Star Warehouse Expansion

Town of Cornwall
Orange County, New York

Stormwater Pollution Prevention Plan

Narrative

PIETRZAK & PFAU ENGINEERING & SURVEYING, PLLC
262 GREENWICH AVENUE
GOSHEN, NEW YORK 10924

P&P No. 29106.01
February 2016
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APPENDICES

I. Executive Summary

This report shall serve as the stormwater pollution prevention plan for the Star Warehouse facility. The proposed project is located on the east side of Interstate 87 (I-87) in the Town of Cornwall, Orange County, New York. The project is currently identified as Section 33, Block 1, Lot 49.12 on the Town of Cornwall Tax Map. The total site area is approximately 36.9± acres according to the Town of Cornwall Tax Map. The project is located in the PIO (Planned Industrial/Office) Zoning District.

The Star Warehouse project consists of a proposed 50,000 sq.ft. expansion to the existing facility and a new stormwater treatment facility. The expansion will only be used for additional storage space for the existing business. Additionally, the building will be served by existing water and sewer systems.

The drainage design for this project has been incorporated to provide the appropriate water quality treatment to the stormwater, utilize proposed runoff reduction techniques and standard SMP's with runoff reduction volume capacity, assure that there are no adverse impacts to areas downstream of the project site, and to provide a zero net increase in peak flow runoff from the project site. This runoff has been calculated for the 1, 2, 10, 25, 100 year storm events. The proposed design provides a decrease in net peak flow runoff from the site for all of the design storms studied.

II. Design Point Designation

One (1) design point has been defined to analyze the stormwater peak flow runoff of the project. This design point, identified in the Hydro-Cad model as Pond 1P, is defined as the existing 12" HDPE culvert located under the gravel drive entrance to the site. The stormwater from this design point flows down along a swale on Creamery Hill Road and enters Woodbury Creek. (See Appendix 9 for Drainage Basin Mapping)

III. Existing Conditions

As previously mentioned, the Star Warehouse project is located on the east side of Interstate 87 (I-87) in the Town of Cornwall, Orange County, New York.

The soils located within the drainage basin studied on the project site have been identified in accordance with the Orange County Soils Survey. The site consists of soils from Hydrologic Soil Groups A and B. The soils located in this area are primarily Unadilla Silt Loam, Hoosic gravelly Sandy Loam, and Udorthents soils (See Appendix 12 for further information on these particular soils).

Coverage onsite consists mainly of an existing warehouse building with associated parking areas and access drives as well as existing lawn and wooded areas.

Topography of the study area consists of slopes in the 0% to 10% range (97% of study area), 10% to 15% (1% of study area) and 15% or greater range (2% of study area).

In modeling the existing site for the drainage analysis, the drainage area was taken to consist of one (1) drainage basin. The existing drainage basin, identified in the Hydro-Cad Output as Subcatchment 1S, includes approximately 3.76± acres of land encompassing the project site. (See Appendix 9 for Drainage Basin Mapping). This area is made up of approximately 0.61 acres of existing impervious area, 0.64 acres of brush in fair condition, and 2.51 acres of existing grass cover in good condition. This area is tributary to the previously defined Design Point 1.

IV. Proposed Conditions

In modeling the project site for the proposed condition, the site was taken to consist of two (2) separate drainage basins.

The first drainage basin, still identified in the Hydro-Cad Output as Subcatchment 1S, has been reduced to contain approximately 0.88± acres of land. This area now consists of approximately 0.09 acres of existing impervious area, 0.09 acres of existing brush in fair condition, and 0.70 acres of existing grass cover in good condition. The drainage pattern of this basin has changed slightly but continues to flow to the previously defined Design Point 1.

Due to the proposed building expansion and site grading, one (1) additional drainage basin has been delineated for the proposed conditions of the study. The additional drainage basin has been identified in the Hydro-Cad Output as Subcatchment 2S.

Subcatchment 2S, includes approximately 2.88± acres of land. This drainage area is made up of approximately 0.24 acres of existing impervious area, 1.48 acres of proposed impervious area, 0.39 acres of existing brush in fair condition, and 0.77 acres of grass cover in good condition. This stormwater is conveyed to a proposed stormwater infiltration pond, identified in the Hydro-Cad Output as Pond 2P. This pond will be further discussed in the Stormwater Management section of this report.

V. Stormwater Management

As previously stated, one of the goals of the drainage design for this project is to ensure that there are no adverse impacts to downstream areas. To meet this goal, storm events shall be conveyed to the stormwater management pond onsite where peak flow rates shall be controlled and released. A Hydro-Cad TR-20 analysis has been performed for both the existing and proposed conditions for the 1, 2, 10, 25 and 100 year storm events to ensure that the stormwater management pond will provide the necessary detention time to provide a zero net increase in the peak flow of stormwater runoff from the project site for the design storms studied.

The proposed I-2 Infiltration Basin 2P has been designed with 3 horizontal to 1 vertical (3:1) side slopes and a 10' wide berm with a stabilized access drive for maintenance purposes. This pond will control stormwater runoff from Subcatchment 2S by utilizing a proposed Outlet Control Structure 2P. This outlet structure will control all design storm events and is proposed to

outlet via a 12" HDPE pipe to Design Point 1. Additionally, a 20 foot long emergency overflow broad crested weir has been incorporated into the pond design.

Soils testing has been completed at the proposed pond location to determine the infiltration rate of the existing soil. Four tests were completed at the proposed infiltration depth (Base pond elevation of 262') and found to have a total stabilized rate of 0.5"/hour, 0.5"/hour, 1.0"/hour, and 1.5"/hour. An approximate average of 1.0"/hour was utilized in modeling the proposed pond's infiltration capacity.

As can be seen in the following tables, the proposed peak flow runoff from the project site has been decreased in comparison to the existing conditions studied for all of the defined design points (See Appendix 10 and 11 for Hydro-CAD output). Additionally, tables have been provided showing the water surface elevations in the proposed I-2 Infiltration Basin. The elevations presented in these tables illustrates the results of the analysis for the 1, 2, 10, 25 and 100 year design storms, and indicates that a minimum of 1 foot of freeboard has been provided in the pond to protect against overtopping.

Design Point 1 (Pond 1P)				
Storm Event	Pre-Developed Peak Flow (cfs) Q out	Post-Developed Peak Flow (cfs) Q out	Change (cfs)	Change (%)
1 Year	0.03	0.00	-0.03	-100.00
2 Year	0.19	0.08	-0.11	-57.89
10 Year	1.42	0.97	-0.45	-31.69
25 Year	2.85	1.95	-0.90	-31.58
100 Year	8.66	7.97	-0.69	-7.97

Proposed I-2 Infiltration Basin 2P		
Storm Event	Post-Developed Peak Water Surface Elevation	Freeboard (ft.) (Pond Top at 266.00')
1 Year	262.34	3.66
2 Year	262.85	3.15
10 Year	263.51	2.49
25 Year	264.02	1.98
100 Year	264.92	1.08

VI. Stormwater Quality and Runoff Reduction

The stormwater water quality and runoff reduction for this project has been designed in accordance with the New York State Department of Environmental Conservation Stormwater Management Design Manual (SMDM) of January 2015. The five-step planning process outlined in the SMDM has been incorporated in the design of this project. These five steps include:

1. Site planning to preserve natural features and reduce impervious cover.
2. Calculation of the Water Quality Volume for the site.
3. Runoff Reduction by Incorporation of Green Infrastructure Techniques and Standard SMPs with Runoff Reduction Volume (RRv) capacity.
4. Use of Standard SMPs to treat the portion of Water Quality Volume not addressed by green infrastructure techniques and Standard SMPs with RRv capacity.
5. Design of volume and peak rate control practices.

Step one of the planning process includes the preservation of natural features and reduction of impervious covers. The placement of the proposed expansion building has been considered during the site planning process to the most practicable extent. The existing pavement/lawn area where the proposed expansion building will be constructed provides adequate space for stormwater treatment of the new impervious area. Any other location of the expansion building would require more disturbance than what is proposed and would not be ideal.

Step two of the planning process was then completed and the Water Quality Volume (WQv) was calculated for the project site using the criteria in Chapter 4 of the Stormwater Management Design Manual. The Water Quality Volume calculated for this project is 9,188 cubic feet.

Step three of the process involves Runoff Reduction by incorporating the Green Infrastructure Techniques and Standard SMP's with RRv capacity outlined in the SMDM. The minimum Runoff Reduction Volume was calculated utilizing the Specific Reduction Factor of the existing soil types located on the project site using the criteria in Chapter 4 of the design manual. The minimum RRv calculated for this project is 3,819 cubic feet. (See Appendix 13 for Calculations and Supporting Data)

The Runoff Reduction Technique utilized for the project is an Infiltration Basin, a standard SMP with RRv capacity. The proposed Infiltration Basin has been designed to capture and temporarily store the remaining WQv before allowing it to infiltrate into the soil over a two-day period. It has been determined that the existing onsite soils will be adequate to support an infiltration practice after review of the NRCS County Soil Mapping and verified through onsite infiltration testing (See Appendix 13 for infiltration testing results). Infiltration practices provide a 100% reduction to the Water Quality Volume that is treated by the device. The infiltration basin has a storage capacity measured to the first outlet of 4,855 cubic feet.

Step five of the process involved applying Volume and Peak Rate Control Practices. The downstream channel protection has been provided within the proposed stormwater management

pond by 24 hours of extended storage for the one year, 24 hour storm event. The pond has been designed to store and infiltrate this storm event such that the runoff discharged over a 24 hour period after the design storm event will be zero. The Overbank Flood (10 year storm event) and the Extreme Storm (100 year storm event) have been managed as outlined in the Stormwater Management section of this report.

VII. Erosion and Sediment Control

Full erosion and sediment control measures will be incorporated into the project construction. These practices will be in accordance with the requirements set forth in the most recent revision of the New York State Department of Environmental Conservation publication entitled "New York State Standards and Specifications for Erosion and Sediment Control".

Erosion Control Measures:

The following erosion control measures will be incorporated to minimize erosion potential:

- Filter fabric silt fence:
  Silt fence shall be used to control erosion from sheet flow on slopes not to exceed two horizontal to one vertical unless specified otherwise. Concentrated flows shall not be directed toward silt fence and spacing shall vary from 50' to 100' depending on slope steepness.

- Permanent and temporary seeding mixtures:
  Permanent and temporary seeding, mulch, fertilizer, soil amendments, and slope stabilization will be used on seeded areas. Land that is stripped of vegetation will be left bare for the shortest time possible. Any area that will remain cleared, but not under construction for 14 days or longer, will be seeded with a temporary mixture. Topsoil shall be stockpiled, stabilized with temporary seeding, and saved for reuse on the site.

- Slope Stabilization:
  All slopes shall be stabilized to minimize erosion. Slopes shall be stabilized with temporary seeding mixtures and straw mulch. Slopes in excess of four horizontal to one vertical shall be stabilized with jute netting and hydro-seed. Existing vegetation, which is not to be removed, will also act as filter strips to protect down-slope areas. Runoff will be diverted from newly graded areas to prevent erosion until a permanent ground cover has been established.

- Dust Control:
  Measures for dust control during construction shall be implemented as needed (daily water sprays will be used during dry conditions and Calcium Chloride will be used only if necessary). In addition to water sprays, temporary plantings will aid in minimizing dust.

- Temporary Diversion Swales:
  Temporary diversion swales shall be constructed to either divert clean stormwater runoff from newly graded areas or direct sediment laden runoff to a sediment trapping device.

- Channel Stabilization:
  Drainage channels and temporary diversion swales shall be stabilized with seed, jute netting or riprap, as specified, to minimize deterioration of the channel bed.

- Sediment Traps:
  Sediment traps shall be constructed in the location of the proposed pond and/or where specified on the approved plan set, and be of size and type specified to collect sediment from sediment laden stormwater runoff. Sediment traps shall be constructed downstream of disturbed areas and be in place prior to disturbance within the contributory area.

- Stabilized Construction Entrance:
  Town and County roads will be protected by installation of crushed stone blanket for cleaning construction vehicle wheels. Blankets shall be placed at any intersection of a construction road with a paved or publicly owned road. Stabilized construction entrances shall be installed in the location and be of size and type specified.

- Tree Protection:
  Trees to be preserved within areas of construction shall be protected. In areas of concentrated construction activity temporary fencing will be placed around the driplines. In all other areas, construction workers will be directed to avoid the storing of equipment or soil under trees to be preserved, in order to prevent soil compaction. If necessary, trees will be preserved with tree wells in fill areas, and retaining walls in cut areas.

- Soil Stockpiles:
  Soil stockpiles are to be utilized during construction and shall be protected on the downhill side with perimeter silt fencing. Stockpiles are to be seeded and stabilized with vegetation and/or mulch.

- Concrete Washout Areas:
  Concrete washout areas are to be utilized for cleaning of concrete trucks. A temporary excavated or above ground lined constructed pit shall be installed so concrete truck mixers and equipment can be washed after their loads have been discharged.

- Spill/Litter Prevention:
  All site construction debris is to be disposed of in an on-site dumpster. Construction chemicals are to be utilized in a manner to prevent soil contamination and are not to be left out overnight. Any spill shall be reported to the New York State Spill Hotline (1-800-457-7362). Federal and State law require the spiller, or responsible party, to notify government agencies and to contain, clean up, and dispose of any spilled/contaminated material in order to correct any environmental damage.

Erosion Control Sequence

Prior to any site disturbance, the developer and contractors should thoroughly review and become familiar with the approved site plan. The installation of erosion control measures should begin with the most downstream device, then working upstream. When installing erosion control measures, the sequence should generally be as follows:

- Prior to commencing construction activities, a meeting shall be held with Town representatives, the contractor, and site engineer to resolve any outstanding questions prior to ground disturbance.

- The limits of clearing and grading shall be clearly marked. Perimeter silt fence and stabilized construction entrances shall be put in place.

- Upon completion of clearing and grubbing activities, topsoil shall be stripped from all areas to be disturbed and stockpiled. Stockpiled topsoil shall be stabilized by temporary seeding and surrounded with a perimeter silt fence.

- Temporary erosion control devices shall be installed prior to commencing earth moving activities. This includes the installation of sediment traps, diversion swales, and check dams beginning at the most downstream portions of the site and then working upstream.

- Immediately after completion of rough grading, remaining temporary erosion control shall be installed as specified, including additional silt fence, diversion swales, and check dams. Any areas not requiring further earth work shall be fine graded topsoiled and stabilized as early as possible.

Maintenance of Erosion Control Devices

The maintenance of erosion control devices will be the responsibility of the contractor. A critical part of an effective erosion control plan is a conscientious maintenance program. All erosion control devices will be cleaned and restored throughout construction to maintain their effectiveness. The Job Superintendent will monitor the condition of all devices and clean or replace them as conditions require. All erosion control devices shall be installed and maintained in accordance with the approved plan, manufacturer's recommendations, and as directed by Town representatives including the Town Engineer, Highway Superintendent, and Building Inspector.

Specific maintenance shall include:

- Maintaining seeded areas including reseeding weak areas, regrading wash outs and fertilizing.

- Maintaining mulched areas including replacement of disturbed mulched areas.

- All devices shall be inspected after each rain and repaired as needed.

- Sediment shall be removed from behind silt fence when bulges start to occur and fencing reset to original condition.

- Outlets in sediment basins shall be free of silt and debris by hand raking and cleaning after each rain storm.

- Construction equipment shall not unnecessarily cross drainage swales. Crossing of drainage channels shall be by means of bridges, culverts or other approved methods.

- Culverts shall be maintained free of silt or debris.

- Tree protection fencing to be inspected daily during grading and finish grading operations.

- Daily water sprays will be used as needed or as directed by the Consulting Engineer or Town representatives. Water sprays will be used to prevent pollution from dust until construction is completed and soil cover is established.

Removal of Erosion Control Devices:

No erosion control structures shall be removed until all work upstream has been completed, stabilized, and approved by the Consulting Engineer and Town Representatives.

The removal of erosion control devices should generally be as follows:

- After construction, the temporary erosion control structures are to be removed in reverse order with the most upstream structure removed first and thence proceeding downstream.

- All hay bales shall be removed and properly disposed of off-site.

- All tree protection fencing shall be removed after adjacent areas have been graded, topsoiled, seeded, and vegetation has been established.

- All temporary construction culverts shall be removed and areas graded, topsoiled, and seeded.

- Any washouts shall be re-topsoiled and seeded.

VIII. Stormwater Infrastructure Maintenance:

Long term maintenance of all drainage pipes and treatment devices will be the responsibility of the property owners once construction of these items is completed.

Long term maintenance shall include the following:

Inspection: The pond and infrastructure should be inspected periodically for the first few months after construction and on an annual basis thereafter. The drainage infrastructure should also be inspected after major storm events to ensure that the orifices, if any and inlets remain open. Particular attention should be given to:

- Evidence of clogging
- Erosion of the flow path
- Condition of the embankments
- Condition of any spillways
- Accumulation of sediment at the culvert inlets and outlets, and in the proposed swales
- Erosion of bio-swales or riprap aprons
- Sources of erosion in the contributory drainage, which should be stabilized.

Debris and Litter Control: Removal of debris and litter should be accomplished during mowing operations. Particular attention should be given to removing debris and trash around inlets and outlets to prevent clogging.

Erosion Control: Eroding soils in drainage areas should be stabilized immediately with vegetative practices or other erosion control practices. Potential problems are erosion that may occur on the embankment, slopes, and any spillways. Also, attention should be given to repositioning protective riprap where appropriate.

Sediment Removal: Sediment should be removed periodically in order to preserve the available stormwater treatment capacity of the infiltration pond and, to prevent inlets and outlets from becoming clogged. Also, unless removed, accumulated sediment may become unsightly. While more frequent clean-out may be needed around the inlets and outlets, a typical clean-out cycle for the entire stormwater infrastructure should range from 5 to 6 years or after 25 percent of the water quality volume capacity has been lost. Sediment excavated from the swales is not considered toxic or hazardous material, and can be safely disposed of by either land application or land filling.

NR
29106.01 Star Warehouse SWPPP
02-2016
08-2016 – Rev.1
11-2016 – Rev.2
03-2023 – Rev.3
09-2023 – Rev.4

APPENDIX

APPENDIX 1

Stormwater Pollution Prevention Plan (SWPPP) Certifications

I. Owner/Operator Information:

PROJECT:	Star Warehouse Expansion
LOCATION:	Town of Cornwall Orange County, New York
RECORD OWNER/APPLICANT:	Cornwall Properties, LLC
OWNER/APPLICANT ADDRESS:	1600 63rd Street Brooklyn, NY 11204
PROJECT SITE ADDRESS:	20 Industry Drive Cornwall, NY 12518

II. Certifications:

Contractor and Subcontractor Certification:

I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the Storm Water Pollution Prevention Plan (SWPPP) and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the owner or operator must comply with the terms and conditions of the most current version of the New York State Pollutant Discharge Elimination System ("SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I am aware that there are significant penalties for submitting false information that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations.

Contractor responsible for project oversight:

_____	_____
Contractor	Print Name & Title
_____	_____
Signature	Date
_____	Address:
Name of Trained Contractor	
	Phone:

Subcontractor responsible for onsite construction and maintenance of erosion and sediment control practices and post-construction stormwater management practices included in the SWPPP:

Subcontractor	Print Name & Title
Signature	Date
Name of Trained Contractor	Address: Phone:

Additional Subcontractors and responsibility:

Subcontractor	Print Name & Title
Signature	Date
Name of Trained Contractor	Address: Phone:
Subcontractor	Print Name & Title
Signature	Date
Name of Trained Contractor	Address: Phone:

APPENDIX 2

Draft MS4 Stormwater Pollution Prevention Plan (SWPPP) Acceptance Form

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

NYS Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

MS4 Stormwater Pollution Prevention Plan (SWPPP) Acceptance Form

for

Construction Activities Seeking Authorization Under SPDES General Permit

*(NOTE: Attach Completed Form to Notice Of Intent and Submit to Address Above)

I. Project Owner/Operator Information
1. Owner/Operator Name:
2. Contact Person:
3. Street Address:
4. City/State/Zip:
II. Project Site Information
5. Project/Site Name: Star Warehouse Expansion
6. Street Address: 20 Industry Drive
7. City/State/Zip: Cornwall, NY, 12518
III. Stormwater Pollution Prevention Plan (SWPPP) Review and Acceptance Information
8. SWPPP Reviewed by:
9. Title/Position:
10. Date Final SWPPP Reviewed and Accepted:
IV. Regulated MS4 Information
11. Name of MS4: Town of Cornwall
12. MS4 SPDES Permit Identification Number: NYR20A
13. Contact Person:
14. Street Address:
15. City/State/Zip:
16. Telephone Number:

MS4 SWPPP Acceptance Form - continued

V. Certification Statement - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative

I hereby certify that the final Stormwater Pollution Prevention Plan (SWPPP) for the construction project identified in question 5 has been reviewed and meets the substantive requirements in the SPDES General Permit For Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s). Note: The MS4, through the acceptance of the SWPPP, assumes no responsibility for the accuracy and adequacy of the design included in the SWPPP. In addition, review and acceptance of the SWPPP by the MS4 does not relieve the owner/operator or their SWPPP preparer of responsibility or liability for errors or omissions in the plan.

Printed Name:

Title/Position:

Signature:

Date:

VI. Additional Information

(NYS DEC - MS4 SWPPP Acceptance Form - January 2015)

APPENDIX 3

Draft Notice of Intent (NOI)

0806372691

NOTICE OF INTENT

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505

NYR ☐☐☐☐☐☐
(for DEC use only)

Stormwater Discharges Associated with Construction Activity Under State Pollutant Discharge Elimination System (SPDES) General Permit # GP-0-15-002

All sections must be completed unless otherwise noted. Failure to complete all items may result in this form being returned to you, thereby delaying your coverage under this General Permit. Applicants must read and understand the conditions of the permit and prepare a Stormwater Pollution Prevention Plan prior to submitting this NOI. Applicants are responsible for identifying and obtaining other DEC permits that may be required.

-IMPORTANT-

RETURN THIS FORM TO THE ADDRESS ABOVE

OWNER/OPERATOR MUST SIGN FORM

Owner/Operator Information

Owner/Operator (Company Name/Private Owner Name/Municipality Name)

Owner/Operator Contact Person Last Name (NOT CONSULTANT)

Owner/Operator Contact Person First Name

Owner/Operator Mailing Address

City

State ☐☐ Zip ☐☐☐☐☐ - ☐☐☐☐

Phone (Owner/Operator) ☐☐☐ - ☐☐☐ - ☐☐☐☐

Fax (Owner/Operator) ☐☐☐ - ☐☐☐ - ☐☐☐☐

Email (Owner/Operator)

FED TAX ID ☐☐ - ☐☐☐☐☐☐☐ (not required for individuals)

Project Site Information

Project/Site Name
STAR WAREHOUSE

Street Address (NOT P.O. BOX)
20 INDUSTRY DRIVE

Side of Street
● North ○ South ○ East ○ West

City/Town/Village (THAT ISSUES BUILDING PERMIT)
CORNWALL

State: NY
Zip: 12518-
County: ORANGE
DEC Region: 3

Name of Nearest Cross Street
NYS ROUTE 32

Distance to Nearest Cross Street (Feet)
1200

Project In Relation to Cross Street
○ North ○ South ○ East ● West

Tax Map Numbers
Section-Block-Parcel
33-1-49.12

Tax Map Numbers

1. Provide the Geographic Coordinates for the project site in NYTM Units. To do this you must go to the NYSDEC Stormwater Interactive Map on the DEC website at:

www.dec.ny.gov/imsmaps/stormwater/viewer.htm

Zoom into your Project Location such that you can accurately click on the centroid of your site. Once you have located your project site, go to the tool boxes on the top and choose "i"(identify). Then click on the center of your site and a new window containing the X, Y coordinates in UTM will pop up. Transcribe these coordinates into the boxes below. For problems with the interactive map use the help function.

X Coordinates (Easting): 576679

Y Coordinates (Northing): 4583774

2. What is the nature of this construction project?

○ **New Construction**

● **Redevelopment with increase in impervious area**

○ **Redevelopment with no increase in impervious area**

3. Select the predominant land use for both pre and post development conditions.
SELECT ONLY ONE CHOICE FOR EACH

Pre-Development Existing Land Use

- ○ FOREST
- ○ PASTURE/OPEN LAND
- ○ CULTIVATED LAND
- ○ SINGLE FAMILY HOME
- ○ SINGLE FAMILY SUBDIVISION
- ○ TOWN HOME RESIDENTIAL
- ○ MULTIFAMILY RESIDENTIAL
- ○ INSTITUTIONAL/SCHOOL
- ○ INDUSTRIAL
- ● COMMERCIAL
- ○ ROAD/HIGHWAY
- ○ RECREATIONAL/SPORTS FIELD
- ○ BIKE PATH/TRAIL
- ○ LINEAR UTILITY
- ○ PARKING LOT
- ○ OTHER

Post-Development Future Land Use

- ○ SINGLE FAMILY HOME — Number of Lots
- ○ SINGLE FAMILY SUBDIVISION
- ○ TOWN HOME RESIDENTIAL
- ○ MULTIFAMILY RESIDENTIAL
- ○ INSTITUTIONAL/SCHOOL
- ○ INDUSTRIAL
- ● COMMERCIAL
- ○ MUNICIPAL
- ○ ROAD/HIGHWAY
- ○ RECREATIONAL/SPORTS FIELD
- ○ BIKE PATH/TRAIL
- ○ LINEAR UTILITY (water, sewer, gas, etc.)
- ○ PARKING LOT
- ○ CLEARING/GRADING ONLY
- ○ DEMOLITION, NO REDEVELOPMENT
- ○ WELL DRILLING ACTIVITY *(Oil, Gas, etc.)
- ○ OTHER

***Note:** for gas well drilling, non-high volume hydraulic fractured wells only

4. In accordance with the larger common plan of development or sale, enter the total project site area; the total area to be disturbed; existing impervious area to be disturbed (for redevelopment activities); and the future impervious area constructed within the disturbed area. (Round to the nearest tenth of an acre.)

Total Site Area	Total Area To Be Disturbed	Existing Impervious Area To Be Disturbed	Future Impervious Area Within Disturbed Area
36.9	2.8	0.3	1.5

5. Do you plan to disturb more than 5 acres of soil at any one time? ○ Yes ● No

6. Indicate the percentage of each Hydrologic Soil Group(HSG) at the site.

A	B	C	D
90 %	10 %	0 %	0 %

7. Is this a phased project? ○ Yes ● No

8. Enter the planned start and end dates of the disturbance activities.

Start Date	End Date
01/01/2024	01/01/2025

9. Identify the nearest surface waterbody(ies) to which construction site runoff will discharge.

Name

WOODBURY CREEK

9a. Type of waterbody identified in Question 9?

- ○ Wetland / State Jurisdiction On Site (Answer 9b)
- ○ Wetland / State Jurisdiction Off Site
- ○ Wetland / Federal Jurisdiction On Site (Answer 9b)
- ○ Wetland / Federal Jurisdiction Off Site
- ● Stream / Creek On Site
- ○ Stream / Creek Off Site
- ○ River On Site
- ○ River Off Site
- ○ Lake On Site
- ○ Lake Off Site
- ○ Other Type On Site
- ○ Other Type Off Site

9b. How was the wetland identified?

- ○ Regulatory Map
- ○ Delineated by Consultant
- ○ Delineated by Army Corps of Engineers
- ○ Other (identify)

10. Has the surface waterbody(ies) in question 9 been identified as a 303(d) segment in Appendix E of GP-0-15-002? ○ Yes ● No

11. Is this project located in one of the Watersheds identified in Appendix C of GP-0-15-002? ○ Yes ● No

12. Is the project located in one of the watershed areas associated with AA and AA-S classified waters? ○ Yes ● No
If no, skip question 13.

13. Does this construction activity disturb land with no existing impervious cover and where the Soil Slope Phase is identified as an E or F on the USDA Soil Survey? ○ Yes ● No
If Yes, what is the acreage to be disturbed?

14. Will the project disturb soils within a State regulated wetland or the protected 100 foot adjacent area? ○ Yes ● No

15. Does the site runoff enter a separate storm sewer system (including roadside drains, swales, ditches, culverts, etc)? ● Yes ○ No ○ Unknown

16. What is the name of the municipality/entity that owns the separate storm sewer system?

TOWN OF CORNWALL

17. Does any runoff from the site enter a sewer classified as a Combined Sewer? ○ Yes ● No ○ Unknown

18. Will future use of this site be an agricultural property as defined by the NYS Agriculture and Markets Law? ○ Yes ● No

19. Is this property owned by a state authority, state agency, federal government or local government? ○ Yes ● No

20. Is this a remediation project being done under a Department approved work plan? (i.e. CERCLA, RCRA, Voluntary Cleanup Agreement, etc.) ○ Yes ● No

21. Has the required Erosion and Sediment Control component of the SWPPP been developed in conformance with the current NYS Standards and Specifications for Erosion and Sediment Control (aka Blue Book)? ● Yes ○ No

22. Does this construction activity require the development of a SWPPP that includes the post-construction stormwater management practice component (i.e. Runoff Reduction, Water Quality and Quantity Control practices/techniques)? ● Yes ○ No
If No, skip questions 23 and 27-39.

23. Has the post-construction stormwater management practice component of the SWPPP been developed in conformance with the current NYS Stormwater Management Design Manual? ● Yes ○ No

24. The Stormwater Pollution Prevention Plan (SWPPP) was prepared by:

- ● **Professional Engineer (P.E.)**
- ○ **Soil and Water Conservation District (SWCD)**
- ○ **Registered Landscape Architect (R.L.A)**
- ○ **Certified Professional in Erosion and Sediment Control (CPESC)**
- ○ **Owner/Operator**
- ○ **Other**

SWPPP Preparer
PIETRZAK & PFAU ENGINEERING & SURVEYING

Contact Name (Last, Space, First)
PIETRZAK, VINCENT, A

Mailing Address
262 GREENWICH AVENUE

City
GOSHEN

State NY Zip 10924-

Phone 845-294-0606

Fax 845-294-0610

Email
pietrzakpfau@pietrzakpfau.com

SWPPP Preparer Certification

I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) for this project has been prepared in accordance with the terms and conditions of the GP-0-15-002. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of this permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

First Name VINCENT **MI** A

Last Name PIETRZAK

Signature

Date 09 / 12 / 2023

25. Has a construction sequence schedule for the planned management practices been prepared? ○ Yes ○ No

26. Select **all** of the erosion and sediment control practices that will be employed on the project site:

Temporary Structural

- ● Check Dams
- ○ Construction Road Stabilization
- ○ Dust Control
- ○ Earth Dike
- ○ Level Spreader
- ○ Perimeter Dike/Swale
- ○ Pipe Slope Drain
- ○ Portable Sediment Tank
- ○ Rock Dam
- ○ Sediment Basin
- ● Sediment Traps
- ● Silt Fence
- ● Stabilized Construction Entrance
- ○ Storm Drain Inlet Protection
- ○ Straw/Hay Bale Dike
- ○ Temporary Access Waterway Crossing
- ○ Temporary Stormdrain Diversion
- ● Temporary Swale
- ○ Turbidity Curtain
- ○ Water bars

Biotechnical

- ○ Brush Matting
- ○ Wattling

Vegetative Measures

- ○ Brush Matting
- ○ Dune Stabilization
- ○ Grassed Waterway
- ● Mulching
- ● Protecting Vegetation
- ○ Recreation Area Improvement
- ● Seeding
- ○ Sodding
- ○ Straw/Hay Bale Dike
- ○ Streambank Protection
- ○ Temporary Swale
- ● Topsoiling
- ○ Vegetating Waterways

Permanent Structural

- ○ Debris Basin
- ○ Diversion
- ○ Grade Stabilization Structure
- ● Land Grading
- ○ Lined Waterway (Rock)
- ○ Paved Channel (Concrete)
- ○ Paved Flume
- ○ Retaining Wall
- ○ Riprap Slope Protection
- ○ Rock Outlet Protection
- ○ Streambank Protection

Other

Post-construction Stormwater Management Practice (SMP) Requirements

Important: Completion of Questions 27-39 is not required if response to Question 22 is No.

27. Identify all site planning practices that were used to prepare the final site plan/layout for the project.

- ○ **Preservation of Undisturbed Areas**
- ○ **Preservation of Buffers**
- ○ **Reduction of Clearing and Grading**
- ○ **Locating Development in Less Sensitive Areas**
- ○ **Roadway Reduction**
- ○ **Sidewalk Reduction**
- ○ **Driveway Reduction**
- ○ **Cul-de-sac Reduction**
- ○ **Building Footprint Reduction**
- ○ **Parking Reduction**

27a. Indicate which of the following soil restoration criteria was used to address the requirements in Section 5.1.6("Soil Restoration") of the Design Manual (2010 version).

- ● All disturbed areas will be restored in accordance with the Soil Restoration requirements in Table 5.3 of the Design Manual (see page 5-22).
- ○ Compacted areas were considered as impervious cover when calculating the **WQv Required**, and the compacted areas were assigned a post-construction Hydrologic Soil Group (HSG) designation that is one level less permeable than existing conditions for the hydrology analysis.

28. Provide the total Water Quality Volume (WQv) required for this project (based on final site plan/layout).

Total WQv Required

0.211 **acre-feet**

29. Identify the RR techniques (Area Reduction), RR techniques(Volume Reduction) and Standard SMPs with RRv Capacity in Table 1 (See Page 9) that were used to reduce the Total WQv Required(#28).

Also, provide in Table 1 the total impervious area that contributes runoff to each technique/practice selected. For the Area Reduction Techniques, provide the total contributing area (includes pervious area) and, if applicable, the total impervious area that contributes runoff to the technique/practice.

Note: Redevelopment projects shall use Tables 1 and 2 to identify the SMPs used to treat and/or reduce the WQv required. If runoff reduction techniques will not be used to reduce the required WQv, skip to question 33a after identifying the SMPs.

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Table 1 - Runoff Reduction (RR) Techniques and Standard Stormwater Management Practices (SMPs)

RR Techniques (Area Reduction)	Total Contributing Area (acres)		Total Contributing Impervious Area (acres)	
○ Conservation of Natural Areas (RR-1)		and/or		
○ Sheetflow to Riparian Buffers/Filters Strips (RR-2)		and/or		
○ Tree Planting/Tree Pit (RR-3)		and/or		
○ Disconnection of Rooftop Runoff (RR-4)		and/or		

RR Techniques (Volume Reduction)	
○ Vegetated Swale (RR-5)	
○ Rain Garden (RR-6)	
○ Stormwater Planter (RR-7)	
○ Rain Barrel/Cistern (RR-8)	
○ Porous Pavement (RR-9)	
○ Green Roof (RR-10)	

Standard SMPs with RRv Capacity	
○ Infiltration Trench (I-1)	
● Infiltration Basin (I-2)	1.72
○ Dry Well (I-3)	
○ Underground Infiltration System (I-4)	
○ Bioretention (F-5)	
○ Dry Swale (O-1)	

Standard SMPs	
○ Micropool Extended Detention (P-1)	
○ Wet Pond (P-2)	
○ Wet Extended Detention (P-3)	
○ Multiple Pond System (P-4)	
○ Pocket Pond (P-5)	
○ Surface Sand Filter (F-1)	
○ Underground Sand Filter (F-2)	
○ Perimeter Sand Filter (F-3)	
○ Organic Filter (F-4)	
○ Shallow Wetland (W-1)	
○ Extended Detention Wetland (W-2)	
○ Pond/Wetland System (W-3)	
○ Pocket Wetland (W-4)	
○ Wet Swale (O-2)	

Table 2 - Alternative SMPs
(DO NOT INCLUDE PRACTICES BEING USED FOR PRETREATMENT ONLY)

Alternative SMP	Total Contributing Impervious Area (acres)
○ Hydrodynamic	
○ Wet Vault	
○ Media Filter	
○ Other	

Provide the name and manufacturer of the Alternative SMPs (i.e. proprietary practice(s)) being used for WQv treatment.

Name

Manufacturer

Note: Redevelopment projects which do not use RR techniques, shall use questions 28, 29, 33 and 33a to provide SMPs used, total WQv required and total WQv provided for the project.

30. Indicate the Total RRv provided by the RR techniques (Area/Volume Reduction) and Standard SMPs with RRv capacity identified in question 29.

Total RRv provided

.203 acre-feet

31. Is the Total RRv provided (#30) greater than or equal to the total WQv required (#28).

○ Yes ● No

If Yes, go to question 36.
If No, go to question 32.

32. Provide the Minimum RRv required based on HSG.
[Minimum RRv Required = (P)(0.95)(Ai)/12, Ai=(S)(Aic)]

Minimum RRv Required

0.088 acre-feet

32a. Is the Total RRv provided (#30) greater than or equal to the Minimum RRv Required (#32)?

● Yes ○ No

If Yes, go to question 33.
Note: Use the space provided in question #39 to summarize the specific site limitations and justification for not reducing 100% of WQv required (#28). A detailed evaluation of the specific site limitations and justification for not reducing 100% of the WQv required (#28) must also be included in the SWPPP.
If No, sizing criteria has not been met, so NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

33. Identify the Standard SMPs in Table 1 and, if applicable, the Alternative SMPs in Table 2 that were used to treat the remaining total WQv(=Total WQv Required in 28 - Total RRv Provided in 30).

Also, provide in Table 1 and 2 the total impervious area that contributes runoff to each practice selected.

Note: Use Tables 1 and 2 to identify the SMPs used on Redevelopment projects.

33a. Indicate the Total WQv provided (i.e. WQv treated) by the SMPs identified in question #33 and Standard SMPs with RRv Capacity identified in question 29.

WQv Provided

.203 **acre-feet**

Note: For the standard SMPs with RRv capacity, the WQv provided by each practice = the WQv calculated using the contributing drainage area to the practice - RRv provided by the practice. (See Table 3.5 in Design Manual)

34. Provide the sum of the Total RRv provided (#30) and the WQv provided (#33a).

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35. Is the sum of the RRv provided (#30) and the WQv provided (#33a) greater than or equal to the total WQv required (#28)? ● **Yes** ○ **No**

If Yes, go to question 36.
If No, sizing criteria has not been met, so NOI can not be processed. SWPPP preparer must modify design to meet sizing criteria.

36. Provide the total Channel Protection Storage Volume (CPv) required and provided or select waiver (36a), if applicable.

CPv Required

0.203 **acre-feet**

CPv Provided

0.203 **acre-feet**

36a. The need to provide channel protection has been waived because:

○ Site discharges directly to tidal waters or a fifth order or larger stream.

○ Reduction of the total CPv is achieved on site through runoff reduction techniques or infiltration systems.

37. Provide the Overbank Flood (Qp) and Extreme Flood (Qf) control criteria or select waiver (37a), if applicable.

Total Overbank Flood Control Criteria (Qp)

Pre-Development

1.42 **CFS**

Post-development

0.97 **CFS**

Total Extreme Flood Control Criteria (Qf)

Pre-Development

8.66 **CFS**

Post-development

7.97 **CFS**

37a. The need to meet the Qp and Qf criteria has been waived because:

- ○ Site discharges directly to tidal waters or a fifth order or larger stream.
- ○ Downstream analysis reveals that the Qp and Qf controls are not required

38. Has a long term Operation and Maintenance Plan for the post-construction stormwater management practice(s) been developed? ● Yes ○ No

If Yes, Identify the entity responsible for the long term Operation and Maintenance

PROPERTY OWNER

39. Use this space to summarize the specific site limitations and justification for not reducing 100% of WQv required(#28). (See question 32a) This space can also be used for other pertinent project information.

The Water Quality Volume for this project has not been reduced completely due to the following limitations. The Green Infrastructure Runoff Reduction Techniques and Standard SMPs with RRv capacity have been evaluated and determined to be infeasible for use with the proposed project. The stormwater runoff contributed by the proposed facility rooftops has been addressed by being captured and treated in the proposed Infiltration Basin (I-2). This eliminates the possible incorporation of Sheet flow to riparian buffers, Disconnection of rooftop runoff, Rain gardens, Green roof, Stormwater planter and Rain Tank/Cistern Runoff Reduction Techniques. Additionally, the use of porous pavement is not feasible as a Runoff Reduction practice for this project due to the use of winter sanding which would reduce the effectiveness of this application.

40. Identify other DEC permits, existing and new, that are required for this project/facility.

- ○ Air Pollution Control
- ○ Coastal Erosion
- ○ Hazardous Waste
- ○ Long Island Wells
- ○ Mined Land Reclamation
- ○ Solid Waste
- ○ Navigable Waters Protection / Article 15
- ○ Water Quality Certificate
- ○ Dam Safety
- ○ Water Supply
- ○ Freshwater Wetlands/Article 24
- ○ Tidal Wetlands
- ○ Wild, Scenic and Recreational Rivers
- ○ Stream Bed or Bank Protection / Article 15
- ○ Endangered or Threatened Species(Incidental Take Permit)
- ○ Individual SPDES
- ○ SPDES Multi-Sector GP [N][Y][R][ ][ ][ ][ ][ ]
- ○ Other [ ]
- ● None

41. Does this project require a US Army Corps of Engineers Wetland Permit? ○ Yes ● No
If Yes, Indicate Size of Impact. [ ][ ][ ][ ][ ][ ].[ ]

42. Is this project subject to the requirements of a regulated, traditional land use control MS4? ● Yes ○ No
(If No, skip question 43)

43. Has the "MS4 SWPPP Acceptance" form been signed by the principal executive officer or ranking elected official and submitted along with this NOI? ○ Yes ● No

44. If this NOI is being submitted for the purpose of continuing or transferring coverage under a general permit for stormwater runoff from construction activities, please indicate the former SPDES number assigned. [N][Y][R][ ][ ][ ][ ][ ][ ]

Owner/Operator Certification

I have read or been advised of the permit conditions and believe that I understand them. I also understand that, under the terms of the permit, there may be reporting requirements. I hereby certify that this document and the corresponding documents were prepared under my direction or supervision. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further understand that coverage under the general permit will be identified in the acknowledgment that I will receive as a result of submitting this NOI and can be as long as sixty (60) business days as provided for in the general permit. I also understand that, by submitting this NOI, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction, and agreeing to comply with all the terms and conditions of the general permit for which this NOI is being submitted.

Print First Name

MI

Print Last Name

Owner/Operator Signature

Date / /

APPENDIX 4

Draft Notice of Termination (NOT)

New York State Department of Environmental Conservation
Division of Water
625 Broadway, 4th Floor
Albany, New York 12233-3505
(NOTE: Submit completed form to address above)

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity

Please indicate your permit identification number: NYR ___ ___ ___ ___ ___ ___

I. Owner or Operator Information

1. Owner/Operator Name:

2. Street Address:

3. City/State/Zip:

4. Contact Person: | 4a.Telephone:

4b. Contact Person E-Mail:

II. Project Site Information

5. Project/Site Name: Star Warehouse Expansion

6. Street Address: 20 Industry Drive

7. City/Zip: Cornwall, 12518

8. County: Orange

III. Reason for Termination

9a. □ All disturbed areas have achieved final stabilization in accordance with the general permit and SWPPP. ***Date final stabilization completed** (month/year): ___

9b. □ Permit coverage has been transferred to new owner/operator. Indicate new owner/operator's permit identification number: NYR ___ ___ ___ ___ ___ ___
(Note: Permit coverage can not be terminated by owner identified in I.1. above until new owner/operator obtains coverage under the general permit)

9c. □ Other (Explain on Page 2)

IV. Final Site Information:

10a. Did this construction activity require the development of a SWPPP that includes post-construction stormwater management practices? ☒ yes □ no (If no, go to question 10f.)

10b. Have all post-construction stormwater management practices included in the final SWPPP been constructed? □ yes □ no (If no, explain on Page 2)

10c. Identify the entity responsible for long-term operation and maintenance of practice(s)?

Property Owner

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity - continued

10d. Has the entity responsible for long-term operation and maintenance been given a copy of the operation and maintenance plan required by the general permit? □ yes □ no

10e. Indicate the method used to ensure long-term operation and maintenance of the post-construction stormwater management practice(s):

□ Post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain practice(s) have been deeded to the municipality.

□ Executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s).

□ For post-construction stormwater management practices that are privately owned, a mechanism is in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the owner or operator's deed of record.

□ For post-construction stormwater management practices that are owned by a public or private institution (e.g. school, university or hospital), government agency or authority, or public utility; policy and procedures are in place that ensures operation and maintenance of the practice(s) in accordance with the operation and maintenance plan.

10f. Provide the total area of impervious surface (i.e. roof, pavement, concrete, gravel, etc.) constructed within the disturbance area? 1.5 Acres (acres)

11. Is this project subject to the requirements of a regulated, traditional land use control MS4? ☒ yes □ no

(If Yes, complete section VI - "MS4 Acceptance" statement

V. Additional Information/Explanation:

(Use this section to answer questions 9c. and 10b., if applicable)

VI. MS4 Acceptance - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative (Note: Not required when 9b. is checked -transfer of coverage)

I have determined that it is acceptable for the owner or operator of the construction project identified in question 5 to submit the Notice of Termination at this time.

Printed Name:

Title/Position:

Signature:	Date:

NOTICE OF TERMINATION for Storm Water Discharges Authorized under the SPDES General Permit for Construction Activity - continued

VII. Qualified Inspector Certification - Final Stabilization:

I hereby certify that all disturbed areas have achieved final stabilization as defined in the current version of the general permit, and that all temporary, structural erosion and sediment control measures have been removed. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:	
Title/Position:	
Signature:	Date:

VIII. Qualified Inspector Certification - Post-construction Stormwater Management Practice(s):

I hereby certify that all post-construction stormwater management practices have been constructed in conformance with the SWPPP. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:	
Title/Position:	
Signature:	Date:

IX. Owner or Operator Certification

I hereby certify that this document was prepared by me or under my direction or supervision. My determination, based upon my inquiry of the person(s) who managed the construction activity, or those persons directly responsible for gathering the information, is that the information provided in this document is true, accurate and complete. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the referenced permit and the laws of the State of New York and could subject me to criminal, civil and/or administrative proceedings.

Printed Name:	
Title/Position:	
Signature:	Date:

(NYS DEC Notice of Termination - January 2015)

APPENDIX 5

New York State Parks, Recreation, and Historic Preservation Correspondence

NEW YORK STATE OF OPPORTUNITY | **Parks, Recreation, and Historic Preservation**

ANDREW M. CUOMO
Governor

ERIK KULLESEID
Commissioner

August 17, 2021

Maureen Fisher
Tim Miller Associates, Inc.
10 North Street
Cold Spring, NY 10516

Re: DEC
Star Warehouse Expansion, Loading Dock, Emergency Access Road & Stormwater Management Facility Construction Project
20 Industry Drive, Cornwall, Orange County, NY
21PR05277

Dear Maureen Fisher:

Thank you for requesting the comments of the Division for Historic Preservation of the Office of Parks, Recreation, and Historic Preservation (OPRHP). We have reviewed the provided information in accordance with the New York State Historic Preservation Act of 1980 (section 14.09 of the New York Parks, Recreation, and Historic Preservation Law). These comments are those of the Division for Historic Preservation and relate only to Historic/Cultural resources.

Based upon this review, and a discussion with Jon Dahlgren, it is OPRHP's understanding that this project was previously reviewed by our office in 2016 under project number 16PR05976, and for which a No Adverse Impact effect finding letter was issued. OPRHP has re-examined the project and rescinded our previous recommendation for a Phase I Archaeological survey for this project. It is thus the opinion of OPRHP that no properties, including archaeological and/or historic resources, listed in or eligible for the New York State and National Registers of Historic Places will be impacted by this project. This recommendation pertains only to the Project Area examined during the above-referenced investigation. It is not applicable to any other portion of the project property. Should the project design be changed OPRHP recommends further consultation with this office.

If you have any questions, I can be reached via e-mail at Josalyn.Ferguson@parks.ny.gov.

Sincerely,

Josalyn Ferguson, Ph.D.
Scientist Archaeology

via email only

c.c. Diane Hines, Town of Cornwall
c.c. Jon Dahlgren, Tim Miller Associates

NEW YORK STATE OF OPPORTUNITY | **Parks, Recreation, and Historic Preservation**

ANDREW M. CUOMO
Governor

ERIK KULLESEID
Commissioner

August 16, 2021

Maureen Fisher
Tim Miller Associates, Inc.
10 North Street
Cold Spring, NY 10516

Re: DEC
Star Warehouse Property, 20 Industry Drive, Cornwall, New York
20 Industry Dr, Cornwall, NY 10930
21PR05277

Dear Maureen Fisher:

Thank you for requesting the comments of the Division for Historic Preservation of the Office of Parks, Recreation and Historic Preservation (OPRHP). We have reviewed the submitted materials in accordance with the New York State Historic Preservation Act of 1980 (section 14.09 of the New York Parks, Recreation and Historic Preservation Law). These comments are those of the Division for Historic Preservation and relate only to Historic/Cultural resources. They do not include potential environmental impacts to New York State Parkland that may be involved in or near your project. Such impacts must be considered as part of the environmental review of the project pursuant to the State Environmental Quality Review Act (New York Environmental Conservation Law Article 8) and its implementing regulations (6NYCRR Part 617).

The project area is adjacent to the Elias Hand House, which is listed in the State and National Registers of Historic Places. Our office has reviewed the proposed warehouse addition received on August 5, 2021. From our review the Technical Preservation Unit has no concerns regarding above ground / architectural resources. Please note however, that our Archaeology Unit has concerns and has requested additional information that must be fulfilled before an impact finding can be rendered.

If you have any questions, I am best reached by email.

Sincerely,

Derek Rohde
Historic Site Restoration Coordinator
e-mail: derek.rohde@parks.ny.gov

via e-mail only

NEW YORK
STATE OF
OPPORTUNITY.

Parks, Recreation, and Historic Preservation

ANDREW M. CUOMO
Governor

ROSE HARVEY
Commissioner

September 22, 2016

Ms. Terri Panico
Pietrzak & Pfau Engineering & Surveying
262 Greenwich Avenue
Goshen , NY 10924

Re: DEC
Star Warehouse Expansion
20 Industry Drive, Cornwall, NY
16PR05976

Dear Ms. Panico:

Thank you for requesting the comments of the Division for Historic Preservation of the Office of Parks, Recreation and Historic Preservation (OPRHP). We have reviewed the submitted materials in accordance with the New York State Historic Preservation Act of 1980 (section 14.09 of the New York Parks, Recreation and Historic Preservation Law). These comments are those of the Division for Historic Preservation and relate only to Historic/Cultural resources. They do not include potential impacts that must be considered as part of the environmental review of the project pursuant to the State Environmental Quality Review Act (New York Environmental Conservation Law Article 8) and its implementing regulations (6NYCRR Part 617).

We have received your submission dated August 26, 2016 for the Star Warehouse Expansion project. We note that the project is located near two National Register listed properties; the Elias Hand House and the Mountainville Grange building. We understand that the proposed project will include construction of a 50,000sf building addition along the north side of the warehouse.

Based on this review, it is the opinion of the SHPO that the proposed project will have No Adverse Impact upon adjacent historic properties. In addition, there are no archaeological concerns associated with this project.

If you have any questions, I can be reached at (518) 268-2164.

Sincerely,

Weston Davey
Historic Site Restoration Coordinator
weston.davey@parks.ny.gov

via e-mail only

APPENDIX 6

Federal Emergency Management Agency (FEMA) – FIRM Panels

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The community map repository should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the floodways were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 18. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same vertical datum. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for bench marks shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from digital orthophotography provided by the New York Sate Office of Cyber Security & Critical Infrastructure Coordination. This information was provided as 30-centimeter and 60-centimeter resolution natural color orthoimagery from photography dated April-May 2004.

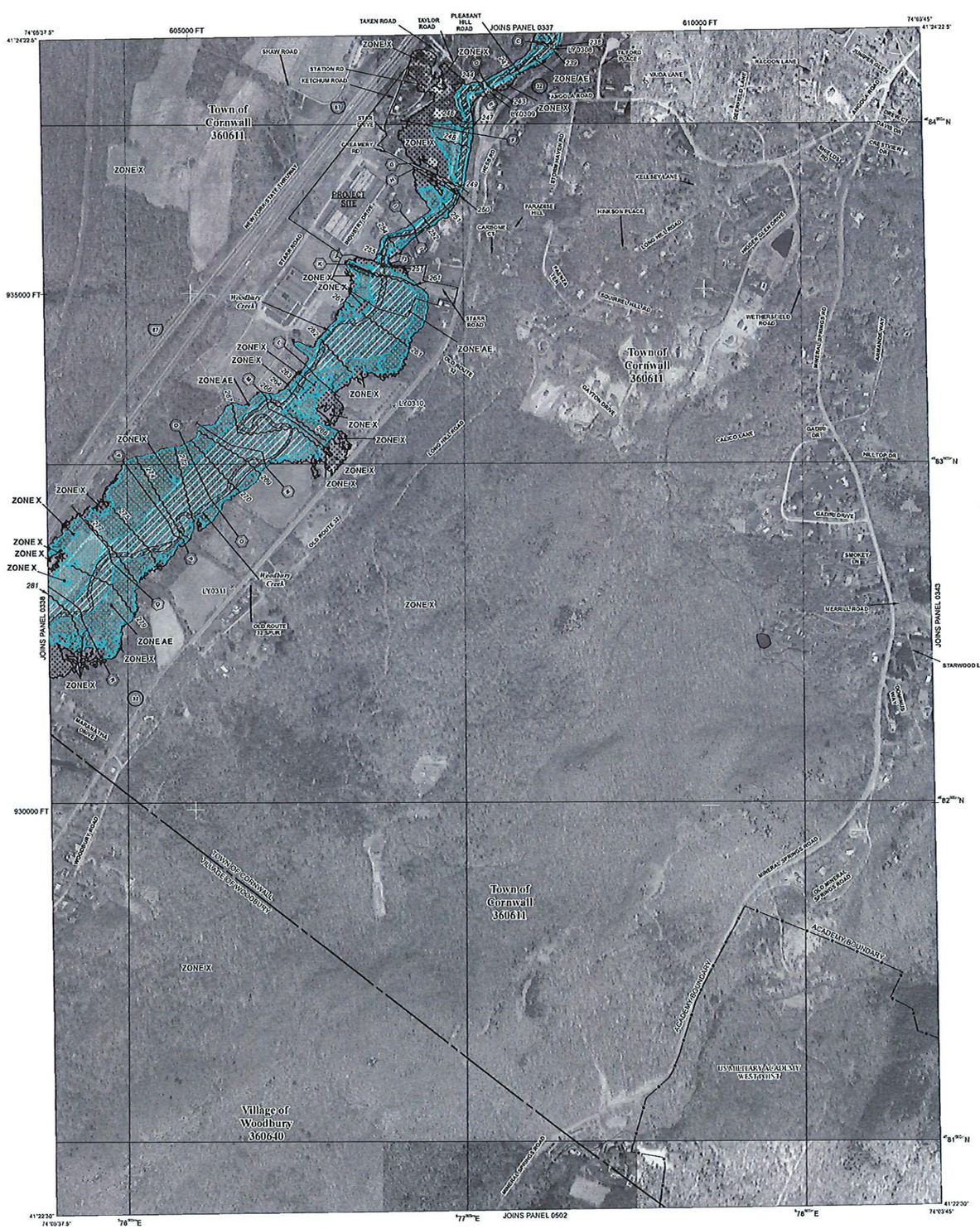
Based on updated topographic information, this map reflects more detailed and up-to-date stream channel configurations and floodplain delineations than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. Also, the road to floodplain relationships for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- 1% annual chance floodplain boundary
- 0.2% annual chance floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL. 687) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

- Cross section line
- Limited detail cross section line
- Transect line
- 87°07'45", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
- 76°N — 1000-meter Universal Transverse Mercator grid values, zone 18N
- 600000 FT — 5000-foot grid ticks: New York State Plane coordinate system, East zone (FIPSZONE 3101), Transverse Mercator projection
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
August 3, 2009

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0339E

FIRM

FLOOD INSURANCE RATE MAP

for ORANGE COUNTY, NEW YORK
(ALL JURISDICTIONS)

CONTAINS:

COMMUNITY	NUMBER
CORNWALL, TOWN OF	360611
WOODBURY, VILLAGE OF	360640

PANEL 339 OF 630
MAP SUFFIX: E
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
36071C0339E

EFFECTIVE DATE
AUGUST 3, 2009

Federal Emergency Management Agency

APPENDIX 7

National Wetlands Inventory Mapping

Environmental Resource Mapper

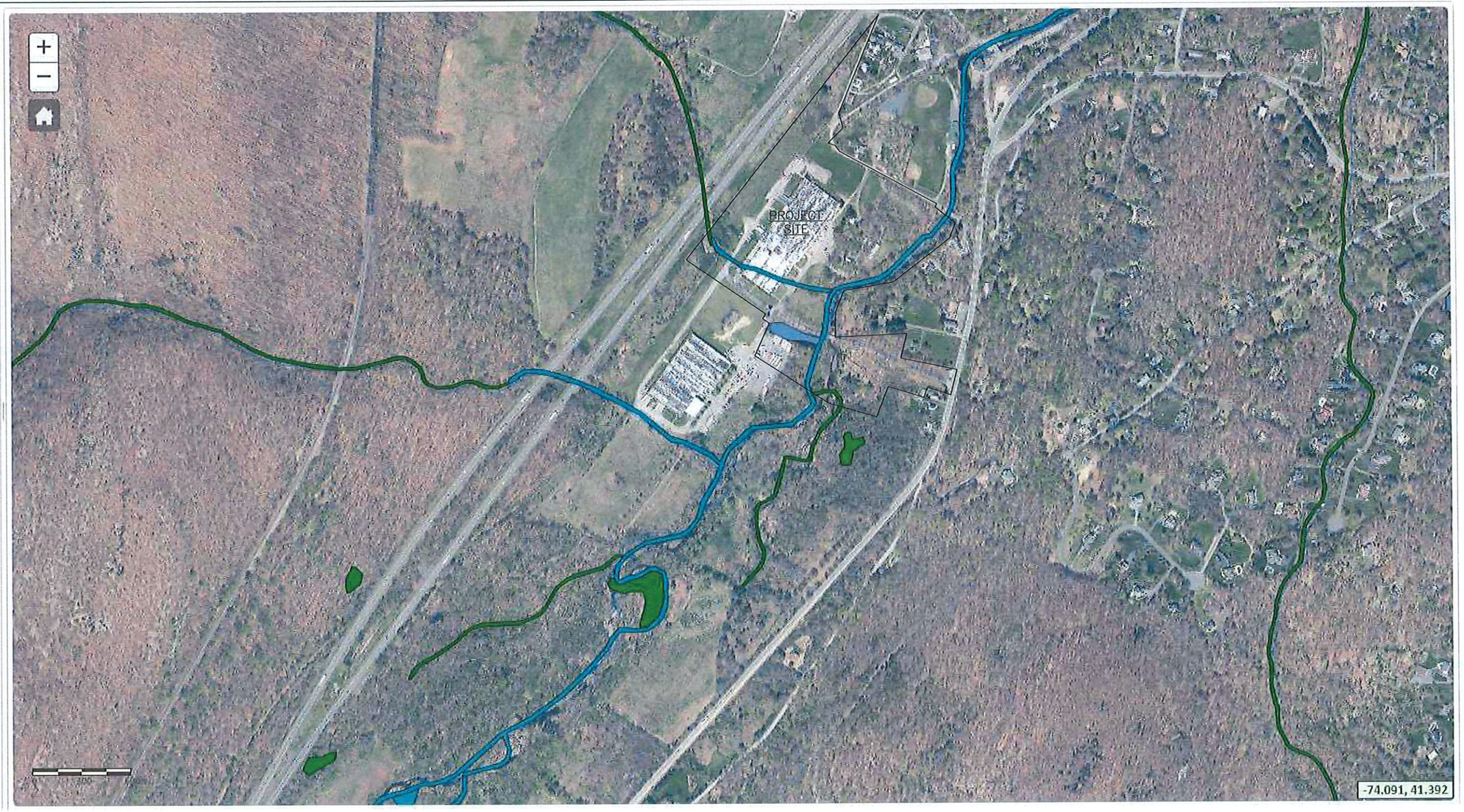
Base Map: Satellite Using this map

- Search
- Tools
- Layers and Legend
- **Other Wetland Layers**

National Wetlands Inventory

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

- Reference Layers
- Tell Me More...
- Need A Permit?
- Contacts



APPENDIX 8

New York State Department of Environmental Conservation – Natural Heritage Program Correspondence

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Division of Fish, Wildlife & Marine Resources
New York Natural Heritage Program
625 Broadway, 5th Floor, Albany, New York 12233-4757
Phone: (518) 402-8935 • **Fax:** (518) 402-8925
Website: www.dec.ny.gov

September 27, 2016

Terri M. Panico
Pietrzak & Pfau Engineering & Surveying, PLLC
262 Greenwich Avenue, Suite A
Goshen, NY 10924

OCT 0 3 2016

29106.01

Re: Expansion to warehouse at tax parcel 33-1-49.12
Town/City: Cornwall. County: Orange.

Dear Terri M. Panico:

In response to your recent request, we have reviewed the New York Natural Heritage Program database with respect to the above project.

Enclosed is a report of rare or state-listed animals and plants, and significant natural communities that our database indicates occur in the vicinity of the project site.

For most sites, comprehensive field surveys have not been conducted; the enclosed report only includes records from our database. We cannot provide a definitive statement as to the presence or absence of all rare or state-listed species or significant natural communities. Depending on the nature of the project and the conditions at the project site, further information from on-site surveys or other sources may be required to fully assess impacts on biological resources.

Our database is continually growing as records are added and updated. If this proposed project is still under development one year from now, we recommend that you contact us again so that we may update this response with the most current information.

The presence of the plants and animals identified in the enclosed report may result in this project requiring additional review or permit conditions. For further guidance, and for information regarding other permits that may be required under state law for regulated areas or activities (e.g., regulated wetlands), please contact the NYS DEC Region 3 Office, Division of Environmental Permits, at dep.r3@dec.ny.gov, (845) 256-3054.

Sincerely,

Nick Conrad

Nicholas Conrad
Information Resources Coordinator
New York Natural Heritage Program

1133

The following state-listed animals have been documented in the vicinity of your project site.

The following list includes animals that are listed by NYS as Endangered, Threatened, or Special Concern; and/or that are federally listed or are candidates for federal listing.

For information about any permit considerations for your project, please contact the Permits staff at the NYSDEC Region 3 Office at dep.r3@dec.ny.gov, (845) 256-3054. For information about potential impacts of your project on these species, and how to avoid, minimize, or mitigate any impacts, contact the Region 3 Wildlife staff at Wildlife.R3@dec.ny.gov, (845) 256-3098.

The following species have been documented about 1.25 miles from the project site. Individual animals may travel 1.5 miles from documented locations.

COMMON NAME	*SCIENTIFIC NAME*	*NY STATE LISTING*	*FEDERAL LISTING*	
Reptiles				
Timber Rattlesnake *hibernaculum*	*Crotalus horridus*	Threatened		1999

The following species have been documented within 2.5 miles of the project site. Individual animals may travel 2.5 miles from documented locations.
The main impact of concern for bats is removal of potential roost trees.

COMMON NAME	*SCIENTIFIC NAME*	*NY STATE LISTING*	*FEDERAL LISTING*	
Mammals				
Indiana Bat *Maternity summer colony*	*Myotis sodalis*	Endangered	Endangered	11288

The following species have been documented within 4.5 miles of the project site. Individual animals may travel 5 miles from documented locations.
The main impact of concern for bats is removal of potential roost trees.

COMMON NAME	*SCIENTIFIC NAME*	*NY STATE LISTING*	*FEDERAL LISTING*	
Mammals				
Northern Long-eared Bat *Hibernaculum*	*Myotis septentrionalis*	Threatened	Threatened	14181

This report only includes records from the NY Natural Heritage database. For most sites, comprehensive field surveys have not been conducted, and we cannot provide a definitive statement as to the presence or absence of all rare or state-listed species. Depending on the nature of the project and the conditions at the project site, further information from on-site surveys or other sources may be required to fully assess impacts on biological resources.

If any rare plants or animals are documented during site visits, we request that information on the observations be provided to the New York Natural Heritage Program so that we may update our database.

Information about many of the listed animals in New York, including habitat, biology, identification, conservation, and management, are available online in Natural Heritage's Conservation Guides at www.guides.nynhp.org, and from NYSDEC at www.dec.ny.gov/animals/7494.html.

The following rare plants have been documented in the vicinity of the project site.

We recommend that potential onsite and offsite impacts of the proposed project on these species be addressed as part of any environmental assessment or review conducted as part of the planning, permitting and approval process, such as reviews conducted under SEQR. Field surveys of the project site may be necessary to determine the status of a species at the site, particularly for sites that are currently undeveloped and may still contain suitable habitat. Final requirements of the project to avoid, minimize, or mitigate potential impacts are determined by the lead permitting agency or the government body approving the project.

The following plants are listed as Endangered or Threatened by New York State, and/or are considered rare by the New York Natural Heritage Program, and so are a vulnerable natural resource of conservation concern.

COMMON NAME	*SCIENTIFIC NAME*	*NY STATE LISTING*	*HERITAGE CONSERVATION STATUS*
Vascular Plants			
About 1/3 mile southwest of project site, on west side of NYS Thruway.			
Glaucous Sedge	*Carex glaucodea*	Threatened	Imperiled in NYS
2002-06-26: The plants are growing along a rocky, unmaintained road in a mesic oak-hickory forest.			1108
Black-edge Sedge	*Carex nigromarginata*	Threatened	Imperiled in NYS
2013-05-23: The site is a southeast-facing, mesic to dry mesic, rocky slope with some more mesic vegetation along a rocky stream. Some of the rock is conglomerate. It is forested with occasional rocky and ledgy openings.			756

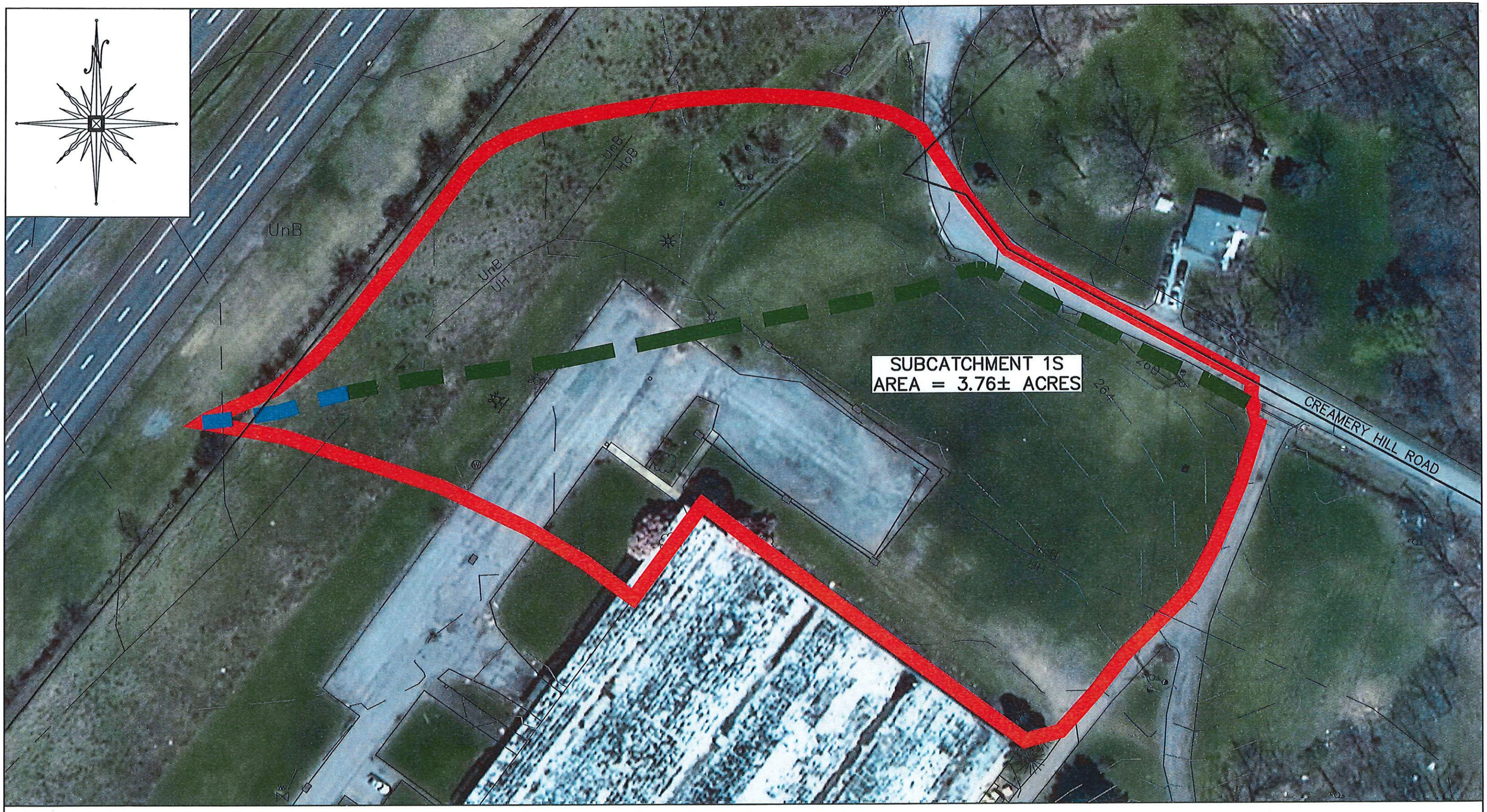
This report only includes records from the NY Natural Heritage database. For most sites, comprehensive field surveys have not been conducted, and we cannot provide a definitive statement as to the presence or absence of all rare or state-listed species. Depending on the nature of the project and the conditions at the project site, further information from on-site surveys or other sources may be required to fully assess impacts on biological resources.

If any rare plants or animals are documented during site visits, we request that information on the observations be provided to the New York Natural Heritage Program so that we may update our database.

Information about many of the rare animals and plants in New York, including habitat, biology, identification, conservation, and management, are available online in Natural Heritage's Conservation Guides at www.guides.nynhp.org, from NatureServe Explorer at www.natureserve.org/explorer, and from USDA's Plants Database at http://plants.usda.gov/index.html (for plants).

APPENDIX 9

Drainage Basin Maps



PIETRZAK & PFAU
ENGINEERING & SURVEYING, PLLC

262 GREENWICH AVENUE, SUITE A
GOSHEN, NEW YORK 10924
TEL: (845) 294-0606

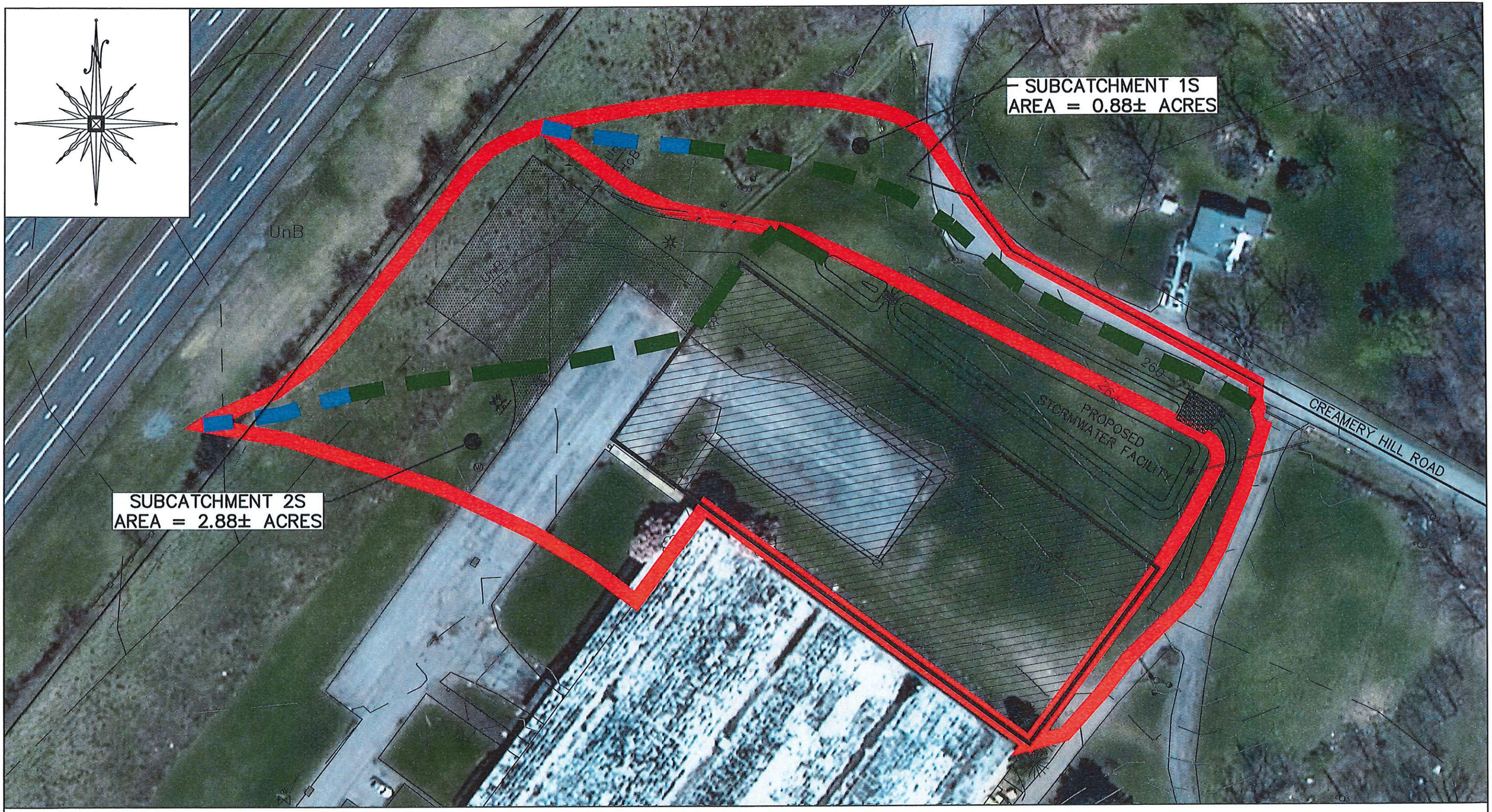
EXISTING CONDITIONS

TOWN OF CORNWALL
COUNTY OF ORANGE, NEW YORK
SECTION 33 BLOCK 1 LOT 49.12

SCALE: 1"=60'

LEGEND

- SHEET FLOW
- SHALLOW CONCENTRATED FLOW
- DRAINAGE BASIN BOUNDARY



PIETRZAK & PFAU
ENGINEERING & SURVEYING, PLLC

262 GREENWICH AVENUE, SUITE A
GOSHEN, NEW YORK 10924
TEL: (845) 294-0606

PROPOSED CONDITIONS

TOWN OF CORNWALL
COUNTY OF ORANGE, NEW YORK
SECTION 33 BLOCK 1 LOT 49.12

SCALE: 1"=60'

LEGEND

- SHEET FLOW
- SHALLOW CONCENTRATED FLOW
- DRAINAGE BASIN BOUNDARY

APPENDIX 10

TR-20 Hydro-CAD Calculations – Existing Conditions

Subcatchment 1S

Design Point 1P

Subcat Reach Pond Link

Routing Diagram for Existing Conditions
Prepared by Pietrzak & Pfau Engineering & Surveying, PLLC

Time span=2.00-22.00 hrs, dt=0.05 hrs, 401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Subcatchment 1S Runoff Area=3.760 ac 16.22% Impervious Runoff Depth>0.05"
Flow Length=734' Tc=16.4 min CN=50 Runoff=0.03 cfs 0.016 af

Pond 1P: Design Point 1P Inflow=0.03 cfs 0.016 af
Primary=0.03 cfs 0.016 af

Total Runoff Area = 3.760 ac Runoff Volume = 0.016 af Average Runoff Depth = 0.05"
83.78% Pervious = 3.150 ac 16.22% Impervious = 0.610 ac

Summary for Subcatchment 1S: Subcatchment 1S

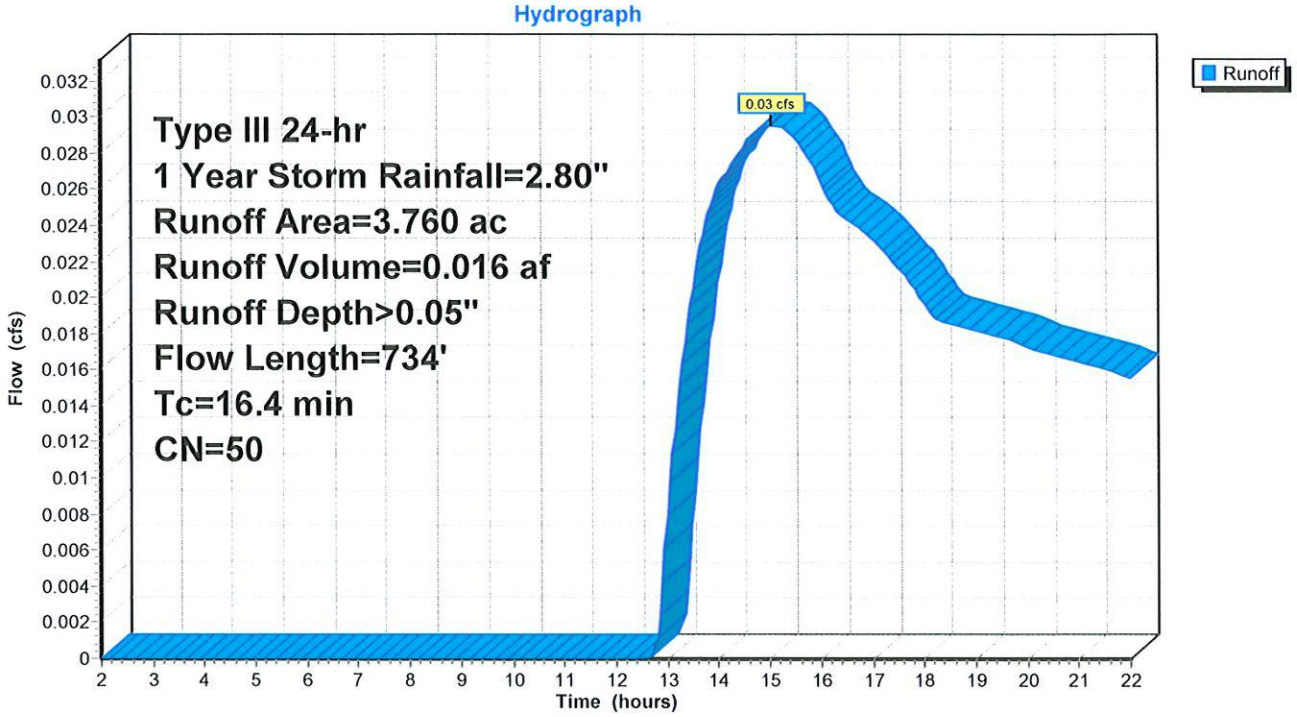
Runoff = 0.03 cfs @ 15.05 hrs, Volume= 0.016 af, Depth> 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-22.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 Year Storm Rainfall=2.80"

Area (ac)	CN	Description
2.510	39	>75% Grass cover, Good, HSG A
0.610	98	Existing Impervious Area
0.250	35	Brush, Fair, HSG A
0.390	56	Brush, Fair, HSG B
3.760	50	Weighted Average
3.150		83.78% Pervious Area
0.610		16.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	100	0.0200	0.20		**Sheet Flow, Sheet Flow** Range n= 0.130 P2= 3.50"
2.0	145	0.0140	1.18		**Shallow Concentrated Flow, Shallow Concentrated Flow** Nearly Bare & Untilled Kv= 10.0 fps
0.6	87	0.0150	2.49		**Shallow Concentrated Flow, Shallow Concentrated Flow** Paved Kv= 20.3 fps
5.4	402	0.0320	1.25		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
16.4	734	Total			

Subcatchment 1S: Subcatchment 1S

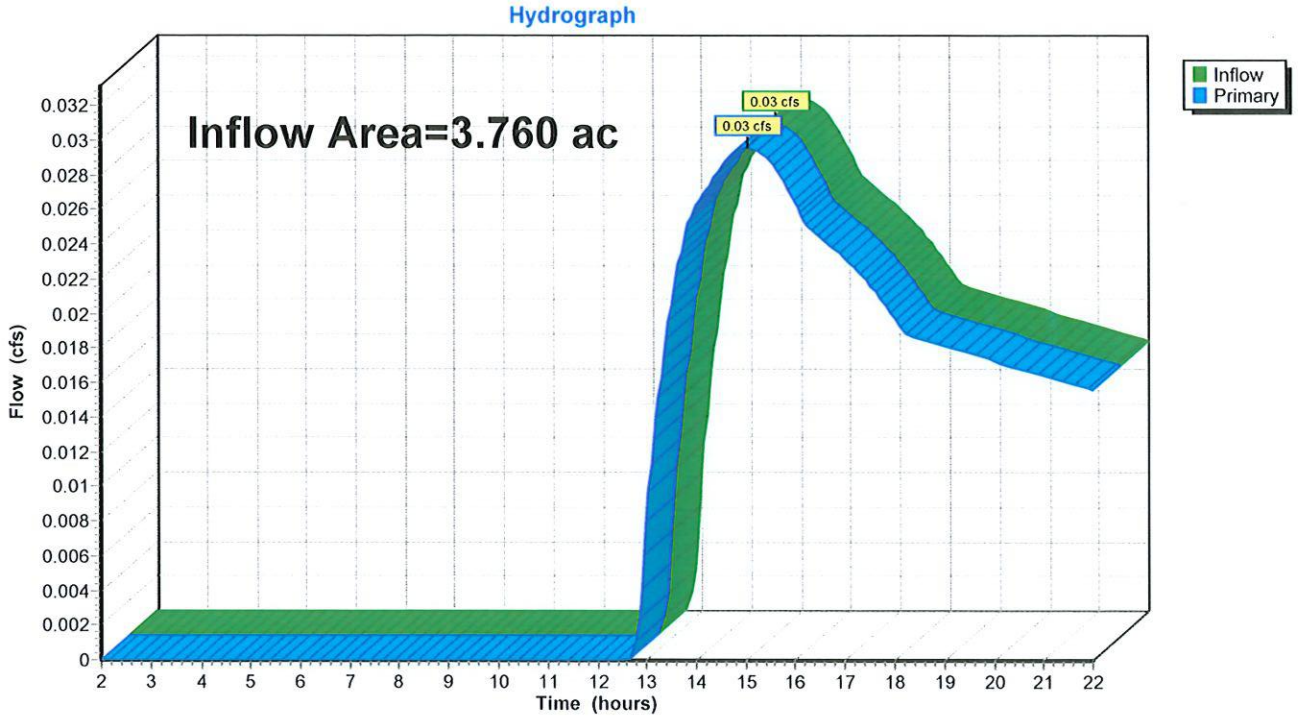


Summary for Pond 1P: Design Point 1P

Inflow Area = 3.760 ac, 16.22% Impervious, Inflow Depth > 0.05" for 1 Year Storm event
Inflow = 0.03 cfs @ 15.05 hrs, Volume= 0.016 af
Primary = 0.03 cfs @ 15.05 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 2.00-22.00 hrs, dt= 0.05 hrs

Pond 1P: Design Point 1P



Time span=2.00-22.00 hrs, dt=0.05 hrs, 401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Subcatchment 1S Runoff Area=3.760 ac 16.22% Impervious Runoff Depth>0.18"
Flow Length=734' Tc=16.4 min CN=50 Runoff=0.19 cfs 0.056 af

Pond 1P: Design Point 1P Inflow=0.19 cfs 0.056 af
Primary=0.19 cfs 0.056 af

Total Runoff Area = 3.760 ac Runoff Volume = 0.056 af Average Runoff Depth = 0.18"
83.78% Pervious = 3.150 ac 16.22% Impervious = 0.610 ac

Summary for Subcatchment 1S: Subcatchment 1S

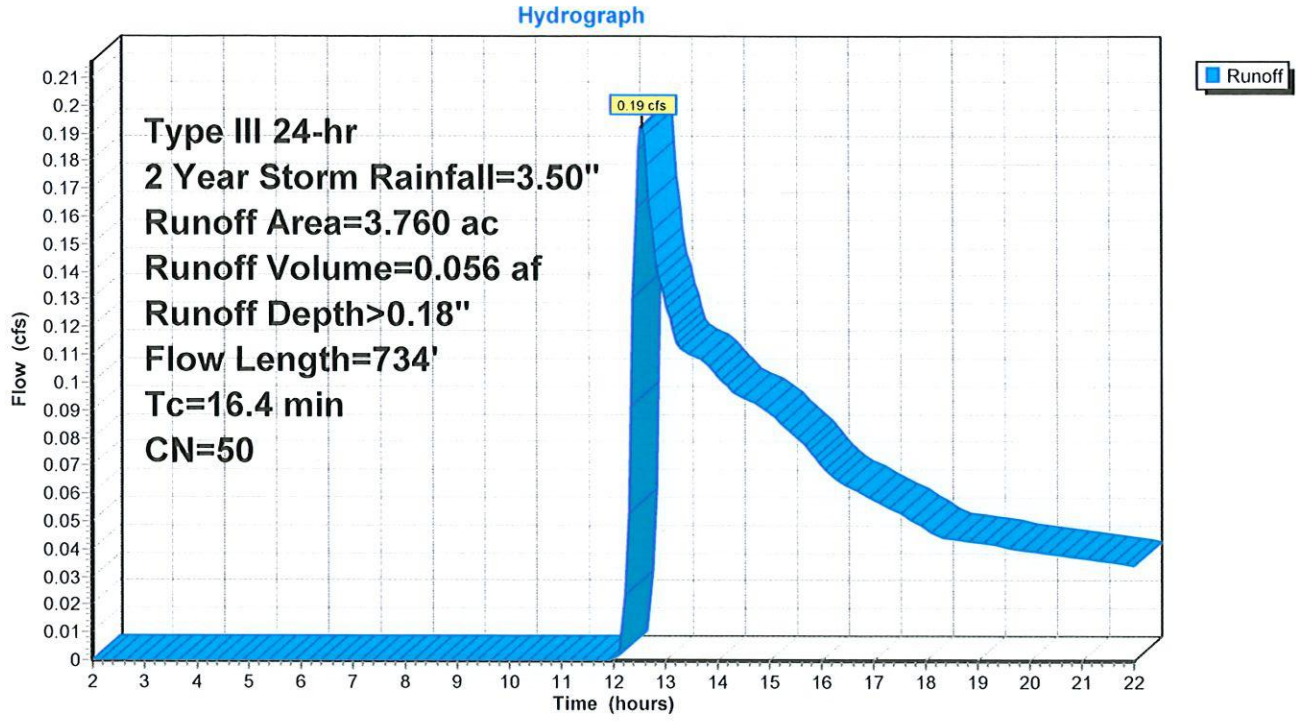
Runoff = 0.19 cfs @ 12.56 hrs, Volume= 0.056 af, Depth> 0.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-22.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Storm Rainfall=3.50"

Area (ac)	CN	Description
2.510	39	>75% Grass cover, Good, HSG A
0.610	98	Existing Impervious Area
0.250	35	Brush, Fair, HSG A
0.390	56	Brush, Fair, HSG B
3.760	50	Weighted Average
3.150		83.78% Pervious Area
0.610		16.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	100	0.0200	0.20		**Sheet Flow, Sheet Flow** Range n= 0.130 P2= 3.50"
2.0	145	0.0140	1.18		**Shallow Concentrated Flow, Shallow Concentrated Flow** Nearly Bare & Untilled Kv= 10.0 fps
0.6	87	0.0150	2.49		**Shallow Concentrated Flow, Shallow Concentrated Flow** Paved Kv= 20.3 fps
5.4	402	0.0320	1.25		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
16.4	734	Total			

Subcatchment 1S: Subcatchment 1S

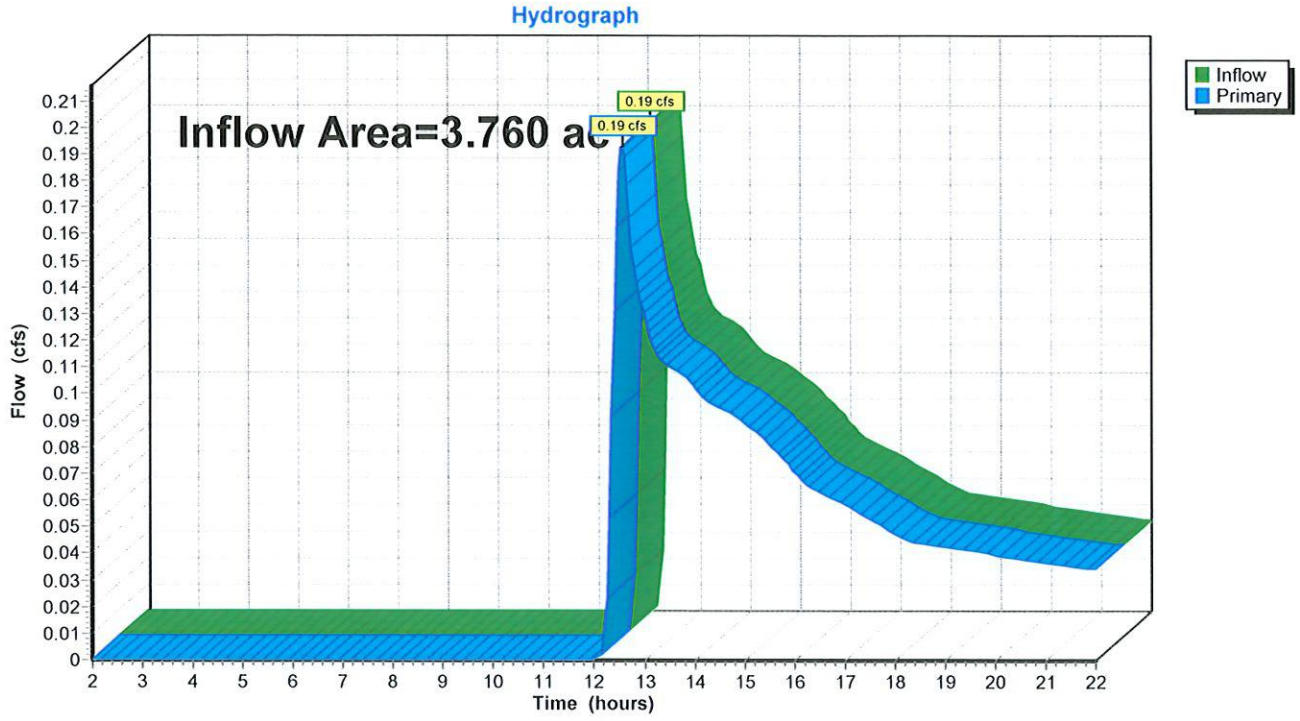


Summary for Pond 1P: Design Point 1P

Inflow Area = 3.760 ac, 16.22% Impervious, Inflow Depth > 0.18" for 2 Year Storm event
Inflow = 0.19 cfs @ 12.56 hrs, Volume= 0.056 af
Primary = 0.19 cfs @ 12.56 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 2.00-22.00 hrs, dt= 0.05 hrs

Pond 1P: Design Point 1P



Time span=2.00-22.00 hrs, dt=0.05 hrs, 401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Subcatchment 1S Runoff Area=3.760 ac 16.22% Impervious Runoff Depth>0.65"
Flow Length=734' Tc=16.4 min CN=50 Runoff=1.42 cfs 0.203 af

Pond 1P: Design Point 1P Inflow=1.42 cfs 0.203 af
Primary=1.42 cfs 0.203 af

Total Runoff Area = 3.760 ac Runoff Volume = 0.203 af Average Runoff Depth = 0.65"
83.78% Pervious = 3.150 ac 16.22% Impervious = 0.610 ac

Summary for Subcatchment 1S: Subcatchment 1S

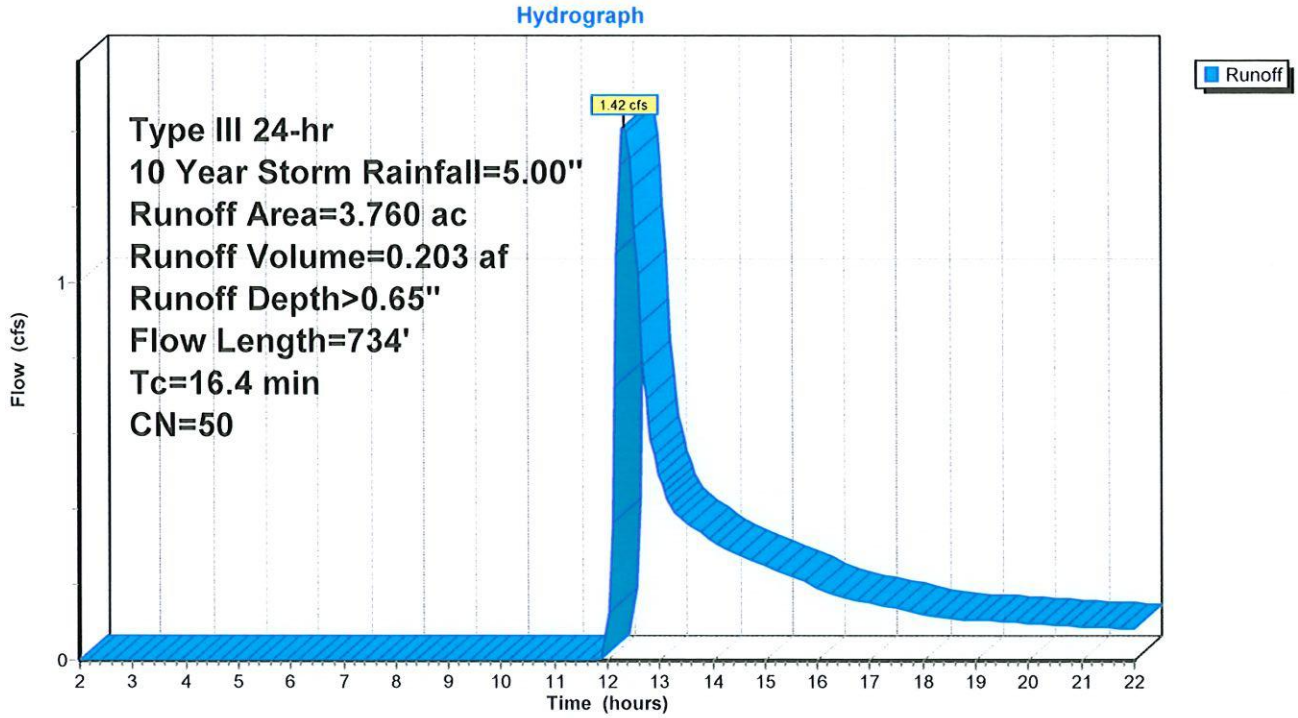
Runoff = 1.42 cfs @ 12.33 hrs, Volume= 0.203 af, Depth> 0.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-22.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Storm Rainfall=5.00"

Area (ac)	CN	Description
2.510	39	>75% Grass cover, Good, HSG A
0.610	98	Existing Impervious Area
0.250	35	Brush, Fair, HSG A
0.390	56	Brush, Fair, HSG B
3.760	50	Weighted Average
3.150		83.78% Pervious Area
0.610		16.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	100	0.0200	0.20		**Sheet Flow, Sheet Flow** Range n= 0.130 P2= 3.50"
2.0	145	0.0140	1.18		**Shallow Concentrated Flow, Shallow Concentrated Flow** Nearly Bare & Untilled Kv= 10.0 fps
0.6	87	0.0150	2.49		**Shallow Concentrated Flow, Shallow Concentrated Flow** Paved Kv= 20.3 fps
5.4	402	0.0320	1.25		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
16.4	734	Total			

Subcatchment 1S: Subcatchment 1S

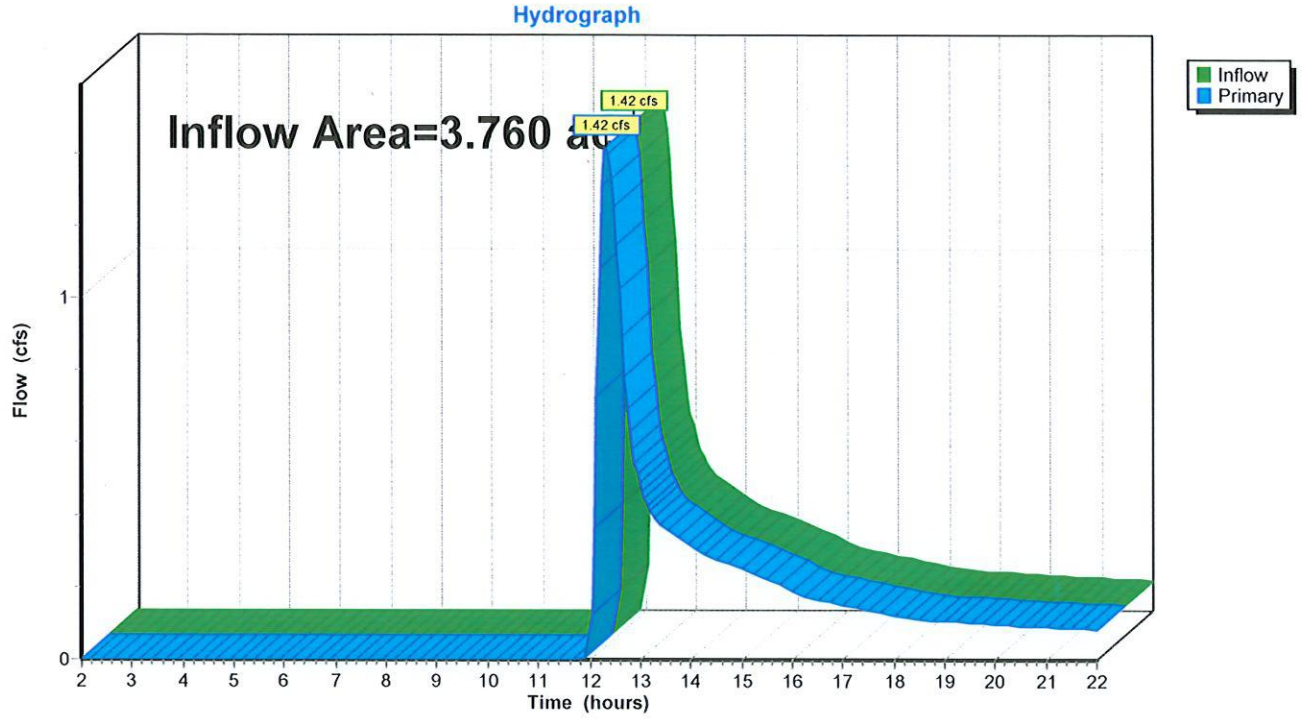


Summary for Pond 1P: Design Point 1P

Inflow Area = 3.760 ac, 16.22% Impervious, Inflow Depth > 0.65" for 10 Year Storm event
Inflow = 1.42 cfs @ 12.33 hrs, Volume= 0.203 af
Primary = 1.42 cfs @ 12.33 hrs, Volume= 0.203 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 2.00-22.00 hrs, dt= 0.05 hrs

Pond 1P: Design Point 1P



Time span=2.00-22.00 hrs, dt=0.05 hrs, 401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Subcatchment 1S Runoff Area=3.760 ac 16.22% Impervious Runoff Depth>1.08"
Flow Length=734' Tc=16.4 min CN=50 Runoff=2.85 cfs 0.338 af

Pond 1P: Design Point 1P Inflow=2.85 cfs 0.338 af
Primary=2.85 cfs 0.338 af

Total Runoff Area = 3.760 ac Runoff Volume = 0.338 af Average Runoff Depth = 1.08"
83.78% Pervious = 3.150 ac 16.22% Impervious = 0.610 ac

Summary for Subcatchment 1S: Subcatchment 1S

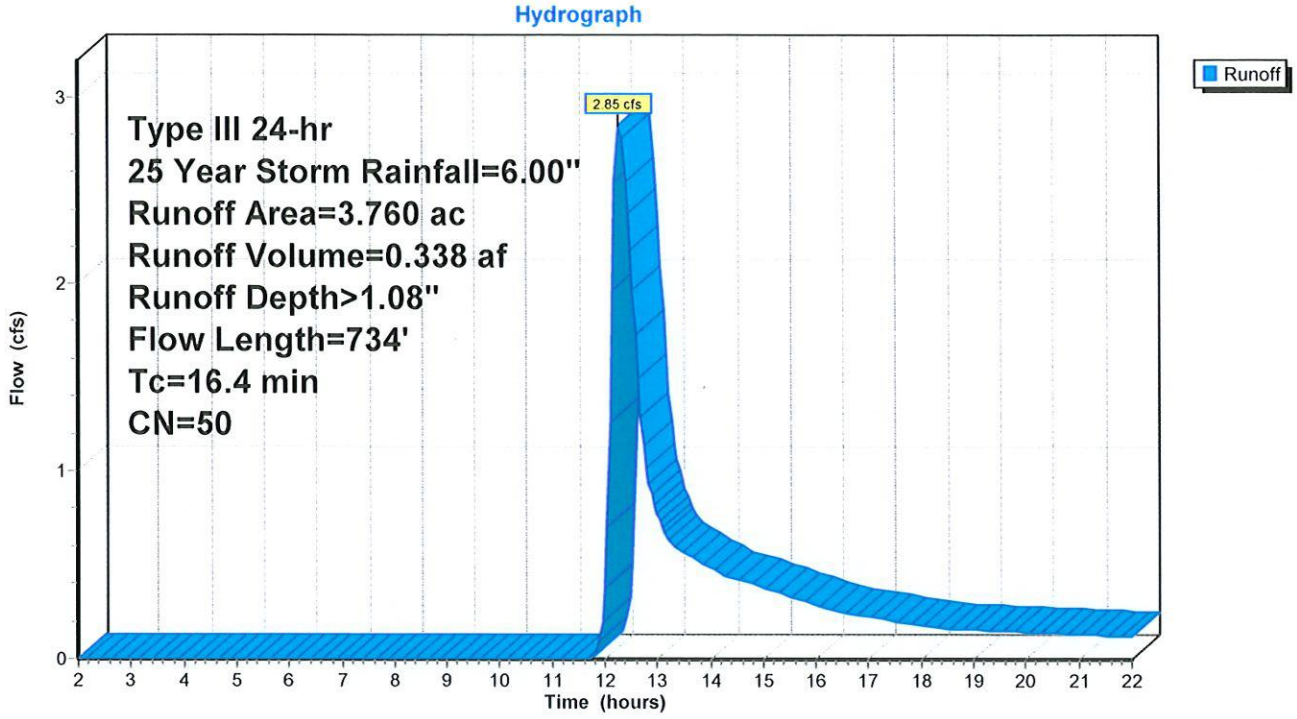
Runoff = 2.85 cfs @ 12.28 hrs, Volume= 0.338 af, Depth> 1.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-22.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Storm Rainfall=6.00"

Area (ac)	CN	Description
2.510	39	>75% Grass cover, Good, HSG A
0.610	98	Existing Impervious Area
0.250	35	Brush, Fair, HSG A
0.390	56	Brush, Fair, HSG B
3.760	50	Weighted Average
3.150		83.78% Pervious Area
0.610		16.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	100	0.0200	0.20		**Sheet Flow, Sheet Flow** Range n= 0.130 P2= 3.50"
2.0	145	0.0140	1.18		**Shallow Concentrated Flow, Shallow Concentrated Flow** Nearly Bare & Untilled Kv= 10.0 fps
0.6	87	0.0150	2.49		**Shallow Concentrated Flow, Shallow Concentrated Flow** Paved Kv= 20.3 fps
5.4	402	0.0320	1.25		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
16.4	734	Total			

Subcatchment 1S: Subcatchment 1S

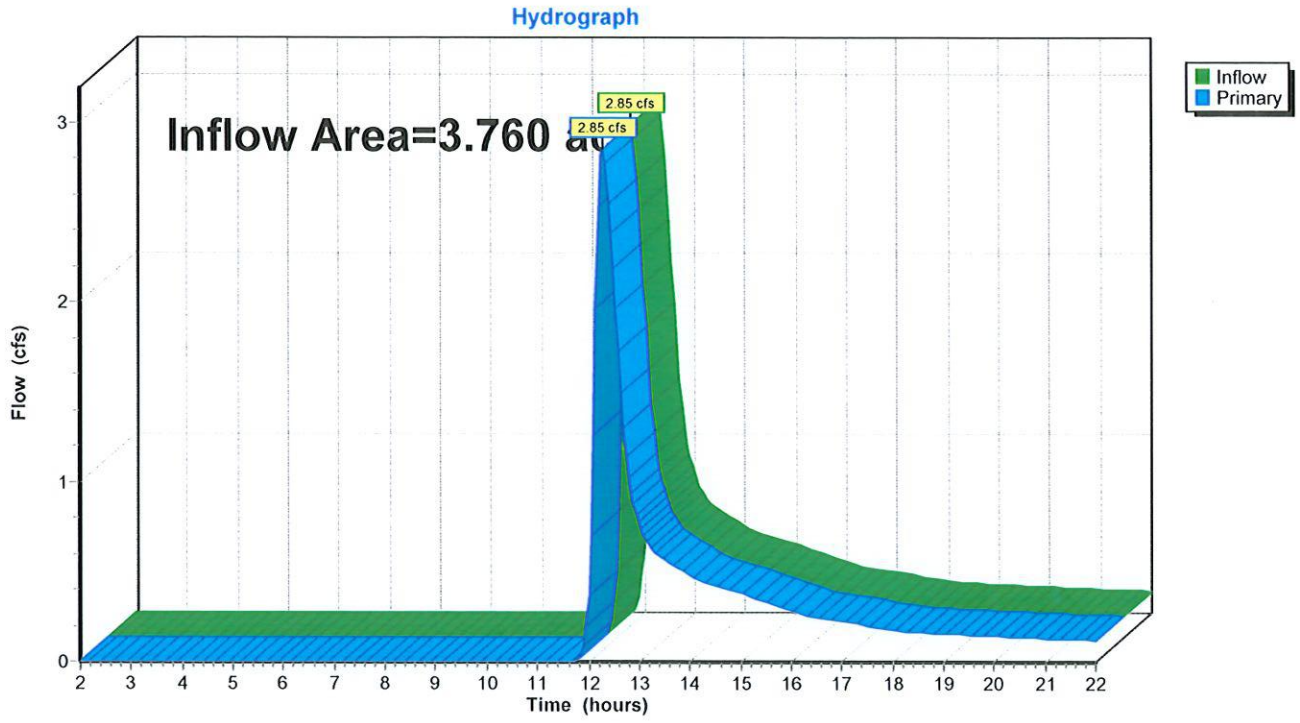


Summary for Pond 1P: Design Point 1P

Inflow Area = 3.760 ac, 16.22% Impervious, Inflow Depth > 1.08" for 25 Year Storm event
Inflow = 2.85 cfs @ 12.28 hrs, Volume= 0.338 af
Primary = 2.85 cfs @ 12.28 hrs, Volume= 0.338 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 2.00-22.00 hrs, dt= 0.05 hrs

Pond 1P: Design Point 1P



Time span=2.00-22.00 hrs, dt=0.05 hrs, 401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Subcatchment 1S Runoff Area=3.760 ac 16.22% Impervious Runoff Depth>2.76"
Flow Length=734' Tc=16.4 min CN=50 Runoff=8.66 cfs 0.863 af

Pond 1P: Design Point 1P Inflow=8.66 cfs 0.863 af
Primary=8.66 cfs 0.863 af

Total Runoff Area = 3.760 ac Runoff Volume = 0.863 af Average Runoff Depth = 2.76"
83.78% Pervious = 3.150 ac 16.22% Impervious = 0.610 ac

Summary for Subcatchment 1S: Subcatchment 1S

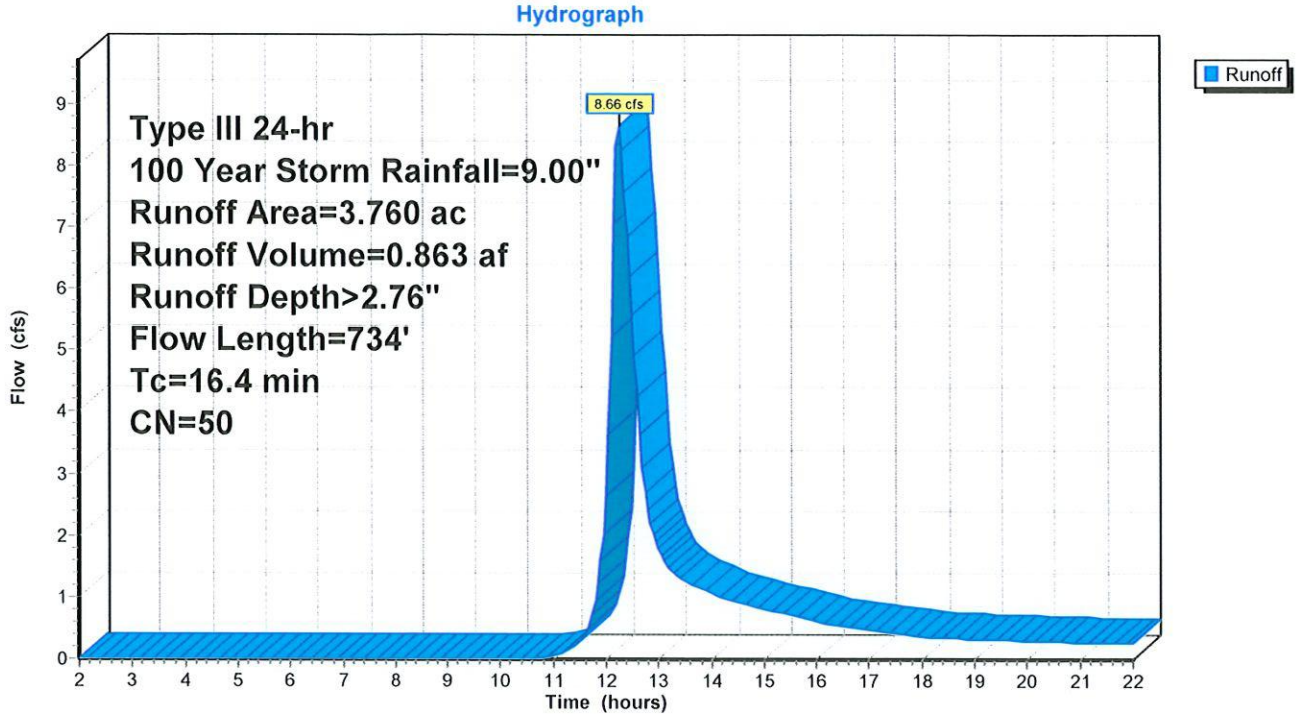
Runoff = 8.66 cfs @ 12.25 hrs, Volume= 0.863 af, Depth> 2.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-22.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Storm Rainfall=9.00"

Area (ac)	CN	Description
2.510	39	>75% Grass cover, Good, HSG A
0.610	98	Existing Impervious Area
0.250	35	Brush, Fair, HSG A
0.390	56	Brush, Fair, HSG B
3.760	50	Weighted Average
3.150		83.78% Pervious Area
0.610		16.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	100	0.0200	0.20		**Sheet Flow, Sheet Flow** Range n= 0.130 P2= 3.50"
2.0	145	0.0140	1.18		**Shallow Concentrated Flow, Shallow Concentrated Flow** Nearly Bare & Untilled Kv= 10.0 fps
0.6	87	0.0150	2.49		**Shallow Concentrated Flow, Shallow Concentrated Flow** Paved Kv= 20.3 fps
5.4	402	0.0320	1.25		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
16.4	734	Total			

Subcatchment 1S: Subcatchment 1S

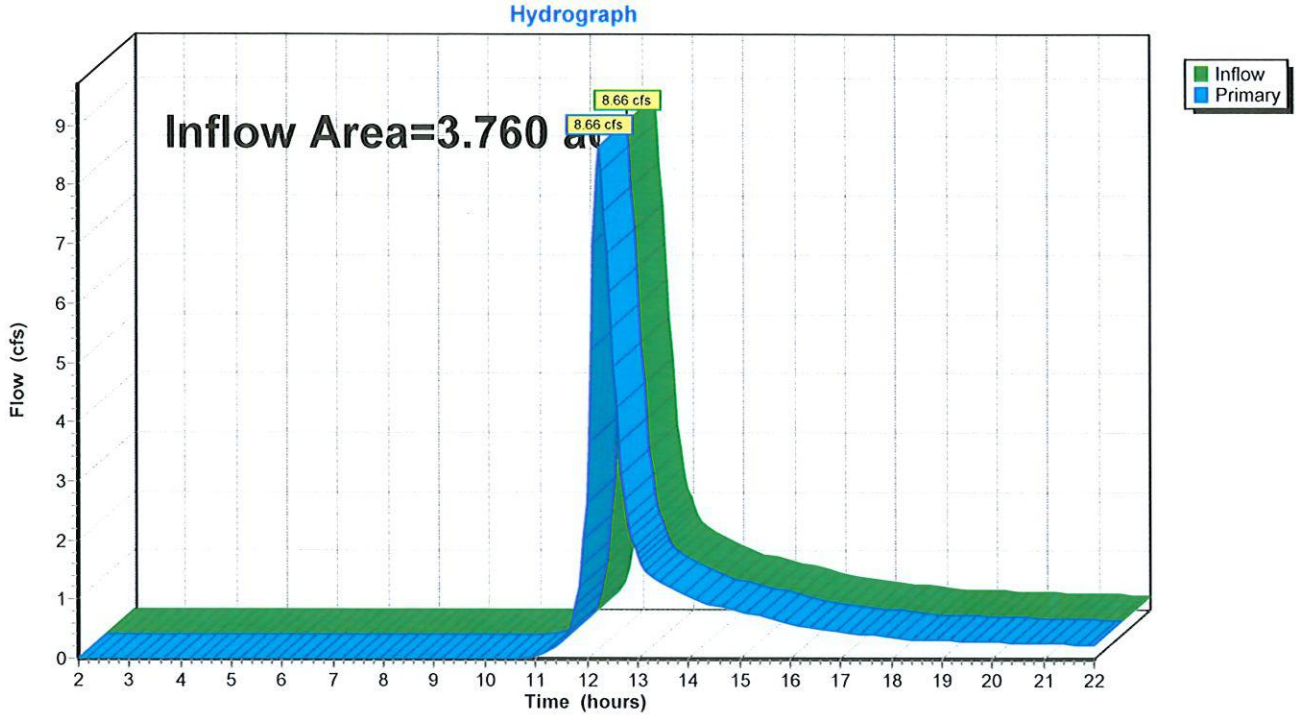


Summary for Pond 1P: Design Point 1P

Inflow Area = 3.760 ac, 16.22% Impervious, Inflow Depth > 2.76" for 100 Year Storm event
Inflow = 8.66 cfs @ 12.25 hrs, Volume= 0.863 af
Primary = 8.66 cfs @ 12.25 hrs, Volume= 0.863 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 2.00-22.00 hrs, dt= 0.05 hrs

Pond 1P: Design Point 1P



Time span=2.00-22.00 hrs, dt=0.05 hrs, 401 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: Subcatchment 1S Runoff Area=3.760 ac 16.22% Impervious Runoff Depth=0.00"
Flow Length=734' Tc=16.4 min CN=50 Runoff=0.00 cfs 0.000 af

Pond 1P: Design Point 1P Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 3.760 ac Runoff Volume = 0.000 af Average Runoff Depth = 0.00"
83.78% Pervious = 3.150 ac 16.22% Impervious = 0.610 ac

Summary for Subcatchment 1S: Subcatchment 1S

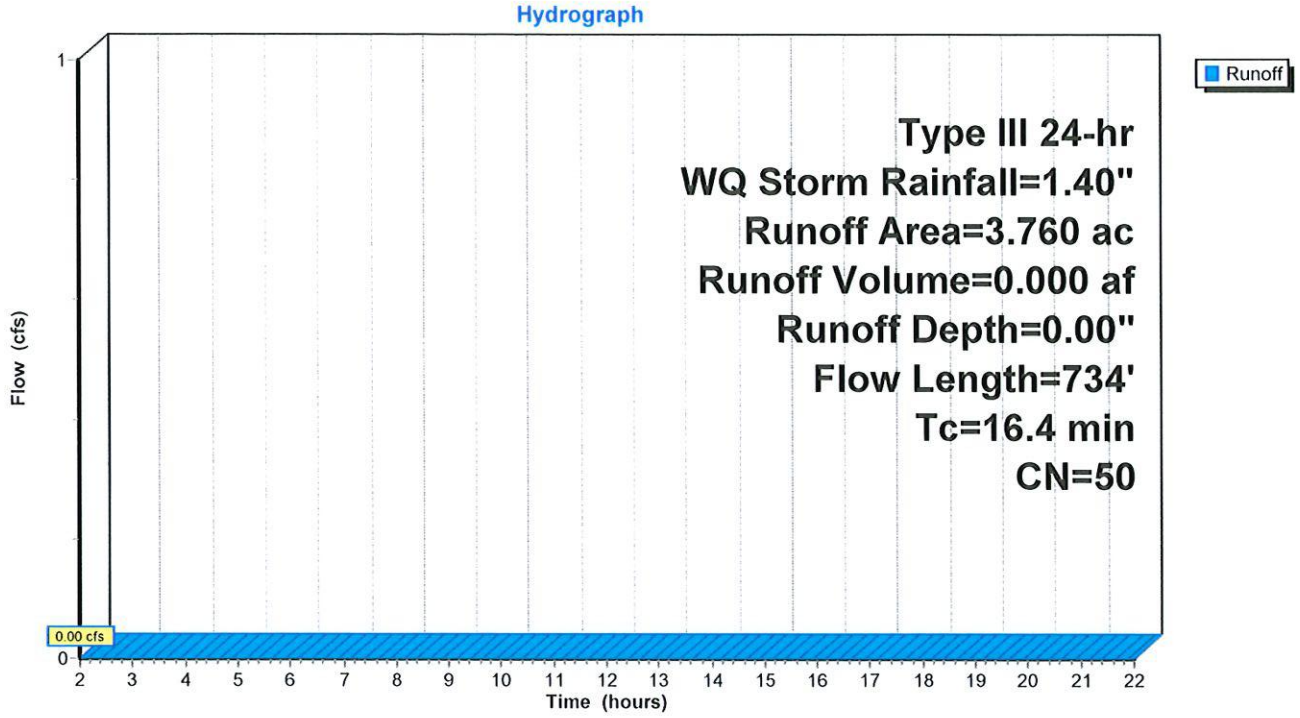
Runoff = 0.00 cfs @ 2.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 2.00-22.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Storm Rainfall=1.40"

Area (ac)	CN	Description
2.510	39	>75% Grass cover, Good, HSG A
0.610	98	Existing Impervious Area
0.250	35	Brush, Fair, HSG A
0.390	56	Brush, Fair, HSG B
3.760	50	Weighted Average
3.150		83.78% Pervious Area
0.610		16.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	100	0.0200	0.20		**Sheet Flow, Sheet Flow** Range n= 0.130 P2= 3.50"
2.0	145	0.0140	1.18		**Shallow Concentrated Flow, Shallow Concentrated Flow** Nearly Bare & Untilled Kv= 10.0 fps
0.6	87	0.0150	2.49		**Shallow Concentrated Flow, Shallow Concentrated Flow** Paved Kv= 20.3 fps
5.4	402	0.0320	1.25		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
16.4	734	Total			

Subcatchment 1S: Subcatchment 1S

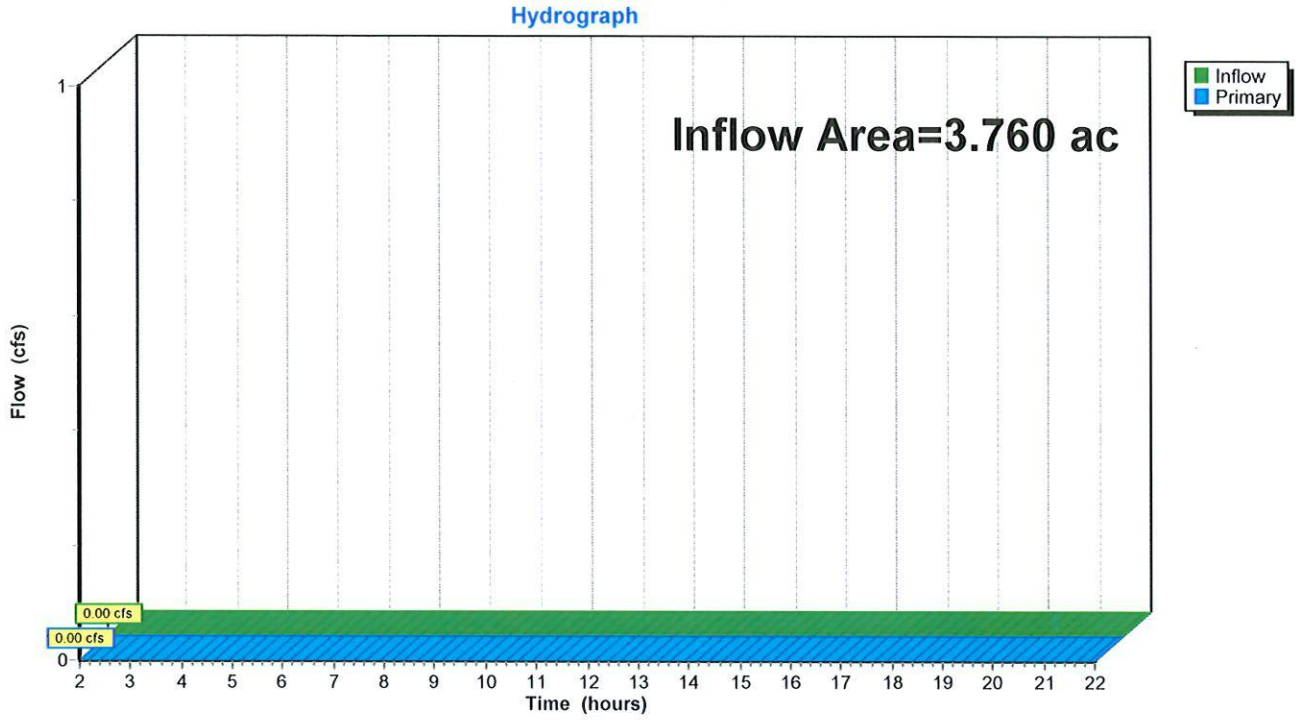


Summary for Pond 1P: Design Point 1P

Inflow Area = 3.760 ac, 16.22% Impervious, Inflow Depth = 0.00" for WQ Storm event
Inflow = 0.00 cfs @ 2.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 2.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

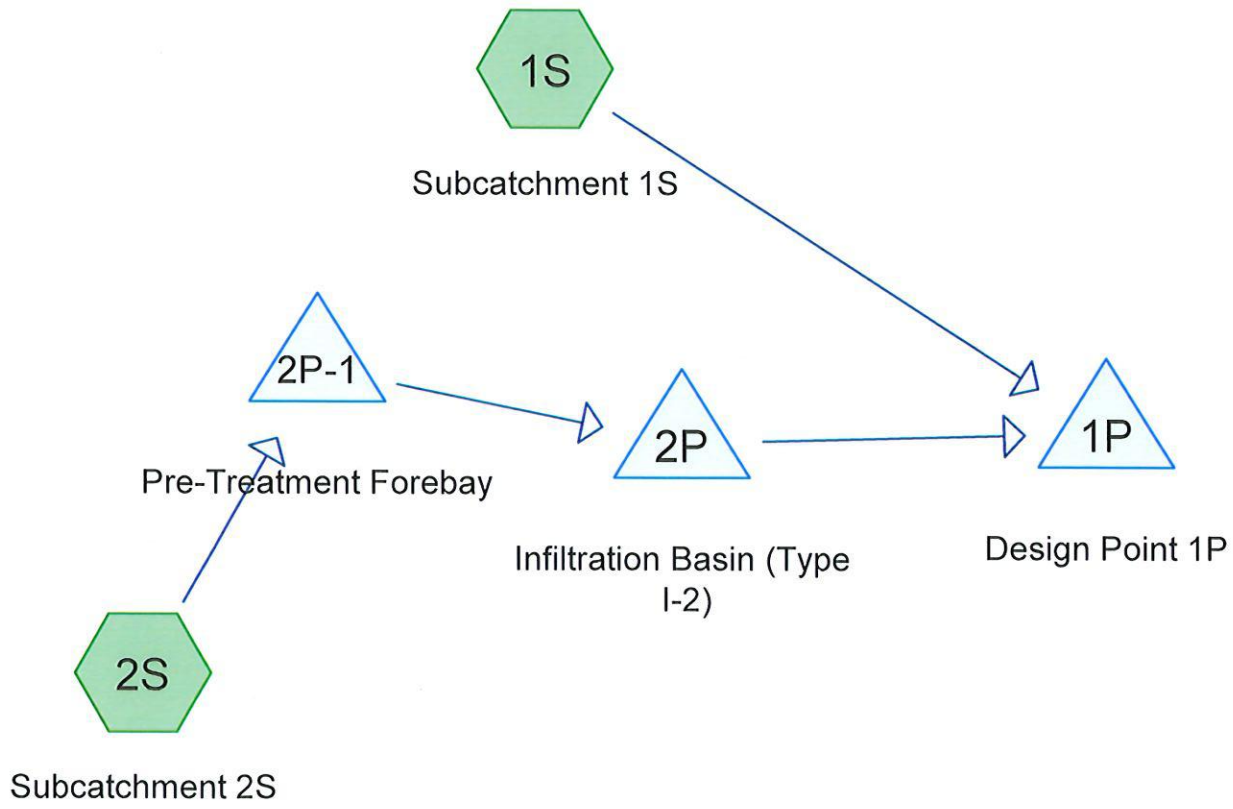
Routing by Stor-Ind method, Time Span= 2.00-22.00 hrs, dt= 0.05 hrs

Pond 1P: Design Point 1P



APPENDIX 11

TR-20 Hydro-CAD Calculations – Proposed Conditions



Subcat Reach Pond Link

Routing Diagram for Proposed Conditions - 2023
Prepared by Pietrzak & Pfau Engineering & Surveying, PLLC

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

Subcatchment 1S: Subcatchment 1S Runoff Area=0.880 ac 10.23% Impervious Runoff Depth>0.02"
Flow Length=520' Tc=12.4 min CN=46 Runoff=0.00 cfs 0.001 af

Subcatchment 2S: Subcatchment 2S Runoff Area=2.880 ac 59.72% Impervious Runoff Depth>0.88"
Flow Length=531' Tc=12.6 min CN=76 Runoff=2.23 cfs 0.211 af

Pond 1P: Design Point 1P Inflow=0.00 cfs 0.001 af
Primary=0.00 cfs 0.001 af

Pond 2P: Infiltration Basin (Type I-2) Peak Elev=262.34' Storage=2,252 cf Inflow=1.05 cfs 0.140 af
Discarded=0.13 cfs 0.124 af Primary=0.00 cfs 0.000 af Outflow=0.13 cfs 0.124 af

Pond 2P-1: Pre-Treatment Forebay Peak Elev=265.13' Storage=3,323 cf Inflow=2.23 cfs 0.211 af
Outflow=1.05 cfs 0.140 af

Total Runoff Area = 3.760 ac Runoff Volume = 0.212 af Average Runoff Depth = 0.68"
51.86% Pervious = 1.950 ac 48.14% Impervious = 1.810 ac

Summary for Subcatchment 1S: Subcatchment 1S

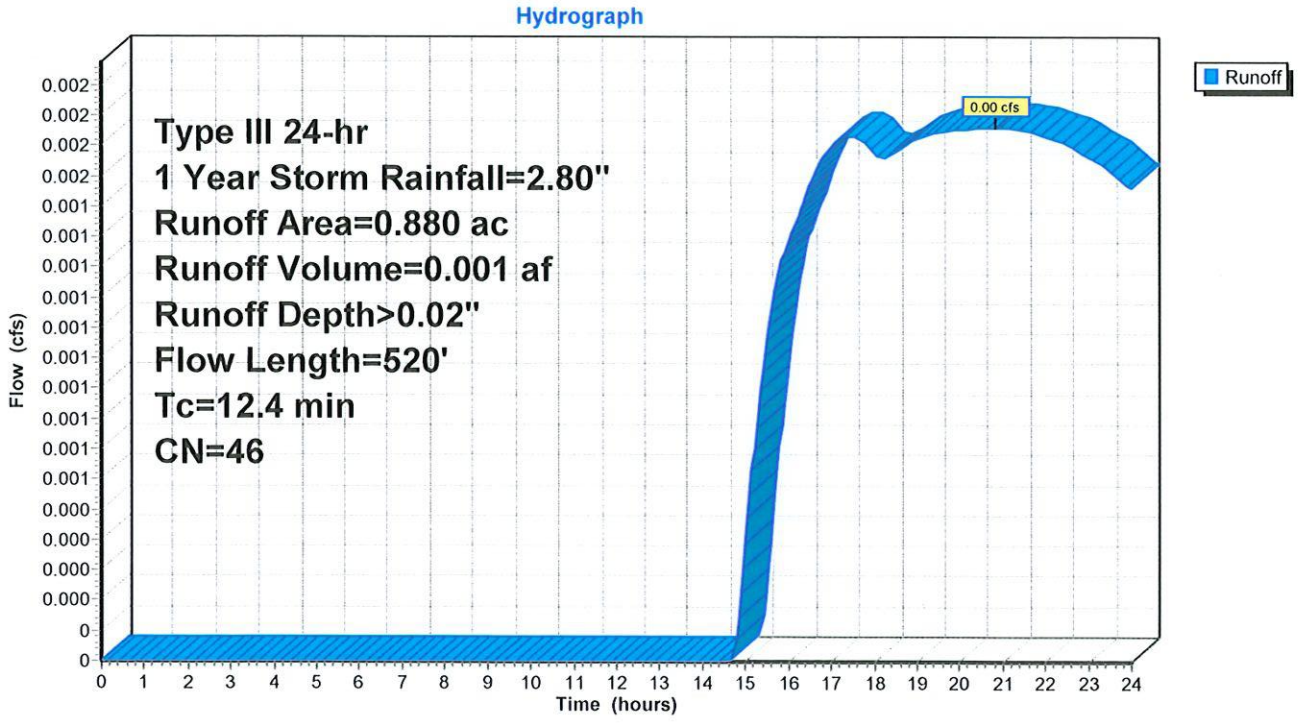
Runoff = 0.00 cfs @ 20.83 hrs, Volume= 0.001 af, Depth> 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 Year Storm Rainfall=2.80"

Area (ac)	CN	Description
0.700	39	>75% Grass cover, Good, HSG A
0.090	98	Existing Impervious Area
0.050	35	Brush, Fair, HSG A
0.040	56	Brush, Fair, HSG B
0.880	46	Weighted Average
0.790		89.77% Pervious Area
0.090		10.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	100	0.0200	0.20		**Sheet Flow, Sheet Flow** Range n= 0.130 P2= 3.50"
4.0	420	0.0300	1.73		**Shallow Concentrated Flow, Shallow Concentrated Flow** Nearly Bare & Untilled Kv= 10.0 fps
12.4	520	Total			

Subcatchment 1S: Subcatchment 1S



Summary for Subcatchment 2S: Subcatchment 2S

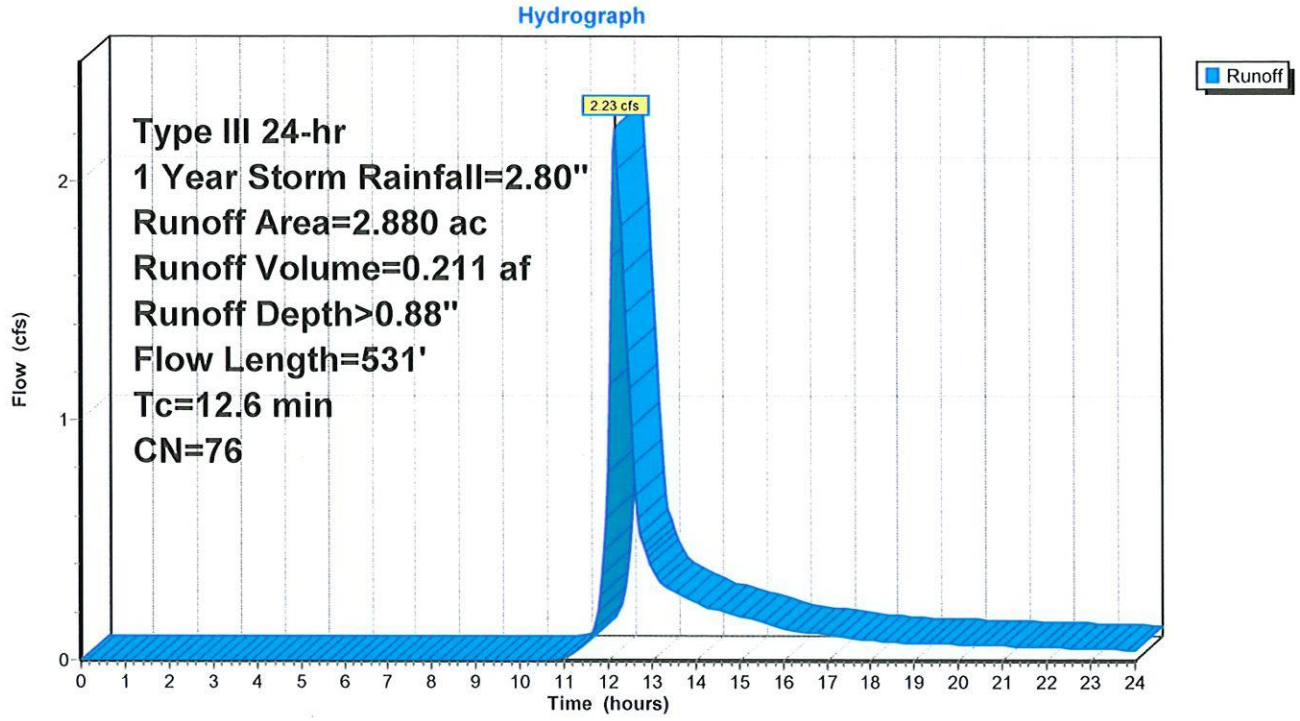
Runoff = 2.23 cfs @ 12.19 hrs, Volume= 0.211 af, Depth> 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 Year Storm Rainfall=2.80"

Area (ac)	CN	Description
0.770	39	>75% Grass cover, Good, HSG A
0.240	98	Existing Impervious Area
1.480	98	Proposed Impervious Area
0.130	35	Brush, Fair, HSG A
0.260	56	Brush, Fair, HSG B
2.880	76	Weighted Average
1.160		40.28% Pervious Area
1.720		59.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	100	0.0200	0.20		**Sheet Flow, Sheet Flow** Range n= 0.130 P2= 3.50"
1.6	107	0.0120	1.10		**Shallow Concentrated Flow, Shallow Concentrated Flow** Nearly Bare & Untilled Kv= 10.0 fps
1.1	159	0.0140	2.40		**Shallow Concentrated Flow, Shallow Concentrated Flow** Paved Kv= 20.3 fps
0.7	60	0.0400	1.40		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
0.8	105	0.0190	2.07		**Shallow Concentrated Flow, Vegetated Swale** Grassed Waterway Kv= 15.0 fps
12.6	531	Total			

Subcatchment 2S: Subcatchment 2S

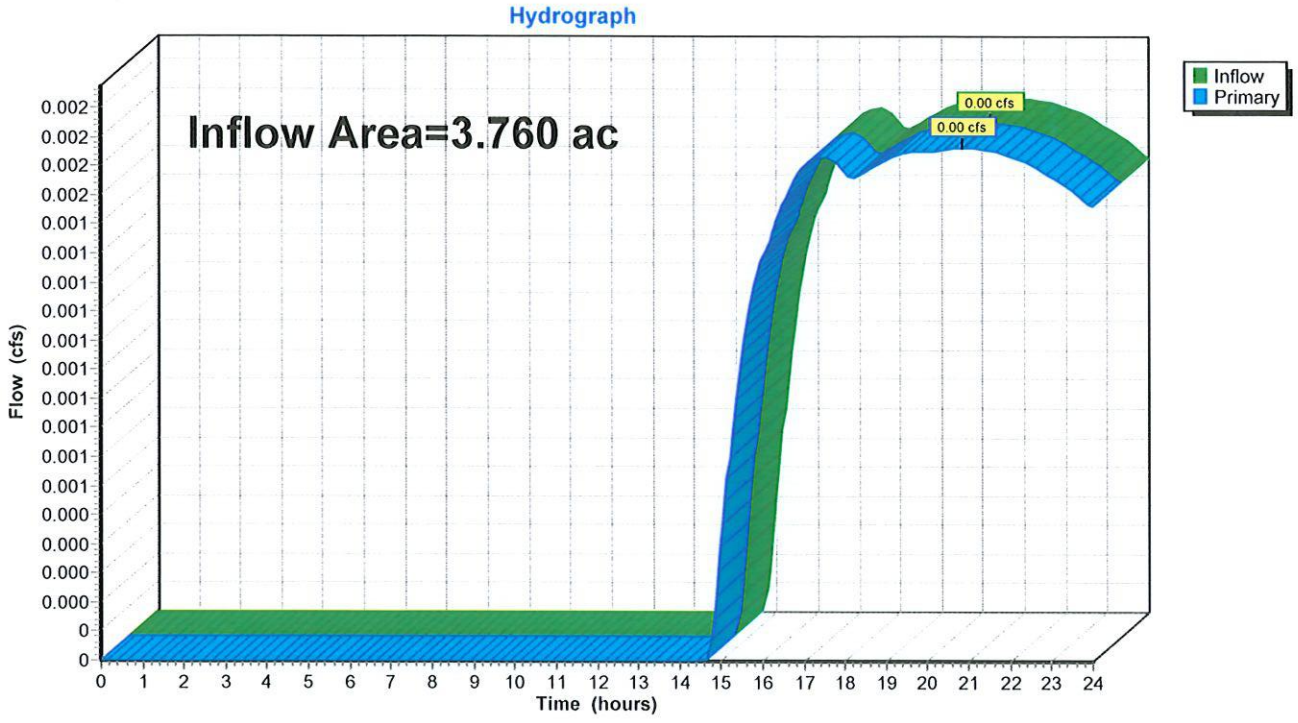


Summary for Pond 1P: Design Point 1P

Inflow Area = 3.760 ac, 48.14% Impervious, Inflow Depth > 0.00" for 1 Year Storm event
Inflow = 0.00 cfs @ 20.83 hrs, Volume= 0.001 af
Primary = 0.00 cfs @ 20.83 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond 1P: Design Point 1P



Summary for Pond 2P: Infiltration Basin (Type I-2)

Inflow Area = 2.880 ac, 59.72% Impervious, Inflow Depth > 0.58" for 1 Year Storm event
Inflow = 1.05 cfs @ 12.53 hrs, Volume= 0.140 af
Outflow = 0.13 cfs @ 16.20 hrs, Volume= 0.124 af, Atten= 87%, Lag= 220.2 min
Discarded = 0.13 cfs @ 16.20 hrs, Volume= 0.124 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 262.34' @ 16.20 hrs Surf.Area= 5,700 sf Storage= 2,252 cf

Plug-Flow detention time= 200.0 min calculated for 0.124 af (89% of inflow)
Center-of-Mass det. time= 150.2 min (1,093.4 - 943.2)

Volume	Invert	Avail.Storage	Storage Description
#1	262.00'	32,776 cf	**Custom Stage Data (Prismatic)** Listed below

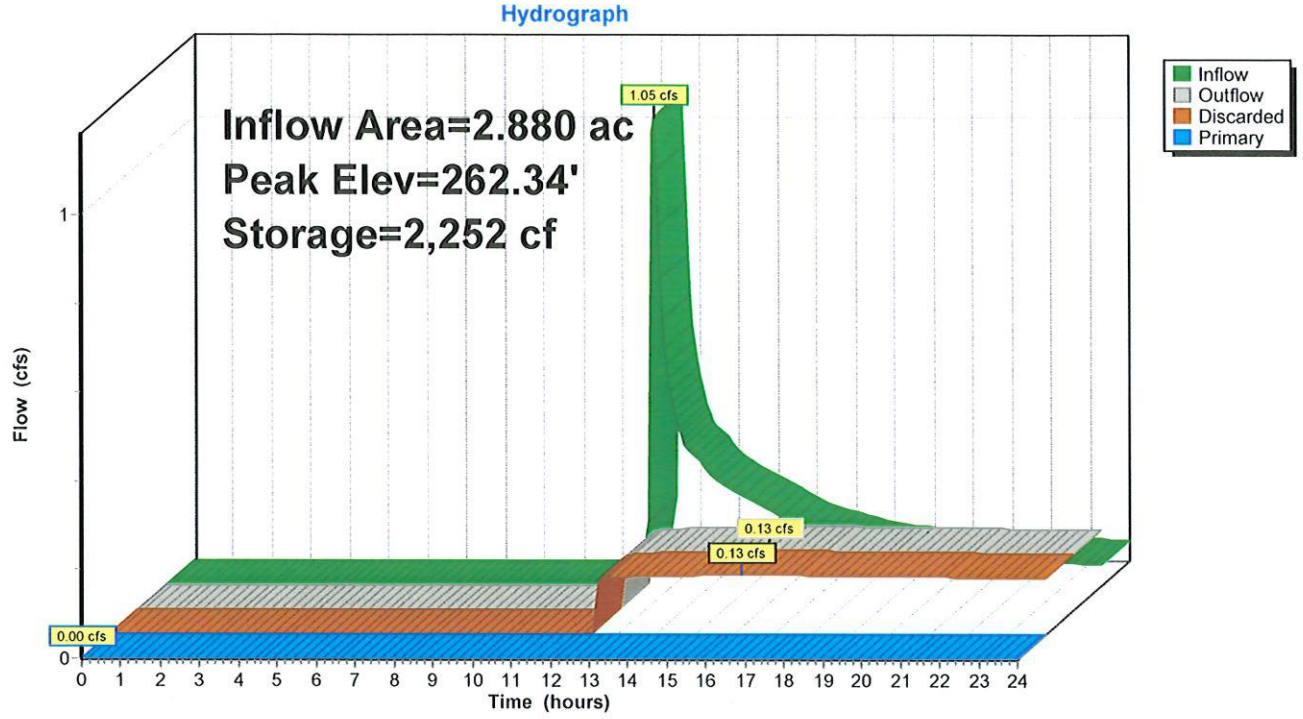
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
262.00	5,205	0	0
264.00	8,137	13,342	13,342
266.00	11,297	19,434	32,776

Device	Routing	Invert	Outlet Devices
#1	Primary	260.00'	**12.0" Round Culvert** L= 80.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.00' / 256.00' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf
#2	Discarded	262.00'	**1.008 in/hr Exfiltration over Surface area**
#3	Device 1	262.73'	**6.0" W x 1.8" H Vert. Orifice/Grate** C= 0.600
#4	Device 1	263.05'	**8.0" Vert. Orifice/Grate** C= 0.600
#5	Device 1	264.00'	**1.5' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#6	Device 1	265.00'	**48.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Primary	265.50'	**25.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.13 cfs @ 16.20 hrs HW=262.34' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=262.00' (Free Discharge)
└**1=Culvert** (Passes 0.00 cfs of 4.63 cfs potential flow)
  └**3=Orifice/Grate** (Controls 0.00 cfs)
  └**4=Orifice/Grate** (Controls 0.00 cfs)
  └**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**6=Orifice/Grate** (Controls 0.00 cfs)
└**7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Infiltration Basin (Type I-2)



Summary for Pond 2P-1: Pre-Treatment Forebay

Inflow Area = 2.880 ac, 59.72% Impervious, Inflow Depth > 0.88" for 1 Year Storm event
Inflow = 2.23 cfs @ 12.19 hrs, Volume= 0.211 af
Outflow = 1.05 cfs @ 12.53 hrs, Volume= 0.140 af, Atten= 53%, Lag= 20.5 min
Primary = 1.05 cfs @ 12.53 hrs, Volume= 0.140 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 265.13' @ 12.53 hrs Surf.Area= 1,894 sf Storage= 3,323 cf

Plug-Flow detention time= 184.3 min calculated for 0.140 af (66% of inflow)
Center-of-Mass det. time= 75.1 min (943.2 - 868.2)

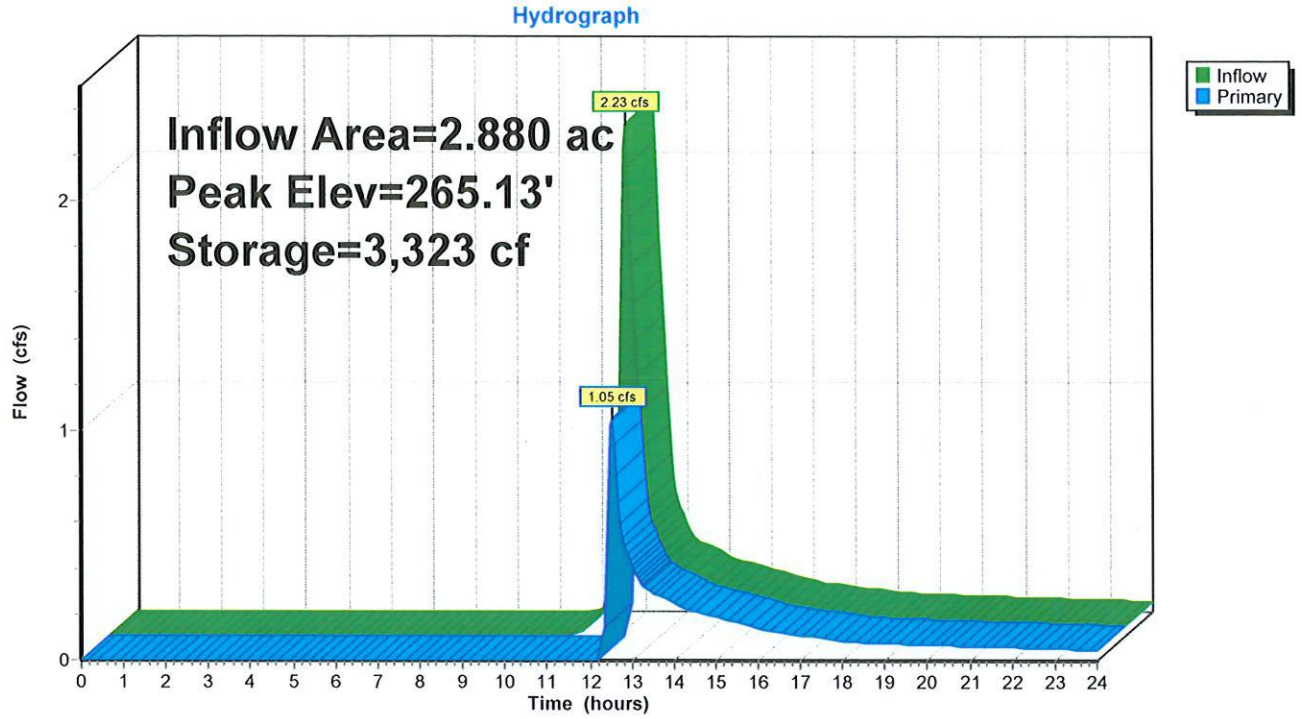
Volume	Invert	Avail.Storage	Storage Description
#1	262.00'	5,218 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
262.00	392	0	0
264.00	1,194	1,586	1,586
266.00	2,438	3,632	5,218

Device	Routing	Invert	Outlet Devices
#1	Primary	265.00'	**10.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=1.04 cfs @ 12.53 hrs HW=265.12' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 1.04 cfs @ 0.83 fps)

Pond 2P-1: Pre-Treatment Forebay



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

Subcatchment 1S: Subcatchment 1S Runoff Area=0.880 ac 10.23% Impervious Runoff Depth>0.10"
Flow Length=520' Tc=12.4 min CN=46 Runoff=0.01 cfs 0.007 af

Subcatchment 2S: Subcatchment 2S Runoff Area=2.880 ac 59.72% Impervious Runoff Depth>1.36"
Flow Length=531' Tc=12.6 min CN=76 Runoff=3.58 cfs 0.327 af

Pond 1P: Design Point 1P Inflow=0.08 cfs 0.027 af
Primary=0.08 cfs 0.027 af

Pond 2P: Infiltration Basin (Type I-2) Peak Elev=262.85' Storage=5,676 cf Inflow=3.02 cfs 0.255 af
Discarded=0.15 cfs 0.143 af Primary=0.07 cfs 0.020 af Outflow=0.22 cfs 0.163 af

Pond 2P-1: Pre-Treatment Forebay Peak Elev=265.25' Storage=3,565 cf Inflow=3.58 cfs 0.327 af
Outflow=3.02 cfs 0.255 af

Total Runoff Area = 3.760 ac Runoff Volume = 0.334 af Average Runoff Depth = 1.07"
51.86% Pervious = 1.950 ac 48.14% Impervious = 1.810 ac

Summary for Subcatchment 1S: Subcatchment 1S

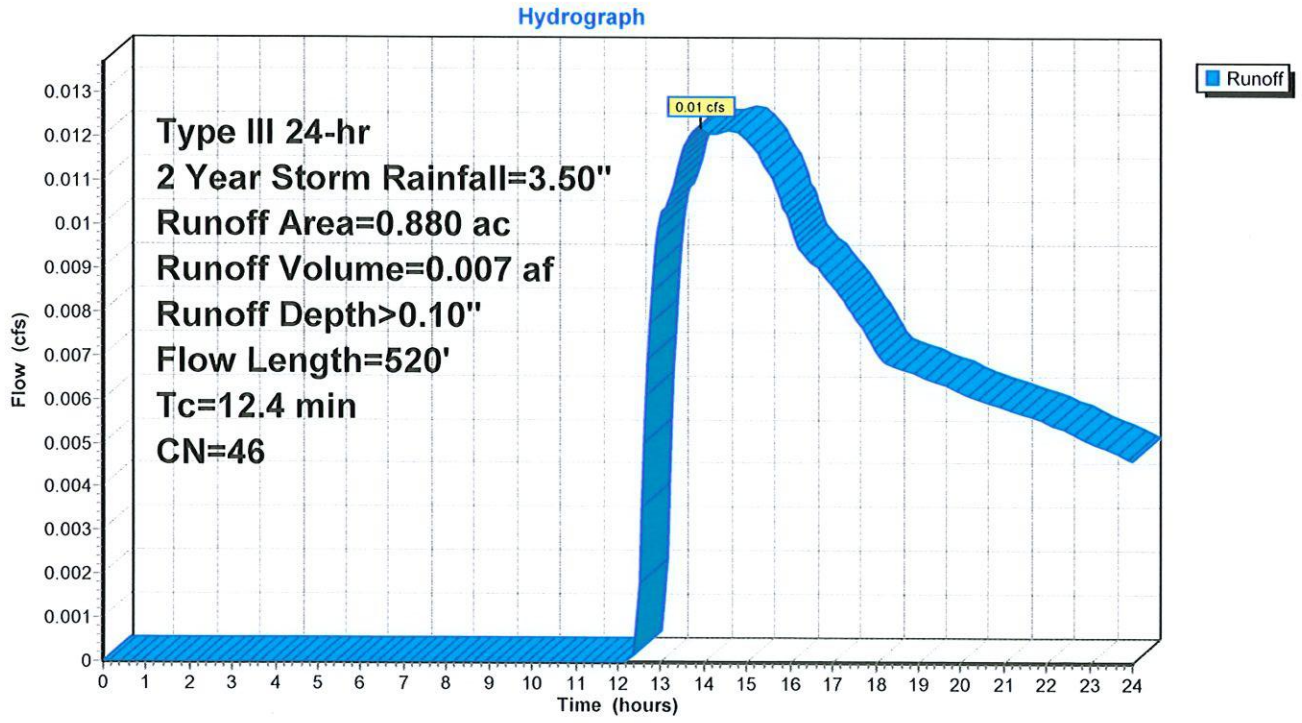
Runoff = 0.01 cfs @ 13.90 hrs, Volume= 0.007 af, Depth> 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Storm Rainfall=3.50"

Area (ac)	CN	Description
0.700	39	>75% Grass cover, Good, HSG A
0.090	98	Existing Impervious Area
0.050	35	Brush, Fair, HSG A
0.040	56	Brush, Fair, HSG B
0.880	46	Weighted Average
0.790		89.77% Pervious Area
0.090		10.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	100	0.0200	0.20		**Sheet Flow, Sheet Flow** Range n= 0.130 P2= 3.50"
4.0	420	0.0300	1.73		**Shallow Concentrated Flow, Shallow Concentrated Flow** Nearly Bare & Untilled Kv= 10.0 fps
12.4	520	Total			

Subcatchment 1S: Subcatchment 1S



Summary for Subcatchment 2S: Subcatchment 2S

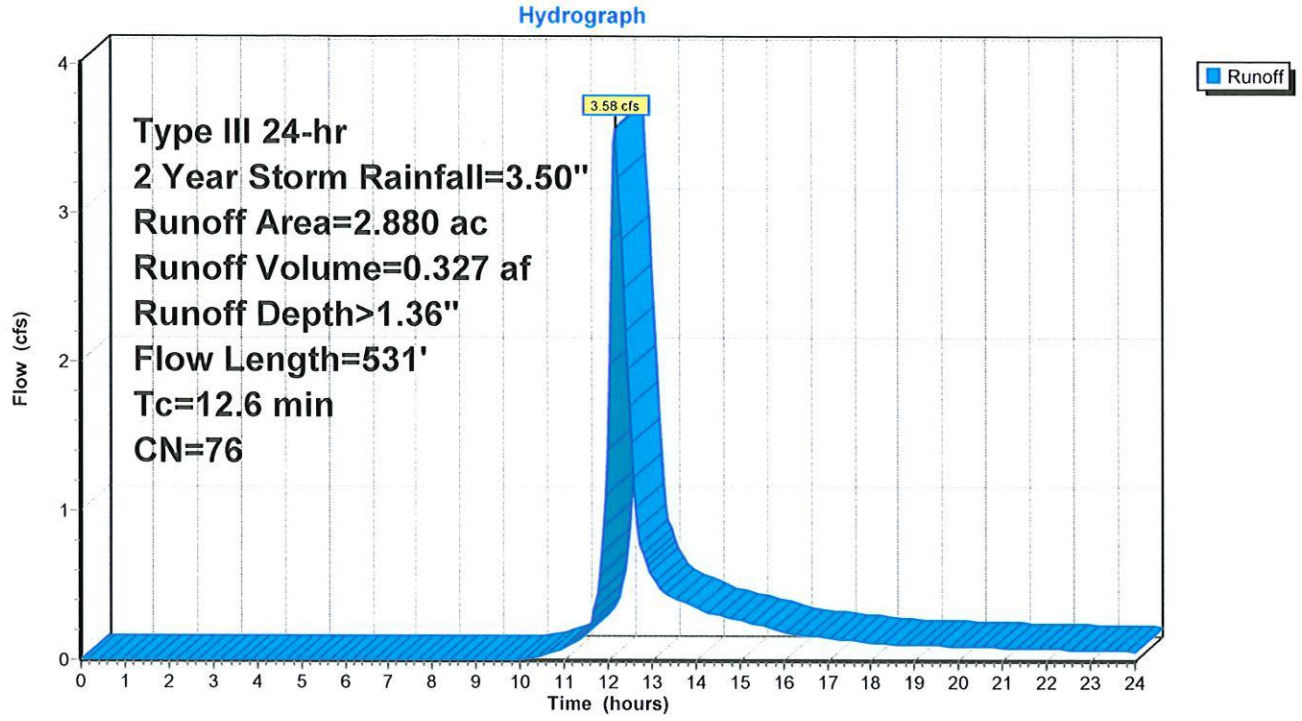
Runoff = 3.58 cfs @ 12.19 hrs, Volume= 0.327 af, Depth> 1.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Storm Rainfall=3.50"

Area (ac)	CN	Description
0.770	39	>75% Grass cover, Good, HSG A
0.240	98	Existing Impervious Area
1.480	98	Proposed Impervious Area
0.130	35	Brush, Fair, HSG A
0.260	56	Brush, Fair, HSG B
2.880	76	Weighted Average
1.160		40.28% Pervious Area
1.720		59.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	100	0.0200	0.20		**Sheet Flow, Sheet Flow** Range n= 0.130 P2= 3.50"
1.6	107	0.0120	1.10		**Shallow Concentrated Flow, Shallow Concentrated Flow** Nearly Bare & Untilled Kv= 10.0 fps
1.1	159	0.0140	2.40		**Shallow Concentrated Flow, Shallow Concentrated Flow** Paved Kv= 20.3 fps
0.7	60	0.0400	1.40		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
0.8	105	0.0190	2.07		**Shallow Concentrated Flow, Vegetated Swale** Grassed Waterway Kv= 15.0 fps
12.6	531	Total			

Subcatchment 2S: Subcatchment 2S

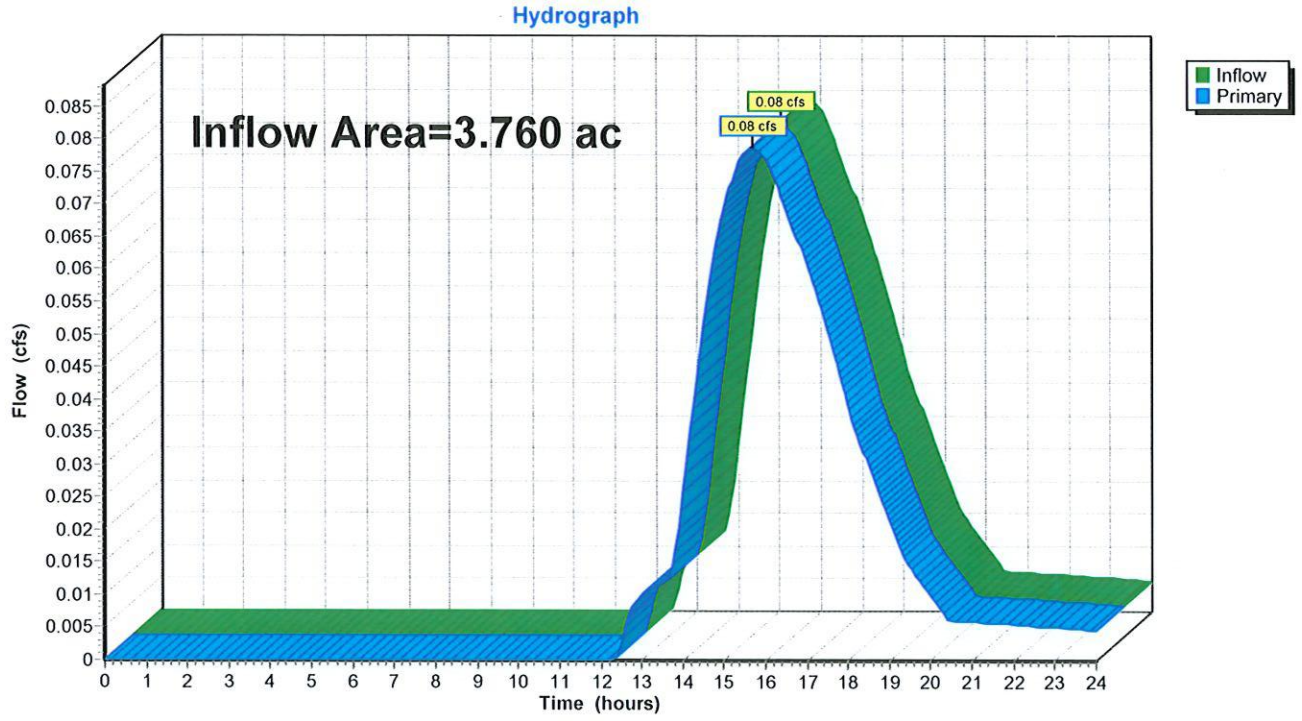


Summary for Pond 1P: Design Point 1P

Inflow Area = 3.760 ac, 48.14% Impervious, Inflow Depth > 0.09" for 2 Year Storm event
Inflow = 0.08 cfs @ 15.70 hrs, Volume= 0.027 af
Primary = 0.08 cfs @ 15.70 hrs, Volume= 0.027 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond 1P: Design Point 1P



Summary for Pond 2P: Infiltration Basin (Type I-2)

Inflow Area = 2.880 ac, 59.72% Impervious, Inflow Depth > 1.06" for 2 Year Storm event
Inflow = 3.02 cfs @ 12.29 hrs, Volume= 0.255 af
Outflow = 0.22 cfs @ 15.76 hrs, Volume= 0.163 af, Atten= 93%, Lag= 208.2 min
Discarded = 0.15 cfs @ 15.76 hrs, Volume= 0.143 af
Primary = 0.07 cfs @ 15.76 hrs, Volume= 0.020 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 262.85' @ 15.76 hrs Surf.Area= 6,452 sf Storage= 5,676 cf

Plug-Flow detention time= 294.5 min calculated for 0.163 af (64% of inflow)
Center-of-Mass det. time= 176.8 min (1,074.3 - 897.5)

Volume	Invert	Avail.Storage	Storage Description
#1	262.00'	32,776 cf	**Custom Stage Data (Prismatic)** Listed below

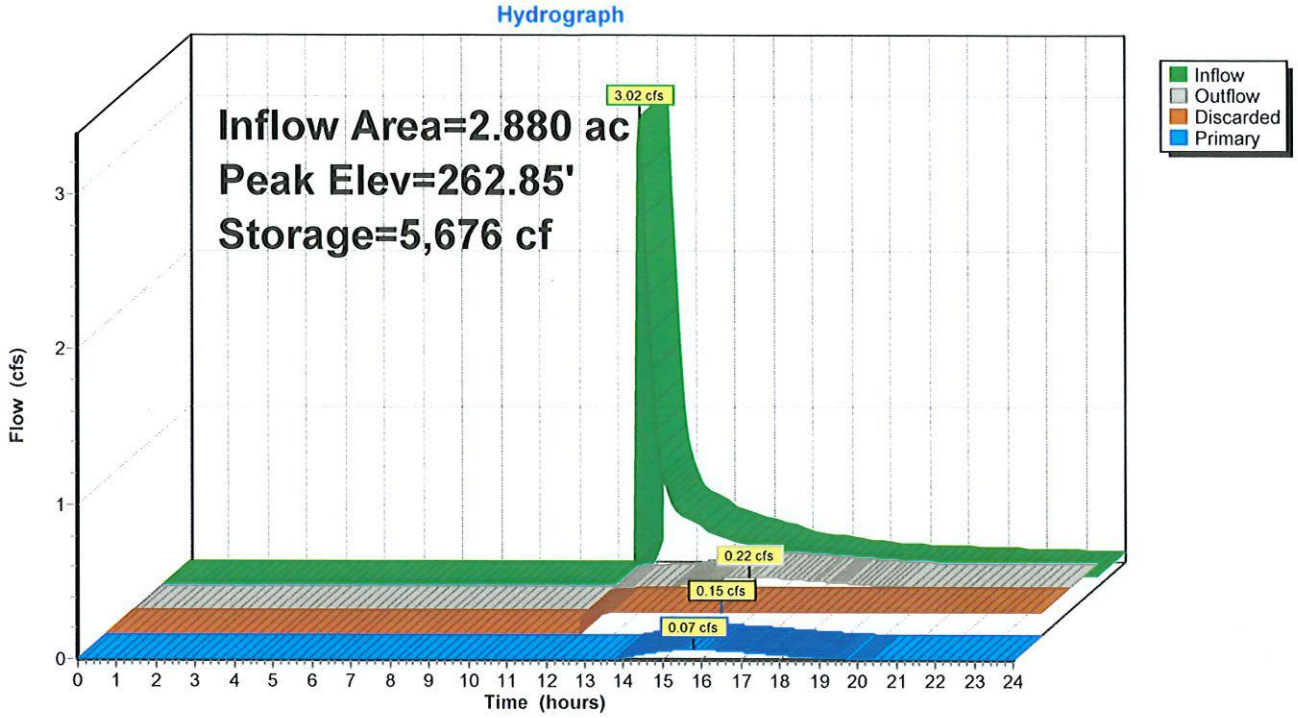
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
262.00	5,205	0	0
264.00	8,137	13,342	13,342
266.00	11,297	19,434	32,776

Device	Routing	Invert	Outlet Devices
#1	Primary	260.00'	**12.0" Round Culvert** L= 80.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.00' / 256.00' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf
#2	Discarded	262.00'	**1.008 in/hr Exfiltration over Surface area**
#3	Device 1	262.73'	**6.0" W x 1.8" H Vert. Orifice/Grate** C= 0.600
#4	Device 1	263.05'	**8.0" Vert. Orifice/Grate** C= 0.600
#5	Device 1	264.00'	**1.5' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#6	Device 1	265.00'	**48.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Primary	265.50'	**25.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.15 cfs @ 15.76 hrs HW=262.85' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.15 cfs)

Primary OutFlow Max=0.07 cfs @ 15.76 hrs HW=262.85' (Free Discharge)
├**1=Culvert** (Passes 0.07 cfs of 5.80 cfs potential flow)
│ ├**3=Orifice/Grate** (Orifice Controls 0.07 cfs @ 1.12 fps)
│ ├**4=Orifice/Grate** (Controls 0.00 cfs)
│ ├**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
│ └**6=Orifice/Grate** (Controls 0.00 cfs)
└**7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Infiltration Basin (Type I-2)



Summary for Pond 2P-1: Pre-Treatment Forebay

Inflow Area = 2.880 ac, 59.72% Impervious, Inflow Depth > 1.36" for 2 Year Storm event
Inflow = 3.58 cfs @ 12.19 hrs, Volume= 0.327 af
Outflow = 3.02 cfs @ 12.29 hrs, Volume= 0.255 af, Atten= 16%, Lag= 6.4 min
Primary = 3.02 cfs @ 12.29 hrs, Volume= 0.255 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 265.25' @ 12.29 hrs Surf.Area= 1,972 sf Storage= 3,565 cf

Plug-Flow detention time= 125.6 min calculated for 0.255 af (78% of inflow)
Center-of-Mass det. time= 42.5 min (897.5 - 855.0)

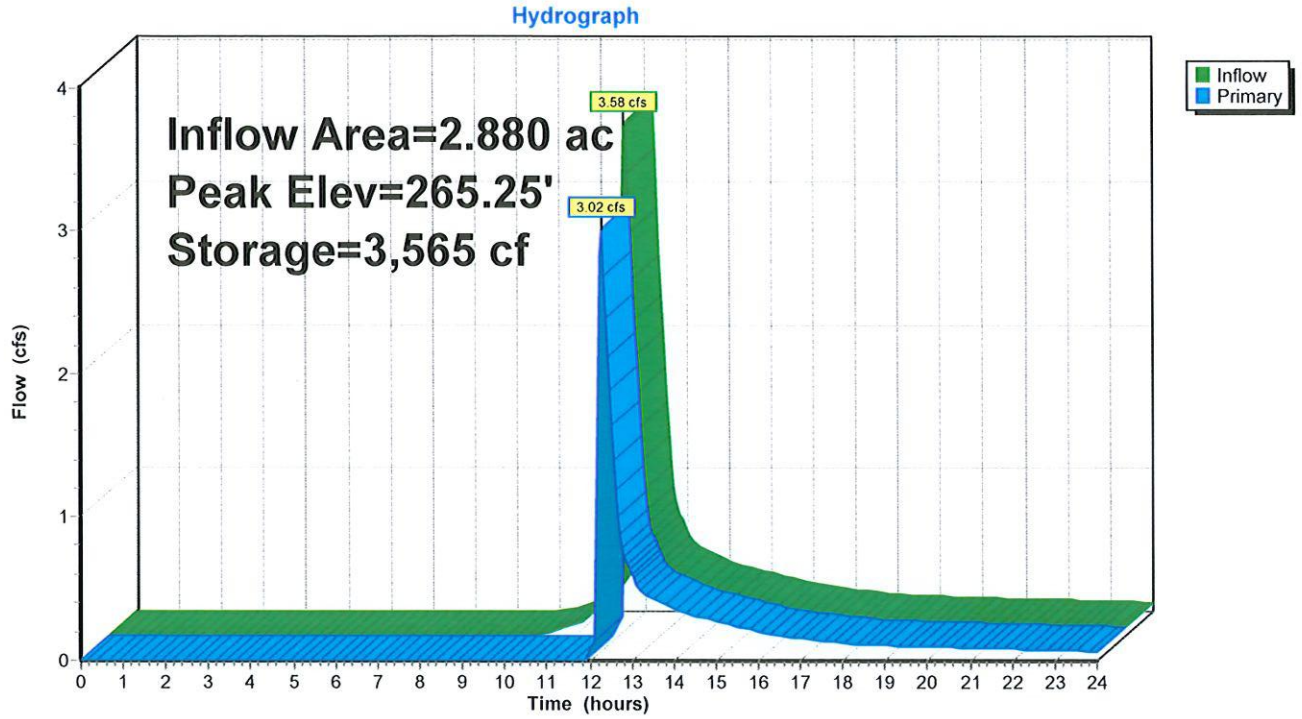
Volume	Invert	Avail.Storage	Storage Description
#1	262.00'	5,218 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
262.00	392	0	0
264.00	1,194	1,586	1,586
266.00	2,438	3,632	5,218

Device	Routing	Invert	Outlet Devices
#1	Primary	265.00'	**10.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=2.98 cfs @ 12.29 hrs HW=265.25' (Free Discharge)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 2.98 cfs @ 1.20 fps)

Pond 2P-1: Pre-Treatment Forebay



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

Subcatchment 1S: Subcatchment 1S Runoff Area=0.880 ac 10.23% Impervious Runoff Depth>0.49"
Flow Length=520' Tc=12.4 min CN=46 Runoff=0.19 cfs 0.036 af

Subcatchment 2S: Subcatchment 2S Runoff Area=2.880 ac 59.72% Impervious Runoff Depth>2.53"
Flow Length=531' Tc=12.6 min CN=76 Runoff=6.81 cfs 0.607 af

Pond 1P: Design Point 1P Inflow=0.97 cfs 0.297 af
Primary=0.97 cfs 0.297 af

Pond 2P: Infiltration Basin (Type I-2) Peak Elev=263.51' Storage=10,063 cf Inflow=6.76 cfs 0.535 af
Discarded=0.17 cfs 0.157 af Primary=0.89 cfs 0.261 af Outflow=1.07 cfs 0.418 af

Pond 2P-1: Pre-Treatment Forebay Peak Elev=265.41' Storage=3,898 cf Inflow=6.81 cfs 0.607 af
Outflow=6.76 cfs 0.535 af

Total Runoff Area = 3.760 ac Runoff Volume = 0.643 af Average Runoff Depth = 2.05"
51.86% Pervious = 1.950 ac 48.14% Impervious = 1.810 ac

Summary for Subcatchment 1S: Subcatchment 1S

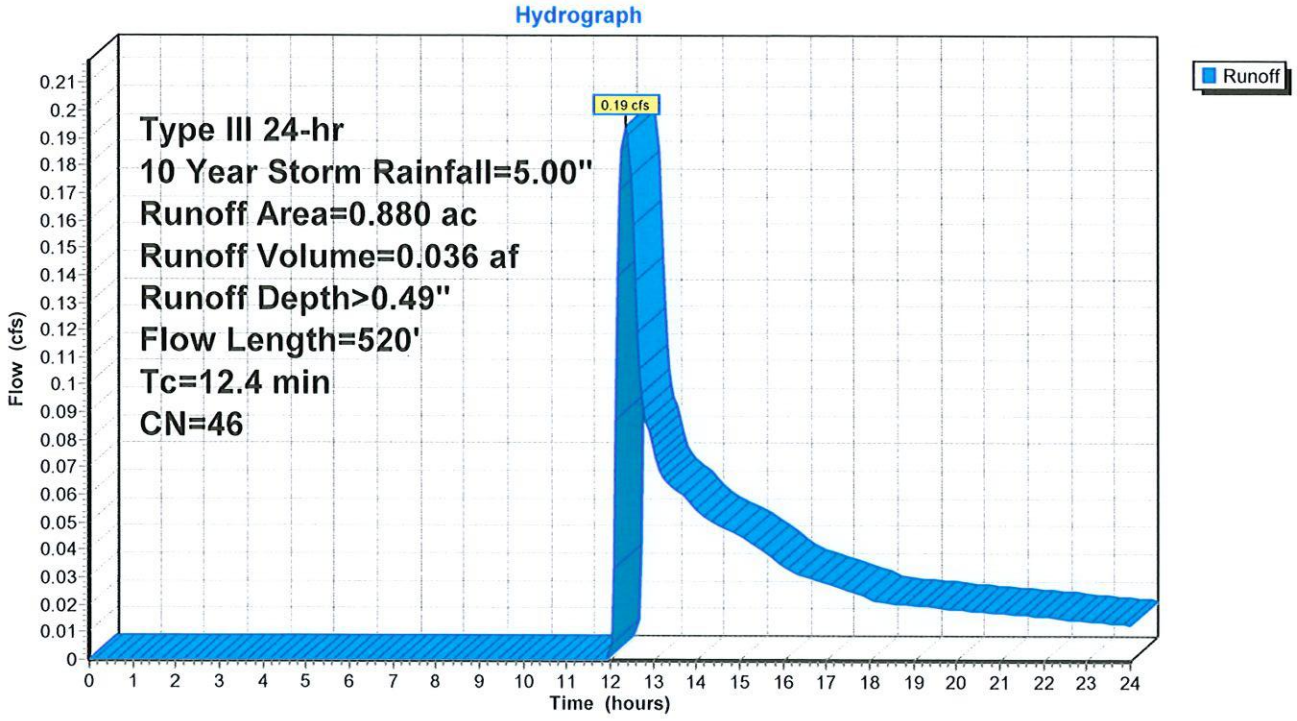
Runoff = 0.19 cfs @ 12.38 hrs, Volume= 0.036 af, Depth> 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Storm Rainfall=5.00"

Area (ac)	CN	Description
0.700	39	>75% Grass cover, Good, HSG A
0.090	98	Existing Impervious Area
0.050	35	Brush, Fair, HSG A
0.040	56	Brush, Fair, HSG B
0.880	46	Weighted Average
0.790		89.77% Pervious Area
0.090		10.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	100	0.0200	0.20		**Sheet Flow, Sheet Flow** Range n= 0.130 P2= 3.50"
4.0	420	0.0300	1.73		**Shallow Concentrated Flow, Shallow Concentrated Flow** Nearly Bare & Untilled Kv= 10.0 fps
12.4	520	Total			

Subcatchment 1S: Subcatchment 1S



Summary for Subcatchment 2S: Subcatchment 2S

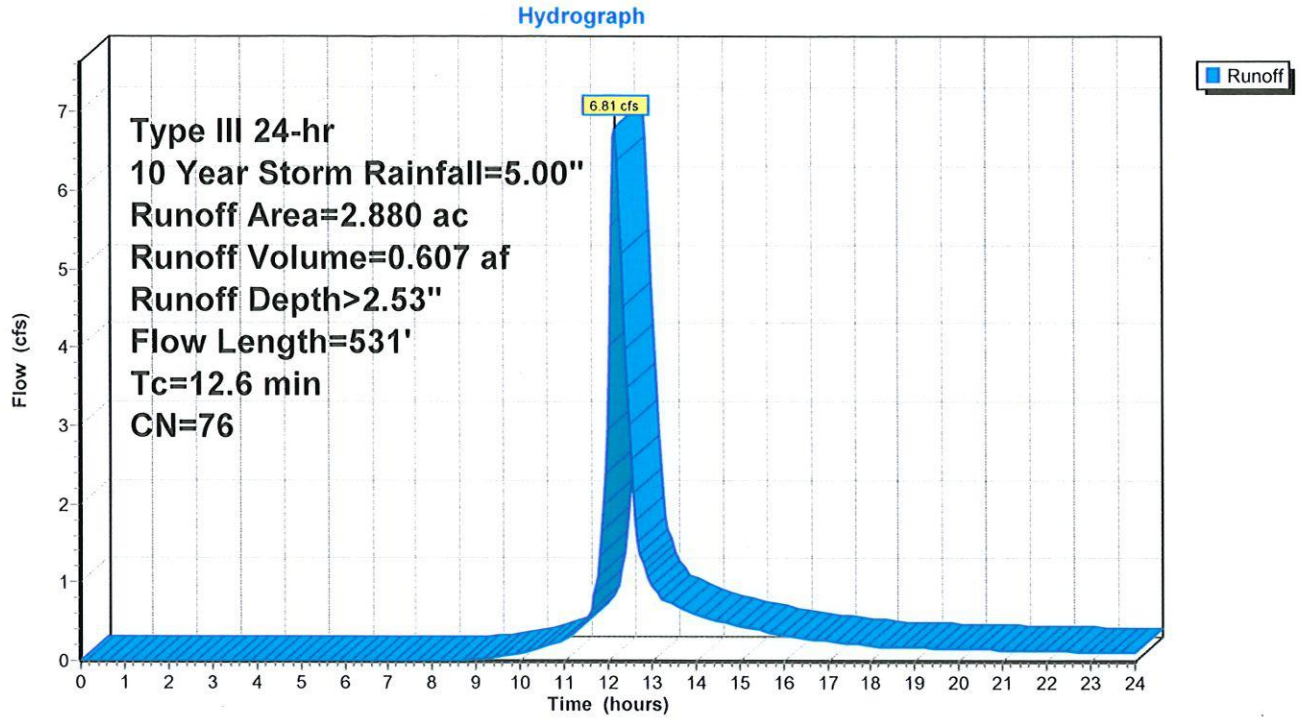
Runoff = 6.81 cfs @ 12.18 hrs, Volume= 0.607 af, Depth> 2.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Storm Rainfall=5.00"

Area (ac)	CN	Description
0.770	39	>75% Grass cover, Good, HSG A
0.240	98	Existing Impervious Area
1.480	98	Proposed Impervious Area
0.130	35	Brush, Fair, HSG A
0.260	56	Brush, Fair, HSG B
2.880	76	Weighted Average
1.160		40.28% Pervious Area
1.720		59.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	100	0.0200	0.20		**Sheet Flow, Sheet Flow** Range n= 0.130 P2= 3.50"
1.6	107	0.0120	1.10		**Shallow Concentrated Flow, Shallow Concentrated Flow** Nearly Bare & Untilled Kv= 10.0 fps
1.1	159	0.0140	2.40		**Shallow Concentrated Flow, Shallow Concentrated Flow** Paved Kv= 20.3 fps
0.7	60	0.0400	1.40		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
0.8	105	0.0190	2.07		**Shallow Concentrated Flow, Vegetated Swale** Grassed Waterway Kv= 15.0 fps
12.6	531	Total			

Subcatchment 2S: Subcatchment 2S

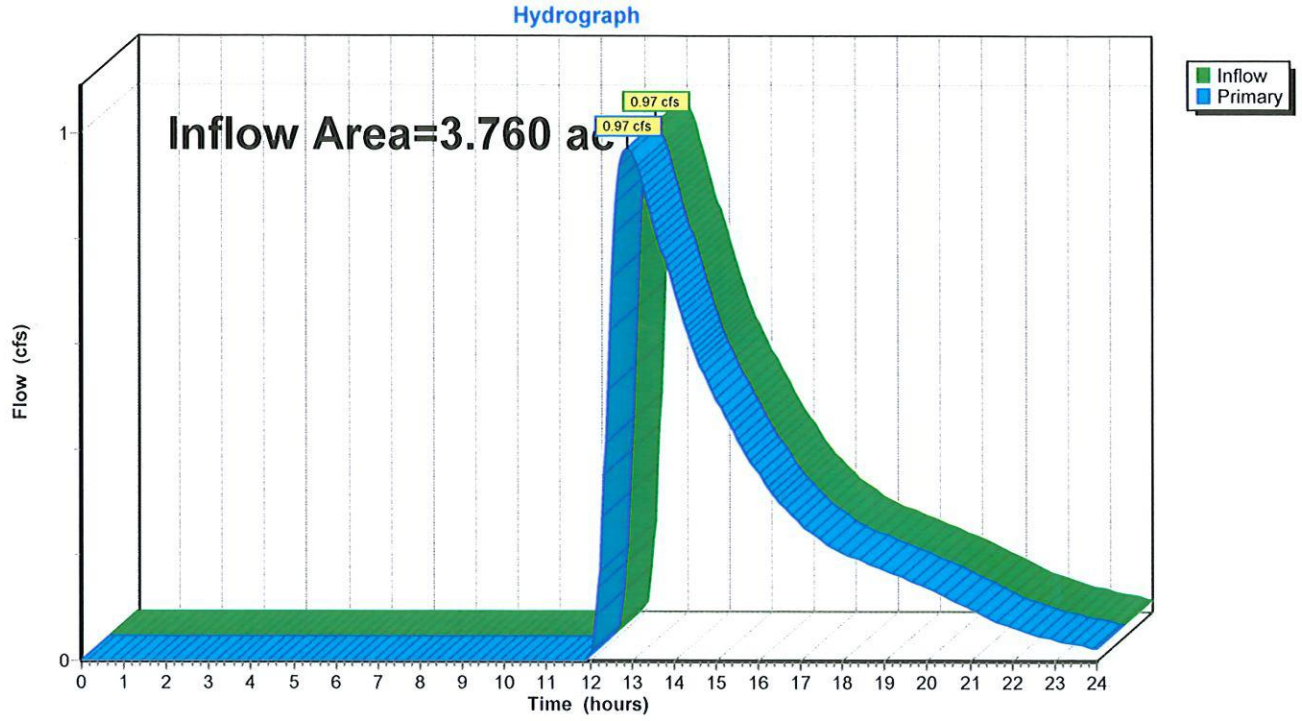


Summary for Pond 1P: Design Point 1P

Inflow Area = 3.760 ac, 48.14% Impervious, Inflow Depth > 0.95" for 10 Year Storm event
Inflow = 0.97 cfs @ 12.93 hrs, Volume= 0.297 af
Primary = 0.97 cfs @ 12.93 hrs, Volume= 0.297 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond 1P: Design Point 1P



Summary for Pond 2P: Infiltration Basin (Type I-2)

Inflow Area = 2.880 ac, 59.72% Impervious, Inflow Depth > 2.23" for 10 Year Storm event
Inflow = 6.76 cfs @ 12.20 hrs, Volume= 0.535 af
Outflow = 1.07 cfs @ 12.97 hrs, Volume= 0.418 af, Atten= 84%, Lag= 45.7 min
Discarded = 0.17 cfs @ 12.97 hrs, Volume= 0.157 af
Primary = 0.89 cfs @ 12.97 hrs, Volume= 0.261 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 263.51' @ 12.97 hrs Surf.Area= 7,416 sf Storage= 10,063 cf

Plug-Flow detention time= 200.1 min calculated for 0.418 af (78% of inflow)
Center-of-Mass det. time= 117.5 min (978.5 - 861.1)

Volume	Invert	Avail.Storage	Storage Description
#1	262.00'	32,776 cf	**Custom Stage Data (Prismatic)** Listed below

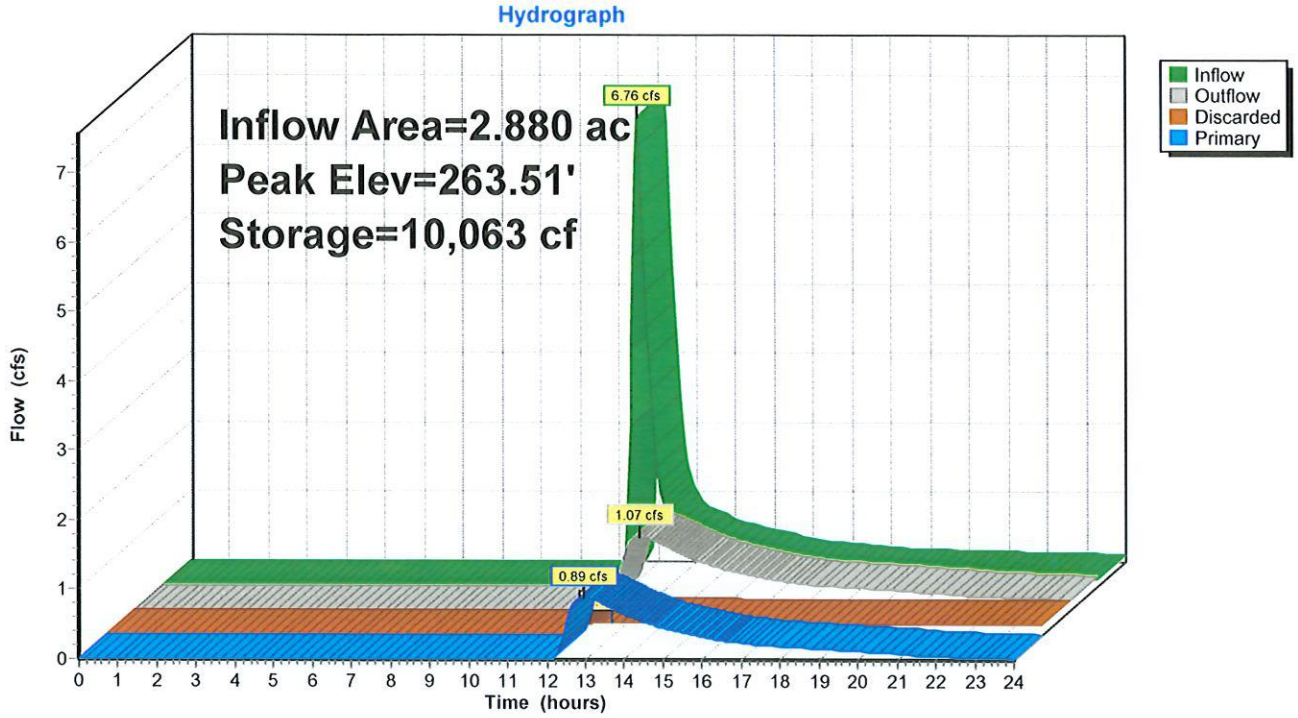
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
262.00	5,205	0	0
264.00	8,137	13,342	13,342
266.00	11,297	19,434	32,776

Device	Routing	Invert	Outlet Devices
#1	Primary	260.00'	**12.0" Round Culvert** L= 80.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.00' / 256.00' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf
#2	Discarded	262.00'	**1.008 in/hr Exfiltration over Surface area**
#3	Device 1	262.73'	**6.0" W x 1.8" H Vert. Orifice/Grate** C= 0.600
#4	Device 1	263.05'	**8.0" Vert. Orifice/Grate** C= 0.600
#5	Device 1	264.00'	**1.5' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#6	Device 1	265.00'	**48.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Primary	265.50'	**25.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.17 cfs @ 12.97 hrs HW=263.51' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.89 cfs @ 12.97 hrs HW=263.51' (Free Discharge)
└**1=Culvert** (Passes 0.89 cfs of 6.56 cfs potential flow)
  ├**3=Orifice/Grate** (Orifice Controls 0.30 cfs @ 4.04 fps)
  ├**4=Orifice/Grate** (Orifice Controls 0.59 cfs @ 2.30 fps)
  ├**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**6=Orifice/Grate** (Controls 0.00 cfs)
└**7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Infiltration Basin (Type I-2)



Summary for Pond 2P-1: Pre-Treatment Forebay

Inflow Area = 2.880 ac, 59.72% Impervious, Inflow Depth > 2.53" for 10 Year Storm event
Inflow = 6.81 cfs @ 12.18 hrs, Volume= 0.607 af
Outflow = 6.76 cfs @ 12.20 hrs, Volume= 0.535 af, Atten= 1%, Lag= 1.6 min
Primary = 6.76 cfs @ 12.20 hrs, Volume= 0.535 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 265.41' @ 12.21 hrs Surf.Area= 2,074 sf Storage= 3,898 cf

Plug-Flow detention time= 77.9 min calculated for 0.534 af (88% of inflow)
Center-of-Mass det. time= 24.1 min (861.1 - 837.0)

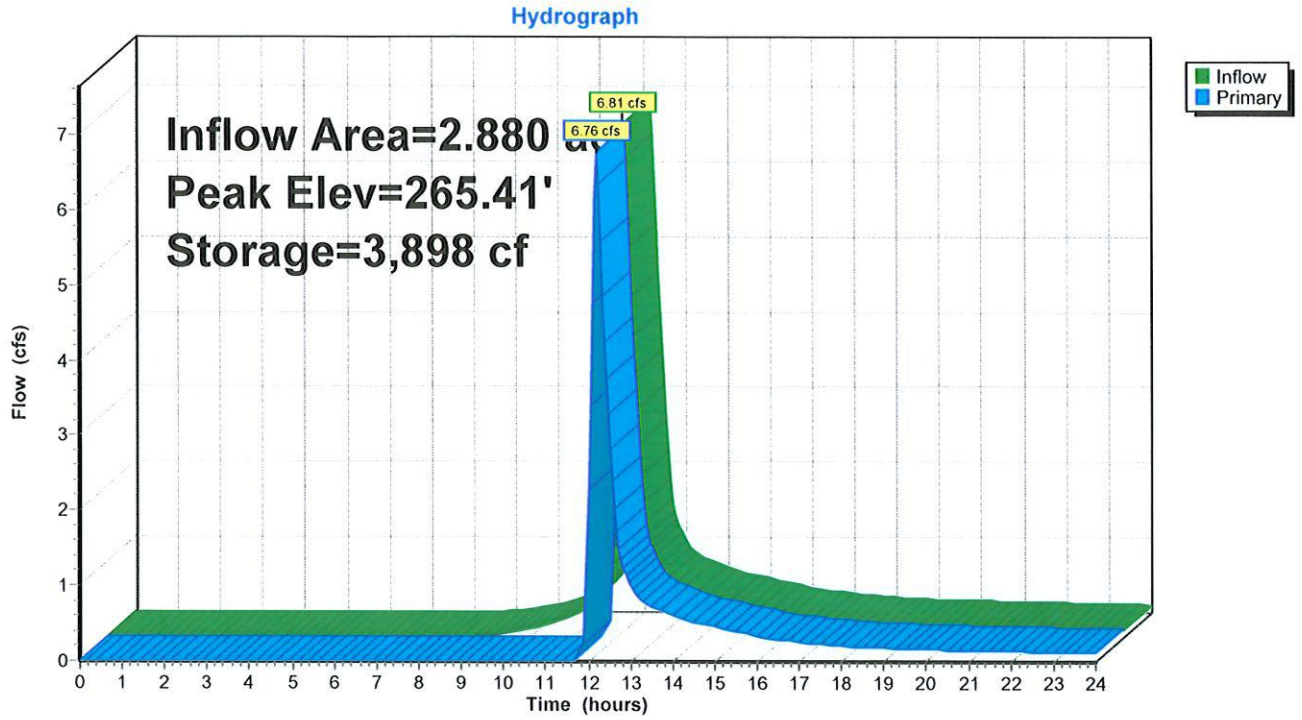
Volume	Invert	Avail.Storage	Storage Description
#1	262.00'	5,218 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
262.00	392	0	0
264.00	1,194	1,586	1,586
266.00	2,438	3,632	5,218

Device	Routing	Invert	Outlet Devices
#1	Primary	265.00'	**10.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=6.70 cfs @ 12.20 hrs HW=265.41' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 6.70 cfs @ 1.62 fps)

Pond 2P-1: Pre-Treatment Forebay



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

Subcatchment 1S: Subcatchment 1S Runoff Area=0.880 ac 10.23% Impervious Runoff Depth>0.86"
Flow Length=520' Tc=12.4 min CN=46 Runoff=0.46 cfs 0.063 af

Subcatchment 2S: Subcatchment 2S Runoff Area=2.880 ac 59.72% Impervious Runoff Depth>3.37"
Flow Length=531' Tc=12.6 min CN=76 Runoff=9.11 cfs 0.809 af

Pond 1P: Design Point 1P Inflow=1.95 cfs 0.512 af
Primary=1.95 cfs 0.512 af

Pond 2P: Infiltration Basin (Type I-2) Peak Elev=264.02' Storage=13,514 cf Inflow=9.05 cfs 0.737 af
Discarded=0.19 cfs 0.164 af Primary=1.75 cfs 0.448 af Outflow=1.94 cfs 0.613 af

Pond 2P-1: Pre-Treatment Forebay Peak Elev=265.49' Storage=4,065 cf Inflow=9.11 cfs 0.809 af
Outflow=9.05 cfs 0.737 af

Total Runoff Area = 3.760 ac Runoff Volume = 0.873 af Average Runoff Depth = 2.79"
51.86% Pervious = 1.950 ac 48.14% Impervious = 1.810 ac

Summary for Subcatchment 1S: Subcatchment 1S

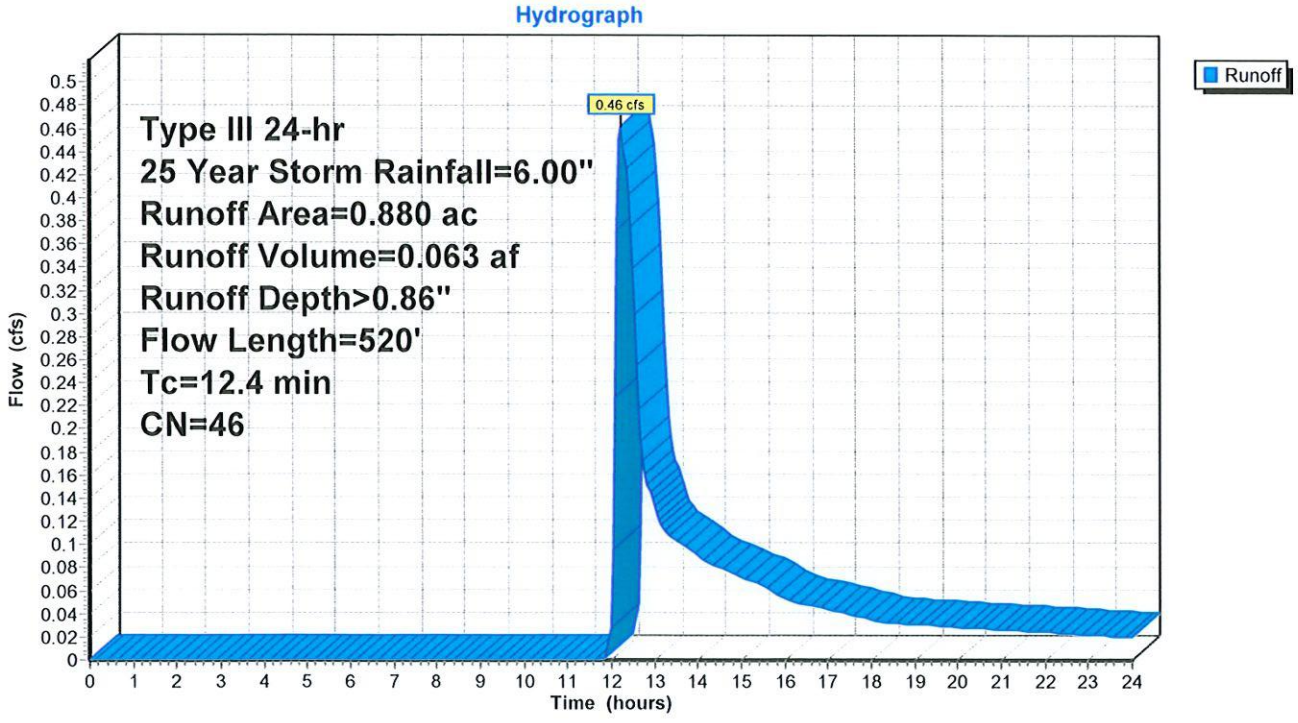
Runoff = 0.46 cfs @ 12.24 hrs, Volume= 0.063 af, Depth> 0.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Storm Rainfall=6.00"

Area (ac)	CN	Description
0.700	39	>75% Grass cover, Good, HSG A
0.090	98	Existing Impervious Area
0.050	35	Brush, Fair, HSG A
0.040	56	Brush, Fair, HSG B
0.880	46	Weighted Average
0.790		89.77% Pervious Area
0.090		10.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	100	0.0200	0.20		**Sheet Flow, Sheet Flow** Range n= 0.130 P2= 3.50"
4.0	420	0.0300	1.73		**Shallow Concentrated Flow, Shallow Concentrated Flow** Nearly Bare & Untilled Kv= 10.0 fps
12.4	520	Total			

Subcatchment 1S: Subcatchment 1S



Summary for Subcatchment 2S: Subcatchment 2S

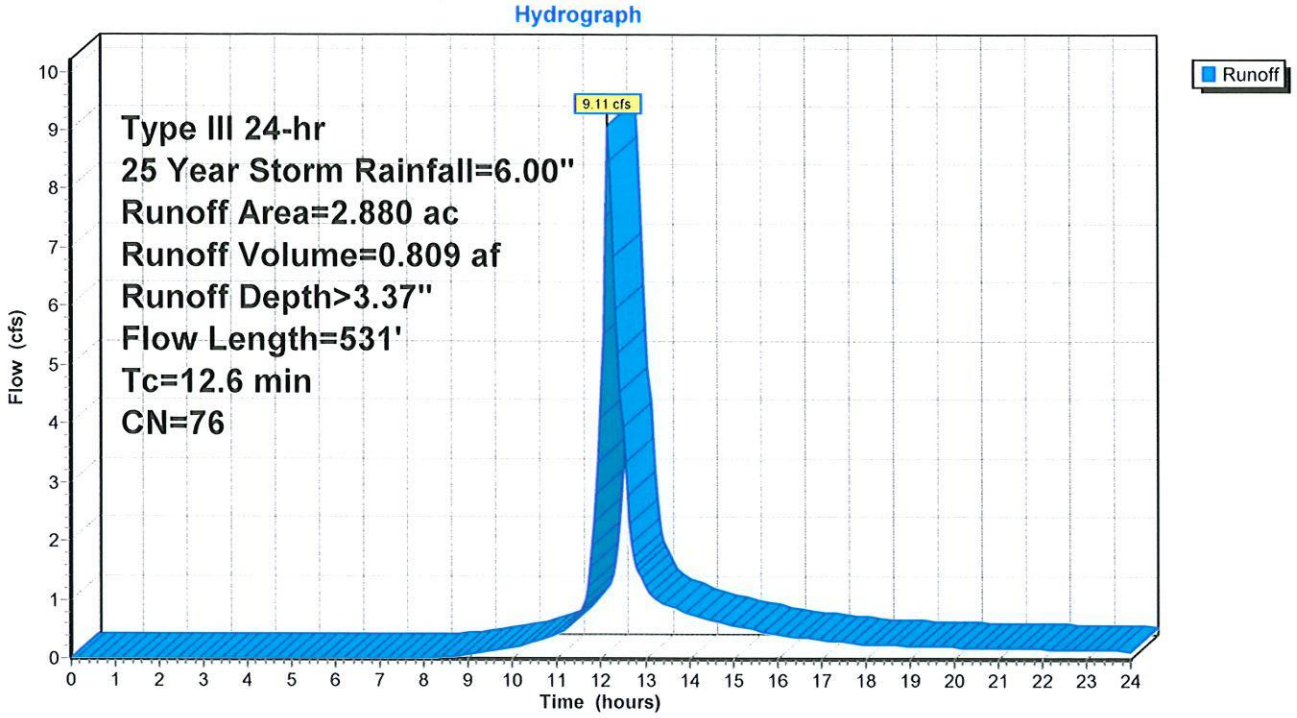
Runoff = 9.11 cfs @ 12.18 hrs, Volume= 0.809 af, Depth> 3.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Storm Rainfall=6.00"

Area (ac)	CN	Description
0.770	39	>75% Grass cover, Good, HSG A
0.240	98	Existing Impervious Area
1.480	98	Proposed Impervious Area
0.130	35	Brush, Fair, HSG A
0.260	56	Brush, Fair, HSG B
2.880	76	Weighted Average
1.160		40.28% Pervious Area
1.720		59.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	100	0.0200	0.20		**Sheet Flow, Sheet Flow** Range n= 0.130 P2= 3.50"
1.6	107	0.0120	1.10		**Shallow Concentrated Flow, Shallow Concentrated Flow** Nearly Bare & Untilled Kv= 10.0 fps
1.1	159	0.0140	2.40		**Shallow Concentrated Flow, Shallow Concentrated Flow** Paved Kv= 20.3 fps
0.7	60	0.0400	1.40		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
0.8	105	0.0190	2.07		**Shallow Concentrated Flow, Vegetated Swale** Grassed Waterway Kv= 15.0 fps
12.6	531	Total			

Subcatchment 2S: Subcatchment 2S

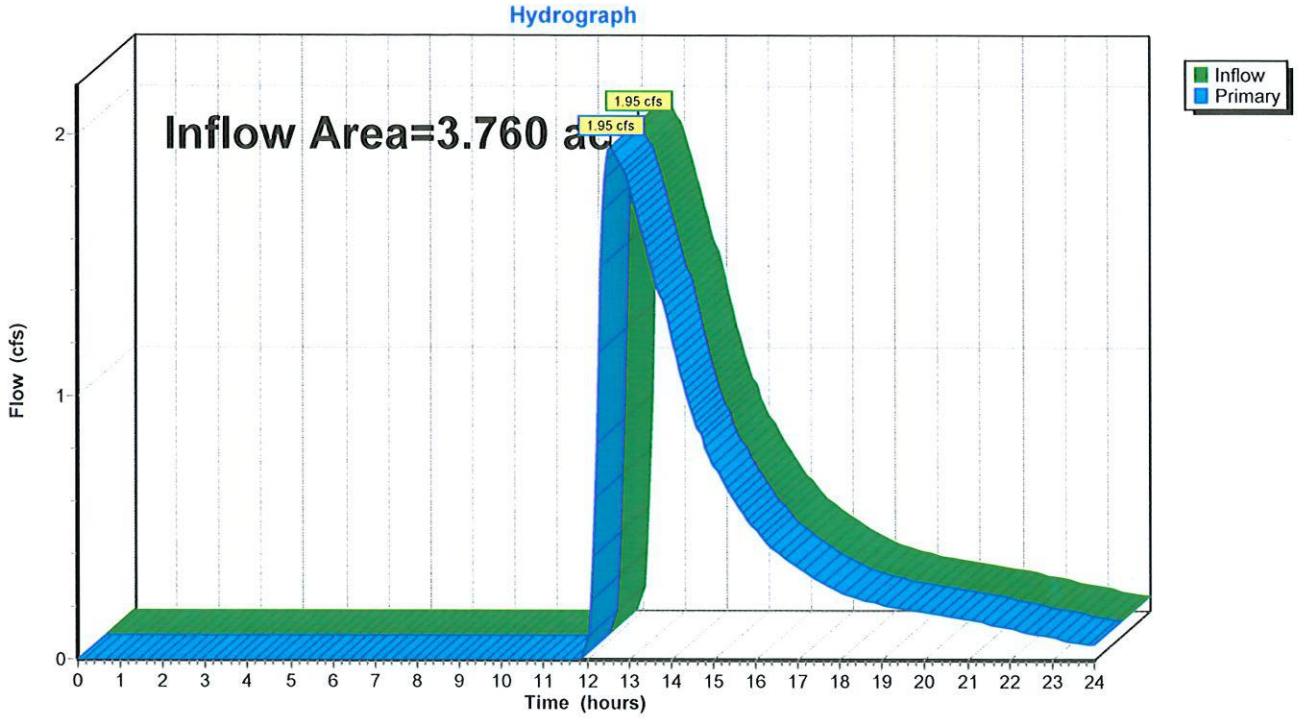


Summary for Pond 1P: Design Point 1P

Inflow Area = 3.760 ac, 48.14% Impervious, Inflow Depth > 1.63" for 25 Year Storm event
Inflow = 1.95 cfs @ 12.61 hrs, Volume= 0.512 af
Primary = 1.95 cfs @ 12.61 hrs, Volume= 0.512 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond 1P: Design Point 1P



Summary for Pond 2P: Infiltration Basin (Type I-2)

Inflow Area = 2.880 ac, 59.72% Impervious, Inflow Depth > 3.07" for 25 Year Storm event
Inflow = 9.05 cfs @ 12.20 hrs, Volume= 0.737 af
Outflow = 1.94 cfs @ 12.75 hrs, Volume= 0.613 af, Atten= 79%, Lag= 32.9 min
Discarded = 0.19 cfs @ 12.75 hrs, Volume= 0.164 af
Primary = 1.75 cfs @ 12.75 hrs, Volume= 0.448 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 264.02' @ 12.75 hrs Surf.Area= 8,165 sf Storage= 13,514 cf

Plug-Flow detention time= 164.1 min calculated for 0.611 af (83% of inflow)
Center-of-Mass det. time= 95.6 min (944.7 - 849.1)

Volume	Invert	Avail.Storage	Storage Description
#1	262.00'	32,776 cf	**Custom Stage Data (Prismatic)** Listed below

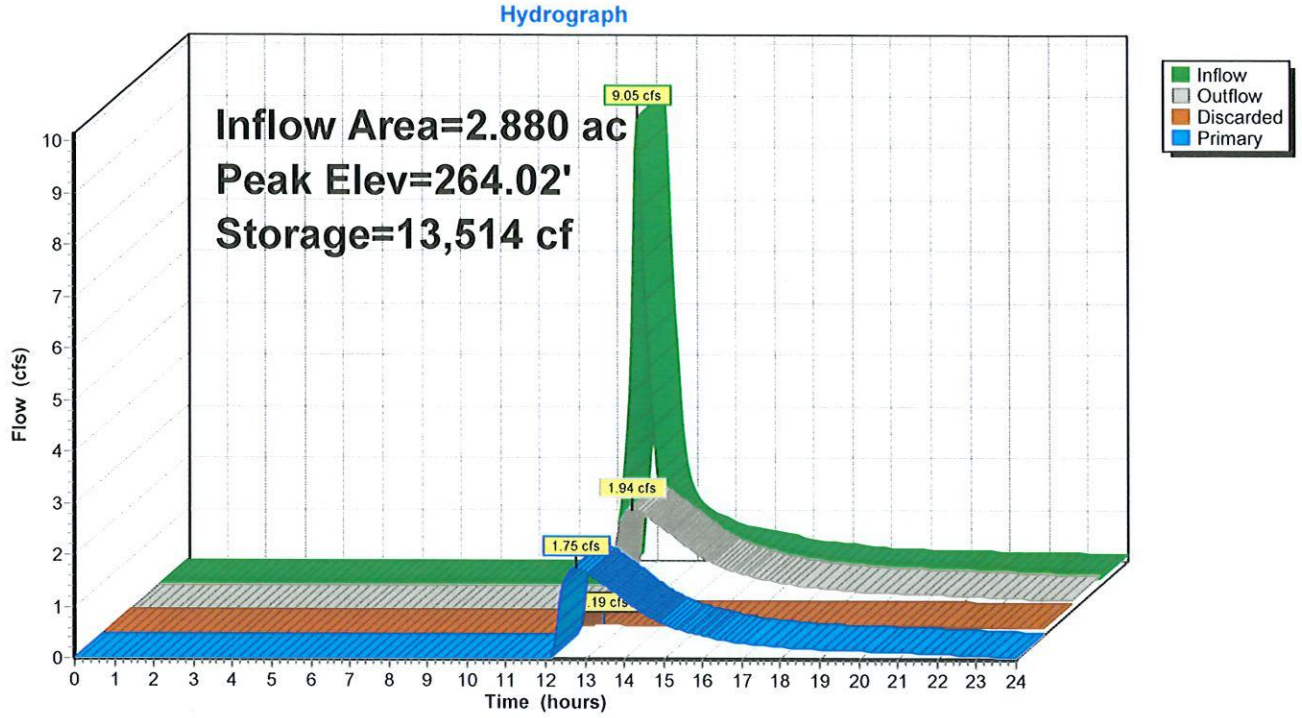
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
262.00	5,205	0	0
264.00	8,137	13,342	13,342
266.00	11,297	19,434	32,776

Device	Routing	Invert	Outlet Devices
#1	Primary	260.00'	**12.0" Round Culvert** L= 80.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.00' / 256.00' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf
#2	Discarded	262.00'	**1.008 in/hr Exfiltration over Surface area**
#3	Device 1	262.73'	**6.0" W x 1.8" H Vert. Orifice/Grate** C= 0.600
#4	Device 1	263.05'	**8.0" Vert. Orifice/Grate** C= 0.600
#5	Device 1	264.00'	**1.5' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#6	Device 1	265.00'	**48.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Primary	265.50'	**25.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.19 cfs @ 12.75 hrs HW=264.02' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.19 cfs)

Primary OutFlow Max=1.75 cfs @ 12.75 hrs HW=264.02' (Free Discharge)
└**1=Culvert** (Passes 1.75 cfs of 7.09 cfs potential flow)
  └**3=Orifice/Grate** (Orifice Controls 0.40 cfs @ 5.30 fps)
  └**4=Orifice/Grate** (Orifice Controls 1.34 cfs @ 3.83 fps)
  └**5=Broad-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.37 fps)
  └**6=Orifice/Grate** (Controls 0.00 cfs)
└**7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Infiltration Basin (Type I-2)



Summary for Pond 2P-1: Pre-Treatment Forebay

Inflow Area = 2.880 ac, 59.72% Impervious, Inflow Depth > 3.37" for 25 Year Storm event
Inflow = 9.11 cfs @ 12.18 hrs, Volume= 0.809 af
Outflow = 9.05 cfs @ 12.20 hrs, Volume= 0.737 af, Atten= 1%, Lag= 1.5 min
Primary = 9.05 cfs @ 12.20 hrs, Volume= 0.737 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 265.49' @ 12.20 hrs Surf.Area= 2,124 sf Storage= 4,065 cf

Plug-Flow detention time= 63.5 min calculated for 0.736 af (91% of inflow)
Center-of-Mass det. time= 20.3 min (849.1 - 828.8)

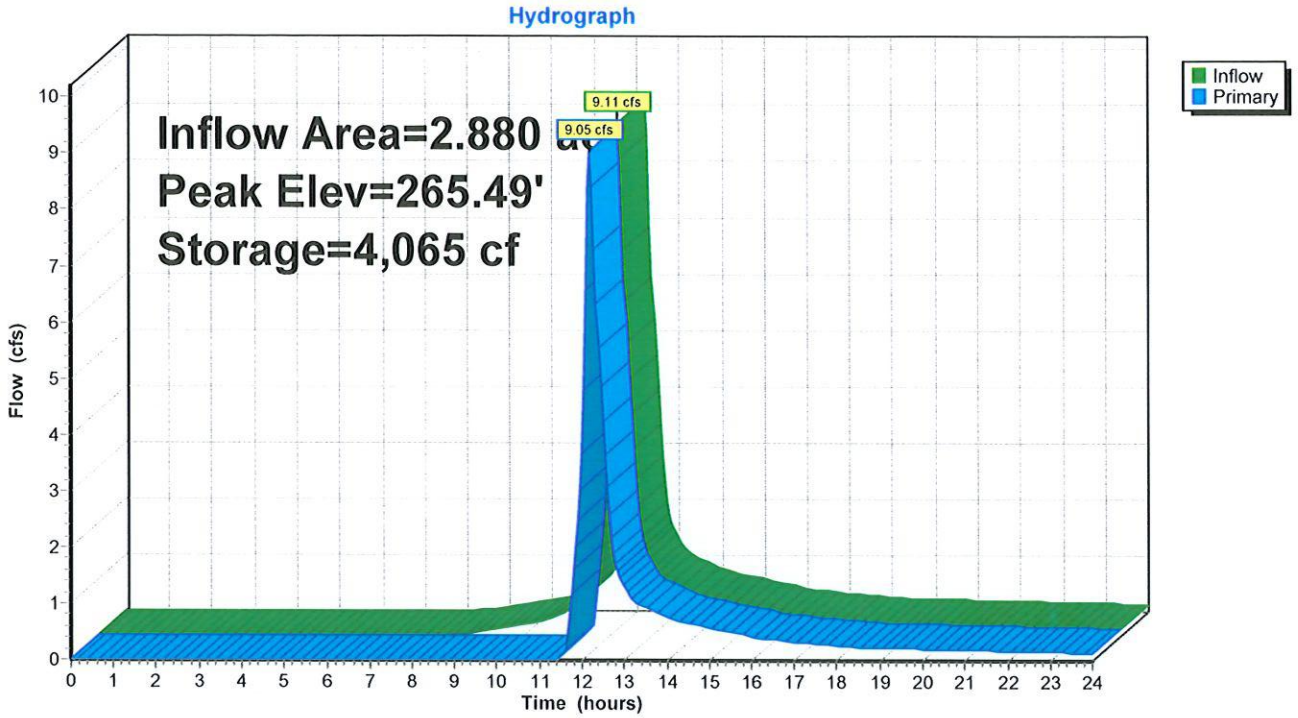
Volume	Invert	Avail.Storage	Storage Description
#1	262.00'	5,218 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
262.00	392	0	0
264.00	1,194	1,586	1,586
266.00	2,438	3,632	5,218

Device	Routing	Invert	Outlet Devices
#1	Primary	265.00'	**10.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=9.04 cfs @ 12.20 hrs HW=265.49' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 9.04 cfs @ 1.83 fps)

Pond 2P-1: Pre-Treatment Forebay



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

Subcatchment 1S: Subcatchment 1S Runoff Area=0.880 ac 10.23% Impervious Runoff Depth>2.40"
Flow Length=520' Tc=12.4 min CN=46 Runoff=1.79 cfs 0.176 af

Subcatchment 2S: Subcatchment 2S Runoff Area=2.880 ac 59.72% Impervious Runoff Depth>6.06"
Flow Length=531' Tc=12.6 min CN=76 Runoff=16.33 cfs 1.455 af

Pond 1P: Design Point 1P Inflow=7.97 cfs 1.221 af
Primary=7.97 cfs 1.221 af

Pond 2P: Infiltration Basin (Type I-2) Peak Elev=264.92' Storage=22,248 cf Inflow=16.12 cfs 1.382 af
Discarded=0.22 cfs 0.188 af Primary=6.96 cfs 1.045 af Outflow=7.19 cfs 1.234 af

Pond 2P-1: Pre-Treatment Forebay Peak Elev=265.71' Storage=4,539 cf Inflow=16.33 cfs 1.455 af
Outflow=16.12 cfs 1.382 af

Total Runoff Area = 3.760 ac Runoff Volume = 1.631 af Average Runoff Depth = 5.21"
51.86% Pervious = 1.950 ac 48.14% Impervious = 1.810 ac

Summary for Subcatchment 1S: Subcatchment 1S

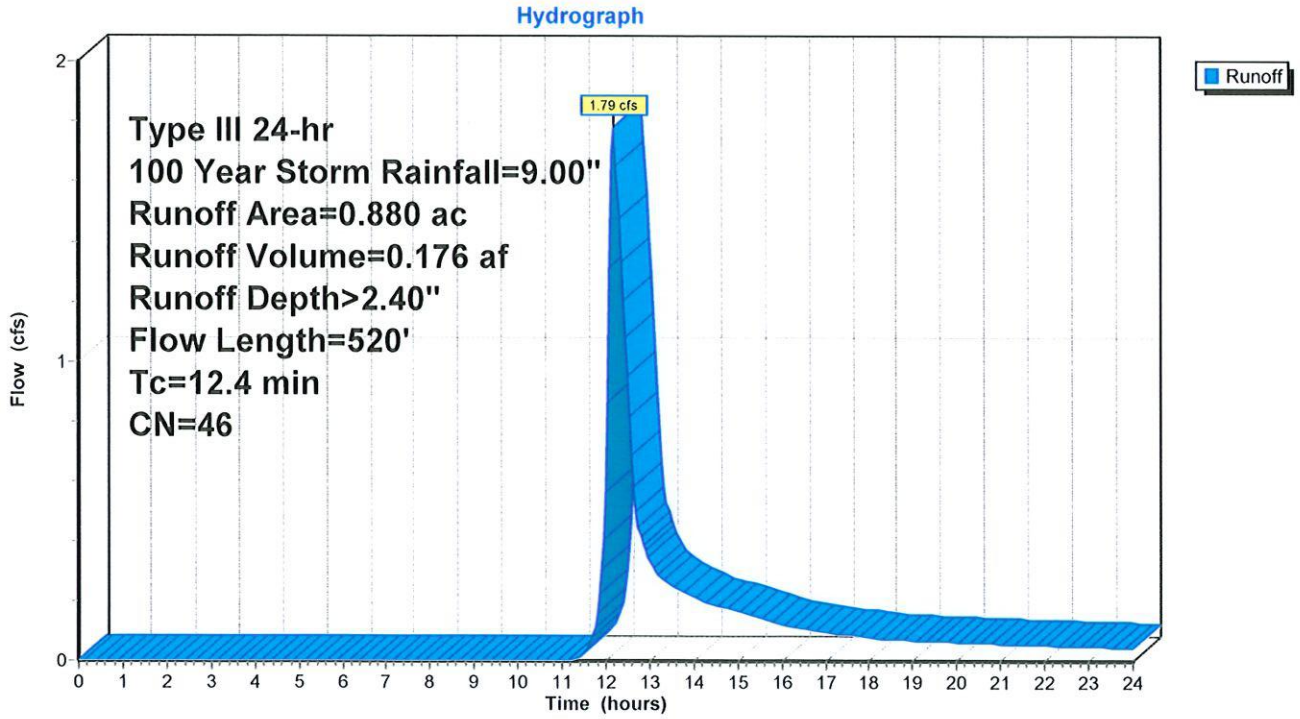
Runoff = 1.79 cfs @ 12.20 hrs, Volume= 0.176 af, Depth> 2.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Storm Rainfall=9.00"

Area (ac)	CN	Description
0.700	39	>75% Grass cover, Good, HSG A
0.090	98	Existing Impervious Area
0.050	35	Brush, Fair, HSG A
0.040	56	Brush, Fair, HSG B
0.880	46	Weighted Average
0.790		89.77% Pervious Area
0.090		10.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	100	0.0200	0.20		**Sheet Flow, Sheet Flow** Range n= 0.130 P2= 3.50"
4.0	420	0.0300	1.73		**Shallow Concentrated Flow, Shallow Concentrated Flow** Nearly Bare & Untilled Kv= 10.0 fps
12.4	520	Total			

Subcatchment 1S: Subcatchment 1S



Summary for Subcatchment 2S: Subcatchment 2S

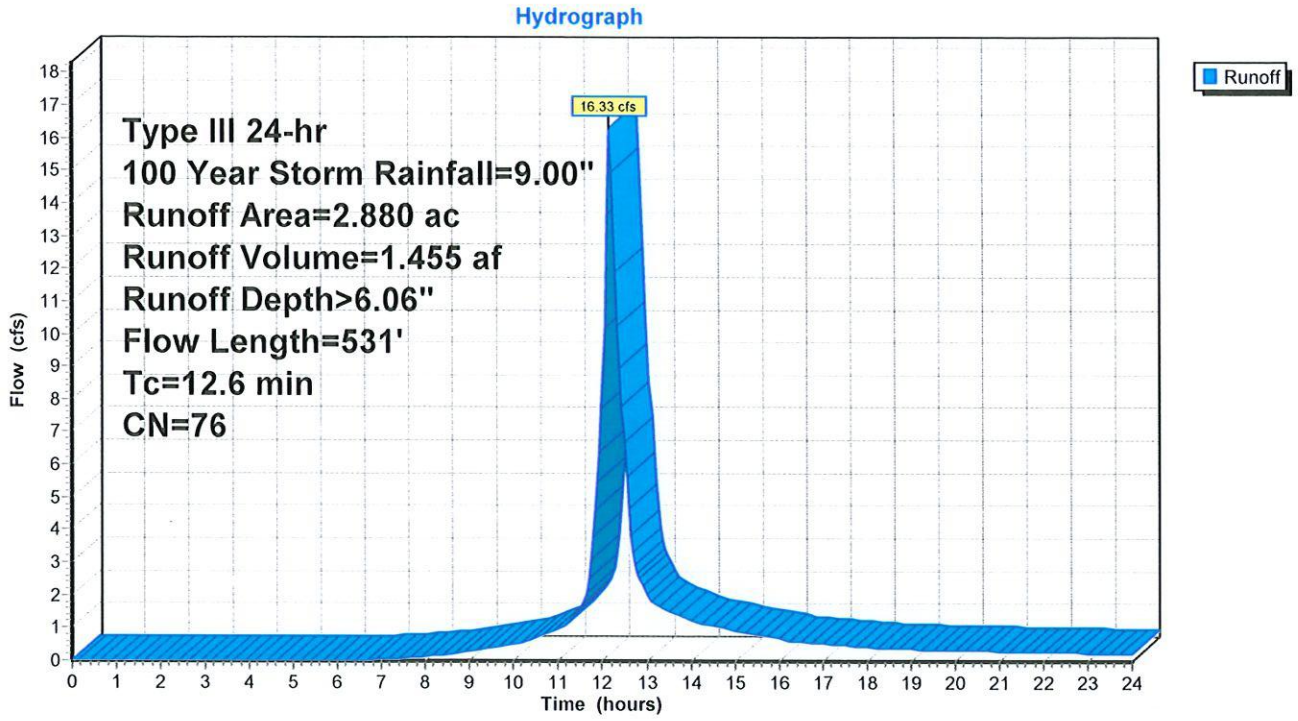
Runoff = 16.33 cfs @ 12.17 hrs, Volume= 1.455 af, Depth> 6.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Storm Rainfall=9.00"

Area (ac)	CN	Description
0.770	39	>75% Grass cover, Good, HSG A
0.240	98	Existing Impervious Area
1.480	98	Proposed Impervious Area
0.130	35	Brush, Fair, HSG A
0.260	56	Brush, Fair, HSG B
2.880	76	Weighted Average
1.160		40.28% Pervious Area
1.720		59.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	100	0.0200	0.20		**Sheet Flow, Sheet Flow** Range n= 0.130 P2= 3.50"
1.6	107	0.0120	1.10		**Shallow Concentrated Flow, Shallow Concentrated Flow** Nearly Bare & Untilled Kv= 10.0 fps
1.1	159	0.0140	2.40		**Shallow Concentrated Flow, Shallow Concentrated Flow** Paved Kv= 20.3 fps
0.7	60	0.0400	1.40		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
0.8	105	0.0190	2.07		**Shallow Concentrated Flow, Vegetated Swale** Grassed Waterway Kv= 15.0 fps
12.6	531	Total			

Subcatchment 2S: Subcatchment 2S

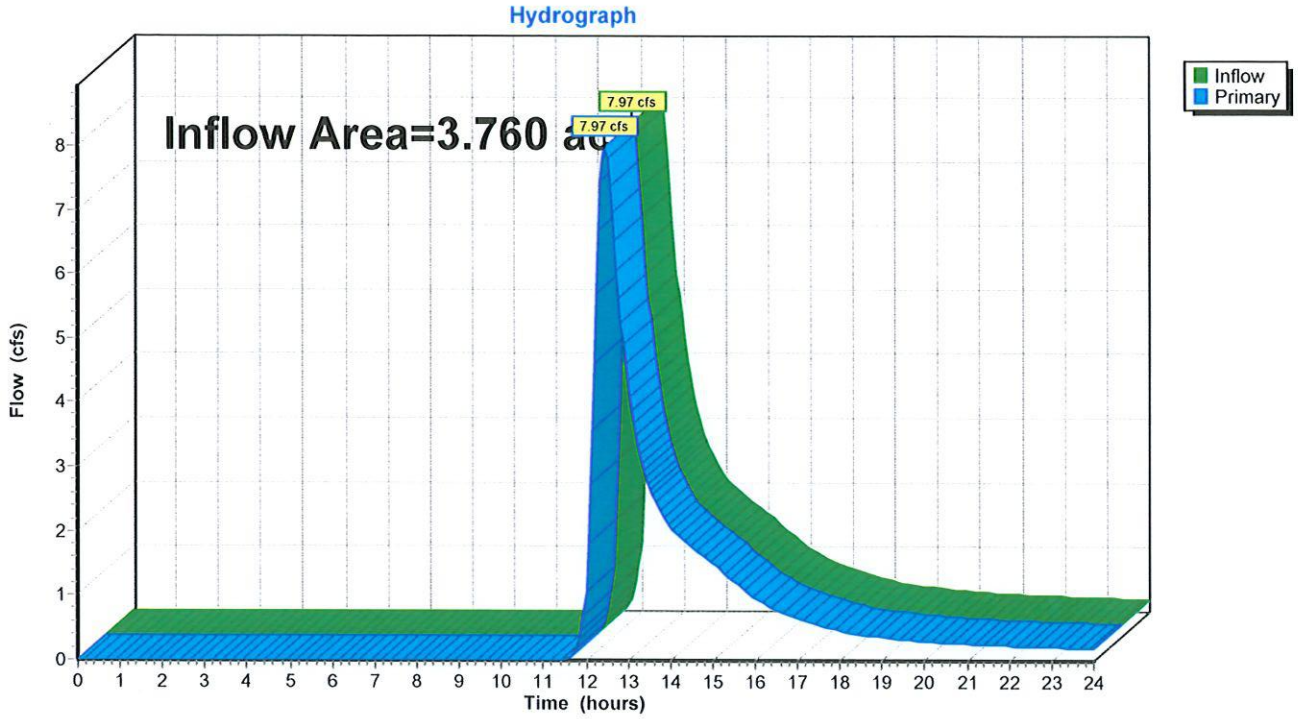


Summary for Pond 1P: Design Point 1P

Inflow Area = 3.760 ac, 48.14% Impervious, Inflow Depth > 3.90" for 100 Year Storm event
Inflow = 7.97 cfs @ 12.46 hrs, Volume= 1.221 af
Primary = 7.97 cfs @ 12.46 hrs, Volume= 1.221 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond 1P: Design Point 1P



Summary for Pond 2P: Infiltration Basin (Type I-2)

Inflow Area = 2.880 ac, 59.72% Impervious, Inflow Depth > 5.76" for 100 Year Storm event
Inflow = 16.12 cfs @ 12.20 hrs, Volume= 1.382 af
Outflow = 7.19 cfs @ 12.50 hrs, Volume= 1.234 af, Atten= 55%, Lag= 18.3 min
Discarded = 0.22 cfs @ 12.50 hrs, Volume= 0.188 af
Primary = 6.96 cfs @ 12.50 hrs, Volume= 1.045 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 264.92' @ 12.50 hrs Surf.Area= 9,585 sf Storage= 22,248 cf

Plug-Flow detention time= 114.8 min calculated for 1.231 af (89% of inflow)
Center-of-Mass det. time= 65.4 min (893.0 - 827.6)

Volume	Invert	Avail.Storage	Storage Description
#1	262.00'	32,776 cf	**Custom Stage Data (Prismatic)** Listed below

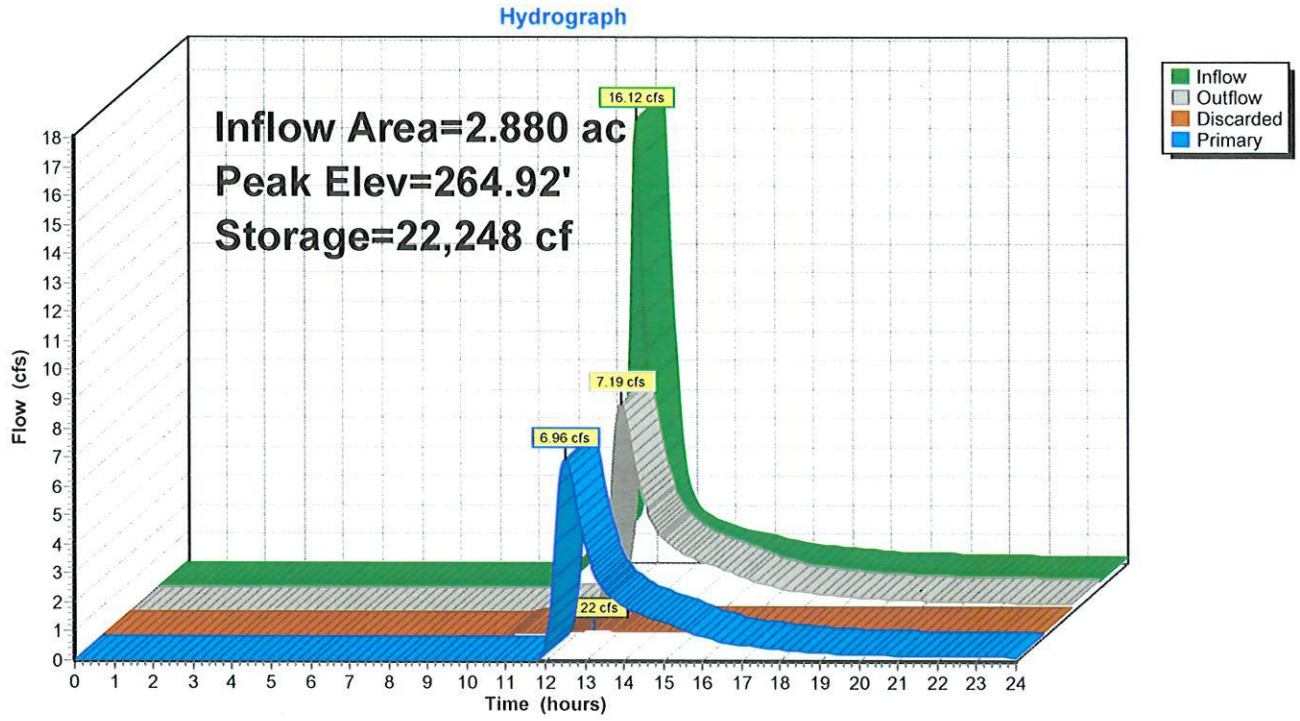
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
262.00	5,205	0	0
264.00	8,137	13,342	13,342
266.00	11,297	19,434	32,776

Device	Routing	Invert	Outlet Devices
#1	Primary	260.00'	**12.0" Round Culvert** L= 80.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.00' / 256.00' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf
#2	Discarded	262.00'	**1.008 in/hr Exfiltration over Surface area**
#3	Device 1	262.73'	**6.0" W x 1.8" H Vert. Orifice/Grate** C= 0.600
#4	Device 1	263.05'	**8.0" Vert. Orifice/Grate** C= 0.600
#5	Device 1	264.00'	**1.5' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#6	Device 1	265.00'	**48.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Primary	265.50'	**25.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.22 cfs @ 12.50 hrs HW=264.92' (Free Discharge)
└─**2=Exfiltration** (Exfiltration Controls 0.22 cfs)

Primary OutFlow Max=6.96 cfs @ 12.50 hrs HW=264.92' (Free Discharge)
├─**1=Culvert** (Passes 6.96 cfs of 7.95 cfs potential flow)
│ ├─**3=Orifice/Grate** (Orifice Controls 0.52 cfs @ 7.00 fps)
│ ├─**4=Orifice/Grate** (Orifice Controls 2.08 cfs @ 5.96 fps)
│ ├─**5=Broad-Crested Rectangular Weir** (Weir Controls 4.36 cfs @ 3.17 fps)
│ └─**6=Orifice/Grate** (Controls 0.00 cfs)
└─**7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Infiltration Basin (Type I-2)



Summary for Pond 2P-1: Pre-Treatment Forebay

Inflow Area = 2.880 ac, 59.72% Impervious, Inflow Depth > 6.06" for 100 Year Storm event
Inflow = 16.33 cfs @ 12.17 hrs, Volume= 1.455 af
Outflow = 16.12 cfs @ 12.20 hrs, Volume= 1.382 af, Atten= 1%, Lag= 1.4 min
Primary = 16.12 cfs @ 12.20 hrs, Volume= 1.382 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 265.71' @ 12.20 hrs Surf.Area= 2,258 sf Storage= 4,539 cf

Plug-Flow detention time= 42.2 min calculated for 1.380 af (95% of inflow)
Center-of-Mass det. time= 15.4 min (827.6 - 812.1)

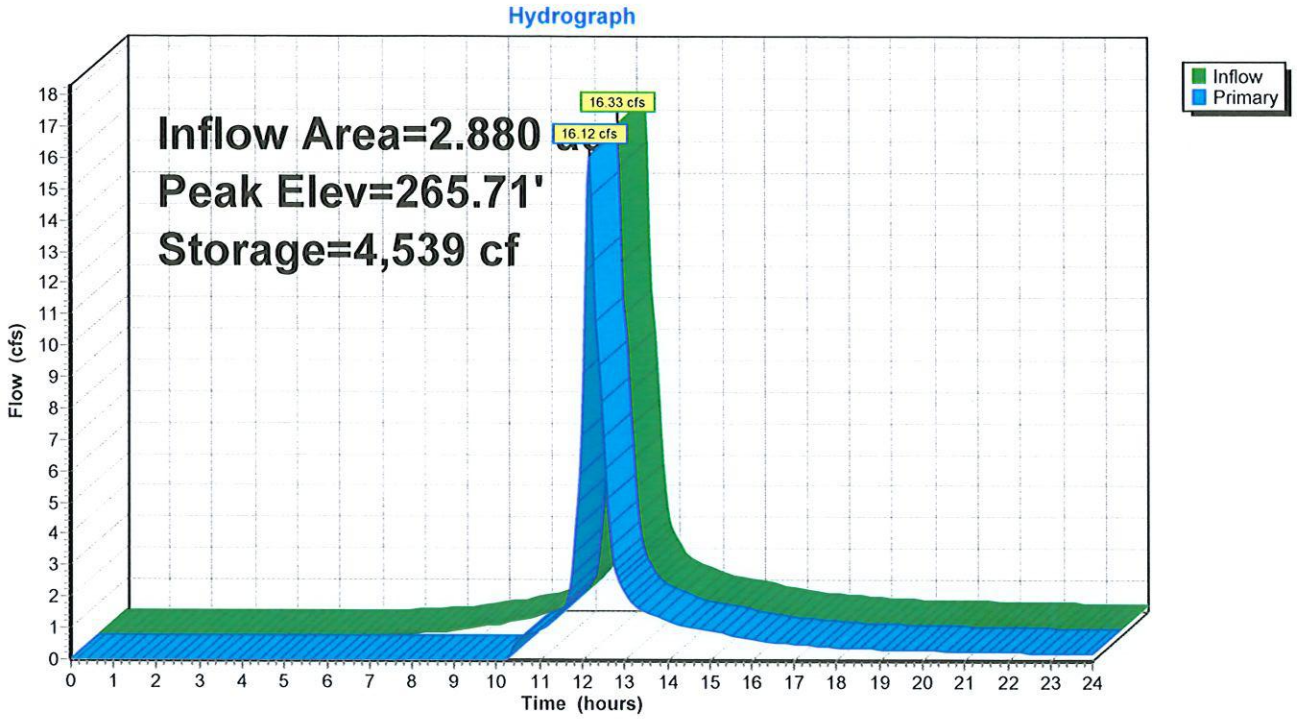
Volume	Invert	Avail.Storage	Storage Description
#1	262.00'	5,218 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
262.00	392	0	0
264.00	1,194	1,586	1,586
266.00	2,438	3,632	5,218

Device	Routing	Invert	Outlet Devices
#1	Primary	265.00'	**10.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=16.03 cfs @ 12.20 hrs HW=265.71' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Weir Controls 16.03 cfs @ 2.26 fps)

Pond 2P-1: Pre-Treatment Forebay



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

Subcatchment 1S: Subcatchment 1S Runoff Area=0.880 ac 10.23% Impervious Runoff Depth=0.00"
Flow Length=520' Tc=12.4 min CN=46 Runoff=0.00 cfs 0.000 af

Subcatchment 2S: Subcatchment 2S Runoff Area=2.880 ac 59.72% Impervious Runoff Depth>0.15"
Flow Length=531' Tc=12.6 min CN=76 Runoff=0.21 cfs 0.036 af

Pond 1P: Design Point 1P Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Pond 2P: Infiltration Basin (Type I-2) Peak Elev=262.00' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 2P-1: Pre-Treatment Forebay Peak Elev=263.98' Storage=1,563 cf Inflow=0.21 cfs 0.036 af
Outflow=0.00 cfs 0.000 af

Total Runoff Area = 3.760 ac Runoff Volume = 0.036 af Average Runoff Depth = 0.11"
51.86% Pervious = 1.950 ac 48.14% Impervious = 1.810 ac

Summary for Subcatchment 1S: Subcatchment 1S

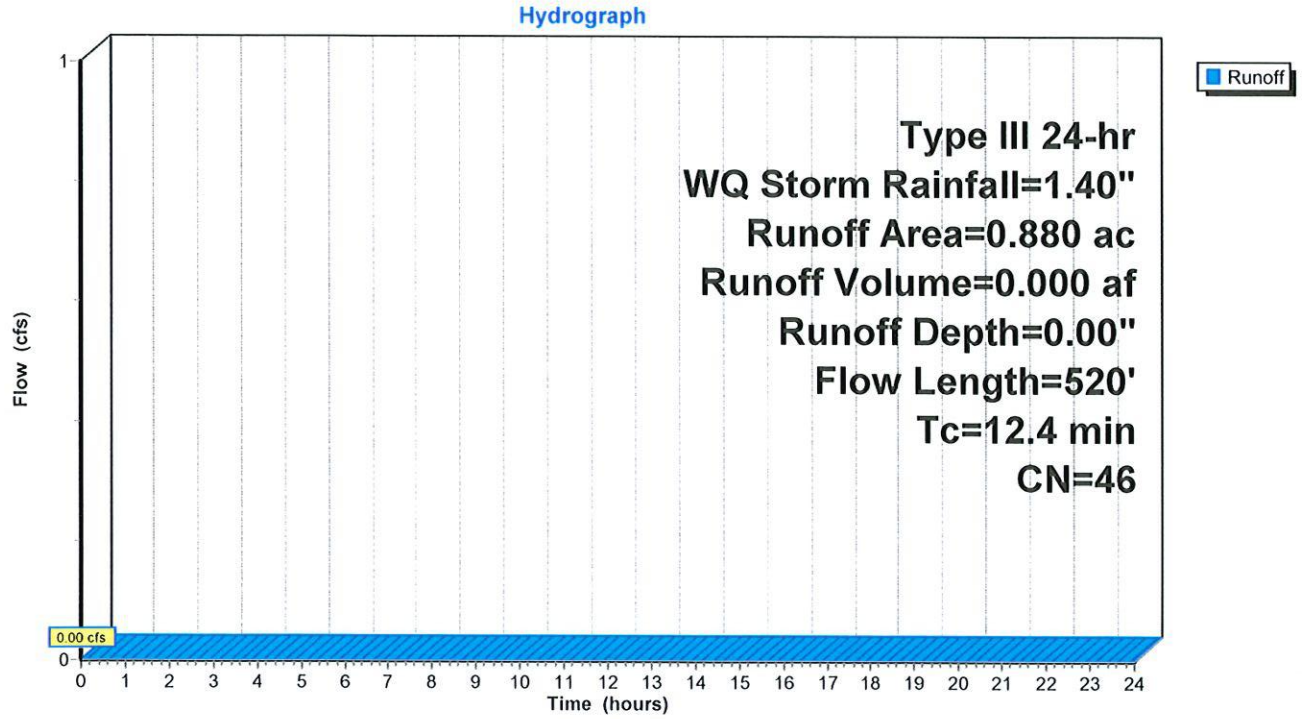
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Storm Rainfall=1.40"

Area (ac)	CN	Description
0.700	39	>75% Grass cover, Good, HSG A
0.090	98	Existing Impervious Area
0.050	35	Brush, Fair, HSG A
0.040	56	Brush, Fair, HSG B
0.880	46	Weighted Average
0.790		89.77% Pervious Area
0.090		10.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	100	0.0200	0.20		**Sheet Flow, Sheet Flow** Range n= 0.130 P2= 3.50"
4.0	420	0.0300	1.73		**Shallow Concentrated Flow, Shallow Concentrated Flow** Nearly Bare & Untilled Kv= 10.0 fps
12.4	520	Total			

Subcatchment 1S: Subcatchment 1S



Summary for Subcatchment 2S: Subcatchment 2S

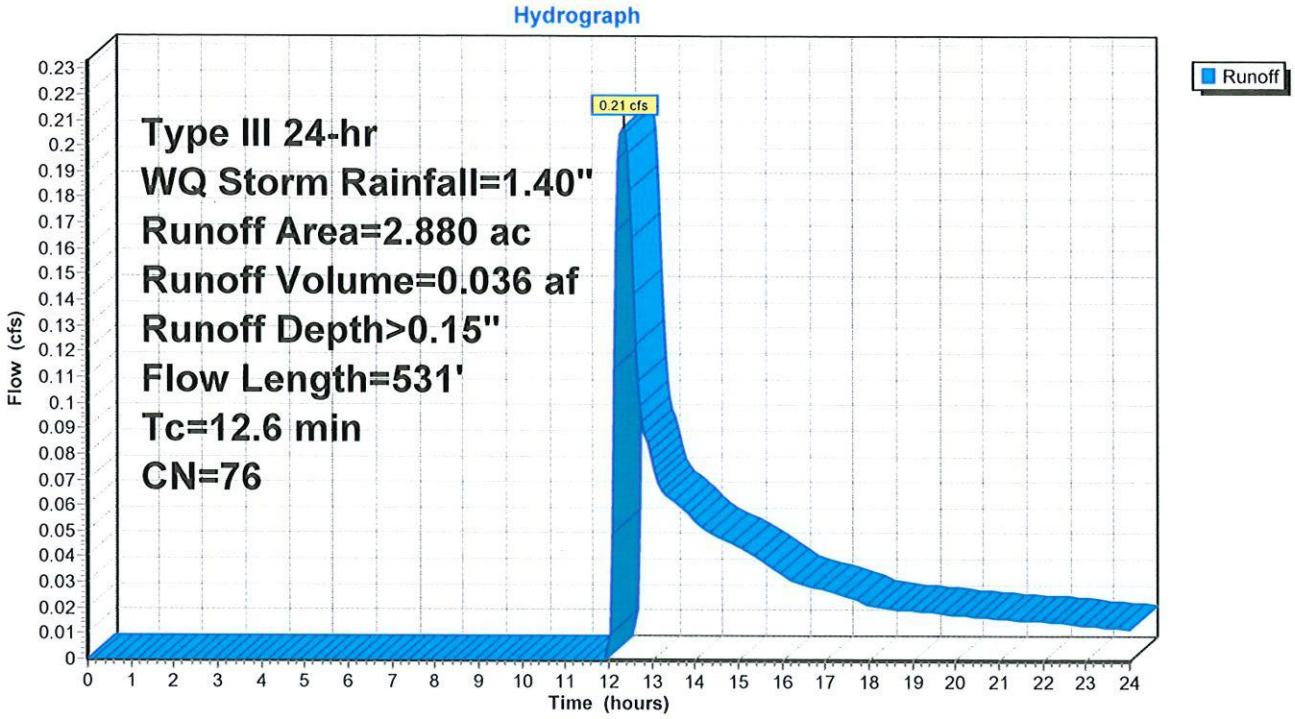
Runoff = 0.21 cfs @ 12.35 hrs, Volume= 0.036 af, Depth> 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr WQ Storm Rainfall=1.40"

Area (ac)	CN	Description
0.770	39	>75% Grass cover, Good, HSG A
0.240	98	Existing Impervious Area
1.480	98	Proposed Impervious Area
0.130	35	Brush, Fair, HSG A
0.260	56	Brush, Fair, HSG B
2.880	76	Weighted Average
1.160		40.28% Pervious Area
1.720		59.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.4	100	0.0200	0.20		**Sheet Flow, Sheet Flow** Range n= 0.130 P2= 3.50"
1.6	107	0.0120	1.10		**Shallow Concentrated Flow, Shallow Concentrated Flow** Nearly Bare & Untilled Kv= 10.0 fps
1.1	159	0.0140	2.40		**Shallow Concentrated Flow, Shallow Concentrated Flow** Paved Kv= 20.3 fps
0.7	60	0.0400	1.40		**Shallow Concentrated Flow, Shallow Concentrated Flow** Short Grass Pasture Kv= 7.0 fps
0.8	105	0.0190	2.07		**Shallow Concentrated Flow, Vegetated Swale** Grassed Waterway Kv= 15.0 fps
12.6	531	Total			

Subcatchment 2S: Subcatchment 2S

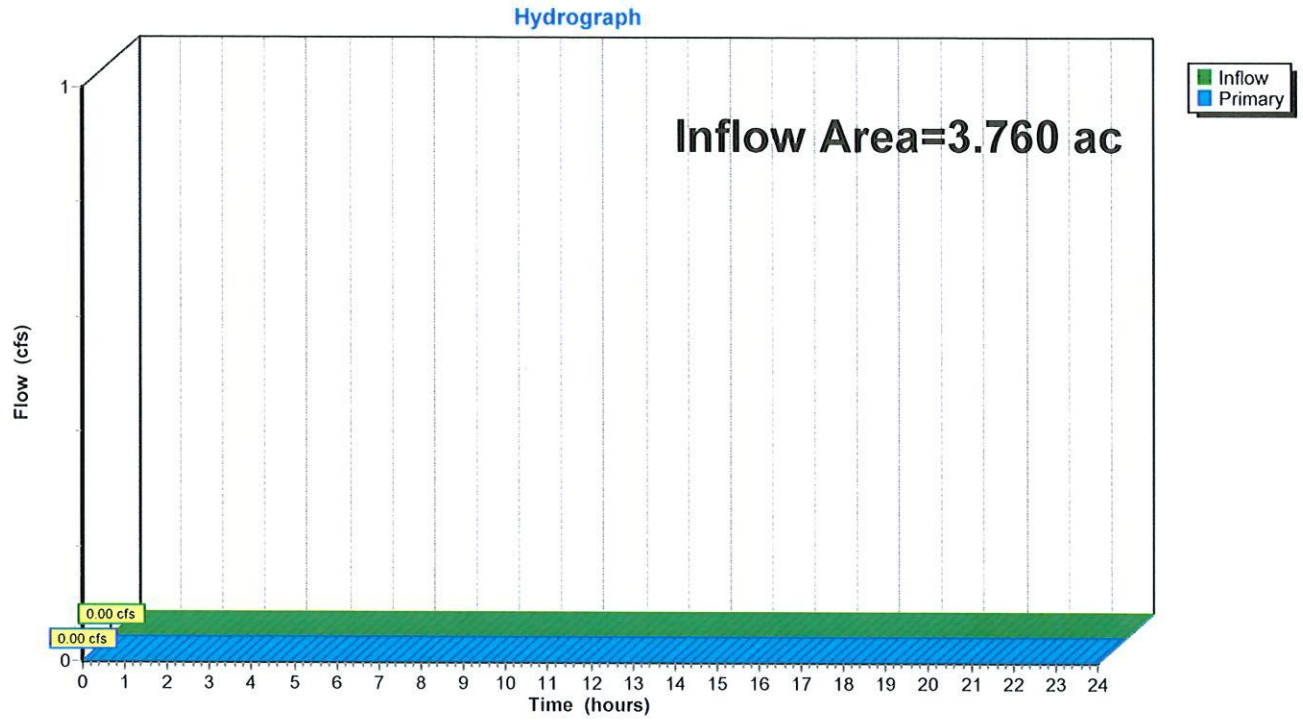


Summary for Pond 1P: Design Point 1P

Inflow Area = 3.760 ac, 48.14% Impervious, Inflow Depth = 0.00" for WQ Storm event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

Pond 1P: Design Point 1P



Summary for Pond 2P: Infiltration Basin (Type I-2)

Inflow Area = 2.880 ac, 59.72% Impervious, Inflow Depth = 0.00" for WQ Storm 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
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 262.00' @ 0.00 hrs Surf.Area= 5,205 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	262.00'	32,776 cf	**Custom Stage Data (Prismatic)** Listed below

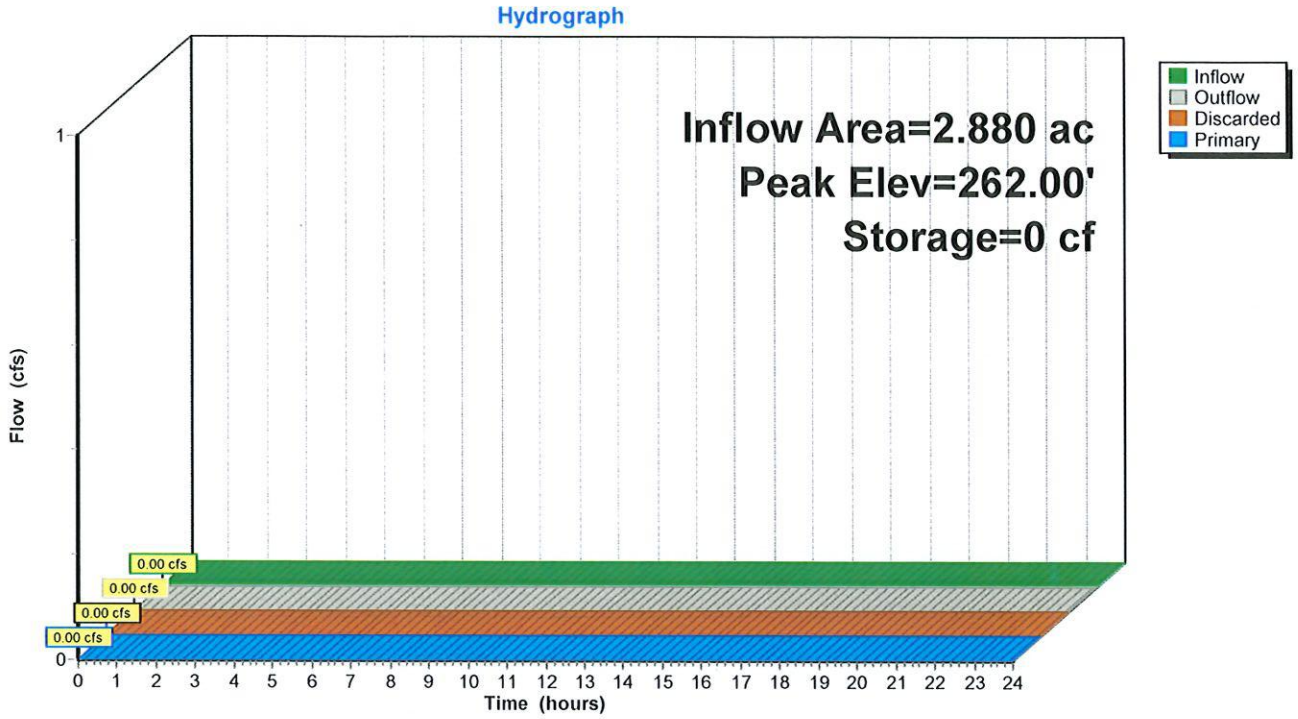
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
262.00	5,205	0	0
264.00	8,137	13,342	13,342
266.00	11,297	19,434	32,776

Device	Routing	Invert	Outlet Devices
#1	Primary	260.00'	**12.0" Round Culvert** L= 80.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 260.00' / 256.00' S= 0.0500 '/' Cc= 0.900 n= 0.011, Flow Area= 0.79 sf
#2	Discarded	262.00'	**1.008 in/hr Exfiltration over Surface area**
#3	Device 1	262.73'	**6.0" W x 1.8" H Vert. Orifice/Grate** C= 0.600
#4	Device 1	263.05'	**8.0" Vert. Orifice/Grate** C= 0.600
#5	Device 1	264.00'	**1.5' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#6	Device 1	265.00'	**48.0" x 30.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#7	Primary	265.50'	**25.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.00 cfs @ 0.00 hrs HW=262.00' (Free Discharge)
└**2=Exfiltration** (Passes 0.00 cfs of 0.12 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=262.00' (Free Discharge)
└**1=Culvert** (Passes 0.00 cfs of 4.63 cfs potential flow)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  ├**4=Orifice/Grate** (Controls 0.00 cfs)
  ├**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**6=Orifice/Grate** (Controls 0.00 cfs)
└**7=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P: Infiltration Basin (Type I-2)



Summary for Pond 2P-1: Pre-Treatment Forebay

Inflow Area = 2.880 ac, 59.72% Impervious, Inflow Depth > 0.15" for WQ Storm event
Inflow = 0.21 cfs @ 12.35 hrs, Volume= 0.036 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 263.98' @ 24.00 hrs Surf.Area= 1,186 sf Storage= 1,563 cf

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

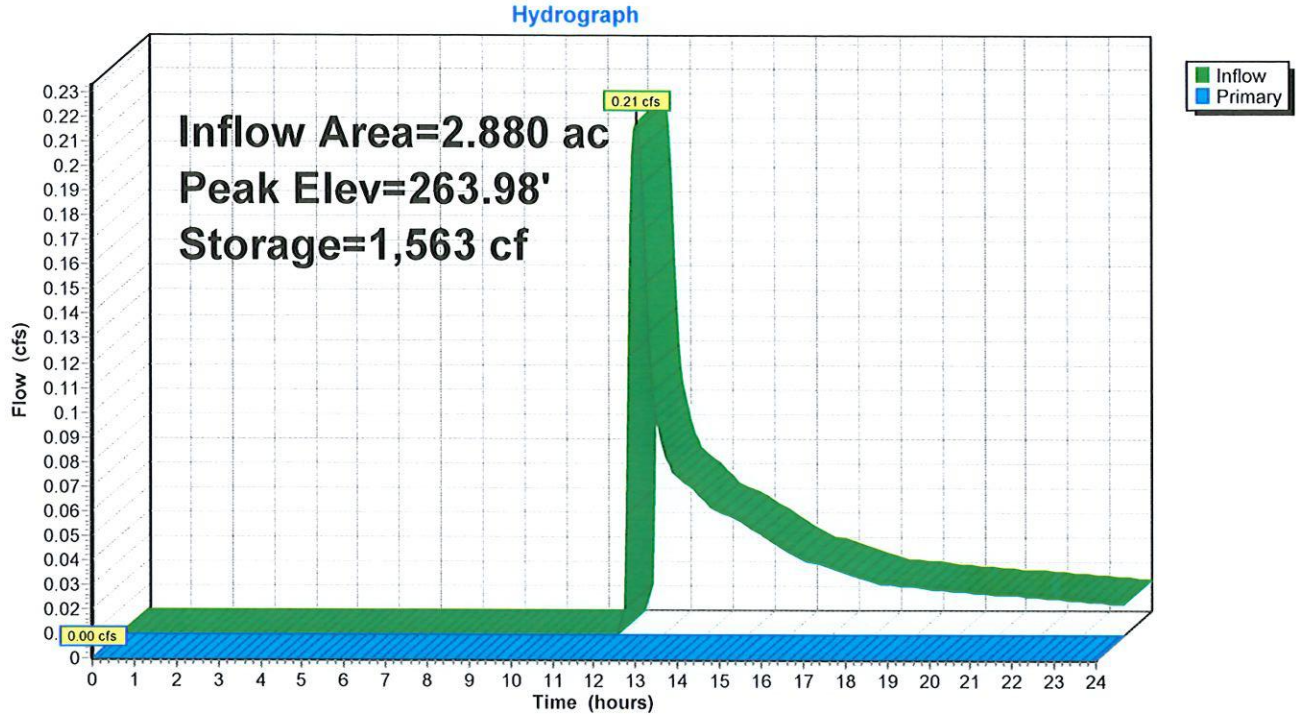
Volume	Invert	Avail.Storage	Storage Description
#1	262.00'	5,218 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
262.00	392	0	0
264.00	1,194	1,586	1,586
266.00	2,438	3,632	5,218

Device	Routing	Invert	Outlet Devices
#1	Primary	265.00'	**10.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=262.00' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 2P-1: Pre-Treatment Forebay



APPENDIX 12

TR-20 Supporting Data

Appendix B Synthetic Rainfall Distributions and Rainfall Data Sources

The highest peak discharges from small watersheds in the United States are usually caused by intense, brief rainfalls that may occur as distinct events or as part of a longer storm. These intense rainstorms do not usually extended over a large area and intensities vary greatly. One common practice in rainfall-runoff analysis is to develop a synthetic rainfall distribution to use in lieu of actual storm events. This distribution includes maximum rainfall intensities for the selected design frequency arranged in a sequence that is critical for producing peak runoff.

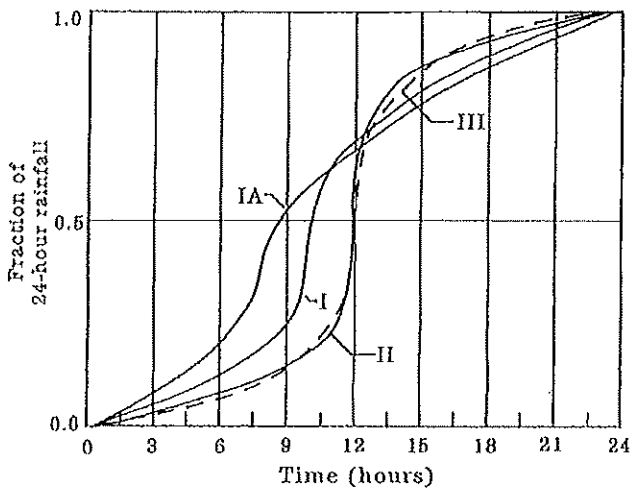
Synthetic rainfall distributions

The length of the most intense rainfall period contributing to the peak runoff rate is related to the time of concentration (T_c) for the watershed. In a hydrograph created with NRCS procedures, the duration of rainfall that directly contributes to the peak is about 170 percent of the T_c. For example, the most intense 8.5-minute rainfall period would contribute to the peak discharge for a watershed with a T_c of 5 minutes. The most intense 8.5-hour period would contribute to the peak for a watershed with a 5-hour T_c.

Different rainfall distributions can be developed for each of these watersheds to emphasize the critical rainfall duration for the peak discharges. However, to avoid the use of a different set of rainfall intensities for each drainage area size, a set of synthetic rainfall distributions having "nested" rainfall intensities was developed. The set "maximizes" the rainfall intensities by incorporating selected short duration intensities within those needed for longer durations at the same probability level.

For the size of the drainage areas for which NRCS usually provides assistance, a storm period of 24 hours was chosen the synthetic rainfall distributions. The 24-hour storm, while longer than that needed to determine peaks for these drainage areas, is appropriate for determining runoff volumes. Therefore, a single storm duration and associated synthetic rainfall distribution can be used to represent not only the peak discharges but also the runoff volumes for a range of drainage area sizes.

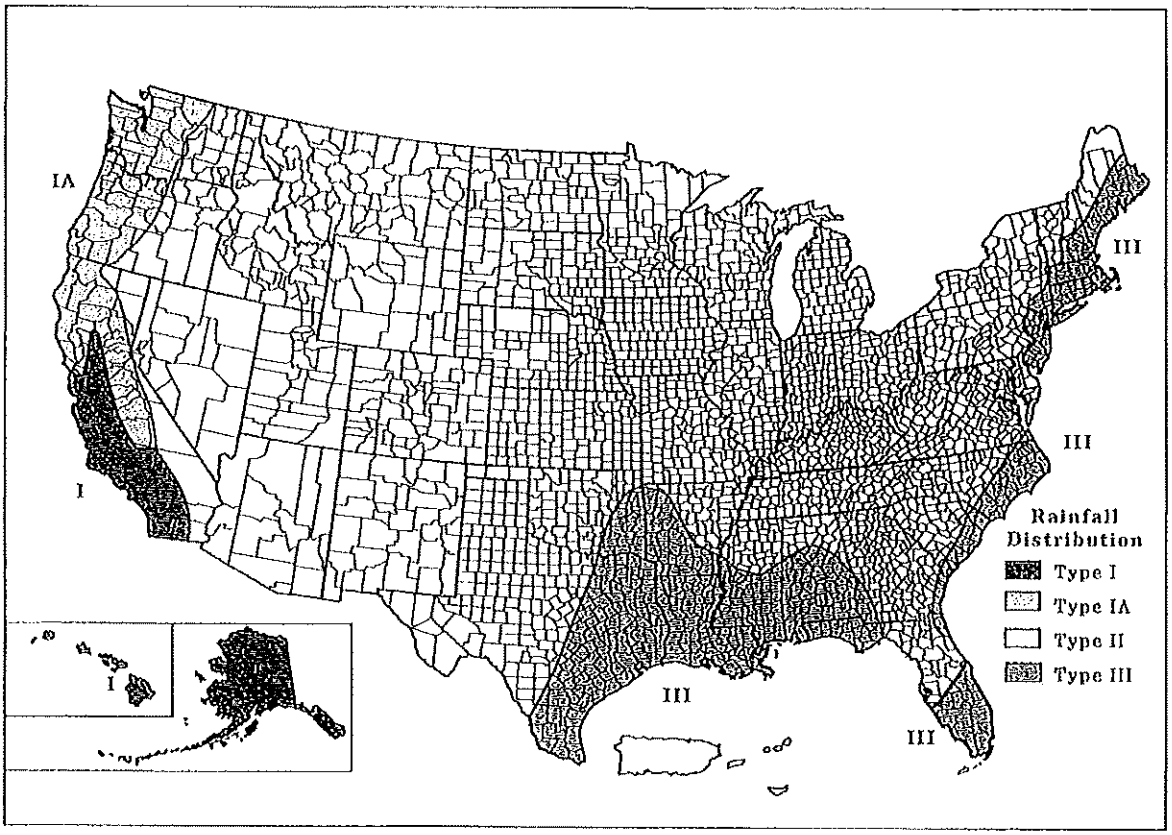
Figure B-1 SCS 24-hour rainfall distributions



The intensity of rainfall varies considerably during a storm as well as geographic regions. To represent various regions of the United States, NRCS developed four synthetic 24-hour rainfall distributions (I, IA, II, and III) from available National Weather Service (NWS) duration-frequency data (Hershfield 1061; Frederick et al., 1977) or local storm data. Type IA is the least intense and type II the most intense short duration rainfall. The four distributions are shown in figure B-1, and figure B-2 shows their approximate geographic boundaries.

Types I and IA represent the Pacific maritime climate with wet winters and dry summers. Type III represents Gulf of Mexico and Atlantic coastal areas where tropical storms bring large 24-hour rainfall amounts. Type II represents the rest of the country. For more precise distribution boundaries in a state having more than one type, contact the NRCS State Conservation Engineer.

Figure B-2 Approximate geographic boundaries for NRCS (SCS) rainfall distributions



Rainfall data sources

This section lists the most current 24-hour rainfall data published by the National Weather Service (NWS) for various parts of the country. Because NWS Technical Paper 40 (TP-40) is out of print, the 24-hour rainfall maps for areas east of the 105th meridian are included here as figures B-3 through B-8. For the area generally west of the 105th meridian, TP-40 has been superseded by NOAA Atlas 2, the Precipitation-Frequency Atlas of the Western United States, published by the National Ocean and Atmospheric Administration.

East of 105th meridian

Hershfield, D.M. 1961. Rainfall frequency atlas of the United States for durations from 30 minutes to 24 hours and return periods from 1 to 100 years. U.S. Dept. Commerce, Weather Bur. Tech. Pap. No. 40. Washington, DC. 155 p.

West of 105th meridian

Miller, J.F., R.H. Frederick, and R.J. Tracey. 1973. Precipitation-frequency atlas of the Western United States. Vol. I Montana; Vol. II, Wyoming; Vol III, Colorado; Vol. IV, New Mexico; Vol V, Idaho; Vol. VI, Utah; Vol. VII, Nevada; Vol. VIII, Arizona; Vol. IX, Washington; Vol. X, Oregon; Vol. XI, California. U.S. Dept. of Commerce, National Weather Service, NOAA Atlas 2. Silver Spring, MD.

Alaska

Miller, John F. 1963. Probable maximum precipitation and rainfall-frequency data for Alaska for areas to 400 square miles, durations to 24 hours and return periods from 1 to 100 years. U.S. Dept. of Commerce, Weather Bur. Tech. Pap. No. 47. Washington, DC. 69 p.

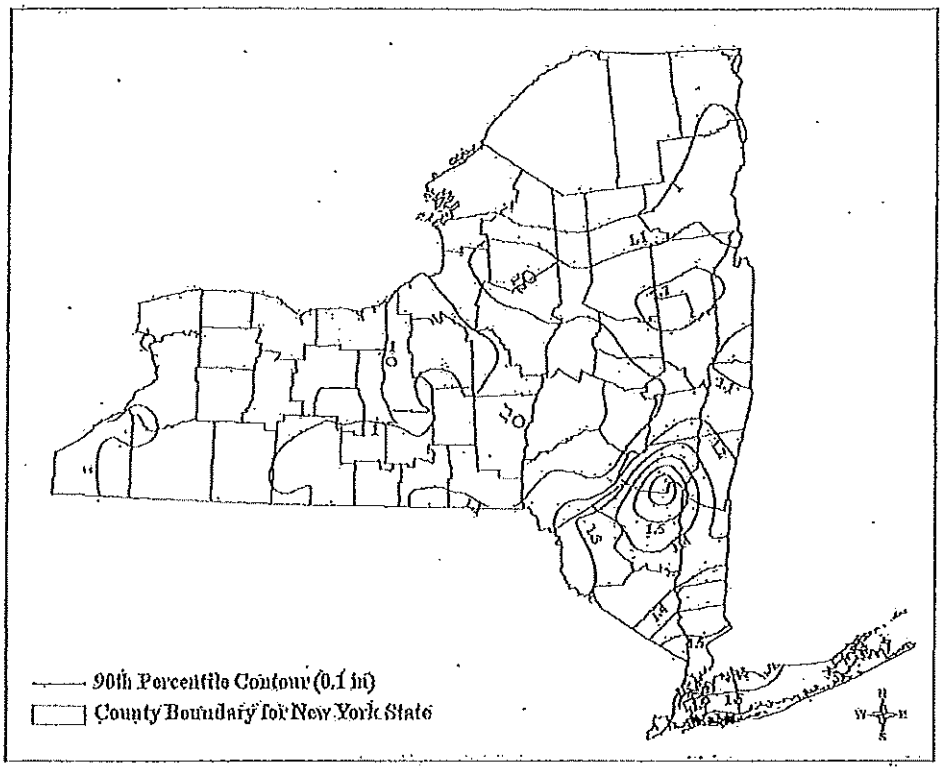
Hawaii

Weather Bureau. 1962. Rainfall-frequency atlas of the Hawaiian Islands for areas to 200 square miles, durations to 24 hours and return periods from 1 to 100 years. U.S. Dept. Commerce, Weather Bur. Tech. Pap. No. 43. Washington, DC. 60 p.

Puerto Rico and Virgin Islands

Weather Bureau. 1961. Generalized estimates of probable maximum precipitation and rainfall-frequency data for Puerto Rico and Virgin Islands for areas to 400 square miles, durations to 24 hours, and return periods from 1 to 100 years. U.S. Dept. Commerce, Weather Bur. Tech. Pap. No. 42. Washington, DC. 94 P.

Figure 4.1: 90th Percentile Rainfall in New York State (NYSDEC, 2013)

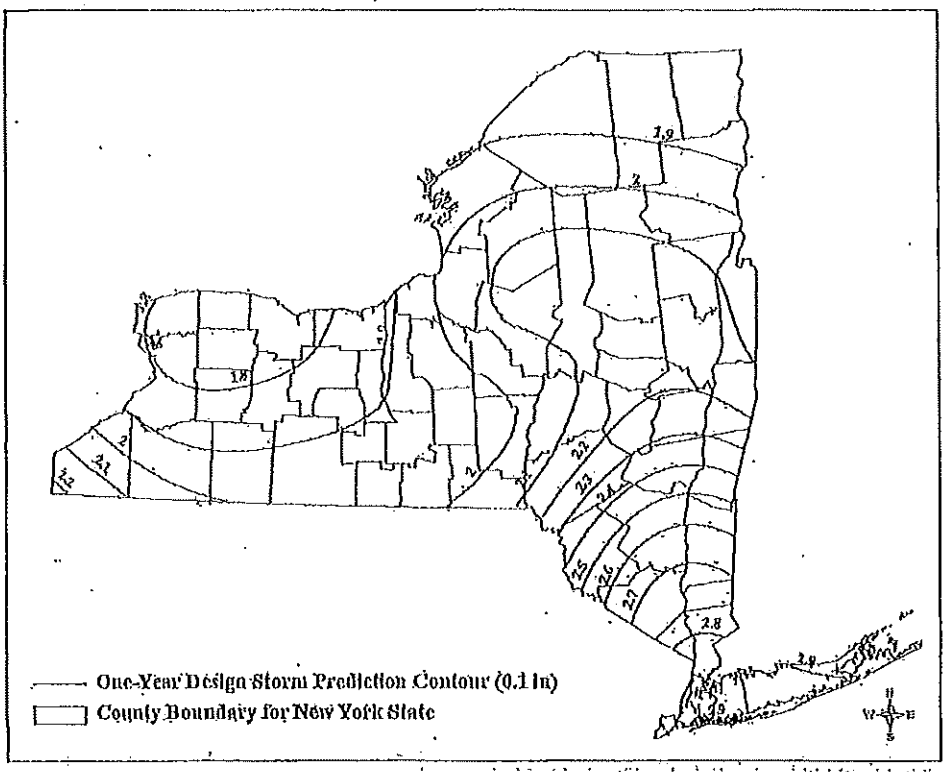


Basis of Design for Water Quality

As a basis for design, the following assumptions may be made:

Measuring Impervious Cover: the measured area of a site plan that does not have permanent vegetative or permeable cover shall be considered total impervious cover. Impervious cover is defined as all impermeable surfaces and includes: paved and gravel road surfaces, paved and gravel parking lots, paved driveways, building structures, paved sidewalks, and miscellaneous impermeable structures such as patios, pools, and sheds. Where site size makes direct measurement of impervious cover impractical, the land use/impervious cover relationships presented in Table 4.2 can be used to initially estimate impervious cover. In site specific planning impervious cover must be calculated based the specific proposed impervious cover.

Figure 4.2: One-Year Design Storm in New York State (NYSDEC, 2013)



Section 4.5 Overbank Flood Control Criteria (Q_p)

The primary purpose of the overbank flood control sizing criterion is to prevent an increase in the frequency and magnitude of out-of-bank flooding generated by urban development (i.e., flow events that exceed the bankfull capacity of the channel, and therefore must spill over into the floodplain).

Overbank control requires storage to attenuate the post development 10-year, 24-hour peak discharge rate (Q_p) to predevelopment rates.

The overbank flood control requirement (Q_p) does not apply in certain conditions, including:

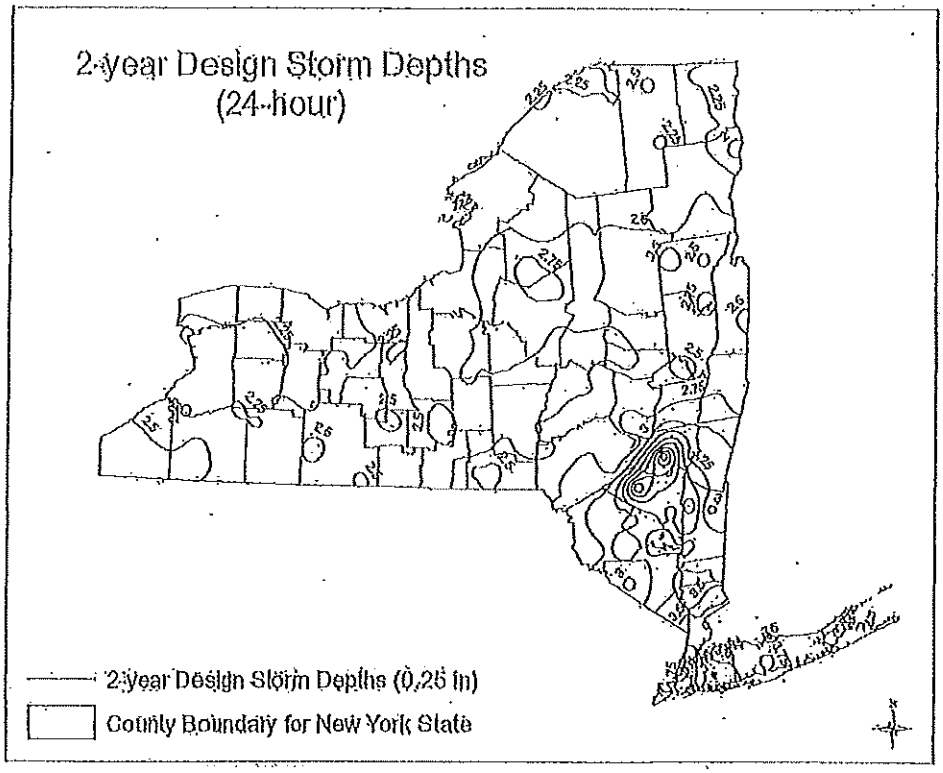
- The site discharges directly tidal waters or fifth order (fifth downstream) or larger streams. Refer to Section 4.3 for instructions.
- A downstream analysis reveals that overbank control is not needed (see section 4.10).

Basis for Design of Overbank Flood Control

When addressing the overbank flooding design criteria, the following represent the minimum basis for design:

closed conveyance systems. Note that some agencies or municipalities may use a different design storm for this purpose.

Figure 4.5: 2-Year Design Storm (2013)



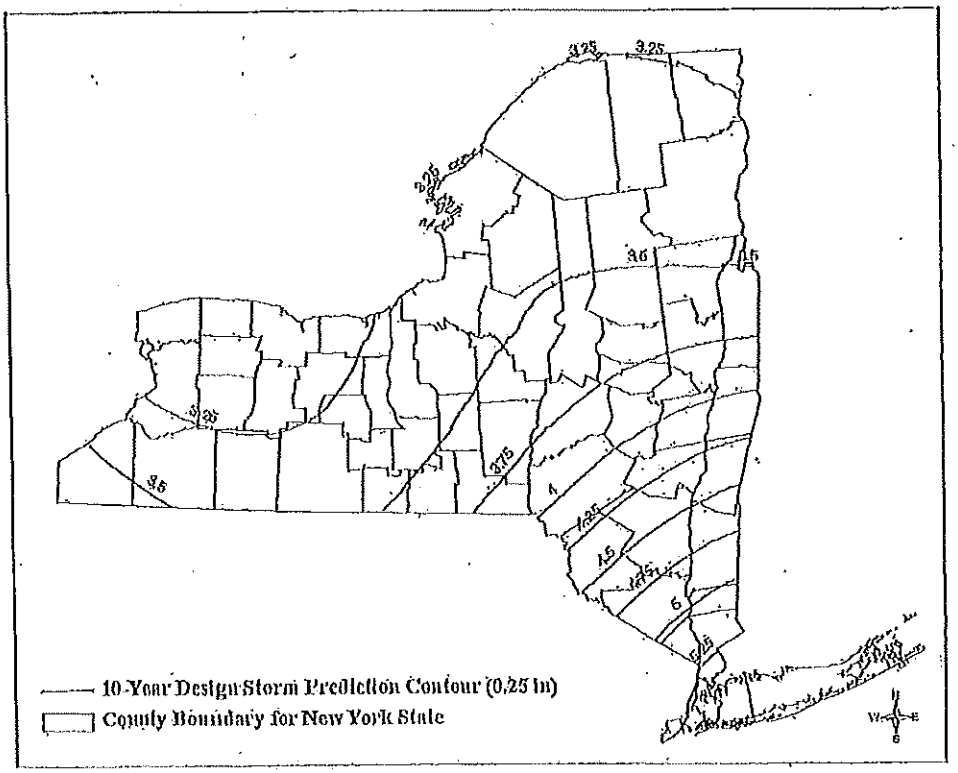
Section 4.9 Stream Order Identification

This section provides an example to help identify stream order based on Strahler-Horton Method. A network of streams drain each watershed. Streams can be classified according to their order in that network. A stream that has no tributaries or branches is defined as a first-order stream. When two first-order streams combine, a second-order stream is created, and so on. Figure 4.6 illustrates the stream order concept (Schueler, T. 1995).

Evaluation of stream order must be performed using the NHDplus dataset to determine if quantity controls do not apply. NHDPlus is an integrated suite of geospatial data sets that incorporate features of the National Hydrography Dataset (NHD) and the National Elevation Dataset (NED) at 1:100K scale. This application-ready data set is an outcome of a multi-agency effort aimed at developing many useful variables for water quality and quantity evaluation including stream order. Example maps are available on DEC website.

- TR-55 and TR-20 (or approved equivalent) will be used to determine peak discharge rates.
- When the predevelopment land use is agriculture, the curve number for the pre-developed condition shall be "taken as meadow".
- Off-site areas should be modeled as "present condition" for the 10-year storm event.
- Figure 4.3 indicates the depth of rainfall (24 hour) associated with the 10-year storm event throughout the State of New York.
- The length of overland flow used in t_o calculations is limited to no more than 150 feet for predevelopment conditions and 100 feet for post development conditions. On areas of extremely flat terrain (<1% average slope), this maximum distance is extended to 250 feet for predevelopment conditions and 150 feet for post development conditions.

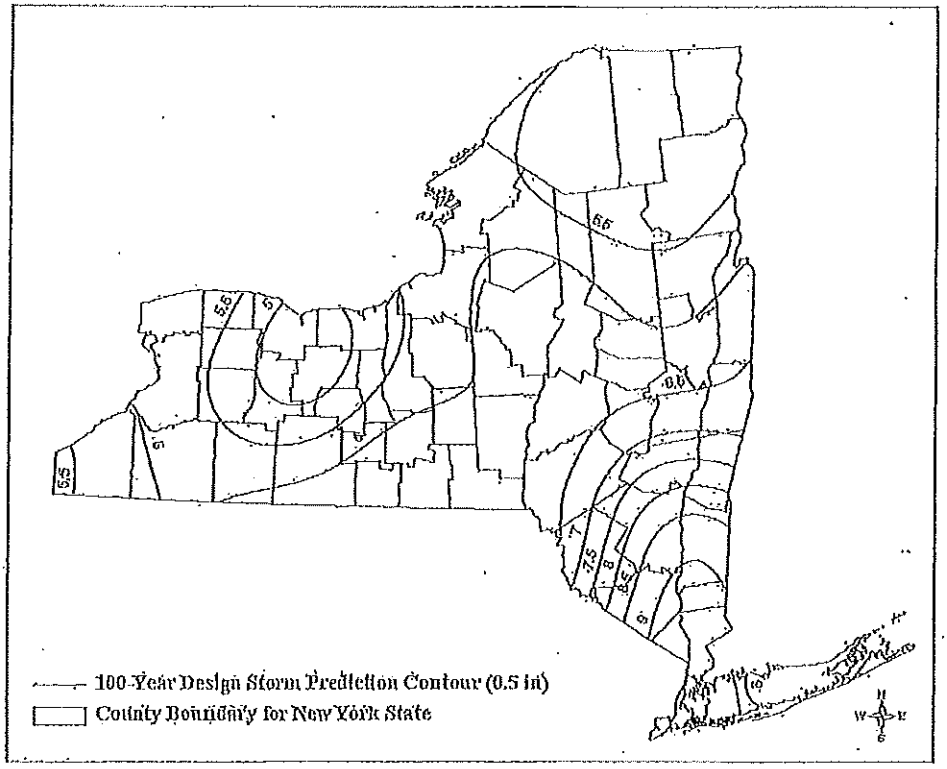
Figure 4.3: Ten-Year Design Storm in New York State (NYSDEC, 2013)



- When determining the storage required to reduce 100-year flood peaks, model off-site areas under current conditions.

- When determining storage required to safely pass the 100-year flood, model off-site areas under ultimate conditions.

Figure 4.4: One Hundred-Year Design Storm in New York State (NYSDEC, 2013)



Section 4.7 Alternative Method

New development causes changes to runoff volume, flow rates, timing of runoff and, most importantly, habitat destruction and degradation of the physical and chemical quality of the receiving waterbody. Traditionally, event based design storms are used for evaluation of hydrology and sizing of stormwater management practices. With an increasing need for assessment of the long term effects of development and maintenance of pre-development hydrology, the necessity of continuous simulation modeling as an effective tool for analysis and evaluation of flow-duration, downstream quality, quantity, biological, and hydro-habitat sustainability has been acknowledged.

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Orange County, New York

Star Warehouse

August 18, 2015

Preface

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

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

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

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

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

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

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Contents

How Soil Surveys Are Made

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

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

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

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

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

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

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

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

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

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

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

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

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

Custom Soil Resource Report
Soil Map

Map Scale: 1:4,930 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 200 400 800 1200

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N 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 1:15,800.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
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: Orange County, New York
Survey Area Data: Version 15, Sep 17, 2014

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

Date(s) aerial images were photographed: Mar 26, 2011—Apr 16, 2012

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

Orange County, New York (NY071)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Fd	Fredon loam	0.2	0.5%
HLC	Hollis soils, sloping	6.6	12.5%
HoB	Hoosic gravelly sandy loam, 3 to 8 percent slopes	5.6	10.7%
MdB	Mardin gravelly silt loam, 3 to 8 percent slopes	9.8	18.8%
SXD	Swartswood and Mardin soils, moderately steep, very stony	1.0	1.9%
Tg	Tioga silt loam	4.7	9.0%
UH	Udorthents, smoothed	20.6	39.3%
Wd	Wayland soils complex, non-calcareous substratum, 0 to 3 percent slopes, frequently flooded	3.8	7.3%
Totals for Area of Interest		**52.4**	**100.0%**

Map Unit Descriptions

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

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

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the

contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

Orange County, New York

Fd—Fredon loam

Map Unit Setting

National map unit symbol: 9vvd
Elevation: 250 to 1,200 feet
Mean annual precipitation: 42 to 52 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 135 to 215 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Fredon, poorly drained, and similar soils: 50 percent
Fredon, somewhat poorly drained, and similar soils: 25 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Fredon, Poorly Drained

Setting

Landform: Valley trains, terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy over sandy and gravelly glaciofluvial deposits

Typical profile

H1 - 0 to 6 inches: loam
H2 - 6 to 24 inches: very fine sandy loam
H3 - 24 to 60 inches: stratified gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D

Description of Fredon, Somewhat Poorly Drained

Setting

Landform: Valley trains, terraces
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread

Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy over sandy and gravelly glaciofluvial deposits

Typical profile

H1 - 0 to 6 inches: loam
H2 - 6 to 24 inches: very fine sandy loam
H3 - 24 to 60 inches: stratified gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: B/D

Minor Components

Raynham

Percent of map unit: 5 percent

Hoosic

Percent of map unit: 5 percent

Castile

Percent of map unit: 5 percent

Chenango

Percent of map unit: 5 percent

Halsey

Percent of map unit: 5 percent
Landform: Depressions

HLC—Hollis soils, sloping

Map Unit Setting

National map unit symbol: 9vvh
Mean annual precipitation: 42 to 52 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 135 to 215 days
Farmland classification: Not prime farmland

Map Unit Composition

Hollis and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hollis

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: A thin mantle of loamy till derived mainly from schist, granite, and gneiss

Typical profile

Oa - 0 to 3 inches: highly decomposed plant material
H1 - 3 to 8 inches: gravelly loam
H2 - 8 to 18 inches: gravelly loam
H3 - 18 to 22 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D

Minor Components

Paxton

Percent of map unit: 5 percent

Charlton

Percent of map unit: 5 percent

Unnamed soils

Percent of map unit: 5 percent

Rock outcrop

Percent of map unit: 5 percent

HoB—Hoosic gravelly sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9vvl
Elevation: 100 to 1,100 feet
Mean annual precipitation: 42 to 52 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 135 to 215 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Hoosic and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hoosic

Setting

Landform: Outwash plains, terraces, deltas
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and gravelly glaciofluvial deposits

Typical profile

H1 - 0 to 6 inches: gravelly sandy loam
H2 - 6 to 28 inches: very gravelly sandy loam
H3 - 28 to 60 inches: very gravelly sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (1.98 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A

Minor Components

Castile

Percent of map unit: 5 percent

Chenango
Percent of map unit: 5 percent

Oakville
Percent of map unit: 5 percent

Fredon
Percent of map unit: 5 percent

MdB—Mardin gravelly silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2v30j
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Mardin

Setting

Landform: Till plains
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till

Typical profile

Ap - 0 to 8 inches: gravelly silt loam
Bw - 8 to 15 inches: gravelly silt loam
E - 15 to 20 inches: gravelly silt loam
Bx - 20 to 72 inches: gravelly silt loam

Properties and qualities

Slope: 3 to 8 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: 14 to 26 inches to fragipan
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 13 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: D

Minor Components

Lordstown

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Side slope
Down-slope shape: Concave, convex
Across-slope shape: Linear

Volusia

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Base slope, side slope
Down-slope shape: Concave
Across-slope shape: Linear

Bath

Percent of map unit: 5 percent
Landform: Till plains, hills, drumlinoid ridges
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Concave
Across-slope shape: Linear

SXD—Swartswood and Mardin soils, moderately steep, very stony

Map Unit Setting

National map unit symbol: 2v30s
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Mardin, very stony, and similar soils: 40 percent
Swartswood, very stony, and similar soils: 40 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Swartswood, Very Stony

Setting

Landform: Hills, till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till derived mainly from quartzite, conglomerate, and sandstone

Typical profile

H1 - 0 to 2 inches: gravelly loam
H2 - 2 to 28 inches: gravelly fine sandy loam
H3 - 28 to 60 inches: gravelly fine sandy loam

Properties and qualities

Slope: 15 to 35 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 20 to 36 inches to fragipan
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.57 in/hr)
Depth to water table: About 23 to 31 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C

Description of Mardin, Very Stony

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy till

Typical profile

A - 0 to 4 inches: gravelly silt loam
Bw - 4 to 15 inches: gravelly silt loam
E - 15 to 20 inches: gravelly silt loam
Bx - 20 to 72 inches: gravelly silt loam

Properties and qualities

Slope: 15 to 35 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 14 to 26 inches to fragipan
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 13 to 24 inches

Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D

Minor Components

Lordstown

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Concave, linear
Across-slope shape: Linear

Wurtsboro, very stony

Percent of map unit: 5 percent
Landform: Till plains, hills
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Concave
Across-slope shape: Convex

Bath, very stony

Percent of map unit: 5 percent
Landform: Till plains, drumlinoid ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Linear
Across-slope shape: Linear

Volusia, very stony

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Concave
Across-slope shape: Linear

Tg—Tioga silt loam

Map Unit Setting

National map unit symbol: 9vx9
Elevation: 600 to 1,800 feet
Mean annual precipitation: 42 to 52 inches
Mean annual air temperature: 46 to 52 degrees F

Frost-free period: 135 to 215 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Tioga and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Tioga

Setting

Landform: Flood plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy alluvium

Typical profile

H1 - 0 to 3 inches: silt loam
H2 - 3 to 25 inches: silt loam
C - 25 to 40 inches: silt loam
2C - 40 to 60 inches: fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 5.95 in/hr)
Depth to water table: About 36 to 72 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 1 percent
Available water storage in profile: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: A

Minor Components

Udifluvents

Percent of map unit: 5 percent

Suncook

Percent of map unit: 5 percent

Barbour

Percent of map unit: 5 percent

Middlebury

Percent of map unit: 5 percent

UH—Udorthents, smoothed

Map Unit Setting

National map unit symbol: 9vxc
Mean annual precipitation: 42 to 52 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 135 to 215 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Typical profile

H1 - 0 to 4 inches: channery loam
H2 - 4 to 70 inches: very gravelly sandy loam

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 5.95 in/hr)
Depth to water table: About 36 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

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

Minor Components

Raynham

Percent of map unit: 5 percent

Wurtsboro

Percent of map unit: 5 percent

Alden

Percent of map unit: 5 percent
Landform: Depressions

Bath

Percent of map unit: 5 percent

Fredon

Percent of map unit: 5 percent

Wd—Wayland soils complex, non-calcareous substratum, 0 to 3 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2srgt
Elevation: 160 to 1,970 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 43 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Wayland and similar soils: 60 percent
Wayland, very poorly drained, and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wayland

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty and clayey alluvium derived from interbedded sedimentary rock

Typical profile

Ap - 0 to 9 inches: silt loam
Bg - 9 to 21 inches: silt loam
Cg1 - 21 to 28 inches: silt loam
Cg2 - 28 to 47 inches: silt loam
Cg3 - 47 to 54 inches: silt loam
Cg4 - 54 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very high (about 13.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D

Description of Wayland, Very Poorly Drained

Setting

Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Silty and clayey alluvium derived from interbedded sedimentary rock

Typical profile

A - 0 to 9 inches: mucky silt loam
Bg - 9 to 21 inches: silt loam
Cg1 - 21 to 28 inches: silt loam
Cg2 - 28 to 47 inches: silt loam
Cg3 - 47 to 54 inches: silt loam
Cg4 - 54 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Very high (about 13.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D

Minor Components

Holderton

Percent of map unit: 10 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear

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APPENDIX 13

Stormwater Quality and Runoff Reduction – Calculations & Supporting Data

Star Warehouse

Water Quality Volume (WQ_v) Calculation for Project Site with Offsite Areas Removed

Utilize 90% Rule:

$$WQ_v = [(P) (R_v) (A)] / 12$$

WQ_v = Water Quality Volume (acre-feet)

$R_v = 0.05 + 0.009 (I)$

I = Impervious Cover (Percent)

P = 90% Rainfall Event Number = 1.4 inches

A = Drainage Area in acres

Calculate Impervious Cover (%):

Drainage Area (A) =	3.76	acres
Impervious area within Site Area =	1.80	acres
Impervious Cover (I) =	47.9	%

Calculate Volumetric Runoff Coefficient (R_v):

$$R_v = 0.05 + 0.009 (I)$$

R_v = 0.48

Use R_v -> 0.48

90% Rainfall Event Number Utilized:

P = 1.4 inches

Calculate Water Quality Volume:

$$WQ_v = [(P) (R_v) (A)] / 12$$

WQ_v = 0.211 acre-feet

= 9188 ft^3

Star Warehouse

Minimum Runoff Reduction Volume (RRv) Calculation

$$RRv = [\ (P)\ (R_{v*})\ (Ai)\ ] / 12$$

RRv = Runoff Reduction Volume (acre-feet)

$R_v = 0.05 + 0.009\ (I)$

(Where I = 100%)

I = Impervious Cover (Percent)

P = 90% Rainfall Event Number = 1.4 inches

Ai = Impervious Cover Targeted for Runoff Reduction = (S) (Aic)

Aic = Total Area of New Impervious Cover

S = Hydrologic Soil Group (HSG) Specific Reduction Factor

S for HSG A =0.55

S for HSG B =0.40

S for HSG C =0.30

S for HSG D =0.20

Calculate Specific Reduction Factor (S)

Total Drainage Area (A) =	3.76	acres
Total Area of HSG A	3.37	acres
Total Area of HSG B	0.39	acres
Total Area of HSG C	0.00	acres
Total Area of HSG D	0.00	acres

$$S = [(HSG\ A)(0.55) + (HSG\ B)(0.40) + (HSG\ C)(0.30) + (HSG\ D)(0.20)] / A$$

S = 0.5344

Calculate Impervious Cover Targeted for Runoff Reduction (Ai)

$$Ai = (S)\ (Aic)$$

Aic = Total Area of New Impervious Cover = 1.48 acres

Ai = 0.79 acres

Calculate Volumetric Runoff Coefficient (R_v):

$$R_v = 0.05 + 0.009\ (I)$$

R_v = 0.95

90% Rainfall Event Number Utilized:

P = 1.4 inches

Calculate Minimum Runoff Reduction Volume:

$$RRv = [(P) (R_v) (Ai)] / 12$$

RRv = 0.088 acre-feet

RRv = 3819 ft^3

Star Warehouse

Infiltration Basin Design (Pond 2P)

Step 1: Calculate the Water Quality Volume (WQ_v)

$$WQ_v = [\ (P)\ (R_v)\ (A)\ ] / 12$$

WQ_v = Water Quality Volume (acre-feet)

P = 90% Rainfall Event Number = 1.4 inches

$R_v = 0.05 + 0.009\ (I)$

I = Impervious Cover (Percent) = 60 %

A = Drainage Area = 2.88 acres

WQ_v = 0.20 ac-ft

WQ_v = 8635.33 ft^3

Step 2: Determine the minimum bottom area of the infiltration basin:

$$A = V_W/d_b$$

V_w = design volume 8635.33 ft^3

d_b= depth of the basin 4.0 ft

Minimum A = 2158.83 ft^2

Provided A = 5205.00 ft^2

Step 3: Determine size of pretreatment:

Pretreatment size = 1/4 of the WQ_v = 2159 ft^3

Provided size = 3015 ft^3 to 265 contour

Star Warehouse

Infiltration Basin (Pond 2P) Storage Volumes

Pond 2P Sedimentation Basin Volume					
Contour Elevation	Depth	Incremental Vol. Avg. End (CU.FT.)	Cumulative Vol. Avg. End (CU.FT.)	Incremental Vol. Conic (CU.FT.)	Cumulative Vol. Conic (CU.FT.)
262	N/A	N/A	0.00	N/A	0.00
264	2.00	1585.75	1585.75	1513.29	1513.29
266	4.00	3632.19	5217.94	3558.83	5072.12

Pond 2P (Infiltration Basin) Total Storage Volume					
Contour Elevation	Depth	Incremental Vol. Avg. End (CU.FT.)	Cumulative Vol. Avg. End (CU.FT.)	Incremental Vol. Conic (CU.FT.)	Cumulative Vol. Conic (CU.FT.)
262	N/A	N/A	0.00	N/A	0.00
264	2.00	13342.05	13342.05	13233.28	13233.28
266	4.00	19433.61	32775.66	19347.46	32580.74

Proposed Pond 2P Channel Protection Volume Calculation

Step 1: Calculate Stream Channel Protection Volume (Cp_v):

Stream Channel Protection Volume (Cp_v) Calculated using HydroCAD Software:

$Cp_v =$ 0.203 acre-feet

** **Stream Channel protection requirements are achieved on site through the proposed infiltration system by infiltration of the entire Cp_v.**

Star Warehouse

Runoff Reduction Volume (RRv) Summary:

Total RRv Calculated =

Total RRv Required per Calculation = 9,188 ft^3

Minimum RRv Required per Calculation = 3,819 ft^3

RRv Provided Utilizing Runoff Reduction Practices = 4,855 ft^3

:. Meets Minimum RRv Required, Utilized SMP for remaining RRv:

Remaining Required RRv:

Total RRv Required - RRv Provided Utilizing GI = 4,333 ft^3

PIETRZAK & PFAU, LLC

SOIL INFILTRATION TEST RESULTS

JOB NO.: 29106.01

PROJECT NAME: STAR WAREHOUSE
TOWN: CORNWALL
COUNTY: ORANGE

DATE: 1/5/2016
WEATHER: 17°, SUNNY
PERFORMED BY: NR, TP, LO
WITNESSED BY:

LOT NO.	TEST HOLE	DEPTH (IN.)	TEST RUN HR. 1	TEST RUN HR. 2	TEST RUN HR. 3	TEST RUN HR. 4	INFILTRATION RATE (IN.)	COMMENTS
	1	48"	FINISH START TOTAL 3.0"	2.0"	1.5"	1.5"	1.5"	
	2	48"	FINISH START TOTAL 1.0"	0.5"	0.5"	0.5"	0.5"	
			FINISH START TOTAL					
			FINISH START TOTAL					
			FINISH START TOTAL					
			FINISH START TOTAL					
			FINISH START TOTAL					
			FINISH START TOTAL					
			FINISH START TOTAL					
			FINISH START TOTAL					

PIETRZAK & PFAU, LLC

SOIL INFILTRATION TEST RESULTS

JOB NO.: 29106.01

PROJECT NAME: STAR WAREHOUSE
TOWN: CORNWALL
COUNTY: ORANGE

DATE: 9/11/2023
WEATHER: 80°, PARTLY CLOUDY
PERFORMED BY: VAP
WITNESSED BY:

LOT NO.	TEST HOLE	DEPTH (IN.)	TEST RUN HR. 1	TEST RUN HR. 2	TEST RUN HR. 3	TEST RUN HR. 4	INFILTRATION RATE (IN.)	COMMENTS
	3	48"	FINISH START TOTAL 2.5"	1.5"	1.0"	1.0"	1.0"	
	4	48"	FINISH START TOTAL 2.0"	1.8"	1.5"	1.5"	1.5"	
			FINISH START TOTAL					
			FINISH START TOTAL					
			FINISH START TOTAL					
			FINISH START TOTAL					
			FINISH START TOTAL					
			FINISH START TOTAL					
			FINISH START TOTAL					
			FINISH START TOTAL					

PIETRZAK & PFAU, LLC

DEEP TEST PIT RESULTS

JOB NO.: 29106.01

PROJECT NAME: STAR WAREHOUSE
TOWN: CORNWALL
COUNTY: ORANGE

DATE: 1/5/2016
WEATHER: 17°, SUNNY
PERFORMED BY: VAP
WITNESSED BY:

LOT NO.	TEST HOLE	SOILS DESCRIPTION		COMMENTS
	1	0-14"	TOPSOIL	NO GW
		14-38"	GRAVELLY SILTY LOAM WITH SOME CLAY POCKETS	NO BR
		38-90"	GRAVELLY SILTY LOAMY CLAY	
	2	0-12"	TOPSOIL	NO GW
		12-39"	GRAVELLY SILTY LOAM WITH SOME CLAY POCKETS	NO BR
		39-85"	GRAVELLY SILTY LOAMY CLAY	

PIETRZAK & PFAU, LLC
DEEP TEST PIT RESULTS

JOB NO.: 29106.01

PROJECT NAME: STAR WAREHOUSE
TOWN: CORNWALL
COUNTY: ORANGE

DATE: 9/11/2023
WEATHER: 80°, PARTLY CLOUDY
PERFORMED BY: VAP
WITNESSED BY:

LOT NO.	TEST HOLE	SOILS DESCRIPTION		COMMENTS
	3	0-10"	TOPSOIL	NO GW
		10-50"	GRAVELLY SILTY LOAM WITH	
			TRACE CLAY	NO BR
		50-86"	GRAVELLY LOAMY CLAY	
	4	0-12"	TOPSOIL	NO GW
		12-36"	GRAVELLY SILTY LOAM	
		36-84"	GRAVELLY SILTY LOAMY CLAY	NO BR

REV: 5/09

\\Pnp-server3\admin\0 Forms and Templates\Engineer\PNP Deep Test Pit Results.pdf

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Aug 23 2016

Existing 12 Inch HDPE Culvert

Circular

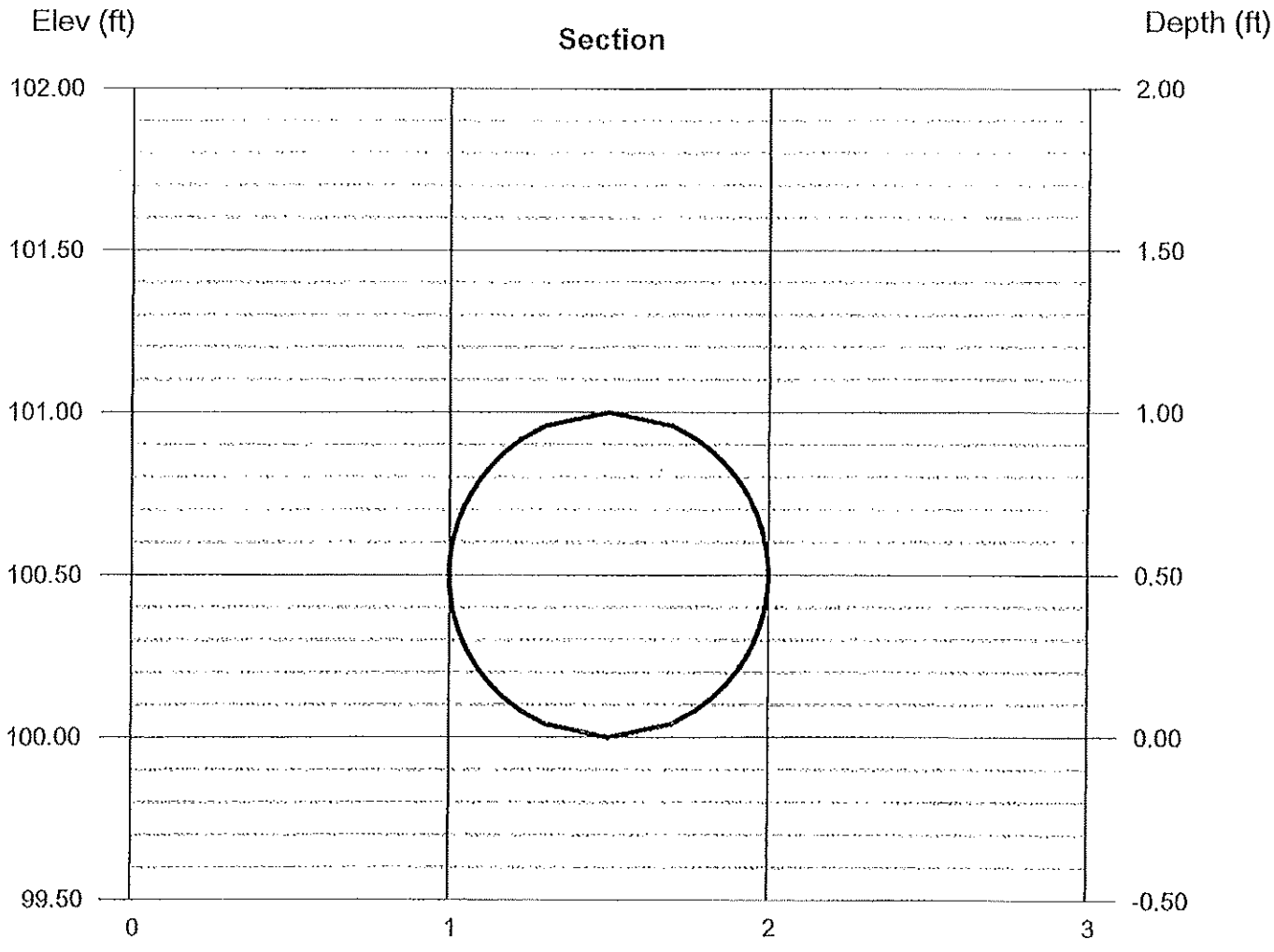
Diameter (ft)	= 1.00
Invert Elev (ft)	= 100.00
Slope (%)	= 2.70
N-Value	= 0.011

Calculations

Compute by:	Known Depth
Known Depth (ft)	= 1.00

Highlighted

Depth (ft)	= 1.00
Q (cfs)	= 6.916
Area (sqft)	= 0.79
Velocity (ft/s)	= 8.81
Wetted Perim (ft)	= 3.14
Crit Depth, Yc (ft)	= 0.98
Top Width (ft)	= 0.00
EGL (ft)	= 2.21



Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Tuesday, Aug 23 2016

Existing Creamery Hill Roadside Swale

Trapezoidal

Bottom Width (ft)	= 2.40
Side Slopes (z:1)	= 2.45, 2.45
Total Depth (ft)	= 1.85
Invert Elev (ft)	= 100.00
Slope (%)	= 0.80
N-Value	= 0.150

Calculations

Compute by:	Known Q
Known Q (cfs)	= 1.40

Highlighted

Depth (ft)	= 0.67
Q (cfs)	= 1.400
Area (sqft)	= 2.71
Velocity (ft/s)	= 0.52
Wetted Perim (ft)	= 5.95
Crit Depth, Yc (ft)	= 0.21
Top Width (ft)	= 5.68
EGL (ft)	= 0.67

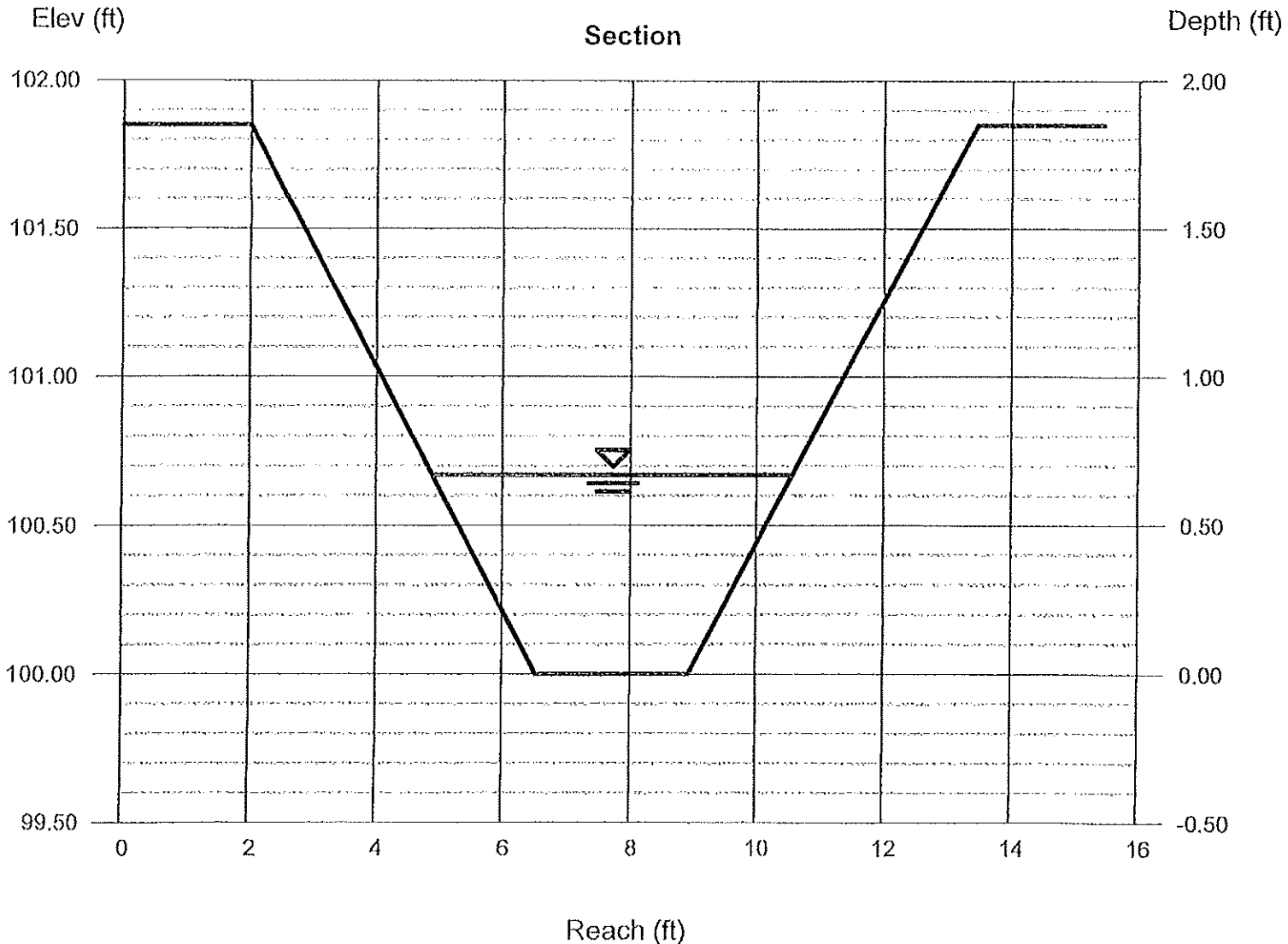
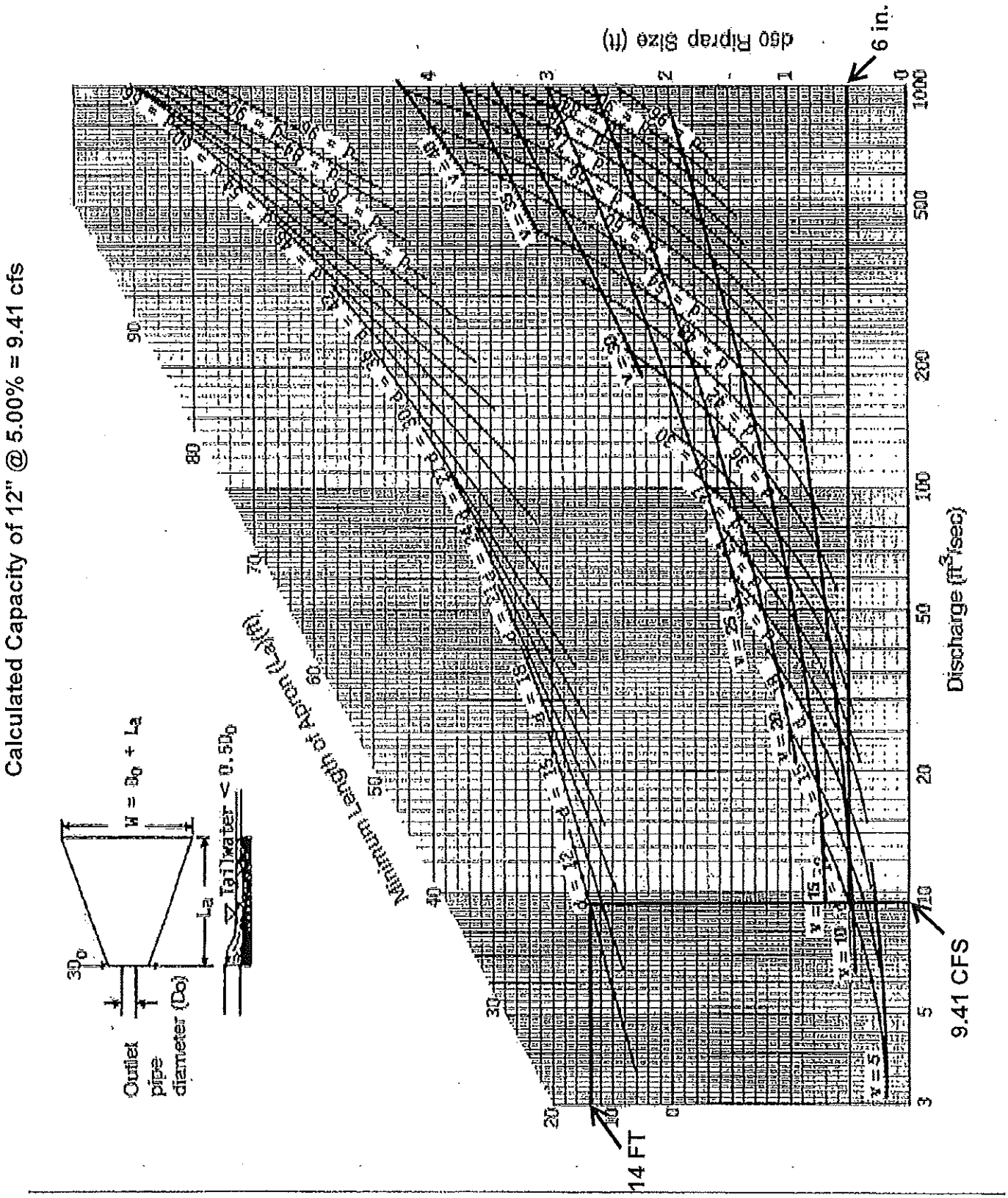


Figure 5B.12
Outlet Protection Design—Minimum Tailwater Condition
(Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



New York State
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Division of Water

Deep-Ripping and Decompaction

April 2008

New York State
Department of Environmental Conservation

Document Prepared by:

John E. Lacey,
Land Resource Consultant and Environmental Compliance Monitor
(Formerly with the Division of Agricultural Protection and Development Services,
NYS Dept. of Agriculture & Markets)

Alternative Stormwater Management
Deep-Ripping and Decompaction

Description

The two-phase practice of 1) "Deep Ripping;" and 2) "Decompaction" (deep subsoiling), of the soil material as a step in the cleanup and restoration/landscaping of a construction site, helps mitigate the physically induced impacts of soil compression; i.e.: soil compaction or the substantial increase in the bulk density of the soil material.

Deep Ripping and Decompaction are key factors which help in restoring soil pore space and permeability for water infiltration. Conversely, the physical actions of cut-and-fill work, land grading, the ongoing movement of construction equipment and the transport of building materials throughout a site alter the architecture and structure of the soil, resulting in: the mixing of layers (horizons) of soil materials, compression of those materials and diminished soil porosity which, if left unchecked, severely impairs the soil's water holding capacity and vertical drainage (rainfall infiltration), from the surface downward.

In a humid climate region, compaction damage on a site is virtually guaranteed over the duration of a project. Soil in very moist to wet condition when compacted, will have severely reduced permeability. Figure 1 displays the early stage of the deep-ripping phase (Note that all topsoil was stripped prior to construction access, and it remains stockpiled until the next phase – decompaction – is complete). A heavy-duty tractor is pulling a three-shank ripper on the first of several series of incrementally deepening passes through the construction access corridor's densely compressed subsoil material. Figure 2 illustrates the approximate volumetric composition of a loam surface soil when conditions are good for plant growth, with adequate natural pore space for fluctuating moisture conditions.

Fig. 1. A typical deep ripping phase of this practice, during the first in a series of progressively deeper "rips" through severely compressed subsoil.

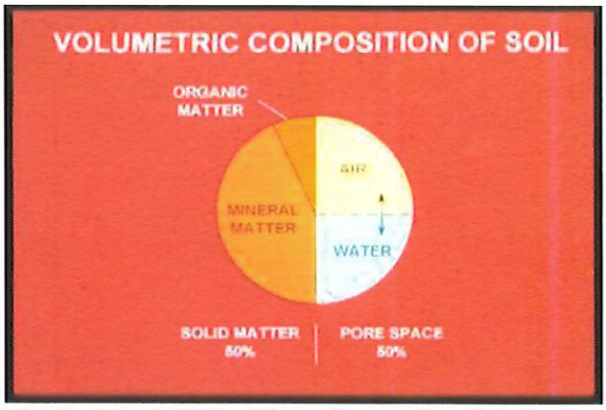


Fig. 2. About 50% of the volume of undisturbed loam surface soil is pore space, when soil is in good condition for plant growth. Brady, 2002.

Recommended Application of Practice

The objective of Deep Ripping and Decompaction is to effectively fracture (vertically and laterallly) through the thickness of the physically compressed subsoil material (see Figure 3), restoring soil porosity and permeability and aiding infiltration to help reduce runoff. Together with topsoil stripping, the "two-phase" practice of Deep Ripping and Decompaction first became established as a "best management practice" through ongoing success on commercial farmlands affected by heavy utility construction right-of-way projects (transmission pipelines and large power lines).

Fig. 3. Construction site with significant compaction of the deep basal till subsoil extends 24 inches below this exposed cut-and-fill work surface.

Soil permeability, soil drainage and cropland productivity were restored. For broader construction application, the two-phase practice of Deep Ripping and Decompaction is best adapted to areas impacted with significant soil compaction, on contiguous open portions of large construction sites and inside long, open construction corridors used as temporary access over the duration of construction. Each mitigation area should have minimal above-and-below-ground obstructions for the easy avoidance and maneuvering of a large tractor and ripping/decompacting implements. Conversely, the complete two-phase practice is not recommended in congested or obstructed areas due to the limitations on tractor and implement movement.

Benefits

Aggressive "deep ripping" through the compressed thickness of exposed subsoil before the replacement/respreading of the topsoil layer, followed by "decompaction," i.e.: "sub-soiling," through the restored topsoil layer down into the subsoil, offers the following benefits:

- Increases the project (larger size) area's direct surface infiltration of rainfall by providing the open site's mitigated soil condition and lowers the demand on concentrated runoff control structures

- Enhances direct groundwater recharge through greater dispersion across and through a broader surface than afforded by some runoff-control structural measures

- Decreases runoff volume generated and provides hydrologic source control

- May be planned for application in feasible open locations either alone or in

conjunction with plans for structural practices (e.g., subsurface drain line or infiltration basin) serving the same or contiguous areas

- Promotes successful long-term revegetation by restoring soil permeability, drainage and water holding capacity for healthy (rather than restricted) root-system development of trees, shrubs and deep rooted ground cover, minimizing plant drowning during wet periods and burnout during dry periods.

Feasibility/Limitations

The effectiveness of Deep Ripping and Decompaction is governed mostly by site factors such as: the original (undisturbed) soil's hydrologic characteristics; the general slope; local weather/timing (soil moisture) for implementation; the space-related freedom of equipment/implement maneuverability (noted above in **Recommended Application of Practice**), and by the proper selection and operation of tractor and implements (explained below in **Design Guidance**). The more notable site-related factors include:

Soil

In the undisturbed condition, each identified soil type comprising a site is grouped into one of four categories of soil hydrology, Hydrologic Soil Group A, B, C or D, determined primarily by a range of characteristics including soil texture, drainage capability when thoroughly wet, and depth to water table. The natural rates of infiltration and transmission of soil-water through the undisturbed soil layers for Group A is "high" with a low runoff potential while soils in Group B are moderate in infiltration and the transmission of soil-water with a moderate runoff potential, depending somewhat on slope. Soils in Group C have slow rates of infiltration and transmission of soil-water and a moderately high runoff potential influenced by soil texture and slope; while soils in Group D have exceptionally slow rates of infiltration and transmission of soil-water, and high runoff potential.

In Figure 4, the profile displays the undisturbed horizons of a soil in Hydrologic Soil Group C and the naturally slow rate of infiltration through the subsoil. The slow rate of infiltration begins immediately below the topsoil horizon (30 cm), due to the limited amount of macro pores, e.g.: natural subsoil fractures, worm holes and root channels. Infiltration after the construction-induced mixing and compression of such subsoil material is virtually absent; but can be restored back to this natural level with the two-phase practice of deep ripping and decompaction, followed by the permanent establishment of an appropriate, deep taproot

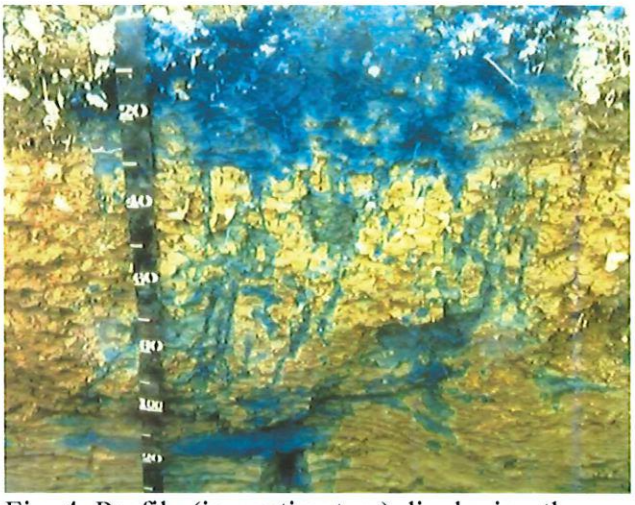


Fig. 4. Profile (in centimeters) displaying the infiltration test result of the natural undisturbed horizons of a soil in Hydrologic Soil Group C.

lawn/ground cover to help maintain the restored subsoil structure. Infiltration after construction-induced mixing and compression of such subsoil material can be notably rehabilitated with the Deep Ripping and Decompaction practice, which prepares the site for the appropriate long-term lawn/ground cover mix including deep taproot plants such as clover, fescue or trefoil, etc. needed for all rehabilitated soils.

Generally, soils in Hydrologic Soil Groups A and B, which respectively may include deep, well-drained, sandy-gravelly materials or deep, moderately well-drained basal till materials, are among the easier ones to restore permeability and infiltration, by deep ripping and decompaction. Among the many different soils in Hydrologic Soil Group C are those unique glacial tills having a natural fragipan zone, beginning about 12 to 18 inches (30 – 45cm), below surface. Although soils in Hydrologic Soil Group C do require a somewhat more carefully applied level of the Deep Ripping and Decompaction practice, it can greatly benefit such affected areas by reducing the runoff and fostering infiltration to a level equal to that of pre-disturbance.

Soils in Hydrologic Soil Group D typically have a permanent high water table close to the surface, influenced by a clay or other highly impervious layer of material. In many locations with clay subsoil material, the bulk density is so naturally high that heavy trafficking has little or no added impact on infiltration; and structural runoff control practices rather than Deep Ripping and Decompaction should be considered.

The information about Hydrologic Soil Groups is merely a general guideline. Site-specific data such as limited depths of cut-and-fill grading with minimal removal or translocation of the inherent subsoil materials (as analyzed in the county soil survey) or, conversely, the excavation and translocation of deeper, unconsolidated substratum or consolidated bedrock materials (unlike the analyzed subsoil horizons' materials referred to in the county soil survey) should always be taken into account.

Sites made up with significant quantities of large rocks, or having a very shallow depth to bedrock, are not conducive to deep ripping and decompation (subsoiling); and other measures may be more practical.

Slope

The two-phase application of 1) deep ripping and 2) decompaction (deep subsoiling), is most practical on flat, gentle and moderate slopes. In some situations, such as but not limited to temporary construction access corridors, inclusion areas that are moderately steep along a project's otherwise gentle or moderate slope may also be deep ripped and decompacted. For limited instances of moderate steepness on other projects, however, the post-construction land use and the relative alignment of the potential ripping and decompaction work in relation to the lay of the slope should be reviewed for safety and practicality. In broad construction areas predominated by moderately steep or steep slopes, the practice is generally not used.

Local Weather/Timing/Soil Moisture

Effective fracturing of compressed subsoil material from the exposed work surface, laterally and vertically down through the affected zone is achieved only when the soil material is moderately dry to moderately moist. Neither one of the two-phases, deep ripping nor decompaction (deep

subsoiling), can be effectively conducted when the soil material (subsoil or replaced topsoil) is in either a "plastic" or "liquid" state of soil consistency. Pulling the respective implements legs through the soil when it is overly moist only results in the "slicing and smearing" of the material or added "squeezing and compression" instead of the necessary fracturing. Ample drying time is needed for a "rippable" soil condition not merely in the material close to the surface, but throughout the material located down to the bottom of the physically compressed zone of the subsoil.

The "poor man's Atterberg field test" for soil plasticity is a simple "hand-roll" method used for quick, on-site determination of whether or not the moisture level of the affected soil material is low enough for: effective deep ripping of subsoil; respreading of topsoil in a friable state; and final decompaction (deep subsoiling). Using a sample of soil material obtained from the planned bottom depth of ripping, e.g.: 20 - 24 inches below exposed subsoil surface, the sample is hand rolled between the palms down to a 1/8-inch diameter thread. (Use the same test for stored topsoil material before respreading on the site.) If the respective soil sample crumbles apart in segments no greater than 3/8 of an inch long, by the time it is rolled down to 1/8 inch diameter, it is low enough in moisture for deep ripping (or topsoil replacement), and decompaction. Conversely, as shown in Figure 5, if the rolled sample stretches out in increments greater than 3/8 of an inch long before crumbling, it is in a "plastic" state of soil consistency and is too wet for subsoil ripping (as well as topsoil replacement) and final decompaction.

Fig. 5. Augered from a depth of 19 inches below the surface of the replaced topsoil, this subsoil sample was hand rolled to a 1/8-inch diameter. The test shows the soil at this site stretches out too far without crumbling; it indicates the material is in a plastic state of consistence, too wet for final decompaction (deep subsoiling) at this time.

Design Guidance

Beyond the above-noted site factors, a vital requirement for the effective Deep Ripping and Decompaction (deep subsoiling), is implementing the practice in its distinct, two-phase process:

1) Deep rip the affected thickness of exposed subsoil material (see Figure 10 and 11), aggressively fracturing it before the protected topsoil is reapplied on the site (see Figure 12); and

2) Decompact (deep subsoil), simultaneously through the restored topsoil layer and the upper half of the affected subsoil (Figure 13). The second phase, "decompaction," mitigates the partial recompaction which occurs during the heavy process of topsoil spreading/grading. Prior to deep ripping and decompacting the site, all construction activity, including construction equipment and material storage, site cleanup and trafficking (Figure 14), should be finished; and the site closed off to further disturbance. Likewise, once the practice is underway and the area's soil permeability and

rainfall infiltration are being restored, a policy limiting all further traffic to permanent travel lanes is maintained.

The other critical elements, outlined below, are: using the proper implements (deep, heavy-duty rippers and subsoilers), and ample pulling-power equipment (tractors); and conducting the practice at the appropriate speed, depth and pattern(s) of movement.

Note that an appropriate plan for the separate practice of establishing a healthy perennial ground cover, with deep rooting to help maintain the restored soil structure, should be developed in advance. This may require the assistance of an agronomist or landscape horticulturist.

Implements

Avoid the use of all undersize implements. The small-to-medium, light-duty tool will, at best, only "scarify" the uppermost surface portion of the mass of compacted subsoil material. The term "chisel plow" is commonly but incorrectly applied to a broad range of implements. While a few may be adapted for the moderate subsoiling of non-impacted soils, the majority are less durable and used for only lighter land-fitting (see Figure 6).

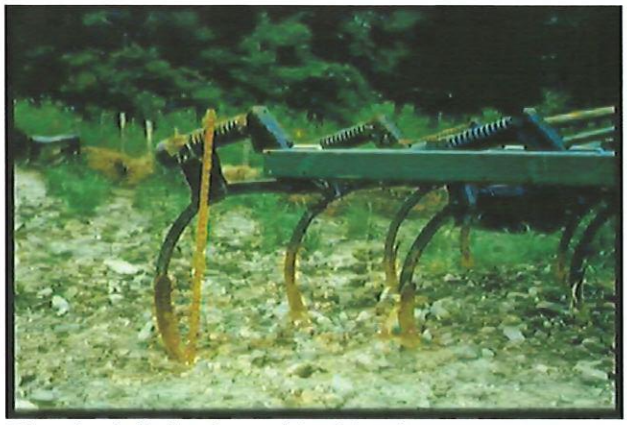


Fig. 6. A light duty chisel implement, not adequate for either the deep ripping or decompaction (deep subsoiling) phase.

Fig. 7. One of several variations of an agricultural ripper. This unit has long, rugged shanks mounted on a steel V-frame for deep, aggressive fracturing through Phase 1.

Use a "heavy duty" agricultural-grade, deep ripper (see Figures 7,9,10 and 11) for the first phase: the lateral and vertical fracturing of the mass of exposed and compressed subsoil, down and through, to the bottom of impact, prior to the replacement of the topsoil layer. (Any oversize rocks which are uplifted to the subsoil surface during the deep ripping phase are picked and removed.) Like the heavy-duty class of implement for the first phase, the decompaction (deep subsoiling) of Phase 2 is conducted with the heavy-duty version of the deep subsoiler. More preferable is the angled-leg variety of deep subsoiler (shown in Figures 8 and 13). It minimizes the inversion of the subsoil and topsoil layers while laterally and vertically fracturing the upper half of the previously ripped subsoil layer and all of the topsoil layer by delivering a momentary, wave-like "lifting and shattering" action up through the soil layers as it is pulled.

Pulling-Power of Equipment

Use the following rule of thumb for tractor horsepower (hp) whenever deep ripping and decompacting a significantly impacted site: For both types of implement, have at least 40 hp of tractor pull available for each mounted shank/ leg.

Using the examples of a 3-shank and a 5-shank implement, the respective tractors should have 120 and 200 hp available for fracturing down to the final depth of 20-to-24 inches per phase. Final depth for the deep ripping in Phase 1 is achieved incrementally by a progressive series of passes (see Depth and Patterns of Movement, below); while for Phase 2, the full operating depth of the deep subsoiler is applied from the beginning.

The operating speed for pulling both types of implement should not exceed 2 to 3 mph. At this slow and managed rate of operating speed, maximum functional performance is sustained by the tractor and the implement performing the soil fracturing. Referring to Figure 8, the implement is the 6-leg version of the deep angled-leg subsoiler. Its two outside legs are "chained up" so that only four legs will be engaged (at the maximum depth), requiring no less than 160 hp, (rather than 240 hp) of pull. The 4-wheel drive, articulated-frame tractor in Figure 8 is 174 hp. It will be decompacting this unobstructed, former construction access area simultaneously through 11 inches of replaced topsoil and the upper 12 inches of the previously deep-ripped subsoil. In constricted areas of Phase 1) Deep Ripping, a medium-size tractor with adequate hp, such as the one in Figure 9 pulling a 3-shank deep ripper, may be more maneuverable.

Fig. 8. A deep, angled-leg subsoiler, ideal for Phase 2 decompaction of after the topsoil layer is graded on top of the ripped subsoil.

Fig. 9. This medium tractor is pulling a 3-shank deep ripper. The severely compacted construction access corridor is narrow, and the 120 hp tractor is more maneuverable for Phase 1 deep ripping (subsoil fracturing), here.

Some industrial-grade variations of ripping implements are attached to power graders and bulldozers. Although highly durable, they are generally not recommended. Typically, the shanks or "teeth" of these rippers are too short and stout; and they are mounted too far apart to achieve the well-distributed type of lateral and vertical fracturing of the soil materials necessary to restore soil permeability and infiltration. In addition, the power graders and bulldozers, as pullers, are far less maneuverable for turns and patterns than the tractor.

Depth and Patterns of Movement

As previously noted both Phase 1 Deep Ripping through significantly compressed, exposed subsoil and Phase 2 Decompaction (deep subsoiling) through the replaced topsoil and upper subsoil need to be performed at maximum capable depth of each implement. With an implement's guide wheels attached, some have a "normal" maximum operating depth of 18 inches, while others may go deeper. In many situations, however, the tractor/implement operator must first remove the guide wheels and other non essential elements from the implement. This adapts the ripper or the deep subsoiler for skillful pulling with its frame only a few inches above surface, while the shanks or legs, fracture the soil material 20-to-24 inches deep.

There may be construction sites where the depth of the exposed subsoil's compression is moderate, e.g.: 12 inches, rather than deep. This can be verified by using a ¾ inch cone penetrometer and a shovel to test the subsoil for its level of compaction, incrementally, every three inches of increasing depth. Once the full thickness of the subsoil's compacted zone is finally "pieced" and there is a significant drop in the psi measurements of the soil penetrometer, the depth/thickness of compaction is determined. This is repeated at several representative locations of the construction site. If the thickness of the site's subsoil compaction is verified as, for example, ten inches, then the Phase 1 Deep Ripping can be correspondingly reduced to the implement's minimum operable depth of 12 inches. However, the Phase 2 simultaneous Decompation (subsoiling) of an 11 inch thick layer of replaced topsoil and the upper subsoil should run at the subsoiling implements full operating depth.

Fig. 10. An early pass with a 3-shank deep ripper penetrating only 8 inches into this worksite's severely compressed subsoil.

Fig. 11. A repeat run of the 3-shank ripper along the same patterned pass area as Fig. 9; here, incrementally reaching 18 of the needed 22 inches of subsoil fracture.

Typically, three separate series (patterns) are used for both the Phase 1 Deep Ripping and the Phase 2 Decompaction on significantly compacted sites. For Phase 1, each series begins with a moderate depth of rip and, by repeat-pass, continues until full depth is reached. Phase 2 applies the full depth of Decompation (subsoiling), from the beginning.

Every separate series (pattern) consists of parallel, forward-and-return runs, with each progressive

pass of the implement's legs or shanks evenly staggered between those from the previous pass. This compensates for the shank or leg-spacing on the implement, e.g., with 24-to-30 inches between each shank or leg. The staggered return pass ensures lateral and vertical fracturing actuated every 12 to 15 inches across the densely compressed soil mass.

Large, Unobstructed Areas

For larger easy areas, use the standard patterns of movement:

- The first series (pattern) of passes is applied lengthwise, parallel with the longest spread of the site; gradually progressing across the site's width, with each successive pass.

- The second series runs obliquely, crossing the first series at an angle of about 45 degrees.

- The third series runs at right angle (or 90 degrees), to the first series to complete the fracturing and shattering on severely compacted sites, and avoid leaving large unbroken blocks of compressed soil material. (In certain instances, the third series may be optional, depending on how thoroughly the first two series loosen the material and eliminate large chunks/blocks of material as verified by tests with a ¾-inch cone penetrometer.)

Fig. 12. Moderately dry topsoil is being replaced on the affected site now that Phase 1 deep ripping of the compressed subsoil is complete.

Fig. 13. The same deep, angled-leg subsoiler shown in Fig. 7 is engaged at maximum depth for Phase 2, decompaction (deep soiling), of the replaced topsoil and the upper subsoil materials.

Corridors

In long corridors of limited width and less maneuverability than larger sites, e.g.: along compacted areas used as temporary construction access, a modified series of pattern passes are used.

- First, apply the same initial lengthwise, parallel series of passes described above.

- A second series of passes makes a broad "S" shaped pattern of rips, continually and gradually alternating the "S" curves between opposite edges inside the compacted corridor.

- The third and final series again uses the broad, alternating S pattern, but it is "flip-flopped" to continually cross the previous S pattern along the corridor's centerline. This final series of the S pattern curves back along the edge areas skipped by the second series.

Maintenance and Cost

Once the two-phase practice of Deep Ripping and Decompation is completed, two items are essential for maintaining a site's soil porosity and permeability for infiltration. They are: planting and maintaining the appropriate ground cover with deep roots to maintain the soil structure (see Figure 15); and keeping the site free of traffic or other weight loads.

Note that site-specific choice of an appropriate vegetative ground-cover seed mix, including the proper seeding ratio of one or more perennial species with a deep taproot system and the proper amount of lime and soil nutrients (fertilizer mix) adapted to the soil-needs, are basic to the final practice of landscaping, i.e: surface tillage, seeding/planting/fertilizing and culti-packing or mulching is applied. The "maintenance" of an effectively deep-ripped and decompacted area is generally limited to the successful perennial (long-term) landscape ground cover; as long as no weight-bearing force of soil compaction is applied.

Fig. 14. The severely compacted soil of a temporary construction yard used daily by heavy equipment for four months; shown before deep ripping, topsoil replacement, and decompaction.

Fig. 15. The same site as Fig. 14 after deep ripping of the exposed subsoil, topsoil replacement, decompaction through the topsoil and upper subsoil and final surface tillage and revegetation to maintain soil permeability and infiltration.

The Deep Ripping and Decompaction practice is, by necessity, more extensive than periodic subsoiling of farmland.The cost of deep ripping and decompacting (deep subsoiling), will vary according to the depth and severity of soil-material compression and the relative amount of tractor and implement time that is required. In some instances, depending on open maneuverability, two-to-three acres of compacted project area may be deep-ripped in one day. In other situations of more severe compaction and - or less maneuverability, as little as one acre may be fully ripped in a day. Generally, if the Phase 1) Deep Ripping is fully effective, the Phase 2) Decompaction should be completed in 2/3 to 3/4 of the time required for Phase 1.

Using the example of two acres of Phase 1) Deep Ripping in one day, at $1800 per day, the net cost is $900 per acre. If the Phase 2) Decompacting or deep subsoiling takes 3/4 the time as Phase 1, it costs $675 per acre for a combined total of $1575 per acre to complete the practice (these figures do not include the cost of the separate practice of topsoil stripping and replacement). Due to the many variables, it must be recognized that cost will be determined by the specific conditions or constraints of the site and the availability of proper equipment.

Resources

Publications:

- American Society of Agricultural Engineers. 1971. *Compaction of Agricultural Soils.* ASAE.
- Brady, N.C., and R.R. Weil. 2002. *The Nature and Properties of Soils. 13th ed.* Pearson Education, Inc.
- Baver, L.D. 1948. *Soil Physics.* John Wiley & Sons.
- Carpachi, N. 1987 (1995 fifth printing). *Excavation and Grading Handbook, Revised. 2nd ed.* Craftsman Book Company
- Ellis, B. (Editor). 1997. Safe & Easy Lawn Care: The Complete Guide to Organic Low Maintenance Lawn. Houghton Mifflin.
- Harpstead, M.I., T.J. Sauer, and W.F. Bennett. 2001. *Soil Science Simplified. 4th ed.* Iowa State University Press.
- Magdoff, F., and H. van Es. 2000. *Building Soils for Better Crops. 2nd ed.* Sustainable Agricultural Networks
- McCarthy, D.F. 1993. *Essentials of Soil Mechanics and Foundations, Basic Geotechnics 4th ed.* Regents/Prentice Hall.
- Plaster, E.J. 1992. *Soil Science & Management. 3rd ed.* Delmar Publishers.
- Union Gas Limited, Ontario, Canada. 1984. *Rehabilitation of Agricultural Lands, Dawn-Kerwood Loop Pipeline; Technical Report.* Ecological Services for Planning, Ltd.; Robinson, Merritt & Devries, Ltd. and Smith, Hoffman Associates, Ltd.
- US Department of Agriculture in cooperation with Cornell University Agricultural Experiment Station. Various years. *Soil Survey of (various names) County, New York.* USDA.

Internet Access:

- Examples of implements:

V-Rippers. Access by internet search of *John Deere Ag -New Equipment for 915* (larger-frame model) *V-Rippe;* and, *for 913* (smaller-frame model) *V-Ripper.* Deep, angled-leg subsoiler. Access by internet search of: *Bigham Brothers Shear Bolt Paratill-Subsoiler.* http://salesmanual.deere.com/sales/salesmanual/en_NA/primary_tillage/2008/feature/rippers/915v_pattern_frame.html?sbu=ag&link=prodcat Last visited March 08.

- Soils data of USDA Natural Resources Conservation Service. *NRCS Web Soil Survey.* http://websoilsurvey.nrcs.usda.gov/app/ and *USDA-NRCS Official Soil Series Descriptions; View by Name.* http://ortho.ftw.nrcs.usda.gov/cgi-bin/osd/osdname.cgi . *Last visited Jan. 08.*
- Soil penetrometer information. Access by internet searches of: *Diagnosing Soil Compaction using a Penetrometer (soil compaction tester), PSU Extension;* as well as *Dickey-john Soil Compaction Tester.* http://www.dickey-johnproducts.com/pdf/SoilCompactionTest.pdf and http://cropsoil.psu.edu/Extension/Facts/uc178pdf Last visited Sept. 07

APPENDIX 14

State Pollutant Discharge Elimination System for Construction Activities Construction Site Log Book

APPENDIX F
CONSTRUCTION SITE INSPECTION AND MAINTENANCE LOG BOOK

STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM FOR CONSTRUCTION ACTIVITIES

SAMPLE CONSTRUCTION SITE LOG BOOK

Table of Contents

I. PRE-CONSTRUCTION MEETING DOCUMENTS

Project Name _____

Permit No. _____ **Date of Authorization** _____

Name of Operator _____

Prime Contractor _____

a. Preamble to Site Assessment and Inspections

The Following Information To Be Read By All Person's Involved in The Construction of Stormwater Related Activities:

The Operator agrees to have a qualified inspector[1] conduct an assessment of the site prior to the commencement of construction[2] and certify in this inspection report that the appropriate erosion and sediment controls described in the SWPPP have been adequately installed or implemented to ensure overall preparedness of the site for the commencement of construction.

Prior to the commencement of construction, the Operator shall certify in this site logbook that the SWPPP has been prepared in accordance with the State's standards and meets all Federal, State and local erosion and sediment control requirements. A preconstruction meeting should be held to review all of the SWPPP requirements with construction personnel.

When construction starts, site inspections shall be conducted by the qualified inspector at least every 7 calendar days. The Operator shall maintain a record of all inspection reports in this site logbook. The site logbook shall be maintained on site and be made available to the permitting authorities upon request.

Prior to filing the Notice of Termination or the end of permit term, the Operator shall have a qualified inspector perform a final site inspection. The qualified inspector shall certify that the site has undergone final stabilization[3] using either vegetative or structural stabilization methods and that all temporary erosion and sediment controls (such as silt fencing) not needed for long-term erosion control have been removed. In addition, the Operator must identify and certify that all permanent structures described in the SWPPP have been constructed and provide the owner(s) with an operation and maintenance plan that ensures the structure(s) continuously functions as designed.

1 Refer to "Qualified Inspector" inspection requirements in the current SPDES General Permit for Stormwater Discharges from Construction Activity for complete list of inspection requirements.
2 "Commencement of construction" means the initial removal of vegetation and disturbance of soils associated with clearing, grading or excavating activities or other construction activities.
3 "Final stabilization" means that all soil-disturbing activities at the site have been completed and a uniform, perennial vegetative cover with a density of eighty (80) percent has been established or equivalent stabilization measures (such as the use of mulches or geotextiles) have been employed on all unpaved areas and areas not covered by permanent structures.

b. Pre-construction Site Assessment Checklist
(NOTE: Provide comments below as necessary)

1. Notice of Intent, SWPPP, and Contractors Certification:

Yes No NA

[ ] [ ] [ ] Has a Notice of Intent been filed with the NYS Department of Conservation?
[ ] [ ] [ ] Is the SWPPP on-site? Where?_____
[ ] [ ] [ ] Is the Plan current? What is the latest revision date?_____
[ ] [ ] [ ] Is a copy of the NOI (with brief description) onsite? Where?_____
[ ] [ ] [ ] Have all contractors involved with stormwater related activities signed a contractor's certification?

2. Resource Protection

Yes No NA

[ ] [ ] [ ] Are construction limits clearly flagged or fenced?
[ ] [ ] [ ] Important trees and associated rooting zones, on-site septic system absorption fields, existing vegetated areas suitable for filter strips, especially in perimeter areas, have been flagged for protection.
[ ] [ ] [ ] Creek crossings installed prior to land-disturbing activity, including clearing and blasting.

3. Surface Water Protection

Yes No NA

[ ] [ ] [ ] Clean stormwater runoff has been diverted from areas to be disturbed.
[ ] [ ] [ ] Bodies of water located either on site or in the vicinity of the site have been identified and protected.
[ ] [ ] [ ] Appropriate practices to protect on-site or downstream surface water are installed.
[ ] [ ] [ ] Are clearing and grading operations divided into areas <5 acres?

4. Stabilized Construction Access

Yes No NA

[ ] [ ] [ ] A temporary construction entrance to capture mud and debris from construction vehicles before they enter the public highway has been installed.
[ ] [ ] [ ] Other access areas (entrances, construction routes, equipment parking areas) are stabilized immediately as work takes place with gravel or other cover.
[ ] [ ] [ ] Sediment tracked onto public streets is removed or cleaned on a regular basis.

5. Sediment Controls

Yes No NA

[ ] [ ] [ ] Silt fence material and installation comply with the standard drawing and specifications.
[ ] [ ] [ ] Silt fences are installed at appropriate spacing intervals
[ ] [ ] [ ] Sediment/detention basin was installed as first land disturbing activity.
[ ] [ ] [ ] Sediment traps and barriers are installed.

6. Pollution Prevention for Waste and Hazardous Materials

Yes No NA

[ ] [ ] [ ] The Operator or designated representative has been assigned to implement the spill prevention avoidance and response plan.
[ ] [ ] [ ] The plan is contained in the SWPPP on page _____
[ ] [ ] [ ] Appropriate materials to control spills are onsite. Where? _____

II. CONSTRUCTION DURATION INSPECTIONS

a. **Directions:**

Inspection Forms will be filled out during the entire construction phase of the project.

Required Elements:

1) On a site map, indicate the extent of all disturbed site areas and drainage pathways. Indicate site areas that are expected to undergo initial disturbance or significant site work within the next 14-day period;

2) Indicate on a site map all areas of the site that have undergone temporary or permanent stabilization;

3) Indicate all disturbed site areas that have not undergone active site work during the previous 14-day period;

4) Inspect all sediment control practices and record the approximate degree of sediment accumulation as a percentage of sediment storage volume (for example, 10 percent, 20 percent, 50 percent);

5) Inspect all erosion and sediment control practices and record all maintenance requirements such as verifying the integrity of barrier or diversion systems (earthen berms or silt fencing) and containment systems (sediment basins and sediment traps). Identify any evidence of rill or gully erosion occurring on slopes and any loss of stabilizing vegetation or seeding/mulching. Document any excessive deposition of sediment or ponding water along barrier or diversion systems. Record the depth of sediment within containment structures, any erosion near outlet and overflow structures, and verify the ability of rock filters around perforated riser pipes to pass water; and

6) Immediately report to the Operator any deficiencies that are identified with the implementation of the SWPPP.

SITE PLAN/SKETCH

Inspector (print name)	**Date of Inspection**
Qualified Inspector (print name)	**Qualified Inspector Signature**

The above signed acknowledges that, to the best of his/her knowledge, all information provided on the forms is accurate and complete.

Maintaining Water Quality

Yes No NA

[ ] [ ] [ ] Is there an increase in turbidity causing a substantial visible contrast to natural conditions at the outfalls?
[ ] [ ] [ ] Is there residue from oil and floating substances, visible oil film, or globules or grease at the outfalls?
[ ] [ ] [ ] All disturbance is within the limits of the approved plans.
[ ] [ ] [ ] Have receiving lake/bay, stream, and/or wetland been impacted by silt from project?

Housekeeping

1. General Site Conditions

Yes No NA

[ ] [ ] [ ] Is construction site litter, debris and spoils appropriately managed?
[ ] [ ] [ ] Are facilities and equipment necessary for implementation of erosion and sediment control in working order and/or properly maintained?
[ ] [ ] [ ] Is construction impacting the adjacent property?
[ ] [ ] [ ] Is dust adequately controlled?

2. Temporary Stream Crossing

Yes No NA

[ ] [ ] [ ] Maximum diameter pipes necessary to span creek without dredging are installed.
[ ] [ ] [ ] Installed non-woven geotextile fabric beneath approaches.
[ ] [ ] [ ] Is fill composed of aggregate (no earth or soil)?
[ ] [ ] [ ] Rock on approaches is clean enough to remove mud from vehicles & prevent sediment from entering stream during high flow.

3. Stabilized Construction Access

Yes No NA

[ ] [ ] [ ] Stone is clean enough to effectively remove mud from vehicles.
[ ] [ ] [ ] Installed per standards and specifications?
[ ] [ ] [ ] Does all traffic use the stabilized entrance to enter and leave site?
[ ] [ ] [ ] Is adequate drainage provided to prevent ponding at entrance?

Runoff Control Practices

1. Excavation Dewatering

Yes No NA

[ ] [ ] [ ] Upstream and downstream berms (sandbags, inflatable dams, etc.) are installed per plan.
[ ] [ ] [ ] Clean water from upstream pool is being pumped to the downstream pool.
[ ] [ ] [ ] Sediment laden water from work area is being discharged to a silt-trapping device.
[ ] [ ] [ ] Constructed upstream berm with one-foot minimum freeboard.

Runoff Control Practices (continued)

2. Flow Spreader

Yes No NA

[ ] [ ] [ ] Installed per plan.
[ ] [ ] [ ] Constructed on undisturbed soil, not on fill, receiving only clear, non-sediment laden flow.
[ ] [ ] [ ] Flow sheets out of level spreader without erosion on downstream edge.

3. Interceptor Dikes and Swales

Yes No NA

[ ] [ ] [ ] Installed per plan with minimum side slopes 2H:1V or flatter.
[ ] [ ] [ ] Stabilized by geotextile fabric, seed, or mulch with no erosion occurring.
[ ] [ ] [ ] Sediment-laden runoff directed to sediment trapping structure

4. Stone Check Dam

Yes No NA

[ ] [ ] [ ] Is channel stable? (flow is not eroding soil underneath or around the structure).
[ ] [ ] [ ] Check is in good condition (rocks in place and no permanent pools behind the structure).
[ ] [ ] [ ] Has accumulated sediment been removed?.

5. Rock Outlet Protection

Yes No NA

[ ] [ ] [ ] Installed per plan.
[ ] [ ] [ ] Installed concurrently with pipe installation.

Soil Stabilization

1. Topsoil and Spoil Stockpiles

Yes No NA

[ ] [ ] [ ] Stockpiles are stabilized with vegetation and/or mulch.
[ ] [ ] [ ] Sediment control is installed at the toe of the slope.

2. Revegetation

Yes No NA

[ ] [ ] [ ] Temporary seedings and mulch have been applied to idle areas.
[ ] [ ] [ ] 4 inches minimum of topsoil has been applied under permanent seedings

Sediment Control Practices

1. Silt Fence and Linear Barriers

Yes No NA

[ ] [ ] [ ] Installed on Contour, 10 feet from toe of slope (not across conveyance channels).
[ ] [ ] [ ] Joints constructed by wrapping the two ends together for continuous support.
[ ] [ ] [ ] Fabric buried 6 inches minimum.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.
Sediment accumulation is ___% of design capacity.

Sediment Control Practices (continued)

2. Storm Drain Inlet Protection (Use for Stone & Block; Filter Fabric; Curb; or, Excavated; Filter Sock or Manufactured practices)

Yes No NA

[ ] [ ] [ ] Installed concrete blocks lengthwise so open ends face outward, not upward.
[ ] [ ] [ ] Placed wire screen between No. 3 crushed stone and concrete blocks.
[ ] [ ] [ ] Drainage area is 1 acre or less.
[ ] [ ] [ ] Excavated area is 900 cubic feet.
[ ] [ ] [ ] Excavated side slopes should be 2:1.
[ ] [ ] [ ] 2" x 4" frame is constructed and structurally sound.
[ ] [ ] [ ] Posts 3-foot maximum spacing between posts.
[ ] [ ] [ ] Fabric is embedded 1 to 1.5 feet below ground and secured to frame/posts with staples at max 8-inch spacing.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.
[ ] [ ] [ ] Manufactured insert fabric is free of tears and punctures.
[ ] [ ] [ ] Filter Sock is not torn or flattened and fill material is contained within the mesh sock.

Sediment accumulation ___% of design capacity.

3. Temporary Sediment Trap

Yes No NA

[ ] [ ] [ ] Outlet structure is constructed per the approved plan or drawing.
[ ] [ ] [ ] Geotextile fabric has been placed beneath rock fill.
[ ] [ ] [ ] Sediment trap slopes and disturbed areas are stabilized.

Sediment accumulation is ___% of design capacity.

4. Temporary Sediment Basin

Yes No NA

[ ] [ ] [ ] Basin and outlet structure constructed per the approved plan.
[ ] [ ] [ ] Basin side slopes are stabilized with seed/mulch.
[ ] [ ] [ ] Drainage structure flushed and basin surface restored upon removal of sediment basin facility.
[ ] [ ] [ ] Sediment basin dewatering pool is dewatering at appropriate rate.

Sediment accumulation is ___% of design capacity.

Note: Not all erosion and sediment control practices are included in this listing. Add additional pages to this list as required by site specific design. All practices shall be maintained in accordance with their respective standards.

Construction inspection checklists for post-development stormwater management practices can be found in Appendix F of the New York Stormwater Management Design Manual.

CONSTRUCTION DURATION INSPECTIONS

b. Modifications to the SWPPP (To be completed as described below)

The Operator shall amend the SWPPP whenever:

1. There is a significant change in design, construction, operation, or maintenance which may have a significant effect on the potential for the discharge of pollutants to the waters of the United States and which has not otherwise been addressed in the SWPPP; or
2. The SWPPP proves to be ineffective in:
   a. Eliminating or significantly minimizing pollutants from sources identified in the SWPPP and as required by this permit; or
   b. Achieving the general objectives of controlling pollutants in stormwater discharges from permitted construction activity; and
3. Additionally, the SWPPP shall be amended to identify any new contractor or subcontractor that will implement any measure of the SWPPP.

Modification & Reason: