Erosion & Sediment Control and

Stormwater Pollution Prevention Plan

Silo Ridge Resort Community Master Development

Prepared for **Silo Ridge Ventures, LLC.**
5021 US Route 44
Amenia, NY 12501
845-373-8020

Prepared By **VHB Engineering, Surveying and Landscape Architecture P.C.**
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White Plains, NY 10606
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April 2014

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Amanda Catherine De Cesare, P.E.

New York License # 084690

Table of Contents

Introduction and Instruction to Owner/Operator

This Erosion and Sediment Control / Pollution Prevention Manual has been developed as a base for the Stormwater Pollution Prevention Plan (SWPPP) to be prepared by the Owner/Operator as required under New York's State Pollutant Discharge Elimination System (SPDES) Permit for Construction Activites (GP-0-10-001). This manual provides the following information, as required for the SWPPP by the SPDES Permit:

- Site Description
- Development Description
- Drainage Characteristics
- Soil Characteristics
- Construction Phasing Information
- Pollution Prevention Practices
- Erosion and Sediment Control BMPs
- Operations and Maintenance Plans
- Grading, Drainage and Erosion Control Plans
- SPDES Permit and Fact Sheet
- Notice of Intent (NOI) Form (to be finalized and Certified by the Owner/Operator)
- Notice of Termination (NOT) Form
- Inspection Forms, Monitoring and Reporting Requirements
- Contractor Certification Form

The SWPPP must be prepared prior to filing of the Notice of Intent (NOI). If the SWPPP conforms to the Department's technical standards and the activities will not discharge a pollutant of concern to an impaired water or a TMDL watershed, authorization to discharge under this permit may occur five (5) business days after the date on which the NOI is received by the Department. For activities which do not comply with the technical standards or for construction site activities subject to a TMDL, authorization to discharge begins no sooner than sixty (60) business days from receipt of the NOI by the DEC unless notified otherwise. NOI forms can be found on the NYS DEC website (http://www.dec.ny.gov/) and must be mailed to the NYSDEC Central Office in Albany (Division of Water, 625 Broadway, 4th Floor, Albany, NY 12233-3505).

In order to complete the pre-construction SWPPP, the Owner/Operator must complete the following:

- Certify that they have read and understand the terms of the SPDES Permit.
- Review this manual and update and/or revise as necessary.

- Update location and types of erosion and sediment control materials as required by the site.
- Include designation letters to authorize implementation of the SWPPP.
- Designate areas for stockpiles, sanitary facilities, dumpsters, wash-down, lay-down and construction trailers and appropriate erosion and sediment control features (these can be hand drawn on a copy of the site plan).
- Designate project contact person(s) and include contact information.

The SWPPP is a dynamic document, and must be continually updated by the Owner/Operator throughout construction. This manual does not comprise a complete SWPPP. It is the responsibility of the Owner/Operator to update this manual and perform the activities herein, including, but not limited to:

- Post a sign at the site construction entrance that includes a copy of the Notice of Intent and a brief description of the project, location of the SWPPP, and a person to contact should the public want to review the SWPPP.
- Perform inspections and maintenance as designated in this manual, and as required as the project phases change.
- Prepare and certify inspection reports and include reports in the SWPPP.
- Update plans, as necessary, to denote major site changes and/or changes in the site BMPs.
- Update Plans to reflect changes in stockpile, sanitary facility, lay-down and other site areas.
- Maintain schedule of dates of major earthwork, stabilization and/or erosion control installations.
- Document any spills.
- Document off-site sedimentation resulting from this construction.

The Owner/Operator completed SWPPP must be updated throughout construction, until a Notice of Termination (NOT) Form has been submitted to the DEC. From the date of submital of the NOT form, the SWPPP documents must be maintained by the Site operator for a period of five years.

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Notice of Intent (NOI) Form

The Department of Enivronmental Conservation must receive the completed NOI at least five (5) business days prior to the start of construction. VHB has supplied some of the information necessary for portions of this form. The remainder of the information must be completely filled out, reviewed, and submitted by the owner and construction site operator. The completed NOI Form must be certified and submitted by the owner/operator in order for it to take effect.

6154147110

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-0-10-001

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)
Silo Ridge Ventures LLC

Owner/Operator Contact Person Last Name (NOT CONSULTANT)
Torres

Owner/Operator Contact Person First Name
Pedro

Owner/Operator Mailing Address
5021 Route 44

City
Amenia

State
NY

Zip
12501 -

Phone (Owner/Operator)
845 - 373 - 8020

Fax (Owner/Operator)
 - -

Email (Owner/Operator)
ptorres@stoneleafpartners.com

FED TAX ID
13 - 4139599 (not required for individuals)

0739147113

Project Site Information

Project/Site Name
Silo Ridge Country Club

Street Address (NOT P.O. BOX)
4651 Route 22

Side of Street
○ North ○ South ○ East ● West

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

State: NY
Zip: 12501 -
County: Dutchess
DEC Region: 3

Name of Nearest Cross Street
Lake Amenia Road

Distance to Nearest Cross Street (Feet)
2800

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

Tax Map Numbers
Section-Block-Parcel
7066-00

Tax Map Numbers
732810 670717

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)	Y Coordinates (Northing)
618532	4632264

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
- ○ SINGLE FAMILY SUBDIVISION — Number of Lots [ ]
- ○ 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
676.0	268.3	14.0	35.0

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
29%	5%	29%	37%

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

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

Start Date 08/01/2014 - **End Date** 08/31/2021

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

Name

Amenia Brook

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-0-10-001? ○ **Yes** ● **No**

11. Is this project located in one of the Watersheds identified in Appendix C of GP-0-10-001? ○ **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?

Note: Runoff that is entering the NYSDOT drainage system occurs for BOTH EXISTING & PROPOSED conditions. Runoff from proposed development is treated before discharging into the NYSDOT drainage system.

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
VHB ENG.,SURV. & LANDSCAPE ARCH. PC

Contact Name (Last, Space, First)
DeCesare, Amanda

Mailing Address
50 Main Street, Suite 360

City
white Plains

State: NY Zip: 10606 -

Phone: 914 - 467 - 6614

Fax: 914 - 761 - 3759

Email
adecesare@vhb.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-0-10-001. 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: Amanda **MI**: C

Last Name: DeCesare

Signature

Date: 04 / 09 / 2014

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.

- [x] **Preservation of Undisturbed Areas**
- [x] **Preservation of Buffers**
- [x] **Reduction of Clearing and Grading**
- [ ] **Locating Development in Less Sensitive Areas**
- [x] **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).

- [x] 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

33.926 **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.

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

	Total Contributing Area (acres)		Total Contributing Impervious Area(acres)	
RR Techniques (Area Reduction)				
● Conservation of Natural Areas (RR-1) ...	464.0	and/or	.	
● Sheetflow to Riparian Buffers/Filters Strips (RR-2)	5.66	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)			.	
○ 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)			14.614	ac-ft
○ Multiple Pond System (P-4)			.	
○ Pocket Pond (P-5)			.	
○ Surface Sand Filter (F-1)			.	
● Underground Sand Filter (F-2)			1.26	ac-ft
○ 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

24.056 **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

6.12 **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.
If No, the sizing criteria has not been met. Contact Regional Office stormwater contact person to discuss next steps.

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.

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

15.874 **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). 39.93

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, the sizing criteria has not been met. Contact Regional Office stormwater contact person to discuss next steps.

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

CPv Required 0. **acre-feet**

CPv Provided 0. **acre-feet**

*CPv is waived because under proposed conditions, there is NO increase in peak flows for the 1-yr or 100-yr storm events

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	**Post-development**
275.75 **CFS**	251.17 **CFS**

Total Extreme Flood Control Criteria (Qf)

Pre-Development	**Post-development**
985.44 **CFS**	769.35 **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

Silo Ridge Ventures LLC

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.

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 NYR
- ● Other Army Corps Nationwide
- ○ None

41. Does this project require a US Army Corps of Engineers Wetland Permit? **If Yes, Indicate Size of Impact.** 1.3 — ● Yes ○ No

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

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. NYR10X867

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 Pedro

MI

Print Last Name Torres

Owner/Operator Signature

Date 04/10/2014

II
Contractor Certifications and Designation Letters

It is a requirement of the SPDES Permit that all those implementing the SWPPP certify that they have read and understand the permit. Certification Forms are included in this manual.

In addition, those implementing the SWPPP must be certified as designees of the contract firm's owner as described in Part III, Subsection A of the SPDES Permit. A copy of the New York State SPDES Permit GP-0-10-001 is included in Section XII of this manual.

CERTIFICATION OF PROJECT CONSTRUCTION CONTRACTORS

Silo Ridge
4651 US Route 22
Amenia, NY 12501

The following certification shall be signed by each contractor and subcontractor responsible for on-site activities, or any other subcontractor who will perform any action that may reasonably be expected to cause or have the potential to cause pollution of the waters of New York.

"I hereby certify that I understand and agree to comply with the terms and conditions of the 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 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. "

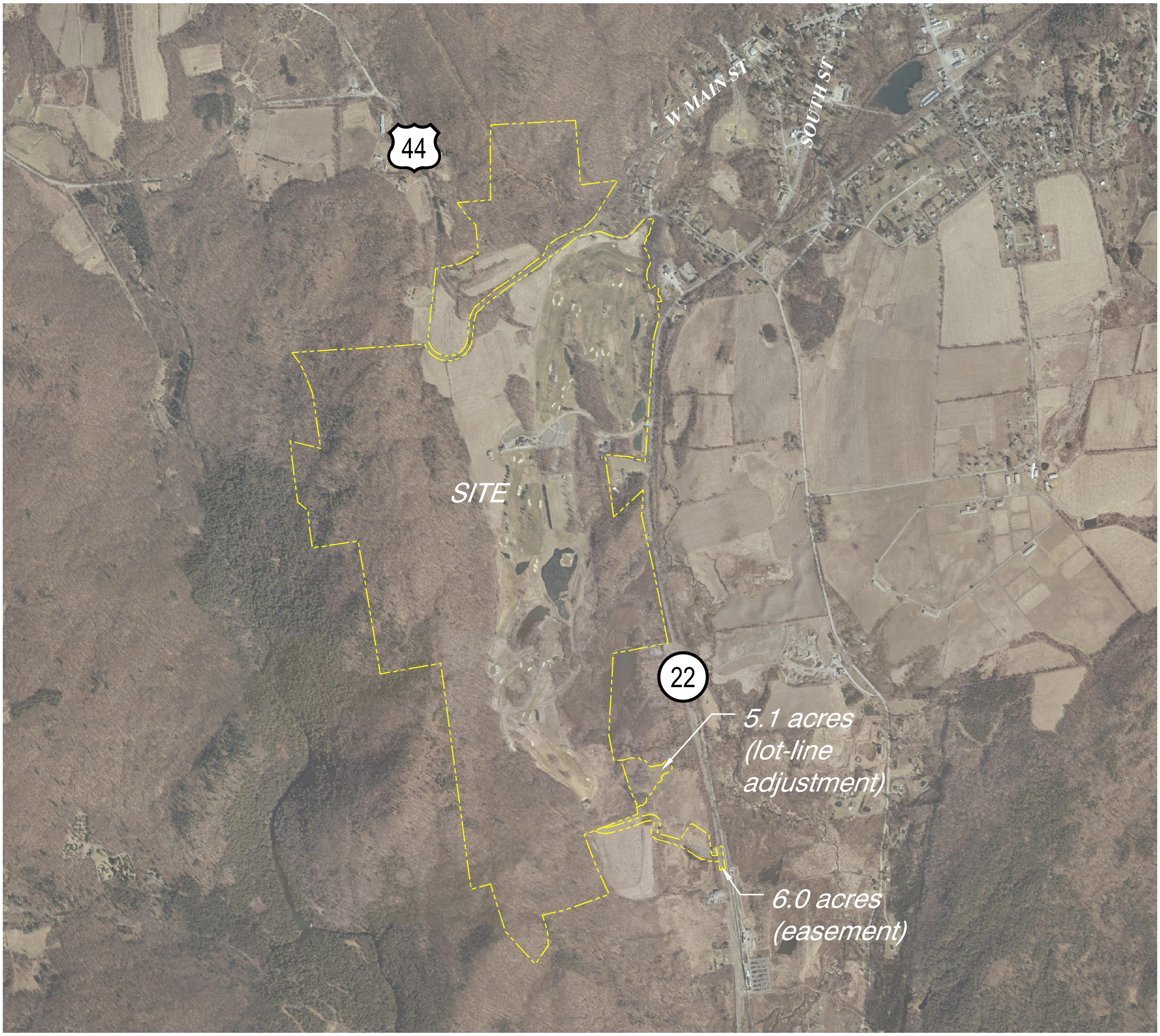
Owner/Operator	**Contractor**	**Subcontractor**
______________________	______________________	______________________
Signature and Date	Signature and Date	Signature and Date
______________________	______________________	______________________
Title	Title	Title
______________________	______________________	______________________
______________________	______________________	______________________
______________________	______________________	______________________
Company and Address	Company and Address	Company and Address

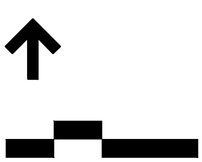
Subcontractor	**Subcontractor**	**Subcontractor**
______________________	______________________	______________________
Signature and Date	Signature and Date	Signature and Date
______________________	______________________	______________________
Title	Title	Title
______________________	______________________	______________________
______________________	______________________	______________________
______________________	______________________	______________________
Company and Address	Company and Address	Company and Address

III
Project Figures

Figure 1. Site Location Map

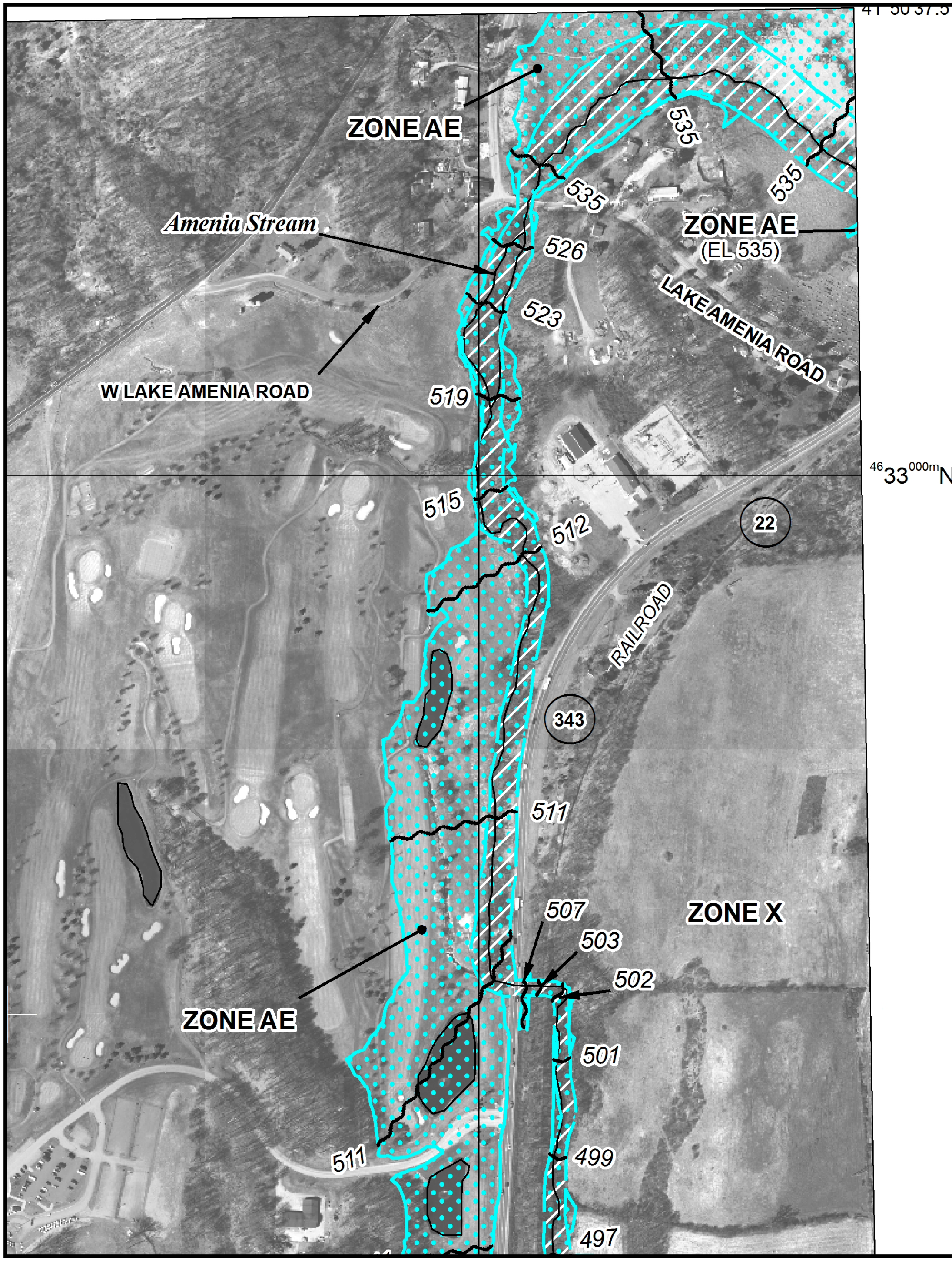
Figure 2. FEMA Floodplain Map





Vanasse Hangen Brustlin, Inc.

Site Location Map
Silo Ridge Resort Community
4651 Route 22
Amenia, New York 12501



MAP SCALE 1" = 500'

250 0 500 1000 FEET

METER

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0329E

FIRM

FLOOD INSURANCE RATE MAP

for DUTCHESS COUNTY, NEW YORK
(ALL JURISDICTIONS)

CONTAINS:

COMMUNITY	NUMBER
AMENIA, TOWN OF	361332

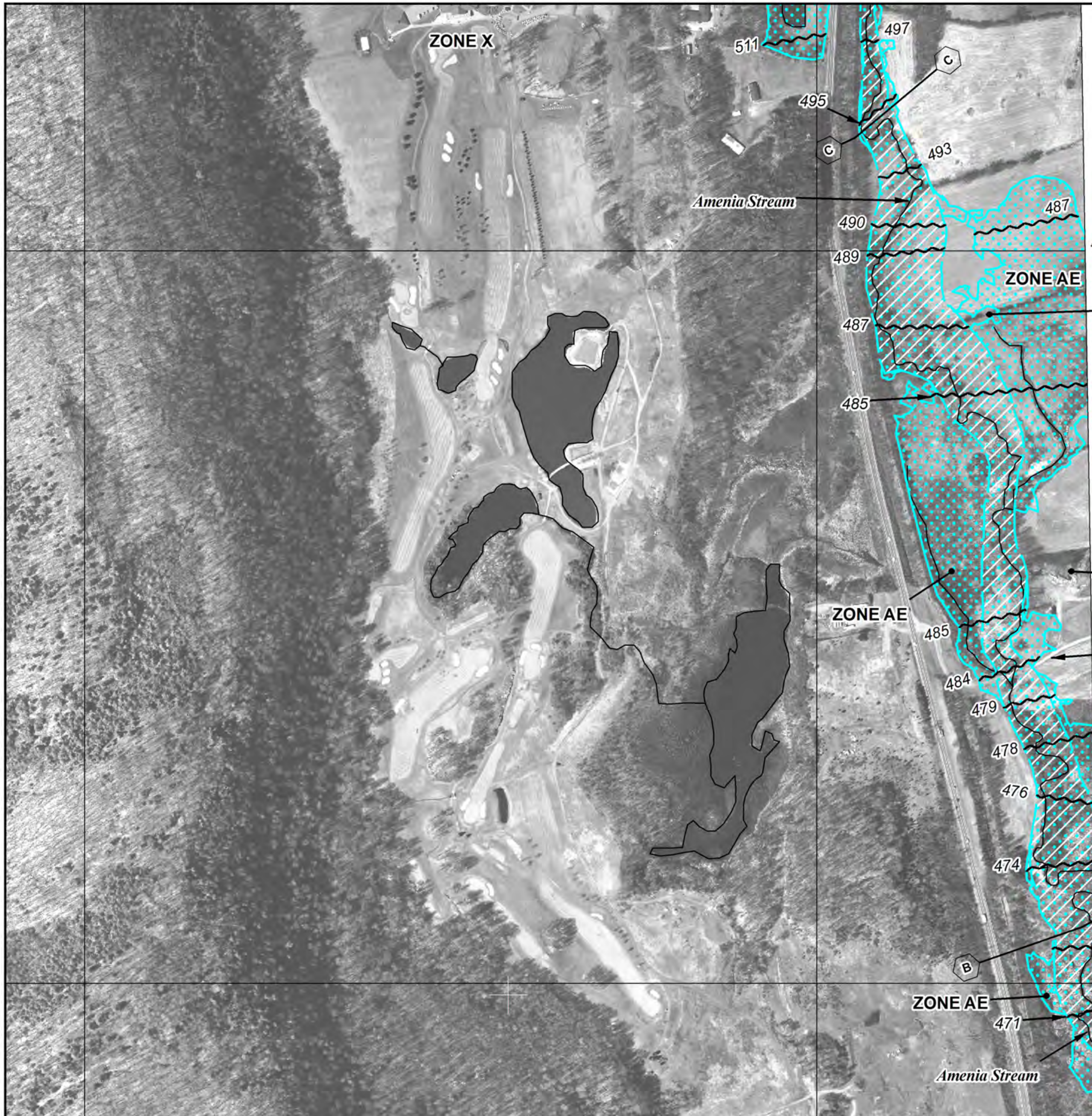
PANEL 329 OF 602
MAP SUFFIX: E
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

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
36027C0329E

EFFECTIVE DATE
MAY 2, 2012

Federal Emergency Management Agency



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METER

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EFFECTIVE DATE
MAY 2, 2012

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

IV
Project Description

Site Location and Summary

The 676 +/- acre (682.5 +/- acres including the 6.6 +/- acre easement area on the adjoining property owned by Harlem Valley Landfill Corp.) project site is located in Town of Amenia, Dutchess County, NY, with a contributing drainage area of 849 +/- acres. The site is bounded to the West and South by Wassaic Creek, the East by Route 22, and the North by Lake Amenia Road and tributary to Amenia Stream. The project is not located within a TMDL watershed nor does it discharge into a 303(d) listed waterbody. The site location is shown on Figures 1 and 2.

Existing Conditions

Currently, the project site consist majority of existing golf course and wooded area. It also consists of a club house, parking lot and few existing ponds and wetlands. In general, the site rainfall runoff drains eastward to existing wetland and Amenia Stream along the Route 22.

According to the Flood Insurance Rate Map (FIRM) prepared by Federal Emergency Management Agency (FEMA) includes as Figure 2, a portion of the project site is located within the 100-year floodplain. [FIRM map number 36027C0329E, effective date May 2, 2012]

According to the NRCS soil survey for Dutchess County, NY, the majority hydrology soil groups for the site are hydrology soil group A, C and D. Soil boring logs, test pit locations, and an NRCS soils information are included in Appendix D.

Proposed Conditions

The proposed development consists of three phases of construction and are shown in the master development plan.

Phase I constructions include:

- Main Entry and Gatehouse

- Sales office, Design Center and General Store
- Artisan Park Overlook
- Golf Course Renovations
- South Entry Access and Golf Maintenance Facility
- Village Green Lodging Unit, Condos
- Club Building, Fitness and Pool
- Activity Barn and Lake Pavilion
- Single Family Homes
- Roads and Utilities
- Wastewater Treatment Plant and Conveyance
- Water Treatment Facilities, Storage and Distribution
- Drainage Piping Network and Stormwater Management Features

Phase II constructions include:

- Club with Lodging Units
- Balance of Single Family Homes
- Roads and Utilities
- Drainage Piping Network and Stormwater Management Features

Phase III constructions include:

- Vineyard Cottages
- Winery Restaurant
- Roads and Utilities
- Drainage Piping Network and Stormwater Management Features

The total disturbance area of the development is 263.8 acres.

Runoff from the site is conveyed through the proposed drainage system to the proposed detention basins before discharging out of the site. The proposed detention basins serve as the water quality and water quantity control measures.

Five Step Process for Stormwater Site Planning and Practices Selection

The NYS Stormwater Management Design Manual (SMDM) required a five-step process that integrates site planning, usage of green infrastructure practices and standard stormwater management practices to treat stormwater. The five steps process are:

1. Site Planning to preserve natural area and reduce impervious cover,
2. Calculate initial required Water Quality Volume for the site,
3. Provide Runoff Reduction by incorporating green infrastructure technique and standard stormwater management practice (SMP) with Runoff Reduction Volume (RRv) capacity,
4. Provide standard SMP's to treat remaining portion of water quality volume (WQv) not addressed by green infrastructure and standard SMP's with RRv capacity, and
5. Provide volume and peak rate control practices where required.

Following further discuss each of the five steps process in details.

Step 1: Site Planning

During site planning process, the designer try to conserve natural resources and reduce proposed impervious coverage to reduce the impact of water quality from proposed development.

Preservation of Natural Resources includes:

- Preservation of undisturbed areas
- Preservation of buffer areas
- Minimizing site clearing and grading
- Avoiding sensitive area
- Open space design

Reduction of impervious coverage includes:

- Roadway reduction
- Sidewalk reduction
- Driveway reduction
- Cul-de-sac reduction
- Building footprint reduction
- Parking reduction

Step 2: Required Water Quality Volume (WQv)

Required WQv was calculated for the site based on Chapter 10 of SWDM – Enhanced Phosphorus Removal Standard (East of Hudson Standard) as per agreement with the Town although the site is not located within the East of Hudson Watershed. One-year rainfall of 2.8 inches was used for the WQv calculation. Weighted CN value was calculated based on the proposed development. Refer to attachment E3 for detailed calculation (WQv and RRv Analysis).

Step 3: Runoff Reduction Volume (RRv)

RRv requirement can be achieved through application of green infrastructure and standard SWM with runoff reduction capacity. If RRv provided by these techniques is greater than the required WQv, the RRv requirement is met. However if the RRv is less than the required WQv, the designer must at a minimum, reduce a percentage of the runoff from impervious areas to be constructed on site. The percent reduction is based on the Hydrologic Soil Groups present on the site, and is determined by the Specific Reduction Factor (S). The Specific Reduction Factor (S) used for this site is assumed to be 0.55 based on hydrologic soil group A to be conservative. Refer to attachment E3 for detailed calculations (WQv and RRv Analysis). Below are the list of green infrastructure techniques and standard SMP with runoff reduction capacity and an evaluation of its use for this project.

Conservation of Natural Area

Conserving the natural area can avoid the unnecessary disturbance of the natural soil and maintain the water quality. The project preserves most of the natural area throughout the perimeter of the property totaling approximately 464± acres. Most of the preserved areas are wooded area. Refer to Figure E3 (Water Quality Map) in appendix E3 for conservation area boundary. Conservation area is used for calculating the runoff reduction volume.
Also, to meet the requirements of the RDO District, the project proposes to maintain at a minimum 80% of the site as Open Space; the proposed plan preserves 541.8± acres as Open Space within conservation easements.
Additionally, the project proposes restoration of the stream connecting to and the floodplain adjacent to the Amenia Cascade brook, as well as stream restoration of Wetland P located near the Estate Homes.

Sheetflow to Riparian Buffers / Filter Strips

The 100-foot buffer around the NYSDEC wetland is the ideal green infrastructure technique which falls under this category. The riparian buffer area on site that is used for runoff reduction volume calculation is shown on Figure E3 as mentioned above. The riparian buffer area hatch on Figure E3 will sheet flow toward the 100-foot buffer before entering the wetland.
Additionally as part of the project's extensive Habitat Management Plan (HMP), the project proposes interior buffering of the wetlands (both constructed and natural) and stormwater management practices. These proposed buffers were not used to calculate the proposed RRv, but do pose a significant improvement to water quality. The project proposes to increase buffers greater than 30' in width along aquatic edges from 81%± to 100%± to the existing natural sensitive habitats. Of note, the Amenia Cascade Brook buffer increases from 46% to 98% and the buffer along Wetland J increases from 41%± to 90%±.

Vegetated Open Swales

RRv is not applied for this green infrastructure technique due to the site topography constrain that prevent the required design flows and exceeding the slope requirement of 4 percent.
However, where the existing or proposed topography allows, the design has sited vegetated open swales to enhance the project's stormwater management and water quality. These swales are not included in the project's RRv calculation.

Tree Planting/Tree Box

RRv is not applied for this green infrastructure technique.
However, there are many natural trees that are being preserved throughout the site as well as an extensive landscape plan being reviewed by the Town of Amenia's Environmental Consultant. The landscape plan proposes many trees on slopes less than 5%. These trees are not included in the project's RRv calculation.

Disconnection of Rooftop Runoff

RRv is not applied for this green infrastructure technique due to the siting of buildings located on undesired soil HSG groups C and D.
However, when practical, it will be encouraged by the Home Owner's Association for rooftop leaders to be directed to rain gardens. This credit is not included in the project's RRv calculation.

Stream Daylighting

RRv is not applied for this green infrastructure technique because this project is not considered as a redevelopment project.
However, the project does propose to daylight a portion of Stream "N/P" located in the southwestern portion of the site. This credit is not included in the project's RRv calculation.

Rain Garden

RRv is not applied for this green infrastructure technique. The contributing drainage area for individual building exceeds the maximum contributing area of 1,000± sf (for a rain garden).
However, when practical it will be encouraged by the Home Owner's Association for rooftop leaders to be directed to rain gardens. This credit is not included in the project's RRv calculation.

Green Roof

RRv is not applied for this green infrastructure technique because the design and architecture of the proposed buildings is not consistent with that of green roofs.

Stormwater Planters

RRv is not applied for this green infrastructure technique because stormwater planters are typically suitable for urban redevelopment site which is not the case for this project site.

Rain Tanks/Cisterns

There are no traditional rain tanks/Cisterns proposed for this project.
However, the proposed irrigation pond is designed as a traditional stormwater management practice (SWM#3), with a static water elevation and capability to store the runoff and attenuate the larger storm events. Nevertheless, this is not applied to the RRv because of the uncertainty of how the calculation would applied because the pond will function for attenuation and storage device for re-use.
Additionally, it will be encouraged by the Home Owner's Association to use rain tanks as part of the individual lot stormwater management design. These rain tanks are not included in the project's RRv calculation.

Porous Pavement

RRv is not applied for this green infrastructure technique.
However, there are specific areas that will use a porous pavement and/or a permeable paver, such as the overflow parking area. No credit is included in the project's RRv calculation for this technique.

Step 4: Water Quality Volume by Standard Stormwater Management Practice

Any remaining required water quality volume that is not being reduced by applying the green infrastructure will be treated by standard stormwater management practices. Following are the standard stormwater management practices applied to the project. Refer to attachment E3 for details calculations.

Underground Sand Filter

Underground sand filter is an filtering practice that treats, capture and temporarily store the stormwater as it flows through a filter bed of sand. There are total of six proposed underground sand filters. Two underground sand filters will be constructed during each of the three phases. Proposed underground sand filter are label as SWM #9 & SWM #12 (for Phase I), SWM #15 & SWM #16 (for Phase II) and SWM #13 & SWM #14 (for Phase III) in the Figure SW-1 Overall Stormwater Management Practice Identification Plan in MDP drawing set. Refer to attachment E3 for details calculations.

Wet Extended Detention Pond

Forebay, permanent pool and extended detention of the pond provides water quality volume. Forebays are sized to contain 10% of the water quality volume, and shall be four to six feet deep. Combined forebay and permanent pool are sized to contain 50% of the water quality volume. The remaining 50% of the water quality volume will be store at the extended detention. Proposed wet extended pond with water quality storage capability are labeled as SWM #1, SWM #2, SWM #5, SWM #6 in Figure SW-1 Overall Stormwater Management Practice Identification Plan in MDP drawing set. Refer to attachment E3 for details calculations.

Step 5: Volume and Peak Rate Control Practices

After satisfying the required water quality volume, designer need to satisfy the channel protection volume (CPv), overbank flood control and extreme flood control. Design criteria for channel protection volume, overbank flood control and extreme flood control are 1-year storm, 10-year storm and 100-year storm respectively.
After consulting with NYSDEC, the CPv requirement can be waived if there is no increase in peak discharge rate for the 1-year storm under proposed condition. In addition to that, the

design criteria for water quality volume is based on 1-year storm therefore it will satisfy the CPv.

Overbank flood control and extreme flood control requirement is satisfied though utilizing wet extended detention pond/dry detention basin and underground detention pipe system.

All of the practices have outlet control device consists of orifices and or weir to control the proposed 10-year and 100-year peak discharge rate to be less than existing condition.

Those practices are label as SWM #2 , SWM 3#, SWM #4, SWM #5, SWM #6, SWM #7, SWM #8 (detention pond/basin) and SWM #10 (underground detention pipe) in Figure SW-1-Overall Stowmwater Management Practice Identification Plan in MDP drawing set. Refer to HydroCAD output in appendix E2 for details analysis.

Hydrologic Analysis

The proposed site generally maintains the drainage pattern as close to existing conditions as possible. Study Points A, B, C and D as indicated on the attached drainage maps (Appendix E), were utilized to evaluate site runoff under pre- and post-development conditions.

All drainage area delineations for existing and proposed conditions are indicated on Existing and Proposed Drainage Maps provided in the Appendix E.

Times of concentration were calculated under existing and proposed conditions by following TR-55 Handbook Guideline. Flows were established for existing and developed conditions utilizing the SCS Method.

The hydrograph calculations and summations were prepared using the HydroCAD software. To establish these flows the 1-, 5-, 10-, 25- and 100-year, 24-hour storm precipitation values that were provided in the software were used.

The analysis indicates that the proposed conditions peak flows at all study points A B, C and D are less than the existing peak flows for all storms ranging from the 1-year to the 100-year design frequencies.

Refer to Summary Tables #1 and #2 for a comparison of flows produced under existing and developed conditions.

Refer to Appendix E for supporting calculations for the hydrologic analysis for both existing and proposed conditions.

Table day – Existing Conditions Peak Flows

Study Point	Area (AC)	Peak Discharges (cfs) of Various Storm Frequency				
		1-yr	5-yr	10-yr	25-yr	100-yr
A	249.16	17.71	77.00	109.45	164.66	292.28
B	462.9	20.44	111.01	151.2	263.57	636.55
C	70.89	0.02	1.81	4.09	11.17	33.26
D	6.5	2.93	9.04	11.01	15.05	23.35

Table 2 – Proposed Conditions Peak Flows

Study Point	Area (AC)	Peak Discharges (cfs) of Various Storm Frequency				
		1-yr	5-yr	10-yr	25-yr	100-yr
A	251.72	16.57	68.64	86.82	128.82	239.79
B	462.77	16.14	104.98	149.46	253.26	475.08
C	68.36	0.02	1.78	3.97	10.70	31.13
D	6.6	2.93	8.99	10.92	14.88	23.35

There is NO INCREASE in peak discharge for the all storm events up to the 100- year storm under proposed conditions.

Water Quality & Runoff Reduction

The proposed site utilized infiltration basins during golf phase for water quality control. As per NYSDEC requirement, WQv of these infiltration basins (for the golf phase) are designed according to the 90% rule not East of Hudson Standard. Only infiltration basin E that will be utilized to receive runoff from the full built development are sized such that it will still satisfy the WQv requirement under East of Hudson standard.

Some of these infiltration basins that are constructed during the golf phase will be eliminated during the full built development. Figure SW-1 (Overall Stormwater Management Practice Identification Plan” that is part of the MDP drawing set shows the infiltration basins that will be remained under full built conditions.

Under full built conditions, wet extended detention ponds and underground sand filters are proposed to provide WQv to meet the East of Hudson standard. The WQv provided for the full built condition are self-satisfied by these proposed ponds and underground sand filters even without considering the WQv contributed by these remaining infiltration basin from golf phase.

In fact the total WQv provided are much more than the required WQv. Therefore the WQv provided by any of these infiltration basins is a bonus to the full built condition. Refer to appendix E3 for details water quality calculations.

Note: RRv and WQv provided by the infiltration basins that will be constructed during golf phase are not being considered in the RRv and WQv analysis under full built conditions. This approach provide a more conservative and simple analysis.

Below are the summary of the Runoff Reduction Volume (RRv) & Water Quality Volume (WQv) analysis for full-built condition. Refer to appendix E3 for the details RRv and WQv analysis.

Required Water Quality Volume (WQv) = ***33.926 ac-ft*** *With a Minimum Required Runoff Reduction Volume (RRv) based on HSG = 6.12 ac-ft* *Total RRv Provided = 24.056 ac-ft* *Total WQv Provided = 15.874 ac-ft* *Total RRv + WQv Provided =* ***39.93 ac-ft***
Total RRv + WQv Provided = **39.93 ac-ft** and is greater than WQv required of **33.926 ac-ft**

General Project Phasing

Site development for each phase will occur in three overlapping stages:

1. Site Preparation,
2. Construction, and
3. Final grading and Stabilization.

Site Preparation Stage

Prior to beginning any construction activities, construction fences will be installed as shown on the attached project plans. Silt fencing and hay bale barriers will be entrenched to eliminate sediment underflow. Fencing will be placed around trees to be protected and will be at a minimum at the drip line of the longest branches. The erosion control barriers will be inspected and maintained routinely throughout the duration of the project. Following the installation of erosion and sediment controls, the site grading and excavation will occur.

The following steps will be followed to ensure that the controls are installed correctly and will be effective.

Resource Protection

- Evaluate, mark and protect important trees and associated rooting zones, wetlands, on-site septic systems absorption fields, etc.

- Fencing will be placed around trees to be protected and will be at a minimum at the drip line of the longest branches.
- Protect existing vegetated areas suitable for filter strips, especially in perimeter areas.
- Protect stream buffers and phasing lines as neccessary.

Surface Water Protection

- Identify the drainage area in the plan. Divide the site into natural drainage areas.
- Divert the off-site clean runoff from entering disturbed areas.
- Identify bodies of water located either on site or in the vicinity of the site.
- Plan appropriate practices to protect on-site or downstream surface water and its buffer.

Stabilized Construction Exit

- Establish a temporary construction entrance to capture mud and debris from construction vehicles before they enter the public highway.
- Stabilize bare areas (entrances, construction routes, equipment parking areas) immediately as work takes place. Top these areas with gravel or maintain vegetative cover.
- Sediment tracked onto public streets should be removed or cleaned on a daily basis.
- A description of the Stabilized Construction Exit is included in Section VI Required Erosion and Sediment Control Practices.

Perimeter Sediment Controls

- Silt fence material and installation must comply with the standard drawing and specifications.
- Silt fencing and hay bale barriers will be entrenched to eliminate sediment underflow.
- Silt fences will be installed based on appropriate spacing intervals. This interval will decrease as the slope increases. Silt fence should be placed on or parallel to contours where there is no concentration of water flowing to the silt fence and where erosion occurs in the form of sheet erosion. On sloped areas, the area below the final silt fence shall be undisturbed ground.
- Principal sediment basins will be installed after construction site is assessed.
- Additional sediment traps and barriers will be installed as needed during grading.
- Erosion control blankets will be stapled and/or staked into place on slopes 4:1 or greater.
- The erosion control barriers will be inspected and maintained routinely throughout the duration of the project.

Runoff Control

- Install practices after sediment traps are installed and before land grading starts.
- Control the runoff in each small drainage area before flow reaches runoff from entire site.
- Divert offsite or clean runoff from disturbed areas.
- Convey surface flows from highly erodible soil and steep slopes to more suitable stable areas.
- Runoff from existing or proposed cut and fill slopes should be redirected to reduce water velocity without causing erosion.
- Final site drainage should be designed to prevent erosion, concentrated flows to adjacent properties, uncontrolled overflow, and ponding.

Runoff Conveyance System

- Stabilize conveyance system.
- Channels and streambanks need to be seeded at the outlet points.
- Install check dams to slow down the velocity of concentrated flow.
- Protect existing natural drainage systems and streams by maintaining vegetative buffers and by implementing other appropriate practices.

Groundwater Recharge Measures

- Install practices to infiltrate the runoff on the site as much as possible.
- Provide groundwater recharge to maintain the hydrologic regime of the downstream water bodies and simulate predevelopment hydrology.
- Use infiltration practices to prevent concentrated flows.
- Provide soil decompaction or minimizing unneccessary soil compaction on site.

Temporary sediment basins will be constructed during this phase. Temporary berms and swales will be used to direct runoff to the basins on the site.

No sediment-laden water will be allowed to discharge to resource areas or to the existing stormwater management system on the site. Following the installation of erosion and sediment controls, the site grading and excavation will occur.

Construction Stage

The proposed building, access drive, utility/infrastructure, stormwater management system, and landscaping will be constructed during this phase. Temporary swales and berms will be constructed and maintained and relocated by the contractor as necessary to control and direct runoff to temporary basins during this phase.

Grading

- Limit the initial clearing and earth disturbance to that necessary to install sediment control measures. Excavation for footings, clearing, or other earth disturbance may only take place after the sediment and erosion controls are installed.
- Stockpile the topsoil removed from the site. The topsoil should be protected, stabilized and sited in a location away from the storm drains and waterbodies, and saved on-site for reuse if not contaminated.
- Changes in grade or removal of vegetation should not disturb established buffers and should not be allowed within any regulated distance from wetlands, the high water line of a body of water affected by tidal action, or other such protected zones.
- Avoid unnecessry disturbance of steep slopes.
- An undisturbed buffer should be maintained to control runoff from steep slopes within sensitive areas.
- Proposed grading should not impair existing surface drainage resulting in a potential erosion hazard impacting adjacent land or waterbodies.

Erosion Control (Stabilization)

- Implement erosion control practices to keep the soil in place.
- Stabilization should be completed immediately for the surface of all perimeter controls and perimeter slopes.
- When activities temporarily cease during construction, soil stockpiles and exposed soil should be stabilized by seed, mulch or other appropriate measures as soon as possible, but in no case more than 14 days after construction activity has ceased.
- Apply temporary or permanent stabilization measures immediately on all disturbed areas where work is delayed or completed.
- Where the initiation of stabilization measures by the 14th day after construction activity temporarily or permanently ceased is precluded by snow cover or frozen ground conditions, stabilization measures shall be initiated as soon as practicable;
- For an area to be disturbed is more than five (5) acres at one time; in areas where soil disturbance activity has been temporarily or permanently ceased, temporary and/or permanent soil stabilization measures shall be installed and/or implemented within seven (7) days from the date the soil disturbance activity ceased. The soil stabilization measures selected shall be in conformance with the most current version of the technical standard, New York State Standards and Specification for Erosion and Sediment Control.
- Consult the local Soil and Water Conservation District for proper timing and application rate of seed, fertilizer and mulch.

Sediment Control

- At any location where surface runoff from disturbed or graded areas may flow off the construction area, sediment control measures must be installed to prevent sediment from being transported off site. No grading, filling or other disturbance is allowed within existing drainage swales.
- Swales or other areas that transport concentrated flow should be appropriately stabilized.
- Downspout or sump pump discharges must have acceptable outfalls that are protected by splash blocks, sod, or piping as required by site conditions (i.e., no concentrated flow directed over fill slopes).

Maintenance and Inspections

- Identify the type, number and frequency of maintenance actions required for stormwater management and erosion control during construction and for permanent practices that remain on the site once construction is finalized.
- Inspections must be indicated on the Construction Sequence Schedule to be prepared by the owner/contractor.
- Inspections must be performed every 7 calendar days.
- For construction where soil disturbance activities are greater than five (5) acres of soil at any one time, the inspection must be performed at least two (2) times every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.
- Inspections must verify that all practices are adequately operational, maintained properly, and that sediment is removed from all control structures.
- Inspections must look for evidence of the soil erosion on the site, potential of pollutants entering drainage systems, problems at discharge points (such as turbidity in receiving water), and signs of soil and mud transport from the site to the public road at the entrance.
- Routine maintenance must be identified on the schedule and performed on a regular basis and as soon as a problem is identified.
- Identify the person or entities responsible for conducting the maintenance actions during construction and post-construction.
- Retain a copy of the inspection on-site with the SWPPP.
- Color photographs shall be taken during inspection and shall be included in the inspection report.
- Inspection and maintenance shall be in compliance with Part IV of the SPDES Permit requirements.

Final Grading and Stabilization Stage

Final site grading and stabilization will be completed as soon as practicable to eliminate exposed soils and potential sources of erosion. Areas to be paved will be covered by bituminous pavement after final subgrades are established. All litter, as well as debris generated by construction activities, will be removed by hand from the site and adjacent undeveloped areas.

Finalize Grading & Landscaping

- Identify the final grading and stabilization plan once the construction is completed.
- All open areas, including borrow and spoil areas must be stabilized.
- Plan a permanent top soil, seed, sod, mulch, riprap or other stabilization practices in the remaining disturbed areas as appropriate.
- Stabilization must be undertaken no later than 14 days after construction activity has ceased except as noted in the GP-0-10-001.
- Remove the temporary control measures.
- Provide soil decompaction or minimizing unneccessary soil compaction on site.

Post-construction Controls

- Identify the permanent structural or non-structural practices that will remain on the site.
- Ensure that the permanent structural or non-structural practices utilized during construction are properly designed to suit the post-construction site conditions.
- In finalizing the plan, evaluate the post-construction runoff condition on the site.
- Minimize the risk of concentrated flow and erosion.
- On-site runoff controls help reduce the risk of increased runoff velocity, erosion and point source discharge. In addition to the standard runoff and erosion control practices identified in NY Standards for Erosion and Sediment Control, some of the techniques discussed under on-site runoff control in the discussion of Site Preparation may be applied.

Project Materials

The materials or substances below are expected to be present on-site during the construction period:

Structural Steel	*Welding Supplies*
Concrete	*Petroleum-Based Products*
Metal Studs	*Paints*
Cleaning Solvents	*Wood*
Detergents	*Fertilizer*

This materials list will be updated by the contractor, as necessary, prior to and during the construction process.

Non-Industrial Discharges

The following non-stormwater discharges may occur on this construction site:

- Fire hydrant flushing;
- Potable water including uncontaminated water line flushing;
- Pavement wash water where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used;
- Uncontaminated air conditioning or compressor condensate;
- Uncontaminated ground water or spring water;
- Foundation or footing drains where flows are not contaminated with process materials such as solvents; and
- Uncontaminated excavation dewatering;

V
Construction Schedule and Sequence

Construction is proposed to occur in three phases. The first phase is planned for Years 1-3, and will include construction of the wastewater treatment plant, water treatment facility, most of the Clubhouse, Village Green neighborhood condominiums and town homes, the Golf Villa neighborhood, 10 South Lawn neighborhood single-family homes, 31 Estate neighborhood single-family homes, Sales Center and General Store, the Artisan's Park Overlook, and related infrastructure. Golf course renovations will also occur during Phase 1. The second phase is planned for Years 4 and 5, and will include construction of the remaining portion of the Clubhouse, 26 Estate neighborhood homes, 22 South Lawn neighborhood homes, and related infrastructure. The third phase is planned for Years 5 to 7, and will include construction of the Vineyard Cottages, a pool and cabana for residents of the Vineyard Cottages, Winery Restaurant, and related infrastructure. A detailed phasing plan is contained in sheet SP-5 of the MDP Plans.

The Owner/Operator will update his construction schedule and sequence as needed and maintain a list of construction milestones.

The Site Contractor shall follow construction sequence scheduling as shown on the Site Plans provided for each construction phase. The sequence of actions in an Erosion and Sediment Control (E&SC) plan is runoff control, stabilization, and then sediment control. The management practices used in each phase of the plan must be identified on the Construction Sequence Schedule and/or on appropriate maps.

Erosion and sediment control provisions should be included for all construction activities where any excavation, stripping, filling, grading or earth movement takes place. Provide dimensional details of proposed practices. The details must include plan & vertical view (cross sectional design) calculations used in the sizing and justification for the siting of selected practices.

VI
Required Erosion and Sediment Control

The Owner/Operator will be responsible for ensuring that the specified stormwater pollution control measures are installed, maintained, relocated and added to as necessary. Details of recommended stormwater pollution control techniques are provided below.

Erosion and Sediment Controls

The purpose of an erosion and Sediment control program is to minimize temporary impacts to downgradient wetlands during the construction phase of the project by retaining sediment on site to the maximum extent practicable. The program incorporates BMPs specified in guidelines developed by the DEC[1] and complies with the requirements of the SPDES General Permit for Storm Water Discharges from Construction Activities.

Proper implementation of the erosion and Sediment control program will:

- minimize exposed soil areas through temporary seeding and construction sequencing;
- place structures to manage stormwater runoff and erosion; and
- establish a permanent vegetative cover or other forms of stabilization as soon as practicable.

All manufactured control measures must be installed and maintained in accordance with the manufacturer's specifications. The following sections describe the erosion and Sediment controls that will be used on this site. The Owner/Operator will implement and add to these site conditions, when required.

Stabilization Practices

Stabilization practices to be used on this site include mulching and temporary seeding. Stabilization practices will be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased. The project has been designed to preserve existing vegetation where possible.

1 New York State Department of Environmental Conservation (DEC). *New York Stormwater Management Design Manual*, August 2010 and *New York Standards and Specifications for Erosion and Sediment Control*, August 2005

Site Layout

A naturally occurring vegetated buffer that will be flagged on site before construction will provide protection for the on-site wetland areas and resources adjacent to the site in addition to the various selected BMPs.

Mulching

Straw mulching will be employed on all inactive and disturbed areas that will remain unstabilized for more than 14 days. Mulch materials will be spread uniformly by hand or machine at a rate of approximately 100 pounds per 1,000 square feet. Mulch will be spread such that at least 75 percent of the ground surface is covered. Mulching may be used with temporary or permanent seeding, or with slope stabilization techniques. Hydro mulch may also be used for temporary soil stabilization

- For an area to be disturbed is more than five (5) acres at one time; in areas where soil disturbance activity has been temporarily or permanently ceased, temporary and/or permanent soil stabilization measures shall be installed and/or implemented within seven (7) days from the date the soil disturbance activity ceased. The soil stabilization measures selected shall be in conformance with the most current version of the technical standard, New York State Standards and Specification for Erosion and Sediment Control.

Erosion Control Slope Blankets

Upon completion of final grading, any areas not covered by pavement, other forms of stabilization or landscaping and which are on slopes of 4:1 and greater will be protected with erosion control slope blankets and seeded with an erosion control seed mix. The blanket will be installed from the top of the slope, with the upper edge of the blanket secured in a trench. Blankets shall be unrolled down the slope or swale in the direction of the water flow. Edges of blanket shall be stapled with approximately four inches of overlap where two or more strip widths are required. The end of an upper blanket shall overlap the end of a lower blanket by at least six inches and both ends shall be stapled in place. The blankets will be staked and/or stapled into place as per manufacturer's recommendations.

Temporary Seeding

A temporary vegetative cover will be established on areas of exposed soils (including stockpiles) that remain inactive and unstabilized for a period of more than 14 days for slopes. The seeded surfaces will be covered with a layer of straw mulch or hydro mulch as described above.

Permanent Seeding

Upon completion of final grading, any areas not covered by pavement, other forms of stabilization, or other methods of landscaping will be seeded with an erosion control seed *mix. Loamed and seeded areas will be mulched with hay to prevent erosion prior to germination of the seed.*

Structural Practices

Structural erosion and Sediment controls to be used on the site include the following:

Hay Bale and Silt Fence Barriers

Prior to any ground disturbance, a professional engineer or land surveyor will certify that a barrier of staked hay bales and silt fence is in place at the downgradient limit of work in accordance with the plan filed with the Conservation Commission (see relevant plans). When necessary, additional hay bale and silt fence barriers will be installed immediately downgradient of erosion-prone areas, such as the base of steep exposed slopes and around the base of stockpiles, throughout the construction phase of the project. The barriers will be entrenched into the substrate to prevent underflow.

The erosion control barriers will be inspected weekly and after every storm event. Any sediment that collects behind the barriers will be removed and will be either reused at the site or disposed of at a suitable offsite location. Any damaged sections of silt fence or hay bales will be repaired or replaced.

Catch Basin Inlet Protection

The inlets of proposed catch basins will be protected from sediment inflow during the work period by following the guideline specify by New York State Standards and Specifications for Erosion and Sediment Control (aka blue book) or approved equal.

Stabilized Construction Exits

Stone anti-tracking pads will be installed at each access point to the work area to prevent the off-site transport of sediment by construction vehicles. The stabilized construction exits will be at least fifty feet long and will consist of a 6-inch thick layer of crushed stone (1.5 to 2.5 inches in diameter). The stone will be placed over a layer of non-woven filter fabric. The anti-tracking pads will remain in place until a binder coat of pavement has been established in areas to be paved.

Diversion Channels

Diversions will also be used to collect runoff from construction areas and convey it to a temporary sediment basin or trap. Diversion Channels must be constructed properly with stabilized beds using crushed stone, plastic or other approved materials, crushed stone check dams as necessary.

Temporary diversions will remain in place until slopes are permanently stabilized or graded level. If vegetation of the diversion channel is required to avoid erosion of the channel, the channel will be temporarily stabilized to ensure viability of the grass seed.

Temporary Sediment Basins

Temporary sediment basins will be designed either as excavations or bermed stormwater detention structures (depending on grading) that will retain runoff for a sufficient period of time to allow suspended soil particles to settle out prior to discharge. These temporary basins will be located at the low points on the site and will receive runoff via temporary diversion swales. A perforated riser surrounded by a crushed stone filter will control discharge from the basin. Points of discharge from sediment basins will be stabilized to minimize erosion. Refer to attachment E for detail calculations.

Riprap Outlet Protection

The purpose of riprap outlet protection is to reduce velocity and energy of water such that the flow will not erode the receiving downstream reach. The riprap outlet protection is placed at the outlet of the culvert, drainage pipe, channels. Refer to attachment E5 for details calculations.

Construction Details of Erosion & Sediment Control Practices

The construction details of erosion & sediment control practices can be found at page C14.01 and C14.02 in the site plan set.

VII
Additional Erosion and Sediment Controls

The following controls may be implemented at the site if necessary.

Interior Site Erosion Controls

Additional erosion controls may be used in the central portions of the site in the event that excessive erosion occurs. Placement of temporary silt fence, hay bales or earthen berms may be used to control the movement of material within the site. If such controls are deemed necessary for adequate protection, they will be installed perpendicular to the flow direction to contain sediment. These measures will be installed to prevent perimeter erosion controls and diversion swales from becoming compromised.

Dust Control

Fugitive dust from large areas of unstabilized soil can be a problem during construction. On dry and windy days when dust generation is a concern, a water truck will traverse the site and spray water as necessary to prevent dust from forming.

VIII
Water Quality and Water Quantity Controls

The Owner/Operator will be responsible for ensuring that the specified water quality and water quantity control measures are installed and maintained as necessary. Details of recommended stormwater pollution control techniques are provided below.

Water Quality Controls

Water quality control measures are designed to minimize impact to receiving waterbodies from stormwater pollution. As stormwater runoff travels across impervious surfaces, it collects pollutants such as sediments, oil, and trash and carries them to a receiving waterbody. Properly installed and maintained stormwater best management practices (BMPs) can capture these pollutants and reduce the impact that the proposed development has on the environment. The BMPs selected for this project were designed based on guidelines developed in the New York State Stormwater Management Design Manual[2].

Proper implementation of the water quality control measures will:

- reduce post-construction sediment impacts; and
- promote infiltration of stormwater to maintain pre-construction hydrology

All manufactured control measures must be installed and maintained in accordance with the manufacturer's specifications. The following sections describe the water quality controls that will be used on this site. The Owner/Operator will implement and add to these site conditions, when required.

2 New York State Department of Environmental Conservation (DEC). *New York Stormwater Management Design Manual*, August 2010

Non-structural Practices

Pavement Sweeping

The sweeping program will remove sediments and contaminants directly from paved surfaces before their release into stormwater runoff. Pavement sweeping has been demonstrated to be an effective initial treatment for reducing pollutant loading.

Catch Basin Cleaning

Sediments and other contaminants that are not removed by pavement sweeping are transported by stormwater runoff to the site's catch basin system. Once in the catch basin, they settle to the bottom of the system. This material will be removed on a regular basis to prevent contaminants from migrating out of the drainage system during high flow events or reducing the infiltration capacity of the devices.

Structural Practices

Structural erosion and Sediment controls to be used on the site include the following:

Underground Sand Filter

Underground sand filter is an infiltration practice that treats, capture and termprarily store the stormwater as it flows through a filter bed of sand. Sediment chamber need to be cleaned when the sediment chamber reaches more than 6" in depth. Silt/sediment removed from the filter bed after it reaches one inch.

Wet Extended Detention Pond

Forebay and permanent pool are part of the proposed detention basin. The purpose of forebay and permanent pool are to trap sediment from on-site runoff. Sediment removal in the forebay and permanent pool shall be performed every five to six years or after 50% of its capacity have been lost.

Infiltration Practices

The following infiltration practices have been selected and approved for installation at this site.

Infiltration Basin

Infiltration basin capture and temporarily store the WQv before allowing it to infiltrate into the soil. Underdrain pipe is proposed at the infiltration basin to enhance the infiltration of process. All of the proposed infiltration basins are for golf phase except SWM #11 where it also receive some of the runoff from full built conditions as indicated on Figure SW-1 (in MDP drawing set).

Water Quantity Controls

Water quantity controls are implemented to manage the discharge rate of stormwater runoff generated from the proposed development. The primary goals of stormwater quantity management are to make sure the 10-year storm (overbank flood) and 100-year storm (Extreme flood) flow rates under proposed conditions are equal or less than the existing conditions.

Detention Practices

Wet Extended Detention Pond / Dry Detention Basin

The detention pond/basin storage volume and a set of outlet openings that is consists of orifice(s), weir(s) and emergency spillway are the major component in water quantity control measure. The outlet openings are designed such that all the proposed flow rates under proposed conditions are equal or less than the existing conditions.

Underground Detention Pipe

The underground pipes with storage volume are temporarily store the flood volume and slowly discharging the volume through outlet structure. The outlet openings are designed such that all the proposed flow rates under proposed conditions are equal or less than the existing conditions.

IX
Maintenance, Inspections and Project Documentation

The SPDES Construction General Permit requires that the Owner/Operator be responsible for implementing, inspecting and maintaining each of the stormwater controls described in the plan. In addition, the Owner/Operator must document compliance with the Permit throughout construction.

Inspections

The operator shall have a qualified professional conduct an assessment of the site prior to the commencement of construction and certify in an inspection report that the appropriate erosion and sediment controls described in the SWPPP and required by this permit have been adequately installed or implemented to ensure overall preparedness of the site for the commencement of construction.

Following the commencement of construction, site inspections shall be conducted by the qualified professional at least every 7 calendar days. If the soil disturbance is greater than five (5) acres at any one time, the qualified inspector shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days. During each inspection, the qualified professional shall record the information required by Part IV.C.4 of the Permit. Color photographs shall be taken during inspection and shall be included in the inspection report

Inspections shall include all areas of the site disturbed by construction activity and areas used for materials storage that are exposed to precipitation. The Inspector must look for evidence of, or the potential for, pollutants entering the storm water system, inspect the BMPs installed as part of the Plan, inspect the site drainage outfalls and inspect the site egress points for tracking. If, in the course of the inspection, the inspector identifies an eroded area or an area impacted by sedimentation, additional erosion and Sediment controls will be implemented, and the SWPPP will be revised to include these changes.

For each inspection, the Inspector must complete a written inspection report in accordance with the Permit. A sample inspection form has been included at the end of this section. The operator shall maintain a record of all inspection reports in a site log book. The site log book shall be maintained on site and be made available to the permitting authority upon request. Prior to the commencement of construction, the operator shall certify in the site log book that the SWPPP, prepared in accordance with Part III of this permit, meets all Federal, State and local erosion and sediment control requirements. The operator shall post at the site, in a publicly-accessible location, a summary of the site inspection activities on a monthly basis.

The completed forms become part of the Owner/Operator's SWPPP and should be maintained for five years after the filing of the Notice of Termination. Prior to filing of the Notice of Termination or the end of permit term, the operator shall have the qualified professional perform a final site inspection. The qualified professional shall certify that the site has undergone final stabilization 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.

Maintenance

All erosion and sediment controls and other protective measures identified in the SWPPP must be maintained in effective operating condition. If site inspections identify BMPs that are not operating effectively, maintenance, modification or replacement with an alternative or additional BMPs must be performed as soon as possible, and before the next storm event whenever practicable. If implementation before the next storm event is impracticable, the situation must be documented in the SWPPP and alternative BMPs must be implemented as soon as possible.

The following maintenance program is proposed to ensure the effectiveness of the structural controls during the construction phase of this project:

- The on-site representative will inspect all sediment and erosion control structures and records of the inspections will be prepared and maintained on-site by the Owner/Operator.
- Silt shall be removed from behind barriers if greater than 6-inches deep or as needed.
- Paved areas of the site will be swept on an as needed basis during the site construction.
- Damaged or deteriorated items will be repaired immediately after identification.
- The underside of hay bales should be kept in close contact with the earth and reset as necessary.
- Sediment from sediment traps or sedimentation ponds must be removed when design capacity has been reduced by 50 percent or every five to six years.
- Sediment that is collected in structures shall be disposed of properly and covered if stored on-site.
- Erosion control structures shall remain in place until all disturbed earth has been securely stabilized. After removal of structures, disturbed areas shall be re-graded and stabilized as necessary.
- A conspicuous and legible sign of not less than 18 inches by 24 inches shall be erect or post in the immediate vicinity of each stormwater management practices bearing the following information:

Stormwater Management Practice – (name of practice)
Project Identification - (SPDES Construction Permit #, other)
Must Be Maintained In Accordance With O&M Plan
DO NOT REMOVE OR ALTER

- Refer to drawing sheet C-14.01 and C14-02 for stromwater management details drawing.
- Refer to Appendix B for the maintenance inspection checklist for each stormwater management practices.

If, in the course of the inspection, the inspector identifies an eroded area or an area impacted by sedimentation, additional erosion and sediment controls will be implemented, and the SWPPP will be revised to include these changes.

Documentation

The following records must be maintained as part of the Owner/Operator's SWPPP:

- Dates when major grading activities occur;
- Dates when construction activities temporarily or permanently cease on a portion of the site;
- Dates when stabilization measures are initiated;
- Inspection dates and processes.

X
Spill Prevention Plan and Response Procedures

All construction personnel will be instructed regarding spill prevention practices and procedures. Notices stating these practices will be posted in the office trailer, and the site construction supervisor will be responsible for seeing that these procedures are followed.

Material Management Practices

The following material management practices will be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff. These include good housekeeping practices and guidelines for the handling of hazardous products.

The following good housekeeping practices will be followed on-site during the construction period.

- An effort will be made to store only enough products required to do the job.
- All materials stored on-site will be stored in a neat, orderly manner in their appropriate containers, and (if possible) under a roof or other enclosure.
- Products will be kept in their original containers with the original manufacturer's label.
- Substances will not be mixed with one another unless recommended by the manufacturer.
- Whenever possible, all of a product will be used before disposing of the container.
- Manufacturer's recommendations for proper use and disposal will be followed.
- The site superintendent will inspect the storage area daily to ensure proper use and disposal of materials on-site.

The following practices will reduce the risks associated with hazardous materials (e.g., petroleum products, solvents):

- A copy of all Material Safety Data Sheets (MSDS) for materials or products used during construction will be kept in the office trailer.
- Products will be kept in original containers unless they are not re-sealable.

- Original labels and material safety data (MSD sheets) will be retained; they contain important product information.
- If surplus product must be disposed, manufacturer's or local- and state-recommended methods for proper disposal will be followed.

Product-Specific Practices

The following product-specific practices will be followed on-site. Recommendations are provided for petroleum products, fertilizers, solvents, paints, and other hazardous substances, and concrete.

Petroleum Products

All on-site vehicles will be monitored for leaks and will receive regular preventive maintenance to reduce the chance of leakage. No vehicle maintenance or handling of petroleum products will occur within 100 feet of a wetland or waterway. Petroleum products will be stored in tightly sealed containers that are clearly labeled. Any asphalt substances used on-site will be applied according to manufacturer's recommendations. No petroleum-based or asphalt substances will be stored within 100 feet of a wetland or waterway.

Fertilizers

Fertilizers will be applied only in the minimum amounts recommended by the manufacturer. Once applied, the fertilizer will be worked into the soil to limit exposure to stormwater. Storage will be in a covered shed; and the contents of any partially used bags will be transferred to a sealable, plastic bin to avoid spills. No fertilizer storage will occur within 100 feet of a wetland or waterway. Refer to the “NYS Dishwater Detergent and Nutrient Runoff Law” for regulation regarding usage of fertilizers. Usage of fertilizers also shall be restricted in the aquifer overlay district and any restrictions from the habitat management plan.

Solvents, Paints, and other Hazardous Substances

All containers will be tightly sealed and stored when not required for use. Excess materials will not be discharged to the storm sewer system, but will be properly disposed according to manufacturer's instructions or state and local regulations. No storage will occur within 100 feet of a wetland or waterway.

Concrete Trucks

Concrete trucks will not be allowed to wash out or discharge surplus concrete or drum wash water within 100 feet of wetland resources or into catch basins that are already in place.

Spill Control/Notification Practices

In addition to the good housekeeping and material management practices discussed above, the following practices will be followed for spill control, notification and cleanup.

- Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be informed of the procedures and the location of the information and cleanup supplies.
- Materials and equipment necessary for spill cleanup will be kept in the material storage area on-site. Equipment and materials will include, but will not be limited to, shovels, wheelbarrows, brooms, dustpans, mops, rags, gloves, goggles, kitty litter or Speedi-Dry, sand, sawdust, and plastic and metal trash containers specifically designated for this purpose.
- All spills will be cleaned up immediately after discovery.
- The spill area will be kept well ventilated and personnel will wear protective clothing to prevent injury from contact with a hazardous substance.
- Spills of toxic or hazardous material in excess of reportable quantities, as established by the New York State Department of Environmental Conservation (NYSDEC), will be reported to the NYSDEC Spill Hotline: 1-800-457-7362 (within NYS) or 1-518 457-7362 (from outside NYS) or to the National Response Center: 1-800-424-8802. The Emergency Spill Response Procedure is attached.
- The construction superintendent responsible for the daily operations will be the spill prevention and cleanup coordinator. He will designate at least three other site personnel to receive spill prevention and cleanup training. The names of the responsible spill personnel will be posted in the material storage area and in the on-site office trailer.

Source Control

Trash removal, designated trash storage areas, pavement sweeping and the controlled use of fertilizer and deicing agents on the site will reduce the pollutant load in the site’s stormwater management system.

Construction Trash Removal

Daily loose trash removal will prevent litter, construction debris, and construction chemicals exposed to stormwater from becoming a pollutant source for stormwater discharges. All loose trash will be placed in appropriate storage containers until disposed of properly off-site.

Covered Trash/Storage Areas

Areas to be used for storing dumpsters, compactors or other raw or waste materials will be covered to prevent contact with stormwater.

Pavement Sweeping

Pavement sweeping may be required daily or even more frequently during construction where sediment tracking from construction equipment is a problem.

Fertilizer

Only slow-release organic fertilizers will be used in landscaped areas. This will limit the amount of nutrients that could enter the stormwater and wetland systems. Fertilizer use will be reduced once the proposed landscaping is established. Refer to the "NYS Dishwater Detergent and Nutrient Runoff Law" for regulation regarding usage of fertilizers.

Waste Disposal

All waste materials will be collected and stored in securely lidded metal dumpsters leased from a licensed solid waste management company and the dumpster will be emptied as necessary. Trash will be hauled by a licensed contractor and disposed in accordance with federal, state, and local environmental regulations. No trash or construction waste will be buried on-site, and all personnel will be instructed regarding the correct procedure for waste disposal. Notices stating these practices will be posted in the office trailer and the site construction supervisor will be responsible for seeing that these procedures are followed.

Hazardous Waste

All hazardous waste materials (e.g., petroleum products, solvents) will be disposed in the manner specified by local and state regulation, or by the manufacturer. Site personnel will be instructed in these practices, and the site construction supervisor will be responsible for seeing that these procedures are followed.

Sanitary Waste

All sanitary waste will be collected from the portable units by a licensed contractor a minimum of three times weekly, and disposed in compliance with state and local regulation.

Spill Response Procedure

Initial Notification

In the event of a spill, the facility and/or construction manager or supervisor will be notified immediately.

Facility Manager: (name) ______________________________

(phone) ______________________________

Construction Manager: (name) ______________________________

(phone) ______________________________

Assessment - Initial Containment

The supervisor or manager will assess the incident and initiate containment control measures with the appropriate spill containment equipment included in the spill kit kept on-site. The supervisor will first contact the *Town of Amenia* Fire Department and then notify the *Town of Amenia* Police Department and *Dutchess County* Public Health Commission. The fire department is ultimately responsible for matters of public health and safety and should be notified immediately.

Fire Department: 911 or *(845) 373-8467*

Police Department: *(845) 373-4300*

Dutchess County Public Health Commission: *(845) 486-3400*
(845) 431-6465 (after hours)

Further Notification

Based on the assessment from the Fire Chief, additional notification to a cleanup contractor may be made. The New York Department of Environmental Conservation and the EPA may be notified depending upon the nature and severity of the spill. The Fire Chief will be responsible for determining the level of cleanup and notification required. The attached list of emergency phone numbers shall be posted in the main construction/facility office and readily accessible to all employees.

NYSDEC Spill Hotline: 1-800-457-7362 (within NYS)

National Response Center: 1-800-424-8802 / (518) 457-7362 (outside NYS)

For further information, contact:

New York State Department of Environmental Conservation

Division of Environmental Remediation

Bureau of Spill Prevention & Response

625 Broadway – 11th Floor

Albany, NY 12233-7020

(518) 402-9546

HAZARDOUS WASTE / OIL SPILL REPORT

Date____/_____/______ Time_____________ AM / PM

Exact location (Transformer #)____

Type of equipment_____________________________Make______________Size_______________

S / N____________________________________Weather Conditions___________________________

On or near water ☐ Yes If yes, name of body of water______________________

☐ No

Type of chemical / oil spilled____________________________

Amount of chemical / oil spilled_________________________

Cause of spill____

____

____

Measures taken to contain or clean up spill____

____

____

Amount of chemical / oil recovered_________________Method______________________________

Material collected as a result of clean up

______________drums containing____

______________drums containing____

______________drums containing____

Location and method of debris disposal____

____

Name and address of any person, firm, or corporation suffering damages_____________________

____

Procedures, method, and precautions instituted to prevent a similar occurrence from recurring___

____

Spill reported to General Office by____________________________Time______________AM / PM

Spill reported to DEC / National Response Center by______________________________________

DEC Date____/_____/______ Time__________ AM / PM Inspector________________

NRC Date____/_____/______ Time__________ AM / PM Inspector________________

Additional comments____

____

____

EMERGENCY RESPONSE EQUIPMENT INVENTORY

The following equipment and materials shall be maintained at all times and stored in a secure area for construction activities emergency response need.

--	SORBENT PADS	5 PADS
--	SAND BAGS (empty)	10
--	SPEEDI-DRI ABSORBENT	5 40# BAGS
--	SHOVEL	1
--	PICK	1
--	PRY BAR	1

The following items shall be placed in a convenient, readily accessible location on site.

--	HAY BALES & GRADE STAKES	10
--	SAND	2 CUBIC YARDS

EMERGENCY NOTIFICATION PHONE NUMBERS

1. SUPERVISOR/MANAGER
   NAME: ___________________ BEEPER: _________________________
   PHONE: ___________________ HOME PHONE: __________________

   ALTERNATE:
   NAME: ___________________ BEEPER: _________________________
   PHONE: ___________________ HOME PHONE: __________________

2. *Town of Amenia* FIRE DEPARTMENT
   EMERGENCY: 911 or *(845) 373-8467*

   Town of Amenia POLICE DEPARTMENT
   GENERAL NUMBER: *(845) 373-4300*

3. CLEANUP CONTRACTOR: _______________________________
   ADDRESS: ______________________________________
   PHONE: ____

4. NEW YORK DEPARTMENT OF ENVIRONMENTAL CONSERVATION
   EMERGENCY: 1-800-457-7362
   OUTSIDE NEW YORK: 1-518 457-7362

5. NATIONAL RESPONSE CENTER
   PHONE: 1-800-424-8802

   ALTERNATE: U.S. ENVIRONMENTAL PROTECTION AGENCY
   BUSINESS: 1-212-637-3660

6. *Dutchess County* PUBLIC HEALTH COMMISSION – ENVIRONMENTAL PROTECTION
   PHONE: *(845) 486-3400*
   (845) 431-6465 (after hours)

XI
Notice of Termination Form

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

5. Contact Person E-Mail:

II. Project Site Information

5. Project/Site Name:

6. Street Address:

7. City/Zip:

8. County:

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)?

____

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, the deed of record has been modified to include a deed covenant that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan.

☐ For post-construction stormwater management practices that are owned by a public or private institution (e.g. school, college, university), or government agency or authority, 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? ______________________________ (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:

XII
SPDES Permit & Fact Sheet

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SPDES GENERAL PERMIT
FOR STORMWATER DISCHARGES

from

CONSTRUCTION ACTIVITY

Permit No. GP-0-10-001

Issued Pursuant to Article 17, Titles 7, 8 and Article 70
of the Environmental Conservation Law

Effective Date: January 29, 2010   Expiration Date: January 28, 2015

William R. Adriance
Chief Permit Administrator

William R. Adriance   January 28, 2010
Authorized Signature   Date

Address: NYS DEC
Div. Environmental Permits
625 Broadway, 4th Floor
Albany, N.Y. 12233-1750

PREFACE

Pursuant to Section 402 of the Clean Water Act ("CWA"), stormwater *discharges* from certain *construction activities* are unlawful unless they are authorized by a *National Pollutant Discharge Elimination System ("NPDES")* permit or by a state permit program. New York's *State Pollutant Discharge Elimination System ("SPDES")* is a NPDES-approved program with permits issued in accordance with the *Environmental Conservation Law ("ECL")*.

This general permit ("permit") is issued pursuant to Article 17, Titles 7, 8 and Article 70 of the ECL. An *owner or operator* may obtain coverage under this permit by submitting a Notice of Intent ("NOI") to the Department. Copies of this permit and the NOI for New York are available by calling (518) 402-8109 or at any New York State Department of Environmental Conservation ("the Department") regional office (see Appendix G).They are also available on the Department's website at:

http://www.dec.ny.gov/

An *owner or operator* of a *construction activity* that is eligible for coverage under this permit must obtain coverage prior to the *commencement of construction activity*. Activities that fit the definition of "*construction activity*", as defined under 40 CFR 122.26(b)(14)(x), (15)(i), and (15)(ii), constitute construction of a point source and therefore, pursuant to Article 17-0505 of the ECL, the *owner or operator* must have coverage under a SPDES permit prior to *commencing construction activity*. They cannot wait until there is an actual *discharge* from the construction site to obtain permit coverage.

***Note: The italicized words/phrases within this permit are defined in Appendix A.**

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
SPDES GENERAL PERMIT FOR STORMWATER DISCHARGES

FROM CONSTRUCTION ACTIVITIES

TABLE OF CONTENTS

Part I. <u>PERMIT COVERAGE AND LIMITATIONS</u>

A. <u>Permit Application</u> - This permit authorizes stormwater *discharges* to *surface waters of the State* from the following *construction activities* identified within 40 CFR Parts 122.26(b)(14)(x), 122.26(b)(15)(i) and 122.26(b)(15)(ii), provided all of the eligibility provisions of this permit are met:

1. *Construction activities* involving soil disturbances of one (1) or more acres; including disturbances of less than one acre that are part of a *larger common plan of development or sale* that will ultimately disturb one or more acres of land; excluding *routine maintenance activity* that is performed to maintain the original line and grade, hydraulic capacity or original purpose of a facility;

2. *Construction activities* involving soil disturbances of less than one (1) acre where the Department has determined that a *SPDES* permit is required for stormwater *discharges* based on the potential for contribution to a violation of a *water quality standard* or for significant contribution of *pollutants* to *surface waters of the State.*

3. *Construction activities* located in the watershed(s) identified in Appendix D that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land.

B. <u>Maintaining Water Quality</u> - It shall be a violation of this permit and the *ECL* for any *discharge* to either cause or contribute to a violation of *water quality standards* as contained in Parts 700 through 705 of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York, such as:

1. There shall be no increase in turbidity that will cause a substantial visible contrast to natural conditions;

2. There shall be no increase in suspended, colloidal or settleable solids that will cause deposition or impair the waters for their best usages; and

3. There shall be no residue from oil and floating substances, nor visible oil film, nor globules of grease.

C. <u>Eligibility Under This General Permit</u>

1. This permit may authorize all *discharges* of stormwater from *construction activity* to *surface waters of the State* and *groundwaters* except for ineligible *discharges* identified under subparagraph D. of this Part.

2. Except for non-stormwater *discharges* explicitly listed in the next paragraph, this permit only authorizes stormwater discharges from *construction activities*.

3. Notwithstanding paragraphs C.1 and C.2 above, the following non-stormwater *discharges* may be authorized by this permit: discharges from fire fighting activities; fire hydrant flushings; waters to which cleansers or other components have not been added that are used to wash vehicles or control dust in accordance with the SWPPP, routine external building washdown which does not use detergents; pavement washwaters where spills or leaks of toxic or hazardous materials have not occurred (unless all spilled material has been removed) and where detergents are not used; air conditioning condensate; uncontaminated groundwater or spring water; uncontaminated discharges from construction site de-watering operations; and foundation or footing drains where flows are not contaminated with process materials such as solvents. For those entities required to obtain coverage under this permit, and who discharge as noted in this paragraph, and with the exception of flows from fire fighting activities, these discharges must be identified in the SWPPP. Under all circumstances, the *owner or operator* must still comply with water quality standards in Part I.B.

D. <u>Activities Which Are Ineligible for Coverage Under This General Permit</u> - All of the following are **<u>not</u>** authorized by this permit:

1. *Discharges* after *construction activities* have been completed and the site has undergone *final stabilization*;

2. *Discharges* that are mixed with sources of non-stormwater other than those expressly authorized under subsection C.3. of this Part and identified in the SWPPP required by this permit;

3. *Discharges* that are required to obtain an individual SPDES permit or another SPDES general permit pursuant to Part VII, subparagraph K of this permit;

4. *Discharges* from *construction activities* that adversely affect a listed, or proposed to be listed, endangered or threatened species, or its critical habitat;

5. *Discharges* which either cause or contribute to a violation of *water quality standards* adopted pursuant to the *ECL* and its accompanying regulations;

6. *Construction activities* for residential, commercial and institutional projects that:

   a. are tributary to waters of the state classified as AA or AA-s; and

(Part I. D. 6)

b. disturb one or more acres of land with no existing impervious cover and where the Soil Slope Phase is identified as an E or F on the USDA Soil Survey for the County in which the disturbance will occur.

7. *Construction activities* for linear transportation projects and linear utility projects that:
   a. are tributary to waters of the state classified as AA or AA-s; and

   b. disturb two or more acres of land with no existing impervious cover and where the Soil Slope Phase is identified as an E or F on the USDA Soil Survey for the County in which the disturbance will occur.

8. *Construction activities* that adversely affect a property that is listed or is eligible for listing on the State or National Register of Historic Places (Note: includes Archeological sites), unless there are written agreements in place with the NYS Office of Parks, Recreation and Historic Preservation (OPRHP) or other governmental agencies to mitigate the effects, or there are local land use approvals evidencing the same.

Part II. OBTAINING PERMIT COVERAGE

A. Notice of Intent (NOI) Submittal

1. An *owner or operator* of a *construction activity* that is not subject to the requirements of a *regulated, traditional land use control MS4* must first develop a SWPPP in accordance with all applicable requirements of this permit and then submit a completed NOI form to the address below in order to be authorized to *discharge* under this permit. The NOI form shall be one which is associated with this permit, signed in accordance with Part VII.H. of this permit.

   NOTICE OF INTENT
   NYS DEC, Bureau of Water Permits
   625 Broadway, 4th Floor
   Albany, New York 12233-3505

2. An *owner or operator* of a *construction activity* that is subject to the requirements of a *regulated, traditional land use control MS4* must first develop a SWPPP in accordance with all applicable requirements of this permit and then have its SWPPP reviewed and accepted by the *MS4* prior to submitting the NOI to the Department. The *owner or operator* shall have the “MS4 SWPPP Acceptance” form signed by the principal executive officer or ranking elected official from the *regulated, traditional land use control MS4,* or by a duly authorized representative of that person, and then submit that form along with the NOI to the address referenced under “Notice of Intent (NOI) Submittal”.

This requirement does not apply to an *owner or operator* that is obtaining permit coverage in accordance with the requirements in Part II.E. (Change of Owner or Operator).

3. The *owner or operator* shall have the SWPPP preparer sign the "SWPPP Preparer Certification" statement on the NOI prior to submitting the form to the Department.

4. As of the date the NOI is submitted to the Department, the *owner or operator* shall make the NOI and SWPPP available for review and copying in accordance with the requirements in Part VII.F. of this permit.

B. <u>Permit Authorization</u>

1. An *owner or operator* shall not *commence construction activity* until their authorization to *discharge* under this permit goes into effect.

2. Authorization to *discharge* under this permit will be effective when the *owner or operator* has satisfied <u>all</u> of the following criteria:

   a. project review pursuant to the State Environmental Quality Review Act (SEQRA) have been satisfied, when SEQRA is applicable,

   b. where required, all necessary Department permits subject to the *Uniform Procedures Act (UPA)* (see 6 NYCRR Part 621) have been obtained, unless otherwise notified by the Department pursuant to 6 NYCRR 621.3(a)(4). *Owners or operators* of *construction activities* that are required to obtain *UPA* permits must submit a preliminary SWPPP to the appropriate DEC Regional Office in Appendix F at the time all other necessary *UPA* permit applications are submitted. The preliminary SWPPP must include sufficient information to demonstrate that the *construction activity* qualifies for authorization under this permit,

   c. the final SWPPP has been prepared, and

   d. an NOI has been submitted to the Department in accordance with the requirements of this permit.

3. An *owner or operator* that has satisfied the requirements of Part II.B.2 above will be authorized to *discharge* stormwater from their *construction activity* in accordance with the following schedule:

(Part II. B. 3)

a. For *construction activities* that are not subject to the requirements of a *regulated, traditional land use control MS4*:

   i. Five (5) business days from the date the Department receives a complete NOI for *construction activities* with a SWPPP that has been prepared in conformance with the technical standards referenced in Parts III.B.1, 2 and/or 3, or

   ii. Sixty (60) business days from the date the Department receives a complete NOI for *construction activities* with a SWPPP that has not been prepared in conformance with the technical standards referenced in Parts III.B.1, 2 or 3.

b. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4*:

   i. Five (5) business days from the date the Department receives a complete NOI and signed "MS4 SWPPP Acceptance" form,

4. The Department may suspend or deny an *owner's or operator's* coverage under this permit if the Department determines that the SWPPP does not meet the permit requirements.

5. Coverage under this permit authorizes stormwater *discharges* from only those areas of disturbance that are identified in the NOI. If an *owner or operator* wishes to have stormwater *discharges* from future or additional areas of disturbance authorized, they must submit a new NOI that addresses that phase of the development, unless otherwise notified by the Department.

C. General Requirements For Owners or Operators With Permit Coverage

1. The *owner or operator* shall ensure that the provisions of the SWPPP are implemented from the *commencement of construction activity* until all areas of disturbance have achieved *final stabilization* and the Notice of Termination (NOT) has been submitted to the Department in accordance with Part V. of this permit. This includes any changes made to the SWPPP pursuant to Part III.A.4.

2. The *owner or operator* shall maintain a copy of the General Permit (GP-0-10-001), NOI, *NOI Acknowledgment Letter*, SWPPP, MS4 SWPPP Acceptance form and inspection reports at the construction site until all disturbed areas have achieved *final stabilization* and the NOT has been submitted to the Department.

(Part II. C. 2)

The documents must be maintained in a secure location, such as a job trailer, on-site construction office, or mailbox with lock. The secure location must be accessible during normal business hours to an individual performing a compliance inspection.

3. The *owner or operator* of a *construction activity* shall not disturb greater than five (5) acres of soil at any one time without prior written authorization from the Department or, in areas under the jurisdiction of a *regulated, traditional land use control MS4*, the MS4 (provided the MS4 is not the *owner or operator* of the construction activity). At a minimum, the *owner or operator* must comply with the following requirements in order to be authorized to disturb greater than five (5) acres of soil at any one time:

    a. The *owner or operator* shall have a *qualified inspector* conduct **at least** two (2) site inspections in accordance with Part IV.C. every seven (7) calendar days, for as long as greater than five (5) acres of soil remain disturbed. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

    b. In areas where soil disturbance activity has been temporarily or permanently ceased, temporary and/or permanent soil stabilization measures shall be installed and/or implemented within seven (7) days from the date the soil disturbance activity ceased. The soil stabilization measures selected shall be in conformance with the most current version of the technical standard, New York State Standards and Specifications for Erosion and Sediment Control.

    c. The *owner or operator* shall prepare a phasing plan that defines maximum disturbed area per phase and shows required cuts and fills.

    d. The *owner or operator* shall install any additional site specific practices needed to protect water quality.

    e. The *owner or operator* shall include the requirements above in their SWPPP.

4. The Department may suspend or revoke an *owner's or operator's* coverage under this permit at any time if the Department determines that the SWPPP does not meet the permit requirements.

(Part II. C)

5. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4*, the *owner or operator* shall notify the *MS4* in writing of any planned amendments or modifications to the post-construction stormwater management practice component of the SWPPP required by Part III.A. 4. and 5. of this permit. Unless otherwise notified by the *MS4*, the *owner or operator* shall have the SWPPP amendments or modifications reviewed and accepted by the *MS4* prior to commencing construction of the post-construction stormwater management practice.

D. Permit Coverage for Discharges Authorized Under GP-0-08-001

1. Upon renewal of SPDES General Permit for Stormwater Discharges from Construction Activity (Permit No. GP-0-08-001), a*n owner or operator* of *construction activity* with coverage under GP-0-08-001, as of the effective date of GP-0-10-001, shall be authorized to *discharge* in accordance with GP-0-10-001 unless otherwise notified by the Department.

E. Change of Owner or Operator

1. When property ownership changes or when there is a change in operational control over the construction plans and specifications, the original *owner or operator* must notify the new *owner or operator*, in writing, of the requirement to obtain permit coverage by submitting a NOI with the Department. Once the new *owner or operator* obtains permit coverage, the original *owner or operator* shall then submit a completed NOT with the name and permit identification number of the new *owner or operator* to the Department at the address in Part II.A.1.. If the original *owner or operator* maintains ownership of a portion of the *construction activity* and will disturb soil, they must maintain their coverage under the permit.

   Permit coverage for the new *owner or operator* will be effective as of the date the Department receives a complete NOI, provided the original *owner or operator* was not subject to a sixty (60) business day authorization period that has not expired as of the date the Department receives the NOI from the new *owner or operator*.

Part III. STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

A. General SWPPP Requirements

1. The SWPPP shall be prepared prior to the submittal of the NOI. The NOI shall be submitted to the Department prior to the *commencement of construction activity*.

2. The SWPPP shall describe the erosion and sediment control practices and where required, post-construction stormwater management practices that will be used and/or constructed to reduce the pollutants in stormwater discharges and to assure compliance with the terms and conditions of this permit. In addition, the SWPPP shall identify potential sources of pollution which may reasonably be expected to affect the quality of stormwater *discharges*.

3. All SWPPPs that require the post-construction stormwater management practice component shall be prepared by a *qualified professional* that is knowledgeable in the principles and practices of stormwater management and treatment.

4. The *owner or operator* must keep the SWPPP current so that it at all times accurately documents the erosion and sediment controls practices that are being used or will be used during construction, and all post-construction stormwater management practices that will be constructed on the site. At a minimum, the *owner or operator* shall amend the SWPPP:

    a. whenever the current provisions prove to be ineffective in minimizing pollutants in stormwater *discharges* from the site;

    b. whenever there is a change in design, construction, or operation at the construction site that has or could have an effect on the discharge of pollutants; and

    c. to address issues or deficiencies identified during an inspection by the *qualified inspector*, the Department or other regulatory authority.

5. The Department may notify the *owner or operator* at any time that the SWPPP does not meet one or more of the minimum requirements of this permit. The notification shall be in writing and identify the provisions of the SWPPP that require modification. Within fourteen (14) calendar days of such notification, or as otherwise indicated by the Department, the *owner or operator* shall make the required changes to the SWPPP and submit written notification to the Department that the changes have been made. If the *owner or operator* does not respond to the Department's comments in the specified time frame, the Department may suspend the *owner's or operator's* coverage under this permit.

6. Prior to the *commencement of construction activity*, the *owner or operator* must identify the contractor(s) and subcontractor(s) that will be responsible for installing, constructing, repairing, replacing, inspecting and maintaining the erosion and sediment control practices included in the SWPPP; and the contractor(s) and subcontractor(s) that will be responsible for constructing the post-construction stormwater management practices included in the SWPPP.

(Part III. A. 6)

The *owner or operator* shall have each of the contractors and subcontractors identify at least one person from their company that will be responsible for implementation of the SWPPP. This person shall be known as the *trained contractor*. The *owner or operator* shall ensure that at least one *trained contractor* is on site on a daily basis when soil disturbance activities are being performed.

The *owner or operator* shall have each of the contractors and subcontractors identified above sign a copy of the following certification statement below before they commence any *construction activity*:

> "I hereby certify that I understand and agree to comply with the terms and conditions of the 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 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. "

In addition to providing the certification statement above, the certification page must also identify the specific elements of the SWPPP that each contractor and subcontractor will be responsible for and include the name and title of the person providing the signature; the name and title of the *trained contractor* responsible for SWPPP implementation; the name, address and telephone number of the contracting firm; the address (or other identifying description) of the site; and the date the certification statement is signed. The *owner or operator* shall attach the certification statement(s) to the copy of the SWPPP that is maintained at the construction site. If new or additional contractors are hired to implement measures identified in the SWPPP after construction has commenced, they must also sign the certification statement and provide the information listed above.

7. For projects where the Department requests a copy of the SWPPP or inspection reports, the *owner or operator* shall submit the documents in both electronic (PDF only) and paper format within five (5) business days, unless otherwise notified by the Department.

8. The SWPPP must include documentation supporting the determination of permit eligibility with regard to Part I.D.8. (Historic Places or Archeological Resource). At a minimum, the supporting documentation shall include the following:

a. Information on whether the stormwater discharge or *construction activities* would have an effect on a property (historic or archeological resource) that is listed or eligible for listing on the State or National Register of Historic Places;

b. Results of historic resources screening determinations conducted. Information regarding the location of historic places listed, or eligible for listing, on the State or National Registers of Historic Places and areas of archeological sensitivity that may indicate the need for a survey can be obtained online by viewing the New York State Office of Parks, Recreation and Historic Places (OPRHP) online resources located on their web site at: http://nysparks.state.ny.us/shpo/online-tools/ (using The Geographic Information System for Archeology and National Register). OPRHP can also be contacted at: NYS OPRHP, State Historic Preservation Office, Peebles Island Resources Center, P.O. Box 189, Waterford, NY 12188-0189, phone: 518-237-8643;

c. A description of measures necessary to avoid or minimize adverse impacts on places listed, or eligible for listing, on the State or National Register of Historic Places. If the *owner or operator* fails to describe and implement such measures, the stormwater *discharge* is ineligible for coverage under this permit; and

d. Where adverse effects may occur, any written agreements in place with OPRHP or other governmental agency to mitigate those effects, or local land use approvals evidencing the same.

B. Required SWPPP Contents

1. Erosion and sediment control component - All SWPPPs prepared pursuant to this permit shall include erosion and sediment control practices designed in conformance with the most current version of the technical standard, New York State Standards and Specifications for Erosion and Sediment Control. Where erosion and sediment control practices are not designed in conformance with this technical standard, the *owner or operator* must demonstrate equivalence to the technical standard. At a minimum, the erosion and sediment control component of the SWPPP shall include the following:

    a. Background information about the scope of the project, including the location, type and size of project;

b. A site map/construction drawing(s) for the project, including a general location map. At a minimum, the site map shall show the total site area; all improvements; areas of disturbance; areas that will not be disturbed; existing vegetation; on-site and adjacent off-site surface water(s), wetlands and drainage patterns that could be affected by the construction activity; existing and final slopes; locations of different soil types with boundaries; material, waste, borrow or equipment storage areas located on adjacent properties; and location(s) of the stormwater discharge(s);

c. A description of the soil(s) present at the site, including an identification of the Hydrologic Soil Group (HSG);

d. A construction phasing plan and sequence of operations describing the intended order of construction activities, including clearing and grubbing, excavation and grading, utility and infrastructure installation and any other activity at the site that results in soil disturbance;

e. A description of the minimum erosion and sediment control practices to be installed or implemented for each construction activity that will result in soil disturbance. Include a schedule that identifies the timing of initial placement or implementation of each erosion and sediment control practice and the minimum time frames that each practice should remain in place or be implemented;

f. A temporary and permanent soil stabilization plan that meets the requirements of the most current version of the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, for each stage of the project, including initial land clearing and grubbing to project completion and achievement of final stabilization;

g. A site map/construction drawing(s) showing the specific location(s), size(s), and length(s) of each erosion and sediment control practice;

h. The dimensions, material specifications, installation details, and operation and maintenance requirements for all erosion and sediment control practices. Include the location and sizing of any temporary sediment basins and structural practices that will be used to divert flows from exposed soils;

i. A maintenance inspection schedule for the contractor(s) identified in Part III.A.6., to ensure continuous and effective operation of the erosion and sediment control practices. The maintenance inspection schedule shall be in accordance with the requirements in the most current version of the technical standard, New York State Standards and Specifications for Erosion and Sediment Control;

j. A description of the pollution prevention measures that will be used to control litter, construction chemicals and construction debris from becoming a pollutant source in the stormwater *discharges*;

k. A description and location of any stormwater *discharges* associated with industrial activity other than construction at the site, including, but not limited to, stormwater *discharges* from asphalt plants and concrete plants located on the construction site; and

l. Identification of any elements of the design that are not in conformance with the requirements in the most current version of the technical standard, New York State Standards and Specifications for Erosion and Sediment Control. Include the reason for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is equivalent to the technical standards.

2. Post-construction stormwater management practice component - All construction projects identified in Table 2 of Appendix B as needing post-construction stormwater management practices shall prepare a SWPPP that includes practices designed in conformance with the most current version of the technical standard, New York State Stormwater Management Design Manual ("Design Manual"). If the Design Manual is revised during the term of this permit, an *owner or operator* must begin using the revised version of the Design Manual to prepare their SWPPP six (6) months from the final revision date of the Design Manual.

   Where post-construction stormwater management practices are not designed in conformance with this technical standard, the *owner or operator* must demonstrate equivalence to the technical standard.

   At a minimum, the post-construction stormwater management practice component of the SWPPP shall include the following:

   a. Identification of all post-construction stormwater management practices to be constructed as part of the project;

b. A site map/construction drawing(s) showing the specific location and size of each post-construction stormwater management practice;

c. The dimensions, material specifications and installation details for each post-construction stormwater management practice;

d. Identification of any elements of the design that are not in conformance with the Design Manual. Include the reason for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is equivalent to the technical standards;

e. A hydrologic and hydraulic analysis for all structural components of the stormwater management control system;

f. A detailed summary (including calculations) of the sizing criteria that was used to design all post-construction stormwater management practices. At a minimum, the summary shall address the required design criteria from the applicable chapter of the Design Manual; including the identification of and justification for any deviations from the Design Manual, and identification of any design criteria that are not required based on the design criteria or waiver criteria included in the Design Manual; and

g. An operations and maintenance plan that includes inspection and maintenance schedules and actions to ensure continuous and effective operation of each post-construction stormwater management practice. The plan shall identify the entity that will be responsible for the long term operation and maintenance of each practice.

3. Enhanced Phosphorus Removal Standards - All construction projects identified in Table 2 of Appendix B that are located in the watersheds identified in Appendix C shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the Enhanced Phosphorus Removal Standards included in the Design Manual. At a minimum, the post-construction stormwater management practice component of the SWPPP shall include items 2.a - 2.g. above.

(Part III. C)

C. <u>Required SWPPP Components by Project Type</u> - Unless otherwise notified by the Department, *owners or operators* of *construction activities* identified in Table 1 of Appendix B are required to prepare a SWPPP that only includes erosion and sediment control practices designed in conformance with Part III.B.1. *Owners or operators* of the *construction activities* identified in Table 2 of Appendix B shall prepare a SWPPP that also includes post-construction stormwater management practices designed in conformance with Part III.B.2 or 3.

Part IV. <u>INSPECTION AND MAINTENANCE REQUIREMENTS</u>

A. <u>General Construction Site Inspection and Maintenance Requirements</u>

1. The *owner or operator* must ensure that all erosion and sediment control practices and all post-construction stormwater management practices identified in the SWPPP are maintained in effective operating condition at all times.

2. The terms of this permit shall not be construed to prohibit the State of New York from exercising any authority pursuant to the ECL, common law or federal law, or prohibit New York State from taking any measures, whether civil or criminal, to prevent violations of the laws of the State of New York, or protect the public health and safety and/or the environment.

B. <u>Owner or Operator Maintenance Inspection Requirements</u>

1. The *owner or operator* shall inspect, in accordance with the requirements in the most current version of the technical standard, New York State Standards and Specifications for Erosion and Sediment Control, the erosion and sediment controls identified in the SWPPP to ensure that they are being maintained in effective operating condition at all times.

2. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and temporary stabilization measures have been applied to all disturbed areas, the *owner or operator* can stop conducting the maintenance inspections. The *owner or operator* shall begin conducting the maintenance inspections in accordance with Part IV.B.1. as soon as soil disturbance activities resume.

3. For construction sites where soil disturbance activities have been shut down with partial project completion, the *owner or operator* can stop conducting the maintenance inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* <u>and</u> all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational.

(Part IV. C)

C. Qualified Inspector Inspection Requirements - The *owner or operator* shall have a *qualified inspector* conduct site inspections in conformance with the following requirements:

[Note: The *trained contractor* identified in Part III.A.6. **cannot** conduct the *qualified inspector* site inspections unless they meet the *qualified inspector* qualifications included in Appendix A. In order to perform these inspections, the *trained contractor* would have to be a:

- Licensed Professional Engineer,
- Certified Professional in Erosion and Sediment Control (CPESC),
- Registered Landscape Architect, or
- Someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity].

1. A *qualified inspector* shall conduct site inspections for all *construction activities* identified in Tables 1 and 2 of Appendix B, with the exception of:

    a. the construction of a single family residential subdivision with 25% or less impervious cover at total site build-out that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is not located in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E;

    b. the construction of a single family home that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres and is not located in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E;

    c. construction on agricultural property that involves a soil disturbance of one (1) or more acres of land but less than five (5) acres; and

    d. construction activities located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land.

2. Unless otherwise notified by the Department, the *qualified inspector* shall conduct site inspections in accordance with the following timetable:

    a. For construction sites where soil disturbance activities are on-going, the *qualified inspector* shall conduct a site inspection at least once every seven (7) calendar days.

(Part IV. C. 2)

b. For construction sites where soil disturbance activities are on-going and the *owner or operator* has received authorization in accordance with Part II.C.3 to disturb greater than five (5) acres of soil at any one time, the *qualified inspector* shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days.

c. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and temporary stabilization measures have been applied to all disturbed areas, the *qualified inspector* shall conduct a site inspection at least once every thirty (30) calendar days. The *owner or operator* shall notify the Regional Office stormwater contact person (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the MS4 (provided the MS4 is not the *owner or operator* of the construction activity) in writing prior to reducing the frequency of inspections.

d. For construction sites where soil disturbance activities have been shut down with partial project completion, the *qualified inspector* can stop conducting inspections if all areas disturbed as of the project shutdown date have achieved *final stabilization* and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational. The *owner or operator* shall notify the Regional Office stormwater contact person (see contact information in Appendix F) or, in areas under the jurisdiction of a *regulated, traditional land use control MS4,* the MS4 (provided the MS4 is not the *owner or operator* of the construction activity). in writing prior to the shutdown. If soil disturbance activities are not resumed within 2 years from the date of shutdown, the *owner or operator* shall have the *qualified inspector* perform a final inspection and certify that all disturbed areas have achieved *final stabilization,* and all temporary, structural erosion and sediment control measures have been removed*;* and that all post-construction stormwater management practices have been constructed in conformance with the SWPPP by signing the “Final Stabilization” and “Post-Construction Stormwater Management Practice” certification statements on the NOT. The *owner or operator* shall then submit the completed NOT form to the address in Part II.A.1..

(Part IV. C. 3)

3. At a minimum, the *qualified inspector* shall inspect all erosion and sediment control practices to ensure integrity and effectiveness, all post-construction stormwater management practices under construction to ensure that they are constructed in conformance with the SWPPP, all areas of disturbance that have not achieved *final stabilization,* all points of discharge to natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the construction site, and all points of discharge from the construction site.

4. The *qualified inspector* shall prepare an inspection report subsequent to each and every inspection. At a minimum, the inspection report shall include and/or address the following:

    a. Date and time of inspection;

    b. Name and title of person(s) performing inspection;

    c. A description of the weather and soil conditions (e.g. dry, wet, saturated) at the time of the inspection;

    d. A description of the condition of the runoff at all points of discharge from the construction site. This shall include identification of any *discharges* of sediment from the construction site. Include *discharges* from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow;

    e. A description of the condition of all natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the construction site which receive runoff from disturbed areas. This shall include identification of any *discharges* of sediment to the surface waterbody;

    f. Identification of all erosion and sediment control practices that need repair or maintenance;

    g. Identification of all erosion and sediment control practices that were not installed properly or are not functioning as designed and need to be reinstalled or replaced;

    h. Description and sketch of areas that are disturbed at the time of the inspection and areas that have been stabilized (temporary and/or final) since the last inspection;

(Part IV. C 4)

i. Current phase of construction of all post-construction stormwater management practices and identification of all construction that is not in conformance with the SWPPP and technical standards;

j. Corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices; and to correct deficiencies identified with the construction of the post-construction stormwater management practice(s); and

k. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report being maintained onsite within seven (7) calendar days of the date of the inspection. The *qualified inspector* shall also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed. The *qualified inspector* shall attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within seven (7) calendar days of that inspection.

5. Within one business day of the completion of an inspection, the *qualified inspector* shall notify the *owner or operator* and appropriate contractor or subcontractor identified in Part III.A.6. of any corrective actions that need to be taken. The contractor or subcontractor shall begin implementing the corrective actions within one business day of this notification and shall complete the corrective actions in a reasonable time frame.

6. All inspection reports shall be signed by the *qualified inspector*. Pursuant to Part II.C.2., the inspection reports shall be maintained on site with the SWPPP.

Part V. <u>TERMINATION OF PERMIT COVERAGE</u>

A. <u>Termination of Permit Coverage</u>

1. An *owner or operator* that is eligible to terminate coverage under this permit must submit a completed NOT form to the address in Part II.A.1. The NOT form shall be one which is associated with this general permit, signed in accordance with Part VII.H.

2. An *owner or operator* may terminate coverage when one or more the following conditions have been met:

a. Total project completion - All construction activity identified in the SWPPP has been completed; and all areas of disturbance have achieved *final stabilization*; and all temporary, structural erosion and sediment control measures have been removed; and all post-construction stormwater management practices have been constructed in conformance with the SWPPP and are operational;

b. Planned shutdown with partial project completion - All soil disturbance activities have ceased; and all areas disturbed as of the project shutdown date have achieved *final stabilization*; and all temporary, structural erosion and sediment control measures have been removed; and all post-construction stormwater management practices required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational;

c. A new *owner or operator* has obtained coverage under this permit in accordance with Part II.E.

3. For *construction activities* meeting subdivision 2a. or 2b. of this Part, the *owner or operator* shall have the *qualified inspector* perform a final site inspection prior to submitting the NOT. The *qualified inspector* shall, by signing the "Final Stabilization" and "Post-Construction Stormwater Management Practice" certification statements on the NOT, certify that all disturbed areas have achieved *final stabilization;* and all temporary, structural erosion and sediment control measures have been removed; and that all post-construction stormwater management practices have been constructed in conformance with the SWPPP.

4. For *construction activities* that are subject to the requirements of a *regulated, traditional land use control MS4* and meet subdivision 2a. or 2b. of this Part, the *owner or operator* shall also have the MS4 sign the "MS4 Acceptance" statement on the NOT. The *owner or operator* shall have the principal executive officer, ranking elected official, or duly authorized representative from the *regulated, traditional land use control MS4,* sign the "MS4 Acceptance" statement. The MS4 official, by signing this statement, has determined that it is acceptable for the *owner or operator* to submit the NOT in accordance with the requirements of this Part. The MS4 can make this determination by performing a final site inspection themselves or by accepting the *qualified inspector's* final site inspection certification(s) required in Part V.3.

5. For *construction activities* that require post-construction stormwater management practices and meet subdivision 2a. of this Part, the *owner or operator* must, prior to submitting the NOT, ensure one of the following:

a. the post-construction stormwater management practice(s) and any right-of-way(s) needed to maintain such practice(s) have been deeded to the municipality in which the practice(s) is located,

b. an executed maintenance agreement is in place with the municipality that will maintain the post-construction stormwater management practice(s),

c. for post-construction stormwater management practices that are privately owned, the *owner or operator* has modified their deed of record to include a deed covenant that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan,

d. for post-construction stormwater management practices that are owned by a public or private institution (e.g. school, college, university), or government agency or authority, the *owner or operator* has policy and procedures in place that ensures operation and maintenance of the practices in accordance with the operation and maintenance plan.

Part VI. REPORTING AND RETENTION OF RECORDS

A. Record Retention - The *owner or operator* shall retain a copy of the NOI, NOI Acknowledgment Letter, SWPPP, MS4 SWPPP Acceptance form and any inspection reports that were prepared in conjunction with this permit for a period of at least five (5) years from the date that the site achieves *final stabilization*. This period may be extended by the Department, in its sole discretion, at any time upon written notification.

B. Addresses - With the exception of the NOI, NOT, and MS4 SWPPP Acceptance form (which must be submitted to the address referenced in Part II.A.1), all written correspondence requested by the Department, including individual permit applications, shall be sent to the address of the appropriate Department Regional Office listed in Appendix F.

Part VII. STANDARD PERMIT CONDITIONS

A. Duty to Comply - The *owner or operator* must comply with all conditions of this permit. All contractors and subcontractors associated with the project must comply with the terms of the SWPPP. Any non-compliance with this permit constitutes a violation of the Clean Water Act (CWA) and the ECL and is grounds for an enforcement action against the *owner or operator* and/or the contractor/subcontractor; permit revocation, suspension or modification; or denial of a permit renewal application. Upon a finding of significant non-compliance with this permit or the applicable SWPPP, the Department may order an immediate stop to all *construction activity* at the site until the non-compliance is remedied.

The stop work order shall be in writing, shall describe the non-compliance in detail, and shall be sent to the *owner or operator*.

B. <u>Continuation of the Expired General Permit</u> - This permit expires five (5) years from the effective date. However, coverage may be obtained under the expired general permit, which will continue in force and effect, until a new general permit is issued. Unless otherwise notified by the Department in writing, an *owner or operator* seeking authorization under the new general permit must submit a new NOI in accordance with the terms of such new general permit.

C. <u>Enforcement</u> - Failure of the *owner or operator*, its contractors, subcontractors, agents and/or assigns to strictly adhere to any of the permit requirements contained herein shall constitute a violation of this permit. There are substantial criminal, civil, and administrative penalties associated with violating the provisions of this permit. Fines of up to $37,500 per day for each violation and imprisonment for up to fifteen (15) years may be assessed depending upon the nature and degree of the offense.

D. <u>Need to Halt or Reduce Activity Not a Defense</u> - It shall not be a defense for an *owner or operator* in an enforcement action that it would have been necessary to halt or reduce the *construction activity* in order to maintain compliance with the conditions of this permit.

E. <u>Duty to Mitigate</u> - The *owner or operator* and its contractors and subcontractors shall take all reasonable steps to minimize or prevent any *discharge* in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

F. <u>Duty to Provide Information</u> - The *owner or operator* shall make available to the Department for review and copying or furnish to the Department within five (5) business days of receipt of a Department request for such information, any information requested for the purpose of determining compliance with this permit. This can include, but is not limited to, the NOI, NOI Acknowledgment Letter, SWPPP, MS4 SWPPP Acceptance form, executed maintenance agreement, and inspection reports. Failure to provide information requested by the Department within the request timeframe shall be a violation of this permit.

The NOI, SWPPP and inspection reports required by this permit are public documents that the *owner or operator* must make available for review and copying by any person within five (5) business days of the *owner or operator* receiving a written request by any such person to review the NOI, SWPPP or inspection reports. Copying of documents will be done at the requester's expense.

G. <u>Other Information</u> - When the *owner or operator* becomes aware that they failed to submit any relevant facts, or submitted incorrect information in the NOI or in any other report, or have made substantive revisions to the SWPPP (e.g. the scope of the project changes significantly, the type of post-construction stormwater management practice(s) changes, there is a reduction in the sizing of the post-construction stormwater management practice, or there is an increase in the disturbance area or impervious area), which were not reflected in the original NOI submitted to the Department, they shall promptly submit such facts or information to the Department. Failure of the *owner or operator* to correct or supplement any relevant facts within five (5) business days of becoming aware of the deficiency shall constitute a violation of this permit.

H. <u>Signatory Requirements</u>

1. All NOIs and NOTs shall be signed as follows:

    a. For a corporation these forms shall be signed by a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

        i. a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation; or

        ii. the manager of one or more manufacturing, production or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

    b. For a partnership or sole proprietorship these forms shall be signed by a general partner or the proprietor, respectively; or

    c. For a municipality, State, Federal, or other public agency these forms shall be signed by either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:

        i. the chief executive officer of the agency, or

ii. a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).

2. The SWPPP and other information requested by the Department shall be signed by a person described in Part VII.H.1. or by a duly authorized representative of that person. A person is a duly authorized representative only if:

   a. The authorization is made in writing by a person described in Part VII.H.1.;

   b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position) and,

   c. The written authorization shall include the name, title and signature of the authorized representative and be attached to the SWPPP.

3. All inspection reports shall be signed by the *qualified inspector* that performs the inspection.

4. The MS4 SWPPP Acceptance form shall be signed by the principal executive officer or ranking elected official from the *regulated, traditional land use control MS4,* or by a duly authorized representative of that person.

   It shall constitute a permit violation if an incorrect and/or improper signatory authorizes any required forms, SWPPP and/or inspection reports.

I. <u>Property Rights</u> - The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations. *Owners or operators* must obtain any applicable conveyances, easements, licenses and/or access to real property prior to *commencing construction activity*.

J. <u>Severability</u> - The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

(Part VII. K)
K. <u>Denial of Coverage Under This Permit</u>

1. At its sole discretion, the Department may require any *owner or operator* authorized by this permit to apply for and/or obtain either an individual SPDES permit or another SPDES general permit. When the Department requires any discharger authorized by a general permit to apply for an individual SPDES permit, it shall notify the discharger in writing that a permit application is required. This notice shall include a brief statement of the reasons for this decision, an application form, a statement setting a time frame for the *owner or operator* to file the application for an individual SPDES permit, and a deadline, not sooner than 180 days from *owner or operator* receipt of the notification letter, whereby the authorization to discharge under this general permit shall be terminated. Applications must be submitted to the appropriate Regional Office. The Department may grant additional time upon demonstration, to the satisfaction of the Regional Water Engineer, that additional time to apply for an alternative authorization is necessary or where the Department has not provided a permit determination in accordance with Part 621 of this Title.

2. Any *owner or operator* authorized by this permit may request to be excluded from the coverage under this permit by applying for an individual permit or another general permit. In such cases, the *owner or operator* shall submit an individual application or an alternative general permit application in accordance with the requirements of this general permit, 40 CFR 122.26(c)(1)(ii) and 6 NYCRR Part 621, with reasons supporting the request, to the Department at the address for the appropriate Department Office (see addresses in Appendix F).The request may be granted by issuance of an individual permit or another general permit at the discretion of the Department.

3. When an individual SPDES permit is issued to a discharger authorized to discharge under a general SPDES permit for the same discharge(s), the general permit authorization for outfalls authorized under the individual SPDES permit is automatically terminated on the effective date of the individual permit unless termination is earlier in accordance with 6 NYCRR Part 750.

L. <u>Proper Operation and Maintenance</u> - The *owner or operator* shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the *owner or operator* to achieve compliance with the conditions of this permit and with the requirements of the SWPPP.

M. <u>Inspection and Entry</u> - The *owner or operator* shall allow the Department or an authorized representative of EPA, the State, or, in the case of a construction site which discharges through an *MS4*, an authorized representative of the *MS4* receiving the discharge, upon the presentation of credentials and other documents as may be required by law, to:

(Part VII. M)

1. Enter upon the *owner's or operator's* premises where a regulated facility or activity is located or conducted or where records must be kept under the conditions of this permit;

2. Have access to and copy at reasonable times, any records that must be kept under the conditions of this permit; and

3. Inspect at reasonable times any facilities or equipment (including monitoring and control equipment).

N. Permit Actions - At the Department's sole discretion, this permit may, at any time, be modified, suspended, revoked, or renewed. The filing of a request by the *owner or operator* for a permit modification, revocation and reissuance, termination, a notification of planned changes or anticipated noncompliance does not limit, diminish and/or stay compliance with any terms of this permit.

O. Definitions - Definitions of key terms are included in Appendix A of this permit.

P. Re-Opener Clause

1. If there is evidence indicating potential or realized impacts on water quality due to any stormwater discharge associated with *construction activity* covered by this permit, the *owner or operator* of such discharge may be required to obtain an individual permit or alternative general permit in accordance with Part VII.K. of this permit or the permit may be modified to include different limitations and/or requirements.

2. Permit modification, suspension or revocation will be conducted in accordance with 6 NYCRR Part 621, 6 NYCRR 750-1.18, and 6 NYCRR 750-1.20.

Q. Penalties for Falsification of Forms and Reports – Article 17 of the ECL provides for a civil penalty of $37,500 per day per violation of this permit. Articles 175 and 210 of the New York State Penal Law provide for a criminal penalty of a fine and/or imprisonment for falsifying forms and reports required by this permit.

R. Other Permits – Nothing in this permit relieves the *owner or operator* from a requirement to obtain any other permits required by law.

APPENDIX A

Definitions

Alter Hydrology from Pre to Post-Development Conditions - means the post-development peak flow rate(s) has increased by more than 5% of the pre-developed condition for the design storm of interest (e.g. 10 yr and 100 yr).

Combined Sewer - means a sewer that is designed to collect and convey both "sewage" and "stormwater".

Commence (Commencement of) Construction Activities - means the initial disturbance of soils associated with clearing, grading or excavation activities; or other construction related activities that disturb or expose soils such as demolition, stockpiling of fill material, and the initial installation of erosion and sediment control practices required in the SWPPP. See definition for "Construction Activity(ies)" also.

Construction Activity(ies) - means any clearing, grading, excavation, filling, demolition or stockpiling activities that result in soil disturbance. Clearing activities can include, but are not limited to, logging equipment operation, the cutting and skidding of trees, stump removal and/or brush root removal. Construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility.

Direct Discharge (to a specific surface waterbody) - means that runoff flows from a construction site by overland flow and the first point of discharge is the specific surface waterbody, or runoff flows from a construction site to a separate storm sewer system and the first point of discharge from the separate storm sewer system is the specific surface waterbody.

Discharge(s) - means any addition of any pollutant to waters of the State through an outlet or point source.

Environmental Conservation Law (ECL) - means chapter 43-B of the Consolidated Laws of the State of New York, entitled the Environmental Conservation Law.

Final Stabilization - means that all soil disturbance activities have ceased and a uniform, perennial vegetative cover with a density of eighty (80) percent over the entire pervious surface has been established; or other equivalent stabilization measures, such as permanent landscape mulches, rock rip-rap or washed/crushed stone have been applied on all disturbed areas that are not covered by permanent structures, concrete or pavement.

General SPDES permit - means a SPDES permit issued pursuant to 6 NYCRR Part 750-1.21 authorizing a category of discharges.

Groundwater - means waters in the saturated zone. The saturated zone is a subsurface zone in which all the interstices are filled with water under pressure greater than that of the atmosphere. Although the zone may contain gas-filled interstices or interstices filled with fluids other than water, it is still considered saturated.

Impervious Area (Cover) - means all impermeable surfaces that cannot effectively infiltrate rainfall. This includes paved, concrete and gravel surfaces (i.e. parking lots, driveways, roads, runways and sidewalks); building rooftops and miscellaneous impermeable structures such as patios, pools, and sheds.

Larger Common Plan of Development or Sale - means a contiguous area where multiple separate and distinct construction activities are occurring, or will occur, under one plan. The term "plan" in "larger common plan of development or sale" is broadly defined as any announcement or piece of documentation (including a sign, public notice or hearing, marketing plan, advertisement, drawing, permit application, State Environmental Quality Review Act (SEQRA) application, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating that construction activities may occur on a specific plot.

For discrete construction projects that are located within a larger common plan of development or sale that are at least 1/4 mile apart, each project can be treated as a separate plan of development or sale provided any interconnecting road, pipeline or utility project that is part of the same "common plan" is not concurrently being disturbed.

Municipal Separate Storm Sewer (MS4) - a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

i. Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, stormwater, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to surface waters of the State*;*
ii. Designed or used for collecting or conveying stormwater;
iii. Which is not a *combined sewer*; and
iv. Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

National Pollutant Discharge Elimination System (NPDES) - means the national system for the issuance of wastewater and stormwater permits under the Federal Water Pollution Control Act (Clean Water Act).

NOI Acknowledgment Letter - means the letter that the Department sends to an owner or operator to acknowledge the Department's receipt and acceptance of a complete Notice of Intent. This letter documents the owner's or operator's authorization to discharge in accordance with the general permit for stormwater discharges from construction activity.

Owner or Operator - means the person, persons or legal entity which owns or leases the property on which the construction activity is occurring; and/or an entity that has operational control over the construction plans and specifications, including the ability to make modifications to the plans and specifications.

Pollutant - means dredged spoil, filter backwash, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand and industrial, municipal, agricultural waste and ballast discharged into water; which may cause or might reasonably be expected to cause pollution of the waters of the state in contravention of the standards or guidance values adopted as provided in Parts 700 et seq of this Title.

Qualified Inspector - means a person that is knowledgeable in the principles and practices of erosion and sediment control, such as a licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, or other Department endorsed individual(s).

It can also mean someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided that person has training in the principles and practices of erosion and sediment control. Training in the principles and practices of erosion and sediment control means that the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect shall receive four (4) hours of training every three (3) years.

It can also mean a person that meets the *Qualified Professional* qualifications in addition to the *Qualified Inspector* qualifications.

Note: Inspections of any post-construction stormwater management practices that include structural components, such as a dam for an impoundment, shall be performed by a licensed Professional Engineer.

Qualified Professional - means a person that is knowledgeable in the principles and practices of stormwater management and treatment, such as a licensed Professional Engineer, Registered Landscape Architect or other Department endorsed individual(s). Individuals preparing SWPPPs that require the post-construction stormwater management practice component must have an understanding of the principles of hydrology, water quality management practice design, water quantity control design, and, in many cases, the principles of hydraulics in order to prepare a SWPPP that conforms to the Department's technical standard. All components of the SWPPP that involve the practice of engineering, as defined by the NYS Education Law (see Article 145), shall be prepared by, or under the direct supervision of, a professional engineer licensed to practice in the State of New York.

Regulated, Traditional Land Use Control MS4 - means a city, town or village with land use control authority that is required to gain coverage under New York State DEC's SPDES General Permit For Stormwater Discharges from Municipal Separate Stormwater Sewer Systems (MS4s).

Routine Maintenance Activity - means construction activity that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility, including, but not limited to:

- Re-grading of gravel roads or parking lots,
- Stream bank restoration projects (does not include the placement of spoil material),
- Cleaning and shaping of existing roadside ditches and culverts that maintains the approximate original line and grade, and hydraulic capacity of the ditch,
- Cleaning and shaping of existing roadside ditches that does not maintain the approximate original grade, hydraulic capacity and purpose of the ditch if the changes to the line and grade, hydraulic capacity or purpose of the ditch are installed to improve water quality and quantity controls (e.g. installing grass lined ditch),
- Placement of aggregate shoulder backing that makes the transition between the road shoulder and the ditch or embankment,
- Full depth milling and filling of existing asphalt pavements, replacement of concrete pavement slabs, and similar work that does not expose soil or disturb the bottom six (6) inches of subbase material,
- Long-term use of equipment storage areas at or near highway maintenance facilities,
- Removal of sediment from the edge of the highway to restore a previously existing sheet-flow drainage connection from the highway surface to the highway ditch or embankment,
- Existing use of Canal Corp owned upland disposal sites for the canal, and
- Replacement of curbs, gutters, sidewalks and guide rail posts.

State Pollutant Discharge Elimination System (SPDES) - means the system established pursuant to Article 17 of the ECL and 6 NYCRR Part 750 for issuance of permits authorizing discharges to the waters of the state.

Surface Waters of the State - shall be construed to include lakes, bays, sounds, ponds, impounding reservoirs, springs, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Atlantic ocean within the territorial seas of the state of New York and all other bodies of surface water, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters that do not combine or effect a junction with natural surface or underground waters), which are wholly or partially within or bordering the state or within its jurisdiction. Waters of the state are further defined in 6 NYCRR Parts 800 to 941.

Temporary Stabilization - means that exposed soil has been covered with material(s) as set forth in the technical standard, New York Standards and Specifications for Erosion and Sediment Control, to prevent the exposed soil from eroding. The materials can include, but are not limited to, mulch, seed and mulch, and erosion control mats (e.g. jute twisted yarn, excelsior wood fiber mats).

Total Maximum Daily Loads (TMDLs) - A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources. It is a calculation of the maximum amount of a pollutant that a waterbody can receive on a daily basis and still meet water quality standards, and an allocation of that amount to the pollutant's sources. A TMDL stipulates wasteload allocations (WLAs) for point source discharges, load allocations (LAs) for nonpoint sources, and a margin of safety (MOS).

Trained Contractor - means an employee from the contracting (construction) company, identified in Part III.A.6., that has received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity. After receiving the initial training, the *trained contractor* shall receive four (4) hours of training every three (3) years.

It can also mean an employee from the contracting (construction) company, identified in Part III.A.6., that meets the *qualified inspector* qualifications (e.g. licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, or someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity).

The *trained contractor* will be responsible for the day to day implementation of the SWPPP.

Uniform Procedures Act (UPA) Permit - means a permit required under 6 NYCRR Part 621 of the Environmental Conservation Law (ECL), Article 70.

Water Quality Standard - means such measures of purity or quality for any waters in relation to their reasonable and necessary use as promulgated in 6 NYCRR Part 700 et seq.

APPENDIX B

Required SWPPP Components by Project Type

Table 1

CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT ONLY INCLUDES EROSION AND SEDIMENT CONTROLS

The following construction activities that involve soil disturbances of one (1) or more acres of land, but less than five (5) acres: • Single family home not located in one of the watersheds listed in Appendix C and not *directly discharging* to one of the 303(d) segments listed in Appendix E • Single family residential subdivisions with 25% or less impervious cover at total site build-out and not located in one of the watersheds listed in Appendix C and not directly discharging to one of the 303(d) segments listed in Appendix E • Construction of a barn or other agricultural building, silo, stock yard or pen.
The following construction activities that involve soil disturbances of one (1) or more acres of land: • Installation of underground, linear utilities; such as gas lines, fiber-optic cable, cable TV, electric, telephone, sewer mains, and water mains • Environmental enhancement projects, such as wetland mitigation projects, stormwater retrofits and stream restoration projects • Bike paths and trails • Sidewalk construction projects that are not part of a road/ highway construction or reconstruction project • Slope stabilization projects • Slope flattening that changes the grade of the site, but does not significantly change the runoff characteristics • Spoil areas that will be covered with vegetation • Land clearing and grading for the purposes of creating vegetated open space (i.e. recreational parks, lawns, meadows, fields), excluding projects that *alter hydrology from pre to post development* conditions • Athletic fields (natural grass) that do not include the construction or reconstruction of *impervious area* and do not *alter hydrology from pre to post development* conditions • Demolition project where vegetation will be established and no redevelopment is planned • Overhead electric transmission line project that does not include the construction of permanent access roads or parking areas surfaced with *impervious cover* • Structural practices as identified in Table II in the "Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State", excluding projects that involve soil disturbances of less than five acres and construction activities that include the construction or reconstruction of impervious area
The following construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land: • All construction activities located in the watersheds identified in Appendix D that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land.

Table 2
CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A SWPPP THAT INCLUDES POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES

The following construction activities that involve soil disturbances of one (1) or more acres of land:

- Single family home located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix E
- Single family residential subdivisions that involve soil disturbances of between one (1) and five (5) acres of land with greater than 25% impervious cover at total site build-out
- Single family residential subdivisions that involve soil disturbances of five (5) or more acres of land, and single family residential subdivisions that involve soil disturbances of less than five (5) acres that are part of a larger common plan of development or sale that will ultimately disturb five or more acres of land
- Multi-family residential developments; includes townhomes, condominiums, senior housing complexes, apartment complexes, and mobile home parks
- Airports
- Amusement parks
- Campgrounds
- Cemeteries that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Commercial developments
- Churches and other places of worship
- Construction of a barn or other agricultural building(e.g. silo) and structural practices as identified in Table II in the "Agricultural Management Practices Catalog for Nonpoint Source Pollution in New York State" that include the construction or reconstruction of *impervious area*, excluding projects that involve soil disturbances of less than five acres.
- Golf courses
- Institutional, includes hospitals, prisons, schools and colleges
- Industrial facilities, includes industrial parks
- Landfills
- Municipal facilities; includes highway garages, transfer stations, office buildings, POTW's and water treatment plants
- Office complexes
- Sports complexes
- Racetracks, includes racetracks with earthen (dirt) surface
- Road construction or reconstruction
- Parking lot construction or reconstruction
- Athletic fields (natural grass) that include the construction or reconstruction of impervious area (>5% of disturbed area) or *alter the hydrology from pre to post development* conditions
- Athletic fields with artificial turf
- Permanent access roads, parking areas, substations, compressor stations and well drilling pads, surfaced with *impervious cover*, and constructed as part of an over-head electric transmission line project , wind-power project, cell tower project, oil or gas well drilling project or other linear utility project
- All other construction activities that include the construction or reconstruction of *impervious area* and *alter the hydrology from pre to post development* conditions, and are not listed in Table 1

APPENDIX C

Watersheds Where Enhanced Phosphorus Removal Standards Are Required

Watersheds where *owners or operators* of construction activities identified in Table 2 of Appendix B must prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the Enhanced Phosphorus Removal Standards included in the technical standard, New York State Stormwater Management Design Manual ("Design Manual").

- Entire New York City Watershed located east of the Hudson River **-** Figure 1
- Onondaga Lake Watershed **-** Figure 2
- Greenwood Lake Watershed **-**Figure 3
- Oscawana Lake Watershed – Figure 4

Figure 1 - New York City Watershed East of the Hudson

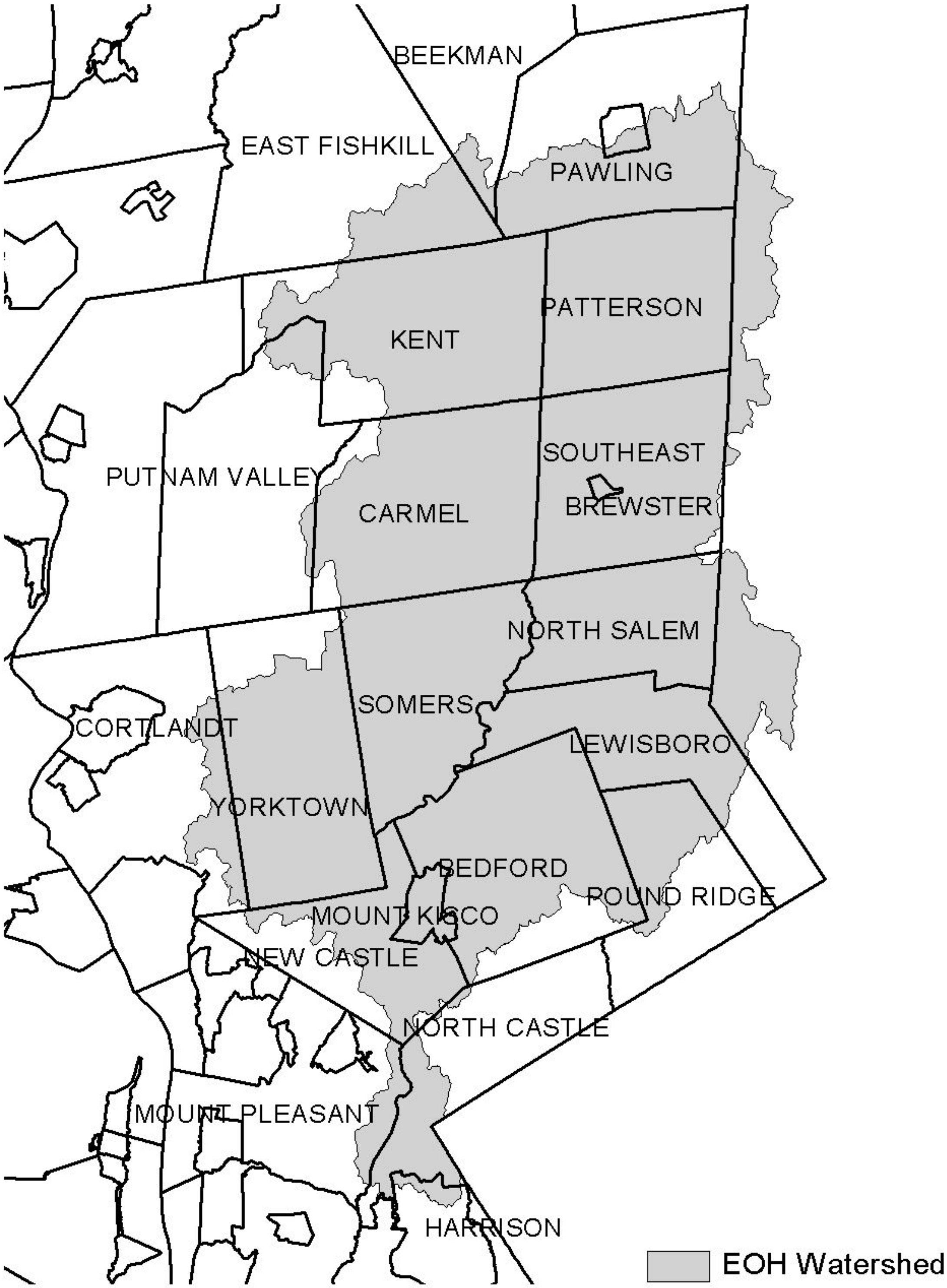


Figure 2 - Onondaga Lake Watershed

Figure 3 - Greenwood Lake Watershed

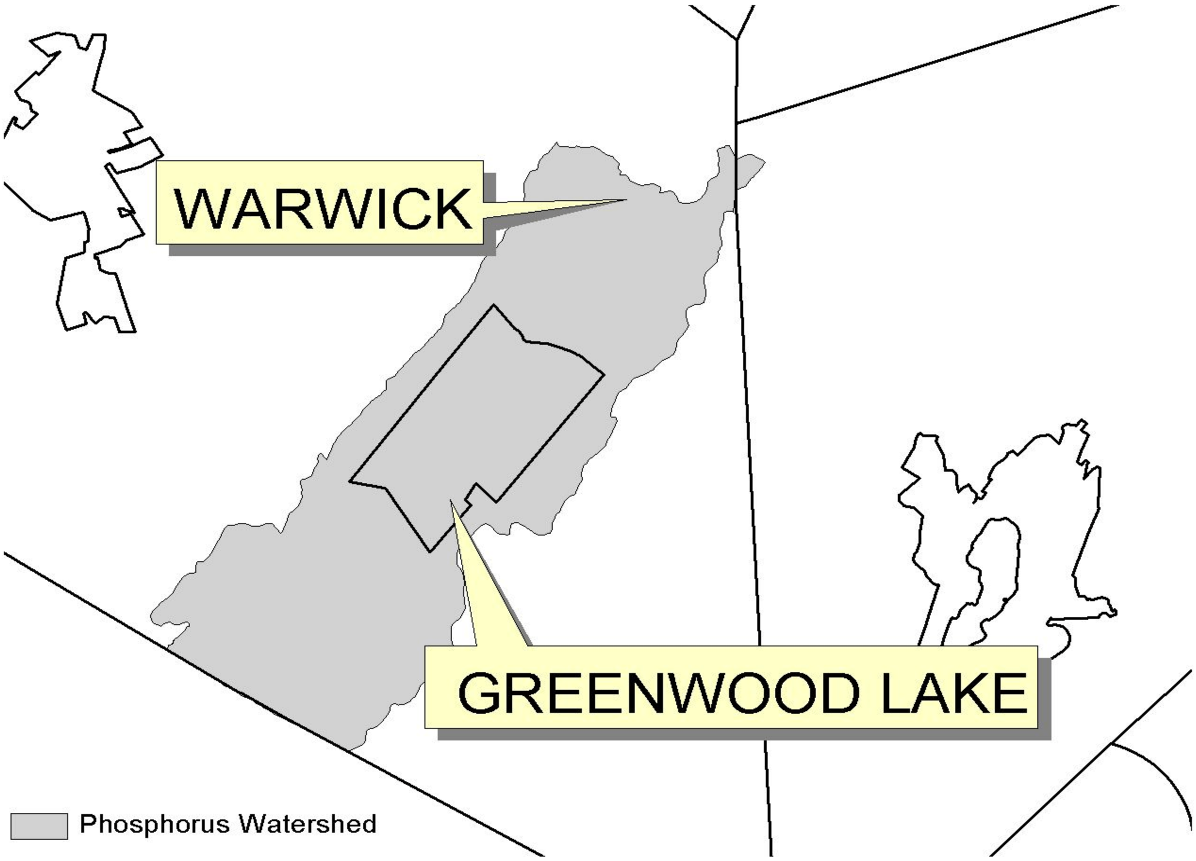
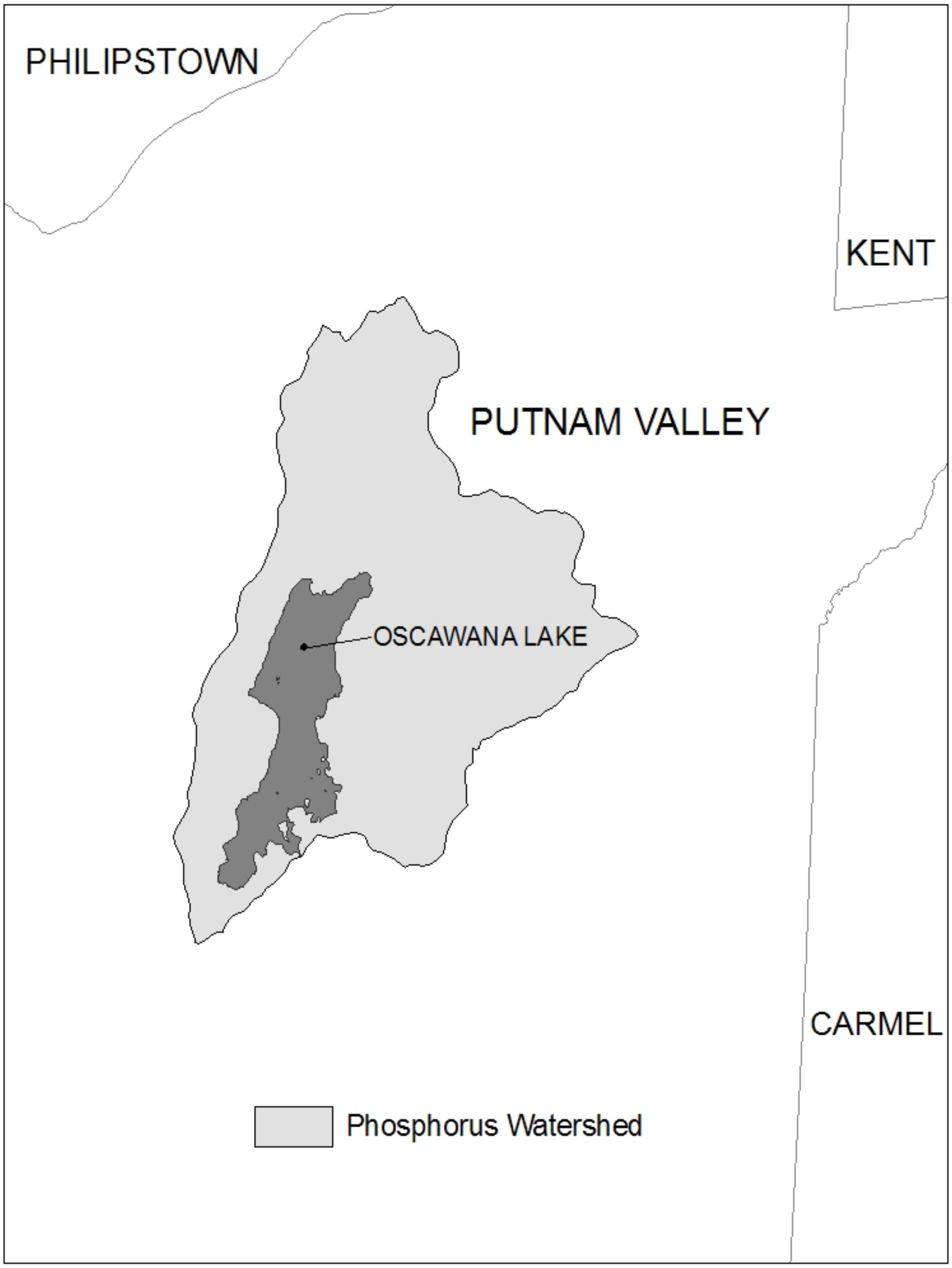


Figure 4 - Oscawana Lake Watershed



APPENDIX D

Watersheds where *owners or operators* of construction activities that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land must obtain coverage under this permit.

Entire New York City Watershed that is located east of the Hudson River **-** See Figure 1 in Appendix C

APPENDIX E

List of 303(d) segments impaired by pollutants related to construction activity (e.g. silt, sediment or nutrients). *Owners or operators* of single family home and single family residential subdivision construction activities that involve soil disturbances of one or more acres of land, but less than 5 acres, and *directly discharge* to one of the listed segments below shall prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the most current version of the technical standard, New York State Stormwater Management Design Manual (“Design Manual”).

COUNTY	WATERBODY
Albany	Ann Lee (Shakers) Pond, Stump Pond
Albany	Basic Creek Reservoir
Bronx	Van Cortlandt Lake
Broome	Whitney Point Lake/Reservoir
Broome	Beaver Lake
Broome	White Birch Lake
Chautauqua	Chautauqua Lake, North
Chautauqua	Chautauqua Lake, South
Chautauqua	Bear Lake
Chautauqua	Chadakoin River and tribs
Chautauqua	Lower Cassadaga Lake
Chautauqua	Middle Cassadaga Lake
Chautauqua	Findley Lake
Clinton	Great Chazy River, Lower, Main Stem
Columbia	Kinderhook Lake
Columbia	Robinson Pond
Dutchess	Hillside Lake
Dutchess	Wappinger Lakes
Dutchess	Fall Kill and tribs
Dutchess	Rudd Pond
Erie	Rush Creek and tribs
Erie	Ellicott Creek, Lower, and tribs
Erie	Beeman Creek and tribs
Erie	Murder Creek, Lower, and tribs
Erie	South Branch Smoke Cr, Lower, and tribs
Erie	Little Sister Creek, Lower, and tribs
Essex	Lake George (primary county listed as Warren)
Genesee	Black Creek, Upper, and minor tribs
Genesee	Tonawanda Creek, Middle, Main Stem
Genesee	Tonawanda Creek, Upper, and minor tribs
Genesee	Little Tonawanda Creek, Lower, and tribs
Genesee	Oak Orchard Creek, Upper, and tribs
Genesee	Bowen Brook and tribs
Genesee	Bigelow Creek and tribs
Greene	Schoharie Reservoir
Greene	Sleepy Hollow Lake
Herkimer	Steele Creek tribs
Kings	Hendrix Creek
Lewis	Mill Creek/South Branch and tribs
Livingston	Conesus Lake
Livingston	Jaycox Creek and tribs
Livingston	Mill Creek and minor tribs
Monroe	Genesee River, Lower, Main Stem
Monroe	Genesee River, Middle, Main Stem
Monroe	Black Creek, Lower, and minor tribs
Monroe	Buck Pond
Monroe	Long Pond
Monroe	Cranberry Pond
Monroe	Mill Creek and tribs
Monroe	Shipbuilders Creek and tribs
Monroe	Minor tribs to Irondequoit Bay
Monroe	Thomas Creek/White Brook and tribs
Nassau	Glen Cove Creek, Lower, and tribs
Nassau	LI Tribs (fresh) to East Bay
Nassau	East Meadow Brook, Upper, and tribs
Nassau	Hempstead Bay
Nassau	Hempstead Lake
Nassau	Grant Park Pond
Niagara	Bergholtz Creek and tribs
Oneida	Ballou, Nail Creeks
Onondaga	Ley Creek and tribs
Onondaga	Onondaga Creek, Lower and tribs
Onondaga	Onondaga creek, Middle and tribs
Onondaga	Onondaga Creek, Upper, and minor tribs
Onondaga	Harbor Brook, Lower, and tribs
Onondaga	Ninemile Creek, Lower, and tribs
Onondaga	Minor tribs to Onondaga Lake
Ontario	Honeoye Lake
Ontario	Hemlock Lake Outlet and minor tribs
Ontario	Great Brook and minor tribs
Oswego	Lake Neatahwanta
Putnam	Oscawana Lake
Putnam	Lake Carmel
Queens	Jamaica Bay, Eastern, and tribs (Queens)
Queens	Bergen Basin
Queens	Shellbank Basin
Rensselaer	Snyders Lake
Richmond	Grasmere, Arbutus and Wolfes Lakes
Saratoga	Dwaas Kill and tribs
Saratoga	Tribs to Lake Lonely
Saratoga	Lake Lonely
Saratoga	Schuyler Creek and tribs
Schenectady	Collins Lake

APPENDIX E

List of 303(d) segments impaired by pollutants related to construction activity, cont'd.

COUNTY	WATERBODY	COUNTY	WATERBODY
Schoharie	Engleville Pond		
Schoharie	Summit Lake		
St. Lawrence	Black Lake Outlet/Black Lake		
Steuben	Lake Salubria		
Steuben	Smith Pond		
Suffolk	Millers Pond		
Suffolk	Mattituck (Marratooka) Pond		
Suffolk	Tidal tribs to West Moriches Bay		
Suffolk	Canaan Lake		
Suffolk	Lake Ronkonkoma		
Tompkins	Cayuga Lake, Southern End		
Tompkins	Owasco Inlet, Upper, and tribs		
Ulster	Ashokan Reservoir		
Ulster	Esopus Creek, Upper, and minor tribs		
Warren	Lake George		
Warren	Tribs to L.George, Village of L George		
Warren	Huddle/Finkle Brooks and tribs		
Warren	Indian Brook and tribs		
Warren	Hague Brook and tribs		
Washington	Tribs to L.George, East Shore of Lake George		
Washington	Cossayuna Lake		
Wayne	Port Bay		
Wayne	Marbletown Creek and tribs		
Westchester	Peach Lake		
Westchester	Mamaroneck River, Lower		
Westchester	Mamaroneck River, Upper, and minor tribs		
Westchester	Sheldrake River and tribs		
Westchester	Blind Brook, Lower		
Westchester	Blind Brook, Upper, and tribs		
Westchester	Lake Lincolndale		
Westchester	Lake Meahaugh		
Wyoming	Java Lake		
Wyoming	Silver Lake		

Note: The list above identifies those waters from the final New York State "2008 Section 303(d) List of Impaired Waters Requiring a TMDL/Other Strategy", dated May 26, 2008, that are impaired by silt, sediment or nutrients.

APPENDIX F

LIST OF NYS DEC REGIONAL OFFICES

Region	COVERING THE FOLLOWING COUNTIES:	DIVISION OF ENVIRONMENTAL PERMITS (DEP) PERMIT ADMINISTRATORS	DIVISION OF WATER (DOW) WATER (SPDES) PROGRAM
1	NASSAU AND SUFFOLK	50 CIRCLE ROAD STONY BROOK, NY 11790 TEL. (631) 444-0365	50 CIRCLE ROAD STONY BROOK, NY 11790-3409 TEL. (631) 444-0405
2	BRONX, KINGS, NEW YORK, QUEENS AND RICHMOND	1 HUNTERS POINT PLAZA, 47-40 21ST ST. LONG ISLAND CITY, NY 11101-5407 TEL. (718) 482-4997	1 HUNTERS POINT PLAZA, 47-40 21ST ST. LONG ISLAND CITY, NY 11101-5407 TEL. (718) 482-4933
3	DUTCHESS, ORANGE, PUTNAM, ROCKLAND, SULLIVAN, ULSTER AND WESTCHESTER	21 SOUTH PUTT CORNERS ROAD NEW PALTZ, NY 12561-1696 TEL. (845) 256-3059	100 HILLSIDE AVENUE, SUITE 1W WHITE PLAINS, NY 10603 TEL. (914) 428 - 2505
4	ALBANY, COLUMBIA, DELAWARE, GREENE, MONTGOMERY, OTSEGO, RENSSELAER, SCHENECTADY AND SCHOHARIE	1150 NORTH WESTCOTT ROAD SCHENECTADY, NY 12306-2014 TEL. (518) 357-2069	1130 NORTH WESTCOTT ROAD SCHENECTADY, NY 12306-2014 TEL. (518) 357-2045
5	CLINTON, ESSEX, FRANKLIN, FULTON, HAMILTON, SARATOGA, WARREN AND WASHINGTON	1115 STATE ROUTE 86, PO BOX 296 RAY BROOK, NY 12977-0296 TEL. (518) 897-1234	232 GOLF COURSE ROAD, PO BOX 220 WARRENSBURG, NY 12885-0220 TEL. (518) 623-1200
6	HERKIMER, JEFFERSON, LEWIS, ONEIDA AND ST. LAWRENCE	STATE OFFICE BUILDING 317 WASHINGTON STREET WATERTOWN, NY 13601-3787 TEL. (315) 785-2245	STATE OFFICE BUILDING 207 GENESEE STREET UTICA, NY 13501-2885 TEL. (315) 793-2554
7	BROOME, CAYUGA, CHENANGO, CORTLAND, MADISON, ONONDAGA, OSWEGO, TIOGA AND TOMPKINS	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7438	615 ERIE BLVD. WEST SYRACUSE, NY 13204-2400 TEL. (315) 426-7500
8	CHEMUNG, GENESEE, LIVINGSTON, MONROE, ONTARIO, ORLEANS, SCHUYLER, SENECA, STEUBEN, WAYNE AND YATES	6274 EAST AVON-LIMA ROAD AVON, NY 14414-9519 TEL. (585) 226-2466	6274 EAST AVON-LIMA RD. AVON, NY 14414-9519 TEL. (585) 226-2466
9	ALLEGANY, CATTARAUGUS, CHAUTAUQUA, ERIE, NIAGARA AND WYOMING	270 MICHIGAN AVENUE BUFFALO, NY 14203-2999 TEL. (716) 851-7165	270 MICHIGAN AVE. BUFFALO, NY 14203-2999 TEL. (716) 851-7070

FACT SHEET

For

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

SPDES GENERAL PERMIT
FOR STORMWATER DISCHARGES

from

CONSTRUCTION ACTIVITY

Permit No. GP-0-10-001

Issued Pursuant to Article 17, Titles 7, 8 and Article 70
of the Environmental Conservation Law

January 2010

Introduction

The New York State Department of Environmental Conservation (NYSDEC) has prepared the new SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-10-001). The new permit is effective on January 29, 2010. This general permit replaces the SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-08-001).

The SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-10-001) is a five (5) year permit that covers discharges of stormwater to surface waters of the State from construction activities as defined in 40 CFR Part 122.26(b)(14)(x) and (b)(15)(i - ii).

Pursuant to Section 402 of the Clean Water Act ("CWA"), stormwater discharges from certain construction activities (including discharges through a municipal separate storm sewer system) are unlawful unless they are authorized by a National Pollutant Discharge Elimination System (NPDES) permit or by a state permit program. New York's State Pollutant Discharge Elimination System (SPDES) is a NPDES-approved program with permits issued in accordance with the Environmental Conservation Law ("ECL"). An owner or operator of a construction activity must obtain permit coverage through either an individual SPDES permit which address the stormwater discharges or obtain coverage under the SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-10-001) prior to the commencement of construction activity.

Updates to the New York State Stormwater Management Design Manual (Design Manual)

One of the foundations of the New York State Stormwater program is the technical standards for stormwater controls. Along the same timeline as renewal of the stormwater permits, the NYSDEC is updating the Design Manual to include green infrastructure techniques. When the Design Manual is updated, an owner or operator of a construction activity that needs post-construction stormwater management practices will be required to prepare a SWPPP that includes practices designed in conformance with or equivalent to the updated Design Manual.

The increased emphasis on a holistic approach to resource protection, water quality treatment, flow volume control, maintenance cost reduction, and the dynamics of stormwater science has led to several changes in stormwater management. Carrying out stormwater management design standards for the past few years has provided the regulatory agencies, regulated entities, and design community with valuable experiences and a body of knowledge to enhance and improve urban runoff planning, methodologies, and techniques towards implementation of green infrastructure.

The term green infrastructure, previously used to describe specific water quality management practices, has expanded in recent years to include a wide array of practices at multiple scales to manage, reduce, and treat stormwater and maintain and restore natural hydrology by infiltration, evapotranspiration, and capture and reuse of stormwater. On a regional scale, green infrastructure is the preservation and restoration of natural landscape features, such as forests, floodplains and wetlands, coupled with policies such as infill and redevelopment that reduce overall imperviousness in a watershed. On the local scale green infrastructure consists of site- and neighborhood-specific practices, such as bioretention, trees, green roofs, porous pavements and cisterns.

The value of runoff reduction by non-structural stormwater control practices or green infrastructure techniques is increasingly recognized as a critical feature for environmentally-sound development. In addition, runoff reduction through this approach can directly translate into cost savings to the developer by reducing the size of structural stormwater control and conveyance facilities. The Design Manual will provide developers and site designers with a step by step approach to implement green infrastructure practices that can reduce the volume of stormwater runoff, minimize pollutant loads from a site, and allow a development project to meet New York State's criteria simply through a more innovative site design.

The green infrastructure approach for stormwater management reduces a site's impact on the aquatic ecosystem through the use of non-structural site planning and innovative techniques. The objective is to replicate pre-development hydrology by maintaining pre-construction infiltration, peak runoff flow, discharge volume, as well as minimizing concentrated flow by using runoff control techniques to provide treatment in a distributed manner before runoff reaches the waterways or the collection system. This approach offers a distinct advantage over conventional "hard" stormwater infrastructure by reducing the production of runoff and the need for collection, storage, and treatment.

Planners and designers must address this approach in a five-step process for stormwater site planning and practice selection in the SWPPP: site planning to preserve natural features and reduce impervious cover, calculation of water quality volume for the site, calculation of runoff reduction volume by applying green infrastructure techniques, use of standard treatment practices where applicable, and finally calculation of volume and peak discharge control practices where required. (See the fourth bulleted item - *SWPPP Preparation In Conformance With Updated Design Manual* under the "Other Permit Revisions" section below)

Major Permit Revision

The Department made only one major change in this general permit compared to the previous version of the general permit (GP-0-08-001). The major change involves construction projects located in the Oscawana Lake Watershed that are required to develop a SWPPP that includes post-construction stormwater management practices (See Table 2 in Appendix B). Under the new general permit, the owner or operator of these construction activities will be required to prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with the Enhanced Phosphorus Removal Standards included in the Design Manual (See Chapter 10).

Other Permit Revisions

Some of the other more significant changes with GP-0-10-001 include:

- Duty To Provide Information - The following language from GP-02-01 has been placed back in this permit (GP-0-10-001). The language deals with an owner or operator making certain permit documentation available to a requester. The language is located in Part VII.F. and referenced in Part II.A.4.

  "The NOI, SWPPP and inspection reports required by this permit are public documents that the owner or operator must make available for review and copying by any person within five (5) business days of the owner or operator receiving a written request by any such person to review the NOI, SWPPP or inspection reports. Copying of documents will be done at the requester's expense."

  Interested parties are reminded that the information supplied by an owner or operator in the Notice of Intent can be viewed on the Department's Stormwater Interactive Map. The link for the Stormwater Interactive Map is: http://www.dec.ny.gov/imsmaps/stormwater/viewer.htm

- Keeping The SWPPP Current - Part III.A.4 has been revised to provide additional clarification as to when an owner or operator must have their SWPPP preparer amend or update their SWPPP. The majority of the language added to this requirement was included in GP-02-01.

- MS4 Notification of SWPPP Amendments – Part II.C.5. requires the owner or operator of a construction activity that is subject to the requirements of a regulated, traditional land use control MS4 to notify the MS4 in writing of any planned amendments or modifications to the post-construction stormwater management practice component of the SWPPP required by Part III.A. 4. and 5.of this permit. Unless otherwise notified by the MS4, the owner or operator shall have the SWPPP amendments or modifications reviewed and accepted by the MS4 prior to commencing construction of the post-construction stormwater management practice.

- SWPPP Preparation In Conformance With Updated Design Manual - Part III.B.2. has been revised to include a transition period for when an owner or operator would be required to prepare a SWPPP that includes post-construction stormwater management practices designed in conformance with updates to the New York State Stormwater Management Design Manual (Design Manual). When the Design Manual is revised during the term of the general permit, an owner or operator must begin using the revised version of the Design Manual to prepare their SWPPP six (6) months from the final revision date of the Design Manual. Owners or operators are allowed, but not required to use the updated Design Manual starting on the final revision date.

Pursuant to 6 NYCRR Part 750-1.21(d)(2), an owner or operator of a construction activity with coverage under the existing SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-08-001) as of the effective date of GP-0-10-001 shall be automatically permitted to discharge in accordance with GP-0-10-001 unless otherwise notified by the Department. These owners or operators may continue to implement the technical/design components of the SWPPP that was developed in accordance with the requirements of GP-0-08-001. However, they will be subject to the other, non-design provisions of the new general permit, GP-0-10-001.

- Additional Qualified Inspector Inspections Requirements – Part IV.C.3. has been revised to require the qualified inspector to inspect all points of discharge to natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the construction site.

- Additional Qualified Inspector Reporting Requirements – Part IV.C.4. has been revised to require the qualified inspector to provide a description of the condition of all points of discharge to natural surface waterbodies located within, or immediately adjacent to, the property boundaries of the construction site which receive runoff from disturbed areas.

  In addition, a requirement has been added to Part IV.C.4 that requires the qualified inspector to take digital photographs of the practices that have been identified as needing corrective actions. The *qualified inspector* is required to attach paper color copies of the digital photographs to the inspection report being maintained onsite within seven (7) calendar days of the date of the inspection. The *qualified inspector* is also required to take digital photographs, with date stamp, which show the condition of the practice(s) after the corrective action has been completed. The *qualified inspector* is required to attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within seven (7) calendar days of that inspection.

- Final Sign Off by MS4 Prior to Filing Notice of Termination (NOT) – Part V.A.4. For construction activities that are subject to the requirements of a regulated, traditional land use control MS4, the owner or operator is required to have the MS4 sign the “MS4 Acceptance” statement on the NOT. The owner or operator shall have the principal executive officer, ranking elected official, or duly authorized representative from the regulated, traditional land use control MS4, sign the “MS4 Acceptance” statement. The MS4 official, by signing this statement, has determined that it is acceptable for the owner or operator to submit the NOT in accordance with the requirements of the permit. The MS4 can make this determination by performing a final site inspection themselves or by accepting the qualified inspector’s final site inspection certification(s) required by the permit.

Other Helpful Information and Important Reminders

- An owner or operator of a construction activity that is eligible for coverage under the SPDES General Permit for Stormwater Discharges from Construction Activity (GP-0-10-

001) must obtain coverage under the permit prior to the commencement of construction activity. They cannot wait until there is an actual discharge from the construction site to obtain permit coverage.

This requirement comes from Section 17-0505 of the ECL which states "The making or use of an outlet or point source discharging into the waters of the state, and the operation or construction of disposal systems, without a valid SPDES permit as provided by section 17-0701 or title 8 hereof are prohibited.". Several federal court cases have held that construction activity, which requires a NPDES permit (SPDES in New York State), is properly defined as a point source under the Clean Water Act (CWA). In other words, activities that fit the definition of "construction activity" under 40 CFR 122.26(b)(14)(x) and (15)(i), constitute point source activity. Therefore, pursuant to Section 17-0505, the owner or operator must have coverage under a SPDES permit prior to commencing construction activity.

- The owner of a construction activity needs to ensure that the appropriate "Qualified Inspector" has been hired to inspect the different components of the SWPPP. Some of the individuals included in the definition of "Qualified Inspector" may not have the necessary qualifications, certification(s) or license(s) to inspect a post-construction stormwater management practice and then certify that it has been constructed in conformance with the SWPPP (Refer to the NYS Education Department rules and regulations that apply to licensed professional engineers). For these inspections, the owner may have to hire the design engineer (or other professional engineer) to act as the "Qualified Inspector" in order to meet any NYS Education Department rules and regulations that apply to licensed professionals.

- The trained contractor identified in Part III.A.6. cannot conduct the qualified inspector site inspections unless they meet the qualified inspector qualifications included in Appendix A of this permit. In order to perform these inspections, the trained contractor would have to be a:
  - licensed Professional Engineer,
  - Certified Professional in Erosion and Sediment Control (CPESC),
  - Registered Landscape Architect, or
  - someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of Department endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other Department endorsed entity.

Attachment A
BMP Construction Inspection Checklist

Stormwater/Wetland Pond Construction Inspection Checklist

Project:
Location:
Site Status:

Date:

Time:

Inspector:

CONSTRUCTION SEQUENCE	SATISFACTORY/ UNSATISFACTORY	COMMENTS
Pre-Construction/Materials and Equipment		
Pre-construction meeting		
Pipe and appurtenances on-site prior to construction and dimensions checked		
1. Material (including protective coating, if specified)		
2. Diameter		
3. Dimensions of metal riser or pre-cast concrete outlet structure		
4. Required dimensions between water control structures (orifices, weirs, etc.) are in accordance with approved plans		
5. Barrel stub for prefabricated pipe structures at proper angle for design barrel slope		
6. Number and dimensions of prefabricated anti-seep collars		
7. Watertight connectors and gaskets		
8. Outlet drain valve		
Project benchmark near pond site		
Equipment for temporary de-watering		

CONSTRUCTION SEQUENCE	SATISFACTORY/ UNSATISFACTORY	COMMENTS
2. Subgrade Preparation		
Area beneath embankment stripped of all vegetation, topsoil, and organic matter		
3. Pipe Spillway Installation		
Method of installation detailed on plans		
A. Bed preparation		
Installation trench excavated with specified side slopes		
Stable, uniform, dry subgrade of relatively impervious material (If subgrade is wet, contractor shall have defined steps before proceeding with installation)		
Invert at proper elevation and grade		
B. Pipe placement		
Metal / plastic pipe		
1. Watertight connectors and gaskets properly installed		
2. Anti-seep collars properly spaced and having watertight connections to pipe		
3. Backfill placed and tamped by hand under “haunches” of pipe		
4. Remaining backfill placed in max. 8 inch lifts using small power tamping equipment until 2 feet cover over pipe is reached		

CONSTRUCTION SEQUENCE	SATISFACTORY/ UNSATISFACTORY	COMMENTS
3. Pipe Spillway Installation		
Concrete pipe		
1. Pipe set on blocks or concrete slab for pouring of low cradle		
2. Pipe installed with rubber gasket joints with no spalling in gasket interface area		
3. Excavation for lower half of anti-seep collar(s) with reinforcing steel set		
4. Entire area where anti-seep collar(s) will come in contact with pipe coated with mastic or other approved waterproof sealant		
5. Low cradle and bottom half of anti-seep collar installed as monolithic pour and of an approved mix		
6. Upper half of anti-seep collar(s) formed with reinforcing steel set		
7. Concrete for collar of an approved mix and vibrated into place (protected from freezing while curing, if necessary)		
8. Forms stripped and collar inspected for honeycomb prior to backfilling. Parge if necessary.		
C. Backfilling		
Fill placed in maximum 8 inch lifts		
Backfill taken minimum 2 feet above top of anti-seep collar elevation before traversing with heavy equipment		

CONSTRUCTION SEQUENCE	SATISFACTORY/ UNSATISFACTORY	COMMENTS
4. Riser / Outlet Structure Installation		
Riser located within embankment		
A. Metal riser		
Riser base excavated or formed on stable subgrade to design dimensions		
Set on blocks to design elevations and plumbed		
Reinforcing bars placed at right angles and projecting into sides of riser		
Concrete poured so as to fill inside of riser to invert of barrel		
B. Pre-cast concrete structure		
Dry and stable subgrade		
Riser base set to design elevation		
If more than one section, no spalling in gasket interface area; gasket or approved caulking material placed securely		
Watertight and structurally sound collar or gasket joint where structure connects to pipe spillway		
C. Poured concrete structure		
Footing excavated or formed on stable subgrade, to design dimensions with reinforcing steel set		
Structure formed to design dimensions, with reinforcing steel set as per plan		
Concrete of an approved mix and vibrated into place (protected from freezing while curing, if necessary)		
Forms stripped & inspected for "honeycomb" prior to backfilling; parge if necessary		

CONSTRUCTION SEQUENCE	SATISFACTORY/ UNSATISFACTORY	COMMENTS
5. Embankment Construction		
Fill material		
Compaction		
Embankment		
1. Fill placed in specified lifts and compacted with appropriate equipment		
2. Constructed to design cross-section, side slopes and top width		
3. Constructed to design elevation plus allowance for settlement		
6. Impounded Area Construction		
Excavated / graded to design contours and side slopes		
Inlet pipes have adequate outfall protection		
Forebay(s)		
Pond benches		
7. Earth Emergency Spillway Construction		
Spillway located in cut or structurally stabilized with riprap, gabions, concrete, etc.		
Excavated to proper cross-section, side slopes and bottom width		
Entrance channel, crest, and exit channel constructed to design grades and elevations		

CONSTRUCTION SEQUENCE	SATISFACTORY / UNSATISFACTORY	COMMENTS
8. Outlet Protection		
A. End section		
Securely in place and properly backfilled		
B. Endwall		
Footing excavated or formed on stable subgrade, to design dimensions and reinforcing steel set, if specified		
Endwall formed to design dimensions with reinforcing steel set as per plan		
Concrete of an approved mix and vibrated into place (protected from freezing, if necessary)		
Forms stripped and structure inspected for "honeycomb" prior to backfilling; parge if necessary		
C. Riprap apron / channel		
Apron / channel excavated to design cross-section with proper transition to existing ground		
Filter fabric in place		
Stone sized as per plan and uniformly place at the thickness specified		
9. Vegetative Stabilization		
Approved seed mixture or sod		
Proper surface preparation and required soil amendments		
Excelsior mat or other stabilization, as per plan		

CONSTRUCTION SEQUENCE	SATISFACTORY/ UNSATISFACTORY	COMMENTS
10. Miscellaneous		
Drain for ponds having a permanent pool		
Trash rack / anti-vortex device secured to outlet structure		
Trash protection for low flow pipes, orifices, etc.		
Fencing (when required)		
Access road		
Set aside for clean-out maintenance		
11. Stormwater Wetlands		
Adequate water balance		
Variety of depth zones present		
Approved pondscaping plan in place Reinforcement budget for additional plantings		
Plants and materials ordered 6 months prior to construction		
Construction planned to allow for adequate planting and establishment of plant community (April-June planting window)		
Wetland buffer area preserved to maximum extent possible		

Comments:

Actions to be Taken:

Infiltration Basin Construction Inspection Checklist

Project:
Location:
Site Status:

Date:

Time:

Inspector:

CONSTRUCTION SEQUENCE	SATISFACTORY/ UNSATISFACTORY	COMMENTS
1. Pre-Construction		
Runoff diverted		
Soil permeability tested		
Groundwater / bedrock depth		
2. Excavation		
Size and location		
Side slopes stable		
Excavation does not compact subsoils		
3. Embankment		
Barrel		
Anti-seep collar or Filter diaphragm		
Fill material		

Construction Sequence	Satisfactory/ Unsatisfactory	Comments
4. Final Excavation		
Drainage area stabilized		
Sediment removed from facility		
Basin floor tilled		
Facility stabilized		
5. Final Inspection		
Pretreatment facility in place		
Inlets / outlets		
Contributing watershed stabilized before flow is routed to the factility		

Comments:

Actions to be Taken:

Sand/Organic Filter System Construction Inspection Checklist

Project:
Location:
Site Status:

Date:

Time:

Inspector:

CONSTRUCTION SEQUENCE	SATISFACTORY / UNSATISFACTORY	COMMENTS
1. Pre-construction		
Pre-construction meeting		
Runoff diverted		
Facility area cleared		
Facility location staked out		
2. Excavation		
Size and location		
Side slopes stable		
Foundation cleared of debris		
If designed as exfilter, excavation does not compact subsoils		
Foundation area compacted		
3. Structural Components		
Dimensions and materials		
Forms adequately sized		
Concrete meets standards		
Prefabricated joints sealed		
Underdrains (size, materials)		

CONSTRUCTION SEQUENCE	SATISFACTORY / UNSATISFACTORY	COMMENTS
4. Completed Facility Components		
24 hour water filled test		
Contributing area stabilized		
Filter material per specification		
Underdrains installed to grade		
Flow diversion structure properly installed		
Pretreatment devices properly installed		
Level overflow weirs, multiple orifices, distribution slots		
5. Final Inspection		
Dimensions		
Surface completely level		
Structural components		
Proper outlet		
Ensure that site is properly stabilized before flow is directed to the structure.		

Comments:

Actions to be Taken:

Attachment B
BMP Maintenance Inspection Checklist

Stormwater Pond/Wetland Operation, Maintenance and Management Inspection Checklist

Project ______________________________
Location: ______________________________
Site Status: ______________________________

Date: ______________________________
Time: ______________________________

Inspector: ______________________________

Maintenance Item	Satisfactory/ Unsatisfactory	Comments
1. Embankment and emergency spillway (Annual, After Major Storms)		
1. Vegetation and ground cover adequate		
2. Embankment erosion		
3. Animal burrows		
4. Unauthorized planting		
5. Cracking, bulging, or sliding of dam		
a. Upstream face		
b. Downstream face		
c. At or beyond toe		
downstream		
upstream		
d. Emergency spillway		
6.Pond, toe & chimney drains clear and functioning		
7.Seeps/leaks on downstream face		
8.Slope protection or riprap failure		
9. Vertical/horizontal alignment of top of dam “As-Built”		

Maintenance Item	Satisfactory/ Unsatisfactory	Comments
10. Emergency spillway clear of obstructions and debris		
11. Other (specify)		
2. Riser and principal spillway (Annual)		
Type: Reinforced concrete ______ Corrugated pipe _______ Masonry _______ 1. Low flow orifice obstructed		
2. Low flow trash rack. a. Debris removal necessary		
b. Corrosion control		
3. Weir trash rack maintenance a. Debris removal necessary		
b. corrosion control		
4. Excessive sediment accumulation insider riser		
5. Concrete/masonry condition riser and barrels a. cracks or displacement		
b. Minor spalling (<1")		
c. Major spalling (rebars exposed)		
d. Joint failures		
e. Water tightness		
6. Metal pipe condition		
7. Control valve a. Operational/exercised		
b. Chained and locked		
8. Pond drain valve a. Operational/exercised		
b. Chained and locked		
9. Outfall channels functioning		
10. Other (specify)		

Maintenance Item	Satisfactory/ Unsatisfactory	Comments
3. Permanent Pool (Wet Ponds) (monthly)		
1. Undesirable vegetative growth		
2. Floating or floatable debris removal required		
3. Visible pollution		
4. Shoreline problem		
5. Other (specify)		
4. Sediment Forebays		
1.Sedimentation noted		
2. Sediment cleanout when depth < 50% design depth		
5. Dry Pond Areas		
1. Vegetation adequate		
2. Undesirable vegetative growth		
3. Undesirable woody vegetation		
4. Low flow channels clear of obstructions		
5. Standing water or wet spots		
6. Sediment and / or trash accumulation		
7. Other (specify)		
6. Condition of Outfalls (Annual , After Major Storms)		
1. Riprap failures		
2. Slope erosion		
3. Storm drain pipes		
4.Endwalls / Headwalls		
5. Other (specify)		
7. Other (Monthly)		
1. Encroachment on pond, wetland or easement area		

Maintenance Item	**Satisfactory/ Unsatisfactory**	**Comments**
2. Complaints from residents		
3.Aesthetics a. Grass growing required		
b. Graffiti removal needed		
c. Other (specify)		
4. Conditions of maintenance access routes.		
5. Signs of hydrocarbon build-up		
6. Any public hazards (specify)		
8. Wetland Vegetation (Annual)		
1. Vegetation healthy and growing Wetland maintaining 50% surface area coverage of wetland plants after the second growing season. (If unsatisfactory, reinforcement plantings needed)		
2. Dominant wetland plants: Survival of desired wetland plant species Distribution according to landscaping plan?		
3. Evidence of invasive species		
4. Maintenance of adequate water depths for desired wetland plant species		
5. Harvesting of emergent plantings needed		
6. Have sediment accumulations reduced pool volume significantly or are plants "choked" with sediment		
7. Eutrophication level of the wetland.		
8. Other (specify)		

Comments:

Actions to be Taken:

Infiltration Basin Operation, Maintenance, and Management Inspection Checklist

Project:
Location:
Site Status:

Date:

Time:

Inspector:

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
1. Debris Cleanout (Monthly)		
Basin surface clear of debris		
Inflow pipes clear of debris		
Overflow spillway clear of debris		
Inlet area clear of debris		
2. Sediment Traps or Forebays (Annual)		
Obviously trapping sediment		
Greater than 50% of storage volume remaining		
3. Dewatering (Monthly)		
Basin dewaters between storms		
4. Sediment Cleanout of Basin (Annual)		
No evidence of sedimentation in basin		
Sediment accumulation doesn't yet require cleanout		
5. Inlets (Annual)		

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
Good condition		
No evidence of erosion		
6. Outlet/Overflow Spillway (Annual)		
Good condition, no need for repair		
No evidence of erosion		
7. Aggregate Repairs (Annual)		
Surface of aggregate clean		
Top layer of stone does not need replacement		
Basin does not need rehabilitation		

Comments:

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Actions to be Taken:

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Sand/Organic Filter Operation, Maintenance and Management Inspection Checklist

Project:
Location:
Site Status:

Date:

Time:

Inspector:

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
1. Debris Cleanout (Monthly)		
Contributing areas clean of debris		
Filtration facility clean of debris		
Inlet and outlets clear of debris		
2. Oil and Grease (Monthly)		
No evidence of filter surface clogging		
Activities in drainage area minimize oil and grease entry		
3. Vegetation (Monthly)		
Contributing drainage area stabilized		
No evidence of erosion		
Area mowed and clipping removed		
4. Water Retention Where Required (Monthly)		
Water holding chambers at normal pool		
No evidence of leakage		
5. Sediment Deposition (Annual)		

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
Filter chamber free of sediments		
Sedimentation chamber not more than half full of sediments		
6. Structural Components (Annual)		
No evidence of structural deterioration		
Any grates are in good condition		
No evidence of spalling or cracking of structural parts		
7. Outlet/Overflow Spillway (Annual)		
Good condition, no need for repairs		
No evidence of erosion (if draining into a natural channel)		
8. Overall Function of Facility (Annual)		
Evidence of flow bypassing facility		
No noticeable odors outside of facility		

Comments:

Actions to be Taken:

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Attachment C
Site Plan (See attached CD)

Attachment D
Soils Information (See attached CD)

United States Department of Agriculture

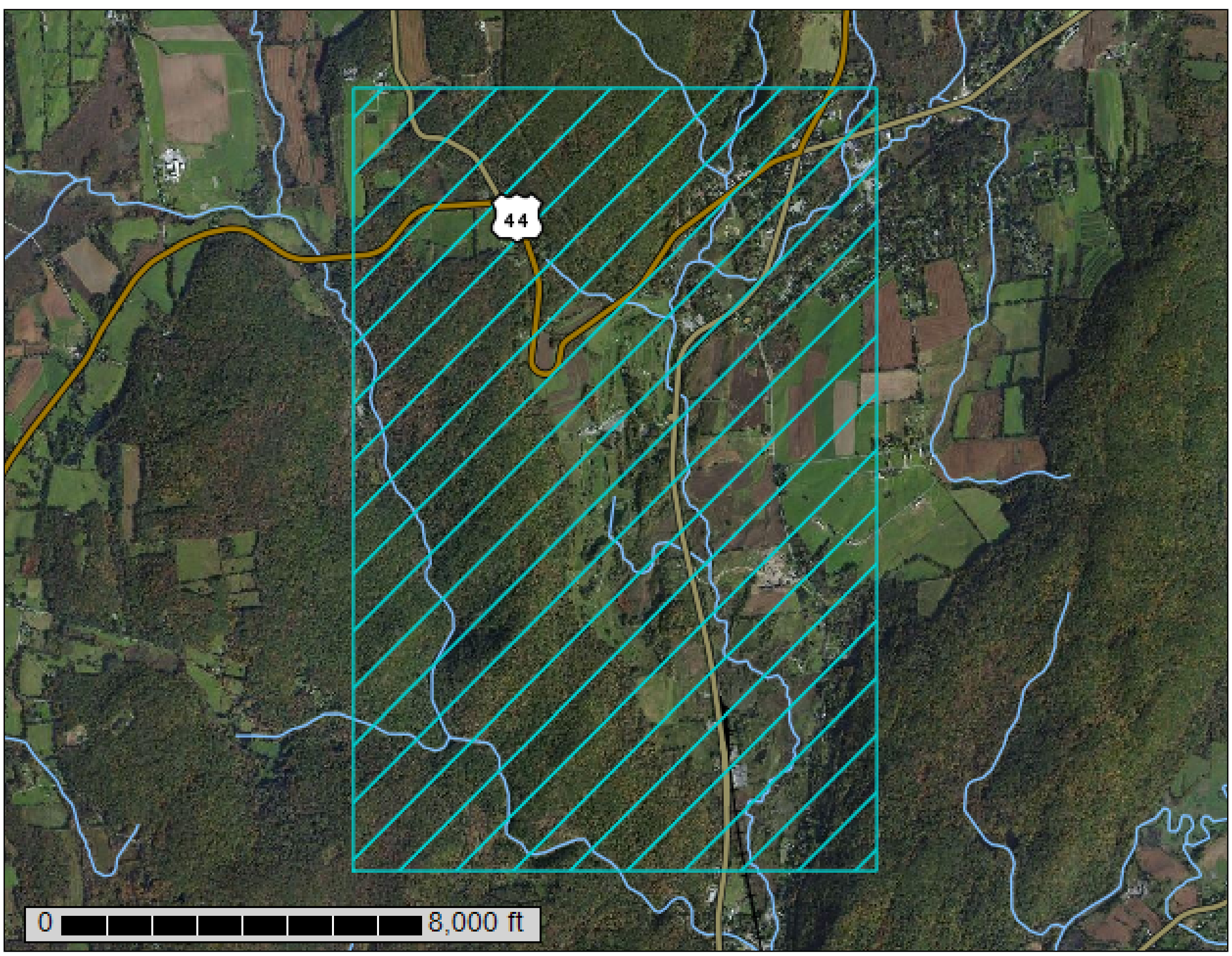
NRCS

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

Dutchess County, New York



September 3, 2013

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://soils.usda.gov/sqi/) 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://soils.usda.gov/contact/state_offices/).

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 Soil Data Mart Web site or the NRCS Web Soil Survey. The Soil Data Mart is the data storage site for the 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.

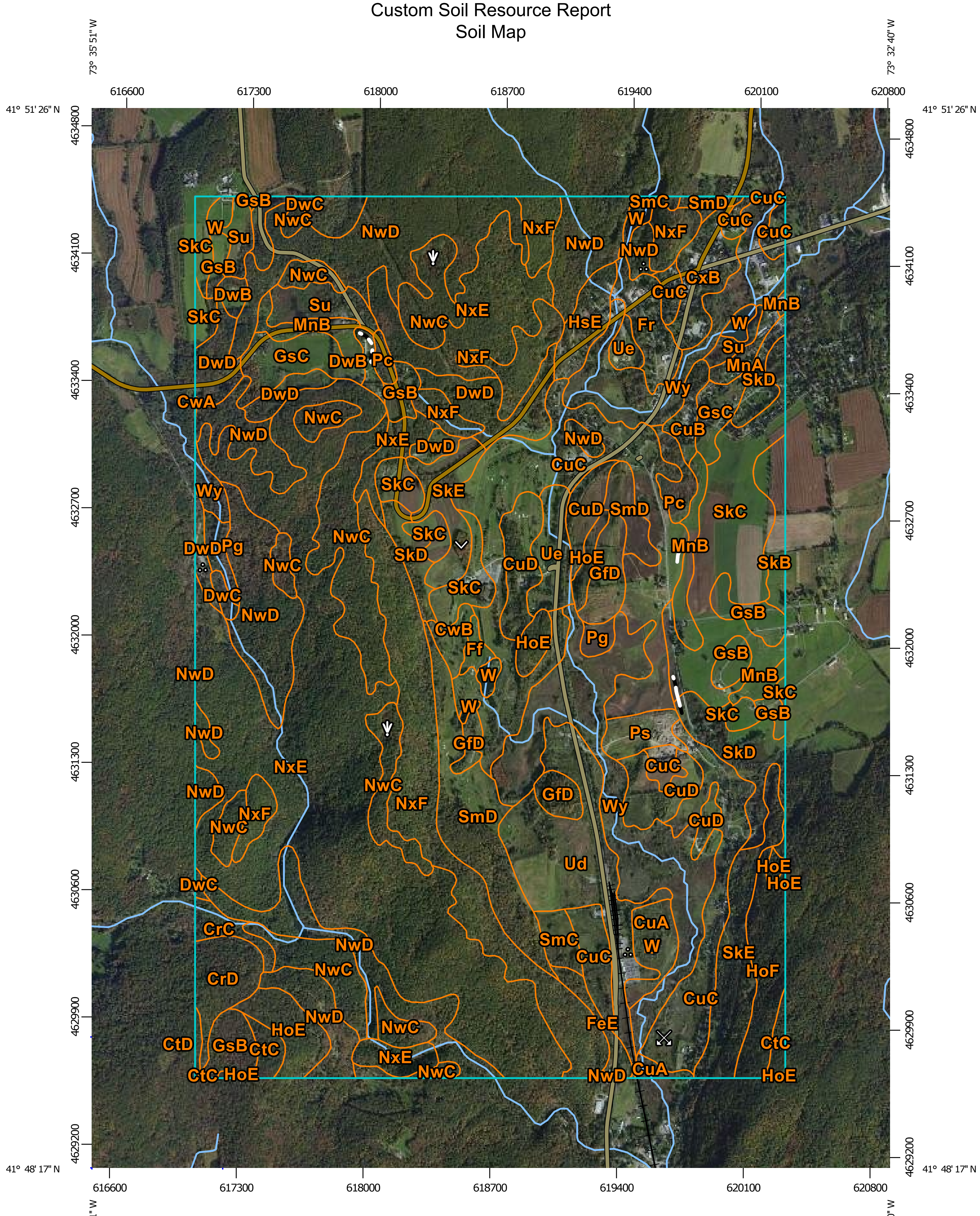
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree 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: 1:28,400 if printed on A portrait (8.5" x 11") sheet.

Meters: 0, 400, 800, 1600, 2400

Feet: 0, 1000, 2000, 4000, 6000

N

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 1:24,000.

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: Dutchess County, New York
Survey Area Data: Version 9, Sep 21, 2012

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

Date(s) aerial images were photographed: Mar 28, 2011—Oct 9, 2011

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

Dutchess County, New York (NY027)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
CrC	Charlton-Chatfield complex, rolling, rocky	14.4	0.4%
CrD	Charlton-Chatfield complex, hilly, rocky	37.0	0.9%
CtC	Chatfield-Hollis complex, rolling, very rocky	18.4	0.5%
CtD	Chatfield-Hollis complex, hilly, very rocky	2.8	0.1%
CuA	Copake gravelly silt loam, nearly level	30.1	0.8%
CuB	Copake gravelly silt loam, undulating	14.8	0.4%
CuC	Copake gravelly silt loam, rolling	363.4	9.3%
CuD	Copake gravelly silt loam, hilly	87.5	2.2%
CwA	Copake channery silt loam, fan, 0 to 3 percent slopes	0.4	0.0%
CwB	Copake channery silt loam, fan, 3 to 8 percent slopes	11.9	0.3%
CxB	Copake-Urban land complex, undulating	39.3	1.0%
DwB	Dutchess-Cardigan complex, undulating, rocky	14.6	0.4%
DwC	Dutchess-Cardigan complex, rolling, rocky	32.2	0.8%
DwD	Dutchess-Cardigan complex, hilly, rocky	94.6	2.4%
FeE	Farmington-Rock outcrop complex, steep	13.4	0.3%
Ff	Fluvaquents-Udifluvents complex, frequently flooded	7.2	0.2%
Fr	Fredon silt loam	33.2	0.8%
GfD	Galway-Farmington complex, hilly	45.8	1.2%
GsB	Georgia silt loam, 3 to 8 percent slopes	78.0	2.0%
GsC	Georgia silt loam, 8 to 15 percent slopes	57.2	1.5%
HoE	Hollis-Chatfield-Rock outcrop complex, steep	57.4	1.5%
HoF	Hollis-Chatfield-Rock outcrop complex, very steep	49.7	1.3%
HsE	Hoosic gravelly loam, 25 to 45 percent slopes	27.4	0.7%

Dutchess County, New York (NY027)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
MnA	Massena silt loam, 0 to 3 percent slopes	12.2	0.3%
MnB	Massena silt loam, 3 to 8 percent slopes	46.1	1.2%
NwC	Nassau-Cardigan complex, rolling, very rocky	237.2	6.1%
NwD	Nassau-Cardigan complex, hilly, very rocky	410.3	10.5%
NxE	Nassau-Rock outcrop complex, steep	697.8	17.8%
NxF	Nassau-Rock outcrop complex, very steep	258.3	6.6%
Pc	Palms muck	21.4	0.5%
Pg	Pawling silt loam	19.1	0.5%
Ps	Pits, gravel	21.2	0.5%
SkB	Stockbridge silt loam, 3 to 8 percent slopes	35.7	0.9%
SkC	Stockbridge silt loam, 8 to 15 percent slopes	202.5	5.2%
SkD	Stockbridge silt loam, 15 to 25 percent slopes	82.4	2.1%
SkE	Stockbridge silt loam, 25 to 45 percent slopes	103.8	2.6%
SmC	Stockbridge-Farmington complex, rolling, rocky	16.0	0.4%
SmD	Stockbridge-Farmington complex, hilly, rocky	113.5	2.9%
Su	Sun silt loam	46.2	1.2%
Ud	Udorthents, smoothed	126.9	3.2%
Ue	Udorthents, wet substratum	39.5	1.0%
W	Water	19.9	0.5%
Wy	Wayland silt loam	277.4	7.1%
Totals for Area of Interest		**3,918.4**	**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.

Dutchess County, New York

CrC—Charlton-Chatfield complex, rolling, rocky

Map Unit Setting

Elevation: 100 to 1,000 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Charlton and similar soils: 50 percent
Chatfield and similar soils: 30 percent
Minor components: 20 percent

Description of Charlton

Setting

Landform: Hills, ridges, till plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Acid loamy till derived mainly from schist, gneiss, or granite

Properties and qualities

Slope: 5 to 16 percent
Depth to restrictive feature: More than 80 inches
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.6 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability (nonirrigated): 3e
Hydrologic Soil Group: B

Typical profile

0 to 8 inches: Loam
8 to 30 inches: Gravelly loam
30 to 72 inches: Gravelly loam

Description of Chatfield

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till derived mainly from granite, gneiss, or schist

Properties and qualities

Slope: 5 to 16 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water capacity: Low (about 4.0 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability (nonirrigated): 3e
Hydrologic Soil Group: B

Typical profile

0 to 9 inches: Fine sandy loam
9 to 30 inches: Loam
30 to 34 inches: Unweathered bedrock

Minor Components

Hollis

Percent of map unit: 9 percent

Georgia

Percent of map unit: 5 percent

Massena

Percent of map unit: 4 percent

Rock outcrop

Percent of map unit: 1 percent

Sun

Percent of map unit: 1 percent
Landform: Depressions

CrD—Charlton-Chatfield complex, hilly, rocky

Map Unit Setting

Elevation: 100 to 1,000 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Chatfield and similar soils: 40 percent
Charlton and similar soils: 40 percent

Minor components: 20 percent

Description of Charlton

Setting

Landform: Hills, ridges, till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Acid loamy till derived mainly from schist, gneiss, or granite

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: More than 80 inches
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 7.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e
Hydrologic Soil Group: B

Typical profile

0 to 8 inches: Loam
8 to 30 inches: Gravelly loam
30 to 72 inches: Gravelly loam

Description of Chatfield

Setting

Landform: Hills, ridges
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 granite, gneiss, or schist

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water capacity: Low (about 4.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e

Hydrologic Soil Group: B

Typical profile

0 to 9 inches: Fine sandy loam
9 to 30 inches: Loam
30 to 34 inches: Unweathered bedrock

Minor Components

Sun

Percent of map unit: 10 percent
Landform: Depressions

Hollis

Percent of map unit: 9 percent

Rock outcrop

Percent of map unit: 1 percent

CtC—Chatfield-Hollis complex, rolling, very rocky

Map Unit Setting

Elevation: 100 to 1,000 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Hollis and similar soils: 40 percent
Chatfield and similar soils: 40 percent
Minor components: 20 percent

Description of Chatfield

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till derived mainly from granite, gneiss, or schist

Properties and qualities

Slope: 5 to 16 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Calcium carbonate, maximum content: 1 percent
Available water capacity: Low (about 4.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 6s
Hydrologic Soil Group: B

Typical profile

0 to 9 inches: Fine sandy loam
9 to 30 inches: Loam
30 to 34 inches: Unweathered bedrock

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

Properties and qualities

Slope: 5 to 16 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.9 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 6s
Hydrologic Soil Group: D

Typical profile

0 to 3 inches: Loam
3 to 15 inches: Loam
15 to 19 inches: Unweathered bedrock

Minor Components

Charlton

Percent of map unit: 10 percent

Rock outcrop

Percent of map unit: 5 percent

Georgia

Percent of map unit: 3 percent

Sun

Percent of map unit: 1 percent
Landform: Depressions

Massena

Percent of map unit: 1 percent

CtD—Chatfield-Hollis complex, hilly, very rocky

Map Unit Setting

Elevation: 100 to 1,000 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Hollis and similar soils: 40 percent
Chatfield and similar soils: 40 percent
Minor components: 20 percent

Description of Chatfield

Setting

Landform: Hills, ridges
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 granite, gneiss, or schist

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water capacity: Low (about 4.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s
Hydrologic Soil Group: B

Typical profile

0 to 9 inches: Fine sandy loam
9 to 30 inches: Loam
30 to 34 inches: Unweathered bedrock

Description of Hollis

Setting

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

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.9 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s
Hydrologic Soil Group: D

Typical profile

0 to 3 inches: Loam
3 to 15 inches: Loam
15 to 19 inches: Unweathered bedrock

Minor Components

Charlton

Percent of map unit: 10 percent

Rock outcrop

Percent of map unit: 5 percent

Sun

Percent of map unit: 5 percent
Landform: Depressions

CuA—Copake gravelly silt loam, nearly level

Map Unit Setting

Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Copake and similar soils: 80 percent
Minor components: 20 percent

Description of Copake

Setting

Landform: Deltas, outwash plains, terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy over calcareous sandy and gravelly glaciofluvial deposits

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Moderate (about 6.3 inches)

Interpretive groups

Farmland classification: All areas are prime farmland
Land capability (nonirrigated): 1
Hydrologic Soil Group: A

Typical profile

0 to 6 inches: Gravelly silt loam
6 to 36 inches: Gravelly loam
36 to 80 inches: Stratified very gravelly coarse sand to gravelly loamy fine sand

Minor Components

Hoosic

Percent of map unit: 10 percent

Halsey

Percent of map unit: 5 percent
Landform: Depressions

Fredon

Percent of map unit: 5 percent
Landform: Depressions

CuB—Copake gravelly silt loam, undulating

Map Unit Setting

Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Copake and similar soils: 80 percent
Minor components: 20 percent

Description of Copake

Setting

Landform: Deltas, outwash plains, terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy over calcareous sandy and gravelly glaciofluvial deposits

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Moderate (about 6.3 inches)

Interpretive groups

Farmland classification: All areas are prime farmland
Land capability (nonirrigated): 2e
Hydrologic Soil Group: A

Typical profile

0 to 6 inches: Gravelly silt loam
6 to 36 inches: Gravelly loam
36 to 80 inches: Stratified very gravelly coarse sand to gravelly loamy fine sand

Minor Components

Hoosic

Percent of map unit: 10 percent

Fredon

Percent of map unit: 5 percent
Landform: Depressions

Halsey

Percent of map unit: 5 percent
Landform: Depressions

CuC—Copake gravelly silt loam, rolling

Map Unit Setting

Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

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

Description of Copake

Setting

Landform: Deltas, outwash plains, terraces
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy over calcareous sandy and gravelly glaciofluvial deposits

Properties and qualities

Slope: 5 to 16 percent
Depth to restrictive feature: More than 80 inches
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Moderate (about 6.3 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability (nonirrigated): 3e
Hydrologic Soil Group: A

Typical profile

0 to 6 inches: Gravelly silt loam
6 to 36 inches: Gravelly loam
36 to 80 inches: Stratified very gravelly coarse sand to gravelly loamy fine sand

Minor Components

Hoosic

Percent of map unit: 10 percent

Fredon

Percent of map unit: 3 percent
Landform: Depressions

Halsey

Percent of map unit: 2 percent
Landform: Depressions

CuD—Copake gravelly silt loam, hilly

Map Unit Setting

Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

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

Description of Copake

Setting

Landform: Deltas, outwash plains, terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy over calcareous sandy and gravelly glaciofluvial deposits

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: More than 80 inches
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Moderate (about 6.3 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e
Hydrologic Soil Group: A

Typical profile

0 to 6 inches: Gravelly silt loam
6 to 36 inches: Gravelly loam
36 to 80 inches: Stratified very gravelly coarse sand to gravelly loamy fine sand

Minor Components

Hoosic

Percent of map unit: 10 percent

Fredon

Percent of map unit: 5 percent
Landform: Depressions

CwA—Copake channery silt loam, fan, 0 to 3 percent slopes

Map Unit Setting

Elevation: 300 to 850 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Copake and similar soils: 80 percent
Minor components: 20 percent

Description of Copake

Setting

Landform: Deltas, outwash plains, terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy over calcareous sandy and gravelly glaciofluvial deposits

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
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: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Moderate (about 6.3 inches)

Interpretive groups

Farmland classification: All areas are prime farmland
Land capability (nonirrigated): 1
Hydrologic Soil Group: A

Typical profile

0 to 6 inches: Channery silt loam
6 to 36 inches: Channery loam

36 to 80 inches: Stratified very gravelly coarse sand to gravelly loamy fine sand

Minor Components

Hoosic

Percent of map unit: 10 percent

Fredon

Percent of map unit: 5 percent
Landform: Depressions

Halsey

Percent of map unit: 5 percent
Landform: Depressions

CwB—Copake channery silt loam, fan, 3 to 8 percent slopes

Map Unit Setting

Elevation: 300 to 850 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Copake and similar soils: 80 percent
Minor components: 20 percent

Description of Copake

Setting

Landform: Deltas, outwash plains, terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy over calcareous sandy and gravelly glaciofluvial deposits

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
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: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Moderate (about 6.3 inches)

Interpretive groups

Farmland classification: All areas are prime farmland
Land capability (nonirrigated): 2e

Hydrologic Soil Group: A

Typical profile

0 to 6 inches: Channery silt loam
6 to 36 inches: Channery loam
36 to 80 inches: Stratified very gravelly coarse sand to gravelly loamy fine sand

Minor Components

Hoosic

Percent of map unit: 10 percent

Fredon

Percent of map unit: 5 percent
Landform: Depressions

Halsey

Percent of map unit: 5 percent
Landform: Depressions

CxB—Copake-Urban land complex, undulating

Map Unit Setting

Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Copake and similar soils: 40 percent
Urban land: 35 percent
Minor components: 25 percent

Description of Copake

Setting

Landform: Deltas, outwash plains, terraces
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy over calcareous sandy and gravelly glaciofluvial deposits

Properties and qualities

Slope: 1 to 6 percent
Depth to restrictive feature: More than 80 inches
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent

Available water capacity: Moderate (about 6.3 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 2e
Hydrologic Soil Group: A

Typical profile

0 to 6 inches: Gravelly silt loam
6 to 36 inches: Gravelly loam
36 to 80 inches: Stratified very gravelly coarse sand to gravelly loamy fine sand

Description of Urban Land

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 8s

Typical profile

0 to 6 inches: Variable

Minor Components

Udorthents

Percent of map unit: 10 percent

Fredon

Percent of map unit: 5 percent
Landform: Depressions

Hoosic

Percent of map unit: 5 percent

Halsey

Percent of map unit: 5 percent
Landform: Depressions

DwB—Dutchess-Cardigan complex, undulating, rocky

Map Unit Setting

Elevation: 50 to 1,000 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Dutchess and similar soils: 40 percent
Cardigan and similar soils: 30 percent
Minor components: 30 percent

Description of Dutchess

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till derived mainly from phyllite, slate, schist, and shale

Properties and qualities

Slope: 1 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 9.6 inches)

Interpretive groups

Farmland classification: All areas are prime farmland
Land capability (nonirrigated): 2e
Hydrologic Soil Group: B

Typical profile

0 to 8 inches: Silt loam
8 to 28 inches: Silt loam
28 to 86 inches: Channery silt loam

Description of Cardigan

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till or colluvium derived from phyllite, slate, shale, and schist

Properties and qualities

Slope: 1 to 6 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.1 inches)

Interpretive groups

Farmland classification: All areas are prime farmland
Land capability (nonirrigated): 2e
Hydrologic Soil Group: C

Typical profile

0 to 8 inches: Channery silt loam
8 to 20 inches: Channery loam
20 to 30 inches: Channery silt loam
30 to 34 inches: Unweathered bedrock

Minor Components

Georgia

Percent of map unit: 10 percent

Massena

Percent of map unit: 9 percent

Nassau

Percent of map unit: 9 percent

Rock outcrop

Percent of map unit: 1 percent

Sun

Percent of map unit: 1 percent
Landform: Depressions

DwC—Dutchess-Cardigan complex, rolling, rocky

Map Unit Setting

Elevation: 50 to 1,000 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Dutchess and similar soils: 40 percent
Cardigan and similar soils: 30 percent
Minor components: 30 percent

Description of Dutchess

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till derived mainly from phyllite, slate, schist, and shale

Properties and qualities

Slope: 5 to 16 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 9.6 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability (nonirrigated): 3e
Hydrologic Soil Group: B

Typical profile

0 to 8 inches: Silt loam
8 to 28 inches: Silt loam
28 to 86 inches: Channery silt loam

Description of Cardigan

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till or colluvium derived from phyllite, slate, shale, and schist

Properties and qualities

Slope: 5 to 16 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.1 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability (nonirrigated): 3e
Hydrologic Soil Group: C

Typical profile

0 to 8 inches: Channery silt loam
8 to 20 inches: Channery loam
20 to 30 inches: Channery silt loam
30 to 34 inches: Unweathered bedrock

Minor Components

Georgia

Percent of map unit: 10 percent

Massena

Percent of map unit: 9 percent

Nassau

Percent of map unit: 9 percent

Rock outcrop

Percent of map unit: 1 percent

Sun

Percent of map unit: 1 percent
Landform: Depressions

DwD—Dutchess-Cardigan complex, hilly, rocky

Map Unit Setting

Elevation: 50 to 1,000 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Dutchess and similar soils: 40 percent
Cardigan and similar soils: 30 percent
Minor components: 30 percent

Description of Dutchess

Setting

Landform: Hills, ridges
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 phyllite, slate, schist, and shale

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: High (about 9.6 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e
Hydrologic Soil Group: B

Typical profile

0 to 8 inches: Silt loam
8 to 28 inches: Silt loam
28 to 86 inches: Channery silt loam

Description of Cardigan

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till or colluvium derived from phyllite, slate, shale, and schist

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e
Hydrologic Soil Group: C

Typical profile

0 to 8 inches: Channery silt loam
8 to 20 inches: Channery loam
20 to 30 inches: Channery silt loam
30 to 34 inches: Unweathered bedrock

Minor Components

Sun

Percent of map unit: 10 percent
Landform: Depressions

Nassau

Percent of map unit: 9 percent

Georgia

Percent of map unit: 5 percent

Massena

Percent of map unit: 5 percent

Rock outcrop

Percent of map unit: 1 percent

FeE—Farmington-Rock outcrop complex, steep

Map Unit Setting

Elevation: 100 to 900 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Farmington and similar soils: 60 percent
Rock outcrop: 20 percent
Minor components: 20 percent

Description of Farmington

Setting

Landform: Benches, ridges, 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 or congeliturbate derived from limestone, dolomite, shale, and sandstone, and in many places mixed with wind and water deposits

Properties and qualities

Slope: 25 to 45 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively 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
Calcium carbonate, maximum content: 5 percent
Available water capacity: Very low (about 2.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s
Hydrologic Soil Group: D

Typical profile

0 to 7 inches: Loam
7 to 15 inches: Very fine sandy loam
15 to 19 inches: Unweathered bedrock

Description of Rock Outcrop

Properties and qualities

Slope: 25 to 45 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s

Typical profile

0 to 60 inches: Unweathered bedrock

Minor Components

Galway

Percent of map unit: 10 percent

Stockbridge

Percent of map unit: 9 percent

Sun

Percent of map unit: 1 percent
Landform: Depressions

Ff—Fluvaquents-Udifluvents complex, frequently flooded

Map Unit Setting

Elevation: 100 to 3,000 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Fluvaquents and similar soils: 50 percent
Udifluvents and similar soils: 40 percent
Minor components: 10 percent

Description of Fluvaquents

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Alluvium with highly variable texture

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.06 to 19.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Moderate (about 6.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 5w
Hydrologic Soil Group: A/D

Typical profile

0 to 5 inches: Gravelly silt loam
5 to 70 inches: Very gravelly silt loam

Description of Udifluvents

Setting

Landform: Flood plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Alluvium with a wide range of texture

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to very high (0.06 to 19.98 in/hr)
Depth to water table: About 24 to 72 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Low (about 5.9 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 5w
Hydrologic Soil Group: A

Typical profile

0 to 4 inches: Gravelly loam
4 to 70 inches: Very gravelly loam

Minor Components

Linlithgo

Percent of map unit: 2 percent
Landform: Depressions

Wayland

Percent of map unit: 2 percent
Landform: Flood plains

Wappinger

Percent of map unit: 1 percent
Landform: Depressions

Pawling

Percent of map unit: 1 percent
Landform: Depressions

Carlisle

Percent of map unit: 1 percent
Landform: Swamps, marshes

Palms

Percent of map unit: 1 percent
Landform: Marshes, swamps

Hoosic, fan

Percent of map unit: 1 percent

Copake, fan

Percent of map unit: 1 percent

Fr—Fredon silt loam

Map Unit Setting

Elevation: 250 to 1,200 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

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

Description of Fredon

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loamy over sandy and gravelly glaciofluvial deposits

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches

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: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Moderate (about 6.1 inches)

Interpretive groups
Farmland classification: Prime farmland if drained
Land capability (nonirrigated): 3w
Hydrologic Soil Group: B/D

Typical profile
0 to 9 inches: Silt loam
9 to 31 inches: Very fine sandy loam
31 to 70 inches: Stratified very gravelly sand to loamy fine sand

Minor Components

Fredon, poorly drained
Percent of map unit: 5 percent
Landform: Depressions

Unnamed soils, glacial outwash
Percent of map unit: 5 percent

Halsey
Percent of map unit: 5 percent
Landform: Depressions

GfD—Galway-Farmington complex, hilly

Map Unit Setting
Elevation: 100 to 1,000 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition
Galway and similar soils: 40 percent
Farmington and similar soils: 35 percent
Minor components: 25 percent

Description of Galway

Setting
Landform: Benches, ridges, till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex

Across-slope shape: Convex
Parent material: Calcareous loamy till

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
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
Calcium carbonate, maximum content: 25 percent
Available water capacity: Low (about 4.2 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e
Hydrologic Soil Group: C

Typical profile

0 to 6 inches: Gravelly loam
6 to 30 inches: Gravelly loam
30 to 31 inches: Gravelly loam
31 to 35 inches: Unweathered bedrock

Description of Farmington

Setting

Landform: Benches, ridges, 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 or congeliturbate derived from limestone, dolomite, shale, and sandstone, and in many places mixed with wind and water deposits

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively 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
Calcium carbonate, maximum content: 5 percent
Available water capacity: Very low (about 2.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 6e
Hydrologic Soil Group: D

Typical profile

0 to 7 inches: Loam
7 to 15 inches: Very fine sandy loam
15 to 19 inches: Unweathered bedrock

Minor Components

Stockbridge

Percent of map unit: 10 percent

Sun

Percent of map unit: 9 percent
Landform: Depressions

Georgia

Percent of map unit: 5 percent

Rock outcrop

Percent of map unit: 1 percent

GsB—Georgia silt loam, 3 to 8 percent slopes

Map Unit Setting

Elevation: 90 to 1,000 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Georgia and similar soils: 80 percent
Minor components: 20 percent

Description of Georgia

Setting

Landform: Drumlinoid ridges, hills, till plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Loamy till derived mainly from limestone, shale, or slate

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 8.6 inches)

Interpretive groups

Farmland classification: All areas are prime farmland

Land capability (nonirrigated): 2e
Hydrologic Soil Group: C

Typical profile

0 to 8 inches: Silt loam
8 to 27 inches: Loam
27 to 80 inches: Gravelly fine sandy loam

Minor Components

Charlton

Percent of map unit: 5 percent

Massena

Percent of map unit: 5 percent

Stockbridge

Percent of map unit: 5 percent

Dutchess

Percent of map unit: 3 percent

Pittstown

Percent of map unit: 2 percent

GsC—Georgia silt loam, 8 to 15 percent slopes

Map Unit Setting

Elevation: 90 to 1,000 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Georgia and similar soils: 80 percent
Minor components: 20 percent

Description of Georgia

Setting

Landform: Drumlinoid ridges, hills, till plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Loamy till derived mainly from limestone, shale, or slate

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)

Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 8.6 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability (nonirrigated): 3e
Hydrologic Soil Group: C

Typical profile

0 to 8 inches: Silt loam
8 to 27 inches: Loam
27 to 80 inches: Gravelly fine sandy loam

Minor Components

Massena

Percent of map unit: 5 percent

Stockbridge

Percent of map unit: 5 percent

Charlton

Percent of map unit: 3 percent

Dutchess

Percent of map unit: 3 percent

Pittstown

Percent of map unit: 2 percent

Sun

Percent of map unit: 2 percent
Landform: Depressions

HoE—Hollis-Chatfield-Rock outcrop complex, steep

Map Unit Setting

Elevation: 100 to 1,000 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Hollis and similar soils: 40 percent
Chatfield and similar soils: 30 percent
Rock outcrop: 20 percent
Minor components: 10 percent

Description of Hollis

Setting

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

Properties and qualities

Slope: 25 to 45 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.9 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s
Hydrologic Soil Group: D

Typical profile

0 to 3 inches: Loam
3 to 15 inches: Loam
15 to 19 inches: Unweathered bedrock

Description of Chatfield

Setting

Landform: Hills, ridges
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 granite, gneiss, or schist

Properties and qualities

Slope: 25 to 45 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water capacity: Low (about 4.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s

Hydrologic Soil Group: B

Typical profile
0 to 9 inches: Fine sandy loam
9 to 30 inches: Loam
30 to 34 inches: Unweathered bedrock

Description of Rock Outcrop

Properties and qualities
Slope: 25 to 45 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Capacity of the most limiting layer to transmit water (Ksat): Very low to very high (0.00 to 19.98 in/hr)

Interpretive groups
Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s

Typical profile
0 to 60 inches: Unweathered bedrock

Minor Components

Charlton
Percent of map unit: 5 percent

Sun
Percent of map unit: 5 percent
Landform: Depressions

HoF—Hollis-Chatfield-Rock outcrop complex, very steep

Map Unit Setting
Elevation: 100 to 1,000 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition
Hollis and similar soils: 40 percent
Rock outcrop: 25 percent
Chatfield and similar soils: 25 percent
Minor components: 10 percent

Description of Hollis

Setting
Landform: Hills, ridges
Landform position (two-dimensional): Backslope

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

Properties and qualities

Slope: 45 to 60 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.9 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s
Hydrologic Soil Group: D

Typical profile

0 to 3 inches: Loam
3 to 15 inches: Loam
15 to 19 inches: Unweathered bedrock

Description of Chatfield

Setting

Landform: Hills, ridges
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 granite, gneiss, or schist

Properties and qualities

Slope: 45 to 70 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water capacity: Low (about 4.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s
Hydrologic Soil Group: B

Typical profile

0 to 9 inches: Fine sandy loam
9 to 30 inches: Loam
30 to 34 inches: Unweathered bedrock

Description of Rock Outcrop

Properties and qualities

Slope: 45 to 70 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Capacity of the most limiting layer to transmit water (Ksat): Very low to very high (0.00 to 19.98 in/hr)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s

Typical profile

0 to 60 inches: Unweathered bedrock

Minor Components

Charlton

Percent of map unit: 5 percent

Sun

Percent of map unit: 5 percent
Landform: Depressions

HsE—Hoosic gravelly loam, 25 to 45 percent slopes

Map Unit Setting

Elevation: 100 to 1,100 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

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

Description of Hoosic

Setting

Landform: Deltas, outwash plains, terraces
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Riser
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Sandy and gravelly glaciofluvial deposits

Properties and qualities

Slope: 25 to 45 percent
Depth to restrictive feature: More than 80 inches

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 capacity: Low (about 3.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7e
Hydrologic Soil Group: A

Typical profile

0 to 9 inches: Gravelly loam
9 to 24 inches: Very gravelly sandy loam
24 to 70 inches: Extremely gravelly loamy sand

Minor Components

Copake

Percent of map unit: 5 percent

Fredon

Percent of map unit: 5 percent
Landform: Depressions

Knickerbocker

Percent of map unit: 5 percent

MnA—Massena silt loam, 0 to 3 percent slopes

Map Unit Setting

Elevation: 100 to 1,000 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Massena and similar soils: 80 percent
Minor components: 20 percent

Description of Massena

Setting

Landform: Drumlinoid ridges, hills, till plains
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy till dominated by siliceous rocks with varying proportions of limestone

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly 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 12 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water capacity: Moderate (about 7.0 inches)

Interpretive groups

Farmland classification: Prime farmland if drained
Land capability (nonirrigated): 3w
Hydrologic Soil Group: C/D

Typical profile

0 to 7 inches: Silt loam
7 to 33 inches: Loam
33 to 72 inches: Fine sandy loam

Minor Components

Sun

Percent of map unit: 10 percent
Landform: Depressions

Georgia

Percent of map unit: 5 percent

Punsit

Percent of map unit: 5 percent

MnB—Massena silt loam, 3 to 8 percent slopes

Map Unit Setting

Elevation: 100 to 1,000 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Massena and similar soils: 80 percent
Minor components: 20 percent

Description of Massena

Setting

Landform: Drumlinoid ridges, hills, till plains
Landform position (two-dimensional): Footslope, summit

Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy till dominated by siliceous rocks with varying proportions of limestone

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly 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 12 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 10 percent
Available water capacity: Moderate (about 7.0 inches)

Interpretive groups

Farmland classification: Prime farmland if drained
Land capability (nonirrigated): 3w
Hydrologic Soil Group: C/D

Typical profile

0 to 7 inches: Silt loam
7 to 33 inches: Loam
33 to 72 inches: Fine sandy loam

Minor Components

Sun

Percent of map unit: 10 percent
Landform: Depressions

Georgia

Percent of map unit: 5 percent

Punsit

Percent of map unit: 5 percent

NwC—Nassau-Cardigan complex, rolling, very rocky

Map Unit Setting

Elevation: 600 to 1,800 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Cardigan and similar soils: 40 percent
Nassau and similar soils: 40 percent
Minor components: 20 percent

Description of Nassau

Setting

Landform: Benches, ridges, till plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Channery loamy till derived mainly from local slate or shale

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.7 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 6s
Hydrologic Soil Group: D

Typical profile

0 to 5 inches: Channery silt loam
5 to 16 inches: Very channery silt loam
16 to 20 inches: Unweathered bedrock

Description of Cardigan

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till or colluvium derived from phyllite, slate, shale, and schist

Properties and qualities

Slope: 5 to 15 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 6s
Hydrologic Soil Group: C

Typical profile

0 to 8 inches: Channery silt loam
8 to 20 inches: Channery loam
20 to 30 inches: Channery silt loam
30 to 34 inches: Unweathered bedrock

Minor Components

Dutchess

Percent of map unit: 9 percent

Rock outcrop

Percent of map unit: 5 percent

Unnamed soils, very shallow

Percent of map unit: 5 percent

Sun

Percent of map unit: 1 percent
Landform: Depressions

NwD—Nassau-Cardigan complex, hilly, very rocky

Map Unit Setting

Elevation: 600 to 1,800 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Nassau and similar soils: 45 percent
Cardigan and similar soils: 30 percent
Minor components: 25 percent

Description of Nassau

Setting

Landform: Benches, ridges, till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Channery loamy till derived mainly from local slate or shale

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.7 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s
Hydrologic Soil Group: D

Typical profile

0 to 5 inches: Channery silt loam
5 to 16 inches: Very channery silt loam
16 to 20 inches: Unweathered bedrock

Description of Cardigan

Setting

Landform: Hills, ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till or colluvium derived from phyllite, slate, shale, and schist

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Low (about 4.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s
Hydrologic Soil Group: C

Typical profile

0 to 8 inches: Channery silt loam
8 to 20 inches: Channery loam
20 to 30 inches: Channery silt loam
30 to 34 inches: Unweathered bedrock

Minor Components

Dutchess

Percent of map unit: 10 percent

Sun

Percent of map unit: 10 percent
Landform: Depressions

Rock outcrop

Percent of map unit: 5 percent

NxE—Nassau-Rock outcrop complex, steep

Map Unit Setting

Elevation: 600 to 1,800 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Nassau and similar soils: 45 percent
Rock outcrop: 30 percent
Minor components: 25 percent

Description of Nassau

Setting

Landform: Benches, ridges, till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Channery loamy till derived mainly from local slate or shale

Properties and qualities

Slope: 25 to 45 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.7 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s
Hydrologic Soil Group: D

Typical profile

0 to 5 inches: Channery silt loam
5 to 16 inches: Very channery silt loam
16 to 20 inches: Unweathered bedrock

Description of Rock Outcrop

Properties and qualities

Slope: 25 to 45 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s

Typical profile

0 to 60 inches: Unweathered bedrock

Minor Components

Cardigan

Percent of map unit: 10 percent

Dutchess

Percent of map unit: 10 percent

Sun

Percent of map unit: 5 percent
Landform: Depressions

NxF—Nassau-Rock outcrop complex, very steep

Map Unit Setting

Elevation: 600 to 1,800 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Nassau and similar soils: 50 percent
Rock outcrop: 30 percent
Minor components: 20 percent

Description of Nassau

Setting

Landform: Benches, ridges, till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Channery loamy till derived mainly from local slate or shale

Properties and qualities

Slope: 45 to 65 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)

Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Very low (about 1.7 inches)

Interpretive groups
Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s
Hydrologic Soil Group: D

Typical profile
0 to 5 inches: Channery silt loam
5 to 16 inches: Very channery silt loam
16 to 20 inches: Unweathered bedrock

Description of Rock Outcrop

Properties and qualities
Slope: 45 to 70 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)

Interpretive groups
Farmland classification: Not prime farmland
Land capability (nonirrigated): 7s

Typical profile
0 to 60 inches: Unweathered bedrock

Minor Components

Cardigan
Percent of map unit: 10 percent

Sun
Percent of map unit: 10 percent
Landform: Depressions

Pc—Palms muck

Map Unit Setting
Elevation: 250 to 1,500 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition
Palms and similar soils: 80 percent
Minor components: 20 percent

Description of Palms

Setting

Landform: Swamps, marshes
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Organic material over loamy glacial drift

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very 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 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 20 percent
Available water capacity: Very high (about 17.4 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 5w
Hydrologic Soil Group: B/D

Typical profile

0 to 12 inches: Muck
12 to 30 inches: Muck
30 to 80 inches: Gravelly fine sandy loam

Minor Components

Carlisle

Percent of map unit: 10 percent
Landform: Swamps, marshes

Sun

Percent of map unit: 5 percent
Landform: Depressions

Fluvaquents

Percent of map unit: 3 percent
Landform: Flood plains

Udifluvents

Percent of map unit: 2 percent
Landform: Marshes

Pg—Pawling silt loam

Map Unit Setting

Elevation: 50 to 500 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Pawling and similar soils: 80 percent
Minor components: 20 percent

Description of Pawling

Setting

Landform: Flood plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Talf
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Loamy over sandy and gravelly alluvium

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: OccasionalNone
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Available water capacity: Moderate (about 6.6 inches)

Interpretive groups

Farmland classification: All areas are prime farmland
Land capability (nonirrigated): 5w
Hydrologic Soil Group: B/D

Typical profile

0 to 8 inches: Silt loam
8 to 33 inches: Silt loam
33 to 72 inches: Very gravelly sand

Minor Components

Linlithgo

Percent of map unit: 10 percent

Wayland

Percent of map unit: 5 percent

Landform: Flood plains

Wappinger
Percent of map unit: 5 percent

Ps—Pits, gravel

Map Unit Setting
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition
Pits, gravel: 70 percent
Minor components: 30 percent

Description of Pits, Gravel

Interpretive groups
Farmland classification: Not prime farmland
Land capability (nonirrigated): 8s

Typical profile
0 to 6 inches: Very gravelly sand
6 to 60 inches: Very gravelly coarse sand

Minor Components

Udorthents
Percent of map unit: 10 percent

Copake
Percent of map unit: 5 percent

Fredon
Percent of map unit: 5 percent
Landform: Depressions

Halsey
Percent of map unit: 5 percent
Landform: Depressions

Hoosic
Percent of map unit: 5 percent

SkB—Stockbridge silt loam, 3 to 8 percent slopes

Map Unit Setting

Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Stockbridge and similar soils: 80 percent
Minor components: 20 percent

Description of Stockbridge

Setting

Landform: Drumlinoid ridges, hills, till plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Calcareous loamy till

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Moderate (about 8.4 inches)

Interpretive groups

Farmland classification: All areas are prime farmland
Land capability (nonirrigated): 2e
Hydrologic Soil Group: C

Typical profile

0 to 6 inches: Silt loam
6 to 23 inches: Silt loam
23 to 80 inches: Silt loam

Minor Components

Georgia

Percent of map unit: 5 percent

Galway

Percent of map unit: 4 percent

Massena

Percent of map unit: 4 percent

Charlton

Percent of map unit: 3 percent

Bernardston

Percent of map unit: 2 percent

Farmington

Percent of map unit: 1 percent

Sun

Percent of map unit: 1 percent
Landform: Depressions

SkC—Stockbridge silt loam, 8 to 15 percent slopes

Map Unit Setting

Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Stockbridge and similar soils: 80 percent
Minor components: 20 percent

Description of Stockbridge

Setting

Landform: Drumlinoid ridges, hills, till plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Calcareous loamy till

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Moderate (about 8.4 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability (nonirrigated): 3e

Hydrologic Soil Group: C

Typical profile

0 to 6 inches: Silt loam
6 to 23 inches: Silt loam
23 to 80 inches: Silt loam

Minor Components

Georgia

Percent of map unit: 5 percent

Galway

Percent of map unit: 4 percent

Massena

Percent of map unit: 4 percent

Charlton

Percent of map unit: 3 percent

Bernardston

Percent of map unit: 2 percent

Farmington

Percent of map unit: 1 percent

Sun

Percent of map unit: 1 percent
Landform: Depressions

SkD—Stockbridge silt loam, 15 to 25 percent slopes

Map Unit Setting

Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Stockbridge and similar soils: 80 percent
Minor components: 20 percent

Description of Stockbridge

Setting

Landform: Drumlinoid ridges, hills, till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Calcareous loamy till

Properties and qualities

Slope: 15 to 25 percent

Depth to restrictive feature: More than 80 inches
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Moderate (about 8.4 inches)

Interpretive groups
Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e
Hydrologic Soil Group: C

Typical profile
0 to 6 inches: Silt loam
6 to 23 inches: Silt loam
23 to 80 inches: Silt loam

Minor Components

Bernardston
Percent of map unit: 5 percent

Charlton
Percent of map unit: 5 percent

Galway
Percent of map unit: 4 percent

Georgia
Percent of map unit: 4 percent

Farmington
Percent of map unit: 1 percent

Sun
Percent of map unit: 1 percent
Landform: Depressions

SkE—Stockbridge silt loam, 25 to 45 percent slopes

Map Unit Setting
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition
Stockbridge and similar soils: 85 percent
Minor components: 15 percent

Description of Stockbridge

Setting

Landform: Drumlinoid ridges, hills, till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Calcareous loamy till

Properties and qualities

Slope: 25 to 45 percent
Depth to restrictive feature: More than 80 inches
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Moderate (about 8.4 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 7e
Hydrologic Soil Group: C

Typical profile

0 to 6 inches: Silt loam
6 to 23 inches: Silt loam
23 to 80 inches: Silt loam

Minor Components

Charlton

Percent of map unit: 5 percent

Bernardston

Percent of map unit: 4 percent

Galway

Percent of map unit: 4 percent

Farmington

Percent of map unit: 1 percent

Sun

Percent of map unit: 1 percent
Landform: Depressions

SmC—Stockbridge-Farmington complex, rolling, rocky

Map Unit Setting

Elevation: 100 to 900 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Stockbridge and similar soils: 50 percent
Farmington and similar soils: 30 percent
Minor components: 20 percent

Description of Stockbridge

Setting

Landform: Drumlinoid ridges, hills, till plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Calcareous loamy till

Properties and qualities

Slope: 5 to 16 percent
Depth to restrictive feature: More than 80 inches
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Moderate (about 8.4 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability (nonirrigated): 3e
Hydrologic Soil Group: C

Typical profile

0 to 6 inches: Silt loam
6 to 23 inches: Silt loam
23 to 80 inches: Silt loam

Description of Farmington

Setting

Landform: Benches, ridges, till plains
Landform position (two-dimensional): Shoulder

Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy till or congeliturbate derived from limestone, dolomite, shale, and sandstone, and in many places mixed with wind and water deposits

Properties and qualities
Slope: 5 to 16 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively 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
Calcium carbonate, maximum content: 5 percent
Available water capacity: Very low (about 2.1 inches)

Interpretive groups
Farmland classification: Farmland of statewide importance
Land capability (nonirrigated): 6s
Hydrologic Soil Group: D

Typical profile
0 to 7 inches: Loam
7 to 15 inches: Very fine sandy loam
15 to 19 inches: Unweathered bedrock

Minor Components

Galway
Percent of map unit: 10 percent

Georgia
Percent of map unit: 5 percent

Massena
Percent of map unit: 3 percent

Rock outcrop
Percent of map unit: 1 percent

Sun
Percent of map unit: 1 percent
Landform: Depressions

SmD—Stockbridge-Farmington complex, hilly, rocky

Map Unit Setting
Elevation: 100 to 900 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F

Frost-free period: 115 to 195 days

Map Unit Composition

Stockbridge and similar soils: 50 percent
Farmington and similar soils: 30 percent
Minor components: 20 percent

Description of Stockbridge

Setting

Landform: Drumlinoid ridges, hills, till plains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Calcareous loamy till

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: More than 80 inches
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: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Moderate (about 8.4 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 4e
Hydrologic Soil Group: C

Typical profile

0 to 6 inches: Silt loam
6 to 23 inches: Silt loam
23 to 80 inches: Silt loam

Description of Farmington

Setting

Landform: Benches, ridges, 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 or congeliturbate derived from limestone, dolomite, shale, and sandstone, and in many places mixed with wind and water deposits

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Drainage class: Somewhat excessively 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
Calcium carbonate, maximum content: 5 percent
Available water capacity: Very low (about 2.1 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 6s
Hydrologic Soil Group: D

Typical profile

0 to 7 inches: Loam
7 to 15 inches: Very fine sandy loam
15 to 19 inches: Unweathered bedrock

Minor Components

Galway

Percent of map unit: 10 percent

Sun

Percent of map unit: 9 percent
Landform: Depressions

Rock outcrop

Percent of map unit: 1 percent

Su—Sun silt loam

Map Unit Setting

Elevation: 600 to 1,800 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Sun and similar soils: 80 percent
Minor components: 20 percent

Description of Sun

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loamy till derived primarily from limestone and sandstone, with a component of schist, shale, or granitic rocks in some areas

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Moderate (about 6.2 inches)

Interpretive groups

Farmland classification: Farmland of statewide importance
Land capability (nonirrigated): 4w
Hydrologic Soil Group: C/D

Typical profile

0 to 4 inches: Silt loam
4 to 22 inches: Loam
22 to 80 inches: Gravelly loam

Minor Components

Canandaigua

Percent of map unit: 5 percent
Landform: Depressions

Massena

Percent of map unit: 5 percent

Palms

Percent of map unit: 5 percent
Landform: Marshes, swamps

Sun, stony

Percent of map unit: 5 percent
Landform: Depressions

Ud—Udorthents, smoothed

Map Unit Setting

Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Udorthents, smoothed, and similar soils: 75 percent
Minor components: 25 percent

Description of Udorthents, Smoothed

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well 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 content: 15 percent
Available water capacity: Low (about 5.5 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 6s
Hydrologic Soil Group: A

Typical profile

0 to 4 inches: Gravelly loam
4 to 70 inches: Very gravelly loam

Minor Components

Urban land

Percent of map unit: 10 percent

Udorthents, wet substratum

Percent of map unit: 10 percent

Unnamed soils, undisturbed

Percent of map unit: 4 percent

Rock outcrop

Percent of map unit: 1 percent

Ue—Udorthents, wet substratum

Map Unit Setting

Elevation: 50 to 2,400 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Udorthents, wet substratum, and similar soils: 80 percent
Minor components: 20 percent

Description of Udorthents, Wet Substratum

Properties and qualities

Slope: 0 to 5 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly 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 12 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 15 percent
Available water capacity: Low (about 5.5 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 5w
Hydrologic Soil Group: B

Typical profile

0 to 4 inches: Gravelly loam
4 to 72 inches: Very gravelly loam

Minor Components

Udorthents, smoothed

Percent of map unit: 10 percent

Urban land

Percent of map unit: 5 percent

Unnamed soils, undisturbed

Percent of map unit: 4 percent

Rock outcrop

Percent of map unit: 1 percent

W—Water

Map Unit Setting

Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Water: 100 percent

Wy—Wayland silt loam

Map Unit Setting

Elevation: 200 to 1,500 feet
Mean annual precipitation: 41 to 47 inches
Mean annual air temperature: 45 to 50 degrees F
Frost-free period: 115 to 195 days

Map Unit Composition

Wayland and similar soils: 80 percent
Minor components: 20 percent

Description of Wayland

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Silty and clayey alluvium washed from uplands that contain some calcareous drift

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: FrequentNone
Frequency of ponding: None
Calcium carbonate, maximum content: 1 percent
Available water capacity: High (about 11.0 inches)

Interpretive groups

Farmland classification: Not prime farmland
Land capability (nonirrigated): 5w
Hydrologic Soil Group: C/D

Typical profile

0 to 9 inches: Silt loam
9 to 80 inches: Silt loam

Minor Components

Pawling

Percent of map unit: 5 percent
Landform: Depressions

Linlithgo

Percent of map unit: 5 percent

Fluvaquents

Percent of map unit: 3 percent
Landform: Flood plains

Palms

Percent of map unit: 3 percent
Landform: Marshes, swamps

Carlisle

Percent of map unit: 2 percent
Landform: Swamps, marshes

Udifluvents

Percent of map unit: 2 percent

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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

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

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

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

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

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

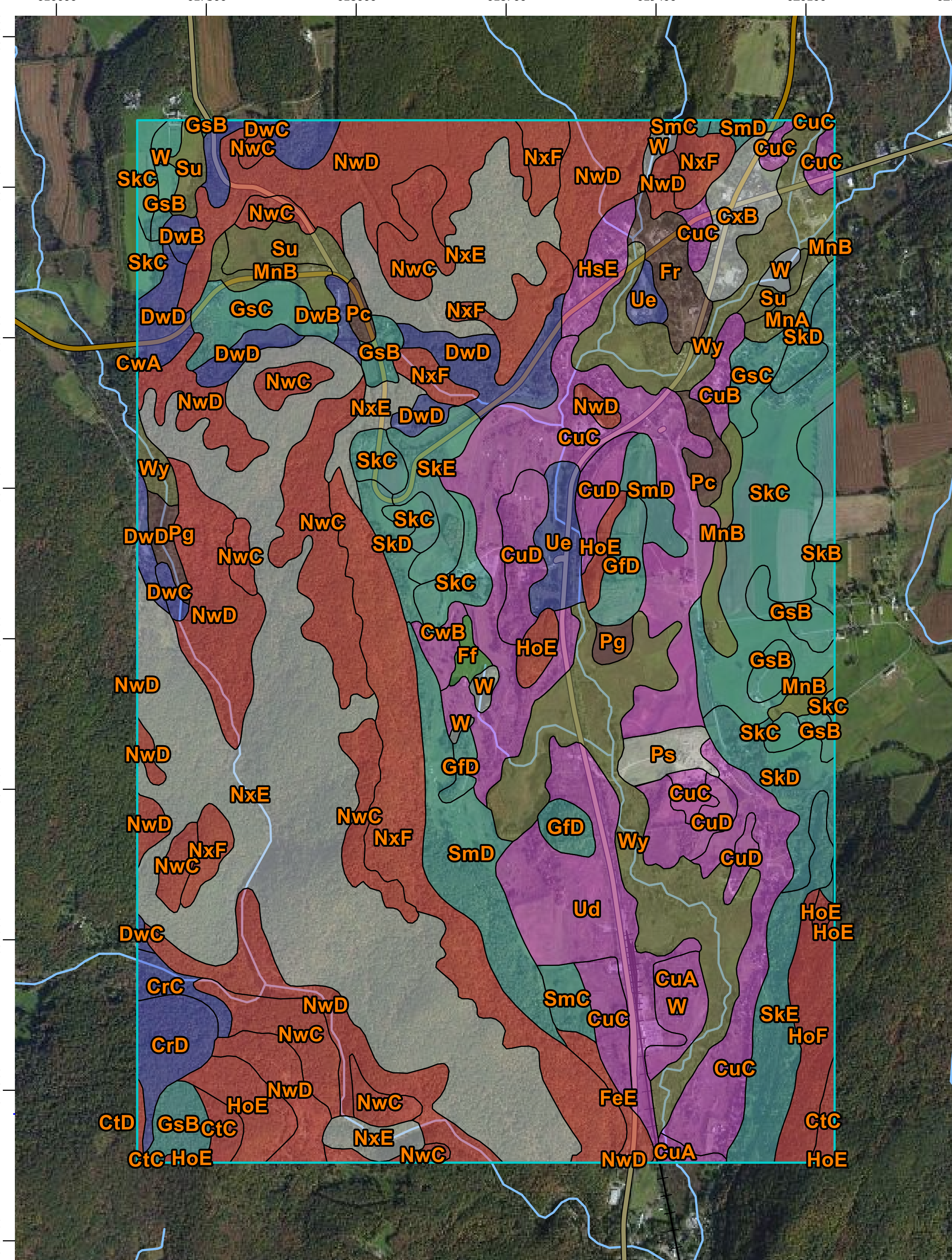
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Map—Hydrologic Soil Group

73° 35' 51" W | 73° 32' 40" W

616600 617300 618000 618700 619400 620100 620800

41° 51' 26" N | 41° 51' 26" N



41° 48' 17" N | 41° 48' 17" N

616600 617300 618000 618700 619400 620100 620800

73° 35' 51" W | 73° 32' 40" W

Map Scale: 1:28,400 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 400 800 1600 2400

Feet: 0 1000 2000 4000 6000

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 Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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 1:24,000.

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: Dutchess County, New York
Survey Area Data: Version 9, Sep 21, 2012

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

Date(s) aerial images were photographed: Mar 28, 2011—Oct 9, 2011

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.

Table—Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Dutchess County, New York (NY027)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
CrC	Charlton-Chatfield complex, rolling, rocky	B	14.4	0.4%
CrD	Charlton-Chatfield complex, hilly, rocky	B	37.0	0.9%
CtC	Chatfield-Hollis complex, rolling, very rocky	D	18.4	0.5%
CtD	Chatfield-Hollis complex, hilly, very rocky	D	2.8	0.1%
CuA	Copake gravelly silt loam, nearly level	A	30.1	0.8%
CuB	Copake gravelly silt loam, undulating	A	14.8	0.4%
CuC	Copake gravelly silt loam, rolling	A	363.4	9.3%
CuD	Copake gravelly silt loam, hilly	A	87.5	2.2%
CwA	Copake channery silt loam, fan, 0 to 3 percent slopes	A	0.4	0.0%
CwB	Copake channery silt loam, fan, 3 to 8 percent slopes	A	11.9	0.3%
CxB	Copake-Urban land complex, undulating		39.3	1.0%
DwB	Dutchess-Cardigan complex, undulating, rocky	B	14.6	0.4%
DwC	Dutchess-Cardigan complex, rolling, rocky	B	32.2	0.8%
DwD	Dutchess-Cardigan complex, hilly, rocky	B	94.6	2.4%
FeE	Farmington-Rock outcrop complex, steep	D	13.4	0.3%
Ff	Fluvaquents-Udifluvents complex, frequently flooded	A/D	7.2	0.2%
Fr	Fredon silt loam	B/D	33.2	0.8%
GfD	Galway-Farmington complex, hilly	C	45.8	1.2%
GsB	Georgia silt loam, 3 to 8 percent slopes	C	78.0	2.0%
GsC	Georgia silt loam, 8 to 15 percent slopes	C	57.2	1.5%
HoE	Hollis-Chatfield-Rock outcrop complex, steep	D	57.4	1.5%

Hydrologic Soil Group— Summary by Map Unit — Dutchess County, New York (NY027)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
HoF	Hollis-Chatfield-Rock outcrop complex, very steep	D	49.7	1.3%
HsE	Hoosic gravelly loam, 25 to 45 percent slopes	A	27.4	0.7%
MnA	Massena silt loam, 0 to 3 percent slopes	C/D	12.2	0.3%
MnB	Massena silt loam, 3 to 8 percent slopes	C/D	46.1	1.2%
NwC	Nassau-Cardigan complex, rolling, very rocky	D	237.2	6.1%
NwD	Nassau-Cardigan complex, hilly, very rocky	D	410.3	10.5%
NxE	Nassau-Rock outcrop complex, steep		697.8	17.8%
NxF	Nassau-Rock outcrop complex, very steep	D	258.3	6.6%
Pc	Palms muck	B/D	21.4	0.5%
Pg	Pawling silt loam	B/D	19.1	0.5%
Ps	Pits, gravel		21.2	0.5%
SkB	Stockbridge silt loam, 3 to 8 percent slopes	C	35.7	0.9%
SkC	Stockbridge silt loam, 8 to 15 percent slopes	C	202.5	5.2%
SkD	Stockbridge silt loam, 15 to 25 percent slopes	C	82.4	2.1%
SkE	Stockbridge silt loam, 25 to 45 percent slopes	C	103.8	2.6%
SmC	Stockbridge-Farmington complex, rolling, rocky	C	16.0	0.4%
SmD	Stockbridge-Farmington complex, hilly, rocky	C	113.5	2.9%
Su	Sun silt loam	C/D	46.2	1.2%
Ud	Udorthents, smoothed	A	126.9	3.2%
Ue	Udorthents, wet substratum	B	39.5	1.0%
W	Water		19.9	0.5%
Wy	Wayland silt loam	C/D	277.4	7.1%
Totals for Area of Interest			**3,918.4**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Aggregation is the process by which a set of component attribute values is reduced to a single value that represents the map unit as a whole.

A map unit is typically composed of one or more "components". A component is either some type of soil or some nonsoil entity, e.g., rock outcrop. For the attribute being aggregated, the first step of the aggregation process is to derive one attribute value for each of a map unit's components. From this set of component attributes, the next step of the aggregation process derives a single value that represents the map unit as a whole. Once a single value for each map unit is derived, a thematic map for soil map units can be rendered. Aggregation must be done because, on any soil map, map units are delineated but components are not.

For each of a map unit's components, a corresponding percent composition is recorded. A percent composition of 60 indicates that the corresponding component typically makes up approximately 60% of the map unit. Percent composition is a critical factor in some, but not all, aggregation methods.

The aggregation method "Dominant Condition" first groups like attribute values for the components in a map unit. For each group, percent composition is set to the sum of the percent composition of all components participating in that group. These groups now represent "conditions" rather than components. The attribute value associated with the group with the highest cumulative percent composition is returned. If more than one group shares the highest cumulative percent composition, the corresponding "tie-break" rule determines which value should be returned. The "tie-break" rule indicates whether the lower or higher group value should be returned in the case of a percent composition tie. The result returned by this aggregation method represents the dominant condition throughout the map unit only when no tie has occurred.

Component Percent Cutoff: None Specified

Components whose percent composition is below the cutoff value will not be considered. If no cutoff value is specified, all components in the database will be considered. The data for some contrasting soils of minor extent may not be in the database, and therefore are not considered.

Tie-break Rule: Higher

The tie-break rule indicates which value should be selected from a set of multiple candidate values, or which value should be selected in the event of a percent composition tie.

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GEOTECHNICAL ENGINEERING REPORT
PROPOSED APWAN DEVELOPMENT
SILO RIDGE COUNTRY CLUB
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AMENIA, NEW YORK

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October 14, 2013
TransTech Project No. G13-3523

TABLE OF CONTENTS

1.0 INTRODUCTION

This report presents the results of a subsurface exploration program and geotechnical engineering evaluation completed by TransTech Engineering Services, P.C., on behalf of TransTech Geotechnical Services, for the proposed Apwan Development planned at Silo Ridge Country Club in the Town of Amenia, New York. VHB Engineering, Surveying and Landscape Architecture, P.C. (VHB) retained TransTech Geotechnical Services to complete this work, which was done in general accordance with our August 21, 2013 Proposal.

Based on the information provided by VHB, we understand the project will consist of a new residential development centered around the existing Silo Ridge Country Club. The development will include a new Lodge/Clubhouse with restaurant, Spa/Fitness center and Kid's Barn arranged around a central village green. The development will also include Custom Homes, Village Green Homes, Townhomes and Cottages.

The site topography is generally comprised of rolling hills with a mixture of open golf course areas and wooded areas. The site is flanked to the north and west by taller ridges. Exposed ledge rock is exposed at various locations and there are several ponds located in the lower-lying areas of the site. The approximate location of the site is shown on the attached Figure No. 1.

2.0 SUBSURFACE EXPLORATION

The subsurface exploration program consisted of twelve (12) test borings, seventeen (17) probe borings, six (6) test pits and six (6) infiltration tests. The test borings were designated as BB-1 through BB-7, BB-8A and BB-9 through BB-12. The probe borings were designated as GB-1 through GB-17 and the test pits were designated as DT-1 through DT-6. The test borings were generally located in proposed building areas. The test boring, probe boring and test pit locations were established and marked in the field by others. The approximate boring and test pit locations are shown on the attached Figure No. 2.

Auger refusal was encountered in test borings BB-1, BB-3, BB-5, BB-8, BB-9, BB-10, BB-11 and BB-12 at depths of 11.0, 44.0, 21.0, 24.0, 19.5, 19.5, 20.0 and 11.0 feet, respectively. The remaining test borings were terminated at a depth of 25 feet.

Auger refusal was encountered in probe borings GB-3, GB-8, GB-9, GB-13, GB-15 and GB-17 at depths of 19.0, 11.0, 2.0, 11.0, 18.0 and 11.0 feet, respectively. The remaining probe borings were terminated at a depth of 20 feet, with the exception of probe boring GB-6 which was terminated at a depth of 25 feet.

The test borings and probe borings were made with a Central Mine Equipment (CME) model 75 all-terrain drill rig, using hollow stem auger techniques. Split spoon samples and Standard Penetration Tests (SPTs) were taken in the test borings continuously from the ground surface to a depth of 10 feet and at intervals of 5 feet thereafter. The split spoon sampling and SPTs were completed in general accordance with *ASTM D 1586 - "Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils"*. No sampling was performed in the probe borings.

The test pits were excavated by others using a rubber tire backhoe. The test pits were excavated prior to our inspector's arrival and were left open for our observation. Photos of the test pit excavations are presented in Appendix B.

Infiltration testing was performed by TransTech at each test pit location. The infiltration tests were performed using 4 inch diameter steel casing, which was installed to a depth of 4 feet below grade.

The test boring and test pit logs were prepared by a geotechnical engineer based on visual observation of the recovered soil and rock samples and review of the driller's field notes. The soil samples were described based on a visual/manual estimation of the grain size distribution, along with characteristics such as color, relative density, consistency, moisture, etc. The test boring and test pit logs are presented in Appendix A, along with general information and a key of terms and symbols used to prepare the logs.

3.0 LABORATORY TESTING

Laboratory testing was performed on selected soil samples recovered from the test borings. The laboratory tests were performed to confirm the visual soil classifications. The laboratory testing included the following tests:

- Natural moisture content testing was performed on ten (10) samples in accordance with ASTM D 2216 – *"Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass."*
- Grain size analysis testing was performed on ten (10) samples in general accordance with ASTM D 422 – *"Standard Test Method for Particle-Size Analysis of Soils"*, and ASTM D 1140 – *"Standard Test Method for Amount of Material in Soils Finer Than the No. 200 Sieve."*

The laboratory test results are presented in Appendix C.

4.0 INFILTRATION TEST RESULTS

Infiltration testing was performed in 4 inch diameter steel cased holes at a depth of 4 feet in general accordance with the New York State Stormwater Design Manual, Appendix D. The holes were pre-soaked overnight prior to the infiltration testing. It was observed that the pre-soak water was still present in the steel casing after 24 hours at each infiltration test location. Water was added to achieve a 24 inch water depth at each location and the water levels were recorded over a period of 3 hours at each location. The infiltration test results are provided in the following table.

Infiltration Test Location	Groundwater Depth (ft)	Test Depth (ft)	Final Infiltration Rate (inches/hour)
DT-1	> 11	4	0.25
DT-2	7.5	4	0
DT-3	6.5	4	0.25
DT-4	> 9.5	4	0
DT-5	> 9.7	4	0
DT-6	> 11.3	4	0

5.0 SUBSURFACE CONDITIONS

5.1 Soil Profile

The subsurface profile encountered at the test boring locations generally consisted of indigenous overburden soils, with the exception of test borings BB-5, BB-6 and BB-10 where possible fill type soils were encountered overlying indigenous overburden soils. The possible fill type soils appeared to consist of re-worked indigenous soils. The possible fill type soils and indigenous soils consisted of varying fractions of clay, silt, sand and gravel soils with zones containing intermixed cobbles at various depths and locations.

SPT "N" values obtained within the cohesive possible fill type soils ranged from 5 to 17 indicating the consistency of these soils varies from "medium" to "very stiff". SPT "N" values obtained within the cohesionless possible fill type soils ranged from 12 to 26 indicating a "firm" relative density. SPT "N" values obtained within the cohesive indigenous soils ranged from 1 to 46 indicating the consistency of these soils varies from "very soft" to "very stiff". SPT "N" values obtained in the cohesionless indigenous overburden soils ranged from 3 to greater than 50 indicating the relative density of these soils varies from "very loose" to "very compact".

5.2 Bedrock Conditions

Auger refusal (apparent top of bedrock) was encountered in the test borings and probe borings at depths ranging from 2.0 to 44.0 feet. In addition, highly decomposed and highly weathered bedrock was encountered in the test borings at depths ranging from 4 to 23 feet. At many locations, the test borings were advanced many feet into the top of the highly decomposed and weathered bedrock before reaching auger refusal, indicating the top of more sound rock had been encountered.

The following table presents the auger refusal depths (apparent top of more sound bedrock) for each test boring and probe boring.

Test Boring No.	Approximate Depth of Auger Refusal (Apparent Top of Bedrock) (feet)
BB-1	11.0
BB-2	NA
BB-3	NA
BB-4	NA
BB-5	21.0
BB-6	NA
BB-7	NA
BB-8	24.0
BB-9	19.5
BB-10	19.5
BB-11	20.0
BB-12	11.0
GB-1	NA
GB-2	NA
GB-3	19.0
GB-4	NA
GB-5	NA
GB-6	NA
GB-7	NA
GB-8	11.0
GB-9	2.0
GB-10	NA
GB-11	NA
GB-12	NA
GB-13	11.0
GB-14	NA
GB-15	18.0
GB-16	NA
GB-17	11.0

5.3 Groundwater Conditions

Groundwater was encountered in test borings BB-1, BB-2, BB-3, BB-4, BB-5 and BB-8 at depths ranging from 6.6 to 19.0 feet. Groundwater was also present in test pits DT-2 and DT-3 at depths of 7.5 and 6.5 feet, respectively. The following table presents the depths at which groundwater conditions were encountered in the test borings and test pits.

Test Boring No.	Depth to Free Standing Water (feet)
BB-1	10.3
BB-2	19.0
BB-3	6.6
BB-4	17.2*
BB-5	14.7*
BB-6	NA
BB-7	NA
BB-8	12.8
BB-9	NA
BB-10	NA
BB-11	NA
BB-12	NA
DT-1	NA
DT-2	7.5*
DT-3	6.5*
DT-4	NA
DT-5	NA
DT-6	NA

*Indicates groundwater level measured 24 hours after drilling/excavation.
NA indicates free standing water was not present.

It should be expected that groundwater conditions could vary with changes in soil conditions, precipitation and seasonal conditions.

6.0 GEOTECHNICAL RECOMMENDATIONS

6.1 General

The primary geotechnical considerations impacting development of the site are the presence of existing fill type soils and bedrock. We recommend that existing fill type soils, which are associated with previous grading activities at the site, be removed where present beneath proposed building areas. Undercut excavations on the order of approximately 4 to 8 feet will be required to remove possible fill type soils at test boring locations BB-5, BB-6 and BB-10. Very soft soil conditions were encountered at the transition from possible fill type soils to indigenous soils in test boring BB-6 from a depth of 8 to 10 feet. These very soft soils are susceptible to potentially excessive settlement under building foundation loads and should be undercut and replaced with imported Structural Fill within proposed building areas. Recommendations for Structural Fill material along with placement and compaction recommendations are presented in Appendix D.

It is also anticipated that bedrock could be encountered in relatively shallow foundation or utility excavations in some areas. Based on the conditions encountered in the test borings, it is anticipated that the upper more weathered and fractured bedrock zone can be excavated using a large track-mounted excavator equipped with rock teeth or a large bulldozer equipped with a single-tooth ripper. However, it is possible that zones of more competent bedrock (i.e. auger refusal depths encountered in the borings) could be encountered that may require controlled blasting to loosen the rock for excavation. Blasting should be performed by a licensed contractor and should be controlled to limit the maximum peak particle velocity (PPV) to less than two (2) inches per second (ips) at the property limits and one (1) ips at the nearest adjacent occupied structure. In addition, the peak airblast overpressure limit should be controlled to less than 0.014 pounds per square inch (psi) at the nearest adjacent occupied structure.

We point out that the controlled blasting guidelines described above are intended to prevent damage to existing structures and greatly exceed the threshold at which humans will notice vibration (approximately 0.02 ips). Accordingly, we recommend that blast vibrations be monitored and recorded at the property limits during each blast event to confirm that the limits recommended above are not exceeded. In addition, we recommend that pre-condition surveys be performed on all adjacent structures to document the condition of existing structures prior to the start of blasting operations.

No blasting should be performed within proposed building areas due to the potential for over-breakage, which could impact the integrity of building foundations.

6.2 Site Preparation

Existing topsoil, vegetation, and any other deleterious materials within the proposed building and pavement areas should be removed. Any existing fill type soils should also be removed within proposed building areas and extending 10 feet beyond the building footprint. Following removal of surface materials and excavation to design subgrade elevations, the exposed subgrades should be evaluated by a geotechnical engineer. Exposed soil subgrades should be thoroughly proof-rolled using a loaded tandem axle dump truck prior to any required fill placement. The proofrolling should be observed by a geotechnical engineer. Any areas that appear wet, loose, soft, unstable or otherwise unsuitable should be undercut based on guidance provided by the geotechnical engineer.

Undercut excavations (if required) beneath proposed foundation, floor slab and pavement areas should be backfilled with controlled imported Structural Fill. Recommendations for Structural Fill material, along with placement and compaction requirements, are presented in Appendix D. Placement of all fill and/or backfill beneath proposed building and pavement areas should be observed and tested by qualified geotechnical personnel.

It is anticipated that the on-site sand and gravel soils can be re-used as Structural Fill to raise existing site grades. The on-site clay and silt soils will lose strength and become unstable if they become wet during construction and are not well suited for re-use as Structural Fill beneath building areas. It should be anticipated that cut and fill grading activities will require separating the sand and gravel soil layers from the silt and clay soil layers for re-use as Structural Fill beneath building areas.

6.3 Spread Foundations

It is our opinion that spread foundations can be used to support the proposed buildings. Spread foundations should bear on firm, undisturbed indigenous soil bearing grades. Existing fill type soils should be removed where present beneath proposed foundation bearing grades. The exposed soil bearing grades for foundations should be compacted to densify any soils loosened by the excavation process.

The exposed bearing grades should be observed and evaluated by a geotechnical engineer. Any soft or otherwise unsuitable soils should be undercut and replaced with compacted imported Structural Fill based on guidance provided by the geotechnical engineer. All final bearing grades should be firm, stable and free of loose soil, mud, water, frost or other deleterious materials.

Continuous wall foundations should be at least 1.5 feet in width and column/individual foundations should be at least 2.5 feet in width. Exterior foundations of heated spaces and all foundations of unheated spaces should be embedded a minimum of 4.0 feet below finished exterior grades for frost protection. Interior foundations in heated spaces should be embedded a minimum of 1.5 feet below finished floor slab elevation to develop adequate bearing capacity.

Spread foundations, which are designed and constructed in accordance with our recommendations, can be sized using a maximum allowable soil bearing pressure of 3,000 pounds per square foot (psf). The allowable soil bearing pressure is based on a factor of safety of at least 3.0.

It is estimated that spread foundations, sized and properly constructed in accordance with our recommendations, will undergo total settlement of less than 1 inch, and differential settlements should be less than ½ inch.

6.4 Slabs-on-Grade

At-grade floor slabs can be constructed as slab-on-grade following proper site preparation as outlined in Section 6.2 above. A minimum of 6 inches of Subbase Stone, as described in Appendix D, is recommended directly beneath lightly loaded interior slabs-on-grade in heated spaces. The floor slabs can be designed in accordance with procedures recommended by the Portland Cement Association or the American Concrete Institute, using a modulus of subgrade reaction of 150 pounds per cubic inch at the top of the Subbase Stone layer.

Frost heaving of non-vehicle loaded exterior slabs and sidewalks can be minimized by constructing sensitive slab areas (i.e. doorways and sidewalk/pavement transitions) over 18 inches of Drainage Stone, as described in Appendix D. The Drainage Stone layer should have an underdrain within it to provide positive drainage to a suitable downslope outlet. Although this may not eliminate all movement associated with frost heave, it should provide adequate protection against excessive differential frost heave during most winters.

We recommend a vapor barrier be provided beneath interior floor slabs, which are designated to receive a moisture sensitive floor covering, in accordance with the American Concrete Institute (ACI) Guide for Concrete Floor and Slab Construction. It is recommended that the slab-on-grade be constructed such that it floats on the subbase and subgrades and is not structurally connected to, or resting directly on, perimeter walls or column footings in order to limit differential settlement effects.

6.5 Lateral Earth Pressure Design Parameters for Basement/Retaining Walls

The design of basement walls and site retaining walls should be based on lateral earth pressures caused by the load of backfill against the walls and the surcharge effects from permanent or temporary loads. Basement walls, which are designed for restrained or non-yielding conditions, should be designed using "at rest" lateral earth pressures. Site retaining walls, which are designed to "yield" can be designed using "active" lateral earth pressures. The basement and site retaining walls should be backfilled in accordance with the recommendations presented in Section 6.6 below.

The lateral earth pressures can be computed using the following soil parameters where the wall backfill consists of imported Structural Fill, as described in Appendix D, and contains proper foundation drain(s) as discussed below. Water must not be allowed to collect against the backside of the exposed wall section unless the wall is designed for the additional hydrostatic pressure.

Recommended Soil Parameters for Basement Wall Design:

Coefficient of At-Rest Lateral Earth Pressure – 0.50
Coefficient of Active Lateral Earth Pressure – 0.33
Coefficient of Passive Lateral Earth Pressure – 3.00*
Coefficient of Sliding Friction – 0.30
Angle of Internal Friction (Structural Fill backfill) – 30 Degrees
Total Moist Unit Weight of Soil (Structural Fill backfill) – 120 pcf

* It should be noted that a horizontal displacement of approximately 0.005 x the height of the resisting soils (i.e. embedment depth of footing/wall on the resisting side) is required to achieve the full passive earth pressure coefficient of 3.00. If it is determined that the

magnitude of horizontal displacement of the footing/wall required to achieve the full passive earth pressure is too large, a reduced coefficient of passive earth pressure should be used for design.

6.6 Basement/Retaining Wall Drainage and Backfill

Basement walls and site retaining walls and should be constructed with foundation drainage systems to intercept any perched or trapped groundwater and relieve potential hydrostatic pressures from acting on the walls. The drainage system should consist of a footing drain and pervious media placed against the wall.

The footing drain should include a non-woven drainage/separation geotextile (i.e. Mirafi 160N or suitable equivalent) installed around Drainage Stone, as described in Appendix D, which surrounds a slotted under-drain pipe. The foundation Drainage Stone and surrounding geotextile should extend 1 foot above the drain pipe. The drain pipes should include clean-outs to allow periodic flushing and maintenance of the system. The drain pipes should be set at the bottom of footing elevation and should discharge to a suitable downslope outlet.

Pervious Granular Backfill or a suitable geosynthetic drainage composite should be placed against the walls, above the footing drain, to allow infiltration to the footing drain. Pervious Granular Backfill, if used against the wall, should be at least 2 feet in width. The remaining excavated area beyond the drainage composite or Pervious Granular Backfill should be backfilled with controlled Structural Fill. The Pervious Granular Fill and/or drainage composite against the wall should extend up to about 1 foot below finished exterior grade where it should be capped off with less permeable on-site soils to reduce surface infiltration. Recommendations for Pervious Granular Fill and Structural Fill material are presented in Appendix D.

6.7 Seismic Design

Based on the conditions encountered in the borings, it is our opinion the site should be classified as **Seismic Site Class "D"** according Table 1615.1.1 of the Building Code of New York State.

The mapped spectral accelerations in the project area for Site Class "B" were determined using the USGS online Seismic "Design Maps" web application, which is based on 2008 National Seismic Hazard Map data.

The spectral response accelerations for site class "B" are as follows:

- Short Period Response (S_S) - 0.182g
- 1 Second Period Response (S_1) - 0.065g

Adjusted Spectral Response Acceleration for Site Class "D":

- Short Period Response (S_{MS}) - 0.291g
- 1 Second Period Response (S_{M1}) - 0.156g

The corresponding five percent damped design spectral response accelerations (S_{DS} and S_{D1}) are as follows:

- **S_{DS} - 0.194g**
- **S_{D1} - 0.104g**

6.8 Pavement Design

Pavement design recommendations are provided for a Light Duty Asphalt Concrete Pavement and Commercial Duty Asphalt Concrete Pavement sections. The Light Duty pavement section can be used for car parking areas and the Commercial Duty pavement section should be used for main drive areas. The pavement sections recommended below are based on the assumption that the subgrades will be prepared as discussed in Section 6.2 above.

Light Duty Asphalt Concrete Pavement:

- 1.0 inches – Top Course
- 2.0 inches – Binder Course
- 10 inches – Subbase Course

Commercial Duty Asphalt Concrete Pavement:

- 1.5 inches – Top Course
- 2.5 inches – Binder Course
- 12 inches – Subbase Course
- Woven Geotextile Fabric

We point out that the pavement sections provided above are not intended for heavy construction vehicle traffic. Construction traffic should not be routed across finished pavement areas.

The installation of an underdrain or edge drain is recommended to drain the pavement subbase course and subgrades in order to limit the potential for frost action and improve pavement structure performance and design life.

Proper grading of the pavement structure subgrades is also recommended. Accumulation of water on pavement subgrades should be avoided by grading the subgrade to a slope of at least 2 percent to allow drainage to the underdrains or drainage swale.

The underdrain system must be properly designed, installed and maintained for long term performance. The underdrain system design should include a filtration geotextile (i.e. Mirafi 160N or suitable equivalent), selected considering drainage and filtration, installed around Drainage Stone surrounding a slotted or perforated drain pipe. The Drainage Stone and surrounding geotextile should extend above the drainpipe and should be hydraulically connected to the pavement subbase.

Alternatively, a "geotextile wrapped slotted pipe" system would also be acceptable, if placed in the subbase material provided the subbase layer is thickened along the underdrains. In all cases, the underdrain (i.e. pipe invert) should be set at least 6-inches below the bottom of the overall subbase layer.

Materials for the above pavement structure components should consist of the following:

A. Asphalt Concrete Top Course - NYSDOT Standard Specifications, Item No. 402.12 - Hot Mix Asphalt, Top Course.

B. Asphalt Concrete Binder Course - NYSDOT Standard Specifications, Item No. 402.25 - Hot Mix Asphalt, Binder Course.

C. Subbase Course – Should comply with NYSDOT Standard Specifications, Item No. 304.12 - Type 2 Subbase or Item No. 304.14 – Type 4 Subbase.

D. Woven Geotextile Fabric – Woven polypropylene stabilization/separation geotextile (i.e., Mirafi 500X or approved equivalent).

Adjacent geotextile panels should have a minimum overlap of 18 inches. The Subbase Stone should be placed and compacted in accordance with the recommendations presented in Appendix D. Construction of the asphaltic concrete courses (i.e., binder and top) should be performed in accordance with NYSDOT Standard Specification Section 400.

6.9 Temporary and Permanent Cut and Fill Slopes

Temporary excavations must be adequately sloped back and/or properly supported (i.e. sheeted, shored, braced, shielded etc.) in accordance with OSHA requirements as a minimum. Based on the test boring and test pit information, it would appear that the overall soil conditions encountered would be generally classified as Type C soil in accordance with OSHA criteria.

Based on the OSHA Type C soil criteria, unsupported excavations less than 20 feet would need to be sloped backed to at least a 1.5 horizontal (min) to 1 vertical slope. The contractor should confirm the OSHA soil classification and excavation requirements at the time of construction based on actual location and soil and groundwater conditions present. The contractor shall be solely responsible for all excavation safety, including the design of all excavation support systems.

We recommend that permanent cut slopes be sloped back to at least a 2.0 horizontal to 1 vertical slope and permanent fill slopes be sloped back to at least a 3.0 horizontal to 1 vertical slope. It should be understood that cut slopes may require stabilization measures if groundwater is seeping from the slopes. Stabilization measures could include placement of rip-rap or geosynthetic stabilization mats.

7.0 CONCLUDING REMARKS

This report was prepared to assist in planning the design and construction of the proposed Apwan Development planned at Silo Ridge Country Club in the Town of Amenia, New York. The report has been prepared for specific application to this site and this project only.

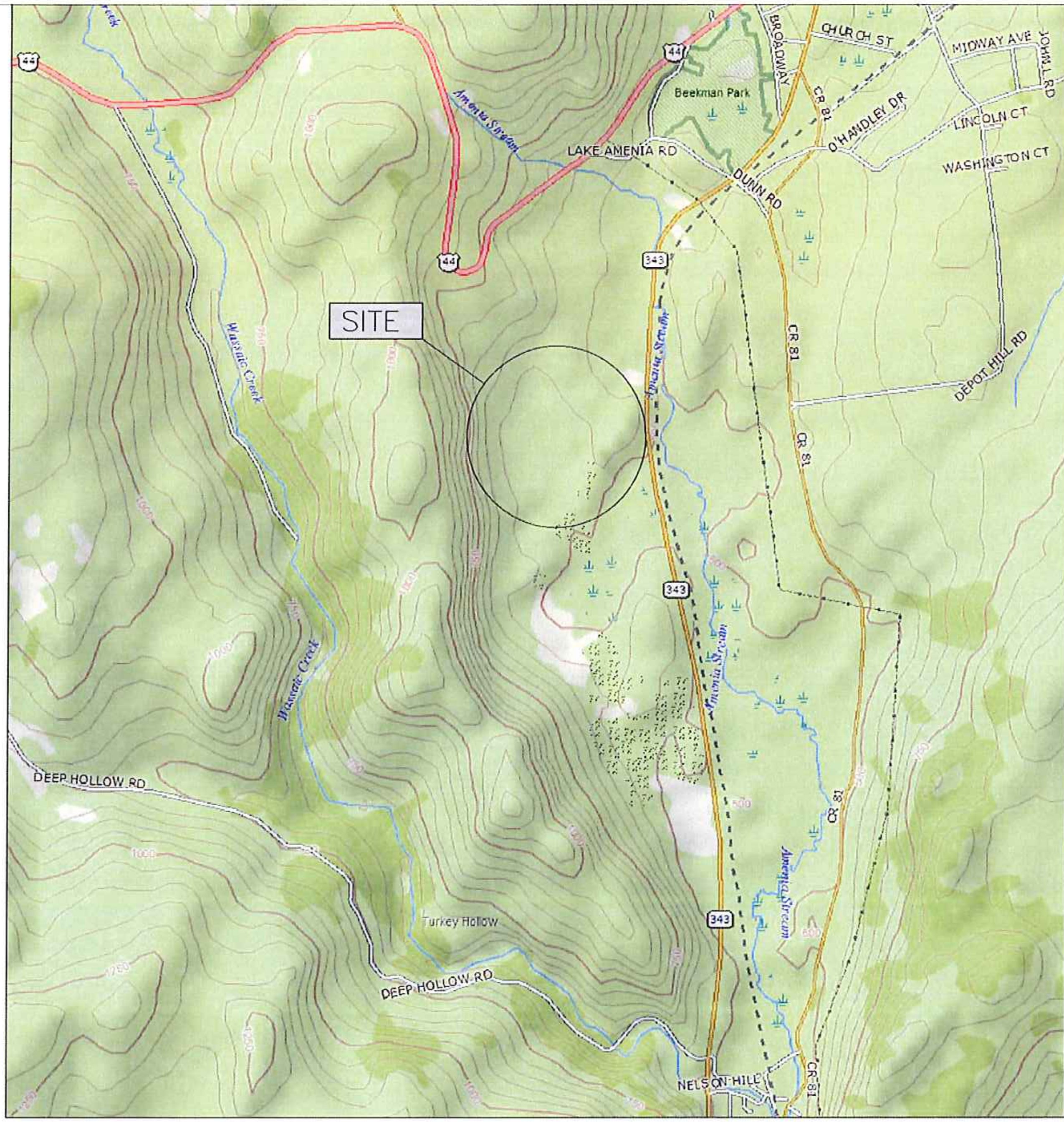
The recommendations were prepared based on our understanding of the proposed project, as described herein, and through the application of generally accepted soils and foundation engineering practices. No warranties, expressed or implied are made by the conclusions, opinions, recommendations or services provided.

Important information regarding the use and interpretation of this report is presented in Appendix E.

Respectfully Submitted:
TransTech Engineering Services, P.C.

Tod M. Kobik, P.E.
Geotechnical Engineer

FIGURES



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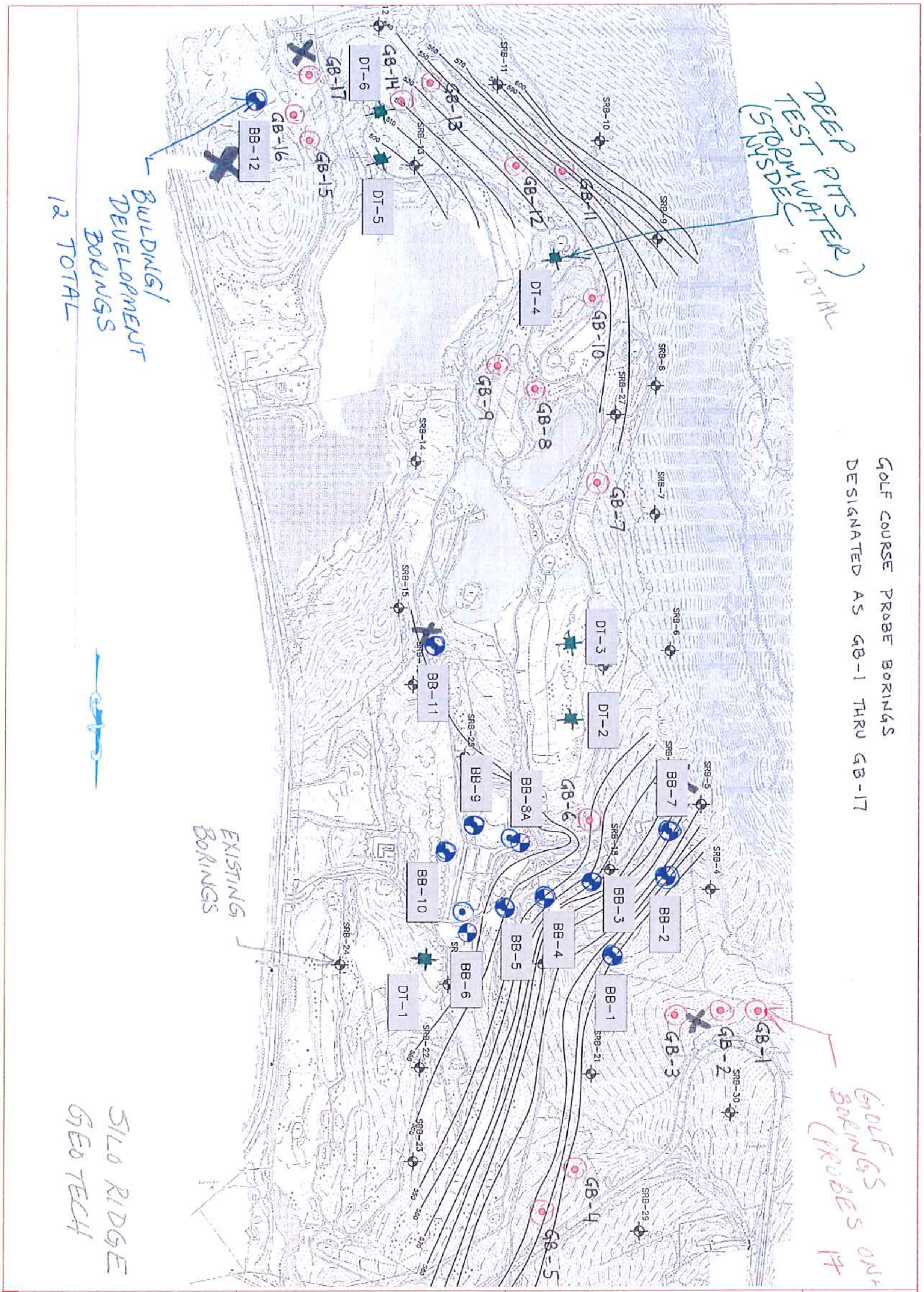
MN (13.6° W)

0 800 1600 2400 3200 4000 ft
Data Zoom 13-0

Trans Tech GEOTECHNICAL SERVICES	SCALE: AS SHOWN	SITE LOCATION MAP
	DRAWN BY: *TMK*	
1594 STATE STREET SCHENECTADY, NEW YORK 12304 PHONE (518) 370-5558 FAX (518) 370-5538	DATE: 10/14/2013	PROPOSED APWAN DEVELOPMENT SILO RIDGE COUNTRY CLUB 4651 ROUTE 22 AMENIA, NEW YORK
	PROJECT No.: G13-3523	
	FIGURE No.: 1	



Trans Tech GEOTECHNICAL SERVICES 1594 STATE STREET SCHENECTADY, NEW YORK 12304 PHONE (518) 370-5558 FAX (518) 370-5538	SUBSURFACE EXPLORATION LOCATION PLAN	PROPOSED APWAN DEVELOPMENT SILO RIDGE COUNTRY CLUB 4651 ROUTE 22 AMENIA, NEW YORK	SCALE: N.T.S. DRAWN BY: TMK DATE 10/14/13 PROJECT No.: G13-3523 FIGURE No.: 2

APPENDIX A

SUBSURFACE EXPLORATION LOGS

DATE
START: 9/12/2013
FINISH: 9/12/2013

SHEET 1 OF 1

Trans Tech DRILLING SERVICES

SUBSURFACE EXPLORATION LOG

BORING NO. BB-1
PROJ. NO. G13-3523
SURF. ELEV. G.S.
G.W. DEPTH See Notes

PROJECT: Proposed Apwan Development
Silo Ridge Country Club

LOCATION: 4651 Route 22
Amenia, New York

DEPTH (ft.)	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	REC. (ft.)	SOIL OR ROCK CLASSIFICATION	NOTES
	/	1	2	2	4	7	6	0.8	Brown Loose Fine-Coarse SAND AND CLAY, Little Gravel, Moist	
	/	2	4	6	6	5	12	1.3	Firm, Grades to "Some" Silt, "Some" Gravel, "Trace" Clay	
5	/	3	3	6	4	16	10	1.2	Brown-Gray Firm SILT, Some Fine-Coarse Sand, Trace Gravel, Moist	
	/	4	56	55	42	50/0.4	97	1.3	Highly Decomposed Rock, sampled as Gray Very Compact SILT with rock fragments	REF = Sample spoon refusal
	/	5	34	50/0.5			REF	0.7		
10										
									Boring terminated with auger refusal at 11.0 feet.	Free standing water was measured at a depth of 10.3' upon completion of drilling and sampling.
15										
20										
25										
30										
35										
40										

N = NO. BLOWS TO DRIVE 2-INCH SPLIT SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFICATION: Visual by T. Kobik

DRILLER: J. Burrowbridge

DRILL RIG TYPE: CME - 75

METHOD OF INVESTIGATION: ASTM D1586 using 3.25" I.D. Hollow Stem Augers

All recovered samples will be retained for approximately sixty (60) days, at which time the samples will be desposed of unless directed otherwise.

DATE
START: 9/12/2013
FINISH: 9/12/2013

SHEET 1 OF 1

Trans Tech DRILLING SERVICES

SUBSURFACE EXPLORATION LOG

BORING NO. **BB-2**
PROJ. NO. G13-3523
SURF. ELEV. G.S.
G.W. DEPTH 19.0'

PROJECT: Proposed Apwan Development
Silo Ridge Country Club

LOCATION: 4651 Route 22
Amenia, New York

DEPTH (ft.)	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	REC. (ft.)	SOIL OR ROCK CLASSIFICATION	NOTES
	/	1	2	3	4	6	7	1.3	Brown Loose Fine-Coarse SAND AND SILT, Little Gravel, Moist	3" Topsoil at ground surface
	/	2	4	7	11	11	18	0.7	Brown Firm SILT, Some Fine-Coarse Sand, Trace Gravel, Moist	
5	/	3	8	4	4	4	8	1.4	Loose, Grades to "Trace" Clay	
	/	4	5	4	6	4	10	0.7	Wet	
10	/	5	2	3	4	3	7	1.5	Brown Loose Fine-Coarse SAND, Some Silt, Some Gravel, Moist	
15	/	6	2	1	2	1	3	1.0	Brown Very Loose GRAVEL AND Fine-Coarse SAND, Some Silt, Trace Clay, Wet	Driller noted "wet" soil layer at a depth of 14'.
20	/	7	5	9	14	20	23	0.8	Brown-Gray Firm SILT, Some Gravel, Some Fine-Coarse Sand, Little Rock fragments, Wet	
25	/	8	22	40	50/0.5		REF	1.3	Very Compact, Dry	REF = Sample spoon refusal
									Boring terminated at a depth of 25.0 feet.	Free standing water was measured at a depth of 19.0' upon completion of drilling and sampling.
30										
35										
40										

N = NO. BLOWS TO DRIVE 2-INCH SPLIT SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFICATION: Visual by T. Kobik

DRILLER: J. Burrowbridge

DRILL RIG TYPE : CME - 75

METHOD OF INVESTIGATION: ASTM D1586 using 3.25" I.D. Hollow Stem Augers

All recovered samples will be retained for approximately sixty (60) days, at which time the samples will be desposed of unless directed otherwise.

DATE START: 9/12/2013 FINISH: 9/12/2013 SHEET 1 OF 2	Trans Tech DRILLING SERVICES **SUBSURFACE EXPLORATION LOG**	BORING NO. **BB-3** PROJ. NO. G13-3523 SURF. ELEV. G.S. G.W. DEPTH 6.6'

PROJECT: Proposed Apwan Development, Silo Ridge Country Club

LOCATION: 4651 Route 22, Amenia, New York

DEPTH (ft.)	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	REC. (ft.)	SOIL OR ROCK CLASSIFICATION	NOTES
	/	1		6	8	8	14	1.0	Brown Firm SILT, Some Fine-Coarse SAND, Some Gravel, Dry	6" Asphalt at ground surface
	/	2	21	10	8	8	18	0.5	Gray Firm Fine-Coarse SAND, Some Gravel, Little Silt, Dry	
5	/	3	3	5	7	8	12	1.5	Gray Highly Decomposed Rock, sampled as Gray Firm SILT with rock fragments	
	/	4	9	10	15	15	25	1.4		
	/	5	4	18	16	15	34	1.9	Compact	Boring was advanced to a depth of 25 feet on 9/12/13 using hollow stem auger drilling technique. Boring was completed on 9/18/13 using rotary wash drilling technique.
10										
	/	6	8	18	17	17	35	1.2		
15										
	/	7	7	20	23	24	43	1.9	Light Gray	
20										
	/	8	18	47	50/0.5		REF	1.4	White-Gray, Very Compact, with Fine Sand Seams, Moist	REF = Sample spoon refusal
25										Free standing water was measured at a depth of 6.6' with augers at a depth of 25.0 feet on 9/12/13.
	/	9	33	75	59	50	144	1.5		
30										
	/	10	42	49	50/0.3		REF	1.0		
35										
	/	11	50/0.1				REF	0.1	Contains Seam of Coarse SAND, Wet	
40										

N = NO. BLOWS TO DRIVE 2-INCH SPLIT SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFICATION: Visual by T. Kobik

DRILLER: J. Burrowbridge

DRILL RIG TYPE : CME - 75

METHOD OF INVESTIGATION: ASTM D1586 using 3.25" I.D. Hollow Stem Augers

All recovered samples will be retained for approximately sixty (60) days, at which time the samples will be desposed of unless directed otherwise.

DATE
START: 9/12/2013
FINISH: 9/18/2013

Trans Tech DRILLING SERVICES

SUBSURFACE EXPLORATION LOG

BORING NO. **BB-3**
PROJ. NO. G13-3523
SURF. ELEV. G.S.
G.W. DEPTH 6.6'

PROJECT: Proposed Apwan Development
Silo Ridge Country Club

LOCATION: 4651 Route 22
Amenia, New York

DEPTH (ft.)	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	REC. (ft.)	SOIL OR ROCK CLASSIFICATION	NOTES
									Highly Decomposed Rock, sampled as White-Gray Very Compact SILT with rock fragments	REF = Sample spoon refusal NR = No recovery
45	/	12	50/0				REF	NR	Boring terminated with auger refusal at 44.0 feet.	
50										
55										
60										
65										
70										
75										
80										

N = NO. BLOWS TO DRIVE 2-INCH SPLIT SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFICATION: Visual by T. Kobik

DRILLER: J. Burrowbridge

DRILL RIG TYPE: CME - 75

METHOD OF INVESTIGATION: ASTM D1586 using 3.25" I.D. Hollow Stem Augers and Rotary Wash Drilling

All recovered samples will be retained for approximately sixty (60) days, at which time the samples will be desposed of unless directed otherwise.

Trans Tech DRILLING SERVICES

SUBSURFACE EXPLORATION LOG

DATE
START: 9/10/2013
FINISH: 9/10/2013

SHEET 1 OF 1

BORING NO. BB-4
PROJ. NO. G13-3523
SURF. ELEV. G.S.
G.W. DEPTH 17.2'

PROJECT: Proposed Apwan Development
Silo Ridge Country Club

LOCATION: 4651 Route 22
Amenia, New York

DEPTH (ft.)	SAMPLE NO.	0/6	6/12	12/18	18/24	N	REC. (ft.)	SOIL OR ROCK CLASSIFICATION	NOTES
	1	6	11	9	6	20	1.5	Brown Firm Fine-Coarse SAND AND SILT, Trace rock fragments, Moist	3" Topsoil at ground surface
	2	5	5	6	6	11	0.7		
5	3	3	4	5	6	9	1.5	Loose	
	4	6	7	10	7	17	0.8	Brown Very Stiff CLAY AND GRAVEL, Little Fine-Coarse Sand, Moist	
	5	2	5	10	16	15	2.0		
10									
	6	7	19	39	28	58	2.0	Gray Very Compact GRAVEL AND SILT, Some Fine-Coarse Sand, Dry	
15									
	7	15	34	33	40	67	1.5	Gray Very Compact SILT AND GRAVEL, Some Fine-Coarse Sand, Dry	
20									
	8	7	19	26	25	45	1.5	Brown-Gray Compact Fine-Coarse SAND AND GRAVEL, Some Clay, Wet	
25								Boring terminated at a depth of 25.0 feet.	Free standing water was measured at a depth of 23.1' upon completion of drilling and sampling. Bore hole was left open overnight and free standing water was measured at a depth of 17.2' after 24 hours.
30									
35									
40									

N = NO. BLOWS TO DRIVE 2-INCH SPLIT SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFICATION: Visual by T. Kobik

DRILLER: J. Burrowbridge

DRILL RIG TYPE: CME - 75

METHOD OF INVESTIGATION: ASTM D1586 using 3.25" I.D. Hollow Stem Augers

All recovered samples will be retained for approximately sixty (60) days, at which time the samples will be desposed of unless directed otherwise.

DATE
START: 9/10/2013
FINISH: 9/10/2013

SHEET 1 OF 1

Trans Tech DRILLING SERVICES

SUBSURFACE EXPLORATION LOG

BORING NO. **BB-5**
PROJ. NO. G13-3523
SURF. ELEV. G.S.
G.W. DEPTH 14.7'

PROJECT: Proposed Apwan Development
Silo Ridge Country Club

LOCATION: 4651 Route 22
Amenia, New York

DEPTH (ft.)	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	REC. (ft.)	SOIL OR ROCK CLASSIFICATION	NOTES
	/	1	3	2	3	3	5	1.5	POSSIBLE FILL: Brown Medium CLAY AND Fine-Coarse Sand, Little Gravel, Moist	3" Topsoil at ground surface
	/	2	12	15	11	12	26	0.8	POSSIBLE FILL: Brown Firm SILT AND Fine-Coarse SAND, Little Gravel, Dry	
5	/	3	5	8	8	9	16	1.9	Grades to "Little" Fine-Coarse Sand	
	/	4	5	9	8	7	17	0.7	POSSIBLE FILL: Brown Very Stiff CLAY, Some Fine-Coarse Sand, Little Gravel, Moist	
10	/	5	6	9	9	7	18	0.4	Brown Firm SILT AND Fine SAND, Little Gravel, Trace Organics, Moist	
15	/	6	6	16	30	20	46	1.8	Compact, Grades to "Some" Fine Sand, "Trace" Gravel, Dry	
20	/	7	10	16	16	100/0.3	32	1.5	Highly Decomposed Rock, sampled as Dark Gray Fine-Medium SAND, Some Silt, Some rock fragments, Wet	
25									Boring terminated with auger refusal at a depth of 21.0 feet.	Free standing water was measured at a depth of 20.0' upon completion of drilling and sampling. Bore hole was left open overnight and free standing water was measured at a depth of 14.7' after 24 hours.
30										
35										
40										

N = NO. BLOWS TO DRIVE 2-INCH SPLIT SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFICATION: Visual by T. Kobik

DRILLER: J. Burrowbridge

DRILL RIG TYPE: CME - 75

METHOD OF INVESTIGATION: ASTM D1586 using 3.25" I.D. Hollow Stem Augers

All recovered samples will be retained for approximately sixty (60) days, at which time the samples will be desposed of unless directed otherwise.

DATE
START: 9/9/2013
FINISH: 9/9/2013

SHEET 1 OF 1

Trans Tech DRILLING SERVICES

SUBSURFACE EXPLORATION LOG

BORING NO. BB-6
PROJ. NO. G13-3523
SURF. ELEV. G.S.
G.W. DEPTH See Notes

PROJECT: Proposed Apwan Development
Silo Ridge Country Club

LOCATION: 4651 Route 22
Amenia, New York

DEPTH (ft.)	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	REC. (ft.)	SOIL OR ROCK CLASSIFICATION	NOTES
	/	1	3	8	11	12	19	0.9	POSSIBLE FILL: Brown Firm Fine-Coarse SAND AND SILT, Some Gravel, Dry	2" Topsoil at ground surface
	/	2	12	10	11	11	21	1.5	Brown-Gray	
5	/	3	4	10	12	12	22	0.8		
	/	4	10	7	5	4	12	0.4	Grades to "Little" Gravel	
10	/	5	WH	WH	1	1	1	0.3	Brown Very Stiff CLAY, Some Fine-Coarse Sand, Trace Gravel, Trace Organics, Moist	WH = Weight of hammer and drilling rods.
15	/	6	2	3	4	4	7	0.5	Brown Loose Fine-Coarse SAND, Some Gravel, Little Silt, Dry	
20	/	7	49	49	43	32	92	0.4	Very Compact	
25	/	8	4	14	16	17	30	0.4	Dark Gray, Very Compact Grades to "AND" CLAY, "Little" Gravel, Moist	
30									Boring terminated at a depth of 25.0 feet.	Free standing water was not encountered upon completion of drilling and sampling. Bore hole was left open overnight and caved in at a depth of 16.7' after 24 hours.
35										
40										

N = NO. BLOWS TO DRIVE 2-INCH SPLIT SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFICATION: Visual by T. Kobik

DRILLER: J. Burrowbridge

DRILL RIG TYPE: CME - 75

METHOD OF INVESTIGATION: ASTM D1586 using 3.25" I.D. Hollow Stem Augers

All recovered samples will be retained for approximately sixty (60) days, at which time the samples will be desposed of unless directed otherwise.

DATE
START: 9/12/2013
FINISH: 9/12/2013

SHEET 1 OF 1

Trans Tech
DRILLING SERVICES

SUBSURFACE EXPLORATION LOG

BORING NO. **BB-7**
PROJ. NO. G13-3523
SURF. ELEV. G.S.
G.W. DEPTH See Notes

PROJECT: Proposed Apwan Development
Silo Ridge Country Club

LOCATION: 4651 Route 22
Amenia, New York

DEPTH (ft.)	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	REC. (ft.)	SOIL OR ROCK CLASSIFICATION	NOTES
	/	1	2	2	2	2	4	0.5	Brown Medium CLAY AND Fine-Coarse SAND, Little Gravel, Dry	4" Topsoil at ground surface
	/	2	3	4	5	5	9	1.0	Stiff	
5	/	3	2	5	5	6	10	1.3		
	/	4	11	7	6	5	13	0.5		
	/	5	2	6	8	13	14	1.8	Grades to "AND" GRAVEL, "Little" Fine-Coarse Sand	
10										
	/	6	9	22	25	37	46	1.8	Hard	
15										
	/	7	9	17	20	23	37	1.2	Gray Compact SILT AND GRAVEL, Little Fine-Coarse Sand, Dry	
20										
	/	8	43	33	60	63	93	1.0	Highly Decomposed Rock, sampled as Gray Very Compact SILT with rock fragments, Dry	
25									Boring terminated at a depth of 25.0 feet.	Free standing water was not encountered upon completion of drilling and sampling.
30										
35										
40										

N = NO. BLOWS TO DRIVE 2-INCH SPLIT SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFICATION: Visual by T. Kobik

DRILLER: J. Burrowbridge

DRILL RIG TYPE : CME - 75

METHOD OF INVESTIGATION: ASTM D1586 using 3.25" I.D. Hollow Stem Augers

All recovered samples will be retained for approximately sixty (60) days, at which time the samples will be desposed of unless directed otherwise.

DATE
START: 9/11/2013
FINISH: 9/11/2013

SHEET 1 OF 1

Trans Tech DRILLING SERVICES

SUBSURFACE EXPLORATION LOG

BORING NO. **BB-8**
PROJ. NO. G13-3523
SURF. ELEV. G.S.
G.W. DEPTH 12.8'

PROJECT: Proposed Apwan Development
Silo Ridge Country Club

LOCATION: 4651 Route 22
Amenia, New York

DEPTH (ft.)	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	REC. (ft.)	SOIL OR ROCK CLASSIFICATION	NOTES
		1	6	6	5	6	11	0.5	Brown Firm SILT, Some Fine-Medium SAND, Little Gravel, Dry	
		2	6	6	7	6	13	1.1		
5		3	4	6	6	7	12	0.6	Grades to "Some" Gravel	
		4	4	2	2	4	4	1.1	Loose, Grades to "Little" Gravel, Moist	
10		5	10	9	17	17	26	1.9	Firm, Dry	
15		6	5	12	14	14	26	1.0	Brown Firm GRAVEL, Some Clay, Some Fine-Coarse Sand, Wet	Driller noted "wet" soil layer at a depth of 15 feet.
20		7	5	10	9	12	19	0.8	Grades to "AND" Fine-Coarse SAND	REF = Sample spoon refusal
		8	100/0.4				REF	0.2	Dark Gray Weathered Rock	
25									Boring terminated with auger refusal at a depth of 24.0 feet.	Free standing water was measured at a depth of 12.8' upon completion of drilling and sampling.
30										
35										
40										

N = NO. BLOWS TO DRIVE 2-INCH SPLIT SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFICATION: Visual by T. Kobik

DRILLER: J. Burrowbridge DRILL RIG TYPE : CME - 75

METHOD OF INVESTIGATION: ASTM D1586 using 3.25" I.D. Hollow Stem Augers

All recovered samples will be retained for approximately sixty (60) days, at which time the samples will be desposed of unless directed otherwise.

DATE
START: 9/11/2013
FINISH: 9/11/2013

SHEET 1 OF 1

Trans Tech DRILLING SERVICES

SUBSURFACE EXPLORATION LOG

BORING NO. BB-9
PROJ. NO. G13-3523
SURF. ELEV. G.S.
G.W. DEPTH 12.8'

PROJECT: Proposed Apwan Development
Silo Ridge Country Club

LOCATION: 4651 Route 22
Amenia, New York

DEPTH (ft.)	SAMPLE NO.	0/6	6/12	12/18	18/24	N	REC. (ft.)	SOIL OR ROCK CLASSIFICATION	NOTES
	1	2	3	4	4	7	0.5	Brown Loose Fine-Coarse SAND AND CLAY, Some Gravel, Trace Organics, Moist	4" Topsoil at ground surface
	2	3	3	3	4	6	0.8	Grades to "AND" SILT, "Trace" Clay	
5	3	2	3	3	4	6	0.8	Contains rock fragments, Dry	
	4	5	8	11	7	19	0.5	Firm	
10	5	3	6	19	39	25	1.0	Highly Decomposed Rock, sampled as Gray Firm SILT with rock fragments, Dry	
15	6	6	9	22	25	31	1.2	Compact	
	7	100/0.1				REF	0.1	Very Compact	REF = Sample spoon refusal
20								Boring terminated with auger refusal at a depth of 19.5 feet.	Free standing water was not encountered upon completion of drilling and sampling.
25									
30									
35									
40									

N = NO. BLOWS TO DRIVE 2-INCH SPLIT SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFICATION: Visual by T. Kobik

DRILLER: J. Burrowbridge   DRILL RIG TYPE: CME - 75

METHOD OF INVESTIGATION: ASTM D1586 using 3.25" I.D. Hollow Stem Augers

All recovered samples will be retained for approximately sixty (60) days, at which time the samples will be desposed of unless directed otherwise.

DATE
START: 9/9/2013
FINISH: 9/10/2013

SHEET 1 OF 1

Trans Tech DRILLING SERVICES

SUBSURFACE EXPLORATION LOG

BORING NO. **BB-10**
PROJ. NO. G13-3523
SURF. ELEV. G.S.
G.W. DEPTH See Notes

PROJECT: Proposed Apwan Development, Silo Ridge Country Club
LOCATION: 4651 Route 22, Amenia, New York

DEPTH (ft.)	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	REC. (ft.)	SOIL OR ROCK CLASSIFICATION	NOTES
	/	1	4	8	10	12	1.5	0.5	POSSIBLE FILL: Brown Firm Fine-Coarse SAND, Some Gravel, Some Silt, Trace Organics, Dry	3" Topsoil at ground surface
	/	2	4	6	6	7	12	0.5		Driller noted boulders at a depth of 2'.
5	/	3	4	6	5	7	11	0.9	Brown Firm SILT, Little Fine Sand, Trace Organics, Dry	
	/	4	7	6	3	5	9	0.5	Loose, Grades to "Little" Gravel, "Little" Rock Fragments	
	/	5	7	12	11	12	23	1.0	Highly Decomposed Rock, sampled as Gray Firm SILT with rock fragments, Dry	
10										
	/	6	11	18	15	16	33	1.5		
15										Driller noted boulder at a depth of 17'.
	/	7	100/0.5				REF	0.3	Sampled as Dark Gray Fine-Coarse SAND, Wet	REF = Sample spoon refusal
20									Boring terminated with auger refusal at a depth of 19.5 feet.	Free standing water was not encountered upon completion of drilling and sampling.
25										
30										
35										
40										

N = NO. BLOWS TO DRIVE 2-INCH SPLIT SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFICATION: Visual by T. Kobik

DRILLER: J. Burrowbridge

DRILL RIG TYPE: CME - 75

METHOD OF INVESTIGATION: ASTM D1586 using 3.25" I.D. Hollow Stem Augers

All recovered samples will be retained for approximately sixty (60) days, at which time the samples will be desposed of unless directed otherwise.

DATE
START: 9/11/2013
FINISH: 9/11/2013

SHEET 1 OF 1

Trans Tech DRILLING SERVICES

SUBSURFACE EXPLORATION LOG

BORING NO. BB-11
PROJ. NO. G13-3523
SURF. ELEV. G.S.
G.W. DEPTH See Notes

PROJECT: Proposed Apwan Development
Silo Ridge Country Club

LOCATION: 4651 Route 22
Amenia, New York

DEPTH (ft.)	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	REC. (ft.)	SOIL OR ROCK CLASSIFICATION	NOTES
	/	1	4	6	7	9	13	1.0	Brown Firm Fine-Coarse SAND, Some Gravel, Some Silt, Dry	1" Topsoil
	/	2	9	13	14	14	27	0.6		
5	/	3	6	12	9	8	21	1.0	Grades to "AND" GRAVEL	
	/	4	17	16	26	28	42	0.6	Gray, Compact, Grades to "Little" Silt, "Little" rock fragments	
10	/	5	12	28	39	41	67	1.2	Highly Decomposed Rock, sampled as Dark Gray Very Compact Rock Fragments	
15	/	6	59	45	56	100/0.4	101	1.5	Sampled as Brown-Gray Very Compact SILT with Rock Fragments	
	/	7	100/0.3				REF	0.2	Dark Gray	REF = Sample spoon refusal
20									Boring terminated with auger refusal at a depth of 20.0 feet.	Free standing water was not encountered upon completion of drilling and sampling.
25										
30										
35										
40										

N = NO. BLOWS TO DRIVE 2-INCH SPLIT SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFICATION: Visual by T. Kobik

DRILLER: J. Burrowbridge

DRILL RIG TYPE : CME - 75

METHOD OF INVESTIGATION: ASTM D1586 using 3.25" I.D. Hollow Stem Augers

All recovered samples will be retained for approximately sixty (60) days, at which time the samples will be desposed of unless directed otherwise.

DATE
START: 9/17/2013
FINISH: 9/17/2013

SHEET 1 OF 1

Trans Tech DRILLING SERVICES

SUBSURFACE EXPLORATION LOG

BORING NO. BB-12
PROJ. NO. G13-3523
SURF. ELEV. G.S.
G.W. DEPTH See Notes

PROJECT: Proposed Apwan Development, Silo Ridge Country Club

LOCATION: 4651 Route 22, Amenia, New York

DEPTH (ft.)	SAMPLES	SAMPLE NO.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	REC. (ft.)	SOIL OR ROCK CLASSIFICATION	NOTES
	/	1	5	12	15	20	27	0.3	Brown Firm Fine-Coarse SAND, Some Gravel, Some Silt, Dry	1" Topsoil
	/	2	28	33	36	41	69	1.0	Gray Very Compact GRAVEL AND Fine-Coarse Sand, Little Silt, Cobbles, Dry	
5	/	3	41	45	49	16	94	1.0	Highly Decomposed Rock, sampled as Light Gray Very Compact Rock Fragments with Little Silt, Dry	
	/	4	23	88	72	45	160	0.8		
	/	5	7	36	44	50/0.1	REF	0.6		REF = Sample spoon refusal
10										
									Boring terminated with auger refusal at a depth of 11.0 feet.	Free standing water was not encountered upon completion of drilling and sampling.
15										
20										
25										
30										
35										
40										

N = NO. BLOWS TO DRIVE 2-INCH SPLIT SPOON 12-INCHES WITH A 140 LB. PIN WT. FALLING 30-INCHES PER BLOW

CLASSIFICATION: Visual by T. Kobik

DRILLER: J. Burrowbridge

DRILL RIG TYPE : CME - 75

METHOD OF INVESTIGATION: ASTM D1586 using 3.25" I.D. Hollow Stem Augers

All recovered samples will be retained for approximately sixty (60) days, at which time the samples will be desposed of unless directed otherwise.

Trans Tech
GEOTECHNICAL SERVICES

1594 State Street
Schenectady, NY 12304
Phone (518) 372-4067
Fax (518) 372-6739

TEST PIT LOG

DATE: 9/13/13

PROJECT: Apwan Development

TEST PIT NO.: DT-1

GROUND ELEV.: NA

PROJECT NO.: G13-3523

INSPECTOR: Tod Kobik, P.E.

WEATHER: Sunny, Warm

EXCAVATION EQUIPMENT: Backhoe

DEPTH (Feet)	SOIL DESCRIPTION	NOTES
0 - 0.5'	Topsoil	
0.5' - 3.0'	Brown Fine-Coarse GRAVEL AND SAND, Some Clayey Silt, Moist	No groundwater was observed.
3.0' - 11.0'	Gray Fine-Coarse GRAVEL AND SAND, Trace Silt, Moist	

Trans Tech
GEOTECHNICAL SERVICES

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Schenectady, NY 12304
Phone (518) 372-4067
Fax (518) 372-6739

TEST PIT LOG

DATE: 9/13/13

PROJECT: Apwan Development

TEST PIT NO.: DT-2

GROUND ELEV.: NA

PROJECT NO.: G13-3523

INSPECTOR: Tod Kobik, P.E.

WEATHER: Sunny, Warm

EXCAVATION EQUIPMENT: Backhoe

DEPTH (Feet)	SOIL DESCRIPTION	NOTES
0 - 1.0'	Dark Brown Fine-Coarse SAND AND Clayey SILT with organics, Moist	
1.0' - 1.7'	Brown Fine-Coarse SAND AND Clayey Silt, Little Gravel, Moist	Groundwater was present at a depth of 7.5 feet.
1.7' - 8.0'	Gray Fine-Coarse GRAVEL AND SAND, Cobbles, Trace Silt, Moist	

Trans Tech
GEOTECHNICAL SERVICES

1594 State Street
Schenectady, NY 12304
Phone (518) 372-4067
Fax (518) 372-6739

TEST PIT LOG

DATE: 9/13/13

PROJECT: Apwan Development

TEST PIT NO.: DT-3

GROUND ELEV.: NA

PROJECT NO.: G13-3523

INSPECTOR: Tod Kobik, P.E.

WEATHER: Sunny, Warm

EXCAVATION EQUIPMENT: Backhoe

DEPTH (Feet)	SOIL DESCRIPTION	NOTES
0 - 1.3'	Dark Brown Fine-Coarse SAND AND Clayey SILT with organics, Moist	
1.3' - 2.3'	Brown Fine-Coarse SAND AND Clayey Silt, Little Gravel, Moist	Groundwater was present at a depth of 6.5 feet.
2.3' - 5.3'	Gray Fine-Coarse GRAVEL AND SAND, Cobbles, Trace Silt, Moist	
5.5' - 7.5'	Gray Silty CLAY, Wet	

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Schenectady, NY 12304
Phone (518) 372-4067
Fax (518) 372-6739

TEST PIT LOG

DATE: 9/13/13

PROJECT: Apwan Development

TEST PIT NO.: DT-4

GROUND ELEV.: NA

PROJECT NO.: G13-3523

INSPECTOR: Tod Kobik, P.E.

WEATHER: Sunny, Warm

EXCAVATION EQUIPMENT: Backhoe

DEPTH (Feet)	SOIL DESCRIPTION	NOTES
0 - 0.7'	Topsoil	
0.7' - 9.5'	Gray Fine-Coarse GRAVEL AND SAND, Trace-Little Silt, Moist	No groundwater was observed.

Trans Tech
GEOTECHNICAL SERVICES

1594 State Street
Schenectady, NY 12304
Phone (518) 372-4067
Fax (518) 372-6739

TEST PIT LOG

DATE: 9/13/13

PROJECT: Apwan Development

TEST PIT NO.: DT-5

GROUND ELEV.: NA

PROJECT NO.: G13-3523

INSPECTOR: Tod Kobik, P.E.

WEATHER: Sunny, Warm

EXCAVATION EQUIPMENT: Backhoe

DEPTH (Feet)	SOIL DESCRIPTION	NOTES
0 - 0.6'	Topsoil	
0.6' - 11.3'	Gray Fine-Coarse GRAVEL AND SAND, Some Cobbles, Trace Silt, Moist	No groundwater was observed.

Trans Tech
GEOTECHNICAL SERVICES

1594 State Street
Schenectady, NY 12304
Phone (518) 372-4067
Fax (518) 372-6739

TEST PIT LOG

DATE: 9/13/13

PROJECT: Apwan Development

TEST PIT NO.: DT-6

GROUND ELEV.: NA

PROJECT NO.: G13-3523

INSPECTOR: Tod Kobik, P.E.

WEATHER: Sunny, Warm

EXCAVATION EQUIPMENT: Backhoe

DEPTH (Feet)	SOIL DESCRIPTION	NOTES
0 - 0.5'	Topsoil	
0.5' - 9.7'	Gray Fine-Coarse GRAVEL AND SAND, Some Cobbles, Trace Silt, Moist.	No groundwater was observed. A vein of Fine-Coarse SAND was present to a depth of 4.5' in west side of test pit.

EXAMPLE KEY TO SUBSURFACE EXPLORATION LOGS

DATE
START: XX/XX/XX
FINISH: XX/XX/XX
SHEET X OF X

Trans Tech DRILLING SERVICES

PROJ. NO. XX-XXXX
HOLE NO. X-X
SURF. ELEV. XXX.X'
G.W. DEPTH X.X'

PROJECT: PROJECT NAME
PROJECT NAME

LOCATION: PROJECT LOCATION
PROJECT LOCATION

DEPTH (ft)	SAMPLES	SAMPLE No.	BLOWS ON SAMPLER 0/6	6/12	12/18	18/24	N	RECOVERY (ft)	SOIL OR ROCK CLASSIFICATION	NOTES
0		1	3	3	4	8	7	1.0	3" TOPSOIL Brown SILT, some Sand, trace clay, ML (Moist-Loose)	Groundwater at 10' upon completion, and 5' 24 hrs. after completion
		2	50/.5				50/.5	NR	Gray SHALE, medium hard, weathered, thin bedded, some fractures	
5										Run#1, 3.5'-6.0' 95% Recovery 50% RQD

① ② ③ ④ ⑤ ⑥ ⑦ *(numbered features explained on reverse)* ⑧ ⑨ ⑩

TABLE I

Split Spoon Sample	
Shelby Tube Sample	
Geoprobe Macro-Core	
Auger or Test Pit Sample	
Rock Core	

TABLE II

Identification of soil type is made on basis of an estimate of particle sizes, and in the case of fine grained soils also on basis of plasticity.

Soil Type	Soil Particle Size	
Boulder	>12"	Coarse Grained (Granular)
Cobble	3" - 12"	
Gravel - Coarse	3" - 3/4"	
- Fine	3/4" - #4	
Sand - Coarse	#4 - #10	
- Medium	#10 - #40	
- Fine	#40 - #200	
Silt - Non Plastic (Granular) Clay - Plastic (Cohesive)	<#200	Fine Grained

TABLE III

The following terms are used in classifying soils consisting of mixtures of two or more soil types. The estimate is based on weight of total sample.

Term	Percent of Total Sample
"and"	35 - 50
"some"	20 - 35
"little"	10 - 20
"trace"	less than 10

(When sampling gravelly soils with a standard split spoon, the true percentage of gravel is often not recovered due to the relatively small sampler diameter.)

TABLE IV

The relative compactness or consistency is described in accordance with the following terms:

Granular Soils Term	Blows per Foot, N	Cohesive Soils Term	Blows per Foot, N
Very Loose	0 - 4	Very Soft	0 - 2
Loose	4 - 10	Soft	2 - 4
Firm	10 - 30	Medium	4 - 8
Compact	30 - 50	Stiff	8 - 15
Very Compact	>50	Very Stiff	15 - 30
		Hard	>30

(Large particles in the soils will often significantly influence the blows per foot recorded during the penetration test)

TABLE V

Varved	Horizontal uniform layers or seams of soil(s).
Layer	Soil deposit more than 6" thick.
Seam	Soil deposit less than 6" thick.
Parting	Soil deposit less than 1/8" thick.
Laminated	Irregular, horizontal and angled seams and partings of soil(s).

TABLE VI

Rock Classification Term		Meaning
Hardness	- Soft	Scratched by fingernail
	- Medium Hard	Scratched easily by penknife
	- Hard	Scratched with difficulty by penknife
	- Very Hard	Cannot be scratched by penknife
Weathering	- Very Weathered - Weathered - Sound	Judged from the relative amounts of disintegration, iron staining, core recovery, clay seams, etc.

Rock Classification Term		Meaning	
Bedding	- Laminated	(<1")	Natural breaks in Rock Layers
	- Thin Bedded	(1" - 4")	
	- Bedded	(4" - 12")	
	- Thick Bedded	(12" - 36")	
	- Massive	(>36")	

(Fracturing refers to natural breaks in the rock oriented at some angle to the rock layers)

GENERAL INFORMATION & KEY TO SUBSURFACE LOGS

The Subsurface Logs attached to this report present the general observations and mechanical data collected by the driller at the site, supplemented by classificiation of the material removed from the borings as determined through visual identification by technicians in the laboratory. It is cautioned that the materials removed from the borings represent only a small fraction of the soils at the site and may not be representative of subusurface conditions between and/or away from the boring locations or betweeen the sampled intervals. The data presented on the Subsurface Logs along with the recovered samples provide a basis for estimating the engineering characteristics of the soils at the site. The evaluation must consider all the recorded details and their relative significance to the project. It is common that evaluation of standard subsurface data indicates the need for additional testing and/or sampling to more accurately evaluate the subsurface conditions. Any evaluation of the data presented on the Subsurface Logs must be performed by qualified professionals. The following information defines some of the procedures and terms used on the Subsurface Logs to describe the conditions encountered. The paragraph numbers below correspond to the numbered features identified on the opposite page.

1. The figures in the Depth column define the scale of the Subsurface Log.

2. The Samples column shows a graphical representation of the depth and type of sampling performed. See Table I for descriptions of the symbols used to represent the various types of samples.

3. The Sample No. is used for identification on sample containers and laboratory test reports.

4. Blows on Sampler - shows the results of the "Standard Penetration Test" (SPT), recording the number of blows required to drive a split spoon sampler into the soil. The number of blows required to drive the sampler for each six inch increment is recorded. The first six inches of penetration is considered a seating drive. The sum of the number of blows required for the second and third six inch increments is termed the penetration resistance, N. The outside diameter of the sampler, hammer weight and length of drop are noted at the bottom of the Subsurface Log.

5. Recovery - Shows the length of the recovered sample.

6. All recovered soil samples are reviewed in the laboratory by an engineering technician or geotechnical engineer, unless noted otherwise. Visual descriptions are made on the basis of a combination of the driller's field descriptions and noted observations together with the sample as received in the laboratory. The method of visual classification is based primarily on the Unified Soil Classificiation System (ASTM D 2487) with regard to the particle size and plasticity (See Table No. II), and the Unified Soil Classification group symbols for the soil types are sometimes included with the soil classification. Additionally, the relative portion, by weight, of two or more granular soil types is described in accordance with "Suggested Methods of Test for Identification of Soils" by D.M. Burmister, ASTM Special Technical Publication 479, June 1970, (See Table No. III). Description of the relative soil density or consistency is based upon the penetration records as defined in Table No. IV. The description of the soil moisture is based upon the relative wetness of the soil as recovered and is decribed as dry, moist, wet or saturated. Water introduced into the boring either naturally or during drilling may have affected the moisture condition of the recovered samples. Special terms are used as required to describe soil deposition in greater detail; several such terms are listed in Table V. When sampling gravelly soils with a standard two inch diameter split spoon sampler, the true percentage of gravel is often not recovered due to the relatively small samper diameter. The presence of boulders and large gravel is sometimes, but not necessarily, detected by an evaluation of the sampler blows or through the action of the drill rig as reported by the driller.

7. Rock descriptions are based on review of the recovered rock core samples and the driller's notes. Typical rock classification terms are included in Table VI.

8. The stratification lines represent the approximate boundary between soil types and the transition may be gradual. Solid stratification lines delineate apparent changes in soil type, based upon review of recovered soil samples and the driller's notes. Dashed lines indicate a lesser degree of certainty with respect to either a change in soil type or where such a change may occur.

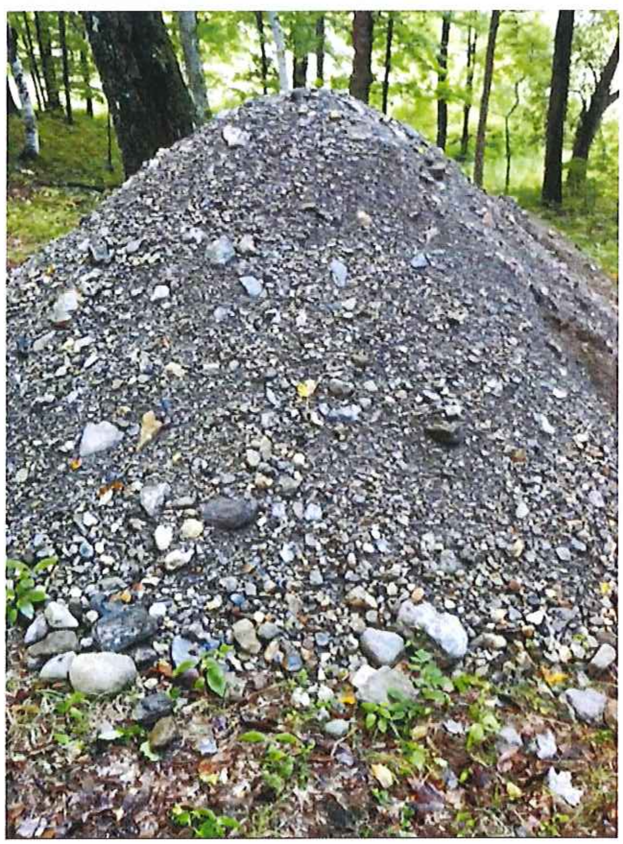
9. Miscellaneous observations and procedures noted by the driller are shown in this column, including water level observations. It is important to understand that the reliability of the water observations depends upon the soil type (water level does not readily stabilize in a bore hole through fine grained soils), and that any drill water used to advance the boring may have influenced the observations. Typically, the ground water level will fluctuate with seasonal changes in precipitation patterns. One or more perched or trapped water levels may exist in the ground seasonally. Generally, it is prudent to install a groundwater observation well to better define water levels.

10. The length of core run is defined as the length of penetration of the core barrel. Core recovery is the length of core recovered divided by the core run length. The Rock Quality Designation (RQD) is the total length of pieces of recovered core exceeding 4 inches divided by the core run length. The size of the core barrel used is also noted.

APPENDIX B

TEST PIT PHOTOS

Test Pit DT-1



Test Pit DT-1 Spoil Pile

Test Pit DT-2, Note Standing Water

Test Pit DT-2 Spoil Pile

Test Pit DT-3, Note Standing Water & Clay Soil Layer

Test Pit DT-3 Spoil Pile

Test Pit DT-4

Test Pit DT-4 Spoil Pile

Test Pit DT-5

Test Pit DT-5 Spoil Pile

Test Pit DT-6

Test Pit DT-6, Note Vein of Fine-Coarse Sand in Side of Excavation

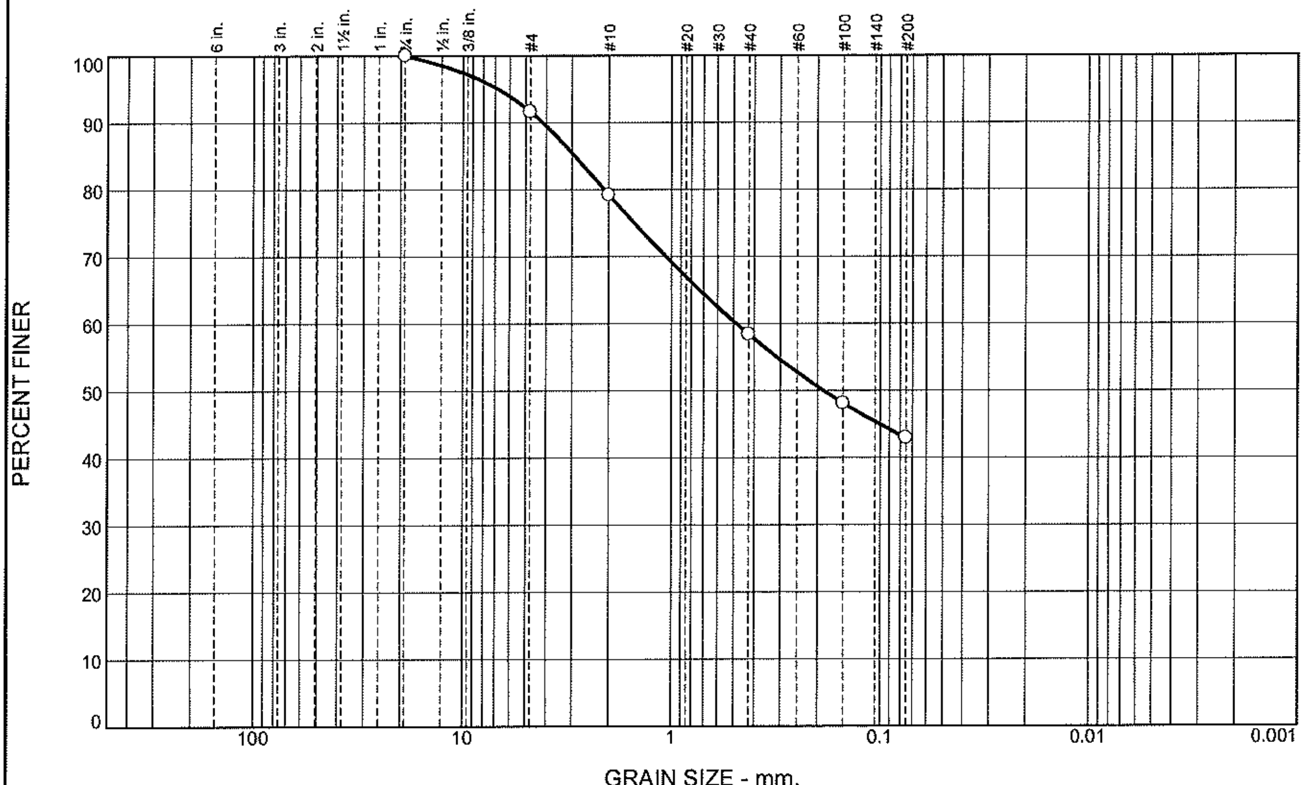
Apwan Development
October 14, 2013

Test Pit DT-6 Spoil Pile

APPENDIX C

LABORATORY TEST RESULTS

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	8.4	12.4	20.8	15.5	42.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
#4	91.6		
#10	79.2		
#40	58.4		
#100	48.1		
#200	42.9		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 4.1604 D_{85}= 2.9160 D_{60}= 0.4878
D_{50}= 0.1870 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Water Content: 16.8 %

Location: B-1, S-1, 2 - 4'
Sample Number: S-2 **Depth:** 2-4' **Date:** 10/11/13

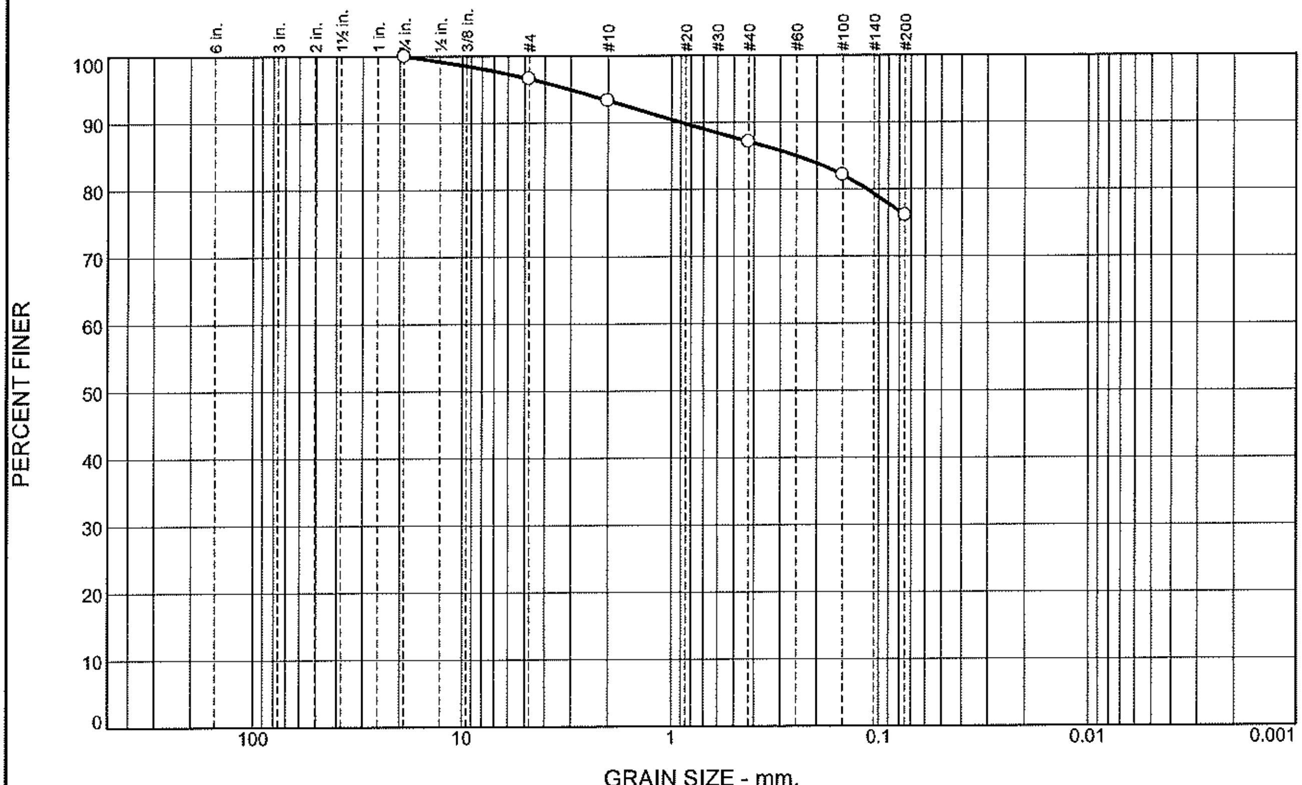
QCQA Laboratories, Inc.

Schenectady, NY

Client: VHB
Project: APWAN Development - Silo Ridge

Project No: G13-3523 **Figure** B1/S2

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.4	3.3	6.2	11.0	76.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
#4	96.6		
#10	93.3		
#40	87.1		
#100	82.1		
#200	76.1		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.8906 D_{85}= 0.2508 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Water Content: 18.4 %

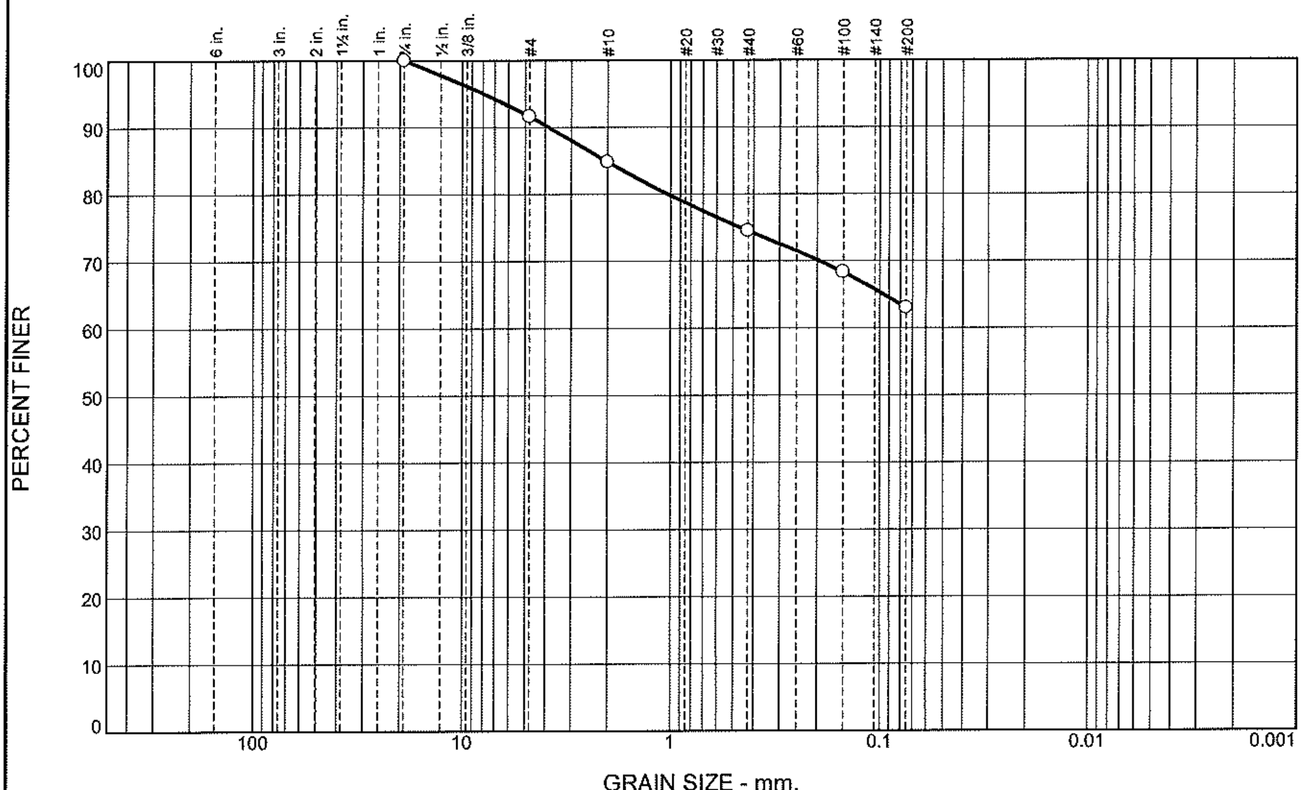
Location: B-1, S-3, 4 - 6'
Sample Number: S-3 **Depth:** 4-6' **Date:** 10/11/13

QCQA Laboratories, Inc.

Schenectady, NY

Client: VHB
Project: APWAN Development - Silo Ridge
Project No: G13-3523 **Figure** B1/S3

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	8.4	6.8	10.3	11.5	63.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
#4	91.6		
#10	84.8		
#40	74.5		
#100	68.3		
#200	63.0		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 3.8447 D_{85}= 2.0520 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Water Content: 15.4 %

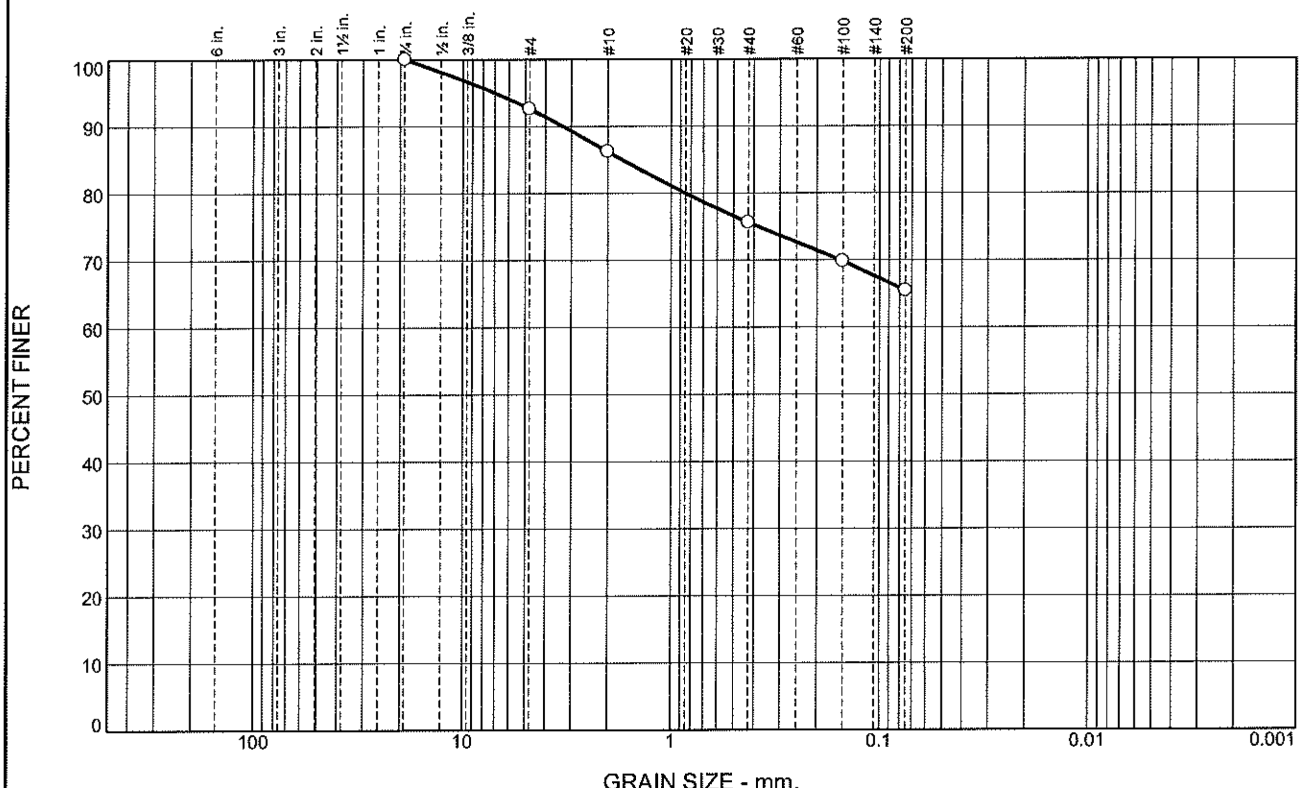
Location: B-2, S-3, 4 - 6'
Sample Number: S-3 **Depth:** 4-6' **Date:** 10/11/13

QCQA Laboratories, Inc.

Schenectady, NY

Client: VHB
Project: APWAN Development - Silo Ridge
Project No: G13-3523 **Figure** B2/S3

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.4	6.4	10.6	10.2	65.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
#4	92.6		
#10	86.2		
#40	75.6		
#100	69.8		
#200	65.4		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 3.2936 D_{85}= 1.7065 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Water Content: 16.2 %

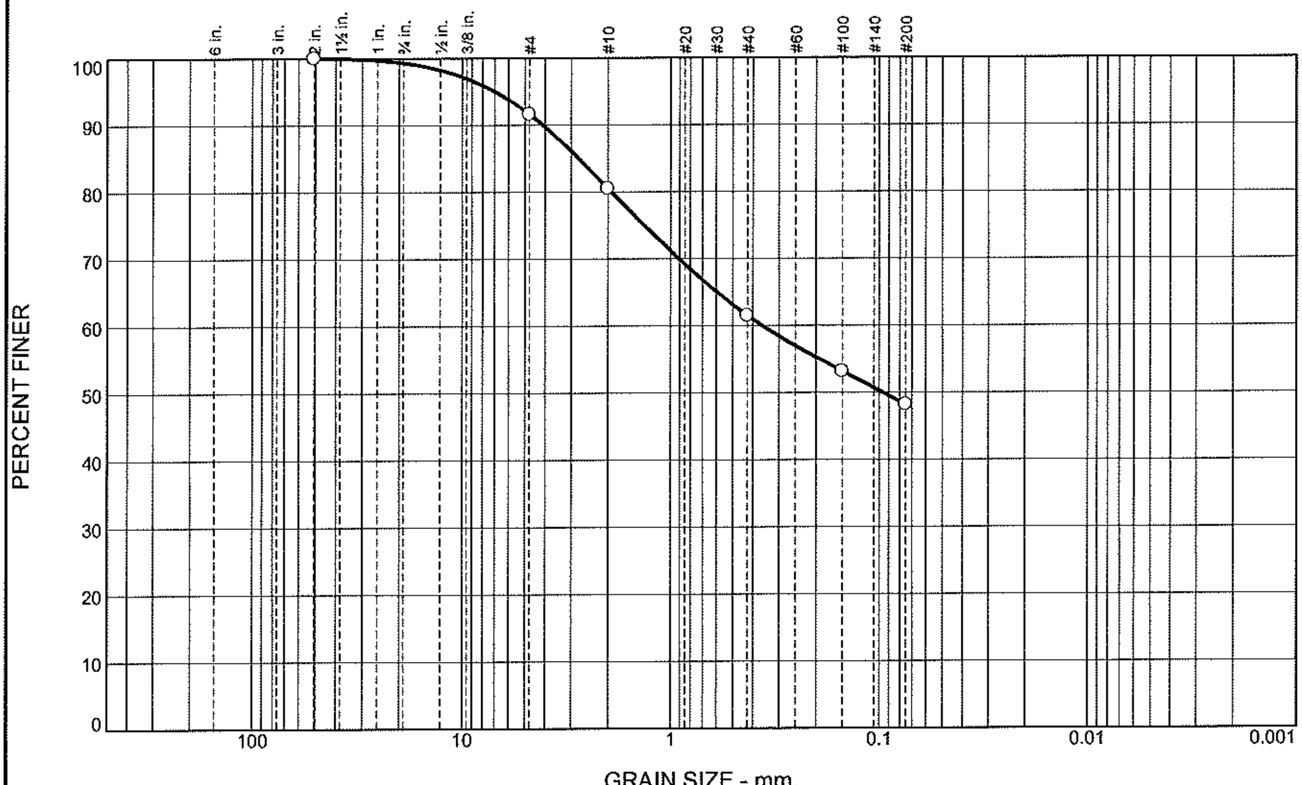
Location: B-2, S-4, 6 - 8'
Sample Number: S-4 **Depth:** 6-8' **Date:** 10/11/13

QCQA Laboratories, Inc.

Schenectady, NY

Client: VHB
Project: APWAN Development - Silo Ridge
Project No: G13-3523 **Figure** B2/S4

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.7	7.7	11.1	19.0	13.3	48.2	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100.0		
#4	91.6		
#10	80.5		
#40	61.5		
#100	53.2		
#200	48.2		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 4.1081 D_{85}= 2.7708 D_{60}= 0.3613
D_{50}= 0.0962 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Water Content: 12.8 %

Location: B-4, S-2, 2 - 4'
Sample Number: S-2 **Depth:** 2-4'

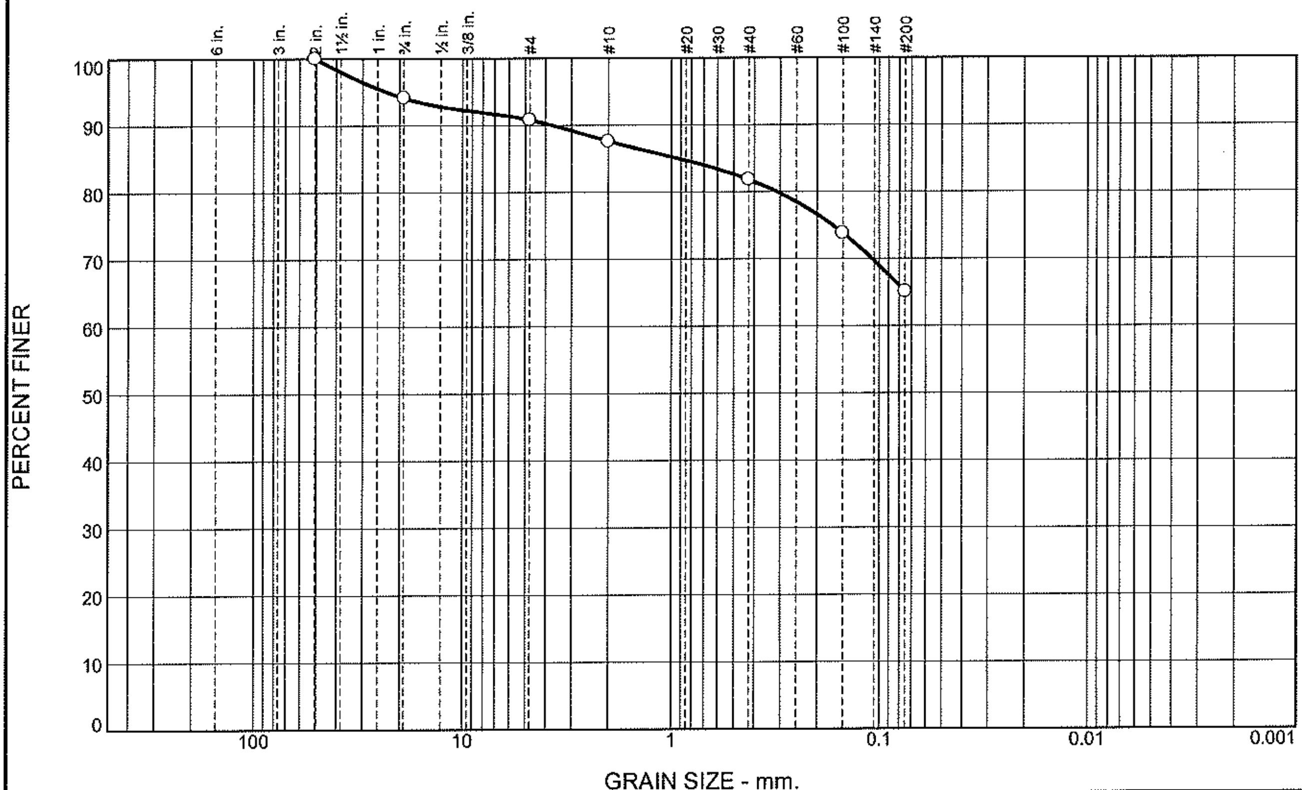
Date: 10/11/13

QCQA Laboratories, Inc.

Schenectady, NY

Client: VHB
Project: APWAN Development - Silo Ridge
Project No: G13-3523 **Figure** B4/S2

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	5.9	3.3	3.2	5.8	16.7	65.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100.0		
.75	94.1		
#4	90.8		
#10	87.6		
#40	81.8		
#100	73.8		
#200	65.1		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 3.7141 D_{85}= 0.9293 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Water Content: 17.9 %

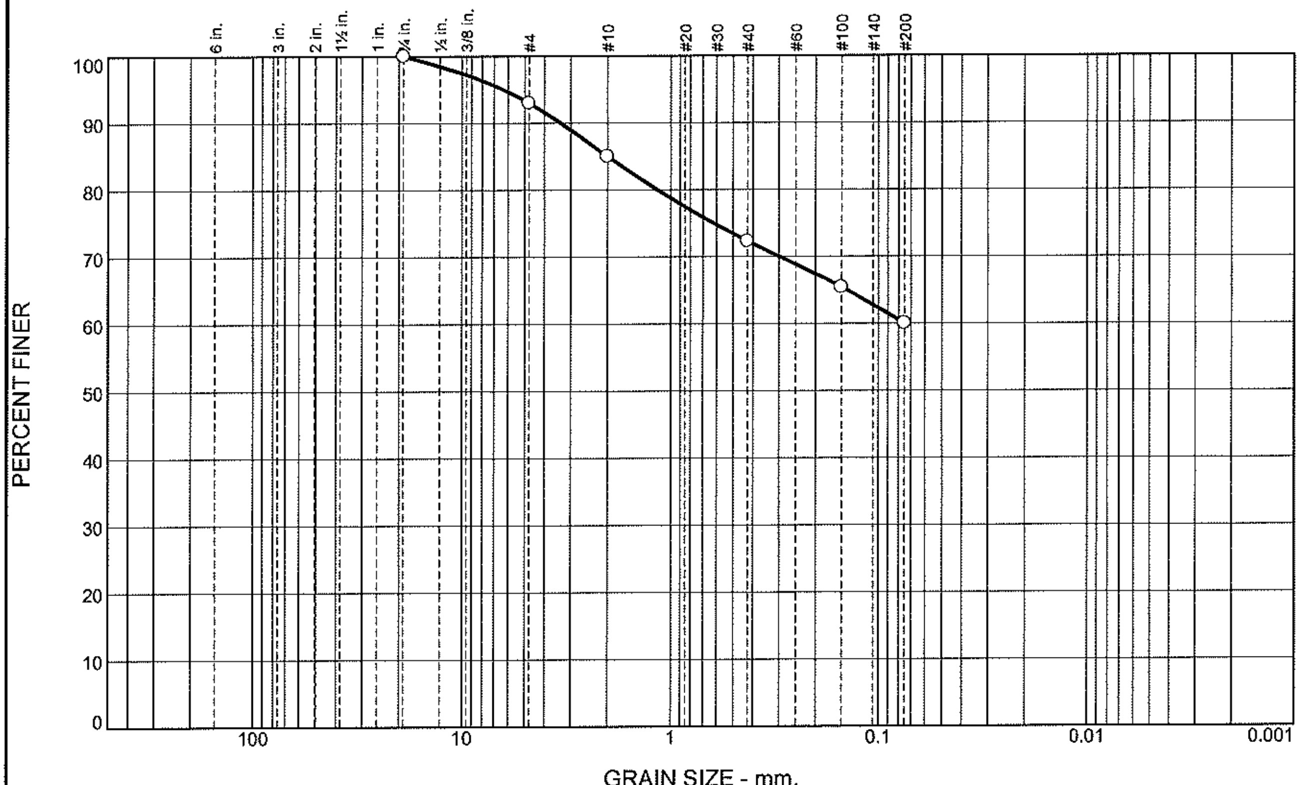
Location: B-5, S-6, 14 - 16'
Sample Number: S-6 **Depth:** 14-16' **Date:** 10/11/13

QCQA Laboratories, Inc.

Schenectady, NY

Client: VHB
Project: APWAN Development - Silo Ridge
Project No: G13-3523 **Figure** B5/S6

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.0	8.0	12.7	12.3	60.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
#4	93.0		
#10	85.0		
#40	72.3		
#100	65.4		
#200	60.0		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 3.3572 D_{85}= 2.0000 D_{60}= 0.0750
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Water Content: 16.7 %

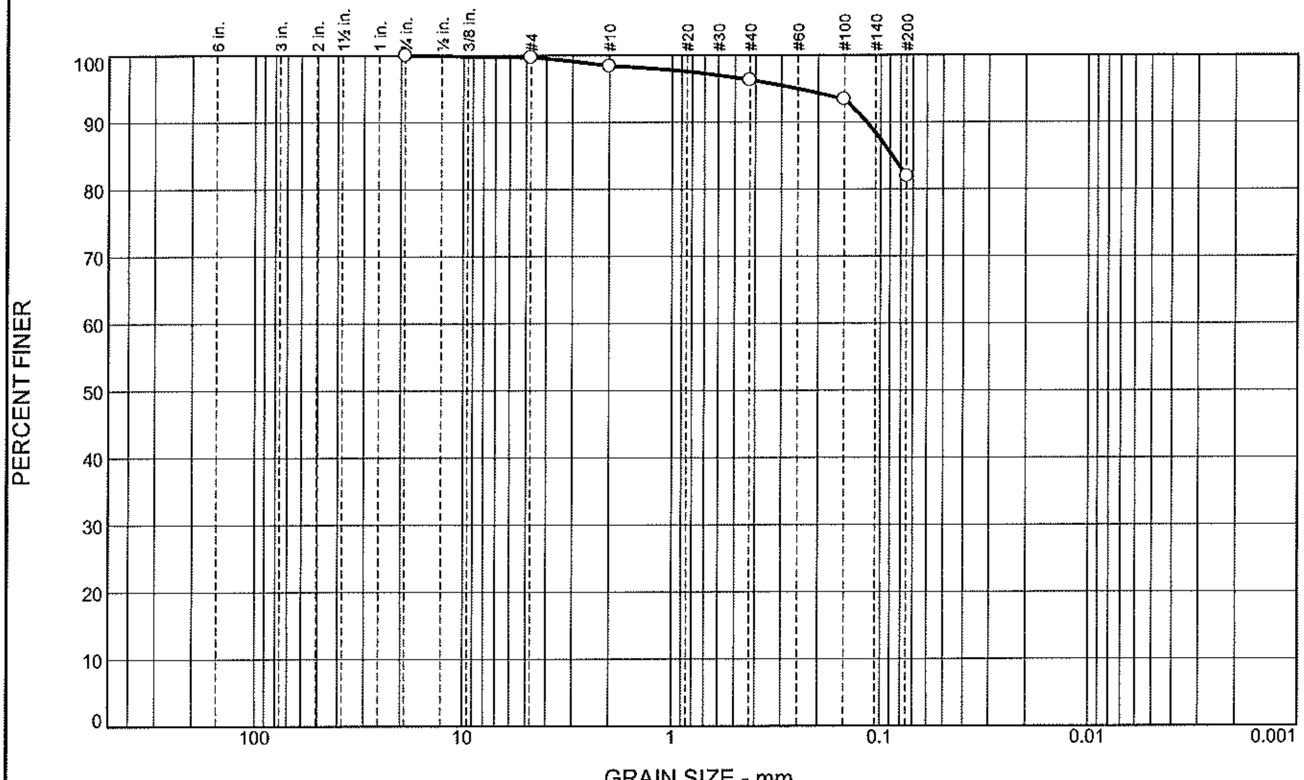
Location: B-6, S-5, 8 - 10'
Sample Number: S-5 **Depth:** 8-10 **Date:** 10/11/13

QCQA Laboratories, Inc.

Schenectady, NY

Client: VHB
Project: APWAN Development - Silo Ridge
Project No: G13-3523 **Figure** B6/S5

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.3	1.3	2.1	14.4	81.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
#4	99.7		
#10	98.4		
#40	96.3		
#100	93.4		
#200	81.9		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1168 D_{85}= 0.0881 D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Water Content: 22.6 %

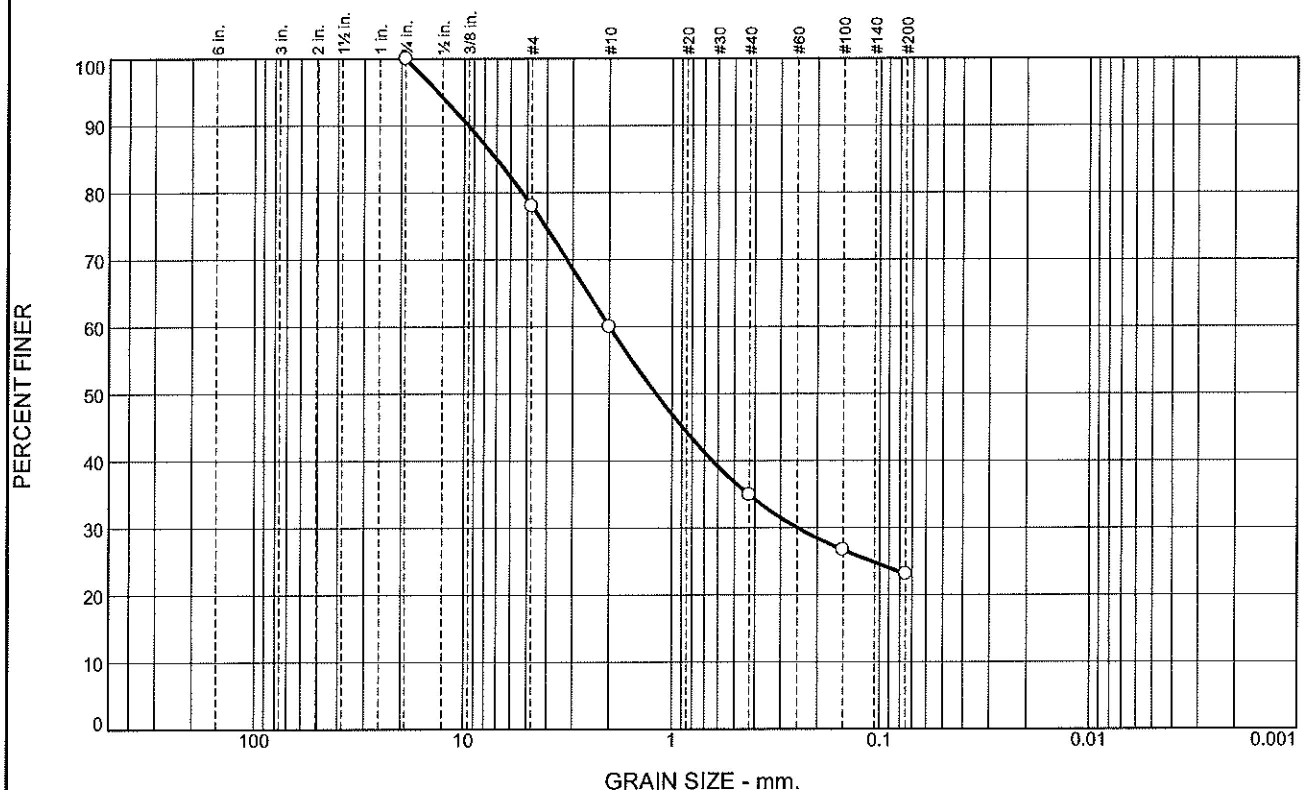
Location: B-10, S-3, 4 - 6'
Sample Number: S-3 **Depth:** 4-6' **Date:** 10/11/13

QCQA Laboratories, Inc.

Schenectady, NY

Client: VHB
Project: APWAN Development - Silo Ridge
Project No: G13-3523 **Figure** B10/S3

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	22.0	18.0	25.1	11.8	23.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
#4	78.0		
#10	60.0		
#40	34.9		
#100	26.7		
#200	23.1		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 9.5727 D_{85}= 7.0101 D_{60}= 2.0000
D_{50}= 1.1914 D_{30}= 0.2487 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Water Content: 5.1 %

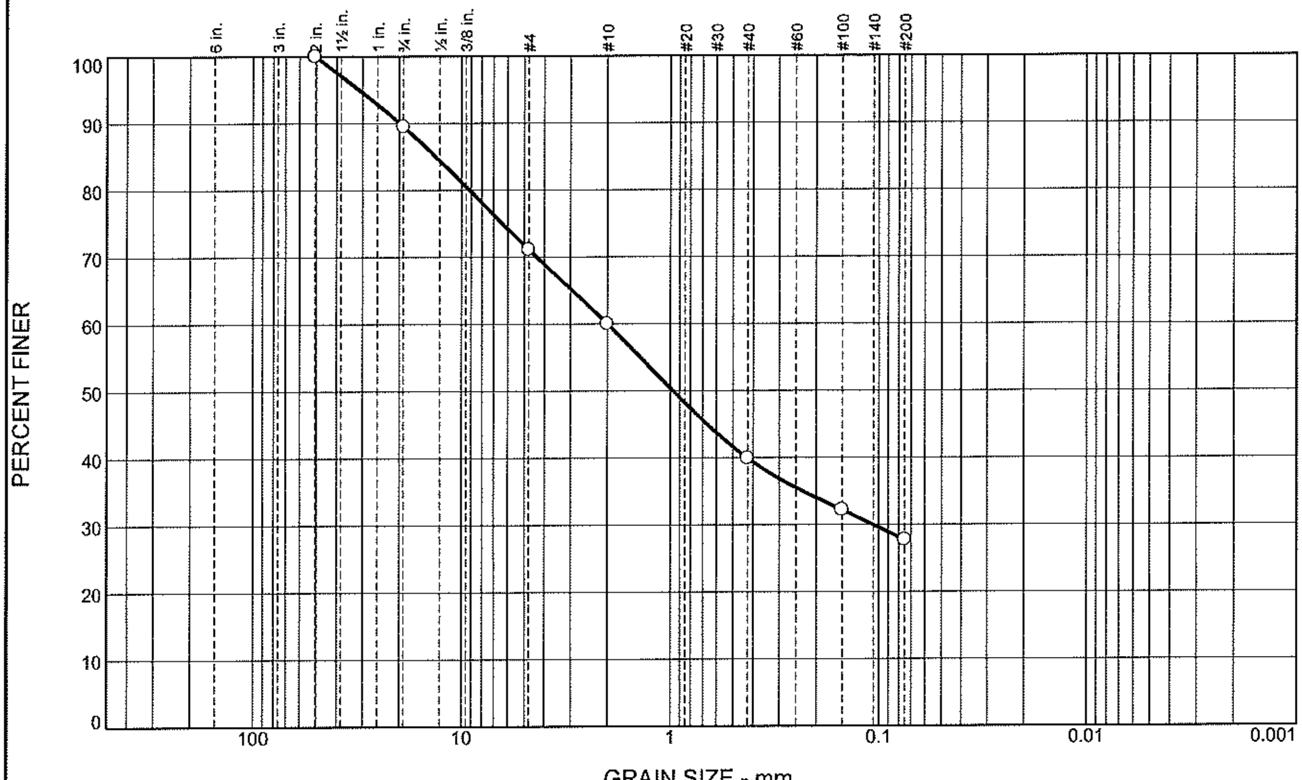
Location: B-11, S-2, 2 - 4'
Sample Number: S-2 **Depth:** 2 - 4' **Date:** 10/11/13

QCQA Laboratories, Inc.

Schenectady, NY

Client: VHB
Project: APWAN Development - Silo Ridge
Project No: G13-3523 **Figure** B11/S2

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	10.5	18.4	11.1	20.1	12.2	27.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
2	100.0		
.75	89.5		
#4	71.1		
#10	60.0		
#40	39.9		
#100	32.2		
#200	27.7		

* (no specification provided)

Soil Description

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 19.8675 D_{85}= 13.3223 D_{60}= 2.0000
D_{50}= 0.9720 D_{30}= 0.1065 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

Water Content: 7.4 %

Location: B-12, S-1, 0 - 2'
Sample Number: S-1 **Depth:** 0-2' **Date:** 10/11/13

QCQA Laboratories, Inc.

Schenectady, NY

Client: VHB
Project: APWAN Development - Silo Ridge
Project No: G13-3523 **Figure** B12/S1

APPENDIX D

FILL MATERIAL AND PLACEMENT RECOMMENDATIONS

FILL MATERIAL AND PLACEMENT RECOMMENDATIONS

I. Fill Material Recommendations

A. Subbase Stone

The subbase stone course placed as the aggregate course beneath slab-on-grade and pavement construction should consist of a crusher run stone meeting the material and gradation requirements of New York State Department of Transportation (NYSDOT), Standard Specifications, Item 304.12 – Type 2 Subbase Course (Item 304.14 could also be used beneath pavement construction).

B. Structural Fill

Structural Fill should consist of a well graded crusher-run stone or bank-run sand and gravel, which is free of clay, expansive shale, organics and friable or deleterious particles. Imported Structural Fill should also conform to the following gradation requirements.

Sieve Size	Percent Finer by Weight
3 inch	100
¼ inch	25-85
No. 40	5-50
No. 200	0-10

C. Drainage Stone

Drainage Stone should consist of a blend of crusher run stone or crushed gravel meeting the material and gradation requirements of NYSDOT, Standard Specifications Section 703-02, Size Designations No. 1 and No. 2 (½-inch and 1-inch washed gravel or stone).

D. Pervious Granular Backfill

Pervious Granular Backfill should consist of a free draining granular fill, which meets the minimum requirements of NYSDOT, Standard Specifications Section 703-07, Concrete Sand, with 100 percent passing 3/8 inch sieve to maximum of 3 percent passing a No. 200 sieve.

E. General Fill

General Fill may be used for backfill in non-loaded areas outside of foundation, structure and slab-on-grade areas. General Fill may consist of on-site or imported soils, which are free of topsoil, organics, debris and deleterious materials and are of a moisture content suitable for proper compaction.

II. Fill Placement and Compaction Recommendations

All controlled fill placed beneath foundations, structures, utilities, slab-on-grade and pavement construction should be compacted to a minimum of 95 percent of the maximum dry density as measured by the modified Proctor test (ASTM D1557), or as directed by the geotechnical engineer. Fill placed in non-loaded grass areas can be compacted to a minimum of 90 percent of the maximum dry density (ASTM D1557).

Placement of fill should not exceed a maximum loose lift thickness of 6 to 9 inches and should be reduced in conjunction with the compaction equipment used so that the required density is attained.

Fill should have a moisture content within two percent of the optimum moisture content prior to compaction. Subgrades should be properly drained and protected from moisture and frost. Placement of fill on frozen subgrades is not acceptable. It is recommended that all fill placement and compaction be monitored and tested by qualified geotechnical personnel.

III. Quality Assurance Testing

The following minimum laboratory and field quality assurance testing frequencies are recommended to confirm fill material quality and post placement and compaction conditions. These minimum frequencies are based on generally uniform material properties and placement conditions. Should material properties vary or conditions at the time of placement vary (i.e. moisture content, placement and compaction, procedures or equipment, etc.), then additional testing is recommended. Additional testing, if required, should be determined by qualified geotechnical personnel based on evaluation of the actual fill material and construction conditions.

A. Laboratory Testing of Material Properties

- Moisture content (ASTM D-2216) - 1 test per 4000 cubic yards or no less than 2 tests per each material type.
- Grain Size Analysis (ASTM D-422) - 1 test per 4000 cubic yards or no less than 2 tests per each material type.
- Modified Proctor Moisture Density Relationship (ASTM D-1557) 1 test per 4000 cubic yards or no less than 1 test per each material type.

B. <u>Field In-Place Moisture/Density Testing (ASTM D D-6938)</u>

- Backfilling along trenches and foundation walls - 1 test per 50 lineal feet per lift.
- Backfilling Isolated Excavations (i.e. column foundations) - 1 test per lift.
- Filling in open areas for slab-on-grade and pavement construction - 1 test per 2500 square feet per lift.

APPENDIX E

INFORMATION REGARDING THIS GEOTECHNICAL ENGINEERING REPORT

Trans Tech

IMPORTANT INFORMATION REGARDING THIS GEOTECHNICAL ENGINEERING REPORT

Transtech Engineering Services, P.C. (TransTech), has endeavored to prepare this report in accordance with generally accepted geotechnical engineering principles and practices. Geotechnical engineering analyses and evaluations are based partly on judgment and opinion, and are therefore far less exact than other engineering disciplines. Accordingly, TransTech believes that providing the report user with information regarding the preparation and limitations of this report will aid in the proper interpretation and implementation of the conclusions and recommendations presented in this report. The following information is provided in an effort to reduce potential geotechnical-related delays, cost over-runs and other problems that can develop during the design and construction process.

SCOPE OF SERVICES: The scope of this report is limited to the specific items identified in TransTech's Proposal for services for this project. The scope of services is limited to a geotechnical engineering evaluation of the conditions disclosed by the subsurface exploration and does not include any geoenvironmental assessment or investigation for the presence, absence or prevention of any hazardous or toxic materials or conditions (or mold) in the soil, groundwater or surface water within or beyond the project site. Unanticipated environmental problems can lead to significant project cost over-runs and TransTech recommends that the Owner retain a geoenvironmental consultant to discuss risk management guidance.

PROJECT-SPECIFIC FACTORS: The conclusions and recommendations presented in this report were prepared based on project-specific factors described in the report, such as the size, loading, type of construction and intended use of the structure; the location of the structure on the site; planned structure elevation(s) and site grading; other planned or existing site improvements, such as access roads, parking lots, underground utilities; and any other pertinent project information. Changes to the project details may alter the factors considered in development of the report conclusions and recommendations. As such, TransTech cannot accept responsibility or liability for problems that may develop if we are not consulted regarding any changes to the project-specific factors that were assumed during preparation of the report.

SUBSURFACE CONDITIONS: The subsurface exploration program for this project consisted of sampling only at discrete test locations. TransTech has used judgment to infer the subsurface conditions between the discrete test locations. The conclusions and recommendations presented in this report were based on the subsurface conditions disclosed/inferred at and between the discrete test locations at the time the subsurface exploration program was performed. We point out that surface and subsurface conditions at the site are subject to change subsequent to preparation of this report. Such changes may include floods, earthquakes, groundwater fluctuations, and construction activities at the site and/or adjoining properties. It should be understood that the actual subsurface conditions could vary from the conditions inferred by TransTech between and away from the discrete test locations, which could be revealed during construction. As such, TransTech should be retained during construction to confirm that the subsurface conditions are consistent with the conditions disclosed by the subsurface exploration program, and to refine our conclusions and recommendations in the event that the subsurface conditions differ from those disclosed by the subsurface exploration program.

USE OF THIS GEOTECHNICAL ENGINEERING REPORT: This report has been prepared for the exclusive use of our client, and any other parties specifically identified in the report, for specific application to the site and project-specific conditions described in the report. This report should not be applied to any other site or project, or for any uses other than those originally intended without TransTech's consent.

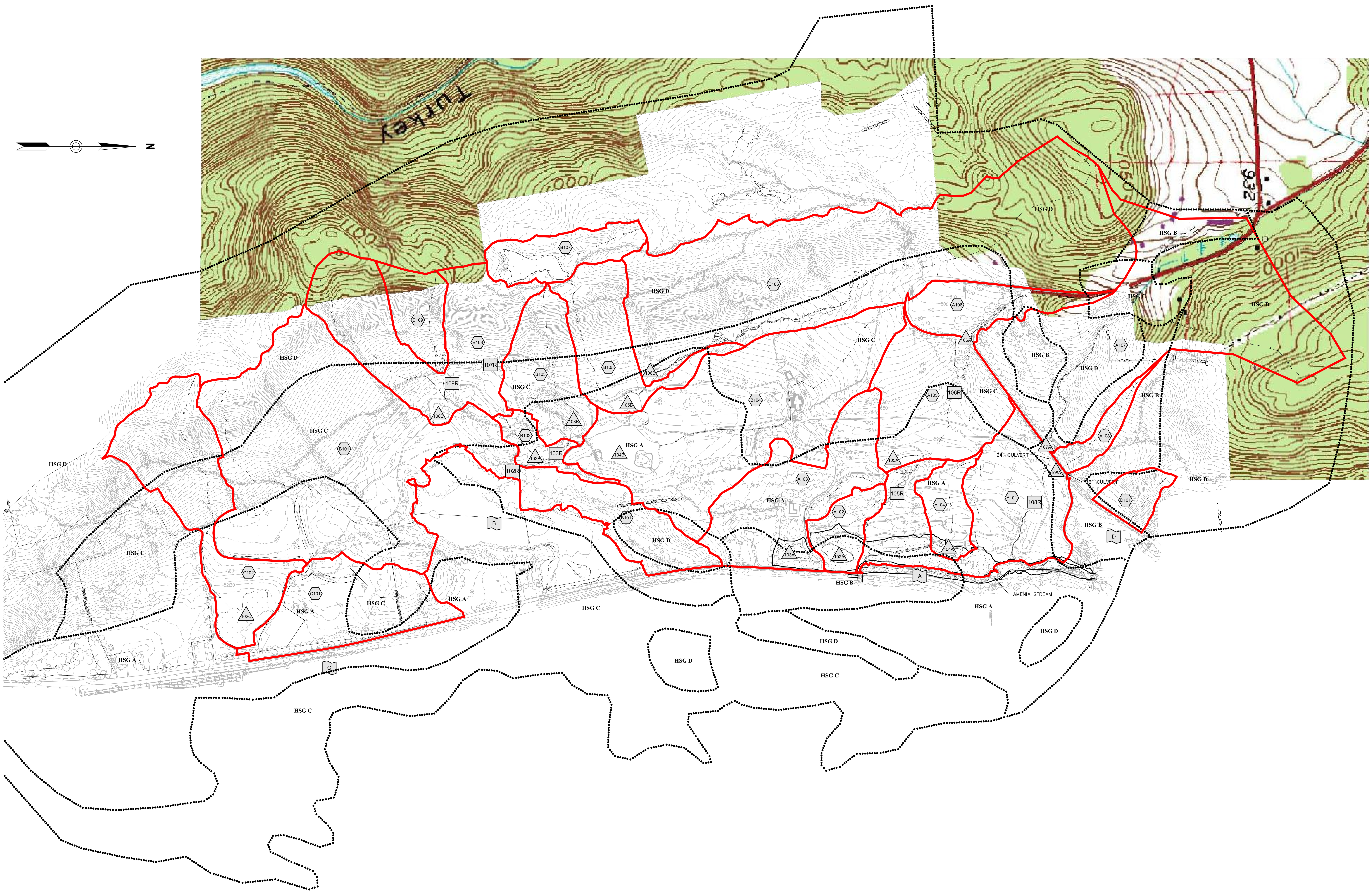
MISINTERPRETATION OF THIS REPORT: The conclusions and recommendations presented in this report are subject to misinterpretation by the design team and contractors, which can result in costly problems. The risk of misinterpretation by the design team can be reduced by having appropriate members of the design team confer with TransTech regarding the conclusions and recommendations presented in this report prior to completing the plans and specifications. In addition, TransTech should be retained to review pertinent elements of the design team's final plans and specifications prior to bidding to confirm that the recommendations presented in this report have been properly interpreted and applied. The risk of misinterpretation by contractors can be reduced by retaining TransTech to attend prebid and preconstruction conferences, and to provide construction observation.

COMPONENTS OF THIS REPORT: Subsurface exploration logs, figures, tables and any other report components are subject to misinterpretation if they are separated from this report. This may occur if copies of the boring logs or other report components are given to the contractors during the bid preparation process. To minimize this risk, report components should not be separated from the report and only complete copies of this report should be distributed as appropriate.

ALTERATION OF THIS REPORT: It is a violation of Section 7209 Subdivision 2 of the New York State Education Law for any person to alter this report in any way, except under the direction of a licensed professional engineer.

■

Attachment E
Drainage Drawings and Calculations (See attached CD)



VHB
Engineering, Surveying & Landscape Architecture, P.C.
Planning
Transportation
Land Development
Environmental Services
50 Main Street - Suite 360
White Plains, NY 10606
914.761.3582 • FAX 914.761.3582

Symbol	Description
# (hexagon)	Drainage Area
red line	Drainage Area Boundary
# (triangle)	Detention Basin/Pond
# (square)	Reach
#	Discharge Point
dashed arrow	Tc Path
HSG dotted line	Soil Boundary

No.	Revision	Date	Appvd

Designed by | Drawn by | Checked by
CAD checked by | Approved by
Scale 1"=400' | Date February 18, 2014

Project Title
Silo Ridge Resort Community

4651 Route 22
Amenia, New York

Issued for
Permitting

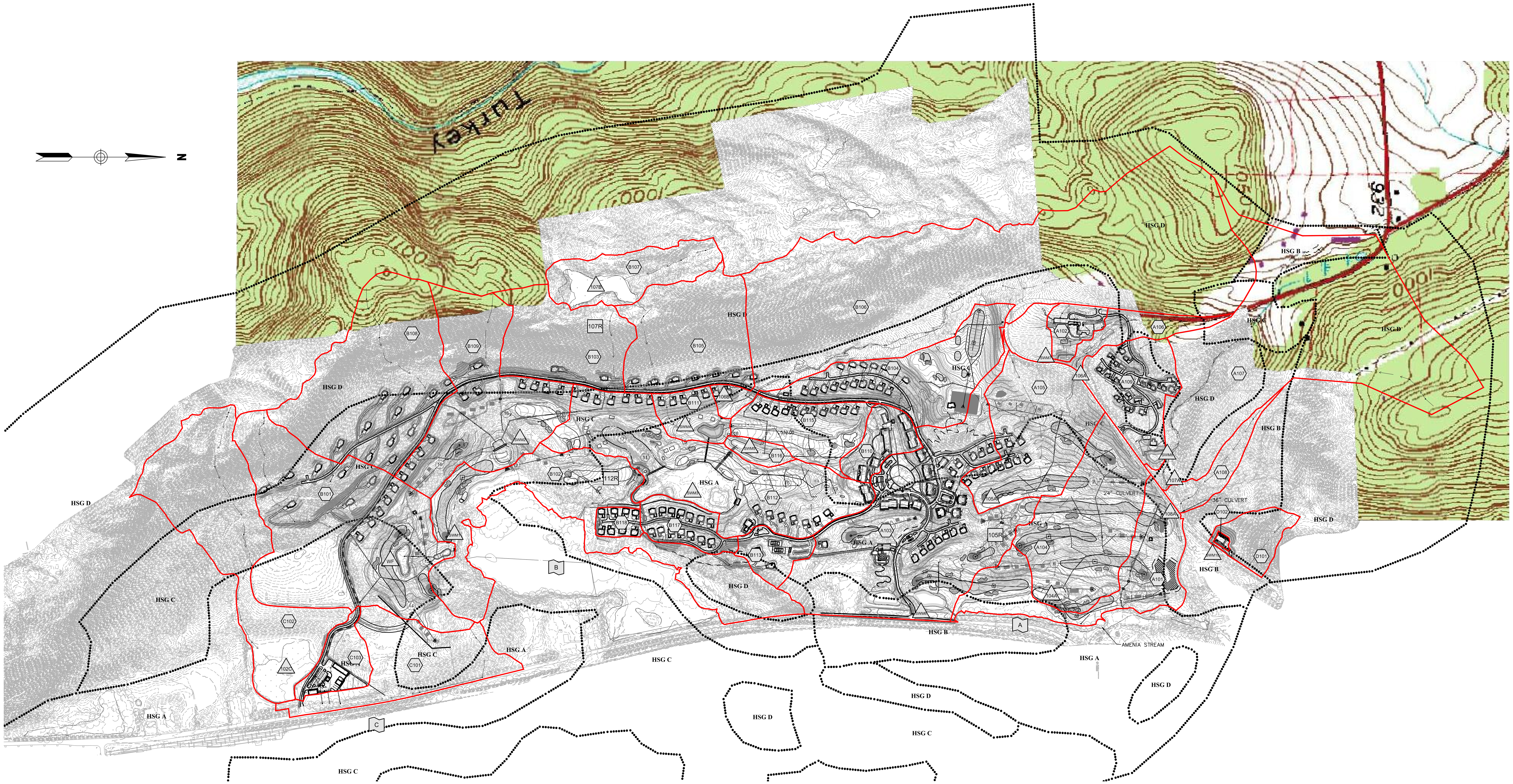
Not Approved for Construction

Drawing Title
Existing Conditions Drainage Area Map

Drawing Number
Fig. 1

Sheet 1 of 1

Project Number
29011.00



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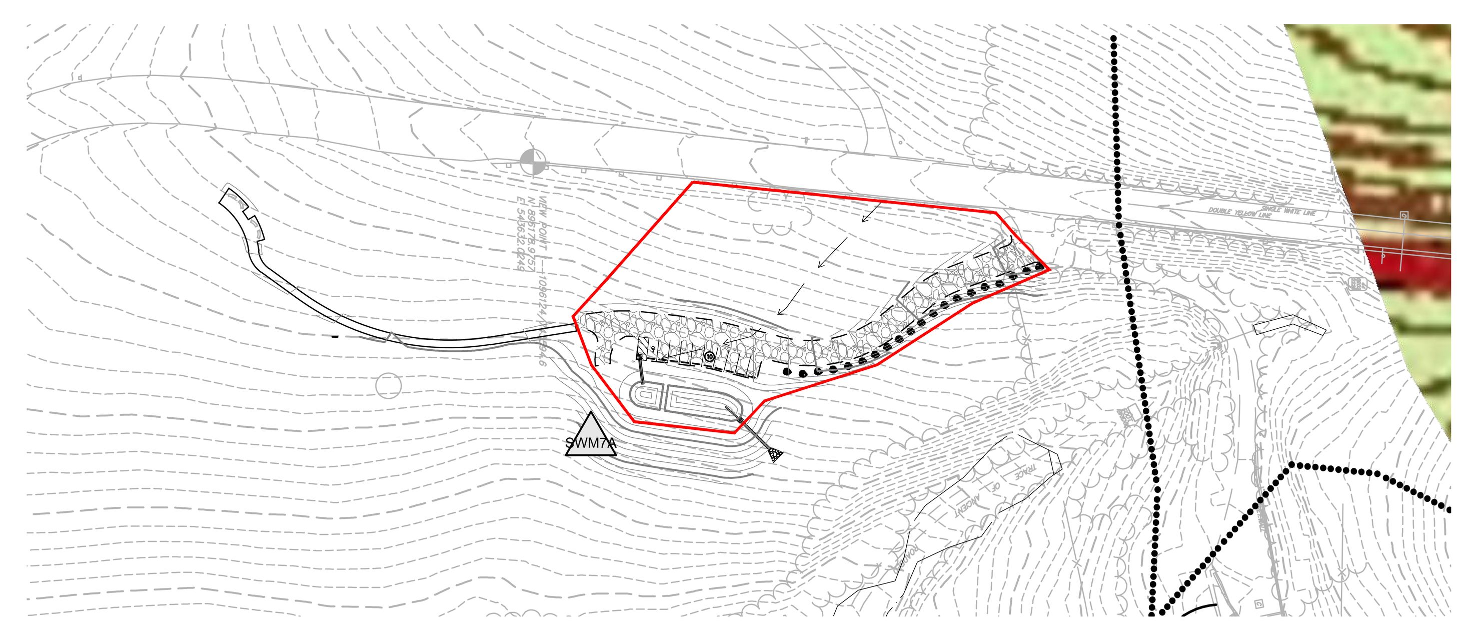
SCALE IN FEET



Phase 1 Overlook

N

100 0 100 200
SCALE IN FEET

VHB

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Planning
Transportation
Land Development
Environmental Services

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White Plains, NY 10606
914.761.3582 • FAX 914.761.3582

Symbol	Description
# (hexagon)	Drainage Area
(red line)	Drainage Area Boundary
# (triangle)	Detention Basin/Pond
# (square)	Reach
#	Discharge Point
(arrow line)	Tc Path
HSG (dotted line)	Soil Boundary

No.	Revision	Date	Appvd.
1	PER TOWN COMMENTS	6/19/14	ACD

Designed by | Drawn by | Checked by
CAD checked by | Approved by
Scale AS NOTED | Date February 18, 2014

Project Title
Silo Ridge Resort Community

4651 Route 22
Amenia, New York

Issued for
Permitting

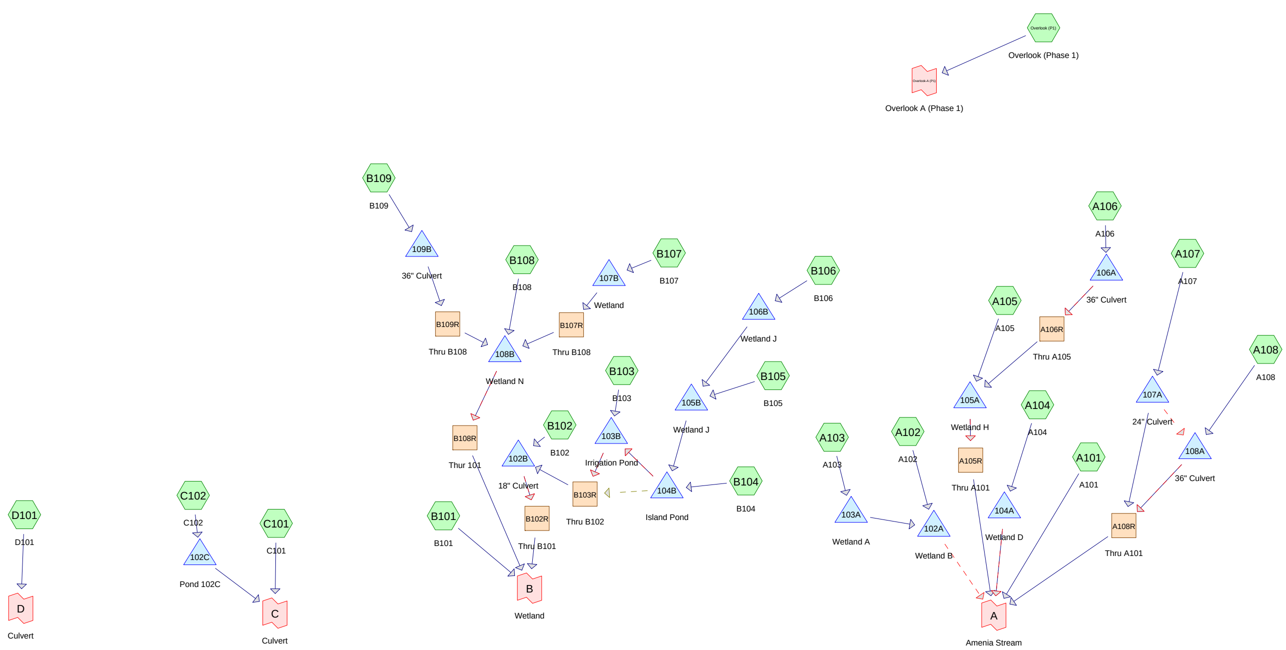
Not Approved for Construction

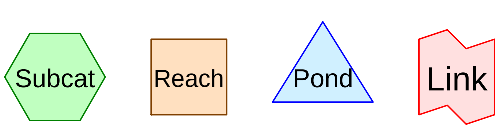
Drawing Title
Proposed Conditions Drainage Area Map

Drawing Number
Fig. 2

Sheet 1 of 1

Project Number
29011.00





Routing Diagram for 29011.00 Existing OS

Prepared by VHB Engineering,Surveying and Landscape Architecture P.C, Printed 7/2/2014

HydroCAD® 10.00 s/n 01038 © 2013 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
170.428	39	>75% Grass cover, Good, HSG A (A101, A102, A103, A104, A105, B101, B102, B103, B104, B105, B106, C101, C102)
26.805	61	>75% Grass cover, Good, HSG B (A101, A102, A103, A104, A106, A107, A108, B106)
137.826	74	>75% Grass cover, Good, HSG C (A101, A103, A105, A106, A107, B101, B102, B103, B104, B105, B106, B108, B109, C101, C102, Overlook (P1))
11.938	80	>75% Grass cover, Good, HSG D (A103, A106, A107, B101, B103, B105, B106, B107, B108, C102)
1.220	98	Building roof (A103, A106, A107, A108, B101, B104, B106)
6.869	96	Gravel surface (A101, A103, A105, A106, A107, A108, B101, B102, B103, B104, B105, B106, B107, B108, C101, C102)
18.932	98	Paved surface (A101, A102, A103, A104, A105, A106, A107, B101, B102, B103, B104, B105, B106, B108, B109, C101)
1.027	98	Rock Outcrop/Ledge (C101, C102)
0.441	30	Sand Trap, HSG C (A103, B101, B102, B103, B104, B108)
0.757	30	Sand trap, HSG A (A101, A102, A103, A104, A105, B104, B105, B106)
0.031	30	Sand trap, HSG B (A101, A102)
10.757	98	Water Surface (A101, A102, A103, A104, A107, A108, B101, B103, B104, B105, B106, C102)
27.787	30	Woods, Good, HSG A (A101, A102, A103, A104, A105, A106, B101, B102, B104, B106, C101, C102)
15.395	55	Woods, Good, HSG B (A101, A103, A104, A107, A108)
81.217	70	Woods, Good, HSG C (A101, A103, A105, A106, A107, B101, B103, B104, B105, B106, B108, B109, C101, C102, Overlook (P1))
279.023	77	Woods, Good, HSG D (A103, A106, A107, B101, B103, B104, B105, B106, B107, B108, B109, C102, D101)
790.453	**66**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
198.972	HSG A	A101, A102, A103, A104, A105, A106, B101, B102, B103, B104, B105, B106, C101, C102
42.231	HSG B	A101, A102, A103, A104, A106, A107, A108, B106
219.484	HSG C	A101, A103, A105, A106, A107, B101, B102, B103, B104, B105, B106, B108, B109, C101, C102, Overlook (P1)
290.961	HSG D	A103, A106, A107, B101, B103, B104, B105, B106, B107, B108, B109, C102, D101
38.805	Other	A101, A102, A103, A104, A105, A106, A107, A108, B101, B102, B103, B104, B105, B106, B107, B108, B109, C101, C102
790.453		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
170.428	26.805	137.826	11.938	0.000	346.997	>75% Grass cover, Good	A101, A102, A103, A104, A105, A106, A107, A108, B101, B102, B103, B104, B105, B106, B107, B108, B109, C101, C102, Overlook (P1)
0.000	0.000	0.000	0.000	1.220	1.220	Building roof	A103, A106, A107, A108, B101, B104, B106
0.000	0.000	0.000	0.000	6.869	6.869	Gravel surface	A101, A103, A105, A106, A107, A108, B101, B102, B103, B104, B105, B106, B107, B108, C101, C102

Ground Covers (all nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	18.932	18.932	Paved surface	A101, A102, A103, A104, A105, A106, A107, B101, B102, B103, B104, B105, B106, B108, B109, C101
0.000	0.000	0.000	0.000	1.027	1.027	Rock Outcrop/Ledge	C101, C102
0.000	0.000	0.441	0.000	0.000	0.441	Sand Trap	A103, B101, B102, B103, B104, B108
0.757	0.031	0.000	0.000	0.000	0.788	Sand trap	A101, A102, A103, A104, A105, B104, B105, B106
0.000	0.000	0.000	0.000	10.757	10.757	Water Surface	A101, A102, A103, A104, A107, A108, B101, B103, B104, B105, B106, C102

Ground Covers (all nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
27.787	15.395	81.217	279.023	0.000	403.422	Woods, Good	A101, A102, A103, A104, A105, A106, A107, A108, B101, B102, B103, B104, B105, B106, B107, B108, B109, C101, C102, D101, Overlook (P1)
198.972	**42.231**	**219.484**	**290.961**	**38.805**	**790.453**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	102A	501.90	500.90	80.0	0.0125	0.013	24.0	0.0	0.0
2	102B	492.20	491.10	20.0	0.0550	0.025	18.0	0.0	0.0
3	103A	500.90	501.90	80.0	-0.0125	0.013	24.0	0.0	0.0
4	104A	507.70	507.30	20.0	0.0200	0.025	12.0	0.0	0.0
5	104B	508.22	505.43	111.0	0.0251	0.025	24.0	0.0	0.0
6	105A	572.90	572.00	20.0	0.0450	0.025	18.0	0.0	0.0
7	106A	716.70	686.00	133.0	0.2308	0.025	36.0	0.0	0.0
8	107A	619.80	607.40	145.0	0.0855	0.010	24.0	0.0	0.0
9	108A	608.80	606.90	45.0	0.0422	0.025	36.0	0.0	0.0
10	108B	500.10	499.60	20.0	0.0250	0.025	18.0	0.0	0.0
11	109B	545.20	532.20	96.0	0.1354	0.025	36.0	0.0	0.0

Time span=0.00-60.00 hrs, dt=0.02 hrs, 3001 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A101: A101 Runoff Area=43.269 ac 4.21% Impervious Runoff Depth=1.24"
Flow Length=1,315' Tc=31.0 min CN=46 Runoff=21.94 cfs 4.459 af

Subcatchment A102: A102 Runoff Area=9.187 ac 13.40% Impervious Runoff Depth=1.67"
Flow Length=675' Tc=29.1 min CN=50 Runoff=7.85 cfs 1.276 af

Subcatchment A103: A103 Runoff Area=36.735 ac 8.79% Impervious Runoff Depth=1.89"
Flow Length=1,190' Tc=45.1 min CN=52 Runoff=30.70 cfs 5.792 af

Subcatchment A104: A104 Runoff Area=9.432 ac 9.40% Impervious Runoff Depth=1.13"
Flow Length=1,015' Tc=29.2 min CN=45 Runoff=4.22 cfs 0.892 af

Subcatchment A105: A105 Runoff Area=34.264 ac 3.27% Impervious Runoff Depth=2.84"
Flow Length=1,326' Tc=19.2 min CN=60 Runoff=74.71 cfs 8.115 af

Subcatchment A106: A106 Runoff Area=15.338 ac 8.12% Impervious Runoff Depth=4.87"
Flow Length=1,260' Tc=26.7 min CN=76 Runoff=53.17 cfs 6.226 af

Subcatchment A107: A107 Runoff Area=95.411 ac 2.35% Impervious Runoff Depth=4.48"
Flow Length=3,685' Tc=61.0 min CN=73 Runoff=199.14 cfs 35.649 af

Subcatchment A108: A108 Runoff Area=5.526 ac 2.32% Impervious Runoff Depth=2.48"
Flow Length=1,235' Tc=30.1 min CN=57 Runoff=8.33 cfs 1.141 af

Subcatchment B101: B101 Runoff Area=127.641 ac 0.75% Impervious Runoff Depth=3.21"
Flow Length=2,934' Tc=43.8 min CN=63 Runoff=221.63 cfs 34.177 af

Subcatchment B102: B102 Runoff Area=6.499 ac 2.62% Impervious Runoff Depth=2.01"
Flow Length=637' Tc=19.6 min CN=53 Runoff=8.62 cfs 1.087 af

Subcatchment B103: B103 Runoff Area=21.581 ac 11.93% Impervious Runoff Depth=4.35"
Flow Length=1,130' Tc=38.7 min CN=72 Runoff=56.16 cfs 7.832 af

Subcatchment B104: B104 Runoff Area=80.536 ac 13.45% Impervious Runoff Depth=3.21"
Flow Length=3,223' Tc=33.2 min CN=63 Runoff=161.16 cfs 21.564 af

Subcatchment B105: B105 Runoff Area=23.978 ac 2.94% Impervious Runoff Depth=3.97"
Flow Length=1,400' Tc=38.0 min CN=69 Runoff=57.24 cfs 7.934 af

Subcatchment B106: B106 Runoff Area=130.289 ac 0.83% Impervious Runoff Depth=4.87"
Flow Length=5,409' Tc=85.7 min CN=76 Runoff=237.14 cfs 52.891 af

Subcatchment B107: B107 Runoff Area=14.330 ac 0.00% Impervious Runoff Depth=5.00"
Flow Length=907' Tc=37.9 min CN=77 Runoff=43.23 cfs 5.972 af

Subcatchment B108: B108 Runoff Area=46.768 ac 1.07% Impervious Runoff Depth=4.87"
Flow Length=2,241' Tc=39.8 min CN=76 Runoff=134.03 cfs 18.985 af

Subcatchment B109: B109 Runoff Area=11.276 ac 0.04% Impervious Runoff Depth=5.00"
Flow Length=1,048' Tc=28.5 min CN=77 Runoff=38.96 cfs 4.699 af

Subcatchment C101: C101 Runoff Area=30.507 ac 4.58% Impervious Runoff Depth=2.01"
Flow Length=1,500' Tc=31.9 min CN=53 Runoff=33.26 cfs 5.102 af

Subcatchment C102: C102 Runoff Area=40.386 ac 4.49% Impervious Runoff Depth=3.34"
Flow Length=2,597' Tc=45.5 min CN=64 Runoff=71.85 cfs 11.234 af

Subcatchment D101: D101 Runoff Area=6.500 ac 0.00% Impervious Runoff Depth=5.00"
Flow Length=1,036' Tc=26.0 min CN=77 Runoff=23.35 cfs 2.709 af

Subcatchment Overlook (P1): Overlook Runoff Area=1.000 ac 0.00% Impervious Runoff Depth=4.48"
Flow Length=176' Tc=7.5 min CN=73 Runoff=5.09 cfs 0.374 af

Reach A105R: Thru A101 Avg. Flow Depth=2.24' Max Vel=8.58 fps Inflow=122.42 cfs 14.325 af
n=0.050 L=1,075.0' S=0.0577 '/' Capacity=152.54 cfs Outflow=121.59 cfs 14.325 af

Reach A106R: Thru A105 Avg. Flow Depth=1.25' Max Vel=7.29 fps Inflow=53.17 cfs 6.226 af
n=0.050 L=1,215.0' S=0.0922 '/' Capacity=153.12 cfs Outflow=52.60 cfs 6.226 af

Reach A108R: Thru A101 Avg. Flow Depth=2.75' Max Vel=11.64 fps Inflow=204.33 cfs 36.790 af
n=0.050 L=1,090.0' S=0.0862 '/' Capacity=244.78 cfs Outflow=203.96 cfs 36.790 af

Reach B102R: Thru B101 Avg. Flow Depth=2.97' Max Vel=5.90 fps Inflow=348.43 cfs 89.057 af
n=0.050 L=122.0' S=0.0164 '/' Capacity=356.26 cfs Outflow=348.43 cfs 89.055 af

Reach B103R: Thru B102 Avg. Flow Depth=3.85' Max Vel=6.86 fps Inflow=346.32 cfs 87.980 af
n=0.050 L=585.0' S=0.0171 '/' Capacity=374.39 cfs Outflow=346.19 cfs 87.971 af

Reach B107R: Thru B108 Avg. Flow Depth=0.49' Max Vel=6.77 fps Inflow=31.60 cfs 5.696 af
n=0.050 L=2,040.0' S=0.2294 '/' Capacity=144.21 cfs Outflow=31.27 cfs 5.696 af

Reach B108R: Thur 101 Avg. Flow Depth=1.88' Max Vel=6.44 fps Inflow=189.14 cfs 29.356 af
n=0.050 L=233.0' S=0.0318 '/' Capacity=474.00 cfs Outflow=189.13 cfs 29.356 af

Reach B109R: Thru B108 Avg. Flow Depth=1.11' Max Vel=6.55 fps Inflow=38.91 cfs 4.699 af
n=0.050 L=355.0' S=0.0851 '/' Capacity=147.09 cfs Outflow=38.86 cfs 4.699 af

Pond 102A: Wetland B Peak Elev=500.30' Storage=88,645 cf Inflow=7.85 cfs 2.035 af
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 102B: 18" Culvert Peak Elev=496.17' Storage=8,424 cf Inflow=348.44 cfs 89.058 af
Primary=10.04 cfs 19.685 af Secondary=341.07 cfs 69.373 af Outflow=348.43 cfs 89.057 af

Pond 102C: Pond 102C Peak Elev=509.11' Storage=334,468 cf Inflow=71.85 cfs 11.234 af
Outflow=8.61 cfs 4.107 af

Pond 103A: Wetland A Peak Elev=502.29' Storage=242,805 cf Inflow=30.70 cfs 5.792 af
24.0" Round Culvert n=0.013 L=80.0' S=-0.0125 '/' Outflow=0.93 cfs 0.759 af

Pond 103B: Irrigation Pond Peak Elev=506.84' Storage=94,914 cf Inflow=160.83 cfs 51.938 af
Primary=17.46 cfs 11.880 af Secondary=141.03 cfs 39.808 af Outflow=158.49 cfs 51.688 af

Pond 104A: Wetland D Peak Elev=508.04' Storage=7,629 cf Inflow=4.22 cfs 0.892 af
Primary=0.35 cfs 0.420 af Secondary=2.28 cfs 0.450 af Outflow=2.63 cfs 0.870 af

Pond 104B: Island Pond Peak Elev=510.92' Storage=677,682 cf Inflow=345.44 cfs 82.388 af
Primary=15.55 cfs 21.840 af Secondary=117.32 cfs 22.266 af Tertiary=188.01 cfs 36.292 af Outflow=320.88 cfs 80.398 af

Pond 105A: Wetland H Peak Elev=575.39' Storage=69,760 cf Inflow=122.88 cfs 14.342 af
Primary=11.24 cfs 7.961 af Secondary=111.18 cfs 6.364 af Outflow=122.42 cfs 14.325 af

Pond 105B: Wetland J Peak Elev=516.66' Storage=55,979 cf Inflow=261.99 cfs 60.825 af
Outflow=261.72 cfs 60.824 af

Pond 106A: 36" Culvert Peak Elev=720.64' Storage=236 cf Inflow=53.17 cfs 6.226 af
Primary=53.17 cfs 6.226 af Secondary=0.00 cfs 0.000 af Outflow=53.17 cfs 6.226 af

Pond 106B: Wetland J Peak Elev=527.29' Storage=26,547 cf Inflow=237.14 cfs 52.891 af
Outflow=237.03 cfs 52.891 af

Pond 107A: 24" Culvert Peak Elev=626.49' Storage=3,862 cf Inflow=199.14 cfs 35.649 af
Primary=45.09 cfs 22.255 af Secondary=154.06 cfs 13.394 af Outflow=199.16 cfs 35.649 af

Pond 107B: Wetland Peak Elev=973.04' Storage=66,447 cf Inflow=43.23 cfs 5.972 af
Outflow=31.60 cfs 5.696 af

Pond 108A: 36" Culvert Peak Elev=613.52' Storage=305 cf Inflow=159.27 cfs 14.535 af
Primary=58.91 cfs 8.660 af Secondary=102.50 cfs 5.875 af Outflow=159.24 cfs 14.535 af

Pond 108B: Wetland N Peak Elev=501.79' Storage=18,505 cf Inflow=189.32 cfs 29.381 af
Primary=4.39 cfs 4.478 af Secondary=185.38 cfs 24.878 af Outflow=189.14 cfs 29.356 af

Pond 109B: 36" Culvert Peak Elev=548.80' Storage=393 cf Inflow=38.96 cfs 4.699 af
Outflow=38.91 cfs 4.699 af

Link A: Amenia Stream Inflow=292.28 cfs 56.445 af
Primary=292.28 cfs 56.445 af

Link B: Wetland Inflow=636.55 cfs 152.587 af
Primary=636.55 cfs 152.587 af

Link C: Culvert Inflow=33.26 cfs 9.208 af
Primary=33.26 cfs 9.208 af

Link D: Culvert Inflow=23.35 cfs 2.709 af
Primary=23.35 cfs 2.709 af

Link Overlook-A (P1): Overlook A (Phase 1) Inflow=5.09 cfs 0.374 af
Primary=5.09 cfs 0.374 af

Total Runoff Area = 790.453 ac Runoff Volume = 238.110 af Average Runoff Depth = 3.61"
95.96% Pervious = 758.517 ac 4.04% Impervious = 31.936 ac

Summary for Subcatchment A101: A101

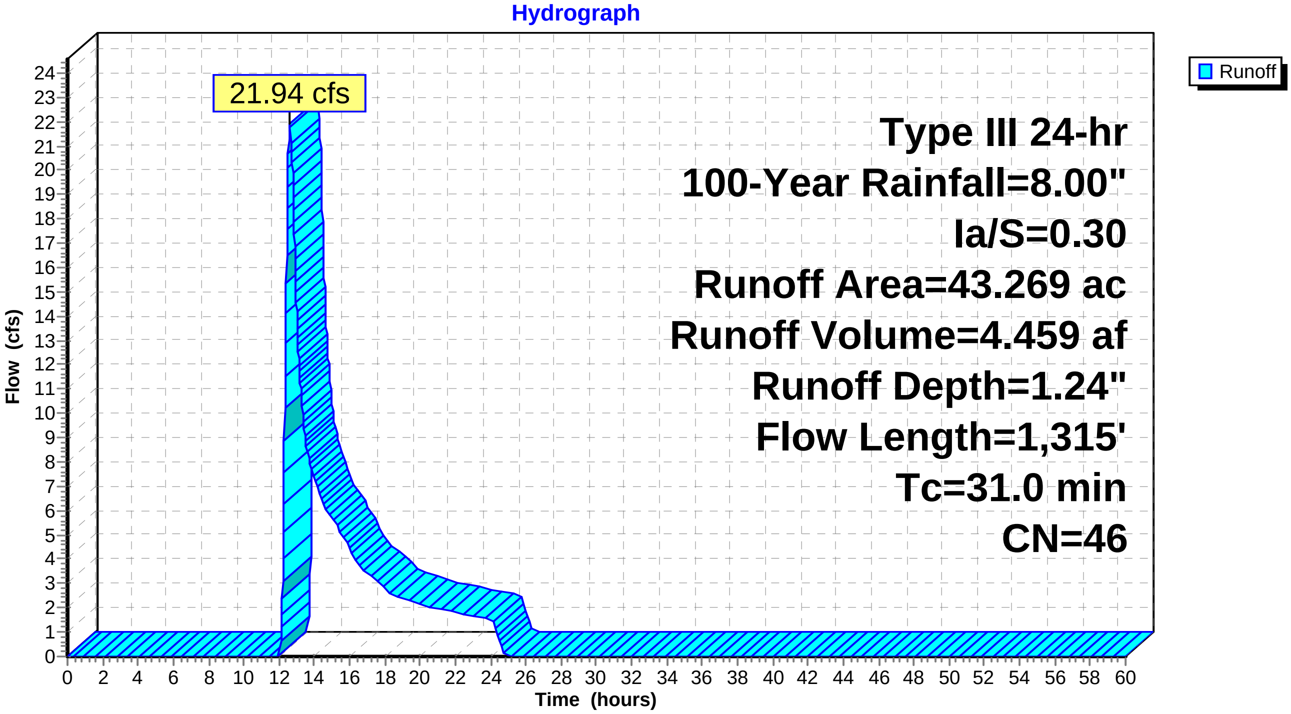
Runoff = 21.94 cfs @ 12.61 hrs, Volume= 4.459 af, Depth= 1.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.000	98	Building roof
*	1.819	98	Paved surface
*	0.089	96	Gravel surface
*	0.001	98	Water Surface
	31.250	39	>75% Grass cover, Good, HSG A
	6.738	61	>75% Grass cover, Good, HSG B
	1.730	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	1.164	30	Woods, Good, HSG A
	0.152	55	Woods, Good, HSG B
	0.088	70	Woods, Good, HSG C
	0.000	77	Woods, Good, HSG D
*	0.223	30	Sand trap, HSG A
*	0.015	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	43.269	46	Weighted Average
	41.449		95.79% Pervious Area
	1.820		4.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.9	100	0.0400	0.11		**Sheet Flow,** Grass: Bermuda n= 0.410 P2= 3.50"
3.0	430	0.1200	2.42		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.5	360	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.6	425	0.0140	0.83		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
31.0	1,315	Total			

Subcatchment A101: A101



Summary for Subcatchment A102: A102

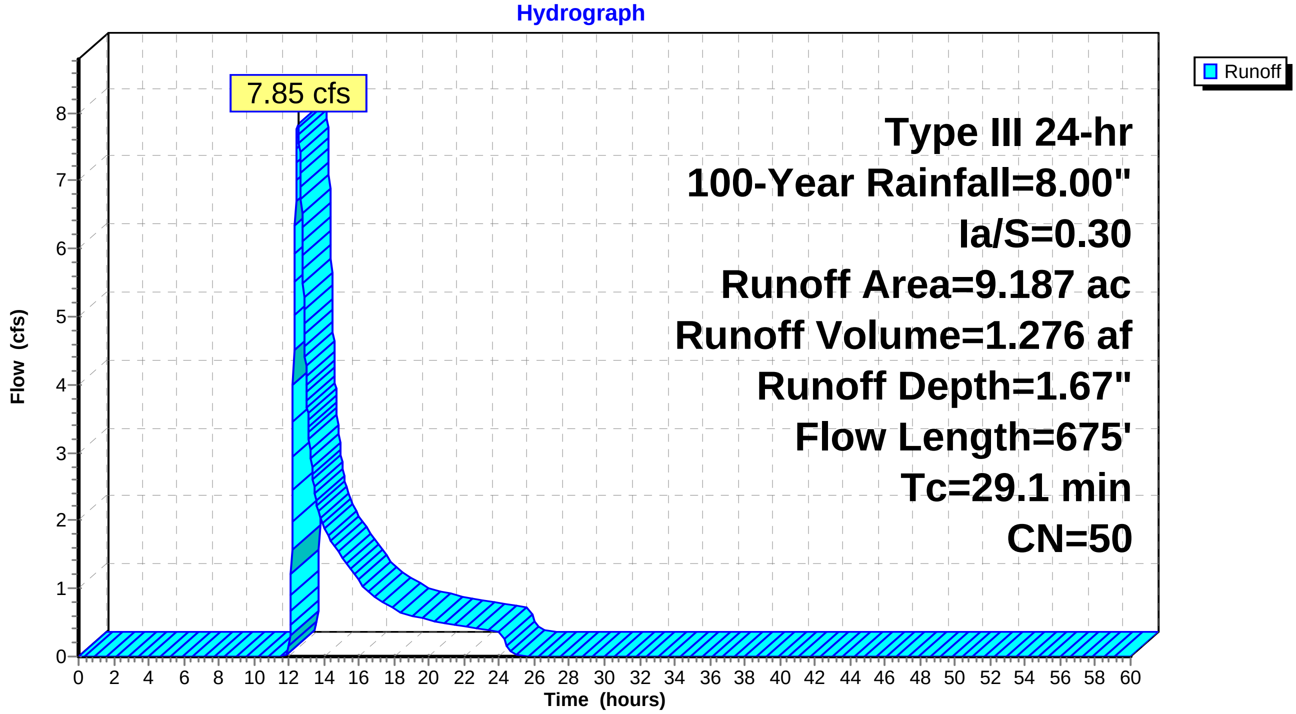
Runoff = 7.85 cfs @ 12.52 hrs, Volume= 1.276 af, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.000	98	Building roof
*	0.387	98	Paved surface
*	0.000	96	Gravel surface
*	0.844	98	Water Surface
	3.520	39	>75% Grass cover, Good, HSG A
	2.156	61	>75% Grass cover, Good, HSG B
	0.000	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	2.260	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	0.000	70	Woods, Good, HSG C
	0.000	77	Woods, Good, HSG D
*	0.004	30	Sand trap, HSG A
*	0.016	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	9.187	50	Weighted Average
	7.956		86.60% Pervious Area
	1.231		13.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.0	100	0.0600	0.07		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
6.1	575	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.1	675	Total			

Subcatchment A102: A102



Summary for Subcatchment A103: A103

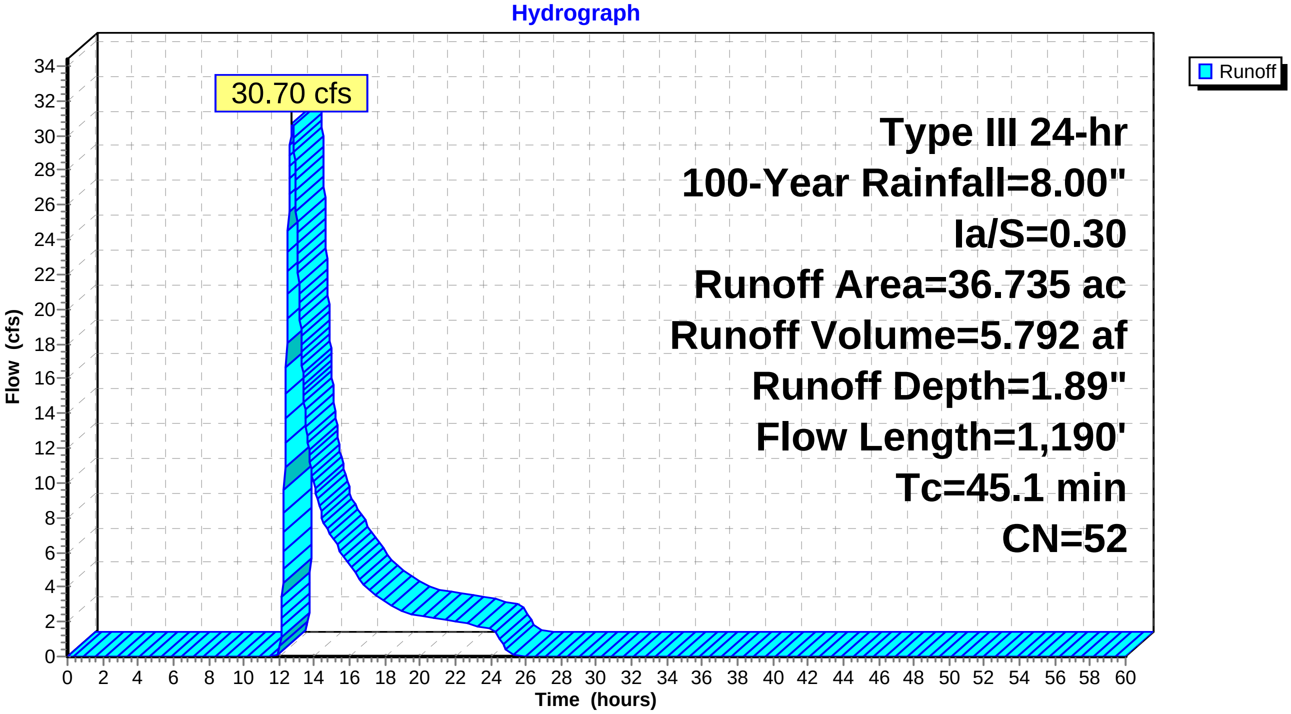
Runoff = 30.70 cfs @ 12.74 hrs, Volume= 5.792 af, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.334	98	Building roof
*	2.378	98	Paved surface
*	0.402	96	Gravel surface
*	0.516	98	Water Surface
	14.616	39	>75% Grass cover, Good, HSG A
	3.182	61	>75% Grass cover, Good, HSG B
	4.088	74	>75% Grass cover, Good, HSG C
	0.029	80	>75% Grass cover, Good, HSG D
	6.882	30	Woods, Good, HSG A
	1.635	55	Woods, Good, HSG B
	1.432	70	Woods, Good, HSG C
	1.137	77	Woods, Good, HSG D
*	0.095	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.009	30	Sand Trap, HSG C
	36.735	52	Weighted Average
	33.507		91.21% Pervious Area
	3.228		8.79% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.7	100	0.0200	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
3.9	227	0.0190	0.96		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.5	75	0.1100	2.32		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	343	0.0400	4.54	18.14	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=2.00' n= 0.050
3.7	445		2.00		**Direct Entry, Pipe Flow**
45.1	1,190	Total			

Subcatchment A103: A103



Summary for Subcatchment A104: A104

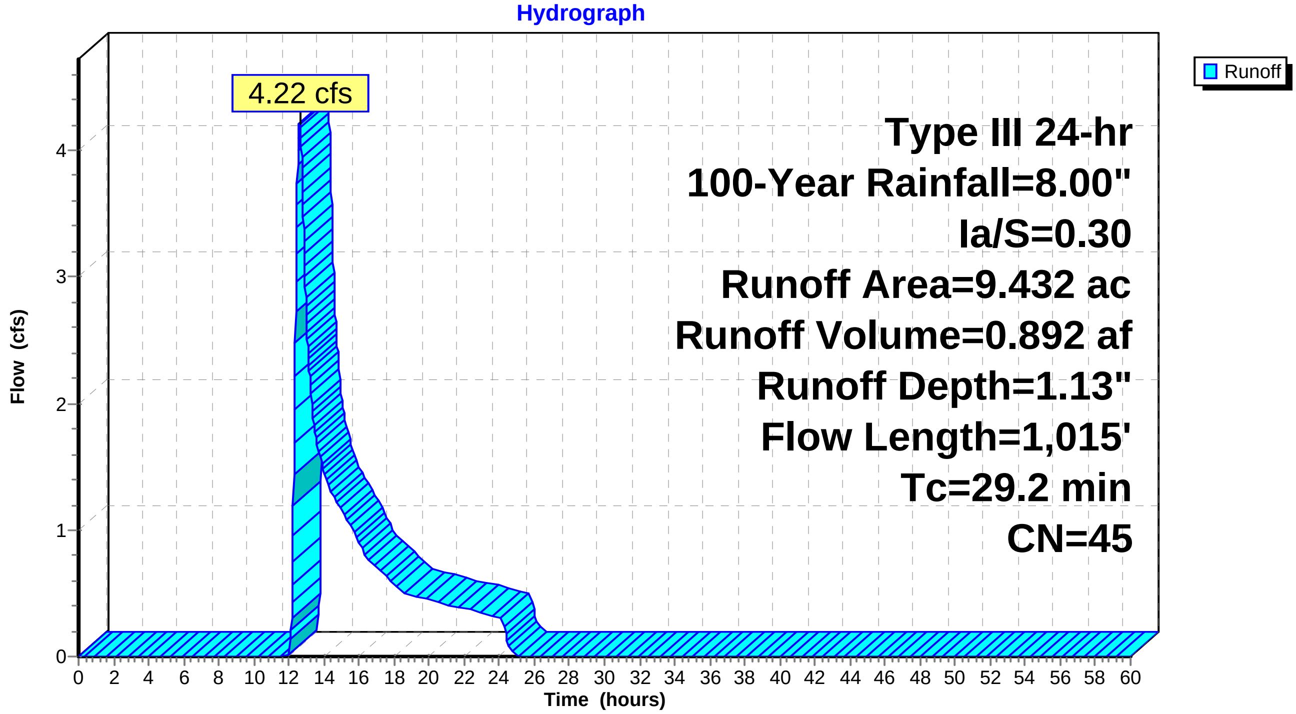
Runoff = 4.22 cfs @ 12.61 hrs, Volume= 0.892 af, Depth= 1.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.000	98	Building roof
*	0.458	98	Paved surface
*	0.000	96	Gravel surface
*	0.429	98	Water Surface
	8.361	39	>75% Grass cover, Good, HSG A
	0.043	61	>75% Grass cover, Good, HSG B
	0.000	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	0.071	30	Woods, Good, HSG A
	0.017	55	Woods, Good, HSG B
	0.000	70	Woods, Good, HSG C
	0.000	77	Woods, Good, HSG D
*	0.053	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	9.432	45	Weighted Average
	8.545		90.60% Pervious Area
	0.887		9.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0200	0.08		**Sheet Flow,** Grass: Bermuda n= 0.410 P2= 3.50"
3.4	375	0.0700	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.5	255	0.1600	2.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.4	285	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.2	1,015	Total			

Subcatchment A104: A104



Summary for Subcatchment A105: A105

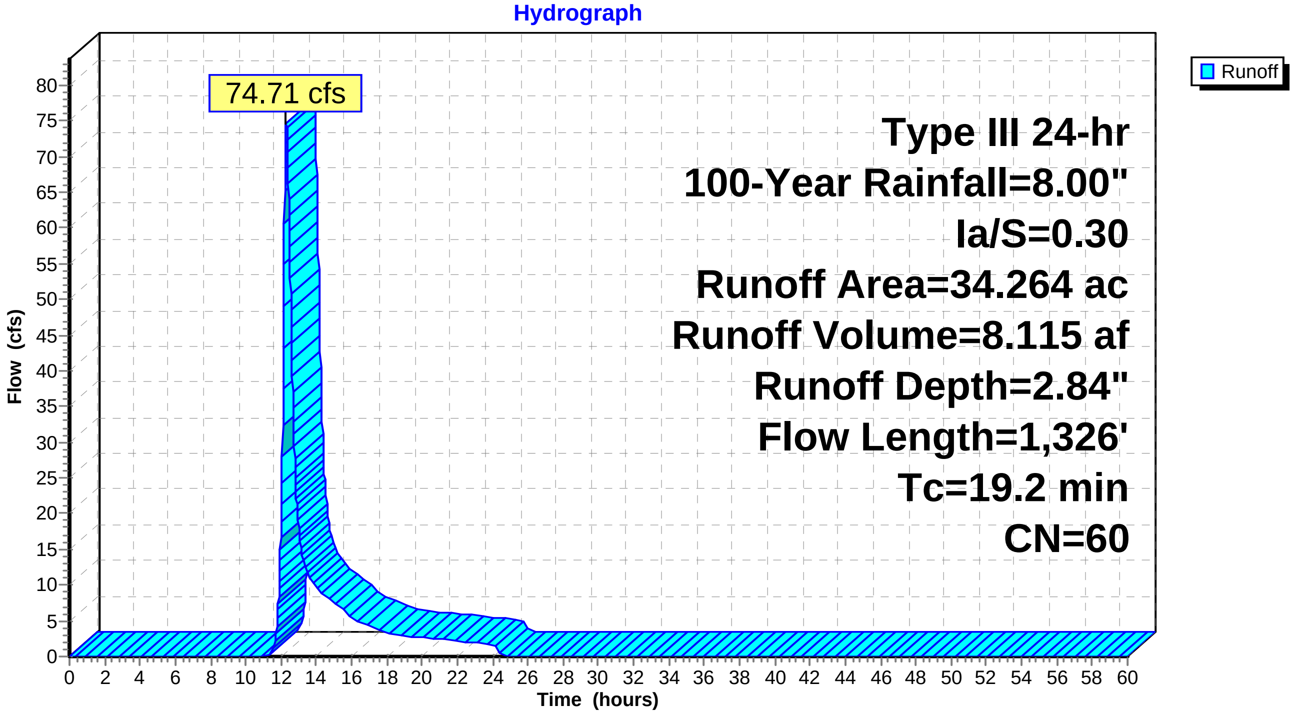
Runoff = 74.71 cfs @ 12.29 hrs, Volume= 8.115 af, Depth= 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.000	98	Building roof
*	1.119	98	Paved surface
*	0.088	96	Gravel surface
*	0.000	98	Water Surface
	13.167	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	15.618	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	0.226	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	3.911	70	Woods, Good, HSG C
	0.000	77	Woods, Good, HSG D
*	0.135	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	34.264	60	Weighted Average
	33.145		96.73% Pervious Area
	1.119		3.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	23	0.1700	0.08		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
9.8	77	0.3000	0.13		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
1.6	150	0.3700	1.52		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
1.3	526	0.0950	6.52	32.61	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=1.00' Z= 3.0 '/' Top.W=8.00' n= 0.050
1.8	550	0.0600	4.98	16.59	**Parabolic Channel,** W=10.00' D=0.50' Area=3.3 sf Perim=10.1' n= 0.035 High grass
19.2	1,326	Total			

Subcatchment A105: A105



Summary for Subcatchment A106: A106

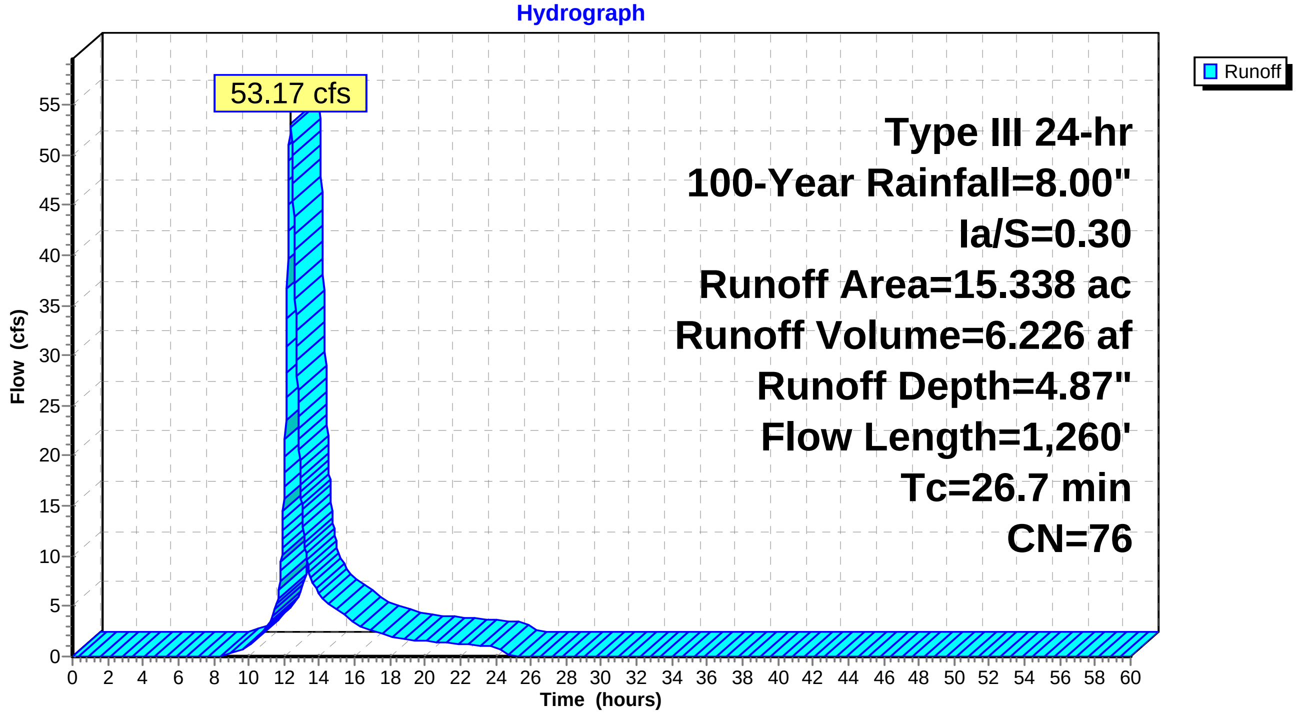
Runoff = 53.17 cfs @ 12.37 hrs, Volume= 6.226 af, Depth= 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.013	98	Building roof
*	1.232	98	Paved surface
*	0.200	96	Gravel surface
*	0.000	98	Water Surface
	0.000	39	>75% Grass cover, Good, HSG A
	0.050	61	>75% Grass cover, Good, HSG B
	9.227	74	>75% Grass cover, Good, HSG C
	2.194	80	>75% Grass cover, Good, HSG D
	0.097	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	1.706	70	Woods, Good, HSG C
	0.619	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	15.338	76	Weighted Average
	14.093		91.88% Pervious Area
	1.245		8.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.1500	0.10		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
10.1	500	0.1100	0.83		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
0.6	660	0.3000	17.87	321.67	**Trap/Vee/Rect Channel Flow,** Bot.W=3.00' D=2.00' Z= 3.0 '/' Top.W=15.00' n= 0.050
26.7	1,260	Total			

Subcatchment A106: A106



Summary for Subcatchment A107: A107

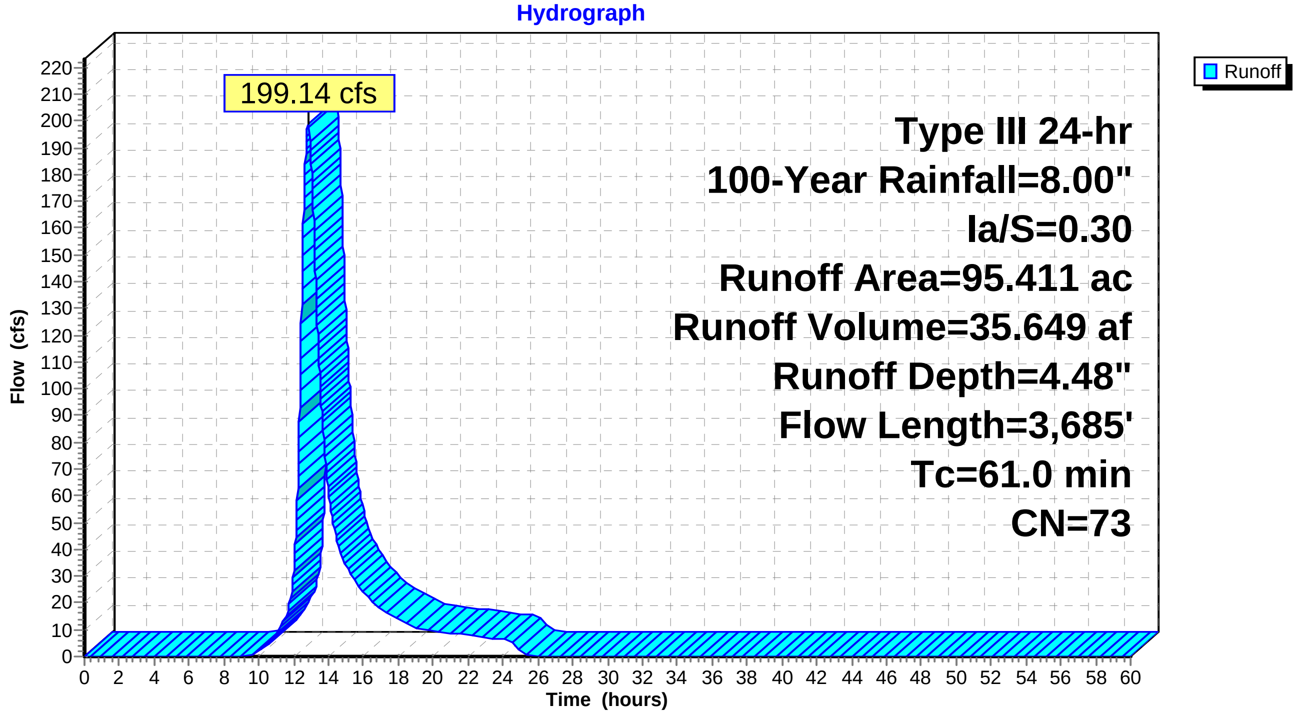
Runoff = 199.14 cfs @ 12.82 hrs, Volume= 35.649 af, Depth= 4.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.392	98	Building roof
*	1.725	98	Paved surface
*	0.071	96	Gravel surface
*	0.129	98	Water Surface
	0.000	39	>75% Grass cover, Good, HSG A
	13.413	61	>75% Grass cover, Good, HSG B
	9.311	74	>75% Grass cover, Good, HSG C
	4.029	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	8.871	55	Woods, Good, HSG B
	4.853	70	Woods, Good, HSG C
	52.617	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	95.411	73	Weighted Average
	93.165		97.65% Pervious Area
	2.246		2.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0800	0.08		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
3.7	230	0.1700	1.03		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
15.0	450	0.0400	0.50		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
18.0	1,210	0.2000	1.12		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
2.3	1,050	0.1300	7.68	25.61	**Parabolic Channel,** W=5.00' D=1.00' Area=3.3 sf Perim=5.5' n= 0.050
1.5	645	0.1100	7.07	23.56	**Parabolic Channel,** W=5.00' D=1.00' Area=3.3 sf Perim=5.5' n= 0.050
61.0	3,685	Total			

Subcatchment A107: A107



Summary for Subcatchment A108: A108

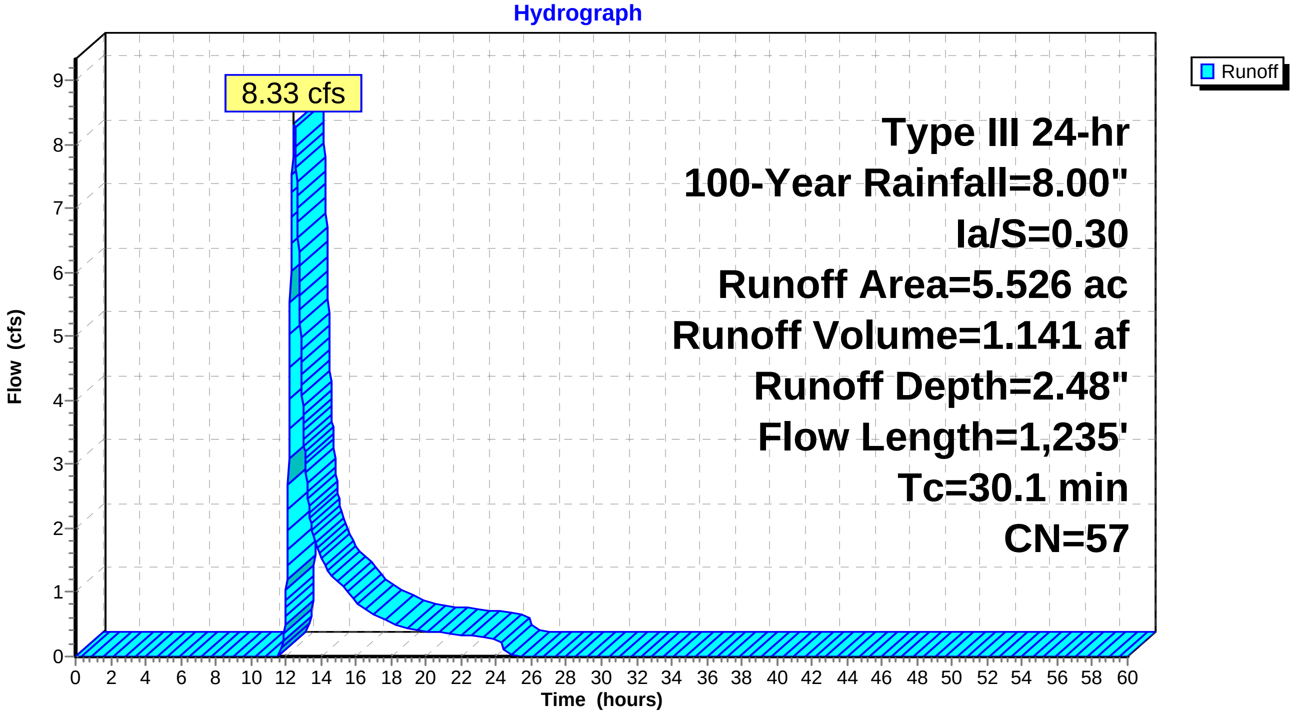
Runoff = 8.33 cfs @ 12.48 hrs, Volume= 1.141 af, Depth= 2.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.040	98	Building roof
*	0.000	98	Paved surface
*	0.049	96	Gravel surface
*	0.088	98	Water Surface
	0.000	39	>75% Grass cover, Good, HSG A
	0.629	61	>75% Grass cover, Good, HSG B
	0.000	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	4.720	55	Woods, Good, HSG B
	0.000	70	Woods, Good, HSG C
	0.000	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	5.526	57	Weighted Average
	5.398		97.68% Pervious Area
	0.128		2.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.2000	0.12		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
12.7	950	0.2500	1.25		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
1.1	85	0.2600	1.27		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
2.1	100	0.1000	0.79		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
30.1	1,235	Total			

Subcatchment A108: A108



Summary for Subcatchment B101: B101

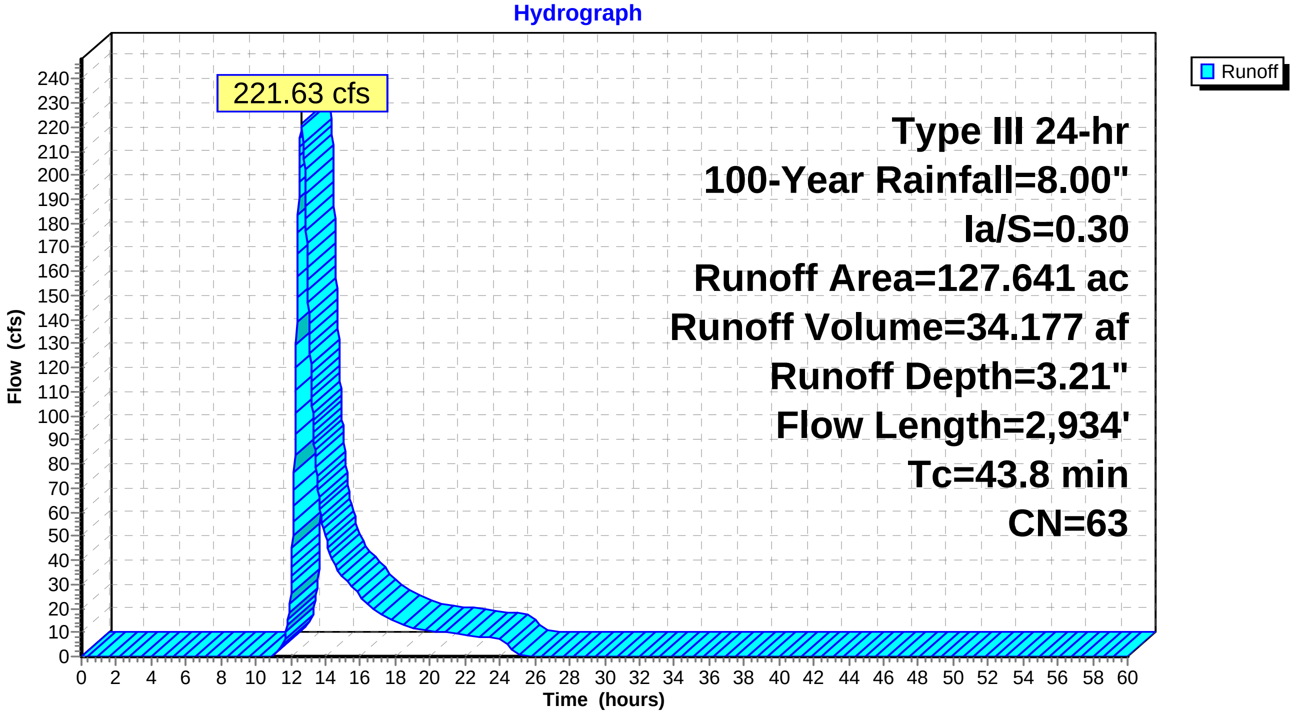
Runoff = 221.63 cfs @ 12.64 hrs, Volume= 34.177 af, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.005	98	Building roof
*	0.948	98	Paved surface
*	2.079	96	Gravel surface
*	0.002	98	Water Surface
	29.023	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	22.752	74	>75% Grass cover, Good, HSG C
	0.768	80	>75% Grass cover, Good, HSG D
	9.025	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	35.889	70	Woods, Good, HSG C
	27.094	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.056	30	Sand Trap, HSG C
	127.641	63	Weighted Average
	126.686		99.25% Pervious Area
	0.955		0.75% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.6	50	0.0400	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
8.2	50	0.2000	0.10		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
4.6	511	0.5600	1.87		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
6.9	524	0.2600	1.27		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
0.7	506	0.1600	12.61	201.73	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=2.00' Z= 3.0 '/' Top.W=14.00' n= 0.050
1.7	112	0.2000	1.12		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
2.5	355	0.1100	2.32		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.5	184	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.1	642	0.0500	9.49	63.28	**Parabolic Channel,** W=5.00' D=2.00' Area=6.7 sf Perim=6.7' n= 0.035 High grass
43.8	2,934	Total			

Subcatchment B101: B101



Summary for Subcatchment B102: B102

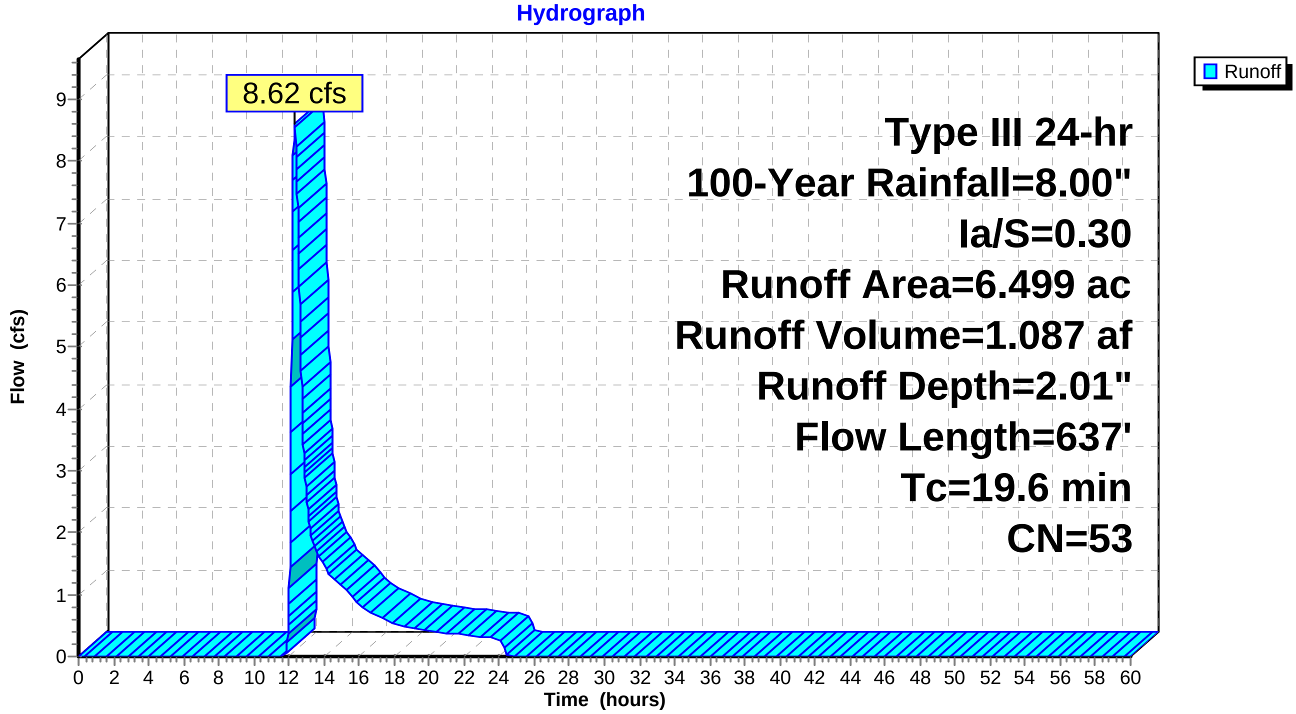
Runoff = 8.62 cfs @ 12.33 hrs, Volume= 1.087 af, Depth= 2.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.000	98	Building roof
*	0.170	98	Paved surface
*	0.290	96	Gravel surface
*	0.000	98	Water Surface
	3.039	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	2.097	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	0.839	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	0.000	70	Woods, Good, HSG C
	0.000	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.064	30	Sand Trap, HSG C
	6.499	53	Weighted Average
	6.329		97.38% Pervious Area
	0.170		2.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	100	0.0500	0.11		**Sheet Flow,** Grass: Bermuda n= 0.410 P2= 3.50"
3.8	457	0.0830	2.02		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	80	0.1750	1.05		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
19.6	637	Total			

Subcatchment B102: B102



Summary for Subcatchment B103: B103

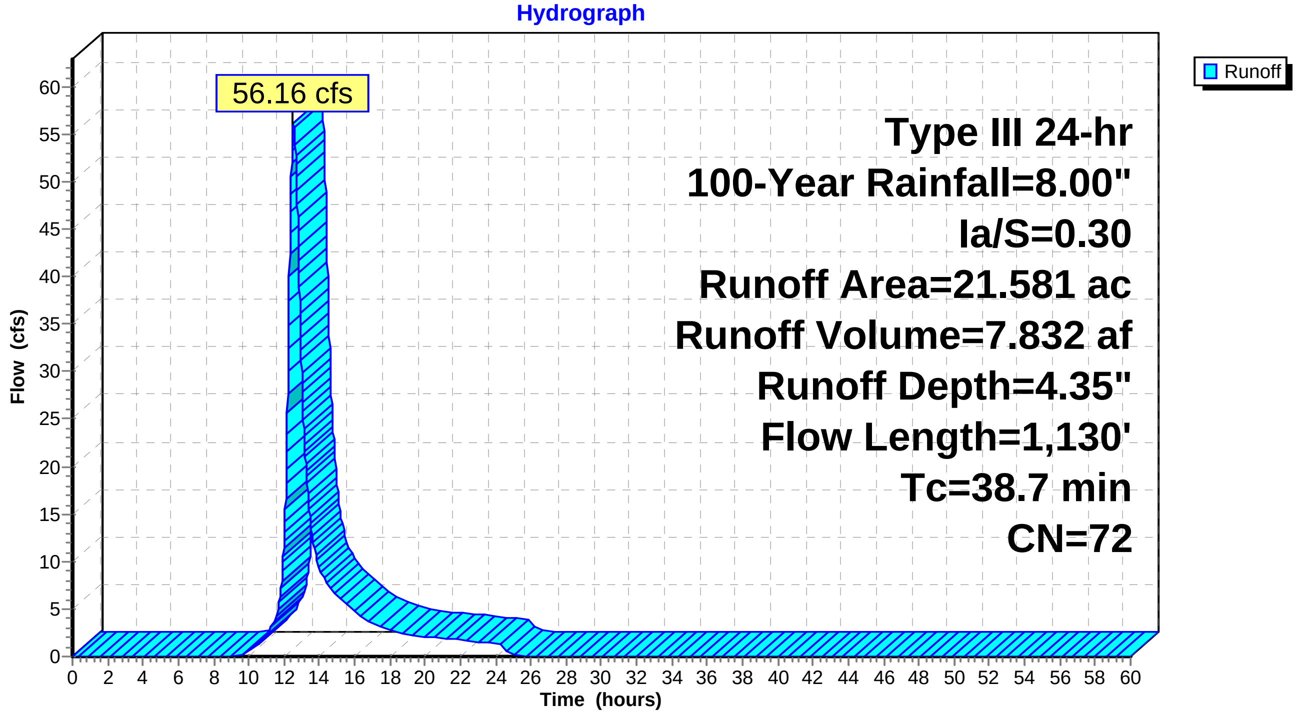
Runoff = 56.16 cfs @ 12.53 hrs, Volume= 7.832 af, Depth= 4.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.000	98	Building roof
*	0.550	98	Paved surface
*	0.039	96	Gravel surface
*	2.025	98	Water Surface
	3.869	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	6.689	74	>75% Grass cover, Good, HSG C
	0.522	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	0.459	70	Woods, Good, HSG C
	7.399	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.029	30	Sand Trap, HSG C
	21.581	72	Weighted Average
	19.006		88.07% Pervious Area
	2.575		11.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.4	100	0.0300	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
6.3	700	0.5500	1.85		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
1.6	280	0.1700	2.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	50	0.7600	2.18		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
38.7	1,130	Total			

Subcatchment B103: B103



Summary for Subcatchment B104: B104

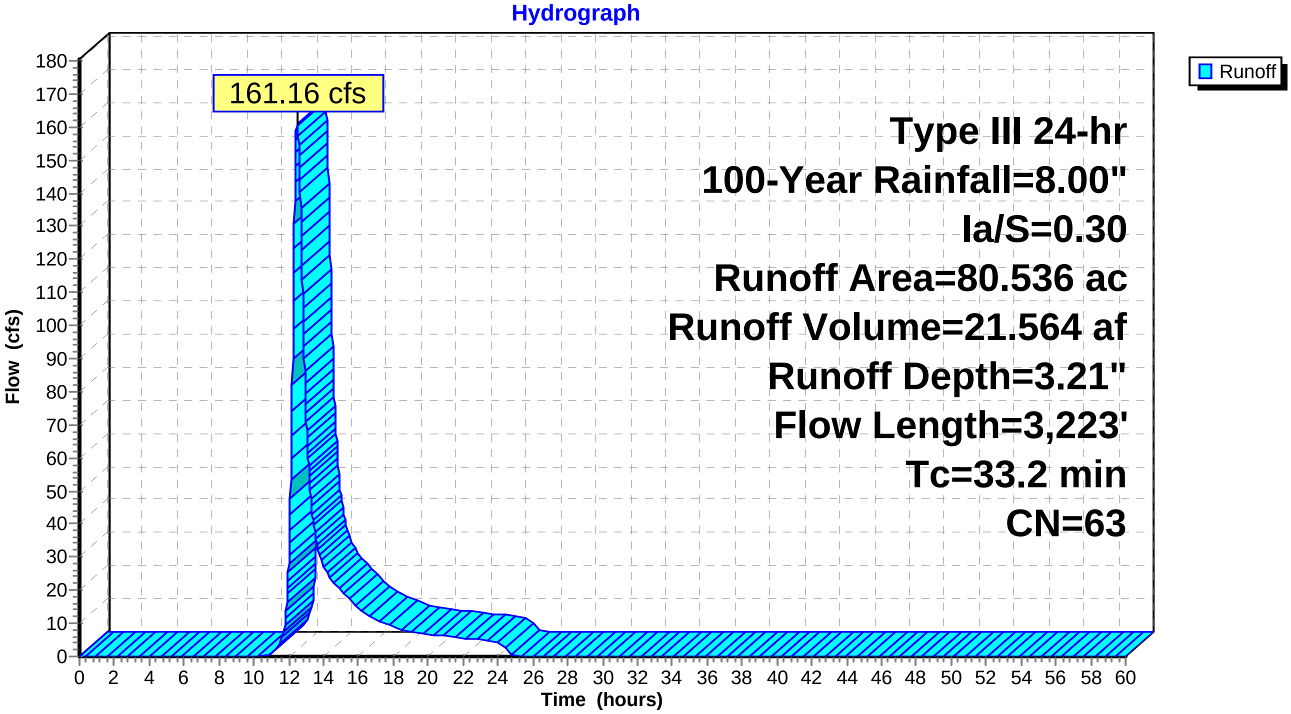
Runoff = 161.16 cfs @ 12.50 hrs, Volume= 21.564 af, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.411	98	Building roof
*	5.140	98	Paved surface
*	1.201	96	Gravel surface
*	5.280	98	Water Surface
	29.268	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	32.742	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	3.144	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	1.770	70	Woods, Good, HSG C
	1.252	77	Woods, Good, HSG D
*	0.185	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.143	30	Sand Trap, HSG C
	80.536	63	Weighted Average
	69.705		86.55% Pervious Area
	10.831		13.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.1300	0.17		**Sheet Flow,** Grass: Bermuda n= 0.410 P2= 3.50"
7.3	1,150	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	130	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
15.4	1,843		2.00		**Direct Entry, Pipe Flow**
33.2	3,223	Total			

Subcatchment B104: B104



Summary for Subcatchment B105: B105

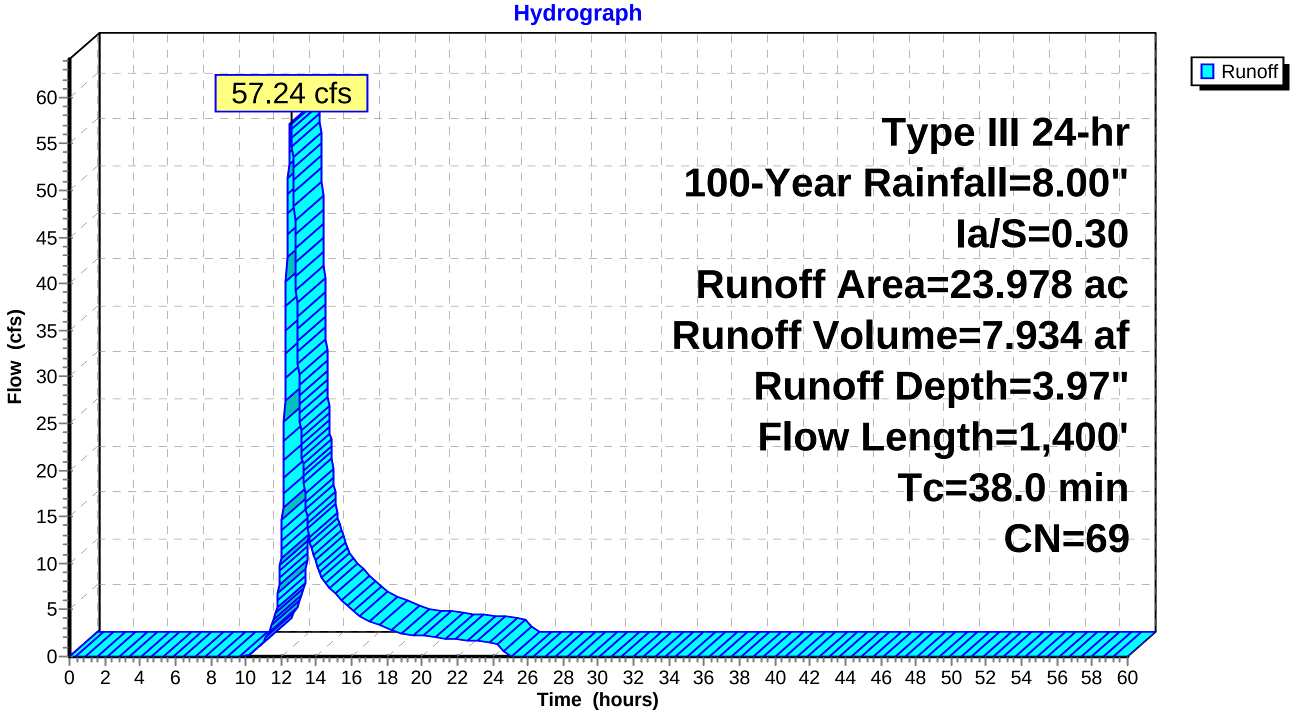
Runoff = 57.24 cfs @ 12.54 hrs, Volume= 7.934 af, Depth= 3.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.000	98	Building roof
*	0.248	98	Paved surface
*	0.181	96	Gravel surface
*	0.458	98	Water Surface
	5.222	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	4.132	74	>75% Grass cover, Good, HSG C
	0.513	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	1.204	70	Woods, Good, HSG C
	11.982	77	Woods, Good, HSG D
*	0.038	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	23.978	69	Weighted Average
	23.272		97.06% Pervious Area
	0.706		2.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.1	100	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
6.5	698	0.5200	1.80		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
1.8	335	0.1900	3.05		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.6	267	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
38.0	1,400	Total			

Subcatchment B105: B105



Summary for Subcatchment B106: B106

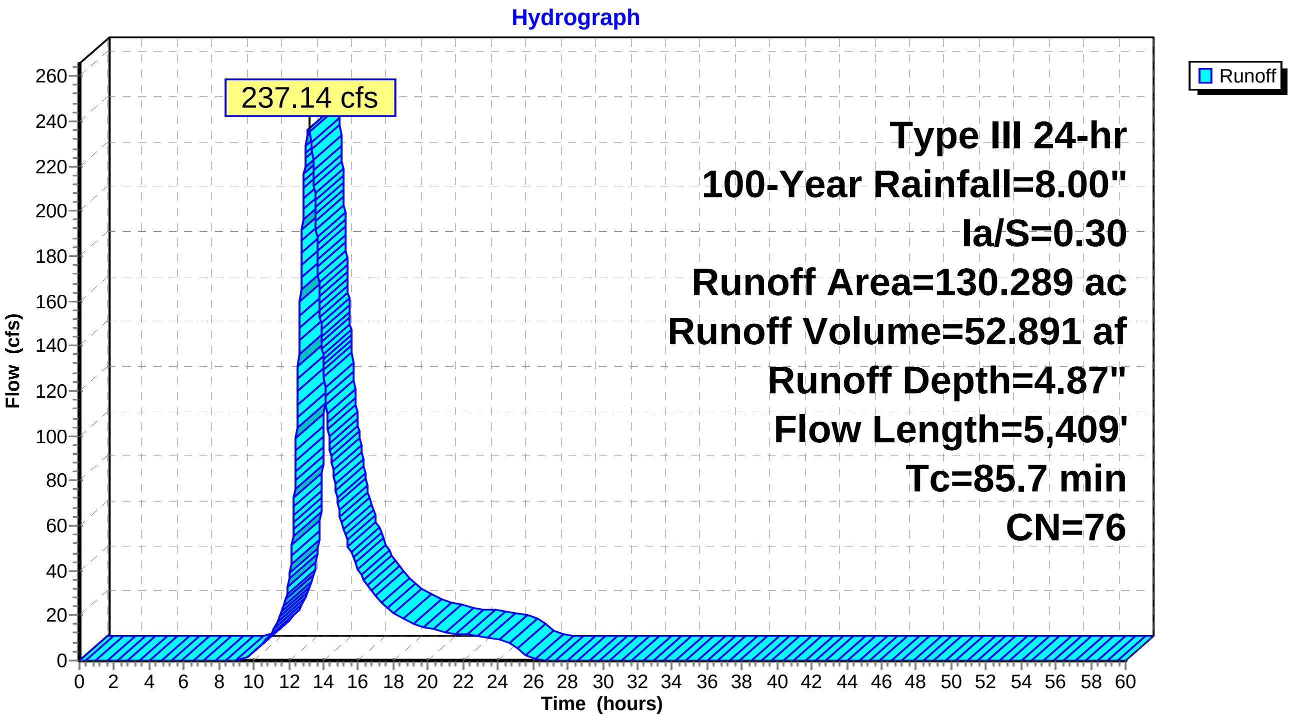
Runoff = 237.14 cfs @ 13.14 hrs, Volume= 52.891 af, Depth= 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.025	98	Building roof
*	0.905	98	Paved surface
*	0.933	96	Gravel surface
*	0.153	98	Water Surface
	0.907	39	>75% Grass cover, Good, HSG A
	0.594	61	>75% Grass cover, Good, HSG B
	13.921	74	>75% Grass cover, Good, HSG C
	2.396	80	>75% Grass cover, Good, HSG D
	0.745	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	11.966	70	Woods, Good, HSG C
	97.720	77	Woods, Good, HSG D
*	0.024	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	130.289	76	Weighted Average
	129.206		99.17% Pervious Area
	1.083		0.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.1	100	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
34.3	1,838	0.1273	0.89		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
19.8	960	0.1040	0.81		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
4.5	2,511	0.0870	9.30	148.75	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=2.00' Z= 3.0 '/' Top.W=14.00' n= 0.050
85.7	5,409	Total			

Subcatchment B106: B106



Summary for Subcatchment B107: B107

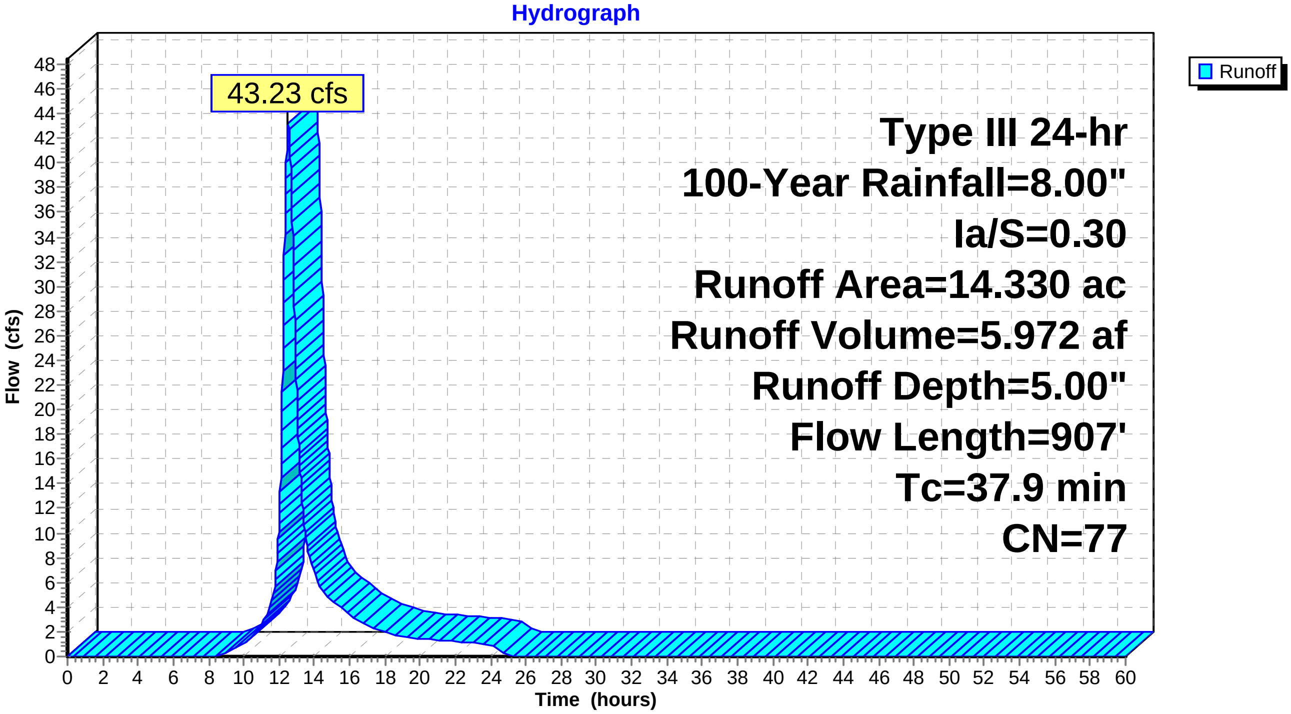
Runoff = 43.23 cfs @ 12.51 hrs, Volume= 5.972 af, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.000	98	Building roof
*	0.000	98	Paved surface
*	0.106	96	Gravel surface
*	0.000	98	Water Surface
	0.000	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	0.000	74	>75% Grass cover, Good, HSG C
	0.301	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	0.000	70	Woods, Good, HSG C
	13.923	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	14.330	77	Weighted Average
	14.330		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.7	100	0.0700	0.08		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
5.4	245	0.0900	0.75		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
10.8	562	0.1200	0.87		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
37.9	907	Total			

Subcatchment B107: B107



Summary for Subcatchment B108: B108

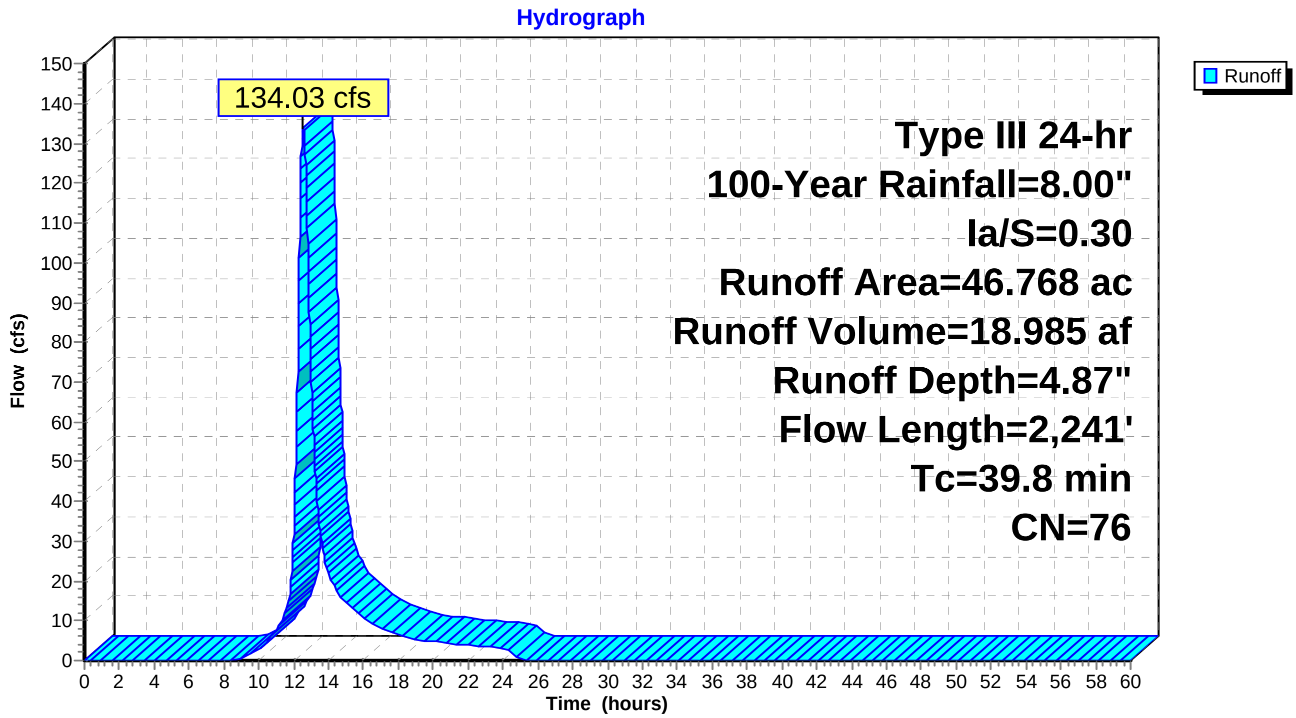
Runoff = 134.03 cfs @ 12.54 hrs, Volume= 18.985 af, Depth= 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.000	98	Building roof
*	0.499	98	Paved surface
*	0.098	96	Gravel surface
*	0.000	98	Water Surface
	0.000	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	9.546	74	>75% Grass cover, Good, HSG C
	0.657	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	3.391	70	Woods, Good, HSG C
	32.437	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.140	30	Sand Trap, HSG C
	46.768	76	Weighted Average
	46.269		98.93% Pervious Area
	0.499		1.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.8	100	0.1000	0.09		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
3.5	270	0.2590	1.27		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
1.8	120	0.2000	1.12		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
10.9	1,071	0.4300	1.64		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
3.2	490	0.1300	2.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.6	190		2.00		**Direct Entry, Pipe Flow**
39.8	2,241	Total			

Subcatchment B108: B108



Summary for Subcatchment B109: B109

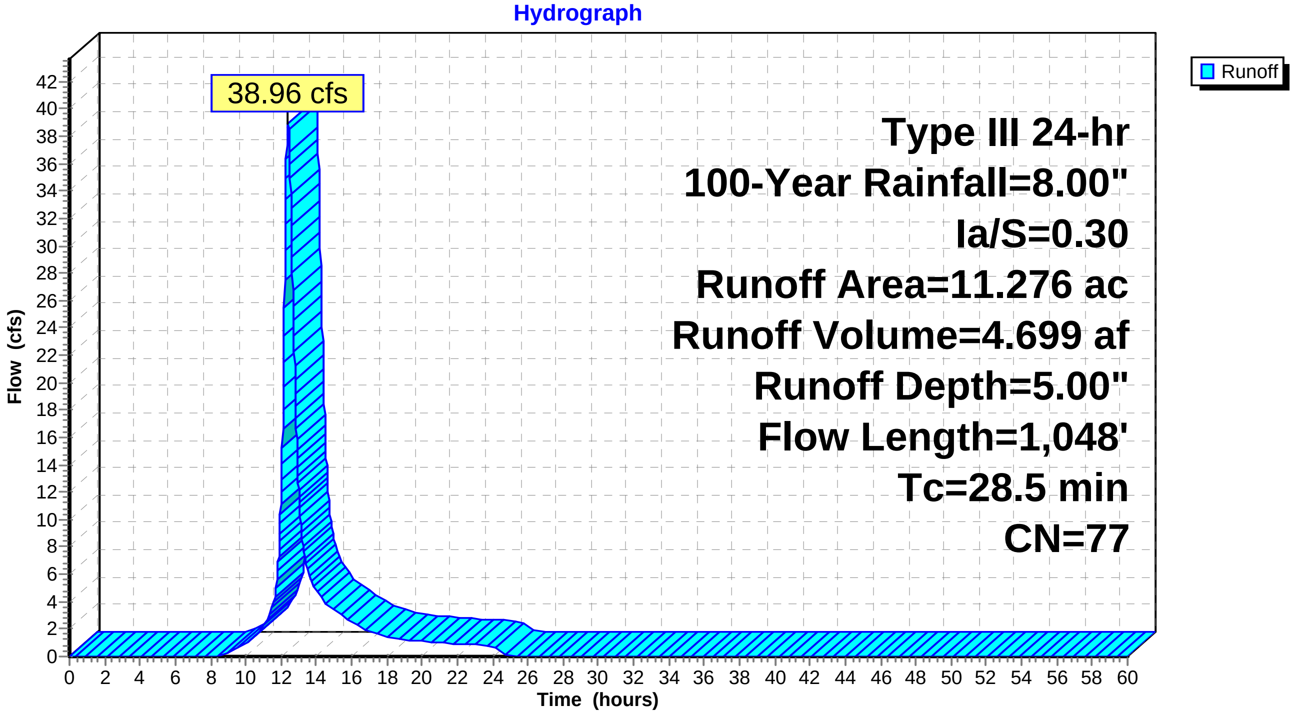
Runoff = 38.96 cfs @ 12.39 hrs, Volume= 4.699 af, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.000	98	Building roof
*	0.004	98	Paved surface
*	0.000	96	Gravel surface
*	0.000	98	Water Surface
	0.000	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	0.045	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	0.299	70	Woods, Good, HSG C
	10.928	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	11.276	77	Weighted Average
	11.272		99.96% Pervious Area
	0.004		0.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.8	100	0.1000	0.09		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
2.8	395	0.8550	2.31		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
2.6	265	0.4500	1.68		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
4.3	288	0.2010	1.12		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
28.5	1,048	Total			

Subcatchment B109: B109



Summary for Subcatchment C101: C101

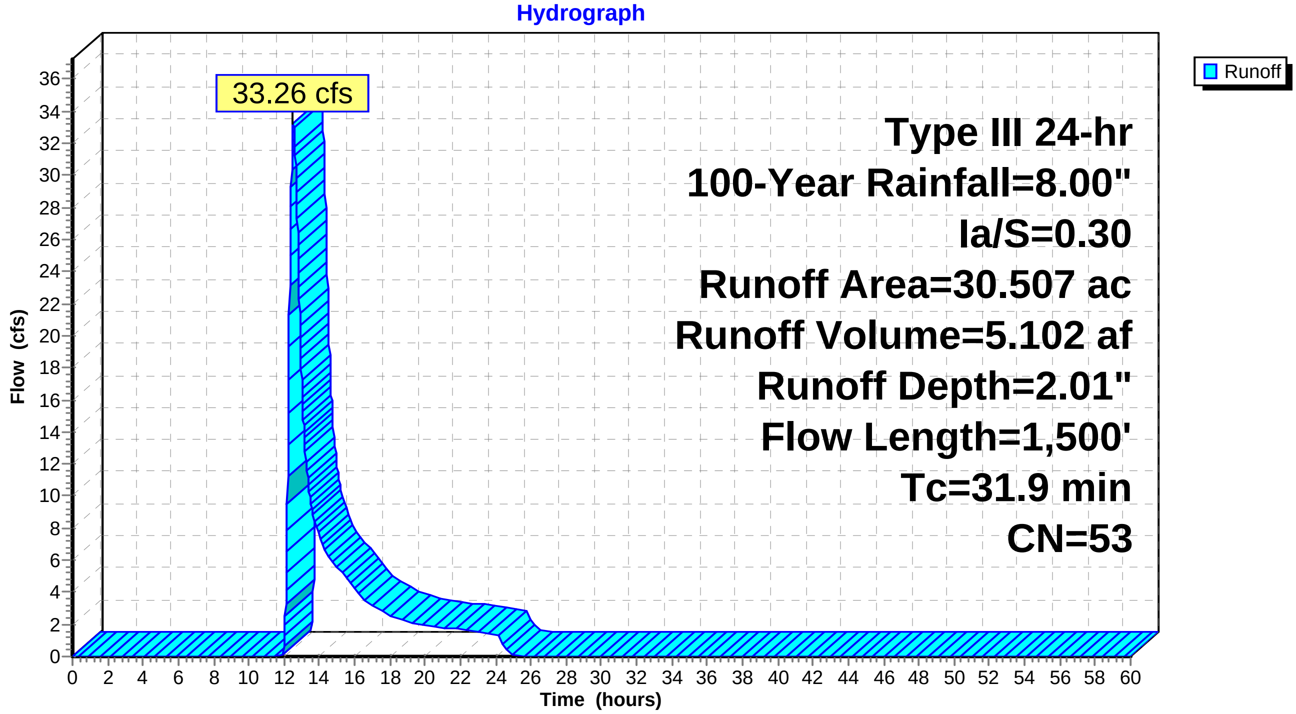
Runoff = 33.26 cfs @ 12.53 hrs, Volume= 5.102 af, Depth= 2.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.000	98	Building roof
*	1.350	98	Paved surface
*	0.425	96	Gravel surface
*	0.000	98	Water Surface
*	0.046	98	Rock Outcrop/Ledge
	15.000	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	3.955	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	3.210	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	6.521	70	Woods, Good, HSG C
	0.000	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	30.507	53	Weighted Average
	29.111		95.42% Pervious Area
	1.396		4.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.7	100	0.0700	0.08		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
5.6	385	0.2100	1.15		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
2.7	595	0.0300	3.66	18.32	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=1.00' Z= 3.0 '/' Top.W=8.00' n= 0.050
1.9	420	0.0290	3.60	18.01	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=1.00' Z= 3.0 '/' Top.W=8.00' n= 0.050
31.9	1,500	Total			

Subcatchment C101: C101



Summary for Subcatchment C102: C102

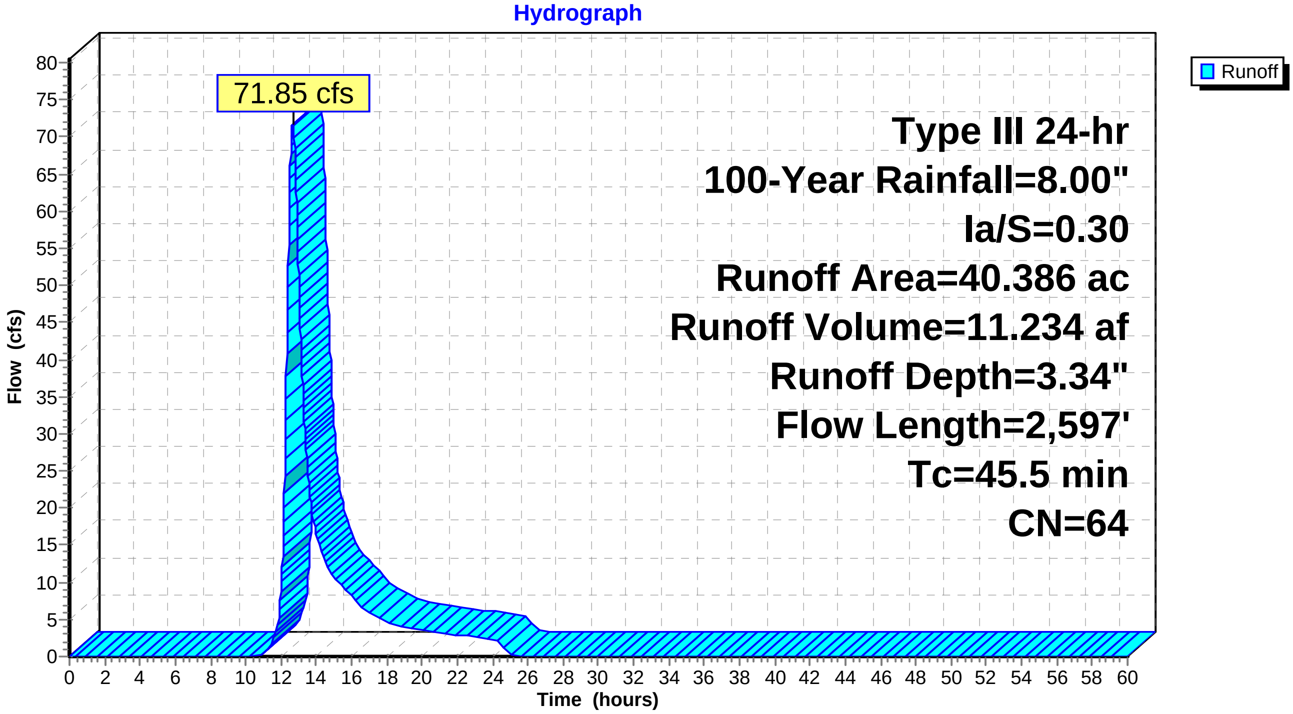
Runoff = 71.85 cfs @ 12.67 hrs, Volume= 11.234 af, Depth= 3.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.000	98	Building roof
*	0.000	98	Paved surface
*	0.618	96	Gravel surface
*	0.832	98	Water Surface
*	0.981	98	Rock Outcrop/Ledge
	13.186	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	1.123	74	>75% Grass cover, Good, HSG C
	0.529	80	>75% Grass cover, Good, HSG D
	0.124	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	7.578	70	Woods, Good, HSG C
	15.415	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	40.386	64	Weighted Average
	38.573		95.51% Pervious Area
	1.813		4.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.4	60	0.0330	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
9.0	40	0.1000	0.07		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
7.2	484	0.2000	1.12		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
6.8	700	0.4700	1.71		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
0.3	304	0.2700	16.38	262.05	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=2.00' Z= 3.0 '/' Top.W=14.00' n= 0.050
1.3	777	0.1100	9.86	65.70	**Parabolic Channel,** W=5.00' D=2.00' Area=6.7 sf Perim=6.7' n= 0.050
1.5	232		2.54		**Lake or Reservoir,** Mean Depth= 0.20'
45.5	2,597	Total			

Subcatchment C102: C102



Summary for Subcatchment D101: D101

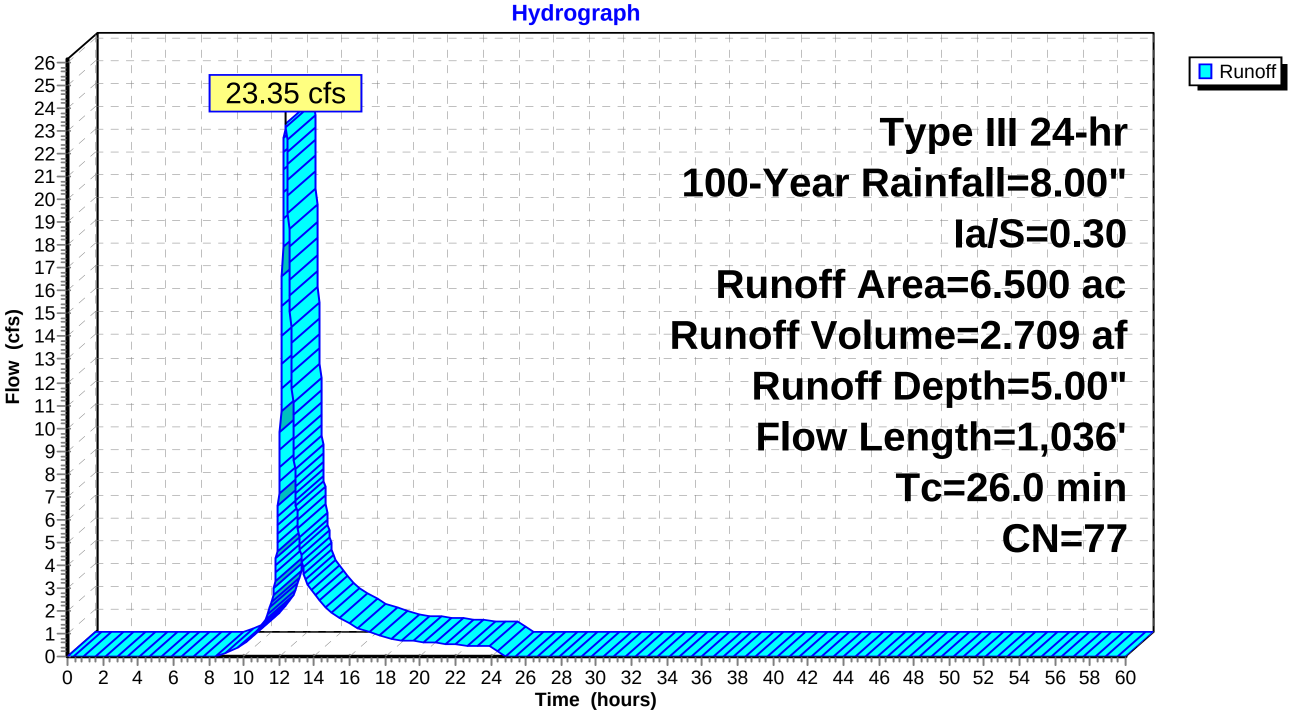
Runoff = 23.35 cfs @ 12.35 hrs, Volume= 2.709 af, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.000	98	Building roof
*	0.000	98	Paved surface
*	0.000	96	Gravel surface
*	0.000	98	Water Surface
*	0.000	98	Rock Outcrop/Ledge
	0.000	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	0.000	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	0.000	70	Woods, Good, HSG C
	6.500	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	6.500	77	Weighted Average
	6.500		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.2	100	0.0950	0.09		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
3.0	608	0.4450	3.34		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.8	328	0.0420	1.43		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
26.0	1,036	Total			

Subcatchment D101: D101



Summary for Subcatchment Overlook (P1): Overlook (Phase 1)

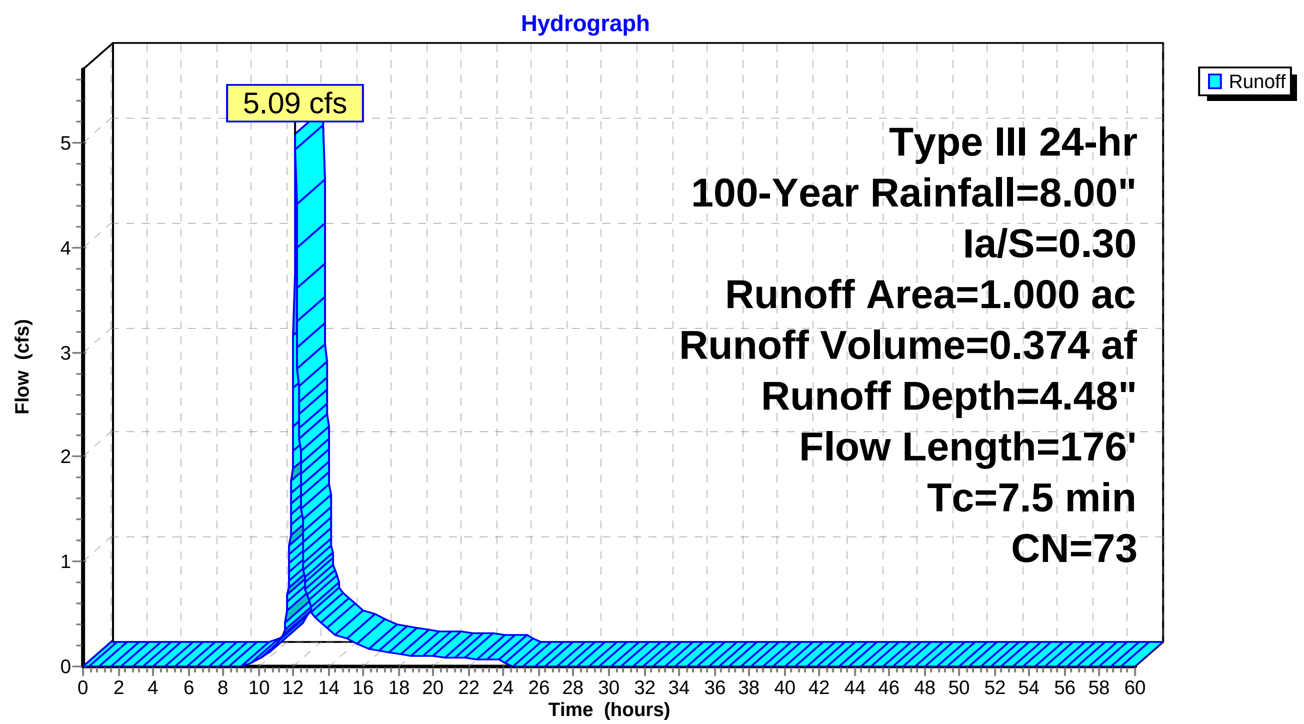
Runoff = 5.09 cfs @ 12.11 hrs, Volume= 0.374 af, Depth= 4.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
	0.150	70	Woods, Good, HSG C
	0.850	74	>75% Grass cover, Good, HSG C
*	0.000	89	Gravel roads and parking, HSG C
	0.000	98	Paved parking, HSG C
	1.000	73	Weighted Average
	1.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	20	0.2000	0.15		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.50"
5.0	80	0.1600	0.27		**Sheet Flow, B to C** Grass: Dense n= 0.240 P2= 3.50"
0.2	76	0.1570	6.38		**Shallow Concentrated Flow, C to D** Unpaved Kv= 16.1 fps
7.5	176	Total			

Subcatchment Overlook (P1): Overlook (Phase 1)



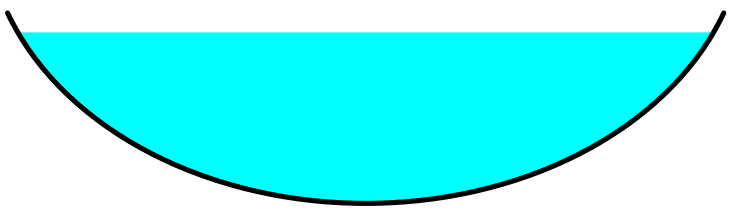
Summary for Reach A105R: Thru A101

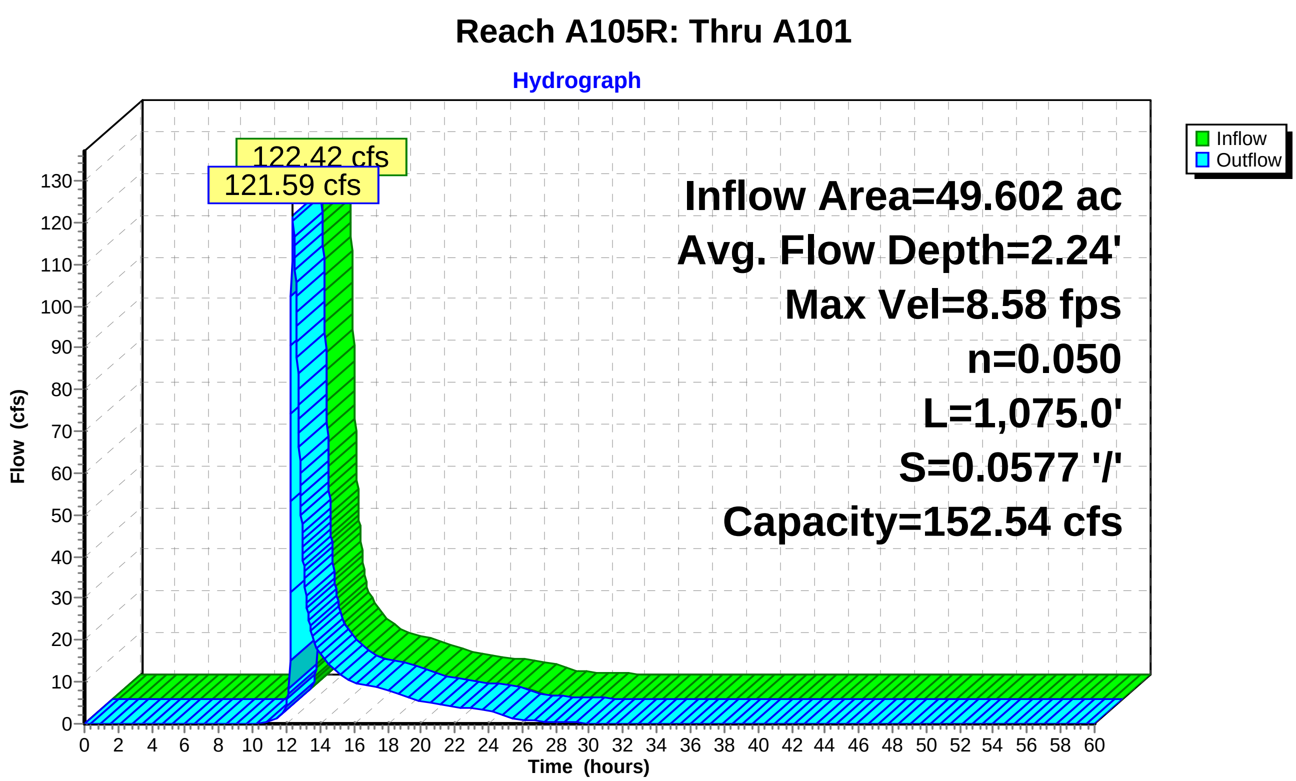
Inflow Area = 49.602 ac, 4.77% Impervious, Inflow Depth = 3.47" for 100-Year event
Inflow = 122.42 cfs @ 12.35 hrs, Volume= 14.325 af
Outflow = 121.59 cfs @ 12.38 hrs, Volume= 14.325 af, Atten= 1%, Lag= 1.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Max. Velocity= 8.58 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 1.65 fps, Avg. Travel Time= 10.9 min

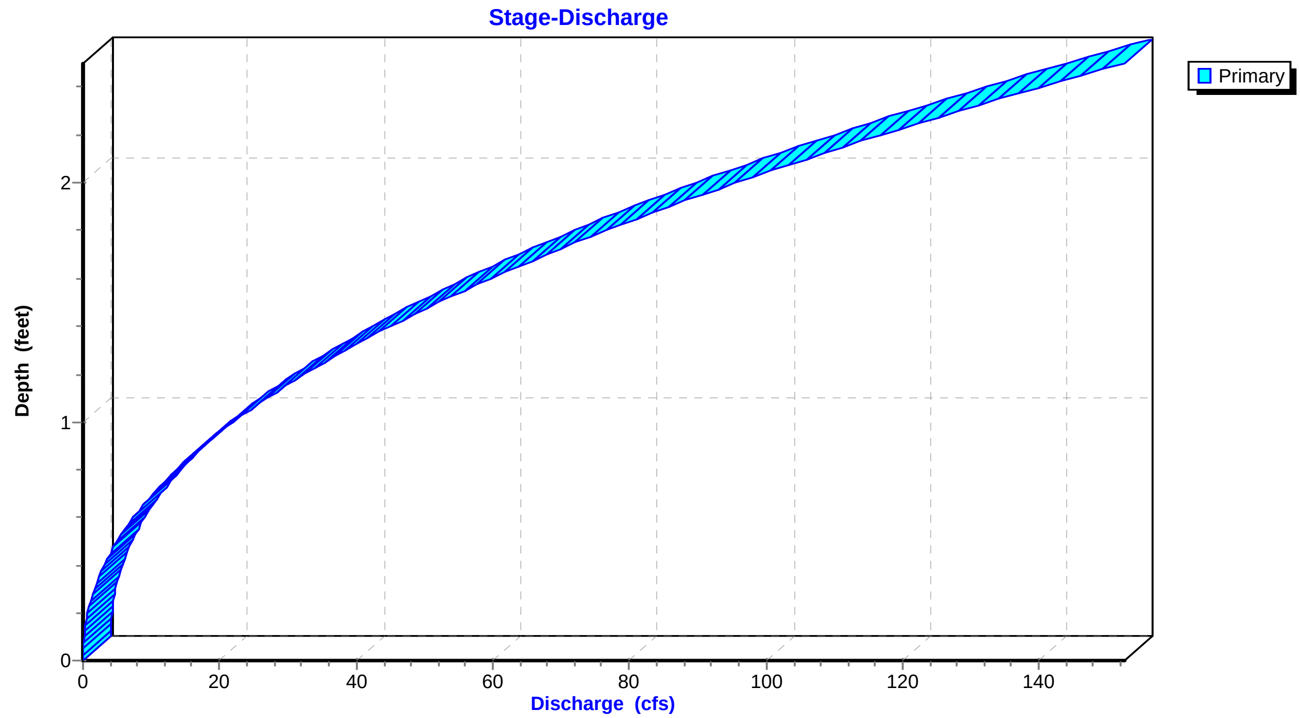
Peak Storage= 15,228 cf @ 12.38 hrs
Average Depth at Peak Storage= 2.24'
Bank-Full Depth= 2.50' Flow Area= 16.7 sf, Capacity= 152.54 cfs

10.00' x 2.50' deep Parabolic Channel, n= 0.050
Length= 1,075.0' Slope= 0.0577 '/'
Inlet Invert= 566.00', Outlet Invert= 504.00'

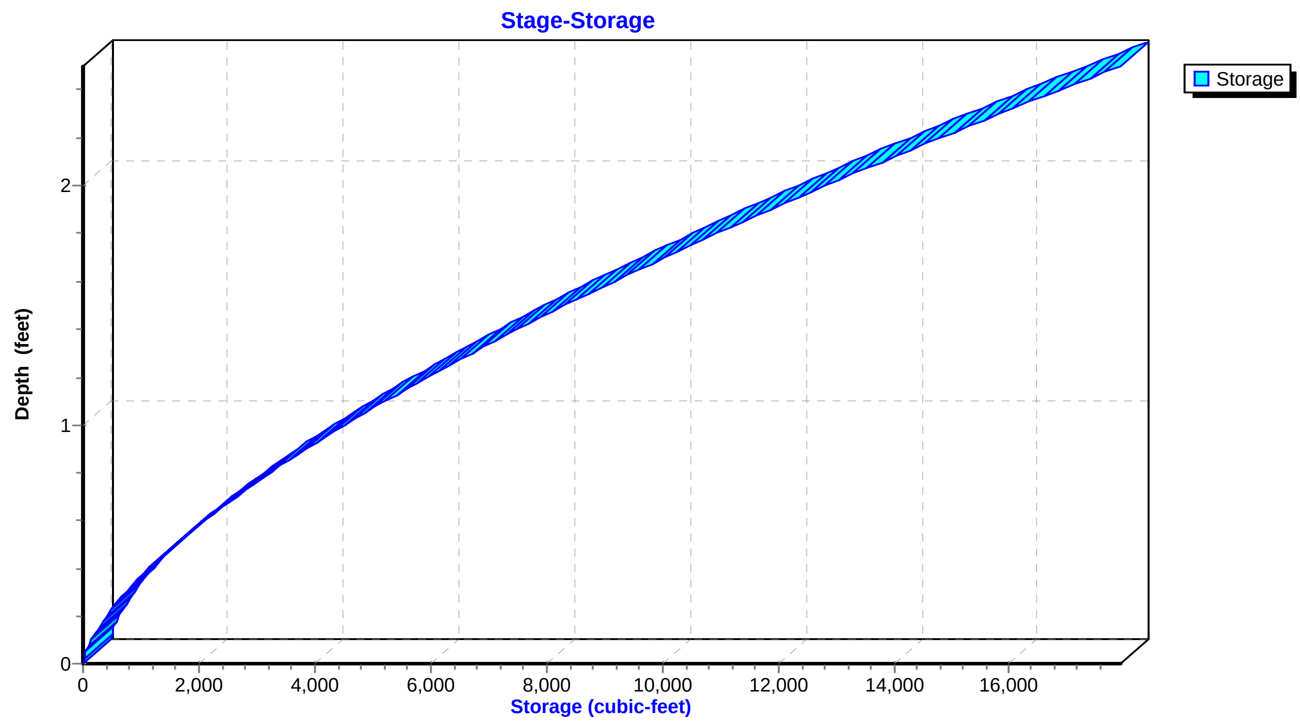




Reach A105R: Thru A101



Reach A105R: Thru A101



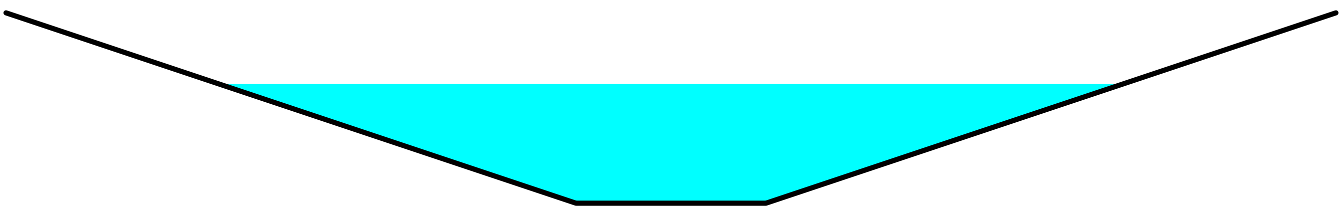
Summary for Reach A106R: Thru A105

Inflow Area = 15.338 ac, 8.12% Impervious, Inflow Depth = 4.87" for 100-Year event
Inflow = 53.17 cfs @ 12.37 hrs, Volume= 6.226 af
Outflow = 52.60 cfs @ 12.41 hrs, Volume= 6.226 af, Atten= 1%, Lag= 2.1 min

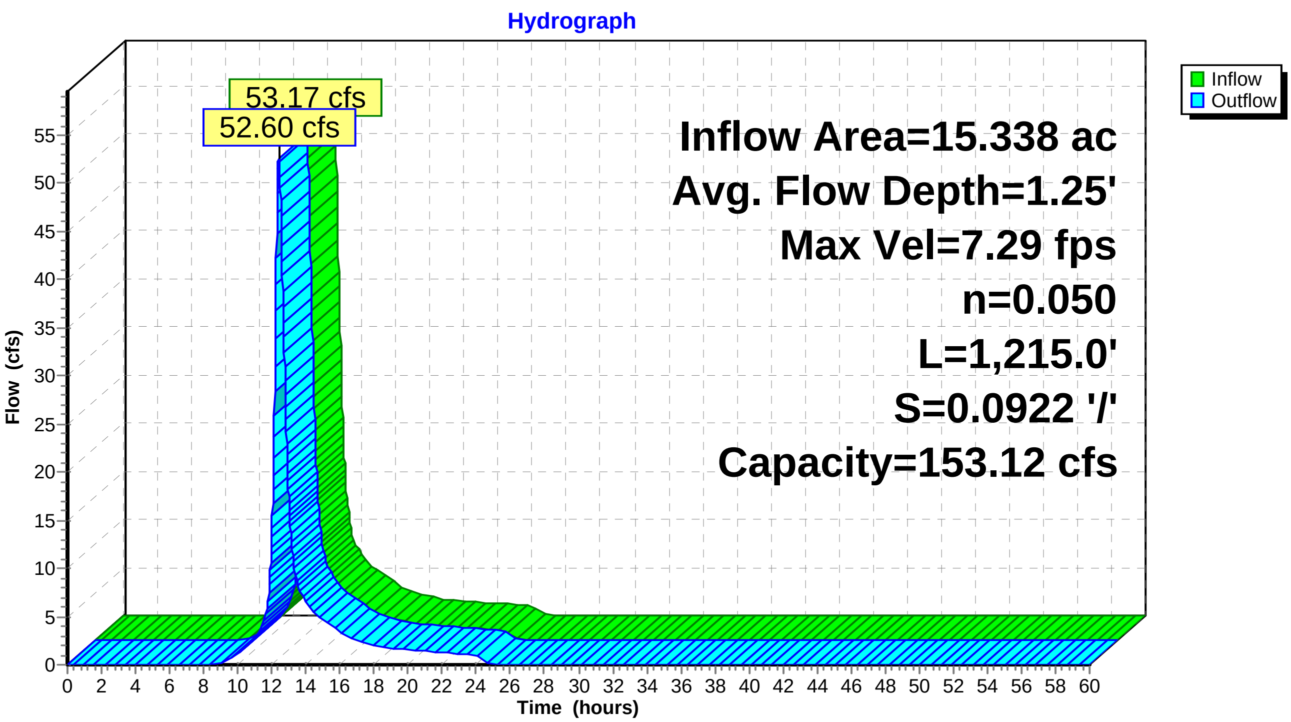
Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Max. Velocity= 7.29 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 2.71 fps, Avg. Travel Time= 7.5 min

Peak Storage= 8,761 cf @ 12.41 hrs
Average Depth at Peak Storage= 1.25'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 153.12 cfs

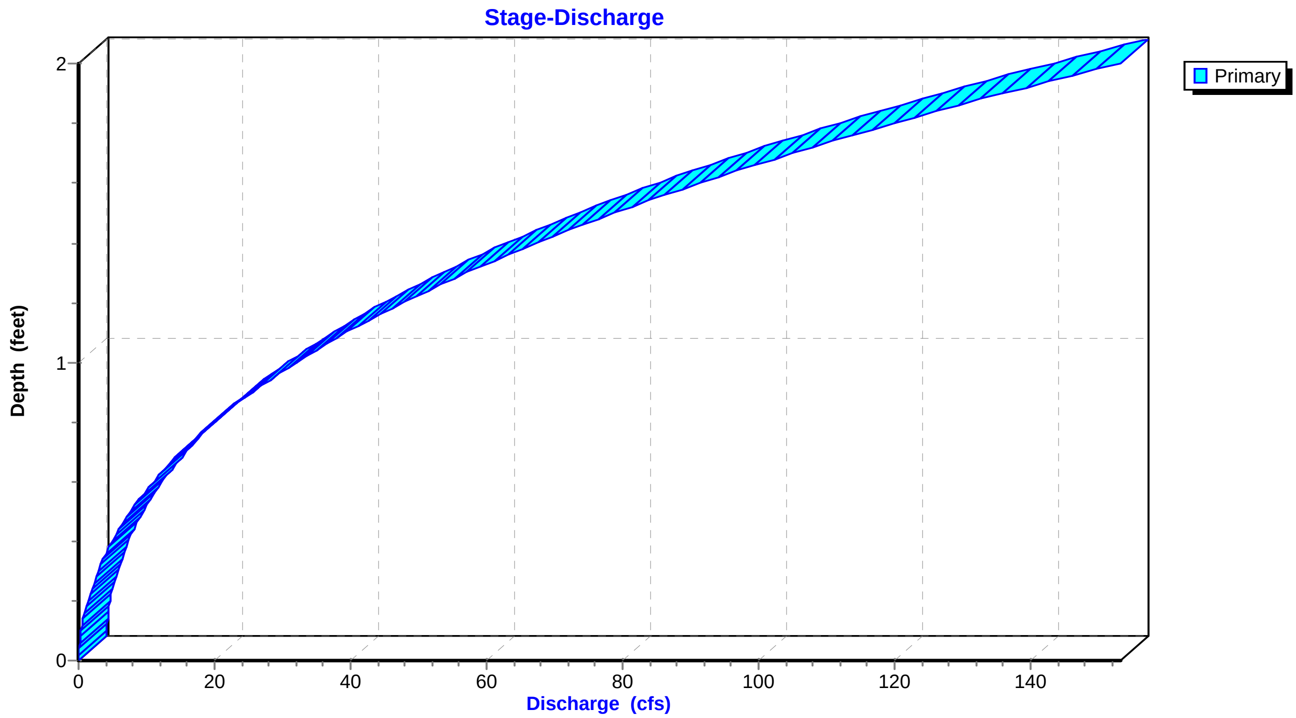
2.00' x 2.00' deep channel, n= 0.050
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 1,215.0' Slope= 0.0922 '/'
Inlet Invert= 686.00', Outlet Invert= 574.00'



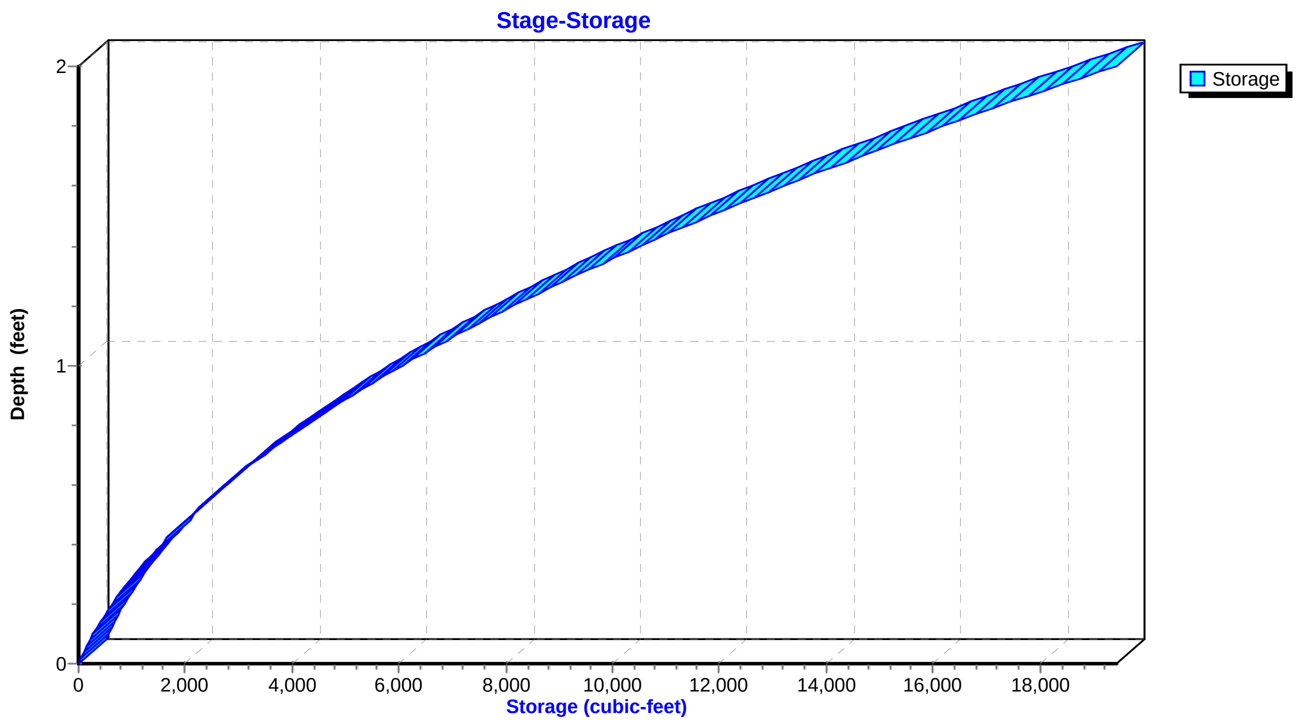
Reach A106R: Thru A105



Reach A106R: Thru A105



Reach A106R: Thru A105



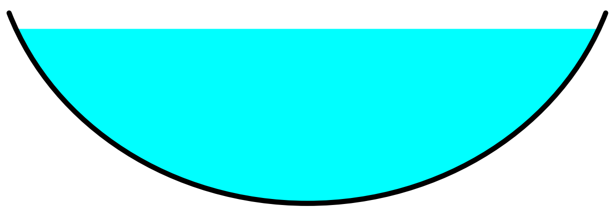
Summary for Reach A108R: Thru A101

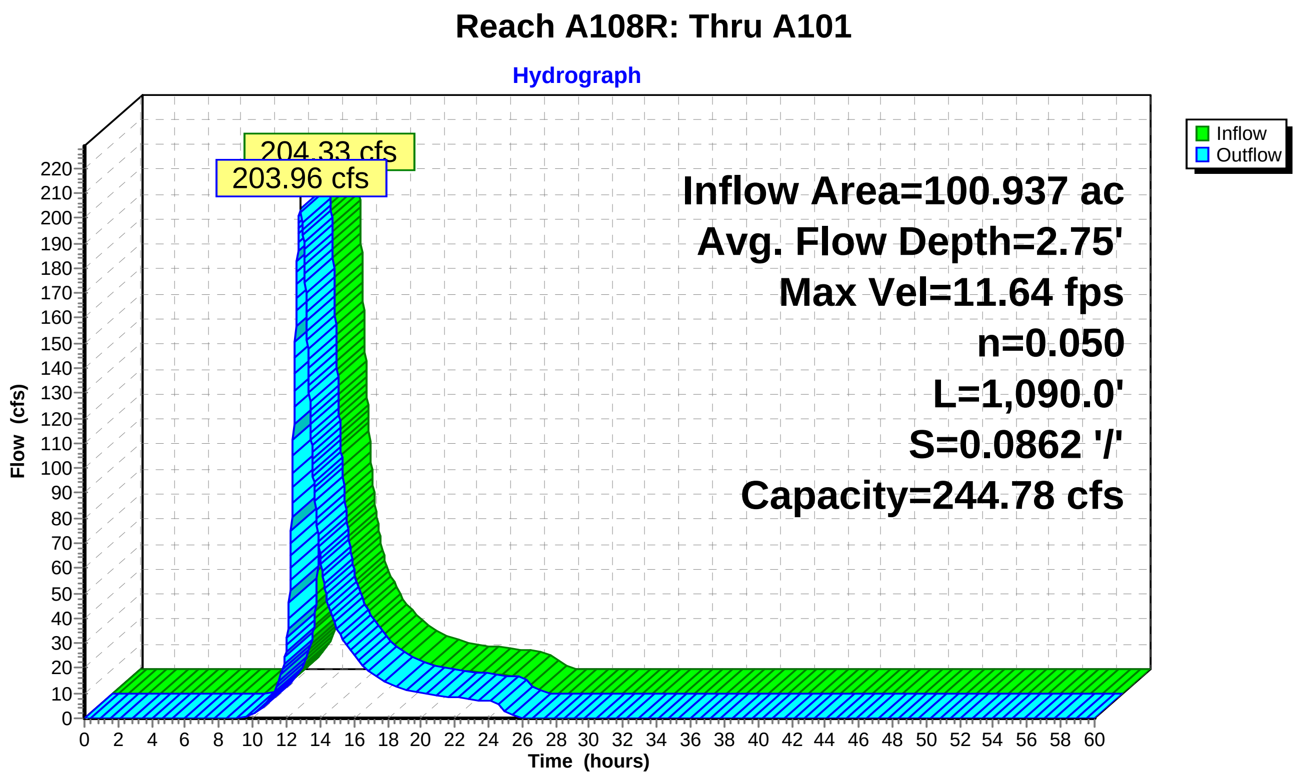
Inflow Area = 100.937 ac, 2.35% Impervious, Inflow Depth = 4.37" for 100-Year event
Inflow = 204.33 cfs @ 12.82 hrs, Volume= 36.790 af
Outflow = 203.96 cfs @ 12.84 hrs, Volume= 36.790 af, Atten= 0%, Lag= 1.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Max. Velocity= 11.64 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 4.55 fps, Avg. Travel Time= 4.0 min

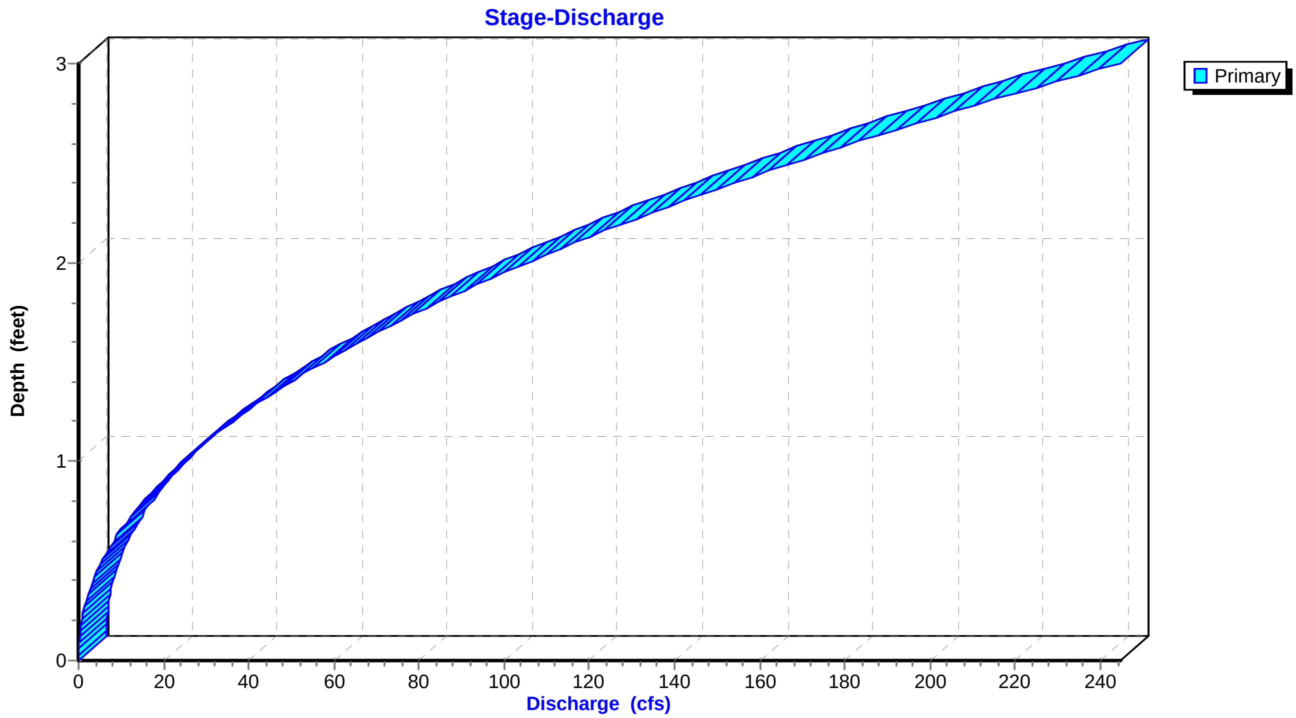
Peak Storage= 19,101 cf @ 12.84 hrs
Average Depth at Peak Storage= 2.75'
Bank-Full Depth= 3.00' Flow Area= 20.0 sf, Capacity= 244.78 cfs

10.00' x 3.00' deep Parabolic Channel, n= 0.050
Length= 1,090.0' Slope= 0.0862 '/'
Inlet Invert= 608.00', Outlet Invert= 514.00'

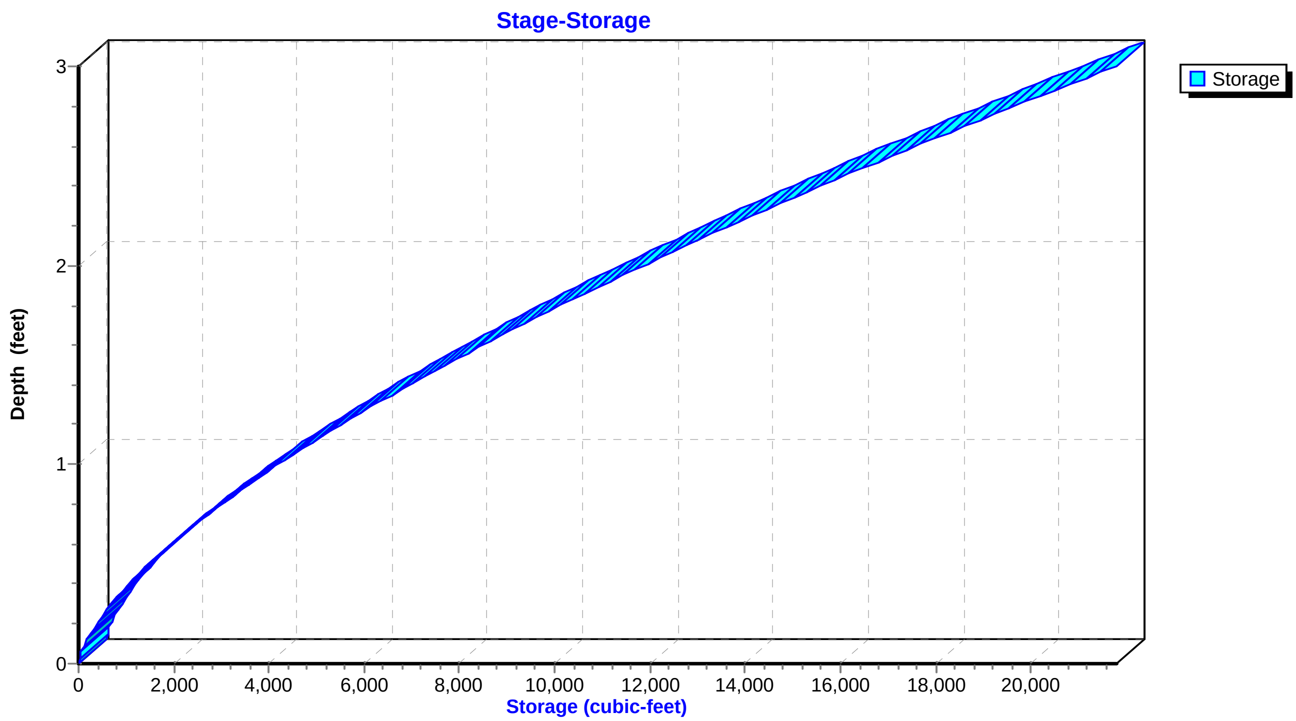




Reach A108R: Thru A101



Reach A108R: Thru A101



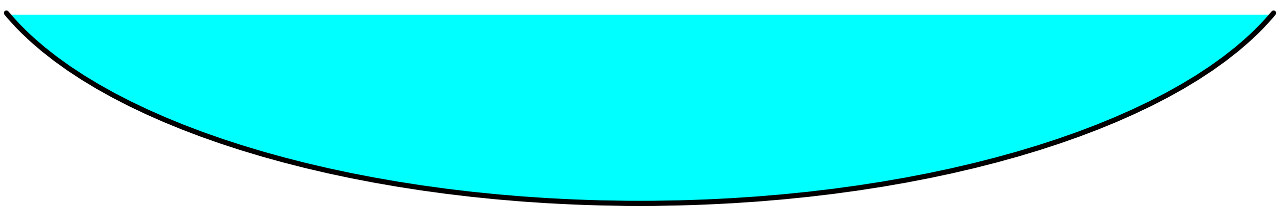
Summary for Reach B102R: Thru B101

Inflow Area = 262.883 ac, 5.84% Impervious, Inflow Depth > 4.07" for 100-Year event
Inflow = 348.43 cfs @ 13.12 hrs, Volume= 89.057 af
Outflow = 348.43 cfs @ 13.12 hrs, Volume= 89.055 af, Atten= 0%, Lag= 0.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Max. Velocity= 5.90 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.80 fps, Avg. Travel Time= 1.1 min

Peak Storage= 7,207 cf @ 13.12 hrs
Average Depth at Peak Storage= 2.97'
Bank-Full Depth= 3.00' Flow Area= 60.0 sf, Capacity= 356.26 cfs

30.00' x 3.00' deep Parabolic Channel, n= 0.050
Length= 122.0' Slope= 0.0164 '/'
Inlet Invert= 492.00', Outlet Invert= 490.00'



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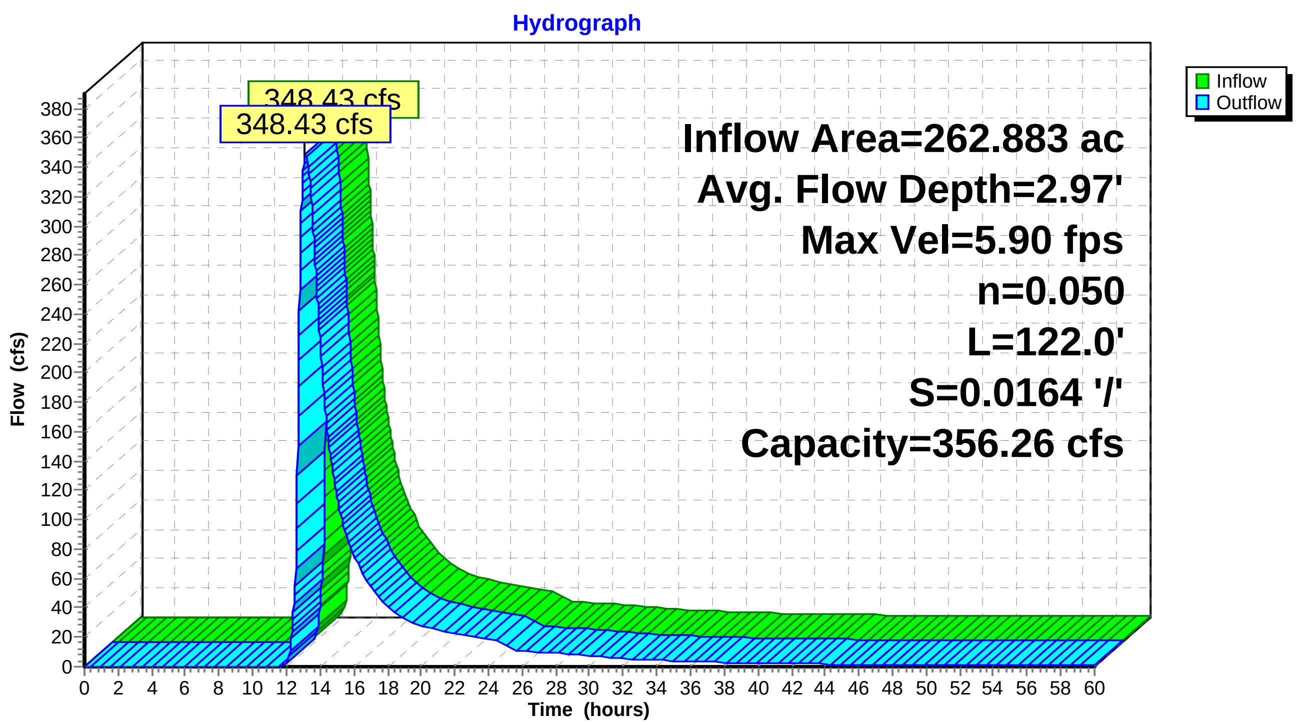
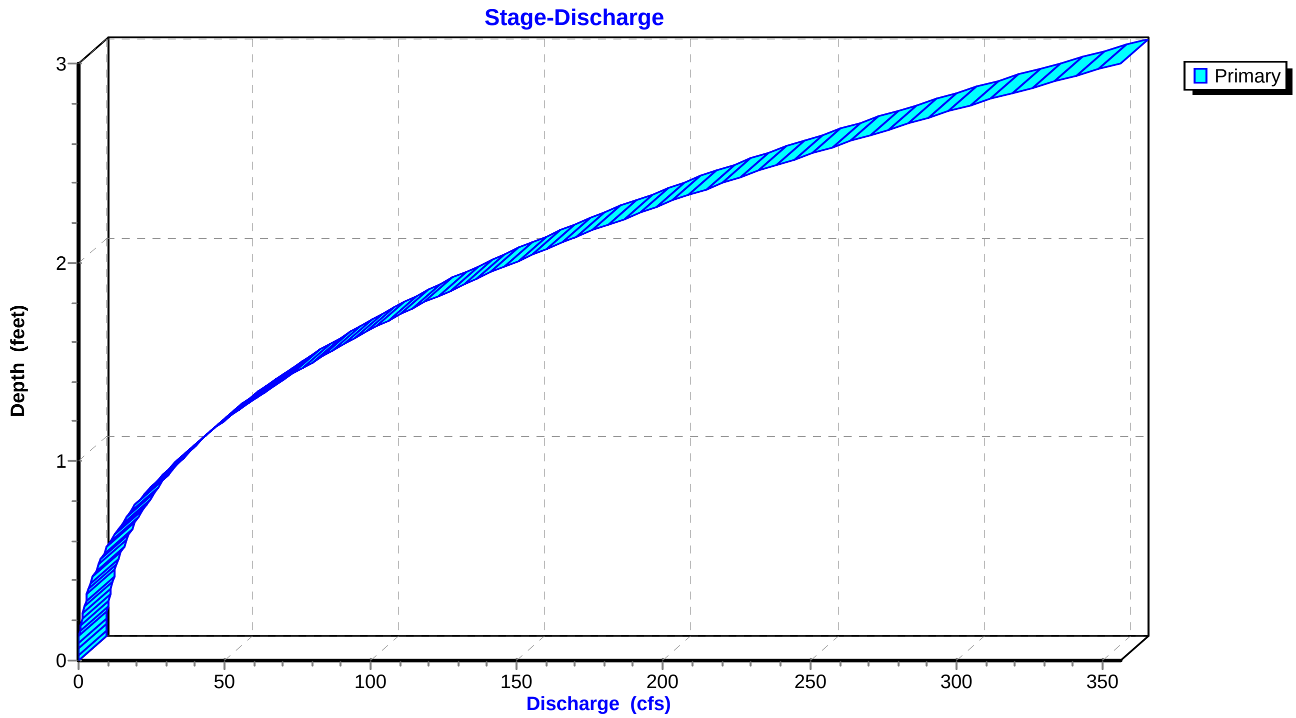
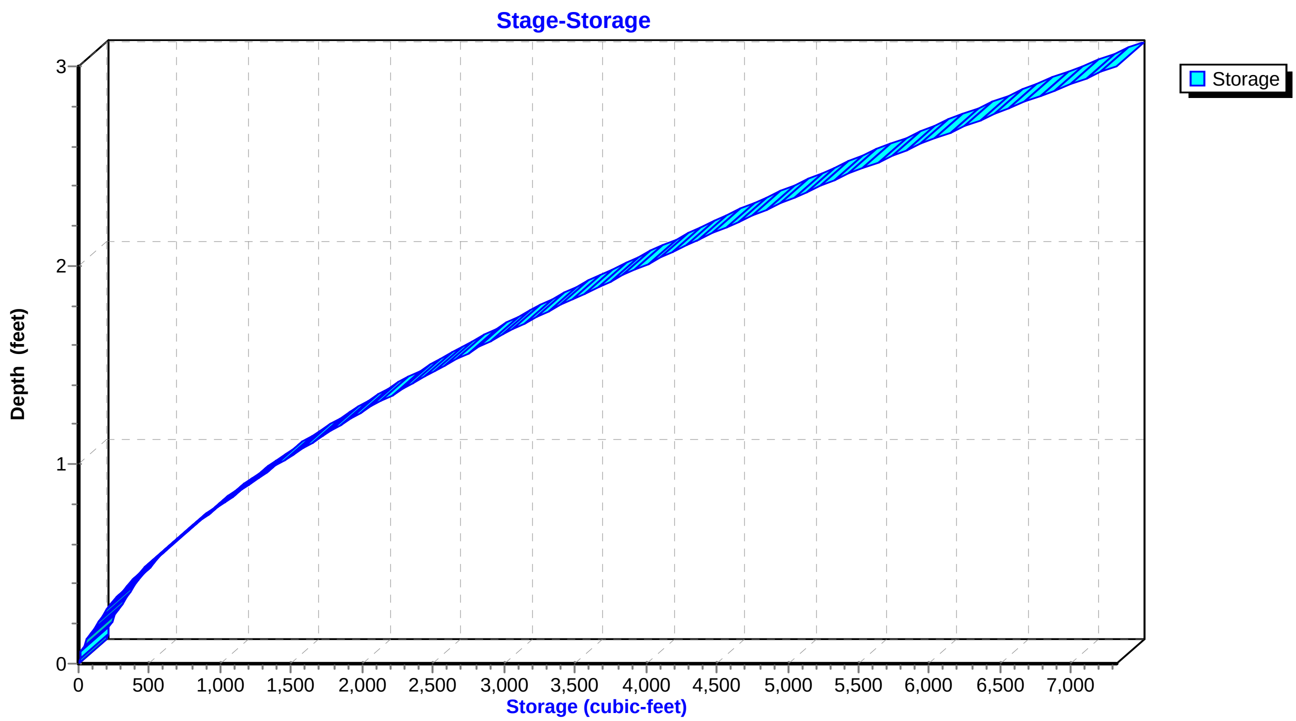
Reach B102R: Thru B101



Reach B102R: Thru B101



Reach B102R: Thru B101



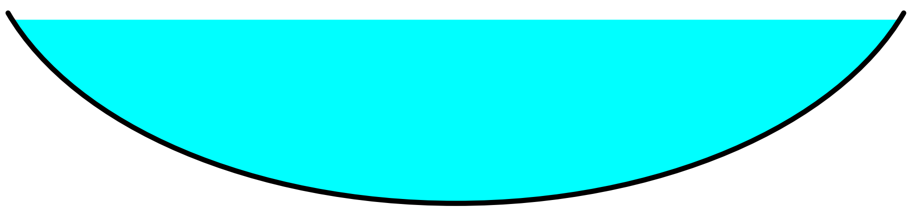
Summary for Reach B103R: Thru B102

Inflow Area = 256.384 ac, 5.93% Impervious, Inflow Depth > 4.12" for 100-Year event
Inflow = 346.32 cfs @ 13.10 hrs, Volume= 87.980 af
Outflow = 346.19 cfs @ 13.12 hrs, Volume= 87.971 af, Atten= 0%, Lag= 1.0 min

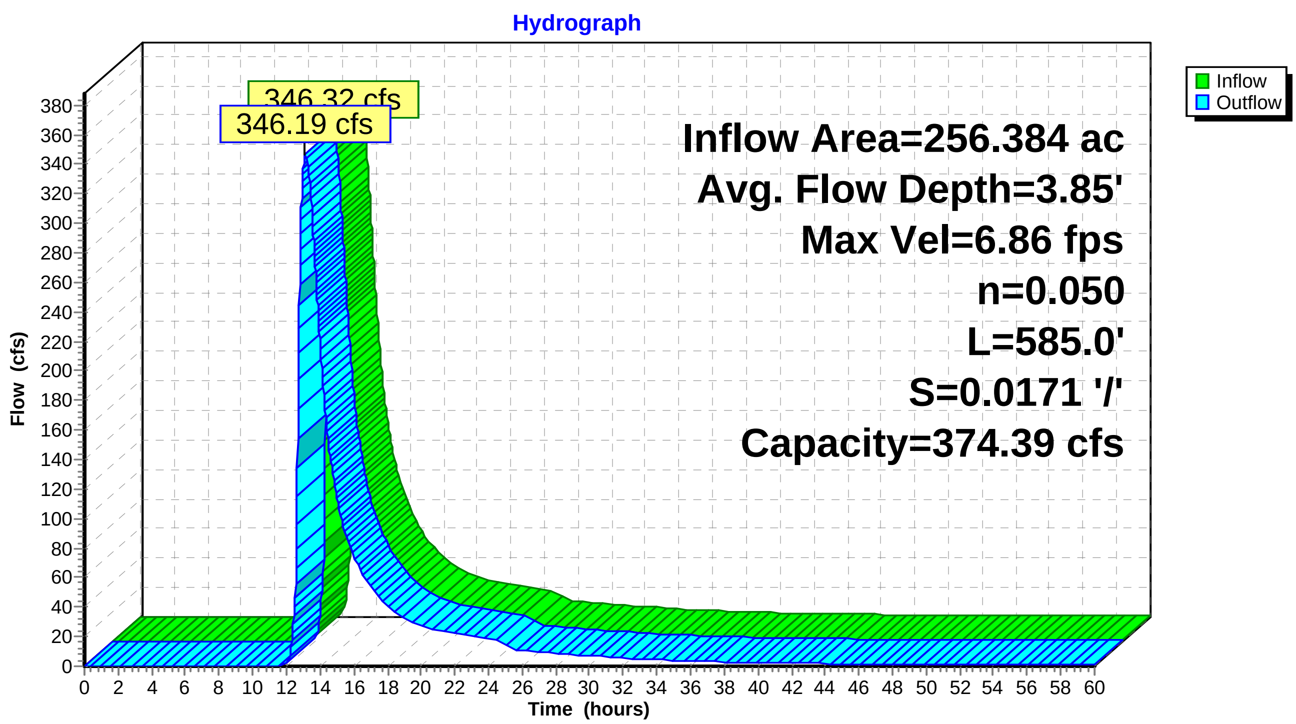
Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Max. Velocity= 6.86 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 2.13 fps, Avg. Travel Time= 4.6 min

Peak Storage= 29,512 cf @ 13.12 hrs
Average Depth at Peak Storage= 3.85'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 374.39 cfs

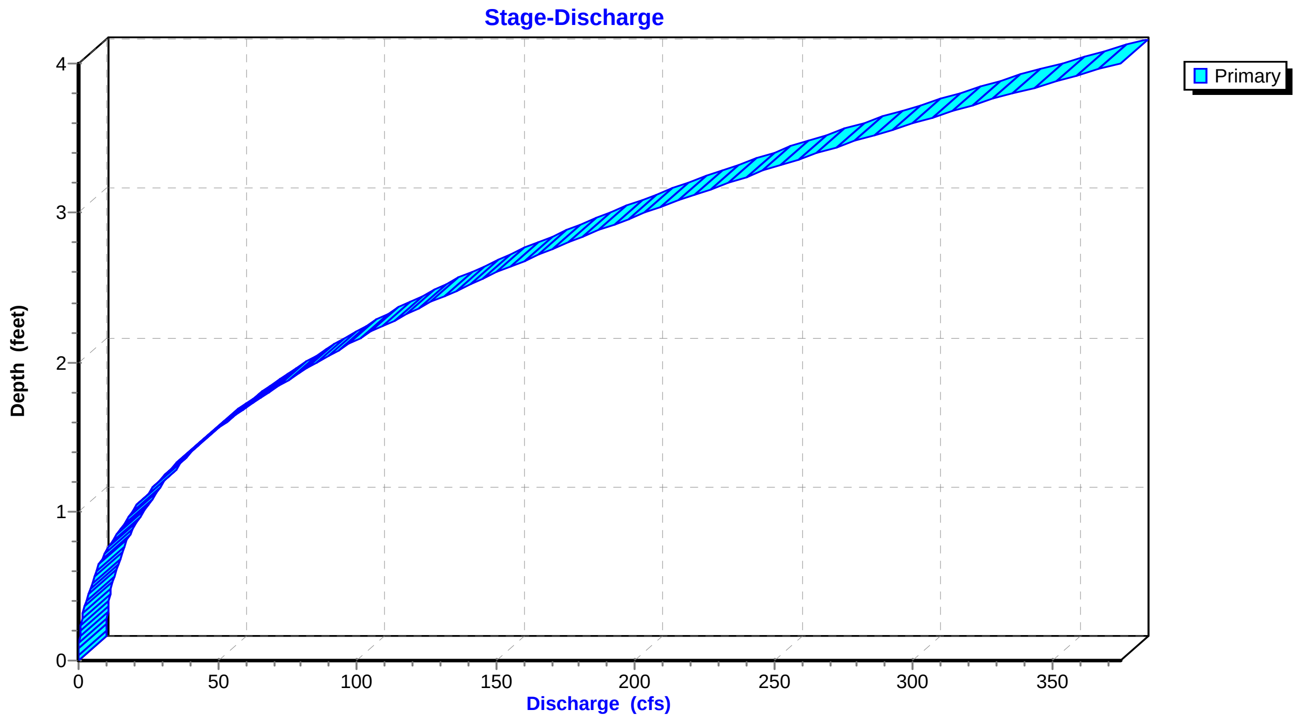
20.00' x 4.00' deep Parabolic Channel, n= 0.050
Length= 585.0' Slope= 0.0171 '/'
Inlet Invert= 502.00', Outlet Invert= 492.00'



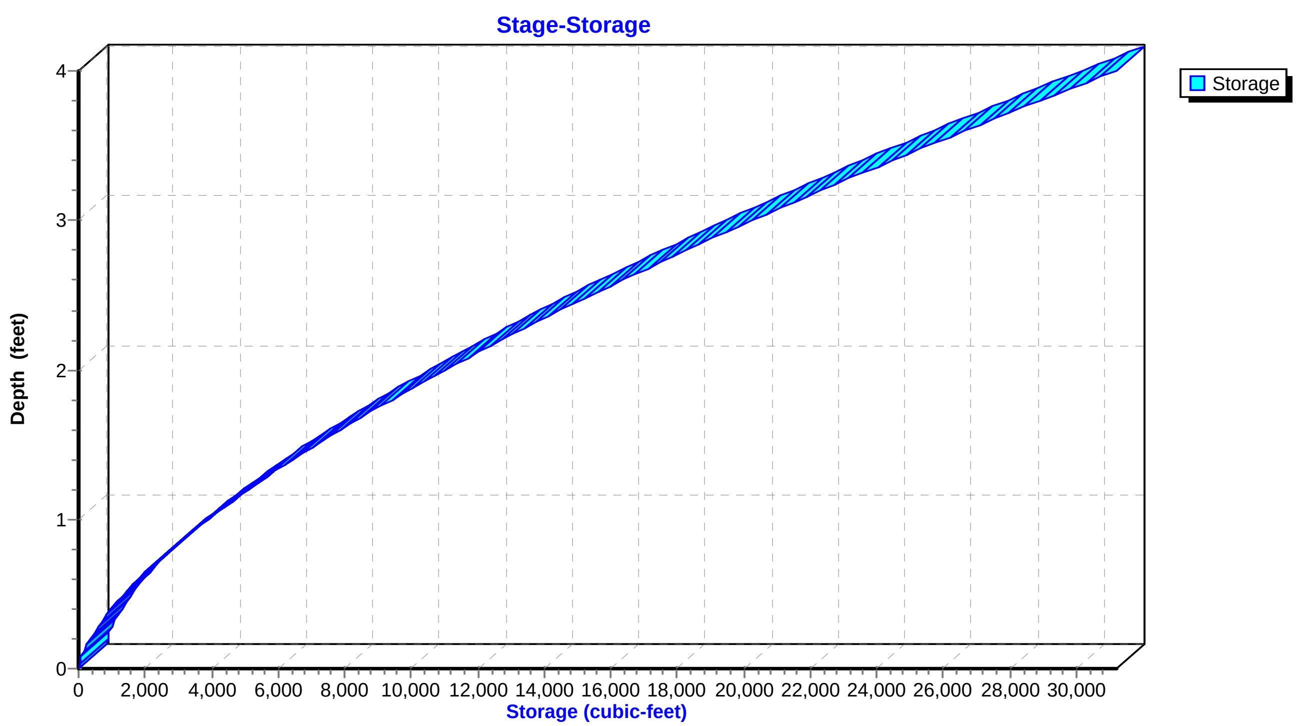
Reach B103R: Thru B102



Reach B103R: Thru B102



Reach B103R: Thru B102



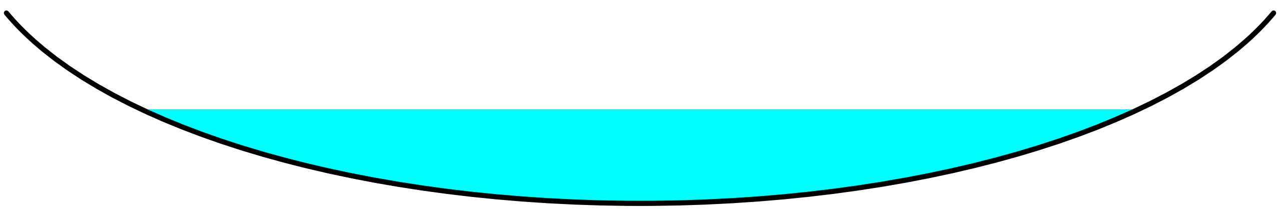
Summary for Reach B107R: Thru B108

Inflow Area = 14.330 ac, 0.00% Impervious, Inflow Depth = 4.77" for 100-Year event
Inflow = 31.60 cfs @ 12.80 hrs, Volume= 5.696 af
Outflow = 31.27 cfs @ 12.87 hrs, Volume= 5.696 af, Atten= 1%, Lag= 3.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Max. Velocity= 6.77 fps, Min. Travel Time= 5.0 min
Avg. Velocity = 1.43 fps, Avg. Travel Time= 23.8 min

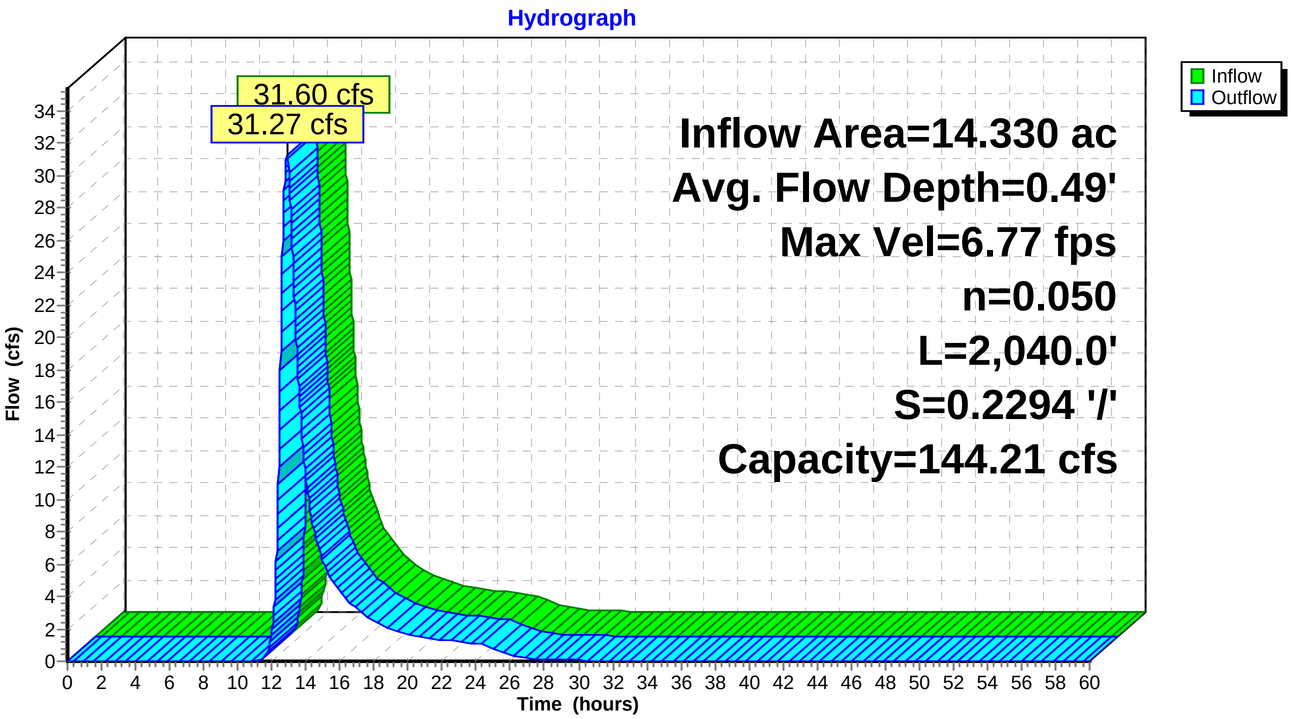
Peak Storage= 9,425 cf @ 12.87 hrs
Average Depth at Peak Storage= 0.49'
Bank-Full Depth= 1.00' Flow Area= 13.3 sf, Capacity= 144.21 cfs

20.00' x 1.00' deep Parabolic Channel, n= 0.050
Length= 2,040.0' Slope= 0.2294 '/'
Inlet Invert= 972.00', Outlet Invert= 504.00'

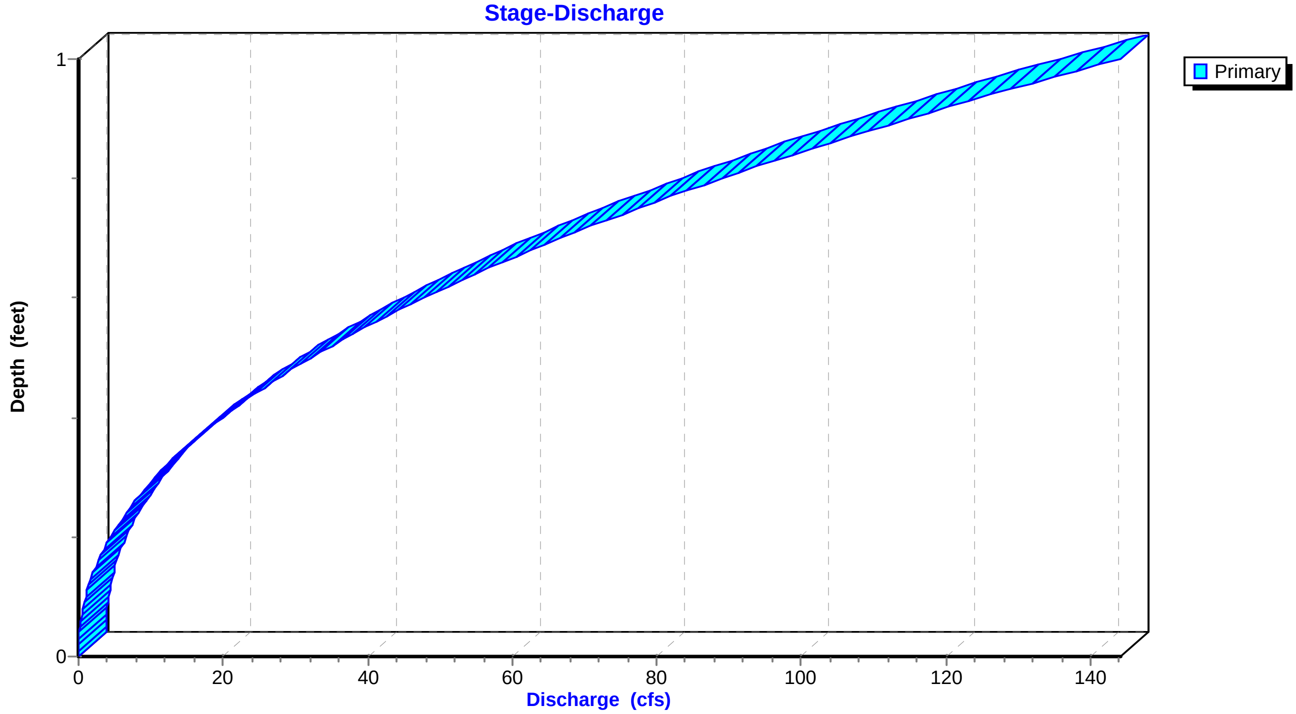


‡

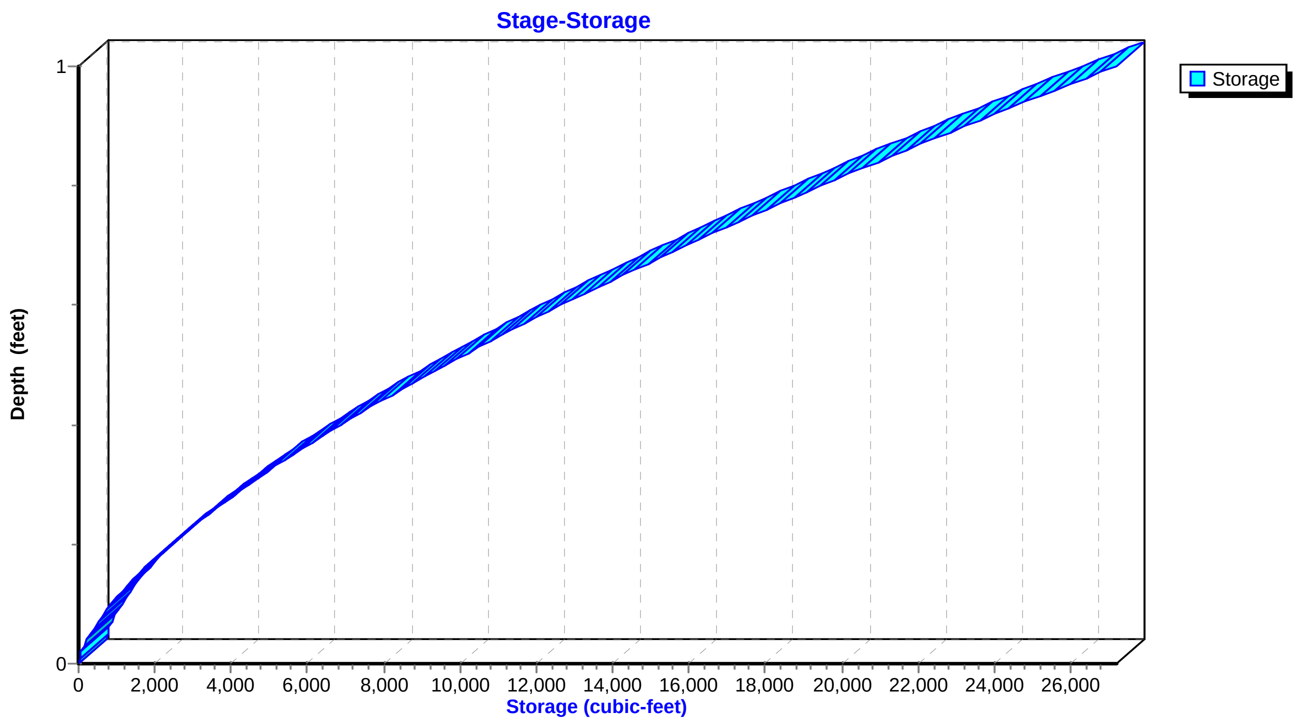
Reach B107R: Thru B108



Reach B107R: Thru B108



Reach B107R: Thru B108



Summary for Reach B108R: Thur 101

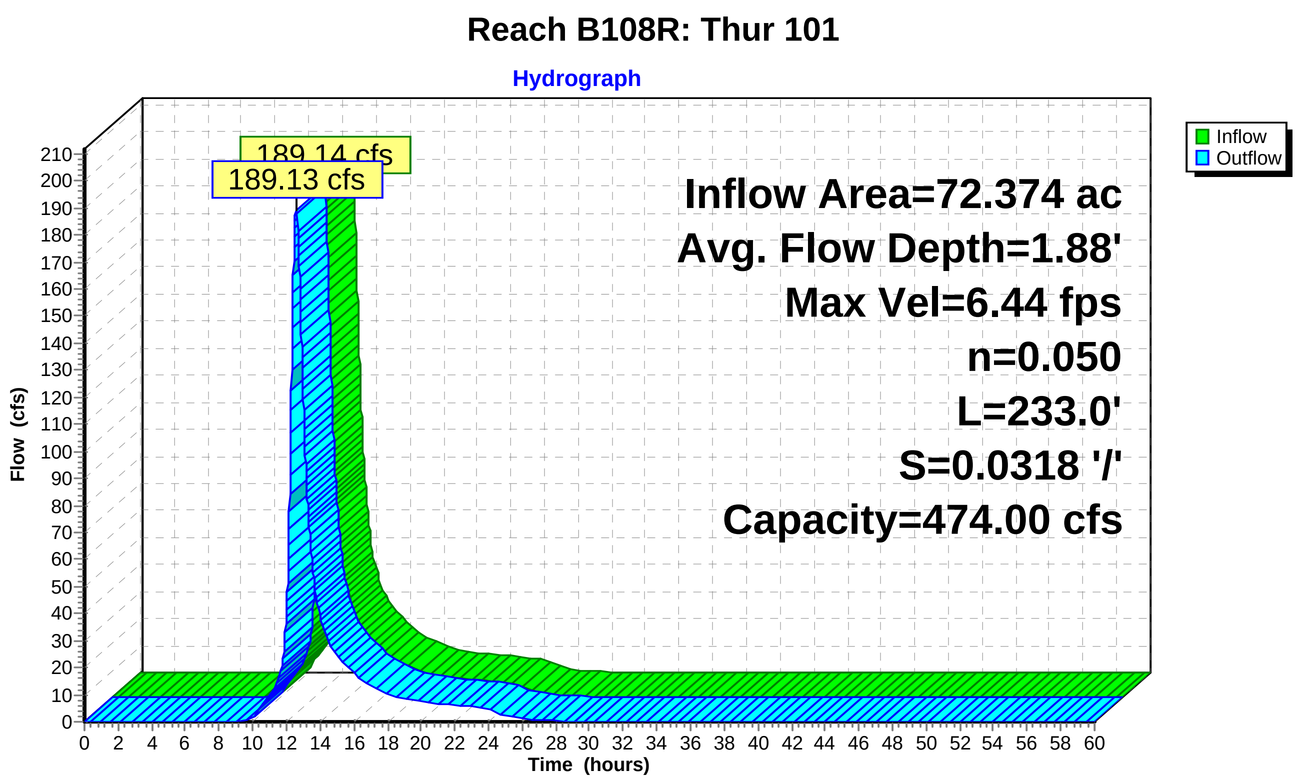
Inflow Area = 72.374 ac, 0.70% Impervious, Inflow Depth = 4.87" for 100-Year event
Inflow = 189.14 cfs @ 12.56 hrs, Volume= 29.356 af
Outflow = 189.13 cfs @ 12.57 hrs, Volume= 29.356 af, Atten= 0%, Lag= 0.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Max. Velocity= 6.44 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.23 fps, Avg. Travel Time= 3.2 min

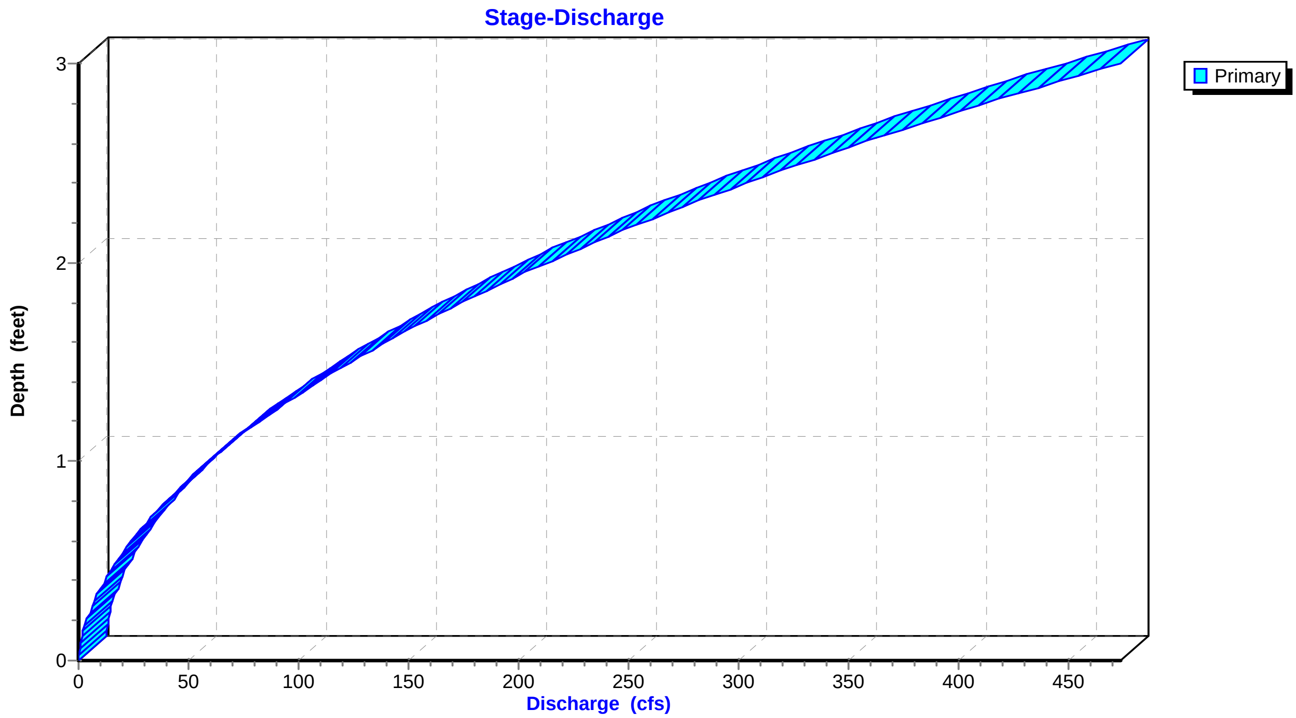
Peak Storage= 6,839 cf @ 12.57 hrs
Average Depth at Peak Storage= 1.88'
Bank-Full Depth= 3.00' Flow Area= 57.0 sf, Capacity= 474.00 cfs

10.00' x 3.00' deep channel, n= 0.050
Side Slope Z-value= 3.0 '/' Top Width= 28.00'
Length= 233.0' Slope= 0.0318 '/'
Inlet Invert= 499.60', Outlet Invert= 492.20'

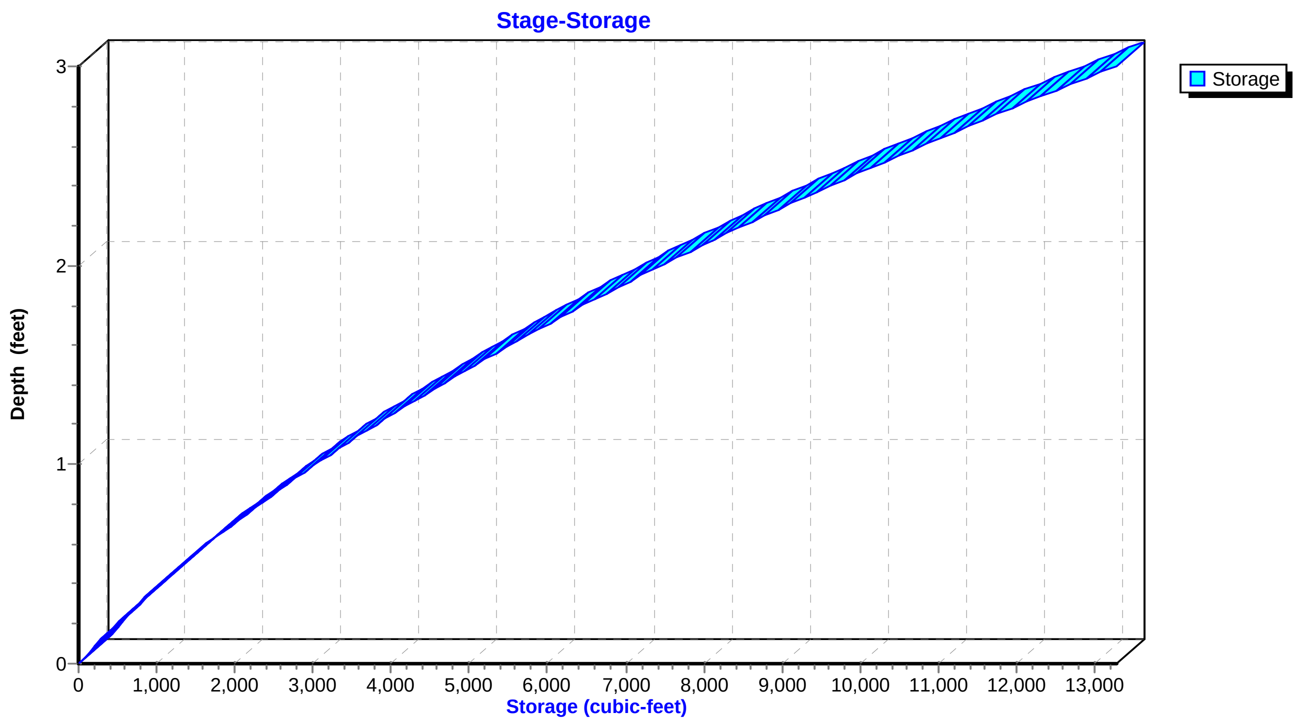
‡



Reach B108R: Thur 101



Reach B108R: Thur 101



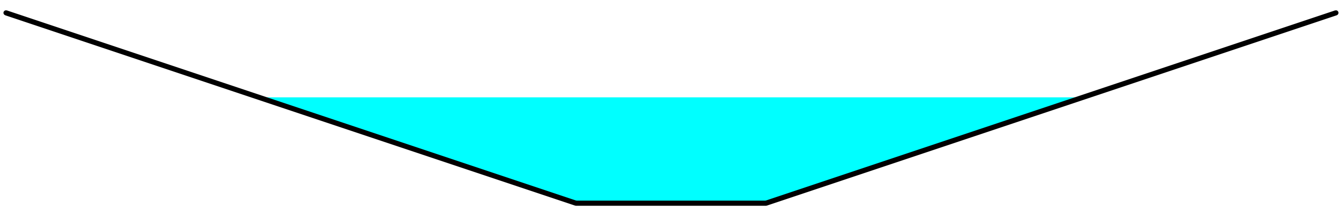
Summary for Reach B109R: Thru B108

Inflow Area = 11.276 ac, 0.04% Impervious, Inflow Depth = 5.00" for 100-Year event
Inflow = 38.91 cfs @ 12.40 hrs, Volume= 4.699 af
Outflow = 38.86 cfs @ 12.41 hrs, Volume= 4.699 af, Atten= 0%, Lag= 0.7 min

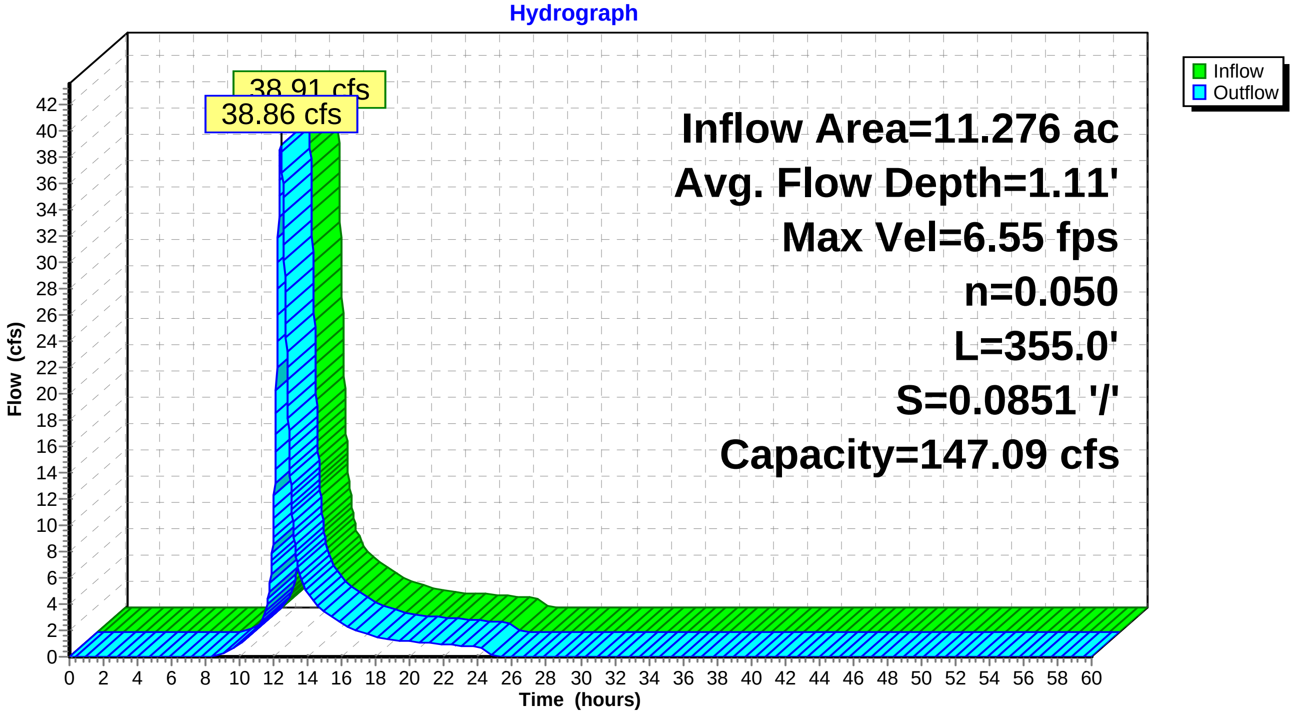
Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Max. Velocity= 6.55 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 2.64 fps, Avg. Travel Time= 2.2 min

Peak Storage= 2,106 cf @ 12.41 hrs
Average Depth at Peak Storage= 1.11'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 147.09 cfs

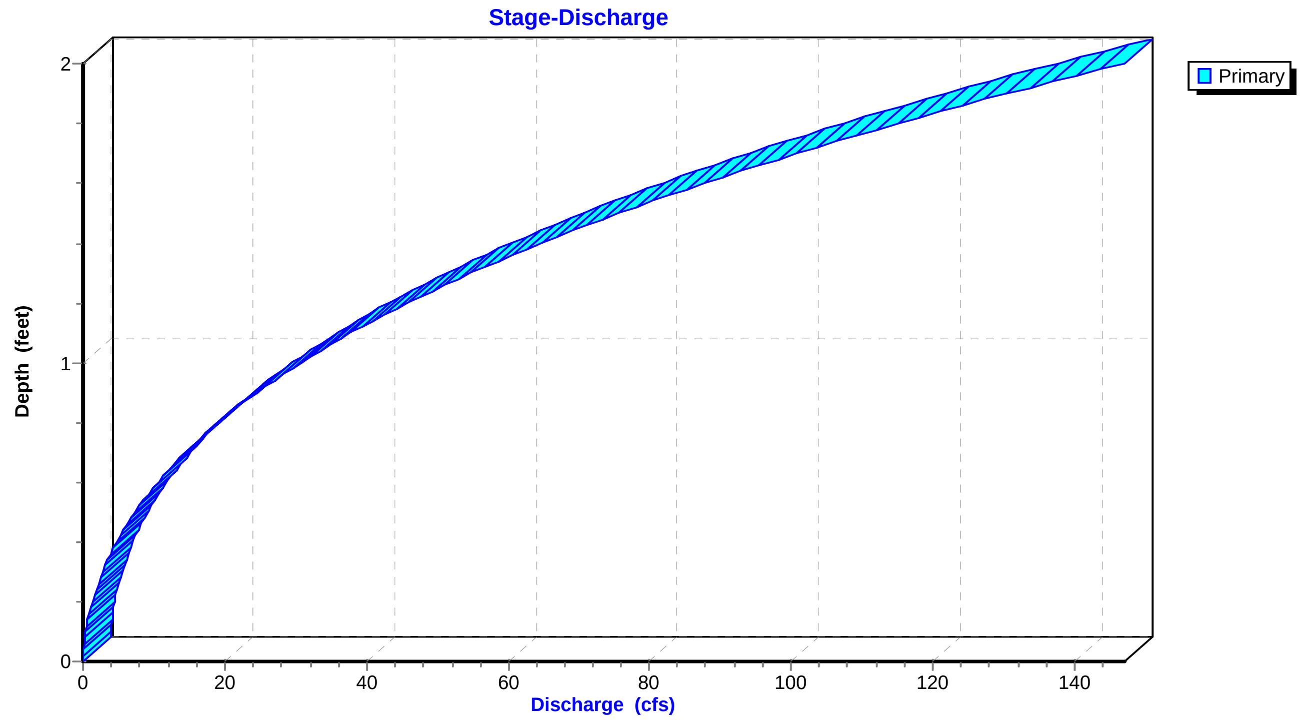
2.00' x 2.00' deep channel, n= 0.050
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 355.0' Slope= 0.0851 '/'
Inlet Invert= 532.20', Outlet Invert= 502.00'



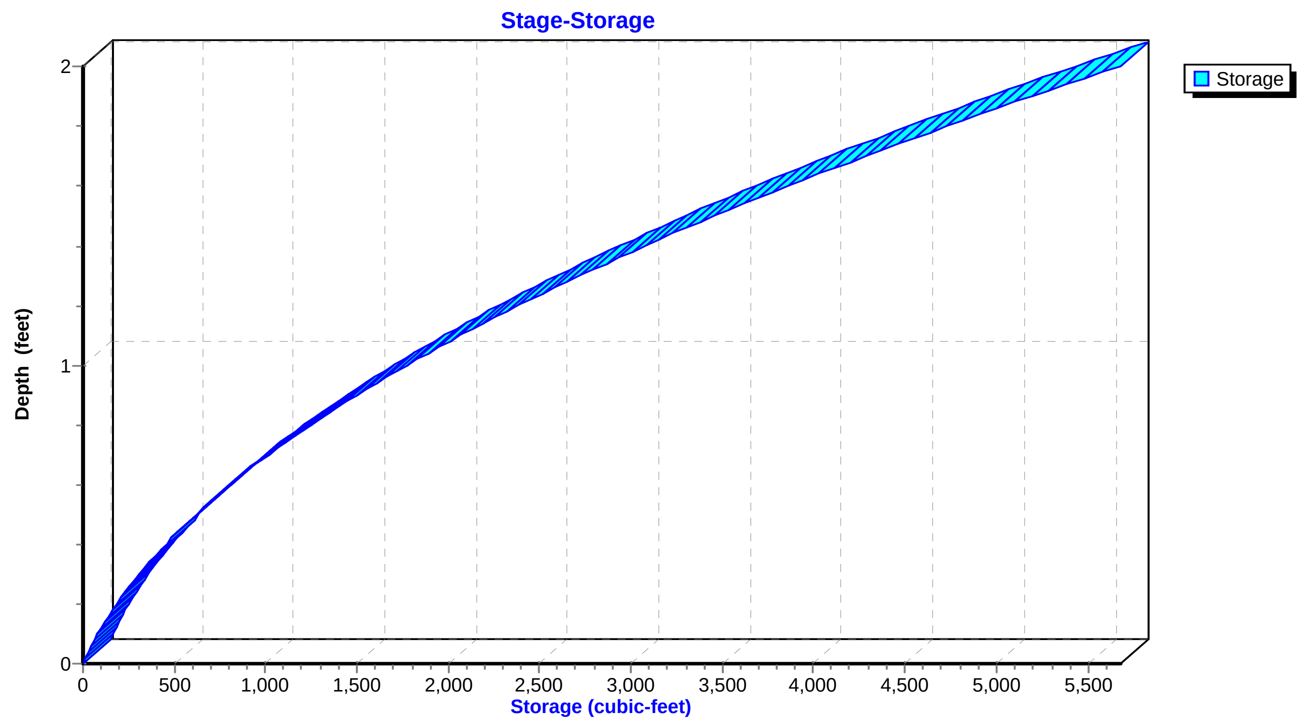
Reach B109R: Thru B108



Reach B109R: Thru B108



Reach B109R: Thru B108



Summary for Pond 102A: Wetland B

Inflow Area = 45.922 ac, 9.71% Impervious, Inflow Depth > 0.53" for 100-Year event
Inflow = 7.85 cfs @ 12.52 hrs, Volume= 2.035 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
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 500.30' @ 60.00 hrs Surf.Area= 44,330 sf Storage= 88,645 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	498.10'	740,168 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

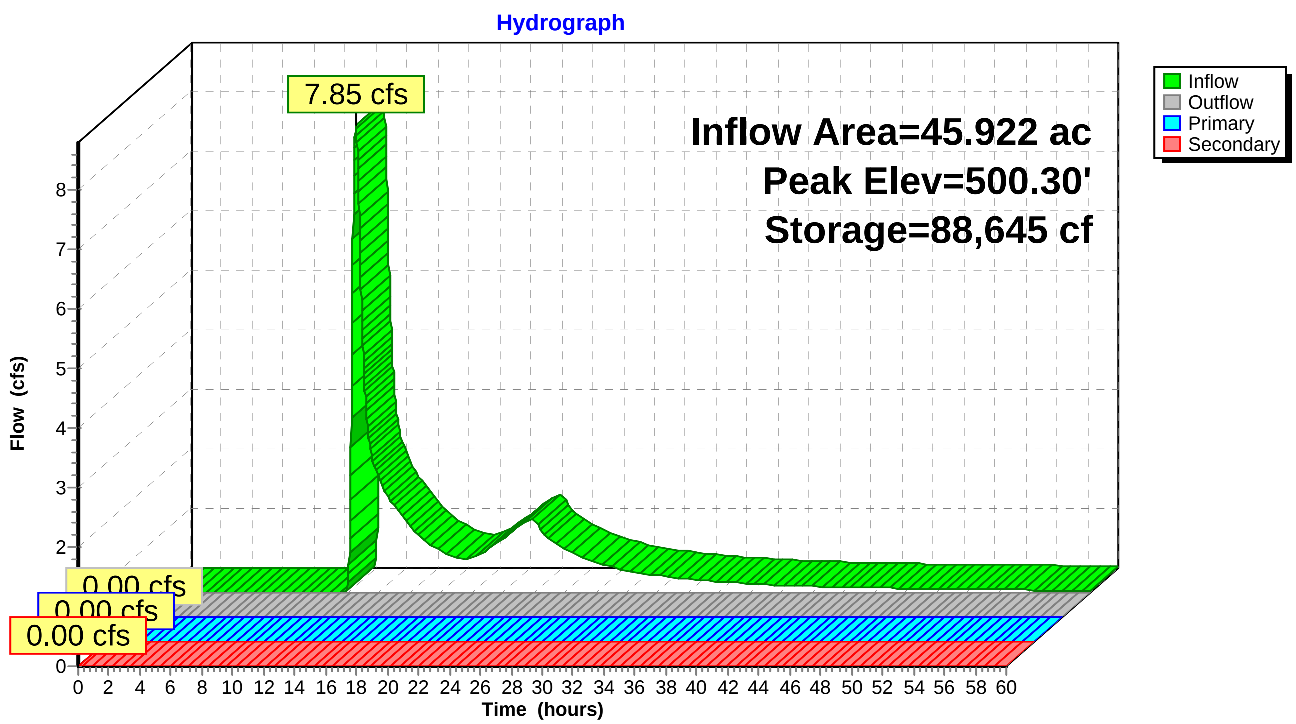
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
498.10	37,121	782.0	0	0	37,121
500.00	42,629	822.0	75,702	75,702	42,449
502.00	54,696	1,028.0	97,075	172,777	72,833
504.00	78,374	1,409.0	132,362	305,139	146,760
506.00	108,988	1,330.0	186,523	491,662	164,196
508.00	140,171	1,485.0	248,506	740,168	199,031

Device	Routing	Invert	Outlet Devices
#1	Primary	501.90'	**24.0" Round Culvert** L= 80.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 501.90' / 500.90' S= 0.0125 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Secondary	506.10'	**100.0' long x 20.0' 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) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

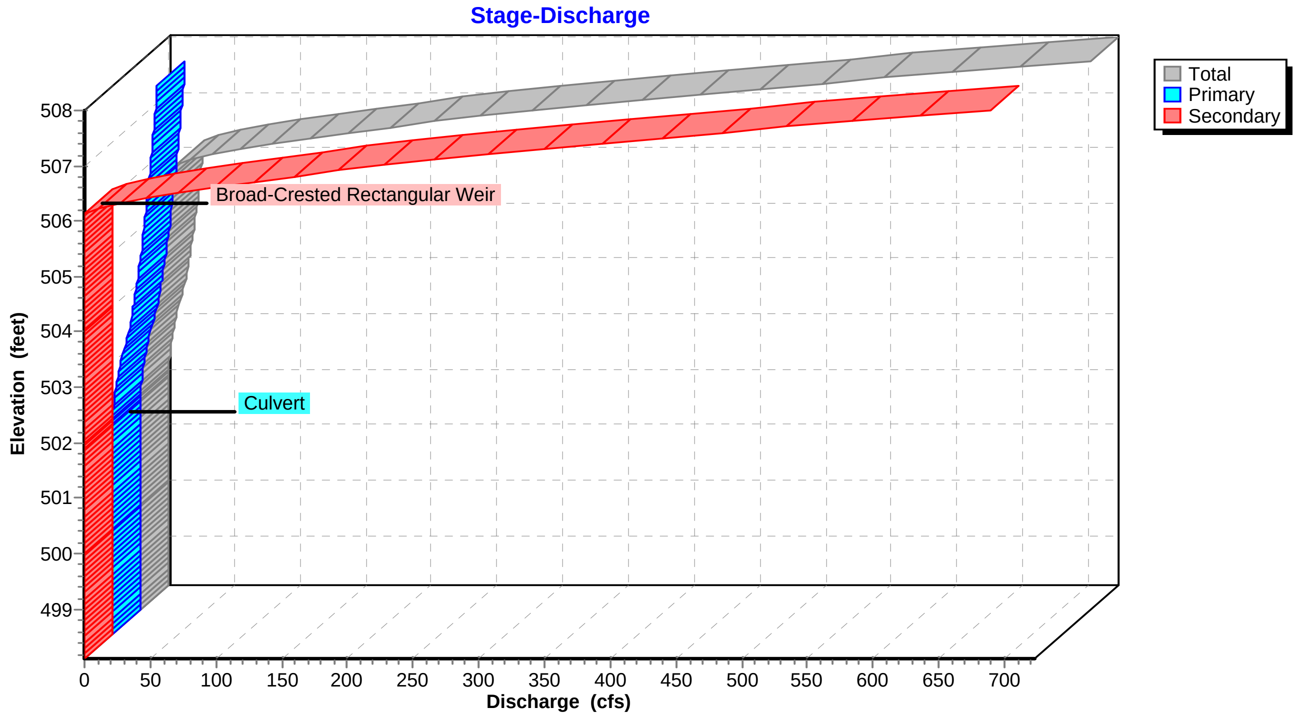
Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=498.10' (Free Discharge)
└─**1=Culvert** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=498.10' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

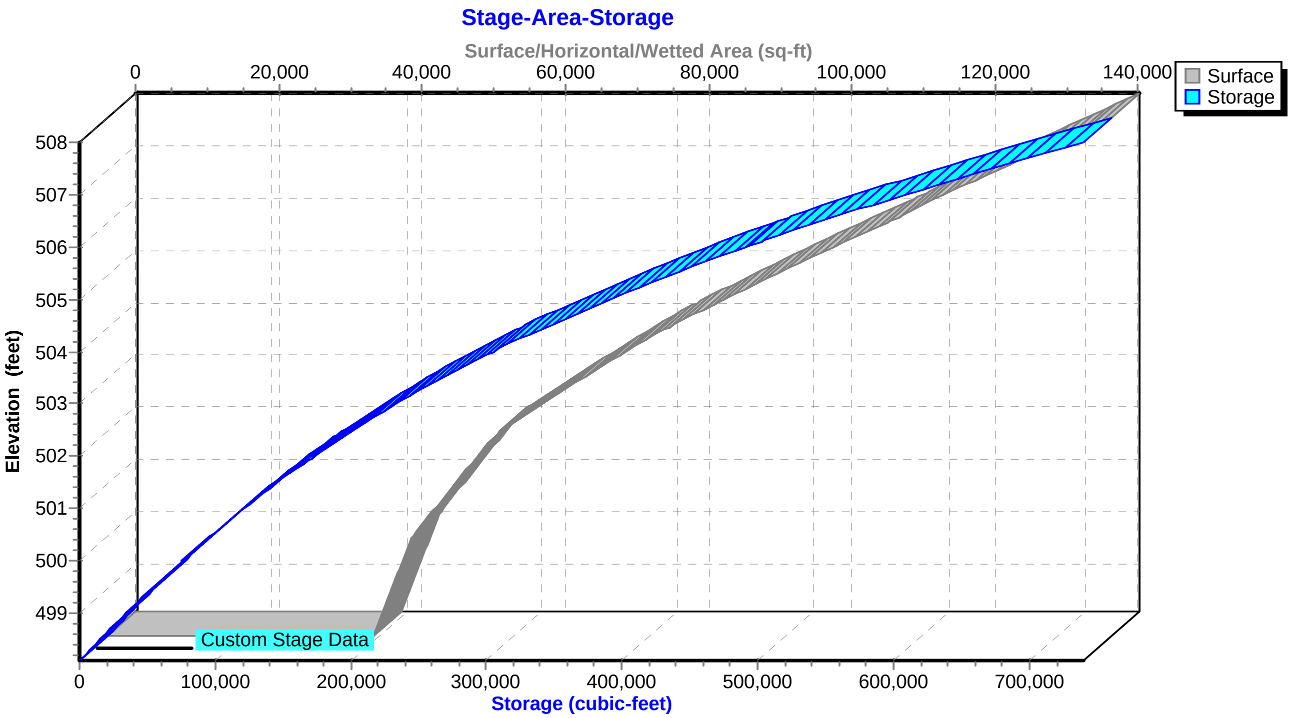
Pond 102A: Wetland B



Pond 102A: Wetland B



Pond 102A: Wetland B



Summary for Pond 102B: 18" Culvert

[62] Hint: Exceeded Reach B103R OUTLET depth by 2.28' @ 27.24 hrs

Inflow Area =	262.883 ac,	5.84% Impervious, Inflow Depth > 4.07" for 100-Year event		
Inflow =	348.44 cfs @	13.12 hrs, Volume=	89.058 af	
Outflow =	348.43 cfs @	13.12 hrs, Volume=	89.057 af,	Atten= 0%, Lag= 0.2 min
Primary =	10.04 cfs @	19.57 hrs, Volume=	19.685 af	
Secondary =	341.07 cfs @	13.12 hrs, Volume=	69.373 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 496.17' @ 13.12 hrs Surf.Area= 6,440 sf Storage= 8,424 cf

Plug-Flow detention time= 1.1 min calculated for 89.028 af (100% of inflow)
Center-of-Mass det. time= 1.1 min (1,055.6 - 1,054.5)

Volume	Invert	Avail.Storage	Storage Description
#1	492.20'	27,470 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

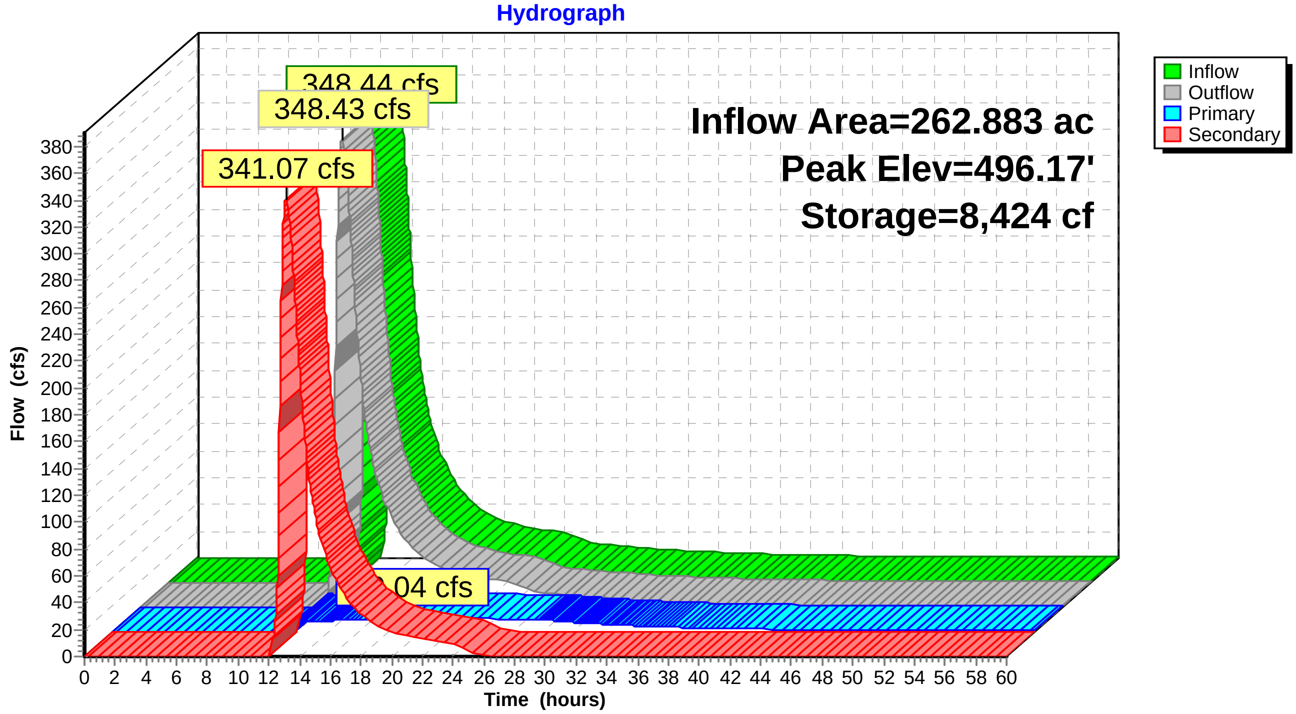
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
492.20	0	0.0	0	0	0
496.00	5,819	521.0	7,371	7,371	21,623
498.00	14,990	910.0	20,099	27,470	65,944

Device	Routing	Invert	Outlet Devices
#1	Primary	492.20'	**18.0" Round Culvert** L= 20.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 492.20' / 491.10' S= 0.0550 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 1.77 sf
#2	Secondary	495.00'	**100.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

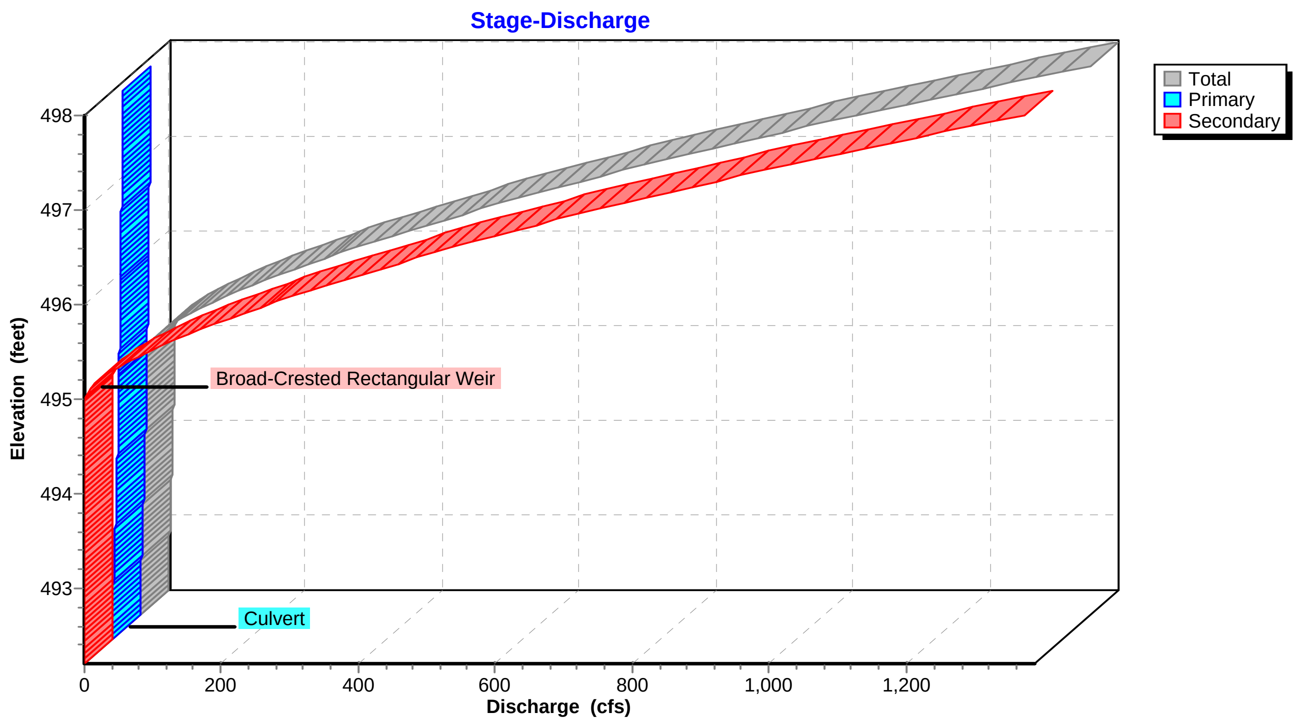
Primary OutFlow Max=10.04 cfs @ 19.57 hrs HW=495.18' TW=492.95' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 10.04 cfs @ 5.68 fps)

Secondary OutFlow Max=341.06 cfs @ 13.12 hrs HW=496.17' TW=494.97' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 341.06 cfs @ 2.91 fps)

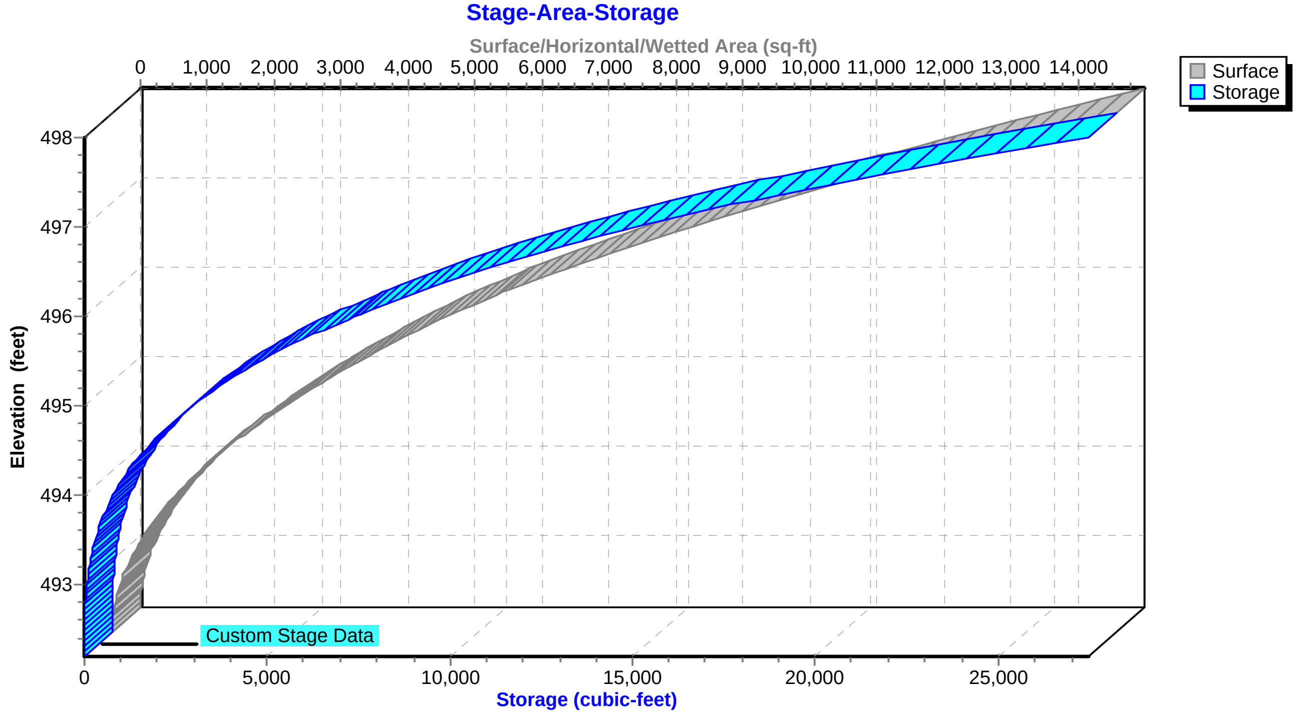
Pond 102B: 18" Culvert



Pond 102B: 18" Culvert



Pond 102B: 18" Culvert



Summary for Pond 102C: Pond 102C

Inflow Area = 40.386 ac, 4.49% Impervious, Inflow Depth = 3.34" for 100-Year event
Inflow = 71.85 cfs @ 12.67 hrs, Volume= 11.234 af
Outflow = 8.61 cfs @ 15.81 hrs, Volume= 4.107 af, Atten= 88%, Lag= 188.3 min
Primary = 8.61 cfs @ 15.81 hrs, Volume= 4.107 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 509.11' @ 15.81 hrs Surf.Area= 220,019 sf Storage= 334,468 cf

Plug-Flow detention time= 391.2 min calculated for 4.107 af (37% of inflow)
Center-of-Mass det. time= 254.3 min (1,143.4 - 889.0)

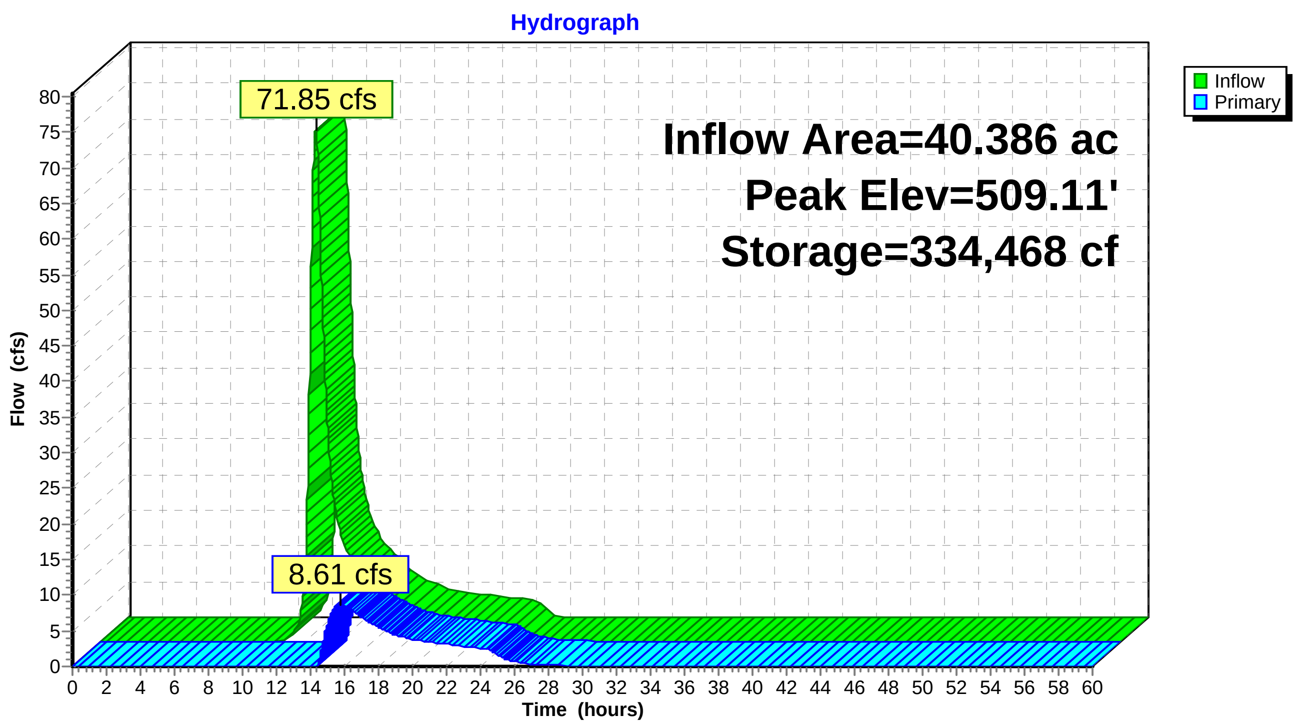
Volume	Invert	Avail.Storage	Storage Description
#1	506.70'	551,461 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
506.70	35,778	1,168.0	0	0	35,778
508.00	165,975	1,973.0	120,819	120,819	237,000
510.00	268,777	2,083.0	430,642	551,461	272,736

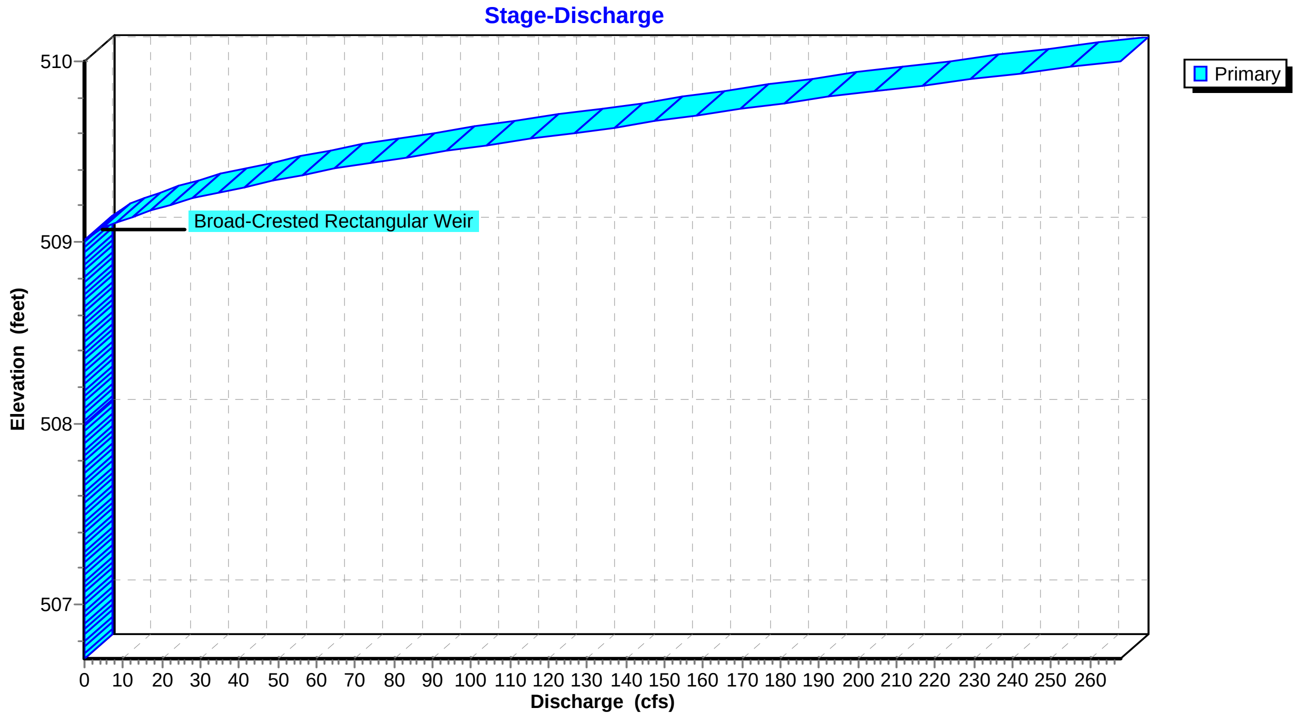
Device	Routing	Invert	Outlet Devices
#1	Primary	509.00'	**100.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=8.61 cfs @ 15.81 hrs HW=509.11' TW=0.00' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 8.61 cfs @ 0.78 fps)

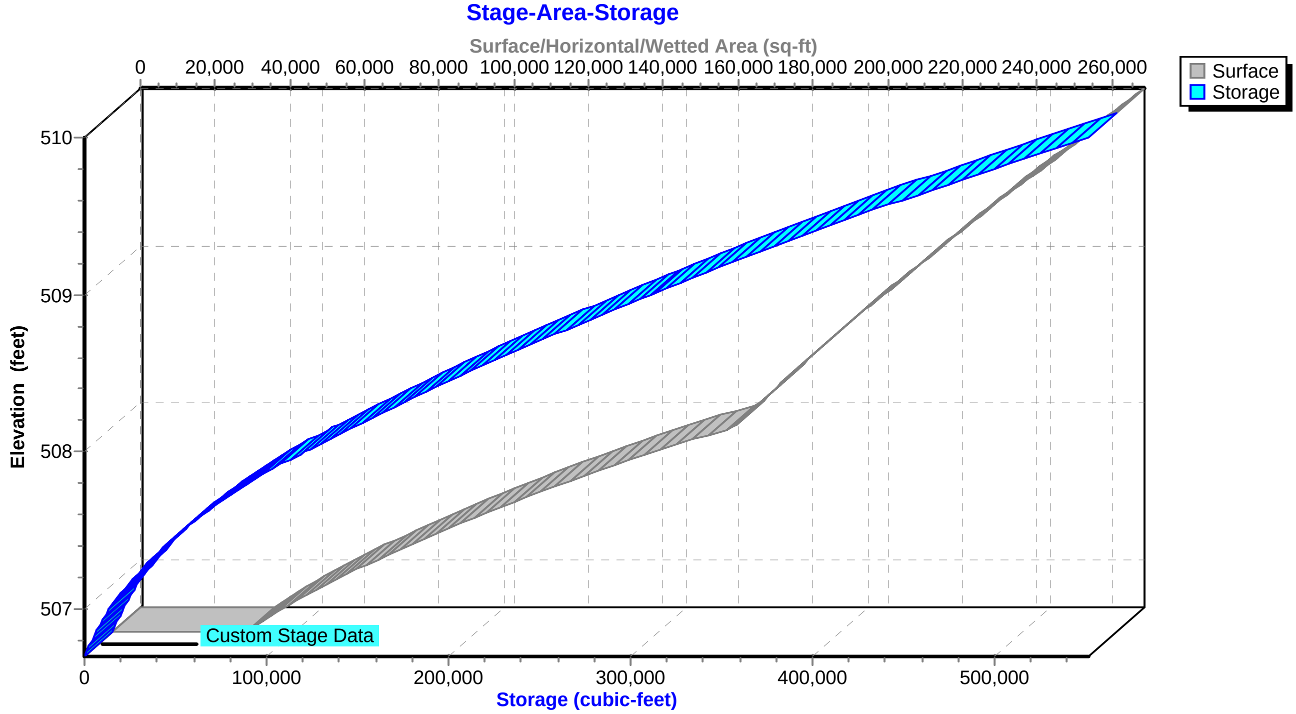
Pond 102C: Pond 102C



Pond 102C: Pond 102C



Pond 102C: Pond 102C



Summary for Pond 103A: Wetland A

Inflow Area = 36.735 ac, 8.79% Impervious, Inflow Depth = 1.89" for 100-Year event
Inflow = 30.70 cfs @ 12.74 hrs, Volume= 5.792 af
Outflow = 0.93 cfs @ 24.57 hrs, Volume= 0.759 af, Atten= 97%, Lag= 709.8 min
Primary = 0.93 cfs @ 24.57 hrs, Volume= 0.759 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 502.29' @ 24.57 hrs Surf.Area= 74,807 sf Storage= 242,805 cf

Plug-Flow detention time= 1,089.9 min calculated for 0.759 af (13% of inflow)
Center-of-Mass det. time= 911.5 min (1,839.8 - 928.3)

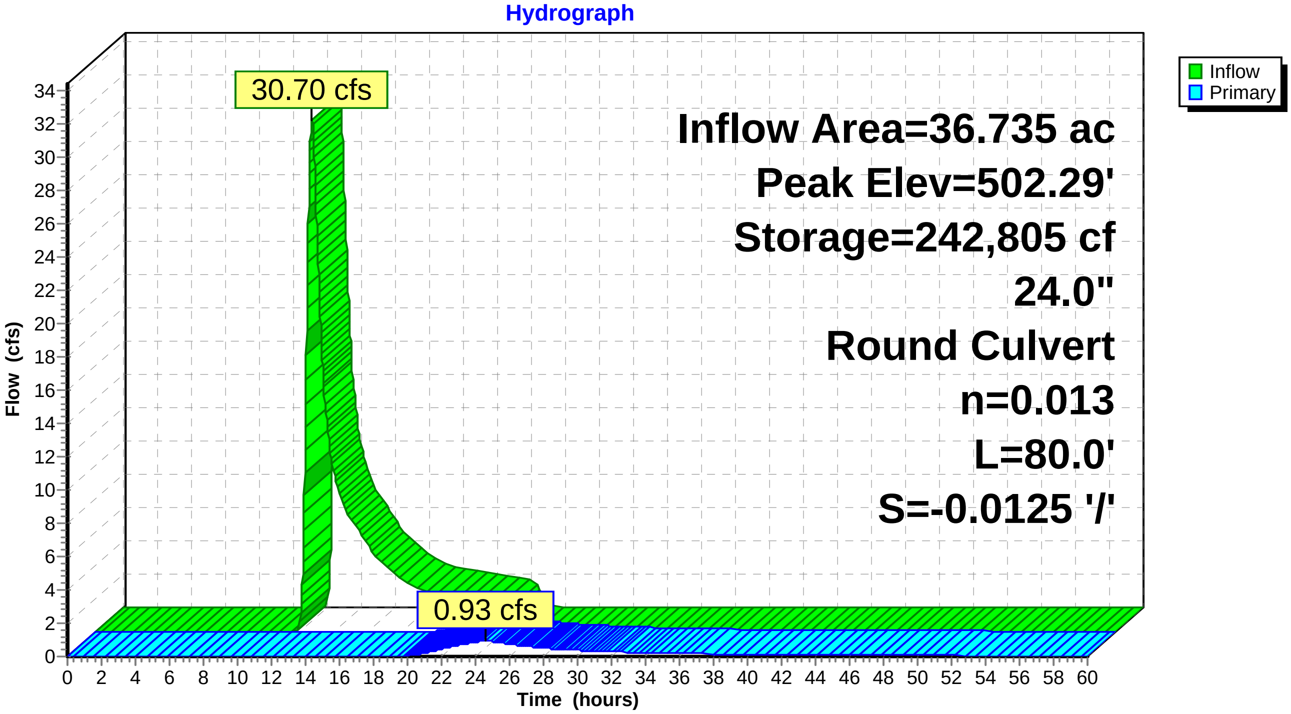
Volume	Invert	Avail.Storage	Storage Description
#1	497.40'	751,373 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
497.40	22,575	625.0	0	0	22,575
500.00	52,914	979.0	95,378	95,378	67,808
502.00	73,309	1,110.0	125,670	221,048	89,686
504.00	83,807	1,169.0	156,999	378,047	100,626
506.00	92,176	1,226.0	175,917	553,963	111,750
508.00	105,381	1,351.0	197,410	751,373	137,513

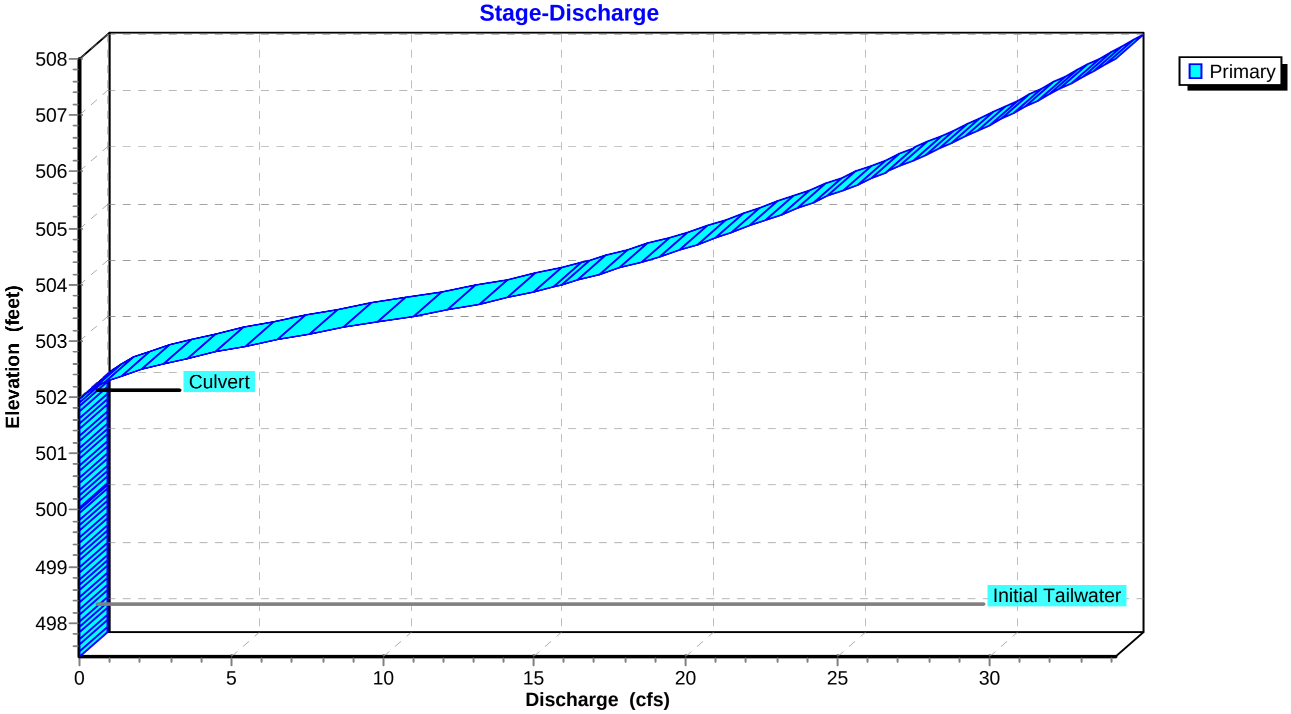
Device	Routing	Invert	Outlet Devices
#1	Primary	501.90'	**24.0" Round Culvert** L= 80.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 500.90' / 501.90' S= -0.0125 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=0.93 cfs @ 24.57 hrs HW=502.29' TW=499.72' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 0.93 cfs @ 2.14 fps)

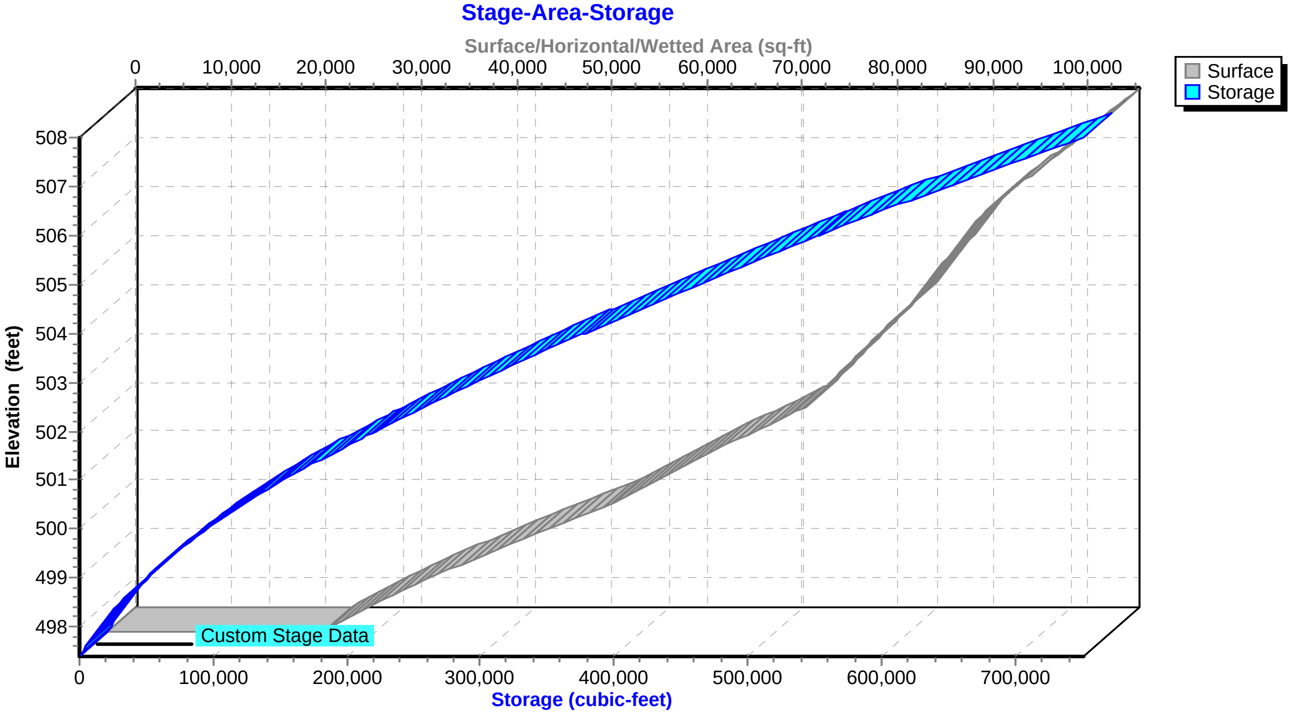
Pond 103A: Wetland A



Pond 103A: Wetland A



Pond 103A: Wetland A



Summary for Pond 103B: Irrigation Pond

Inflow Area = 256.384 ac, 5.93% Impervious, Inflow Depth > 2.43" for 100-Year event
Inflow = 160.83 cfs @ 12.96 hrs, Volume= 51.938 af
Outflow = 158.49 cfs @ 13.08 hrs, Volume= 51.688 af, Atten= 1%, Lag= 7.1 min
Primary = 17.46 cfs @ 13.07 hrs, Volume= 11.880 af
Secondary = 141.03 cfs @ 13.08 hrs, Volume= 39.808 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 506.84' @ 13.08 hrs Surf.Area= 93,674 sf Storage= 94,914 cf

Plug-Flow detention time= 33.9 min calculated for 51.688 af (100% of inflow)
Center-of-Mass det. time= 22.6 min (1,165.9 - 1,143.3)

Volume	Invert	Avail.Storage	Storage Description
#1	505.80'	416,210 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

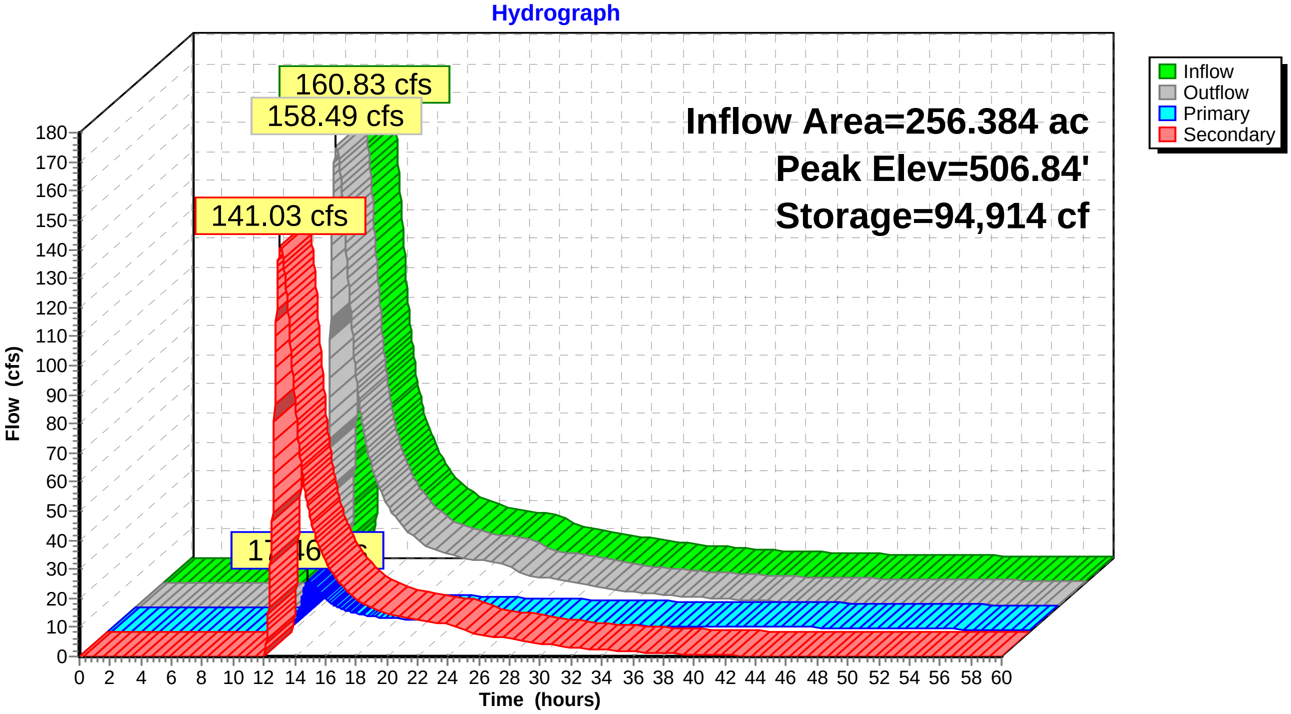
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
505.80	88,106	1,403.0	0	0	88,106
508.00	100,033	1,579.0	206,814	206,814	129,999
510.00	109,433	1,610.0	209,396	416,210	138,488

Device	Routing	Invert	Outlet Devices
#1	Primary	505.80'	**5.0' long x 1.80' rise Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)
#2	Secondary	506.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.50 1.00 1.50 2.00 Width (feet) 45.00 60.00 80.00 95.00 120.00

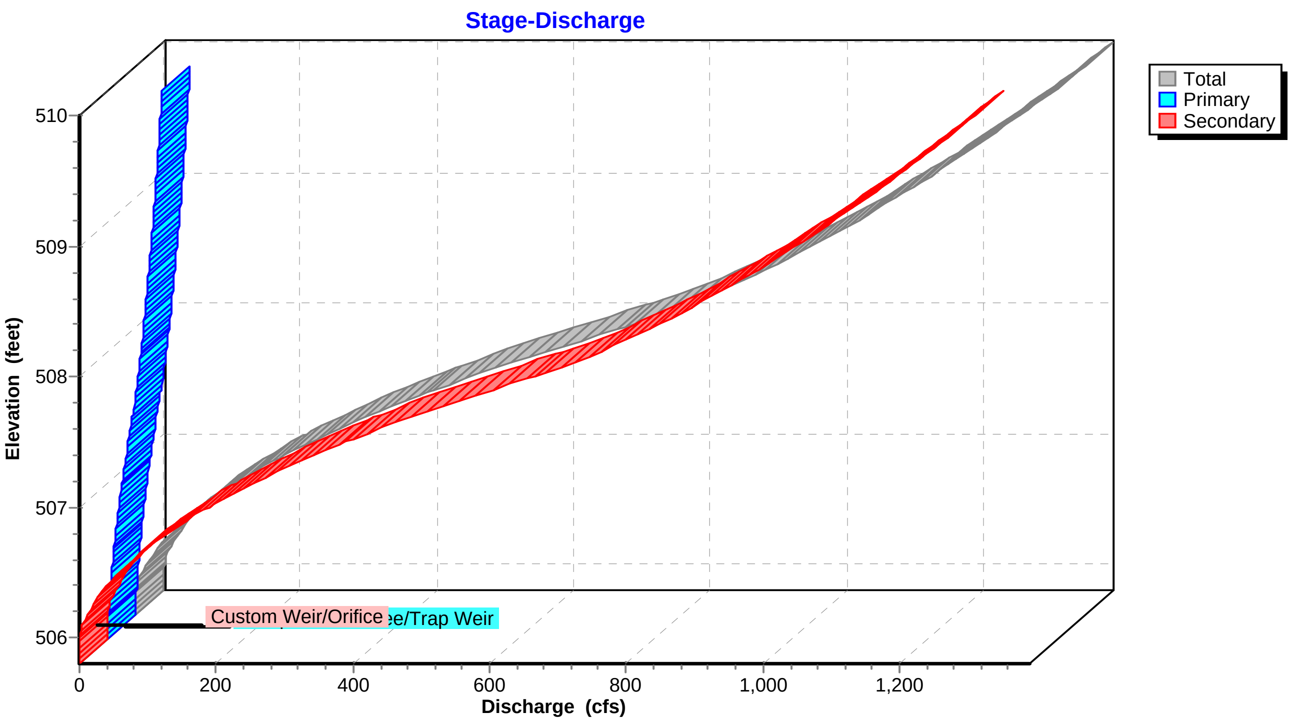
Primary OutFlow Max=17.46 cfs @ 13.07 hrs HW=506.84' TW=505.85' (Dynamic Tailwater)
↑**1=Sharp-Crested Vee/Trap Weir** (Weir Controls 17.46 cfs @ 3.34 fps)

Secondary OutFlow Max=141.02 cfs @ 13.08 hrs HW=506.84' TW=505.85' (Dynamic Tailwater)
↑**2=Custom Weir/Orifice** (Weir Controls 141.02 cfs @ 2.86 fps)

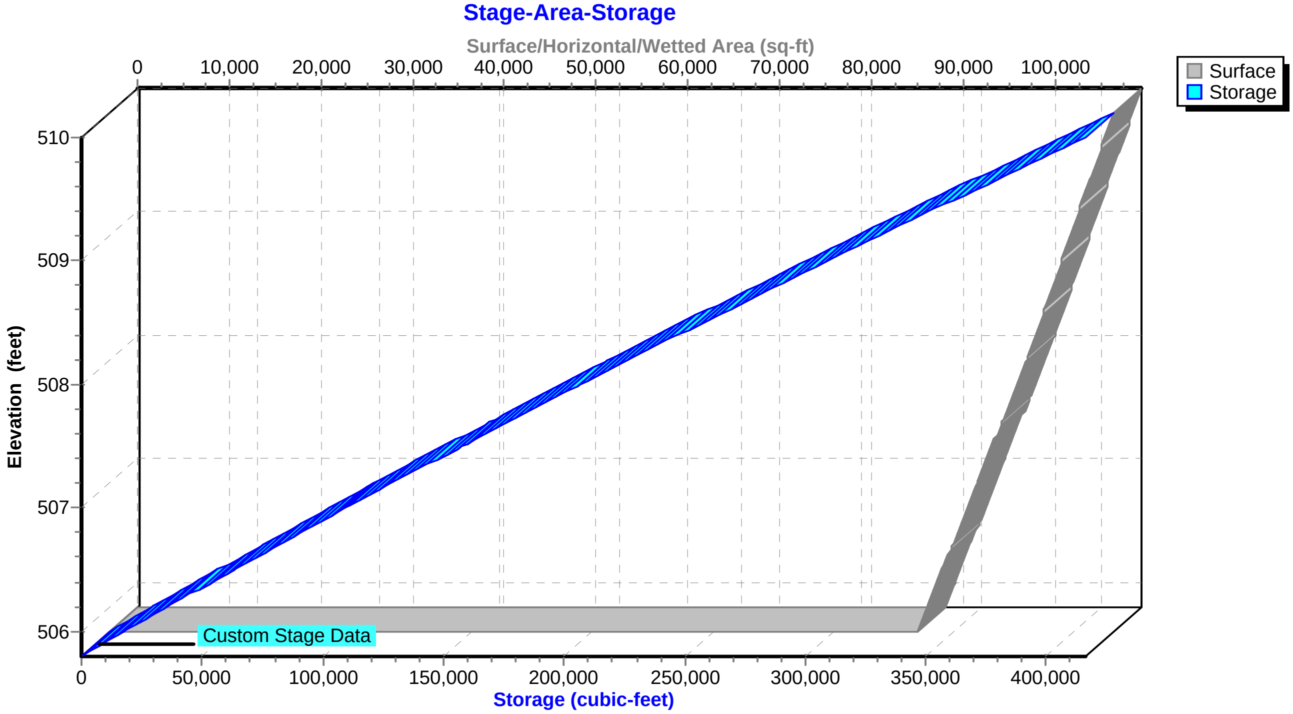
Pond 103B: Irrigation Pond



Pond 103B: Irrigation Pond



Pond 103B: Irrigation Pond



Summary for Pond 104A: Wetland D

Inflow Area = 9.432 ac, 9.40% Impervious, Inflow Depth = 1.13" for 100-Year event
Inflow = 4.22 cfs @ 12.61 hrs, Volume= 0.892 af
Outflow = 2.63 cfs @ 13.02 hrs, Volume= 0.870 af, Atten= 38%, Lag= 24.7 min
Primary = 0.35 cfs @ 13.02 hrs, Volume= 0.420 af
Secondary = 2.28 cfs @ 13.02 hrs, Volume= 0.450 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 508.04' @ 13.02 hrs Surf.Area= 25,453 sf Storage= 7,629 cf

Plug-Flow detention time= 197.8 min calculated for 0.870 af (98% of inflow)
Center-of-Mass det. time= 186.5 min (1,137.9 - 951.4)

Volume	Invert	Avail.Storage	Storage Description
#1	507.70'	19,762 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

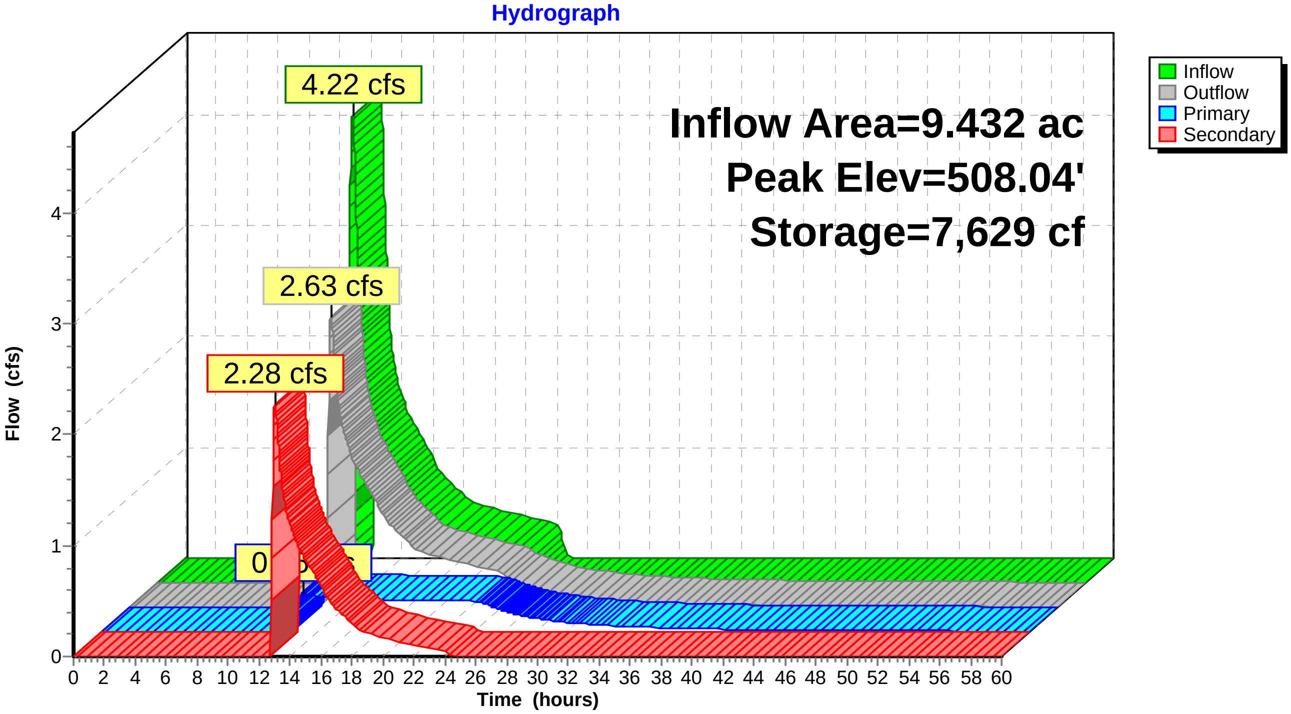
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
507.70	18,708	688.0	0	0	18,708
508.00	25,271	735.0	6,572	6,572	24,034
508.50	27,505	755.0	13,190	19,762	26,435

Device	Routing	Invert	Outlet Devices
#1	Primary	507.70'	**12.0" Round Culvert** L= 20.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 507.70' / 507.30' S= 0.0200 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf
#2	Secondary	508.00'	**100.0' long x 20.0' 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) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

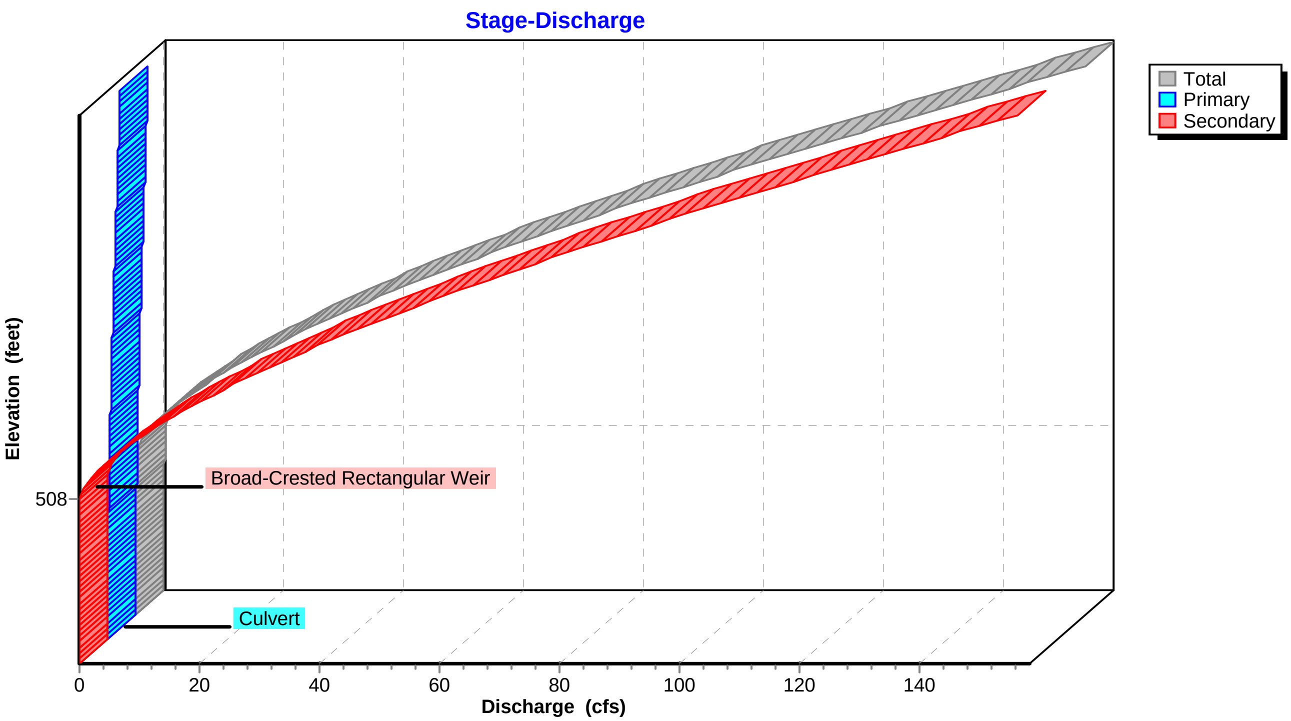
Primary OutFlow Max=0.35 cfs @ 13.02 hrs HW=508.04' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.35 cfs @ 2.19 fps)

Secondary OutFlow Max=2.28 cfs @ 13.02 hrs HW=508.04' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 2.28 cfs @ 0.55 fps)

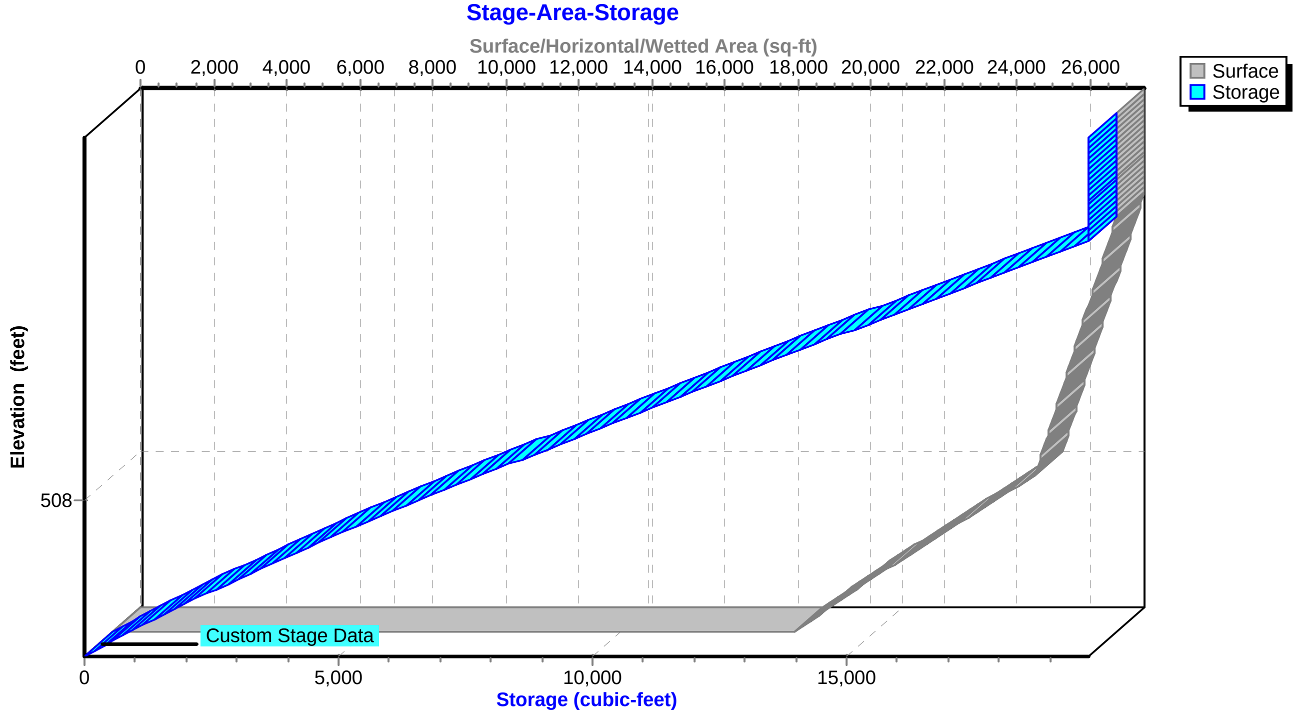
Pond 104A: Wetland D



Pond 104A: Wetland D



Pond 104A: Wetland D



Summary for Pond 104B: Island Pond

Inflow Area = 234.803 ac, 5.37% Impervious, Inflow Depth = 4.21" for 100-Year event
Inflow = 345.44 cfs @ 12.72 hrs, Volume= 82.388 af
Outflow = 320.88 cfs @ 13.12 hrs, Volume= 80.398 af, Atten= 7%, Lag= 24.3 min
Primary = 15.55 cfs @ 13.12 hrs, Volume= 21.840 af
Secondary = 117.32 cfs @ 13.12 hrs, Volume= 22.266 af
Tertiary = 188.01 cfs @ 13.12 hrs, Volume= 36.292 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 510.92' @ 13.12 hrs Surf.Area= 291,674 sf Storage= 677,682 cf

Plug-Flow detention time= 171.3 min calculated for 80.371 af (98% of inflow)
Center-of-Mass det. time= 156.3 min (1,058.7 - 902.4)

Volume	Invert	Avail.Storage	Storage Description
#1	508.20'	1,023,136 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
508.20	228,830	3,183.0	0	0	228,830
510.00	249,447	3,224.0	430,316	430,316	250,515
512.00	346,000	3,042.0	592,820	1,023,136	341,482

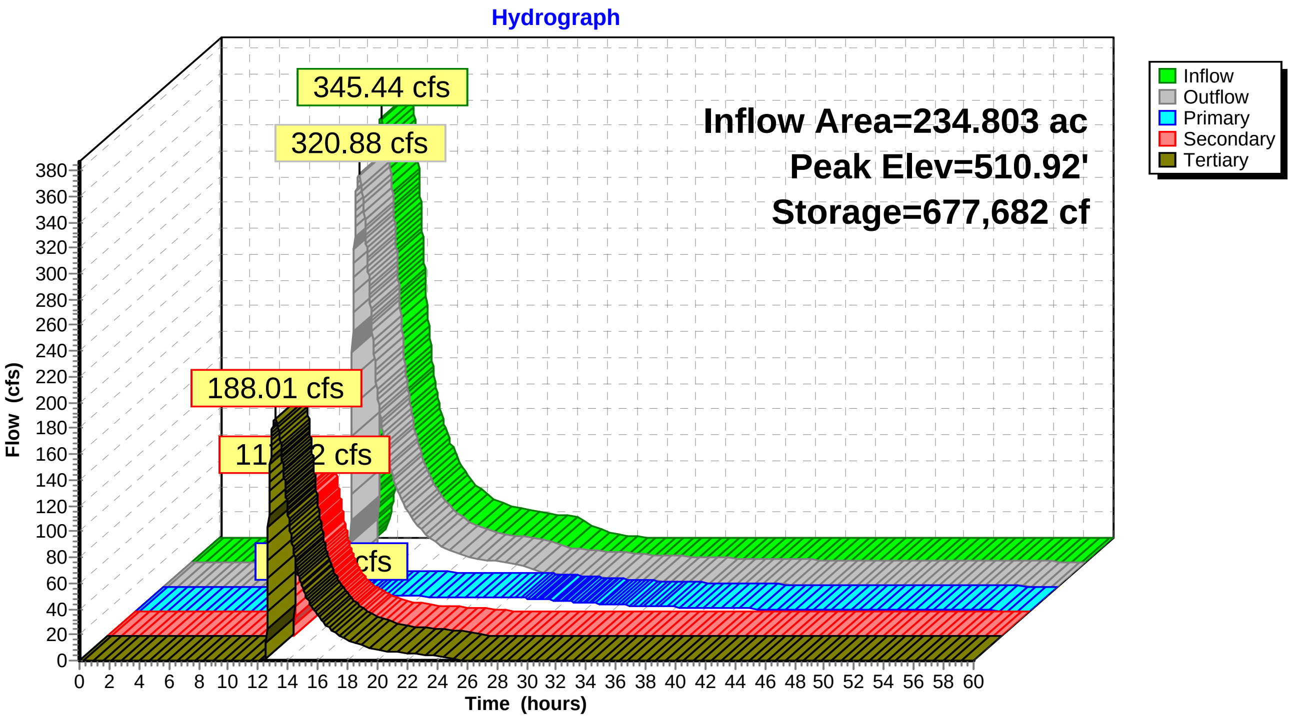
Device	Routing	Invert	Outlet Devices
#1	Primary	508.22'	**24.0" Round Culvert** L= 111.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 508.22' / 505.43' S= 0.0251 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 3.14 sf
#2	Secondary	510.00'	**50.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Tertiary	510.00'	**80.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=15.55 cfs @ 13.12 hrs HW=510.92' TW=506.84' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 15.55 cfs @ 4.95 fps)

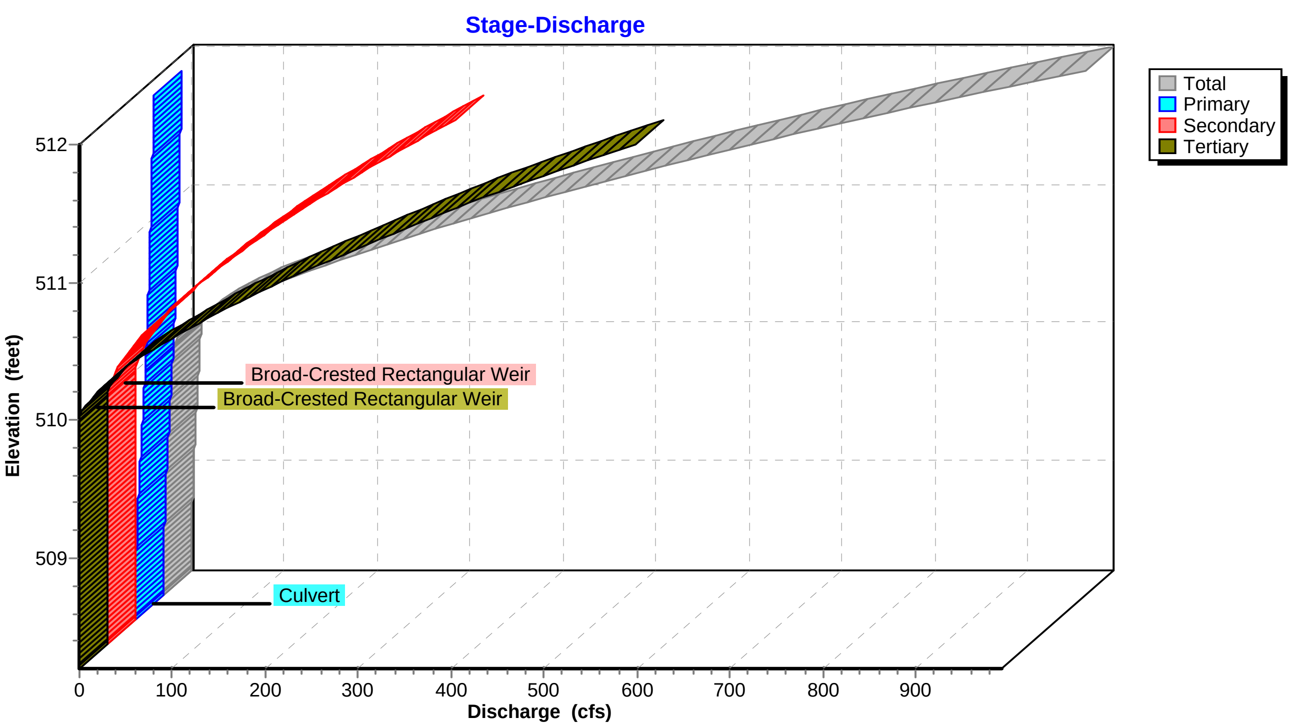
Secondary OutFlow Max=117.32 cfs @ 13.12 hrs HW=510.92' TW=506.84' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 117.32 cfs @ 2.56 fps)

Tertiary OutFlow Max=188.01 cfs @ 13.12 hrs HW=510.92' TW=505.85' (Dynamic Tailwater)
└─**3=Broad-Crested Rectangular Weir** (Weir Controls 188.01 cfs @ 2.57 fps)

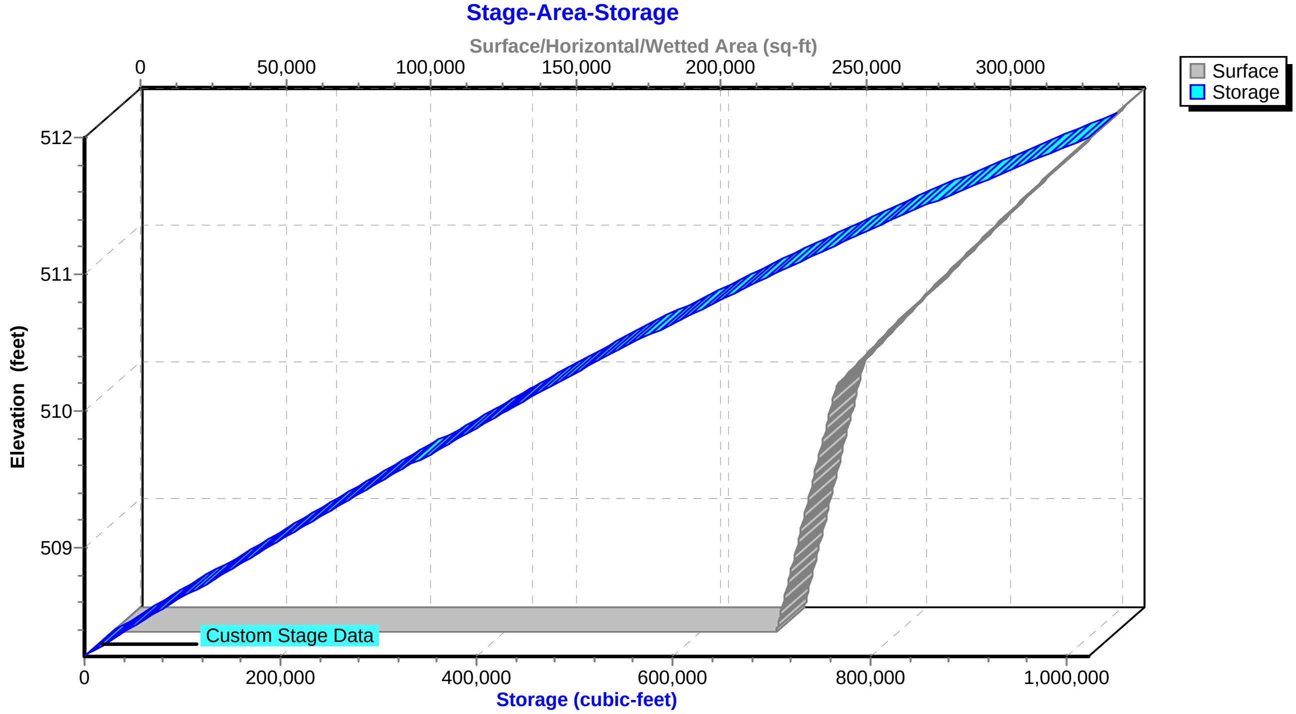
Pond 104B: Island Pond



Pond 104B: Island Pond



Pond 104B: Island Pond



Summary for Pond 105A: Wetland H

[62] Hint: Exceeded Reach A106R OUTLET depth by 0.66' @ 15.86 hrs

Inflow Area = 49.602 ac, 4.77% Impervious, Inflow Depth = 3.47" for 100-Year event
Inflow = 122.88 cfs @ 12.33 hrs, Volume= 14.342 af
Outflow = 122.42 cfs @ 12.35 hrs, Volume= 14.325 af, Atten= 0%, Lag= 1.3 min
Primary = 11.24 cfs @ 12.35 hrs, Volume= 7.961 af
Secondary = 111.18 cfs @ 12.35 hrs, Volume= 6.364 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 575.39' @ 12.35 hrs Surf.Area= 32,564 sf Storage= 69,760 cf

Plug-Flow detention time= 56.5 min calculated for 14.320 af (100% of inflow)
Center-of-Mass det. time= 56.4 min (919.2 - 862.8)

Volume	Invert	Avail.Storage	Storage Description
#1	572.90'	73,215 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

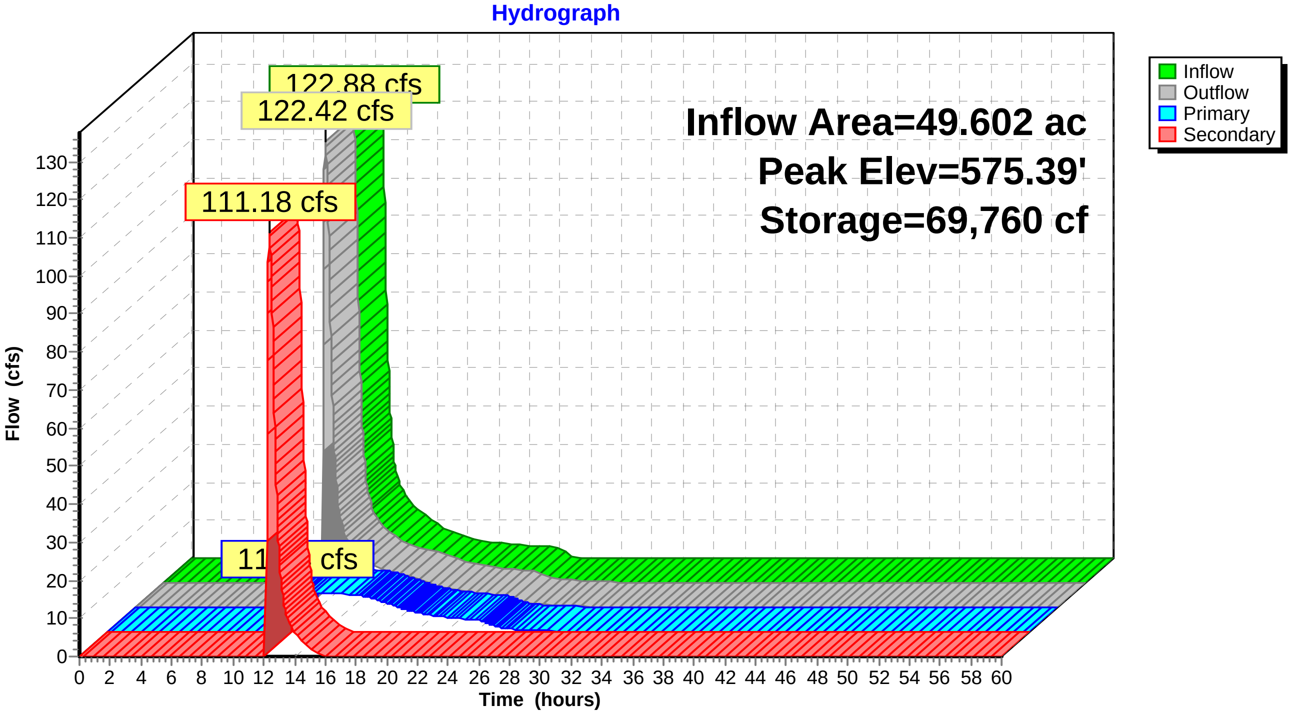
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
572.90	21,891	815.0	0	0	21,891
574.00	27,791	848.0	27,261	27,261	26,353
575.00	31,858	892.0	29,801	57,062	32,507
575.50	32,755	899.0	16,153	73,215	33,601

Device	Routing	Invert	Outlet Devices
#1	Primary	572.90'	**18.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 572.90' / 572.00' S= 0.0450 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 1.77 sf
#2	Secondary	575.00'	**180.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

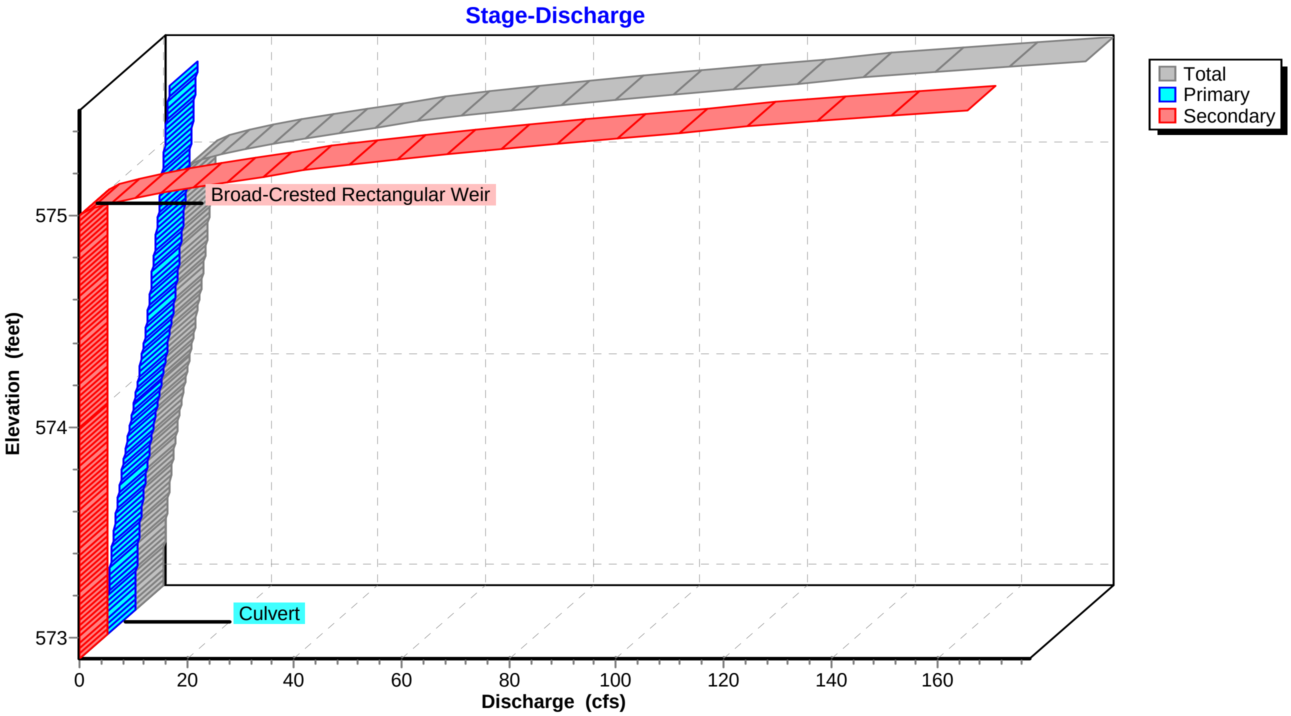
Primary OutFlow Max=11.24 cfs @ 12.35 hrs HW=575.39' TW=568.23' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 11.24 cfs @ 6.36 fps)

Secondary OutFlow Max=111.10 cfs @ 12.35 hrs HW=575.39' TW=568.23' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 111.10 cfs @ 1.57 fps)

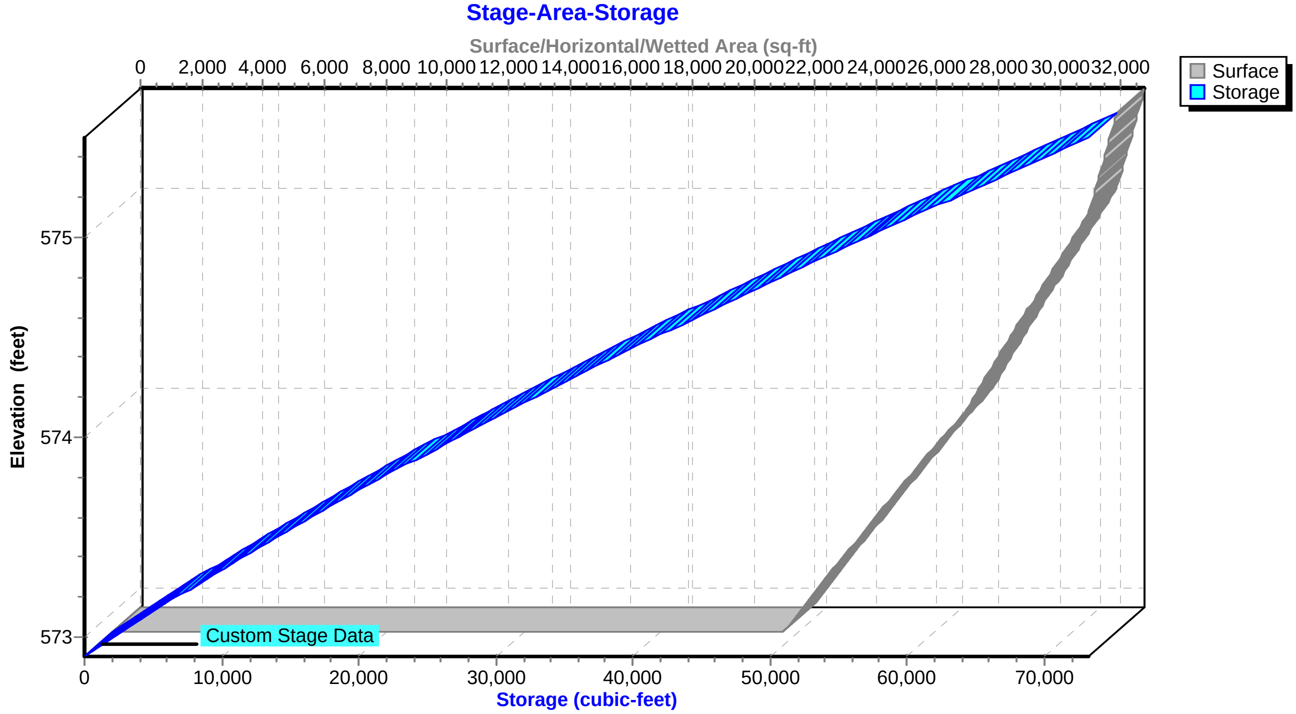
Pond 105A: Wetland H



Pond 105A: Wetland H



Pond 105A: Wetland H



Summary for Pond 105B: Wetland J

Inflow Area = 154.267 ac, 1.16% Impervious, Inflow Depth = 4.73" for 100-Year event
Inflow = 261.99 cfs @ 13.06 hrs, Volume= 60.825 af
Outflow = 261.72 cfs @ 13.08 hrs, Volume= 60.824 af, Atten= 0%, Lag= 1.2 min
Primary = 261.72 cfs @ 13.08 hrs, Volume= 60.824 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 516.66' @ 13.08 hrs Surf.Area= 29,340 sf Storage= 55,979 cf

Plug-Flow detention time= 13.0 min calculated for 60.824 af (100% of inflow)
Center-of-Mass det. time= 12.9 min (910.2 - 897.3)

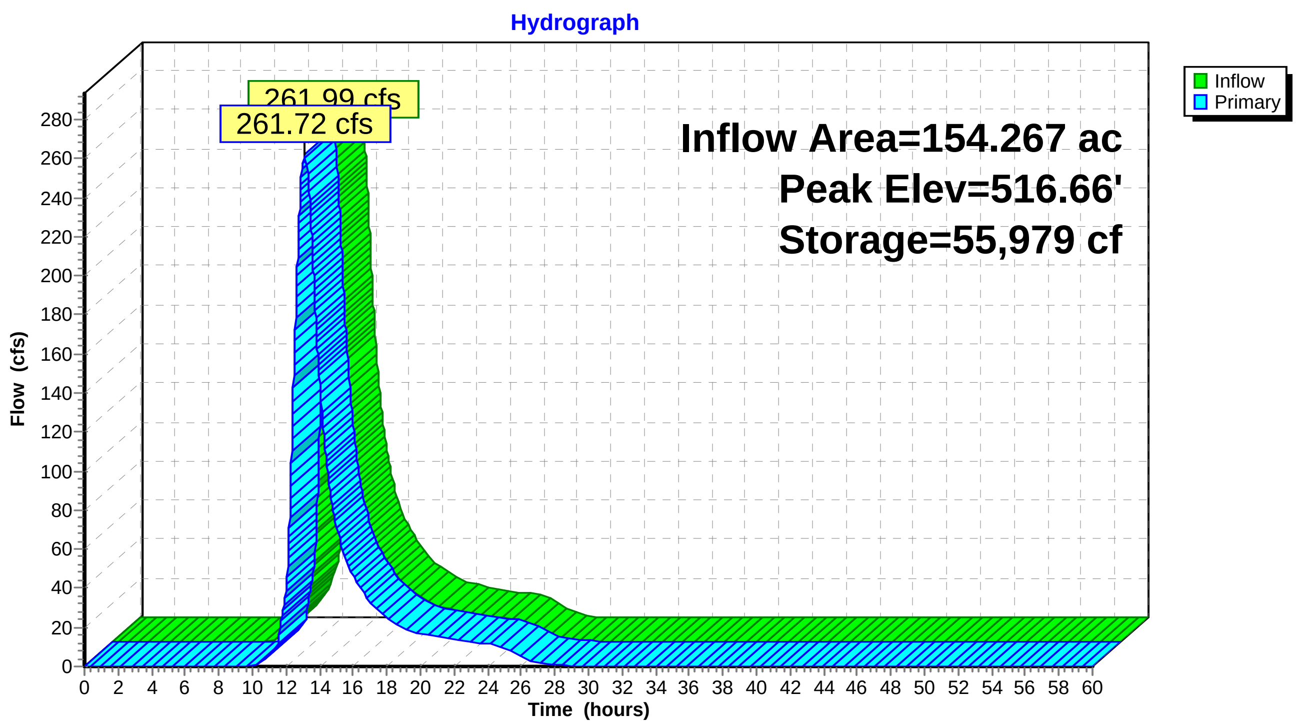
Volume	Invert	Avail.Storage	Storage Description
#1	514.40'	102,307 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
514.40	19,952	567.0	0	0	19,952
516.00	27,082	686.0	37,482	37,482	31,860
516.50	28,121	699.0	13,800	51,282	33,334
518.00	40,275	840.0	51,025	102,307	50,641

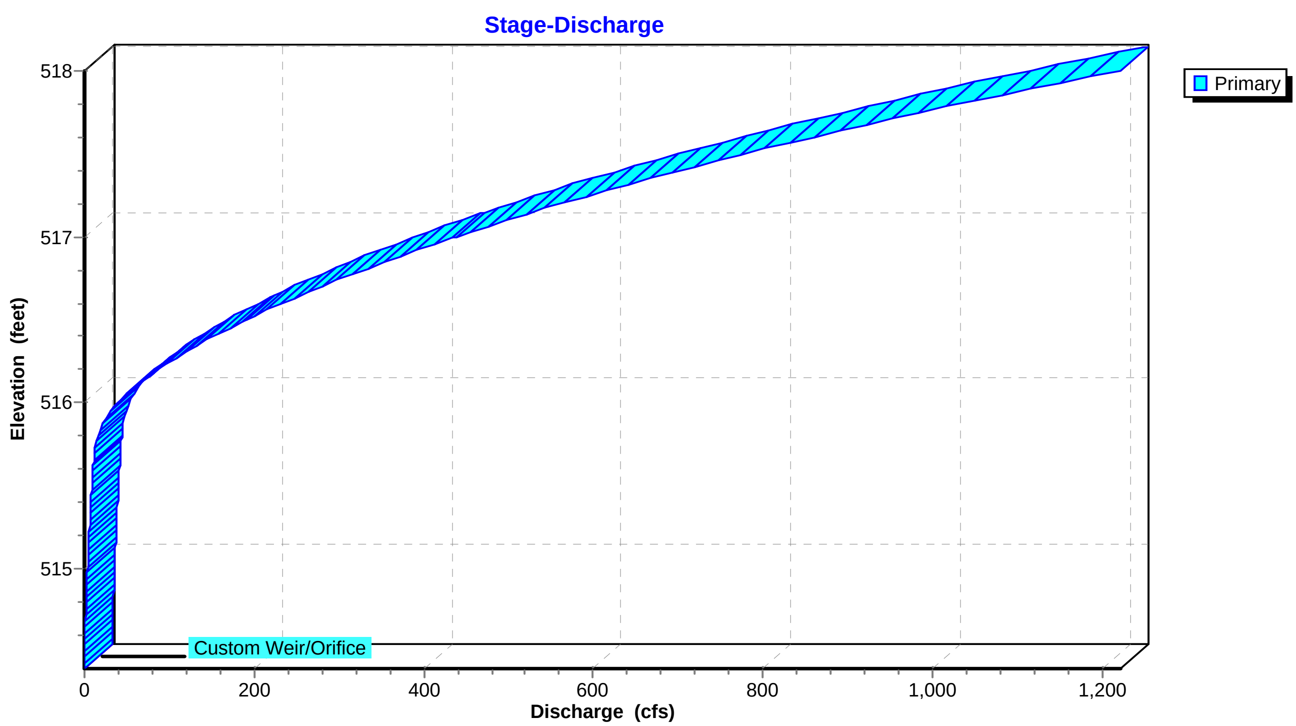
Device	Routing	Invert	Outlet Devices
#1	Primary	514.40'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.25 1.60 2.60 3.60 Width (feet) 2.33 2.33 90.00 120.00 170.00

Primary OutFlow Max=261.69 cfs @ 13.08 hrs HW=516.66' TW=510.91' (Dynamic Tailwater)
└─**1=Custom Weir/Orifice** (Weir Controls 261.69 cfs @ 3.07 fps)

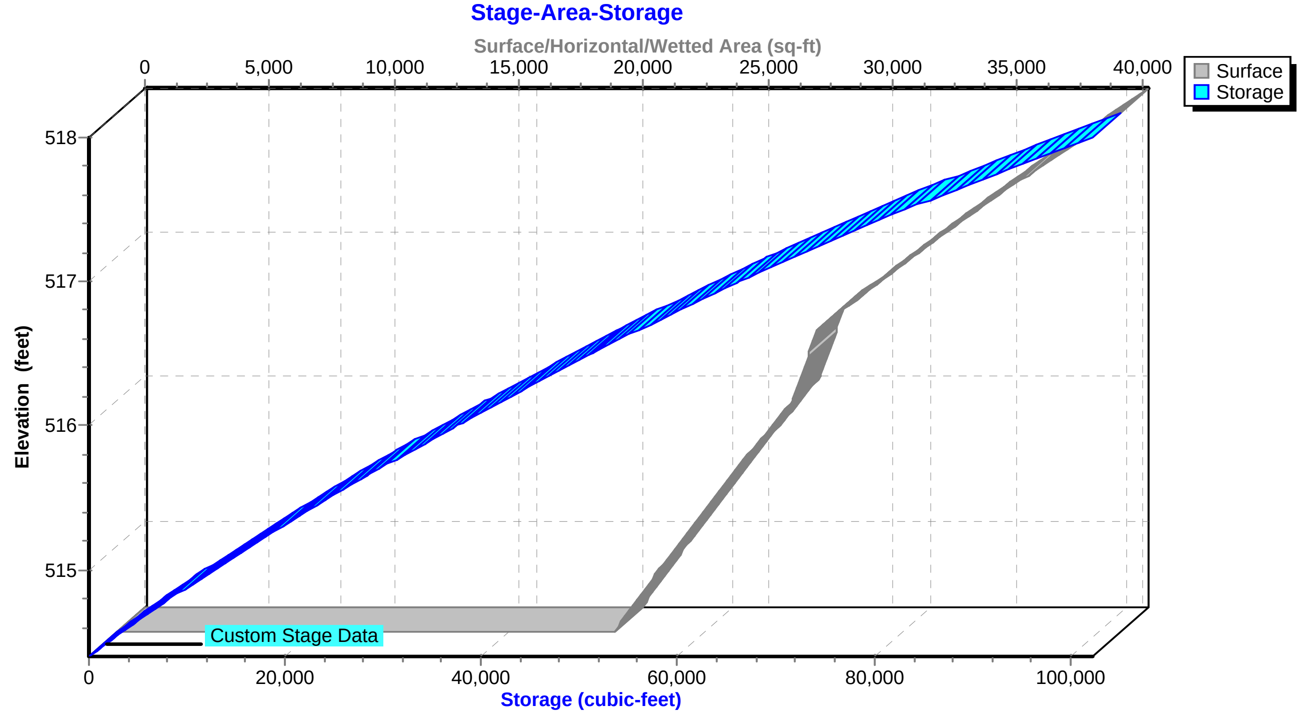
Pond 105B: Wetland J



Pond 105B: Wetland J



Pond 105B: Wetland J



Summary for Pond 106A: 36" Culvert

Inflow Area = 15.338 ac, 8.12% Impervious, Inflow Depth = 4.87" for 100-Year event
Inflow = 53.17 cfs @ 12.37 hrs, Volume= 6.226 af
Outflow = 53.17 cfs @ 12.37 hrs, Volume= 6.226 af, Atten= 0%, Lag= 0.3 min
Primary = 53.17 cfs @ 12.37 hrs, Volume= 6.226 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 720.64' @ 12.37 hrs Surf.Area= 180 sf Storage= 236 cf

Plug-Flow detention time= 0.0 min calculated for 6.224 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (840.9 - 840.9)

Volume	Invert	Avail.Storage	Storage Description
#1	716.70'	9,700 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

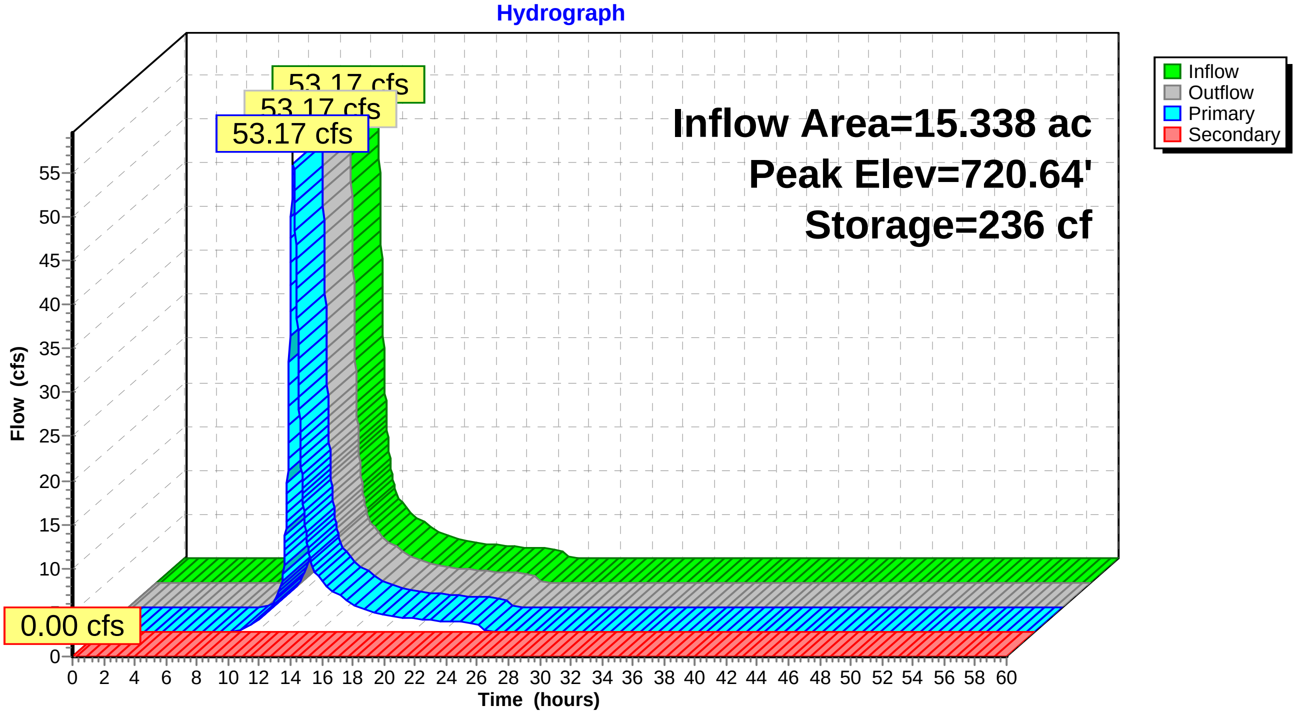
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
716.70	0	0.0	0	0	0
728.00	1,478	185.0	5,567	5,567	2,917
730.00	2,717	256.0	4,133	9,700	5,448

Device	Routing	Invert	Outlet Devices
#1	Primary	716.70'	**36.0" Round Culvert** L= 133.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 716.70' / 686.00' S= 0.2308 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	728.00'	**8.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

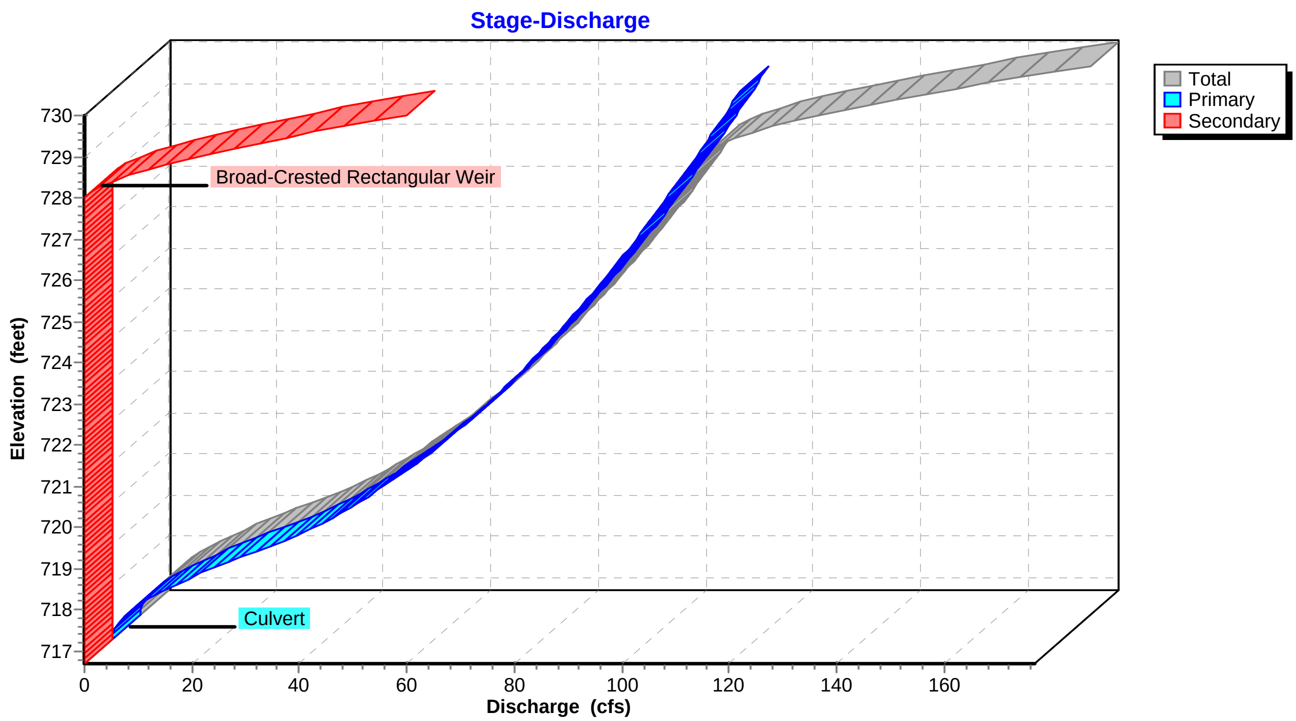
Primary OutFlow Max=53.12 cfs @ 12.37 hrs HW=720.64' TW=687.25' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 53.12 cfs @ 7.52 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=716.70' TW=686.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

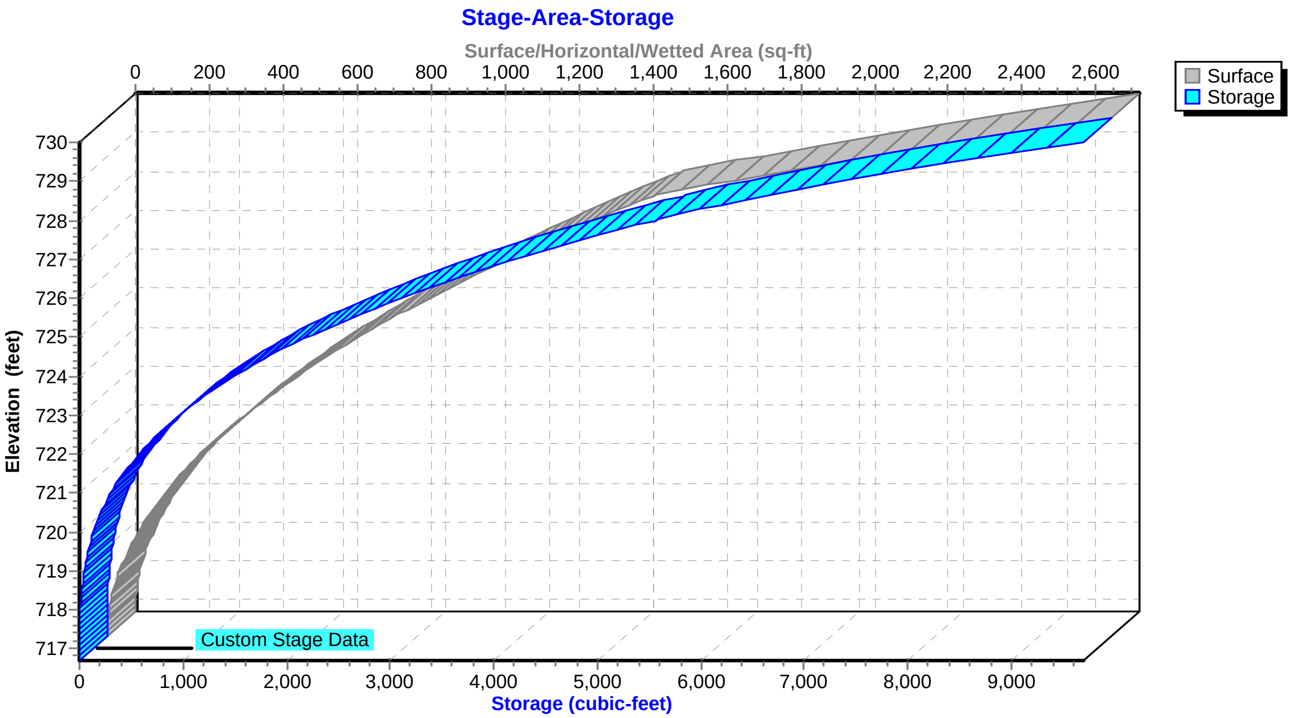
Pond 106A: 36" Culvert



Pond 106A: 36" Culvert



Pond 106A: 36" Culvert



Summary for Pond 106B: Wetland J

Inflow Area = 130.289 ac, 0.83% Impervious, Inflow Depth = 4.87" for 100-Year event
Inflow = 237.14 cfs @ 13.14 hrs, Volume= 52.891 af
Outflow = 237.03 cfs @ 13.15 hrs, Volume= 52.891 af, Atten= 0%, Lag= 0.7 min
Primary = 237.03 cfs @ 13.15 hrs, Volume= 52.891 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 527.29' @ 13.15 hrs Surf.Area= 12,660 sf Storage= 26,547 cf

Plug-Flow detention time= 5.9 min calculated for 52.873 af (100% of inflow)
Center-of-Mass det. time= 6.0 min (901.6 - 895.6)

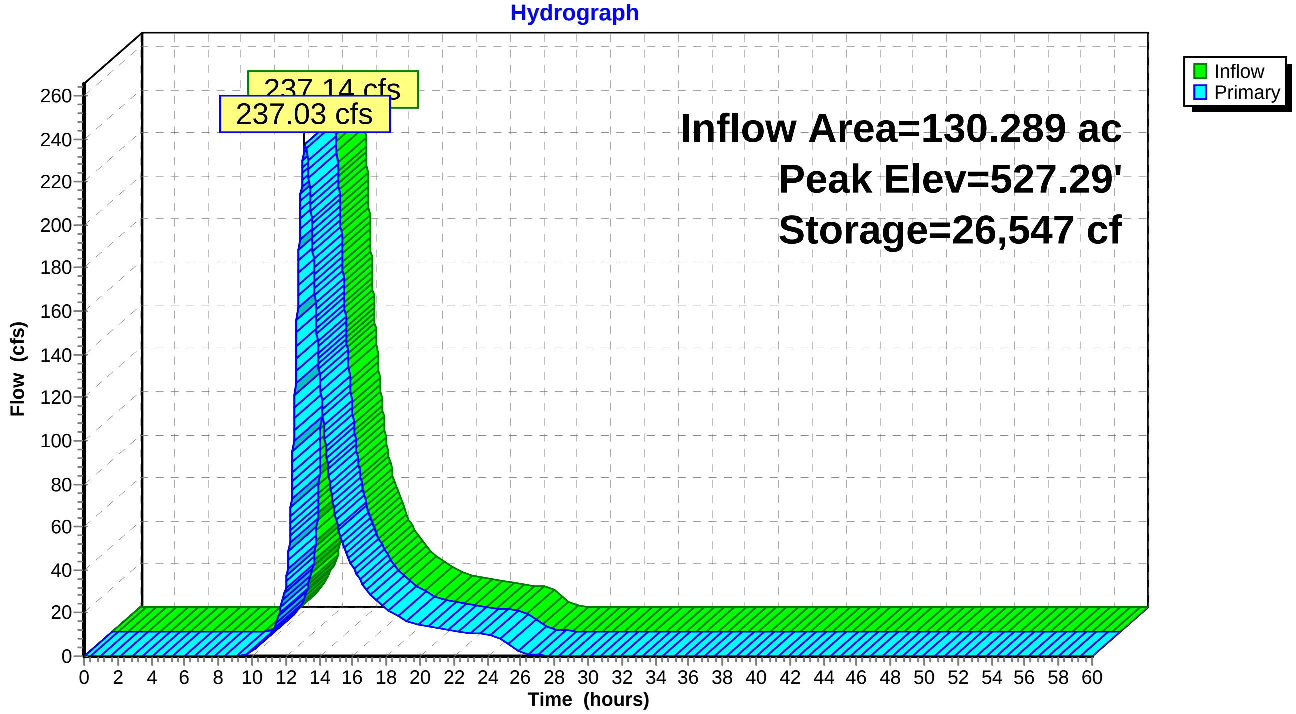
Volume	Invert	Avail.Storage	Storage Description
#1	524.70'	35,483 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
524.70	6,700	344.0	0	0	6,700
526.00	10,653	430.0	11,181	11,181	12,021
527.00	12,660	461.0	11,642	22,823	14,264
528.00	12,660	461.0	12,660	35,483	14,725

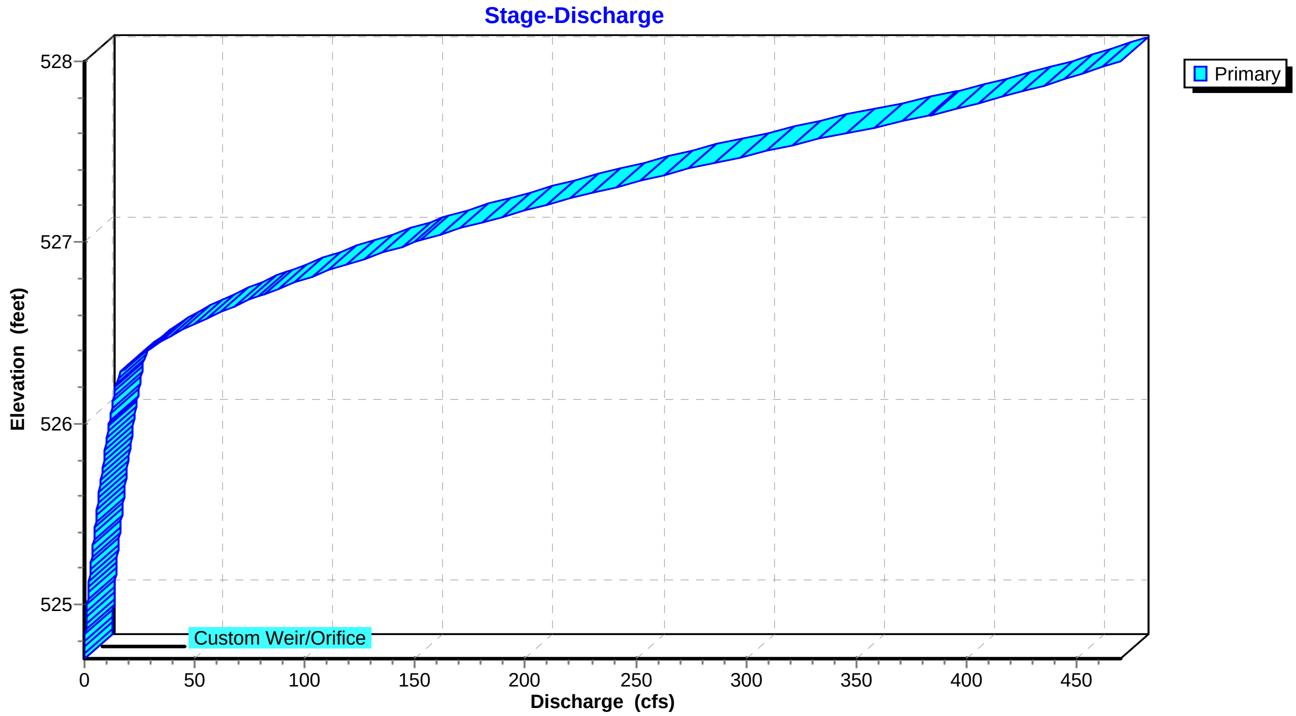
Device	Routing	Invert	Outlet Devices
#1	Primary	524.70'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.50 1.60 2.00 3.00 Width (feet) 2.33 2.33 60.00 60.00 70.00

Primary OutFlow Max=236.98 cfs @ 13.15 hrs HW=527.29' TW=516.66' (Dynamic Tailwater)
↑—**1=Custom Weir/Orifice** (Weir Controls 236.98 cfs @ 3.48 fps)

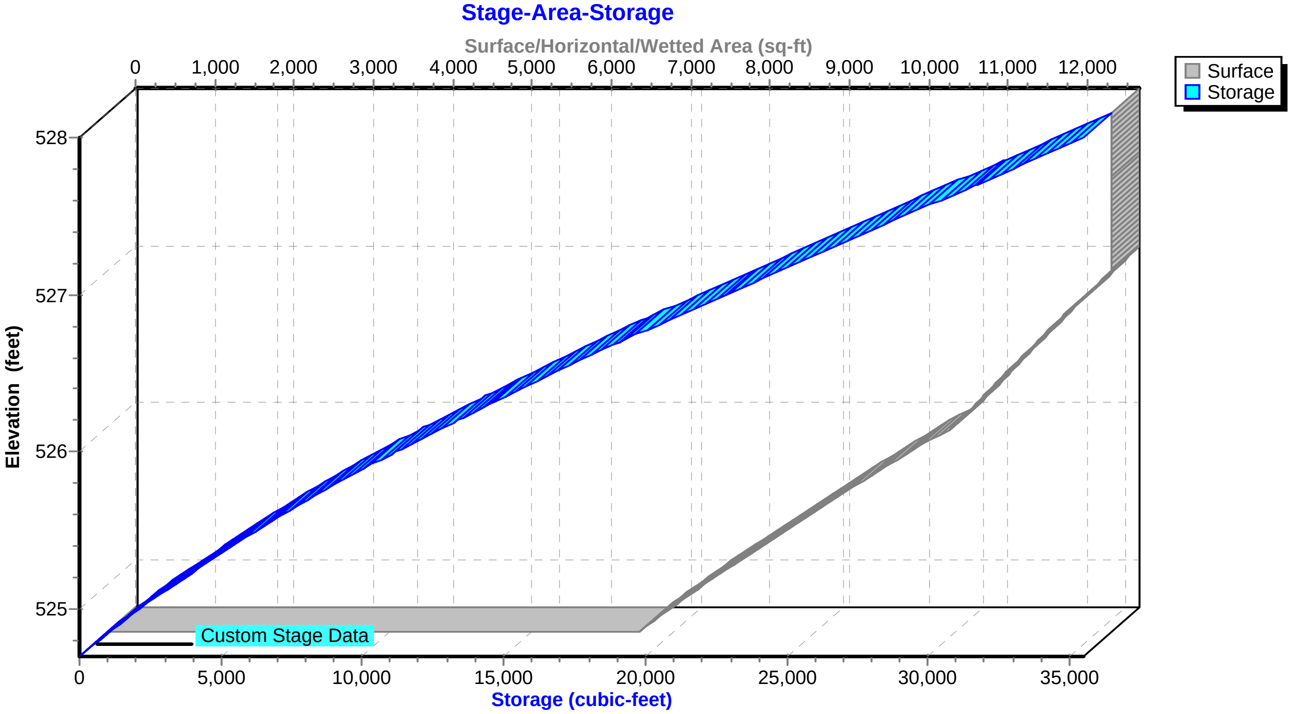
Pond 106B: Wetland J



Pond 106B: Wetland J



Pond 106B: Wetland J



Summary for Pond 107A: 24" Culvert

[90] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 95.411 ac, 2.35% Impervious, Inflow Depth = 4.48" for 100-Year event
Inflow = 199.14 cfs @ 12.82 hrs, Volume= 35.649 af
Outflow = 199.16 cfs @ 12.82 hrs, Volume= 35.649 af, Atten= 0%, Lag= 0.2 min
Primary = 45.09 cfs @ 12.82 hrs, Volume= 22.255 af
Secondary = 154.06 cfs @ 12.82 hrs, Volume= 13.394 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 626.49' @ 12.82 hrs Surf.Area= 1,682 sf Storage= 3,862 cf

Plug-Flow detention time= 0.3 min calculated for 35.637 af (100% of inflow)
Center-of-Mass det. time= 0.3 min (880.6 - 880.2)

Volume	Invert	Avail.Storage	Storage Description
#1	619.60'	13,340 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

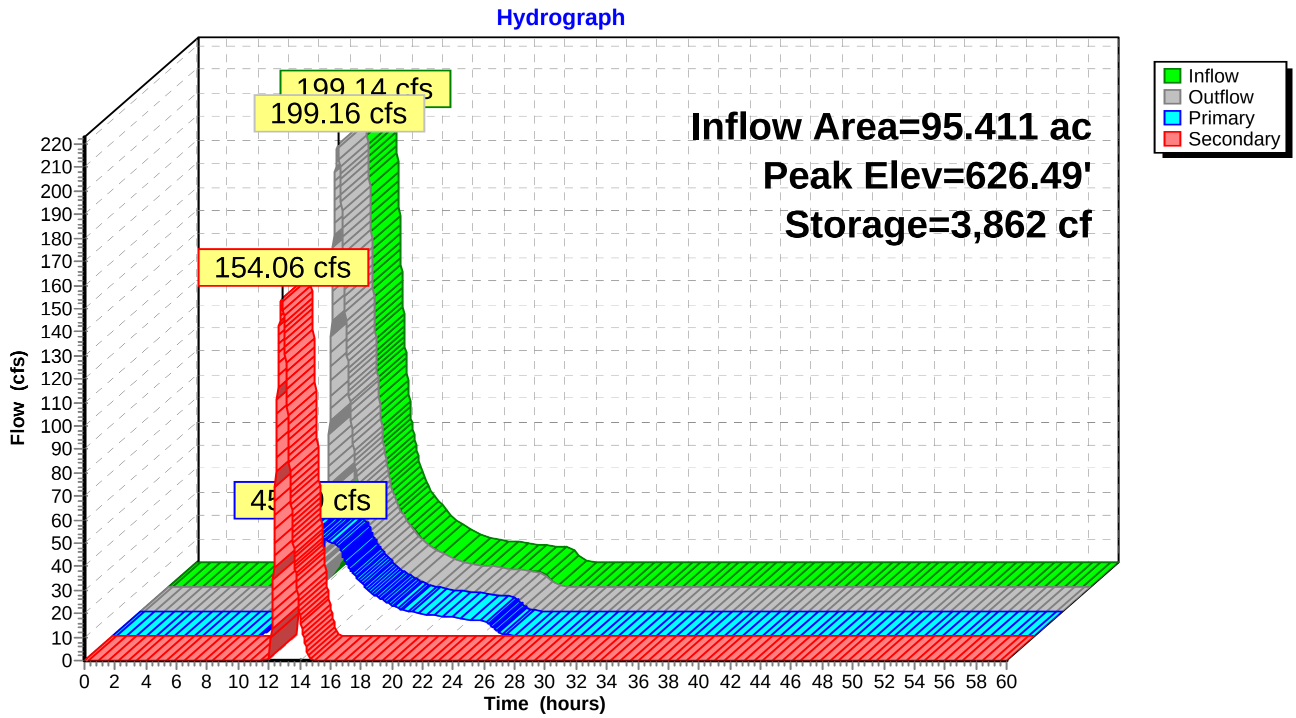
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
619.60	0	0.0	0	0	0
626.00	1,453	185.0	3,100	3,100	2,787
628.00	2,500	275.0	3,906	7,006	6,114
630.00	3,885	330.0	6,334	13,340	8,830

Device	Routing	Invert	Outlet Devices
#1	Primary	619.80'	**24.0" Round Culvert** L= 145.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 619.80' / 607.40' S= 0.0855 '/' Cc= 0.900 n= 0.010, Flow Area= 3.14 sf
#2	Secondary	625.00'	**25.0' long x 5.0' breadth Broad-Crested Rectangular Weir X 0.00** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Secondary	625.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.50 1.00 1.50 2.00 2.50 3.00 Width (feet) 20.00 25.00 30.00 35.00 40.00 45.00 50.00

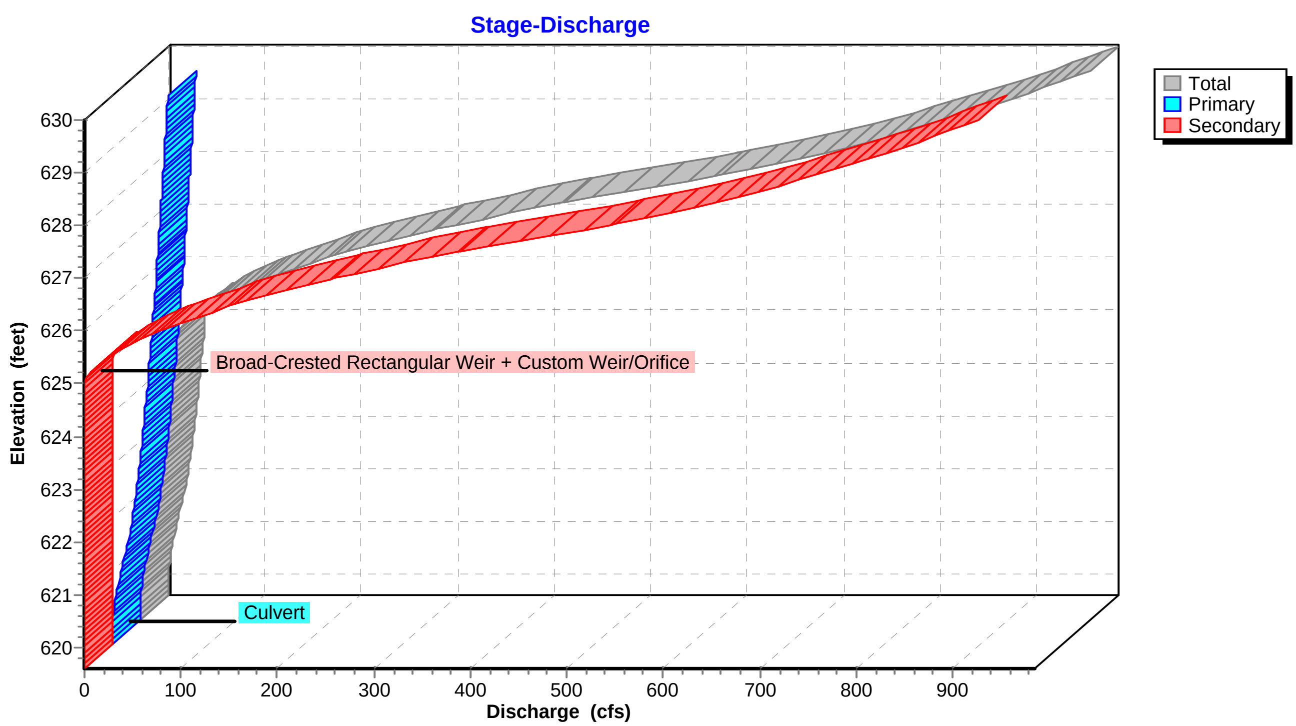
Primary OutFlow Max=45.09 cfs @ 12.82 hrs HW=626.49' TW=610.75' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 45.09 cfs @ 14.35 fps)

Secondary OutFlow Max=154.03 cfs @ 12.82 hrs HW=626.49' TW=613.52' (Dynamic Tailwater)
├─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└─**3=Custom Weir/Orifice** (Weir Controls 154.03 cfs @ 3.78 fps)

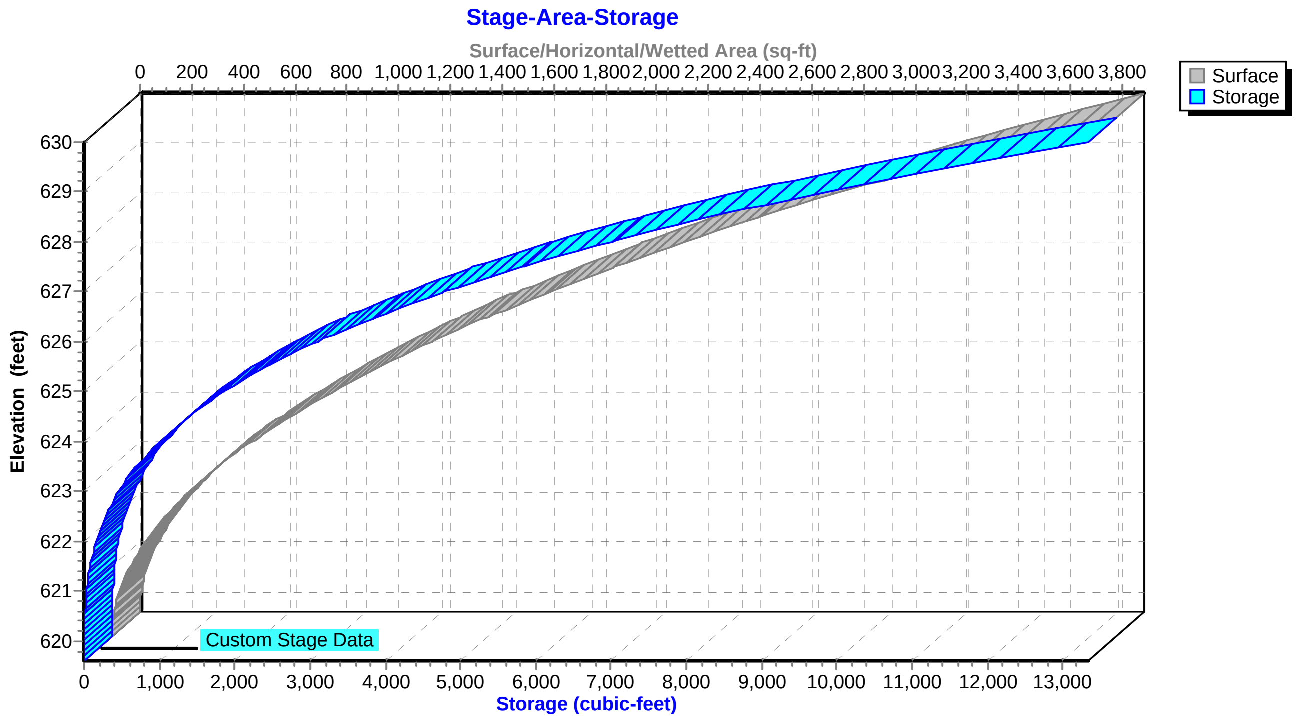
Pond 107A: 24" Culvert



Pond 107A: 24" Culvert



Pond 107A: 24" Culvert



Summary for Pond 107B: Wetland

Inflow Area = 14.330 ac, 0.00% Impervious, Inflow Depth = 5.00" for 100-Year event
Inflow = 43.23 cfs @ 12.51 hrs, Volume= 5.972 af
Outflow = 31.60 cfs @ 12.80 hrs, Volume= 5.696 af, Atten= 27%, Lag= 17.3 min
Primary = 31.60 cfs @ 12.80 hrs, Volume= 5.696 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 973.04' @ 12.80 hrs Surf.Area= 126,505 sf Storage= 66,447 cf

Plug-Flow detention time= 83.5 min calculated for 5.694 af (95% of inflow)
Center-of-Mass det. time= 58.4 min (907.1 - 848.7)

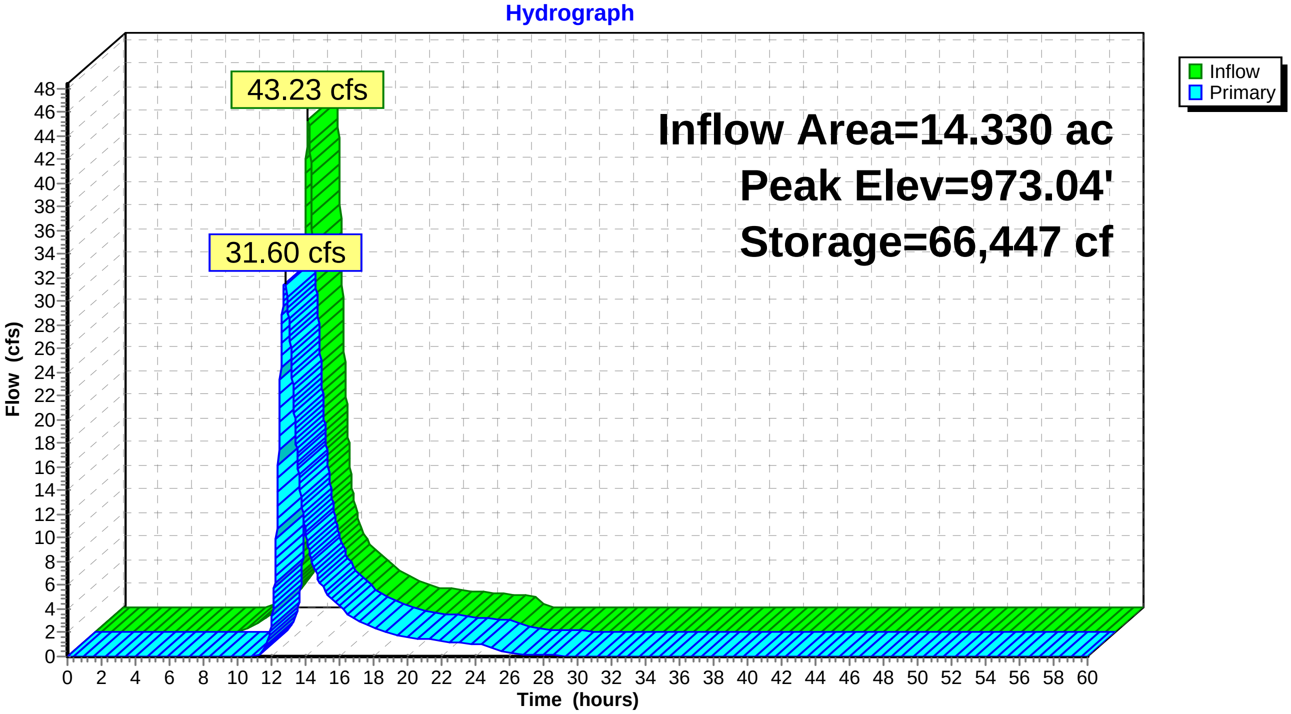
Volume	Invert	Avail.Storage	Storage Description
#1	972.50'	194,134 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
972.50	119,286	2,006.0	0	0	119,286
974.00	139,831	2,145.0	194,134	194,134	165,307

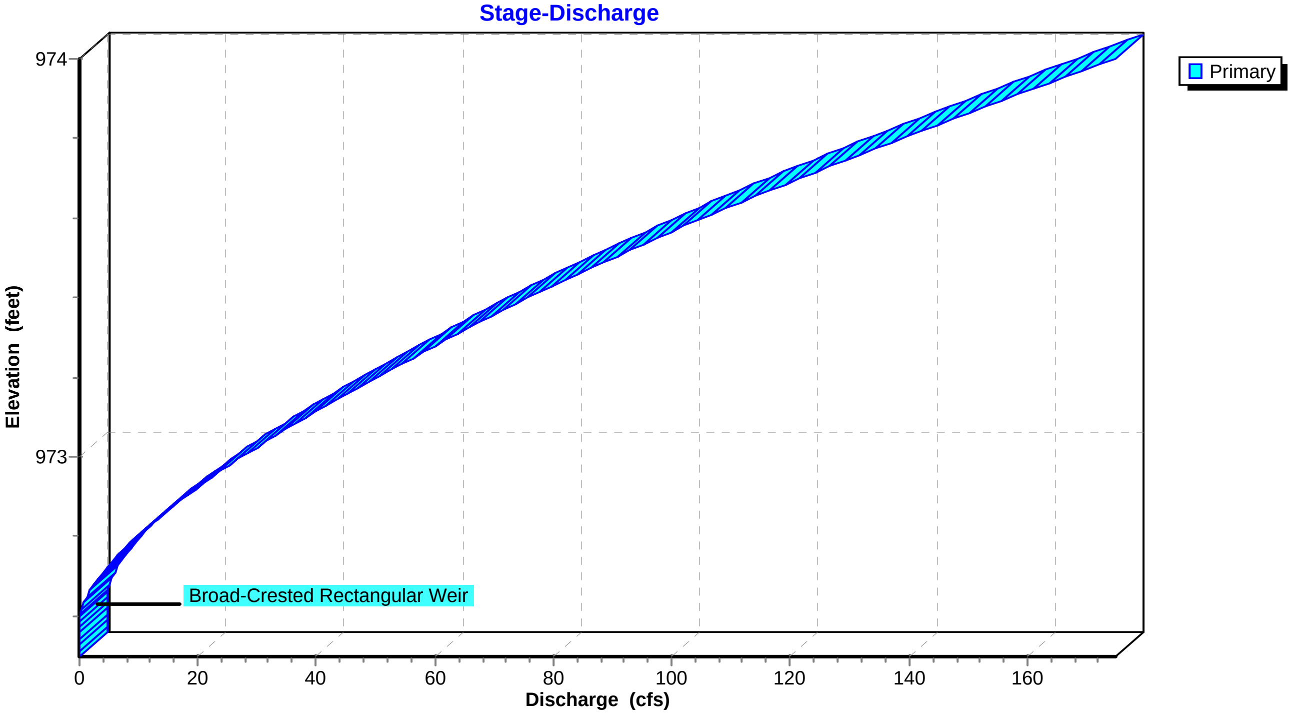
Device	Routing	Invert	Outlet Devices
#1	Primary	972.60'	**40.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=31.60 cfs @ 12.80 hrs HW=973.04' TW=972.49' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 31.60 cfs @ 1.79 fps)

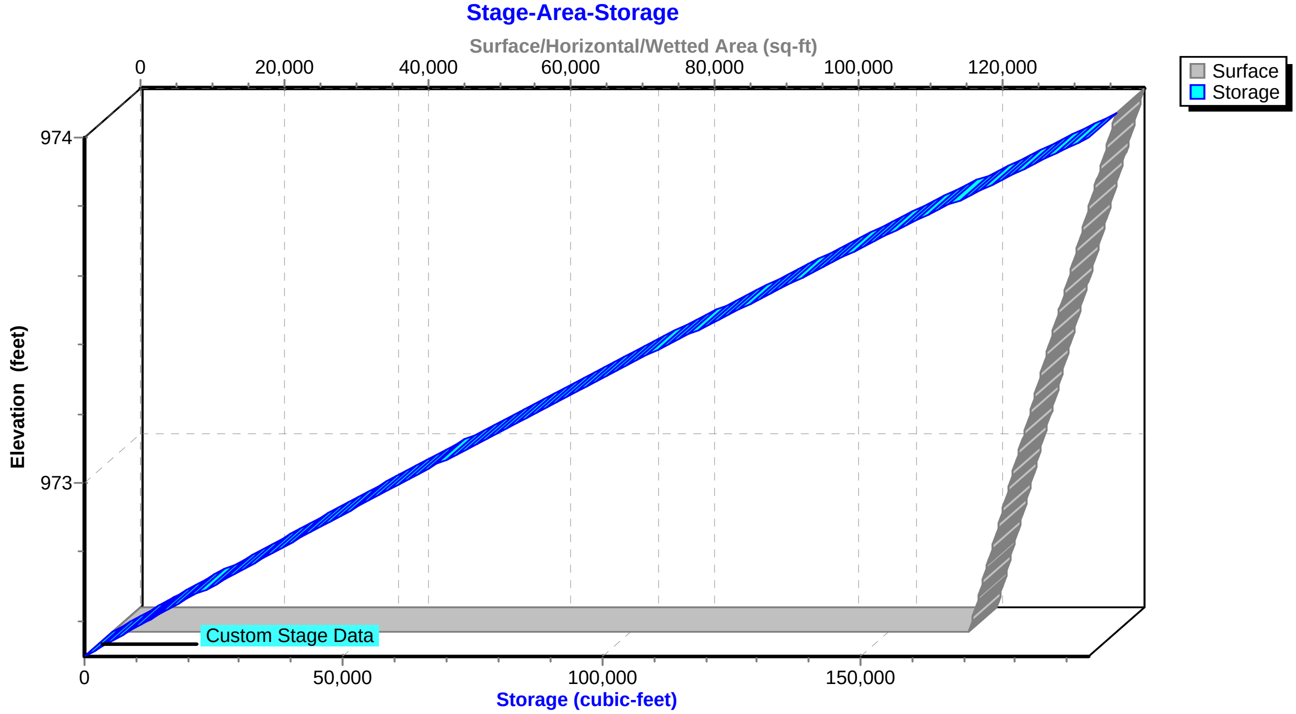
Pond 107B: Wetland



Pond 107B: Wetland



Pond 107B: Wetland



Summary for Pond 108A: 36" Culvert

Inflow Area = 5.526 ac, 2.32% Impervious, Inflow Depth = 31.56" for 100-Year event
Inflow = 159.27 cfs @ 12.82 hrs, Volume= 14.535 af
Outflow = 159.24 cfs @ 12.82 hrs, Volume= 14.535 af, Atten= 0%, Lag= 0.0 min
Primary = 58.91 cfs @ 12.49 hrs, Volume= 8.660 af
Secondary = 102.50 cfs @ 12.82 hrs, Volume= 5.875 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 613.52' @ 12.82 hrs Surf.Area= 808 sf Storage= 305 cf

Plug-Flow detention time= 0.4 min calculated for 14.535 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (790.4 - 790.4)

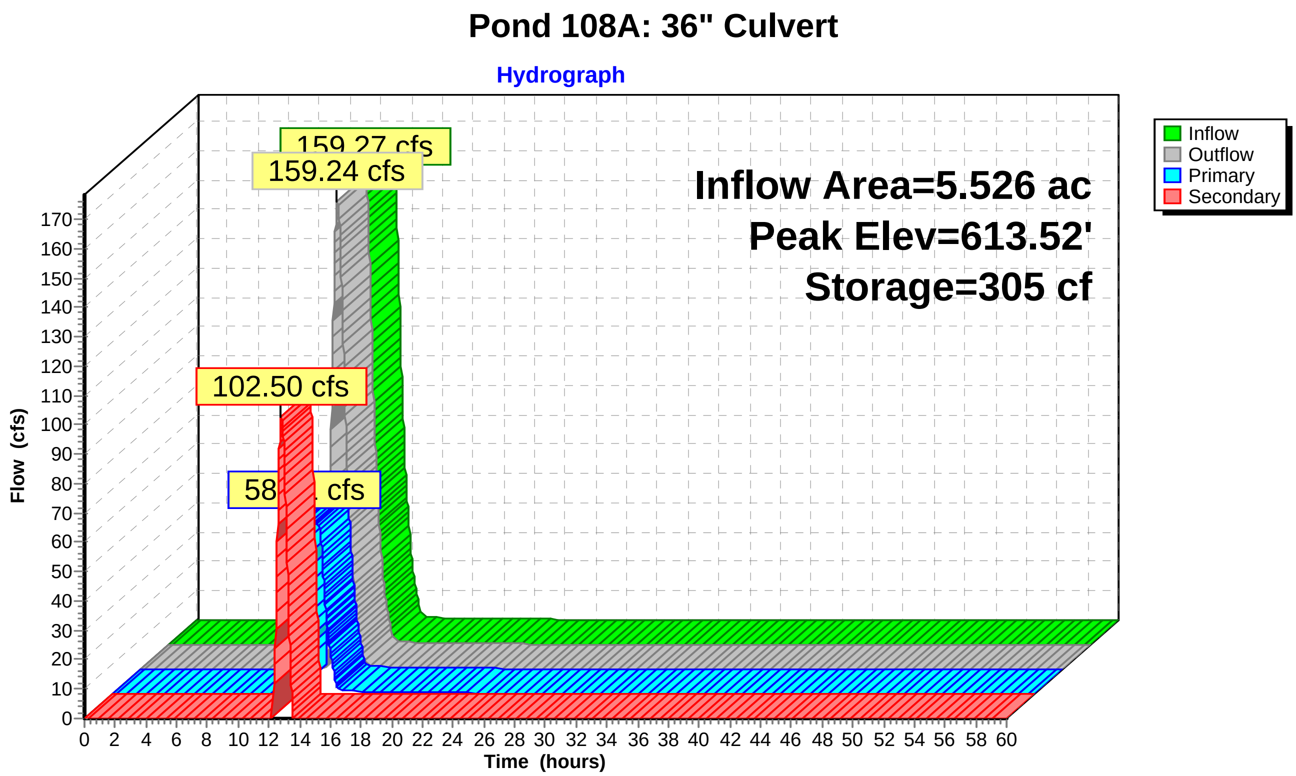
Volume	Invert	Avail.Storage	Storage Description
#1	608.80'	26,148 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

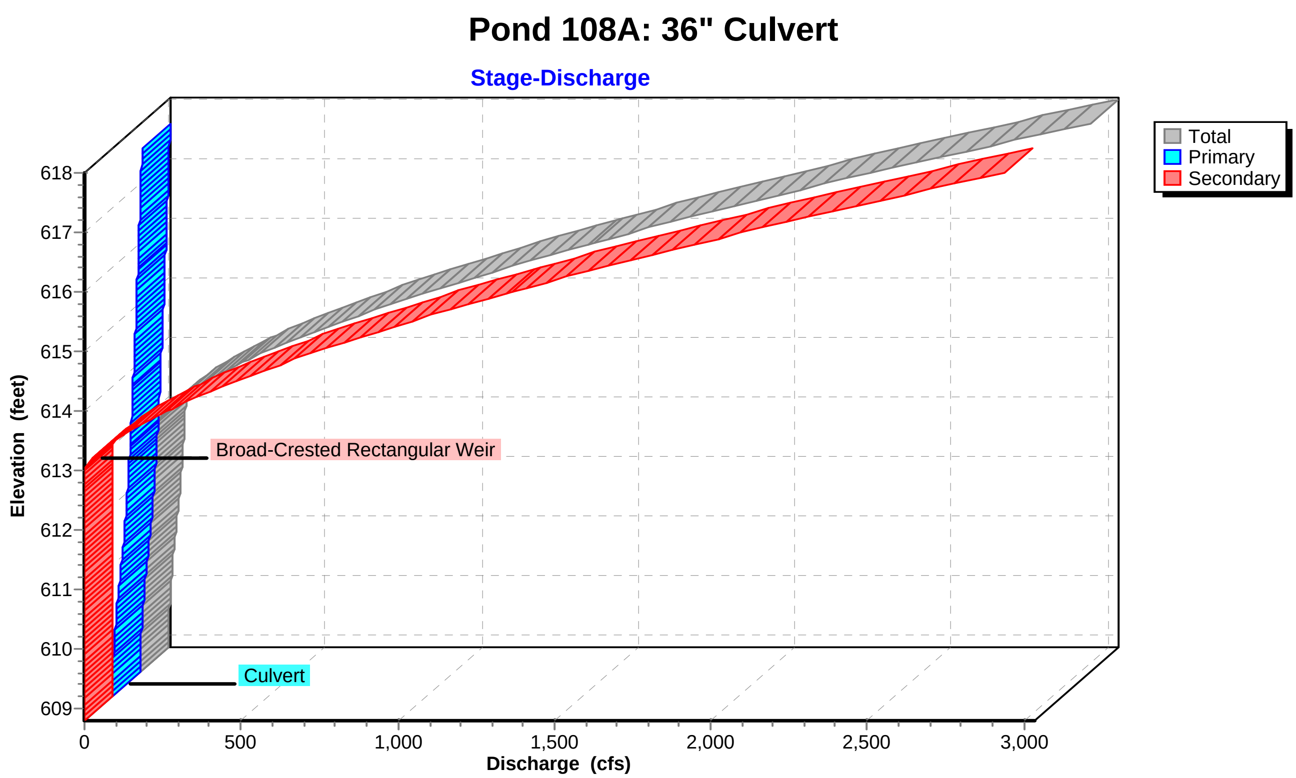
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
608.80	13	13.0	0	0	13
612.70	13	13.0	51	51	64
614.00	1,828	415.0	865	915	13,758
616.00	7,012	545.0	8,280	9,195	23,736
618.00	10,030	620.0	16,952	26,148	30,786

Device	Routing	Invert	Outlet Devices
#1	Primary	608.80'	**36.0" Round Culvert** L= 45.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 608.80' / 606.90' S= 0.0422 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	613.00'	**100.0' long x 24.0' 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) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

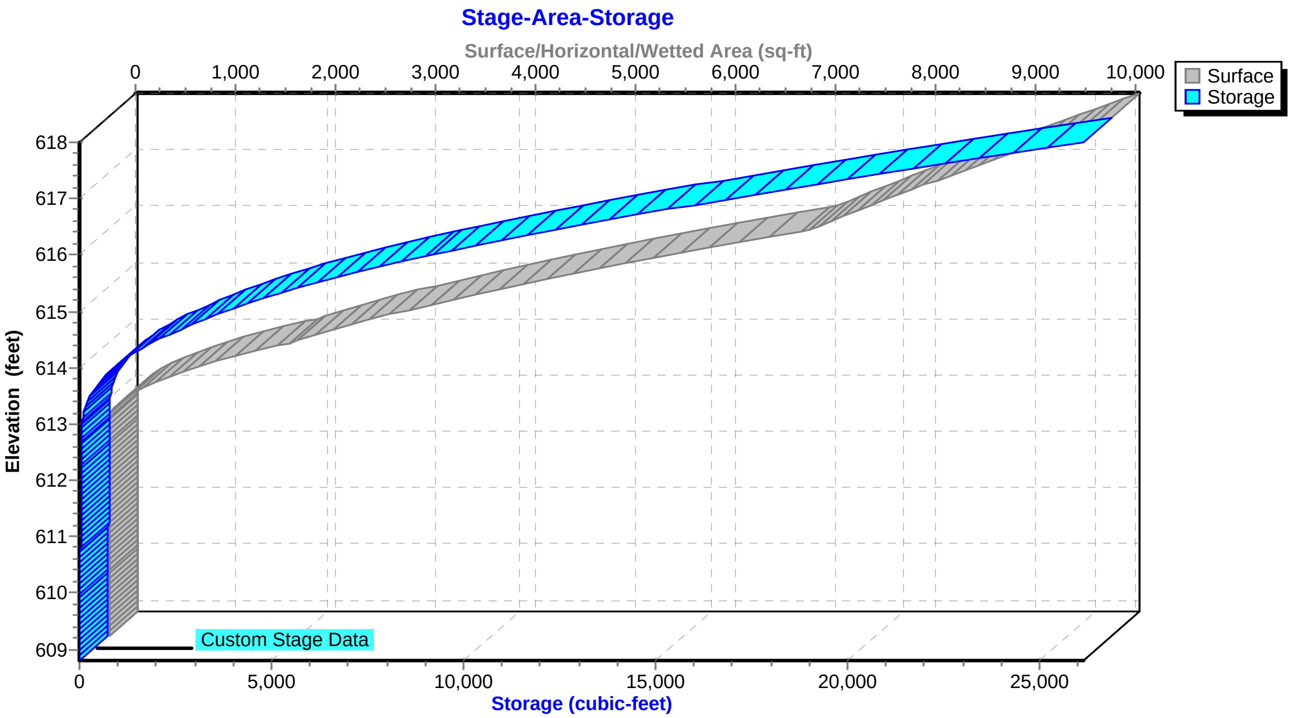
Primary OutFlow Max=58.99 cfs @ 12.49 hrs HW=613.30' TW=610.30' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 58.99 cfs @ 8.35 fps)

Secondary OutFlow Max=102.47 cfs @ 12.82 hrs HW=613.52' TW=610.75' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 102.47 cfs @ 1.95 fps)


Pond 108A: 36" Culvert
Hydrograph
159.27 cfs
159.24 cfs
102.50 cfs
58 cfs
Inflow Area=5.526 ac
Peak Elev=613.52'
Storage=305 cf
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)


Pond 108A: 36" Culvert
Stage-Discharge
Total
Primary
Secondary
Broad-Crested Rectangular Weir
Culvert
Elevation (feet)
Discharge (cfs)

Pond 108A: 36" Culvert



Summary for Pond 108B: Wetland N

Inflow Area = 72.374 ac, 0.70% Impervious, Inflow Depth = 4.87" for 100-Year event
Inflow = 189.32 cfs @ 12.55 hrs, Volume= 29.381 af
Outflow = 189.14 cfs @ 12.56 hrs, Volume= 29.356 af, Atten= 0%, Lag= 0.8 min
Primary = 4.39 cfs @ 12.10 hrs, Volume= 4.478 af
Secondary = 185.38 cfs @ 12.56 hrs, Volume= 24.878 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 501.79' @ 12.57 hrs Surf.Area= 11,308 sf Storage= 18,505 cf

Plug-Flow detention time= 9.7 min calculated for 29.356 af (100% of inflow)
Center-of-Mass det. time= 8.7 min (871.9 - 863.2)

Volume	Invert	Avail.Storage	Storage Description
#1	500.00'	32,385 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

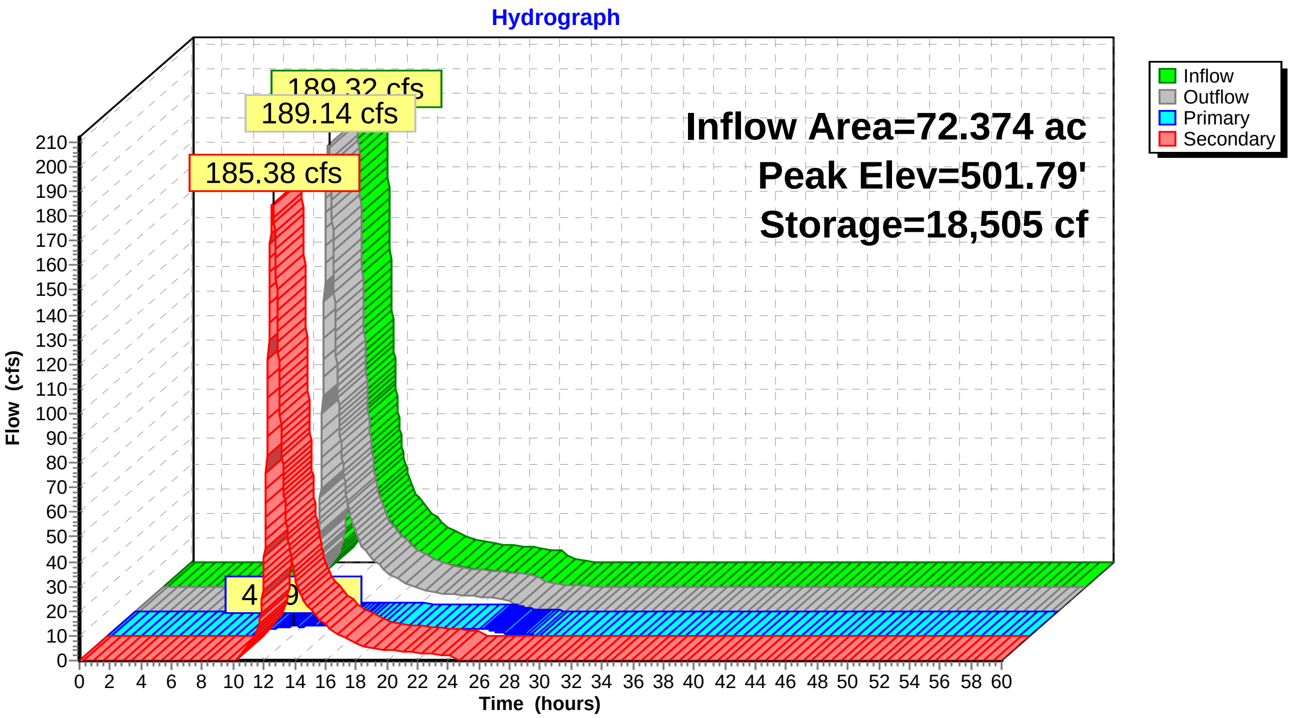
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
500.00	8,398	412.0	0	0	8,398
500.50	10,185	434.0	4,639	4,639	9,894
502.00	11,496	452.0	16,251	20,889	11,327
503.00	11,496	452.0	11,496	32,385	11,779

Device	Routing	Invert	Outlet Devices
#1	Primary	500.10'	**18.0" Round Culvert** L= 20.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 500.10' / 499.60' S= 0.0250 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 1.77 sf
#2	Secondary	501.00'	**125.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

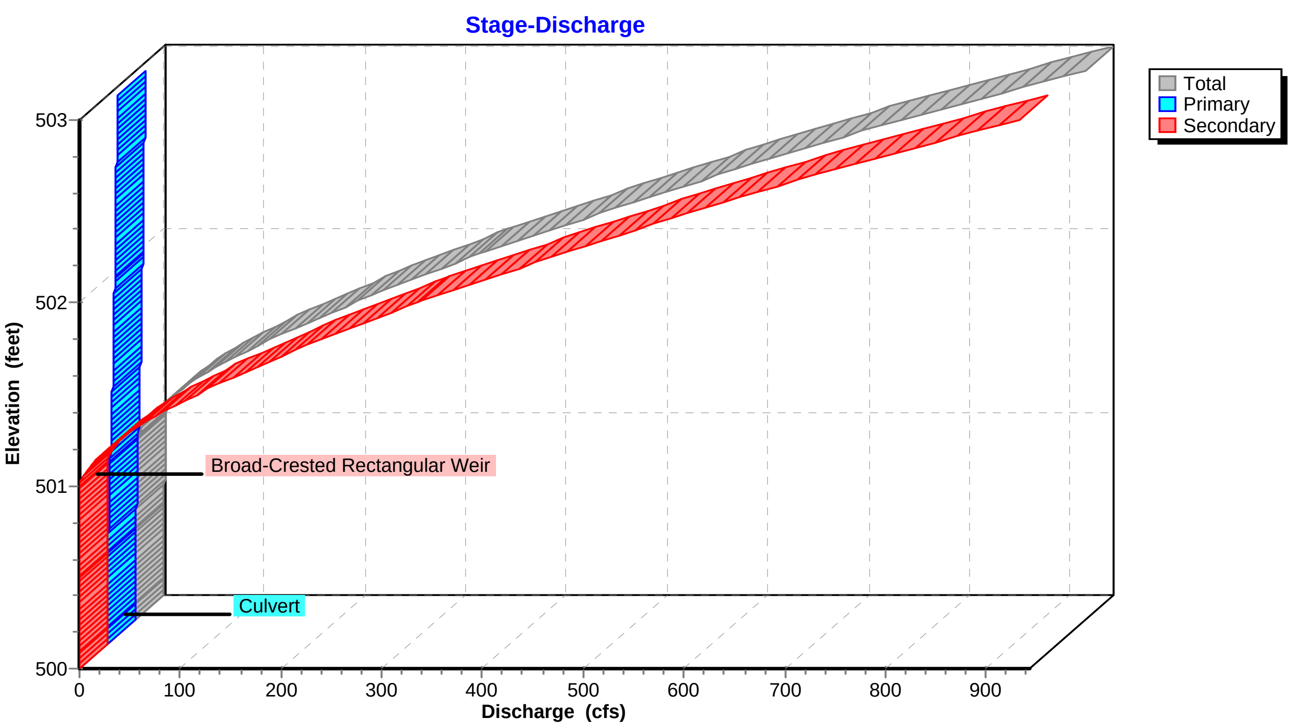
Primary OutFlow Max=4.39 cfs @ 12.10 hrs HW=501.33' TW=500.62' (Dynamic Tailwater)
↑—**1=Culvert** (Outlet Controls 4.39 cfs @ 3.86 fps)

Secondary OutFlow Max=185.32 cfs @ 12.56 hrs HW=501.79' TW=501.48' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 185.32 cfs @ 1.88 fps)

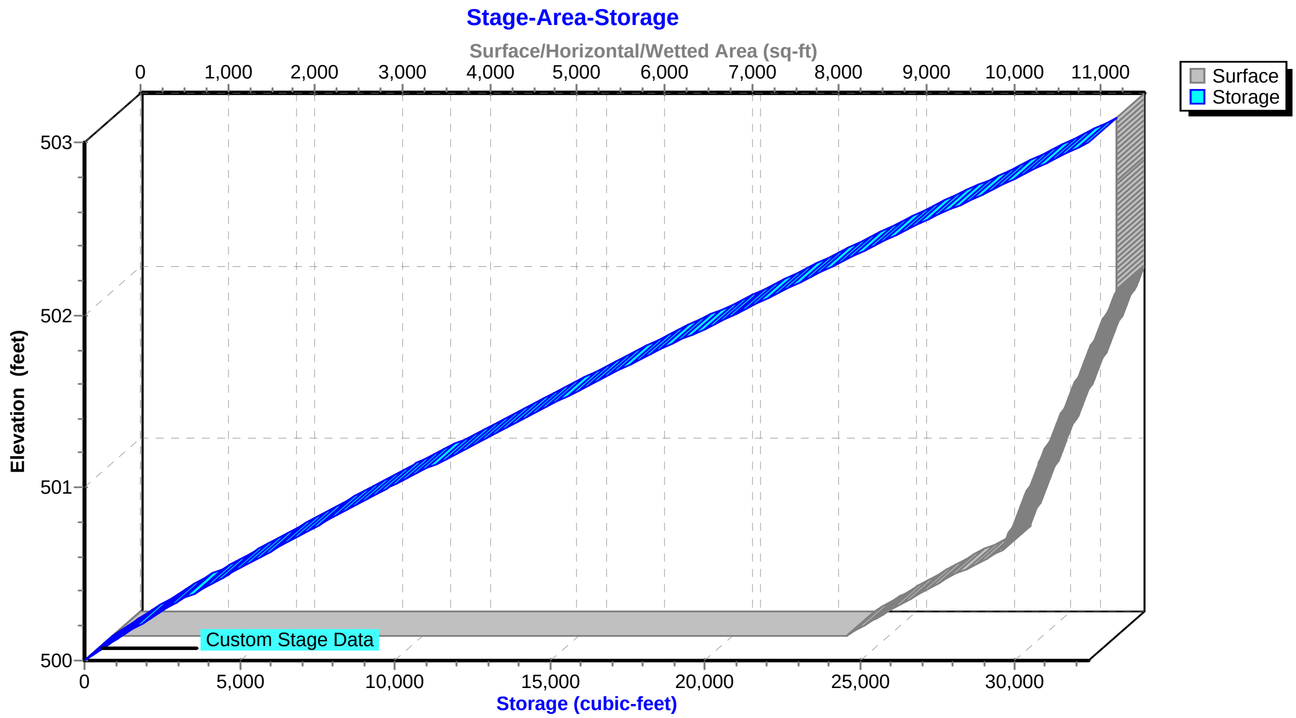
Pond 108B: Wetland N



Pond 108B: Wetland N



Pond 108B: Wetland N



Summary for Pond 109B: 36" Culvert

Inflow Area = 11.276 ac, 0.04% Impervious, Inflow Depth = 5.00" for 100-Year event
Inflow = 38.96 cfs @ 12.39 hrs, Volume= 4.699 af
Outflow = 38.91 cfs @ 12.40 hrs, Volume= 4.699 af, Atten= 0%, Lag= 0.7 min
Primary = 38.91 cfs @ 12.40 hrs, Volume= 4.699 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 548.80' @ 12.40 hrs Surf.Area= 311 sf Storage= 393 cf

Plug-Flow detention time= 0.1 min calculated for 4.698 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (840.1 - 840.0)

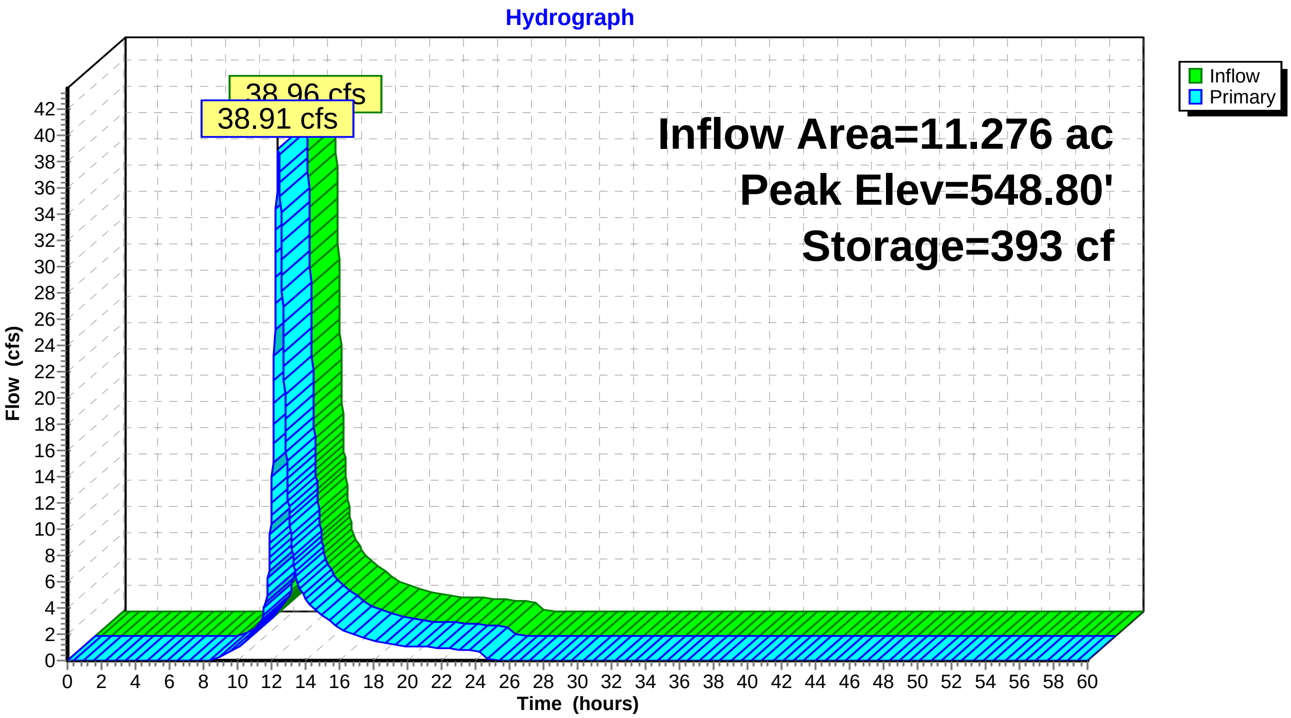
Volume	Invert	Avail.Storage	Storage Description
#1	545.20'	5,884 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
545.20	0	0.0	0	0	0
548.00	203	65.0	189	189	348
550.00	519	101.0	698	887	852
552.00	1,050	140.0	1,538	2,425	1,638
554.00	2,514	230.0	3,459	5,884	4,313

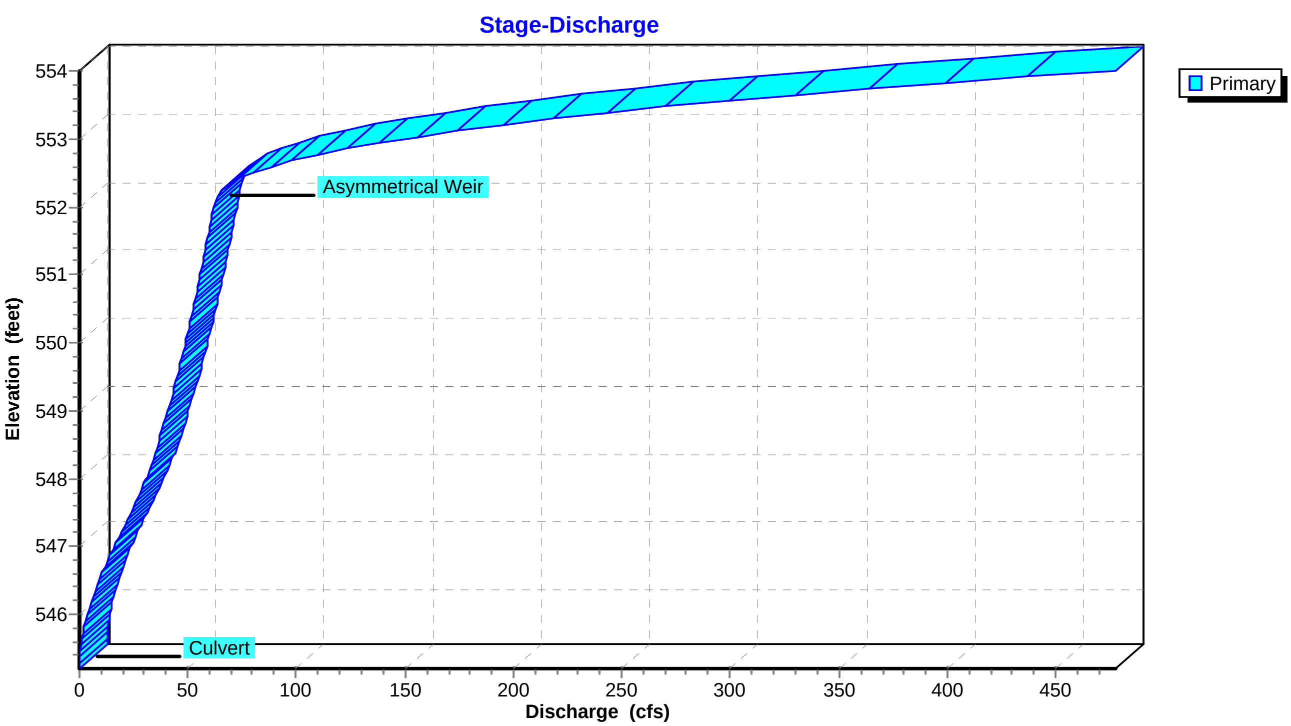
Device	Routing	Invert	Outlet Devices
#1	Primary	545.20'	**36.0" Round Culvert** L= 96.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 545.20' / 532.20' S= 0.1354 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Primary	552.00'	**Asymmetrical Weir, C= 3.27** Offset (feet) 0.00 35.00 65.00 95.00 Height (feet) 2.00 0.60 0.00 2.00

Primary OutFlow Max=38.90 cfs @ 12.40 hrs HW=548.80' TW=533.31' (Dynamic Tailwater)
├─**1=Culvert** (Inlet Controls 38.90 cfs @ 5.50 fps)
└─**2=Asymmetrical Weir** (Controls 0.00 cfs)

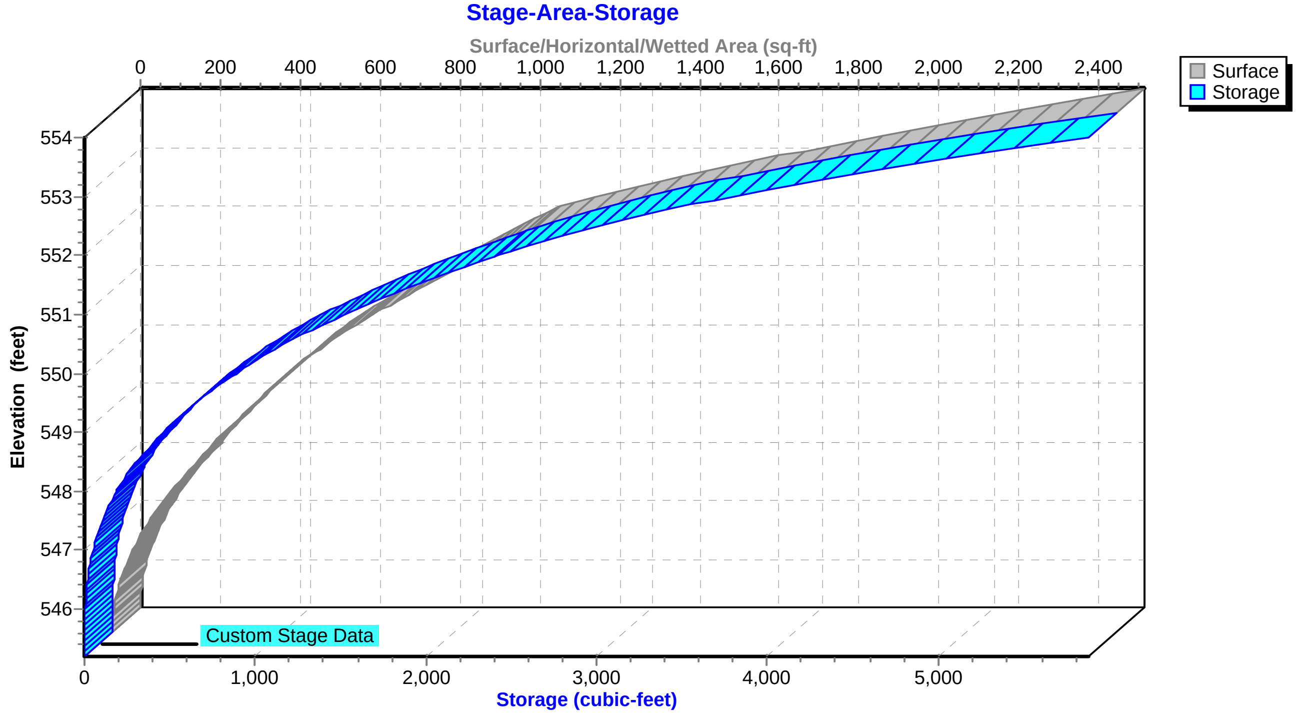
Pond 109B: 36" Culvert



Pond 109B: 36" Culvert



Pond 109B: 36" Culvert

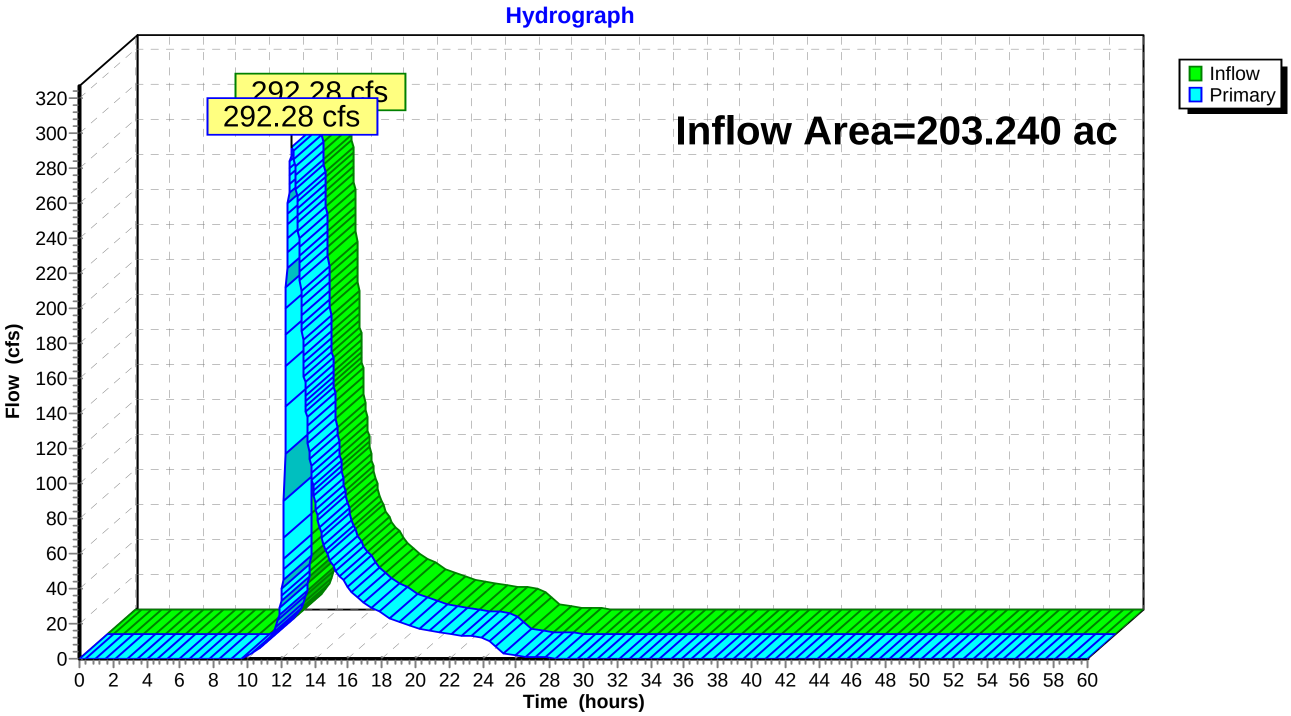


Summary for Link A: Amenia Stream

Inflow Area = 203.240 ac, 3.66% Impervious, Inflow Depth = 3.33" for 100-Year event
Inflow = 292.28 cfs @ 12.66 hrs, Volume= 56.445 af
Primary = 292.28 cfs @ 12.66 hrs, Volume= 56.445 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs

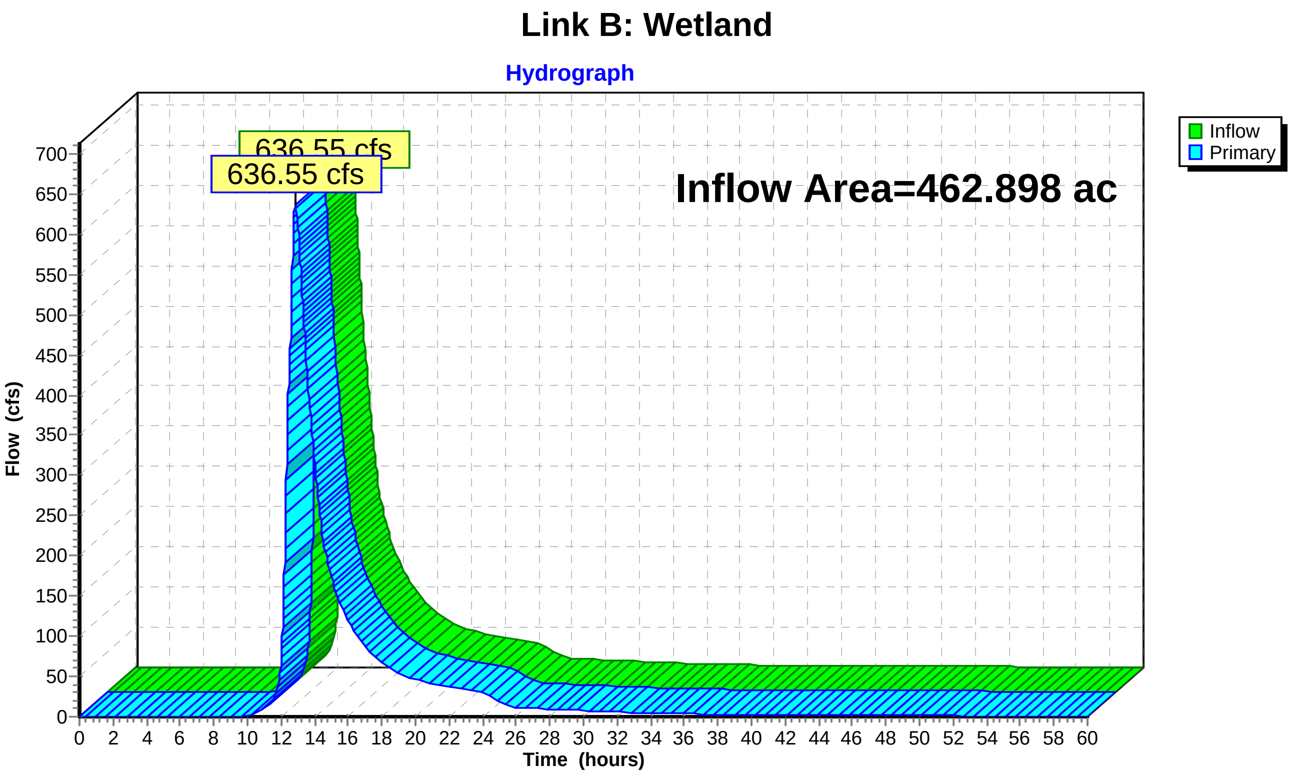
Link A: Amenia Stream



Summary for Link B: Wetland

Inflow Area = 462.898 ac, 3.63% Impervious, Inflow Depth > 3.96" for 100-Year event
Inflow = 636.55 cfs @ 12.85 hrs, Volume= 152.587 af
Primary = 636.55 cfs @ 12.85 hrs, Volume= 152.587 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs

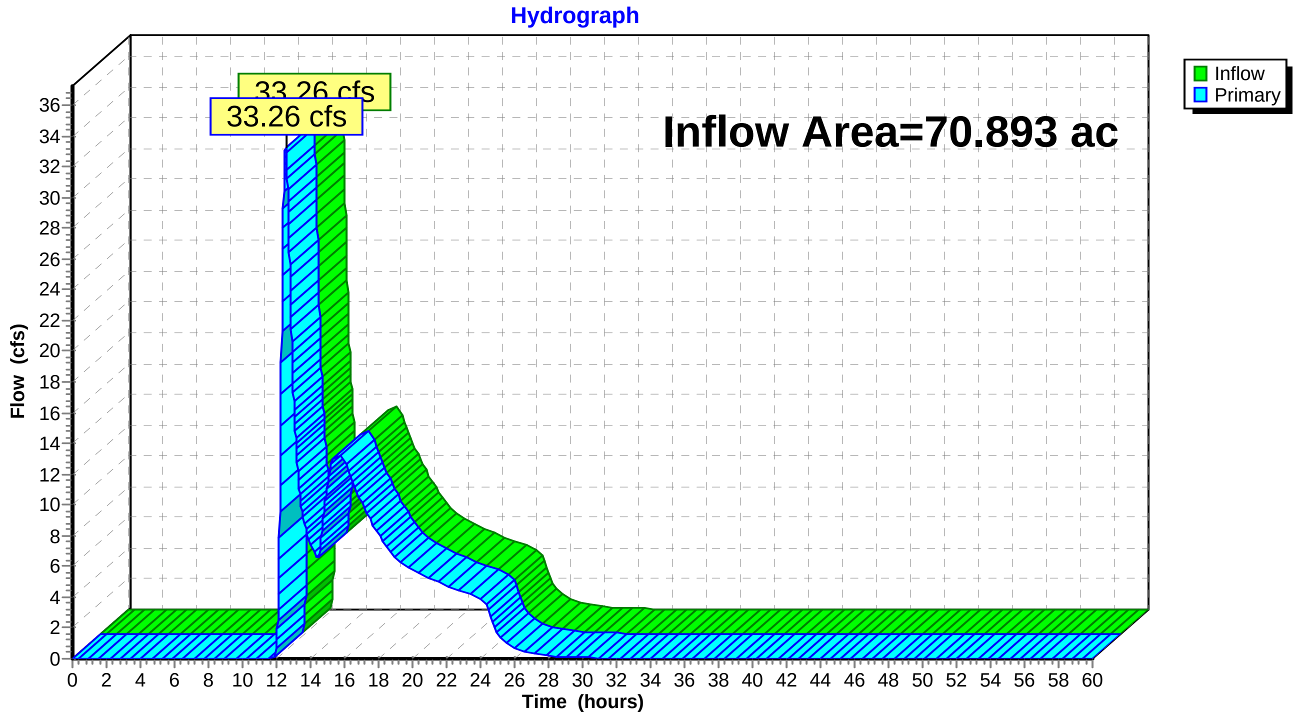


Summary for Link C: Culvert

Inflow Area = 70.893 ac, 4.53% Impervious, Inflow Depth = 1.56" for 100-Year event
Inflow = 33.26 cfs @ 12.53 hrs, Volume= 9.208 af
Primary = 33.26 cfs @ 12.53 hrs, Volume= 9.208 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs

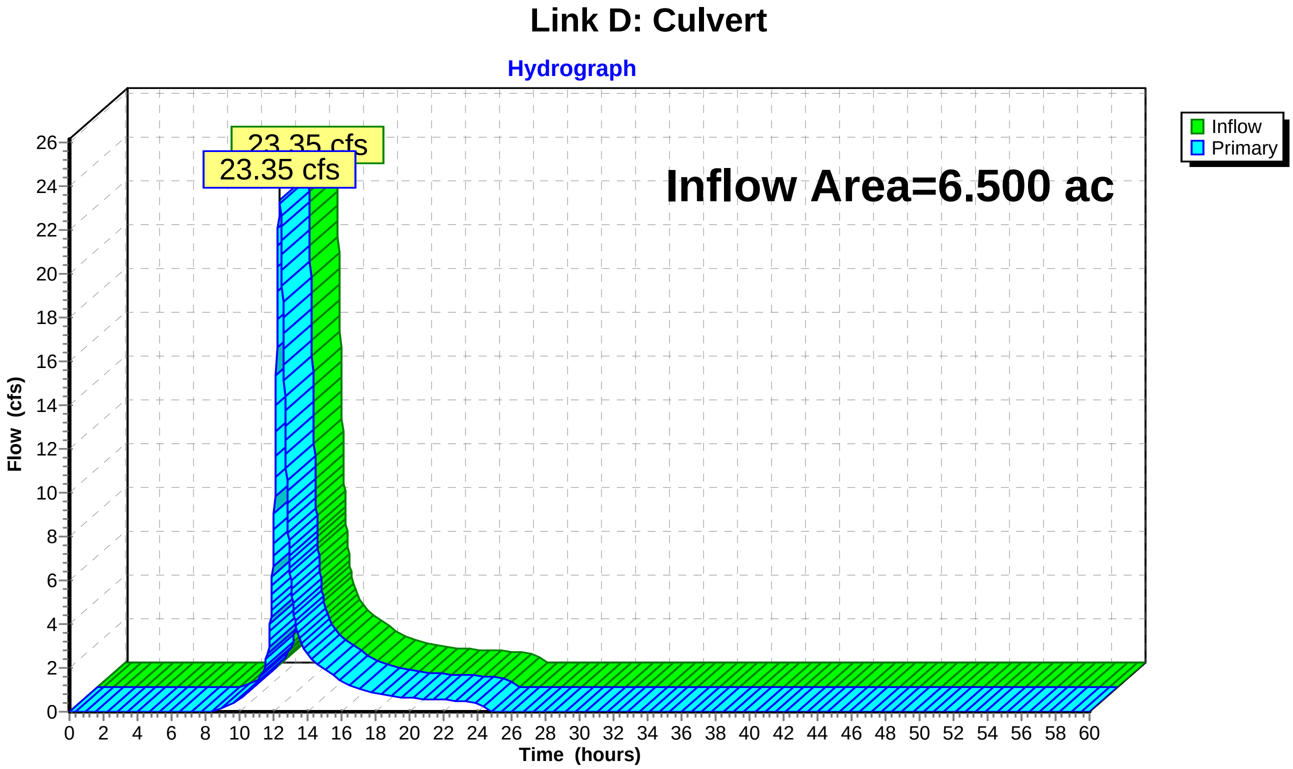
Link C: Culvert



Summary for Link D: Culvert

Inflow Area = 6.500 ac, 0.00% Impervious, Inflow Depth = 5.00" for 100-Year event
Inflow = 23.35 cfs @ 12.35 hrs, Volume= 2.709 af
Primary = 23.35 cfs @ 12.35 hrs, Volume= 2.709 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs

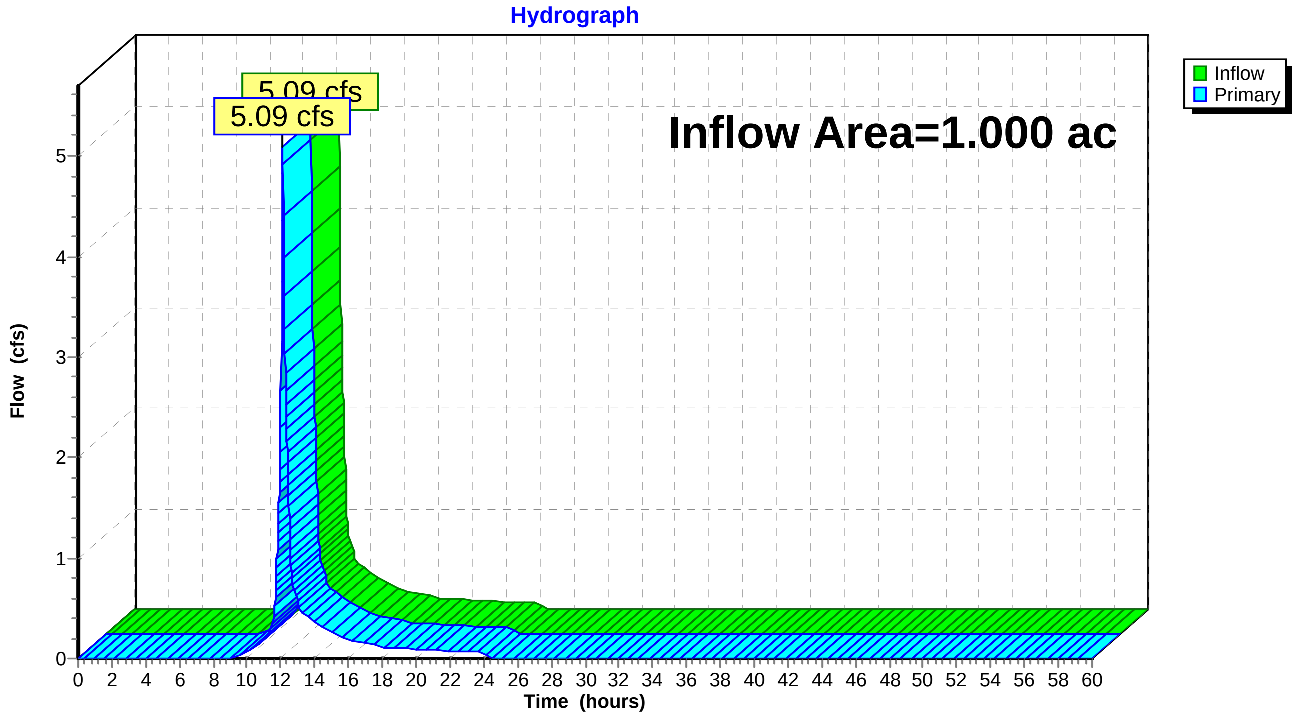


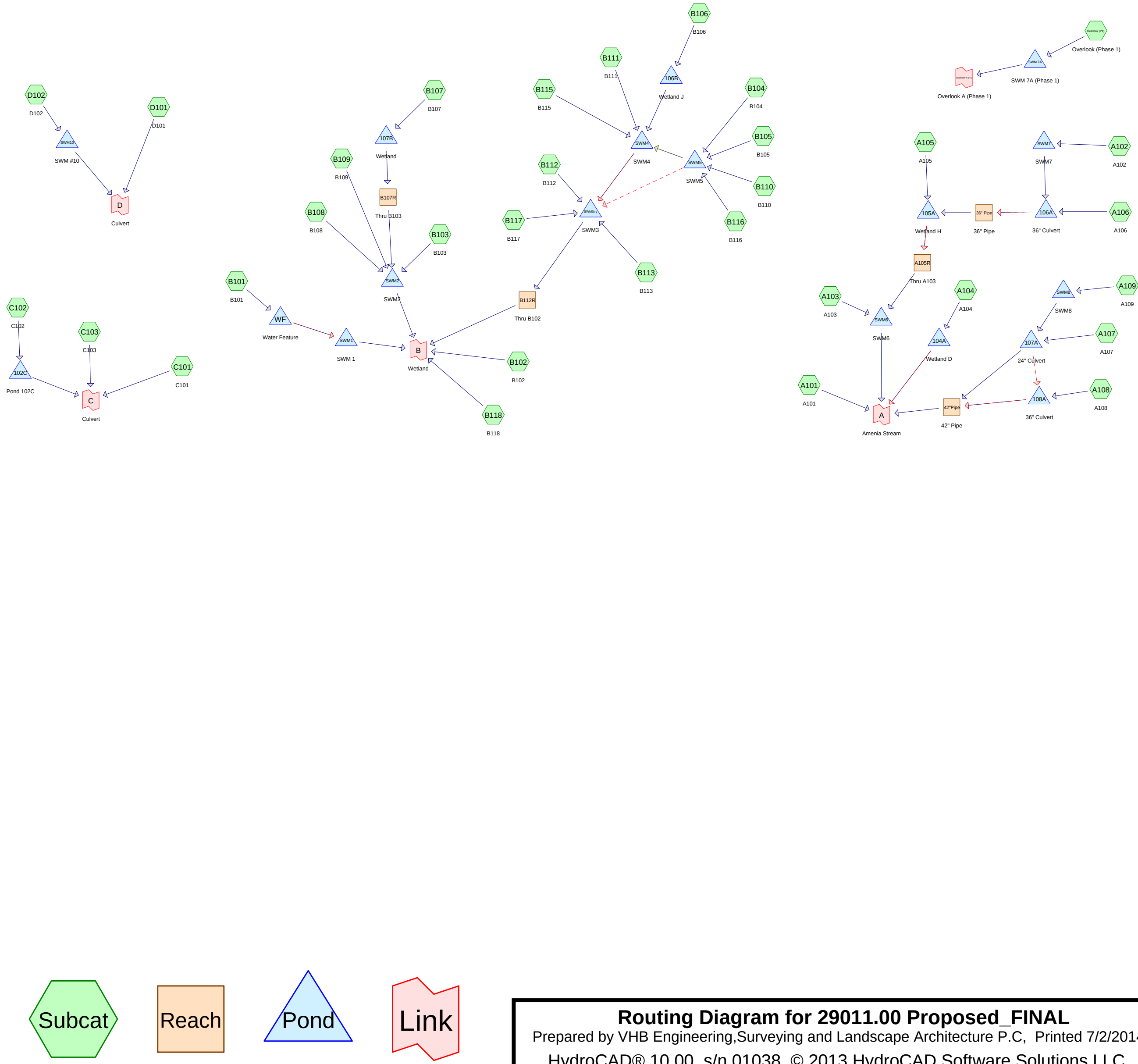
Summary for Link Overlook-A (P1): Overlook A (Phase 1)

Inflow Area = 1.000 ac, 0.00% Impervious, Inflow Depth = 4.48" for 100-Year event
Inflow = 5.09 cfs @ 12.11 hrs, Volume= 0.374 af
Primary = 5.09 cfs @ 12.11 hrs, Volume= 0.374 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs

Link Overlook-A (P1): Overlook A (Phase 1)





Routing Diagram for 29011.00 Proposed_FINAL
Prepared by VHB Engineering,Surveying and Landscape Architecture P.C, Printed 7/2/2014
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
168.007	39	>75% Grass cover, Good, HSG A (A101, A103, A104, A105, B101, B102, B104, B105, B106, B111, B112, B113, B115, B116, B117, B118, C101, C102, C103)
25.839	61	>75% Grass cover, Good, HSG B (A101, A103, A104, A106, A107, A108, A109, B102, B106)
149.391	74	>75% Grass cover, Good, HSG C (A101, A102, A103, A104, A105, A106, A107, A109, B101, B102, B103, B104, B105, B106, B108, B109, B110, B111, B112, B115, C101, C102, Ocerlook (P1))
22.616	80	>75% Grass cover, Good, HSG D (A103, A106, A107, A109, B101, B102, B103, B105, B106, B107, B108, B109, B112, B113, B117, C102)
15.426	98	Building roof (A101, A102, A103, A105, A107, A108, B101, B103, B104, B105, B106, B108, B109, B110, B111, B112, B113, B115, B117, B118, C103)
0.260	89	Gravel roads and parking, HSG C (Ocerlook (P1))
0.084	91	Gravel roads, HSG D (D102)
3.067	96	Gravel surface (A103, A107, A108, B101, B102, B103, B104, B105, B106, B107, B113, C101, C102)
2.000	98	Paved parking, HSG B (A109)
34.108	98	Paved surface (A101, A102, A103, A104, A105, A106, A107, A108, B101, B102, B103, B104, B105, B106, B108, B109, B110, B111, B112, B113, B115, B116, B117, B118, C101, C102, C103, D102)
0.331	98	Rock Outcrop/Ledge (C102, C103)
0.857	98	Roofs, HSG B (A109)
1.006	30	Sand Trap, HSG C (A104, A105, B101, B102, B104, B109, B115)
2.070	30	Sand trap, HSG A (A101, A103, A104, A105, B101, B102, B112, B115)
0.160	30	Sand trap, HSG B (A101, A103)
13.938	98	Water Surface (A102, A103, A104, A105, A107, B101, B102, B109, B111, B112, B116, C102)
17.308	30	Woods, Good, HSG A (A101, A103, A104, A105, B101, B102, B112, B113, B115, B117, B118, C101, C102, C103)
14.630	55	Woods, Good, HSG B (A103, A104, A106, A107, A108, A109)
52.704	70	Woods, Good, HSG C (A102, A103, A104, A105, A106, A107, A109, B101, B102, B104, B106, B108, B109, B110, B112, B115, C101, C102, C103, Ocerlook (P1))
266.653	77	Woods, Good, HSG D (A103, A106, A107, A109, B101, B102, B103, B105, B106, B107, B108, B109, B113, B117, C102, D101)
790.455	**68**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
187.385	HSG A	A101, A103, A104, A105, B101, B102, B104, B105, B106, B111, B112, B113, B115, B116, B117, B118, C101, C102, C103
43.486	HSG B	A101, A103, A104, A106, A107, A108, A109, B102, B106
203.361	HSG C	A101, A102, A103, A104, A105, A106, A107, A109, B101, B102, B103, B104, B105, B106, B108, B109, B110, B111, B112, B115, C101, C102, C103, Ocerlook (P1)
289.353	HSG D	A103, A106, A107, A109, B101, B102, B103, B105, B106, B107, B108, B109, B112, B113, B117, C102, D101, D102
66.870	Other	A101, A102, A103, A104, A105, A106, A107, A108, B101, B102, B103, B104, B105, B106, B107, B108, B109, B110, B111, B112, B113, B115, B116, B117, B118, C101, C102, C103, D102
790.455		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
168.007	25.839	149.391	22.616	0.000	365.853	>75% Grass cover, Good	A101, A102, A103, A104, A105, A106, A107, A108, A109, B101, B102, B103, B104, B105, B106, B107, B108, B109, B110, B111, B112, B113, B115, B116, B117, B118, C101, C102, C103, Ocerlook (P1)
0.000	0.000	0.000	0.000	15.426	15.426	Building roof	A101, A102, A103, A105, A107, A108, B101, B103, B104, B105, B106, B108, B109, B110, B111,

Ground Covers (all nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.084	0.000	0.084	Gravel roads	D102
0.000	0.000	0.260	0.000	0.000	0.260	Gravel roads and parking	Ocerlook (P1)
0.000	0.000	0.000	0.000	3.067	3.067	Gravel surface	A103, A107, A108, B101, B102, B103, B104, B105, B106, B107, B113, C101, C102
0.000	2.000	0.000	0.000	0.000	2.000	Paved parking	A109
0.000	0.000	0.000	0.000	34.108	34.108	Paved surface	A101, A102, A103, A104, A105, A106, A107, A108, B101, B102, B103, B104, B105, B106, B108, B109, B110, B111, B112, B113, B115, B116, B117, B118, C101, C102, C103, D102

Ground Covers (all nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	0.331	0.331	Rock Outcrop/Ledge	C102, C103
0.000	0.857	0.000	0.000	0.000	0.857	Roofs	A109
0.000	0.000	1.006	0.000	0.000	1.006	Sand Trap	A104, A105, B101, B102, B104, B109, B115
2.070	0.160	0.000	0.000	0.000	2.230	Sand trap	A101, A103, A104, A105, B101, B102, B112, B115
0.000	0.000	0.000	0.000	13.938	13.938	Water Surface	A102, A103, A104, A105, A107, B101, B102, B109, B111, B112, B116, C102
17.308	14.630	52.704	266.653	0.000	351.295	Woods, Good	A101, A102, A103, A104, A105, A106, A107, A108, A109, B101, B102, B103, B104, B105, B106, B107,

Ground Covers (all nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
187.385	**43.486**	**203.361**	**289.353**	**66.870**	**790.455**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	A103	0.00	0.00	1,520.0	0.0690	0.012	30.0	0.0	0.0
2	B101	0.00	0.00	545.0	0.1000	0.012	36.0	0.0	0.0
3	B103	0.00	0.00	1,243.0	0.0670	0.012	36.0	0.0	0.0
4	B104	0.00	0.00	1,035.0	0.0350	0.012	36.0	0.0	0.0
5	B105	0.00	0.00	900.0	0.0400	0.012	36.0	0.0	0.0
6	B108	0.00	0.00	725.0	0.1640	0.012	36.0	0.0	0.0
7	B109	0.00	0.00	100.0	0.2800	0.012	36.0	0.0	0.0
8	B110	0.00	0.00	715.0	0.0360	0.024	24.0	0.0	0.0
9	B113	0.00	0.00	436.0	0.0700	0.015	15.0	0.0	0.0
10	36" Pipe	635.00	571.00	935.0	0.0684	0.015	36.0	0.0	0.0
11	42"Pipe	602.00	535.00	520.0	0.1288	0.015	42.0	0.0	0.0
12	104A	507.70	507.30	20.0	0.0200	0.025	12.0	0.0	0.0
13	105A	572.90	572.00	20.0	0.0450	0.025	18.0	0.0	0.0
14	106A	716.70	686.00	133.0	0.2308	0.025	36.0	0.0	0.0
15	107A	619.80	607.40	145.0	0.0855	0.010	24.0	0.0	0.0
16	108A	608.80	606.90	45.0	0.0422	0.025	36.0	0.0	0.0
17	SWM 7A	805.00	804.00	40.0	0.0250	0.015	15.0	0.0	0.0
18	SWM1	512.00	510.00	57.0	0.0351	0.012	3.0	0.0	0.0
19	SWM10	606.00	605.50	60.0	0.0083	0.012	15.0	0.0	0.0
20	SWM2	498.00	496.00	100.0	0.0200	0.024	6.0	0.0	0.0
21	SWM4	510.00	505.50	250.0	0.0180	0.020	36.0	0.0	0.0
22	SWM5	516.00	515.00	90.0	0.0111	0.015	5.0	0.0	0.0
23	SWM5	512.00	505.00	270.0	0.0259	0.020	30.0	0.0	0.0
24	SWM6	500.00	498.50	135.0	0.0111	0.012	8.0	0.0	0.0
25	SWM6	501.50	500.00	105.0	0.0143	0.012	18.0	0.0	0.0
26	SWM7	740.00	739.00	60.0	0.0167	0.012	30.0	0.0	0.0
27	SWM8	650.00	648.00	90.0	0.0222	0.010	36.0	0.0	0.0
28	WF	520.00	513.00	225.0	0.0311	0.015	36.0	0.0	0.0

Time span=0.00-60.00 hrs, dt=0.02 hrs, 3001 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment A101: A101 Runoff Area=21.492 ac 4.36% Impervious Runoff Depth=1.45"
Flow Length=1,320' Tc=20.2 min CN=48 Runoff=16.54 cfs 2.593 af

Subcatchment A102: A102 Runoff Area=4.590 ac 29.85% Impervious Runoff Depth=5.52"
Flow Length=530' Tc=15.8 min CN=81 Runoff=22.16 cfs 2.112 af

Subcatchment A103: A103 Runoff Area=57.467 ac 18.55% Impervious Runoff Depth=2.72"
Flow Length=2,529' Tc=22.2 min CN=59 Runoff=111.51 cfs 13.025 af

Subcatchment A104: A104 Runoff Area=29.922 ac 5.68% Impervious Runoff Depth=1.34"
Flow Length=1,871' Tc=21.8 min CN=47 Runoff=19.75 cfs 3.344 af

Subcatchment A105: A105 Runoff Area=26.522 ac 10.56% Impervious Runoff Depth=2.97"
Flow Length=1,484' Tc=19.3 min CN=61 Runoff=60.91 cfs 6.553 af

Subcatchment A106: A106 Runoff Area=10.791 ac 11.31% Impervious Runoff Depth=5.00"
Flow Length=1,260' Tc=26.7 min CN=77 Runoff=38.35 cfs 4.497 af

Subcatchment A107: A107 Runoff Area=79.700 ac 2.24% Impervious Runoff Depth=4.61"
Flow Length=3,685' Tc=61.0 min CN=74 Runoff=171.28 cfs 30.636 af

Subcatchment A108: A108 Runoff Area=5.527 ac 2.32% Impervious Runoff Depth=2.48"
Flow Length=1,235' Tc=30.1 min CN=57 Runoff=8.33 cfs 1.141 af

Subcatchment A109: A109 Runoff Area=15.712 ac 18.18% Impervious Runoff Depth=4.48"
Flow Length=1,315' Tc=33.2 min CN=73 Runoff=45.35 cfs 5.871 af

Subcatchment B101: B101 Runoff Area=56.627 ac 6.87% Impervious Runoff Depth=3.09"
Flow Length=2,334' Tc=36.7 min CN=62 Runoff=102.85 cfs 14.575 af

Subcatchment B102: B102 Runoff Area=41.568 ac 1.26% Impervious Runoff Depth=2.84"
Flow Length=955' Tc=20.3 min CN=60 Runoff=88.66 cfs 9.845 af

Subcatchment B103: B103 Runoff Area=22.950 ac 5.23% Impervious Runoff Depth=5.26"
Flow Length=2,127' Tc=38.5 min CN=79 Runoff=72.03 cfs 10.061 af

Subcatchment B104: B104 Runoff Area=24.602 ac 14.51% Impervious Runoff Depth=4.87"
Flow Length=3,620' Tc=24.7 min CN=76 Runoff=88.17 cfs 9.987 af

Subcatchment B105: B105 Runoff Area=24.733 ac 4.33% Impervious Runoff Depth=5.13"
Flow Length=2,606' Tc=36.4 min CN=78 Runoff=78.04 cfs 10.575 af

Subcatchment B106: B106 Runoff Area=118.111 ac 1.03% Impervious Runoff Depth=4.87"
Flow Length=5,409' Tc=85.7 min CN=76 Runoff=214.98 cfs 47.947 af

Subcatchment B107: B107 Runoff Area=14.330 ac 0.00% Impervious Runoff Depth=5.00"
Flow Length=907' Tc=37.9 min CN=77 Runoff=43.23 cfs 5.972 af

Subcatchment B108: B108 Runoff Area=42.121 ac 6.08% Impervious Runoff Depth=5.00"
Flow Length=2,038' Tc=32.2 min CN=77 Runoff=137.25 cfs 17.554 af

Subcatchment B109: B109 Runoff Area=34.539 ac 8.27% Impervious Runoff Depth=5.00"
Flow Length=1,371' Tc=24.9 min CN=77 Runoff=126.36 cfs 14.394 af

Subcatchment B110: B110 Runoff Area=6.622 ac 45.47% Impervious Runoff Depth=6.04"
Flow Length=936' Tc=11.9 min CN=85 Runoff=38.12 cfs 3.335 af

Subcatchment B111: B111 Runoff Area=6.162 ac 18.97% Impervious Runoff Depth=3.21"
Flow Length=516' Tc=6.8 min CN=63 Runoff=22.36 cfs 1.650 af

Subcatchment B112: B112 Runoff Area=39.484 ac 29.38% Impervious Runoff Depth=3.34"
Flow Length=989' Tc=15.8 min CN=64 Runoff=113.49 cfs 10.983 af

Subcatchment B113: B113 Runoff Area=5.540 ac 15.56% Impervious Runoff Depth=2.36"
Flow Length=836' Tc=14.0 min CN=56 Runoff=10.63 cfs 1.089 af

Subcatchment B115: B115 Runoff Area=13.073 ac 9.68% Impervious Runoff Depth=2.60"
Flow Length=1,419' Tc=11.1 min CN=58 Runoff=31.27 cfs 2.831 af

Subcatchment B116: B116 Runoff Area=2.600 ac 30.58% Impervious Runoff Depth=2.48"
Tc=6.0 min CN=57 Runoff=6.97 cfs 0.537 af

Subcatchment B117: B117 Runoff Area=7.158 ac 31.99% Impervious Runoff Depth=2.60"
Tc=6.0 min CN=58 Runoff=20.47 cfs 1.550 af

Subcatchment B118: B118 Runoff Area=2.551 ac 42.77% Impervious Runoff Depth=3.34"
Tc=6.0 min CN=64 Runoff=9.95 cfs 0.710 af

Subcatchment C101: C101 Runoff Area=20.871 ac 4.93% Impervious Runoff Depth=2.01"
Flow Length=1,500' Tc=31.9 min CN=53 Runoff=22.76 cfs 3.490 af

Subcatchment C102: C102 Runoff Area=40.074 ac 2.80% Impervious Runoff Depth=3.34"
Flow Length=2,597' Tc=45.5 min CN=64 Runoff=71.30 cfs 11.147 af

Subcatchment C103: C103 Runoff Area=7.416 ac 24.41% Impervious Runoff Depth=2.12"
Flow Length=689' Tc=17.5 min CN=54 Runoff=11.19 cfs 1.312 af

Subcatchment D101: D101 Runoff Area=6.254 ac 0.00% Impervious Runoff Depth=5.00"
Flow Length=1,036' Tc=26.0 min CN=77 Runoff=22.47 cfs 2.606 af

Subcatchment D102: D102 Runoff Area=0.346 ac 75.72% Impervious Runoff Depth=7.48"
Tc=6.0 min CN=96 Runoff=2.69 cfs 0.216 af

Subcatchment Ocerlook (P1): Overlook Runoff Area=1.000 ac 0.00% Impervious Runoff Depth=5.00"
Flow Length=176' Tc=7.5 min CN=77 Runoff=5.65 cfs 0.417 af

Reach 36" Pipe: 36" Pipe Avg. Flow Depth=1.17' Max Vel=19.07 fps Inflow=48.77 cfs 6.609 af
36.0" Round Pipe n=0.015 L=935.0' S=0.0684 '/' Capacity=151.23 cfs Outflow=48.72 cfs 6.609 af

Reach 42"Pipe: 42" Pipe Avg. Flow Depth=2.06' Max Vel=34.65 fps Inflow=203.91 cfs 37.646 af
42.0" Round Pipe n=0.015 L=520.0' S=0.1288 '/' Capacity=312.99 cfs Outflow=203.93 cfs 37.646 af

Reach A105R: Thru A103 Avg. Flow Depth=2.11' Max Vel=8.17 fps Inflow=106.52 cfs 13.146 af
n=0.050 L=1,170.0' S=0.0564 '/' Capacity=150.86 cfs Outflow=105.31 cfs 13.145 af

Reach B107R: Thru B103 Avg. Flow Depth=0.43' Max Vel=8.28 fps Inflow=31.60 cfs 5.696 af
n=0.050 L=938.0' S=0.4072 '/' Capacity=192.14 cfs Outflow=31.56 cfs 5.696 af

Reach B112R: Thru B102 Avg. Flow Depth=2.92' Max Vel=5.71 fps Inflow=189.74 cfs 89.406 af
n=0.050 L=600.0' S=0.0167 '/' Capacity=369.68 cfs Outflow=189.70 cfs 89.398 af

Pond 102C: Pond 102C Peak Elev=509.11' Storage=334,069 cf Inflow=71.30 cfs 11.147 af
Outflow=8.40 cfs 4.020 af

Pond 104A: Wetland D Peak Elev=508.17' Storage=10,904 cf Inflow=19.75 cfs 3.344 af
Primary=0.63 cfs 0.493 af Secondary=18.61 cfs 2.831 af Outflow=19.24 cfs 3.323 af

Pond 105A: Wetland H Peak Elev=575.36' Storage=68,605 cf Inflow=107.03 cfs 13.162 af
Primary=11.12 cfs 7.765 af Secondary=95.40 cfs 5.380 af Outflow=106.52 cfs 13.146 af

Pond 106A: 36" Culvert Peak Elev=720.25' Storage=173 cf Inflow=48.77 cfs 6.609 af
Primary=48.77 cfs 6.609 af Secondary=0.00 cfs 0.000 af Outflow=48.77 cfs 6.609 af

Pond 106B: Wetland J Peak Elev=527.22' Storage=25,661 cf Inflow=214.98 cfs 47.947 af
Outflow=214.87 cfs 47.947 af

Pond 107A: 24" Culvert Peak Elev=626.48' Storage=3,858 cf Inflow=198.70 cfs 36.504 af
Primary=45.08 cfs 22.847 af Secondary=153.63 cfs 13.658 af Outflow=198.71 cfs 36.504 af

Pond 107B: Wetland Peak Elev=973.04' Storage=66,447 cf Inflow=43.23 cfs 5.972 af
Outflow=31.60 cfs 5.696 af

Pond 108A: 36" Culvert Peak Elev=613.51' Storage=292 cf Inflow=158.84 cfs 14.799 af
Primary=60.96 cfs 9.062 af Secondary=97.86 cfs 5.737 af Outflow=158.83 cfs 14.799 af

Pond SWM 7A: SWM 7A (Phase 1) Peak Elev=811.41' Storage=3,299 cf Inflow=5.65 cfs 0.417 af
Outflow=4.56 cfs 0.417 af

Pond SWM1: SWM 1 Peak Elev=514.52' Storage=34,045 cf Inflow=72.88 cfs 14.575 af
Outflow=72.31 cfs 14.561 af

Pond SWM10: SWM #10 Peak Elev=609.50' Storage=0.080 af Inflow=2.69 cfs 0.216 af
Outflow=0.89 cfs 0.216 af

Pond SWM2: SWM2 Peak Elev=505.72' Storage=358,924 cf Inflow=341.07 cfs 47.706 af
Outflow=311.53 cfs 47.358 af

Pond SWM3try: SWM3 Peak Elev=510.77' Storage=1,474,835 cf Inflow=321.61 cfs 90.091 af
Outflow=189.74 cfs 89.406 af

Pond SWM4: SWM4 Peak Elev=519.05' Storage=118,746 cf Inflow=222.19 cfs 54.773 af
Primary=205.39 cfs 54.761 af Secondary=0.00 cfs 0.000 af Outflow=205.39 cfs 54.761 af

Pond SWM5: SWM5 Peak Elev=521.52' Storage=197,776 cf Inflow=182.43 cfs 24.434 af
Primary=0.67 cfs 1.847 af Secondary=125.35 cfs 21.709 af Tertiary=20.54 cfs 0.498 af Outflow=146.53 cfs 24.053 af

Pond SWM6: SWM6 Peak Elev=504.87' Storage=599,323 cf Inflow=215.85 cfs 26.171 af
Outflow=17.92 cfs 25.291 af

Pond SWM7: SWM7 Peak Elev=747.10' Storage=26,437 cf Inflow=22.16 cfs 2.112 af
Outflow=10.84 cfs 2.112 af

Pond SWM8: SWM8 Peak Elev=657.39' Storage=70,453 cf Inflow=45.35 cfs 5.871 af
Outflow=27.42 cfs 5.868 af

Pond WF: Water Feature Peak Elev=529.35' Storage=102,653 cf Inflow=102.85 cfs 14.575 af
Primary=62.30 cfs 14.331 af Secondary=10.57 cfs 0.244 af Outflow=72.88 cfs 14.575 af

Link A: Amenia Stream Inflow=239.79 cfs 68.853 af
Primary=239.79 cfs 68.853 af

Link B: Wetland Inflow=475.08 cfs 161.872 af
Primary=475.08 cfs 161.872 af

Link C: Culvert Inflow=31.13 cfs 8.822 af
Primary=31.13 cfs 8.822 af

Link D: Culvert Inflow=23.35 cfs 2.822 af
Primary=23.35 cfs 2.822 af

Link Overlook-A (P1): Overlook A (Phase 1) Inflow=4.56 cfs 0.417 af
Primary=4.56 cfs 0.417 af

Total Runoff Area = 790.455 ac Runoff Volume = 252.558 af Average Runoff Depth = 3.83"
91.57% Pervious = 723.795 ac 8.43% Impervious = 66.660 ac

Summary for Subcatchment A101: A101

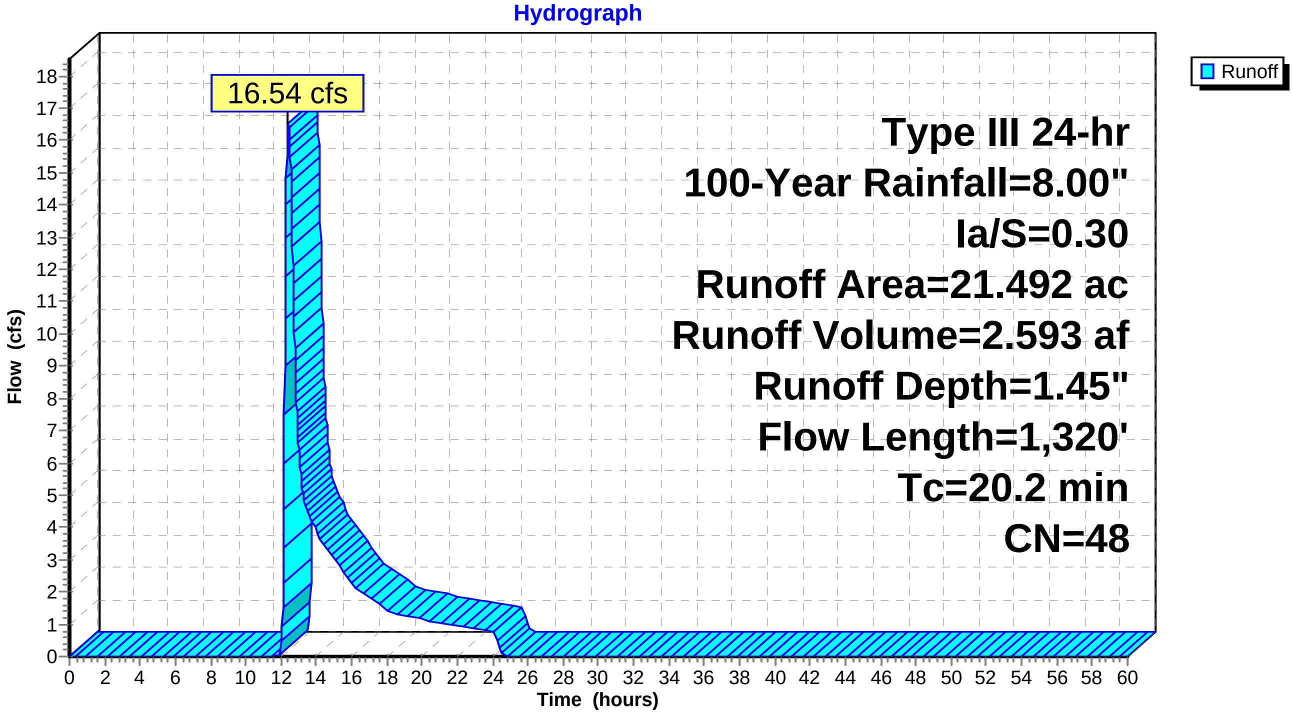
Runoff = 16.54 cfs @ 12.40 hrs, Volume= 2.593 af, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.015	98	Building roof
*	0.921	98	Paved surface
*	0.000	96	Gravel surface
*	0.000	98	Water Surface
	13.290	39	>75% Grass cover, Good, HSG A
	6.490	61	>75% Grass cover, Good, HSG B
	0.050	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	0.270	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	0.000	70	Woods, Good, HSG C
	0.000	77	Woods, Good, HSG D
*	0.426	30	Sand trap, HSG A
*	0.030	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	21.492	48	Weighted Average
	20.556		95.64% Pervious Area
	0.936		4.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.1400	0.17		**Sheet Flow,** Grass: Bermuda n= 0.410 P2= 3.50"
6.0	800	0.1000	2.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.6	420	0.0480	1.53		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
20.2	1,320	Total			

Subcatchment A101: A101



Summary for Subcatchment A102: A102

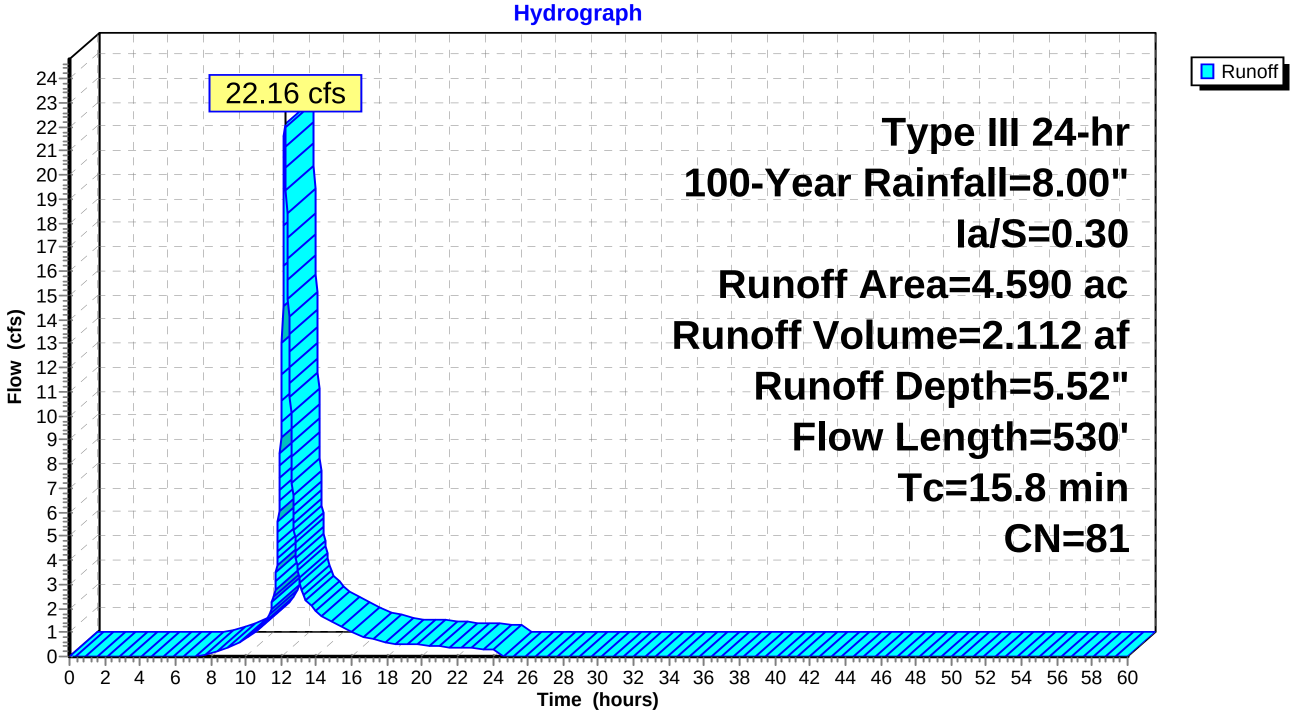
Runoff = 22.16 cfs @ 12.21 hrs, Volume= 2.112 af, Depth= 5.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.200	98	Building roof
*	1.040	98	Paved surface
*	0.000	96	Gravel surface
*	0.130	98	Water Surface
	0.000	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	2.970	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	0.250	70	Woods, Good, HSG C
	0.000	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	4.590	81	Weighted Average
	3.220		70.15% Pervious Area
	1.370		29.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	100	0.1500	0.18		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
1.1	50	0.1000	0.79		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
0.8	130	0.1700	2.89		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.7	250	0.1280	0.89		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
15.8	530	Total			

Subcatchment A102: A102



Summary for Subcatchment A103: A103

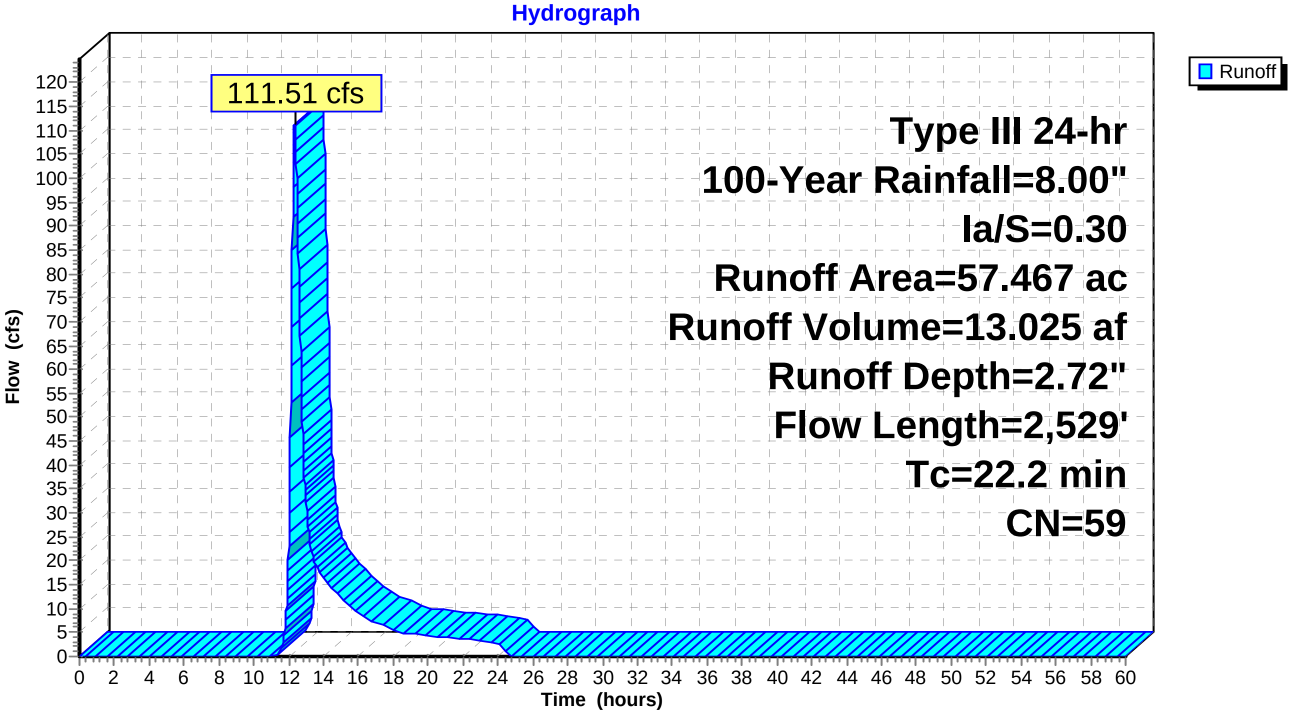
Runoff = 111.51 cfs @ 12.34 hrs, Volume= 13.025 af, Depth= 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	2.908	98	Building roof
*	6.292	98	Paved surface
*	0.438	96	Gravel surface
*	1.461	98	Water Surface
	22.890	39	>75% Grass cover, Good, HSG A
	5.353	61	>75% Grass cover, Good, HSG B
	8.379	74	>75% Grass cover, Good, HSG C
	0.029	80	>75% Grass cover, Good, HSG D
	5.112	30	Woods, Good, HSG A
	1.620	55	Woods, Good, HSG B
	1.505	70	Woods, Good, HSG C
	1.130	77	Woods, Good, HSG D
*	0.220	30	Sand trap, HSG A
*	0.130	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	57.467	59	Weighted Average
	46.806		81.45% Pervious Area
	10.661		18.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.8	100	0.0300	0.09		**Sheet Flow,** Grass: Bermuda n= 0.410 P2= 3.50"
2.2	355	0.1430	2.65		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.1	554	0.0680	8.24	98.89	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.050
1.1	1,520	0.0690	23.78	116.72	**Pipe Channel,** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012
22.2	2,529	Total			

Subcatchment A103: A103



Summary for Subcatchment A104: A104

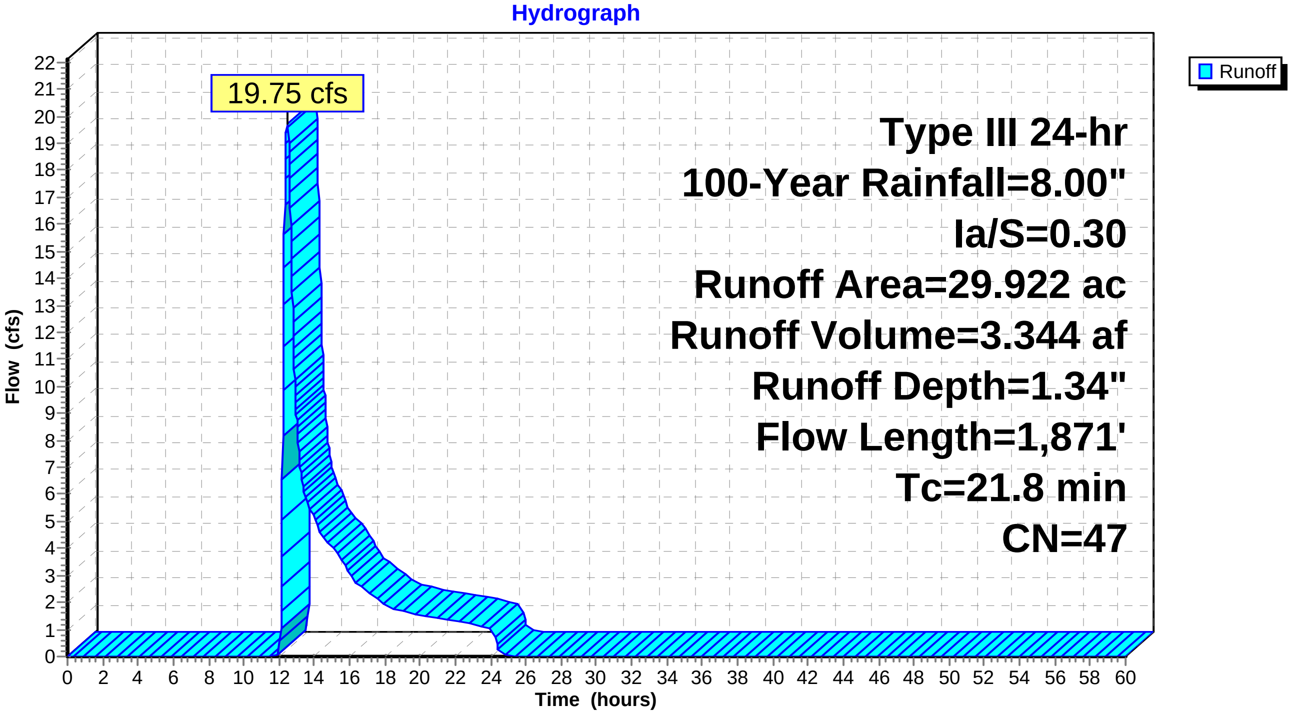
Runoff = 19.75 cfs @ 12.45 hrs, Volume= 3.344 af, Depth= 1.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.000	98	Building roof
*	1.270	98	Paved surface
*	0.000	96	Gravel surface
*	0.430	98	Water Surface
	23.530	39	>75% Grass cover, Good, HSG A
	0.110	61	>75% Grass cover, Good, HSG B
	3.720	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	0.028	30	Woods, Good, HSG A
	0.017	55	Woods, Good, HSG B
	0.100	70	Woods, Good, HSG C
	0.000	77	Woods, Good, HSG D
*	0.635	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.082	30	Sand Trap, HSG C
	29.922	47	Weighted Average
	28.222		94.32% Pervious Area
	1.700		5.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	100	0.2400	0.22		**Sheet Flow,** Grass: Bermuda n= 0.410 P2= 3.50"
9.7	1,231	0.0920	2.12		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.3	540	0.0900	2.10		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
21.8	1,871	Total			

Subcatchment A104: A104



Summary for Subcatchment A105: A105

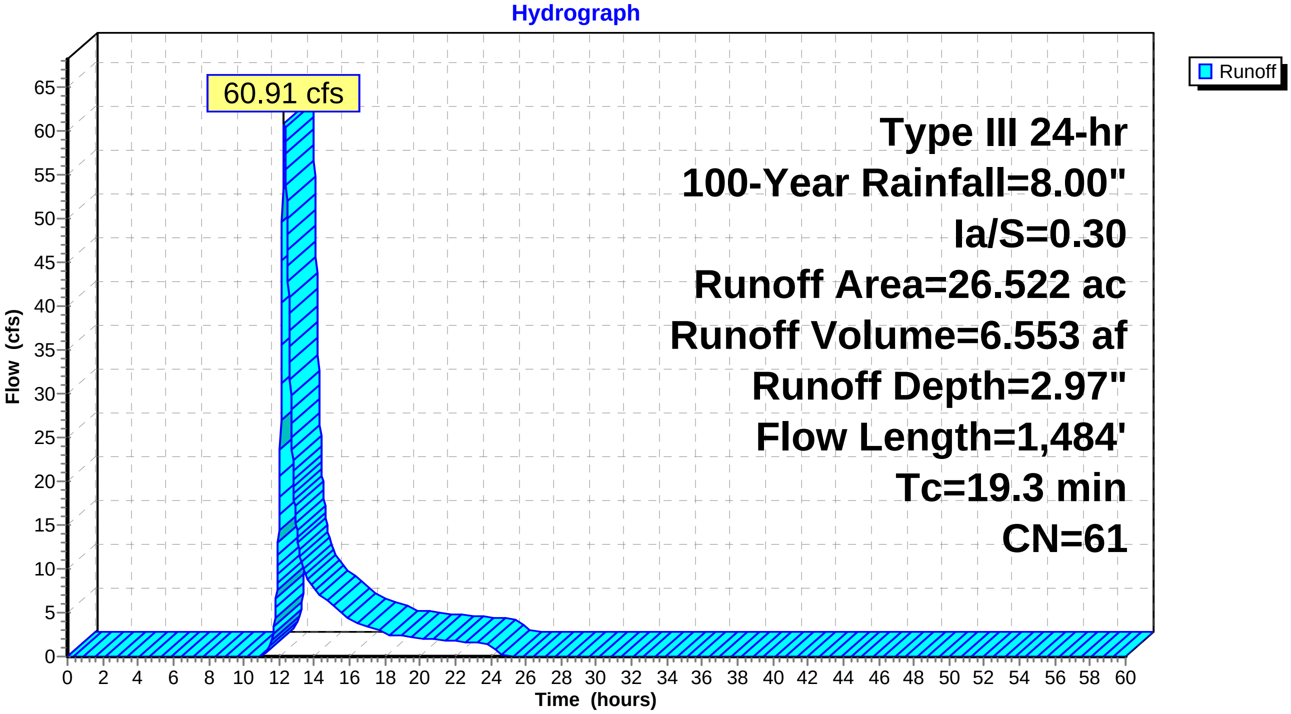
Runoff = 60.91 cfs @ 12.29 hrs, Volume= 6.553 af, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.842	98	Building roof
*	1.458	98	Paved surface
*	0.000	96	Gravel surface
*	0.500	98	Water Surface
	10.832	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	9.080	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	0.094	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	3.565	70	Woods, Good, HSG C
	0.000	77	Woods, Good, HSG D
*	0.145	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.006	30	Sand Trap, HSG C
	26.522	61	Weighted Average
	23.722		89.44% Pervious Area
	2.800		10.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	100	0.1500	0.18		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
3.0	395	0.1920	2.19		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.1	989	0.1100	2.32		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
19.3	1,484	Total			

Subcatchment A105: A105



Summary for Subcatchment A106: A106

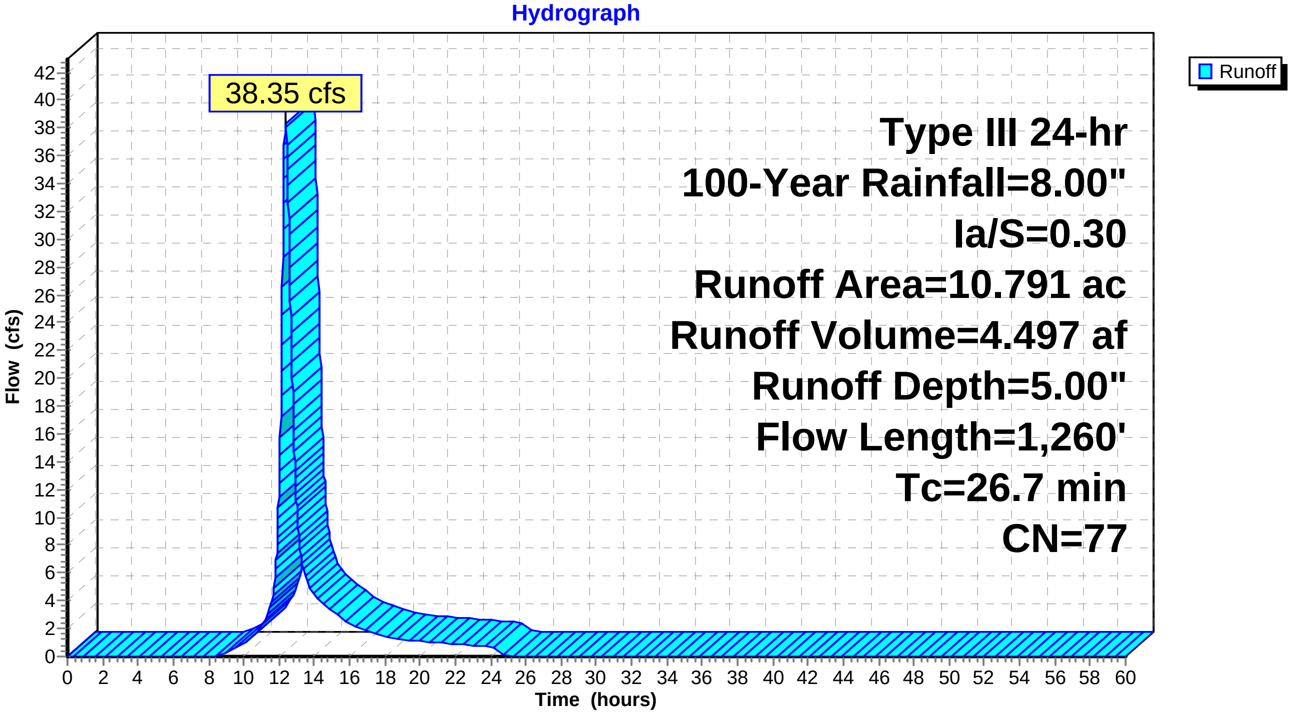
Runoff = 38.35 cfs @ 12.37 hrs, Volume= 4.497 af, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.000	98	Building roof
*	1.220	98	Paved surface
*	0.000	96	Gravel surface
*	0.000	98	Water Surface
	0.000	39	>75% Grass cover, Good, HSG A
	0.078	61	>75% Grass cover, Good, HSG B
	5.210	74	>75% Grass cover, Good, HSG C
	2.190	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	0.100	55	Woods, Good, HSG B
	1.390	70	Woods, Good, HSG C
	0.603	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	10.791	77	Weighted Average
	9.571		88.69% Pervious Area
	1.220		11.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.0	100	0.1500	0.10		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
10.1	500	0.1100	0.83		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
0.6	660	0.3000	17.87	321.67	**Trap/Vee/Rect Channel Flow,** Bot.W=3.00' D=2.00' Z= 3.0 '/' Top.W=15.00' n= 0.050
26.7	1,260	Total			

Subcatchment A106: A106



Summary for Subcatchment A107: A107

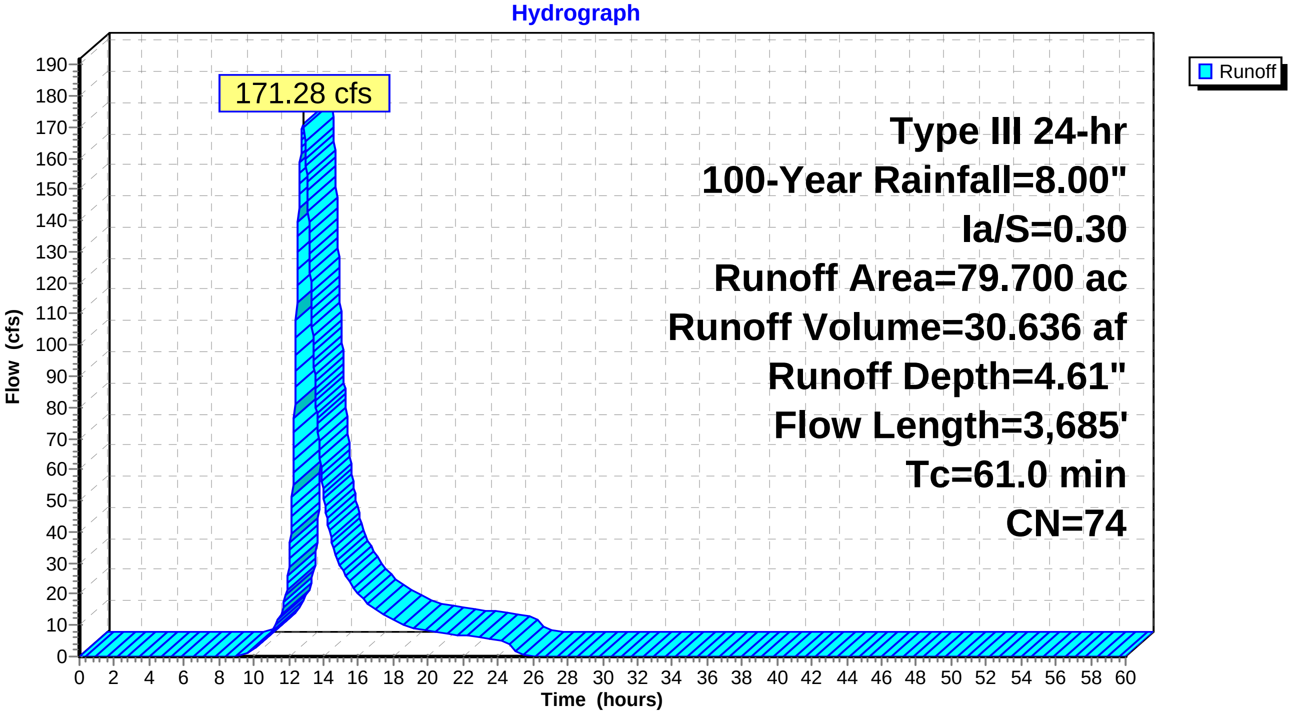
Runoff = 171.28 cfs @ 12.82 hrs, Volume= 30.636 af, Depth= 4.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.340	98	Building roof
*	1.314	98	Paved surface
*	0.071	96	Gravel surface
*	0.130	98	Water Surface
	0.000	39	>75% Grass cover, Good, HSG A
	6.390	61	>75% Grass cover, Good, HSG B
	4.750	74	>75% Grass cover, Good, HSG C
	3.470	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	7.845	55	Woods, Good, HSG B
	3.580	70	Woods, Good, HSG C
	51.810	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	79.700	74	Weighted Average
	77.916		97.76% Pervious Area
	1.784		2.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.5	100	0.0800	0.08		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
3.7	230	0.1700	1.03		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
15.0	450	0.0400	0.50		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
18.0	1,210	0.2000	1.12		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
2.3	1,050	0.1300	7.68	25.61	**Parabolic Channel,** W=5.00' D=1.00' Area=3.3 sf Perim=5.5' n= 0.050
1.5	645	0.1100	7.07	23.56	**Parabolic Channel,** W=5.00' D=1.00' Area=3.3 sf Perim=5.5' n= 0.050
61.0	3,685	Total			

Subcatchment A107: A107



Summary for Subcatchment A108: A108

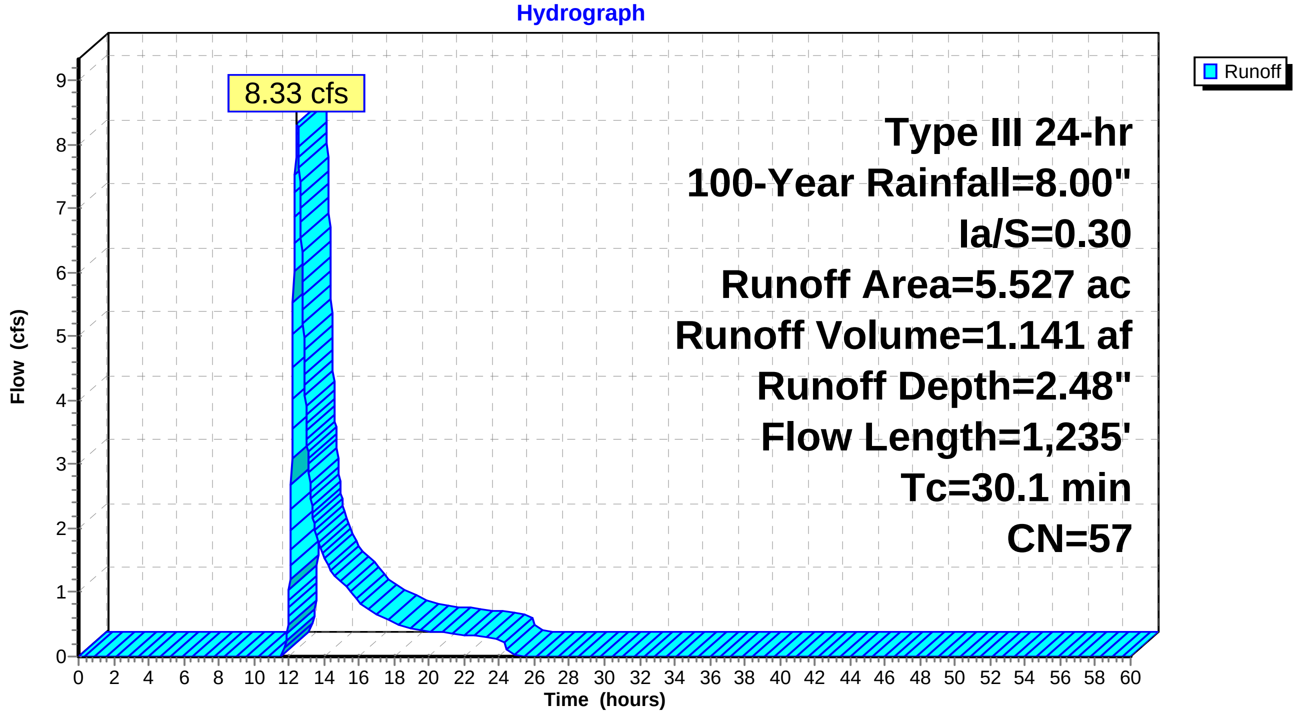
Runoff = 8.33 cfs @ 12.48 hrs, Volume= 1.141 af, Depth= 2.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.040	98	Building roof
*	0.088	98	Paved surface
*	0.049	96	Gravel surface
*	0.000	98	Water Surface
	0.000	39	>75% Grass cover, Good, HSG A
	0.630	61	>75% Grass cover, Good, HSG B
	0.000	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	4.720	55	Woods, Good, HSG B
	0.000	70	Woods, Good, HSG C
	0.000	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	5.527	57	Weighted Average
	5.399		97.68% Pervious Area
	0.128		2.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.2	100	0.2000	0.12		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
12.7	950	0.2500	1.25		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
1.1	85	0.2600	1.27		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
2.1	100	0.1000	0.79		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
30.1	1,235	Total			

Subcatchment A108: A108



Summary for Subcatchment A109: A109

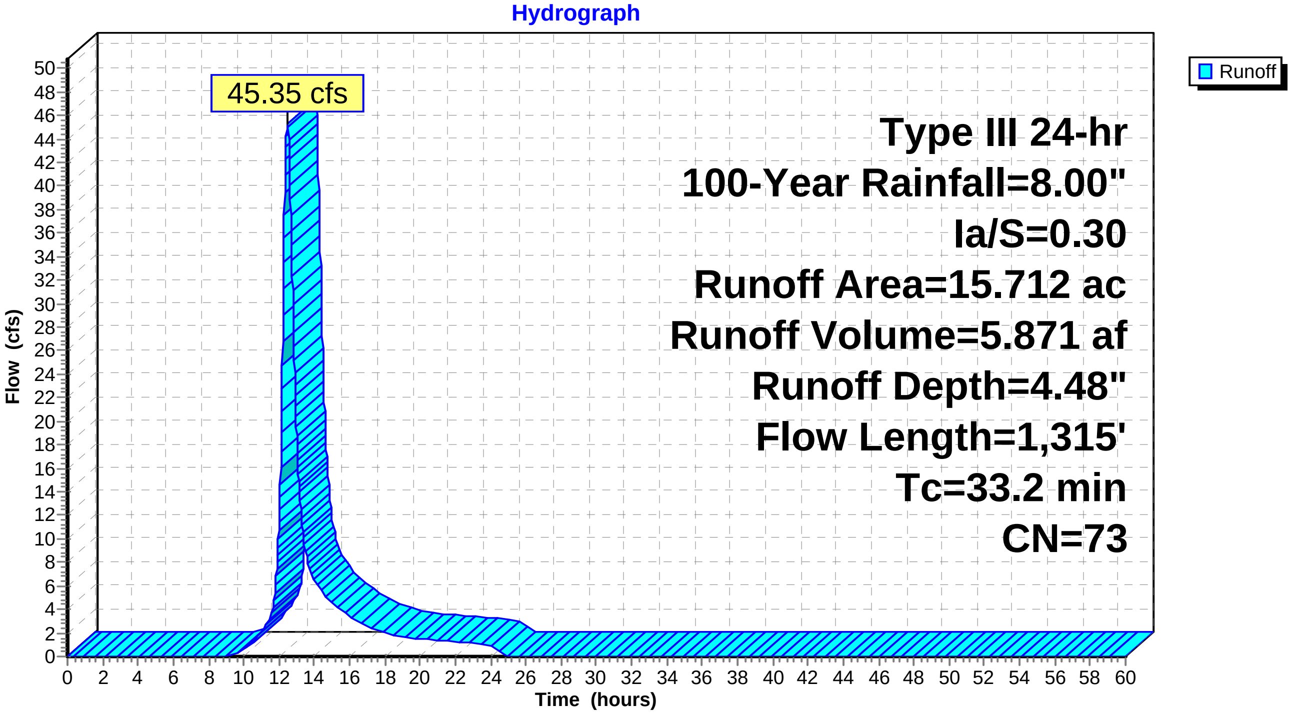
Runoff = 45.35 cfs @ 12.46 hrs, Volume= 5.871 af, Depth= 4.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

Area (ac)	CN	Description
0.857	98	Roofs, HSG B
5.730	61	>75% Grass cover, Good, HSG B
4.502	74	>75% Grass cover, Good, HSG C
0.592	80	>75% Grass cover, Good, HSG D
2.000	98	Paved parking, HSG B
0.328	55	Woods, Good, HSG B
0.823	70	Woods, Good, HSG C
0.880	77	Woods, Good, HSG D
15.712	73	Weighted Average
12.855		81.82% Pervious Area
2.857		18.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
22.3	100	0.0650	0.07		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
2.0	388	0.2200	3.28		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.7	427	0.1400	2.62		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.2	400	0.1850	1.08		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
33.2	1,315	Total			

Subcatchment A109: A109



Summary for Subcatchment B101: B101

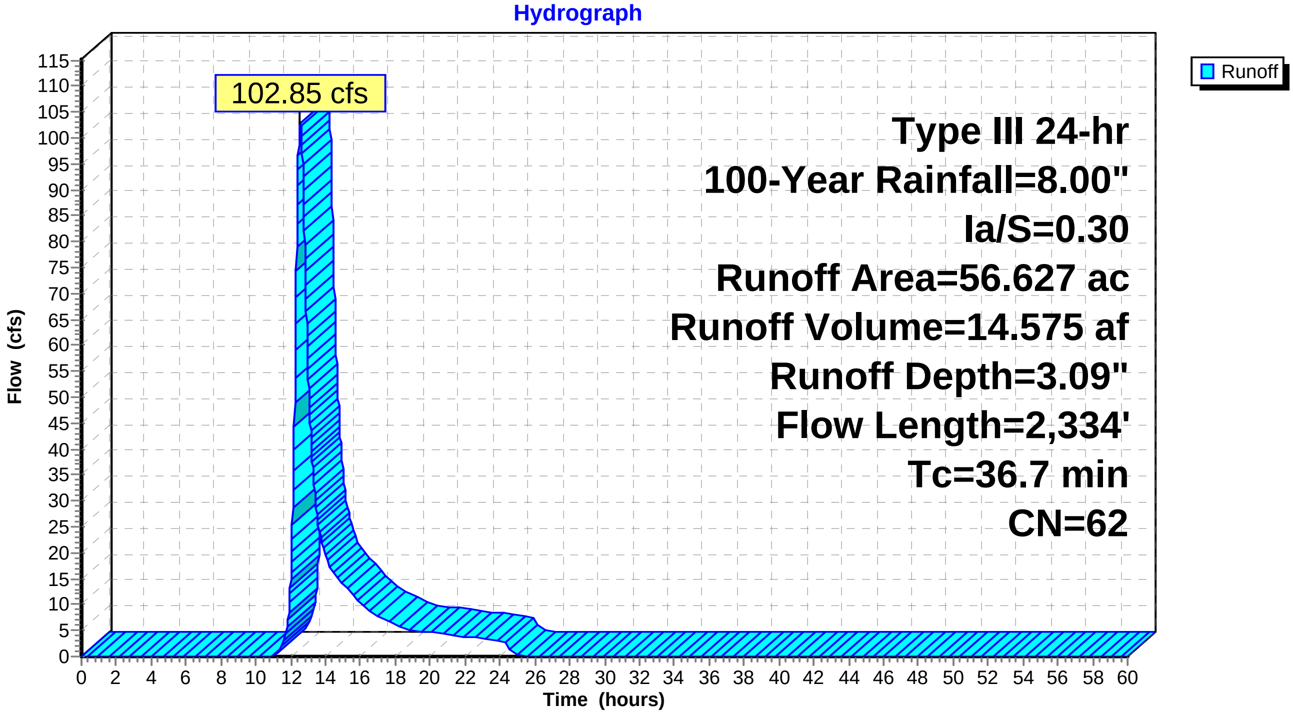
Runoff = 102.85 cfs @ 12.55 hrs, Volume= 14.575 af, Depth= 3.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.985	98	Building roof
*	2.491	98	Paved surface
*	0.439	96	Gravel surface
*	0.412	98	Water Surface
	21.653	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	14.370	74	>75% Grass cover, Good, HSG C
	0.555	80	>75% Grass cover, Good, HSG D
	0.553	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	8.567	70	Woods, Good, HSG C
	6.416	77	Woods, Good, HSG D
*	0.142	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.044	30	Sand Trap, HSG C
	56.627	62	Weighted Average
	52.739		93.13% Pervious Area
	3.888		6.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.6	50	0.0400	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
8.2	50	0.2000	0.10		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
4.6	511	0.5600	1.87		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
6.9	524	0.2600	1.27		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
0.8	554	0.1520	12.29	196.62	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=2.00' Z= 3.0 '/' Top.W=14.00' n= 0.050
0.3	100	0.0300	5.47	65.68	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.050
0.3	545	0.1000	32.33	228.50	**Pipe Channel,** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012
36.7	2,334	Total			

Subcatchment B101: B101



Summary for Subcatchment B102: B102

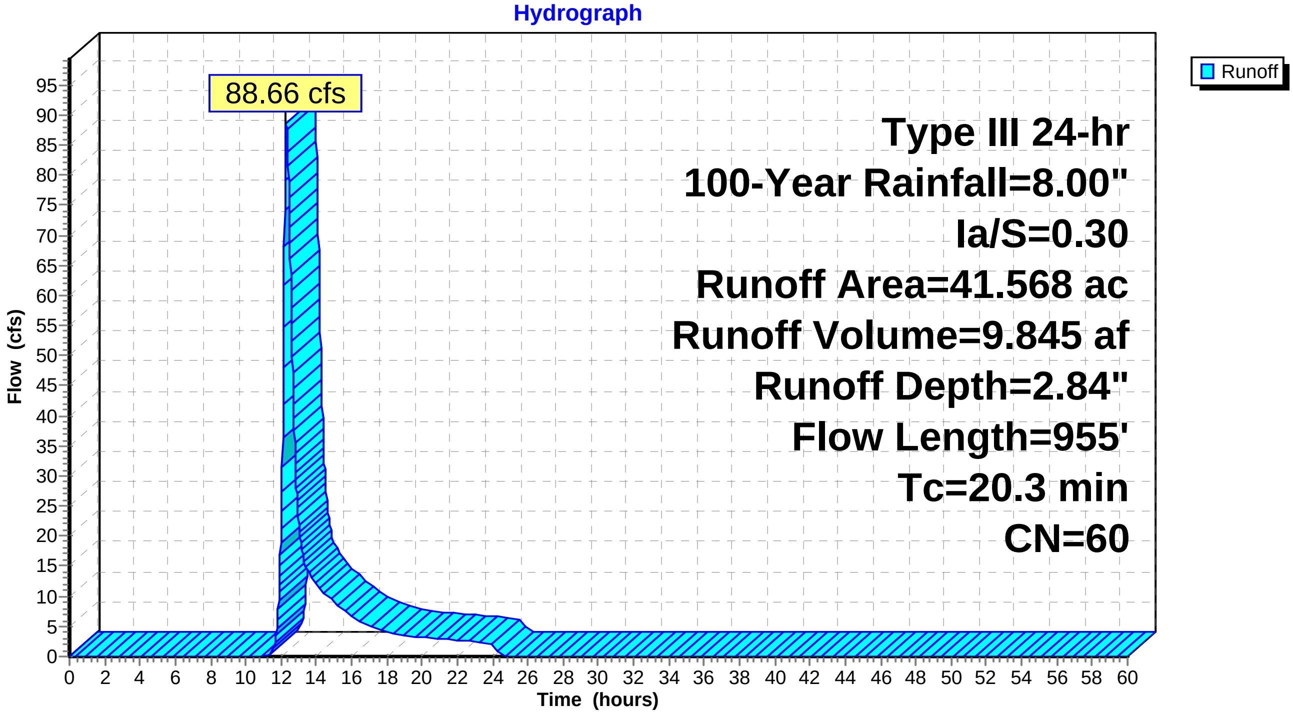
Runoff = 88.66 cfs @ 12.30 hrs, Volume= 9.845 af, Depth= 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.000	98	Building roof
*	0.516	98	Paved surface
*	0.210	96	Gravel surface
*	0.009	98	Water Surface
	7.476	39	>75% Grass cover, Good, HSG A
	0.464	61	>75% Grass cover, Good, HSG B
	12.033	74	>75% Grass cover, Good, HSG C
	0.764	80	>75% Grass cover, Good, HSG D
	6.808	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	5.496	70	Woods, Good, HSG C
	7.405	77	Woods, Good, HSG D
*	0.060	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.327	30	Sand Trap, HSG C
	41.568	60	Weighted Average
	41.043		98.74% Pervious Area
	0.525		1.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	100	0.0500	0.11		**Sheet Flow,** Grass: Bermuda n= 0.410 P2= 3.50"
3.8	457	0.0830	2.02		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.3	80	0.1750	1.05		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
0.7	318	0.0250	7.19	287.53	**Parabolic Channel,** W=20.00' D=3.00' Area=40.0 sf Perim=21.1' n= 0.050
20.3	955	Total			

Subcatchment B102: B102



Summary for Subcatchment B103: B103

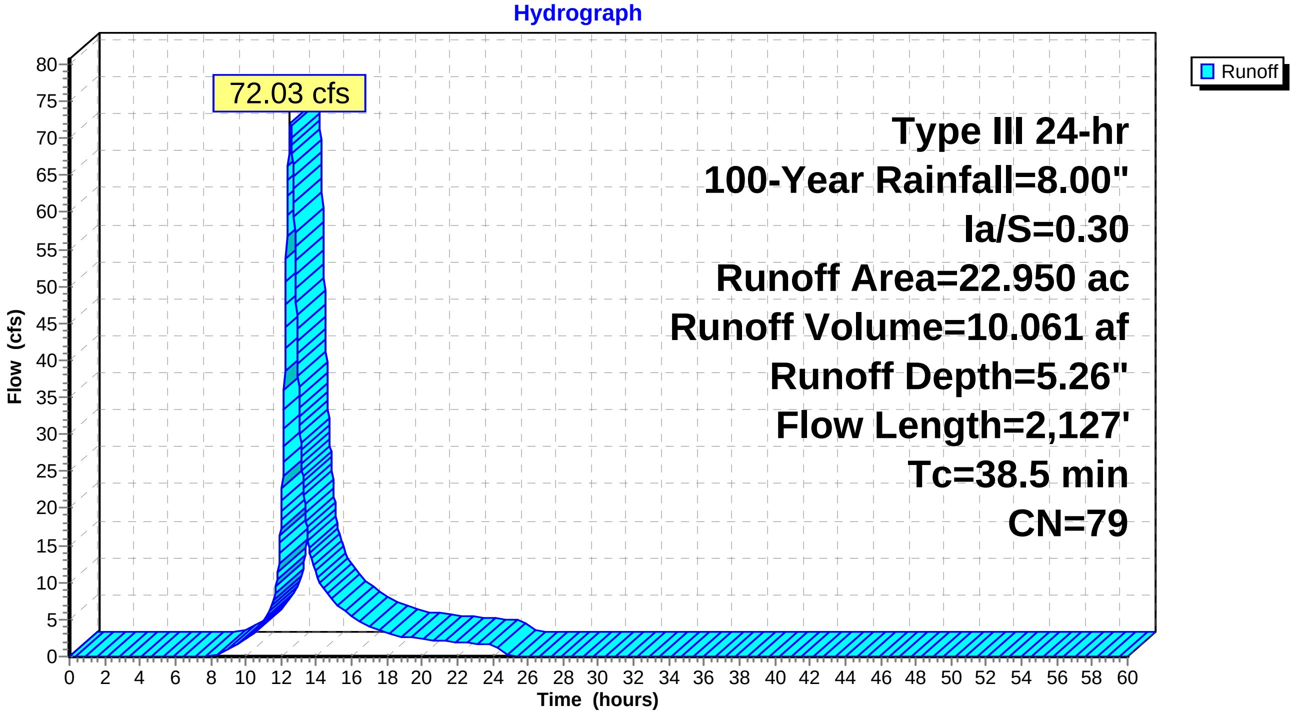
Runoff = 72.03 cfs @ 12.53 hrs, Volume= 10.061 af, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.200	98	Building roof
*	1.000	98	Paved surface
*	0.123	96	Gravel surface
*	0.000	98	Water Surface
	0.000	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	0.674	74	>75% Grass cover, Good, HSG C
	3.453	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	0.000	70	Woods, Good, HSG C
	17.500	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	22.950	79	Weighted Average
	21.750		94.77% Pervious Area
	1.200		5.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.4	100	0.0300	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
7.3	784	0.5100	1.79		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
0.8	1,243	0.0670	26.46	187.03	**Pipe Channel,** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012
38.5	2,127	Total			

Subcatchment B103: B103



Summary for Subcatchment B104: B104

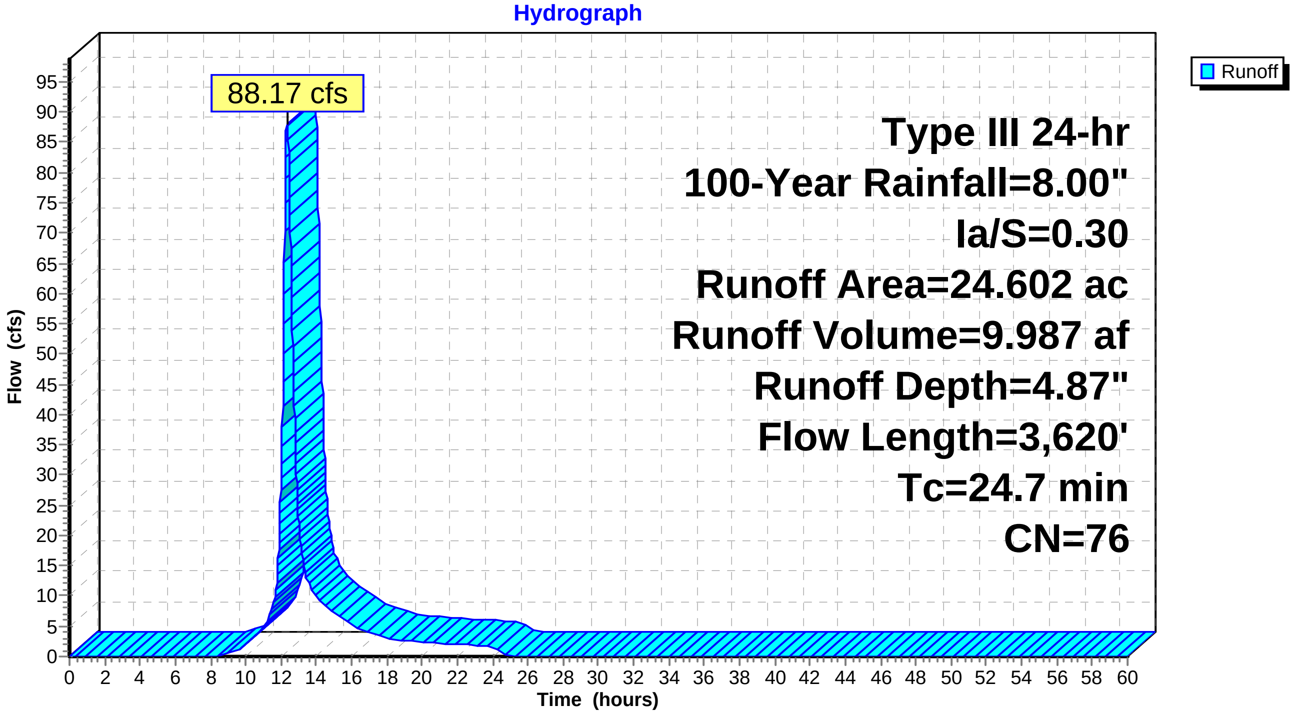
Runoff = 88.17 cfs @ 12.34 hrs, Volume= 9.987 af, Depth= 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	1.255	98	Building roof
*	2.315	98	Paved surface
*	0.016	96	Gravel surface
*	0.000	98	Water Surface
	0.452	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	20.057	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	0.315	70	Woods, Good, HSG C
	0.000	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.192	30	Sand Trap, HSG C
	24.602	76	Weighted Average
	21.032		85.49% Pervious Area
	3.570		14.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.1000	0.15		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
8.0	823	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.6	452	0.1720	2.90		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.4	1,210	0.0580	8.46	101.48	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.045
0.9	1,035	0.0350	19.12	135.18	**Pipe Channel,** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012
24.7	3,620	Total			

Subcatchment B104: B104



Summary for Subcatchment B105: B105

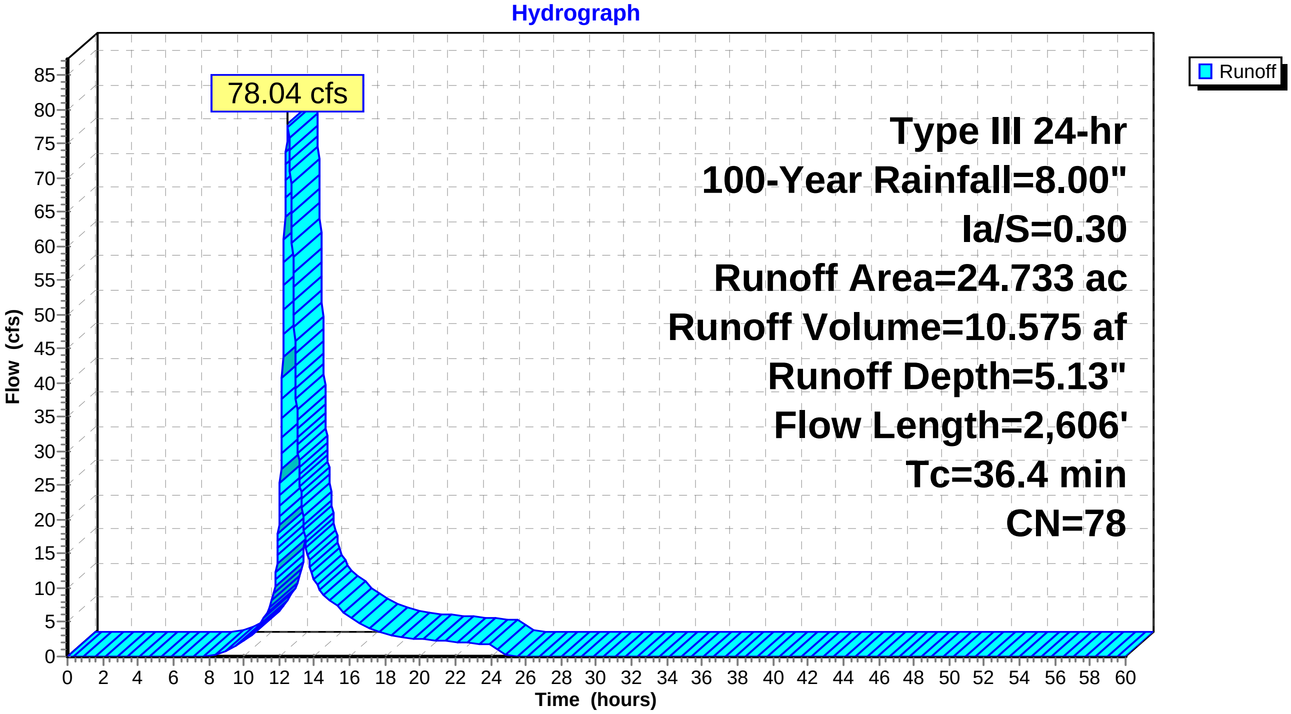
Runoff = 78.04 cfs @ 12.50 hrs, Volume= 10.575 af, Depth= 5.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.308	98	Building roof
*	0.763	98	Paved surface
*	0.287	96	Gravel surface
*	0.000	98	Water Surface
	0.052	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	1.735	74	>75% Grass cover, Good, HSG C
	2.688	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	0.000	70	Woods, Good, HSG C
	18.900	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	24.733	78	Weighted Average
	23.662		95.67% Pervious Area
	1.071		4.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.1	100	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
5.4	612	0.5680	1.88		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
0.6	114	0.2280	3.34		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.6	880	0.0320	5.65	67.84	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.050
0.7	900	0.0400	20.44	144.51	**Pipe Channel,** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012
36.4	2,606	Total			

Subcatchment B105: B105



Summary for Subcatchment B106: B106

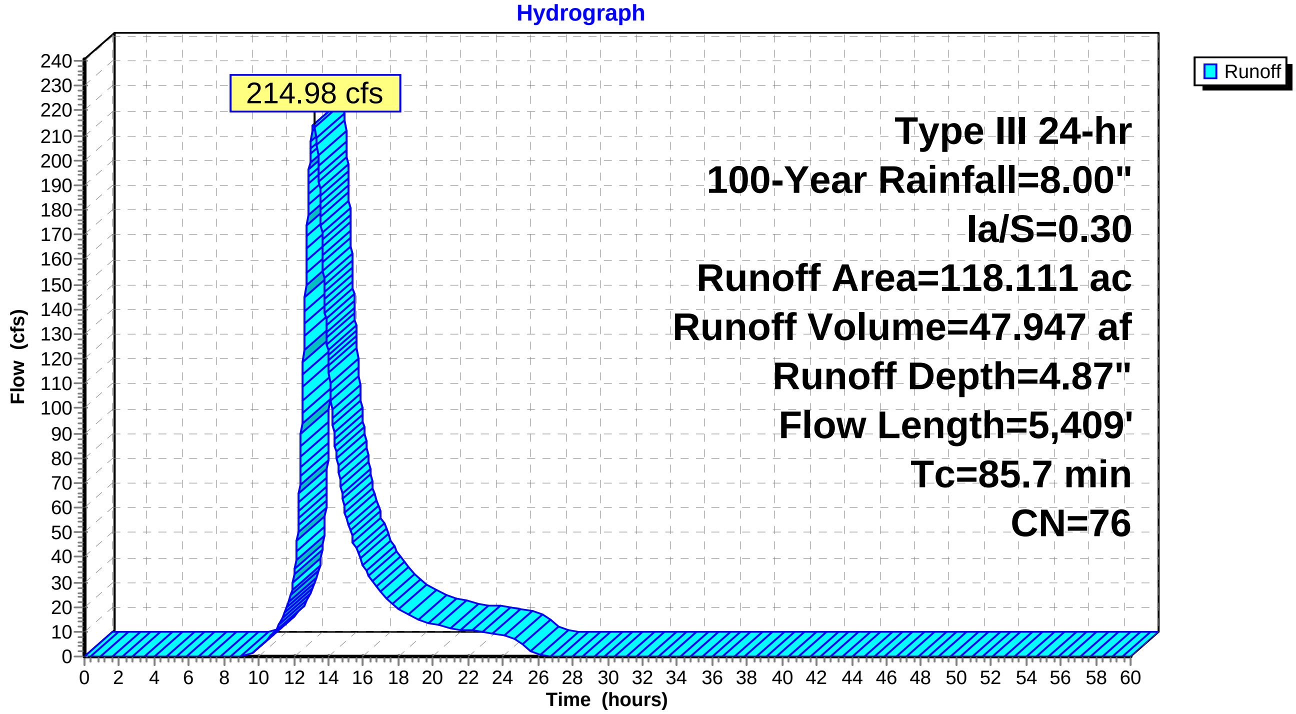
Runoff = 214.98 cfs @ 13.14 hrs, Volume= 47.947 af, Depth= 4.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.224	98	Building roof
*	0.994	98	Paved surface
*	0.746	96	Gravel surface
*	0.000	98	Water Surface
	2.090	39	>75% Grass cover, Good, HSG A
	0.594	61	>75% Grass cover, Good, HSG B
	12.281	74	>75% Grass cover, Good, HSG C
	2.068	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	10.050	70	Woods, Good, HSG C
	89.064	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	118.111	76	Weighted Average
	116.893		98.97% Pervious Area
	1.218		1.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.1	100	0.0400	0.06		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
34.3	1,838	0.1273	0.89		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
19.8	960	0.1040	0.81		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
4.5	2,511	0.0870	9.30	148.75	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=2.00' Z= 3.0 '/' Top.W=14.00' n= 0.050
85.7	5,409	Total			

Subcatchment B106: B106



Summary for Subcatchment B107: B107

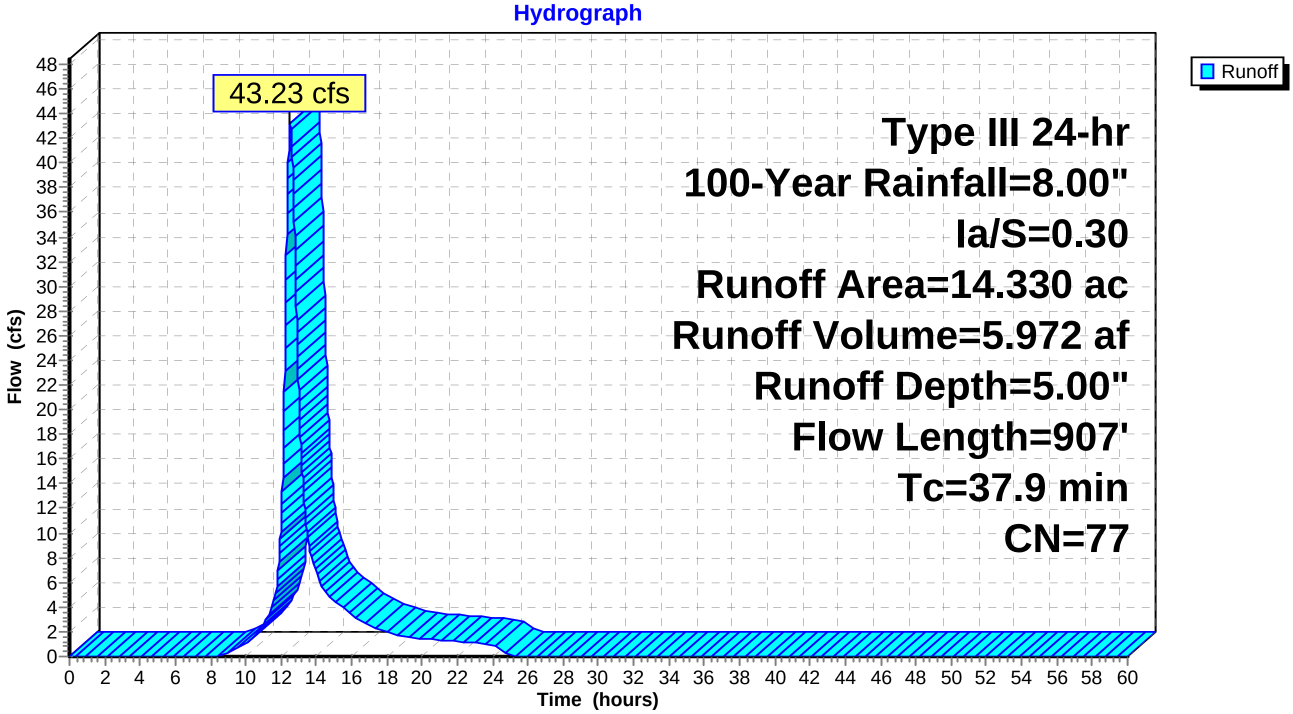
Runoff = 43.23 cfs @ 12.51 hrs, Volume= 5.972 af, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.000	98	Building roof
*	0.000	98	Paved surface
*	0.106	96	Gravel surface
*	0.000	98	Water Surface
	0.000	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	0.000	74	>75% Grass cover, Good, HSG C
	0.301	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	0.000	70	Woods, Good, HSG C
	13.923	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	14.330	77	Weighted Average
	14.330		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.7	100	0.0700	0.08		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
5.4	245	0.0900	0.75		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
10.8	562	0.1200	0.87		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
37.9	907	Total			

Subcatchment B107: B107



Summary for Subcatchment B108: B108

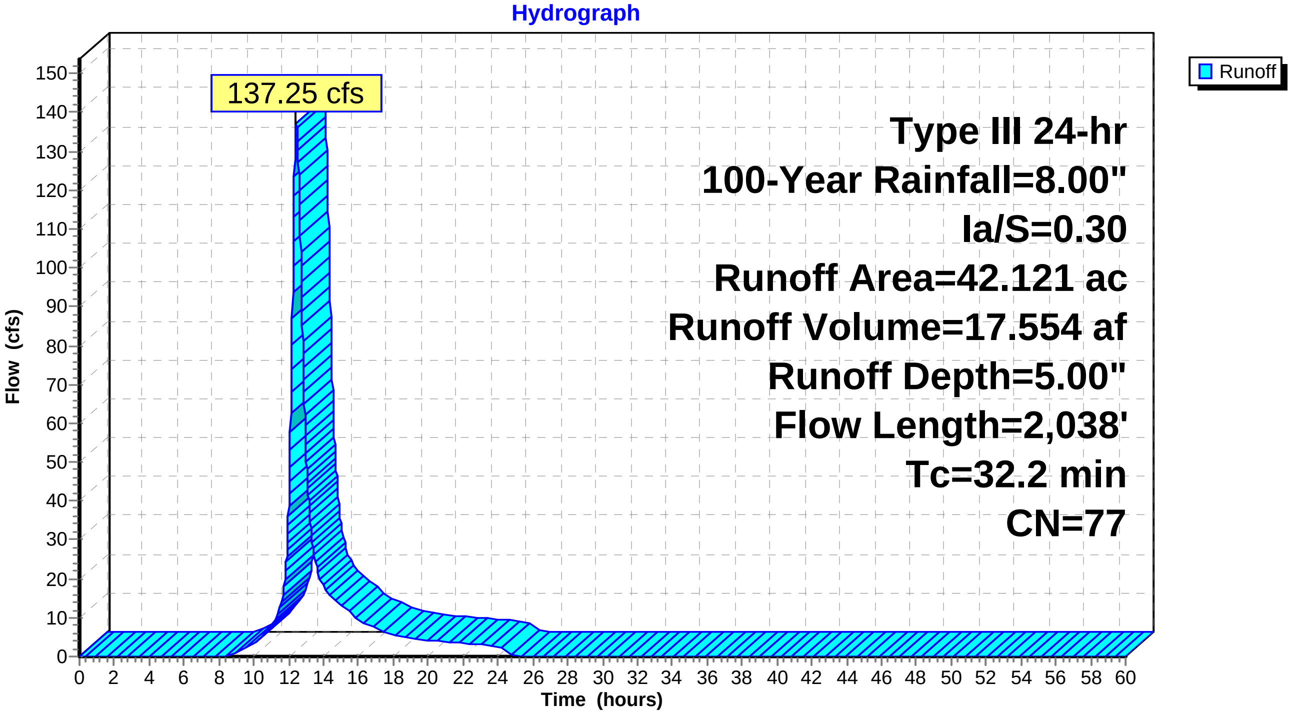
Runoff = 137.25 cfs @ 12.44 hrs, Volume= 17.554 af, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.825	98	Building roof
*	1.738	98	Paved surface
*	0.000	96	Gravel surface
*	0.000	98	Water Surface
	0.000	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	9.100	74	>75% Grass cover, Good, HSG C
	1.909	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	1.842	70	Woods, Good, HSG C
	26.707	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	42.121	77	Weighted Average
	39.558		93.92% Pervious Area
	2.563		6.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.8	100	0.1000	0.09		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
3.5	270	0.2590	1.27		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
1.8	120	0.2000	1.12		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
7.8	823	0.5000	1.77		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
0.3	725	0.1640	41.40	292.62	**Pipe Channel,** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012
32.2	2,038	Total			

Subcatchment B108: B108



Summary for Subcatchment B109: B109

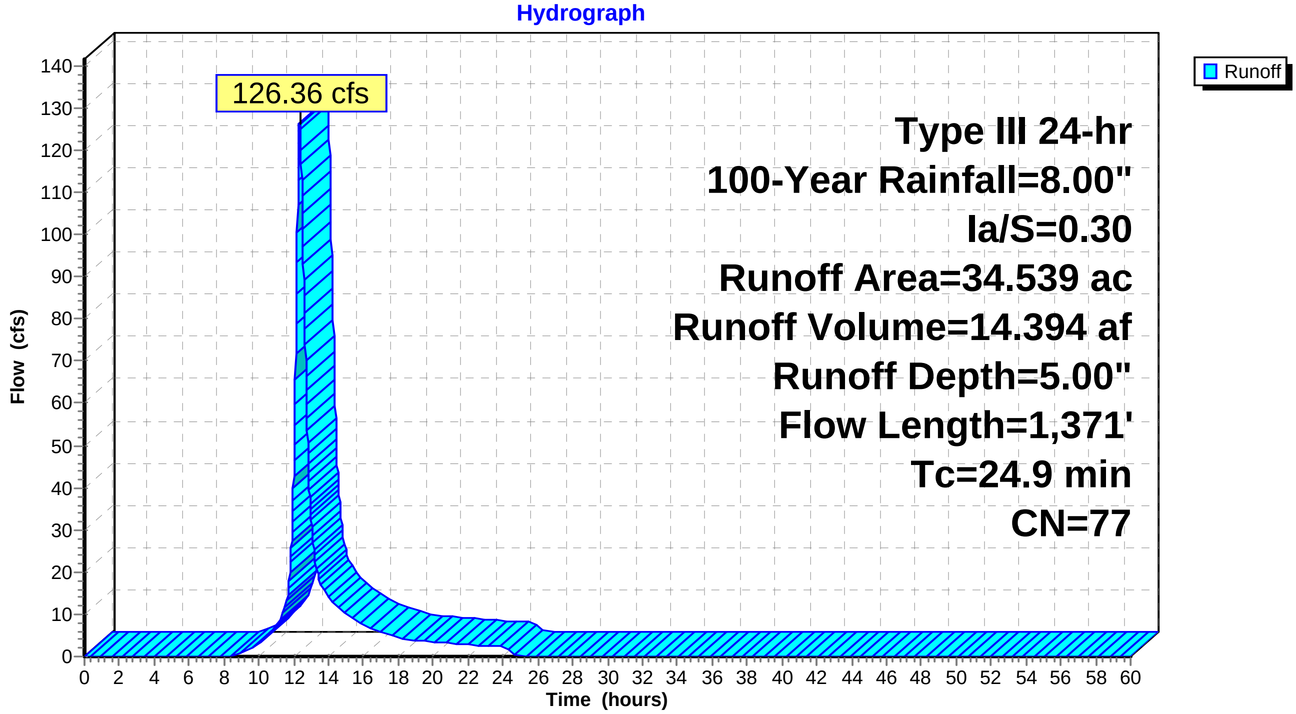
Runoff = 126.36 cfs @ 12.34 hrs, Volume= 14.394 af, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	1.002	98	Building roof
*	1.264	98	Paved surface
*	0.000	96	Gravel surface
*	0.592	98	Water Surface
	0.000	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	16.332	74	>75% Grass cover, Good, HSG C
	3.160	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	2.067	70	Woods, Good, HSG C
	9.847	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.275	30	Sand Trap, HSG C
	34.539	77	Weighted Average
	31.681		91.73% Pervious Area
	2.858		8.27% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.8	100	0.1000	0.09		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
2.8	395	0.8550	2.31		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
2.6	265	0.4450	1.67		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
0.2	70	0.0280	5.29	63.46	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.050
0.0	100	0.2800	54.09	382.35	**Pipe Channel,** 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.012
0.2	160	0.1600	14.62	219.28	**Channel Flow,** Area= 15.0 sf Perim= 11.0' r= 1.36' n= 0.050
0.3	281	0.1600	14.62	219.28	**Channel Flow,** Area= 15.0 sf Perim= 11.0' r= 1.36' n= 0.050
24.9	1,371	Total			

Subcatchment B109: B109



Summary for Subcatchment B110: B110

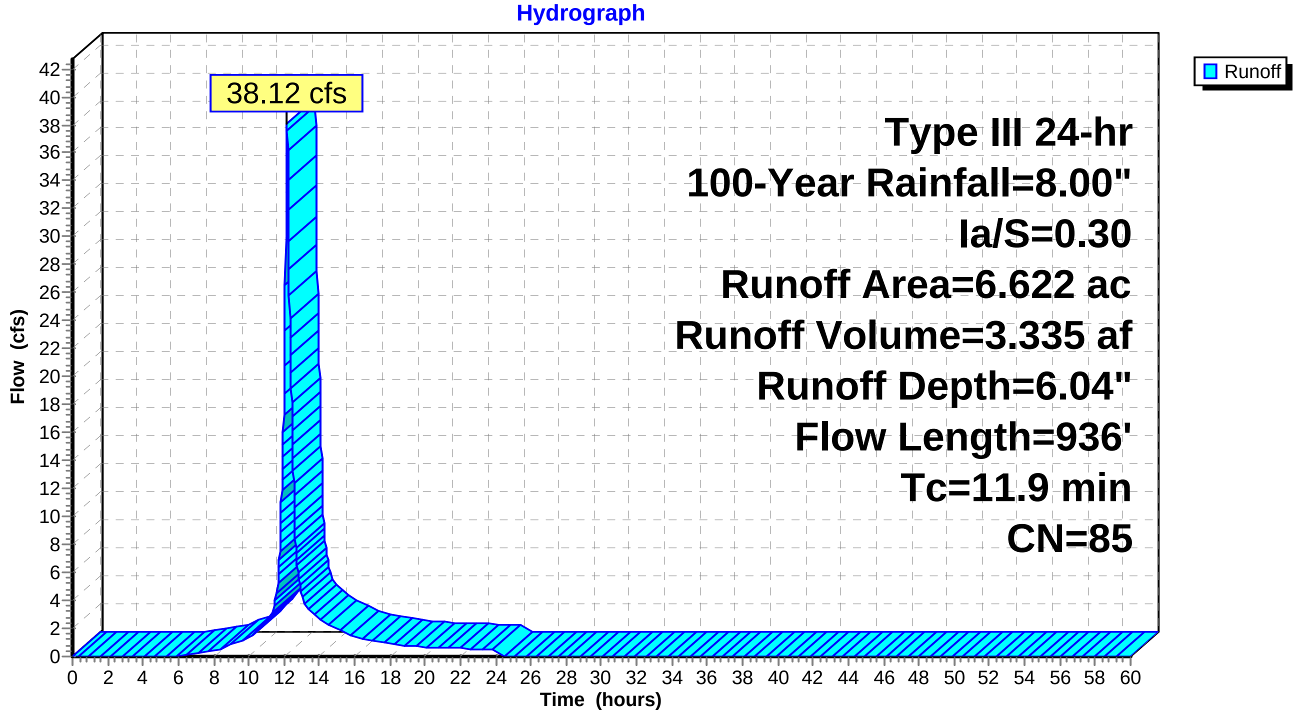
Runoff = 38.12 cfs @ 12.16 hrs, Volume= 3.335 af, Depth= 6.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	1.381	98	Building roof
*	1.630	98	Paved surface
*	0.000	96	Gravel surface
*	0.000	98	Water Surface
	0.000	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	3.550	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	0.061	70	Woods, Good, HSG C
	0.000	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	6.622	85	Weighted Average
	3.611		54.53% Pervious Area
	3.011		45.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.7	100	0.1300	0.17		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
0.6	121	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.6	715	0.0360	7.40	23.25	**Pipe Channel,** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.024
11.9	936	Total			

Subcatchment B110: B110



Summary for Subcatchment B111: B111

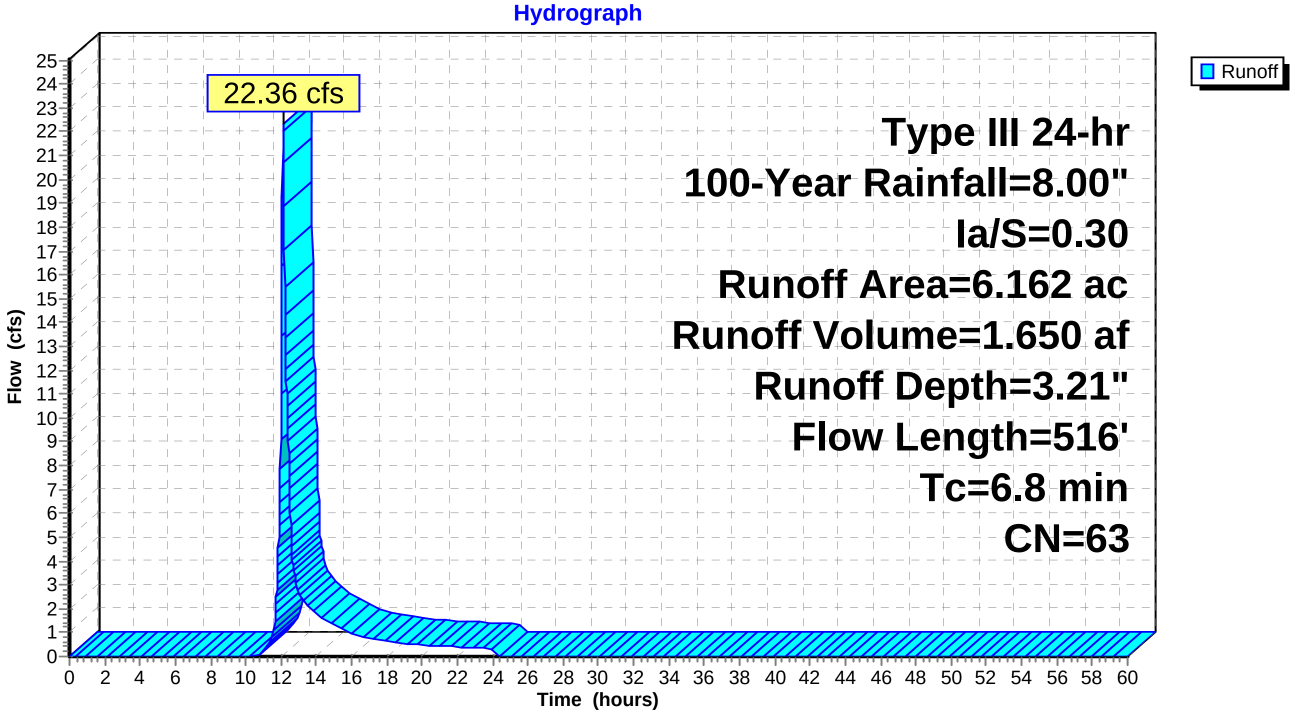
Runoff = 22.36 cfs @ 12.11 hrs, Volume= 1.650 af, Depth= 3.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.374	98	Building roof
*	0.259	98	Paved surface
*	0.000	96	Gravel surface
*	0.536	98	Water Surface
	2.753	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	2.240	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	0.000	70	Woods, Good, HSG C
	0.000	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	6.162	63	Weighted Average
	4.993		81.03% Pervious Area
	1.169		18.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.7	100	0.2000	0.45		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
0.6	115	0.2000	3.13		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.5	301	0.0800	1.98		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
6.8	516	Total			

Subcatchment B111: B111



Summary for Subcatchment B112: B112

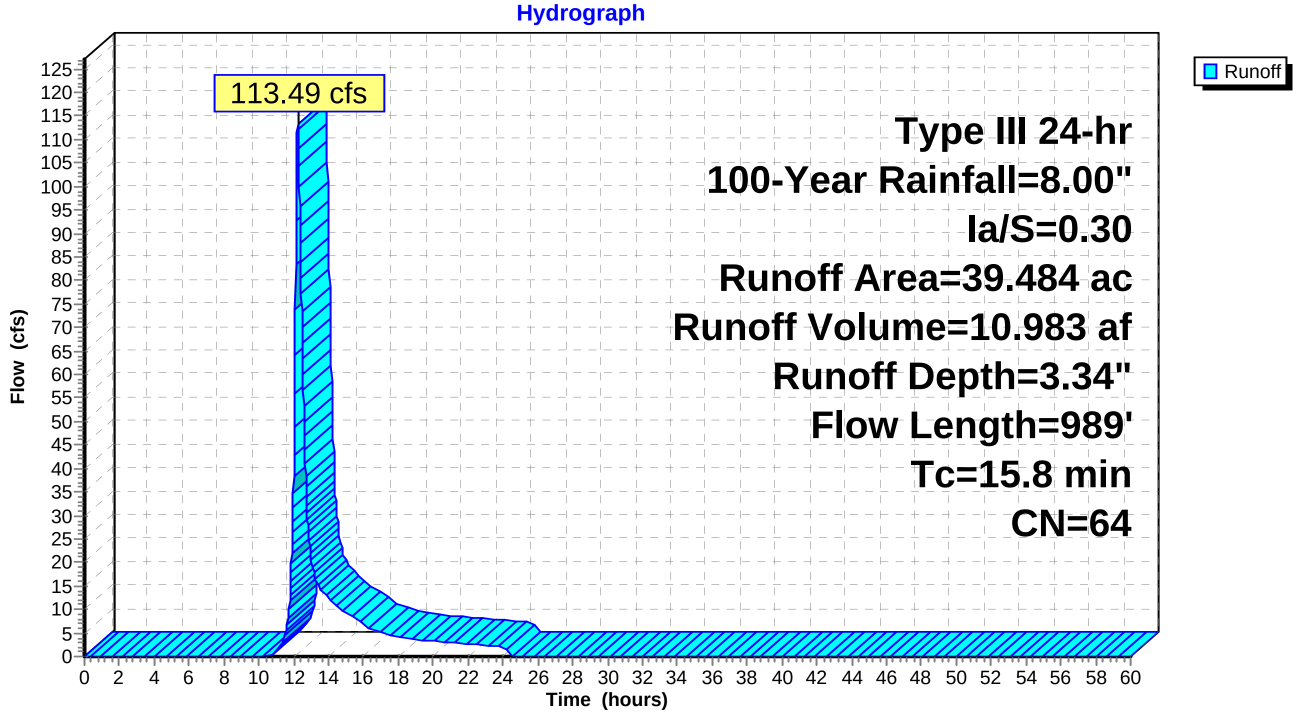
Runoff = 113.49 cfs @ 12.23 hrs, Volume= 10.983 af, Depth= 3.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	1.437	98	Building roof
*	1.880	98	Paved surface
*	0.000	96	Gravel surface
*	8.285	98	Water Surface
	18.759	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	8.382	74	>75% Grass cover, Good, HSG C
	0.015	80	>75% Grass cover, Good, HSG D
	0.052	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	0.289	70	Woods, Good, HSG C
	0.000	77	Woods, Good, HSG D
*	0.385	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	39.484	64	Weighted Average
	27.882		70.62% Pervious Area
	11.602		29.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0400	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
3.1	375	0.0850	2.04		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.6	514	0.0470	1.52		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
15.8	989	Total			

Subcatchment B112: B112



Summary for Subcatchment B113: B113

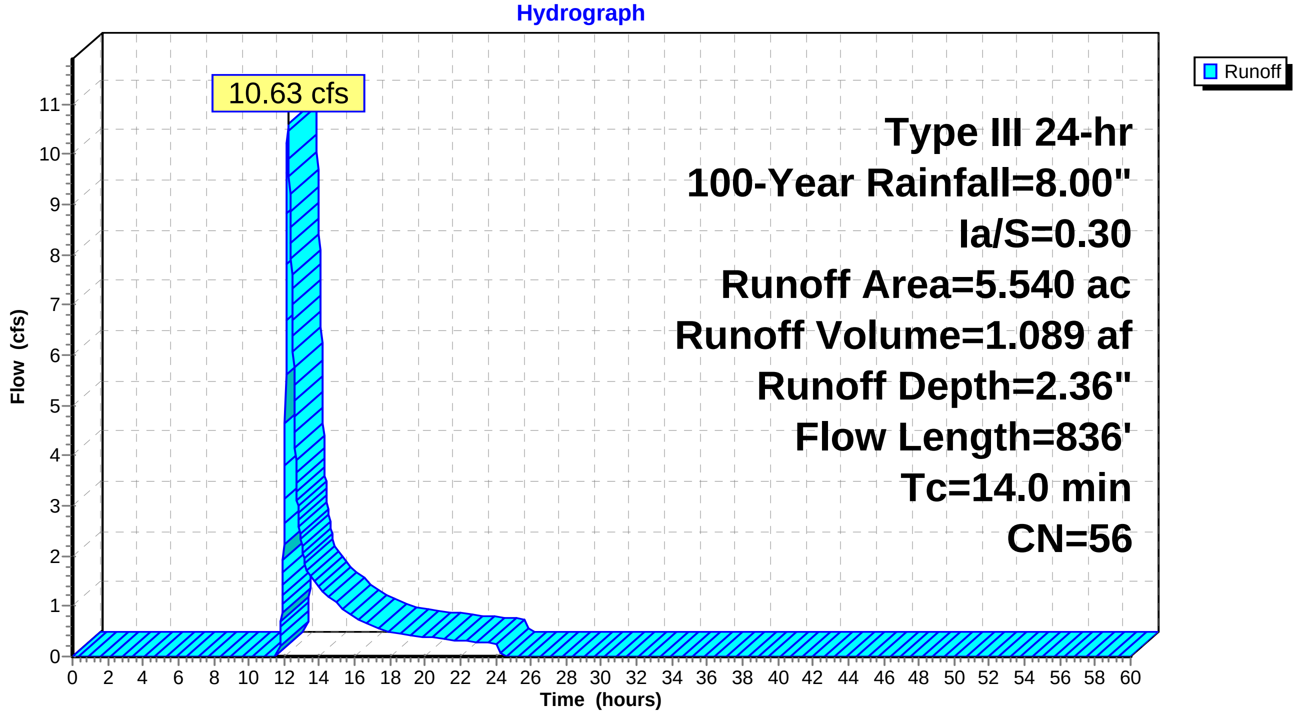
Runoff = 10.63 cfs @ 12.22 hrs, Volume= 1.089 af, Depth= 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.178	98	Building roof
*	0.684	98	Paved surface
*	0.009	96	Gravel surface
*	0.000	98	Water Surface
	2.724	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	0.000	74	>75% Grass cover, Good, HSG C
	0.135	80	>75% Grass cover, Good, HSG D
	0.720	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	0.000	70	Woods, Good, HSG C
	1.090	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	5.540	56	Weighted Average
	4.678		84.44% Pervious Area
	0.862		15.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.8	100	0.0800	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.50"
1.6	300	0.0360	3.05		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	436	0.0700	12.07	14.81	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.015
14.0	836	Total			

Subcatchment B113: B113



Summary for Subcatchment B115: B115

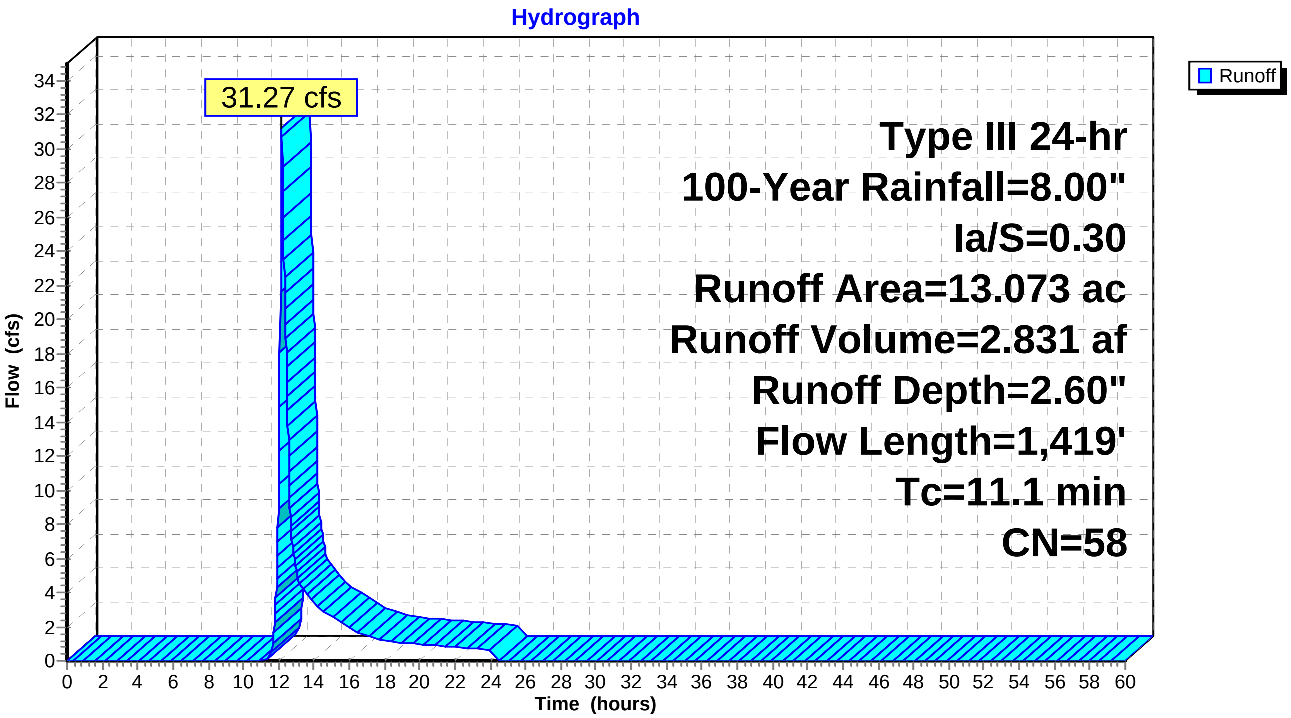
Runoff = 31.27 cfs @ 12.17 hrs, Volume= 2.831 af, Depth= 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.817	98	Building roof
*	0.449	98	Paved surface
*	0.000	96	Gravel surface
*	0.000	98	Water Surface
	6.589	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	5.040	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	0.030	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	0.011	70	Woods, Good, HSG C
	0.000	77	Woods, Good, HSG D
*	0.057	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.080	30	Sand Trap, HSG C
	13.073	58	Weighted Average
	11.807		90.32% Pervious Area
	1.266		9.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.7	100	0.1100	0.35		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.50"
4.0	340	0.0410	1.42		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.4	979	0.0130	6.80	136.10	**Channel Flow,** Area= 20.0 sf Perim= 12.0' r= 1.67' n= 0.035
11.1	1,419	Total			

Subcatchment B115: B115



Summary for Subcatchment B116: B116

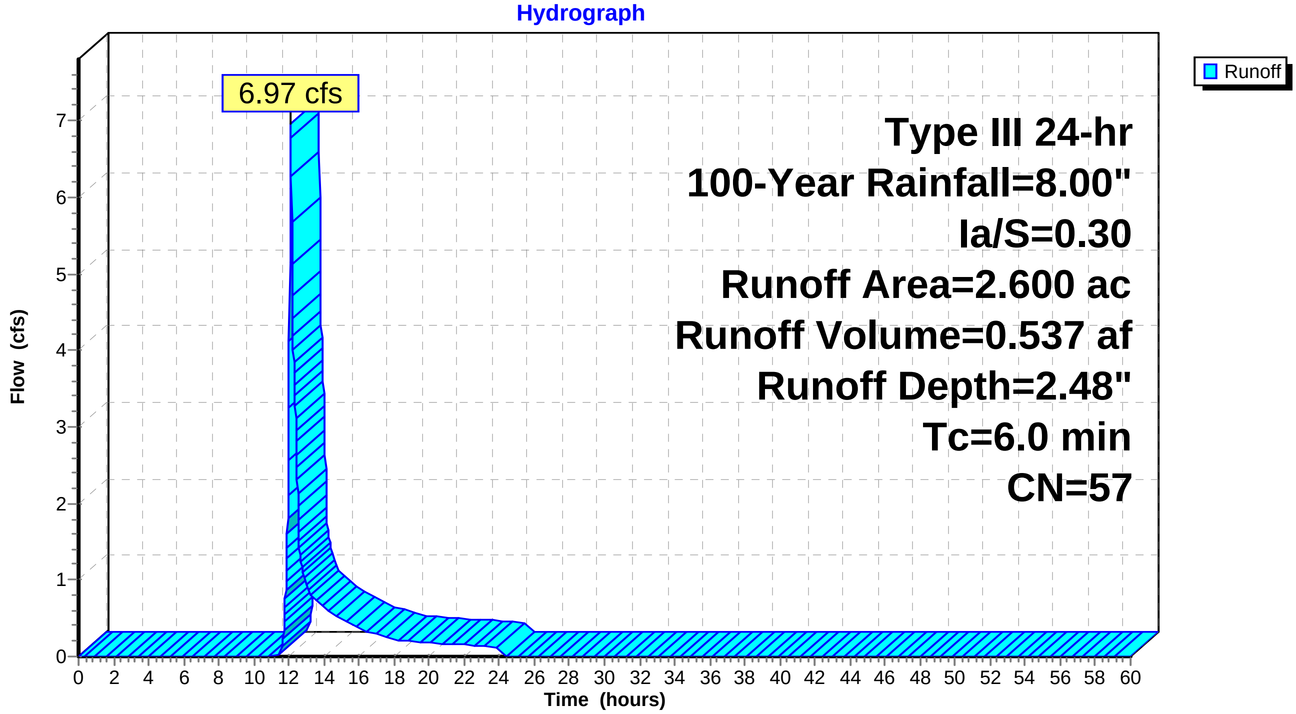
Runoff = 6.97 cfs @ 12.10 hrs, Volume= 0.537 af, Depth= 2.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.000	98	Building roof
*	0.174	98	Paved surface
*	0.000	96	Gravel surface
*	0.621	98	Water Surface
	1.805	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	0.000	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	0.000	70	Woods, Good, HSG C
	0.000	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	2.600	57	Weighted Average
	1.805		69.42% Pervious Area
	0.795		30.58% Impervious Area

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

Subcatchment B116: B116



Summary for Subcatchment B117: B117

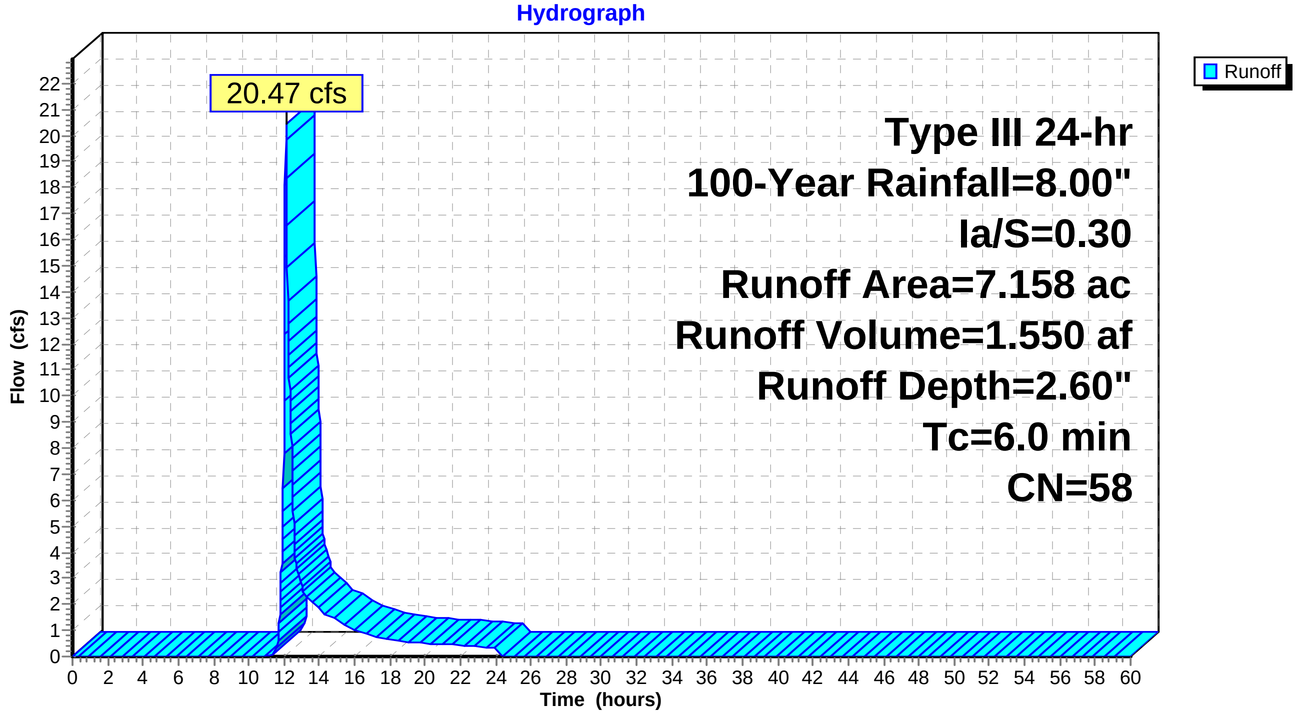
Runoff = 20.47 cfs @ 12.10 hrs, Volume= 1.550 af, Depth= 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	1.155	98	Building roof
*	1.135	98	Paved surface
*	0.000	96	Gravel surface
*	0.000	98	Water Surface
	4.555	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	0.000	74	>75% Grass cover, Good, HSG C
	0.018	80	>75% Grass cover, Good, HSG D
	0.268	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	0.000	70	Woods, Good, HSG C
	0.027	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	7.158	58	Weighted Average
	4.868		68.01% Pervious Area
	2.290		31.99% Impervious Area

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

Subcatchment B117: B117



Summary for Subcatchment B118: B118

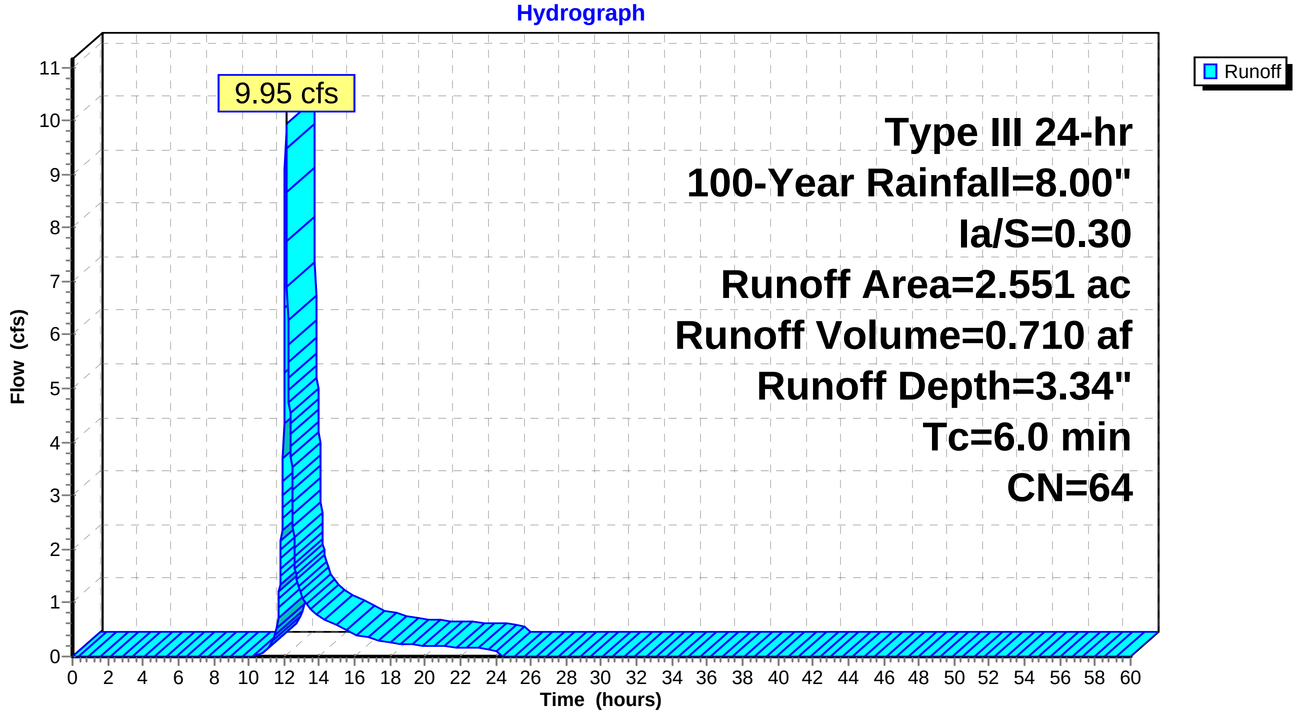
Runoff = 9.95 cfs @ 12.09 hrs, Volume= 0.710 af, Depth= 3.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.653	98	Building roof
*	0.438	98	Paved surface
*	0.000	96	Gravel surface
*	0.000	98	Water Surface
	1.320	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	0.000	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	0.140	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	0.000	70	Woods, Good, HSG C
	0.000	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	2.551	64	Weighted Average
	1.460		57.23% Pervious Area
	1.091		42.77% Impervious Area

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

Subcatchment B118: B118



Summary for Subcatchment C101: C101

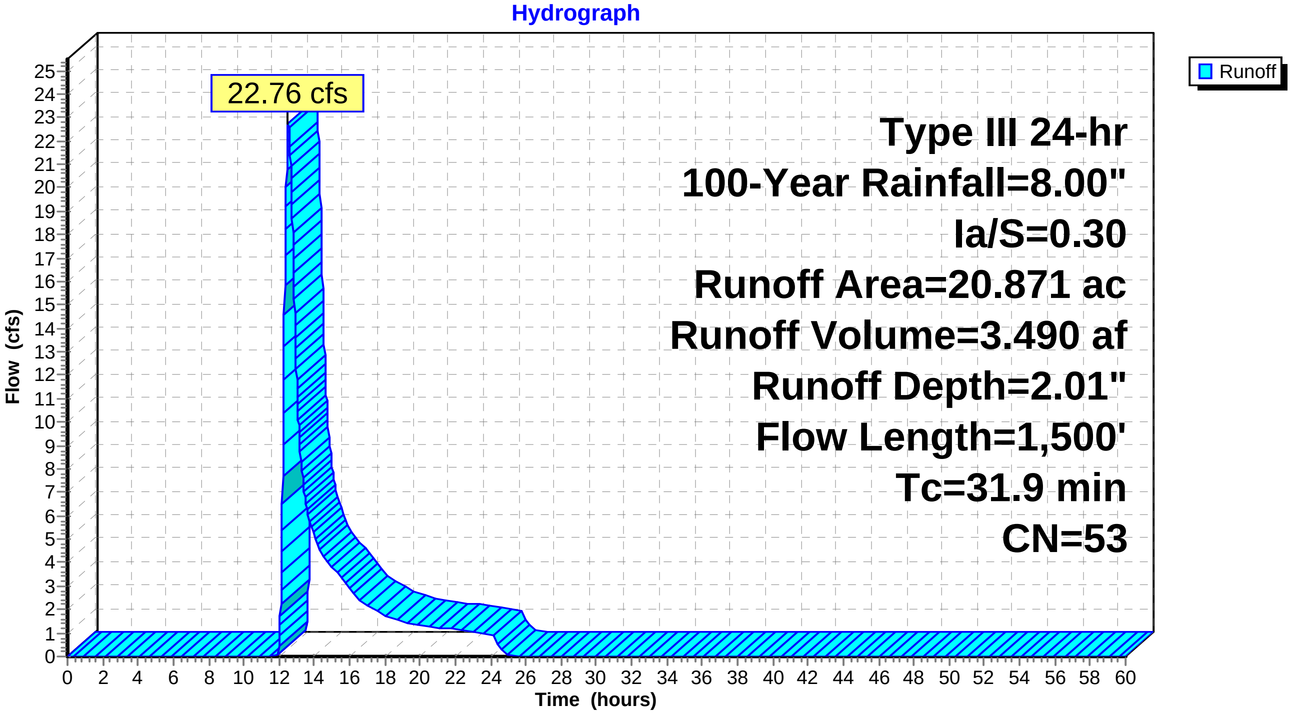
Runoff = 22.76 cfs @ 12.53 hrs, Volume= 3.490 af, Depth= 2.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.000	98	Building roof
*	1.029	98	Paved surface
*	0.058	96	Gravel surface
*	0.000	98	Water Surface
*	0.000	98	Rock Outcrop/Ledge
	8.770	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	3.156	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	2.968	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	4.890	70	Woods, Good, HSG C
	0.000	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	20.871	53	Weighted Average
	19.842		95.07% Pervious Area
	1.029		4.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.7	100	0.0700	0.08		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
5.6	385	0.2100	1.15		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
2.7	595	0.0300	3.66	18.32	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=1.00' Z= 3.0 '/' Top.W=8.00' n= 0.050
1.9	420	0.0290	3.60	18.01	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=1.00' Z= 3.0 '/' Top.W=8.00' n= 0.050
31.9	1,500	Total			

Subcatchment C101: C101



Summary for Subcatchment C102: C102

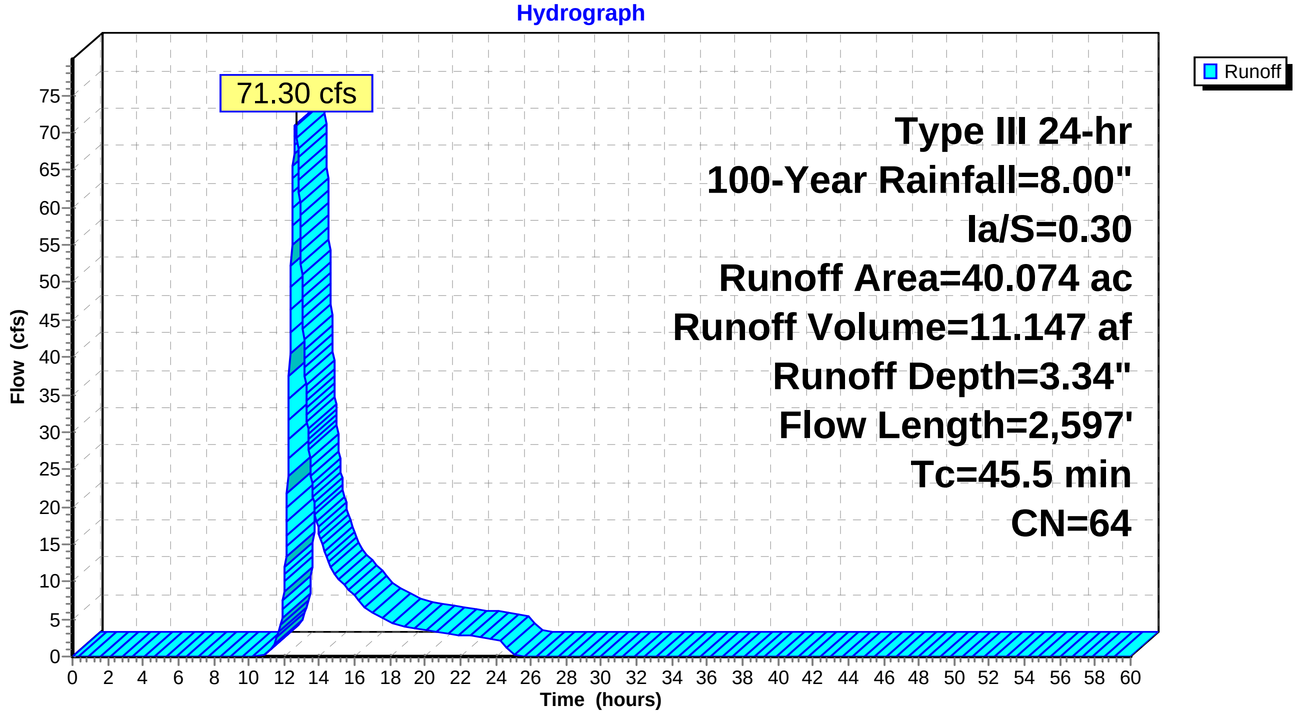
Runoff = 71.30 cfs @ 12.67 hrs, Volume= 11.147 af, Depth= 3.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.000	98	Building roof
*	0.007	98	Paved surface
*	0.515	96	Gravel surface
*	0.832	98	Water Surface
*	0.285	98	Rock Outcrop/Ledge
	13.181	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	1.190	74	>75% Grass cover, Good, HSG C
	1.269	80	>75% Grass cover, Good, HSG D
	0.124	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	7.574	70	Woods, Good, HSG C
	15.097	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	40.074	64	Weighted Average
	38.950		97.20% Pervious Area
	1.124		2.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.4	60	0.0330	0.05		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
9.0	40	0.1000	0.07		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
7.2	484	0.2000	1.12		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
6.8	700	0.4700	1.71		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
0.3	304	0.2700	16.38	262.05	**Trap/Vee/Rect Channel Flow,** Bot.W=2.00' D=2.00' Z= 3.0 '/' Top.W=14.00' n= 0.050
1.3	777	0.1100	9.86	65.70	**Parabolic Channel,** W=5.00' D=2.00' Area=6.7 sf Perim=6.7' n= 0.050
1.5	232		2.54		**Lake or Reservoir,** Mean Depth= 0.20'
45.5	2,597	Total			

Subcatchment C102: C102



Summary for Subcatchment C103: C103

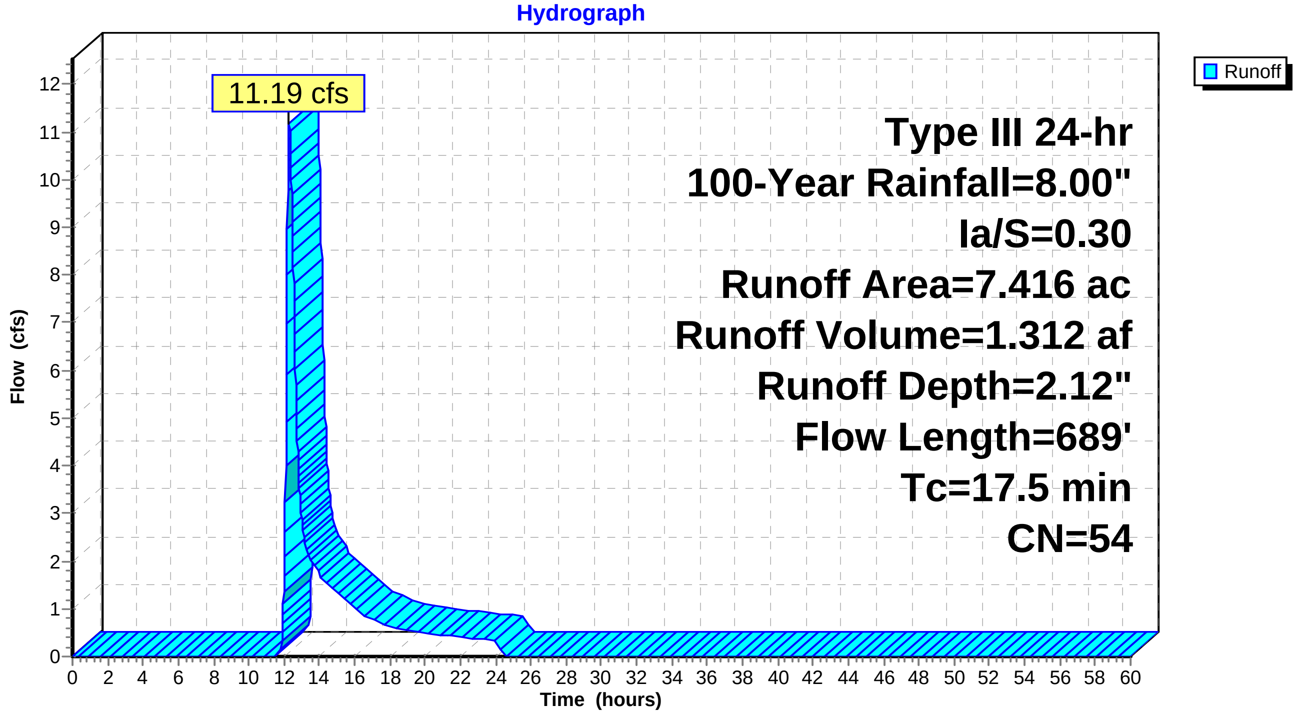
Runoff = 11.19 cfs @ 12.28 hrs, Volume= 1.312 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.287	98	Building roof
*	1.477	98	Paved surface
*	0.000	96	Gravel surface
*	0.000	98	Water Surface
*	0.046	98	Rock Outcrop/Ledge
	5.286	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	0.000	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	0.141	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	0.179	70	Woods, Good, HSG C
	0.000	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	7.416	54	Weighted Average
	5.606		75.59% Pervious Area
	1.810		24.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.3	100	0.0400	0.16		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.50"
5.7	327	0.1480	0.96		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
1.5	262	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
17.5	689	Total			

Subcatchment C103: C103



Summary for Subcatchment D101: D101

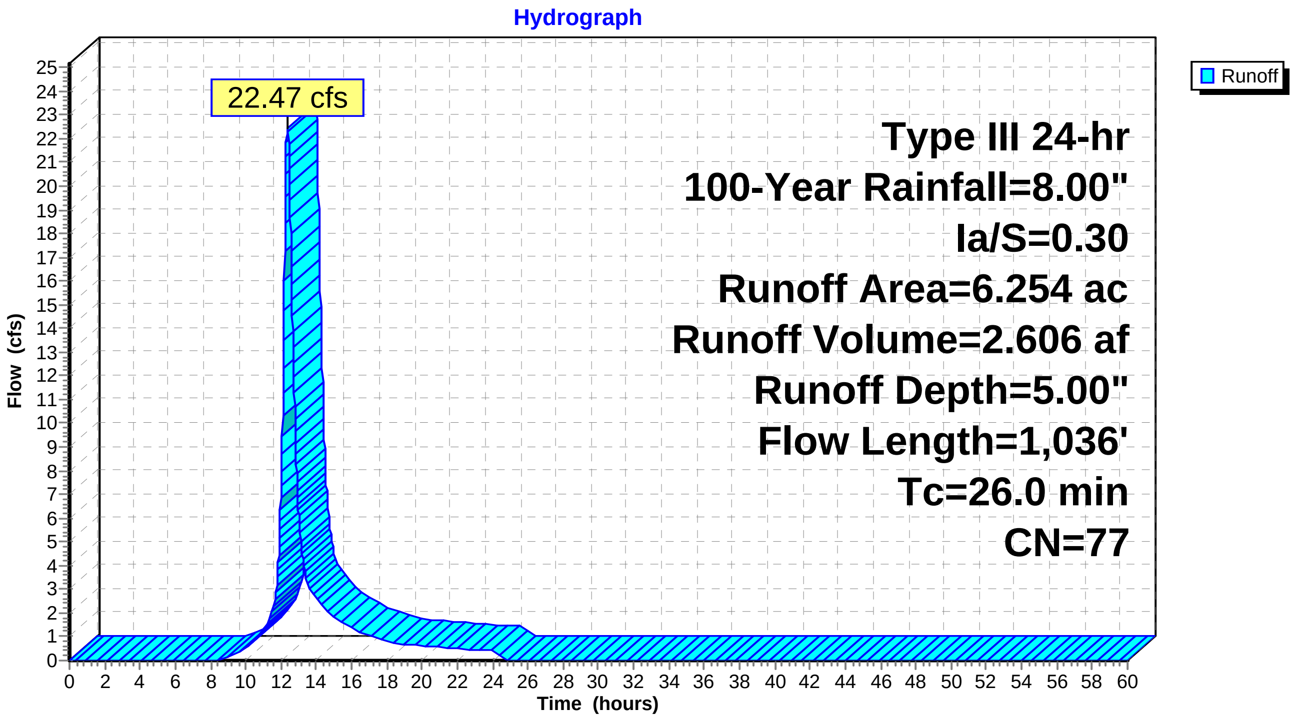
Runoff = 22.47 cfs @ 12.35 hrs, Volume= 2.606 af, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.000	98	Building roof
*	0.000	98	Paved surface
*	0.000	96	Gravel surface
*	0.000	98	Water Surface
*	0.000	98	Rock Outcrop/Ledge
	0.000	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	0.000	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	0.000	70	Woods, Good, HSG C
	6.254	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	6.254	77	Weighted Average
	6.254		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.2	100	0.0950	0.09		**Sheet Flow,** Woods: Dense underbrush n= 0.800 P2= 3.50"
3.0	608	0.4450	3.34		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
3.8	328	0.0420	1.43		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
26.0	1,036	Total			

Subcatchment D101: D101



Summary for Subcatchment D102: D102

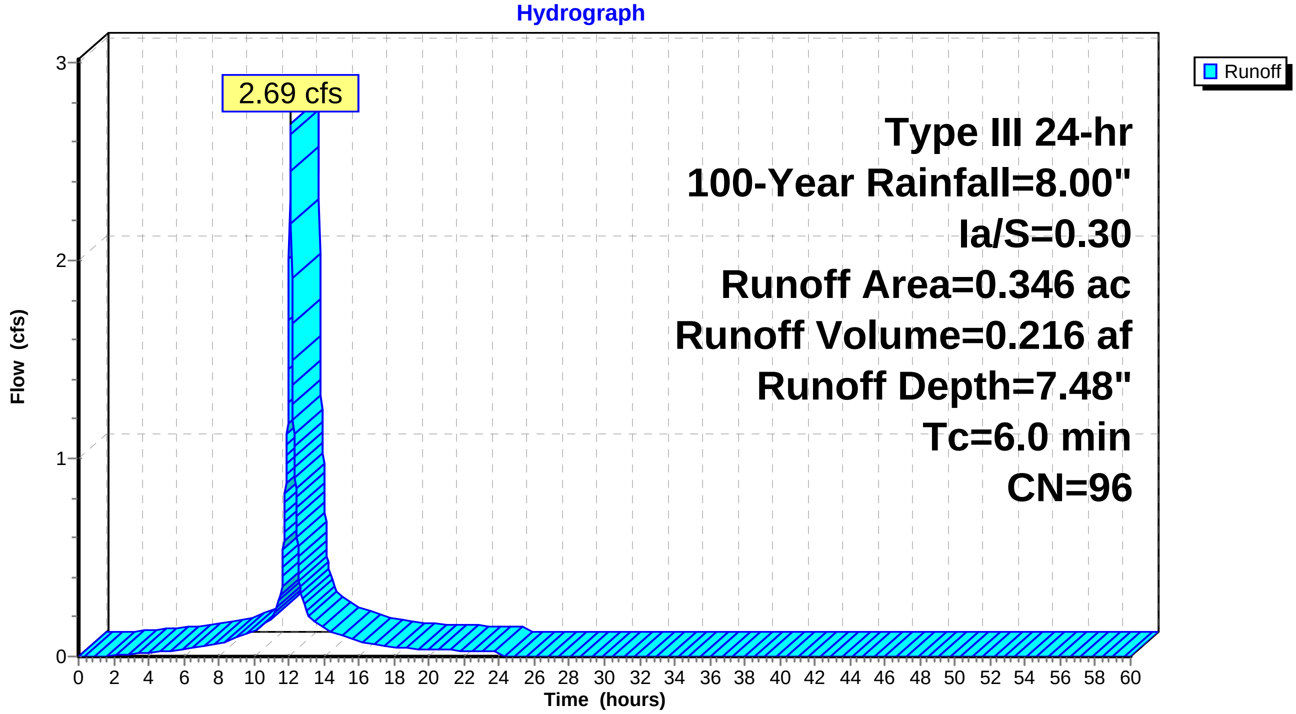
Runoff = 2.69 cfs @ 12.08 hrs, Volume= 0.216 af, Depth= 7.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
*	0.000	98	Building roof
*	0.262	98	Paved surface
	0.084	91	Gravel roads, HSG D
*	0.000	98	Water Surface
*	0.000	98	Rock Outcrop/Ledge
	0.000	39	>75% Grass cover, Good, HSG A
	0.000	61	>75% Grass cover, Good, HSG B
	0.000	74	>75% Grass cover, Good, HSG C
	0.000	80	>75% Grass cover, Good, HSG D
	0.000	30	Woods, Good, HSG A
	0.000	55	Woods, Good, HSG B
	0.000	70	Woods, Good, HSG C
	0.000	77	Woods, Good, HSG D
*	0.000	30	Sand trap, HSG A
*	0.000	30	Sand trap, HSG B
*	0.000	30	Sand Trap, HSG C
	0.346	96	Weighted Average
	0.084		24.28% Pervious Area
	0.262		75.72% Impervious Area

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

Subcatchment D102: D102



Summary for Subcatchment Ocerlook (P1): Overlook (Phase 1)

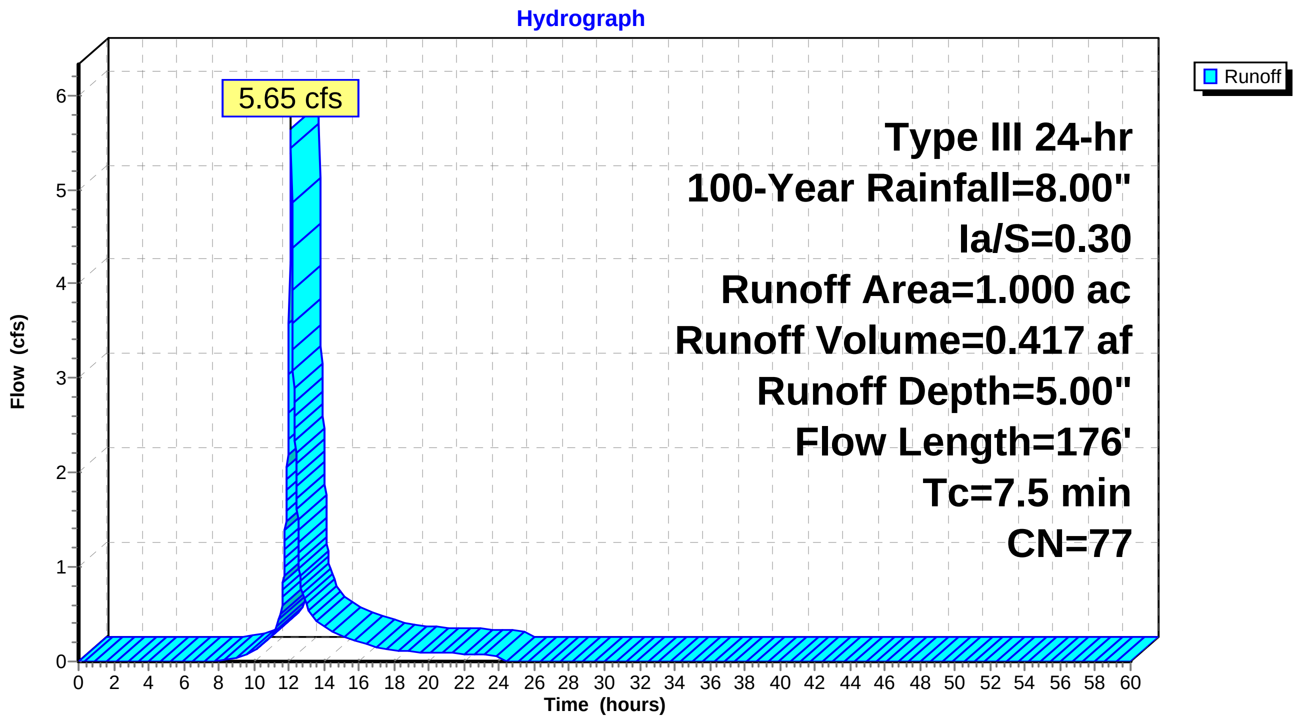
Runoff = 5.65 cfs @ 12.11 hrs, Volume= 0.417 af, Depth= 5.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs
Type III 24-hr 100-Year Rainfall=8.00", Ia/S=0.30

	Area (ac)	CN	Description
	0.150	70	Woods, Good, HSG C
	0.590	74	>75% Grass cover, Good, HSG C
*	0.260	89	Gravel roads and parking, HSG C
	0.000	98	Paved parking, HSG C
	1.000	77	Weighted Average
	1.000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.3	20	0.2000	0.15		**Sheet Flow, A to B** Woods: Light underbrush n= 0.400 P2= 3.50"
5.0	80	0.1600	0.27		**Sheet Flow, B to C** Grass: Dense n= 0.240 P2= 3.50"
0.2	76	0.1100	6.73		**Shallow Concentrated Flow, C to D** Paved Kv= 20.3 fps
7.5	176	Total			

Subcatchment Ocerlook (P1): Overlook (Phase 1)



Summary for Reach 36" Pipe: 36" Pipe

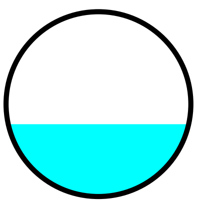
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 15.381 ac, 16.84% Impervious, Inflow Depth = 5.16" for 100-Year event
Inflow = 48.77 cfs @ 12.38 hrs, Volume= 6.609 af
Outflow = 48.72 cfs @ 12.39 hrs, Volume= 6.609 af, Atten= 0%, Lag= 0.6 min

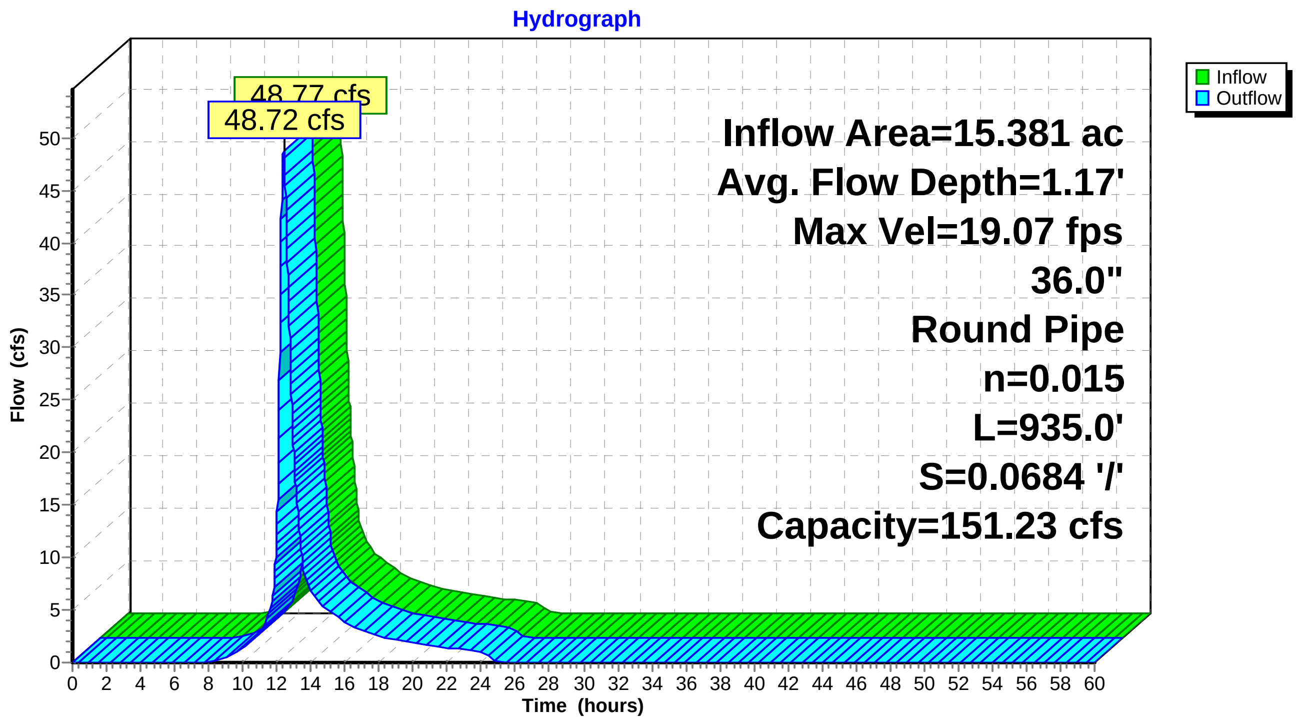
Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Max. Velocity= 19.07 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 5.59 fps, Avg. Travel Time= 2.8 min

Peak Storage= 2,389 cf @ 12.39 hrs
Average Depth at Peak Storage= 1.17'
Bank-Full Depth= 3.00' Flow Area= 7.1 sf, Capacity= 151.23 cfs

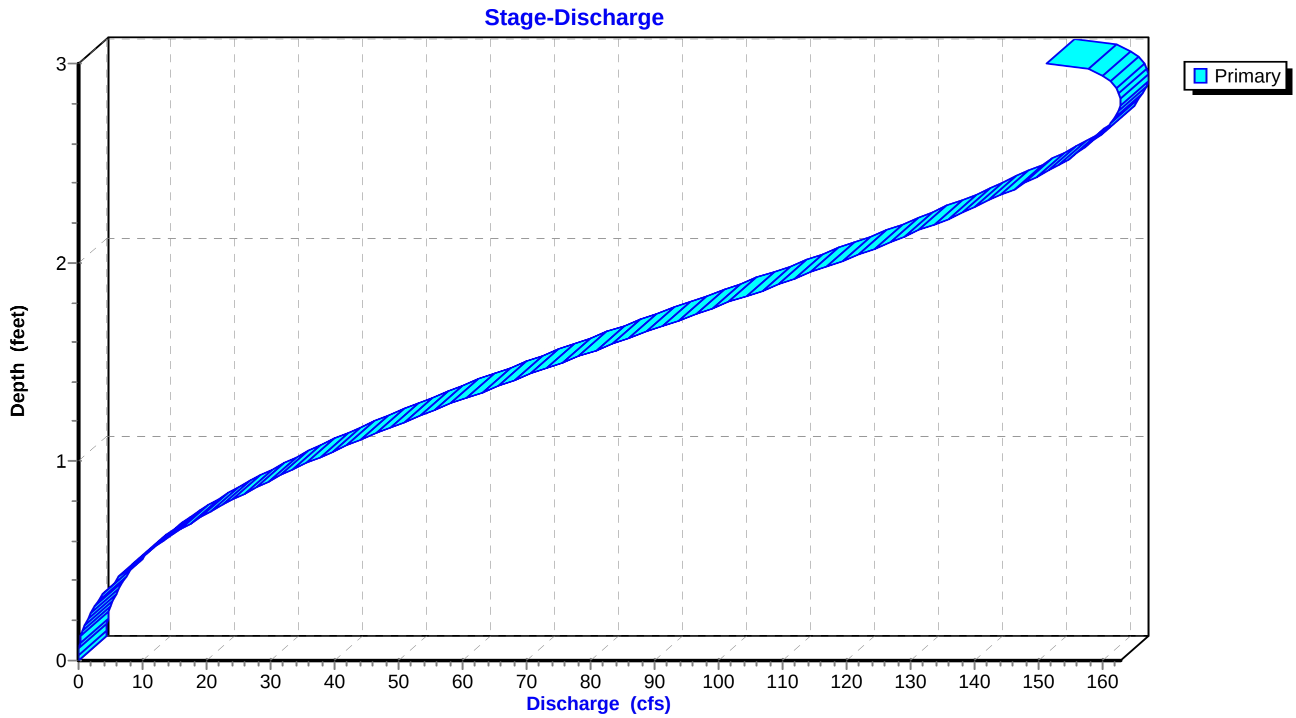
36.0" Round Pipe
n= 0.015
Length= 935.0' Slope= 0.0684 '/'
Inlet Invert= 635.00', Outlet Invert= 571.00'



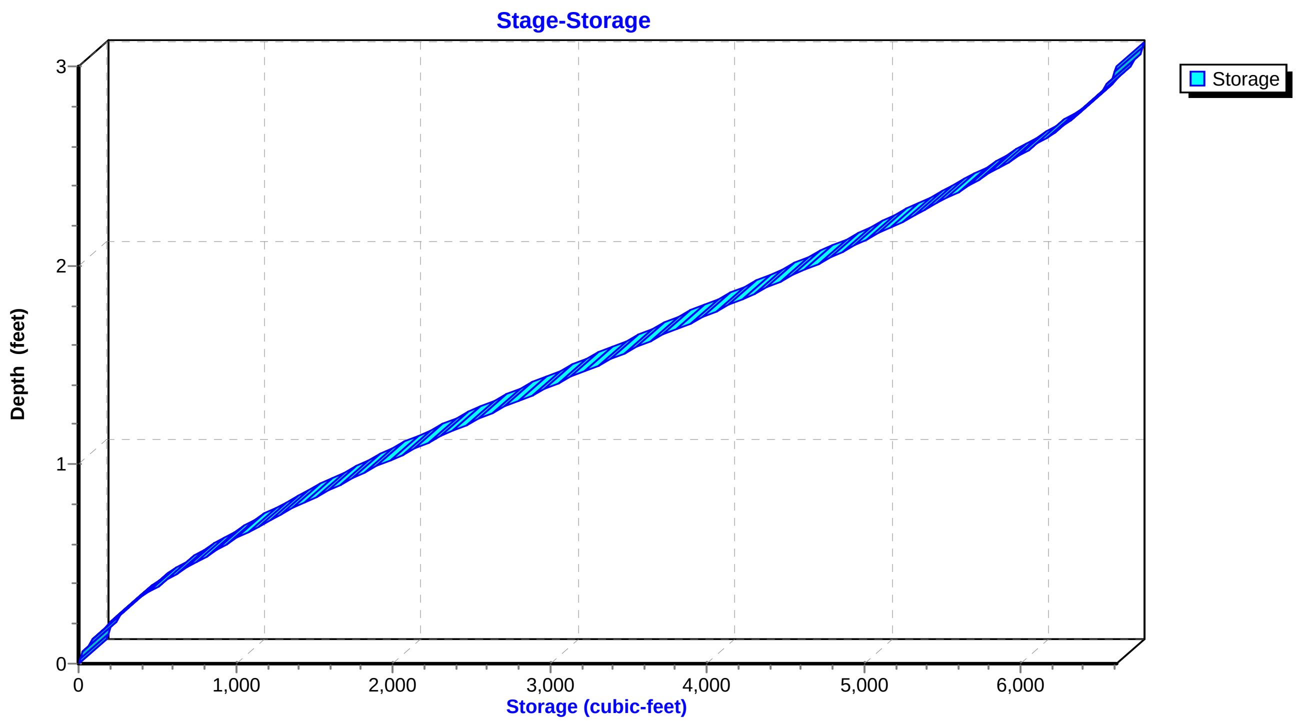
Reach 36" Pipe: 36" Pipe



Reach 36" Pipe: 36" Pipe



Reach 36" Pipe: 36" Pipe



Summary for Reach 42"Pipe: 42" Pipe

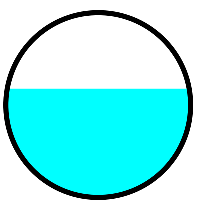
[52] Hint: Inlet/Outlet conditions not evaluated
[90] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 100.939 ac, 4.72% Impervious, Inflow Depth = 4.48" for 100-Year event
Inflow = 203.91 cfs @ 12.82 hrs, Volume= 37.646 af
Outflow = 203.93 cfs @ 12.82 hrs, Volume= 37.646 af, Atten= 0%, Lag= 0.2 min

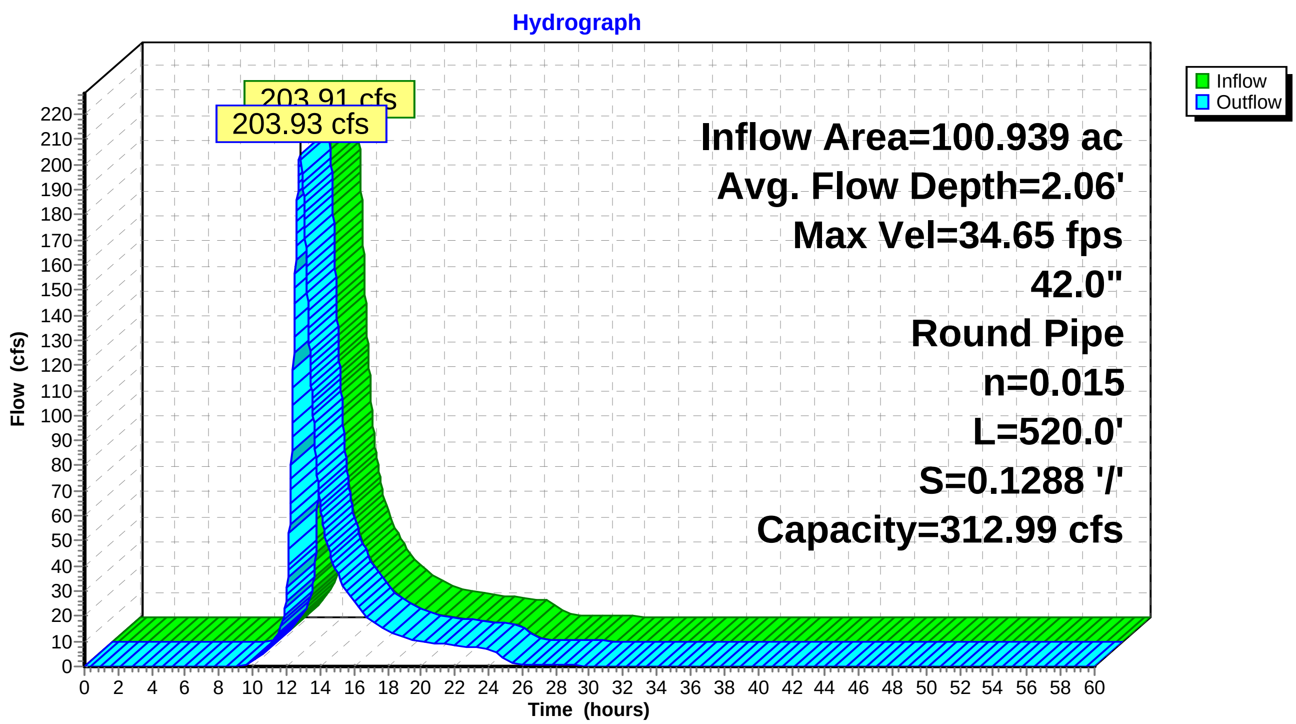
Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Max. Velocity= 34.65 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 7.77 fps, Avg. Travel Time= 1.1 min

Peak Storage= 3,060 cf @ 12.82 hrs
Average Depth at Peak Storage= 2.06'
Bank-Full Depth= 3.50' Flow Area= 9.6 sf, Capacity= 312.99 cfs

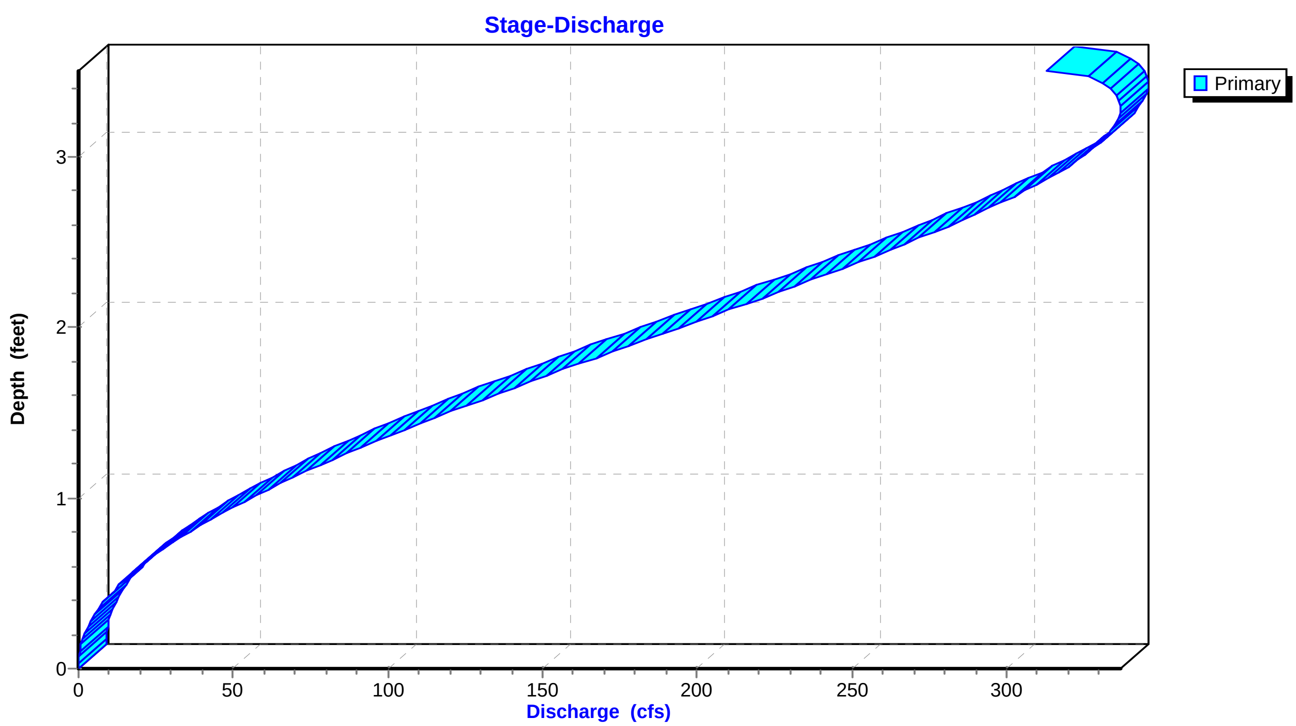
42.0" Round Pipe
n= 0.015
Length= 520.0' Slope= 0.1288 '/'
Inlet Invert= 602.00', Outlet Invert= 535.00'



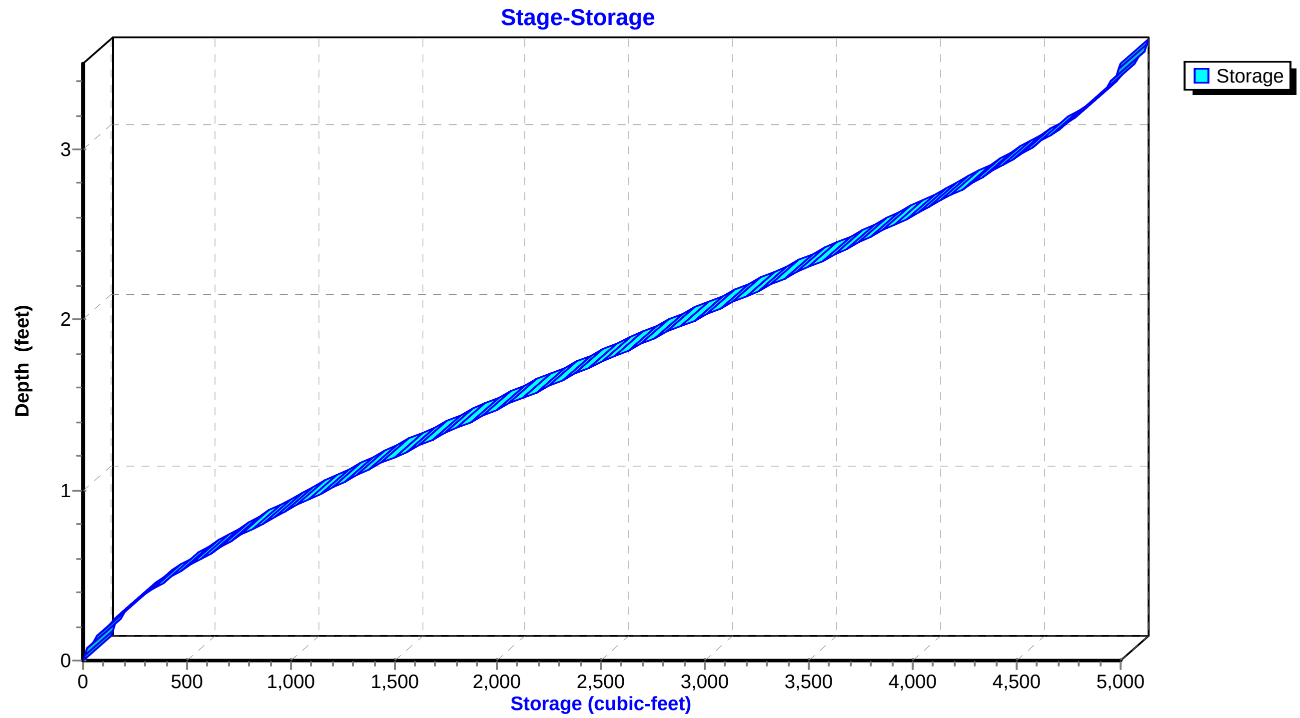
Reach 42"Pipe: 42" Pipe



Reach 42"Pipe: 42" Pipe



Reach 42"Pipe: 42" Pipe



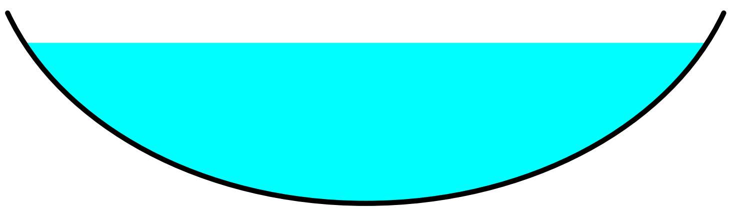
Summary for Reach A105R: Thru A103

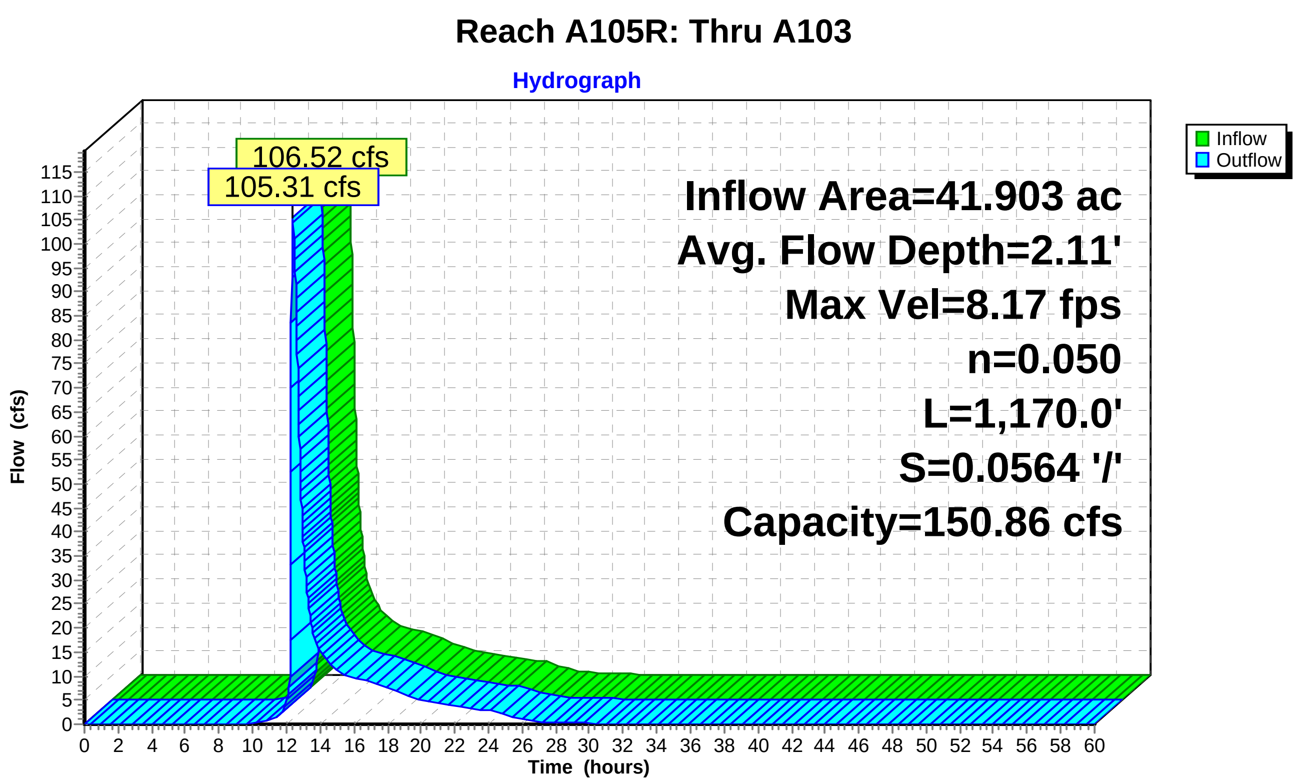
Inflow Area = 41.903 ac, 12.86% Impervious, Inflow Depth = 3.76" for 100-Year event
Inflow = 106.52 cfs @ 12.35 hrs, Volume= 13.146 af
Outflow = 105.31 cfs @ 12.38 hrs, Volume= 13.145 af, Atten= 1%, Lag= 2.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Max. Velocity= 8.17 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 1.61 fps, Avg. Travel Time= 12.1 min

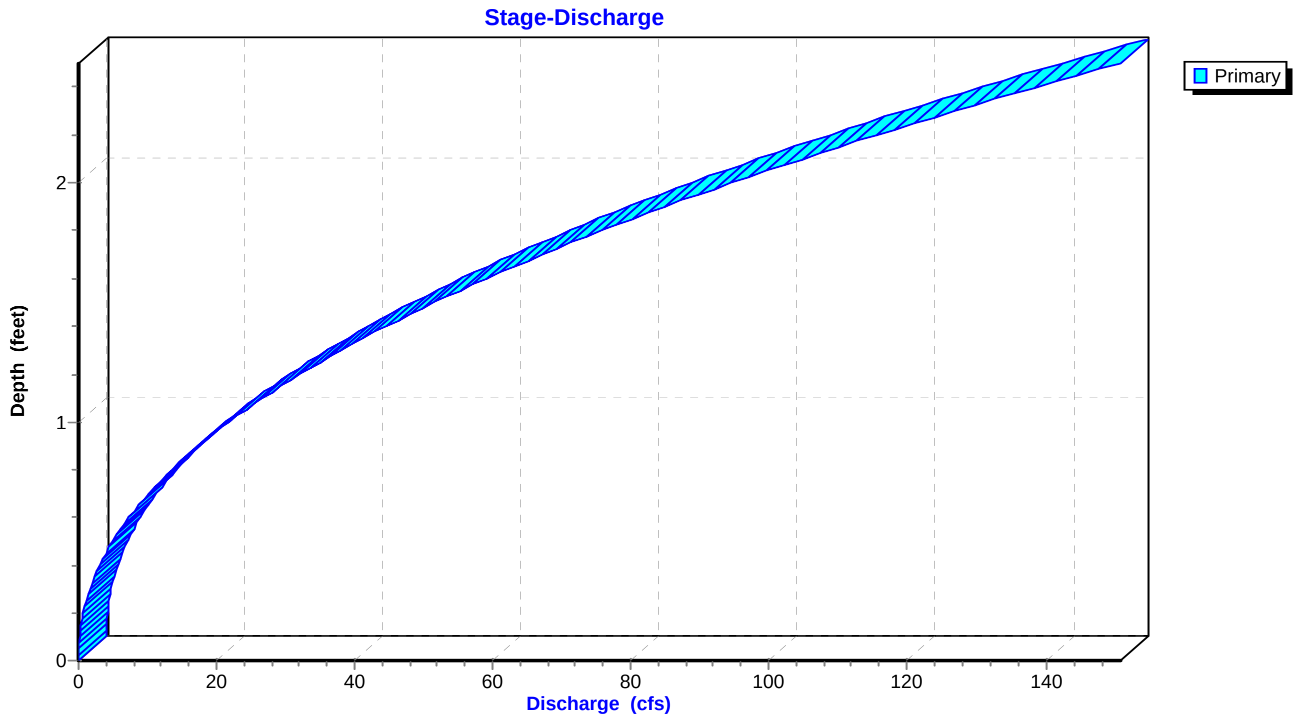
Peak Storage= 15,073 cf @ 12.38 hrs
Average Depth at Peak Storage= 2.11'
Bank-Full Depth= 2.50' Flow Area= 16.7 sf, Capacity= 150.86 cfs

10.00' x 2.50' deep Parabolic Channel, n= 0.050
Length= 1,170.0' Slope= 0.0564 '/'
Inlet Invert= 566.00', Outlet Invert= 500.00'

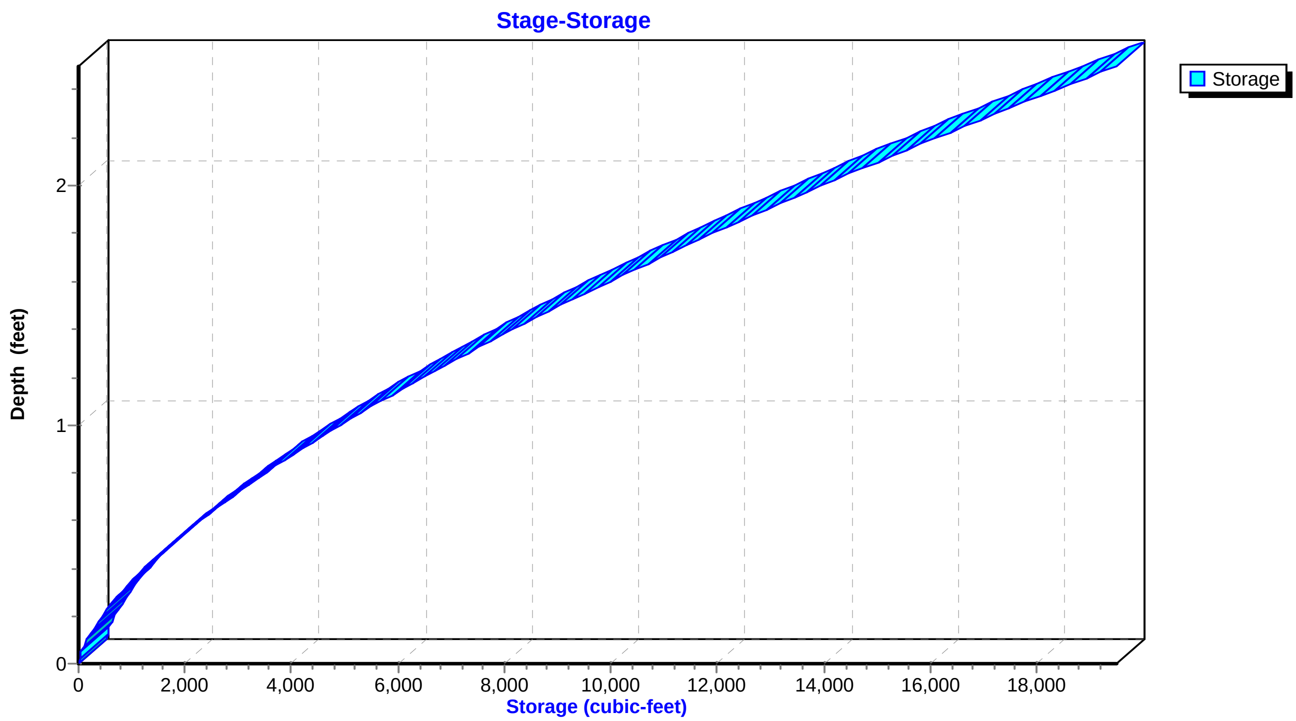




Reach A105R: Thru A103



Reach A105R: Thru A103



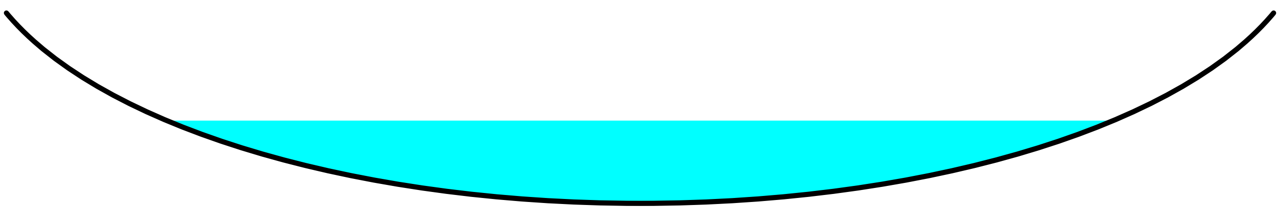
Summary for Reach B107R: Thru B103

Inflow Area = 14.330 ac, 0.00% Impervious, Inflow Depth = 4.77" for 100-Year event
Inflow = 31.60 cfs @ 12.80 hrs, Volume= 5.696 af
Outflow = 31.56 cfs @ 12.83 hrs, Volume= 5.696 af, Atten= 0%, Lag= 1.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Max. Velocity= 8.28 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 1.76 fps, Avg. Travel Time= 8.9 min

Peak Storage= 3,575 cf @ 12.83 hrs
Average Depth at Peak Storage= 0.43'
Bank-Full Depth= 1.00' Flow Area= 13.3 sf, Capacity= 192.14 cfs

20.00' x 1.00' deep Parabolic Channel, n= 0.050
Length= 938.0' Slope= 0.4072 '/'
Inlet Invert= 972.00', Outlet Invert= 590.00'



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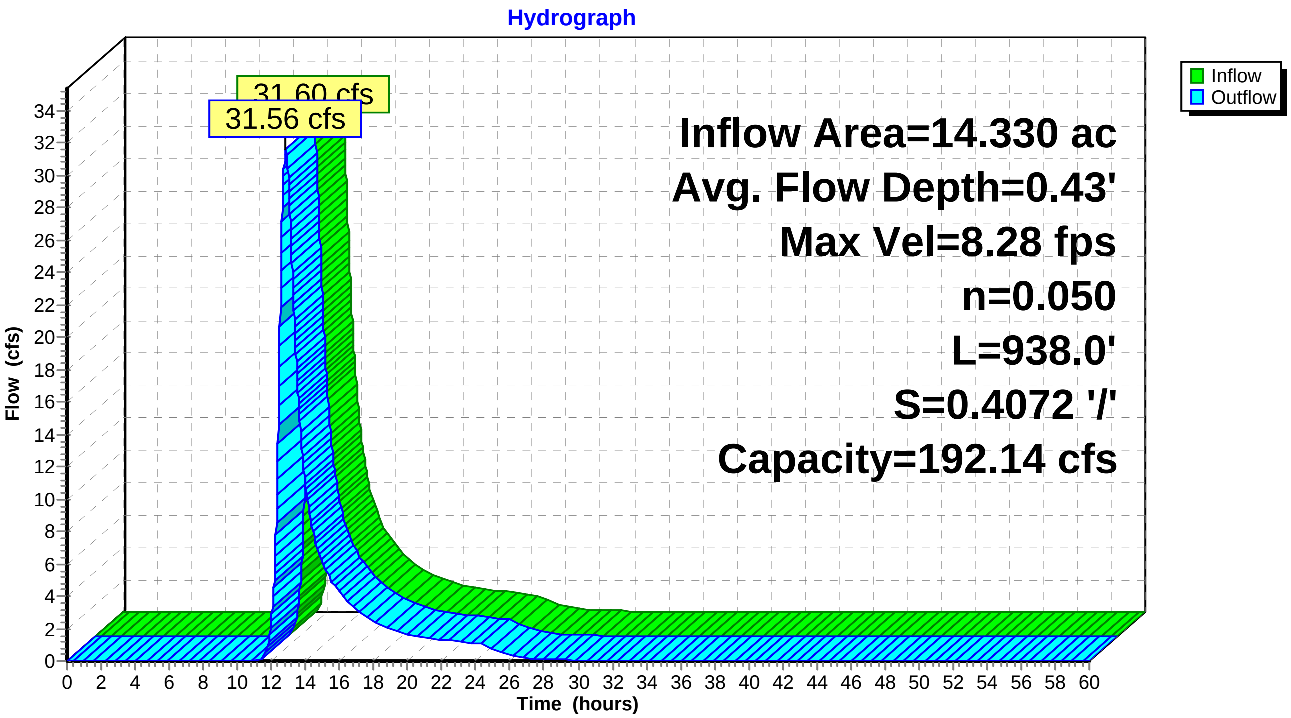
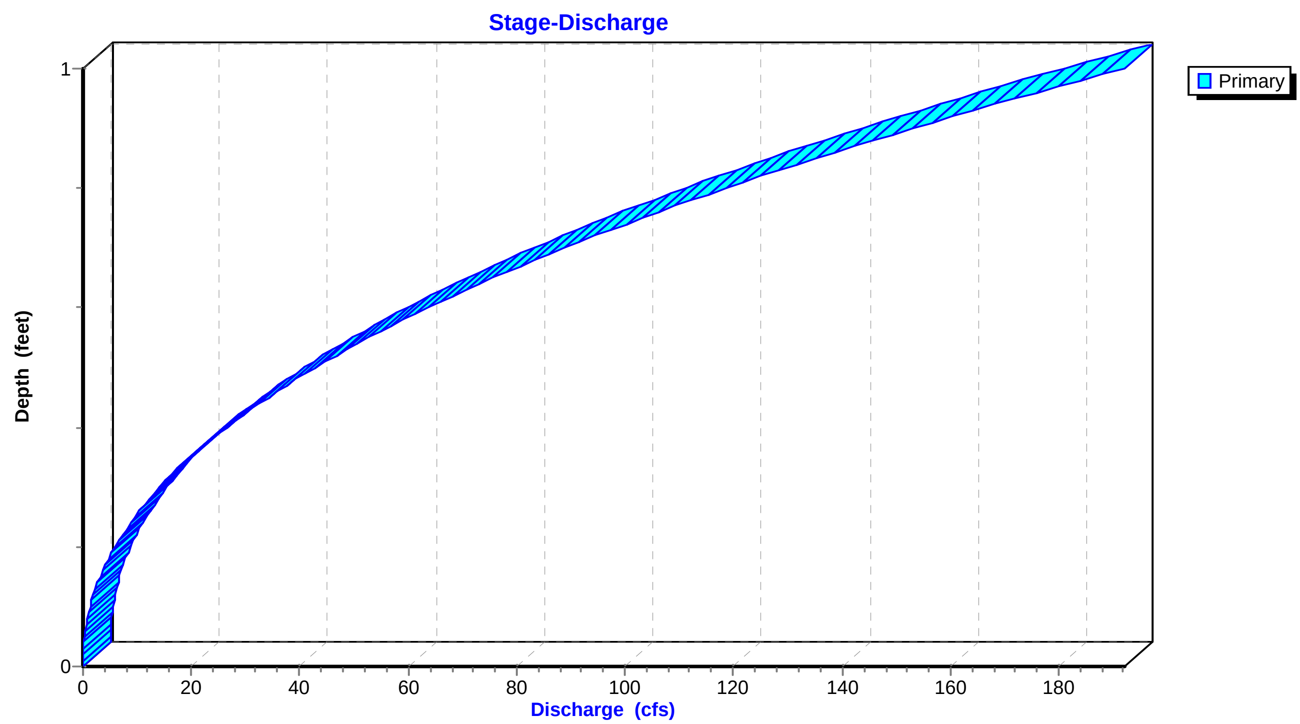
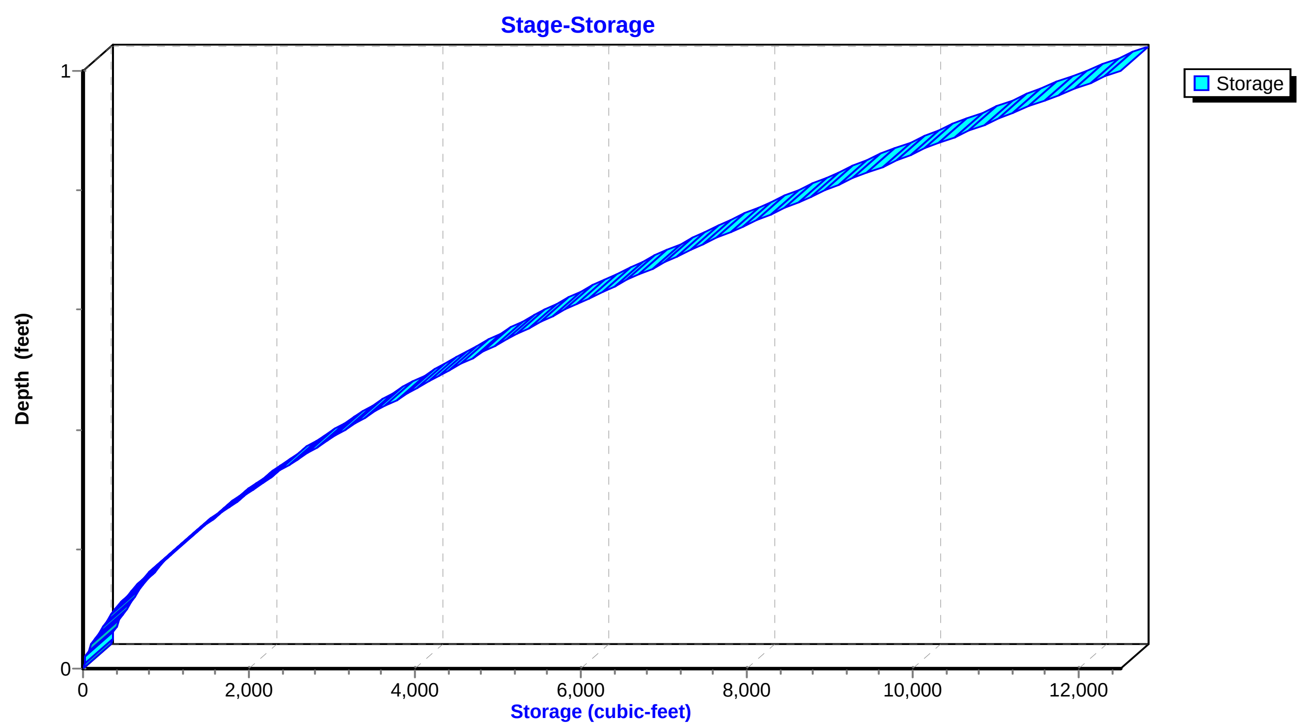
Reach B107R: Thru B103



Reach B107R: Thru B103



Reach B107R: Thru B103



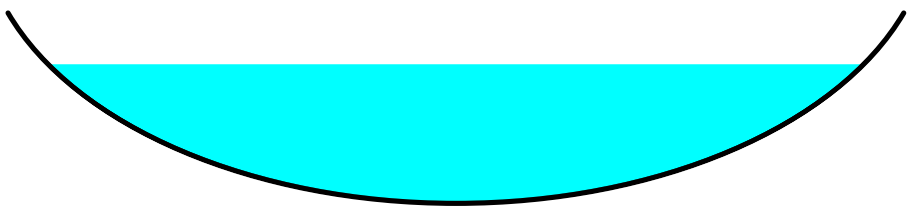
Summary for Reach B112R: Thru B102

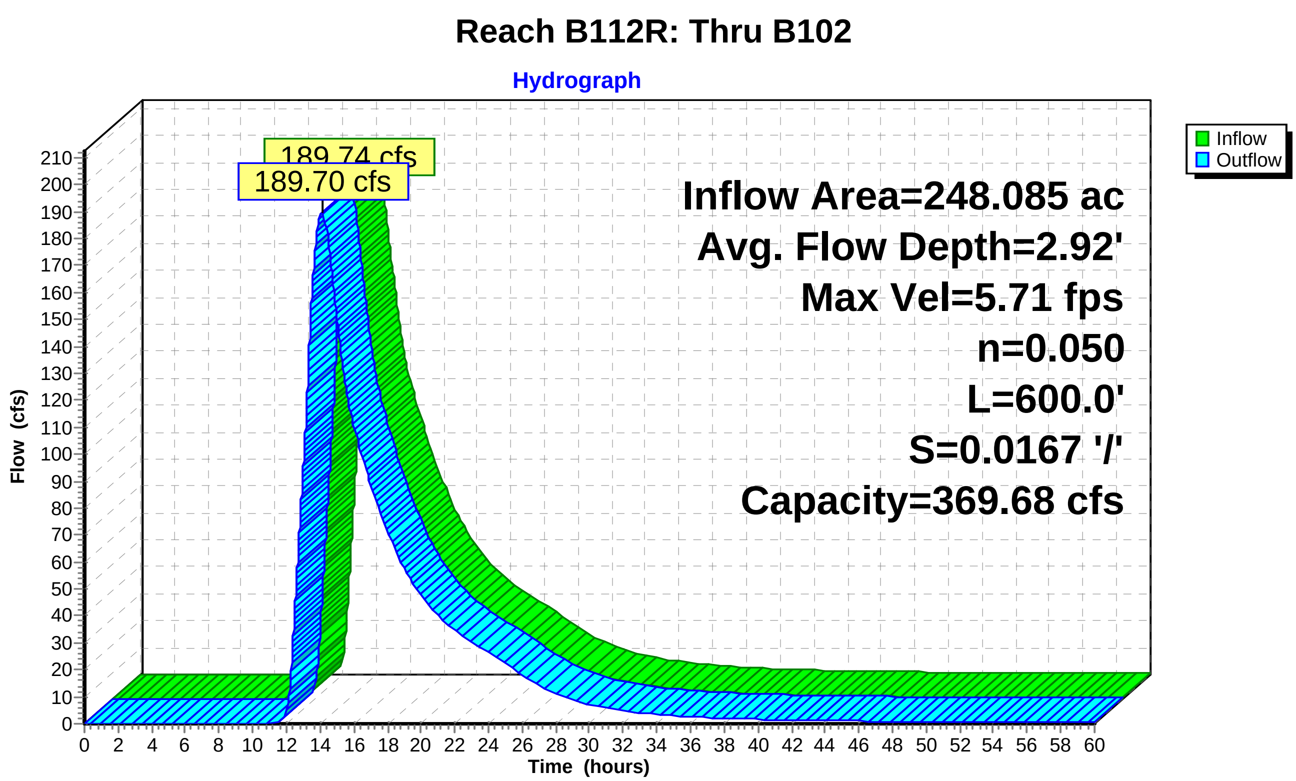
Inflow Area = 248.085 ac, 10.82% Impervious, Inflow Depth > 4.32" for 100-Year event
Inflow = 189.74 cfs @ 14.07 hrs, Volume= 89.406 af
Outflow = 189.70 cfs @ 14.09 hrs, Volume= 89.398 af, Atten= 0%, Lag= 1.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Max. Velocity= 5.71 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 2.12 fps, Avg. Travel Time= 4.7 min

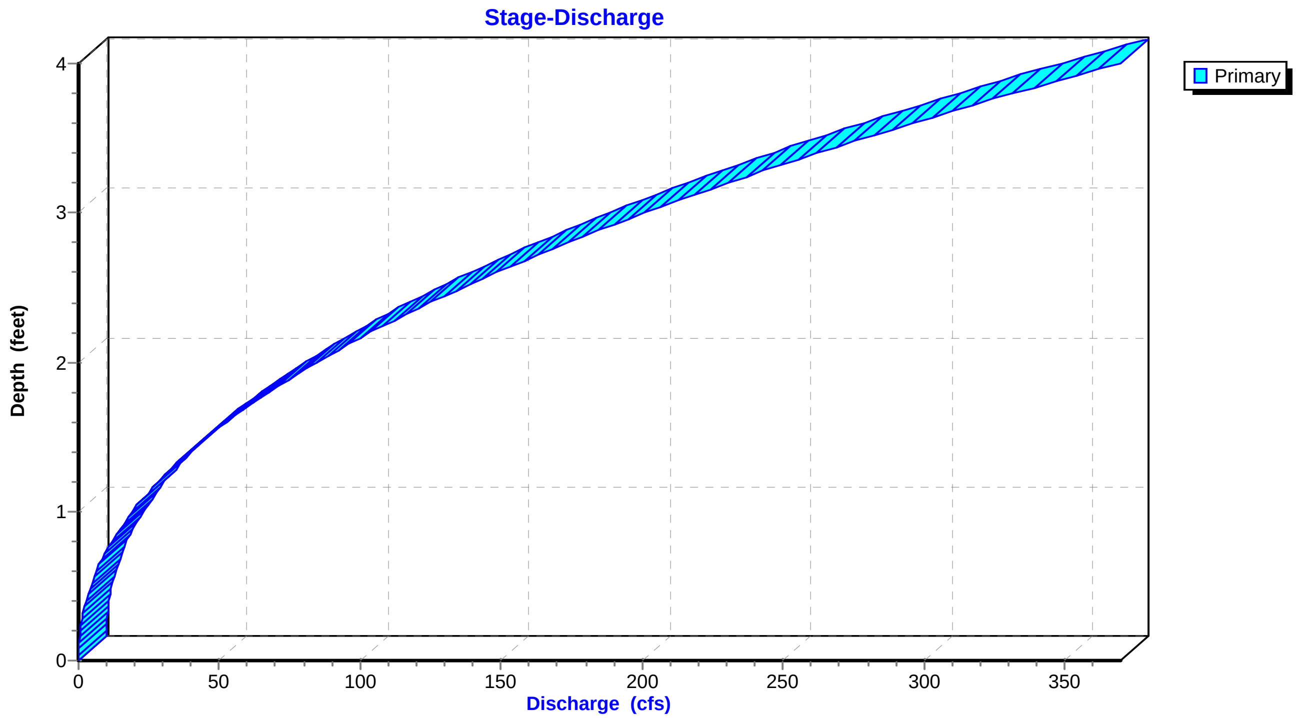
Peak Storage= 19,949 cf @ 14.09 hrs
Average Depth at Peak Storage= 2.92'
Bank-Full Depth= 4.00' Flow Area= 53.3 sf, Capacity= 369.68 cfs

20.00' x 4.00' deep Parabolic Channel, n= 0.050
Length= 600.0' Slope= 0.0167 '/'
Inlet Invert= 502.00', Outlet Invert= 492.00'

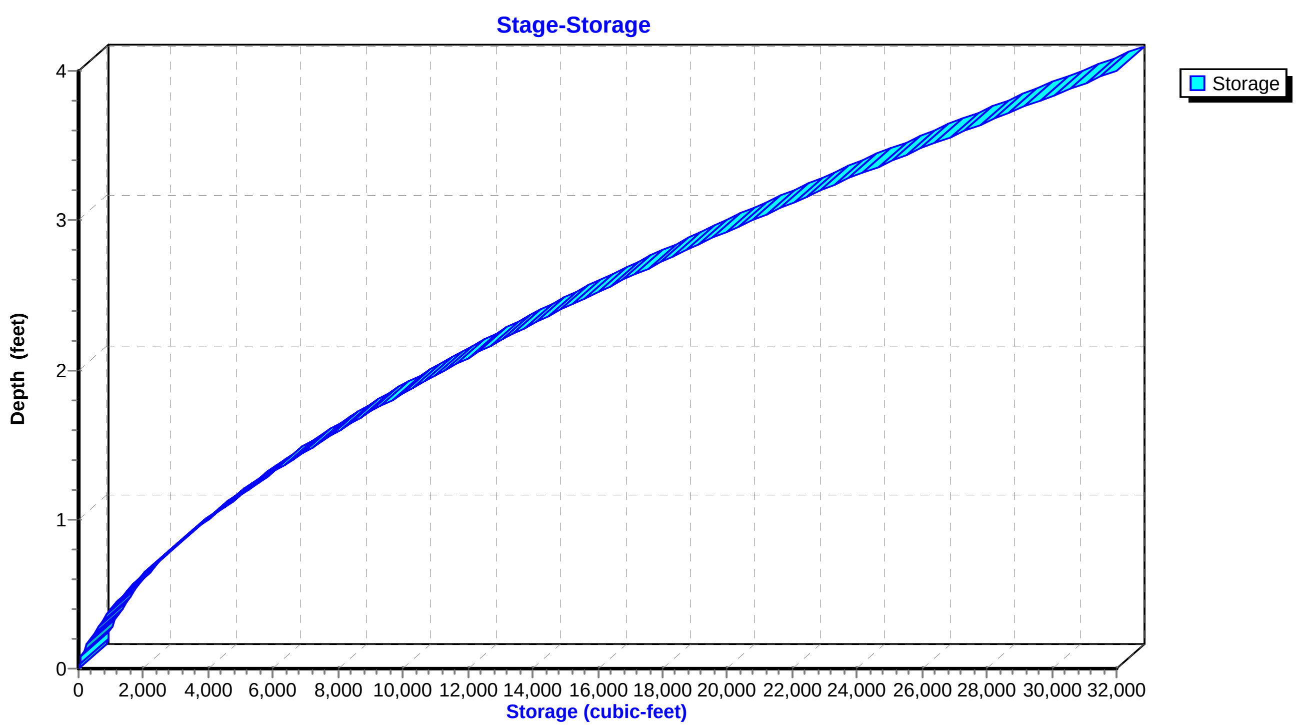




Reach B112R: Thru B102



Reach B112R: Thru B102



Summary for Pond 102C: Pond 102C

Inflow Area = 40.074 ac, 2.80% Impervious, Inflow Depth = 3.34" for 100-Year event
Inflow = 71.30 cfs @ 12.67 hrs, Volume= 11.147 af
Outflow = 8.40 cfs @ 15.86 hrs, Volume= 4.020 af, Atten= 88%, Lag= 191.5 min
Primary = 8.40 cfs @ 15.86 hrs, Volume= 4.020 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 509.11' @ 15.86 hrs Surf.Area= 219,925 sf Storage= 334,069 cf

Plug-Flow detention time= 394.2 min calculated for 4.018 af (36% of inflow)
Center-of-Mass det. time= 257.7 min (1,146.7 - 889.0)

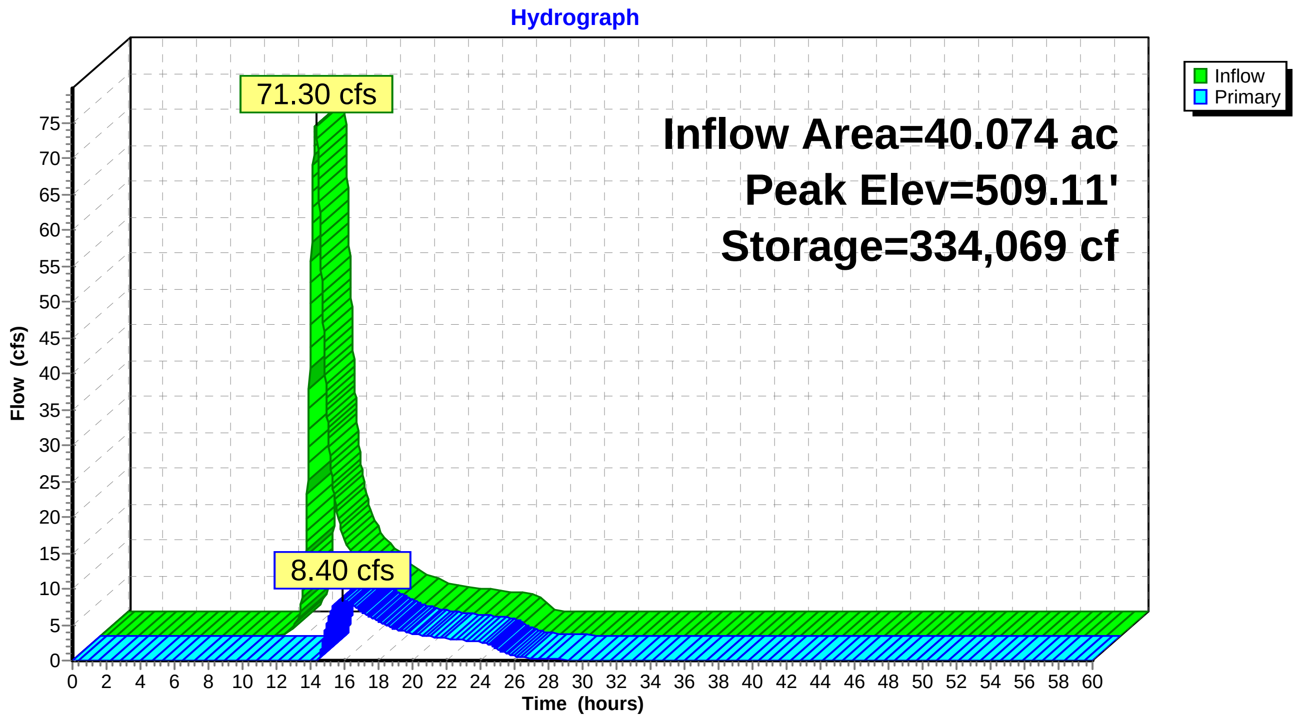
Volume	Invert	Avail.Storage	Storage Description
#1	506.70'	551,461 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
506.70	35,778	1,168.0	0	0	35,778
508.00	165,975	1,973.0	120,819	120,819	237,000
510.00	268,777	2,083.0	430,642	551,461	272,736

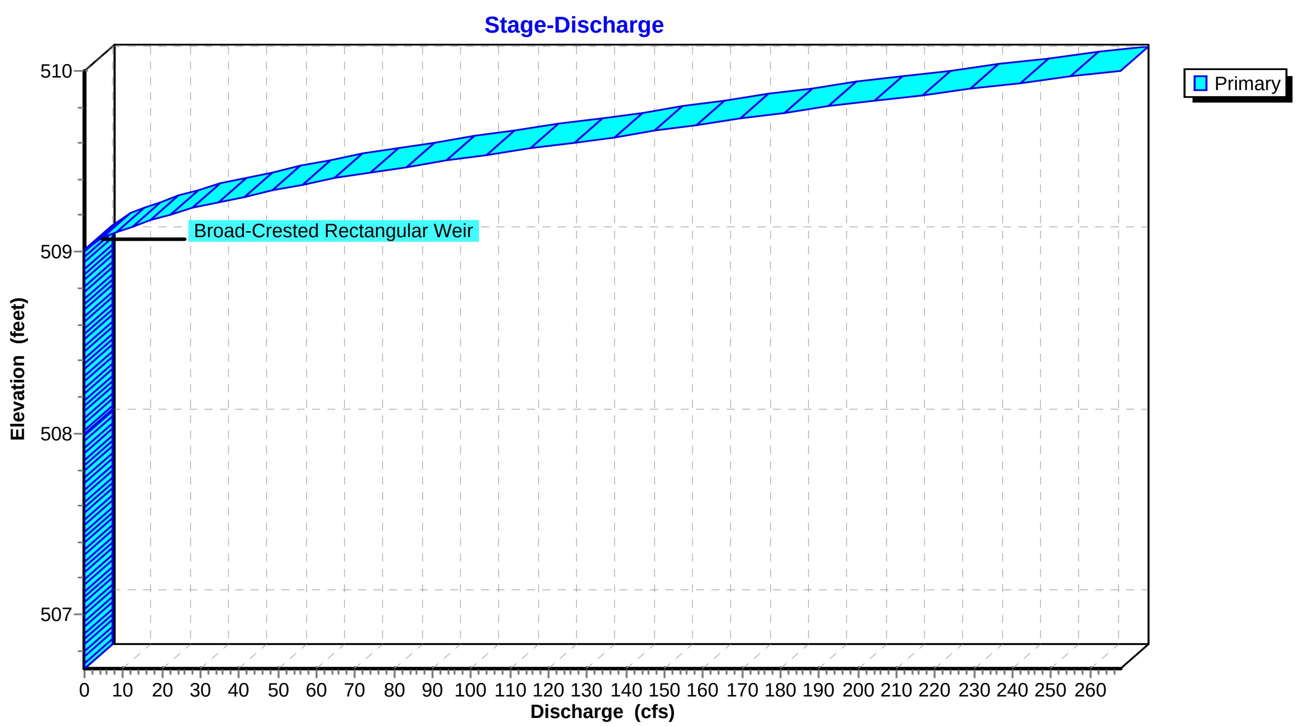
Device	Routing	Invert	Outlet Devices
#1	Primary	509.00'	**100.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=8.40 cfs @ 15.86 hrs HW=509.11' TW=0.00' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 8.40 cfs @ 0.77 fps)

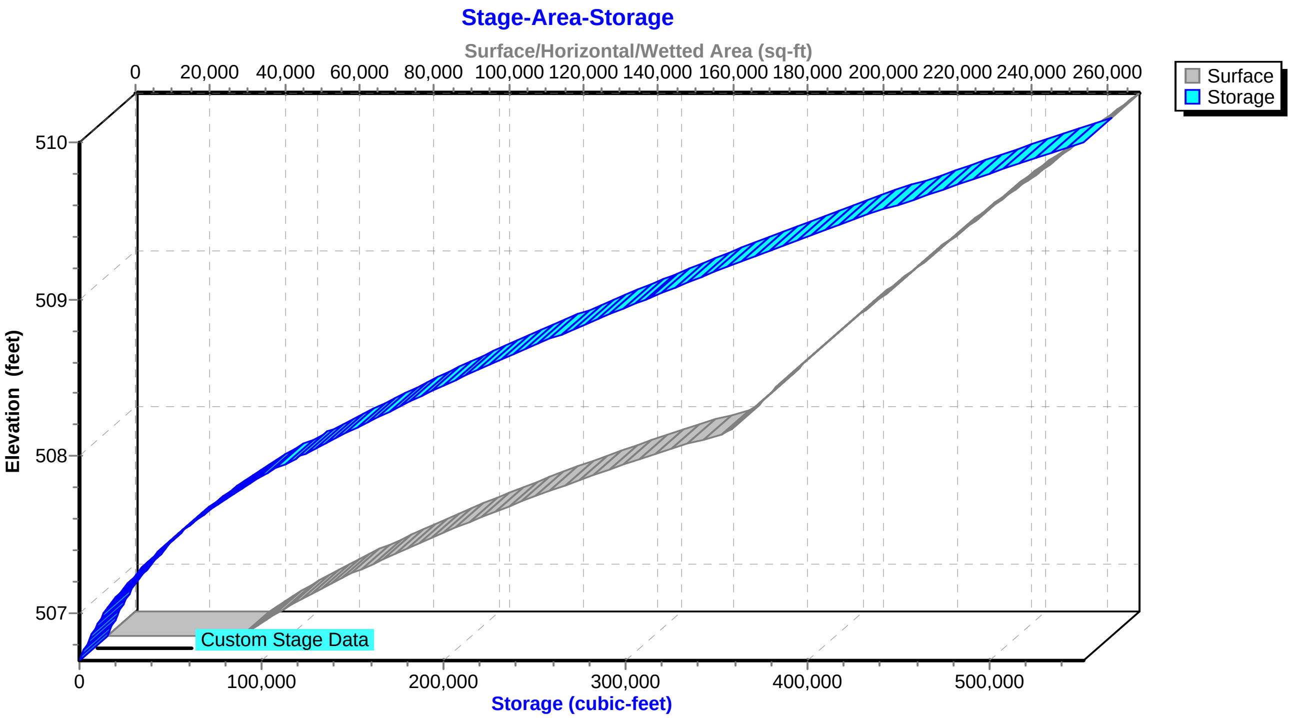
Pond 102C: Pond 102C



Pond 102C: Pond 102C



Pond 102C: Pond 102C



Summary for Pond 104A: Wetland D

Inflow Area =	29.922 ac,	5.68% Impervious, Inflow Depth = 1.34"	for 100-Year event
Inflow =	19.75 cfs @	12.45 hrs, Volume=	3.344 af
Outflow =	19.24 cfs @	12.53 hrs, Volume=	3.323 af, Atten= 3%, Lag= 4.4 min
Primary =	0.63 cfs @	12.53 hrs, Volume=	0.493 af
Secondary =	18.61 cfs @	12.53 hrs, Volume=	2.831 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 508.17' @ 12.53 hrs Surf.Area= 26,015 sf Storage= 10,904 cf

Plug-Flow detention time= 56.6 min calculated for 3.322 af (99% of inflow)
Center-of-Mass det. time= 53.9 min (985.7 - 931.7)

Volume	Invert	Avail.Storage	Storage Description
#1	507.70'	19,762 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

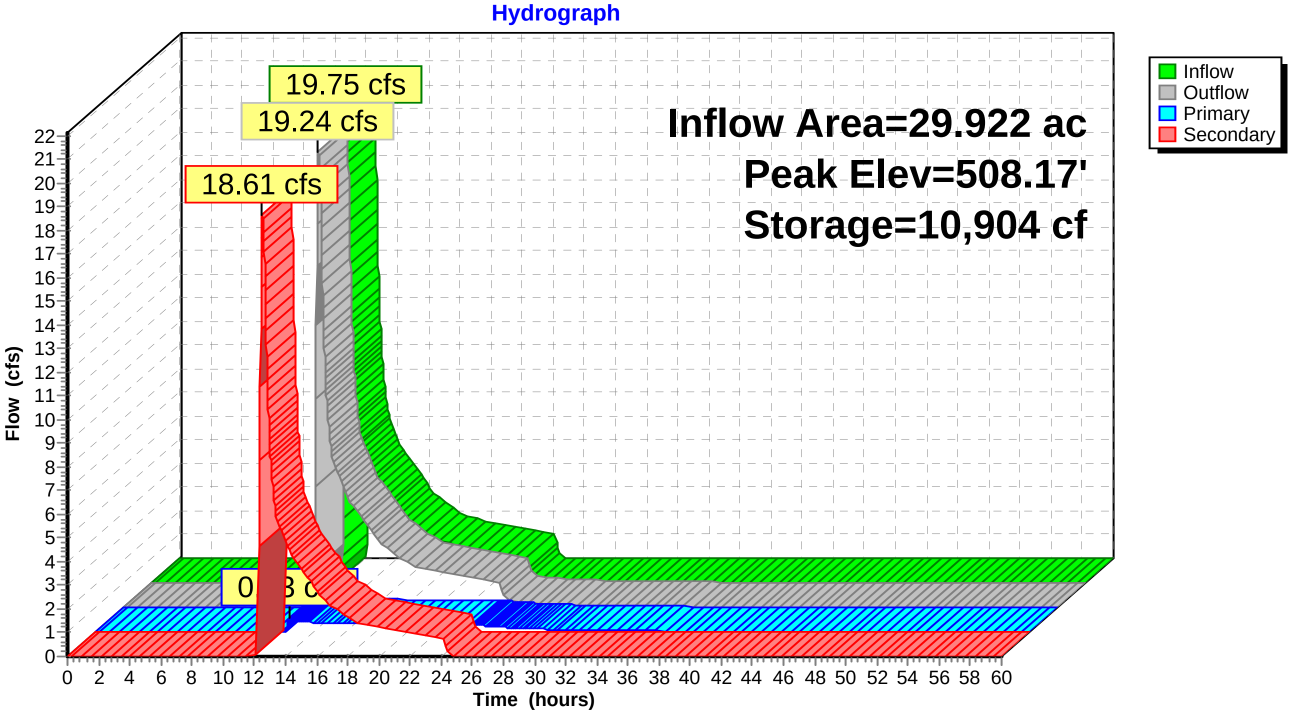
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
507.70	18,708	688.0	0	0	18,708
508.00	25,271	735.0	6,572	6,572	24,034
508.50	27,505	755.0	13,190	19,762	26,435

Device	Routing	Invert	Outlet Devices
#1	Primary	507.70'	**12.0" Round Culvert** L= 20.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 507.70' / 507.30' S= 0.0200 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf
#2	Secondary	508.00'	**100.0' long x 20.0' 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) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

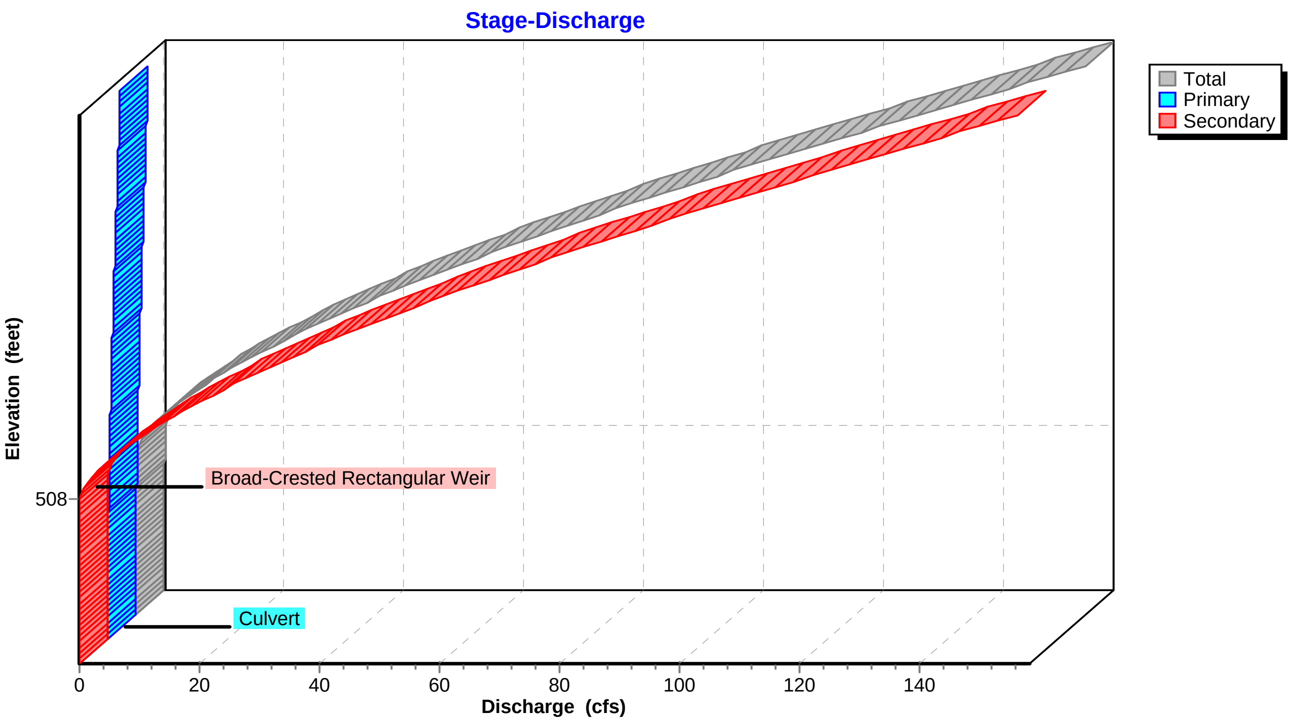
Primary OutFlow Max=0.63 cfs @ 12.53 hrs HW=508.17' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 0.63 cfs @ 2.54 fps)

Secondary OutFlow Max=18.60 cfs @ 12.53 hrs HW=508.17' TW=0.00' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 18.60 cfs @ 1.10 fps)

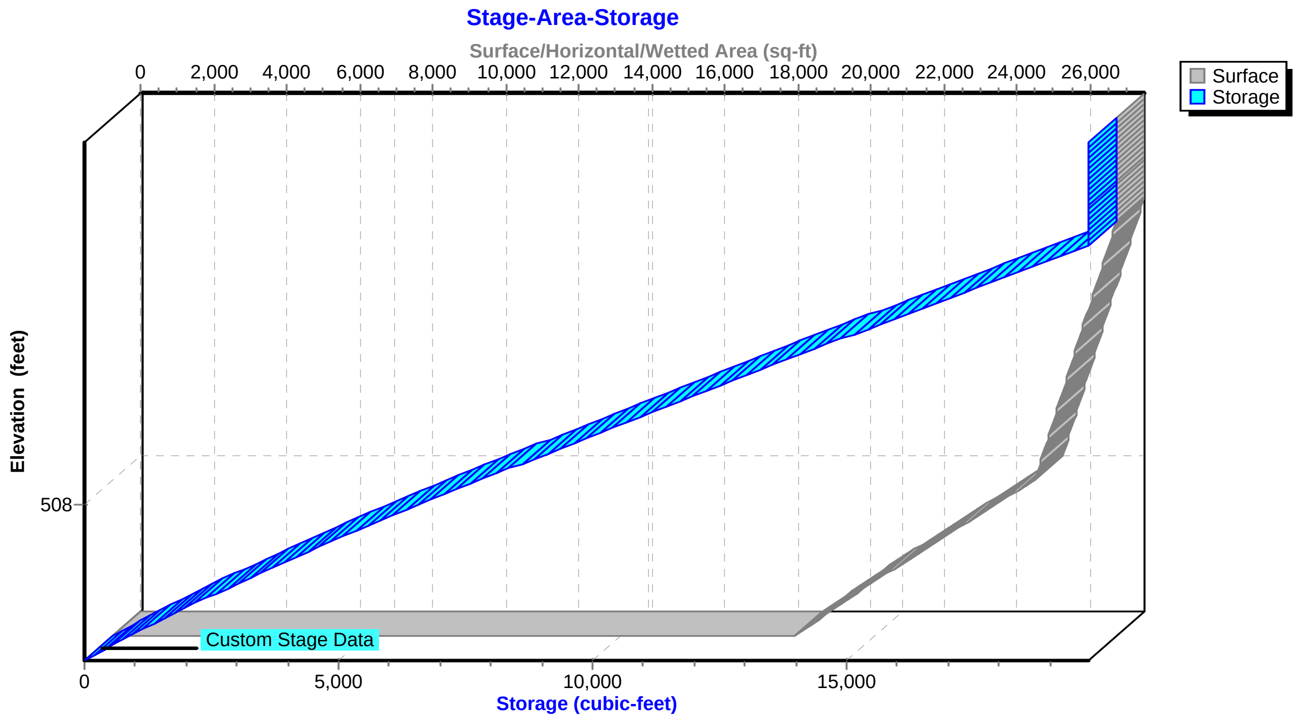
Pond 104A: Wetland D



Pond 104A: Wetland D



Pond 104A: Wetland D



Summary for Pond 105A: Wetland H

[62] Hint: Exceeded Reach 36" Pipe OUTLET depth by 3.65' @ 15.50 hrs

Inflow Area = 41.903 ac, 12.86% Impervious, Inflow Depth = 3.77" for 100-Year event
Inflow = 107.03 cfs @ 12.32 hrs, Volume= 13.162 af
Outflow = 106.52 cfs @ 12.35 hrs, Volume= 13.146 af, Atten= 0%, Lag= 1.4 min
Primary = 11.12 cfs @ 12.35 hrs, Volume= 7.765 af
Secondary = 95.40 cfs @ 12.35 hrs, Volume= 5.380 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 575.36' @ 12.35 hrs Surf.Area= 32,500 sf Storage= 68,605 cf

Plug-Flow detention time= 61.1 min calculated for 13.146 af (100% of inflow)
Center-of-Mass det. time= 60.3 min (923.4 - 863.1)

Volume	Invert	Avail.Storage	Storage Description
#1	572.90'	73,215 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

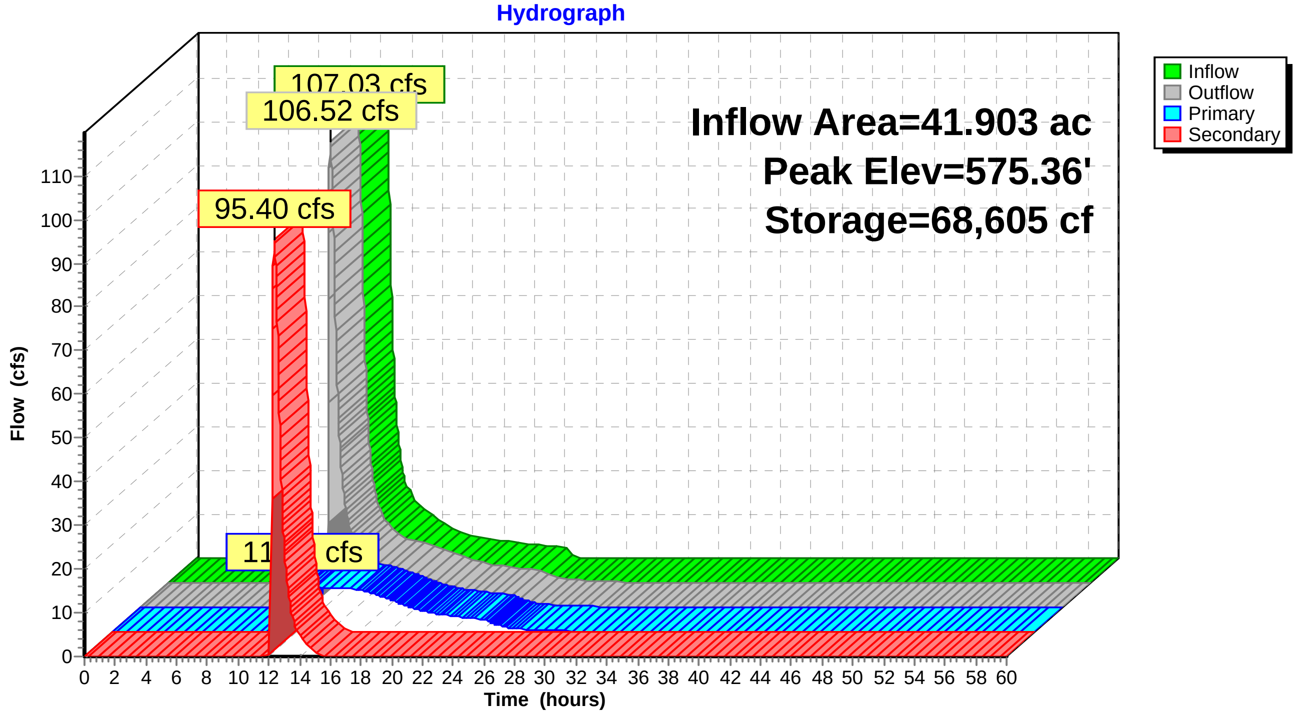
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
572.90	21,891	815.0	0	0	21,891
574.00	27,791	848.0	27,261	27,261	26,353
575.00	31,858	892.0	29,801	57,062	32,507
575.50	32,755	899.0	16,153	73,215	33,601

Device	Routing	Invert	Outlet Devices
#1	Primary	572.90'	**18.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 572.90' / 572.00' S= 0.0450 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 1.77 sf
#2	Secondary	575.00'	**180.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

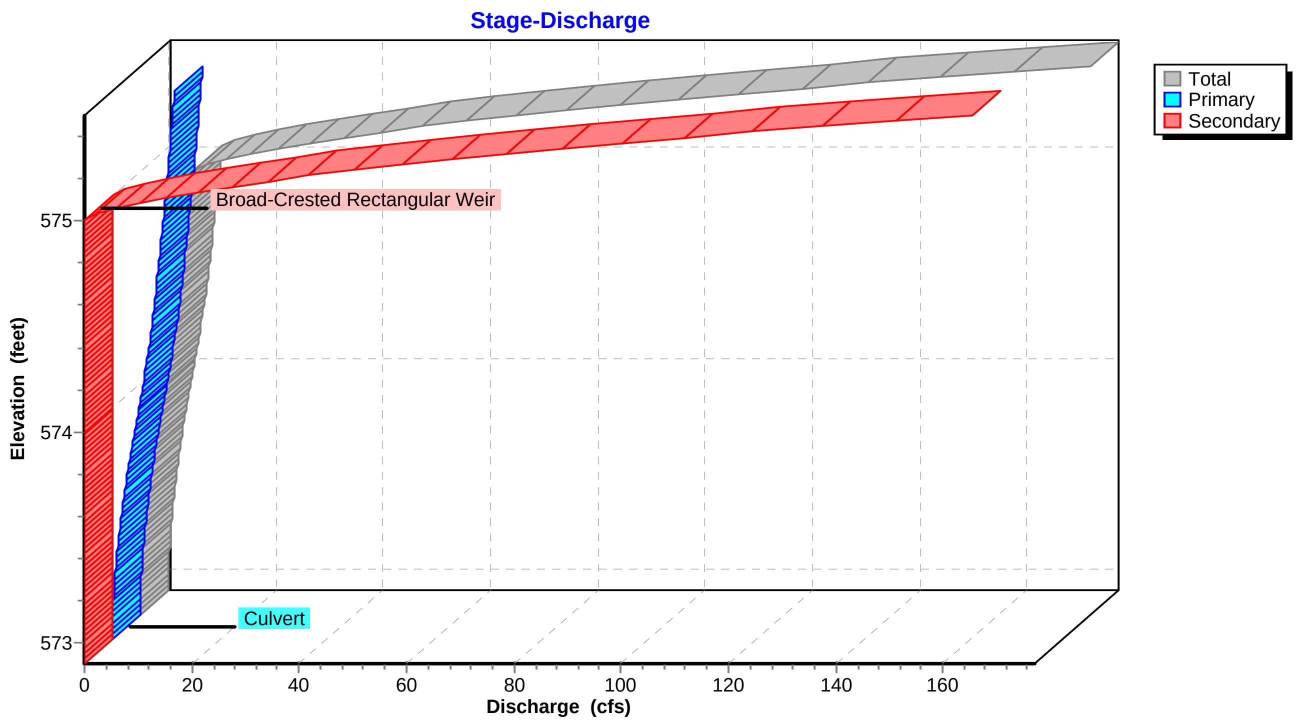
Primary OutFlow Max=11.12 cfs @ 12.35 hrs HW=575.36' TW=568.09' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 11.12 cfs @ 6.29 fps)

Secondary OutFlow Max=95.30 cfs @ 12.35 hrs HW=575.36' TW=568.09' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 95.30 cfs @ 1.48 fps)

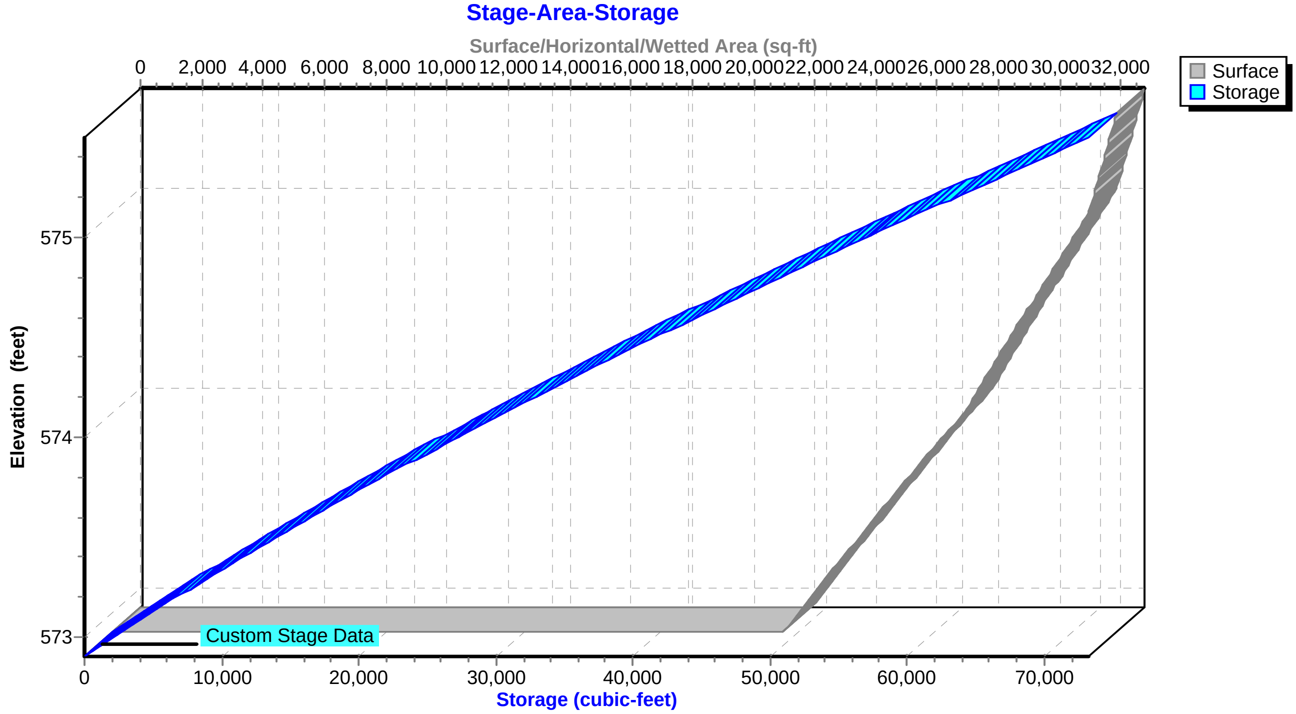
Pond 105A: Wetland H



Pond 105A: Wetland H



Pond 105A: Wetland H



Summary for Pond 106A: 36" Culvert

Inflow Area = 15.381 ac, 16.84% Impervious, Inflow Depth = 5.16" for 100-Year event
Inflow = 48.77 cfs @ 12.38 hrs, Volume= 6.609 af
Outflow = 48.77 cfs @ 12.38 hrs, Volume= 6.609 af, Atten= 0%, Lag= 0.2 min
Primary = 48.77 cfs @ 12.38 hrs, Volume= 6.609 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 720.25' @ 12.38 hrs Surf.Area= 146 sf Storage= 173 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (851.7 - 851.7)

Volume	Invert	Avail.Storage	Storage Description
#1	716.70'	9,700 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

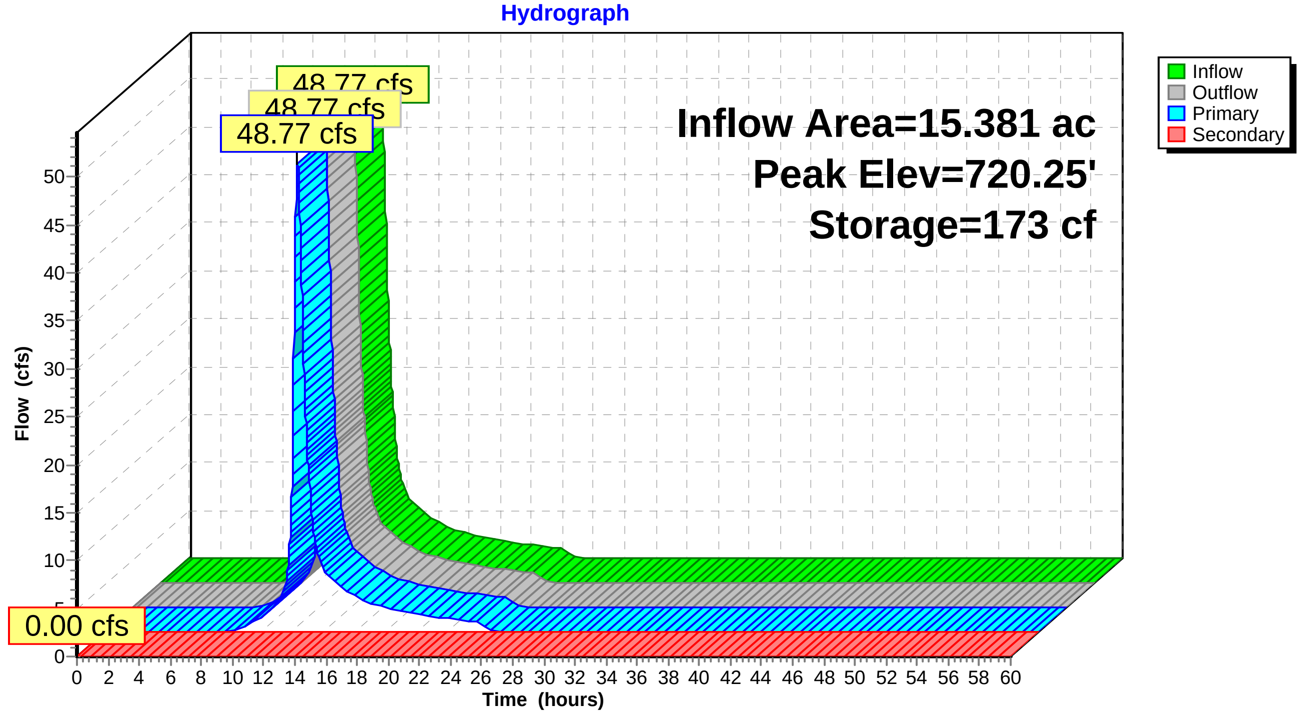
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
716.70	0	0.0	0	0	0
728.00	1,478	185.0	5,567	5,567	2,917
730.00	2,717	256.0	4,133	9,700	5,448

Device	Routing	Invert	Outlet Devices
#1	Primary	716.70'	**36.0" Round Culvert** L= 133.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 716.70' / 686.00' S= 0.2308 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	728.00'	**8.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

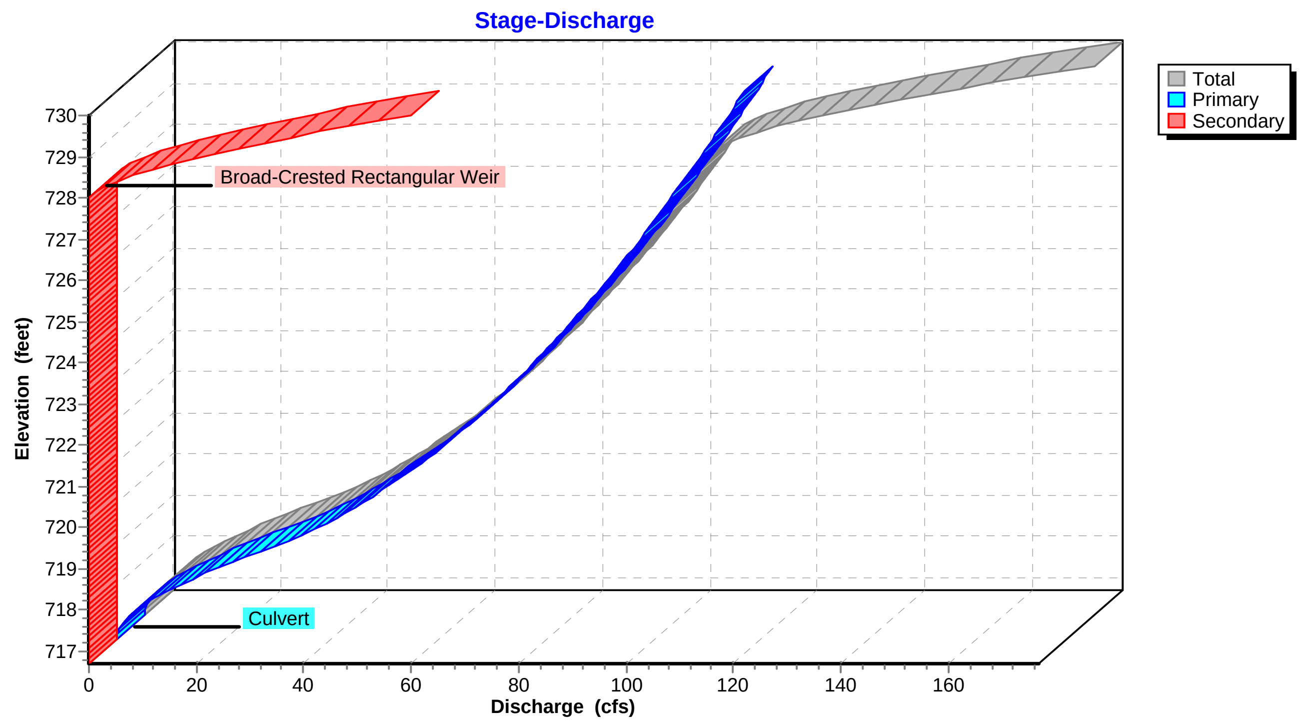
Primary OutFlow Max=48.77 cfs @ 12.38 hrs HW=720.25' TW=636.17' (Dynamic Tailwater)
↑—**1=Culvert** (Inlet Controls 48.77 cfs @ 6.90 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=716.70' TW=635.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

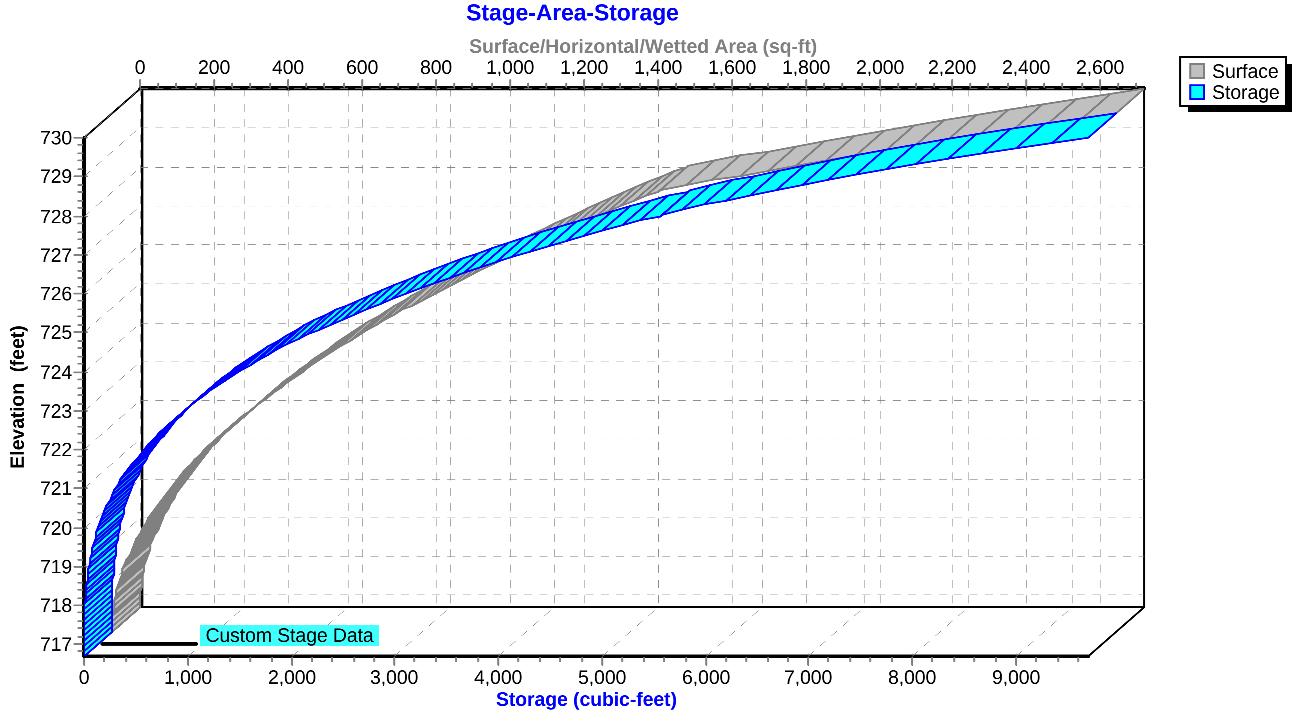
Pond 106A: 36" Culvert



Pond 106A: 36" Culvert



Pond 106A: 36" Culvert



Summary for Pond 106B: Wetland J

Inflow Area = 118.111 ac, 1.03% Impervious, Inflow Depth = 4.87" for 100-Year event
Inflow = 214.98 cfs @ 13.14 hrs, Volume= 47.947 af
Outflow = 214.87 cfs @ 13.15 hrs, Volume= 47.947 af, Atten= 0%, Lag= 0.7 min
Primary = 214.87 cfs @ 13.15 hrs, Volume= 47.947 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 527.22' @ 13.15 hrs Surf.Area= 12,660 sf Storage= 25,661 cf

Plug-Flow detention time= 6.6 min calculated for 47.947 af (100% of inflow)
Center-of-Mass det. time= 6.3 min (901.9 - 895.6)

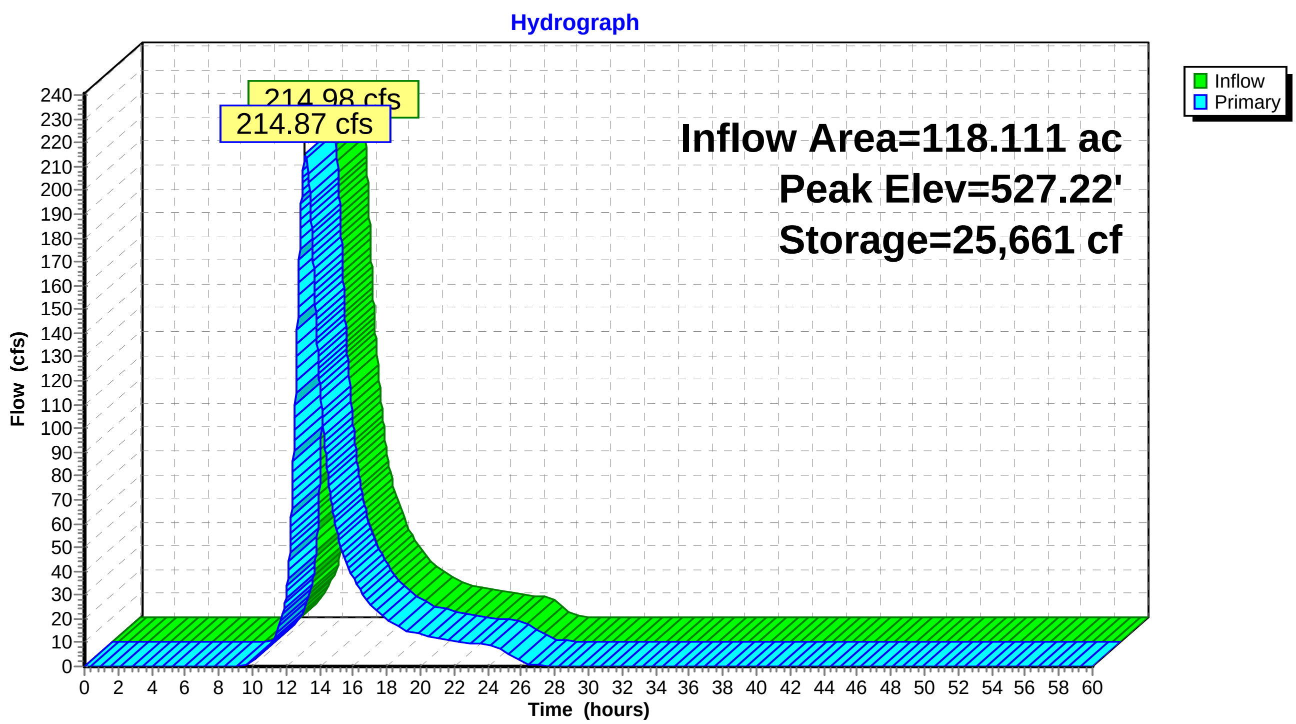
Volume	Invert	Avail.Storage	Storage Description
#1	524.70'	35,483 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
524.70	6,700	344.0	0	0	6,700
526.00	10,653	430.0	11,181	11,181	12,021
527.00	12,660	461.0	11,642	22,823	14,264
528.00	12,660	461.0	12,660	35,483	14,725

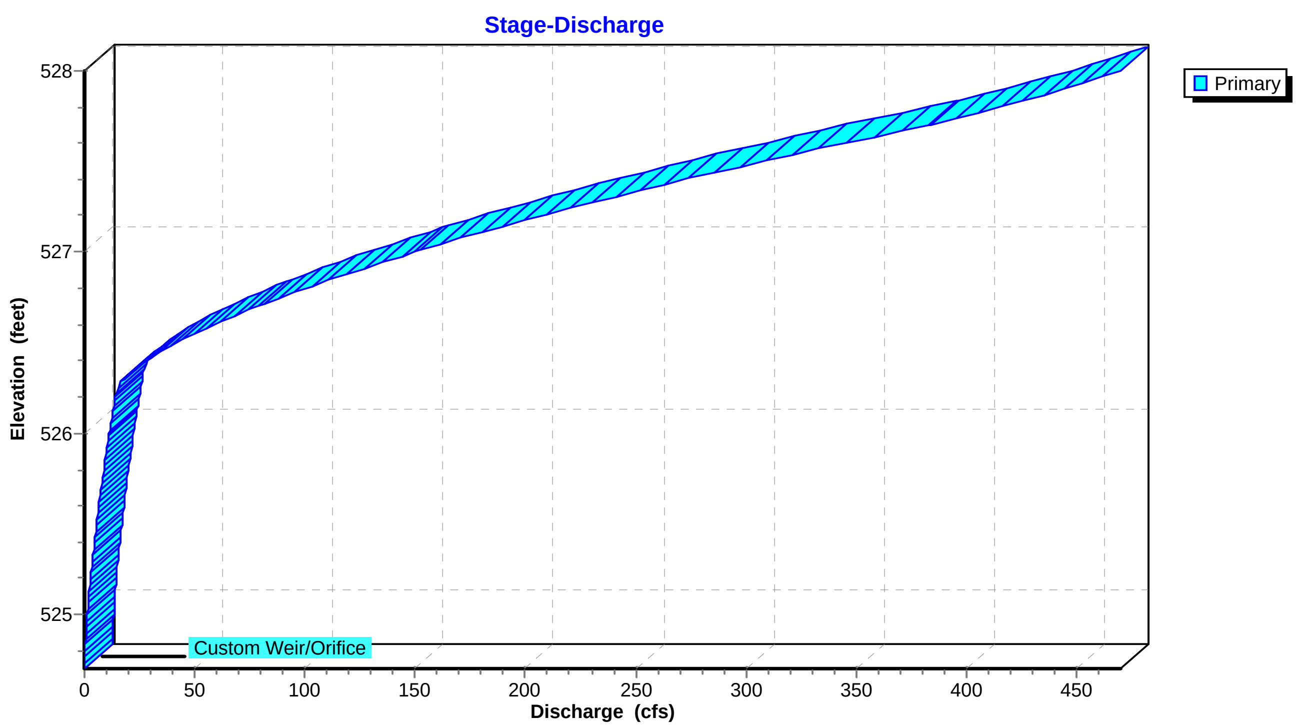
Device	Routing	Invert	Outlet Devices
#1	Primary	524.70'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 1.50 1.60 2.00 3.00 Width (feet) 2.33 2.33 60.00 60.00 70.00

Primary OutFlow Max=214.83 cfs @ 13.15 hrs HW=527.22' TW=518.69' (Dynamic Tailwater)
└─**1=Custom Weir/Orifice** (Weir Controls 214.83 cfs @ 3.39 fps)

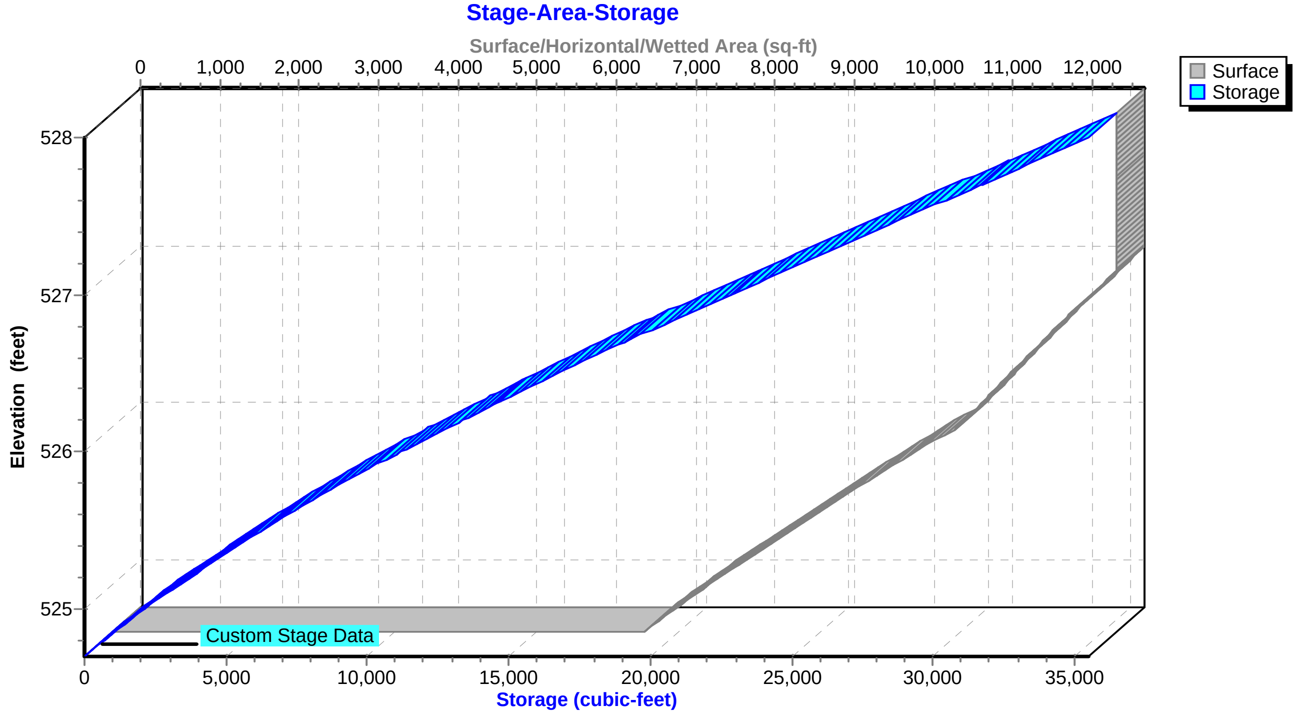
Pond 106B: Wetland J



Pond 106B: Wetland J



Pond 106B: Wetland J



Summary for Pond 107A: 24" Culvert

[90] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 95.412 ac, 4.86% Impervious, Inflow Depth = 4.59" for 100-Year event
Inflow = 198.70 cfs @ 12.82 hrs, Volume= 36.504 af
Outflow = 198.71 cfs @ 12.82 hrs, Volume= 36.504 af, Atten= 0%, Lag= 0.2 min
Primary = 45.08 cfs @ 12.82 hrs, Volume= 22.847 af
Secondary = 153.63 cfs @ 12.82 hrs, Volume= 13.658 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 626.48' @ 12.82 hrs Surf.Area= 1,681 sf Storage= 3,858 cf

Plug-Flow detention time= 0.4 min calculated for 36.492 af (100% of inflow)
Center-of-Mass det. time= 0.4 min (887.7 - 887.3)

Volume	Invert	Avail.Storage	Storage Description
#1	619.60'	13,340 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

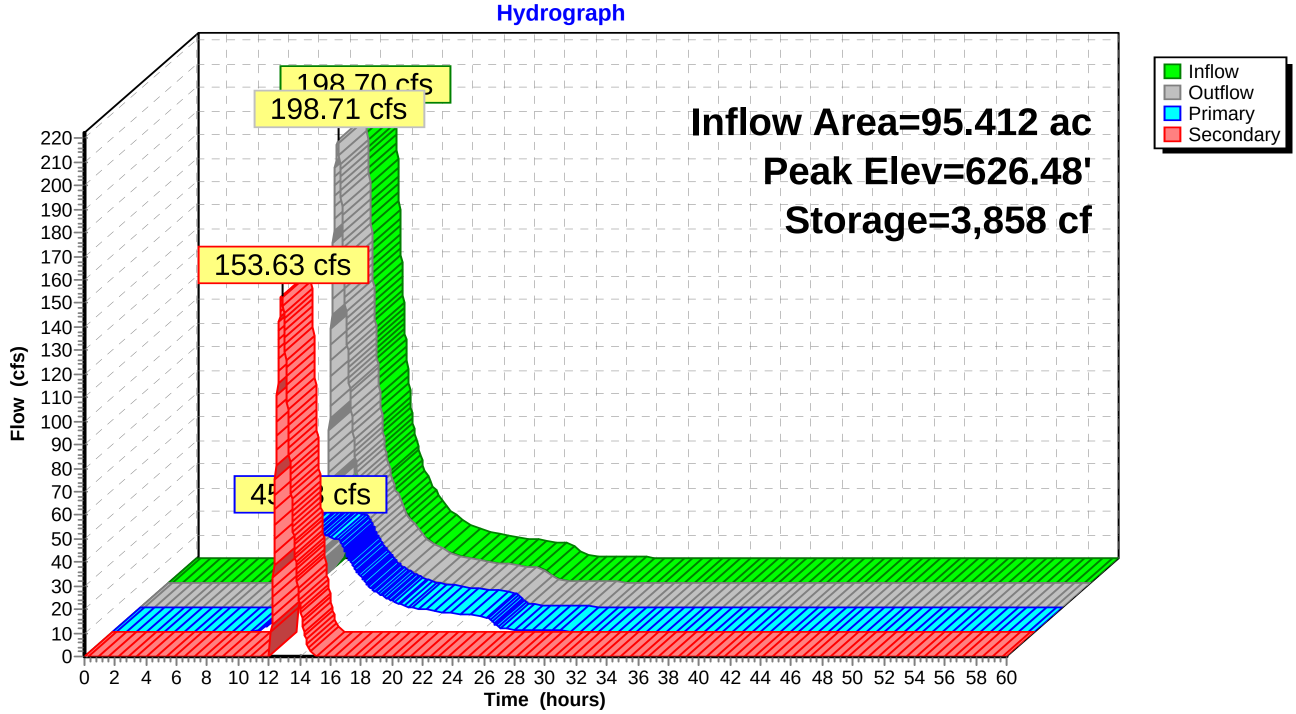
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
619.60	0	0.0	0	0	0
626.00	1,453	185.0	3,100	3,100	2,787
628.00	2,500	275.0	3,906	7,006	6,114
630.00	3,885	330.0	6,334	13,340	8,830

Device	Routing	Invert	Outlet Devices
#1	Primary	619.80'	**24.0" Round Culvert** L= 145.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 619.80' / 607.40' S= 0.0855 '/' Cc= 0.900 n= 0.010, Flow Area= 3.14 sf
#2	Secondary	625.00'	**25.0' long x 5.0' breadth Broad-Crested Rectangular Weir X 0.00** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88
#3	Secondary	625.00'	**Custom Weir/Orifice, Cv= 2.62 (C= 3.28)** Head (feet) 0.00 0.50 1.00 1.50 2.00 2.50 3.00 Width (feet) 20.00 25.00 30.00 35.00 40.00 45.00 50.00

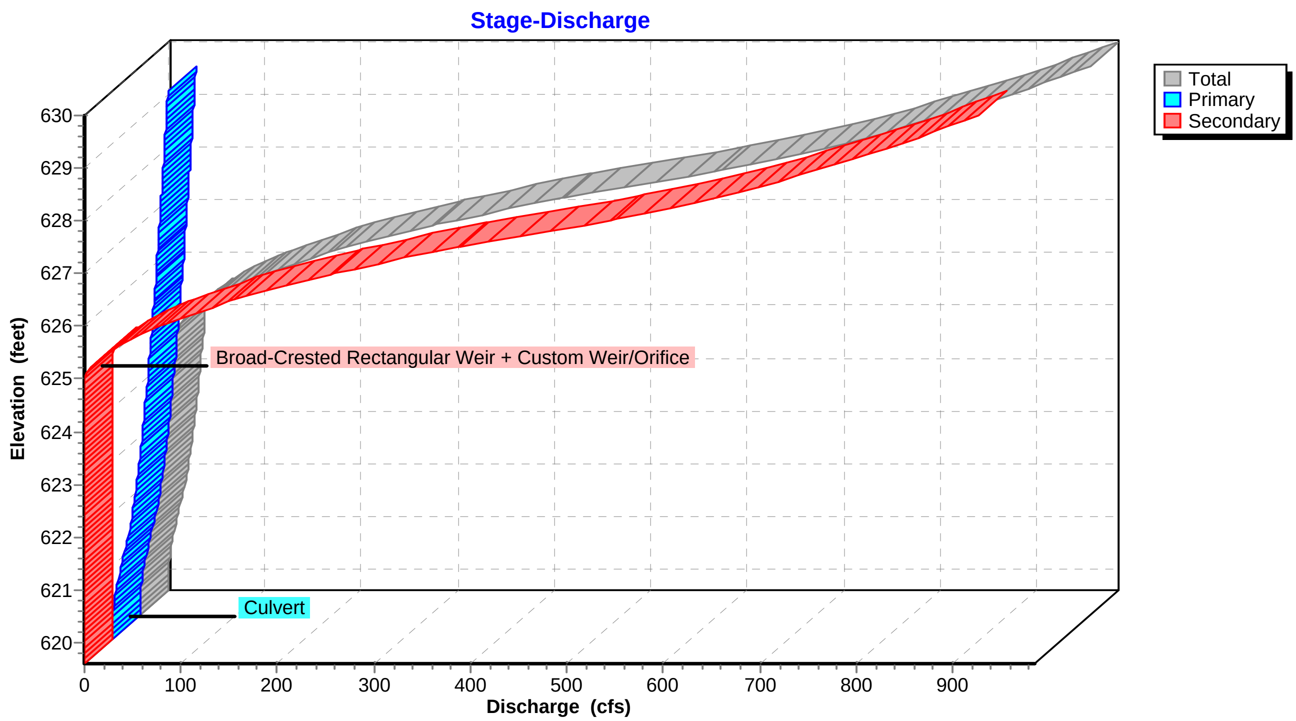
Primary OutFlow Max=45.08 cfs @ 12.82 hrs HW=626.48' TW=604.06' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 45.08 cfs @ 14.35 fps)

Secondary OutFlow Max=153.62 cfs @ 12.82 hrs HW=626.48' TW=613.51' (Dynamic Tailwater)
├─**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└─**3=Custom Weir/Orifice** (Weir Controls 153.62 cfs @ 3.77 fps)

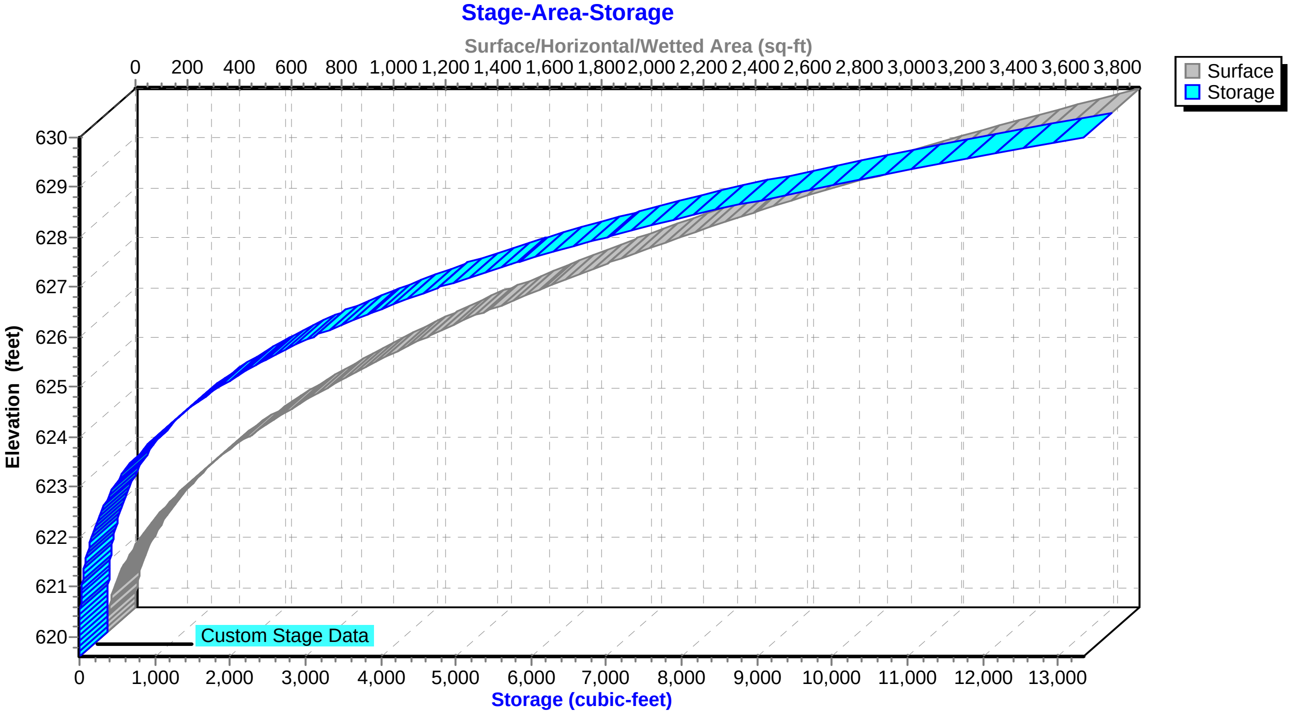
Pond 107A: 24" Culvert



Pond 107A: 24" Culvert



Pond 107A: 24" Culvert



Summary for Pond 107B: Wetland

Inflow Area = 14.330 ac, 0.00% Impervious, Inflow Depth = 5.00" for 100-Year event
Inflow = 43.23 cfs @ 12.51 hrs, Volume= 5.972 af
Outflow = 31.60 cfs @ 12.80 hrs, Volume= 5.696 af, Atten= 27%, Lag= 17.3 min
Primary = 31.60 cfs @ 12.80 hrs, Volume= 5.696 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 973.04' @ 12.80 hrs Surf.Area= 126,505 sf Storage= 66,447 cf

Plug-Flow detention time= 83.5 min calculated for 5.694 af (95% of inflow)
Center-of-Mass det. time= 58.4 min (907.1 - 848.7)

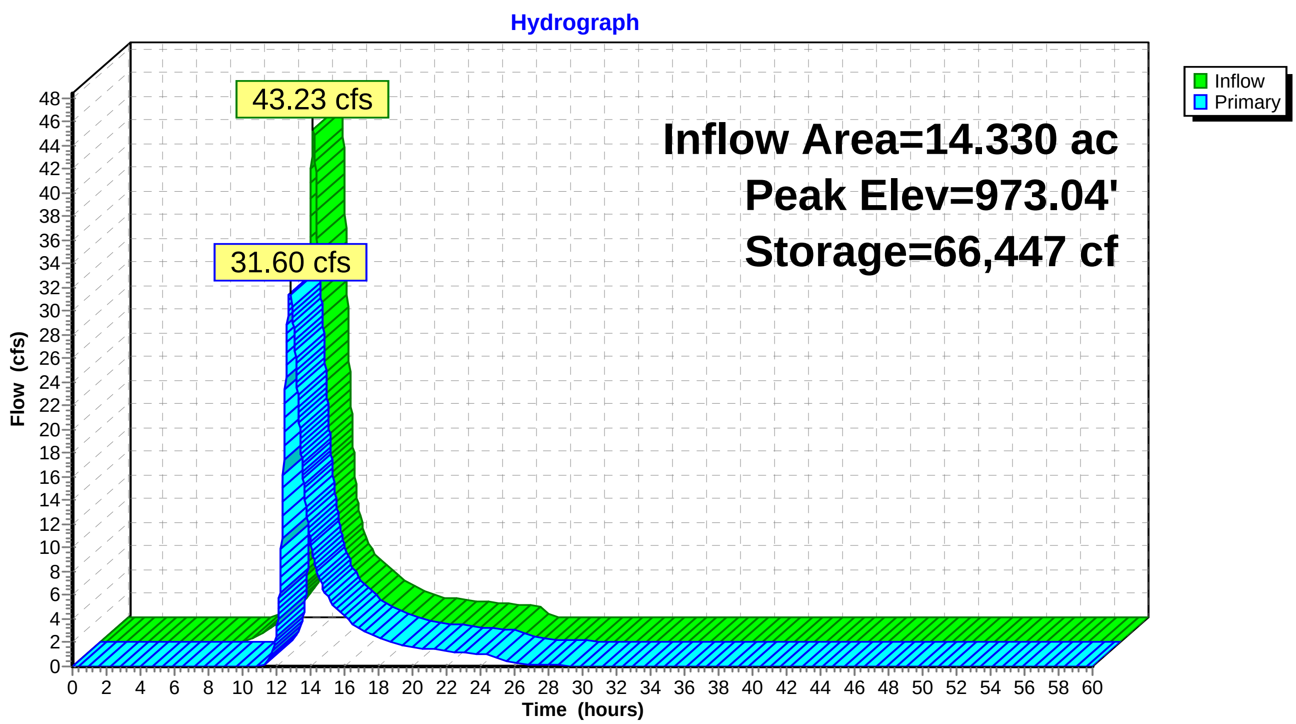
Volume	Invert	Avail.Storage	Storage Description
#1	972.50'	194,134 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
972.50	119,286	2,006.0	0	0	119,286
974.00	139,831	2,145.0	194,134	194,134	165,307

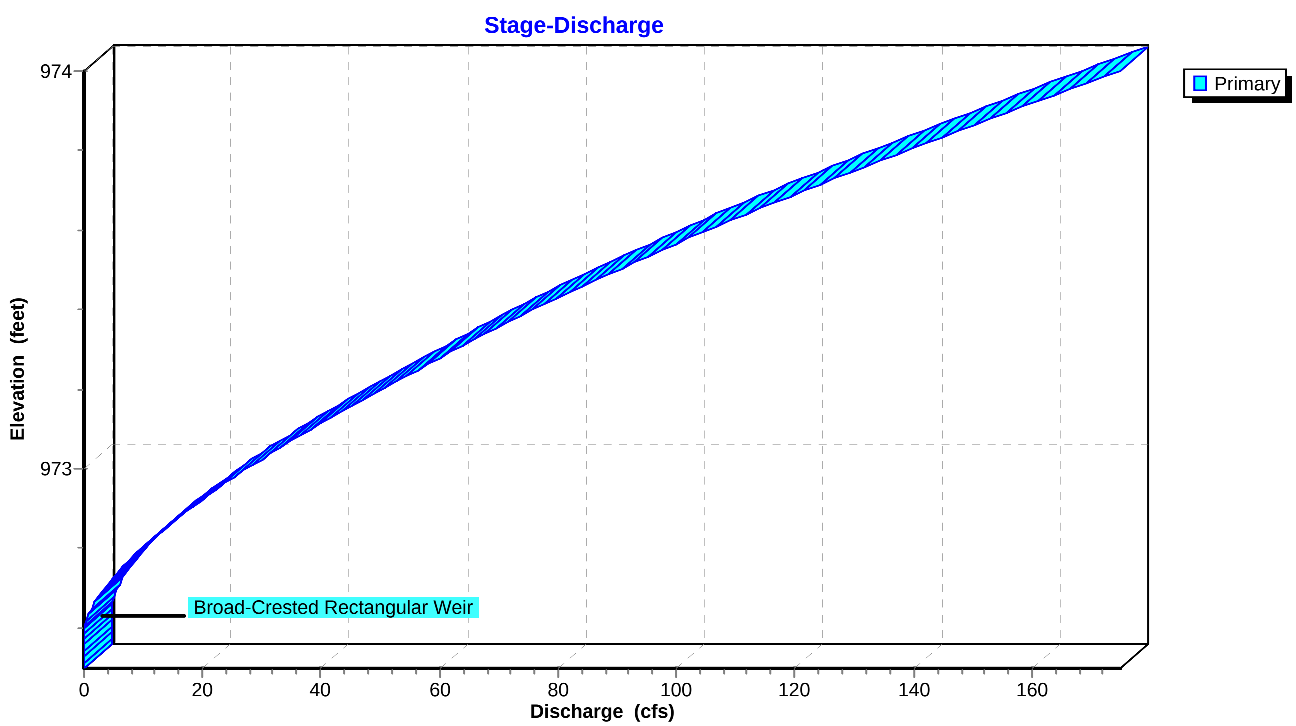
Device	Routing	Invert	Outlet Devices
#1	Primary	972.60'	**40.0' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=31.60 cfs @ 12.80 hrs HW=973.04' TW=972.43' (Dynamic Tailwater)
└─**1=Broad-Crested Rectangular Weir** (Weir Controls 31.60 cfs @ 1.79 fps)

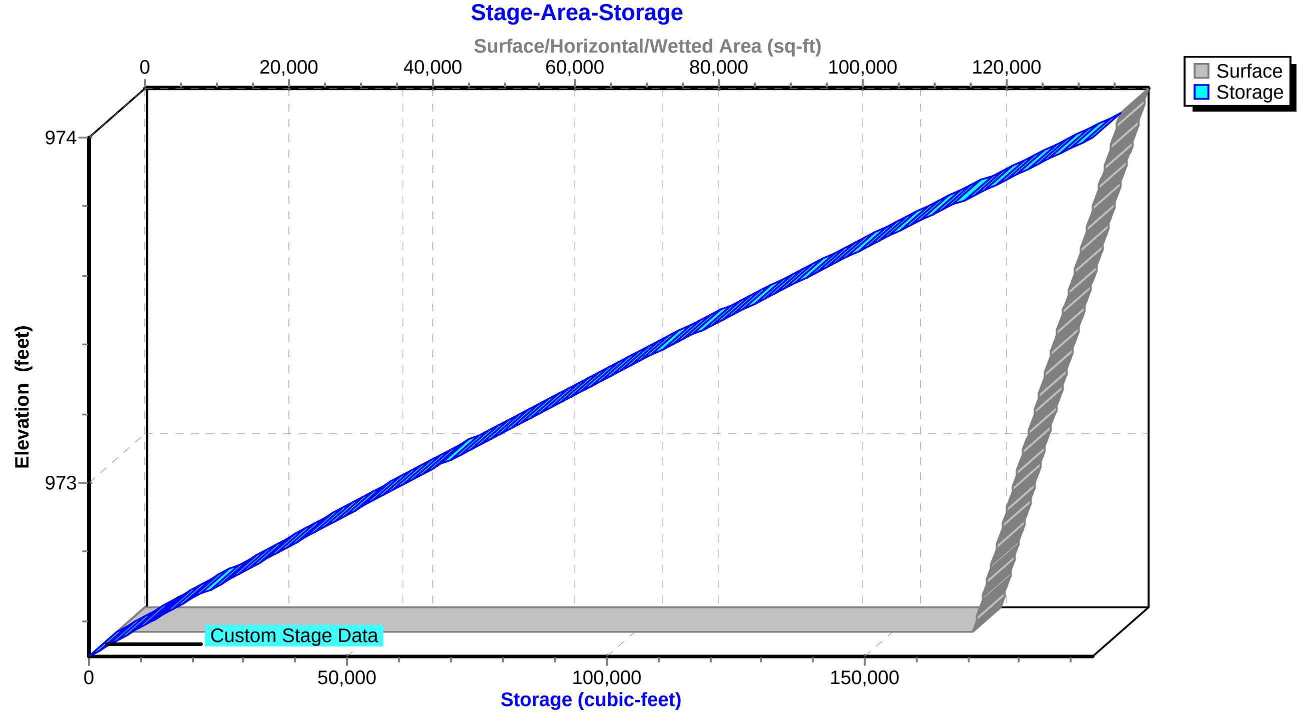
Pond 107B: Wetland



Pond 107B: Wetland



Pond 107B: Wetland



Summary for Pond 108A: 36" Culvert

Inflow Area = 5.527 ac, 2.32% Impervious, Inflow Depth = 32.13" for 100-Year event
Inflow = 158.84 cfs @ 12.82 hrs, Volume= 14.799 af
Outflow = 158.83 cfs @ 12.82 hrs, Volume= 14.799 af, Atten= 0%, Lag= 0.0 min
Primary = 60.96 cfs @ 12.82 hrs, Volume= 9.062 af
Secondary = 97.86 cfs @ 12.82 hrs, Volume= 5.737 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 613.51' @ 12.82 hrs Surf.Area= 781 sf Storage= 292 cf

Plug-Flow detention time= 0.4 min calculated for 14.799 af (100% of inflow)
Center-of-Mass det. time= 0.0 min (791.3 - 791.3)

Volume	Invert	Avail.Storage	Storage Description
#1	608.80'	26,148 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

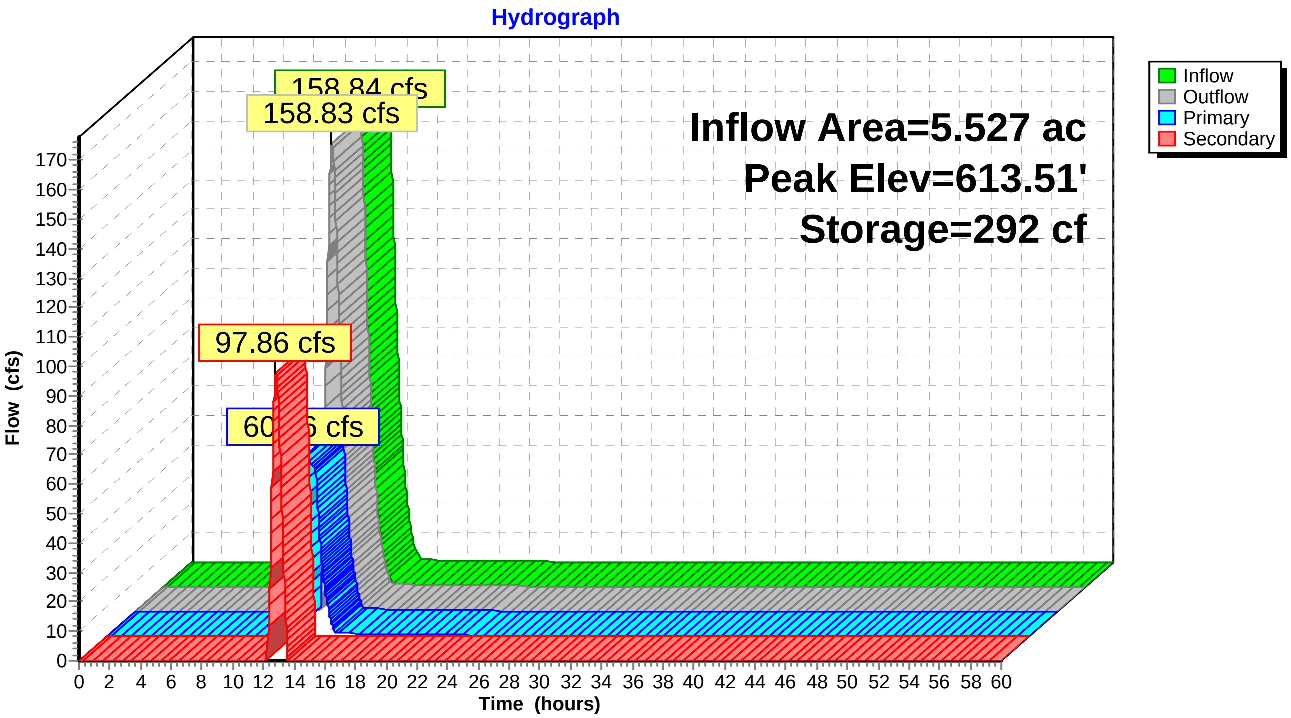
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
608.80	13	13.0	0	0	13
612.70	13	13.0	51	51	64
614.00	1,828	415.0	865	915	13,758
616.00	7,012	545.0	8,280	9,195	23,736
618.00	10,030	620.0	16,952	26,148	30,786

Device	Routing	Invert	Outlet Devices
#1	Primary	608.80'	**36.0" Round Culvert** L= 45.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 608.80' / 606.90' S= 0.0422 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 7.07 sf
#2	Secondary	613.00'	**100.0' long x 24.0' 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) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

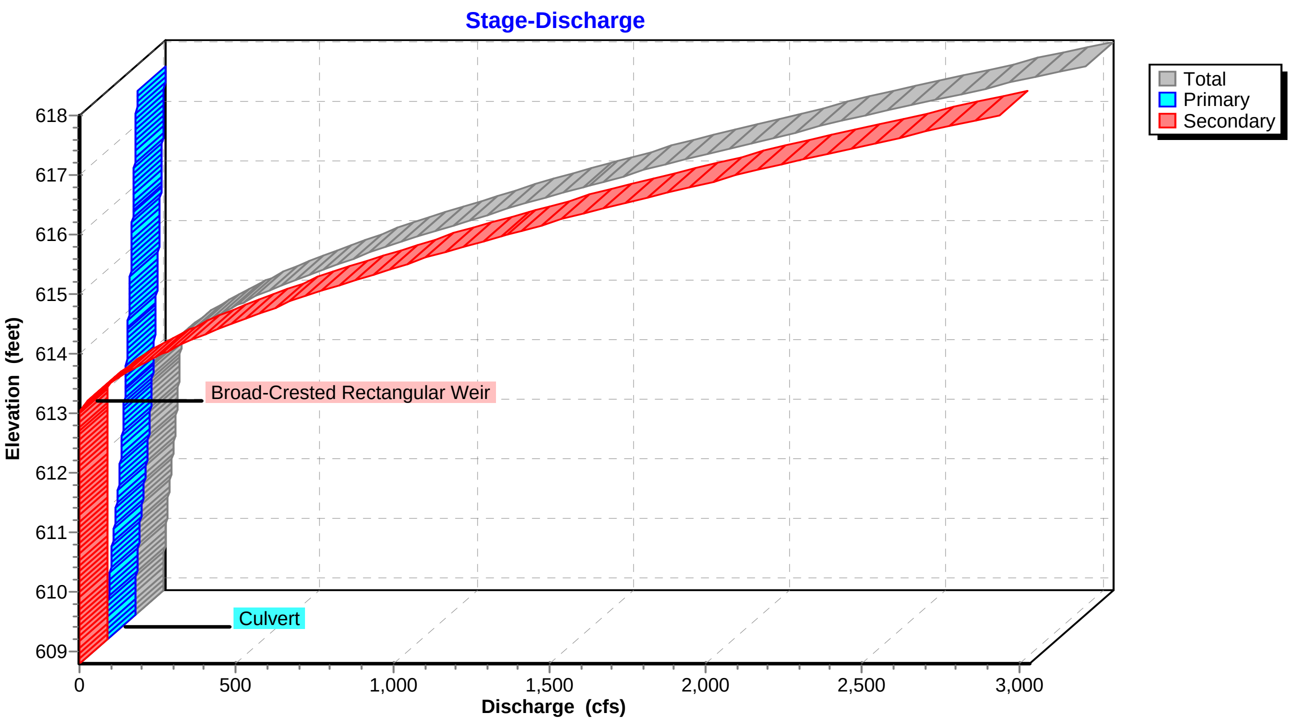
Primary OutFlow Max=60.96 cfs @ 12.82 hrs HW=613.51' TW=604.06' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 60.96 cfs @ 8.62 fps)

Secondary OutFlow Max=97.80 cfs @ 12.82 hrs HW=613.51' TW=604.06' (Dynamic Tailwater)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 97.80 cfs @ 1.92 fps)

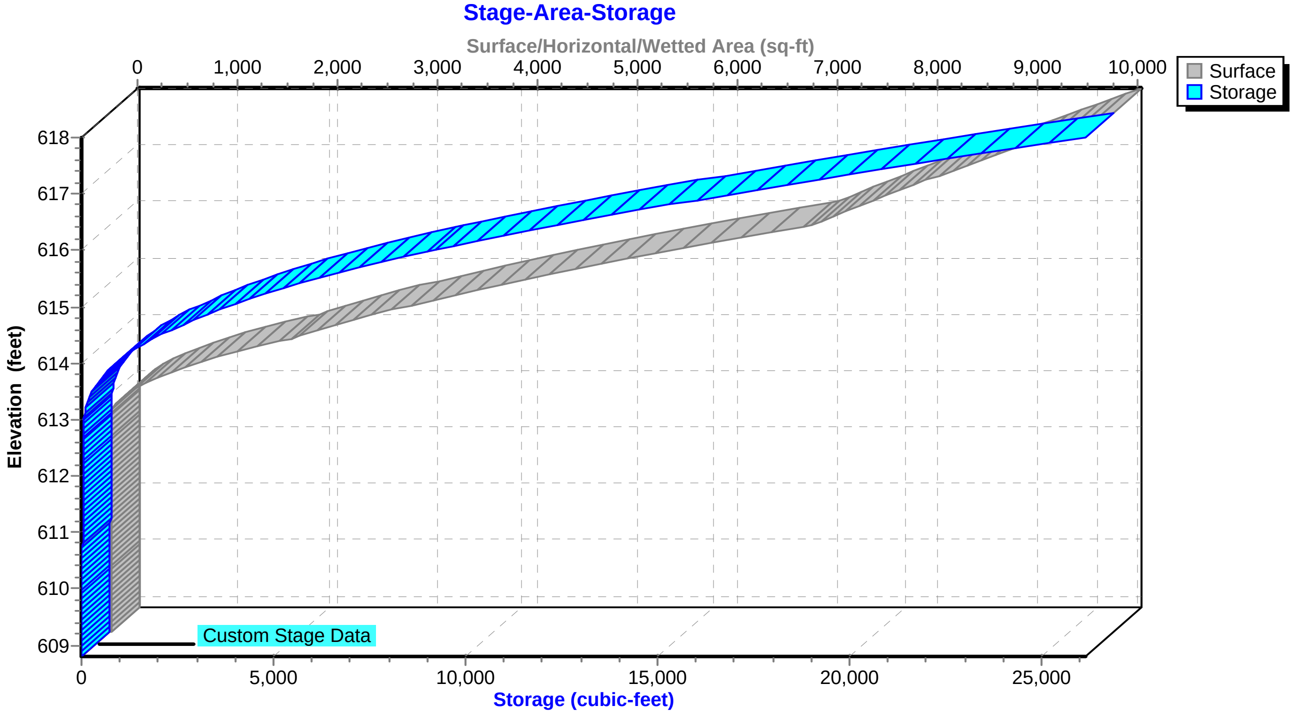
Pond 108A: 36" Culvert



Pond 108A: 36" Culvert



Pond 108A: 36" Culvert



Summary for Pond SWM 7A: SWM 7A (Phase 1)

Inflow Area = 1.000 ac, 0.00% Impervious, Inflow Depth = 5.00" for 100-Year event
Inflow = 5.65 cfs @ 12.11 hrs, Volume= 0.417 af
Outflow = 4.56 cfs @ 12.17 hrs, Volume= 0.417 af, Atten= 19%, Lag= 4.1 min
Primary = 4.56 cfs @ 12.17 hrs, Volume= 0.417 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 811.41' @ 12.17 hrs Surf.Area= 3,016 sf Storage= 3,299 cf

Plug-Flow detention time= 30.5 min calculated for 0.417 af (100% of inflow)
Center-of-Mass det. time= 30.2 min (850.8 - 820.5)

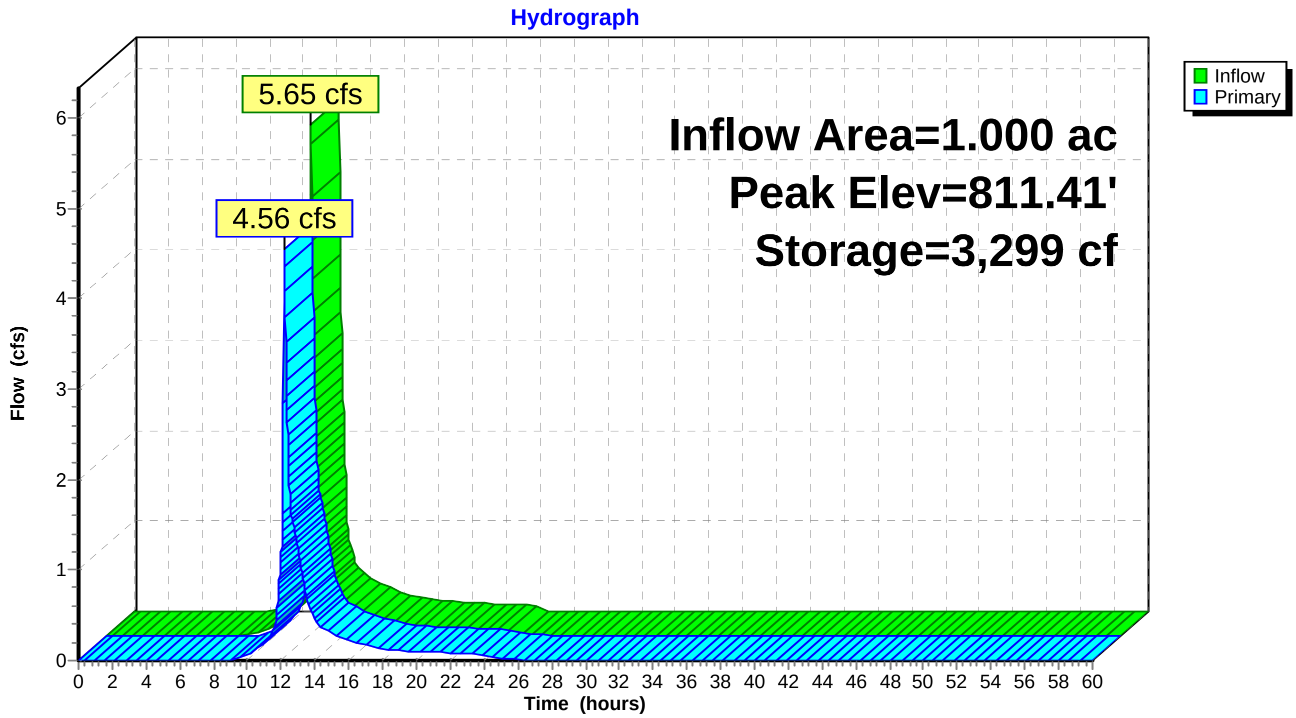
Volume	Invert	Avail.Storage	Storage Description
#1	810.00'	5,238 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
810.00	1,656	0	0
812.00	3,582	5,238	5,238

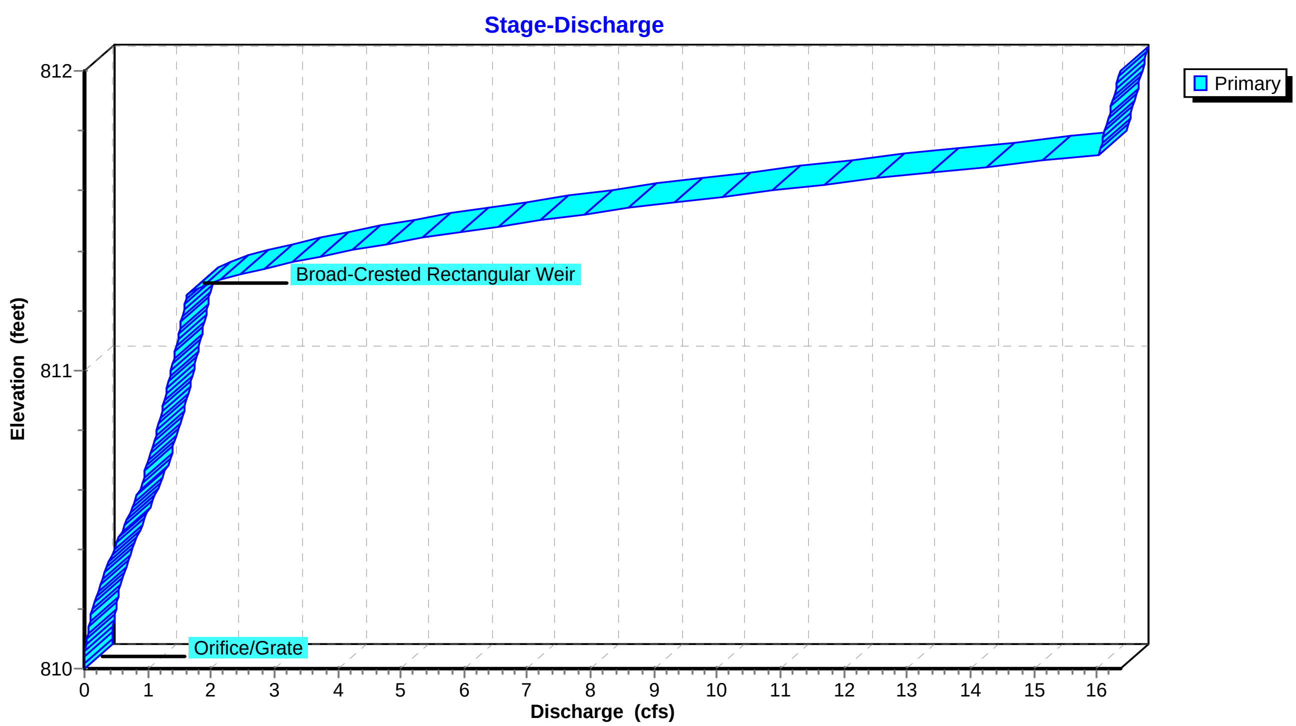
Device	Routing	Invert	Outlet Devices
#1	Primary	805.00'	**15.0" Round Culvert** L= 40.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 805.00' / 804.00' S= 0.0250 '/' Cc= 0.900 n= 0.015, Flow Area= 1.23 sf
#2	Device 1	810.00'	**8.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	811.25'	**16.0' long x 1.0' 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=4.53 cfs @ 12.17 hrs HW=811.41' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 4.53 cfs of 15.64 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.75 cfs @ 5.00 fps)
  └─**3=Broad-Crested Rectangular Weir** (Weir Controls 2.79 cfs @ 1.08 fps)

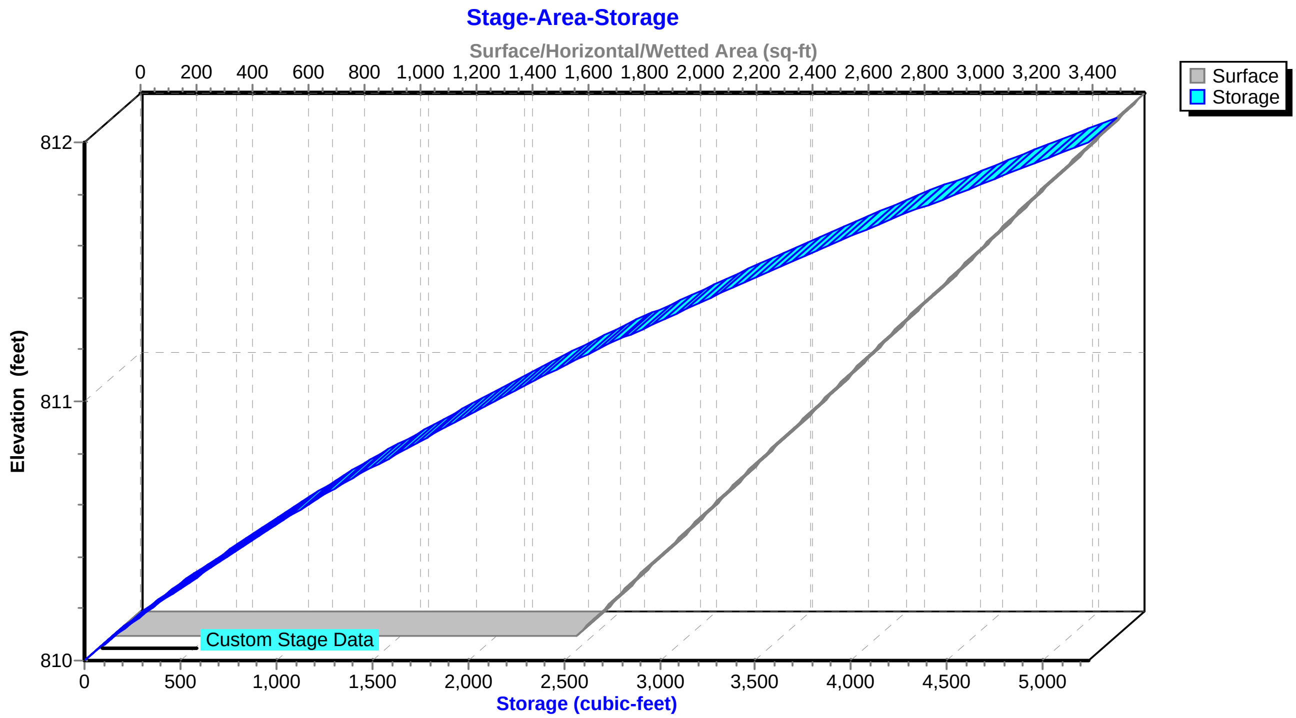
Pond SWM 7A: SWM 7A (Phase 1)



Pond SWM 7A: SWM 7A (Phase 1)



Pond SWM 7A: SWM 7A (Phase 1)



Summary for Pond SWM1: SWM 1

Inflow Area = 56.627 ac, 6.87% Impervious, Inflow Depth = 3.09" for 100-Year event
Inflow = 72.88 cfs @ 12.85 hrs, Volume= 14.575 af
Outflow = 72.31 cfs @ 12.89 hrs, Volume= 14.561 af, Atten= 1%, Lag= 2.4 min
Primary = 72.31 cfs @ 12.89 hrs, Volume= 14.561 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 514.52' @ 12.89 hrs Surf.Area= 17,955 sf Storage= 34,045 cf

Plug-Flow detention time= 51.3 min calculated for 14.556 af (100% of inflow)
Center-of-Mass det. time= 51.1 min (960.3 - 909.2)

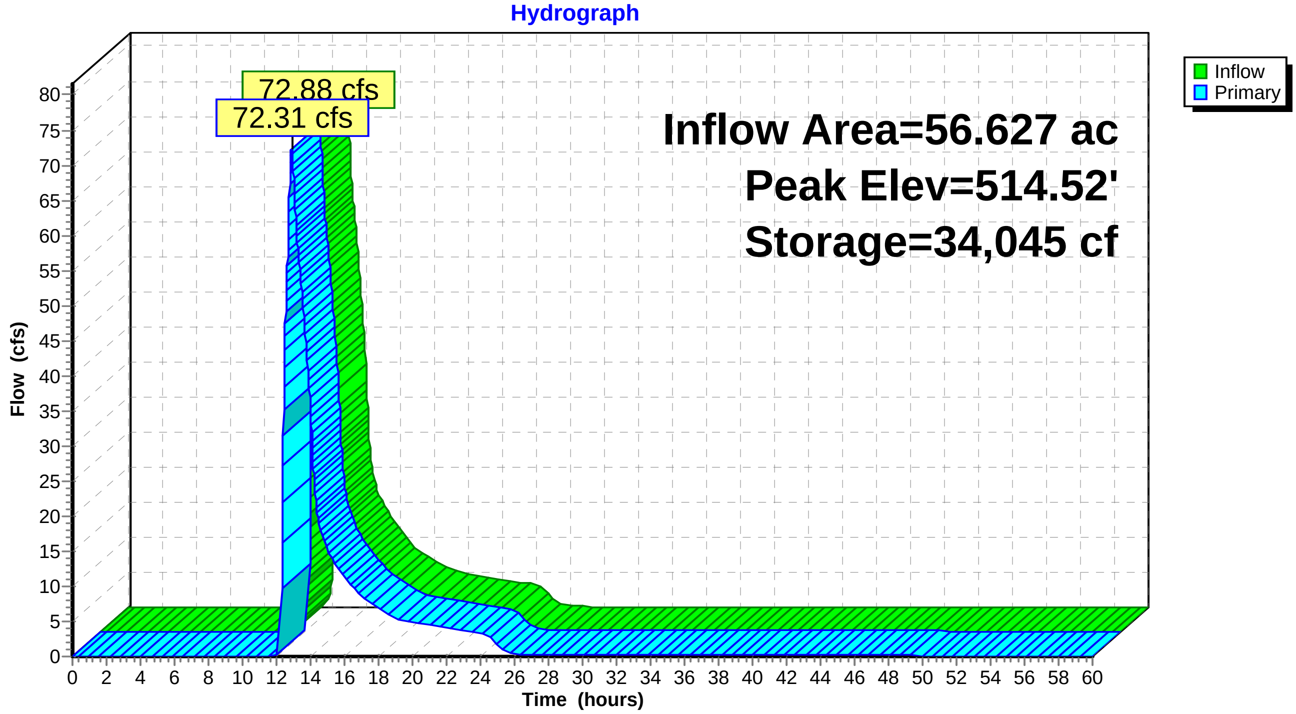
Volume	Invert	Avail.Storage	Storage Description
#1	512.00'	60,656 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
512.00	7,821	0	0
513.00	11,858	9,840	9,840
514.00	17,955	14,907	24,746
516.00	17,955	35,910	60,656

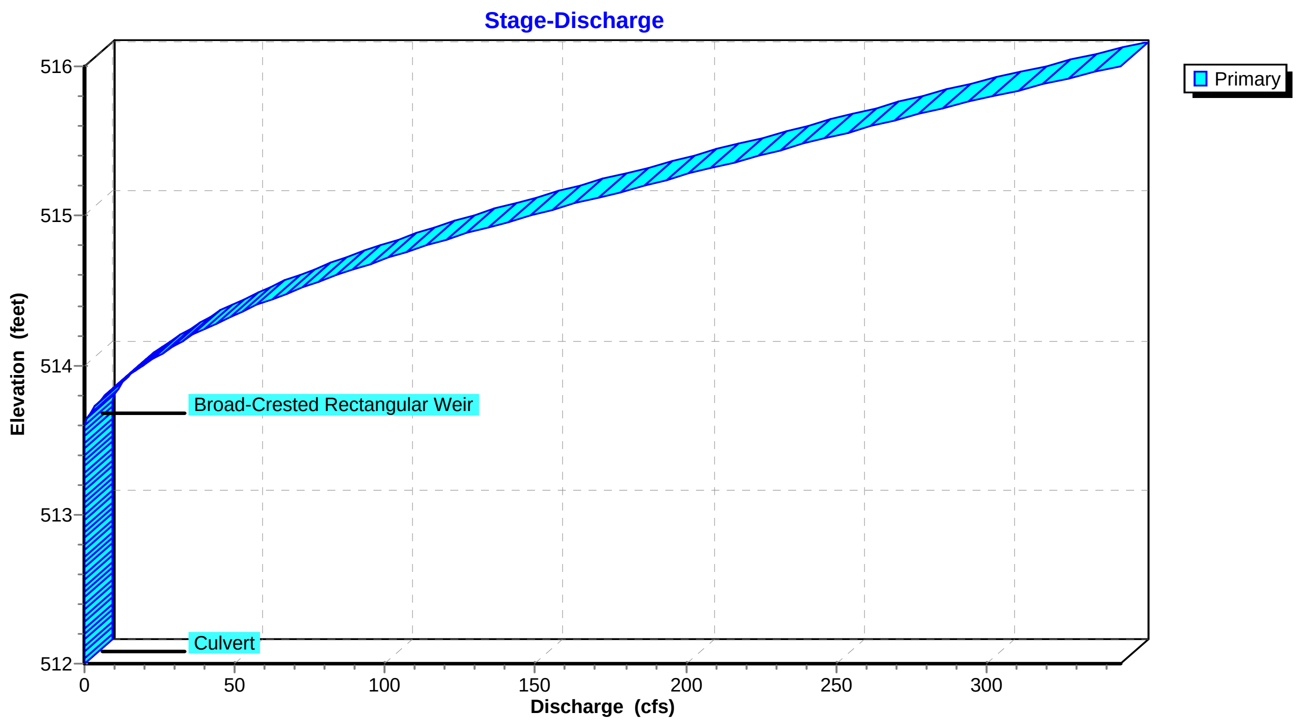
Device	Routing	Invert	Outlet Devices
#1	Primary	512.00'	**3.0" Round Culvert** L= 57.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 512.00' / 510.00' S= 0.0351 '/' Cc= 0.900 n= 0.012, Flow Area= 0.05 sf
#2	Primary	513.60'	**28.0' long x 1.0' breadth Broad-Crested Rectangular Weir** Head (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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=72.28 cfs @ 12.89 hrs HW=514.52' TW=0.00' (Dynamic Tailwater)
—**1=Culvert** (Barrel Controls 0.25 cfs @ 5.03 fps)
—**2=Broad-Crested Rectangular Weir** (Weir Controls 72.03 cfs @ 2.80 fps)

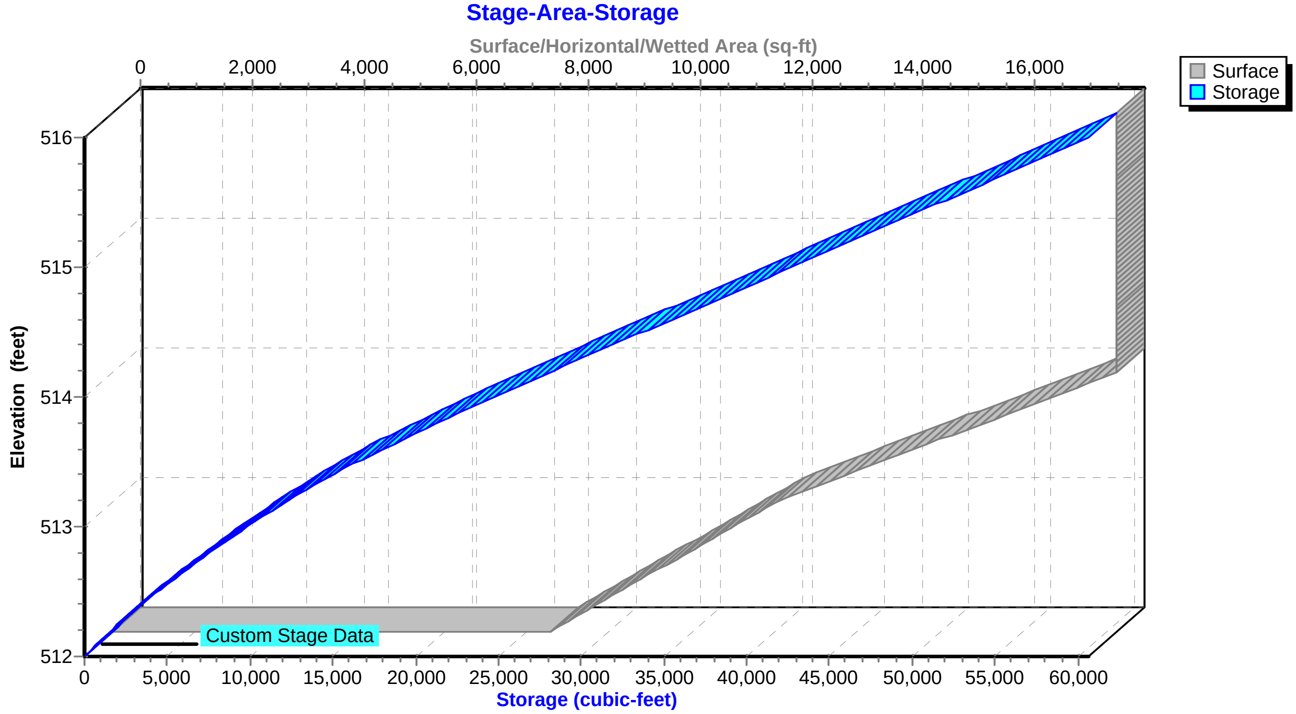
Pond SWM1: SWM 1



Pond SWM1: SWM 1



Pond SWM1: SWM 1



Summary for Pond SWM10: SWM #10

Inflow Area = 0.346 ac, 75.72% Impervious, Inflow Depth = 7.48" for 100-Year event
Inflow = 2.69 cfs @ 12.08 hrs, Volume= 0.216 af
Outflow = 0.89 cfs @ 12.37 hrs, Volume= 0.216 af, Atten= 67%, Lag= 16.9 min
Primary = 0.89 cfs @ 12.37 hrs, Volume= 0.216 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 609.50' @ 12.37 hrs Surf.Area= 0.018 ac Storage= 0.080 af

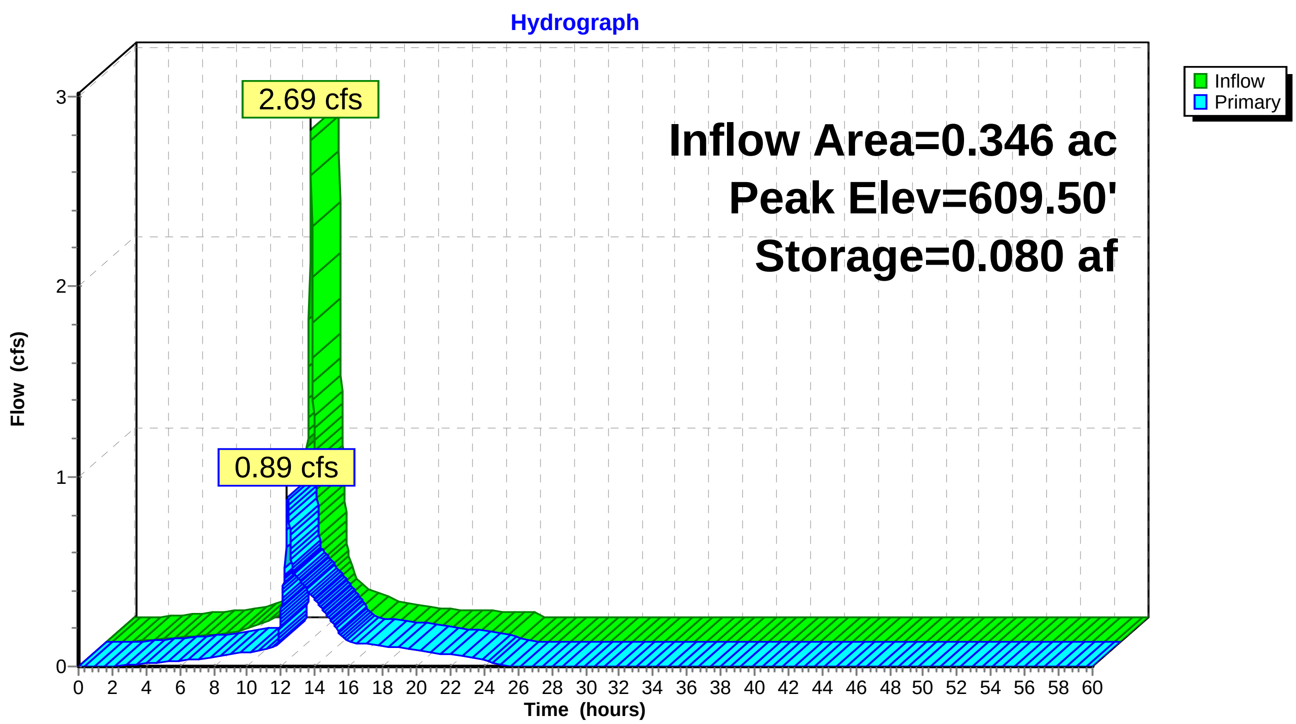
Plug-Flow detention time= 102.5 min calculated for 0.216 af (100% of inflow)
Center-of-Mass det. time= 102.5 min (857.6 - 755.1)

Volume	Invert	Avail.Storage	Storage Description
#1	606.00'	0.087 af	**48.0" Round Pipe Storage 1** x 3 L= 100.0'

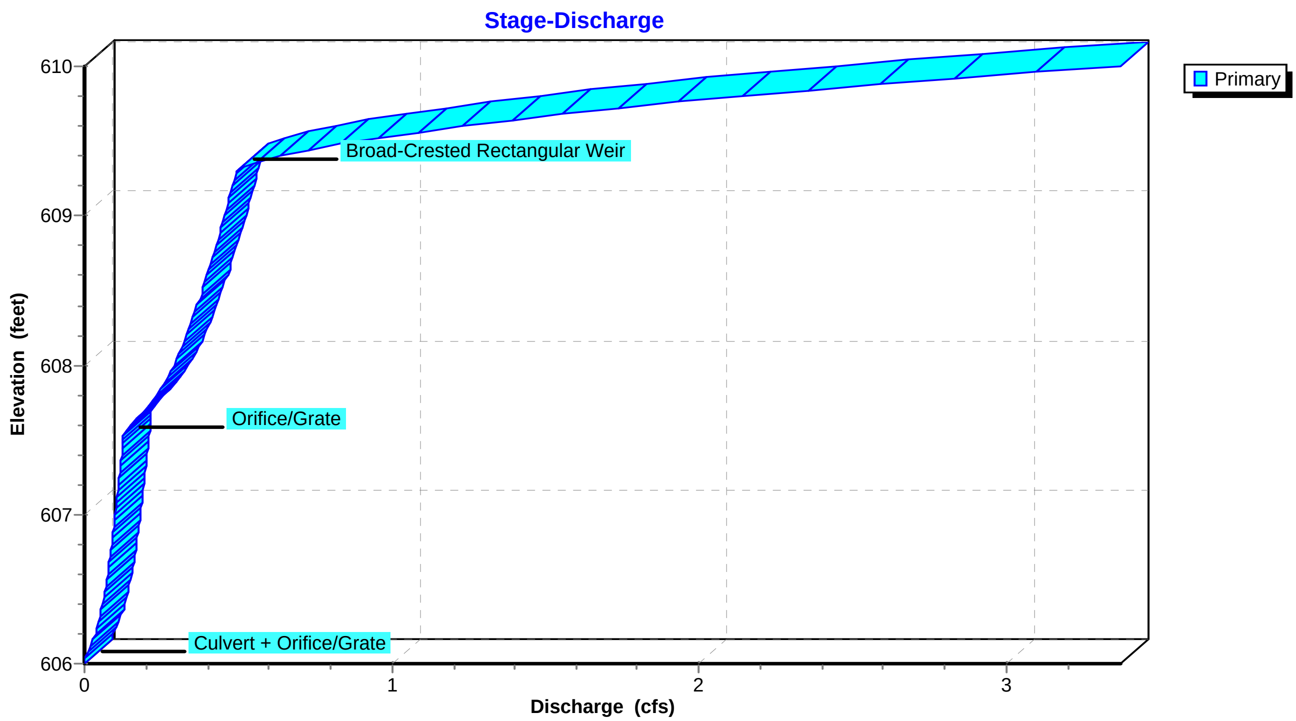
Device	Routing	Invert	Outlet Devices
#1	Primary	606.00'	**15.0" Round Culvert** L= 60.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 606.00' / 605.50' S= 0.0083 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 1.23 sf
#2	Device 1	606.00'	**2.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	607.50'	**3.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	609.30'	**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

Primary OutFlow Max=0.89 cfs @ 12.37 hrs HW=609.50' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.89 cfs of 10.56 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.19 cfs @ 8.90 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.32 cfs @ 6.59 fps)
  └─**4=Broad-Crested Rectangular Weir** (Weir Controls 0.37 cfs @ 1.25 fps)

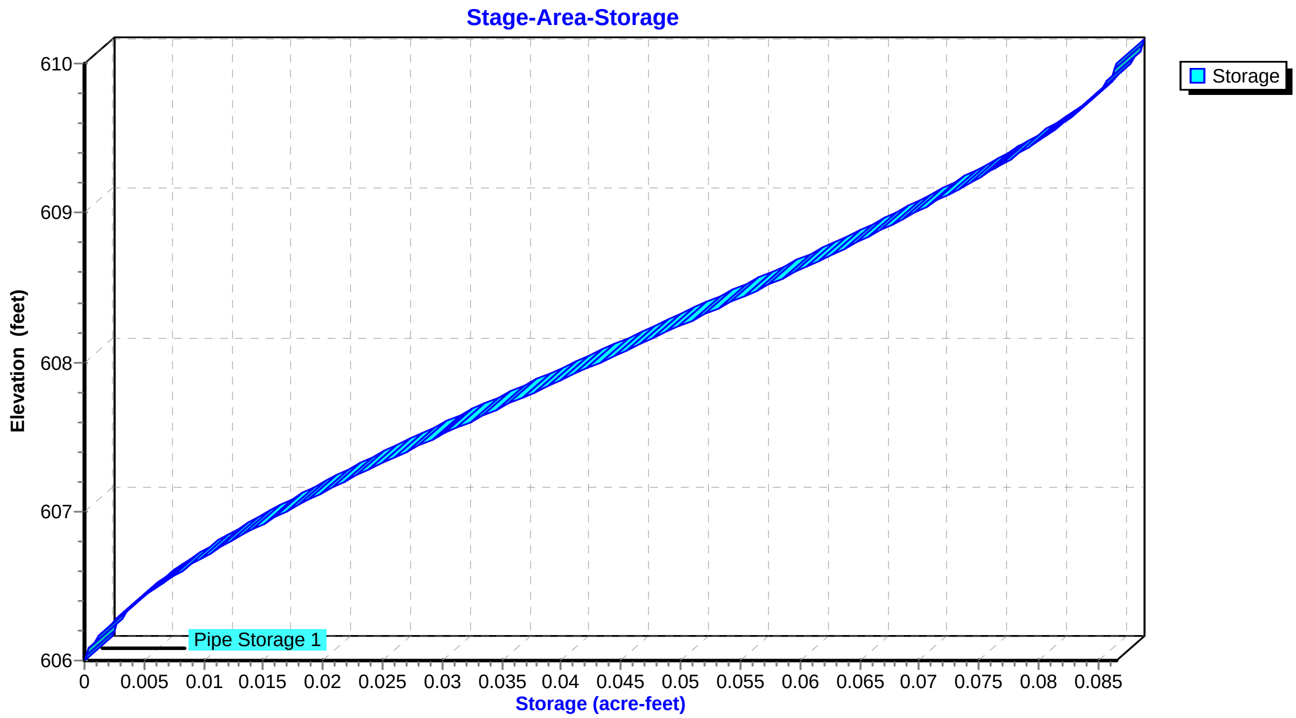
Pond SWM10: SWM #10



Pond SWM10: SWM #10



Pond SWM10: SWM #10



Summary for Pond SWM2: SWM2

Inflow Area = 113.940 ac, 5.81% Impervious, Inflow Depth = 5.02" for 100-Year event
Inflow = 341.07 cfs @ 12.43 hrs, Volume= 47.706 af
Outflow = 311.53 cfs @ 12.57 hrs, Volume= 47.358 af, Atten= 9%, Lag= 8.9 min
Primary = 311.53 cfs @ 12.57 hrs, Volume= 47.358 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 505.72' @ 12.57 hrs Surf.Area= 68,016 sf Storage= 358,924 cf

Plug-Flow detention time= 88.7 min calculated for 47.342 af (99% of inflow)
Center-of-Mass det. time= 84.4 min (933.9 - 849.5)

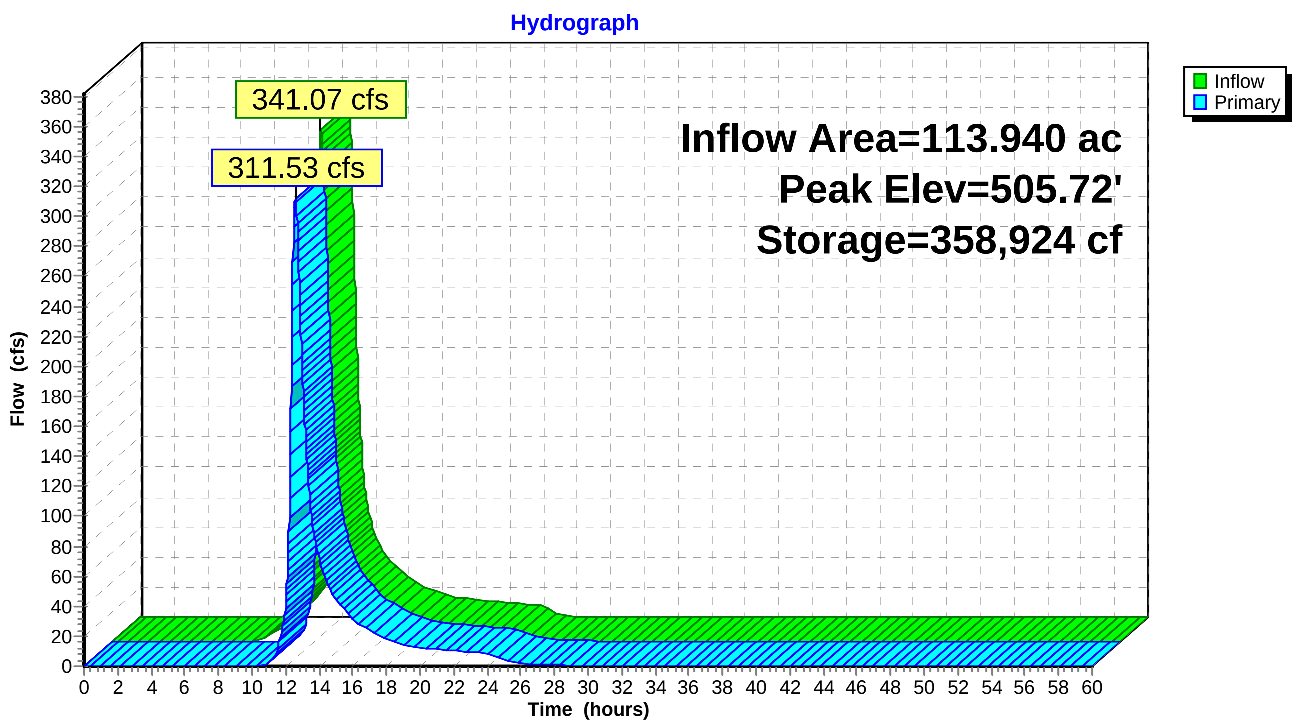
Volume	Invert	Avail.Storage	Storage Description
#1	498.00'	378,344 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
498.00	24,893	0	0
499.00	36,355	30,624	30,624
500.00	39,366	37,861	68,485
501.00	42,483	40,925	109,409
502.00	46,025	44,254	153,663
503.00	50,017	48,021	201,684
504.00	54,900	52,459	254,143
505.00	61,469	58,185	312,327
506.00	70,565	66,017	378,344

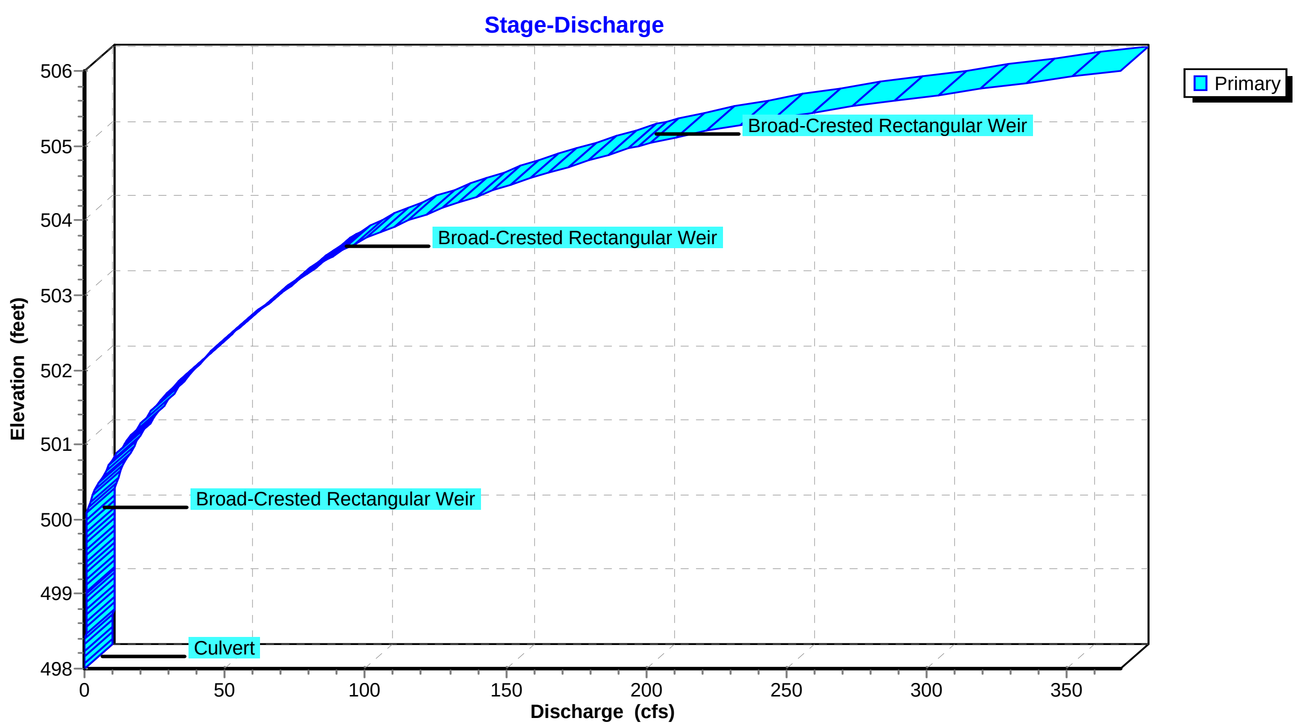
Device	Routing	Invert	Outlet Devices
#1	Primary	498.00'	**6.0" Round Culvert** L= 100.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 498.00' / 496.00' S= 0.0200 '/' Cc= 0.900 n= 0.024, Flow Area= 0.20 sf
#2	Primary	500.00'	**5.0' long x 10.0' breadth Broad-Crested Rectangular Weir** 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
#3	Primary	503.50'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#4	Primary	505.00'	**26.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=311.39 cfs @ 12.57 hrs HW=505.72' TW=0.00' (Dynamic Tailwater)
├─**1=Culvert** (Barrel Controls 0.89 cfs @ 4.54 fps)
├─**2=Broad-Crested Rectangular Weir** (Weir Controls 180.53 cfs @ 6.31 fps)
├─**3=Broad-Crested Rectangular Weir** (Weir Controls 87.26 cfs @ 3.93 fps)
└─**4=Broad-Crested Rectangular Weir** (Weir Controls 42.70 cfs @ 2.28 fps)

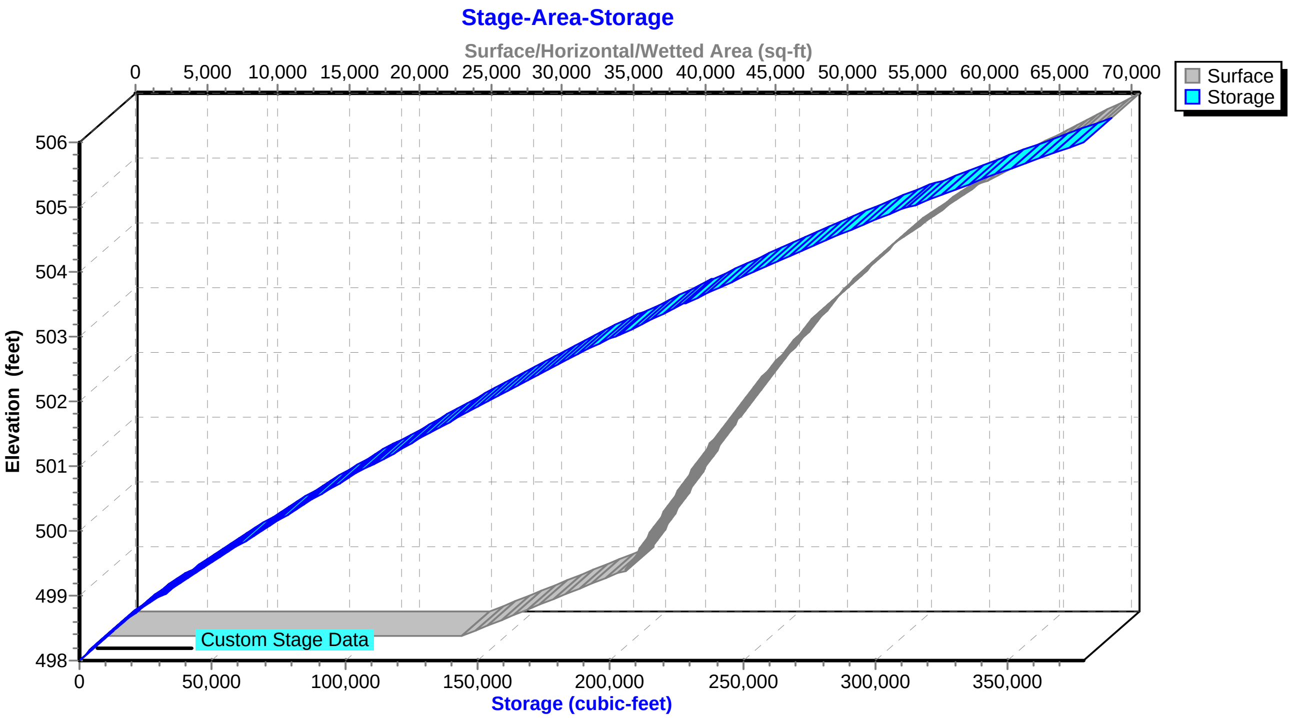
Pond SWM2: SWM2



Pond SWM2: SWM2



Pond SWM2: SWM2



Summary for Pond SWM3try: SWM3

Inflow Area = 248.085 ac, 10.82% Impervious, Inflow Depth > 4.36" for 100-Year event
Inflow = 321.61 cfs @ 12.27 hrs, Volume= 90.091 af
Outflow = 189.74 cfs @ 14.07 hrs, Volume= 89.406 af, Atten= 41%, Lag= 108.0 min
Primary = 189.74 cfs @ 14.07 hrs, Volume= 89.406 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 510.77' @ 14.07 hrs Surf.Area= 436,252 sf Storage= 1,474,835 cf

Plug-Flow detention time= 207.0 min calculated for 89.406 af (99% of inflow)
Center-of-Mass det. time= 191.5 min (1,102.0 - 910.4)

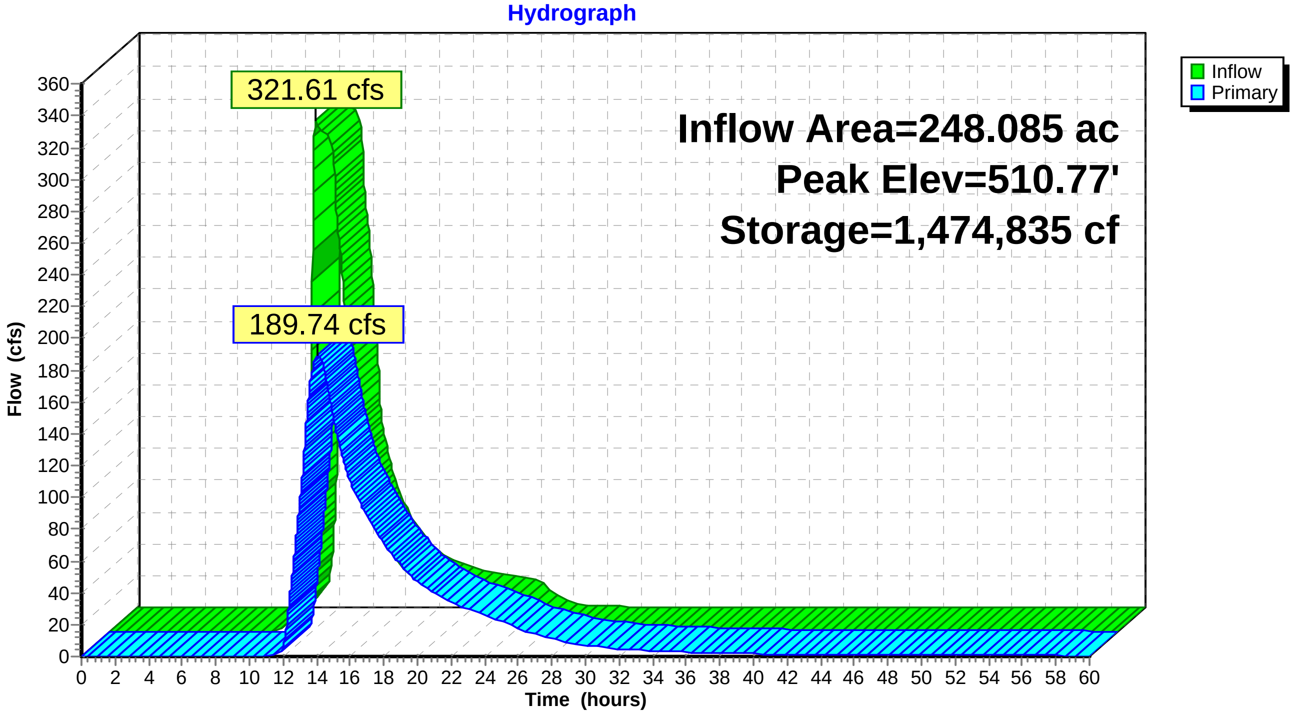
Volume	Invert	Avail.Storage	Storage Description
#1	507.00'	2,034,374 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
507.00	359,082	0	0
508.00	370,212	364,647	364,647
510.00	413,188	783,400	1,148,047
512.00	473,139	886,327	2,034,374

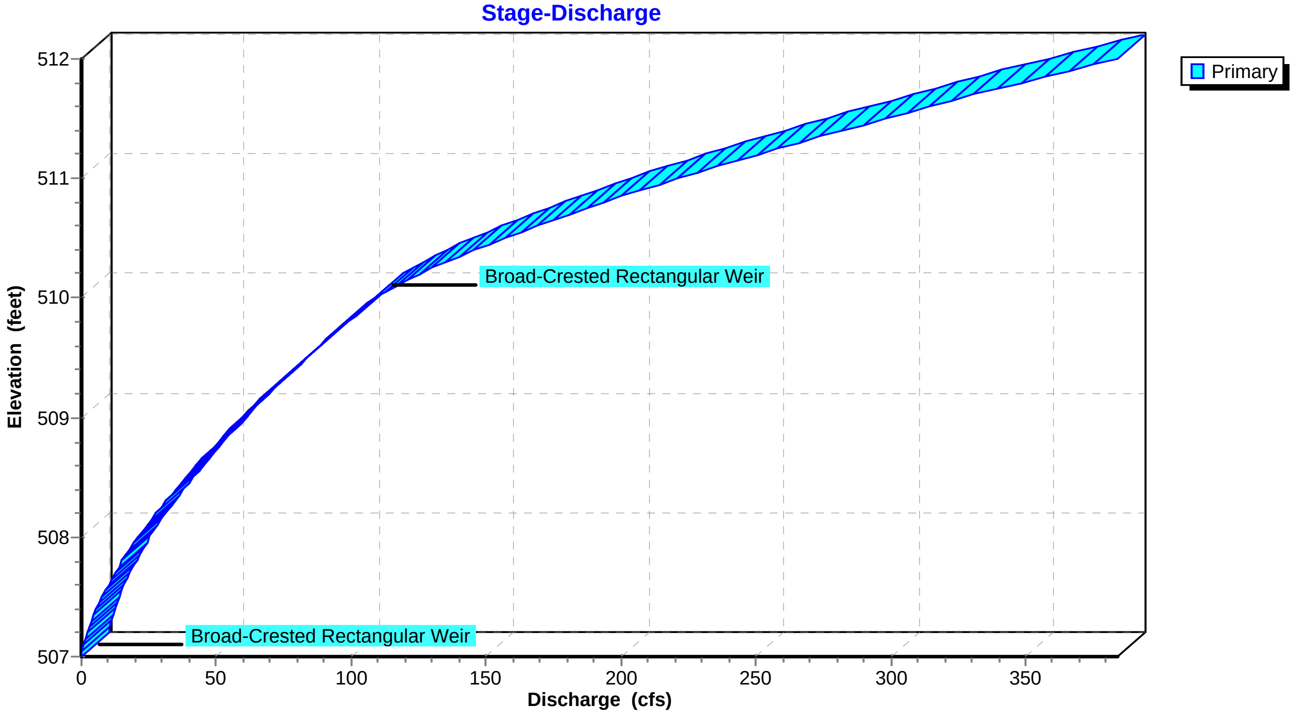
Device	Routing	Invert	Outlet Devices
#1	Primary	507.00'	**8.0' long x 50.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63
#2	Primary	510.00'	**20.0' long x 50.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=189.73 cfs @ 14.07 hrs HW=510.77' TW=504.92' (Dynamic Tailwater)
├─**1=Broad-Crested Rectangular Weir** (Weir Controls 153.97 cfs @ 5.11 fps)
└─**2=Broad-Crested Rectangular Weir** (Weir Controls 35.75 cfs @ 2.32 fps)

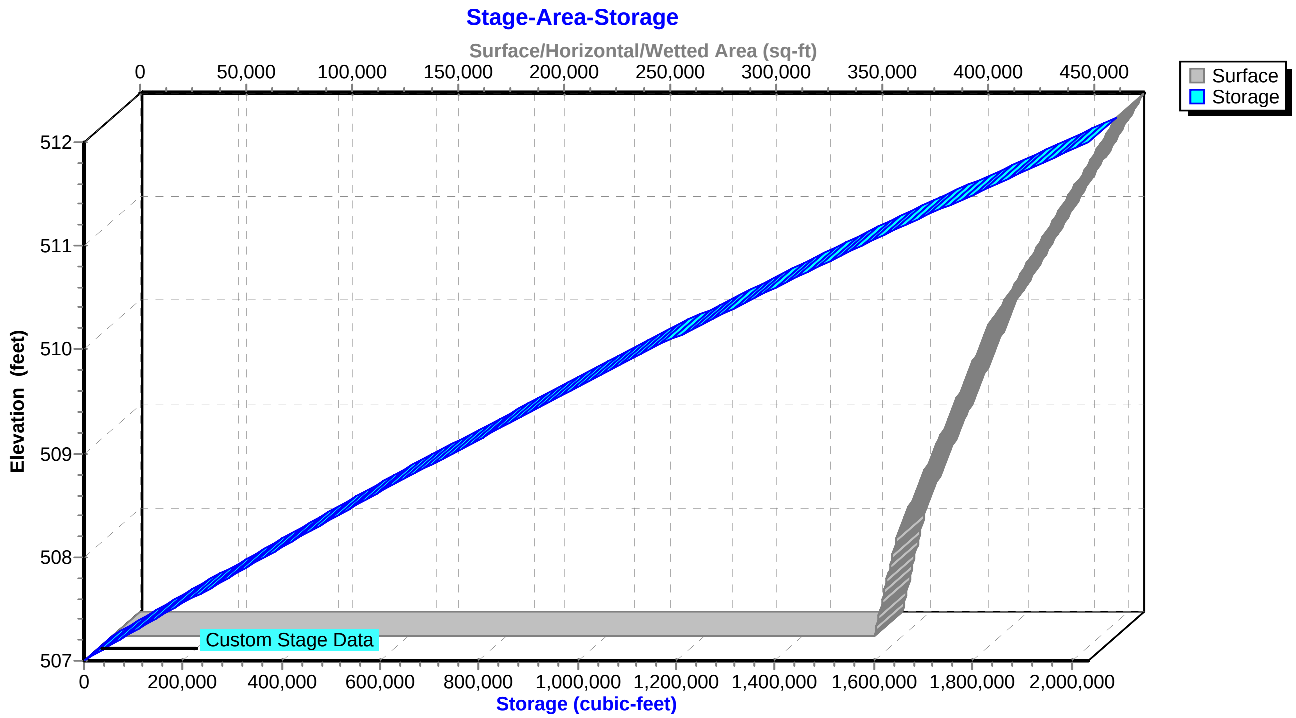
Pond SWM3try: SWM3



Pond SWM3try: SWM3



Pond SWM3try: SWM3



Summary for Pond SWM4: SWM4

Inflow Area = 195.903 ac, 6.18% Impervious, Inflow Depth > 3.36" for 100-Year event
Inflow = 222.19 cfs @ 13.15 hrs, Volume= 54.773 af
Outflow = 205.39 cfs @ 13.41 hrs, Volume= 54.761 af, Atten= 8%, Lag= 15.7 min
Primary = 205.39 cfs @ 13.41 hrs, Volume= 54.761 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 519.05' @ 13.41 hrs Surf.Area= 36,400 sf Storage= 118,746 cf

Plug-Flow detention time= 7.4 min calculated for 54.742 af (100% of inflow)
Center-of-Mass det. time= 6.9 min (941.3 - 934.5)

Volume	Invert	Avail.Storage	Storage Description
#1	515.00'	235,273 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

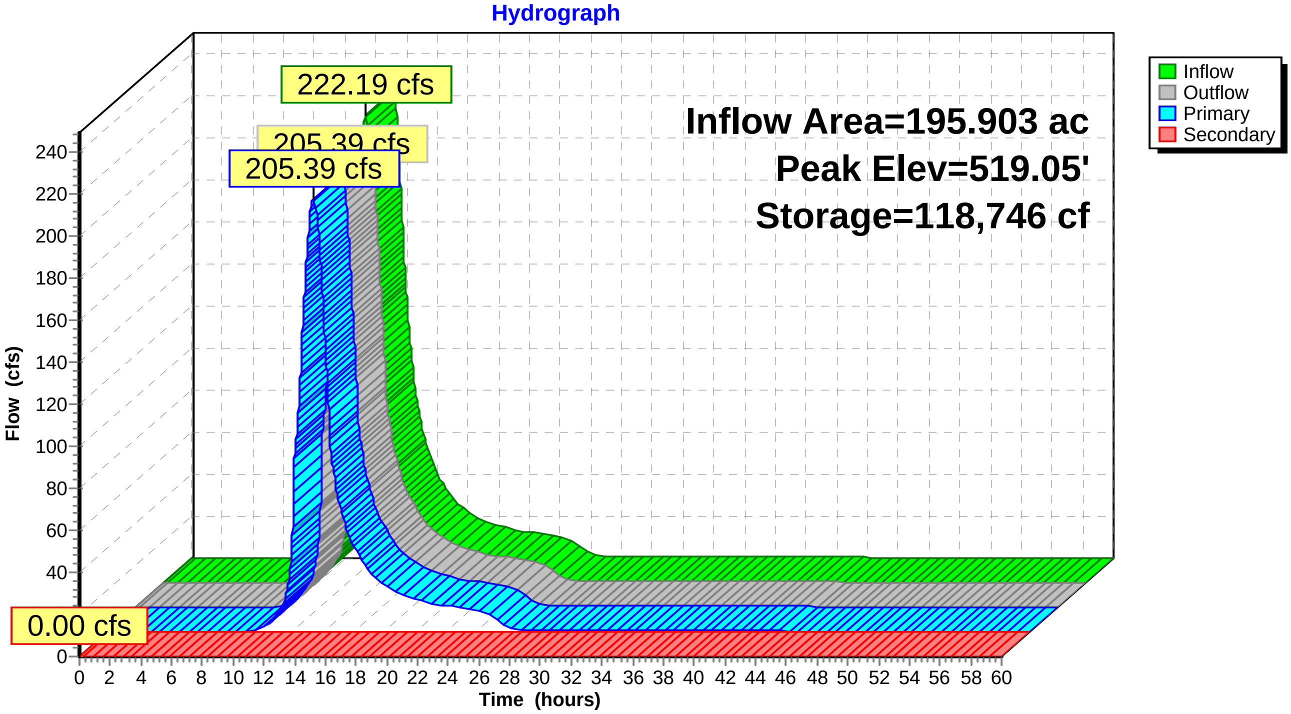
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
515.00	23,225	0	0
516.00	25,820	24,523	24,523
518.00	32,405	58,225	82,748
520.00	40,040	72,445	155,193
522.00	40,040	80,080	235,273

Device	Routing	Invert	Outlet Devices
#1	Primary	510.00'	**36.0" Round Culvert X 3.00** L= 250.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 510.00' / 505.50' S= 0.0180 '/' Cc= 0.900 n= 0.020, Flow Area= 7.07 sf
#2	Device 1	515.00'	**36.0" Horiz. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads
#3	Secondary	520.00'	**25.0' long x 20.0' 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) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

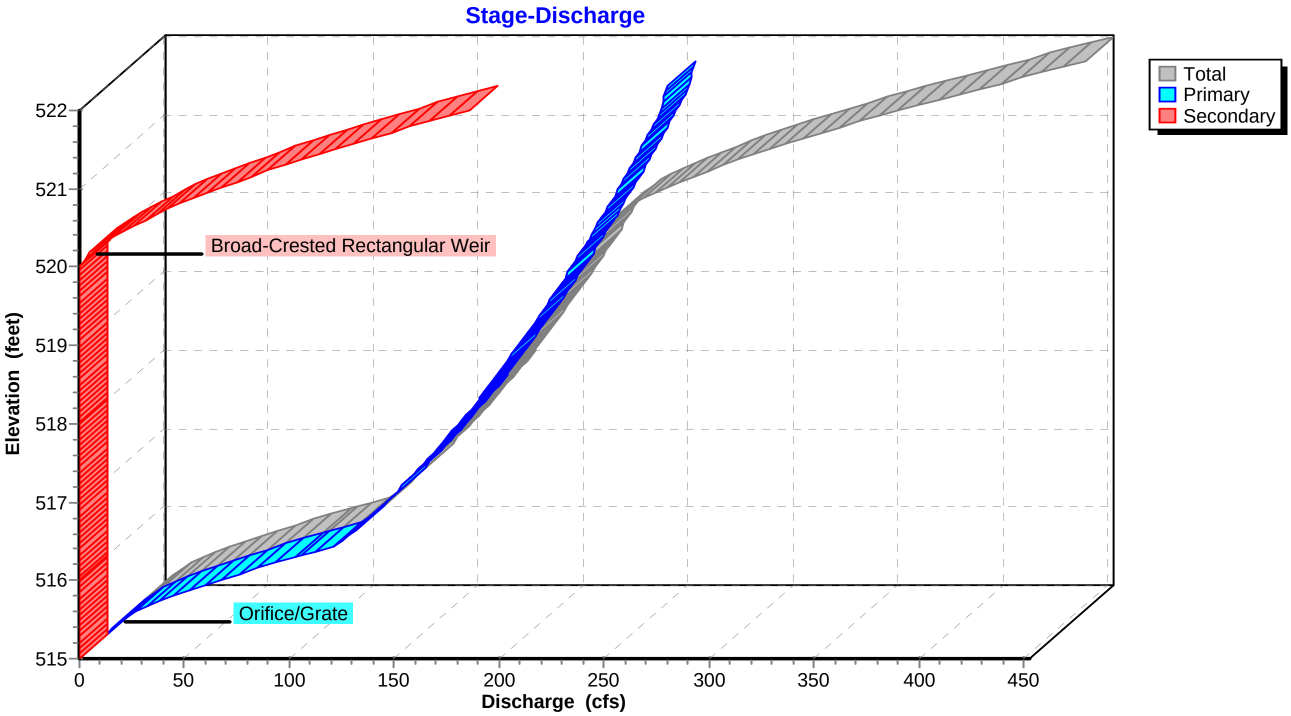
Primary OutFlow Max=205.38 cfs @ 13.41 hrs HW=519.05' TW=510.44' (Dynamic Tailwater)
└─**1=Culvert** (Passes 205.38 cfs of 212.98 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 205.38 cfs @ 9.68 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=515.00' TW=507.00' (Dynamic Tailwater)
└─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

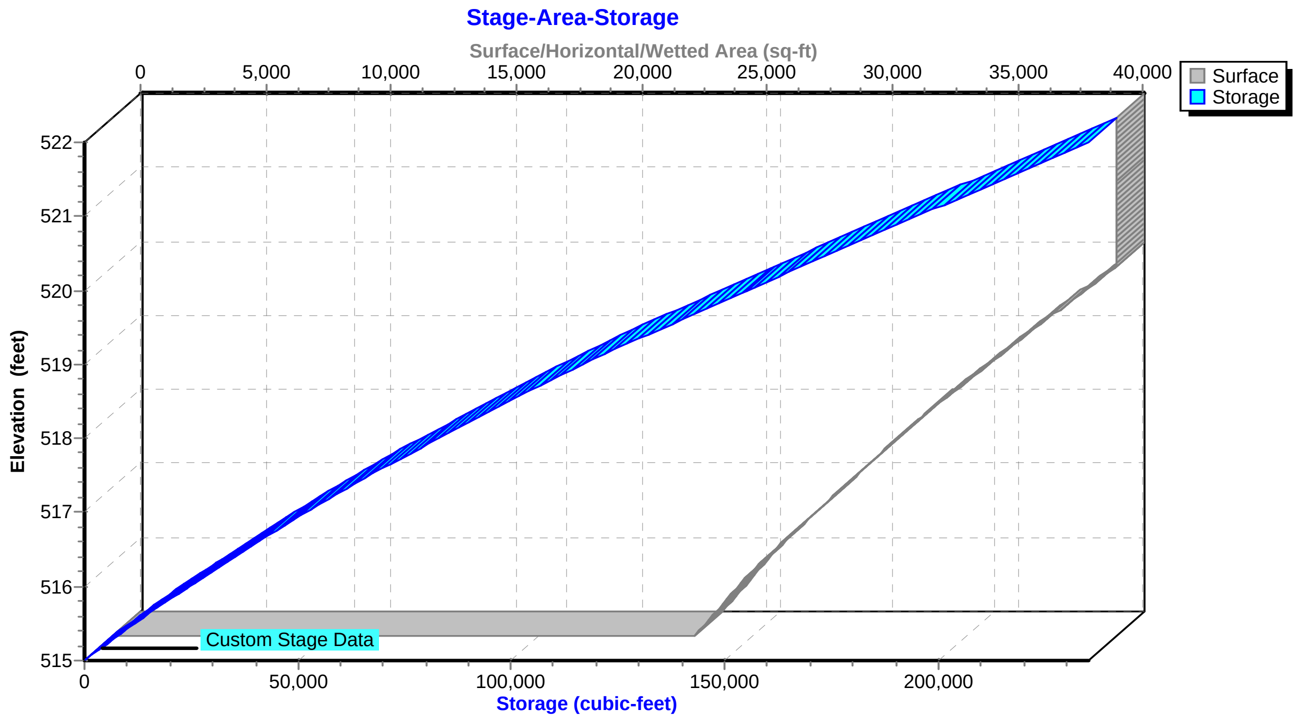
Pond SWM4: SWM4



Pond SWM4: SWM4



Pond SWM4: SWM4



Summary for Pond SWM5: SWM5

Inflow Area = 58.557 ac, 14.43% Impervious, Inflow Depth = 5.01" for 100-Year event
Inflow = 182.43 cfs @ 12.37 hrs, Volume= 24.434 af
Outflow = 146.53 cfs @ 12.59 hrs, Volume= 24.053 af, Atten= 20%, Lag= 13.2 min
Primary = 0.67 cfs @ 12.48 hrs, Volume= 1.847 af
Secondary = 125.35 cfs @ 12.59 hrs, Volume= 21.709 af
Tertiary = 20.54 cfs @ 12.59 hrs, Volume= 0.498 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 521.52' @ 12.59 hrs Surf.Area= 49,233 sf Storage= 197,776 cf

Plug-Flow detention time= 118.0 min calculated for 24.053 af (98% of inflow)
Center-of-Mass det. time= 108.6 min (946.0 - 837.3)

Volume	Invert	Avail.Storage	Storage Description
#1	516.00'	221,753 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
516.00	23,707	0	0
518.00	31,902	55,609	55,609
520.00	41,263	73,165	128,774
522.00	51,716	92,979	221,753

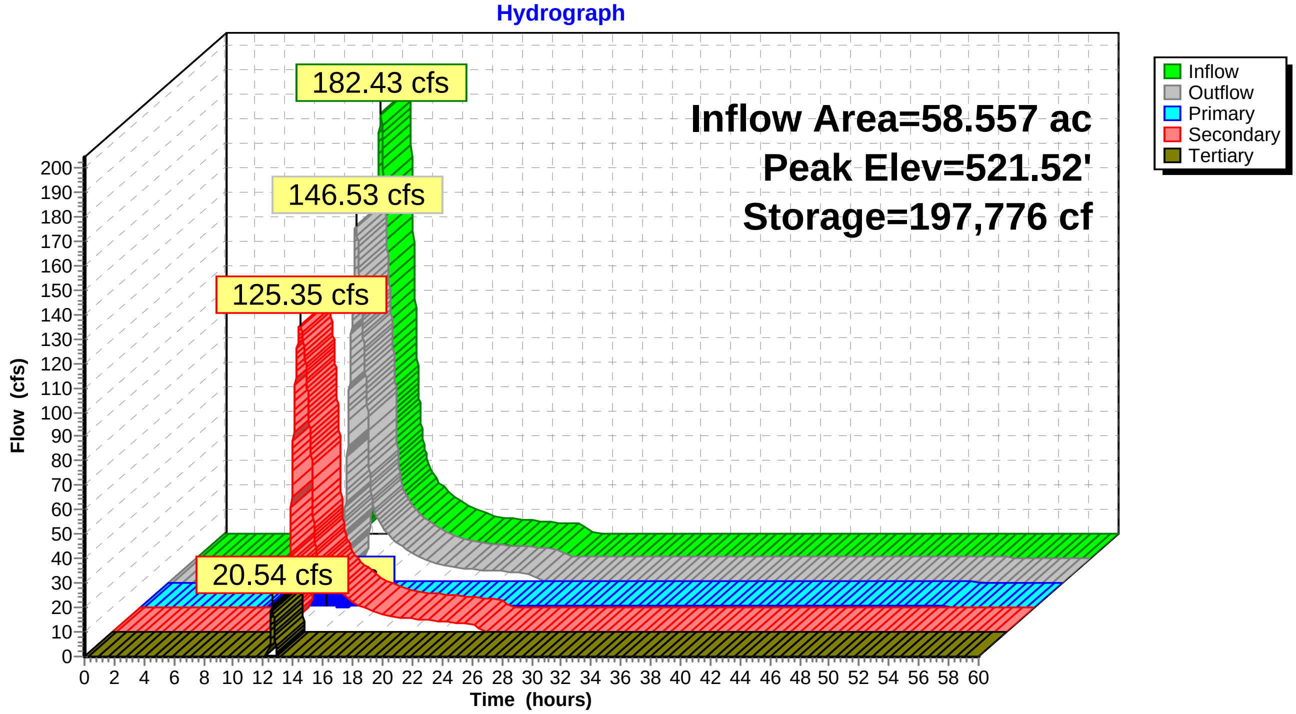
Device	Routing	Invert	Outlet Devices
#1	Primary	516.00'	**5.0" Round Culvert** L= 90.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 516.00' / 515.00' S= 0.0111 '/' Cc= 0.900 n= 0.015, Flow Area= 0.14 sf
#2	Secondary	512.00'	**30.0" Round Culvert X 3.00** L= 270.0' RCP, groove end w/headwall, Ke= 0.200 Inlet / Outlet Invert= 512.00' / 505.00' S= 0.0259 '/' Cc= 0.900 n= 0.020, Flow Area= 4.91 sf
#3	Device 2	518.40'	**30.0" Horiz. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads
#4	Tertiary	521.00'	**20.0' long x 30.0' 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) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.67 cfs @ 12.48 hrs HW=521.39' TW=516.19' (Dynamic Tailwater)
└─**1=Culvert** (Outlet Controls 0.67 cfs @ 4.89 fps)

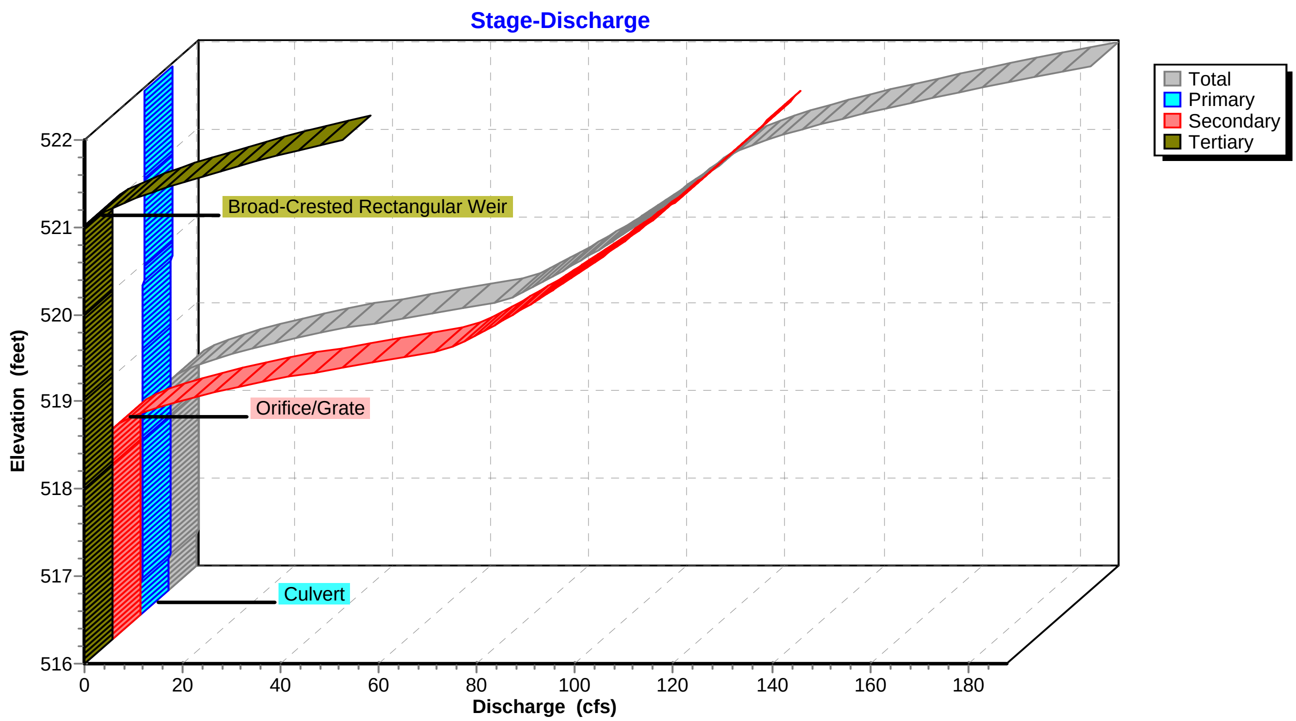
Secondary OutFlow Max=125.33 cfs @ 12.59 hrs HW=521.52' TW=508.92' (Dynamic Tailwater)
└─**2=Culvert** (Passes 125.33 cfs of 157.26 cfs potential flow)
  └─**3=Orifice/Grate** (Orifice Controls 125.33 cfs @ 8.51 fps)

Tertiary OutFlow Max=20.49 cfs @ 12.59 hrs HW=521.52' TW=516.59' (Dynamic Tailwater)
└─**4=Broad-Crested Rectangular Weir** (Weir Controls 20.49 cfs @ 1.95 fps)

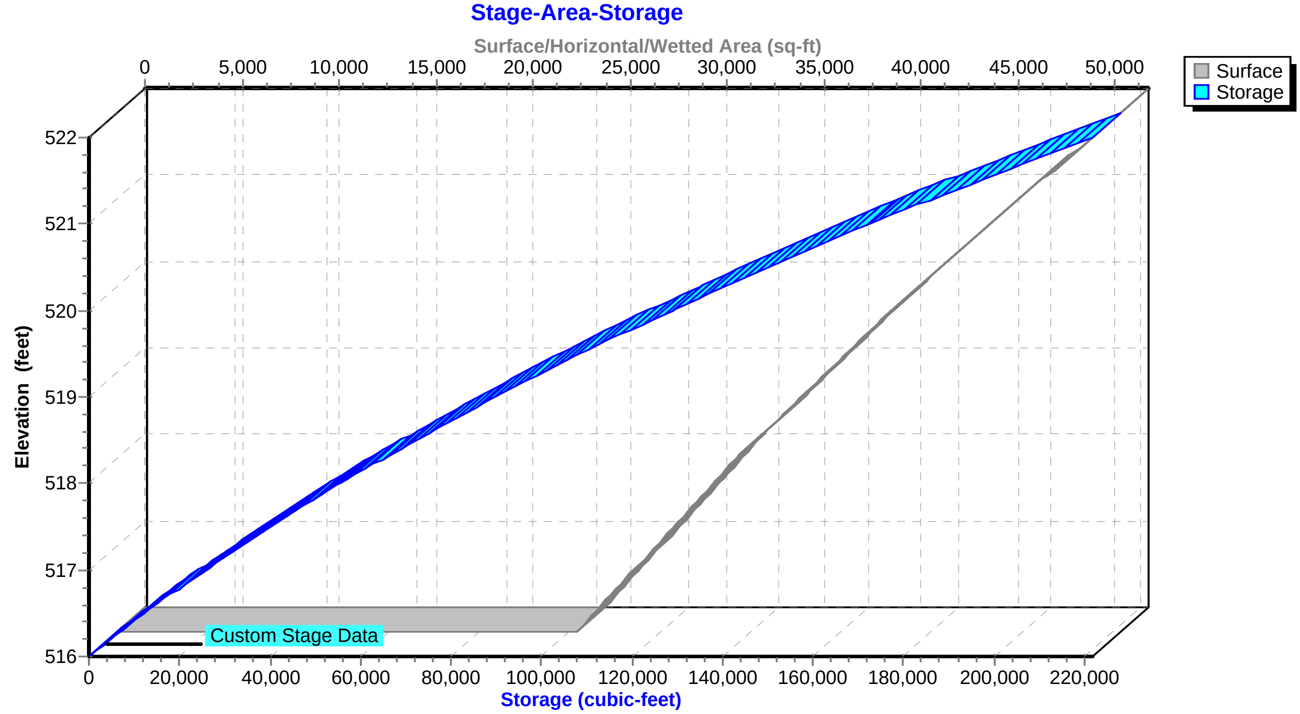
Pond SWM5: SWM5



Pond SWM5: SWM5



Pond SWM5: SWM5



Summary for Pond SWM6: SWM6

[62] Hint: Exceeded Reach A105R OUTLET depth by 4.20' @ 16.84 hrs

Inflow Area = 99.370 ac, 16.15% Impervious, Inflow Depth = 3.16" for 100-Year event
Inflow = 215.85 cfs @ 12.36 hrs, Volume= 26.171 af
Outflow = 17.92 cfs @ 16.24 hrs, Volume= 25.291 af, Atten= 92%, Lag= 232.6 min
Primary = 17.92 cfs @ 16.24 hrs, Volume= 25.291 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 504.87' @ 16.24 hrs Surf.Area= 160,790 sf Storage= 599,323 cf

Plug-Flow detention time= 549.5 min calculated for 25.283 af (97% of inflow)
Center-of-Mass det. time= 527.5 min (1,432.4 - 904.9)

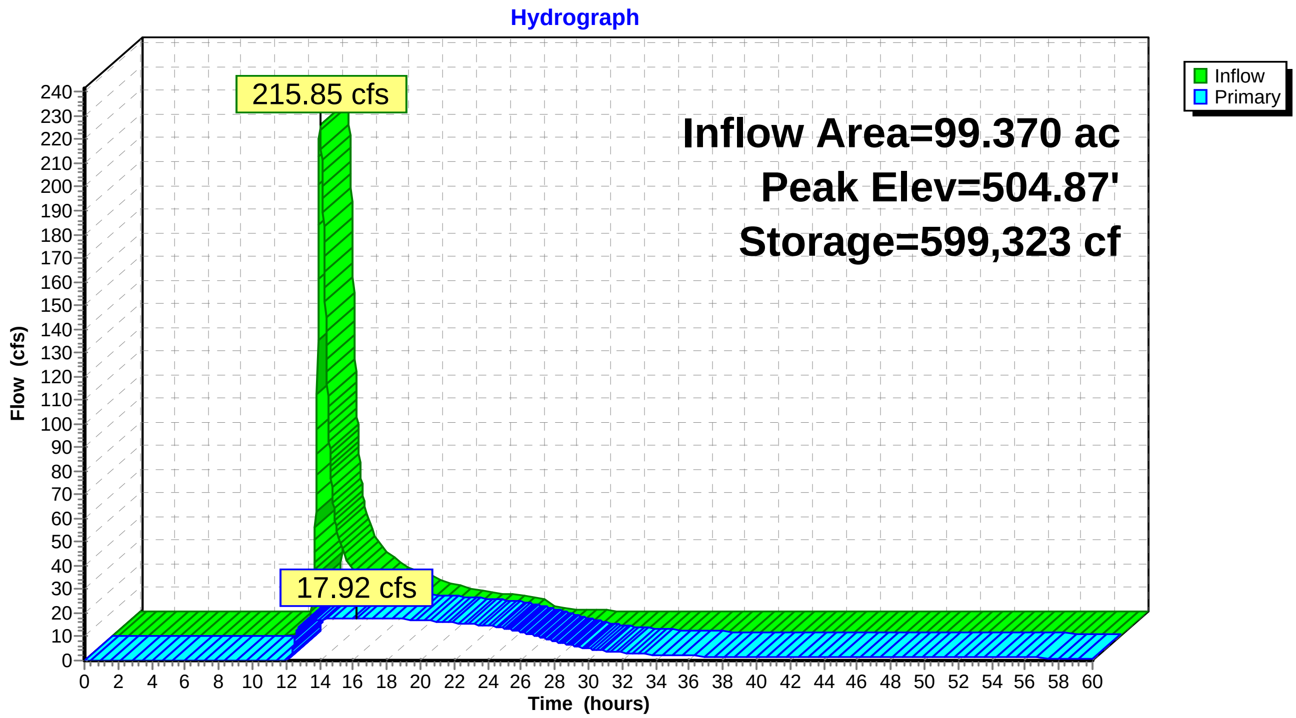
Volume	Invert	Avail.Storage	Storage Description
#1	500.00'	877,730 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
500.00	64,186	0	0
501.00	99,879	82,033	82,033
502.00	122,401	111,140	193,173
504.00	148,997	271,398	464,571
506.00	176,108	325,105	789,676
506.50	176,108	88,054	877,730

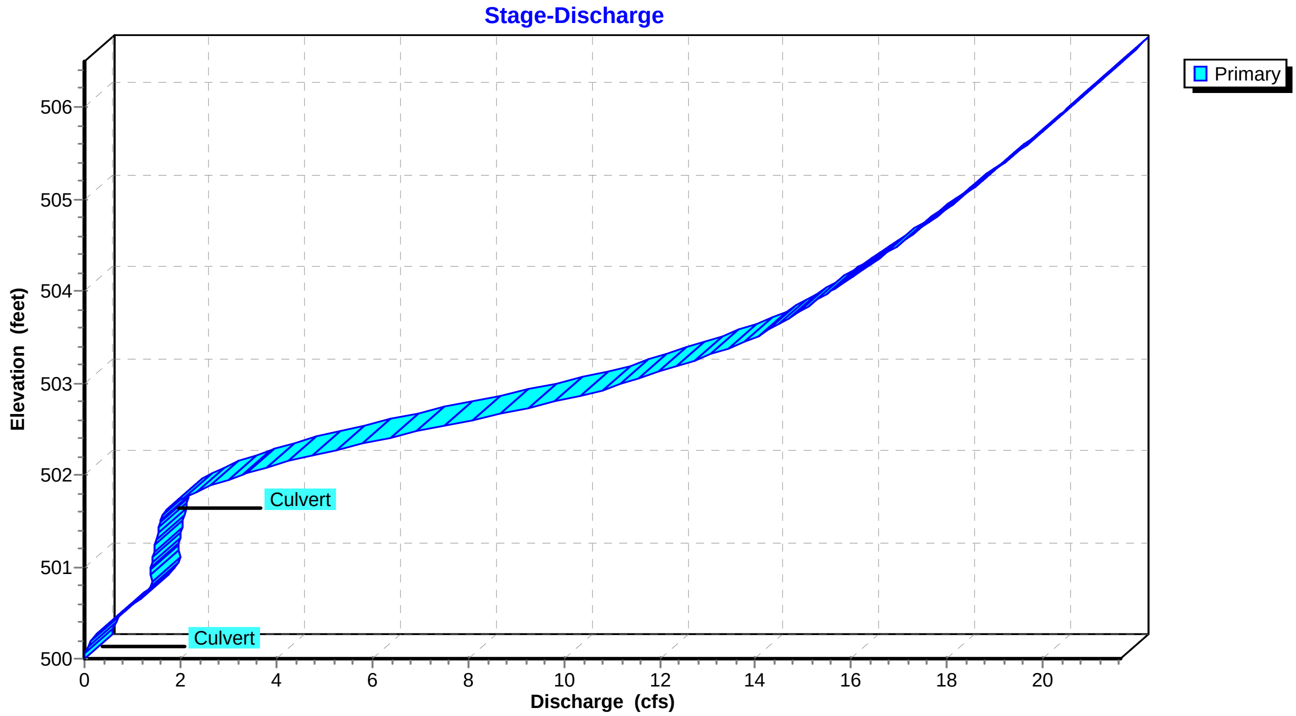
Device	Routing	Invert	Outlet Devices
#1	Primary	500.00'	**8.0" Round Culvert** L= 135.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 500.00' / 498.50' S= 0.0111 '/' Cc= 0.900 n= 0.012, Flow Area= 0.35 sf
#2	Primary	501.50'	**18.0" Round Culvert** L= 105.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 501.50' / 500.00' S= 0.0143 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Primary OutFlow Max=17.92 cfs @ 16.24 hrs HW=504.87' TW=0.00' (Dynamic Tailwater)
1=Culvert (Barrel Controls 2.46 cfs @ 7.04 fps)
2=Culvert (Barrel Controls 15.46 cfs @ 8.75 fps)

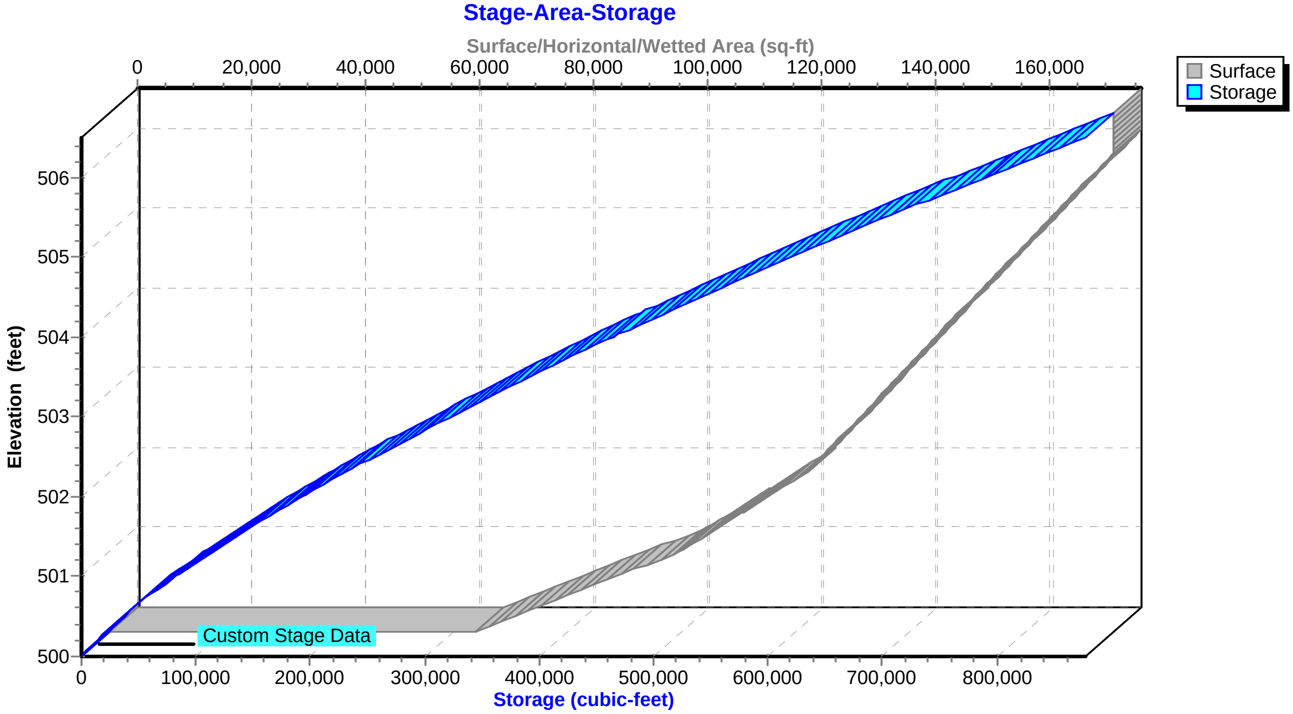
Pond SWM6: SWM6



Pond SWM6: SWM6



Pond SWM6: SWM6



Summary for Pond SWM7: SWM7

Inflow Area = 4.590 ac, 29.85% Impervious, Inflow Depth = 5.52" for 100-Year event
Inflow = 22.16 cfs @ 12.21 hrs, Volume= 2.112 af
Outflow = 10.84 cfs @ 12.52 hrs, Volume= 2.112 af, Atten= 51%, Lag= 18.4 min
Primary = 10.84 cfs @ 12.52 hrs, Volume= 2.112 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 747.10' @ 12.52 hrs Surf.Area= 7,059 sf Storage= 26,437 cf

Plug-Flow detention time= 62.2 min calculated for 2.111 af (100% of inflow)
Center-of-Mass det. time= 62.3 min (880.1 - 817.8)

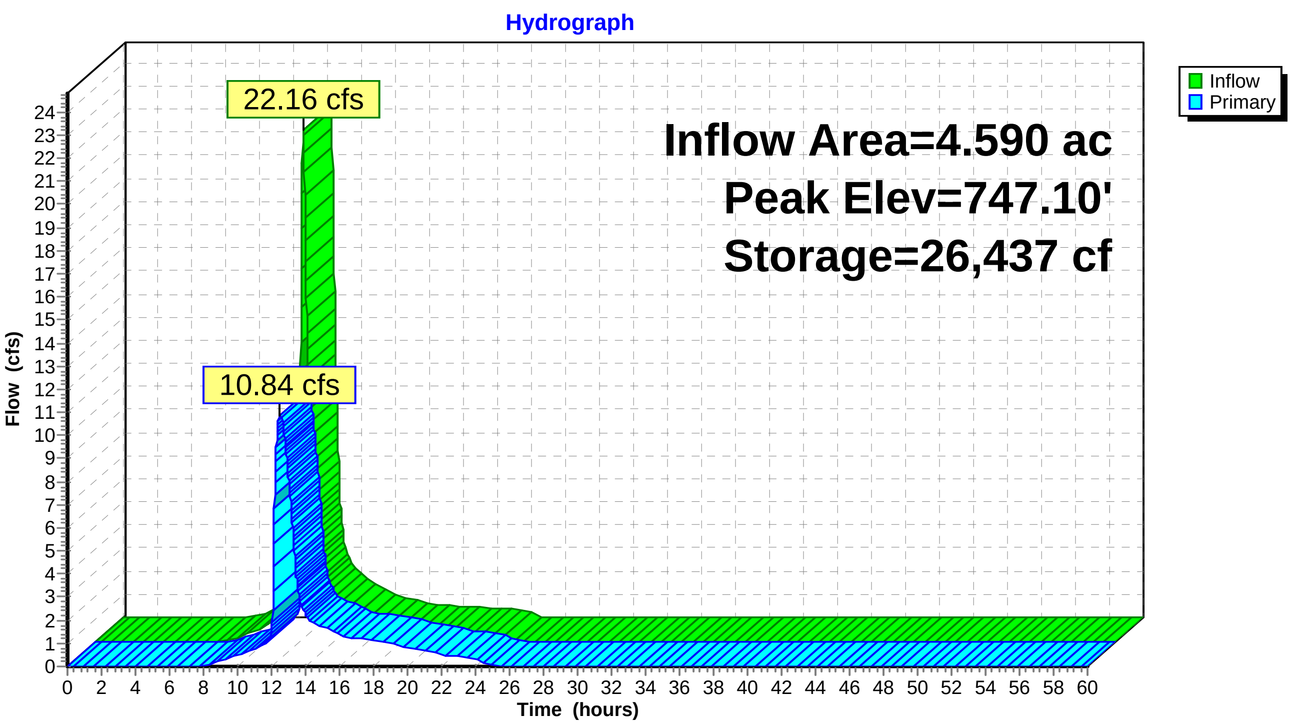
Volume	Invert	Avail.Storage	Storage Description
#1	740.00'	33,203 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
740.00	1,005	0	0
741.00	1,611	1,308	1,308
742.00	2,307	1,959	3,267
743.00	3,095	2,701	5,968
744.00	3,949	3,522	9,490
745.00	4,882	4,416	13,906
746.00	5,886	5,384	19,290
747.00	6,942	6,414	25,704
748.00	8,056	7,499	33,203

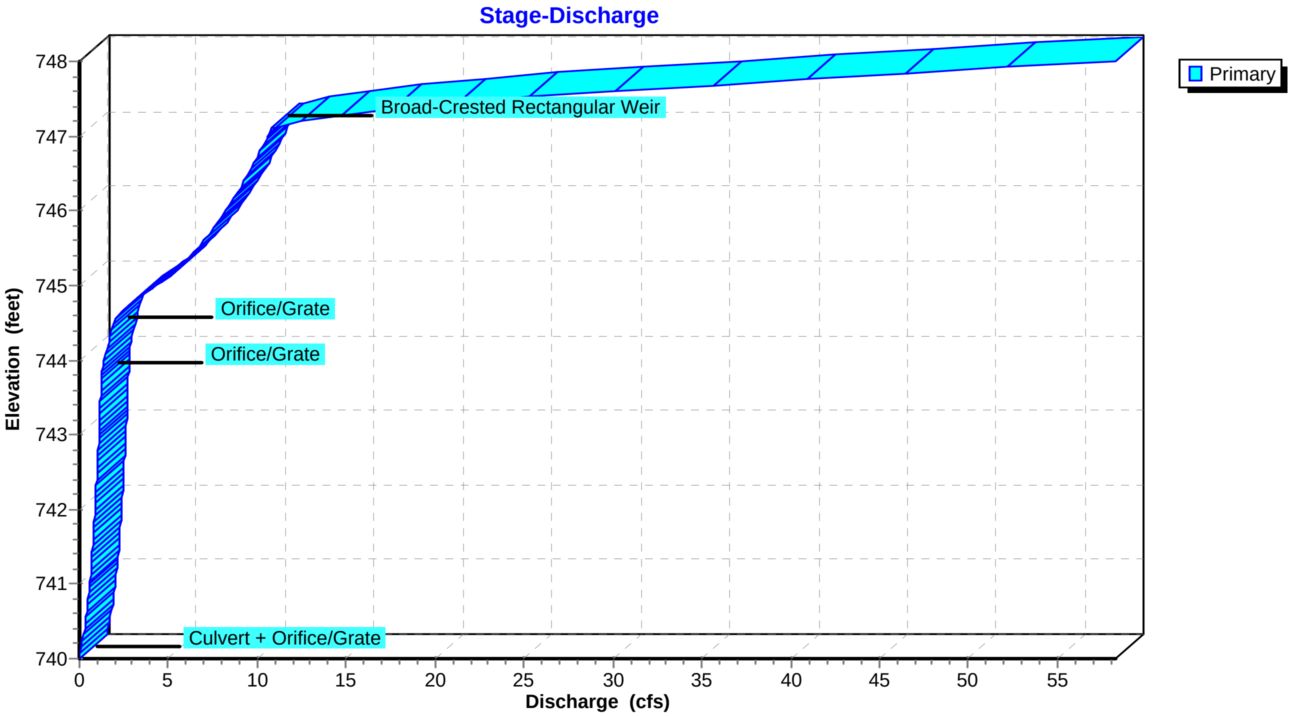
Device	Routing	Invert	Outlet Devices
#1	Primary	740.00'	**30.0" Round Culvert** L= 60.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 740.00' / 739.00' S= 0.0167 '/' Cc= 0.900 n= 0.012, Flow Area= 4.91 sf
#2	Device 1	740.00'	**5.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	743.80'	**5.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	744.40'	**10.0" Vert. Orifice/Grate X 2.00** C= 0.600
#5	Device 1	747.10'	**20.0' long x 5.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=10.84 cfs @ 12.52 hrs HW=747.10' TW=719.86' (Dynamic Tailwater)
└─**1=Culvert** (Passes 10.84 cfs of 71.48 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.72 cfs @ 12.64 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 1.16 cfs @ 8.47 fps)
  ├─**4=Orifice/Grate** (Orifice Controls 7.94 cfs @ 7.28 fps)
  └─**5=Broad-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.15 fps)

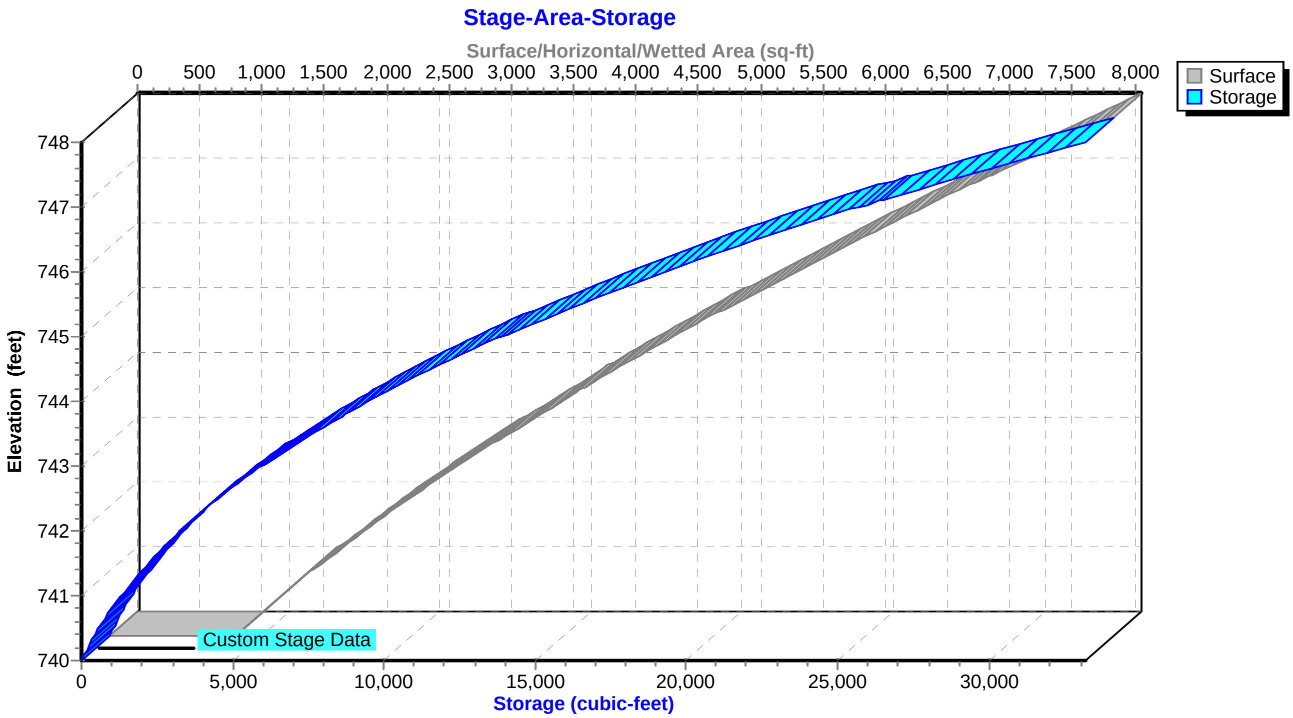
Pond SWM7: SWM7



Pond SWM7: SWM7



Pond SWM7: SWM7



Summary for Pond SWM8: SWM8

Inflow Area = 15.712 ac, 18.18% Impervious, Inflow Depth = 4.48" for 100-Year event
Inflow = 45.35 cfs @ 12.46 hrs, Volume= 5.871 af
Outflow = 27.42 cfs @ 12.82 hrs, Volume= 5.868 af, Atten= 40%, Lag= 21.7 min
Primary = 27.42 cfs @ 12.82 hrs, Volume= 5.868 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 657.39' @ 12.82 hrs Surf.Area= 14,073 sf Storage= 70,453 cf

Plug-Flow detention time= 82.8 min calculated for 5.866 af (100% of inflow)
Center-of-Mass det. time= 83.1 min (937.5 - 854.5)

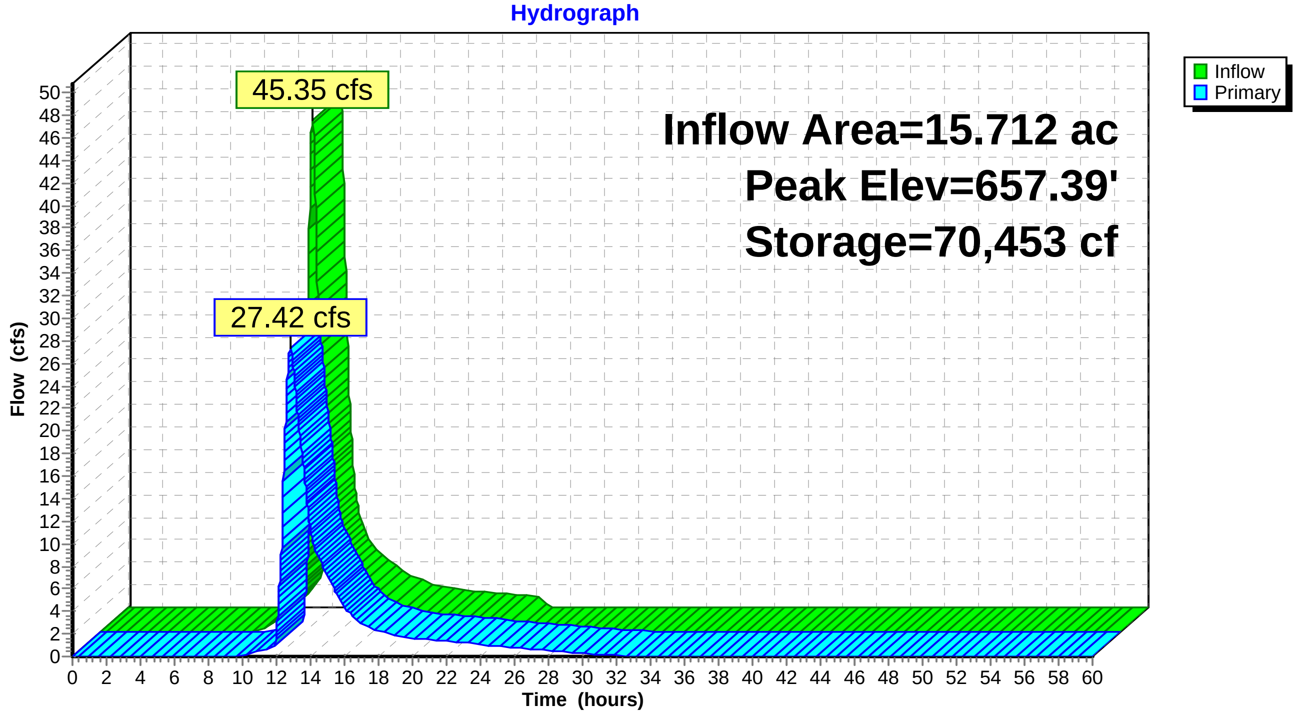
Volume	Invert	Avail.Storage	Storage Description
#1	650.00'	79,275 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
650.00	5,538	0	0
652.00	7,499	13,037	13,037
654.00	9,725	17,224	30,261
656.00	12,197	21,922	52,183
658.00	14,895	27,092	79,275

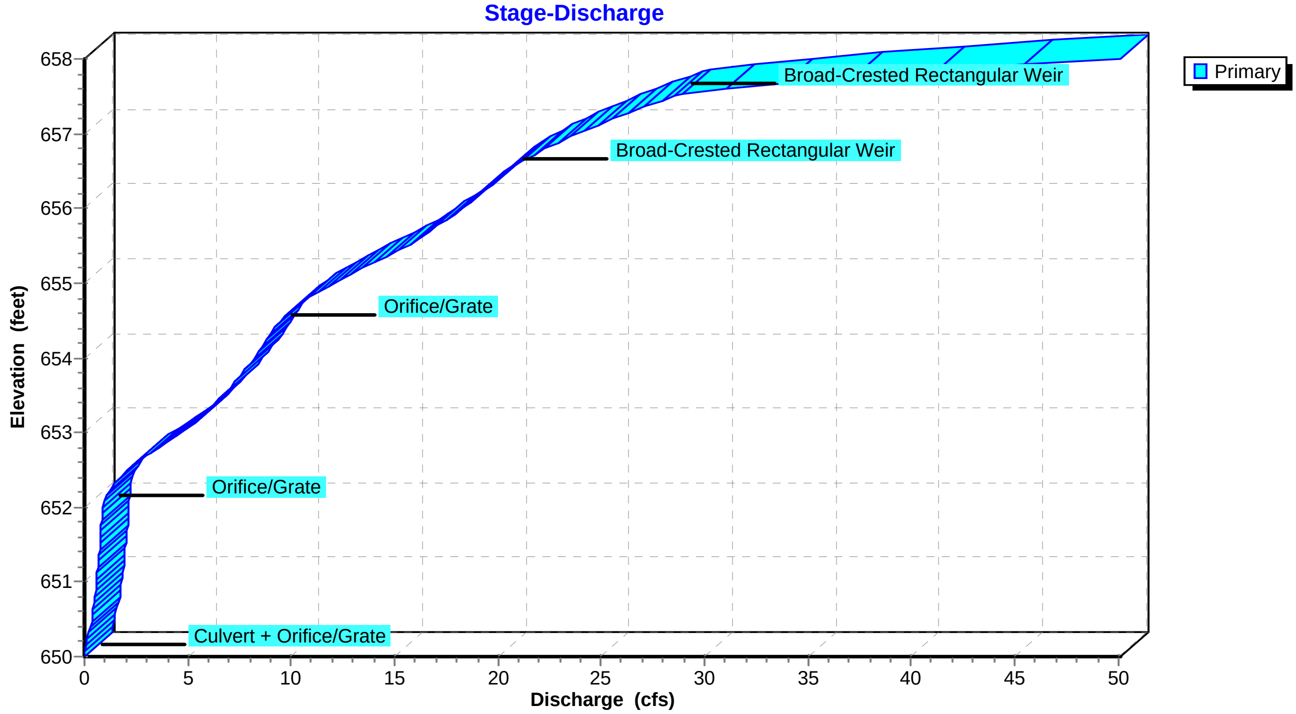
Device	Routing	Invert	Outlet Devices
#1	Primary	650.00'	**36.0" Round Culvert** L= 90.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 650.00' / 648.00' S= 0.0222 '/' Cc= 0.900 n= 0.010, Flow Area= 7.07 sf
#2	Device 1	650.00'	**5.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	652.00'	**15.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	654.40'	**15.0" Vert. Orifice/Grate** C= 0.600
#5	Device 1	656.50'	**1.5' long x 1.0' 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#6	Device 1	657.50'	**16.0' long x 1.0' 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=27.41 cfs @ 12.82 hrs HW=657.39' TW=626.48' (Dynamic Tailwater)
└─**1=Culvert** (Passes 27.41 cfs of 103.26 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.76 cfs @ 12.90 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 12.90 cfs @ 10.51 fps)
  ├─**4=Orifice/Grate** (Orifice Controls 9.09 cfs @ 7.41 fps)
  ├─**5=Broad-Crested Rectangular Weir** (Weir Controls 3.67 cfs @ 2.75 fps)
  └─**6=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

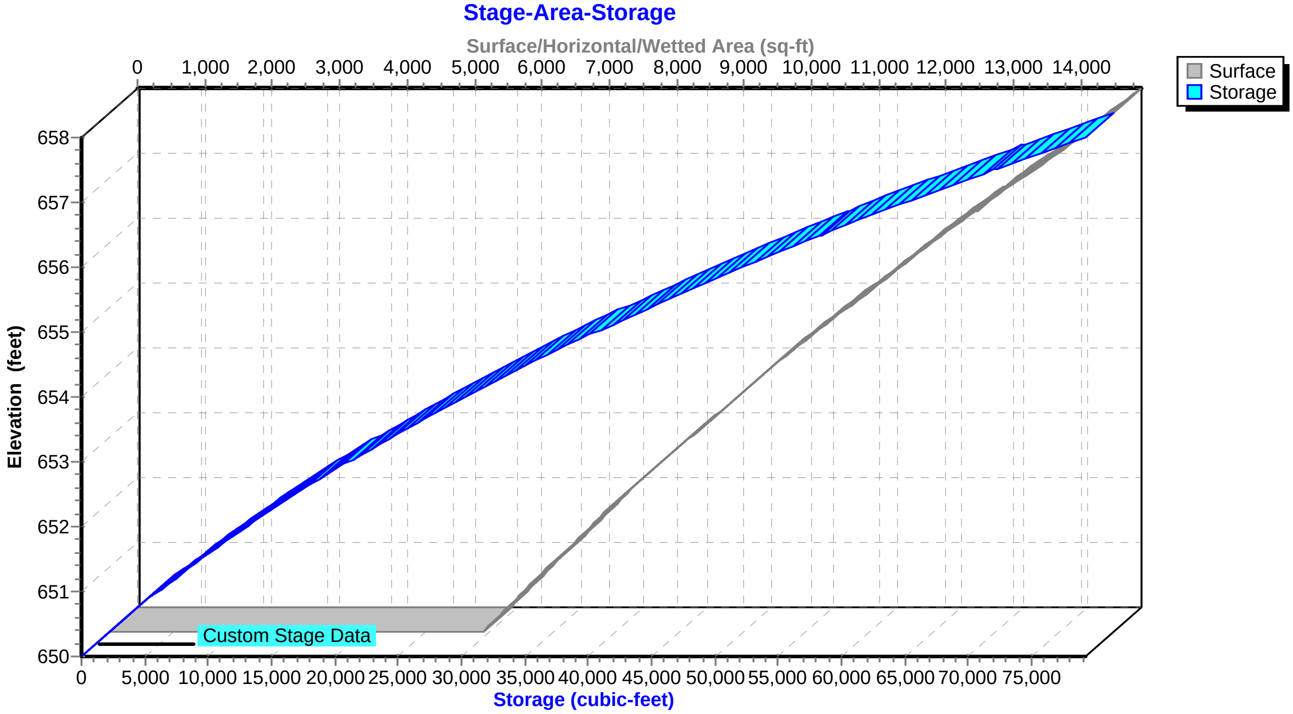
Pond SWM8: SWM8



Pond SWM8: SWM8



Pond SWM8: SWM8



Summary for Pond WF: Water Feature

Inflow Area = 56.627 ac, 6.87% Impervious, Inflow Depth = 3.09" for 100-Year event
Inflow = 102.85 cfs @ 12.55 hrs, Volume= 14.575 af
Outflow = 72.88 cfs @ 12.85 hrs, Volume= 14.575 af, Atten= 29%, Lag= 18.3 min
Primary = 62.30 cfs @ 12.85 hrs, Volume= 14.331 af
Secondary = 10.57 cfs @ 12.85 hrs, Volume= 0.244 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs / 3
Peak Elev= 529.35' @ 12.85 hrs Surf.Area= 34,415 sf Storage= 102,653 cf

Plug-Flow detention time= 22.6 min calculated for 14.570 af (100% of inflow)
Center-of-Mass det. time= 22.8 min (909.2 - 886.4)

Volume	Invert	Avail.Storage	Storage Description
#1	526.00'	125,474 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

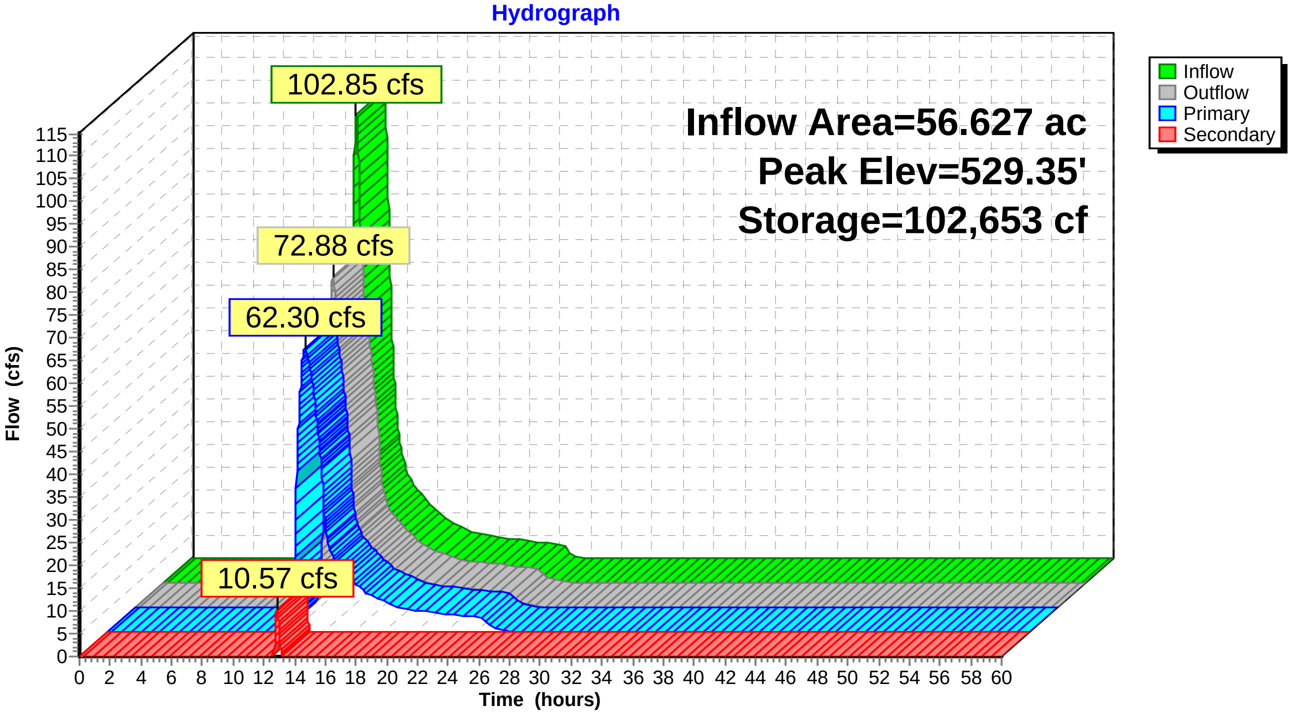
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
526.00	26,946	0	0
528.00	31,311	58,257	58,257
530.00	35,906	67,217	125,474

Device	Routing	Invert	Outlet Devices
#1	Primary	520.00'	**36.0" Round Culvert** L= 225.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 520.00' / 513.00' S= 0.0311 '/' Cc= 0.900 n= 0.015, Flow Area= 7.07 sf
#2	Device 1	526.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Secondary	529.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

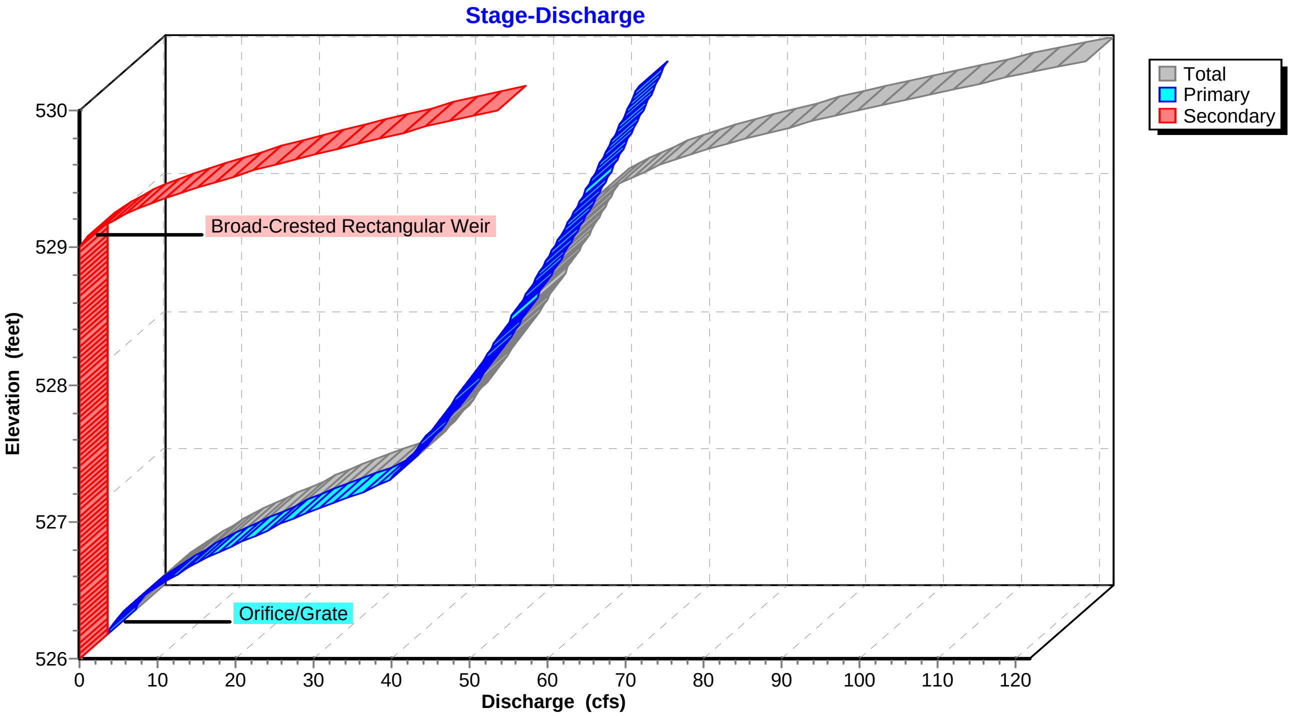
Primary OutFlow Max=62.30 cfs @ 12.85 hrs HW=529.35' TW=514.51' (Dynamic Tailwater)
└─**1=Culvert** (Passes 62.30 cfs of 112.83 cfs potential flow)
  └─**2=Orifice/Grate** (Orifice Controls 62.30 cfs @ 8.81 fps)

Secondary OutFlow Max=10.54 cfs @ 12.85 hrs HW=529.35' TW=514.51' (Dynamic Tailwater)
└─**3=Broad-Crested Rectangular Weir** (Weir Controls 10.54 cfs @ 1.50 fps)

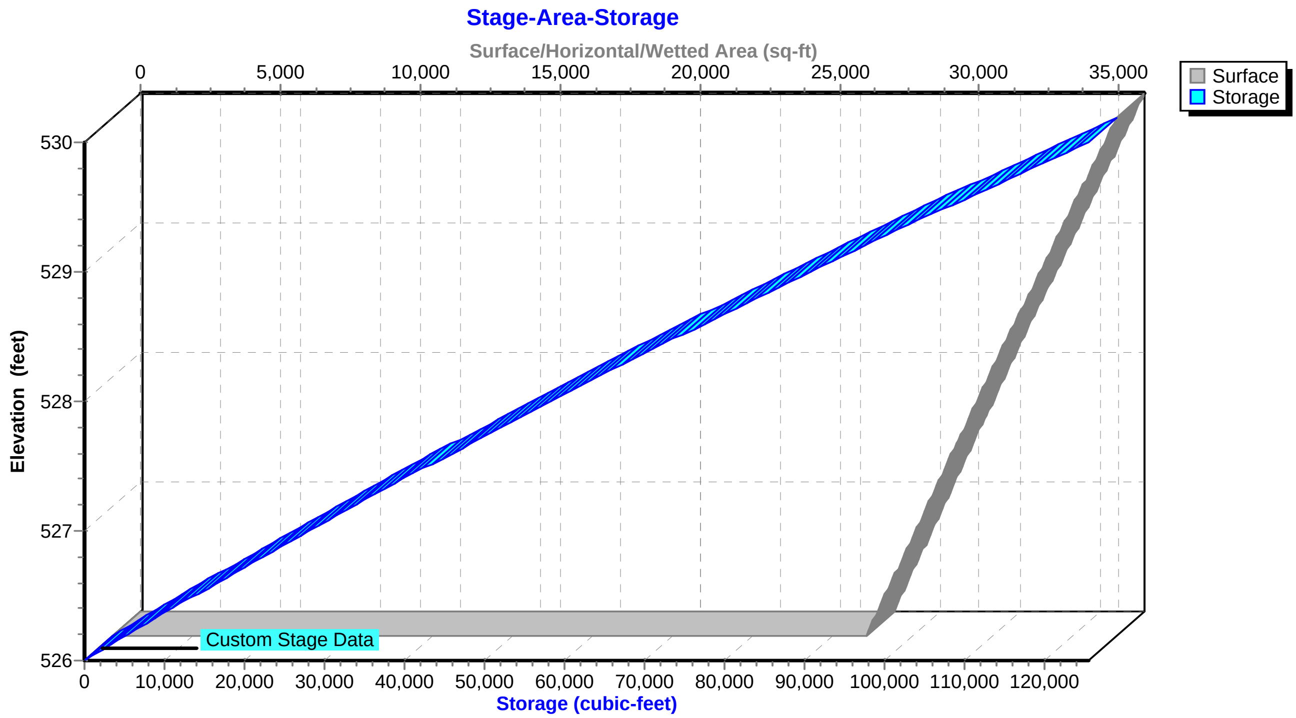
Pond WF: Water Feature



Pond WF: Water Feature



Pond WF: Water Feature

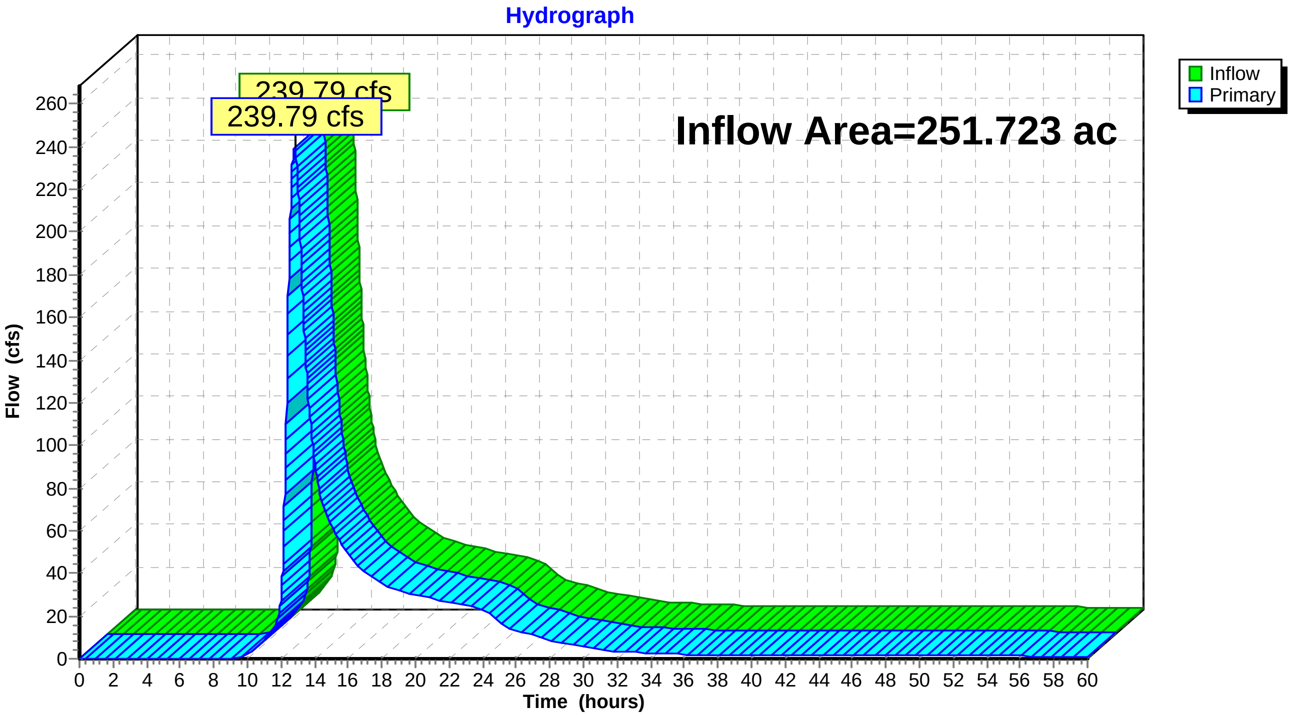


Summary for Link A: Amenia Stream

Inflow Area = 251.723 ac, 9.32% Impervious, Inflow Depth > 3.28" for 100-Year event
Inflow = 239.79 cfs @ 12.80 hrs, Volume= 68.853 af
Primary = 239.79 cfs @ 12.80 hrs, Volume= 68.853 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs

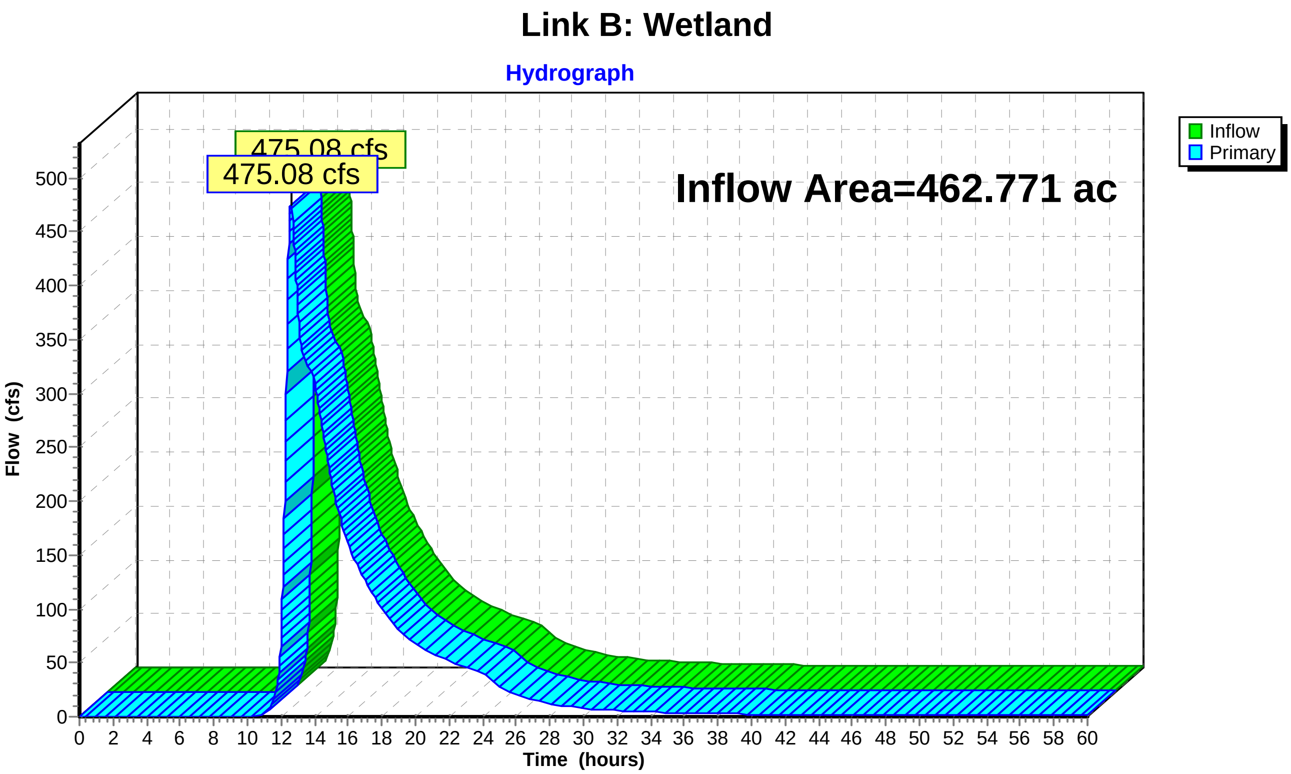
Link A: Amenia Stream



Summary for Link B: Wetland

Inflow Area =	462.771 ac,	8.42% Impervious, Inflow Depth > 4.20"	for 100-Year event
Inflow =	475.08 cfs @	12.58 hrs, Volume=	161.872 af
Primary =	475.08 cfs @	12.58 hrs, Volume=	161.872 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs

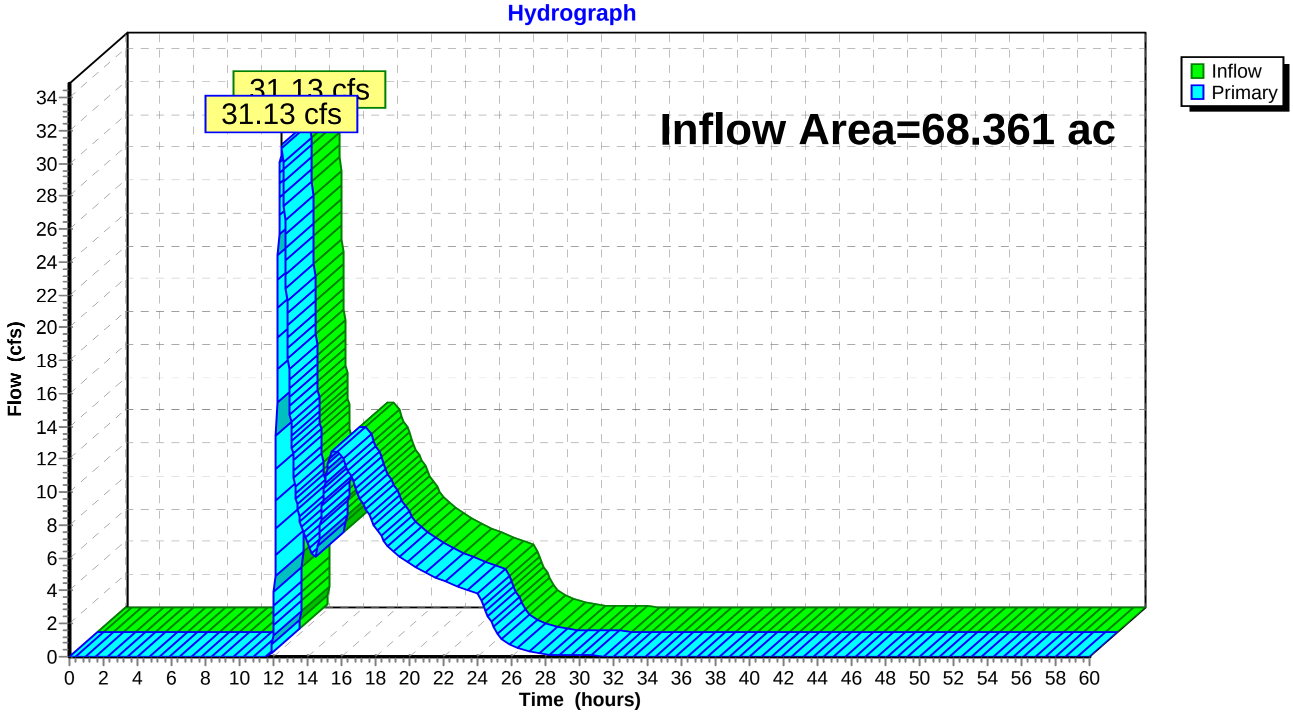


Summary for Link C: Culvert

Inflow Area =	68.361 ac,	5.80% Impervious,	Inflow Depth = 1.55"	for 100-Year event
Inflow =	31.13 cfs @	12.48 hrs, Volume=	8.822 af	
Primary =	31.13 cfs @	12.48 hrs, Volume=	8.822 af, Atten= 0%, Lag= 0.0 min	

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs

Link C: Culvert

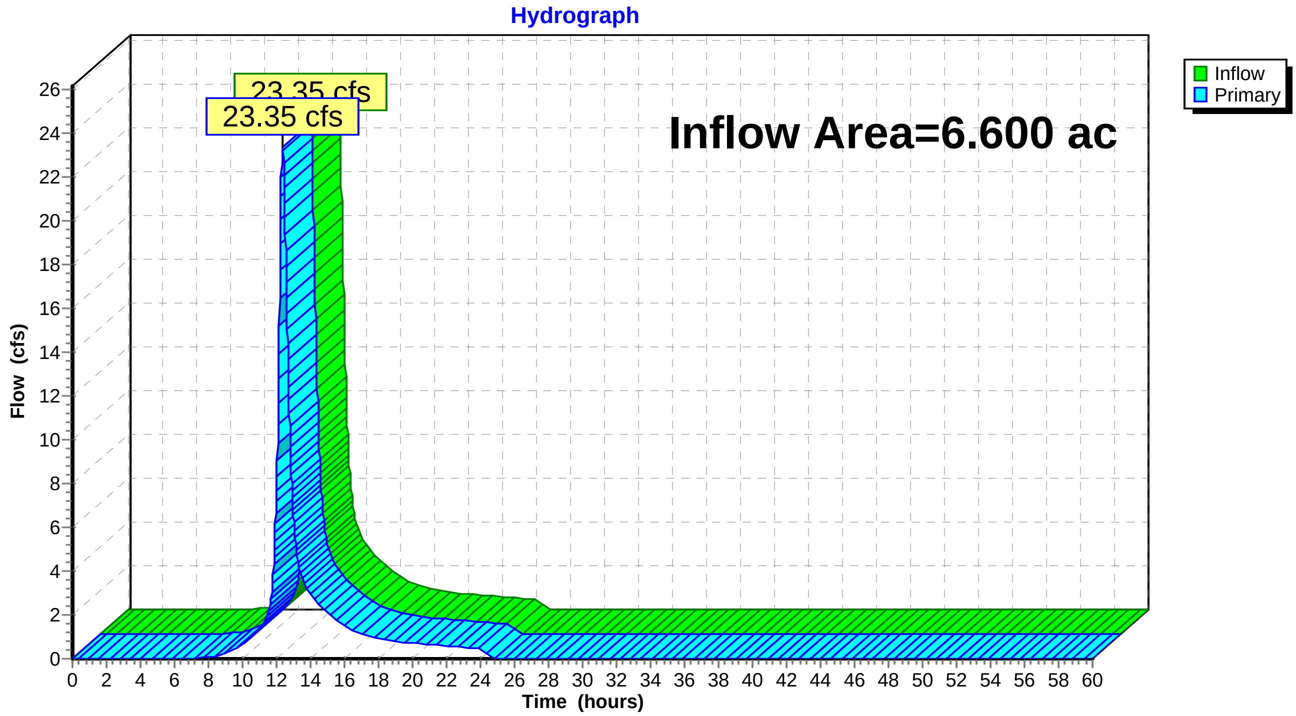


Summary for Link D: Culvert

Inflow Area =	6.600 ac,	3.97% Impervious,	Inflow Depth = 5.13"	for 100-Year event
Inflow =	23.35 cfs @	12.35 hrs, Volume=	2.822 af	
Primary =	23.35 cfs @	12.35 hrs, Volume=	2.822 af, Atten= 0%, Lag= 0.0 min	

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs

Link D: Culvert

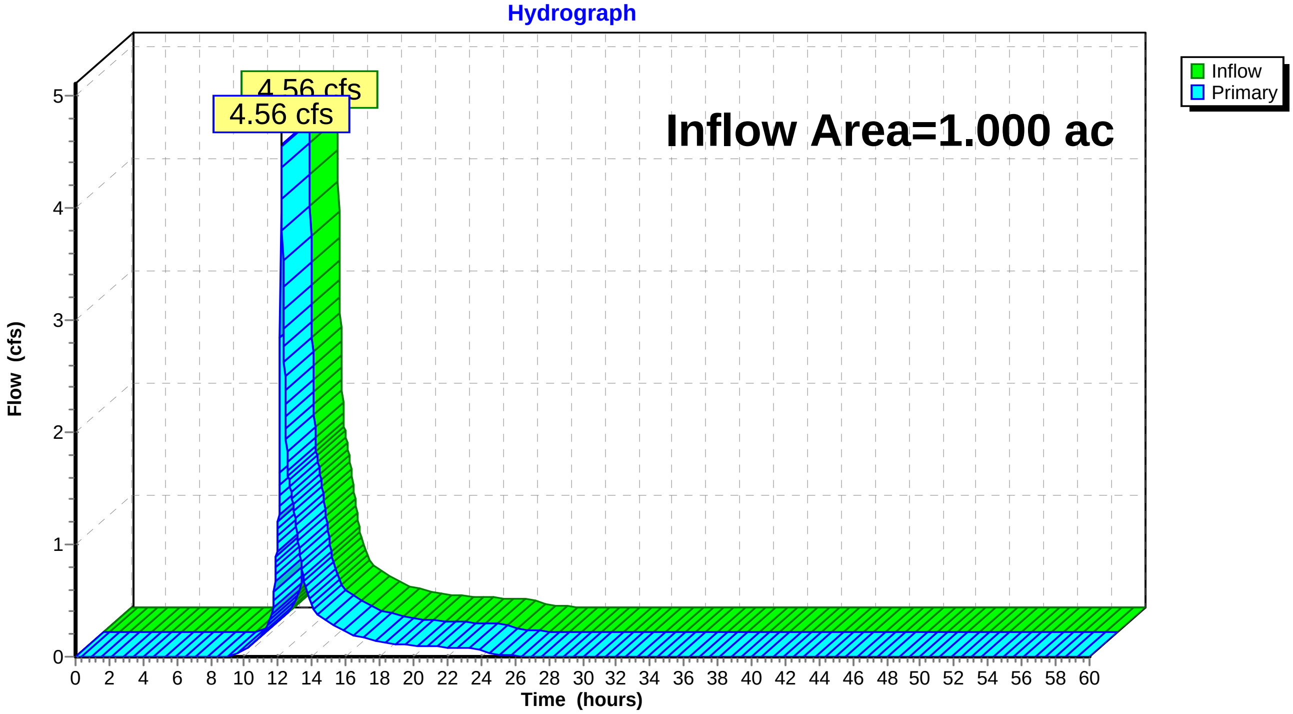


Summary for Link Overlook-A (P1): Overlook A (Phase 1)

Inflow Area =	1.000 ac,	0.00% Impervious,	Inflow Depth = 5.00"	for 100-Year event	
Inflow =	4.56 cfs @	12.17 hrs,	Volume=	0.417 af	
Primary =	4.56 cfs @	12.17 hrs,	Volume=	0.417 af,	Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.02 hrs

Link Overlook-A (P1): Overlook A (Phase 1)



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Date: 5/15/2014
Project: Silo Ridge
Project No: 29011

Calculated By: JC
Checked By:

Infiltration Basin Design -IB #B

Step 1: Compute Water Quality Volumes

NYSDEC Required Water Quality Volume (WQv):

Data:

P:	1.08	= 90% Rainfall Event Number from Figure #1
Rv:	0.1310	= 0.05 + 0.009(I) (Min. Rv =0.2) Use Rv = 0.2000
I:	9	= Impervious coverage percentage
A:	3.1	= Site Area to Basin (in acres)

WQv: **0.056** = Req'd Water Quality Volume (in ac-ft)

$$= \frac{(P)(Rv)(A)}{12}$$

Step 2: Appropriateness Infiltration Basin for Site

Soil underneath the infiltration basin will be replaced with permeasible soil with at least 0.5 in/hour infiltration rate
Also underdrain pipe will be provided to enhance the infiltration as suggested in SMDM
Infiltration basin is not located on area with slope greater than 15%
Infiltration basin is not located in fill soil
Bottom of infiltration basin is at lease 3 ft from ground water table (to be field verify)
Infiltration basin is at least 100 ft from water supply well
Infiltration basin is at least 25 ft from any structure

Step 3: Confirm local design criteria and applicability

Not applicable

Step 4: Calculate Pretreatment Volume

Pretreatment Requirements

Minimum Size: 25% of WQv = *0.0140* ac-ft
607.662 ft^3

Storage of Plunge Pool

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Volume Provided (ac-ft)	2 Req'd WQ Volume (ac-ft)
506	320		0.0073						
		419		0.0096	1	419	0.0096	0.0096	0.0140
507	519		0.0119						
		618		0.0142	1	618	0.0142	0.0238	0.0140
508	717		0.0165						

Step 5: Overflow Weir Sizing

(a) *Compute peak water quality discharge (Qwq):*

Compute modified CN for 1" rainfall

P = 1 inch

Qa = WQv / Area

Qa = **0.22** inch

CN = 1000 / [10 + 5P + 10Q_a - 10(Q_a^2 + 1.25*Q_a*P)^0.5]

CN = **86.7**

From TR-55, Table 4-1: **Ia = 0.3** **Ia / P = 0.300**

From TR-55, Exhibit 4-III: **q_u = 350 csm/in**

Q_{wq} = (q_u)(Site Area, ac/ 640 ac/ sq. mi)(Q_a)

Q_{wq} = **0.37** cfs

(b) *Water quality weir design:*

Width of weir = 3 ft.

Q_{wq} = $CLH^{3/2}$

0.37 = 3.1*L*(Hp^1.5)

Hp = **0.12** ft

Set weir elevation (infiltration basin) = 507.5

(c) *10-Year flow weir design:*

Q_{10} = 4.7 cfs

Design flow, Q_{10d} = Q_{10} - Q_{wq}

= 4.65 - 0.37

= 4.28 cfs

Width of weir = 8 ft.

Q_{10d} = $CLH^{3/2}$

4.28 = 3.1*L*(Hp^1.5)

Hp = **0.31** ft

Overflow Velocity (ft/s) = Q10d / (weir width * depth)

= **1.73** ft/s ok

Set weir elevation = 507.6

Design High Water Elevation = Weir Elevation + Hp

= 507.62 + 0.31

= 507.93

Top of Plunge Pool Elevation = 508.5 (6" freeboard)

Step 6: Determine Infiltration Basin Size

WQv Requirements:

100% WQv = *0.0558* ac-ft
= 2430.648 ft^3
Side Slope = 2 on 1

Storage of Infiltration Basin

Contour Elev. (ft)	Contour Area: Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Volume Provided (ac-ft)	2 Req'd WQ Volume (ac-ft)
506	936		0.0215						
		1177		0.0270	1	1177	0.0270	0.0270	0.0558
507	1419		0.0326						
		1660		0.0381	1	1660	0.0381	0.0651	0.0558
508	1901		0.0436						

Determine Required WQv Elevation:

		Elev. (ft)	Cumulative Volume (ac-ft)
Required Water Quality Volume (WQv) =		X	0.0558
Water Quality Storage Elevation Range:	High:	508.00	0.0651
	Low:	507.00	0.0270

Required water quality elevation, X = **507.8** ft
Required Water quality volume at elevation X = **0.0558** ac-ft

Provided water quality elevation = **508.0** ft
Provided water quality volume = **0.0651** ac-ft
Depth of WQ elevation = **24.0** in

Provide 4" PVC underdrain pipe at inv. 504

Other Requirements

a) Determine Infiltration basin to dewater within 48 hours

Infiltration rate = 0.5 in/hr

Time of infiltration = Depth of ponding / infiltration rate

$$= \frac{24.0}{0.500}$$

= 48 hr ok

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Date: 5/15/2014
Project: Silo Ridge
Project No: 29011

Calculated By: JC
Checked By:

Infiltration Basin Design -IB #B1

Step 1: Compute Water Quality Volumes

NYSDEC Required Water Quality Volume (WQv):

Data:

P:	1.08	= 90% Rainfall Event Number from Figure #1	
Rv:	0.1310	= 0.05 + 0.009(I) (Min. Rv =0.2)	Use Rv = 0.2000
I:	9	= Impervious coverage percentage	
A:	0.76	= Site Area to Basin (in acres)	

WQv: **0.014** = Req'd Water Quality Volume (in ac-ft)

$$= \frac{(P)(Rv)(A)}{12}$$

Step 2: Appropriateness Infiltration Basin for Site

Soil underneath the infiltration basin will be replaced with permeasible soil with at least 0.5 in/hour infiltration rate
Also underdrain pipe will be provided to enhance the infiltration as suggested in SMDM
Infiltration basin is not located on area with slope greater than 15%
Infiltration basin is not located in fill soil
Bottom of infiltration basin is at lease 3 ft from ground water table (to be field verify)
Infiltration basin is at least 100 ft from water supply well
Infiltration basin is at least 25 ft from any structure

Step 3: Confirm local design criteria and applicability

Not applicable

Step 4: Calculate Pretreatment Volume

Pretreatment Requirements

Minimum Size: 25% of WQv = *0.0034* ac-ft
148.9752 ft^3

Storage of Plunge Pool

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Contour Area Average (ft^2)	Contour Area Proposed (ac)	Contour Area Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Volume Provided (ac-ft)	2 Req'd WQ Volume (ac-ft)
533	121		0.0028						
		198		0.0045	1	198	0.0045	0.0045	0.0034
534	274		0.0063						

Step 5: Overflow Weir Sizing

(a) *Compute peak water quality discharge (Qwq):*

Compute modified CN for 1" rainfall

P = 1 inch

Qa = WQv / Area

Qa = **0.22** inch

CN = 1000 / [10 + 5P + $10Q_a$ - $10(Q_a^2$ + $1.25*Q_a$*P)^0.5]

CN = **86.7**

From TR-55, Table 4-1: **Ia = 0.3** **Ia / P = 0.300**

From TR-55, Exhibit 4-III: **q_u = 350 csm/in**

Q_{wq} = (q_u)(Site Area, ac/ 640 ac/ sq. mi)(Q_a)

Q_{wq} = **0.09** cfs

(b) *Water quality weir design:*

Width of weir = 3 ft.

$Q_{wq} = CLH^{3/2}$

0.09 = 3.1*L*(Hp^1.5)

Hp = **0.05** ft

Set weir elevation (infiltration basin) = 533.8

(c) *10-Year flow weir design:*

Q_{10} = 1.14 cfs

Design flow, Q_{10d} = Q_{10} - Q_{wq}

= 1.14 - 0.09

= 1.05 cfs

Width of weir = 5 ft.

$Q_{10d} = CLH^{3/2}$

1.05 = 3.1*L*(Hp^1.5)

Hp = **0.17** ft

Overflow Velocity (ft/s) = Q10d / (weir width * depth)

= **1.26** ft/s ok

Set weir elevation = 533.85

Design High Water Elevation = Weir Elevation + Hp

= 533.85 + 0.17

= 534.01

Top of Plunge Pool Elevation = 534.5 (6" freeboard)

Step 6: Determine Infiltration Basin Size

WQv Requirements:

100% WQv = *0.0137* ac-ft

= 595.9008 ft^3

Side Slope = 2 on 1

Storage of Infiltration Basin

Contour Elev. (ft)	Contour Area Proposed (ft²)	Average (ft²)	Proposed (ac)	Average (ac)	Depth (ft)	Total Volume (ft³)	Total Volume (ac-ft)	1 Volume Provided (ac-ft)	2 Req'd WQ Volume (ac-ft)
532	329		0.0076						
		422		0.0097	1	422	0.0097	0.0097	0.0137
533	514		0.0118						
		607		0.0139	1	607	0.0139	0.0236	0.0137
534	699		0.0160						

Determine Required WQv Elevation:

		Elev. (ft)	Cumulative Volume (ac-ft)
Required Water Quality Volume (WQv) =		X	0.0137
Water Quality Storage Elevation Range:	High:	534.00	0.0236
	Low:	533.00	0.0097

Required water quality elevation, X = **533.3** ft

Required Water quality volume at elevation X = **0.0137** ac-ft

Provided water quality elevation = **534.0** ft

Provided water quality volume = **0.0236** ac-ft

Depth of WQ elevation = **24.0** in

Provide 4" PVC underdrain pipe at inv. 529

Other Requirements

a) Determine Infiltration basin to dewater within 48 hours

Infiltration rate = 0.5 in/hr

Time of infiltration = Depth of ponding / infiltration rate

$= \frac{24.0}{0.500}$

= 48 hr ok

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Date: 5/15/2014
Project: Silo Ridge
Project No: 29011

Calculated By: JC
Checked By:

Infiltration Basin Design -IB #B2

Step 1: Compute Water Quality Volumes

NYSDEC Required Water Quality Volume (WQv):

Data:

P:	1.08	= 90% Rainfall Event Number from Figure #1	
Rv:	0.1310	= 0.05 + 0.009(I) (Min. Rv =0.2)	Use Rv = 0.2000
I:	9	= Impervious coverage percentage	
A:	1.33	= Site Area to Basin (in acres)	

WQv: **0.024** = Req'd Water Quality Volume (in ac-ft)

$$= \frac{(P)(Rv)(A)}{12}$$

Step 2: Appropriateness Infiltration Basin for Site

Soil underneath the infiltration basin will be replaced with permeasible soil with at least 0.5 in/hour infiltration rate
Also underdrain pipe will be provided to enhance the infiltration as suggested in SMDM
Infiltration basin is not located on area with slope greater than 15%
Infiltration basin is not located in fill soil
Bottom of infiltration basin is at lease 3 ft from ground water table (to be field verify)
Infiltration basin is at least 100 ft from water supply well
Infiltration basin is at least 25 ft from any structure

Step 3: Confirm local design criteria and applicability

Not applicable

Step 4: Calculate Pretreatment Volume

Pretreatment Requirements

Minimum Size: 25% of WQv = *0.0060* ac-ft
260.7066 ft^3

Storage of Plunge Pool

Contour Elev. (ft)	Contour Area: Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1: Volume Provided (ac-ft)	2: Req'd WQ Volume (ac-ft)
512	122		0.0028						
		238		0.0055	2	475	0.0109	0.0109	0.0060
514	353		0.0081						

Step 5: Overflow Weir Sizing

(a) *Compute peak water quality discharge (Qwq):*

Compute modified CN for 1" rainfall

P = 1 inch

Qa = WQv / Area

Qa = **0.22** inch

CN = 1000 / [10 + 5P + 10Q_a - 10(Q_a^2 + 1.25*Q_a*P)^0.5]

CN = **86.7**

From TR-55, Table 4-1: **Ia = 0.3** **Ia / P = 0.300**

From TR-55, Exhibit 4-III: **q_u = 350 csm/in**

Q_{wq} = (q_u)(Site Area, ac/ 640 ac/ sq. mi)(Q_a)

Q_{wq} = **0.16** cfs

(b) *Water quality weir design:*

Width of weir = 3 ft.

Q_{wq} = $CLH^{3/2}$

0.16 = 3.1*L*(Hp^1.5)

Hp = **0.07** ft

Set weir elevation (infiltration basin) = 513.7

(c) *10-Year flow weir design:*

Q_{10} = 2.0 cfs

Design flow, Q_{10d} = Q_{10} - Q_{wq}

= 2.00 - 0.16

= 1.84 cfs

Width of weir = 6 ft.

Q_{10d} = $CLH^{3/2}$

1.84 = 3.1*L*(Hp^1.5)

Hp = **0.21** ft

Overflow Velocity (ft/s) = Q10d / (weir width * depth)

= **1.43** ft/s ok

Set weir elevation = 513.77

Design High Water Elevation = Weir Elevation + Hp

= 513.77 + 0.21

= 513.98

Top of Plunge Pool Elevation = 514.5 (6" freeboard)

Step 6: Determine Infiltration Basin Size

WQv Requirements:

100% WQv = *0.0239* ac-ft

= 1042.8264 ft^3

Side Slope = 2 on 1

Storage of Infiltration Basin

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Volume Provided (ac-ft)	2 Req'd WQ Volume (ac-ft)
512	545		0.0125						
		652		0.0150	1	652	0.0150	0.0150	0.0239
513	759		0.0174						
		865		0.0199	1	865	0.0199	0.0348	0.0239
514	972		0.0223						

Determine Required WQv Elevation:

		Elev. (ft)	Cumulative Volume (ac-ft)
Required Water Quality Volume (WQv) =		X	0.0239
Water Quality Storage Elevation Range:	High:	514.00	0.0348
	Low:	513.00	0.0150

Required water quality elevation, X = **513.5** ft

Required Water quality volume at elevation X = **0.0239** ac-ft

Provided water quality elevation = **514.0** ft

Provided water quality volume = **0.0348** ac-ft

Depth of WQ elevation = **24.0** in

Provide 4" PVC underdrain pipe at inv. 509

Other Requirements

a) Determine Infiltration basin to dewater within 48 hours

Infiltration rate = 0.5 in/hr

Time of infiltration = Depth of ponding / infiltration rate

$= \frac{24.0}{0.500}$

= 48 hr ok

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Project: Silo Ridge
Project No: 29011

Calculated By: JC
Checked By: ____

Infiltration Basin Design -IB #C

Step 1: Compute Water Quality Volumes

NYSDEC Required Water Quality Volume (WQv):

Data:

P:	1.08	= 90% Rainfall Event Number from Figure #1	
Rv:	0.1310	= 0.05 + 0.009(I) (Min. Rv =0.2)	Use Rv = 0.2000
I:	9	= Impervious coverage percentage	
A:	2.39	= Site Area to Basin (in acres)	

WQv: **0.043** = Req'd Water Quality Volume (in ac-ft)

$$= \frac{(P)(Rv)(A)}{12}$$

Step 2: Appropriateness Infiltration Basin for Site

Soil underneath the infiltration basin will be replaced with permeasible soil with at least 0.5 in/hour infiltration rate
Also underdrain pipe will be provided to enhance the infiltration as suggested in SMDM
Infiltration basin is not located on area with slope greater than 15%
Infiltration basin is not located in fill soil
Bottom of infiltration basin is at lease 3 ft from ground water table (to be field verify)
Infiltration basin is at least 100 ft from water supply well
Infiltration basin is at least 25 ft from any structure

Step 3: Confirm local design criteria and applicability

Not applicable

Step 4: Calculate Pretreatment Volume

Pretreatment Requirements

Minimum Size: 25% of WQv = *0.0108* ac-ft
468.4878 ft^3

Storage of Plunge Pool

Contour Elev. (ft)	Contour Area: Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Volume Provided (ac-ft)	2 Req'd WQ Volume (ac-ft)
546	448		0.0103						
		541		0.0124	1	541	0.0124	0.0124	0.0108
547	634		0.0146						
		727		0.0167	1	727	0.0167	0.0291	0.0108
548	820		0.0188						

Step 5: Overflow Weir Sizing

(a) *Compute peak water quality discharge (Qwq):*

Compute modified CN for 1" rainfall

P = 1 inch

Qa = WQv / Area

Qa = **0.22** inch

$CN = 1000 / [10 + 5P + 10Q_a - 10(Q_a^2 + 1.25*Q_a*P)^{0.5}]$

CN = **86.7**

From TR-55, Table 4-1: **Ia = 0.3** **Ia / P = 0.300**

From TR-55, Exhibit 4-III: **q_u = 350 csm/in**

$Q_{wq} = (q_u)(\text{Site Area, ac/ 640 ac/ sq. mi})(Q_a)$

Q_{wq} = **0.28** cfs

(b) *Water quality weir design:*

Width of weir = 2 ft.

$Q_{wq} = CLH^{3/2}$

0.28 = 3.1*L*(Hp^1.5)

Hp = **0.13** ft

Set weir elevation (infiltration basin) = 547.5

(c) *10-Year flow weir design:*

Q_{10} = 3.6 cfs

Design flow, Q_{10d}	=	$Q_{10} - Q_{wq}$		
	=	3.60	-	0.28
	=	3.32 cfs		

Width of weir = 10 ft.

$Q_{10d} = CLH^{3/2}$

3.32 = 3.1*L*(Hp^1.5)

Hp = **0.23** ft

Overflow Velocity (ft/s) = Q10d / (weir width * depth)

= **1.47** ft/s ok

Set weir elevation = 547.63

Design High Water Elevation = Weir Elevation + Hp

= 547.63 + 0.23

= 547.85

Top of Plunge Pool Elevation = 548.4 (6" freeboard)

Step 6: Determine Infiltration Basin Size

WQv Requirements:

100% WQv = *0.0430* ac-ft

= 1873.9512 ft^3

Side Slope = 2 on 1

Storage of Infiltration Basin

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Volume Provided (ac-ft)	2 Req'd WQ Volume (ac-ft)
546	717		0.0165						
		890		0.0204	1	890	0.0204	0.0204	0.0430
547	1062		0.0244						
		1235		0.0283	1	1235	0.0283	0.0488	0.0430
548	1407		0.0323						

Determine Required WQv Elevation:

		Elev. (ft)	Cumulative Volume (ac-ft)
Required Water Quality Volume (WQv) =		X	0.0430
Water Quality Storage Elevation Range:	High:	548.00	0.0488
	Low:	547.00	0.0204

Required water quality elevation, X = **547.8** ft

Required Water quality volume at elevation X = **0.0430** ac-ft

Provided water quality elevation = **548.0** ft

Provided water quality volume = **0.0488** ac-ft

Depth of WQ elevation = **24.0** in

Provide 4" PVC underdrain pipe at inv. 543

Other Requirements

a) Determine Infiltration basin to dewater within 48 hours

Infiltration rate = 0.5 in/hr

Time of infiltration = Depth of ponding / infiltration rate

$$= \frac{24.0}{0.500}$$

= 48 hr ok

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Project: Silo Ridge
Project No: 29011

Calculated By: JC
Checked By:

Infiltration Basin Design -IB #D

Step 1: Compute Water Quality Volumes

NYSDEC Required Water Quality Volume (WQv):

Data:

P:	1.08	= 90% Rainfall Event Number from Figure #1	
Rv:	0.1310	= 0.05 + 0.009(I) (Min. Rv =0.2)	Use Rv = 0.2000
I:	9	= Impervious coverage percentage	
A:	2.02	= Site Area to Basin (in acres)	

WQv: **0.036** = Req'd Water Quality Volume (in ac-ft)

$$= \frac{(P)(Rv)(A)}{12}$$

Step 2: Appropriateness Infiltration Basin for Site

Soil underneath the infiltration basin will be replaced with permeasible soil with at least 0.5 in/hour infiltration rate
Also underdrain pipe will be provided to enhance the infiltration as suggested in SMDM
Infiltration basin is not located on area with slope greater than 15%
Infiltration basin is not located in fill soil
Bottom of infiltration basin is at lease 3 ft from ground water table (to be field verify)
Infiltration basin is at least 100 ft from water supply well
Infiltration basin is at least 25 ft from any structure

Step 3: Confirm local design criteria and applicability

Not applicable

Step 4: Calculate Pretreatment Volume

Pretreatment Requirements

Minimum Size: 25% of WQv = *0.0091* ac-ft
395.9604 ft^3

Storage of Plunge Pool

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Contour Area Average (ft^2)	Contour Area Proposed (ac)	Contour Area Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Volume Provided (ac-ft)	2 Req'd WQ Volume (ac-ft)
520	117		0.0027						
		190		0.0044	1	190	0.0044	0.0044	0.0091
521	262		0.0060						
		335		0.0077	1	335	0.0077	0.0120	0.0091
522	407		0.0093						

Step 5: Overflow Weir Sizing

(a) *Compute peak water quality discharge (Qwq):*

Compute modified CN for 1" rainfall

P = 1 inch

Qa = WQv / Area

Qa = **0.22** inch

CN = $1000 / [10 + 5P + 10Q_a - 10(Q_a^2 + 1.25*Q_a*P)^{0.5}]$

CN = **86.7**

From TR-55, Table 4-1: **Ia = 0.3** **Ia / P = 0.300**

From TR-55, Exhibit 4-III: **q_u = 350 csm/in**

Q_{wq} = (q_u)(Site Area, ac/ 640 ac/ sq. mi)(Q_a)

Q_{wq} = **0.24** cfs

(b) *Water quality weir design:*

Width of weir = 4 ft.

$Q_{wq} = CLH^{3/2}$

0.24 = 3.1*L*(Hp^1.5)

Hp = **0.07** ft

Set weir elevation (infiltration basin) = 521.8

(c) *10-Year flow weir design:*

Q_{10} = 6.3 cfs (from hydroCAD)

Design flow, Q_{10d} = $Q_{10} - Q_{wq}$

= 6.30 - 0.24

= 6.06 cfs

Width of weir = 10 ft.

$Q_{10d} = CLH^{3/2}$

6.06 = 3.1*L*(Hp^1.5)

Hp = **0.34** ft

Overflow Velocity (ft/s) = Q10d / (weir width * depth)

= **1.80** ft/s ok

Set weir elevation = 521.87

Design High Water Elevation = Weir Elevation + Hp

= 521.87 + 0.34

= 522.21

Top of Plunge Pool Elevation = 522.8 (6" freeboard)

Step 6: Determine Infiltration Basin Size

WQv Requirements:

100% WQv = *0.0364* ac-ft

= 1583.8416 ft^3

Side Slope = 2 on 1

Storage of Infiltration Basin

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Contour Area Average (ft^2)	Contour Area Proposed (ac)	Contour Area Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Volume Provided (ac-ft)	2 Req'd WQ Volume (ac-ft)
520	1051		0.0241						
		1219		0.0280	1	1219	0.0280	0.0280	0.0364
521	1387		0.0318						
		1555		0.0357	1	1555	0.0357	0.0637	0.0364
522	1723		0.0396						

Determine Required WQv Elevation:

		Elev. (ft)	Cumulative Volume (ac-ft)
Required Water Quality Volume (WQv) =		X	0.0364
Water Quality Storage Elevation Range:	High:	522.00	0.0637
	Low:	521.00	0.0280

Required water quality elevation, X = **521.2** ft

Required Water quality volume at elevation X = **0.0364** ac-ft

Provided water quality elevation = **522.0** ft

Provided water quality volume = **0.0637** ac-ft

Depth of WQ elevation = **24.0** in

Provide 4" PVC underdrain pipe at inv. 517

Other Requirements

a) Determine Infiltration basin to dewater within 48 hours

Infiltration rate = 0.5 in/hr

Time of infiltration = Depth of ponding / infiltration rate

$= \frac{24.0}{0.500}$

= 48 hr ok

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Date: 5/15/2014
Project: Silo Ridge
Project No: 29011

Calculated By: JC
Checked By:

Infiltration Basin Design -IB #E3

Step 1: Compute Water Quality Volumes

NYSDEC Required Water Quality Volume (WQv):

Data:

P: 1.08 = 90% Rainfall Event Number from Figure #1
Rv: 0.1310 = 0.05 + 0.009(I) (Min. Rv =0.2) Use Rv = 0.2000
I: 9 = Impervious coverage percentage
A: 2.43 = Site Area to Basin (in acres)

WQv: **0.044** = Req'd Water Quality Volume (in ac-ft)

$$= \frac{(P)(Rv)(A)}{12}$$

Step 2: Appropriateness Infiltration Basin for Site

Soil underneath the infiltration basin will be replaced with permeasible soil with at least 0.5 in/hour infiltration rate
Also underdrain pipe will be provided to enhance the infiltration as suggested in SMDM
Infiltration basin is not located on area with slope greater than 15%
Infiltration basin is not located in fill soil
Bottom of infiltration basin is at lease 3 ft from ground water table (to be field verify)
Infiltration basin is at least 100 ft from water supply well
Infiltration basin is at least 25 ft from any structure

Step 3: Confirm local design criteria and applicability

Not applicable

Step 4: Calculate Pretreatment Volume

Pretreatment Requirements

Minimum Size: 25% of WQv = *0.0109* ac-ft
476.3286 ft^3

Storage of Plunge Pool

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Volume Provided (ac-ft)	2 Req'd WQ Volume (ac-ft)
508	260	418	0.0060	0.0096	2	836	0.0192	0.0192	0.0109
510	576		0.0132						

Step 5: Overflow Weir Sizing

(a) *Compute peak water quality discharge (Qwq):*

Compute modified CN for 1" rainfall

P = 1 inch

Qa = WQv / Area

Qa = **0.22** inch

$CN = 1000 / [10 + 5P + 10Q_a - 10(Q_a^2 + 1.25*Q_a*P)^{0.5}]$

CN = **86.7**

From TR-55, Table 4-1: **Ia = 0.3** **Ia / P = 0.300**

From TR-55, Exhibit 4-III: **q_u = 350 csm/in**

Q_{wq} = (q_u)(Site Area, ac/ 640 ac/ sq. mi)(Q_a)

Q_{wq} = **0.29** cfs

(b) *Water quality weir design:*

Width of weir = 3 ft.

$Q_{wq} = CLH^{3/2}$

0.29 = 3.1*L*(Hp^1.5)

Hp = **0.10** ft

Set weir elevation (infiltration basin) = 509.4

(c) *10-Year flow weir design:*

Q_{10} = 3.7 cfs

Design flow, Q_{10d} = $Q_{10} - Q_{wq}$

= 3.65 - 0.29

= 3.36 cfs

Width of weir = 10 ft.

$Q_{10d} = CLH^{3/2}$

3.36 = 3.1*L*(Hp^1.5)

Hp = **0.23** ft

Overflow Velocity (ft/s) = Q10d / (weir width * depth)

= **1.48** ft/s ok

Set weir elevation = 509.50

Design High Water Elevation = Weir Elevation + Hp

= 509.50 + 0.23

= 509.73

Top of Plunge Pool Elevation = 510.3 (6" freeboard)

Step 6: Determine Infiltration Basin Size

WQv Requirements:

100%	WQv	=	*0.0437*	ac-ft
		=	1905.3144	ft^3
	Side Slope =		2 on 1	

Storage of Infiltration Basin

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Volume Provided (ac-ft)	2 Req'd WQ Volume (ac-ft)
509	3978	4262	0.0913	0.0978	1	4262	0.0978	0.0978	0.0437
510	4546		0.1044						

Determine Required WQv Elevation:

		Elev. (ft)	Cumulative Volume (ac-ft)
Required Water Quality Volume (WQv) =		X	0.0437
Water Quality Storage Elevation Range:	High:	510.00	0.0978
	Low:	509.00	0.0000

Required water quality elevation, X = **509.4** ft

Required Water quality volume at elevation X = **0.0437** ac-ft

Provided water quality elevation = **510.0** ft

Provided water quality volume = **0.0978** ac-ft

Depth of WQ elevation = **12.0** in

Provide 4" PVC underdrain pipe at inv. 507.5

Other Requirements

a) Determine Infiltration basin to dewater within 48 hours

Infiltration rate = 0.5 in/hr

Time of infiltration = Depth of ponding / infiltration rate

$$= \frac{12.0}{0.500}$$

= 24 hr ok

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Project: Silo Ridge
Project No: 29011

Calculated By: JC
Checked By:

Infiltration Basin Design -SWM 11

Step 1: Compute Water Quality Volumes

Note: This infiltration basin (which is constructed during the golf phase) is designed to satisfy the East of Hudson standard because it received part of the runoff from the full built conditions. WQv from SWM 11 (constructed during golf phase) is not being considered in full built WQv & RRv analysis to be conservative.

NYSDEC Required Water Quality Volume (WQv):

Data:

East of Hudson Standard

P:	2.8	= 1-year Rainfall Precipitation (in.)
CN:	56	= CN value for developed condition
Q:	0.17	= 1-year runoff (in.)
A:	16.24	= Site Area to Basin (in acres)

$S = 1000/cn - 10$

S= 7.9

$$Q = \frac{(P-0.2S)^2}{(P+0.8S)}$$

Q= 0.17

WQv: **0.2248** = Req'd Water Quality Volume (in ac-ft)

$$= \frac{(Q)(A)}{12}$$

90% Rainfall Event Standard

P:	1.08	= 90% Rainfall Event Number from Figure #1	
Rv:	0.1310	= 0.05 + 0.009(I) (Min. Rv =0.2)	Use Rv = 0.2000
I:	9	= Impervious coverage percentage	
A:	7.9	= Site Area to Basin (in acres)	

WQv: **0.142** = Req'd Water Quality Volume (in ac-ft)

$$= \frac{(P)(Rv)(A)}{12}$$

USE WQv = 0.2248 ac-ft for design purposes

Step 2: Appropriateness Infiltration Basin for Site

Soil underneath the infiltration basin will be replaced with permeasible soil with at least 0.5 in/hour infiltration rate
Also underdrain pipe will be provided to enhance the infiltration as suggested in SMDM
Infiltration basin is not located on area with slope greater than 15%
Infiltration basin is not located in fill soil

Bottom of infiltration basin is at lease 3 ft from ground water table (to be field verify)
Infiltration basin is at least 100 ft from water supply well
Infiltration basin is at least 25 ft from any structure

Step 3: Confirm local design criteria and applicability

The town required the design to be done to East of Hudson standard.

Step 4: Calculate Pretreatment Volume

Pretreatment Requirements

Minimum Size: 25% of WQv = *0.0562* ac-ft
2448.35509 ft^3

Storage of Plunge Pool

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Volume Provided (ac-ft)	2 Req'd WQ Volume (ac-ft)
509	944		0.0217						
		1434		0.0329	2	2867	0.0658	0.0658	0.0562
511	1923		0.0441						

Step 5: Overflow Weir Sizing

(a) Compute peak water quality discharge (Qwq):

Compute modified CN for 2.8" rainfall

P = 2.8 inch
Qa = WQv / Area
Qa = **0.17** inch

$CN = 1000 / [10 + 5P + 10Q_a - 10(Q_a^2 + 1.25*Q_a*P)^{0.5}]$
CN = **56.0**

From TR-55, Table 4-1: **Ia = 1.448** **Ia / P = 0.517**

From TR-55, Exhibit 4-III: **q_u = 180 csm/in**

$Q_{wq} = (q_u)(\text{Site Area, ac/ 640 ac/ sq. mi})(Q_a)$
Q_{wq} = **0.76** cfs

(b) Water quality weir design:

Width of weir = 10 ft.

$Q_{wq} = CLH^{3/2}$
0.76 = 3.1*L*(Hp^1.5)
Hp = **0.08** ft

Set weir elevation (infiltration basin) = 510.8

(c) 10-Year flow weir design:

Q_{10} = 15.6 cfs (from hydroCAD)

Design flow, Q_{10d} = $Q_{10} - Q_{wq}$

= 15.59 - 0.76

= 14.83 cfs

Width of weir = 15 ft.

$Q_{10d} = CLH^{3/2}$

14.83 = 3.1*L*(Hp^1.5)

Hp = **0.47** ft

Overflow Velocity (ft/s) = Q10d / (weir width * depth)

= **2.12** ft/s ok

Set weir elevation
(diverted from infiltration basin)= 510.88

Design High Water Elevation = Weir Elevation + Hp

= 510.88 + 0.47

= 511.35

Top of Plunge Pool Elevation = 511.9 (6" freeboard)

Step 6: Determine Infiltration Basin Size

WQv Requirements:

100% WQv = 0.2248 ac-ft

= 9793.42038 ft^3

Side Slope = 2 on 1

Storage of Infiltration Basin

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Contour Area Average (ft^2)	Contour Area Proposed (ac)	Contour Area Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Volume Provided (ac-ft)	2 Req'd WQ Volume (ac-ft)
509	4898		0.1124						
		5206		0.1195	1	5206	0.1195	0.1195	0.2248
510	5515		0.1266						
		5823		0.1337	1	5823	0.1337	0.2532	0.2248
511	6131		0.1407						

Determine Required WQv Elevation:

		Elev. (ft)	Cumulative Volume (ac-ft)
Required Water Quality Volume (WQv) =		X	0.2248
Water Quality Storage Elevation Range:	High:	511.00	0.2532
	Low:	510.00	0.1195

Required Water quality elevation, X =	**510.8**	ft
Required Water quality volume at elevation X =	**0.2248**	ac-ft
Provided water quality elevation =	**511.0**	ft
Provided water quality volume =	**0.2532**	ac-ft
Depth of required WQ elevation =	**24.0**	in

Provide 4" PVC underdrain pipe at inv. 507.2

Other Requirements

a) Determine Infiltration basin to dewater within 48 hours

Infiltration rate = 0.5 in/hr

Time of infiltration = Depth of ponding / infiltration rate

$$= \frac{24.0}{0.500}$$

= 48 hr ok

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Date: 5/27/2014
Project: Silo Ridge
Project No: 29011

Calculated By: JC
Checked By:

Wet Extended Detention Pond Design - (SMW #1) (refer to section 8.2 in SMDM)

Step 1: Compute Preliminary Runoff Control Volumes

Water Quality Volume Calculations

NYSDEC Required Water Quality Volume (WQv):

Data:

P:	2.8	= 1-year Rainfall Precipitation (in.)
CN:	62	= CN value for developed condition
Q:	0.32	= 1-year runoff (in.)
A:	32.77	= Site Area to Basin (in acres)

S= 1000/cn -10
S= 6.1

$$Q = \frac{(P-0.2S)^2}{(P+0.8S)}$$

Q= 0.32

WQv: **0.878** = Req'd Water Quality Volume (in ac-ft)

$$= \frac{(Q)(A)}{12}$$

Note: CPv is waive because there are no increase in 1-year peak dischage rate compare to existing condition. In addition to that, WQv provided is already accounted for the 1-year storm.

Qp (peak control volume) and Qf (flood control volume) are not estimated at this step because several design iterations have been performed to archive the peak control volume & rate (step 8) and flood control volume & rate (step 9) using HydroCAD

Step 2: Appropriateness Stormwater Pond for Site

Drainage Area = 32.8 Ac
Existing ground at proposed pond outlet = 508'
Seasonal high water table is deeper than 500' (no ground water is observed)
(OK)

Step 2A: Determin Hazardous Class of Dam

Height of pond is less than 40 feet
Storage of pond at normal water surface is less than 1000 ac-ft
Therefore, the pond is classified as small class "A" dam.

Step 3: Confirm local design criteria and applicability

The town required the design to be done to East of Hudson standard.

Step 4: Determin Pretreatment Volume

Forebay Requirements

Minimum Size: 10% of WQv = *0.0878* ac-ft
3826.72007 ft^3

Step 5: Determine Permanent Pool Volume and ED Volume

Permanent Pool Requirements:

Minimum Size: 50% of WQv = *0.4392* ac-ft
19133.6004 ft^3

Step 6: Determine Pond Geometry, Storage Available for Permanent Pool and WQv-ED

Forebay Storage Volume:

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Volume (ft^3)	Volume (ac-ft)	1 Volume Provided (ac-ft)	2 Req'd Forebay Volume (ac-ft)
508	367		0.0084						
		672		0.0154	2	1343	0.0308	0.0308	0.0878
510	976		0.0224						
		1409		0.0323	2	2818	0.0647	0.0955	0.0878
512	1842		0.0423						

Permanent Pool Storage Volume (including Forebay Volumes)

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Volume (ft^3)	Volume (ac-ft)	Volume Forebay Provided (ac-ft)	1 Volume Provided (ac-ft)	2 Req'd Permanent Pool Volume (ac-ft)
508	2413		0.0554							
		3108		0.0713	2	6215	0.1427	0.0308	0.1735	0.4392
510	3802		0.0873							
		4610		0.1058	2	9219	0.2116	0.0647	0.4498	0.4392
512	5417		0.1244							

Set Permanent Pool Elevation (WQ_{PPE}) = 512.00 ft.

Required Water Quality Volume above Permanent Pool:

	(Total Req'd Volume)		(Permanent Pool Cumulative Volume)			
*Balance of Required Water Quality Volume = above permanent pool	0.8785	-	0.4498	=	0.4287	ac-ft.

Basin Volume (above Permanent Pool Elevation)

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Volume (ft^3)	Volume (ac-ft)	Cumulative Volume above Permanent Pool (ac-ft)
512	7259		0.1666					
		9559		0.2194	1	9559	0.2194	0.2194
513	11858		0.2722					
		14799		0.3397	1	14799	0.3397	0.5592
514	17739		0.4072					

Determine WQv-Extended Detention Elevation:

		Elev. (ft.)	Cumulative Volume
Required WQv-ED Volume/Elev =		X	0.4287
Basin Storage Elevation Range:	High:	514.00	0.5592
(above permanent pool elev)	Low:	513.00	0.2194

Required WQv-ED Volume = **0.4287** ac-ft

Required water quality elevation, X = **513.6** ft

Set Water Quality Elevation (WQv-ED)=	**513.60**	ft
Water quality volume provided =	**0.878**	ac-ft

Determine the required WQ $_{V}$ -ED orifice:

(Note: ED means extended detention.)

Balance of required WQv = 0.4287 ac-ft.
Average ED release rate = 0.4287 x 43560 ft^2/ac / (24 hr x 3600 sec/hr)
Average ED release rate = 0.22 cfs

****Size WQv-ED orifice:***

Qavg =	**0.22**	cfs

Average head (h) = $(WQ_{V-ED} - WQ_{PPE})/2$

Average h = (513.60 - 512.00) / 2

Average h =	0.80	ft.

****Use the orifice flow equation to calculate the required cross-sectional area and diameter for the WQV-ED orifice:***

[Q=ca(sq. rt. (2gh))]

where:
c = 0.61
g = 32.2 sqrt(2gh) = 7.178
Average h = 0.80 a= 0.049 sq. ft. Based upon: [a=Q/c (sq. rt. (2gh)

Resulting diameter of orifice based upon area = D = 0.251 ft. Based upon: [D = sq. rt. (4a/3.142
D = 3.008 in.

For Design, Use a	**3**	in. diameter hole.

Orifice centerline elevation = Orifice invert + (Orifice size in feet/2)
Orifice centerline elevation = 512.00 + 0.13

Orifice centerline elevation =	512.13	ft.

Step 7: Determine Channel Protection Volume (CPv)

Note: CPv is waive because there are no increase in 1-year peak dischage rate compare to existing condition. In addition to that, WQv provided is already accounted for the 1-year storm.

Step 8: Calculate Q_{p10} (10-year Storm) Release Rate and Water Surface Elevation

This pond is designed only for water quality purposes. No water quantity is provided because the overall water quantity requirement at study point B already achieved even without any detention from this pond.

Step 9: Calculate Qf_{100} (100-year Storm) Release Rate and Water Surface Elevation

This pond is designed only for water quality purposes. No water quantity is provided because the overall water quantity requirement at study point B already achieved even without any detention from this pond.

Step 10: Calculate Safe Passage of Qf_{100} (100-year Storm) and Set Top of Embankment Elevation

Note: Refer to HydroCAD output for these analysis.
Qf100 (100-year Storm) water elevation = 514.5'
Top of Embankment is set at elevation = 515.5'
Freeboard provided = 1 ft

Other Requirements

a) Determine Pond Drain to dewater within 24 hours

Permanent Pool Volume = 0.4498 ac-ft.
Average release rate = 0.4498 x 43560 ft^2/ac / (24 hr x 3600 sec/hr)
Average ED release rate = 0.23 cfs

****Size Pond Drain orifice:***

Qavg =	**0.23**	cfs

Average head (h) = (Permanent Pool Elev - Basin Bottom Elev)/2

$$\text{Average h} = \frac{512.00 - 510.00}{2}$$

Average h =	1.00	ft.

****Use the orifice flow equation to calculate the required cross-sectional area and diameter for the Pond Drain Orifice:***

[Q=ca(sq. rt. (2gh))]
where:
c = 0.61
g = 32.2 sqrt(2gh) = 8.025
Average h = 1.00 a= 0.046 sq. ft. Based upon: [a=Q/c (sq. rt. (2gh))]

Resulting diameter of orifice based upon area = D = 0.243 ft. Based upon: [D = sq. rt. (4a/3.142)]
D = 2.915 in.

For Design, Use a	**4**	in. diameter hole.

Orifice centerline elevation = Orifice invert + (Orifice size in feet/2)
Orifice centerline elevation = 508.00 + 0.17

Orifice centerline elevation =	508.17	ft.

Adjustable gate valve shall be provided to pond drain

b) Pond liner is not required since the pond is not located in gravelly sands or fractured bedrock area.
However liner will be provided if during construction verify the need of liner.
c) Inlet pipes are partially submerged as suggested in SMDM and to ensure non-erosive condition.
d) Riprap protection at the oulet has been size to prevent erosion. See Appendix E5
e) Length to width ratio = 170/55 = 3:1 (minimum required is 1.5:1)
f) Surface area to drainage area ratio = 0.17:32.8 = 1:193 (minimum required is 1:100)
This SWM #1 itself does not satisfy the surface area to drainage area ratio eventhough it satisfy the WQv. However just uphill of this SWM #1 there is one water feature pond that wasn't take into consideration during the WQv calculation. Thus by considering the combined surface area of this water feature pond and SWM #1, the surface area to drainage ratio = 0.79/32.8 = 1/41.5
g) Safety bench is not required since the design side slope is 4:1.
h) Adequate aquatic bench is provided as shown in the site plan.
i) There is no permanent structure within 25 ft buffer from the maximum water surface elevation of the pond
j) The pond is easily accessible for maintenance via cart path and lot of open spaces

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Date: 5/27/2014
Project: Silo Ridge
Project No: 29011

Calculated By: JC
Checked By:

Wet Extended Detention Pond Design -SMW #2 (refer to section 8.2 in SMDM)

Step 1: Compute Preliminary Runoff Control Volumes

Water Quality Volume Calculations

NYSDEC Required Water Quality Volume (WQv):

Data:

P:	2.8	= 1-year Rainfall Precipitation (in.)
CN:	77.4	= CN value for developed condition
Q:	0.96	= 1-year runoff (in.)
A:	44	= Site Area to Basin (in acres)

S= 1000/cn -10
S= 2.9

$$Q = \frac{(P-0.2S)^2}{(P+0.8S)}$$

Q= 0.96

WQv: **3.506** = Req'd Water Quality Volume (in ac-ft)

$$= \frac{(Q)(A)}{12}$$

Note: CPv is waive because there are no increase in 1-year peak dischage rate compare to existing condition. In addition to that, WQv provided is already accounted for the 1-year storm.
Qp (peak control volume) and Qf (flood control volume) are not estimated at this step because several design iterations have been performed to archive the peak control volume & rate (step 8) and flood control volume & rate (step 9) using HydroCAD

Step 2: Appropriateness Stormwater Pond for Site

Drainage Area = 44 Ac
Existing ground at proposed pond outlet = 493'
Seasonal high water table is deeper than 493' (no ground water is observed)
(OK)

Step 2A: Determin Hazardous Class of Dam

Height of pond is less than 40 feet
Storage of pond at normal water surface is less than 1000 ac-ft
Therefore, the pond is classified as small class "A" dam.

Step 3: Confirm local design criteria and applicability

The town required the design to be done to East of Hudson standard.

Step 4: Determine Pretreatment Volume

Forebay Requirements

Minimum Size: 10% of WQv = *0.3506* ac-ft
15271.753 ft^3

Step 5: Determine Permanent Pool Volume and ED Volume

Permanent Pool Requirements:

Minimum Size: 50% of WQv = *1.7530* ac-ft
76358.765 ft^3

ED Volume will remaining of the WQv = WQv - Permanent Pool Volume

Step 6: Determine Pond Geometry, Storage Available for Permanent Pool and WQv-ED

Forebay Storage Volume:

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Volume (ft^3)	Volume (ac-ft)	1 Volume Provided (ac-ft)	2 Req'd Forebay Volume (ac-ft)
493	1401		0.0322						
		1763		0.0405	1	1763	0.0405	0.0405	0.3506
494	2124		0.0488						
		2538		0.0583	1	2538	0.0583	0.0987	0.3506
495	2951		0.0677						
		3430		0.0787	1	3430	0.0787	0.1775	0.3506
496	3909		0.0897						
		4434		0.1018	1	4434	0.1018	0.2792	0.3506
497	4959		0.1138						
		5533		0.1270	1	5533	0.1270	0.4063	0.3506
498	6107		0.1402						

Permanent Pool Storage Volume (including Forebay Volumes)

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Volume (ft^3)	Volume (ac-ft)	Volume Forebay Provided (ac-ft)	1 Volume Provided (ac-ft)	2 Req'd Permanent Pool Volume (ac-ft)
493	10085		0.2315							
		10855		0.2492	1	10855	0.2492	0.0405	0.2896	1.7530
494	11624		0.2669							
		12444		0.2857	1	12444	0.2857	0.0583	0.6336	1.7530
495	13264		0.3045							
		14134		0.3456	1	14134	0.3245	0.0787	1.0368	1.7530
496	15004		0.3444							
		15925		0.3879	1	15925	0.3656	0.1018	1.5042	1.7530
497	16845		0.3867							
		17816		0.4090	1	17816	0.4090	0.1270	2.0402	1.7530
498	18786		0.4313							

Set Permanent Pool Elevation (WQ_{PPE}) = 498.00 ft.

Required Water Quality Volume above Permanent Pool (WQv-ED):

	(Total Req'd Volume)		(Permanent Pool Cumulative Volume)			
*Balance of Required Water Quality Volume = above permanent pool	3.5059	-	2.0402	=	1.4657	ac-ft.

Basin Volume (above Permanent Pool Elevation)

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Volume (ft^3)	Volume (ac-ft)	Cum. Volume above Permanent Pool (ac-ft)
498	24893		0.5715					
		30624		0.7030	1	30624	0.7030	0.7030
499	36355		0.8346					
		37861		0.8692	1	37861	0.8692	1.5722
500	39366		0.9037					
		40925		0.9395	1	40925	0.9395	2.5117
501	42483		0.9753					
		44254		1.0159	1	44254	1.0159	3.5276
502	46025		1.0566					
		48021		1.1024	1	48021	1.1024	4.6300
503	50017		1.1482					
		52459		1.2043	1	52459	1.2043	5.8343
504	54900		1.2603					
		58185		1.3357	1	58185	1.3357	7.1700
505	61469		1.4111					
		66347		1.5231	1	66347	1.5231	8.6931
506	71224		1.6351					

Determine WQv-Extended Detention Elevation:

		Elev. (ft.)	Cumulative Volume
Required WQv-ED Volume/Elev =		X	1.4657
Basin Storage Elevation Range:	High:	500.00	1.5722
(above permanent pool elev)	Low:	499.00	0.7030

Required WQv-ED Volume = **1.4657** ac-ft

Required water quality elevation, X = **499.9** ft

Set Water Quality Elevation (WQv-ED)=	**500.00**	ft
Water quality volume provided =	**3.506**	ac-ft

Determine the required WQ_V-ED orifice:

(Note: ED means extended detention.)

Required WQv-ED Volume = 1.4657 ac-ft.
Average ED release rate = 1.4657 x 43560 ft^2/ac / (24 hr x 3600 sec/hr)
Average ED release rate = 0.74 cfs

****Size WQv-ED orifice:***

Qavg = **0.74** cfs

Average head (h) = $(WQ_{V-ED} - WQ_{PPE})/2$

$$\text{Average h} = \frac{500.00 - 498.00}{2}$$

Average h = 1.00 ft.

****Use the orifice flow equation to calculate the required cross-sectional area and diameter for the WQV-ED orifice:***

[Q=ca(sq. rt. (2gh))]

where:

c = 0.61

g = 32.2

Average h = 1.00

sqrt(2gh) = 8.025

a= 0.151 sq. ft. Based upon: [a=Q/c (sq. rt. (2gh))]

Resulting diameter of orifice based upon area = D = 0.438 ft. Based upon: [D = sq. rt. (4a/3.142)]

D = 5.261 in.

For Design, Use a **6** in. diameter hole.

Orifice centerline elevation = Orifice invert + (Orifice size in feet/2)

Orifice centerline elevation = 498.00 + 0.25

Orifice centerline elevation = 498.25 ft.

Step 7: Determine Channel Protection Volume (CPv)

Note: CPv is waive because there are no increase in 1-year peak dischage rate compare to existing condition. In addition to that, WQv provided is already accounted for the 1-year storm.

Step 8: Calculate Q_{p10} (10-year Storm) Release Rate and Water Surface Elevation

Note: Refer to HydroCAD output for these analysis. Stage-storage-discharge relationshop for the pond have been established in HydroCAD along with the outlet control. Several design iterations have been performed such that the proposed conditions Qp10 is less than the existing conditions (Study Point B)

Step 9: Calculate Qf_{100} (100-year Storm) Release Rate and Water Surface Elevation

Note: Refer to HydroCAD output for these analysis. Stage-storage-discharge relationshop for the pond have been established in HydroCAD along with the outlet control. Several design iterations have been performed such that the proposed conditions Qf100 is less than the existing conditions (Study Point B)

Step 10: Calculate Safe Passage of Qf_{100} (100-year Storm) and Set Top of Embankment Elevation

Note: Refer to HydroCAD output for these analysis.

Qf100 (100-year Storm) water elevation = 505.7'

Top of Embankment is set at elevation = 506.8'

Freeboard provided = 1.1 ft

Other Requirements

a) Determine Pond Drain to dewater within 24 hours

Permanent Pool Volume = 2.0402 ac-ft.

Average release rate = 2.0402 x 43560 ft^2/ac / (24 hr x 3600 sec/hr)

Average ED release rate = 1.03 cfs

****Size Pond Drain orifice:***

Qavg = **1.03** cfs

Average head (h) = (Permanent Pool Elev - Basin Dewater Elev)/2

$$\text{Average h} = \frac{498.00 - 496.00}{2}$$

Average h = 1.00 ft.

Use the orifice flow equation to calculate the required cross-sectional area and diameter for the Pond Drain Orifice:

[Q=ca(sq. rt. (2gh))]

where:

c = 0.61

g = 32.2 sqrt(2gh) = 8.025

Average h = 1.00 a= 0.210 sq. ft. Based upon: [a=Q/c (sq. rt. (2gh))]

Resulting diameter of orifice based upon area = D = 0.517 ft. Based upon: [D = sq. rt. (4a/3.142)]

D = 6.207 in.

For Design, Use a	**6**	in. diameter hole.

Orifice centerline elevation = Orifice invert + (Orifice size in feet/2)

Orifice centerline elevation = 496.00 + 0.25

Orifice centerline elevation =	496.25	ft.

Adjustable gate valve shall be provided to pond drain

b) Pond liner is not required since the pond is not located in gravelly sands or fractured bedrock area.
However liner will be provided if during construction verify the need of liner.
c) Inlet pipes are partially submerged as suggested in SMDM and to ensure non-erosive condition.
d) Riprap protection at the oulet has been size to prevent erosion. See Appendix E5
e) Length to width ratio = 250/160 = 1.56:1 (minimum required is 1.5:1)
f) Surface area to drainage area ratio = 0.57:44 = 1:77 (minimum required is 1:100)
g) Safety bench is not required since the design side slope is 4:1.
h) Adequate aquatic bench is provided as shown in the site plan.
i) There is no permanent structure within 25 ft buffer from the maximum water surface elevation of the pond
j) The pond is easily accessible for maintenance via cart path and lot of open spaces

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Date: 5/27/2014
Project: Silo Ridge
Project No: 29011

Calculated By: JC
Checked By:

Wet Extended Detention Pond Design -SMW #3 (refer to section 8.2 in SMDM)

Step 1: Compute Preliminary Runoff Control Volumes

Note: This Pond is designed for water quantity purposes only. No water quality is provided.
Qp (peak control volume) and Qf (flood control volume) are not estimated at this step because several design iterations have been performed to archive the peak control volume & rate (step 8) and flood control volume & rate (step 9) using HydroCAD

Step 2: Appropriateness Stormwater Pond for Site

Drainage Area = 248 Ac
These are existing pond. Under proposed condition, the ponds will be merged and improved the overall performance (OK)

Step 2A: Determin Hazardous Class of Dam

Height of pond is less than 40 feet
Storage of pond at normal water surface is less than 1000 ac-ft
Therefore, the pond is classified as small class "A" dam.

Step 3: Confirm local design criteria and applicability

The town required the design to be done to East of Hudson standard.

Step 4: Determine Pretreatment Volume

This step is not applicable since this pond is not for water quality surposes.

Step 5: Determine Permanent Pool Volume and ED Volume

This step is not applicable since this pond is not for water quality surposes.

Step 6: Determine Pond Geometry, Storage Available for Permanent Pool and WQv-ED

WQv-Ed is not applicable for this step. Below are the pond geometry and storage availability for detention

Basin Volume (above normal surface elevation)
Note: Normal surface elevation is set at 507'

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Volume (ft^3)	Volume (ac-ft)	Cumulative Volume above Permanent Pool (ac-ft)
507	353384		8.1126					
		359141		8.2447	1	359141	8.2447	8.2447
508	364897		8.3769					
		386708		8.8776	2	773416	17.7552	25.9999
510	408519		9.3783					
		440829		10.1200	2	881658	20.2401	46.2400
512	473139		10.8618					

Step 7: Determine Channel Protection Volume (CPv)

Note: CPv is waive because there are no increase in 1-year peak dischage rate compare to existing condition. In addition to that, overall WQv provided is already accounted for the 1-year storm.

Step 8: Calculate Q_{p10} (10-year Storm) Release Rate and Water Surface Elevation

Note: Refer to HydroCAD output for these analysis. Stage-storage-discharge relationshop for the pond have been established in HydroCAD along with the outlet control. Several design iterations have been performed such that the proposed conditions Qp10 is less than the existing conditions (Study Point B)

Step 9: Calculate Qf_{100} (100-year Storm) Release Rate and Water Surface Elevation

Note: Refer to HydroCAD output for these analysis. Stage-storage-discharge relationshop for the pond have been established in HydroCAD along with the outlet control. Several design iterations have been performed such that the proposed conditions Qf100 is less than the existing conditions (Study Point B)

Step 10: Calculate Safe Passage of Qf_{100} (100-year Storm) and Set Top of Embankment Elevation

Note: Refer to HydroCAD output for these analysis.

Qf100 (100-year Storm) water elevation = 510.80

Top of Embankment is set at elevation = 512.00

Freeboard provided = 1.2 ft

Other Requirements

a) Determine Pond Drain to dewater within 24 hours

Permanent Pool Volume = 25.0 ac-ft.

Average release rate = 25.0 x 43560 ft^2/ac / (24 hr x 3600 sec/hr)

Average ED release rate = 12.60 cfs

***Size Pond Drain orifice:**

Qavg = **12.60** cfs

Average head (h) = (Permanent Pool Elev - Basin Bottom Elev)/2

Average h = (507.00 - 504.00) / 2

Average h = 1.50 ft.

***Use the orifice flow equation to calculate the required cross-sectional area and diameter for the Pond Drain Orifice:**

[Q=ca(sq. rt. (2gh))]

where:

c = 0.61

g = 32.2

Average h = 1.50

sqrt(2gh) = 9.829

a= 2.102 sq. ft. — Based upon: [a=Q/c (sq. rt. (2gh))]

Resulting diameter of orifice based upon area = D = 1.636 ft. — Based upon: [D = sq. rt. (4a/3.142)]

D = 19.633 in.

For Design, Use a **24** in. diameter hole.

Orifice centerline elevation = Orifice invert + (Orifice size in feet/2)

Orifice centerline elevation = 504.00 + 1.00

Orifice centerline elevation = 505.00 ft.

Adjustable gate valve shall be provided to pond drain

b) Pond liner is not required since this is an modified existing pond.
However liner will be provided if during construction verify the need of liner.
c) Inlet pipes are partially submerged as suggested in SMDM and to ensure non-erosive condition.
d) Riprap protection at the oulet has been size to prevent erosion. See Appendix E5
e) Length to width ratio = 1400/430 = 3.2:1 (minimum required is 1.5:1)
f) Surface area to drainage area ratio = 8.29:248 = 1:30 (minimum required is 1:100)
g) Safety bench is not required since the design side slope is 4:1.
h) Adequate aquatic bench is provided as shown in the site plan.
i) There is no permanent structure within 25 ft buffer from the maximum water surface elevation of the pond
j) The pond is easily accessible for maintenance via cart path and lot of open spaces

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Date: 5/27/2014
Project: Silo Ridge
Project No: 29011

Calculated By: JC
Checked By: ________

Wet Extended Detention Pond Design -SMW #4 (refer to section 8.2 in SMDM)

Step 1: Compute Preliminary Runoff Control Volumes

Note: This Pond is designed for water quantity purposes only. No water quality is provided.
Qp (peak control volume) and Qf (flood control volume) are not estimated at this step because several design iterations have been performed to archive the peak control volume & rate (step 8) and flood control volume & rate (step 9) using HydroCAD

Step 2: Appropriateness Stormwater Pond for Site

Drainage Area = 196 Ac
These are existing pond. Under proposed condition, the ponds will be enlarged and improved the overall performance (OK)

Step 2A: Determin Hazardous Class of Dam

Height of pond is less than 40 feet
Storage of pond at normal water surface is less than 1000 ac-ft
Therefore, the pond is classified as small class "A" dam.

Step 3: Confirm local design criteria and applicability

The town required the design to be done to East of Hudson standard.

Step 4: Determine Pretreatment Volume

This step is not applicable since this pond is not for water quality surposes.

Step 5: Determine Permanent Pool Volume and ED Volume

This step is not applicable since this pond is not for water quality surposes.

Step 6: Determine Pond Geometry, Storage Available for Permanent Pool and WQv-ED

WQv-Ed is not applicable for this step. Below are the pond geometry and storage availability for detention

Basin Volume (above normal surface elevation)

Note: Normal surface elevation is set at 515'

Contour	Contour Area							Cumulative Volume
Elev. (ft)	Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Volume (ft^3)	Volume (ac-ft)	above Permanent Pool (ac-ft)
515	23225		0.5332					
		24523		0.5630	1	24523	0.5630	0.5630
516	25820		0.5927					
		29113		0.6683	2	58225	1.3367	1.8996
518	32405		0.7439					
		36223		0.8316	2	72445	1.6631	3.5627
520	40040		0.9192					

Step 7: Determine Channel Protection Volume (CPv)

Note: CPv is waive because there are no increase in 1-year peak dischage rate compare to existing condition. In addition to that, overall WQv provided is already accounted for the 1-year storm.

Step 8: Calculate Q_{p10} (10-year Storm) Release Rate and Water Surface Elevation

Note: Refer to HydroCAD output for these analysis. Stage-storage-discharge relationshop for the pond have been established in HydroCAD along with the outlet control. Several design iterations have been performed such that the proposed conditions Qp10 is less than the existing conditions (Study Point B)

Step 9: Calculate Qf_{100} (100-year Storm) Release Rate and Water Surface Elevation

Note: Refer to HydroCAD output for these analysis. Stage-storage-discharge relationshop for the pond have been established in HydroCAD along with the outlet control. Several design iterations have been performed such that the proposed conditions Qf100 is less than the existing conditions (Study Point B)

Step 10: Calculate Safe Passage of Qf_{100} (100-year Storm) and Set Top of Embankment Elevation

Note: Refer to HydroCAD output for these analysis.

Qf100 (100-year Storm) water elevation = 519'

Top of Embankment is set at elevation = 520.5'

Freeboard provided = 1.5 ft

Other Requirements

a) Location of this modified existing pond prohibit pond drain to be provided

b) Pond liner is not required since this is an modified existing pond.
However liner will be provided if during construction verify the need of liner.

c) Inlet pipes are partially submerged as suggested in SMDM and to ensure non-erosive condition.

d) Oulet pipes have been partially submerged at SWM 3 to prevent erosion.

e) Length to width ratio = 260/100 = 2.6:1 (minimum required is 1.5:1)

f) Surface area to drainage area ratio = 0.5:195 = 1:390 (minimum required is 1:100)
This is an existing pond that was being enlarged. The surface area to drainage area ratio is actually improved.
Furthermore, SWM #3 which is located at downstream of SWM #4 receiving all the drainage area from SMW #4.
Therefore, the satisfaction of surface area to drainage area requirement in SMW #3 will also satisfy the SMW #4.

g) Safety bench is not required since the design side slope is 4:1.

h) Adequate aquatic bench is provided as shown in the site plan.

i) There is no permanent structure within 25 ft buffer from the maximum water surface elevation of the pond

j) The pond is easily accessible for maintenance via cart path and lot of open spaces

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Calculated By: JC
Checked By:

Wet Extended Detention Pond Design -SMW #5 (refer to section 8.2 in SMDM)

Step 1: Compute Preliminary Runoff Control Volumes

Water Quality Volume Calculations

NYSDEC Required Water Quality Volume (WQv):

Data:

P:	2.8	= 1-year Rainfall Precipitation (in.)
CN:	77	= CN value for developed condition
Q:	0.93	= 1-year runoff (in.)
A:	39.65	= Site Area to Basin (in acres)

S= 1000/cn -10
S= 3.0

$$Q = \frac{(P-0.2S)^2}{(P+0.8S)}$$

Q= 0.93

WQv: **3.089** = Req'd Water Quality Volume (in ac-ft)

$$= \frac{(Q)(A)}{12}$$

Note: CPv is waive because there are no increase in 1-year peak dischage rate compare to existing condition. In addition to that, WQv provided is already accounted for the 1-year storm.
Qp (peak control volume) and Qf (flood control volume) are not estimated at this step because several design iterations have been performed to archive the peak control volume & rate (step 8) and flood control volume & rate (step 9) using HydroCAD

Step 2: Appropriateness Stormwater Pond for Site

Drainage Area = 39.7 Ac
Existing ground at proposed pond outlet = 512'
Seasonal high water table is = 509.5'
(OK)

Step 2A: Determin Hazardous Class of Dam

Height of pond is less than 39.7 feet
Storage of pond at normal water surface is less than 1000 ac-ft
Therefore, the pond is classified as small class "A" dam.

Step 3: Confirm local design criteria and applicability

The town required the design to be done to East of Hudson standard.

Step 4: Determine Pretreatment Volume

Forebay Requirements

Minimum Size: 10% of WQv = *0.3089* ac-ft
13455.0497 ft^3

Step 5: Determine Permanent Pool Volume and ED Volume

Permanent Pool Requirements:

Minimum Size: 50% of WQv = *1.5444* ac-ft
= 67275.2487 ft^3

ED Volume will remaining of the WQv = WQv - Permanent Pool Volume

Step 6: Determine Pond Geometry, Storage Available for Permanent Pool and WQv-ED

Forebay Storage Volume:

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Contour Area Average (ft^2)	Contour Area Proposed (ac)	Contour Area Average (ac)	Depth (ft)	Volume (ft^3)	Volume (ac-ft)	1 Volume Provided (ac-ft)	2 Req'd Forebay Volume (ac-ft)
512	1996		0.0458						
		2844		0.0653	2	5688	0.1306	0.1306	0.3089
514	3692		0.0848						
		4742		0.1088	2	9483	0.2177	0.3483	0.3089
516	5791		0.1329						

Permanent Pool Storage Volume (including Forebay Volumes)

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Contour Area Average (ft^2)	Contour Area Proposed (ac)	Contour Area Average (ac)	Depth (ft)	Volume (ft^3)	Volume (ac-ft)	Volume Forebay Provided (ac-ft)	1 Volume Provided (ac-ft)	2 Req'd Permanent Pool Volume (ac-ft)
512	8256		0.1895							
		10557		0.2423	2	21113	0.4847	0.1306	0.6153	1.5444
514	12857		0.2952							
		15387		0.3532	2	30773	0.7065	0.3483	1.6700	1.5444
516	17916		0.4113							

Set Permanent Pool Elevation (WQ_{PPE}) = 516.00 ft.

Required Water Quality Volume above Permanent Pool:

	(Total Req'd Volume)		(Permanent Pool Cumulative Volume)			
*Balance of Required Water Quality Volume = above permanent pool	3.0889	-	1.6700	=	1.4189	ac-ft.

Basin Volume (above Permanent Pool Elevation)

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Contour Area Average (ft^2)	Contour Area Proposed (ac)	Contour Area Average (ac)	Depth (ft)	Volume (ft^3)	Volume (ac-ft)	Cumulative Volume above Permanent Pool (ac-ft)
516	23707		0.5442					
		27805		0.6383	2	55609	1.2766	1.2766
518	31902		0.7324					
		39478		0.8398	2	78956	1.8126	3.0892
520	41263		0.9473					
		46490		1.0673	2	92979	2.1345	5.2237
522	51716		1.1872					

Determine WQv-Extended Detention Elevation:

		Elev. (ft.)	Cumulative Volume
Required WQv-ED Volume/Elev =		X	1.4189
Basin Storage Elevation Range:	High:	520.00	1.8126
(above permanent pool elev)	Low:	518.00	1.2766

Required WQv-ED Volume = **1.4189** ac-ft

Required water quality elevation, X = **518.5** ft

Set Water Quality Elevation (WQv-ED)=	**518.50**	ft
Water quality volume provided =	**3.089**	ac-ft

Determine the required WQ_V-ED orifice:

(Note: ED means extended detention.)

Balance of required WQv = 1.4189 ac-ft.
Average ED release rate = 1.4189 x 43560 ft^2/ac / (24 hr x 3600 sec/hr)
Average ED release rate = 0.72 cfs

Size WQv-ED orifice:

Qavg = **0.72** cfs

Average head (h) = $(WQ_{V\text{-}ED} - WQ_{PPE})/2$

Average h = (518.50 - 516.00) / 2

Average h = 1.25 ft.

Use the orifice flow equation to calculate the required cross-sectional area and diameter for the WQV-ED orifice:

[Q=ca(sq. rt. (2gh))]

where:
c = 0.61
g = 32.2 sqrt(2gh) = 8.972
Average h = 1.25 a= 0.131 sq. ft. Based upon: [a=Q/c (sq. rt. (2gh))]

Resulting diameter of orifice based upon area = D = 0.408 ft. Based upon: [D = sq. rt. (4a/3.142)]
D = 4.895 in.

For Design, Use a **5** in. diameter hole.

Orifice centerline elevation = Orifice invert + (Orifice size in feet/2)
Orifice centerline elevation = 516.00 + 0.21

Orifice centerline elevation = 516.21 ft.

Step 7: Determine Channel Protection Volume (CPv)

Note: CPv is waive because there are no increase in 1-year peak dischage rate compare to existing condition. In addition to that, WQv provided is already accounted for the 1-year storm.

Step 8: Calculate Q_{p10} (10-year Storm) Release Rate and Water Surface Elevation

Note: Refer to HydroCAD output for these analysis. Stage-storage-discharge relationshop for the pond have been established in HydroCAD along with the outlet control. Several design iterations have been performed such that the proposed conditions Qp10 is less than the existing conditions (Study Point B)

Step 9: Calculate Qf_{100} (100-year Storm) Release Rate and Water Surface Elevation

Note: Refer to HydroCAD output for these analysis. Stage-storage-discharge relationshop for the pond have been established in HydroCAD along with the outlet control. Several design iterations have been performed such that the proposed conditions Qf100 is less than the existing conditions (Study Point B)

Step 10: Calculate Safe Passage of Qf_{100} (100-year Storm) and Set Top of Embankment Elevation

Note: Refer to HydroCAD output for these analysis.

Qf100 (100-year Storm) water elevation = 521.5'

Top of Embankment is set at elevation = 522.5'

Freeboard provided = 1 ft

Other Requirements

a) Determine Pond Drain to dewater within 24 hours

Permanent Pool Volume = 1.6700 ac-ft.

Average release rate = 1.6700 x 43560 ft^2/ac / (24 hr x 3600 sec/hr)

Average ED release rate = 0.84 cfs

***Size Pond Drain orifice:**

Qavg = **0.84** cfs

Average head (h) = (Permanent Pool Elev - Basin Bottom Elev)/2

Average h = (516.00 - 512.00) / 2

Average h = 2.00 ft.

***Use the orifice flow equation to calculate the required cross-sectional area and diameter for the Pond Drain Orifice:**

[Q=ca(sq. rt. (2gh))]

where:

c = 0.61

g = 32.2

Average h = 2.00

sqrt(2gh) = 11.349

a= 0.122 sq. ft. Based upon: [a=Q/c (sq. rt. (2gh))]

Resulting diameter of orifice based upon area = D = 0.394 ft. Based upon: [D = sq. rt. (4a/3.142)]

D = 4.722 in.

For Design, Use a **6** in. diameter hole.

Orifice centerline elevation = Orifice invert + (Orifice size in feet/2)

Orifice centerline elevation = 512.00 + 0.25

Orifice centerline elevation = 512.25 ft.

Adjustable gate valve shall be provided to pond drain

b) Pond liner is not required since the pond is not located in gravelly sands or fractured bedrock area However liner will be provided if during construction verify the need of liner.

c) Inlet pipes are partially submerged as suggested in SMDM and to ensure non-erosive condition.

d) Oulet pipes have been partially submerged at SWM 3 to prevent erosion.

e) Length to width ratio = 400/100 = 4:1 (minimum required is 1.5:1)

f) Surface area to drainage area ratio = 0.54:39.7 = 1:74 (minimum required is 1:100)

g) Safety bench is not required since the design side slope is 4:1.

h) Adequate aquatic bench is provided as shown in the site plan.

i) There is no permanent structure within 25 ft buffer from the maximum water surface elevation of the pond

j) The pond is easily accessible for maintenance via cart path and lot of open spaces

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Wet Extended Detention Pond Design -SMW #6 (refer to section 8.2 in SMDM)

Step 1: Compute Preliminary Runoff Control Volumes

Water Quality Volume Calculations

NYSDEC Required Water Quality Volume (WQv):

Data:

P:	2.8	= 1-year Rainfall Precipitation (in.)
CN:	60	= CN value for developed condition
Q:	0.26	= 1-year runoff (in.)
A:	84	= Site Area to Basin (in acres)

S= 1000/cn -10
S= 6.7

$$Q = \frac{(P-0.2S)^2}{(P+0.8S)}$$

Q= 0.26

WQv: **1.851** = Req'd Water Quality Volume (in ac-ft)

$$= \frac{(Q)(A)}{12}$$

Note: CPv is waive because there are no increase in 1-year peak dischage rate compare to existing condition. In addition to that, WQv provided is already accounted for the 1-year storm.
Qp (peak control volume) and Qf (flood control volume) are not estimated at this step because several design iterations have been performed to archive the peak control volume & rate (step 8) and flood control volume & rate (step 9) using HydroCAD

Step 2: Appropriateness Stormwater Pond for Site

Drainage Area = 84 Ac
These are existing pond. Under proposed condition, the ponds will be merged and improved the overall performance

Step 2A: Determin Hazardous Class of Dam

Height of pond is less than 40 feet
Storage of pond at normal water surface is less than 1000 ac-ft
Therefore, the pond is classified as small class "A" dam.
(OK)

Step 3: Confirm local design criteria and applicability

The town required the design to be done to East of Hudson standard.

Step 4: Determine Pretreatment Volume

Forebay Requirements

Minimum Size:	10%	of WQv =	*0.1851*	ac-ft
			8064.55082	ft^3

Step 5: Determine Permanent Pool Volume and ED Volume

Permanent Pool Requirements:

Minimum Size: 50% of WQv = *0.9257* ac-ft

= 40322.7541 ft^3

Step 6: Determine Pond Geometry, Storage Available for Permanent Pool and WQv-ED

Forebay Storage Volume:

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Volume (ft^3)	Volume (ac-ft)	1 Volume Provided (ac-ft)	2 Req'd Forebay Volume (ac-ft)
494	13388		0.3073						
		14498		0.3328	1	14498	0.3328	0.3328	0.1851
495	15608		0.3583						
		16768		0.3849	1	16768	0.3849	0.7178	0.1851
496	17928		0.4116						
		19327		0.4437	1	19327	0.4437	1.1615	0.1851
497	20726		0.4758						
		22205		0.5098	1	22205	0.5098	1.6712	0.1851
498	23684		0.5437						

Permanent Pool Storage Volume (including Forebay Volumes)

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Volume (ft^3)	Volume (ac-ft)	Volume Forebay Provided (ac-ft)	1 Volume Provided (ac-ft)	2 Req'd Permanent Pool Volume (ac-ft)
494	23154		0.5315							
		24486		0.5621	1	24486	0.5621	0.3328	0.8949	0.9257
495	25818		0.5927							
		27200		0.6244	1	27200	0.6244	0.3849	1.9043	0.9257
496	28582		0.6562							
		30331		0.6963	1	30331	0.6963	0.4437	3.0443	0.9257
497	32079		0.7364							
		34018		0.7809	1	34018	0.7809	0.5098	4.3350	0.9257
498	35957		0.8255							
		51599		1.1845	1	51599	1.1845	0.0000	5.5195	0.9257
499	67240		1.5436							
		70638		1.6216	1	70638	1.6216	0.0000	7.1412	0.9257
500	74035		1.6996							

Set Permanent Pool Elevation (WQ_{PPE}) = **500.00** ft.

Required Water Quality Volume above Permanent Pool:

(Total Req'd Volume) *(Permanent Pool Cumulative Volume)*

*Balance of Required Water Quality Volume = 0.926 - 7.1412 = -6.2155 ac-ft.
above permanent pool

Note: Permanent Pool Provided more than 100% of WQv therefore extended detention for water quality is not needed

Water quality volume provided = **7.141** ac-ft

Basin Volume (above Permanent Pool Elevation)

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Volume (ft^3)	Volume (ac-ft)	Cumulative Volume above Permanent Pool (ac-ft)
500	74035		1.6996					
		86957		1.9963	1	86957	1.9963	1.9963
501	99879		2.2929					
		111140		2.5514	1	111140	2.5514	4.5477
502	122401		2.8099					
		135699		3.1152	2	271398	6.2304	10.7781
504	148997		3.4205					
		162553		3.7317	2	325105	7.4634	18.2415
506	176108		4.0429					

Step 7: Determine Channel Protection Volume (CPv)

Note: CPv is waive because there are no increase in 1-year peak dischage rate compare to existing condition. In addition to that, WQv provided is already accounted for the 1-year storm.

Step 8: Calculate Q_{p10} (10-year Storm) Release Rate and Water Surface Elevation

Note: Refer to HydroCAD output for these analysis. Stage-storage-discharge relationshop for the pond have been established in HydroCAD along with the outlet control. Several design iterations have been performed such that the proposed conditions Qp10 is less than the existing conditions (Study Point A)

Step 9: Calculate Qf_{100} (100-year Storm) Release Rate and Water Surface Elevation

Note: Refer to HydroCAD output for these analysis. Stage-storage-discharge relationshop for the pond have been established in HydroCAD along with the outlet control. Several design iterations have been performed such that the proposed conditions Qf100 is less than the existing conditions (Study Point A)

Step 10: Calculate Safe Passage of Qf_{100} (100-year Storm) and Set Top of Embankment Elevation

Note: Refer to HydroCAD output for these analysis.
Qf100 (100-year Storm) water elevation = 504.9'
Top of Embankment is set at elevation = 506.5'
Freeboard provided = 1.6 ft

Other Requirements

a) Location of this modified existing pond prohibit pond drain to be provided
b) Pond liner is not required since this is an modified existing pond.
However liner will be provided if during construction verify the need of liner.
c) Inlet pipes are partially submerged as suggested in SMDM and to ensure non-erosive condition.
d) Oulet pipes have been partially submerged to prevent erosion.
e) Length to width ratio = 730/140 = 5.2:1 (minimum required is 1.5:1)
f) Surface area to drainage area ratio = 1.7:84 = 1:50 (minimum required is 1:100)
g) Safety bench is not required since the design side slope is 4:1.
h) Adequate aquatic bench is provided as shown in the site plan.
i) There is no permanent structure within 25 ft buffer from the maximum water surface elevation of the pond
j) The pond is easily accessible for maintenance via entrance road and lot of open spaces

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Date: 5/22/2014
Project: Silo Ridge
Project No: 29011

Calculated By: JC
Checked By:

Pocket Pond Design -SMW #7A (Overlook area-Phase 1)

Step 1: Compute Preliminary Runoff Control Volumes

Water Quality Volume Calculations

NYSDEC Required Water Quality Volume (WQv):

P:	2.8	= 1-year Rainfall Precipitation (in.)
CN:	76.25	= CN value for developed condition
Q:	0.90	= 1-year runoff (in.)
A:	2.3	= Site Area to Basin (in acres)

S= 1000/cn -10
S= 3.1

$$Q = \frac{(P-0.2S)^2}{(P+0.8S)}$$

Q= 0.90

WQv: **0.172** = Req'd Water Quality Volume (in ac-ft)

$$= \frac{(Q)(A)}{12}$$

Note: CPv is waive because there are no increase in 1-year peak dischage rate compare to existing condition. In addition to that, WQv provided is already accounted for the 1-year storm.
Qp (peak control volume) and Qf (flood control volume) are not estimated at this step because several design iterations have been performed to archive the peak control volume & rate (step 8) and flood control volume & rate (step 9) using HydroCAD

Step 2: Appropriateness Stormwater Pond for Site

Drainage Area = 2.3 Ac
Existing ground at proposed pond outlet = 782'
Seasonal high water table is = 776' (to be field verify)
(OK)

Step 2A: Determin Hazardous Class of Dam

Height of pond is less than 40 feet
Storage of pond at normal water surface is less than 1000 ac-ft
Therefore, the pond is classified as small class "A" dam.

Step 3: Confirm local design criteria and applicability

The town required the design to be done to East of Hudson standard.

Step 4: Determine Pretreatment Volume

Forebay Requirements

Minimum Size:	10%	of WQv =	*0.0172*	ac-ft
			747.862287	ft^3

Step 5: Determine Permanent Pool Volume and ED Volume

Permanent Pool Requirements:

Minimum Size: 50% of WQv = *0.0858* ac-ft

= 3739.31144 ft^3

ED Volume will remaining of the WQv = WQv - Permanent Pool Volume

Step 6: Determine Pond Geometry, Storage Available for Permanent Pool and WQv-ED

Forebay Storage Volume:

Contour Elev. (ft)	Contour Area: Proposed (ft^2)	Contour Area: Average (ft^2)	Contour Area: Proposed (ac)	Contour Area: Average (ac)	Depth (ft)	Volume (ft^3)	Volume (ac-ft)	1: Cumulative Volume (ac-ft)	2: Req'd Forebay Volume (ac-ft)
782	25		0.0006						
		148		0.0034	2	295	0.0068	0.0068	0.0172
784	270		0.0062						
		522		0.0120	2	1043	0.0239	0.0307	0.0172
786	773		0.0177						

Permanent Pool Storage Volume (including Forebay Volumes)

Contour Elev. (ft)	Contour Area: Proposed (ft^2)	Contour Area: Average (ft^2)	Contour Area: Proposed (ac)	Contour Area: Average (ac)	Depth (ft)	Volume (ft^3)	Volume (ac-ft)	Volume Forebay Provided (ac-ft)	1: Cumulative Total Volume (ac-ft)	2: Req'd Permanent Pool Volume (ac-ft)
782	132		0.0030							
		419		0.0096	2	837	0.0192	0.0068	0.0260	0.0858
784	705		0.0162							
		1121		0.0257	2	2241	0.0514	0.0307	0.1081	0.0858
786	1536		0.0353							

Set Permanent Pool Elevation (WQ_{PPE}) = 786.00 ft.

Required Water Quality Volume above Permanent Pool:

	(Total Req'd Volume)		(Permanent Pool Cumulative Volume)			
*Balance of Required Water Quality Volume = above permanent pool	0.1717	-	0.1081	=	0.0635	ac-ft.

Basin Volume (above Permanent Pool Elevation)

Contour Elev. (ft)	Contour Area: Proposed (ft^2)	Contour Area: Average (ft^2)	Contour Area: Proposed (ac)	Contour Area: Average (ac)	Depth (ft)	Volume (ft^3)	Volume (ac-ft)	Cumulative Volume above Permanent Pool (ac-ft)
786	2309		0.0530					
		3381		0.0776	2	6762	0.1552	0.1552
788	4453		0.1022					
		6023		0.1294	2	12045	0.2765	0.4317
790	6819		0.1565					

Determine WQv-Extended Detention Elevation:

		Elev. (ft.)	Cumulative Volume
Required WQv-ED Volume/Elev =		X	0.0635
Basin Storage Elevation Range:	High:	788.00	0.1552
(above permanent pool elev)	Low:	786.00	0.0000

Required WQv-ED Volume = **0.0635** ac-ft

Required water quality elevation, X = **786.8** ft

Set Water Quality Elevation (WQv-ED)=	787.00	ft
Water Quality Volume Provided=	0.172	ac-ft

Determine the required WQ_V-ED orifice:

(Note: ED means extended detention.)

Balance of required WQv = 0.0635 ac-ft.
Average ED release rate = 0.0635 x 43560 ft^2/ac / (24 hr x 3600 sec/hr)
Average ED release rate = 0.03 cfs

****Size WQv-ED orifice:***

Qavg = **0.03** cfs

Average head (h) = $(WQ_{V\text{-}ED} - WQ_{PPE})/2$

Average h = (787.00 - 786.00) / 2

Average h = 0.50 ft.

****Use the orifice flow equation to calculate the required cross-sectional area and diameter for the WQV-ED orifice:***

[Q=ca(sq. rt. (2gh))]

where:
c = 0.61
g = 32.2
Average h = 0.50

sqrt(2gh) = 5.675
a= 0.009 sq. ft. Based upon: [a=Q/c (sq. rt. (2gh)

Resulting diameter of orifice based upon area = D = 0.109 ft. Based upon: [D = sq. rt. (4a/3.142
D = 1.303 in.

For Design, Use a **3** in. diameter hole.

Orifice centerline elevation = Orifice invert + (Orifice size in feet/2)
Orifice centerline elevation = 786.00 + 0.13

Orifice centerline elevation = 786.13 ft.

Step 7: Determine Channel Protection Volume (CPv)

Note: CPv is waive because there are no increase in 1-year peak dischage rate compare to existing condition. In addition to that, WQv provided is already accounted for the 1-year storm.

Step 8: Calculate Q_{p10} (10-year Storm) Release Rate and Water Surface Elevation

Note: Refer to HydroCAD output for these analysis. Stage-storage-discharge relationshop for the pond have been established in HydroCAD along with the outlet control. Several design iterations have been performed such that the proposed conditions Qp10 is less than the existing conditions (Study Point E)

Step 9: Calculate Qf_{100} (100-year Storm) Release Rate and Water Surface Elevation

Note: Refer to HydroCAD output for these analysis. Stage-storage-discharge relationshop for the pond have been established in HydroCAD along with the outlet control. Several design iterations have been performed such that the proposed conditions Qf100 is less than the existing conditions (Study Point E)

Step 10: Calculate Safe Passage of Qf_{100} (100-year Storm) and Set Top of Embankment Elevation

Note: Refer to HydroCAD output for these analysis.

Qf100 (100-year Storm) water elevation = 789'
Top of Embankment is set at elevation = 790'
Freeboard provided = 1 ft

Other Requirements

a) Determine Pond Drain to dewater within 24 hours

Permanent Pool Volume = 0.1081 ac-ft.
Average release rate = 0.1081 x 43560 ft^2/ac / (24 hr x 3600 sec/hr)
Average ED release rate = 0.05 cfs

****Size Pond Drain orifice:***

Qavg = **0.05** cfs

Average head (h) = (Permanent Pool Elev - Basin Bottom Elev)/2

Average h = (786.00 - 782.00) / 2

Average h = 2.00 ft.

****Use the orifice flow equation to calculate the required cross-sectional area and diameter for the Pond Drain Orifice:***

[Q=ca(sq. rt. (2gh))]
where:
c = 0.61
g = 32.2
Average h = 2.00

sqrt(2gh) = 11.349
a= 0.008 sq. ft. — Based upon: [a=Q/c (sq. rt. (2gh))]

Resulting diameter of orifice based upon area = D = 0.100 ft. — Based upon: [D = sq. rt. (4a/3.142)]
D = 1.202 in.

For Design, Use a **3** in. diameter hole.

Orifice centerline elevation = Orifice invert + (Orifice size in feet/2)
Orifice centerline elevation = 782.00 + 0.13

Orifice centerline elevation = 782.13 ft.

Adjustable gate valve shall be provided to pond drain

b) Pond liner is not required since the pond is not located in gravelly sands or fractured bedrock area. However liner will be provided if during construction verify the need of liner.
c) Riprap protection at the oulet has been size to prevent erosion. See attachment E5
d) Length to width ratio = 90/30 = 3:1 (minimum required is 1.5:1)
e) Surface area to drainage area ratio = 0.05:2.3 = 1:46 (minimum required is 1:100)
f) Safety bench is not required since the design side slope is 4:1.
g Adequate aquatic bench is provided as shown in the site plan.
h) There is no permanent structure within 25 ft buffer from the maximum water surface elevation of the pond
i) The pond is easily accessible for maintenance since the open spaces area have slope <15%

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Date: 5/27/2014
Project: Silo Ridge
Project No: 29011

Calculated By: JC
Checked By:

Underground Sand Filter Design -SMW #9 (USF-122) (refer to section 8.3 in SMDM)

Step 1: Compute Water Quality Volume

NYSDEC Required Water Quality Volume (WQv):

Data:

P:	2.8	= 1-year Rainfall Precipitation (in.)
CN:	96	= CN value for developed condition
Q:	2.36	= 1-year runoff (in.)
A:	0.346	= Site Area to Basin (in acres)

S= 1000/cn -10
S= 0.4

$$Q = \frac{(P-0.2S)^2}{(P+0.8S)}$$

Q= 2.36

WQv: **0.068** = Req'd Water Quality Volume (in ac-ft)

$$= \frac{(Q)(A)}{12}$$

Step 2: Appropriateness Underground Sand Filter for Site

Filter bottom invert = 606
Ground water elevation = Not Available (to be field verify)

Step 3: Compute Available Head and Peak Discharge (Qwq)

Availabel average depth (hf) is set as = 1.75 ft in step 5 below

Compute peak discharge (Q_{wq})

(a) Set high-flow pipe invert at elev.= 612 ft

(b) *Compute peak water quality discharge (Qwq):*

Compute modified CN for 2.8" rainfall
P = 2.8 inch
Qa = WQv / Area
Qa = **2.36** inch

$CN = 1000 / [10 + 5P + 10Q_a - 10(Q_a^2 + 1.25*Q_a*P)^{0.5}]$
CN = **96.0**

From TR-55, Table 4-1: **Ia = 0.5** **Ia / P = 0.179**

From TR-55, Exhibit 4-III: **q_u = 400 csm/in**

Q_{wq} = (q_u)(Site Area, ac/ 640 ac/ sq. mi)(Q_a)
Q_{wq} = **0.51** cfs

Step 4: Size the Flow Diversion Structure

(a) *Size low-flow orifice to pass Water Quality Storm Flow (Q_{wq})*

Assume Head = 1.0 ft (measured from center line of low-flow orifice to inv of high flow)

h = **1**

Q_{wq} = CA*(2gh)^0.5

A = Q_{wq}/[C* ((2gh)^0.5)]

A = **0.1058** ft^2

A = $\pi d^2/4$

= $3.142*d^2/4$

d = 0.37 ft

d = 4.40 in

Low-flow orifice = **5** inch diameter to pass Water Quality Storm Flow

Low-flow orifice invert at elev.= 610.50 ft

(b) *Size high flow pipe to pass larger storm*

Pipe Size Selected = 15"

Q_{25} = 5.5 cfs (from hydroCAD)

Pipe Capacity = 7 cfs

Set high flow pipe invert at 612.00 ft

Pipe selected can bypass the 25-year flow (even though the requirement is only for 10-year flow)

Step 5: Size Filtration Bed Chamber

$A_f = (WQ_v)(d_f)/[(k)(h_f+d_f)(t_f)]$

1. Data:

A_f: = Surface area of filter bed (ft^2)

100% WQ_v = 0.068 ac-ft

100% WQ_v = 2958.3 ft^3

d_f:	1.5	= Filter bed depth in feet (18" minimum)
k:	3.5	= Coefficient of permeability of filter media (ft/day) - sand coefficient utilized (see manual)
h_f:	1.75	= Average head on filter (ft) = $h_f/2$
t_f:	1.67	= Design filter bed drain time (days) (1.67 days is recommended t for sand filters)

$A_f = (WQ_v)(d_f)/[(k)(h_f+d_f)(t_f)]$

A_f = 233.6 ft^2

Filtration Chamber = 23 x 12 or = 276 ft^2

Step 6: Size Sedimentation Chamber

Sedimentation depth = **2.50** ft

Required to store 25% WQv = 739.59 ft^3

Therefore, As = 25%WQv / depth

As = 295.8 ft^2

Sedimentation Chamber = 23 x 16 or = 368 ft^2

Step 7: Compute Minimum Volume, Vmin

V_{min} = 0.75 WQv

V_{min} = 2218.8 ft^3

Step 8: Compute volume within practice

Volume within filter bed, $V_f = A_f(d_f)(n)$; n = **0.4** for sand

V_f = 165.6 ft^3

Temporary storage above filter bed, $V_{f\text{-temp}} = 2\ (h_f)\ (A_f)$

$V_{f\text{-temp}}$ = 966.0 ft^3

Compute storage in the Sedimentation Chamber, V_s

V_s = (invert of high flow event - bottom of sedimentation tank) (L*W)]

V_s = (2*hf + df + 8" of gravel-Sedimentation depth)* (L*W)

V_s = 1165 ft^3

Total volume provided = Vf + Vf-temp + Vs

= **2296.9** ft^3 > 2218.8 ft^3 OK

Step 9: Compute Sedimentation Chamber and Filter Bed Overflow Weir Size

This step is not apply to underground sand filter as the sand filter is burried underground thus no overflow should come out from the sand filter.

However 3ft weir is provided between the sedimentation and filter bed chamber such that the water can flow freely between the chamber.

The high flow pipe at diversion structure will divert the high flow from underground sand filter

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Underground Sand Filter Design -SMW #12 (USF-104) (refer to section 8.3 in SMDM)

Step 1: Compute Water Quality Volume

NYSDEC Required Water Quality Volume (WQv):

Data:

P:	2.8	= 1-year Rainfall Precipitation (in.)
CN:	74	= CN value for developed condition
Q:	0.78	= 1-year runoff (in.)
A:	3.1	= Site Area to Basin (in acres)

S= 1000/cn -10
S= 3.5

$$Q = \frac{(P-0.2S)^2}{(P+0.8S)}$$

Q= 0.78

WQv: **0.203** = Req'd Water Quality Volume (in ac-ft)

$$= \frac{(Q)(A)}{12}$$

Step 2: Appropriateness Underground Sand Filter for Site

Filter bottom invert = 496
Ground water elevation = 494 (to be field verify)

Step 3: Compute Available Head and Peak Discharge (Qwq)

Availabel average depth (hf) is set as = 2.50 ft in step 5 below

Compute peak discharge (Q_{wq})

(a) Set high-flow pipe invert at elev.= 501.9 ft

(b) *Compute peak water quality discharge (Qwq):*

Compute modified CN for 2.8" rainfall

P = 2.8 inch
Qa = WQv / Area
Qa = **0.78** inch

$CN = 1000 / [10 + 5P + 10Q_a - 10(Q_a^2 + 1.25*Q_a*P)$^0.5]
CN = **74.0**

From TR-55, Table 4-1: **Ia = 1.704** **Ia / P = 0.609**

From TR-55, Exhibit 4-III: **q_u = 280 csm/in**

Q_{wq} = (q_u)(Site Area, ac/ 640 ac/ sq. mi)(Q_a)
Q_{wq} = **1.06** cfs

Step 4: Size the Flow Diversion Structure

(a) *Size low-flow orifice to pass Water Quality Storm Flow (Q_{wq})*

Assume Head = 1.5 ft (measured from center line of low-flow orifice to inv of high flow)

h = **1.5**

Q_{wq} = CA*(2gh)^0.5

A = Q_{wq}/[C* ((2gh)^0.5)]

A = **0.1803** ft^2

A = π $d^2/4$

= 3.142*$d^2/4$

d = 0.48 ft

d = 5.75 in

Low-flow orifice = **6** inch diameter to pass Water Quality Storm Flow

Low-flow orifice invert at elev.= 500.40 ft

(b) *Size high flow pipe to pass larger storm*

Pipe Size Selected =	15"	
Q_{25} =	3.8 cfs	(from hydroCAD)
Pipe Capacity =	12	cfs
Set high flow pipe invert at	501.90	ft

Pipe selected can bypass the 25-year flow (even though the requirement is only for 10-year flow)

Step 5: Size Filtration Bed Chamber

A_f = $(WQ_v)(d_f)/[(k)(h_f+d_f)(t_f)]$

1. Data:

A_f: = Surface area of filter bed (ft^2)

100% WQ_v = 0.203 ac-ft

100% WQ_v = 8821.9 ft^3

d_f:	1.5	= Filter bed depth in feet (18" minimum)
k:	3.5	= Coefficient of permeability of filter media (ft/day) - sand coefficient utilized (see manual)
h_f:	2.50	= Average head on filter (ft) = $h_t/2$
t_f:	1.67	= Design filter bed drain time (days) (1.67 days is recommended t_f for sand filters)

A_f = $(WQ_v)(d_f)/[(k)(h_f+d_f)(t_f)]$

A_f = 566.0 ft^2

Filtration Chamber = 25 x 24 or = 600 ft^2

Step 6: Size Sedimentation Chamber

Sedimentation depth = **2.50** ft

Required to store 25% WQv = 2205.48 ft^3

Therefore, As = 25%WQv / depth

As = 882.2 ft^2

Sedimentation Chamber = 25 x 36 or = 900 ft^2

Step 7: Compute Minimum Volume, Vmin

V_{min} = 0.75 WQv

V_{min} = 6616.4 ft^3

Step 8: Compute volume within practice

Volume within filter bed, $V_f = A_f(d_f)(n)$; n = **0.4** for sand

V_f = 360.0 ft^3

Temporary storage above filter bed, $V_{f\text{-}temp} = 2\,(h_f)\,(A_f)$

$V_{f\text{-}temp}$ = 3000.0 ft^3

Compute storage in the Sedimentation Chamber, V_s

V_s = (invert of high flow event - bottom of sedimentation tank) (L*W)]

V_s = (2*hf + df + 8" of gravel-Sedimentation depth)* (L*W)

V_s = 4200 ft^3

Total volume provided = Vf + Vf-temp + Vs

= **7560.0** ft^3 > 6616.4 ft^3 OK

Step 9: Compute Sedimentation Chamber and Filter Bed Overflow Weir Size

This step is not apply to underground sand filter as the sand filter is burried underground thus no overflow should come out from the sand filter.

However 3ft weir is provided between the sedimentation and filter bed chamber such that the water can flow freely between the chamber.

The high flow pipe at diversion structure will divert the high flow from underground sand filter

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Underground Sand Filter Design -SMW #13 (USF-984) (refer to section 8.3 in SMDM)

Step 1: Compute Water Quality Volume

NYSDEC Required Water Quality Volume (WQv):

Data:

P:	2.8	= 1-year Rainfall Precipitation (in.)
CN:	81	= CN value for developed condition
Q:	1.16	= 1-year runoff (in.)
A:	2.9	= Site Area to Basin (in acres)

S= 1000/cn -10
S= 2.3

$$Q = \frac{(P-0.2S)^2}{(P+0.8S)}$$

Q= 1.16

WQv: **0.281** = Req'd Water Quality Volume (in ac-ft)

$$= \frac{(Q)(A)}{12}$$

Step 2: Appropriateness Underground Sand Filter for Site

Filter bottom invert = 771'
Ground water elevation = 769' (to be field verify)

Step 3: Compute Available Head and Peak Discharge (Qwq)

Availabel average depth (hf) is set as = 3.50 ft in step 5 below

Compute peak discharge (Q_{wq})

(a) Set high-flow pipe invert at elev.= 782.5 ft

(b) *Compute peak water quality discharge (Qwq):*

P = 2.8 inch
Qa = WQv / Area
Qa = **1.16** inch

$CN = 1000 / [10 + 5P + 10Q_a - 10(Q_a^2 + 1.25*Q_a*P)^{0.5}]$
CN = **81.0**

From TR-55, Table 4-1: **Ia = 0.469** **Ia / P = 0.168**

From TR-55, Exhibit 4-III: **q_u = 460 csm/in**

Q_{wq} = (q_u)(Site Area, ac/ 640 ac/ sq. mi)(Q_a)
Q_{wq} = **2.42** cfs

Step 4: Size the Flow Diversion Structure

(a) *Size low-flow orifice to pass Water Quality Storm Flow (Q_{wq})*

Assume Head = 1.5 ft (measured from center line of low-flow orifice to inv of high flow)

h = **1.5**

Q_{wq} = CA*(2gh)^0.5

A = Q_{wq}/[C* ((2gh)^0.5)]

A = **0.4106** ft^2

A = $\pi d^2/4$

= $3.142*d^2/4$

d = 0.72 ft

d = 8.68 in

Low-flow orifice = **10** inch diameter to pass Water Quality Storm Flow

Low-flow orifice invert at elev.= 781.00 ft

(b) *Size high flow pipe to pass larger storm*

Pipe Size Selected =	18"	
Q_{25} =	14.92	(from hydroCAD)
Pipe Capacity =	25	cfs
Set high flow pipe invert at	782.50	ft

Pipe selected can bypass the 25-year flow (even though the requirement is only for 10-year flow)

Step 5: Size Filtration Bed Chamber

A_f = $(WQ_v)(d_f)/[(k)(h_f+d_f)(t_f)]$

1. Data:

A_f: = Surface area of filter bed (ft^2)

100% WQ_v =	0.281	ac-ft
100% WQ_v =	12229.6	ft^3

d_f:	1.5	= Filter bed depth in feet (18" minimum)
k:	3.5	= Coefficient of permeability of filter media (ft/day) - sand coefficient utilized (see manual)
h_f:	3.50	= Average head on filter (ft) = $h_t/2$
t_f:	1.67	= Design filter bed drain time (days) (1.67 days is recommended ŧ for sand filters)

A_f = $(WQ_v)(d_f)/[(k)(h_f+d_f)(t_f)]$

A_f = 627.7 ft^2

Filtration Chamber = 32 x 21 or =	**672**	ft^2

Step 6: Size Sedimentation Chamber

Sedimentation depth = **4.00** ft

Required to store 25% WQv = 3057.41 ft^3

Therefore, As = 25%WQv / depth

As = 764.4 ft^2

Sedimentation Chamber = 32 x 25 or =	**800**	ft^2

Step 7: Compute Minimum Volume, Vmin

V_{min} = 0.75 WQv

V_{min} = 9172.2 ft^3

Step 8: Compute volume within practice

Volume within filter bed, $V_f = A_f(d_f)(n)$; n = **0.4** for sand

V_f = 403.2 ft^3

Temporary storage above filter bed, $V_{f\text{-}temp} = 2\ (h_f)\ (A_f)$

$V_{f\text{-}temp}$ = 4704.0 ft^3

Compute storage in the Sedimentation Chamber, V_s

V_s = (invert of high flow event - bottom of sedimentation tank) (L*W)]

V_s = (2*hf + df + 8" of gravel-Sedimentation depth)* (L*W)

V_s = 4133 ft^3

Total volume provided = Vf + Vf-temp + Vs

= **9240.5** ft^3 > 9172.2 ft^3 OK

Step 9: Compute Sedimentation Chamber and Filter Bed Overflow Weir Size

This step is not apply to underground sand filter as the sand filter is burried underground thus no overflow should come out from the sand filter.

However 3ft weir is provided between the sedimentation and filter bed chamber such that the water can flow freely between the chamber.

The high flow pipe at diversion structure will divert the high flow from underground sand filter

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Underground Sand Filter Design -SMW #14 (USF-991) (refer to section 8.3 in SMDM)

Step 1: Compute Water Quality Volume

NYSDEC Required Water Quality Volume (WQv):

Data:

P:	2.8	= 1-year Rainfall Precipitation (in.)
CN:	73	= CN value for developed condition
Q:	0.74	= 1-year runoff (in.)
A:	9.2	= Site Area to Basin (in acres)

S= 1000/cn -10
S= 3.7

$$Q = \frac{(P-0.2S)^2}{(P+0.8S)}$$

Q= 0.74

WQv: **0.565** = Req'd Water Quality Volume (in ac-ft)

$$= \frac{(Q)(A)}{12}$$

Step 2: Appropriateness Underground Sand Filter for Site

Filter bottom invert = 684'
Ground water elevation = 682' (to be field verify)

Step 3: Compute Available Head and Peak Discharge (Qwq)

Availabel average depth (hf) is set as = 4.50 ft in step 5 below

Compute peak discharge (Q_{wq})

(a) Set high-flow pipe invert at elev.= 695.5 ft

(b) *Compute peak water quality discharge (Qwq):*

P = 2.8 inch
Qa = WQv / Area
Qa = **0.74** inch

CN = $1000 / [10 + 5P + 10Q_a - 10(Q_a^2 + 1.25*Q_a*P)^{0.5}]$
CN = **73.0**

From TR-55, Table 4-1: **Ia = 0.667** **Ia / P = 0.238**

From TR-55, Exhibit 4-III: **q_u = 360 csm/in**

Q_{wq} = (q_u)(Site Area, ac/ 640 ac/ sq. mi)(Q_a)
Q_{wq} = **3.81** cfs

Step 4: Size the Flow Diversion Structure

(a) *Size low-flow orifice to pass Water Quality Storm Flow (Q_{wq})*

Assume Head = 1.5 ft (measured from center line of low-flow orifice to inv of high flow)

h = **1.5**

Q_{wq} = CA*(2gh)^0.5

A = Q_{wq}/[C* ((2gh)^0.5)]

A = **0.6468** ft^2

A = $\pi d^2/4$

= $3.142*d^2/4$

d = 0.91 ft

d = 10.89 in

Low-flow orifice = **12** inch diameter to pass Water Quality Storm Flow

Low-flow orifice invert at elev.= 694.00 ft

(b) *Size high flow pipe to pass larger storm*

Pipe Size Selected =	24"	
Q_{25} =	27.8 cfs	(from hydroCAD)
Pipe Capacity =	31	cfs
Set high flow pipe invert at	695.50	ft

Pipe selected can bypass the 25-year flow (even though the requirement is only for 10-year flow)

Step 5: Size Filtration Bed Chamber

$A_f = (WQ_v)(d_f)/[(k)(h_f+d_f)(t_f)]$

1. Data:

A_f: = Surface area of filter bed (ft^2)

100% WQ_v = 0.565 ac-ft

100% WQ_v = 24615.3 ft^3

d_f:	1.5	= Filter bed depth in feet (18" minimum)
k:	3.5	= Coefficient of permeability of filter media (ft/day) - sand coefficient utilized (see manual)
h_f:	4.50	= Average head on filter (ft) = $h_t/2$
t_f:	1.67	= Design filter bed drain time (days) (1.67 days is recommended t_f for sand filters)

$A_f = (WQ_v)(d_f)/[(k)(h_f+d_f)(t_f)]$

A_f = 1052.8 ft^2

Filtration Chamber = 36 x 32 or = 1152 ft^2

Step 6: Size Sedimentation Chamber

Sedimentation depth = **5.00** ft

Required to store 25% WQv = 6153.82 ft^3

Therefore, As = 25%WQv / depth

As = 1230.8 ft^2

Sedimentation Chamber = 36 x 35 or = 1260 ft^2

Step 7: Compute Minimum Volume, Vmin

V_{min} = 0.75 WQv

V_{min} = 18461.5 ft^3

Step 8: Compute volume within practice

Volume within filter bed, $V_f = A_f(d_f)(n)$; n = **0.4** for sand

V_f = 691.2 ft^3

Temporary storage above filter bed, $V_{f\text{-temp}} = 2\,(h_f)\,(A_f)$

$V_{f\text{-temp}}$ = 10368.0 ft^3

Compute storage in the Sedimentation Chamber, V_s

V_s = (invert of high flow event - bottom of sedimentation tank) (L*W)]

V_s = (2*hf + df + 8" of gravel-Sedimentation depth)* (L*W)

V_s = 7770 ft^3

Total volume provided = Vf + Vf-temp + Vs

= **18829.2** ft^3 > 18461.5 ft^3 OK

Step 9: Compute Sedimentation Chamber and Filter Bed Overflow Weir Size

This step is not apply to underground sand filter as the sand filter is burried underground thus no overflow should come out from the sand filter.
However 3ft weir is provided between the sedimentation and filter bed chamber such that the water can flow freely between the chamber.
The high flow pipe at diversion structure will divert the high flow from underground sand filter

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Underground Sand Filter Design -SMW #15 (USF-652) (refer to section 8.3 in SMDM)

Step 1: Compute Water Quality Volume

NYSDEC Required Water Quality Volume (WQv):

Data:

P:	2.8	= 1-year Rainfall Precipitation (in.)
CN:	60	= CN value for developed condition
Q:	0.26	= 1-year runoff (in.)
A:	2.25	= Site Area to Basin (in acres)

S= 1000/cn -10
S= 6.7

$$Q = \frac{(P-0.2S)^2}{(P+0.8S)}$$

Q= 0.26

WQv: **0.050** = Req'd Water Quality Volume (in ac-ft)

$$= \frac{(Q)(A)}{12}$$

Step 2: Appropriateness Underground Sand Filter for Site

Filter bottom invert = 497'
Ground water elevation = 492 (to be field verify)

Step 3: Compute Available Head and Peak Discharge (Qwq)

Availabel average depth (hf) is set as = 2.00 ft in step 5 below

Compute peak discharge (Q_{wq})

(a) Set high-flow pipe invert at elev.= 504.5 ft

(b) *Compute peak water quality discharge (Qwq):*

P = 2.8 inch
Qa = WQv / Area
Qa = **0.26** inch

CN = $1000 / [10 + 5P + 10Q_a - 10(Q_a^2 + 1.25*Q_a*P)^{0.5}]$
CN = **60.0**

From TR-55, Table 4-1: **Ia = 1.333** **Ia / P = 0.476**

From TR-55, Exhibit 4-III: **q_u = 300 csm/in**

Q_{wq} = (q_u)(Site Area, ac/ 640 ac/ sq. mi)(Q_a)
Q_{wq} = **0.28** cfs

Step 4: Size the Flow Diversion Structure

(a) *Size low-flow orifice to pass Water Quality Storm Flow (Q_{wq})*

Assume Head = 1.5 ft (measured from center line of low-flow orifice to inv of high flow)

h = **1.5**

Q_{wq} = CA*(2gh)^0.5

A = Q_{wq}/[C* ((2gh)^0.5)]

A = **0.0473** ft^2

A = $\pi d^2/4$

= $3.142*d^2/4$

d = 0.25 ft

d = 2.94 in

Low-flow orifice = **4** inch diameter to pass Water Quality Storm Flow

Low-flow orifice invert at elev.= 503.00 ft

(b) *Size high flow pipe to pass larger storm*

Pipe Size Selected = 15"

Q_{25} = 5.18 cfs (from hydroCAD)

Pipe Capacity = 12 cfs

Set high flow pipe invert at 504.50 ft

Pipe selected can bypass the 25-year flow (even though the requirement is only for 10-year flow)

Step 5: Size Filtration Bed Chamber

$A_f = (WQ_v)(d_f)/[(k)(h_f+d_f)(t_f)]$

1. Data:

A_f: = Surface area of filter bed (ft^2)

100% WQ_v = 0.050 ac-ft

100% WQ_v = 2160.1 ft^3

d_f:	1.5	= Filter bed depth in feet (18" minimum)
k:	3.5	= Coefficient of permeability of filter media (ft/day) - sand coefficient utilized (see manual)
h_f:	2.00	= Average head on filter (ft) = $h_f/2$
t_f:	1.67	= Design filter bed drain time (days) (1.67 days is recommended f for sand filters)

$A_f = (WQ_v)(d_f)/[(k)(h_f+d_f)(t_f)]$

A_f = <u>158.4</u> ft^2

Filtration Chamber = 20 x 10 or = 200 ft^2

Step 6: Size Sedimentation Chamber

Sedimentation depth = **2.50** ft

Required to store 25% WQv = 540.04 ft^3

Therefore, As = 25%WQv / depth

As = 216.0 ft^2

Sedimentation Chamber = 20x12 or = 240 ft^2

Step 7: Compute Minimum Volume, Vmin

V_{min} = 0.75 WQv

V_{min} = 1620.1 ft^3

Step 8: Compute volume within practice

Volume within filter bed, $V_f = A_f(d_f)(n)$; n = **0.4** for sand

V_f = 120.0 ft^3

Temporary storage above filter bed, $V_{f\text{-}temp} = 2\,(h_f)\,(A_f)$

$V_{f\text{-}temp}$ = 800.0 ft^3

Compute storage in the Sedimentation Chamber, V_s

V_s = (invert of high flow event - bottom of sedimentation tank) (L*W)]

V_s = (2*hf + df + 8" of gravel-Sedimentation depth)* (L*W)

V_s = 880 ft^3

Total volume provided = Vf + Vf-temp + Vs

= **1800.0** ft^3 > 1620.1 ft^3 OK

Step 9: Compute Sedimentation Chamber and Filter Bed Overflow Weir Size

This step is not apply to underground sand filter as the sand filter is burried underground thus no overflow should come out from the sand filter.
However 3ft weir is provided between the sedimentation and filter bed chamber such that the water can flow freely between the chamber.
The high flow pipe at diversion structure will divert the high flow from underground sand filter

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Date: 5/27/2014
Project: Silo Ridge
Project No: 29011

Calculated By: JC
Checked By:

Underground Sand Filter Design -SMW #16 (USF-605) (refer to section 8.3 in SMDM)

Step 1: Compute Water Quality Volume

NYSDEC Required Water Quality Volume (WQv):

Data:

P:	2.8	= 1-year Rainfall Precipitation (in.)
CN:	58	= CN value for developed condition
Q:	0.21	= 1-year runoff (in.)
A:	5.3	= Site Area to Basin (in acres)

S= 1000/cn -10
S= 7.2

$$Q = \frac{(P-0.2S)^2}{(P+0.8S)}$$

Q= 0.21

WQv: **0.094** = Req'd Water Quality Volume (in ac-ft)

$$= \frac{(Q)(A)}{12}$$

Step 2: Appropriateness Underground Sand Filter for Site

Filter bottom invert = 509'
Ground water elevation = 492 (to be field verify)

Step 3: Compute Available Head and Peak Discharge (Qwq)

Availabel average depth (hf) is set as = 2.00 ft in step 5 below

Compute peak discharge (Q_{wq})

(a) Set high-flow pipe invert at elev.= 517.2 ft

(b) *Compute peak water quality discharge (Qwq):*

P = 2.8 inch
Qa = WQv / Area
Qa = **0.21** inch

$CN = 1000 / [10 + 5P + 10Q_a - 10(Q_a^2 + 1.25*Q_a*P)^{0.5}]$
CN = **58.0**

From TR-55, Table 4-1: **Ia = 1.448** **Ia / P = 0.517**

From TR-55, Exhibit 4-III: **q_u = 290 csm/in**

Q_{wq} = (q_u)(Site Area, ac/ 640 ac/ sq. mi)(Q_a)
Q_{wq} = **0.51** cfs

Step 4: Size the Flow Diversion Structure

(a) Size low-flow orifice to pass Water Quality Storm Flow (Q_{wq})

Assume Head = 1.5 ft (measured from center line of low-flow orifice to inv of high flow)

h = **1.5**

Q_{wq} = CA*(2gh)^0.5

A = Q_{wq}/[C* ((2gh)^0.5)]

A = **0.0866** ft^2

A = $\pi d^2/4$

= $3.142*d^2/4$

d = 0.33 ft

d = 3.98 in

Low-flow orifice = **5** inch diameter to pass Water Quality Storm Flow

Low-flow orifice invert at elev.= 515.70 ft

(b) Size high flow pipe to pass larger storm

Pipe Size Selected =	15"	
Q_{25} =	8.54 cfs	(from hydroCAD)
Pipe Capacity =	12	cfs
Set high flow pipe invert at	517.20	ft

Pipe selected can bypass the 25-year flow (even though the requirement is only for 10-year flow)

Step 5: Size Filtration Bed Chamber

$A_f = (WQ_v)(d_f)/[(k)(h_f+d_f)(t_f)]$

1. Data:

A_f: = Surface area of filter bed (ft^2)

100% WQ_v = 0.094 ac-ft

100% WQ_v = 4090.8 ft^3

d_f:	1.5	= Filter bed depth in feet (18" minimum)
k:	3.5	= Coefficient of permeability of filter media (ft/day) - sand coefficient utilized (see manual)
h_f:	2.00	= Average head on filter (ft) = $h_t/2$
t_f:	1.67	= Design filter bed drain time (days) (1.67 days is recommended t_f for sand filters)

$A_f = (WQ_v)(d_f)/[(k)(h_f+d_f)(t_f)]$

A_f = 299.9 ft^2

Filtration Chamber = 25x 14 or = 350 ft^2

Step 6: Size Sedimentation Chamber

Sedimentation depth = **2.50** ft

Required to store 25% WQv = 1022.70 ft^3

Therefore, As = 25%WQv / depth

As = 409.1 ft^2

Sedimentation Chamber = 25 x 17 or = 425 ft^2

Step 7: Compute Minimum Volume, Vmin

V_{min} = 0.75 WQv

V_{min} = 3068.1 ft^3

Step 8: Compute volume within practice

Volume within filter bed, $V_f = A_f(d_f)(n)$; n = **0.4** for sand

V_f = 210.0 ft^3

Temporary storage above filter bed, $V_{f\text{-}temp} = 2\,(h_f)\,(A_f)$

$V_{f\text{-}temp}$ = 1400.0 ft^3

Compute storage in the Sedimentation Chamber, V_s

V_s = (invert of high flow event - bottom of sedimentation tank) (L*W)]

V_s = (2*hf + df + 8" of gravel-Sedimentation depth)* (L*W)

V_s = 1558 ft^3

Total volume provided = Vf + Vf-temp + Vs

= **3168.3** ft^3 > 3068.1 ft^3 OK

Step 9: Compute Sedimentation Chamber and Filter Bed Overflow Weir Size

This step is not apply to underground sand filter as the sand filter is burried underground thus no overflow should come out from the sand filter.

However 3ft weir is provided between the sedimentation and filter bed chamber such that the water can flow freely between the chamber.

The high flow pipe at diversion structure will divert the high flow from underground sand filter

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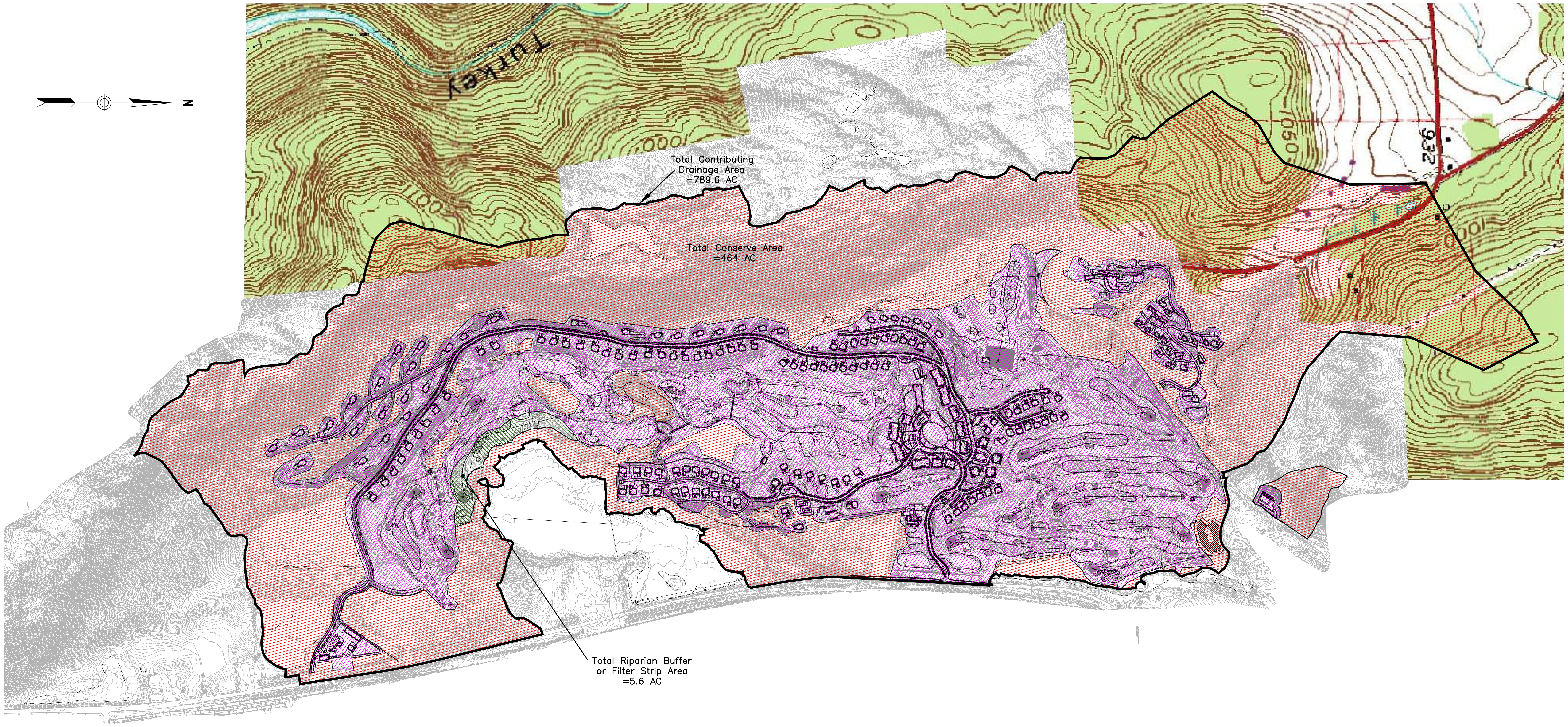

No.	Revision	Date	Appvd

Designed by | Drawn by | Checked by
CAD checked by | Approved by
Scale 1"=400' | Date June 19, 2014

Project Title
Silo Ridge Resort Community

4651 Route 22
Amenia, New York

Issued for
Permitting

Not Approved for Construction

Drawing Title
Proposed Conditions
Water Quality Map

Drawing Number
Fig. E3

Sheet 1 of 1

Project Number
29011.00

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Date: 7/2/2014
Project: Silo Ridge
Project No: 29011

Calculated By: JC
Checked By:

Water Quality Volume & Runoff Reduction Volume Analysis

1) Required Water Quality Volume Calculations (#28 in NOI)

NYSDEC Required Water Quality Volume (WQv):

Data:

P:	2.8	= 1-year Rainfall Precipitation (in.)
CN:	67.7	= CN value for developed condition
Q:	0.52	= 1-year runoff (in.)
A:	789.6	= Contributing Drainage Area (in acres)

S= 1000/cn -10
S= 4.8

$$Q = \frac{(P-0.2S)^2}{(P+0.8S)}$$

Q= 0.52

WQv: **33.926** = Req'd Water Quality Volume (in ac-ft)

$$= \frac{(Q)(A)}{12}$$

Required WQv = 33.926 Ac-ft

2) Runoff Reduction Volume- Conservation area (#30 in NOI)

NYSDEC Required Water Quality Volume (WQv):

Data:

P:	2.8	= 1-year Rainfall Precipitation (in.)
CN:	70.2	= CN value for Conservation Area
Q:	0.61	= 1-year runoff (in.)
A:	464	= Contributing Drainage Area (in acres)

S= 1000/cn -10
S= 4.3

$$Q = \frac{(P-0.2S)^2}{(P+0.8S)}$$

Q= 0.61

WQv: **23.686** = Req'd Water Quality Volume (in ac-ft)

$$= \frac{(Q)(A)}{12}$$

2A) Runoff Reduction Volume- Buffer / Filter Strip Area (#30 in NOI)

NYSDEC Required Water Quality Volume (WQv):

Data:

P:	2.8	= 1-year Rainfall Precipitation (in.)
CN:	74	= CN value for Buffer/ Filter Strip Area
Q:	0.78	= 1-year runoff (in.)
A:	5.66	= Contributing Drainage Area (in acres)

S= 1000/cn -10
S= 3.5

$$Q = \frac{(P-0.2S)^2}{(P+0.8S)}$$

Q= 0.78

WQv: **0.370** = Req'd Water Quality Volume (in ac-ft)

$$= \frac{(Q)(A)}{12}$$

3) Total Runoff Reduction Volume Provided (#30 in NOI)

Total RRv Provided =	**Step 2 +Step 2A =**	**24.056 Ac-ft**

Note: RRv provided by infiltration basins which are constructed during golf phase are not being considered for built conditions to be conservative.

4) Minimum Required Runoff Reduction Volume Based on HSG (#32 in NOI)

RRv (min) = (P * 0.95 * Ai) / 12
Where Ai = S * Aic
Aic = Total area of new Impervious
Aic = 50.2 Ac
S = 0.55 (to be conservative assume all soil A)

RRv (min) = (P * 0.95 * Ai) / 12
= (2.8 x 0.95 x 0.55 x 50.2)/12
= 6.12 Ac-ft

RRv (min) =	**6.12**	**Ac-ft**

5) Water Quality Volume Provided by Standard Stormwater Management Practise During Full-Built Condition
(#33a in NOI)

Stormwater Management Practise	Water Quality Volume Provided (ac-ft)
Wet Extended Pond	14.614
Underground Sand Filter	1.260
Total WQv Provided	15.874

Note: WQv provided by infiltration basins which are constructed during golf phase are not being considered for for built conditions to be conservative.

6) Total Runoff Reduction Volume and Water Quality Volume Provided (#34 in NOI)

Total RRv & WQv Provided = 24.056 + 15.874

Total RRv & WQv Provided = 39.930 Ac-ft

7) Total RRv & WQv Provided Vs. Required WQv (#35 in NOI)

Total RRv & WQv Provided = 39.930 Ac-ft

Required WQv = 33.926 Ac-ft

Total RRv & WQv Provided > Required WQv ok

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Project: Silo Ridge
Project No: 29011

Calculated By: JC
Checked By: ________

TEMPORARY SEDIMENT BASIN DESIGN FOR OVERLOOK AREA (SB #1)

Drainage Area = 1 acres
Riser Crest Elevation = 809

Peak discharge for construction condition (Rational Method) :

$Q_{p(10)}$ = CIA
= 0.9 * 5 in * 1 ac
= 4.5 cfs

$Q_{p(10)}$ = 4.50 cfs

A. BASIN SIZE DESIGN REQUIREMENTS

1) Minimum Required Sediment Storage Volume (134 cu.yd./acre)

= 134 cu.yds/ac x Drainage Area (acres)
= 134 cu.yds.
= 0.083 ac-ft

2) Determine storage volume and elevation to be cleaned out when sediment has achieved 50% of basin storage volume.

a. Sediment basin shall be cleaned out when sediment has achieved 50% of basin storage volume.

= 50% of 134
= 67 cu.yds.
= 0.042 ac-ft

b. Elevation corresponding to scheduled time to clean out when sediment has achieved 50% of basin storage volume.

Chart : Sediment Basin Design Elevation VS Volume

								1	2	1-2=3
Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	Cumulative Total Volume (ac-ft)	*Req'd Sediment Storage Volume (ac-ft)	Net Volume (ac-ft)
806	984		0.0226							
		1367		0.0314	2	2733	0.0627	0.0627	0.0831	-0.0203
808	1749		0.0402							
		2182		0.0501	2	4364	0.1002	0.1629	0.0831	0.0799
810	2615		0.0600							

		Elev. (ft.)	Cumulative Volume (ac-ft)
Volume/elevation corresponding to scheduled time to clean out =		X	0.042
Elevation Range:	High:	810.00	0.1629
	Low:	808.00	0.0627

Interpolated Elevation for scheduled time to clean out = **807.6**

Elevation corresponding to scheduled time to clean out =	808.00 ft.

c. Distance below top of riser, h

h = Riser Crest Elevation - Elevation at 50% of basin storage volume
h = 809.0 - 808.00
h = 1 ft.

3) Minimum Basin Surface Area,

$As = 0.01 \times Q_{p(10)}$ or $0.015 \times DA$

$As = 0.01 \times Q_{p(10)}$
As = 0.01 x 4.50
As = 0.045 ac

or As = 0.015 x DA
As = 0.015 x 1
As = 0.015 ac

Use As = 0.045 ac which is greater than As = 0.015 ac

B. DESIGN OF SPILLWAY AND ELEVATIONS

Bottom of Basin = 806.0

Runoff:

4) $Q_{p(10)}$ = 4.50 cfs

Pipe Spillway (Q_{ps})

5) Minimum Pipe Spillway Capacity, Qps = 0.2 x DA
= 0.20 cfs

6) H = 809.0 - 805.0
= 4.0 ft.

Barrel Length, L 50 ft.

7) Barrel Diameter, Dp = 15 inches
Q = 6.96 cfs (Fig. 5A.26- Pipe flow chart ; "n"=0.025)
Correction Factor = 1.14 (Fig. 5A.26 - Pipe flow chart ; "n"=0.025)

Qps = Q x Correction Factor
= 7.93 cfs

8) Riser Diameter = 15 inches
Length of Riser = Riser Crest Elevation - Bottom of Basin
= 809.0 - 806.0
= 3.0 ft.

Required, h = 0.6 ft. (Fig. 5A.25 - Riser Inflow Chart)
Provided, h = 1.0 ft.

9) Trash Rack Diameter = 21" (Fig. 5A.29 (2))

H = 7" (Fig. 5A.29(2))

Design High Water Elevation = Riser Crest Elevation + h
= 809.0 + 1.00
= 810.0
Top of Dam Elevation = 811.0 (1 ft freeboard)

C. ANTI-SEEP COLLAR/ SEEPAGE DIAPHRAGM DESIGN

(Note: the length of pipe within saturated zone is determined graphically from Sediment basin cross section.)

12) Expected highest water elevation 810.0

Distance from upstream invert to highest water level, y =	3.0	ft.	
Slope upstream embankment, Z =	2	:1	
pipe slope =	0.020		2.00%
Length of pipe in saturated zone, L_s =	20	ft.	

Required collar number =	2			(Fig. 5A.31 - Anti-Seep Collar Design Charts)
Anti-Seep collar size =	3.0	ft.		
Outlet pipe size =	1.25	ft.		
Projection =	0.9	ft.		
Collar spacing is between =	4.5	ft. to	12.3	ft.
Provided collar spacing =	10.0	ft.		

D. DEWATERING ORIFICE SIZING

13) $$A_o = \frac{A_s \times (2 \times h)^{0.5}}{122{,}568}$$

As = 0.045 ac

h = 1 ft.

$$\frac{3.14\, d_0^2}{4} = 0.023 \text{ ft}^2$$

$$d_0 = 0.170 \text{ ft.}$$

$$= 2.04 \text{ inches}$$

Provide 3-inch diameter hole at elevation for dewatering orifice	808.00

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Project: Silo Ridge
Project No: 29011

Calculated By: JC
Checked By: ______

TEMPORARY SEDIMENT BASIN DESIGN FOR DRAINAGE AREA D102 (SB #2)

Drainage Area = 0.35 acres
Riser Crest Elevation = 614.5

Peak discharge for construction condition (from HydroCAD analysis) :

$Q_{p(10)}$:	1.66 cfs

A. BASIN SIZE DESIGN REQUIREMENTS

1) Minimum Required Sediment Storage Volume (134 cu.yd./acre)

= 134 cu.yds/ac x Drainage Area (acres)
= 46.9 cu.yds.
= 0.029 ac-ft

2) Determine storage volume and elevation to be cleaned out when sediment has achieved 50% of basin storage volume.

a. Sediment basin shall be cleaned out when sediment has achieved 50% of basin storage volume.

= 50% of 46.9
= 23.45 cu.yds.
= 0.015 ac-ft

b. Elevation corresponding to scheduled time to clean out when sediment has achieved 50% of basin storage volume.

Chart : Sediment Basin Design Elevation VS Volume

Contour Elev. (ft)	Contour Area Proposed (ft²)	Average (ft²)	Proposed (ac)	Average (ac)	Depth (ft)	Total Volume (ft³)	Total Volume (ac-ft)	1 Cumulative Total Volume (ac-ft)	2 *Req'd Sediment Storage Volume (ac-ft)	1-2=3 Net Volume (ac-ft)
612	231		0.0053							
		390		0.0089	2	779	0.0179	0.0179	0.0291	-0.0112
614	548		0.0126							
		758		0.0174	2	1515	0.0348	0.0527	0.0291	0.0236
616	967		0.0222							

		Elev. (ft.)	Cumulative Volume (ac-ft)
Volume/elevation corresponding to scheduled time to clean out =		X	0.015
Elevation Range:	High:	614.00	0.0179
	Low:	612.00	0.0000

Interpolated Elevation for scheduled time to clean out = **613.6**

Elevation corresponding to scheduled time to clean out = 613.60 ft.

c. Distance below top of riser, h

h = Riser Crest Elevation - Elevation at 50% of basin storage volume
h = 614.5 - 613.60
h = 0.9 ft.

3) Minimum Basin Surface Area,

As = 0.01 x $Q_{p(10)}$ or 0.015 x DA

As = 0.01 x $Q_{p(10)}$
As = 0.01 x 1.66
As = 0.017 ac

or As = 0.015 x DA
As = 0.015 x 0.35
As = 0.005 ac

Use As = 0.017 ac which is greater than As = 0.005 ac

B. DESIGN OF SPILLWAY AND ELEVATIONS

Bottom of Basin = 612.0

Runoff:

4) $Q_{p(10)}$ = 1.66 cfs

Pipe Spillway (Q_{ps})

5) Minimum Pipe Spillway Capacity, Qps = 0.2 x DA
= 0.07 cfs

6) H = 614.5 - 610.0
= 4.5 ft.

Barrel Length, L 100 ft.

7) Barrel Diameter, Dp	=	12	inches	
Q	=	4.00	cfs	(Fig. 5A.26- Pipe flow chart ; "n"=0.025)
Correction Factor	=	0.86		(Fig. 5A.26 - Pipe flow chart ; "n"=0.025)
Qps	=	Q x Correction Factor		
	=	3.44	cfs	
8) Riser Diameter	=	12	inches	
Length of Riser	=	Riser Crest Elevation - Bottom of Basin		
	=	614.5 - 612.0		
	=	2.5	ft.	
Required, h	=	0.4	ft.	(Fig. 5A.25 - Riser Inflow Chart)
Provided, h	=	1.0	ft.	
9) Trash Rack Diameter	=	18"	(Fig. 5A.29 (2))	
H	=	6"	(Fig. 5A.29(2))	

Design High Water Elevation = Riser Crest Elevation + h
= 614.5 + 1.00
= 615.5
Top of Dam Elevation = 616.5 (1 ft freeboard)

C. ANTI-SEEP COLLAR/ SEEPAGE DIAPHRAGM DESIGN

(Note: the length of pipe within saturated zone is determined graphically from Sediment basin cross section.)

12) Expected highest water elevation 615.5

Distance from upstream invert to highest water level, y =	2.5	ft.	
Slope upstream embankment, Z =	2	:1	
pipe slope =	0.020		2.00%
Length of pipe in saturated zone, L_s =	16	ft.	

Required collar number =	2			(Fig. 5A.31 - Anti-Seep Collar Design Charts)
Anti-Seep collar size =	2.3	ft.		
Outlet pipe size =	1	ft.		
Projection =	0.6	ft.		
Collar spacing is between =	3.0	ft. to	8.8	ft.
Provided collar spacing =	8.0	ft.		

D. DEWATERING ORIFICE SIZING

13) $$A_o = \frac{A_s \times (2 \times h)^{0.5}}{122{,}568}$$

As = 0.017 ac
h = 0.9 ft.

$$\frac{3.14\, d_0^2}{4} = 0.008 \text{ ft}^2$$

$$d_0 = 0.100 \text{ ft.}$$

$$= 1.20 \text{ inches}$$

Provide 3-inch diameter hole at elevation for dewatering orifice	613.60

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Date: 1/16/2014
Project: Silo Ridge
Project No: 29011

Calculated By: JC
Checked By: ________

TEMPORARY SEDIMENT BASIN DESIGN FOR DRAINAGE AREA A101 (SB #3)

Drainage Area = 12.36 acres
Riser Crest Elevation = Emergency Spillway Elevation - Req'd 1-foot of freeboard
= 529.00 - 1
= 528.00

Peak discharge for construction condition (from HydroCAD analysis) :

$Q_{p(10)}$:	18.54 cfs

A. BASIN SIZE DESIGN REQUIREMENTS

1) Minimum Required Sediment Storage Volume (134 cu.yd./acre)

= 134 cu.yds/ac x Drainage Area (acres)
= 1656.2 cu.yds.
= 1.027 ac-ft

2) Determine storage volume and elevation to be cleaned out when sediment has achieved 50% of basin storage volume.

a. Sediment basin shall be cleaned out when sediment has achieved 50% of basin storage volume.

= 50% of 1656.2
= 828.12 cu.yds.
= 0.513 ac-ft

b. Elevation corresponding to scheduled time to clean out when sediment has achieved 50% of basin storage volume.

Chart : Sediment Basin Design Elevation VS Volume

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Cumulative Total Volume (ac-ft)	2 *Req'd Sediment Storage Volume (ac-ft)	1-2=3 Net Volume (ac-ft)
524	6111		0.1403							
		6745		0.1548	2	13490	0.3097	0.3097	1.0266	-0.7169
526	7379		0.1694							
		8063		0.1851	2	16126	0.3702	0.6799	1.0266	-0.3467
528	8747		0.2008							
		9482		0.2177	2	18963	0.4353	1.1152	1.0266	0.0886
530	10216		0.2345							

		Elev. (ft.)	Cumulative Volume (ac-ft)
Volume/elevation corresponding to scheduled time to clean out =		X	0.513
Elevation Range:	High:	528.00	0.6799
	Low:	526.00	0.3097

Interpolated Elevation for scheduled time to clean out = **527.1**

Elevation corresponding to scheduled time to clean out =	527.10 ft.

c. Distance below top of riser, h

h = Riser Crest Elevation - Elevation at 50% of basin storage volume
h = 528.00 - 527.10
h = 0.9 ft.

3) Minimum Basin Surface Area,

As = 0.01 x $Q_{p(10)}$ or 0.015 x DA

As = 0.01 x $Q_{p(10)}$
As = 0.01 x 18.54
As = 0.185 ac

or

As = 0.015 x DA
As = 0.015 x 12.36
As = 0.185 ac

Use As = 0.185 ac which is greater than As = 0.185 ac

B. DESIGN OF SPILLWAY AND ELEVATIONS

Bottom of Basin = 524.0

Runoff:

4) $Q_{p(10)}$ = 18.54 cfs

Pipe Spillway (Q_{ps})

5) Minimum Pipe Spillway Capacity, Qps = 0.2 x DA
= 2.47 cfs

6) H = 529.0 - 522.0
= 7.0 ft.

Barrel Length, L 100 ft.

7) Barrel Diameter, Dp = 18 inches
Q = 14.50 cfs (Fig. 5A.26- Pipe flow chart ; "n"=0.025)
Correction Factor = 0.88 (Fig. 5A.26 - Pipe flow chart ; "n"=0.025)

Qps = Q x Correction Factor
= 12.76 cfs

8) Riser Diameter = 24 inches
Length of Riser = Riser Crest Elevation - Bottom of Basin
= 528.0 - 524.0
= 4 ft.

Required, h = 0.7 ft. (Fig. 5A.25 - Riser Inflow Chart)
Provided, h = 1.0 ft.

Riser Crest Elevation = Emergency Spillway Elevation - h
= 529.0 - 1.0
= 528.0 ft.

9) Trash Rack Diameter = 36" (Fig. 5A.29 (2))

H = 13" (Fig. 5A.29(2))

Emergency Spillway Design

10) Emergency Spillway Flow, Q_{es} = Q_p - Q_{ps}
= 18.54 - 12.76
= 5.78 cfs

11) Width of spillway = 10 ft.

Q_{es} = $CLH^{3/2}$
5.78 = 3.1*L*(Hp^1.5)
Hp = **0.33** ft
Spillway Elevation = 529.0
Design High Water Elevation = Spillway Elevation + Hp
= 529.0 + 0.33
= 529.3
Top of Dam Elevation = 530.3 (1 ft freeboard)

C. ANTI-SEEP COLLAR/ SEEPAGE DIAPHRAGM DESIGN

(Note: the length of pipe within saturated zone is determined graphically from Sediment basin cross section.)

12) Expected highest water elevation 529.3

Distance from upstream invert to highest water level, y =	4.0	ft.	
Slope upstream embankment, Z =	2	:1	
pipe slope =	0.020		2.0%
Length of pipe in saturated zone, L_s =	26	ft.	

Required collar number =	2			(Fig. 5A.31 - Anti-Seep Collar Design Charts)
Anti-Seep collar size =	3.25	ft.		
Outlet pipe size =	1.5	ft.		
Projection =	0.9	ft.		
Collar spacing is between =	4.5	ft. to	12.3	ft.
Provided collar spacing =	10.0	ft.		

D. DEWATERING ORIFICE SIZING

13) $$A_o = \frac{A_s \times (2 \times h)^{0.5}}{122{,}568}$$

As = 0.185 ac

h = 0.9 ft.

$$\frac{3.14\, d_0^2}{4} = 0.088 \text{ ft}^2$$

$$d_0 = 0.336 \text{ ft.}$$

$$= 4.03 \text{ inches}$$

Provide 4-inch diameter hole at elevation 527.10 for dewatering orifice

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Date: 1/14/2014
Project: Silo Ridge
Project No: 29011

Calculated By: JC
Checked By:

TEMPORARY SEDIMENT BASIN DESIGN FOR DRAINAGE AREA A104 (SB #4)

Drainage Area = 11.58 acres
Riser Crest Elevation = Emergency Spillway Elevation - Req'd 1-foot of freeboard
= 583.50 - 1
= 582.50

Peak discharge for construction condition (from HydroCAD analysis) :

$Q_{p(10)}$:	17.40 cfs

A. BASIN SIZE DESIGN REQUIREMENTS

1) Minimum Required Sediment Storage Volume (134 cu.yd./acre)

= 134 cu.yds/ac x Drainage Area (acres)
= 1551.7 cu.yds.
= 0.962 ac-ft

2) Determine storage volume and elevation to be cleaned out when sediment has achieved 50% of basin storage volume.

a. Sediment basin shall be cleaned out when sediment has achieved 50% of basin storage volume.

= 50% of 1551.7
= 775.86 cu.yds.
= 0.481 ac-ft

b. Elevation corresponding to scheduled time to clean out when sediment has achieved 50% of basin storage volume.

Chart : Sediment Basin Design Elevation VS Volume

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Cumulative Total Volume (ac-ft)	2 *Req'd Sediment Storage Volume (ac-ft)	1-2=3 Net Volume (ac-ft)
578	6111		0.1403							
		6745		0.1548	2	13490	0.3097	0.3097	0.9618	-0.6521
580	7379		0.1694							
		8063		0.1851	2	16126	0.3702	0.6799	0.9618	-0.2819
582	8747		0.2008							
		9482		0.2177	2	18963	0.4353	1.1152	0.9618	0.1534
584	10216		0.2345							

		Elev. (ft.)	Cumulative Volume (ac-ft)
Volume/elevation corresponding to scheduled time to clean out =		X	0.481
Elevation Range:	High:	582.00	0.6799
	Low:	580.00	0.3097

Interpolated Elevation for scheduled time to clean out = **580.9**

Elevation corresponding to scheduled time to clean out = 581.00 ft.

c. Distance below top of riser, h

h = Riser Crest Elevation - Elevation at 50% of basin storage volume
h = 582.50 - 581.00
h = 1.5 ft.

3) Minimum Basin Surface Area,

As = 0.01 x $Q_{p(10)}$ or 0.015 x DA

As = 0.01 x $Q_{p(10)}$
As = 0.01 x 17.40
As = 0.174 ac

or

As = 0.015 x DA
As = 0.015 x 11.58
As = 0.174 ac

Use As = 0.174 ac which is greater than As = 0.174 ac

B. DESIGN OF SPILLWAY AND ELEVATIONS

Bottom of Basin = 578.0

Runoff:

4) $Q_{p(10)}$ = 17.40 cfs

Pipe Spillway (Q_{ps})

5) Minimum Pipe Spillway Capacity, Qps = 0.2 x DA
= 2.32 cfs

6) H = 583.5 - 576.0
= 7.5 ft.

Barrel Length, L 90 ft.

7) Barrel Diameter, Dp = 18 inches
Q = 15.00 cfs (Fig. 5A.26- Pipe flow chart ; "n"=0.025)
Correction Factor = 0.91 (Fig. 5A.26 - Pipe flow chart ; "n"=0.025)

Qps = Q x Correction Factor
= 13.65 cfs

8) Riser Diameter = 24 inches
Length of Riser = Riser Crest Elevation - Bottom of Basin
= 582.5 - 578.0
= 4.5 ft.

Required, h = 0.8 ft. (Fig. 5A.25 - Riser Inflow Chart)
Provided, h = 1.0 ft.

Riser Crest Elevation = Emergency Spillway Elevation - h
= 583.5 - 1.0
= 582.5 ft.

9) Trash Rack Diameter = 36" (Fig. 5A.29 (2))

H = 13" (Fig. 5A.29(2))

Emergency Spillway Design

10) Emergency Spillway Flow, Q_{es} = Q_p - Q_{ps}
= 17.40 - 13.65
= 3.75 cfs

11) Width of spillway = 25 ft.

$Q_{es} = CLH^{3/2}$
3.75 = 3.1*L*(Hp^1.5)
Hp = **0.13** ft
Spillway Elevation = 583.5
Design High Water Elevation = Spillway Elevation + Hp
= 583.5 + 0.13
= 583.6
Top of Dam Elevation = 584.6 (1 ft freeboard)

C. ANTI-SEEP COLLAR/ SEEPAGE DIAPHRAGM DESIGN

(Note: the length of pipe within saturated zone is determined graphically from Sediment basin cross section.)

12) Expected highest water elevation 583.6

Distance from upstream invert to highest water level, y =	4.5	ft.	
Slope upstream embankment, Z =	2	:1	
pipe slope =	0.022		2.2%
Length of pipe in saturated zone, L_s =	30	ft.	

Required collar number =	2			(Fig. 5A.31 - Anti-Seep Collar Design Charts)
Anti-Seep collar size =	3.75	ft.		
Outlet pipe size =	1.5	ft.		
Projection =	1.1	ft.		
Collar spacing is between =	5.5	ft. to	15.8	ft.
Provided collar spacing =	10.0	ft.		

D. DEWATERING ORIFICE SIZING

13) $$Ao = \frac{As \times (2 \times h)^{0.5}}{122{,}568}$$

As = 0.174 ac

h = 1.5 ft.

$$\frac{3.14\, d_0^2}{4} = 0.107 \text{ ft}^2$$

$$d_0 = 0.369 \text{ ft.}$$

$$= 4.43 \text{ inches}$$

Provide 4-inch diameter hole at elevation 581.00 for dewatering orifice

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Project: Silo Ridge
Project No: 29011

Calculated By: JC
Checked By:

TEMPORARY SEDIMENT BASIN DESIGN FOR DRAINAGE AREA A104 - LOWER PART (SB #5)

Drainage Area = 9.25 acres
Riser Crest Elevation = Emergency Spillway Elevation - Req'd 1-foot of freeboard
= 513.00 - 1
= 512.00

Peak discharge for construction condition (from HydroCAD analysis) :

$Q_{p(10)}$:	13.90 cfs

A. BASIN SIZE DESIGN REQUIREMENTS

1) Minimum Required Sediment Storage Volume (134 cu.yd./acre)

= 134 cu.yds/ac x Drainage Area (acres)
= 1239.5 cu.yds.
= 0.768 ac-ft

2) Determine storage volume and elevation to be cleaned out when sediment has achieved 50% of basin storage volume.

a. Sediment basin shall be cleaned out when sediment has achieved 50% of basin storage volume.

= 50% of 1239.5
= 619.75 cu.yds.
= 0.384 ac-ft

b. Elevation corresponding to scheduled time to clean out when sediment has achieved 50% of basin storage volume.

Chart : Sediment Basin Design Elevation VS Volume

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Cumulative Total Volume (ac-ft)	2 *Req'd Sediment Storage Volume (ac-ft)	1-2=3 Net Volume (ac-ft)
508	6111		0.1403							
		6745		0.1548	2	13490	0.3097	0.3097	0.7683	-0.4586
510	7379		0.1694							
		8063		0.1851	2	16126	0.3702	0.6799	0.7683	-0.0884
512	8747		0.2008							
		9482		0.2177	2	18963	0.4353	1.1152	0.7683	0.3469
514	10216		0.2345							

		Elev. (ft.)	Cumulative Volume (ac-ft)
Volume/elevation corresponding to scheduled time to clean out =		X	0.384
Elevation Range:	High:	512.00	0.6799
	Low:	510.00	0.3097

Interpolated Elevation for scheduled time to clean out = **510.4**

Elevation corresponding to scheduled time to clean out = 510.50 ft.

c. Distance below top of riser, h

h = Riser Crest Elevation - Elevation at 50% of basin storage volume
h = 512.00 - 510.50
h = 1.5 ft.

3) Minimum Basin Surface Area,

As = 0.01 x $Q_{p(10)}$ or 0.015 x DA

As = 0.01 x $Q_{p(10)}$
As = 0.01 x 13.90
As = 0.139 ac

or

As = 0.015 x DA
As = 0.015 x 9.25
As = 0.139 ac

Use As = 0.139 ac which is greater than As = 0.139 ac

B. DESIGN OF SPILLWAY AND ELEVATIONS

Bottom of Basin = 508.0

Runoff:

4) $Q_{p(10)}$ = 13.90 cfs

Pipe Spillway (Q_{ps})

5) Minimum Pipe Spillway Capacity, Qps = 0.2 x DA
= 1.85 cfs

6) H = 513.0 - 507.0
= 6.0 ft.

Barrel Length, L 120 ft.

7) Barrel Diameter, Dp = 18 inches
Q = 13.40 cfs (Fig. 5A.26- Pipe flow chart ; "n"=0.025)
Correction Factor = 0.82 (Fig. 5A.26 - Pipe flow chart ; "n"=0.025)

Qps = Q x Correction Factor
= 10.99 cfs

8) Riser Diameter = 24 inches
Length of Riser = Riser Crest Elevation - Bottom of Basin
= 512.0 - 508.0
= 4 ft.

Required, h = 0.7 ft. (Fig. 5A.25 - Riser Inflow Chart)
Provided, h = 1.0 ft.

Riser Crest Elevation = Emergency Spillway Elevation - h
= 513.0 - 1.0
= 512.0 ft.

9) Trash Rack Diameter = 36" (Fig. 5A.29 (2))

H = 13" (Fig. 5A.29(2))

Emergency Spillway Design

10) Emergency Spillway Flow, Q_{es} = Q_p - Q_{ps}
= 13.90 - 10.99
= 2.91 cfs

11) Width of spillway = 10 ft.

$Q_{es} = CLH^{3/2}$
2.91 = 3.1*L*(Hp^1.5)
Hp = **0.21** ft
Spillway Elevation = 513.0
Design High Water Elevation = Spillway Elevation + Hp
= 513.0 + 0.21
= 513.2
Top of Dam Elevation = 514.2 (1 ft freeboard)

C. ANTI-SEEP COLLAR/ SEEPAGE DIAPHRAGM DESIGN

(Note: the length of pipe within saturated zone is determined graphically from Sediment basin cross section.)

12) Expected highest water elevation 513.2

Distance from upstream invert to highest water level, y =	4.0	ft.	
Slope upstream embankment, Z =	2	:1	
pipe slope =	0.013		1.3%
Length of pipe in saturated zone, L_s =	25	ft.	

Required collar number =	2		(Fig. 5A.31 - Anti-Seep Collar Design Charts)	
Anti-Seep collar size =	3.25	ft.		
Outlet pipe size =	1.5	ft.		
Projection =	0.9	ft.		
Collar spacing is between =	4.5	ft. to	12.3	ft.
Provided collar spacing =	10.0	ft.		

D. DEWATERING ORIFICE SIZING

13) $$Ao = \frac{As \times (2 \times h)^{0.5}}{122,568}$$

As = 0.139 ac
h = 1.5 ft.

$$\frac{3.14\, d_0^2}{4} = 0.086 \text{ ft}^2$$

$$d_0 = 0.330 \text{ ft.}$$
$$= 3.96 \text{ inches}$$

Provide 4-inch diameter hole at elevation for dewatering orifice	510.50

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Project: Silo Ridge
Project No: 29011

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Checked By: ________

TEMPORARY SEDIMENT BASIN DESIGN FOR DRAINAGE AREA A105 (SB #6)

Drainage Area = 13.8 acres
Riser Crest Elevation = Emergency Spillway Elevation - Req'd 1-foot of freeboard
= 579.00 - 1
= 578.00

Peak discharge for construction condition (from HydroCAD analysis) :

$Q_{p(10)}$:	15.40 cfs

A. BASIN SIZE DESIGN REQUIREMENTS

1) Minimum Required Sediment Storage Volume (134 cu.yd./acre)

= 134 cu.yds/ac x Drainage Area (acres)
= 1849.2 cu.yds.
= 1.146 ac-ft

2) Determine storage volume and elevation to be cleaned out when sediment has achieved 50% of basin storage volume.

a. Sediment basin shall be cleaned out when sediment has achieved 50% of basin storage volume.

= 50% of 1849.2
= 924.6 cu.yds.
= 0.573 ac-ft

b. Elevation corresponding to scheduled time to clean out when sediment has achieved 50% of basin storage volume.

Chart : Sediment Basin Design Elevation VS Volume

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Cumulative Total Volume (ac-ft)	2 *Req'd Sediment Storage Volume (ac-ft)	1-2=3 Net Volume (ac-ft)
574	7009		0.1609							
		7688		0.1765	2	15375	0.3530	0.3530	1.1462	-0.7932
576	8366		0.1921							
		9095		0.2088	2	18190	0.4176	0.7705	1.1462	-0.3757
578	9824		0.2255							
		10603		0.2434	2	21206	0.4868	1.2574	1.1462	0.1112
580	11382		0.2613							

		Elev. (ft.)	Cumulative Volume (ac-ft)
Volume/elevation corresponding to scheduled time to clean out =		X	0.573
Elevation Range:	High:	578.00	0.7705
	Low:	576.00	0.3530

Interpolated Elevation for scheduled time to clean out = **577.1**

Elevation corresponding to scheduled time to clean out = 577.10 ft.

c. Distance below top of riser, h

h = Riser Crest Elevation - Elevation at 50% of basin storage volume
h = 579.00 - 577.10
h = 1.9 ft.

3) Minimum Basin Surface Area,

$As = 0.01 \times Q_{p(10)}$ or $0.015 \times DA$

$As = 0.01 \times Q_{p(10)}$
As = 0.01 x 15.40
As = 0.154 ac

or

As = 0.015 x DA
As = 0.015 x 13.8
As = 0.207 ac

Use As = 0.207 ac which is greater than As = 0.154 ac

B. DESIGN OF SPILLWAY AND ELEVATIONS

Bottom of Basin = 574.0

Runoff:

4) $Q_{p(10)}$ = 15.40 cfs

Pipe Spillway (Q_{ps})

5) Minimum Pipe Spillway Capacity, Qps = 0.2 x DA
= 2.76 cfs

6) H = 579.0 - 572.5
= 6.5 ft.

Barrel Length, L 85 ft.

7) Barrel Diameter, Dp = 18 inches
Q = 13.95 cfs (Fig. 5A.26- Pipe flow chart ; "n"=0.025)
Correction Factor = 0.93 (Fig. 5A.26 - Pipe flow chart ; "n"=0.025)

Qps = Q x Correction Factor
= 12.97 cfs

8) Riser Diameter = 24 inches
Length of Riser = Riser Crest Elevation - Bottom of Basin
= 578.0 - 574.0
= 4 ft.

Required, h = 0.8 ft. (Fig. 5A.25 - Riser Inflow Chart)
Provided, h = 1.0 ft.

Riser Crest Elevation = Emergency Spillway Elevation - h
= 579.0 - 1.0
= 578.0 ft.

9) Trash Rack Diameter = 36" (Fig. 5A.29 (2))

H = 13" (Fig. 5A.29(2))

Emergency Spillway Design

10) Emergency Spillway Flow, Q_{es} = $Q_p - Q_{ps}$
= 15.40 - 12.97
= 2.43 cfs

11) Width of spillway = 5 ft.

$Q_{es} = CLH^{3/2}$
2.43 = 3.1*L*(Hp^1.5)
Hp = **0.29** ft
Spillway Elevation = 579.0
Design High Water Elevation = Spillway Elevation + Hp
= 579.0 + 0.29
= 579.3
Top of Dam Elevation = 580.3 (1 ft freeboard)

C. ANTI-SEEP COLLAR/ SEEPAGE DIAPHRAGM DESIGN

(Note: the length of pipe within saturated zone is determined graphically from Sediment basin cross section.)

12) Expected highest water elevation 579.3

Distance from upstream invert to highest water level, y =	4.0	ft.		
Slope upstream embankment, Z =	2	:1		
pipe slope =	0.017		1.7%	
Length of pipe in saturated zone, L_s =	26	ft.		

Required collar number =	2		(Fig. 5A.31 - Anti-Seep Collar Design Charts)	
Anti-Seep collar size =	3.25	ft.		
Outlet pipe size =	1.5	ft.		
Projection =	0.9	ft.		
Collar spacing is between =	4.5	ft. to	12.3	ft.
Provided collar spacing =	10.0	ft.		

D. DEWATERING ORIFICE SIZING

13) $Ao = \frac{As \times (2 \times h)^{0.5}}{122{,}568}$ As = 0.207 ac; h = 1.9 ft.

$\frac{3.14\, d_0^2}{4} = 0.143\ ft^2$

$d_0 = 0.427$ ft.

$= 5.13$ inches

Provide 5-inch diameter hole at elevation for dewatering orifice	577.10

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Project: Silo Ridge
Project No: 29011

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Checked By: ____________

TEMPORARY SEDIMENT BASIN DESIGN FOR DRAINAGE AREA A103 (SB #7)

Drainage Area = 57.5 acres
Riser Crest Elevation = 503

Peak discharge for construction condition (from HydroCAD analysis) :

$Q_{p(10)}$:	24.75 cfs

A. BASIN SIZE DESIGN REQUIREMENTS

1) Minimum Required Sediment Storage Volume (134 cu.yd./acre)

= 134 cu.yds/ac x Drainage Area (acres)
= 7705 cu.yds.
= 4.776 ac-ft

2) Determine storage volume and elevation to be cleaned out when sediment has achieved 50% of basin storage volume.

a. Sediment basin shall be cleaned out when sediment has achieved 50% of basin storage volume.

= 50% of 7705
= 3852.5 cu.yds.
= 2.388 ac-ft

b. Elevation corresponding to scheduled time to clean out when sediment has achieved 50% of basin storage volume.

Chart : Sediment Basin Design Elevation VS Volume

Contour Elev. (ft)	Contour Area Proposed (ft²)	Average (ft²)	Proposed (ac)	Average (ac)	Depth (ft)	Total Volume (ft³)	Total Volume (ac-ft)	1 Cumulative Total Volume (ac-ft)	2 *Req'd Sediment Storage Volume (ac-ft)	1-2=3 Net Volume (ac-ft)
496	29906		0.6865							
		31322		0.7191	2	62644	1.4381	1.4381	4.7758	-3.3377
498	32738		0.7516							
		34204		0.7852	2	68408	1.5704	3.0085	4.7758	-1.7673
500	35670		0.8189							
		37187		0.8537	2	74373	1.7074	4.7159	4.7758	-0.0599
502	38703		0.8885							
		40270		0.9245	2	80539	1.8489	6.5648	4.7758	1.7890
504	41836		0.9604							

		Elev. (ft.)	Cumulative Volume (ac-ft)
Volume/elevation corresponding to scheduled time to clean out =		X	2.388
Elevation Range:	High:	500.00	3.0085
	Low:	498.00	1.4381

Interpolated Elevation for scheduled time to clean out = **499.2**

Elevation corresponding to scheduled time to clean out = 500.00 ft.

c. Distance below top of riser, h

h = Riser Crest Elevation - Elevation at 50% of basin storage volume
h = 503.00 - 500.00
h = 3 ft.

3) Minimum Basin Surface Area,

As = 0.01 x $Q_{p(10)}$ or 0.015 x DA

As = 0.01 x $Q_{p(10)}$
As = 0.01 x 24.75
As = 0.248 ac

or As = 0.015 x DA
As = 0.015 x 57.5
As = 0.863 ac

Use As = 0.863 ac which is greater than As = 0.248 ac

B. DESIGN OF SPILLWAY AND ELEVATIONS

Bottom of Basin = 496.0

Runoff:

4) $Q_{p(10)}$ = 24.75 cfs

Pipe Spillway (Q_{ps})

5) Minimum Pipe Spillway Capacity, Qps = 0.2 x DA
= 11.50 cfs

6) H = 503.0 - 499.0
= 4.0 ft.

Barrel Length, L 140 ft.

7) Barrel Diameter, Dp = 30 inches
Q = 32.60 cfs (Fig. 5A.26- Pipe flow chart ; "n"=0.025)
Correction Factor = 0.81 (Fig. 5A.26 - Pipe flow chart ; "n"=0.025)

Qps = Q x Correction Factor
= 26.41 cfs

8) Riser Diameter = 36 inches
Length of Riser = Riser Crest Elevation - Elevation at 50% of basin storage volume
= 503.0 - 500.0
= 3.0 ft.

Required, h = 0.9 ft. (Fig. 5A.25 - Riser Inflow Chart)
Provided, h = 1.0 ft.

9) Trash Rack Diameter = 54" (Fig. 5A.29 (2))

H = 17" (Fig. 5A.29(2))

Design High Water Elevation = Riser Crest Elevation + h
= 503.0 + 1.00
= 504.0
Top of Dam Elevation = 504.0

C. ANTI-SEEP COLLAR/ SEEPAGE DIAPHRAGM DESIGN

(Note: the length of pipe within saturated zone is determined graphically from Sediment basin cross section.)

12) Expected highest water elevation 504.0

Distance from upstream invert to highest water level, y =	3.0	ft.	
Slope upstream embankment, Z =	2	:1	
pipe slope =	0.007		0.7%
Length of pipe in saturated zone, L_s =	19	ft.	

Required collar number =	3			(Fig. 5A.31 - Anti-Seep Collar Design Charts)
Anti-Seep collar size =	3.50	ft.		
Outlet pipe size =	2.5	ft.		
Projection =	0.5	ft.		
Collar spacing is between =	2.5	ft. to	7.0	ft.
Provided collar spacing =	7.0	ft.		

D. DEWATERING ORIFICE SIZING

13) $Ao = \frac{As \times (2 \times h)^{0.5}}{122,568}$ As = 0.863 ac; h = 3 ft.

$\frac{3.14\, d_0^2}{4} = 0.751\ ft^2$

$d_0 = 0.978$ ft.

$= 11.74$ inches

Provide 12-inch diameter hole at elevation 500.00 for dewatering orifice

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Project: Silo Ridge
Project No: 29011

Calculated By: JC
Checked By: ________

TEMPORARY SEDIMENT BASIN DESIGN FOR DRAINAGE AREA B102 & B103 (SB #8)

Drainage Area = 16.15 acres
Riser Crest Elevation = 516

Peak discharge for construction condition (from HydroCAD analysis) :

$Q_{p(10)}$:	14.35 cfs

A. BASIN SIZE DESIGN REQUIREMENTS

1) Minimum Required Sediment Storage Volume (134 cu.yd./acre)

= 134 cu.yds/ac x Drainage Area (acres)
= 2164.1 cu.yds.
= 1.341 ac-ft

2) Determine storage volume and elevation to be cleaned out when sediment has achieved 50% of basin storage volume.

a. Sediment basin shall be cleaned out when sediment has achieved 50% of basin storage volume.

= 50% of 2164.1
= 1082.1 cu.yds.
= 0.671 ac-ft

b. Elevation corresponding to scheduled time to clean out when sediment has achieved 50% of basin storage volume.

Chart : Sediment Basin Design Elevation VS Volume

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Cumulative Total Volume (ac-ft)	2 *Req'd Sediment Storage Volume (ac-ft)	1-2=3 Net Volume (ac-ft)
512	8601		0.1975							
		9480		0.2176	2	18959	0.4352	0.4352	1.3414	-0.9061
514	10358		0.2378							
		11287		0.2591	2	22573	0.5182	0.9534	1.3414	-0.3879
516	12215		0.2804							
		13194		0.3029	2	26388	0.6058	1.5592	1.3414	0.2178
518	14173		0.3254							

		Elev. (ft.)	Cumulative Volume (ac-ft)
Volume/elevation corresponding to scheduled time to clean out =		X	0.671
Elevation Range:	High:	516.00	0.9534
	Low:	514.00	0.4352

Interpolated Elevation for scheduled time to clean out = **514.9**

Elevation corresponding to scheduled time to clean out = 515.00 ft.

c. Distance below top of riser, h

h = Riser Crest Elevation - Elevation at 50% of basin storage volume
h = 516.00 - 515.00
h = 1 ft.

3) Minimum Basin Surface Area,

As = 0.01 x $Q_{p(10)}$ or 0.015 x DA

As = 0.01 x $Q_{p(10)}$
As = 0.01 x 14.35
As = 0.144 ac

or

As = 0.015 x DA
As = 0.015 x 16.15
As = 0.242 ac

Use As = 0.242 ac which is greater than As = 0.144 ac

B. DESIGN OF SPILLWAY AND ELEVATIONS

Bottom of Basin = 512.0

Runoff:

4) $Q_{p(10)}$ = 14.35 cfs

Pipe Spillway (Q_{ps})

5) Minimum Pipe Spillway Capacity, Qps = 0.2 x DA
= 3.23 cfs

6) H = 516.0 - 508.5
= 7.5 ft.

Barrel Length, L 60 ft.

7) Barrel Diameter, Dp = 18 inches
Q = 13.95 cfs (Fig. 5A.26- Pipe flow chart ; "n"=0.025)
Correction Factor = 1.05 (Fig. 5A.26 - Pipe flow chart ; "n"=0.025)

Qps = Q x Correction Factor
= 14.65 cfs

8) Riser Diameter = 24 inches
Length of Riser = Riser Crest Elevation - Bottom of Basin
= 516.0 - 512.0
= 4.0 ft.

Required, h = 0.9 ft. (Fig. 5A.25 - Riser Inflow Chart)
Provided, h = 1.0 ft.

9) Trash Rack Diameter = 36" (Fig. 5A.29 (2))

H = 13" (Fig. 5A.29(2))

Design High Water Elevation = Riser Crest Elevation + h
= 516.0 + 1.00
= 517.0
Top of Dam Elevation = 518.0

C. ANTI-SEEP COLLAR/ SEEPAGE DIAPHRAGM DESIGN

(Note: the length of pipe within saturated zone is determined graphically from Sediment basin cross section.)

12) Expected highest water elevation 517.0

Distance from upstream invert to highest water level, y =	4.0	ft.	
Slope upstream embankment, Z =	2	:1	
pipe slope =	0.058		5.8%
Length of pipe in saturated zone, L_s =	31	ft.	

Required collar number =	2			(Fig. 5A.31 - Anti-Seep Collar Design Charts)
Anti-Seep collar size =	3.75	ft.		
Outlet pipe size =	1.5	ft.		
Projection =	1.1	ft.		
Collar spacing is between =	5.5	ft. to	15.8	ft.
Provided collar spacing =	8.0	ft.		

D. DEWATERING ORIFICE SIZING

13) $$A_o = \frac{A_s \times (2 \times h)^{0.5}}{122{,}568}$$ As = 0.242 ac, h = 1 ft.

$$\frac{3.14\, d_0^2}{4} = 0.122 \text{ ft}^2$$

$$d_0 = 0.394 \text{ ft.}$$

$$= 4.73 \text{ inches}$$

Provide 4-inch diameter hole at elevation 515.00
for dewatering orifice

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TEMPORARY SEDIMENT BASIN DESIGN FOR DRAINAGE AREA B117 (SB #8A)

Drainage Area = 7.2 acres
Riser Crest Elevation = 514

Peak discharge for construction condition (from HydroCAD analysis) :

$Q_{p(10)}$:	3.68 cfs

A. BASIN SIZE DESIGN REQUIREMENTS

1) Minimum Required Sediment Storage Volume (134 cu.yd./acre)

= 134 cu.yds/ac x Drainage Area (acres)
= 964.8 cu.yds.
= 0.598 ac-ft

2) Determine storage volume and elevation to be cleaned out when sediment has achieved 50% of basin storage volume.

a. Sediment basin shall be cleaned out when sediment has achieved 50% of basin storage volume.

= 50% of 964.8
= 482.4 cu.yds.
= 0.299 ac-ft

b. Elevation corresponding to scheduled time to clean out when sediment has achieved 50% of basin storage volume.

Chart : Sediment Basin Design Elevation VS Volume

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Contour Area Average (ft^2)	Contour Area Proposed (ac)	Contour Area Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Cumulative Total Volume (ac-ft)	2 *Req'd Sediment Storage Volume (ac-ft)	1-2=3 Net Volume (ac-ft)
510	3344		0.0768							
		3826		0.0878	2	7652	0.1757	0.1757	0.5980	-0.4224
512	4308		0.0989							
		4841		0.1111	2	9681	0.2222	0.3979	0.5980	-0.2001
514	5373		0.1233							
		5956		0.1367	2	11911	0.2734	0.6713	0.5980	0.0733
516	6538		0.1501							

	Elev. (ft.)	Cumulative Volume (ac-ft)
Volume/elevation corresponding to scheduled time to clean out =	X	0.299
Elevation Range: High:	514.00	0.3979
Low:	512.00	0.1757

Interpolated Elevation for scheduled time to clean out = **513.1**

Elevation corresponding to scheduled time to clean out =	513.10 ft.

c. Distance below top of riser, h

h = Riser Crest Elevation - Elevation at 50% of basin storage volume

h = 514.00 - 513.10

h = 0.9 ft.

3) Minimum Basin Surface Area,

As = 0.01 x $Q_{p(10)}$ or 0.015 x DA

As = 0.01 x $Q_{p(10)}$

As = 0.01 x 3.68

As = 0.037 ac

or As = 0.015 x DA

As = 0.015 x 7.2

As = 0.108 ac

Use As = 0.108 ac which is greater than As = 0.037 ac

B. DESIGN OF SPILLWAY AND ELEVATIONS

Bottom of Basin = 510.0

Runoff:

4) $Q_{p(10)}$ = 3.68 cfs

Pipe Spillway (Q_{ps})

5) Minimum Pipe Spillway Capacity, Qps = 0.2 x DA
= 1.44 cfs

6) H = 514.0 - 508.0
= 6.0 ft.

Barrel Length, L 60 ft.

7) Barrel Diameter, Dp	=	15	inches	
Q	=	8.50	cfs	(Fig. 5A.26- Pipe flow chart ; "n"=0.025)
Correction Factor	=	1		(Fig. 5A.26 - Pipe flow chart ; "n"=0.025)
Qps	=	Q x Correction Factor		
	=	8.50	cfs	
8) Riser Diameter	=	18	inches	
Length of Riser	=	Riser Crest Elevation - Bottom of Basin		
	=	514.0	-	510.0
	=	4.0	ft.	
Required, h	=	0.8	ft.	(Fig. 5A.25 - Riser Inflow Chart)
Provided, h	=	1.0	ft.	
9) Trash Rack Diameter	=	27"	(Fig. 5A.29 (2))	
H	=	8"	(Fig. 5A.29(2))	

Design High Water Elevation = Riser Crest Elevation + h
= 514.0 + 1.00
= 515.0
Top of Dam Elevation = 516.0

C. ANTI-SEEP COLLAR/ SEEPAGE DIAPHRAGM DESIGN

(Note: the length of pipe within saturated zone is determined graphically from Sediment basin cross section.)

12) Expected highest water elevation 515.0

Distance from upstream invert to highest water level, y =	4.0	ft.	
Slope upstream embankment, Z =	2	:1	
pipe slope =	0.033		3.3%
Length of pipe in saturated zone, L_s =	28	ft.	

Required collar number =	2		(Fig. 5A.31 - Anti-Seep Collar Design Charts)	
Anti-Seep collar size =	3.50	ft.		
Outlet pipe size =	1.25	ft.		
Projection =	1.1	ft.		
Collar spacing is between =	5.5	ft. to	15.8	ft.
Provided collar spacing =	10.0	ft.		

D. DEWATERING ORIFICE SIZING

13) $Ao = \frac{As \times (2 \times h)^{0.5}}{122{,}568}$ As = 0.108 ac   h = 0.9 ft.

$\frac{3.14\, d_0^2}{4} = 0.051$ ft^2

$d_0 = 0.256$ ft.

$= 3.07$ inches

Provide 3-inch diameter hole at elevation 513.10 for dewatering orifice

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TEMPORARY SEDIMENT BASIN DESIGN FOR DRAINAGE AREA B104, B110 & B115 (SB #9)

Drainage Area = 26.1 acres
Riser Crest Elevation = Emergency Spillway Elevation - Req'd 1-foot of freeboard
= 523.30 - 1.3
= 522.00

Peak discharge for construction condition (from HydroCAD analysis) :

$Q_{p(10)}$:	59.50 cfs

A. BASIN SIZE DESIGN REQUIREMENTS

1) Minimum Required Sediment Storage Volume (134 cu.yd./acre)

= 134 cu.yds/ac x Drainage Area (acres)
= 3497.4 cu.yds.
= 2.168 ac-ft

2) Determine storage volume and elevation to be cleaned out when sediment has achieved 50% of basin storage volume.

a. Sediment basin shall be cleaned out when sediment has achieved 50% of basin storage volume.

= 50% of 3497.4
= 1748.7 cu.yds.
= 1.084 ac-ft

b. Elevation corresponding to scheduled time to clean out when sediment has achieved 50% of basin storage volume.

Chart : Sediment Basin Design Elevation VS Volume

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Cumulative Total Volume (ac-ft)	2 *Req'd Sediment Storage Volume (ac-ft)	1-2=3 Net Volume (ac-ft)
516	8939		0.2052							
		9841		0.2259	2	19681	0.4518	0.4518	2.1678	-1.7160
518	10742		0.2466							
		11694		0.2685	2	23388	0.5369	0.9887	2.1678	-1.1791
520	12646		0.2903							
		13648		0.3133	2	27296	0.6266	1.6154	2.1678	-0.5525
522	14650		0.3363							
		15703		0.3605	2	31405	0.7210	2.3363	2.1678	0.1685
524	16755		0.3846							

		Elev. (ft.)	Cumulative Volume (ac-ft)
Volume/elevation corresponding to scheduled time to clean out =		X	1.084
Elevation Range:	High:	522.00	1.6154
	Low:	520.00	0.9887

Interpolated Elevation for scheduled time to clean out = **520.3**

Elevation corresponding to scheduled time to clean out = 520.30 ft.

c. Distance below top of riser, h

h = Riser Crest Elevation - Elevation at 50% of basin storage volume
h = 522.00 - 520.30
h = 1.7 ft.

3) Minimum Basin Surface Area,

As = 0.01 x $Q_{p(10)}$ or 0.015 x DA

As = 0.01 x $Q_{p(10)}$
As = 0.01 x 59.50
As = 0.595 ac

or

As = 0.015 x DA
As = 0.015 x 26.1
As = 0.392 ac

Use As = 0.595 ac which is greater than As = 0.392 ac

B. DESIGN OF SPILLWAY AND ELEVATIONS

Bottom of Basin = 516.0

Runoff:

4) $Q_{p(10)}$ = 59.50 cfs

Pipe Spillway (Q_{ps})

5) Minimum Pipe Spillway Capacity, Qps = 0.2 x DA
= 5.22 cfs

6) H = 523.3 - 515.0
= 8.3 ft.

Barrel Length, L 90 ft.

7) Barrel Diameter, Dp = 30 inches
Q = 53.20 cfs (Fig. 5A.26- Pipe flow chart ; "n"=0.025)
Correction Factor = 0.93 (Fig. 5A.26 - Pipe flow chart ; "n"=0.025)

Qps = Q x Correction Factor
= 49.48 cfs

8) Riser Diameter = 42 inches
Length of Riser = Riser Crest Elevation - Bottom of Basin
= 522.0 - 516.0
= 6 ft.

Required, h = 1.3 ft. (Fig. 5A.25 - Riser Inflow Chart)
Provided, h = 1.3 ft.

Riser Crest Elevation = Emergency Spillway Elevation - h
= 523.3 - 1.3
= 522.0 ft.

9) Trash Rack Diameter = 60" (Fig. 5A.29 (2))

H = 19" (Fig. 5A.29(2))

Emergency Spillway Design

10) Emergency Spillway Flow, Q_{es} = Q_p - Q_{ps}
= 59.50 - 49.48
= 10.02 cfs

11) Width of spillway = 20 ft.

$Q_{es} = CLH^{3/2}$
10.02 = 3.1*L*(Hp^1.5)
Hp = **0.30** ft
Spillway Elevation = 523.3
Design High Water Elevation = Spillway Elevation + Hp
= 523.3 + 0.30
= 523.6
Top of Dam Elevation = 524.6 (1 ft freeboard)

C. ANTI-SEEP COLLAR/ SEEPAGE DIAPHRAGM DESIGN

(Note: the length of pipe within saturated zone is determined graphically from Sediment basin cross section.)

12) Expected highest water elevation 523.6

Distance from upstream invert to highest water level, y =	6.0	ft.	
Slope upstream embankment, Z =	2	:1	
pipe slope =	0.011		1.1%
Length of pipe in saturated zone, L_s =	38	ft.	

Required collar number =	3		(Fig. 5A.31 - Anti-Seep Collar Design Charts)	
Anti-Seep collar size =	4.50	ft.		
Outlet pipe size =	2.5	ft.		
Projection =	1.0	ft.		
Collar spacing is between =	5.0	ft. to	14.0	ft.
Provided collar spacing =	10.0	ft.		

D. DEWATERING ORIFICE SIZING

13) $$Ao = \frac{As \times (2 \times h)^{0.5}}{122,568}$$ As = 0.595 ac; h = 1.7 ft.

$$\frac{3.14\, d_0^2}{4} = 0.390 \text{ ft}^2$$

$$d_0 = 0.705 \text{ ft.}$$
$$= 8.46 \text{ inches}$$

Provide 8-inch diameter hole at elevation for dewatering orifice	520.30

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TEMPORARY SEDIMENT BASIN DESIGN FOR DRAINAGE AREA B105 & B111 (SB #10)

Drainage Area = 12.6 acres
Riser Crest Elevation = Emergency Spillway Elevation - Req'd 1-foot of freeboard
= 523.20 - 1
= 522.20

Peak discharge for construction condition (from HydroCAD analysis) :

$Q_{p(10)}$:	40.00 cfs

A. BASIN SIZE DESIGN REQUIREMENTS

1) Minimum Required Sediment Storage Volume (134 cu.yd./acre)

= 134 cu.yds/ac x Drainage Area (acres)
= 1688.4 cu.yds.
= 1.047 ac-ft

2) Determine storage volume and elevation to be cleaned out when sediment has achieved 50% of basin storage volume.

a. Sediment basin shall be cleaned out when sediment has achieved 50% of basin storage volume.

= 50% of 1688.4
= 844.2 cu.yds.
= 0.523 ac-ft

b. Elevation corresponding to scheduled time to clean out when sediment has achieved 50% of basin storage volume.

Chart : Sediment Basin Design Elevation VS Volume

Contour Elev. (ft)	Contour Area Proposed (ft²)	Contour Area Average (ft²)	Contour Area Proposed (ac)	Contour Area Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Cumulative Total Volume (ac-ft)	2 *Req'd Sediment Storage Volume (ac-ft)	1-2=3 Net Volume (ac-ft)
518	6140		0.1410							
		6779		0.1556	2	13557	0.3112	0.3112	1.0465	-0.7353
520	7417		0.1703							
		8106		0.1861	2	16211	0.3722	0.6834	1.0465	-0.3631
522	8794		0.2019							
		9533		0.2188	2	19066	0.4377	1.1211	1.0465	0.0745
524	10272		0.2358							

		Elev. (ft.)	Cumulative Volume (ac-ft)
Volume/elevation corresponding to scheduled time to clean out =		X	0.523
Elevation Range:	High:	522.00	0.6834
	Low:	520.00	0.3112

Interpolated Elevation for scheduled time to clean out = **521.1**

Elevation corresponding to scheduled time to clean out =	521.10 ft.

c. Distance below top of riser, h

h = Riser Crest Elevation - Elevation at 50% of basin storage volume
h = 522.20 - 521.10
h = 1.1 ft.

3) Minimum Basin Surface Area,

As = 0.01 x $Q_{p(10)}$ or 0.015 x DA

As = 0.01 x $Q_{p(10)}$
As = 0.01 x 40.00
As = 0.400 ac

or As = 0.015 x DA
As = 0.015 x 12.6
As = 0.189 ac

Use As = 0.400 ac which is greater than As = 0.189 ac

B. DESIGN OF SPILLWAY AND ELEVATIONS

Bottom of Basin = 518.0

Runoff:

4) $Q_{p(10)}$ = 40.00 cfs

Pipe Spillway (Q_{ps})

5) Minimum Pipe Spillway Capacity, Qps = 0.2 x DA
= 2.52 cfs

6) H = 523.2 - 516.0
= 7.2 ft.

Barrel Length, L 65 ft.

7) Barrel Diameter, Dp = 24 inches
Q = 29.20 cfs (Fig. 5A.26- Pipe flow chart ; "n"=0.025)
Correction Factor = 1 (Fig. 5A.26 - Pipe flow chart ; "n"=0.025)

Qps = Q x Correction Factor
= 29.20 cfs

8) Riser Diameter = 36 inches
Length of Riser = Riser Crest Elevation - Bottom of Basin
= 522.2 - 518.0
= 4.2 ft.

Required, h = 1 ft. (Fig. 5A.25 - Riser Inflow Chart)
Provided, h = 1.0 ft.

Riser Crest Elevation = Emergency Spillway Elevation - h
= 523.2 - 1.0
= 522.2 ft.

9) Trash Rack Diameter = 54" (Fig. 5A.29 (2))

H = 17" (Fig. 5A.29(2))

Emergency Spillway Design

10) Emergency Spillway Flow, Q_{es} = Q_p - Q_{ps}
= 40.00 - 29.20
= 10.80 cfs

11) Width of spillway = 12 ft.

$Q_{es} = CLH^{3/2}$
10.80 = 3.1*L*(Hp^1.5)
Hp = **0.44** ft
Spillway Elevation = 523.2
Design High Water Elevation = Spillway Elevation + Hp
= 523.2 + 0.44
= 523.6
Top of Dam Elevation = 524.6 (1 ft freeboard)

C. ANTI-SEEP COLLAR/ SEEPAGE DIAPHRAGM DESIGN

(Note: the length of pipe within saturated zone is determined graphically from Sediment basin cross section.)

12) Expected highest water elevation 523.6

Distance from upstream invert to highest water level, y =	4.2	ft.		
Slope upstream embankment, Z =	2	:1		
pipe slope =	0.030		3.0%	
Length of pipe in saturated zone, L_s =	29	ft.		

Required collar number =	2		(Fig. 5A.31 - Anti-Seep Collar Design Charts)	
Anti-Seep collar size =	4.25	ft.		
Outlet pipe size =	2	ft.		
Projection =	1.1	ft.		
Collar spacing is between =	5.5	ft. to	15.8	ft.
Provided collar spacing =	10.0	ft.		

D. DEWATERING ORIFICE SIZING

13) $$Ao = \frac{As \times (2 \times h)^{0.5}}{122{,}568}$$

As = 0.400 ac

h = 1.1 ft.

$$\frac{3.14\, d_0^2}{4} = 0.211 \text{ ft}^2$$

$$d_0 = 0.518 \text{ ft.}$$

$$= 6.22 \text{ inches}$$

Provide 6-inch diameter hole at elevation 521.10
for dewatering orifice

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TEMPORARY SEDIMENT BASIN DESIGN FOR DRAINAGE AREA B114 & B103 (SB #11)

Drainage Area = 7.95 acres
Riser Crest Elevation = Emergency Spillway Elevation - Req'd 1-foot of freeboard
= 557.20 - 1
= 556.20

Peak discharge for construction condition (from HydroCAD analysis) :

$Q_{p(10)}$:	24.00 cfs

A. BASIN SIZE DESIGN REQUIREMENTS

1) Minimum Required Sediment Storage Volume (134 cu.yd./acre)

= 134 cu.yds/ac x Drainage Area (acres)
= 1065.3 cu.yds.
= 0.660 ac-ft

2) Determine storage volume and elevation to be cleaned out when sediment has achieved 50% of basin storage volume.

a. Sediment basin shall be cleaned out when sediment has achieved 50% of basin storage volume.

= 50% of 1065.3
= 532.65 cu.yds.
= 0.330 ac-ft

b. Elevation corresponding to scheduled time to clean out when sediment has achieved 50% of basin storage volume.

Chart : Sediment Basin Design Elevation VS Volume

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Cumulative Total Volume (ac-ft)	2 *Req'd Sediment Storage Volume (ac-ft)	1-2=3 Net Volume (ac-ft)
552	3464		0.0795							
		4089		0.0939	2	8177	0.1877	0.1877	0.6603	-0.4726
554	4713		0.1082							
		5388		0.1237	2	10776	0.2474	0.4351	0.6603	-0.2252
556	6063		0.1392							
		6788		0.1558	2	13576	0.3117	0.7468	0.6603	0.0865
558	7513		0.1725							

		Elev. (ft.)	Cumulative Volume (ac-ft)
Volume/elevation corresponding to scheduled time to clean out =		X	0.330
Elevation Range:	High:	556.00	0.4351
	Low:	554.00	0.1877

Interpolated Elevation for scheduled time to clean out = **555.2**

Elevation corresponding to scheduled time to clean out =	555.20 ft.

c. Distance below top of riser, h

h = Riser Crest Elevation - Elevation at 50% of basin storage volume
h = 556.20 - 555.20
h = 1 ft.

3) Minimum Basin Surface Area,

As = 0.01 x $Q_{p(10)}$ or 0.015 x DA

As = 0.01 x $Q_{p(10)}$
As = 0.01 x 24.00
As = 0.240 ac

or As = 0.015 x DA
As = 0.015 x 7.95
As = 0.119 ac

Use As = 0.240 ac which is greater than As = 0.119 ac

B. DESIGN OF SPILLWAY AND ELEVATIONS

Bottom of Basin = 552.0

Runoff:

4) $Q_{p(10)}$ = 24.00 cfs

Pipe Spillway (Q_{ps})

5) Minimum Pipe Spillway Capacity, Qps = 0.2 x DA
= 1.59 cfs

6) H = 557.2 - 550.0
= 7.2 ft.

Barrel Length, L 50 ft.

7) Barrel Diameter, Dp = 21 inches
Q = 21.10 cfs (Fig. 5A.26- Pipe flow chart ; "n"=0.025)
Correction Factor = 1.11 (Fig. 5A.26 - Pipe flow chart ; "n"=0.025)

Qps = Q x Correction Factor
= 23.42 cfs

8) Riser Diameter = 36 inches
Length of Riser = Riser Crest Elevation - Bottom of Basin
= 556.2 - 552.0
= 4.2 ft.

Required, h = 0.9 ft. (Fig. 5A.25 - Riser Inflow Chart)
Provided, h = 1.0 ft.

Riser Crest Elevation = Emergency Spillway Elevation - h
= 557.2 - 1.0
= 556.2 ft.

9) Trash Rack Diameter = 54" (Fig. 5A.29 (2))

H = 17" (Fig. 5A.29(2))

Emergency Spillway Design

10) Emergency Spillway Flow, Q_{es} = Q_p - Q_{ps}
= 24.00 - 23.42
= 0.58 cfs

11) Width of spillway = 10 ft.

$Q_{es} = CLH^{3/2}$
0.58 = 3.1*L*(Hp^1.5)
Hp = **0.07** ft
Spillway Elevation = 557.2
Design High Water Elevation = Spillway Elevation + Hp
= 557.2 + 0.07
= 557.3
Top of Dam Elevation = 558.3 (1 ft freeboard)

C. ANTI-SEEP COLLAR/ SEEPAGE DIAPHRAGM DESIGN

(Note: the length of pipe within saturated zone is determined graphically from Sediment basin cross section.)

12) Expected highest water elevation 557.3

Distance from upstream invert to highest water level, y =	4.2	ft.	
Slope upstream embankment, Z =	2	:1	
pipe slope =	0.040		4.0%
Length of pipe in saturated zone, L_s =	30	ft.	

Required collar number =	2			(Fig. 5A.31 - Anti-Seep Collar Design Charts)
Anti-Seep collar size =	4.25	ft.		
Outlet pipe size =	1.75	ft.		
Projection =	1.3	ft.		
Collar spacing is between =	6.5	ft. to	17.5	ft.
Provided collar spacing =	10.0	ft.		

D. DEWATERING ORIFICE SIZING

13) $A_o = \frac{A_s \times (2 \times h)^{0.5}}{122{,}568}$ As = 0.240 ac; h = 1 ft.

$\frac{3.14\, d_0^2}{4} = 0.121\ ft^2$

$d_0 = 0.392$ ft.

$= 4.70$ inches

Provide 4.5-inch diameter hole at elevation 555.20 for dewatering orifice

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Project: Silo Ridge
Project No: 29011

Calculated By: JC
Checked By: ____________

TEMPORARY SEDIMENT BASIN DESIGN FOR DRAINAGE AREA C103 (SB #12)

Drainage Area = 3.8 acres
Riser Crest Elevation = 502

Peak discharge for construction condition (from HydroCAD analysis) :

$Q_{p(10)}$:	5.70 cfs

A. BASIN SIZE DESIGN REQUIREMENTS

1) Minimum Required Sediment Storage Volume (134 cu.yd./acre)

= 134 cu.yds/ac x Drainage Area (acres)
= 509.2 cu.yds.
= 0.316 ac-ft

2) Determine storage volume and elevation to be cleaned out when sediment has achieved 50% of basin storage volume.

a. Sediment basin shall be cleaned out when sediment has achieved 50% of basin storage volume.

= 50% of 509.2
= 254.6 cu.yds.
= 0.158 ac-ft

b. Elevation corresponding to scheduled time to clean out when sediment has achieved 50% of basin storage volume.

Chart : Sediment Basin Design Elevation VS Volume

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Contour Area Average (ft^2)	Contour Area Proposed (ac)	Contour Area Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Cumulative Total Volume (ac-ft)	2 *Req'd Sediment Storage Volume (ac-ft)	1-2=3 Net Volume (ac-ft)
498	1735		0.0398							
		2088		0.0479	2	4176	0.0959	0.0959	0.3156	-0.2198
500	2441		0.0560							
		2844		0.0653	2	5688	0.1306	0.2264	0.3156	-0.0892
502	3247		0.0745							
		3700		0.0849	2	7400	0.1699	0.3963	0.3156	0.0807
504	4153		0.0953							

		Elev. (ft.)	Cumulative Volume (ac-ft)
Volume/elevation corresponding to scheduled time to clean out =		X	0.158
Elevation Range:	High:	502.00	0.2264
	Low:	500.00	0.0959

Interpolated Elevation for scheduled time to clean out = **<u>500.9</u>**

Elevation corresponding to scheduled time to clean out =	501.00 ft.

c. Distance below top of riser, h

h = Riser Crest Elevation - Elevation at 50% of basin storage volume
h = 502.00 - 501.00
h = 1 ft.

3) Minimum Basin Surface Area,

As = 0.01 x $Q_{p(10)}$ <u>or</u> 0.015 x DA

As = 0.01 x $Q_{p(10)}$
As = 0.01 x 5.70
As = 0.057 ac

<u>or</u> As = 0.015 x DA
As = 0.015 x 3.8
As = 0.057 ac

Use As = <u>0.057</u> ac which is greater than As = 0.057 ac

B. DESIGN OF SPILLWAY AND ELEVATIONS

Bottom of Basin = 498.0

Runoff:

4) $Q_{p(10)}$ = 5.70 cfs

Pipe Spillway (Q_{ps})

5) Minimum Pipe Spillway Capacity, Qps = 0.2 x DA
= 0.76 cfs

6) H = 502.0 - 496.0
= 6.0 ft.

Barrel Length, L 140 ft.

7) Barrel Diameter, Dp = 15 inches
Q = 8.52 cfs (Fig. 5A.26- Pipe flow chart ; "n"=0.025)
Correction Factor = 0.76 (Fig. 5A.26 - Pipe flow chart ; "n"=0.025)

Qps = Q x Correction Factor
= 6.48 cfs

8) Riser Diameter = 18 inches
Length of Riser = Riser Crest Elevation - Bottom of Basin
= 502.0 - 498.0
= 4.0 ft.

Required, h = 0.9 ft. (Fig. 5A.25 - Riser Inflow Chart)
Provided, h = 1.0 ft.

9) Trash Rack Diameter = 27" (Fig. 5A.29 (2))

H = 8" (Fig. 5A.29(2))

Design High Water Elevation = Riser Crest Elevation + h
= 502.0 + 1.00
= 503.0
Top of Dam Elevation = 504.0

C. ANTI-SEEP COLLAR/ SEEPAGE DIAPHRAGM DESIGN

(Note: the length of pipe within saturated zone is determined graphically from Sediment basin cross section.)

12) Expected highest water elevation 503.0

Distance from upstream invert to highest water level, y =	4.0	ft.	
Slope upstream embankment, Z =	2	:1	
pipe slope =	0.014		1.4%
Length of pipe in saturated zone, L_s =	25	ft.	

Required collar number =	2		(Fig. 5A.31 - Anti-Seep Collar Design Charts)	
Anti-Seep collar size =	3.25	ft.		
Outlet pipe size =	1.25	ft.		
Projection =	1.0	ft.		
Collar spacing is between =	5.0	ft. to	14.0	ft.
Provided collar spacing =	10.0	ft.		

D. DEWATERING ORIFICE SIZING

13) $$Ao = \frac{As \times (2 \times h)^{0.5}}{122,568}$$

As = 0.057 ac

h = 1 ft.

$$\frac{3.14\, d_0^2}{4} = 0.029 \text{ ft}^2$$

$$d_0 = 0.191 \text{ ft.}$$

$$= 2.29 \text{ inches}$$

Provide 3-inch diameter hole at elevation for dewatering orifice	501.00

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Checked By: ____________

TEMPORARY SEDIMENT BASIN DESIGN FOR DRAINAGE AREA B101 (SB #13)

Drainage Area = 35.9 acres
Riser Crest Elevation = 513

Peak discharge for construction condition (from HydroCAD analysis) :

$Q_{p(10)}$:	28.60 cfs

A. BASIN SIZE DESIGN REQUIREMENTS

1) Minimum Required Sediment Storage Volume (134 cu.yd./acre)

= 134 cu.yds/ac x Drainage Area (acres)
= 4810.6 cu.yds.
= 2.982 ac-ft

2) Determine storage volume and elevation to be cleaned out when sediment has achieved 50% of basin storage volume.

a. Sediment basin shall be cleaned out when sediment has achieved 50% of basin storage volume.

= 50% of 4810.6
= 2405.3 cu.yds.
= 1.491 ac-ft

b. Elevation corresponding to scheduled time to clean out when sediment has achieved 50% of basin storage volume.

Chart : Sediment Basin Design Elevation VS Volume

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Cumulative Total Volume (ac-ft)	2 *Req'd Sediment Storage Volume (ac-ft)	1-2=3 Net Volume (ac-ft)
506	13378		0.3071							
		14374		0.3300	2	28747	0.6599	0.6599	2.9818	-2.3218
508	15369		0.3528							
		16415		0.3768	2	32830	0.7537	1.4136	2.9818	-1.5682
510	17461		0.4008							
		18557		0.4260	2	37114	0.8520	2.2656	2.9818	-0.7161
512	19653		0.4512							
		20800		0.4775	2	41599	0.9550	3.2206	2.9818	0.2388
514	21946		0.5038							

		Elev. (ft.)	Cumulative Volume (ac-ft)
Volume/elevation corresponding to scheduled time to clean out =		X	1.491
Elevation Range:	High:	512.00	2.2656
	Low:	510.00	1.4136

Interpolated Elevation for scheduled time to clean out = **510.2**

Elevation corresponding to scheduled time to clean out = 510.20 ft.

c. Distance below top of riser, h

h = Riser Crest Elevation - Elevation at 50% of basin storage volume
h = 513.00 - 510.20
h = 2.8 ft.

3) Minimum Basin Surface Area,

As = 0.01 x $Q_{p(10)}$ or 0.015 x DA

As = 0.01 x $Q_{p(10)}$
As = 0.01 x 28.60
As = 0.286 ac

or

As = 0.015 x DA
As = 0.015 x 35.9
As = 0.539 ac

Use As = 0.539 ac which is greater than As = 0.286 ac

B. DESIGN OF SPILLWAY AND ELEVATIONS

Bottom of Basin = 506.0

Runoff:

4) $Q_{p(10)}$ = 28.60 cfs

Pipe Spillway (Q_{ps})

5) Minimum Pipe Spillway Capacity, Qps = 0.2 x DA
= 7.18 cfs

6) H = 513.0 - 505.0
= 8.0 ft.

Barrel Length, L 70 ft.

7) Barrel Diameter, Dp = 24 inches
Q = 31.20 cfs (Fig. 5A.26- Pipe flow chart ; "n"=0.025)
Correction Factor = 0.96 (Fig. 5A.26 - Pipe flow chart ; "n"=0.025)

Qps = Q x Correction Factor
= 29.95 cfs

8) Riser Diameter = 36 inches
Length of Riser = Riser Crest Elevation - Bottom of Basin
= 513.0 - 506.0
= 7.0 ft.

Required, h = 1 ft. (Fig. 5A.25 - Riser Inflow Chart)
Provided, h = 1.0 ft.

9) Trash Rack Diameter = 54" (Fig. 5A.29 (2))

H = 17" (Fig. 5A.29(2))

Design High Water Elevation = Riser Crest Elevation + h
= 513.0 + 1.00
= 514.0
Top of Dam Elevation = 514.0

C. ANTI-SEEP COLLAR/ SEEPAGE DIAPHRAGM DESIGN

(Note: the length of pipe within saturated zone is determined graphically from Sediment basin cross section.)

12) Expected highest water elevation 514.0

Distance from upstream invert to highest water level, y =	7.0	ft.	
Slope upstream embankment, Z =	2	:1	
pipe slope =	0.014		1.4%
Length of pipe in saturated zone, L_s =	44	ft.	

Required collar number =	3			(Fig. 5A.31 - Anti-Seep Collar Design Charts)
Anti-Seep collar size =	4.25	ft.		
Outlet pipe size =	2	ft.		
Projection =	1.1	ft.		
Collar spacing is between =	5.5	ft. to	15.8	ft.
Provided collar spacing =	10.0	ft.		

D. DEWATERING ORIFICE SIZING

13) $$A_o = \frac{A_s \times (2 \times h)^{0.5}}{122{,}568}$$

As = 0.539 ac

h = 2.8 ft.

$$\frac{3.14\, d_0^2}{4} = 0.453 \text{ ft}^2$$

$$d_0 = 0.760 \text{ ft.}$$

$$= 9.11 \text{ inches}$$

Provide 9-inch diameter hole at elevation 510.20 for dewatering orifice

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Checked By: ___________

TEMPORARY SEDIMENT BASIN DESIGN FOR DRAINAGE AREA B101 (SB #14)

Drainage Area = 4.6 acres
Riser Crest Elevation = 502.5

Peak discharge for construction condition (from HydroCAD analysis) :

$Q_{p(10)}$:	6.90 cfs

A. BASIN SIZE DESIGN REQUIREMENTS

1) Minimum Required Sediment Storage Volume (134 cu.yd./acre)

= 134 cu.yds/ac x Drainage Area (acres)
= 616.4 cu.yds.
= 0.382 ac-ft

2) Determine storage volume and elevation to be cleaned out when sediment has achieved 50% of basin storage volume.

a. Sediment basin shall be cleaned out when sediment has achieved 50% of basin storage volume.

= 50% of 616.4
= 308.2 cu.yds.
= 0.191 ac-ft

b. Elevation corresponding to scheduled time to clean out when sediment has achieved 50% of basin storage volume.

Chart : Sediment Basin Design Elevation VS Volume

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Cumulative Total Volume (ac-ft)	2 *Req'd Sediment Storage Volume (ac-ft)	1-2=3 Net Volume (ac-ft)
498	2065		0.0474							
		2448		0.0562	2	4896	0.1124	0.1124	0.3821	-0.2697
500	2831		0.0650							
		3265		0.0749	2	6529	0.1499	0.2623	0.3821	-0.1198
502	3698		0.0849							
		4182		0.0960	2	8363	0.1920	0.4543	0.3821	0.0722
504	4665		0.1071							

		Elev. (ft.)	Cumulative Volume (ac-ft)
Volume/elevation corresponding to scheduled time to clean out =		X	0.191
Elevation Range:	High:	502.00	0.2623
	Low:	500.00	0.1124

Interpolated Elevation for scheduled time to clean out = **501.0**

Elevation corresponding to scheduled time to clean out =	501.00 ft.

c. Distance below top of riser, h

h = Riser Crest Elevation - Elevation at 50% of basin storage volume
h = 502.50 - 501.00
h = 1.5 ft.

3) Minimum Basin Surface Area,

As = 0.01 x $Q_{p(10)}$ or 0.015 x DA

As = 0.01 x $Q_{p(10)}$
As = 0.01 x 6.90
As = 0.069 ac

or As = 0.015 x DA
As = 0.015 x 4.6
As = 0.069 ac

Use As = 0.069 ac which is greater than As = 0.069 ac

B. DESIGN OF SPILLWAY AND ELEVATIONS

Bottom of Basin = 498.0

Runoff:

4) $Q_{p(10)}$ = 6.90 cfs

Pipe Spillway (Q_{ps})

5) Minimum Pipe Spillway Capacity, Qps = 0.2 x DA
= 0.92 cfs

6) H = 502.5 - 496.0
= 6.5 ft.

Barrel Length, L 50 ft.

7) Barrel Diameter, Dp	=	15	inches	
Q	=	8.70	cfs	(Fig. 5A.26- Pipe flow chart ; "n"=0.025)
Correction Factor	=	1.1		(Fig. 5A.26 - Pipe flow chart ; "n"=0.025)
Qps	=	Q x Correction Factor		
	=	9.57	cfs	
8) Riser Diameter	=	18	inches	
Length of Riser	=	Riser Crest Elevation - Bottom of Basin		
	=	502.5 - 498.0		
	=	4.5	ft.	
Required, h	=	0.6	ft.	(Fig. 5A.25 - Riser Inflow Chart)
Provided, h	=	1.0	ft.	
9) Trash Rack Diameter	=	27"	(Fig. 5A.29 (2))	
H	=	8"	(Fig. 5A.29(2))	

Design High Water Elevation = Riser Crest Elevation + h
= 502.5 + 1.00
= 503.5
Top of Dam Elevation = 504.5

C. ANTI-SEEP COLLAR/ SEEPAGE DIAPHRAGM DESIGN

(Note: the length of pipe within saturated zone is determined graphically from Sediment basin cross section.)

12) Expected highest water elevation 503.5

Distance from upstream invert to highest water level, y =	4.5	ft.	
Slope upstream embankment, Z =	2	:1	
pipe slope =	0.040		4.0%
Length of pipe in saturated zone, L_s =	32	ft.	

Required collar number =	2			(Fig. 5A.31 - Anti-Seep Collar Design Charts)
Anti-Seep collar size =	3.50	ft.		
Outlet pipe size =	1.25	ft.		
Projection =	1.1	ft.		
Collar spacing is between =	5.5	ft. to	15.8	ft.
Provided collar spacing =	10.0	ft.		

D. DEWATERING ORIFICE SIZING

13) $$A_o = \frac{A_s \times (2 \times h)^{0.5}}{122,568}$$

As = 0.069 ac
h = 1.5 ft.

$$\frac{3.14\, d_0^2}{4} = 0.042 \text{ ft}^2$$

$$d_0 = 0.233 \text{ ft.}$$

$$= 2.79 \text{ inches}$$

Provide 3-inch diameter hole at elevation for dewatering orifice	501.00

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Checked By: ___________

TEMPORARY SEDIMENT BASIN DESIGN FOR DRAINAGE AREA B108, B109 B 103 (SB #15)

Drainage Area = 99.6 acres
Riser Crest Elevation = Emergency Spillway Elevation - Req'd 1-foot of freeboard
= 504.50 - 1.5
= 503.00

Peak discharge for construction condition (from HydroCAD analysis) :

$Q_{p(10)}$:	155.80 cfs

A. BASIN SIZE DESIGN REQUIREMENTS

1) Minimum Required Sediment Storage Volume (134 cu.yd./acre)

= 134 cu.yds/ac x Drainage Area (acres)
= 13346 cu.yds.
= 8.273 ac-ft

2) Determine storage volume and elevation to be cleaned out when sediment has achieved 50% of basin storage volume.

a. Sediment basin shall be cleaned out when sediment has achieved 50% of basin storage volume.

= 50% of 13346
= 6673.2 cu.yds.
= 4.136 ac-ft

b. Elevation corresponding to scheduled time to clean out when sediment has achieved 50% of basin storage volume.

Chart : Sediment Basin Design Elevation VS Volume

Contour Elev. (ft)	Contour Area Proposed (ft^2)	Average (ft^2)	Proposed (ac)	Average (ac)	Depth (ft)	Total Volume (ft^3)	Total Volume (ac-ft)	1 Cumulative Total Volume (ac-ft)	2 *Req'd Sediment Storage Volume (ac-ft)	1-2=3 Net Volume (ac-ft)
496	28098		0.6450							
		30815		0.7074	2	61629	1.4148	1.4148	8.2726	-6.8578
498	33531		0.7698							
		36449		0.8367	2	72897	1.6735	3.0883	8.2726	-5.1843
500	39366		0.9037							
		42696		0.9802	2	85391	1.9603	5.0486	8.2726	-3.2240
502	46025		1.0566							
		50463		1.1585	2	100925	2.3169	7.3655	8.2726	-0.9070
504	54900		1.2603							
		62727		1.4400	2	125453	2.8800	10.2455	8.2726	1.9730
506	70553		1.6197							

	Elev. (ft.)	Cumulative Volume (ac-ft)
Volume/elevation corresponding to scheduled time to clean out =	X	4.136
Elevation Range: High:	502.00	5.0486
Low:	500.00	3.0883

Interpolated Elevation for scheduled time to clean out = **501.1**

Elevation corresponding to scheduled time to clean out =	501.10 ft.

c. Distance below top of riser, h

h = Riser Crest Elevation - Elevation at 50% of basin storage volume
h = 503.00 - 501.10
h = 1.9 ft.

3) Minimum Basin Surface Area,

As = 0.01 x $Q_{p(10)}$ or 0.015 x DA

As = 0.01 x $Q_{p(10)}$
As = 0.01 x 155.80
As = 1.558 ac

or As = 0.015 x DA
As = 0.015 x 99.6
As = 1.494 ac

Use As = 1.558 ac which is greater than As = 1.494 ac

B. DESIGN OF SPILLWAY AND ELEVATIONS

Bottom of Basin = 496.0

Runoff:

4) $Q_{p(10)}$ = 155.80 cfs

Pipe Spillway (Q_{ps})

5) Minimum Pipe Spillway Capacity, Qps = 0.2 x DA
= 19.92 cfs

6) H = 504.5 - 495.0
= 9.5 ft.

Barrel Length, L 110 ft.

7) Barrel Diameter, Dp	=	36	inches	
Q	=	88.90	cfs	(Fig. 5A.26- Pipe flow chart ; "n"=0.025)
Correction Factor	=	0.92		(Fig. 5A.26 - Pipe flow chart ; "n"=0.025)
Qps	=	Q x Correction Factor		
	=	81.79	cfs	
8) Riser Diameter	=	54	inches	
Length of Riser	=	Riser Crest Elevation - Bottom of Basin		
	=	503.0 - 496.0		
	=	7	ft.	
Required, h	=	1.5	ft.	(Fig. 5A.25 - Riser Inflow Chart)
Provided, h	=	1.5	ft.	
Riser Crest Elevation	=	Emergency Spillway Elevation - h		
	=	504.5 - 1.5		
	=	503.0	ft.	
9) Trash Rack Diameter	=	78"	(Fig. 5A.29 (2))	
H	=	25"	(Fig. 5A.29(2))	

Emergency Spillway Design

10) Emergency Spillway Flow, Q_{es} = $Q_p - Q_{ps}$
= 155.80 - 81.79
= 74.01 cfs

11) Width of spillway = 25 ft.

$Q_{es} = CLH^{3/2}$

74.01 = 3.1*L*(Hp^1.5)

Hp = **0.97** ft

Spillway Elevation = 504.5

Design High Water Elevation = Spillway Elevation + Hp
= 504.5 + 0.97
= 505.5

Top of Dam Elevation = 506.5 (1 ft freeboard)

C. ANTI-SEEP COLLAR/ SEEPAGE DIAPHRAGM DESIGN

(Note: the length of pipe within saturated zone is determined graphically from Sediment basin cross section.)

12) Expected highest water elevation 505.5

Distance from upstream invert to highest water level, y =	7.0	ft.		
Slope upstream embankment, Z =	2	:1		
pipe slope =	0.010		1.0%	
Length of pipe in saturated zone, L_s =	44	ft.		

Required collar number =	2		(Fig. 5A.31 - Anti-Seep Collar Design Charts)	
Anti-Seep collar size =	6.25	ft.		
Outlet pipe size =	3	ft.		
Projection =	1.6	ft.		
Collar spacing is between =	8.0	ft. to	22.8	ft.
Provided collar spacing =	15.0	ft.		

D. DEWATERING ORIFICE SIZING

13) $$A_o = \frac{A_s \times (2 \times h)^{0.5}}{122,568}$$

As = 1.558 ac
h = 1.9 ft.

$$\frac{3.14\, d_0^2}{4} = 1.079 \text{ ft}^2$$

$$d_0 = 1.173 \text{ ft.}$$

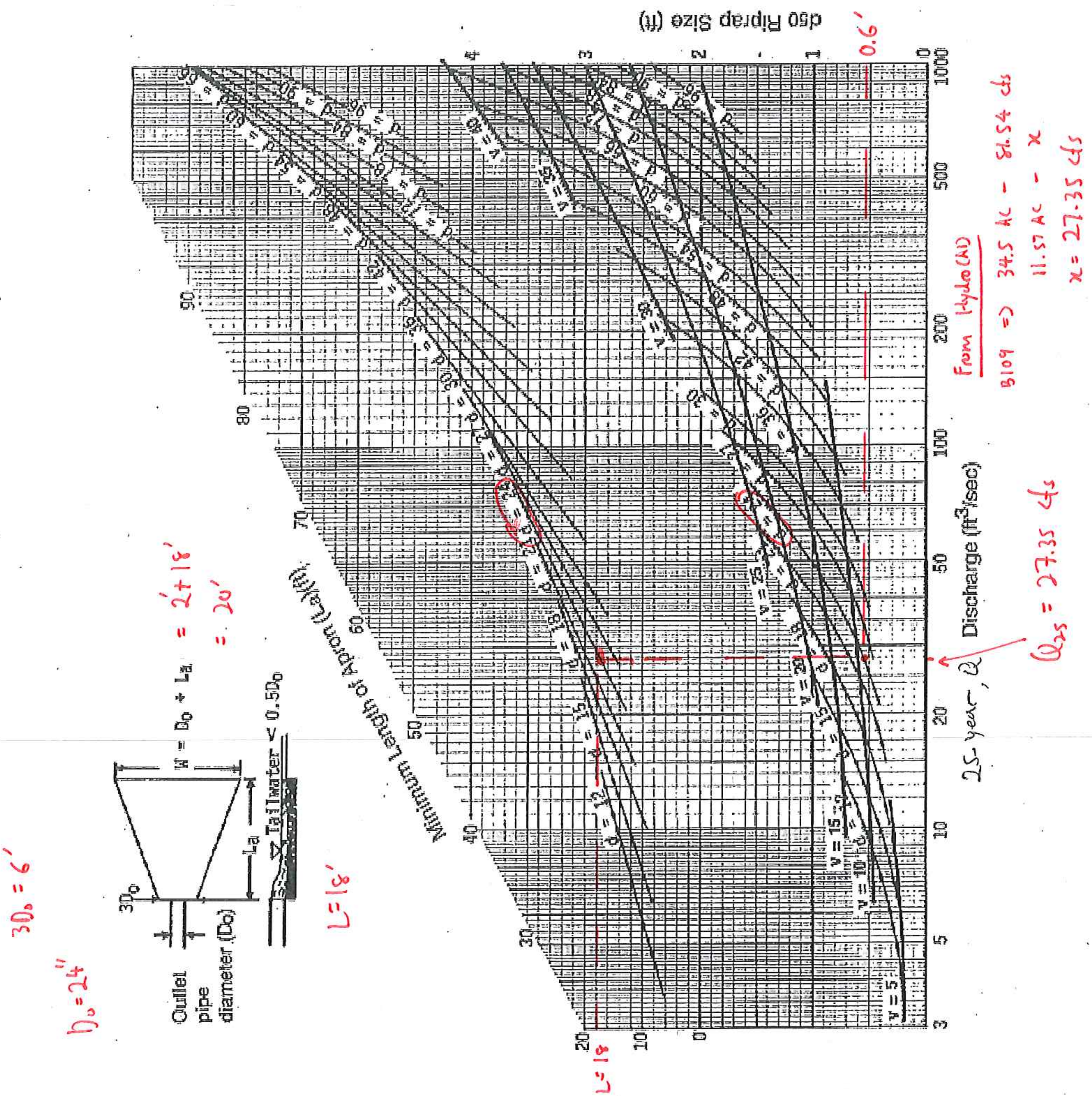
$$= 14.07 \text{ inches}$$

Provide 14-inch diameter hole at elevation 501.10 for dewatering orifice

F.E.S # 852 (Phase I)

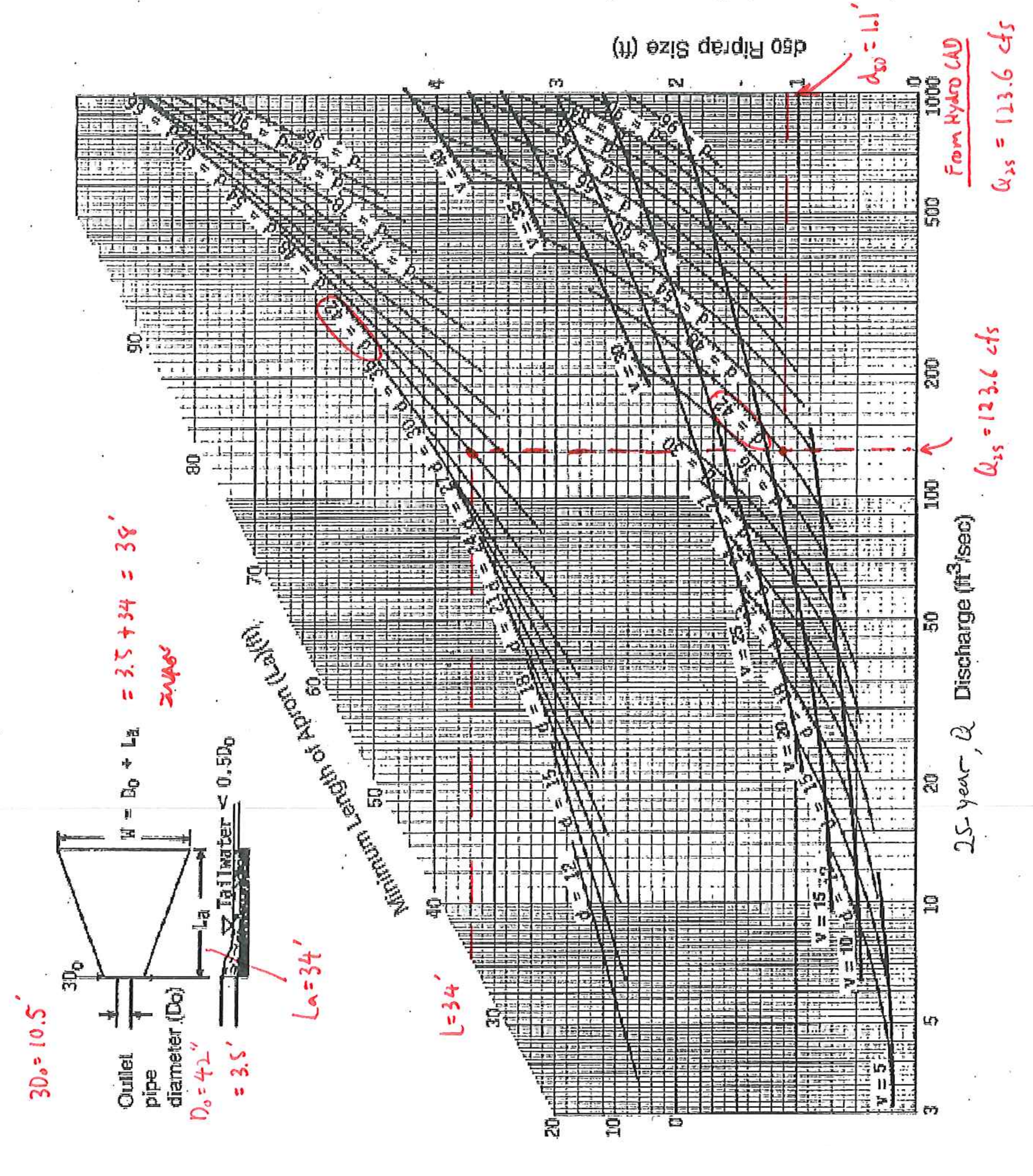
Figure 5B.12

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)



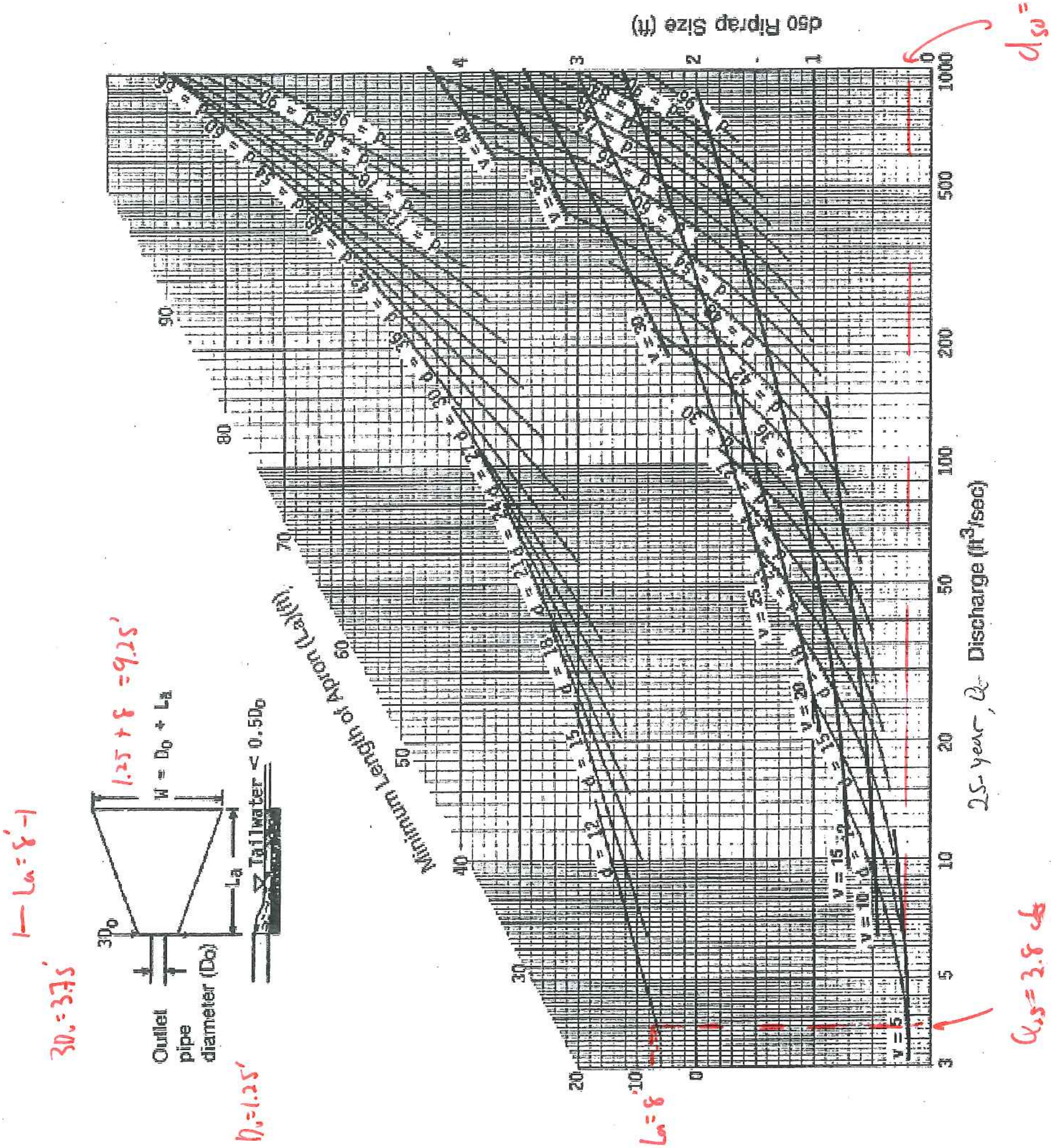
F.E.S # 206 (Phase I)

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)



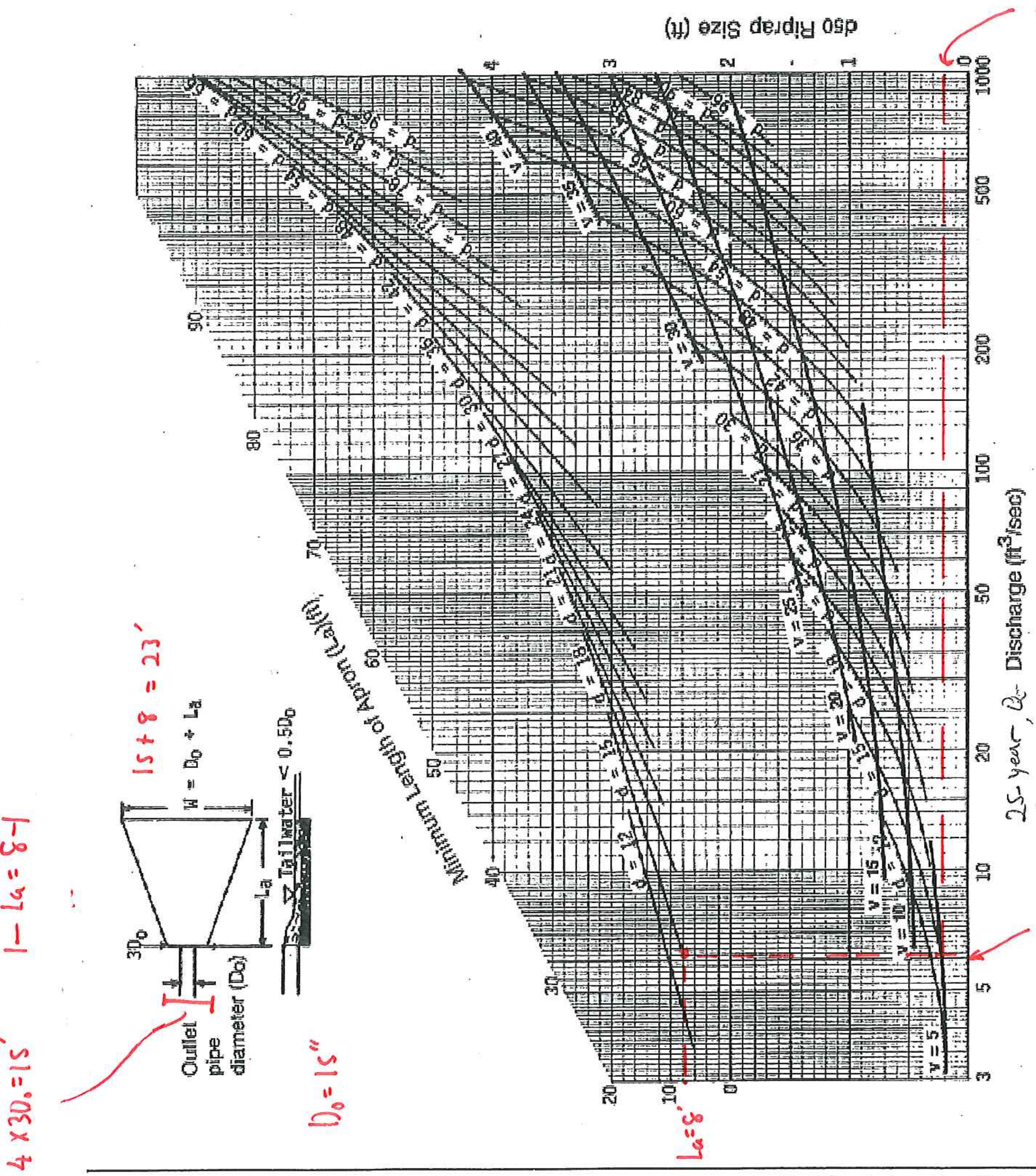
Riprap / FES -100 A

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)



Riprap Protection for FES-957C (Phase I)

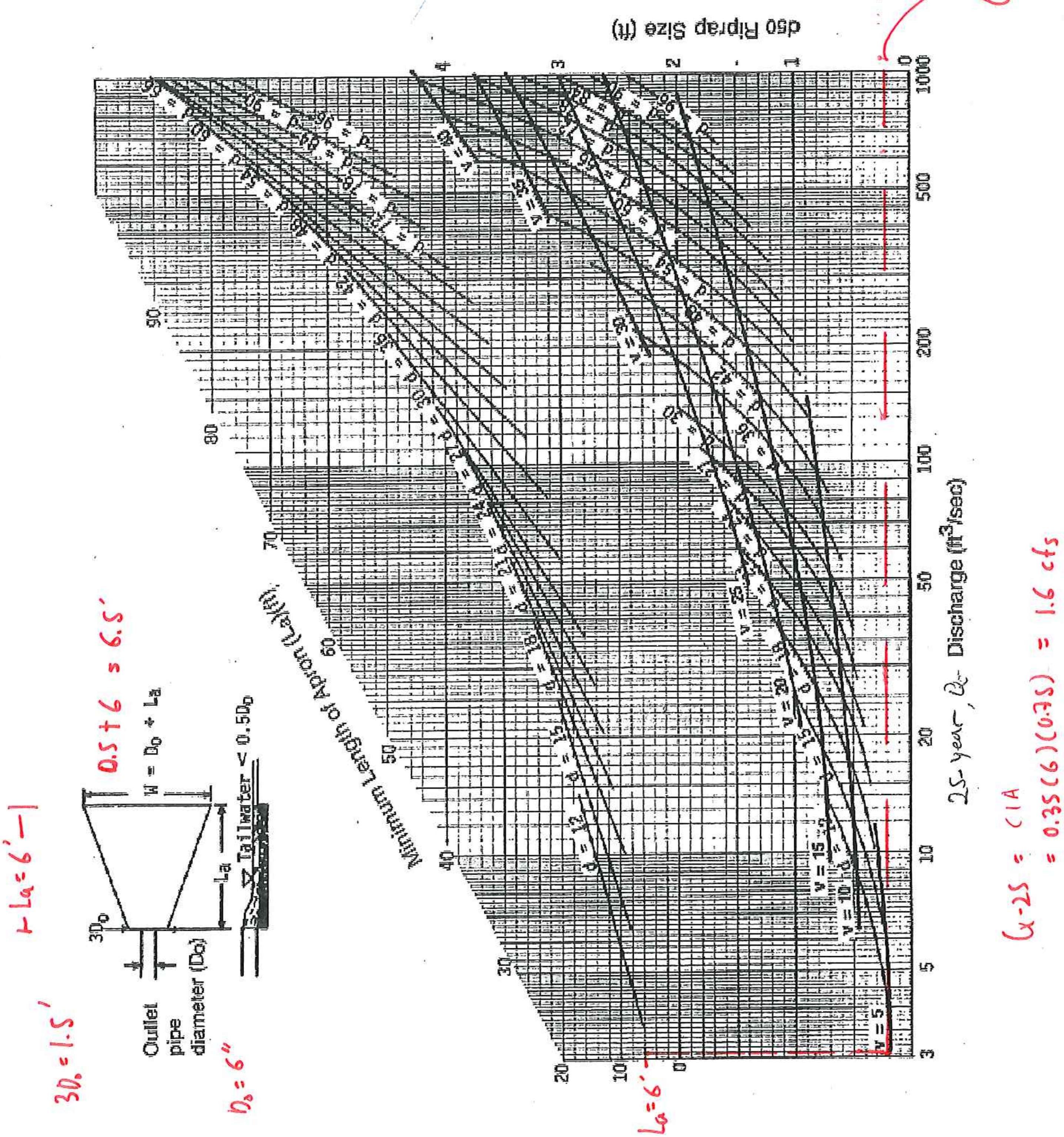
Figure 5B.12
Outlet Protection Design—Minimum Tailwater Condition
(Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



Riprap for FES 1026 A (Phase I)

Figure 5B.12

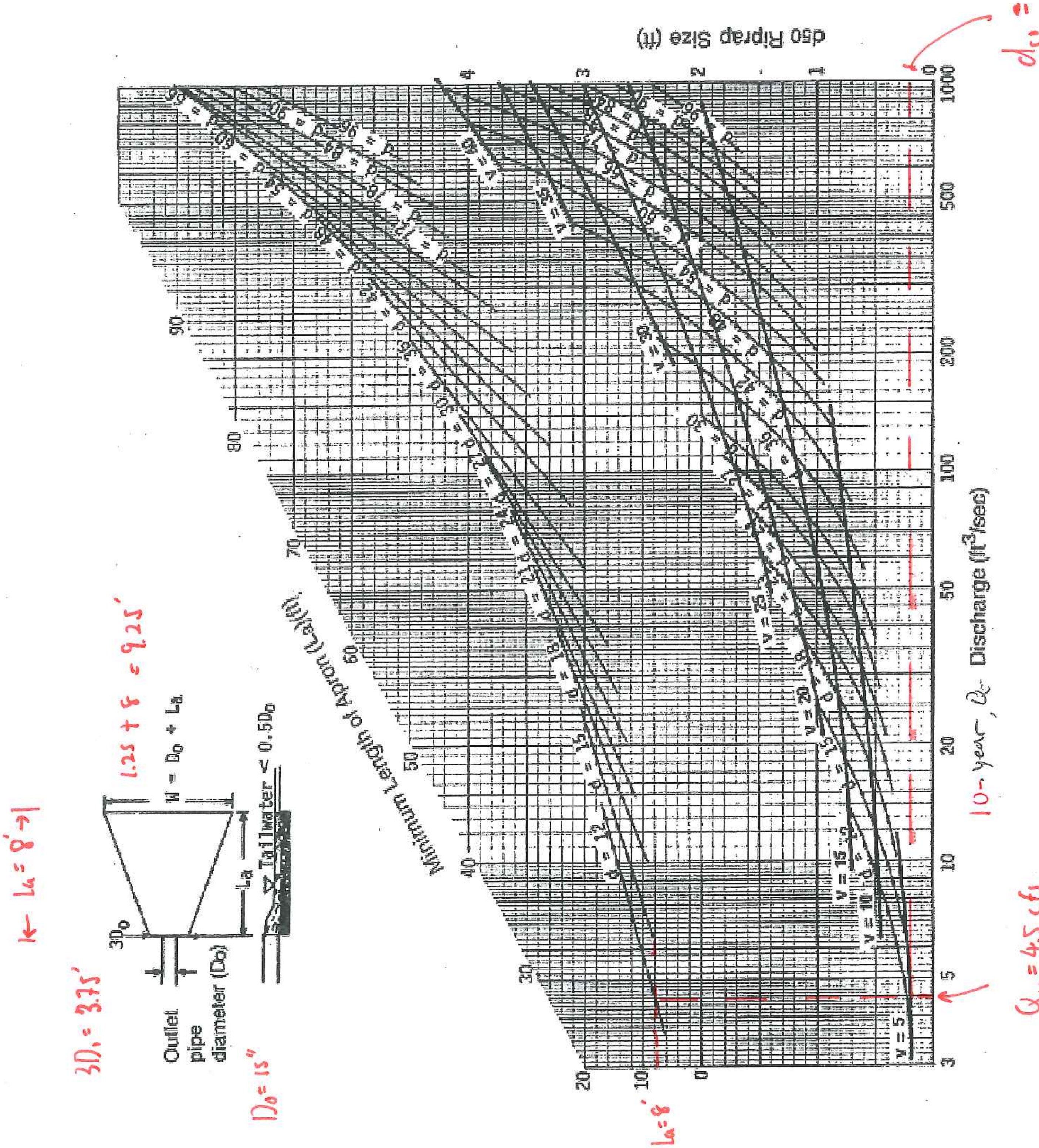
Outlet Protection Design—Minimum Tailwater Condition (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



Riprap for Temporary Sediment Basin (SB #1) - Overlook

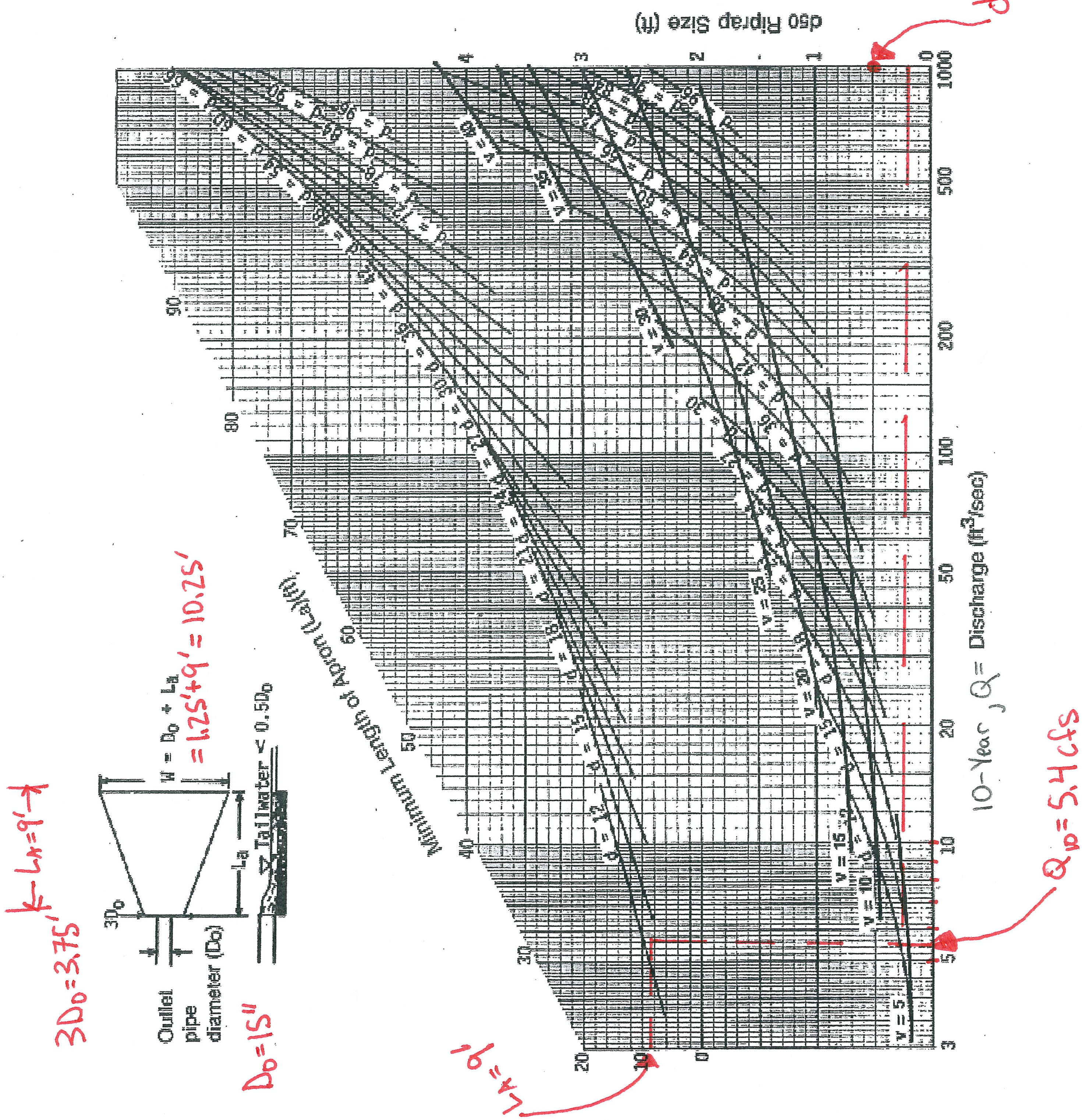
Figure 5B.12

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)



Temporary Sediment Basin (SB #2)

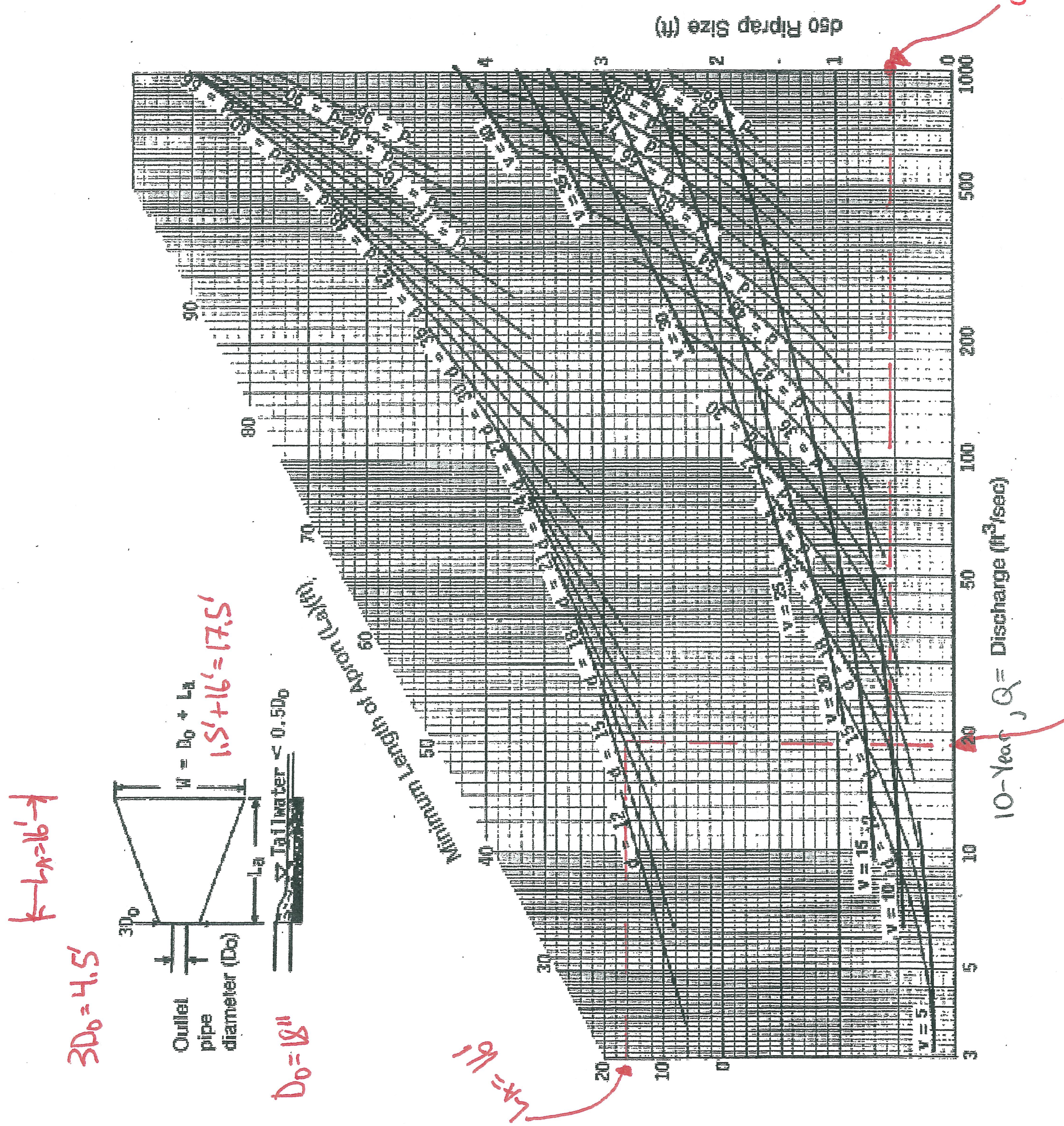
Figure 5B.12
Outlet Protection Design—Minimum Tailwater Condition
(Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



Temporary Sediment Basin (SB #3)

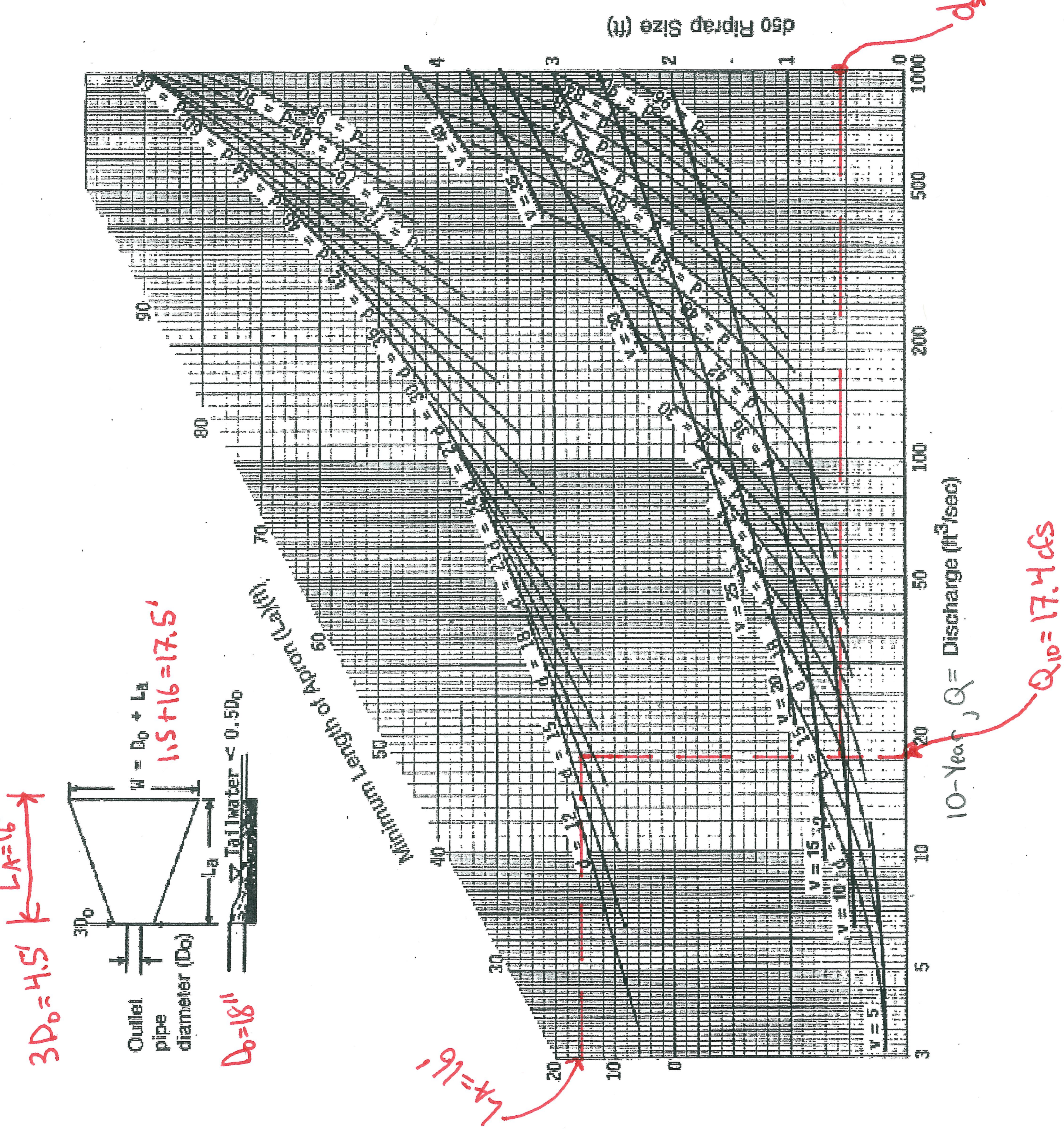
Figure 5B.12

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)



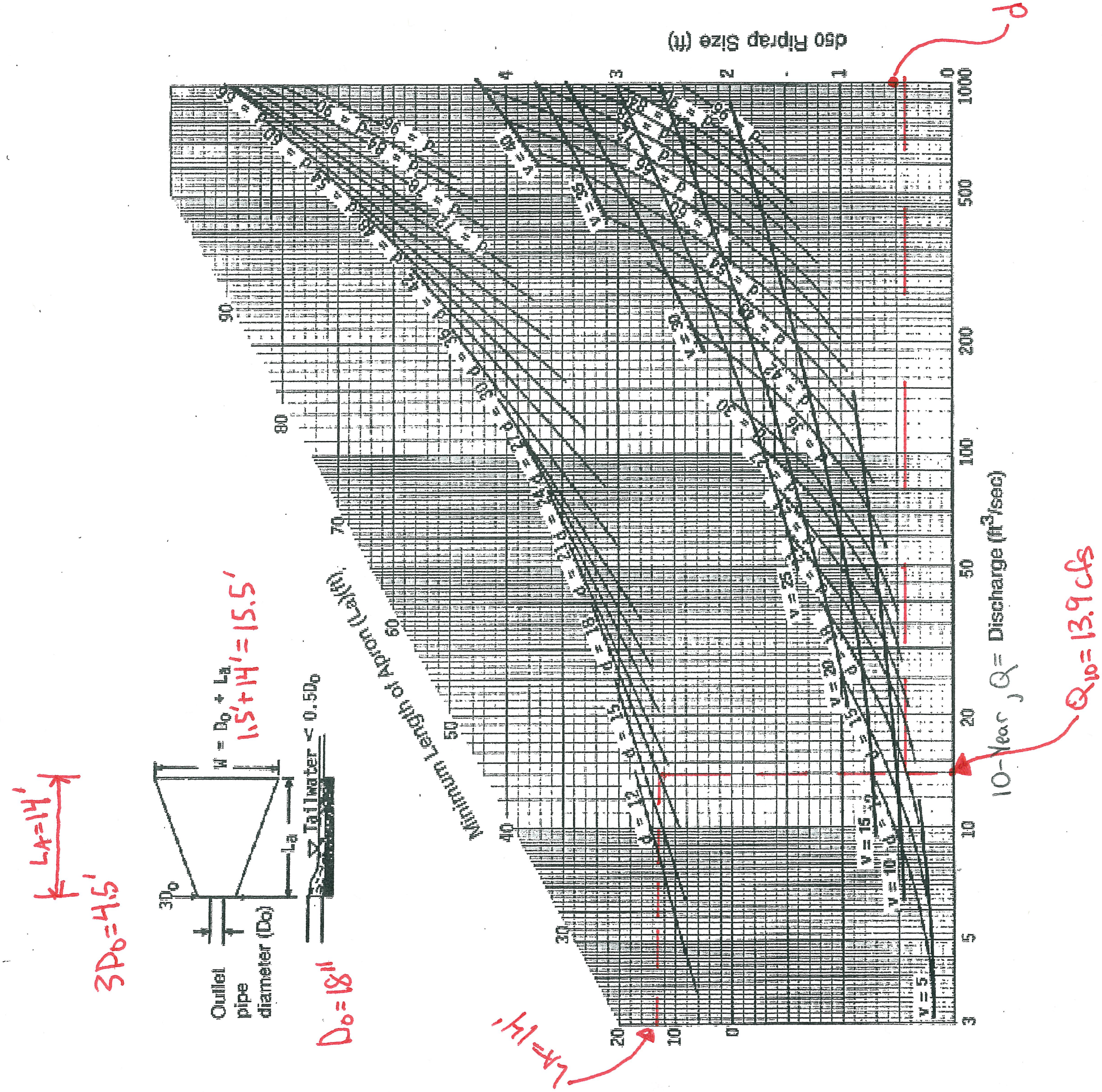
Temporary Sediment Basin (SB#4)

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)



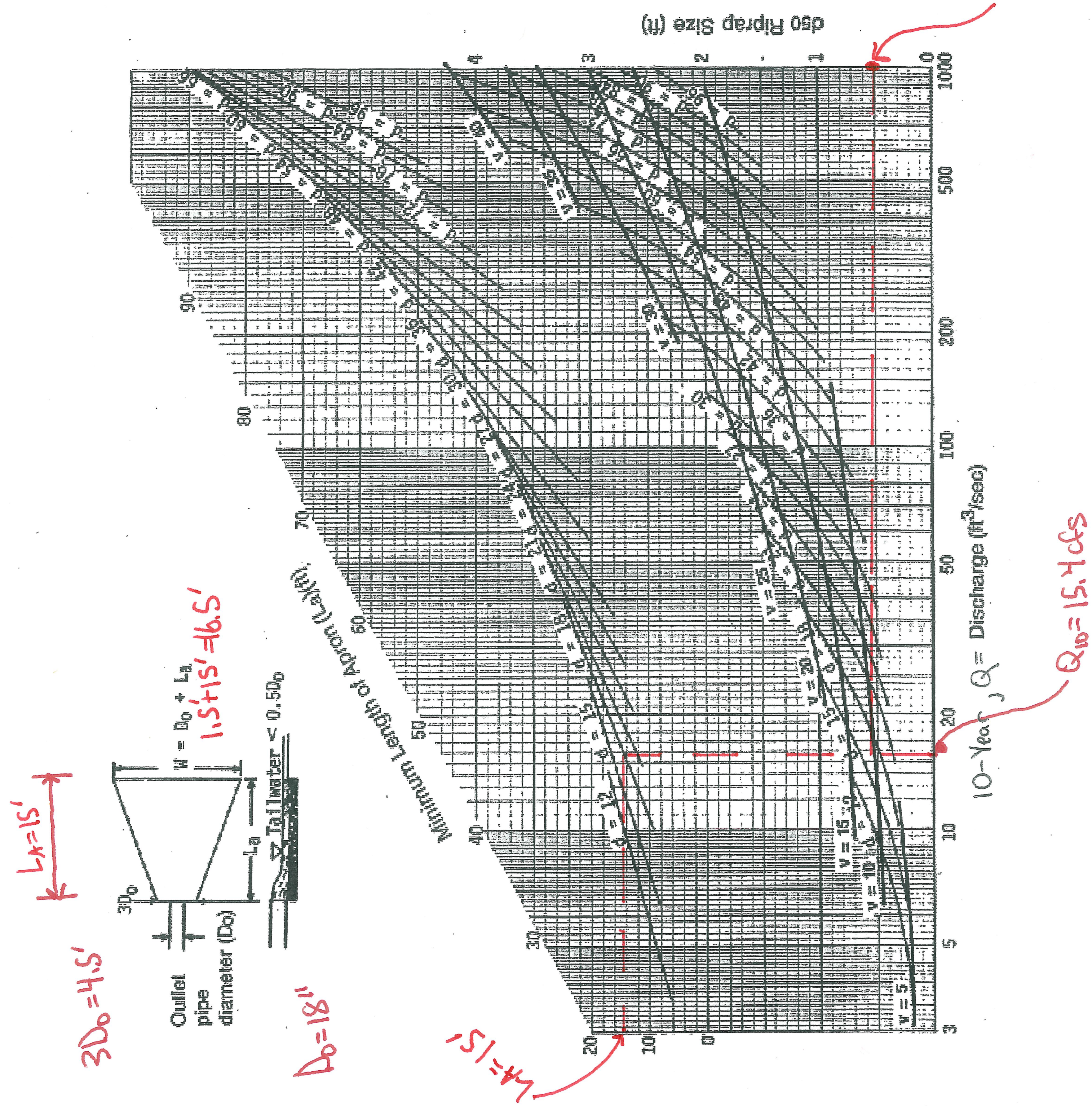
Temporary Sediment Basin (SB #5)

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)



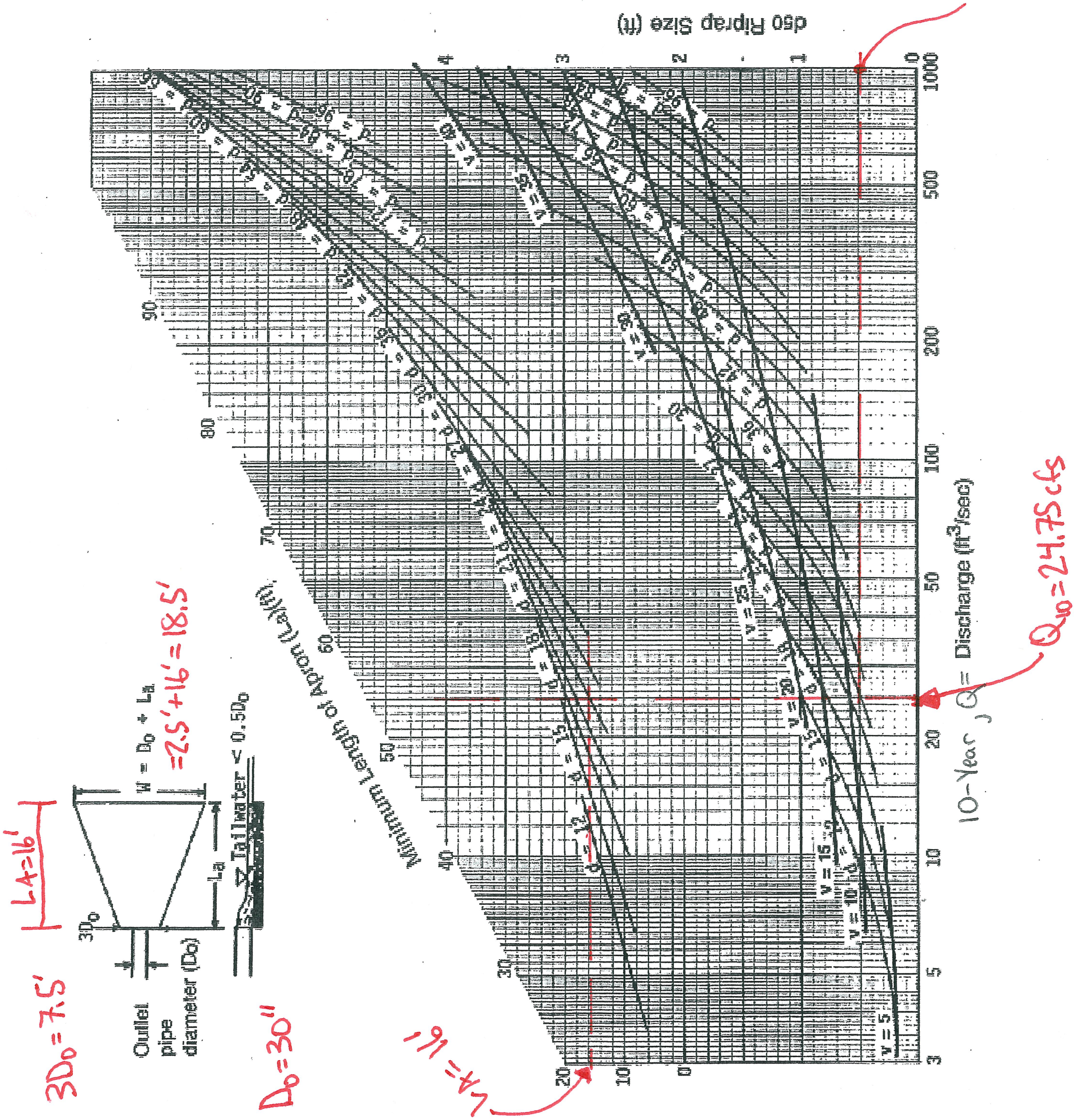
Temporary Sediment Basin (SB #6)

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)



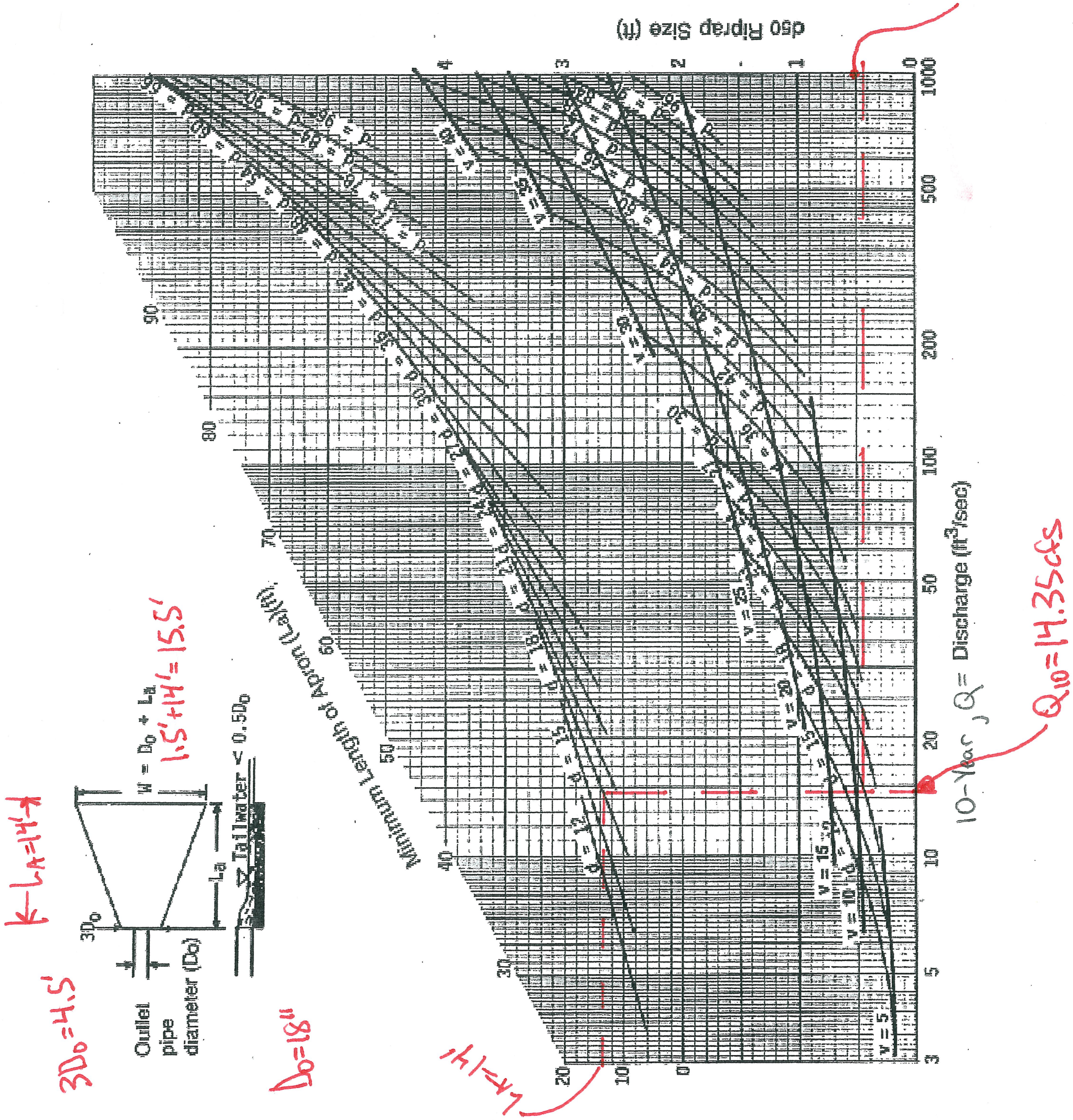
Temporary Sediment Basin (SB#7)

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)



Temporary Sediment Basin (SB #8)

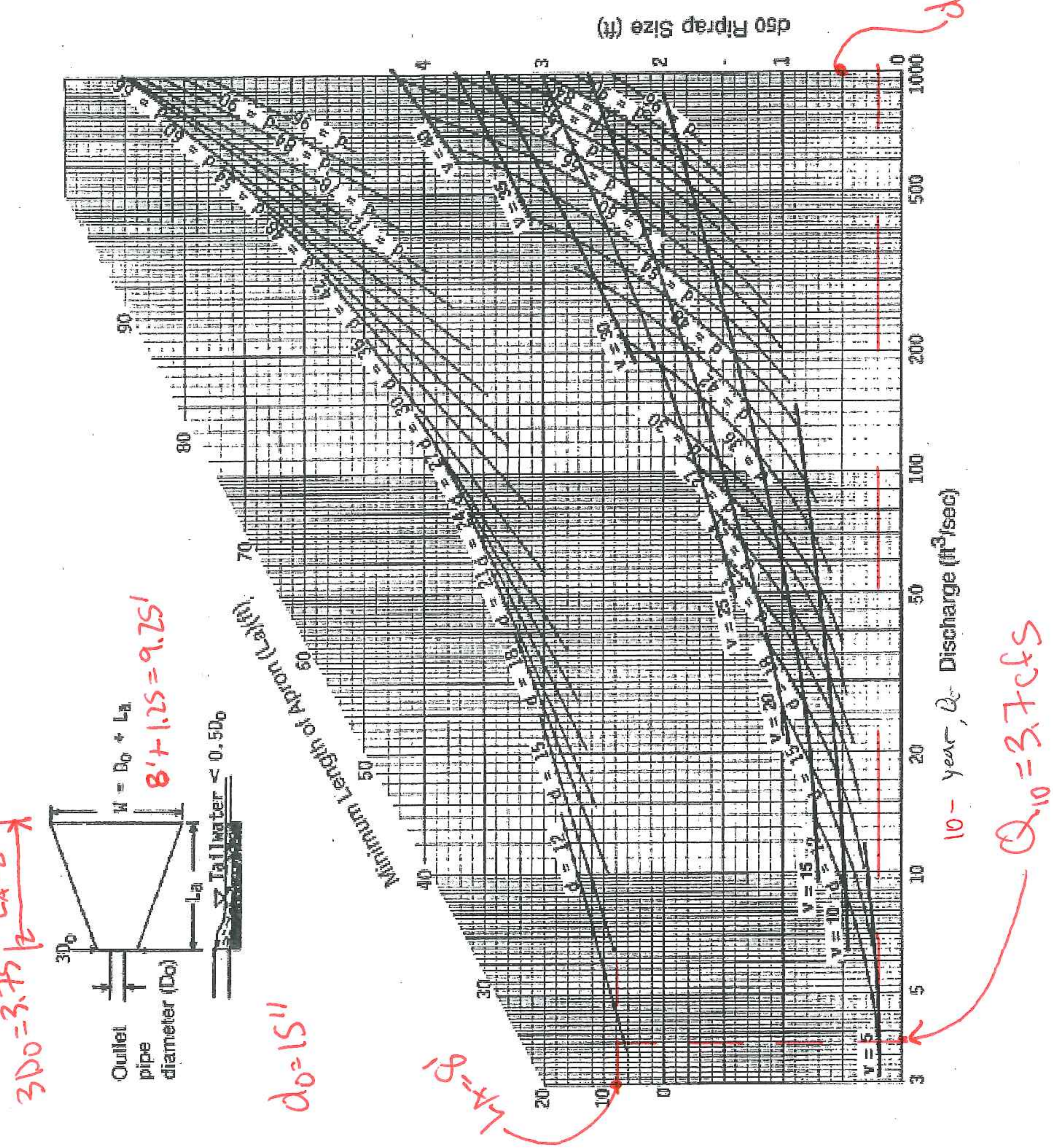
Figure 5B.12
Outlet Protection Design—Minimum Tailwater Condition
(Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



Temporary Sediment Basin (SB #8A)

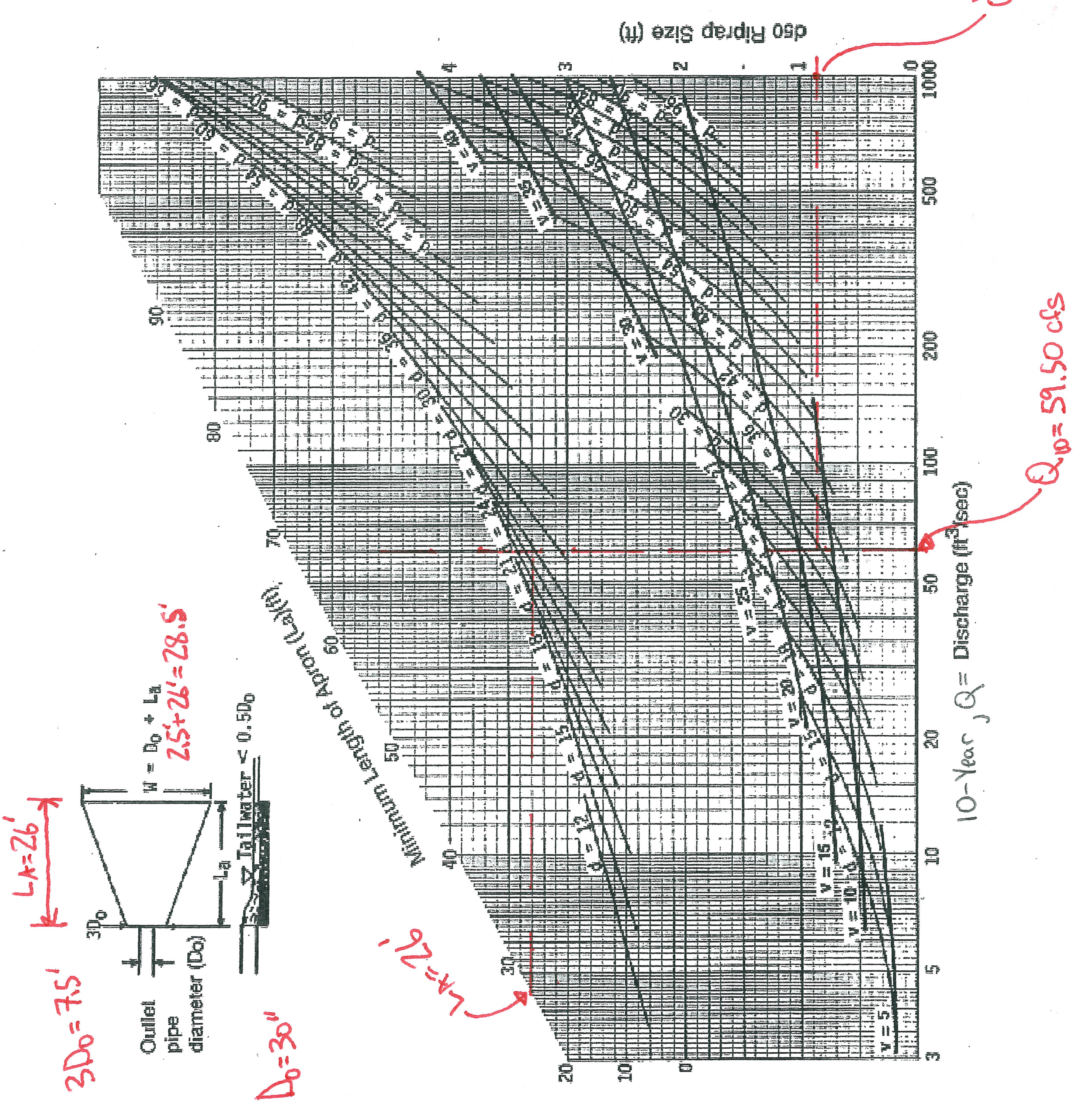
Figure 5B.12

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)



Temporary Sediment Basin (SB #9)

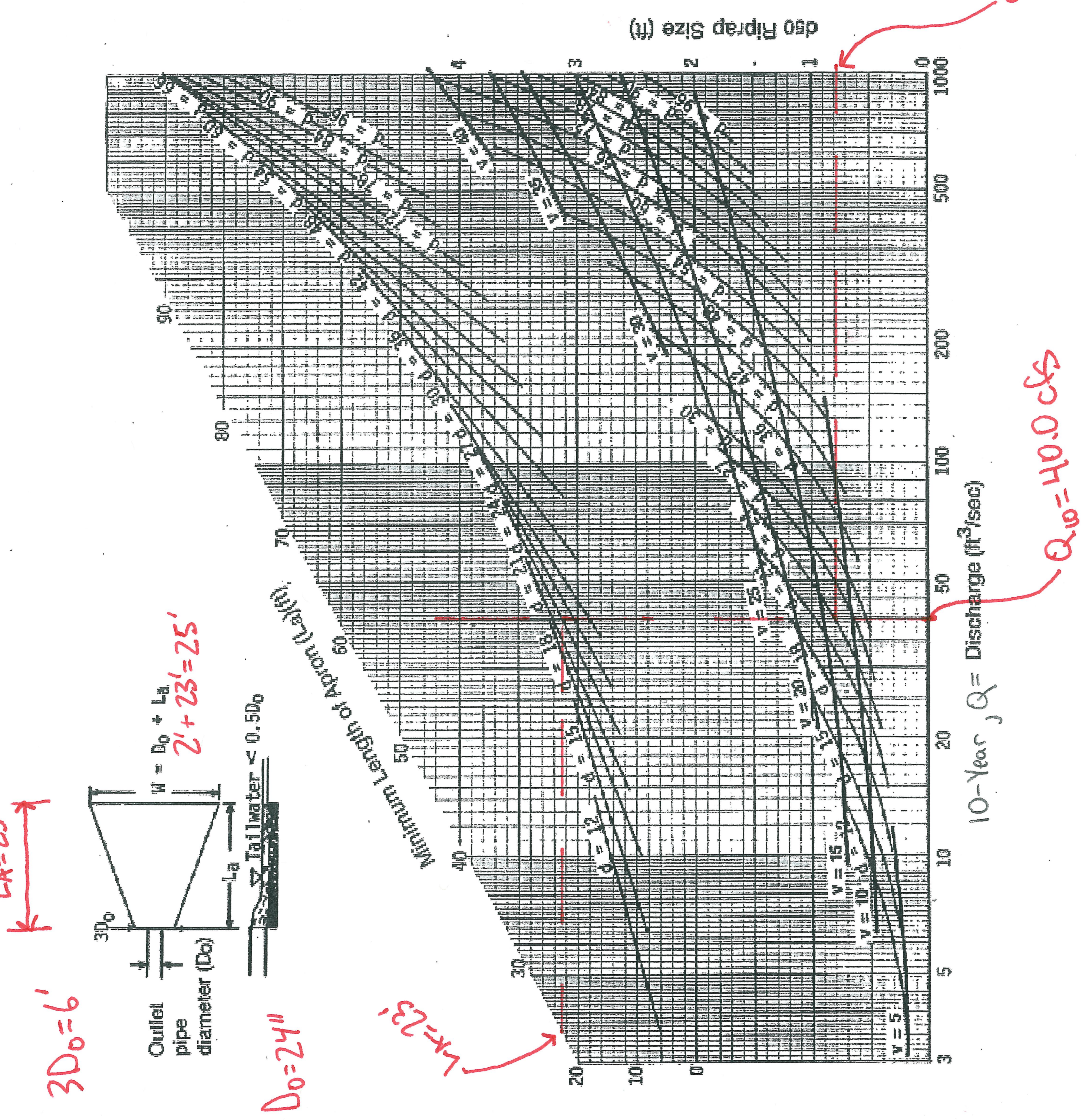
Figure 5B.12
Outlet Protection Design—Minimum Tailwater Condition
(Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



Temporary Sediment Basin (SB #10)

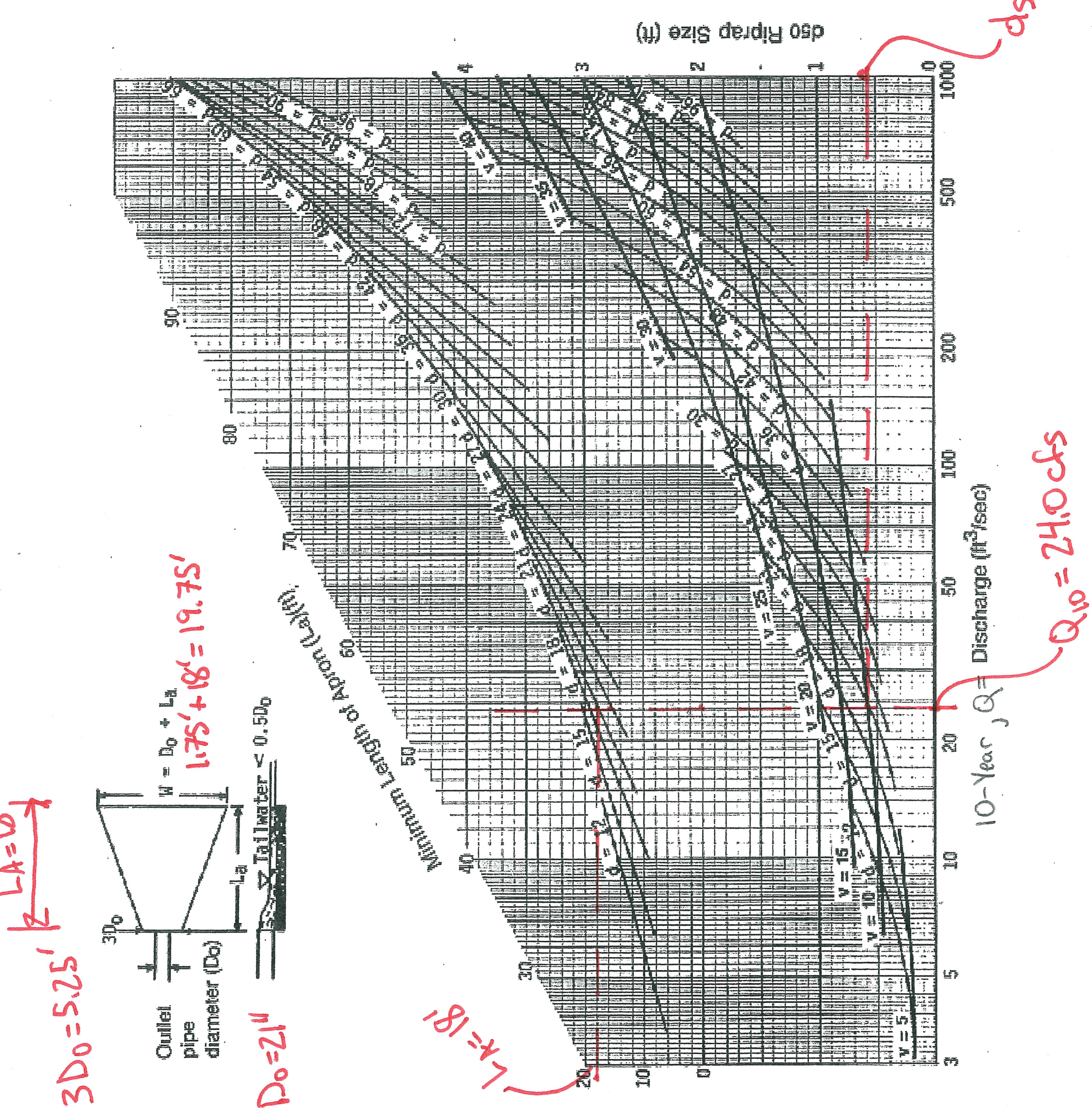
Figure 5B.12

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)



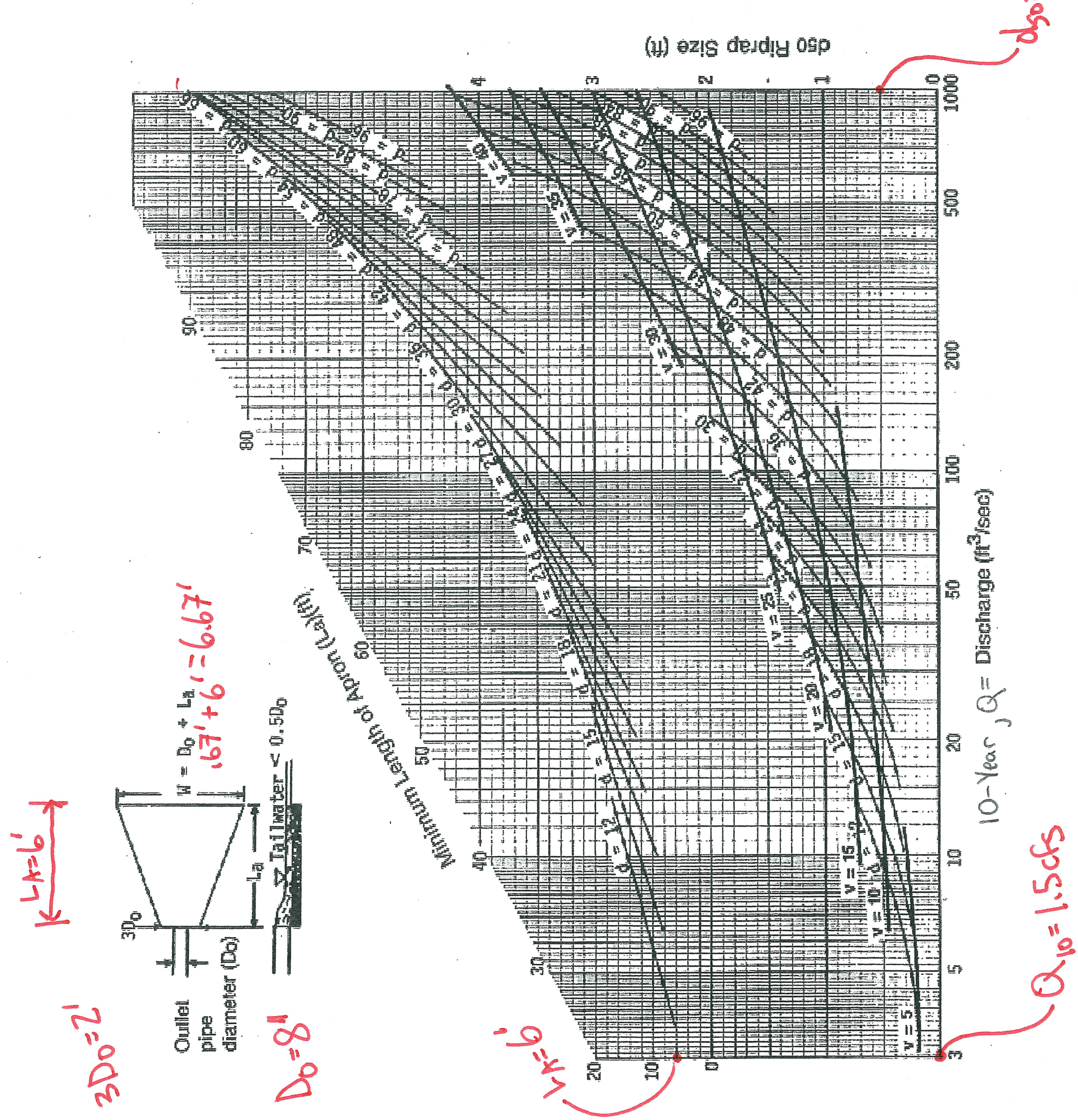
Temporary Sediment Basin (SB#11)

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)



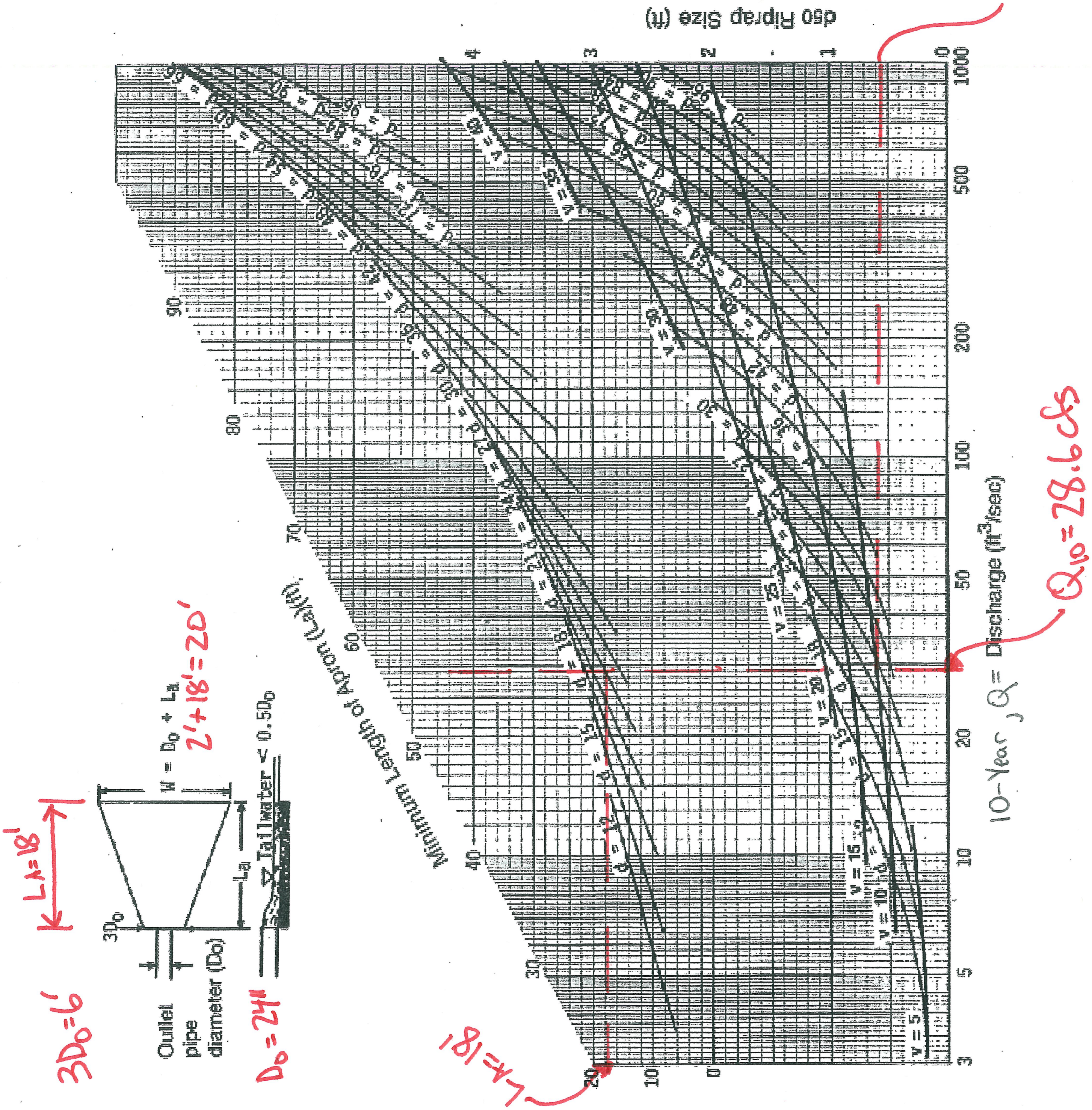
Temporary Sediment Basin (SB #12)

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)



Temporary Sediment Basin (SB#13)

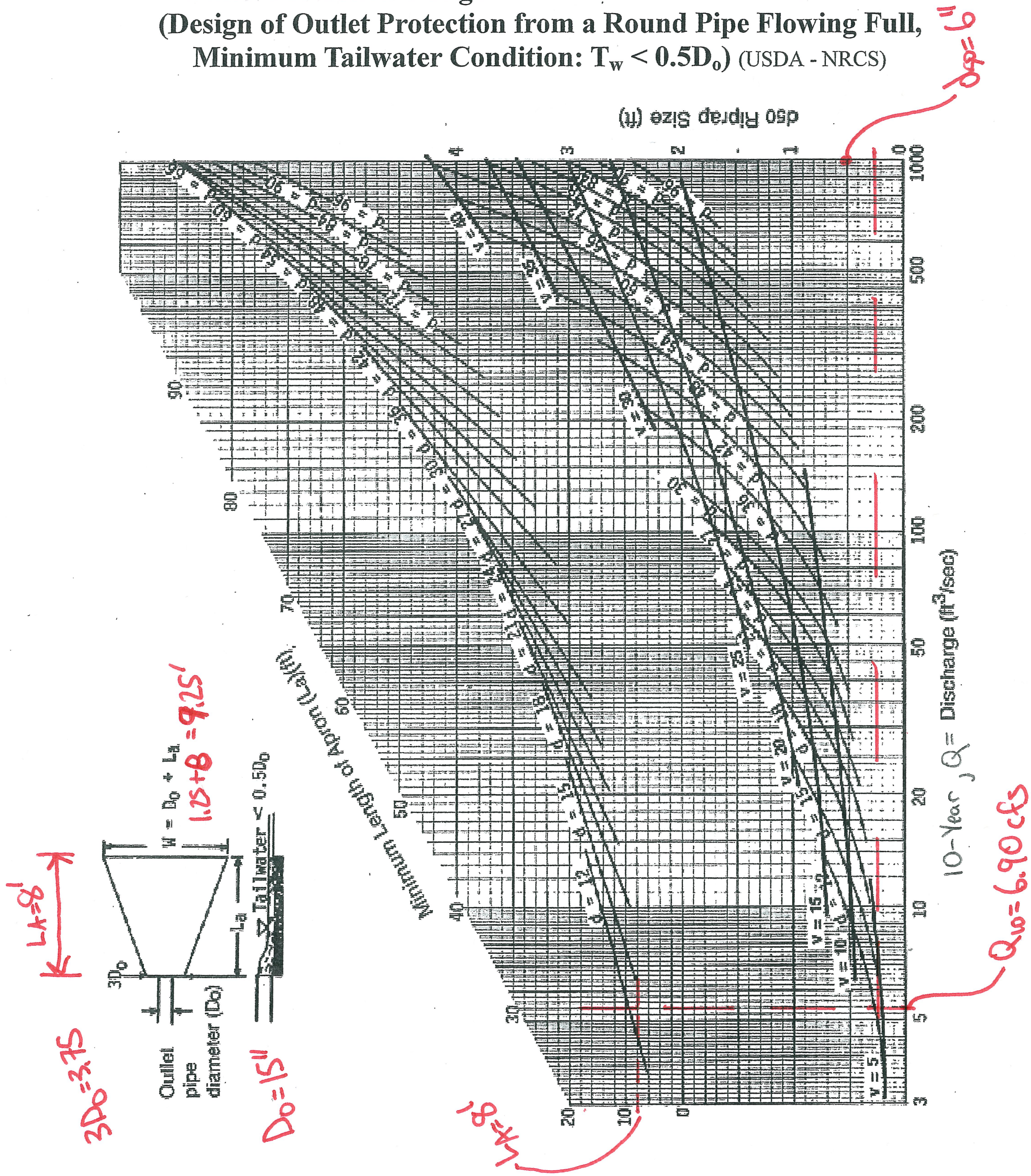
Figure 5B.12
Outlet Protection Design—Minimum Tailwater Condition (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



Temporary Sediment Basin (SB#14)

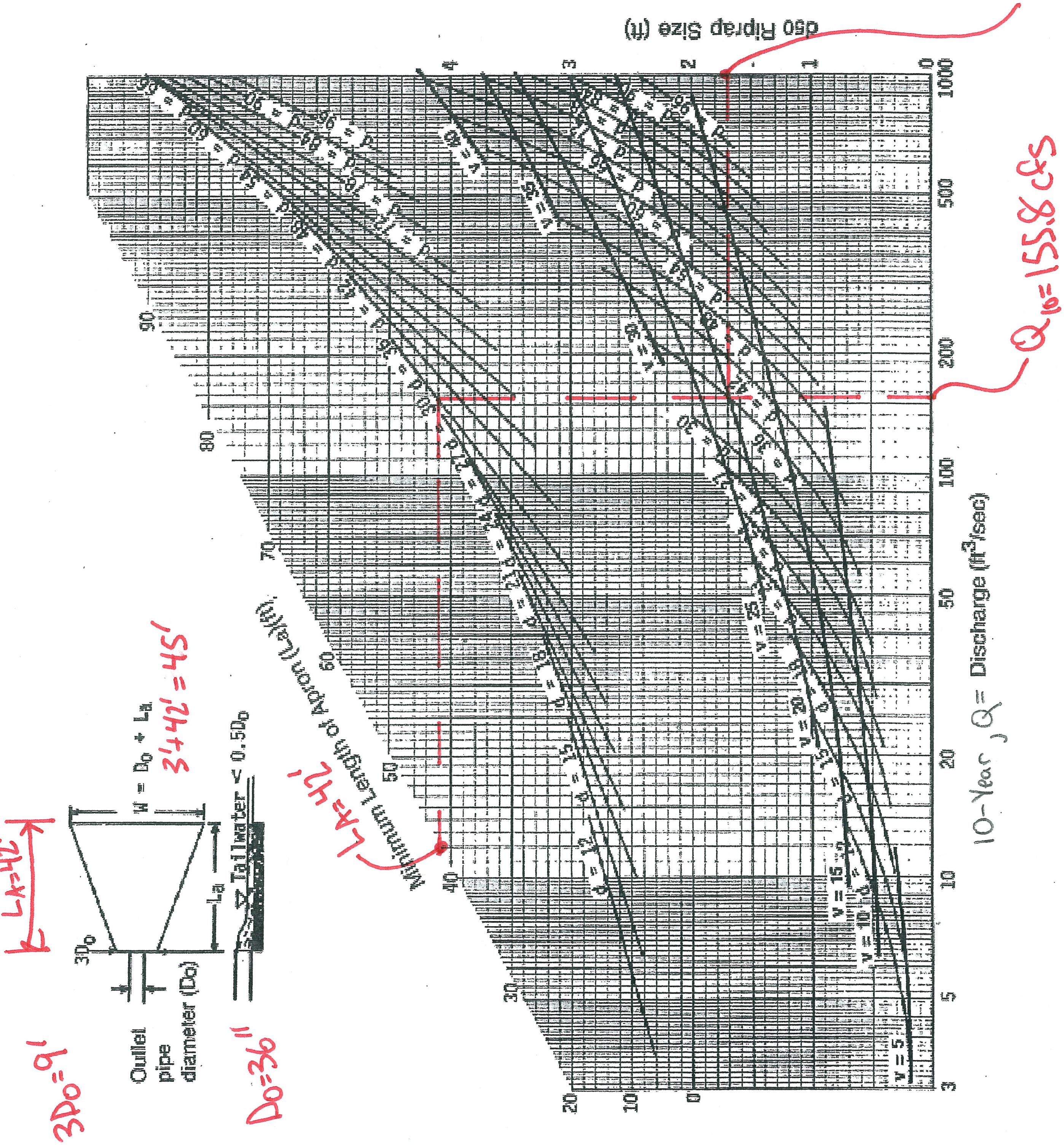
Figure 5B.12

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)



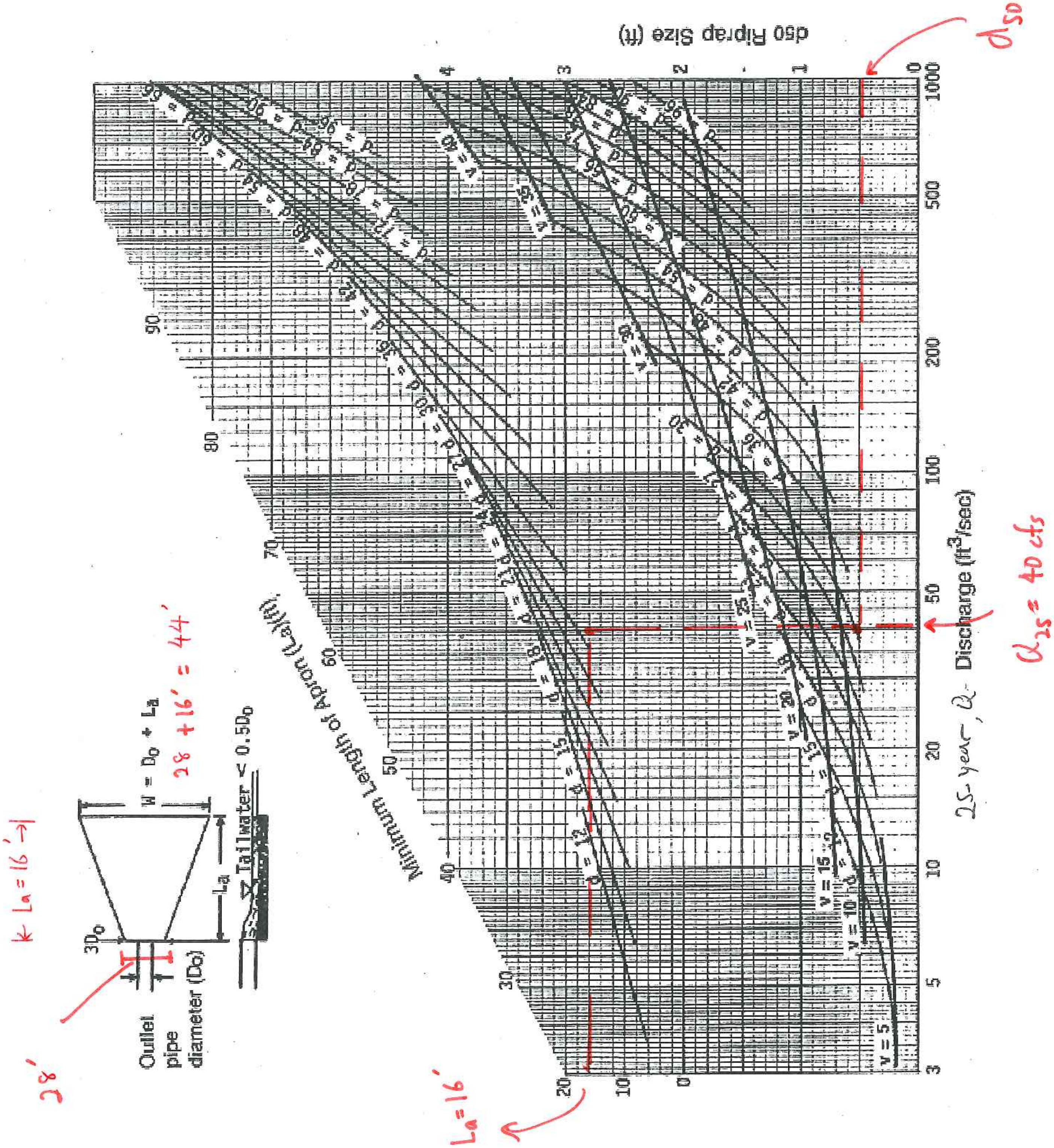
Temporary Sediment Basin (SB#15)

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)



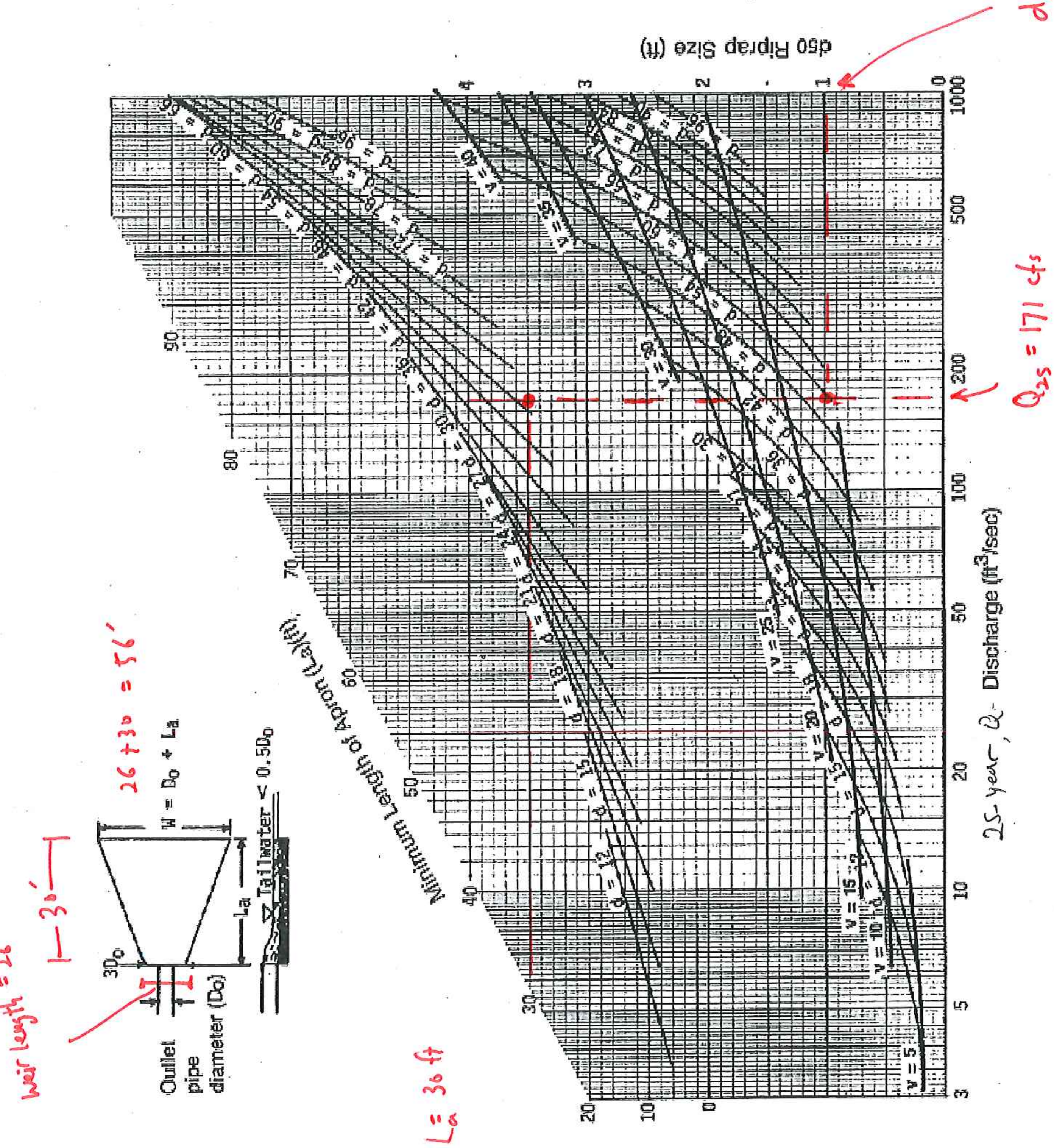
Riprap for SWM # 1 outlet

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)



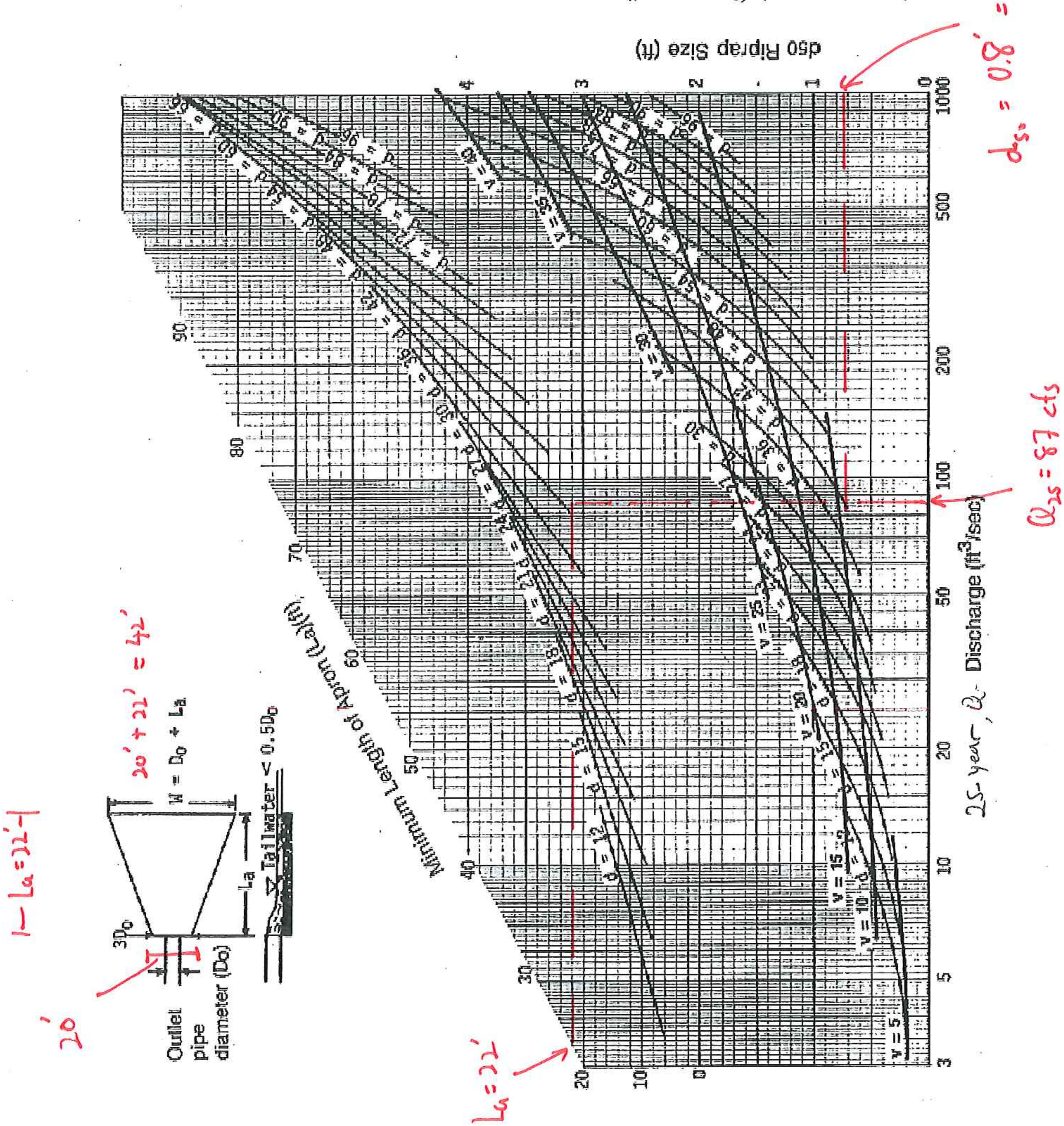
Riprap for SWM #2 Outlet

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)



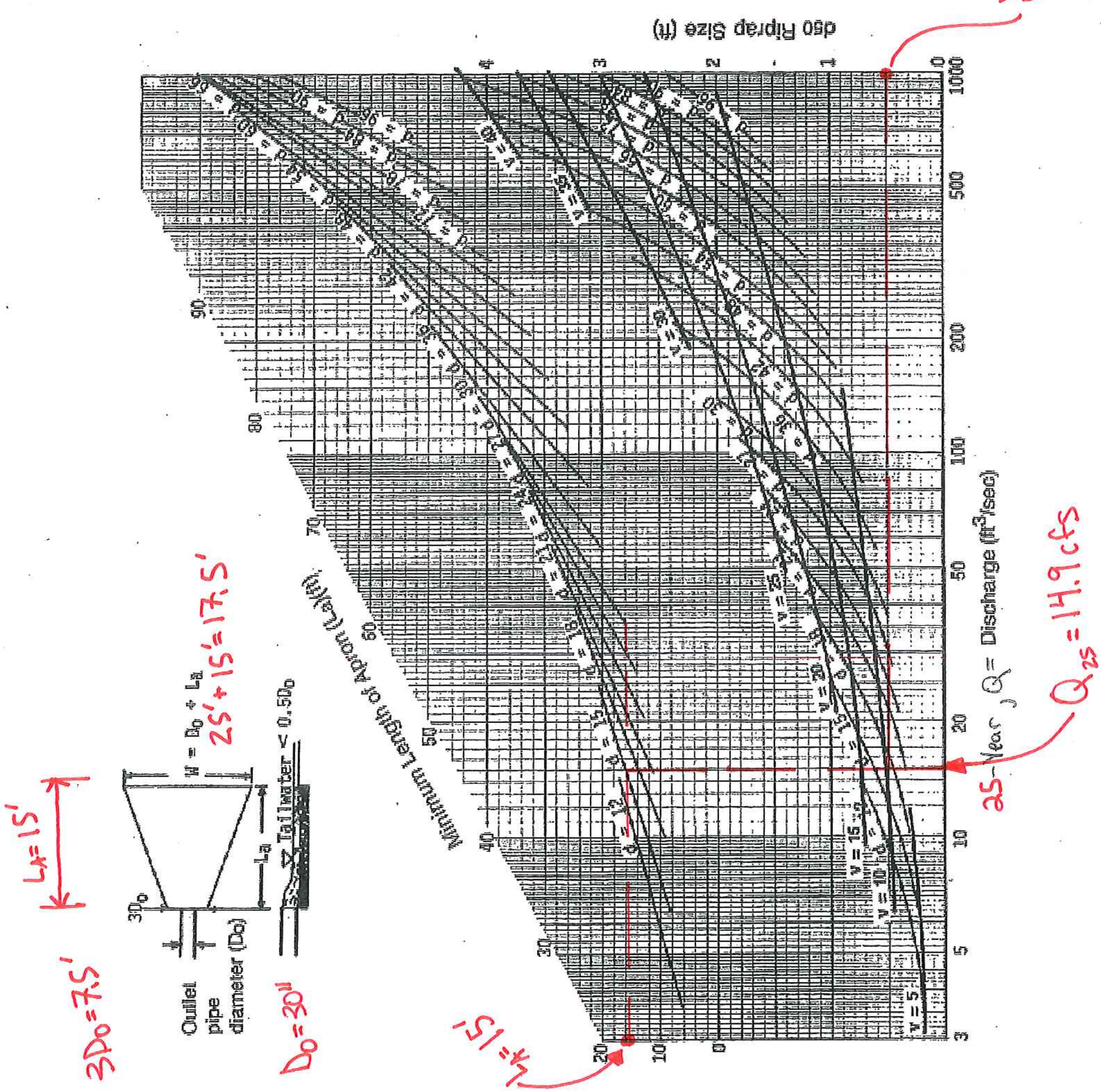
Riprap for SWM #3 outlet

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)



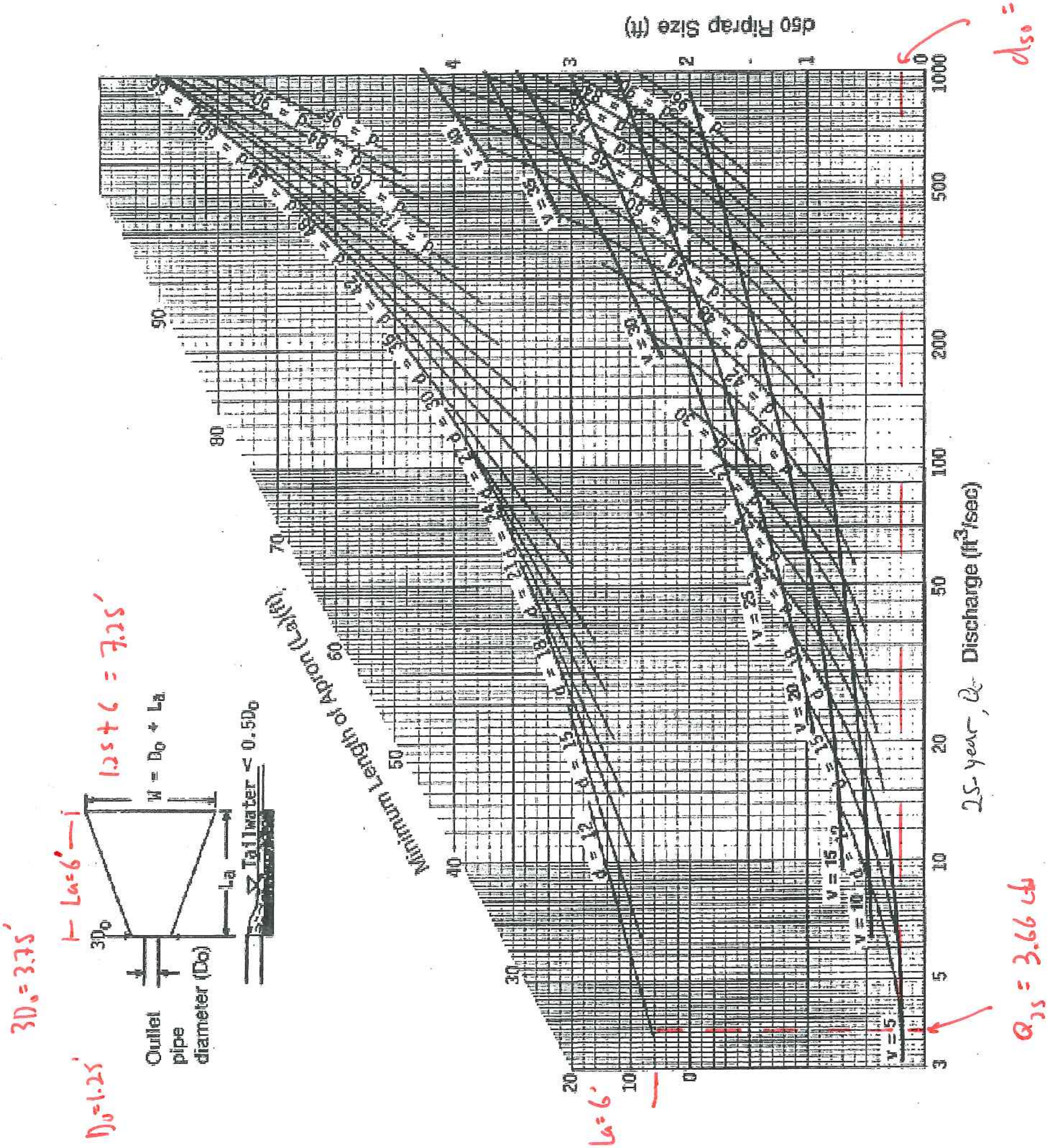
Riprap for SWM#7 outlet

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)



Riprap for SWM 7A (Overlook) / FES 966

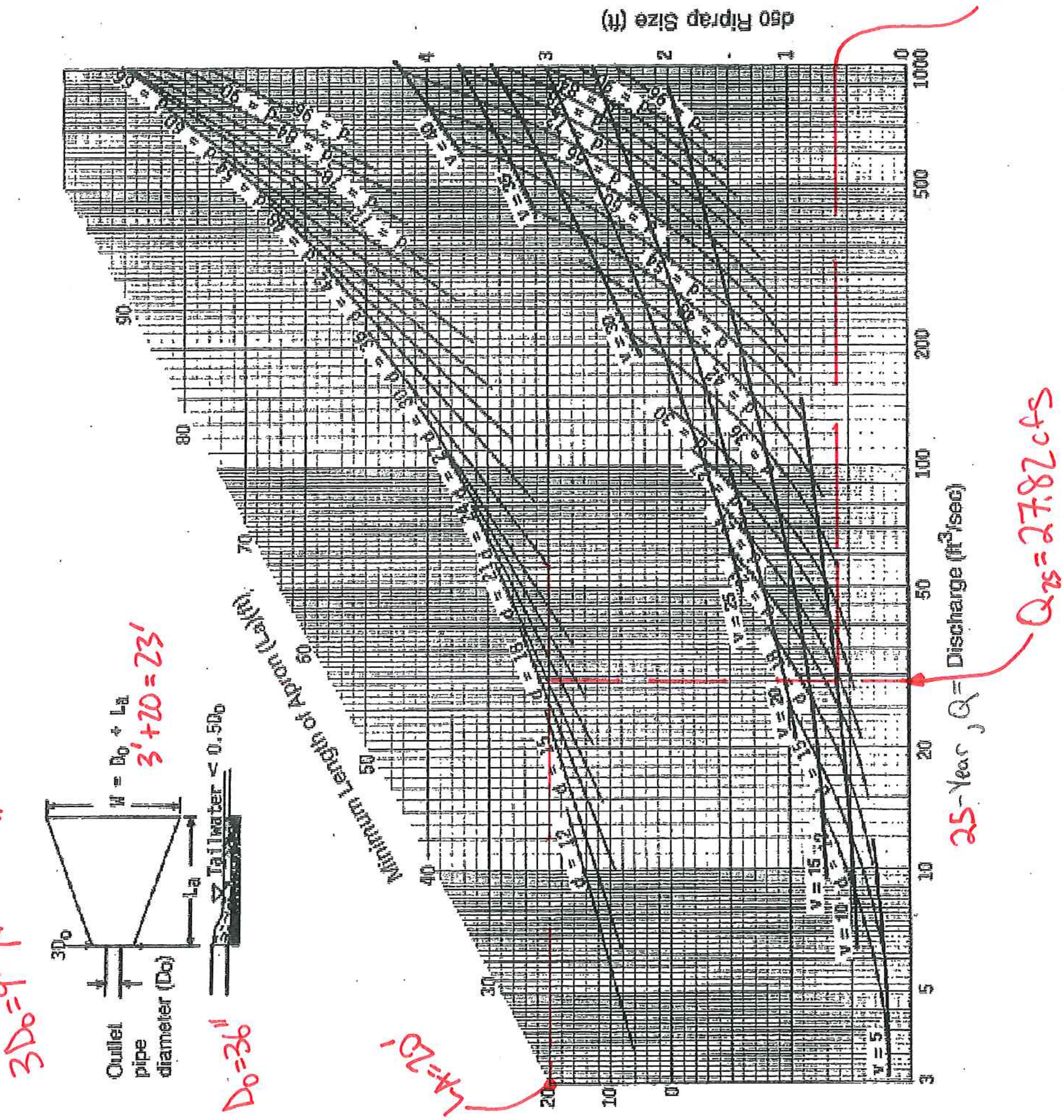
Figure 5B.12
Outline Protection Design—Minimum Tailwater Condition
(Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



Riprap for SWM #8 Outlet

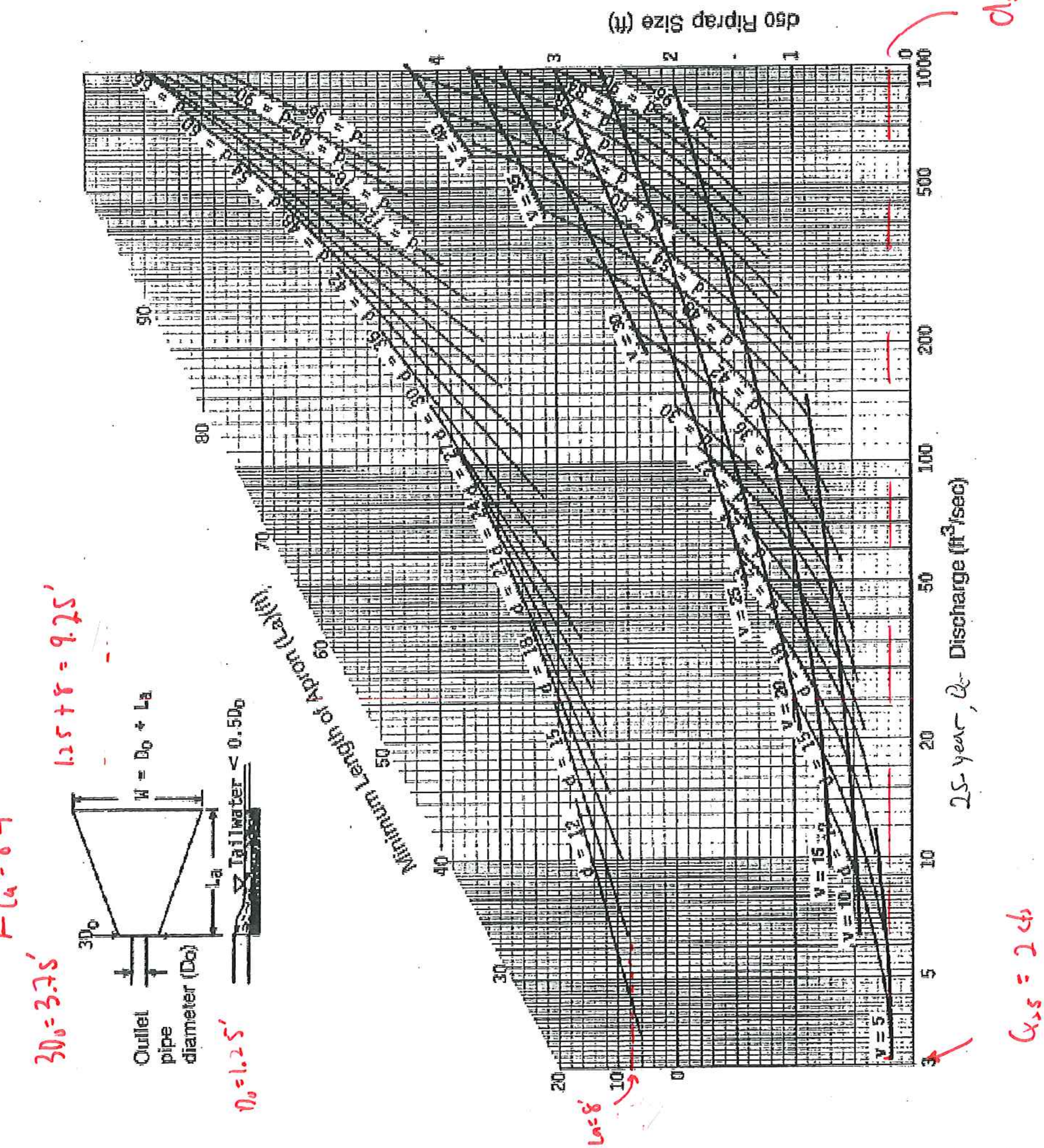
Figure 5B.12

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)



Riprap for SUM #10 outlet

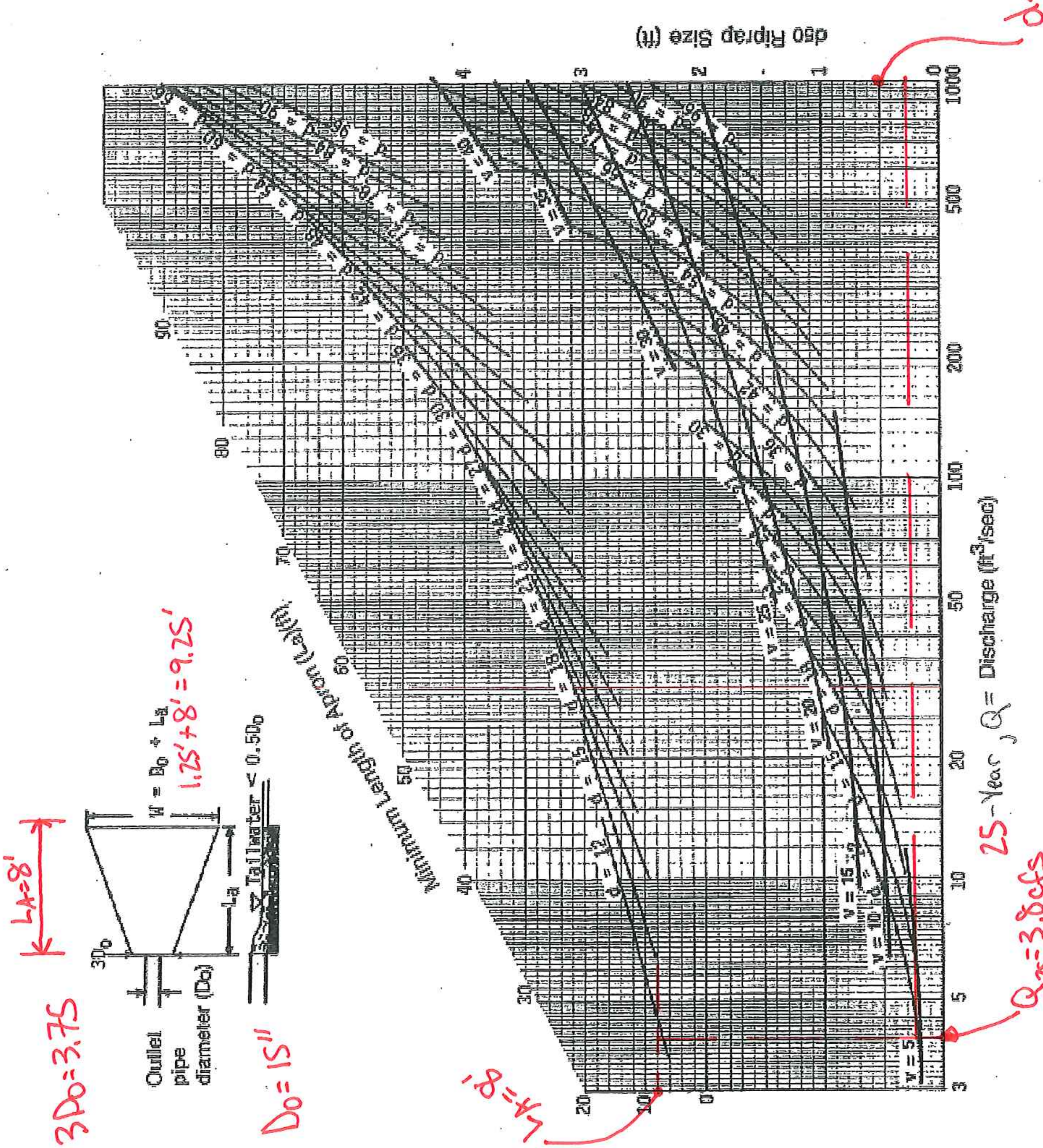
Figure 5B.12
Outlet Protection Design—Minimum Tailwater Condition (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)



Riprap for SWM #12 Outlet

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)

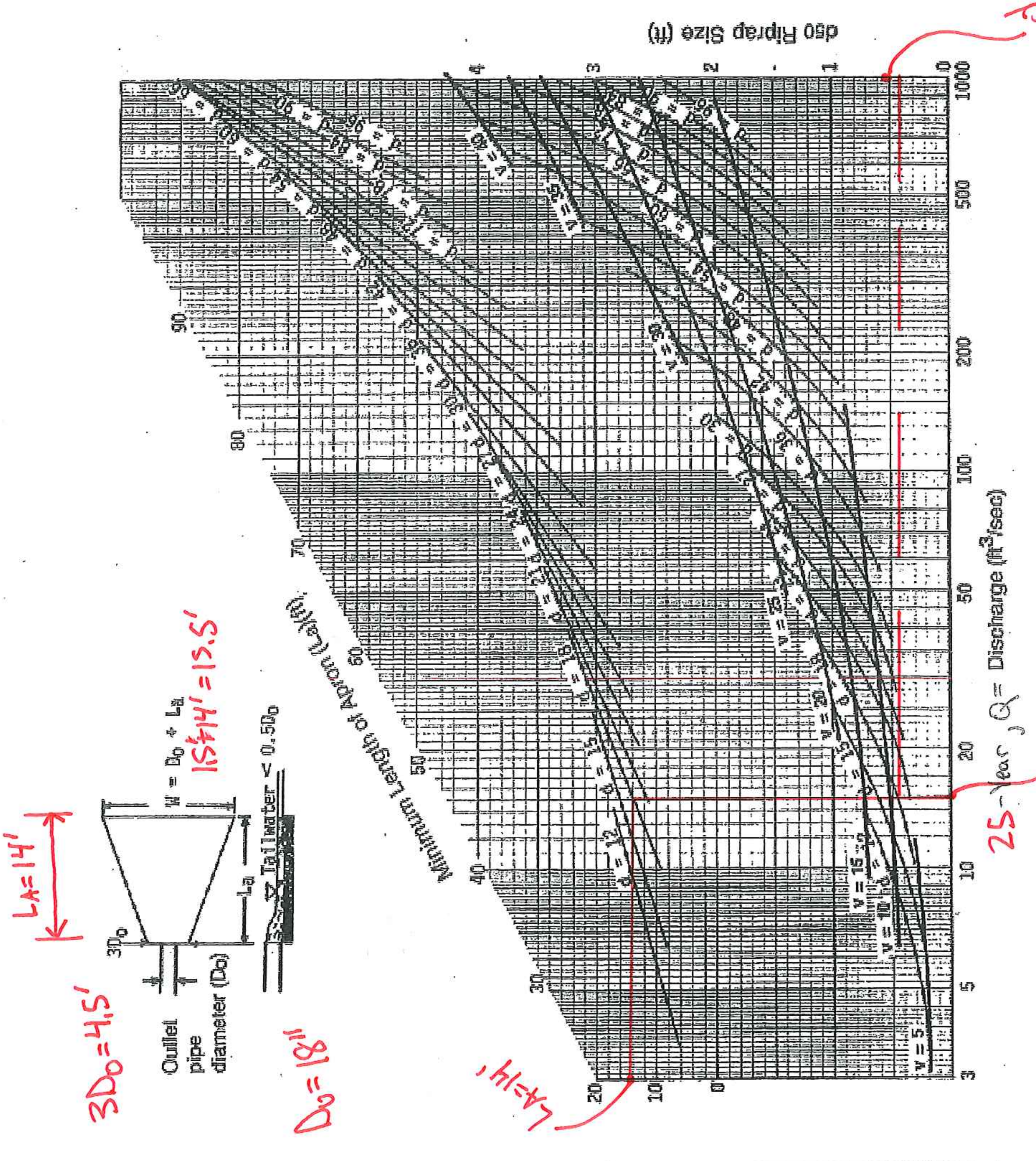
$d_{50} = 6''$



Riprap for SWM #13 Outlet

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)



Riprap for SWM #15 Outlet

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)