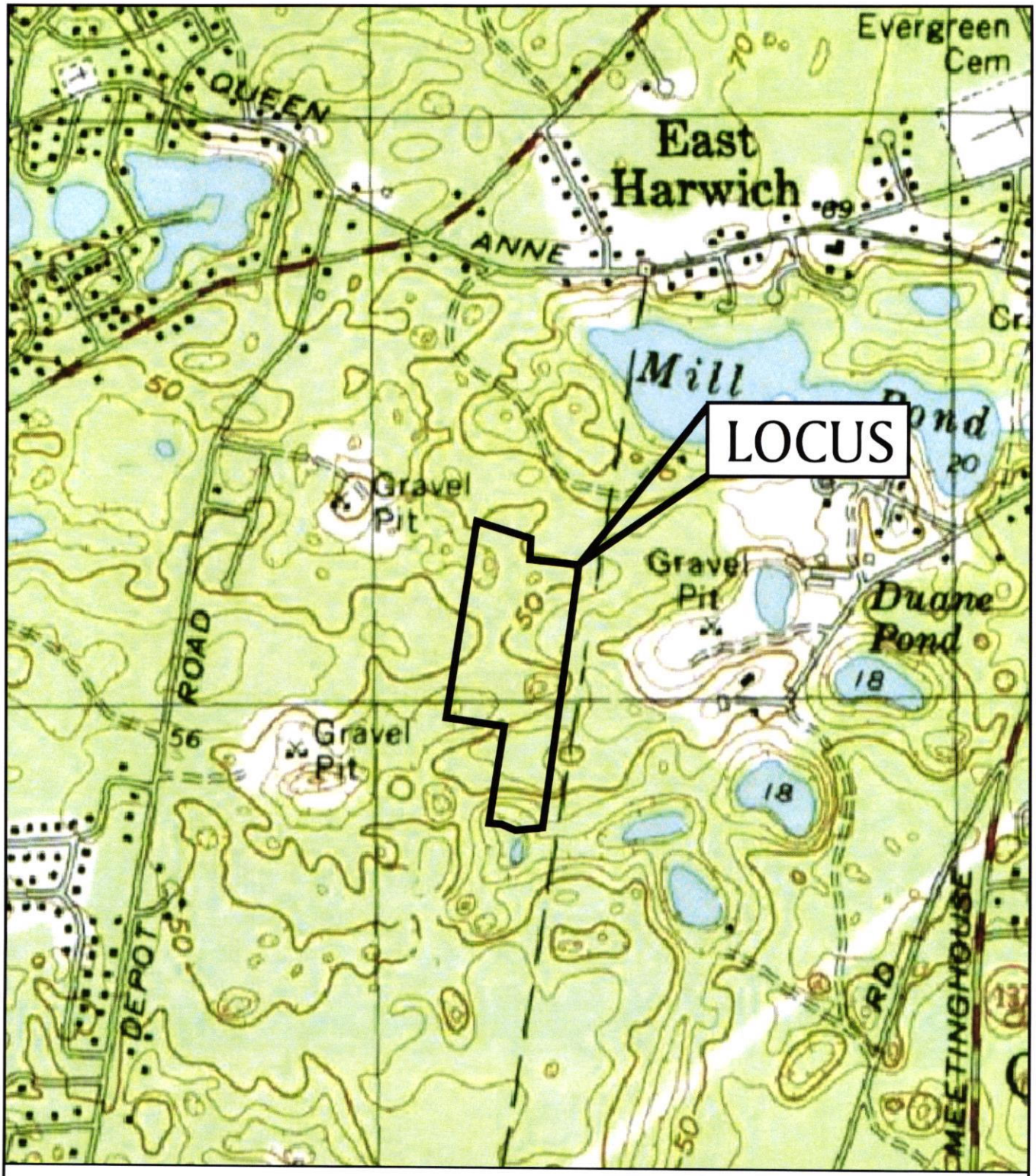
$A_{IMP} = 0.098$ ac

$V_{WQ} = (1 \text{ inch}/12 \text{ inches/foot}) * (0.098 \text{ ac} \times 43{,}560 \text{ square feet/ac})$

V_{WQ} = 356 cubic feet (required volume), provided volume = 8,480 cubic feet (refer to HydroCAD

APPENDIX A

USGS LOCUS MAP



SCALE: 1" = 800'

0 400 800 1600 FEET

PREPARED FOR:

NEXTGRID, INC.
PO BOX 7775 #73069
SAN FRANCISCO, CA
94120

USGS LOCUS MAP

Source: http://maps.massgis.state.ma.us/

PHOTOVOLTAIC SYSTEM
0 DEPOT ROAD
HARWICH, MA

BSC GROUP
349 Main Street - Route 28
West Yarmouth, Massachusetts
02673
508 778 8919

Job No.: 5-0416.00 Date: 6/4/2020
Scale: 1"=800' Revised:
Dwg. No: Figure:

APPENDIX B

FEMA MAP

National Flood Hazard Layer FIRMette

FEMA

70°2'6"W 41°41'54"N

70°1'28"W 41°41'27"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

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

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

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

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

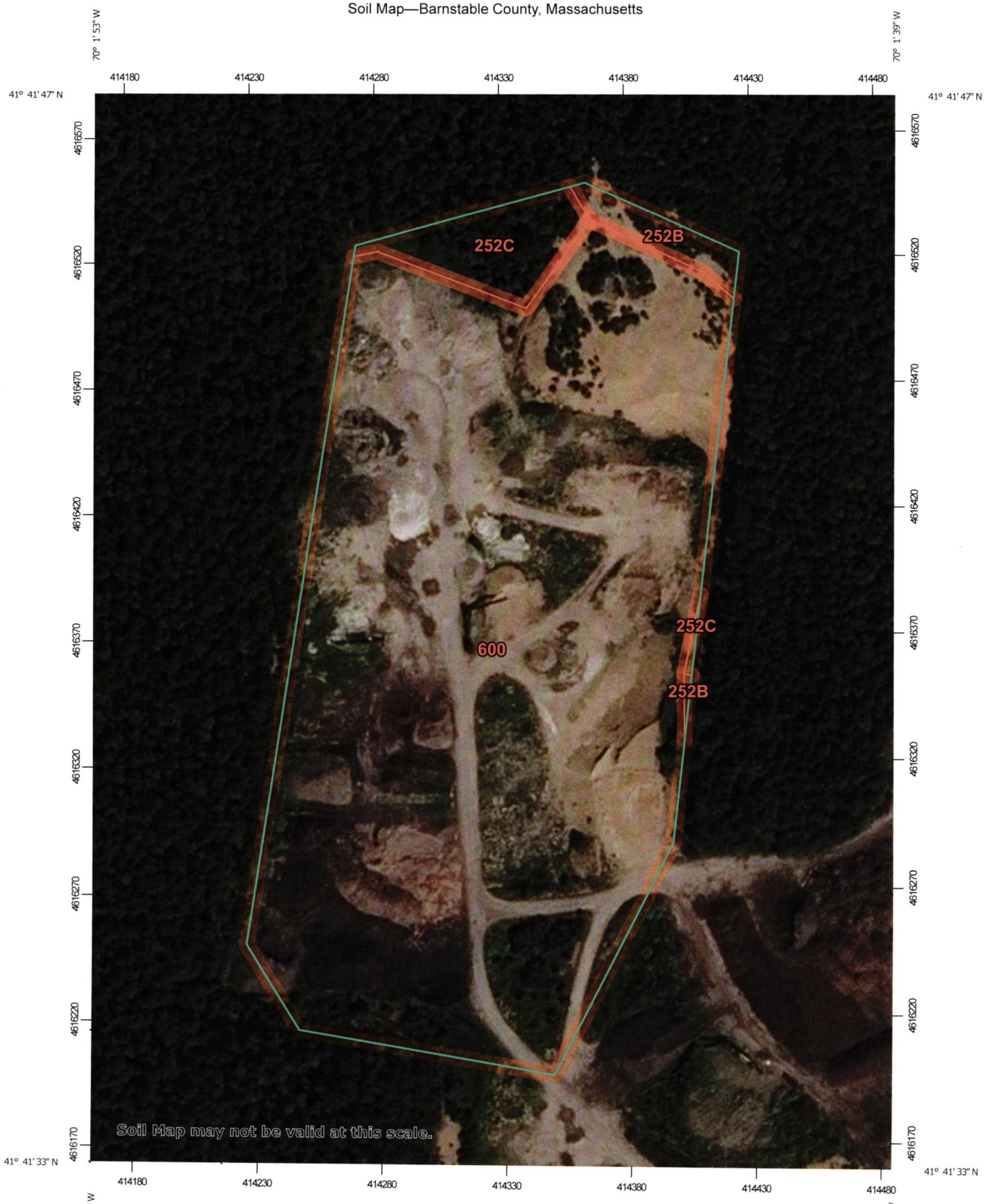
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/8/2020 at 4:14 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

APPENDIX C

WEB SOIL SURVEY

Soil Map—Barnstable County, Massachusetts



Map Scale: 1:2,070 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

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: Barnstable County, Massachusetts
Survey Area Data: Version 16, Sep 12, 2019

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

Date(s) aerial images were photographed: Jul 10, 2018—Nov 17, 2018

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
252B	Carver coarse sand, 3 to 8 percent slopes	0.2	1.9%
252C	Carver coarse sand, 8 to 15 percent slopes	0.6	4.4%
600	Pits, sand and gravel	11.9	93.7%
Totals for Area of Interest		**12.7**	**100.0%**

APPENDIX D

SOIL TEST PIT LOGS

Commonwealth of Massachusetts
City/Town of Harwich

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

A. Facility Information

TW Nickerson INC
Owner Name

0 Depot Road (off of 160 Mill Hill Rd Chatham)
Street Address

64/S1-0-R
Map/Lot #

Harwich
City

MA
State

02645
Zip Code

B. Site Information

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

2. Soil Survey Available? ☒ Yes ☐ No If yes: CA Web Soil Sur. (Source) See page 2 (Soil Map Unit)

   See page 2 (Soil Name) See Page 2 (Soil Limitations)

   See Page 2 (Soil Parent material) See Page 2 (Landform)

3. Surficial Geological Report Available? ☒ Yes ☐ No If yes: 2018 (Year Published/Source) Coarse deposits (Map Unit)

   consists of gravel deposits, and and gravel deposits and sand deposits
   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: N/A (Wetland Type)

7. Current Water Resource Conditions (USGS): July / 2020 (Month/Day/ Year) Range: ☒ Above Normal ☐ Normal ☐ Below Normal

8. Other references reviewed: Harwich GIS Maps

Soil Map Unit	Soil Name	Soil Limitations	Soil Parent Material	Landform
252B	Carver coarse sand, 3 to 8 percent slopes	N/A	Sandy glaciofluvial deposits	Outwash Plains
252C	Carver coarse sand, 8 to 15 percent slopes	N/A	Sandy glaciofluvial deposits	Outwash Plains
600	Pits, sand and gravel	N/A	N/A	N/A

Commonwealth of Massachusetts
City/Town of Harwich

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: TP-1 (Hole #) | 7/16/20 (Date) | 9 AM (Time) | 75 CLOUDY (Weather) | Latitude | Longitude:

1. Land Use: Gravel Pit (e.g., woodland, agricultural field, vacant lot, etc.) | None (Vegetation) | few surface stones (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0-8 (Slope (%))

Description of Location:

2. Soil Parent Material: Pits, sand & gravel (sandy glaciofluvial) | Moraine (Landform) | SH (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body >1000 feet | Drainage Way N/A feet | Wetlands 200 feet | Property Line 100 feet | Drinking Water Well N/A 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 Weeping from Pit | 8.5' (102") 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	Fill	-	-	-	-	-	-	-	-	-	-
12-102	C	M/FS	10YR 6/8	-	-	-	1	1	SG	V. Loose	
											GW observed at 8.5' (102")

Additional Notes:

Commonwealth of Massachusetts
City/Town of Harwich

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: TP-2 (Hole #) | 7/16/20 (Date) | 10 AM (Time) | 75 CLOUDY (Weather) | _____ (Latitude) | _____ (Longitude:)

1. Land Use: Gravel Pit (e.g., woodland, agricultural field, vacant lot, etc.) | None (Vegetation) | few surface stones (Surface Stones (e.g., cobbles, stones, boulders, etc.) | 0-8 (Slope (%))

Description of Location: on the floor of gravel pit

2. Soil Parent Material: Pits, sand and gravel (sandy glaciofluvial) | Moraine (Landform) | SH (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body >1500 feet | Drainage Way N/A feet | Wetlands 800 feet
Property Line 100 feet | Drinking Water Well N/A 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 Weeping from Pit | 9.5' (114") 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			
0-6	Fill	-	-	-	-	-	-	-	-	-	-
6-114	C	M/FS	10YR 6/8	*	*	*	1	1	SG	V. Loose	
											GW observed at 9.5' (114")

Additional Notes:

Commonwealth of Massachusetts
City/Town of Harwich

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

D. Determination of High Groundwater Elevation

1. Method Used:

	Obs. Hole #TP-1	Obs. Hole #_____
☒ Depth observed standing water in observation hole	102 inches	_____ inches
☐ Depth weeping from side of observation hole	_____ inches	_____ inches
☐ Depth to soil redoximorphic features (mottles)	_____ inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

Index Well Number _____ Reading Date _____

$S_h = S_c - [S_r \times (OW_c - OW_{max})/OW_r]$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: 72 inches

(with Cape Cod GW adjustment)

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☒ Yes ☐ No

b. If yes, at what depth was it observed (exclude A and O Horizons)?	Upper boundary:	12 inches	Lower boundary:	102 inches
c. If no, at what depth was impervious material observed?	Upper boundary:	_____ inches	Lower boundary:	_____ inches

Commonwealth of Massachusetts
City/Town of Harwich

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

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator

7/17/20
Date

15Todd MacDonald - SE14157
Typed or Printed Name of Soil Evaluator / License #

12/1/2020
Expiration Date of License

N/A
Name of Approving Authority Witness

N/A
Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Field Diagrams: Use this area for field diagrams: