Baroda Cluster Subdivision

Town of Chester
Orange County, New York

Stormwater Pollution Prevention Plan

Narrative

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APPENDICES

I. Executive Summary

This report shall serve as the Stormwater Pollution Prevention Plan for the Baroda Cluster Subdivision project, which is located on the east side of Black Meadow Road, between its intersection with Shunoski Lane and Odyssey Drive in the Town of Chester, Orange County, New York. The project is currently identified as Section 12, Block 1, Lot 31 on the Town of Chester Tax Map. The total site area is approximately 168.2± acres.

The project parcel is bisected by a gravel road known as Bairds Cross Road. The portion of the property located on the northern side of Bairds Cross Road is mostly encumbered by federally regulated wetlands and has a history of farming row type crops. The portion of the property located on the southern side of Bairds Cross Road is a mixture of open grass fields, and wooded areas with the eastern most portion of the site containing New York State Department of Environmental Conservation Wetland WR-18, which is surrounded by a 100' adjacent area, and a 300' buffer for protection of a possible bog turtle habitat. The eastern most portion of the site abuts the Hudson & Lehigh Railroad track.

The project proposes to construct 29 single family homes in a cluster subdivision on approximately 43.8± acres of the overall 168.2± acre parcel. The project will be accessed by two (2) roadway entrances off of Black Meadow Road, leading to approximately 2,715 linear feet of 30 foot wide roadway, with associated drainage infrastructure improvements. The proposed single family homes will be serviced by individual well and sewage disposal systems.

The drainage design for this project has been incorporated to provide the appropriate water quality treatment to the stormwater runoff, utilize proposed runoff reduction practices, and ensure there are no adverse impacts to the downstream areas of the project site. In order to meet these goals, a TR-20 hydraulic analysis of the stormwater runoff has been prepared utilizing HydroCAD Stormwater Modeling software. The software was used to analyze the Channel Protection (1 year), Overbank Flood (10 year), and Extreme Storm (100 year) storm events in accordance with the New York State Stormwater Management Design Manual. Based on this analysis, the proposed design provided within this report and on the project plans provides the required stormwater mitigation to ensure that no adverse impact will occur to downstream areas due to the construction of the proposed project.

II. Design Point Designation

Two (2) design points were defined to analyze the stormwater peak flow run-off of the Baroda Cluster Subdivision project. The first design point, identified in the HydroCAD model as Pond 1P, is defined as the point where an unnamed stream, which flows through a portion of the project site, passes through an existing bridge culvert under Black Meadow Road at the Black Meadow Road - Shunoski Lane intersection. The majority of the project site is tributary to this design point. The stormwater from this point flows through the unnamed stream and is ultimately tributary the Black Meadow

Creek located approximately 0.5 miles downstream. (See Appendix 5 for Drainage Basin Mapping)

The second design point, identified in the HydroCAD model as Pond 2P, is defined as the point where an unnamed stream, which flows through the NYS DEC Wetland WR-18 in the eastern most portion of the project site, passes through an existing concrete headwall and box culvert under the Hudson & Lehigh Railroad tracks. The stormwater from this point flows through the unnamed stream and is ultimately tributary the Black Meadow Creek located approximately 0.5 miles downstream.

III. Existing Conditions

As previously mentioned, the Baroda Cluster Subdivision is located on the east side of Black Meadow Road, between its intersection with Shunoski Lane and Odyssey Drive in the Town of Chester, Orange County, New York.

The soils located within the studied drainage basins have been identified in accordance with the United States Department of Agriculture, Natural Resources Conservation Service National Cooperative Soil Survey. The site consists of soil from Hydrologic Soil Groups C and D. The soils located in the drainage study area are Alden silt loam, Bath-Nassau channery silt loam, Erie gravelly silt loam, Madalin silt loam, Mardin gravelly silt loam, Pits gravel, Raynham silt loam, Rhinebeck silt loam, and Rock outcrop – Nassau complex. (See Appendix 8 for further information on these particular soils).

The existing ground cover of the project parcel varies from abandoned farm row crops in the northern portion of the site, to open grassed fields in the southwestern portion of the site, and wooded areas on the steeper slopes in the southeastern portion of the parcel. The site is bisected by the gravel road known as Bairds Cross Road. The entire northern portion of the parcel in the area of the abandoned row crops is encompassed by federally regulated wetlands with an additional pocket of federally regulated wetlands being located within the tree line, east of the open grassed field. The eastern most portion of the parcel contains NYS DEC Wetland WR-18, the 100 foot adjacent area, and a 300' buffer for protection of a possible bog turtle habitat in this area.

Additionally, the project parcel contains a portion of the Federal Emergency Management Agency limits of the 1% annual flood (100-year flood) plain, Zone AE per the National Flood Insurance Program Map No. 36071C0458E dated August 3, 2009.

Topography on this site consists of slopes in the 0% to 10% range (54% of site), 10% to 15% (13% of site) and 15% or greater range (33% of site).

In accordance with the New York State Department of Environmental Conservation SPDES General Permit No. GP-0-15-002, New York State Office of Parks, Recreation and Historic Preservation (NYSOPRHP) has been contacted for information regarding the impact that the proposed project may have on any possible historic property

or archeology in the vicinity of the project. The initial correspondence with NYSOPRHP has been provided in Appendix 3. Consultation with NYSOPRHP will continue until a determination on possible impact is made.

In modeling the existing site for the drainage analysis, the drainage area was taken to consist of two (2) drainage basins on the proposed project parcel. The first existing drainage basin, identified in the HydroCAD Output as Subcatchment 1S, includes approximately 131.58± acres of land (see Appendix 5 for Drainage Basin Mapping). This area is made up of approximately 0.67 acres of gravel road from Bairds Cross Road, on Hydrologic Soils Group D, 1.56 acres of water surface from an existing pond on the project parcel, 45.60 acres of straight row crops in poor condition on Hydrologic Soils Group D, 32.84 acres of woods in good condition on Hydrologic Soils Groups C and D, and 50.91 acres of grass cover in good condition on Hydrologic Soils Groups C and D. The stormwater from this area generally flows from the higher elevations on the southern portion of the parcel, through an existing culvert under Bairds Cross Road, through the drainage ditches in the abandoned row crops, and to the unnamed stream flowing through the parcel to the previously defined Design Point 1.

The second existing drainage basin, identified in the HydroCAD Output as Subcatchment 2S, includes approximately 36.65± acres of land on the eastern portion of the parcel. This area is made up of approximately 0.50 acres of gravel road from Bairds Cross Road, on Hydrologic Soils Group D, 0.40 acres of water surface from an existing stream running through NYS DEC Wetland WR-18, 31.78 acres of woods in good condition on Hydrologic Soils Group D, 1.33 acres of wood/grass combination in good condition on Hydrologic Soils Group D, 2.81 acres of brush in good condition on Hydrologic Soils Group D, and 0.28 acres of grass cover in good condition on Hydrologic Soils Group D. The stormwater from this area generally flows from the higher elevations on the western portion of the subcatchment, through NYS DEC Wetland WR-18 and an existing an existing unnamed stream to the previously defined Design Point 2.

IV. Proposed Conditions

In modeling the project site for the proposed condition, the site was taken to consist of four (4) separate drainage basins.

The two additional drainage basins, Subcatchments 3S and 4S, have been created due to the proposed project improvements and stormwater infrastructure. Previously defined Subcatchment 1S has been reduced in size due to the proposed improvements. Previously defined Subcatchment 2S remains unchanged from the existing to the proposed condition.

Subcatchment 1S has been reduced in size and now contains approximately 107.06± acres of land. This area is now made up of approximately 0.79 acres of impervious area from proposed dwelling roof area and driveways, 0.46 acres of gravel road from Bairds Cross Road, on Hydrologic Soils Group D, 1.56 acres of water surface from an existing pond on the project parcel, 45.60 acres of straight row crops in poor

condition on Hydrologic Soils Group D, 31.66 acres of woods in good condition on Hydrologic Soils Groups C and D, and 27.13 acres of grass cover in good condition on Hydrologic Soils Groups C and D. This area continues to be tributary to the previously defined Design Point 1.

Subcatchment 3S, contains approximately 6.29± acres of land located to the west of Subcatchment 1S. This area consists of approximately 1.52 acres of proposed impervious area, 0.04 acres of gravel road from Bairds Cross Road, on Hydrologic Soils Group D, 0.35 acres of woods in good condition on Hydrologic Soils Groups C and D, and 4.38 acres of grass cover in good condition on Hydrologic Soils Groups C and D. The stormwater runoff from this area is collected by the proposed stormwater infrastructure and is directed to a stormwater control structure (Micropool Extended Detention Pond 3P) which will be discussed in the Stormwater Management section of this report. This basin outlets to a rip-rap stabilized pipe outlet and flows directly to the previously defined Design Point 1.

Subcatchment 4S, contains approximately 18.23± acres of land located on the southwest portion of the parcel, fronting on Black Meadow Road. This area consists of approximately 2.39 acres of proposed impervious area, 0.17 acres of gravel road from Bairds Cross Road, on Hydrologic Soils Group D, 0.11 acres of woods in good condition on Hydrologic Soils Group D, and 15.56 acres of grass cover in good condition on Hydrologic Soils Groups C and D. The stormwater runoff from this area is collected by the proposed stormwater infrastructure and is directed to a stormwater control structure (Micropool Extended Detention Pond 4P) which will be discussed in the Stormwater Management section of this report. This basin outlets to a rip-rap stabilized pipe outlet and flows directly to the previously defined Design Point 1.

V. Stormwater Management

As previously stated, one of the goals of the drainage design for this project is to ensure that there are no adverse impacts to downstream areas. To meet this goal, two (2) Type P-1 Micropool Extended Detention Ponds will be utilized to treat stormwater runoff and provide peak flow attenuation for the design point studied for the project. A HydroCAD TR-20 analysis was performed for both the existing and proposed conditions for the Channel Protection (1 year), Overbank Flood (10 year), and Extreme Storm (100 year) storm events to ensure that no adverse impacts will occur to downstream areas.

Proposed Micropool Extended Detention Pond 3P will collect the stormwater runoff from Subcatchment 3S, as defined in the Proposed Conditions above. This pond has been chosen due to the soils investigation performed in analyzing the project site for stormwater management design. The Micropool Extended Detention Pond has been designed in accordance with Section 6.1 of the New York State Stormwater Management Design Manual to provide the required Pretreatment, low flow channel, Permanent Pool Water Quality volume, and Extended Detention volume. The pond has been designed with 4 horizontal to 1 vertical (4:1) interior side slopes, a 10' wide aquatic bench, and a bottom elevation of the forebay and permanent pool of 472'. The Extended Detention

Pond requires that a minimum of 20 percent of the water quality volume be provided by the permanent pool, while the extended detention is utilized to provide a maximum of 80 percent of the water quality volume. The pond has been designed to utilize the permanent pool for 100% of the water quality volume, while utilizing Proposed Outlet Control Structure 3P to provide the required detention of the Channel Protection storm event. The Channel Protection storm event will be addressed by providing the appropriate release rate of 0.32 cfs to meet Channel Protection requirements. The pond will also provide stormwater attenuation of the larger design storms by utilizing the proposed outlet control structure. The basin has been designed to include one (1) emergency overflow consisting of a 20 foot wide weir in the downhill berm of the basin. The basin will outlet to a stabilized outfall tributary to Design Point 1.

Proposed Micropool Extended Detention Pond 4P will collect the stormwater runoff from Subcatchment 4S, as defined in the Proposed Conditions above. This pond has also been chosen due to the soils investigation performed in analyzing the project site for stormwater management design. Micropool Extended Detention Pond 4P has been designed in accordance with Section 6.1 of the New York State Stormwater Management Design Manual to provide the required Pretreatment, low flow channel, Permanent Pool Water Quality volume, and Extended Detention volume. The pond has been designed with 4 horizontal to 1 vertical (4:1) interior side slopes, a 10' wide aquatic bench, and a bottom elevation of the forebay and permanent pool of 470'. As with Micropool Extended Detention Pond 3P, the pond has been designed to utilize the permanent pool for 100% of the water quality volume, while utilizing Proposed Outlet Control Structure 3P to provide the required detention of the Channel Protection storm event. The Channel Protection storm event will be addressed by providing the appropriate release rate of 0.84 cfs to meet Channel Protection requirements. The pond will also provide stormwater attenuation of the larger design storms by utilizing the proposed outlet control structure, and a 30 foot wide rip-rapped broad-crested weir in the downhill berm of the basin. The basin will outlet to a stabilized outfall tributary to Design Point 1.

As can be seen in the following table, the proposed peak flow runoff from the project site has been mitigated to ensure that no adverse impacts will occur at the design points studied from the Channel Protection (1 year), Overbank Flood (10 year), and Extreme Storm (100 year) storm events due to the proposed project's construction. (See Appendix 6 and 7 for HydroCAD output)

Design Point 1 (Pond 1P)				
Storm Event	Pre-Developed Peak Flow (cfs) Q out	Post-Developed Peak Flow (cfs) Q out	Change (cfs)	Change (%)
1 Year	99.17	86.41	-12.76	-12.87
10 Year	252.66	245.23	-7.43	-2.94
100 Year	534.35	513.97	-20.38	-3.81

Design Point 2 (Pond 2P)				
Storm Event	Pre-Developed Peak Flow (cfs) Q out	Post-Developed Peak Flow (cfs) Q out	Change (cfs)	Change (%)
1 Year	22.80	22.80	0.00	0.00
10 Year	70.02	70.02	0.00	0.00
100 Year	163.50	163.50	0.00	0.00

Additionally, the tables below have been provided showing the water surface elevations in the proposed Micropool Extended Detention Ponds. The elevations presented in these tables illustrate the results of the analysis for the 1, 10, and 100 year design storms. The elevations indicate that a minimum of 1 foot of freeboard has been provided in each pond to protect against overtopping.

Proposed P-1 Micropool Extended Detention Pond 3P		
Storm Event	Post-Developed Peak Water Surface Elevation	Freeboard (ft.) (Pond Top at 482.00')
1 Year	479.59	2.41
10 Year	480.39	1.61
100 Year	480.97	1.03

Proposed P-1 Micropool Extended Detention Pond 4P		
Storm Event	Post-Developed Peak Water Surface Elevation	Freeboard (ft.) (Pond Top at 482.00')
1 Year	479.75	2.25
10 Year	480.42	1.58
100 Year	480.95	1.05

VI. Storm Water Quality and Runoff Reduction

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

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

Step one of the planning process includes the preservation of natural features and reduction of impervious covers. This goal has been accomplished by creating a Cluster or Conservation type subdivision, reducing the required lot size from 3 acres to 32,760 square feet. Creating a cluster type subdivision allows the project to reduce the linear feet of required roadway to access the proposed lots and dwellings, as well as allow the project to be located in the less sensitive open grassed field area of the parcel, enabling the conservation of the existing wooded area, federal and state regulated wetland areas, and the steeper sloped areas of the site. Last, the required setback lines have been reduced, allowing for shorter driveways, eliminating impervious surface.

Step two of the planning process was then completed and the Water Quality Volume (WQv) was calculated for the project site using the criteria in Chapter 4 of the Stormwater Management Design Manual. The Water Quality Volume calculated for the proposed project is 1.454 acre-feet.

Step three of the process involves Runoff Reduction by incorporating the Runoff Reduction Techniques and Standard SMPs with RRv capacity outlined in the SMDM. The minimum Runoff Reduction Volume was then calculated utilizing the Specific Reduction Factor of the existing soil types located on the project site using the criteria in Chapter 4 of the design manual. The minimum RRv calculated for this project is 0.106 acre-feet. (See Appendix 9 for Calculations and Supporting Data)

Conservation of Natural Areas is proposed to be utilized by placing a conservation easement over a large portion of the project parcel, including the existing federally regulated and NYS DEC regulated wetlands located on the project site. The proposed easement is 124.45± acres in size, and will provide 0.716 acre-feet of runoff reduction volume.

Tree Planting Technique in accordance with Section 5.3.4 of the SMDM is proposed to be utilized as an area reduction technique. The total number of applicable proposed tree planting is 130 trees, providing an area reduction of 0.30 acres. The Tree Planting Technique will provide 0.033 acre-feet of runoff reduction volume.

The Disconnection of Rooftop Runoff is proposed to be utilized for Lots 1, 2, 9, 10, 13, 14, 15, 16, and 29, for a total of 9 rooftops. The roof drains from each roof will outlet to a small stone level spreader and allow the stormwater to run over landscaped lawn and natural area in accordance with Section 5.3.5 of the SMDM. This practice will provide an area reduction of 0.36 acres. The Disconnection of Rooftop Runoff Technique will provide 0.037 acre-feet of runoff reduction volume.

Utilizing Step three of the design process, the Runoff Reduction Volume provided for the project is 0.786 acre-feet, which exceeds the minimum required RRv of 0.106 acre-feet. Based on the soils analysis for possible infiltration and shallow boundary layer, as well as other site limitations located throughout the other portions of the site, the project requires the use of a Standard SMP to address the remaining Water Quality Volume required to be addressed, which is Step four of the design process.

Two P-1 Micropool Extended Detention Ponds have been selected as the best Standard Management Practice to address the remaining required WQv. Each proposed Micropool Extended Detention Pond has been proposed to contain a pretreatment forebay which is 10% of the Water Quality Volume, as required by the SMDM. Additionally, each pond has been designed to provide 100 percent of the Water Quality Volume in the permanent pool, to properly treat the stormwater runoff. The total Water Quality Treatment provided by both proposed ponds is 0.751 acre-feet.

The total Water Quality Volume provided by the proposed design is 1.537 acre-feet, which exceeds the required Water Quality Volume of 1.454 acre-feet.

Step five of the process involves applying Volume and Peak Rate Control Practices. The downstream channel protection has been provided within the proposed Micropool Extended Detention Ponds above the water quality volume, by 24 hours of extended storage for the one year, 24 hour storm event. The outflow from the pond for this storm event has been designed such that runoff will be discharged over a 24 hour period after the design storm event.

The Overbank Flood (10 year storm event) and the Extreme Storm (100 year storm event) are addressed in the Stormwater Management Section of this report.

VII. Erosion and Sediment Control

Full erosion and sediment control measures will be incorporated into the project construction. These practices will be in accordance with the requirements set forth in the most recent revision of the New York State Department of Environmental Conservation

publication entitled "New York State Standards and Specifications for Erosion and Sediment Control".

Erosion Control Measures:

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

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

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

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

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

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

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

- Sediment Traps:
  Sediment traps shall be constructed in the location of the proposed P-1 ponds on the approved plan set, and be of size and type specified to collect sediment from sediment laden stormwater runoff. Sediment traps shall be constructed downstream of disturbed areas and be in place prior to disturbance within the contributory area.

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

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

Erosion Control Sequence

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

- Prior to commencing construction activities, the limits of clearing and grading shall be clearly marked. Perimeter silt fence and stabilized construction entrances shall be put in place.

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

- Temporary erosion control devices shall be installed prior to commencing earth moving activities. This includes the installation of sediment traps,

diversion swales, and check dams (if any) beginning at the most downstream portions of the site and then working upstream.

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

Maintenance of Erosion Control Devices

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

Specific maintenance shall include:

- Maintaining seeded areas including reseeding weak areas, regrading wash outs and fertilizing.
- Maintaining mulched areas including replacement of disturbed mulched areas.
- All devices shall be inspected after each rain and repaired as needed.
- Sediment shall be removed from behind silt fence when bulges start to occur and fencing reset to original condition.
- Outlets in sediment basins shall be free of silt and debris by hand raking and cleaning after each rain storm.
- Construction equipment shall not unnecessarily cross drainage swales. Crossing of drainage channels shall be by means of bridges, culverts or other approved methods.
- Culverts shall be maintained free of silt or debris.
- Tree protection fencing to be inspected daily during grading and finish grading operations.

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

It should be noted that work associated with erosion control and erosion control maintenance may change during the process of job construction. Additional erosion control requirements may need to be implemented as conditions may arise in the field or as directed by Village representatives or the consulting engineer.

Removal of Erosion Control Devices:

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

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

- After construction, the temporary erosion control structures are to be removed in reverse order with the most upstream structure removed first and thence proceeding downstream.
- All hay bales (if any) shall be removed and properly disposed of off-site.
- All tree protection fencing shall be removed after adjacent areas have been graded, topsoiled, seeded, and vegetation has been established.
- All temporary construction culverts shall be removed and areas graded, topsoiled, and seeded.
- Any washouts shall be re-topsoiled and seeded.

VIII. Stormwater Infrastructure Maintenance:

Long term maintenance of all drainage swales, drainage pipes and treatment devices will be the responsibility of the Town of Chester once the project is completed and the public improvements are dedicated to the Town.

Long term maintenance shall include the following:

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

- Evidence of clogging
- Erosion of the flow path
- Condition of the embankments
- Condition of any spillways
- Accumulation of sediment at the culvert, outlet structure, and catch basin inlets and outlets, and in the proposed swales (if any)
- Accumulation of sediment in the pretreatment area of infiltration basins
- Sources of erosion in the contributory drainage, which should be stabilized.

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

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

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

Spill Prevention: The discharge of pollutants from spills and leaks shall be prevented. Any spill shall be reported to the New York State Spill Hotline (1-800-457-7362). Federal and State law require the spiller, or responsible party, to notify government agencies and to contain, clean up, and dispose of any spilled/contaminated material in order to correct any environmental damage.

IX. Pipe Analysis

Stormwater management for the Baroda Cluster Subdivision project will be accomplished via a network of pipes and treatment facilities. In sizing the drainage pipes, a pipe analysis was performed using the Rational Method to study all drainage areas tributary to the piping network. In performing the Rational Method analysis, the values

of the runoff coefficient (C) were taken to be 0.9 for all impervious areas and 0.3 for all pervious areas. A rainfall intensity of 6.0 inches per hour was used, as taken from the Northeast Regional Climate Center Rainfall Intensity Frequency Duration Curves for the 25 year storm event. A time of concentration of 10 minutes has been utilized.

MWS
14118.01 SWPPP
02-2018

APPENDIX

Appendix 1

Stormwater Pollution Prevention Plan (SWPPP) Certifications

I. Owner/Operator Information:

PROJECT:	Baroda Cluster Subdivision
LOCATION:	Town of Chester Orange County, New York
RECORD APPLICANT:	B D R Group, LLC
APPLICANT ADDRESS:	P.O. Box 259 Garnerville, New York 10923
PROJECT SITE ADDRESS:	Bairds Cross Road Chester, New York 10918

II. Certifications:

Contractor and Subcontractor Certification:

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

Contractor responsible for project oversight:

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

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

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

Additional Subcontractors and responsibility:

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

Appendix 2

MS4 Stormwater Pollution Prevention (SWPPP) Acceptance Form

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

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

MS4 Stormwater Pollution Prevention Plan (SWPPP) Acceptance Form

for

Construction Activities Seeking Authorization Under SPDES General Permit

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

I. Project Owner/Operator Information	
1. Owner/Operator Name:	B D R Group, LLC
2. Contact Person:	
3. Street Address:	P.O. Box 259
4. City/State/Zip:	Garnerville, New York 10923
II. Project Site Information	
5. Project/Site Name:	Baroda Cluster Subdivision
6. Street Address:	Bairds Cross Road
7. City/State/Zip:	Chester, New York, 10918
III. Stormwater Pollution Prevention Plan (SWPPP) Review and Acceptance Information	
8. SWPPP Reviewed by:	
9. Title/Position:	
10. Date Final SWPPP Reviewed and Accepted:	
IV. Regulated MS4 Information	
11. Name of MS4:	
12. MS4 SPDES Permit Identification Number: NYR20A	
13. Contact Person:	
14. Street Address:	
15. City/State/Zip:	
16. Telephone Number:	

MS4 SWPPP Acceptance Form - continued

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

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

Printed Name:

Title/Position:

Signature:

Date:

VI. Additional Information

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

Appendix 3

New York State Parks, Recreation, and Historic Preservation Correspondence

NEW YORK
STATE OF
OPPORTUNITY.

Parks, Recreation,
and Historic Preservation

ANDREW M. CUOMO
Governor

ROSE HARVEY
Commissioner

January 25, 2018

Mr. Mark Siemers, P.E.
Pietrzak & Pfau, PLLC
262 Greenwich Ave., Suite A
Goshen, NY 10924

Re: DEC
Baroda Cluster Subdivision
Town of Chester, Orange County, NY
18PR00389

Dear Mr. Siemers:

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

Based on available information, this project is located in an archaeologically sensitive area. Therefore, OPRHP recommends that a Phase I archaeological survey is warranted for all portions of the project that will involve ground disturbance, unless substantial prior ground disturbance can be documented. If you consider the project area to be disturbed, documentation of the disturbance will need to be reviewed by OPRHP. Examples of disturbance include mining activities and multiple episodes of building construction and demolition.

Documentation of ground disturbance should include a description of the disturbance with confirming evidence. Confirmation can include current photographs and/or older photographs of the project area which illustrate the disturbance (approximately keyed to a project area map), past maps or site plans that accurately record previous disturbances, or current soil borings that verify past disruptions to the land. Agricultural activity is not considered to be substantial ground disturbance and many significant sites have been identified in previously cultivated land.

Please note that in areas with alluvial soils or fill archaeological deposits may exist below the depth of superficial disturbances, such as pavement or even deeper disturbances, depending on the thickness of the alluvium or fill. Evaluation of the possible impact of prior disturbance on archaeological sites must consider the depth of potentially culture-bearing deposits and the depth of planned disturbance by the proposed project.

Also, please note that wetlands may have areas of higher elevation that were suitable for habitation and/or the staging of temporary resource procurement camps. In addition, past

climatic variations or modern changes in hydrology may have inundated areas formerly available for occupation.

A Phase I survey is designed to determine the presence or absence of archaeological sites or other cultural resources in the project's area of potential effect. The OPRHP can provide standards for conducting cultural resource investigations upon request. Cultural resource surveys and survey reports that meet these standards will be accepted and approved by the OPRHP.

Our office does not conduct cultural resources surveys. A 36 CFR 61 qualified archaeologist should be retained to undertake the Phase I survey. Many archaeological consulting firms advertise their availability in the yellow pages. The services of qualified archaeologists can also be obtained by contacting local, regional, or statewide professional archaeological organizations. Phase I surveys can be expected to vary in cost per mile of right-of-way or by the number of acres impacted. We encourage you to contact a number of consulting firms and compare examples of each firm's work to obtain the best product.

Please also be aware that a Section 233 permit from the New York State Education Department (SED) may be necessary before any archaeological survey activities are conducted on State-owned land. If any portion of the project includes the lands of New York State you should contact the SED before initiating survey activities. The SED contact is Christina B. Rieth and she can be reached at (518) 402-5975. Section 233 permits are not required for projects on private land.

This office has no concerns regarding architectural resources for this project.

If you have any questions, please don't hesitate to contact me.

Sincerely,

Philip A. Perazio, Historic Preservation Program Analyst - Archaeology Unit
Phone: 518-268-2175
e-mail: philip.perazio@parks.ny.gov via email only

Appendix 4

Draft Notice of Intent

0644089821

NOTICE OF INTENT

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

NYR ☐☐☐☐☐☐
(for DEC use only)

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

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

-IMPORTANT-

RETURN THIS FORM TO THE ADDRESS ABOVE

OWNER/OPERATOR **MUST SIGN FORM**

Owner/Operator Information

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

Owner/Operator Contact Person Last Name (NOT CONSULTANT)

Owner/Operator Contact Person First Name

Owner/Operator Mailing Address

City

State ☐☐ Zip ☐☐☐☐☐ - ☐☐☐☐

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

Fax (Owner/Operator) ☐☐☐ - ☐☐☐ - ☐☐☐☐

Email (Owner/Operator)

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

Project Site Information

Project/Site Name
Baroda Cluster Subdivision

Street Address (NOT P.O. BOX)
Bairds Cross Road

Side of Street
○ **North** ● **South** ○ **East** ○ **West**

City/Town/Village (THAT ISSUES BUILDING PERMIT)
Town of Chester

State: NY Zip: 10924- County: Orange DEC Region: 3

Name of Nearest Cross Street
Black Meadow Road

Distance to Nearest Cross Street (Feet)
0

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

Tax Map Numbers
Section-Block-Parcel
12-1-31

Tax Map Numbers

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

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

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

X Coordinates (Easting): 559077

Y Coordinates (Northing): 4576266

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: 29
- ○ TOWN HOME RESIDENTIAL
- ○ MULTIFAMILY RESIDENTIAL
- ○ INSTITUTIONAL/SCHOOL
- ○ INDUSTRIAL
- ○ COMMERCIAL
- ○ MUNICIPAL
- ○ ROAD/HIGHWAY
- ○ RECREATIONAL/SPORTS FIELD
- ○ BIKE PATH/TRAIL
- ○ LINEAR UTILITY (water, sewer, gas, etc.)
- ○ PARKING LOT
- ○ CLEARING/GRADING ONLY
- ○ DEMOLITION, NO REDEVELOPMENT
- ○ WELL DRILLING ACTIVITY *(Oil, Gas, etc.)
- ○ OTHER

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

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

Total Site Area	Total Area To Be Disturbed	Existing Impervious Area To Be Disturbed	Future Impervious Area Within Disturbed Area
168.2	31.9	0.0	4.7

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
0 %	0 %	6 %	94 %

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

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

Start Date ___ / ___ / ____ – **End Date** ___ / ___ / ____

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

Name

On Site Federally Regulated Wetlands

9a. Type of waterbody identified in Question 9?

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

9b. How was the wetland identified?

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

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

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

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

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

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

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

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

Town of Chester

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

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

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

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

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

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

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

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

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

SWPPP Preparer

Pietrzak & Pfau, PLLC

Contact Name (Last, Space, First)

Pfau, Joseph

Mailing Address

262 Greenwich Avenue, Suite A

City

Goshen

State NY Zip 10924-

Phone 845-294-0606 Fax 845-294-0610

Email

pietrzakpfau@pietrzakpfau.com

SWPPP Preparer Certification

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

First Name Joseph **MI** J

Last Name Pfau

Signature

Date / /

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

Slope Stabilization Blankets

Post-construction Stormwater Management Practice (SMP) Requirements

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

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

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

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

- ● All disturbed areas will be restored in accordance with the Soil Restoration requirements in Table 5.3 of the Design Manual (see page 5-22).

- ○ Compacted areas were considered as impervious cover when calculating the **WQv Required**, and the compacted areas were assigned a post-construction Hydrologic Soil Group (HSG) designation that is one level less permeable than existing conditions for the hydrology analysis.

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

Total WQv Required

		1	.	4	5	4	**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)	124.45	and/or	00.00
○ Sheetflow to Riparian Buffers/Filters Strips (RR-2)		and/or	
● Tree Planting/Tree Pit (RR-3)		and/or	0.30
● Disconnection of Rooftop Runoff (RR-4)		and/or	0.36
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)			4.04
○ Wet Pond (P-2)			
○ Wet Extended Detention (P-3)			
○ Multiple Pond System (P-4)			
○ Pocket Pond (P-5)			
○ Surface Sand Filter (F-1)			
○ Underground Sand Filter (F-2)			
○ Perimeter Sand Filter (F-3)			
○ Organic Filter (F-4)			
○ Shallow Wetland (W-1)			
○ Extended Detention Wetland (W-2)			
○ Pond/Wetland System (W-3)			
○ Pocket Wetland (W-4)			
○ Wet Swale (O-2)			

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

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

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

Name

Manufacturer

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

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

Total RRv provided

0.786 **acre-feet**

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

○ **Yes** ● **No**

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

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

Minimum RRv Required

0.106 **acre-feet**

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

● **Yes** ○ **No**

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

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

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

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

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

WQv Provided

0.751 **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).

1.537

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

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

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

CPv Required

2.312 **acre-feet**

CPv Provided

2.312 **acre-feet**

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

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

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

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

Total Overbank Flood Control Criteria (Qp)

Pre-Development

322.68 **CFS**

Post-development

315.25 **CFS**

Total Extreme Flood Control Criteria (Qf)

Pre-Development

697.85 **CFS**

Post-development

677.47 **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

Town of Chester

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.

A soils investigation of the project parcel was conducted in conjunction with the development of the SWPPP. Based on this investigation, the site soils are insufficient for stormwater infiltration practices, and have shallow boundary conditions in the area of the stormwater management facilities, which eliminate many of the RRv practices outlined in the Stormwater Management Design Manual. Due to these limitations, approximately 54% of the WQv and over 7 times the minimum required RRv was provided through area reduction techniques, such as conservation area, tree planting, and disconnection of rooftop runoff. The remaining WQv is provided within the two (2) P-1 Micropool Extended Detention Ponds located on the project site.

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

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

41. Does this project require a US Army Corps of Engineers Wetland Permit? ○ **Yes** ● **No**
If Yes, Indicate Size of Impact. [| | | | 0 . 1]

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

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

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

Owner/Operator Certification

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

Print First Name

MI

Print Last Name

Owner/Operator Signature

Date / /

Appendix 5

Drainage Basin Maps

LEGEND

----------	TIME OF CONCENTRATION SHEET FLOW
----·---·---·	TIME OF CONCENTRATION SHALLOW CONCENTRATED FLOW
·····	TIME OF CONCENTRATION CHANNEL FLOW
▭	DRAINAGE BASIN BOUNDARY
SUBCATCHMENT 1S 19.37± ACRES	DRAINAGE BASIN LABEL
▭	EXISTING SOIL LINE BOUNDARY
MdC	EXISTING SOIL LABEL
1P	DESIGN POINT DESIGNATION

EXISTING CONCRETE HEADWALL W/ ARCHED METAL CULVERT PIPE

EXISTING 24" CIP

EXISTING STREAM

N/F EIGHTEEN-EIGHT GROUP, LLC SECTION 8, BLOCK 1, LOT 102

EXISTING STREAM

TOP OF N.Y.S.D.E.C. WETLAND

EXISTING 30" CIP

EXISTING 48" CMP

100' ADJACENT AREA

LIMITS OF 100 YEAR FLOOD PLAIN ZONE AE PER NATIONAL FLOOD INSURANCE PROGRAM MAP NUMBER 36071C0488E, EFFECTIVE DATE OF AUGUST 3, 2009

EXISTING STREAM

EX. CONCRETE HEADWALL

FEDERAL WETLANDS AREA "A"= 43.30 ACRES

EXISTING 18" HDPE

EXISTING 18" CIP

EXISTING 36" CIP

RIDGE PRESERVATION OVERLAY DISTRICT ELEVATION=500'

EX. CONCRETE HEADWALL

EXISTING 36" CIP

N/F OCRANE PROPERTIES, LLC SECTION 7, BLOCK 1, LOT 45.12

EX. CONCRETE HEADWALL

2P

SUBCATCHMENT 1S
131.58± ACRES

SUBCATCHMENT 2S
36.65± ACRES

FEDERAL WETLANDS AREA "F"= 3.61 ACRES

TIME OF CONCENTRATION PATH (TY)

100' ADJACENT AREA

LIMITS OF N.Y.S.D.E.C. WETLAND TR-18

HUDSON RIVER VALLEY GREENWAY

N/F NORFOLK SOUTHERN CORP. SECTION 7, BLOCK 1, LOT 44

N/F HARTEL SECTION 12, BLOCK 1, LOT 71

N/F CALZADA SECTION 12, BLOCK 1, LOT 70

N/F ANDRICI SECTION 12, BLOCK 1, LOT 69

N/F DUGGAN SECTION 12, BLOCK 1, LOT 66

N/F COTSIS SECTION 12, BLOCK 1, LOT 65

N/F TOWN OF CHESTER SECTION 13, BLOCK 1, LOT 86.23

N/F TOWN OF CHESTER SECTION 13, BLOCK 1, LOT 1.221

2-07-18	ORIGINAL PREPARATION DATE	MWS
DATE	DESCRIPTION	INITIALS
	REVISIONS	
MAP CHECK DATE: 00/00/00	INITIALED BY: -_-	

PIETRZAK & PFAU
ENGINEERING & SURVEYING, PLLC
282 GREENWICH AVENUE, SUITE A
GOSHEN, NEW YORK 10924
(845) 294-3600

JOSEPH J. PFAU P.E. LICENSE NO. 068945
MICHAEL E. CORRIGAN P.L.S. LICENSE NO. 050025
VINCENT A. PIETRZAK P.E., P.L.S., LEED AP
P.E. LICENSE NO. 076936
P.L.S. LICENSE NO. 050075
N.J.P.L.S. LICENSE NO. 35386

SIGNATURE _____ DATE _____

BARODA CLUSTER SUBDIVISION

TOWN OF CHESTER
COUNTY OF ORANGE, NEW YORK

PROJECT TITLE

DRAINAGE BASIN MAP EXISTING CONDITIONS

SECTION 12, BLOCK 1, LOT 31

DRAWING TITLE

O.C.H.D. SHEET NO	D.E.C. SHEET NO	DRAWING NUMBER
N/A OF 4	N/A OF 4	1 OF 2
SCALE 1"=300'	CAD REFERENCE WORKING	PROJECT NUMBER 14118.01

LEGEND

- TIME OF CONCENTRATION SHEET FLOW
- TIME OF CONCENTRATION SHALLOW CONCENTRATED FLOW
- TIME OF CONCENTRATION CHANNEL FLOW
- DRAINAGE BASIN BOUNDARY
- SUBCATCHMENT 1S, 19.37± ACRES — DRAINAGE BASIN LABEL
- EXISTING SOIL LINE BOUNDARY
- MdC — EXISTING SOIL LABEL
- 1P — DESIGN POINT DESIGNATION

EXISTING CONCRETE HEADWALL W/ ARCHED METAL CULVERT PIPE

EXISTING 24" CIP

EXISTING STREAM

N/F EIGHTEEN-EIGHT GROUP, LLC SECTION 6 BLOCK 1 LOT 102

EDGE OF NYSDEC WETLANDS

EXISTING 48" CMP

100' ADJACENT AREA

EXISTING 30" CIP

LIMITS OF 100 YEAR FLOOD PLAIN ZONE AE PER NATIONAL FLOOD INSURANCE PROGRAM MAP NUMBER 36071C0408E, EFFECTIVE DATE OF AUGUST 3, 2009

EXISTING POND

FEDERAL WETLANDS AREA "A" = 43.30 ACRES

EX. CONCRETE HEADWALL

EXISTING 18" HDPE

EXISTING 18" CIP

EXISTING 36" CIP

RIDGE PRESERVATION OVERLAY DISTRICT ELEVATION=500'

SAUERS CROSS ROAD

SUBCATCHMENT 4S, 18.23± ACRES

SUBCATCHMENT 1S, 107.06± ACRES

SUBCATCHMENT 2S, 36.65± ACRES

SUBCATCHMENT 3S, 6.29± ACRES

FEDERAL WETLANDS AREA "B" = 3.61 ACRES

TIME OF CONCENTRATION PATH (Tt)

100' ADJACENT AREA

LIMITS OF N.Y.S.D.E.C. WETLAND WB-16

EX. CONCRETE HEADWALL

EXISTING 36" CIP

2P

EX. CONCRETE HEADWALL

N/F OCEANE PROPERTIES, LLC SECTION 7 BLOCK 1 LOT 45.12

HUDSON VALLEY RAILROAD

N/F NORFOLK SOUTHERN CORP SECTION 7 BLOCK 1 LOT 44

N/F HARTEL SECTION 12 BLOCK 1 LOT 71

N/F CALZADA SECTION 12 BLOCK 1 LOT 70

N/F ANDRICI SECTION 12 BLOCK 1 LOT 69

N/F DUGGAN SECTION 12 BLOCK 1 LOT 66

N/F COTSIS SECTION 12 BLOCK 1 LOT 65

N/F TOWN OF CHESTER SECTION 13 BLOCK 1 LOT 88.23

N/F TOWN OF CHESTER SECTION 13 BLOCK 1 LOT 1.221

2-07-18	ORIGINAL PREPARATION DATE	MWS
DATE	DESCRIPTION	INITIALS
	REVISIONS	
MAP CHECK DATE: 00/00/00	INITIALED BY: --.-	

PIETRZAK & PFAU
ENGINEERING & SURVEYING, PLLC
282 GREENWICH AVENUE, SUITE A
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JOSEPH J. PFAU P.E. LICENSE NO. 069845
MICHAEL F. CREEGAN P.L.S. LICENSE NO. 050023
VINCENT A. PIETRZAK P.E. P.L.S. LEED AP
P.E. LICENSE NO. 076236
P.L.S. LICENSE NO. 050075
N.J.P.L.S. LICENSE NO. 35396

SIGNATURE _____ DATE _____

BARODA CLUSTER SUBDIVISION

TOWN OF CHESTER
COUNTY OF ORANGE, NEW YORK

PROJECT TITLE

DRAINAGE BASIN MAP PROPOSED CONDITIONS

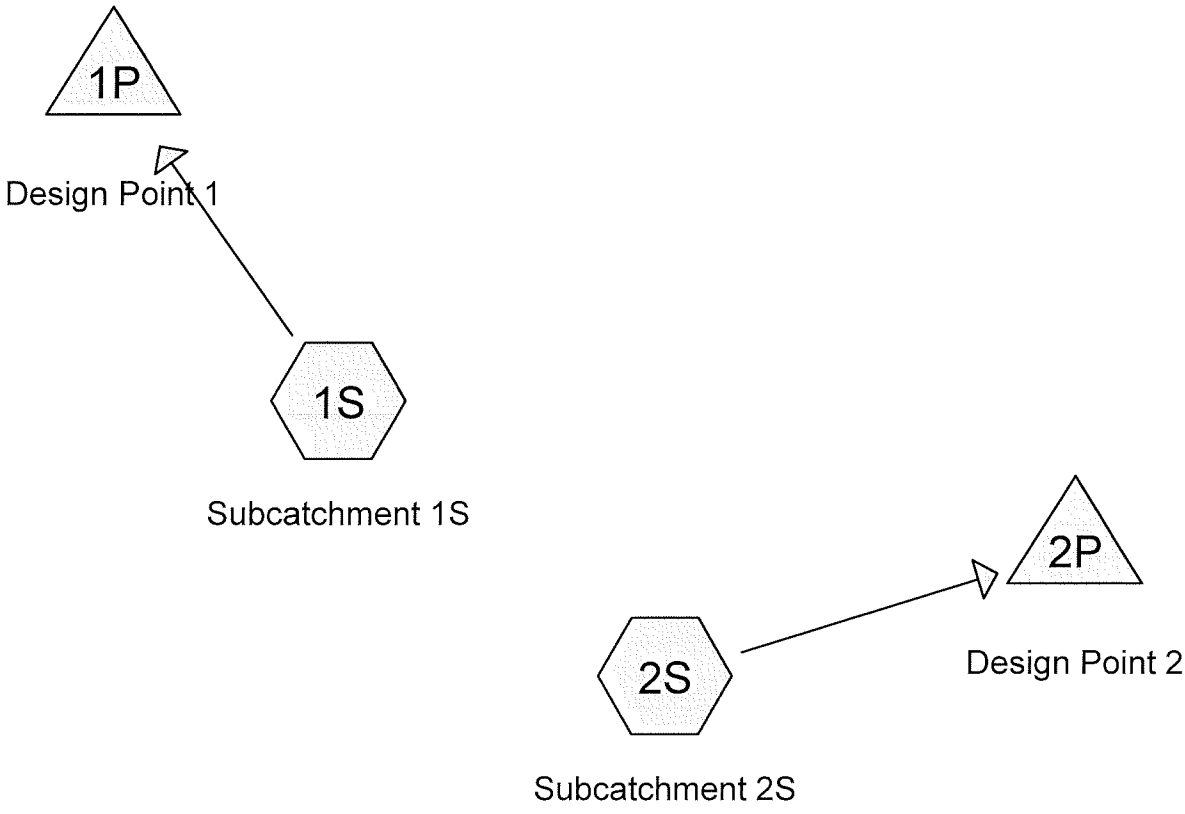
SECTION 12, BLOCK 1, LOT 31

DRAWING TITLE

O.C.H.D. SHEET NO	D.E.C. SHEET NO	DRAWING NUMBER
N/A OF #	N/A OF #	2 OF 2
SCALE 1"=300'	CAD REFERENCE WORKING	PROJECT NUMBER 14118.01

Appendix 6

TR-20 Hydro-CAD Calculations – Existing Conditions



Subcat Reach Pond Link

Drainage Diagram for 14118.01 Existing Conditions
Prepared by {enter your company name here} 2/23/2018

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcatchment 1S Runoff Area=131.580 ac Runoff Depth=1.15"
Flow Length=4,613' Tc=30.6 min CN=83 Runoff=99.17 cfs 12.657 af

Subcatchment 2S: Subcatchment 2S Runoff Area=36.650 ac Runoff Depth=0.83"
Flow Length=1,688' Tc=19.3 min CN=77 Runoff=22.80 cfs 2.520 af

Pond 1P: Design Point 1 Inflow=99.17 cfs 12.657 af
Primary=99.17 cfs 12.657 af

Pond 2P: Design Point 2 Inflow=22.80 cfs 2.520 af
Primary=22.80 cfs 2.520 af

Total Runoff Area = 168.230 ac Runoff Volume = 15.177 af Average Runoff Depth = 1.08"

Subcatchment 1S: Subcatchment 1S

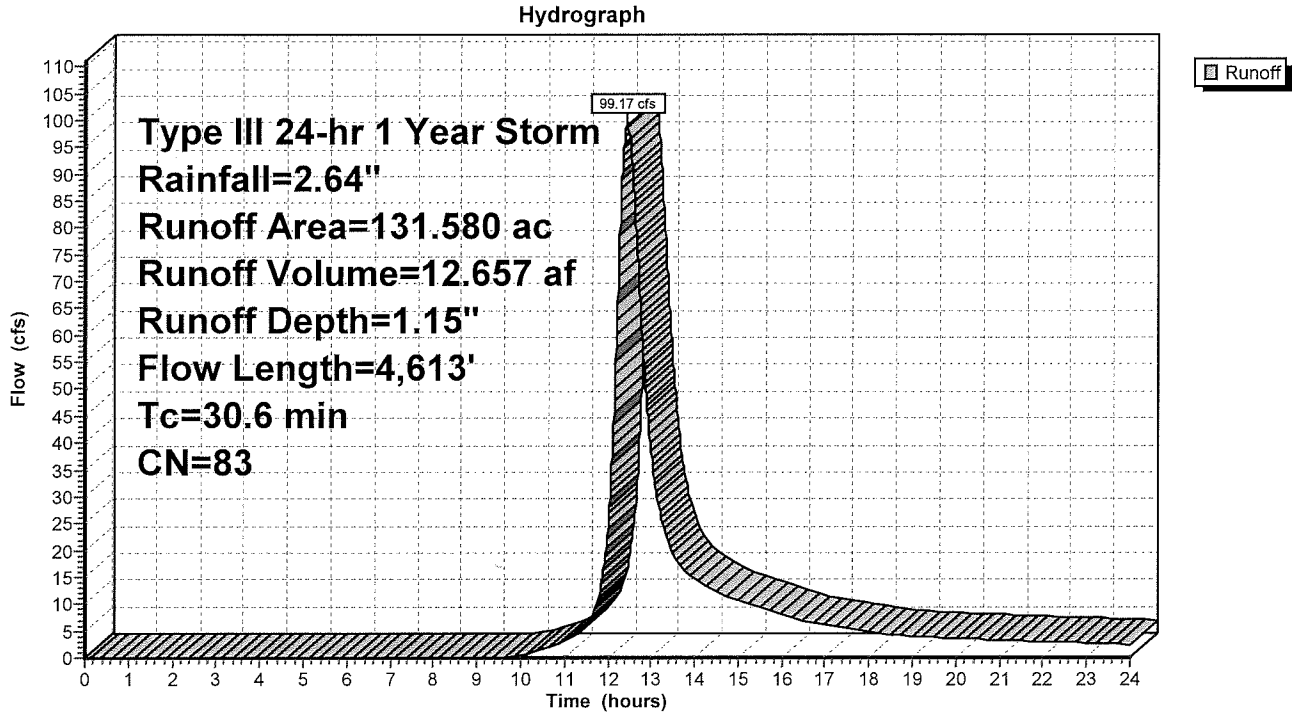
Runoff = 99.17 cfs @ 12.44 hrs, Volume= 12.657 af, Depth= 1.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 Year Storm Rainfall=2.64"

Area (ac)	CN	Description
0.670	91	Gravel roads, HSG D
1.560	98	Water Surface
45.600	91	Row crops, straight row, Poor, HSG D
4.180	70	Woods, Good, HSG C
28.660	77	Woods, Good, HSG D
5.620	74	>75% Grass cover, Good, HSG C
45.290	80	>75% Grass cover, Good, HSG D
131.580	83	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.1123	0.2		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.7	1,860	0.1157	5.5		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	41	0.0500	21.1	149.14	**Circular Channel (pipe),** Diam= 36.0" Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
14.1	2,612	0.0071	3.1	49.37	**Channel Flow,** Area= 16.0 sf Perim= 11.7' r= 1.37' n= 0.050
30.6	4,613	Total			

Subcatchment 1S: Subcatchment 1S



Subcatchment 2S: Subcatchment 2S

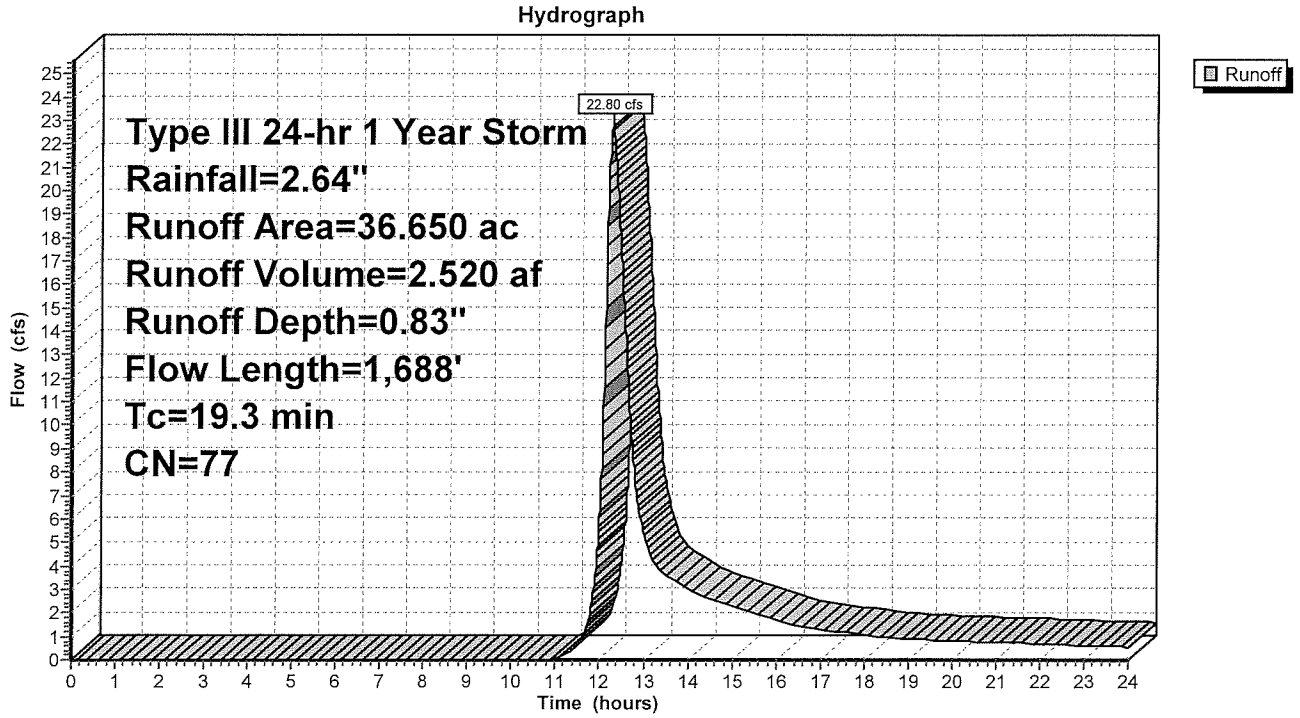
Runoff = 22.80 cfs @ 12.29 hrs, Volume= 2.520 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 Year Storm Rainfall=2.64"

Area (ac)	CN	Description
0.050	91	Gravel roads, HSG D
0.400	98	Water Surface
31.780	77	Woods, Good, HSG D
1.330	79	Woods/grass comb., Good, HSG D
2.810	73	Brush, Good, HSG D
0.280	80	>75% Grass cover, Good, HSG D
36.650	77	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	100	0.0857	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
2.2	1,024	0.2267	7.7		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.1	564	0.0025	1.8	29.29	**Channel Flow,** Area= 16.0 sf Perim= 11.7' r= 1.37' n= 0.050
19.3	1,688	Total			

Subcatchment 2S: Subcatchment 2S

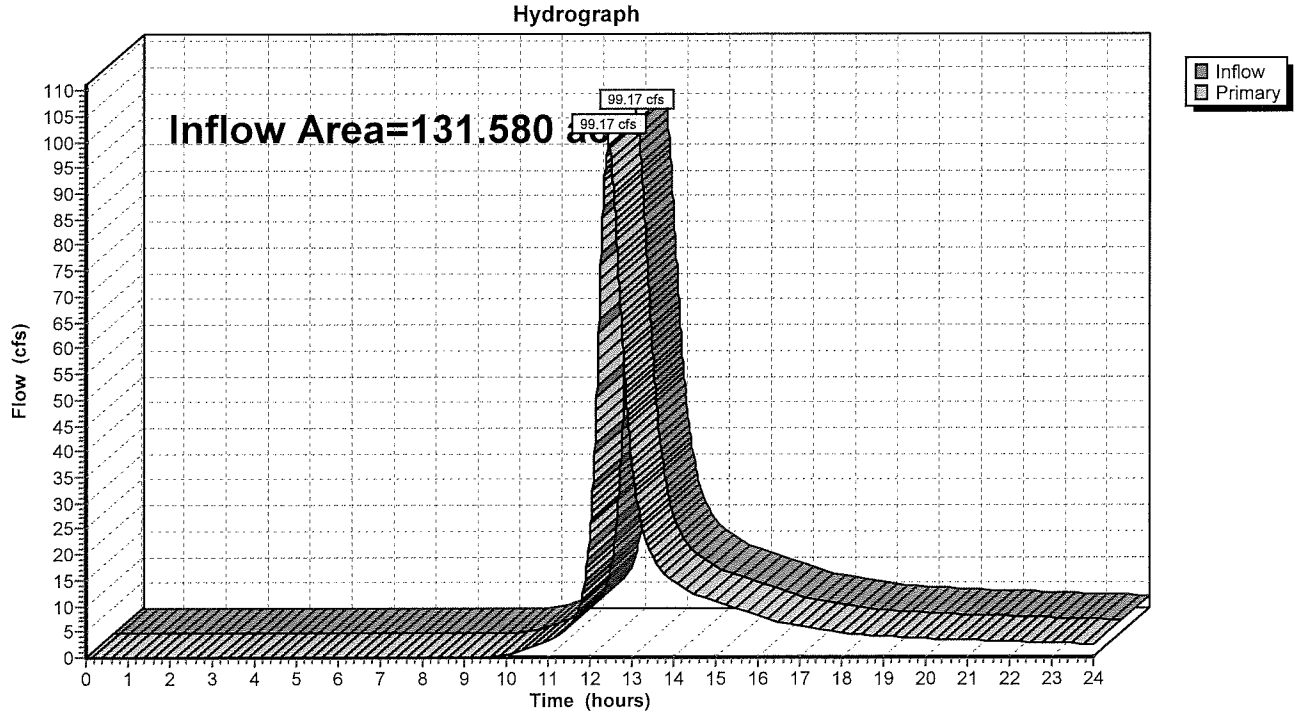


Pond 1P: Design Point 1

Inflow Area = 131.580 ac, Inflow Depth = 1.15" for 1 Year Storm event
Inflow = 99.17 cfs @ 12.44 hrs, Volume= 12.657 af
Primary = 99.17 cfs @ 12.44 hrs, Volume= 12.657 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Pond 1P: Design Point 1

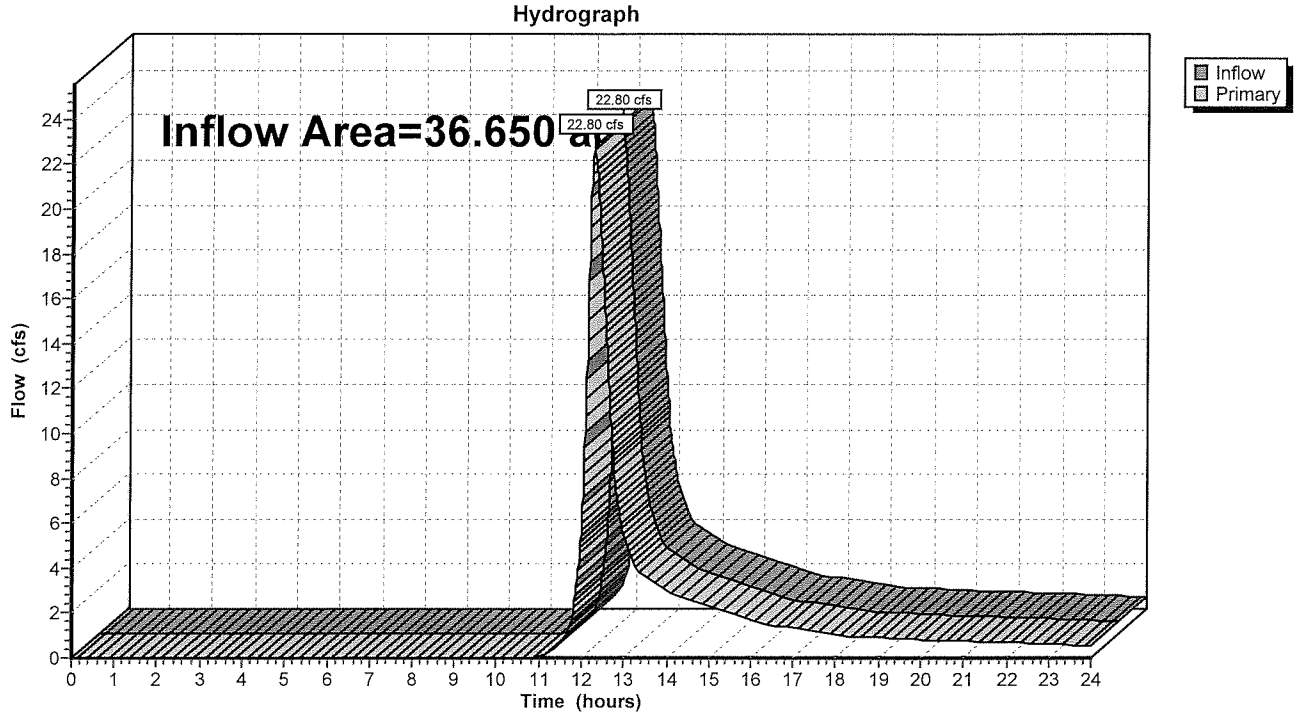


Pond 2P: Design Point 2

Inflow Area = 36.650 ac, Inflow Depth = 0.83" for 1 Year Storm event
Inflow = 22.80 cfs @ 12.29 hrs, Volume= 2.520 af
Primary = 22.80 cfs @ 12.29 hrs, Volume= 2.520 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Pond 2P: Design Point 2



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcatchment 1S Runoff Area=131.580 ac Runoff Depth=2.90"
Flow Length=4,613' Tc=30.6 min CN=83 Runoff=252.66 cfs 31.847 af

Subcatchment 2S: Subcatchment 2S Runoff Area=36.650 ac Runoff Depth=2.38"
Flow Length=1,688' Tc=19.3 min CN=77 Runoff=70.02 cfs 7.271 af

Pond 1P: Design Point 1 Inflow=252.66 cfs 31.847 af
Primary=252.66 cfs 31.847 af

Pond 2P: Design Point 2 Inflow=70.02 cfs 7.271 af
Primary=70.02 cfs 7.271 af

Total Runoff Area = 168.230 ac Runoff Volume = 39.118 af Average Runoff Depth = 2.79"

Subcatchment 1S: Subcatchment 1S

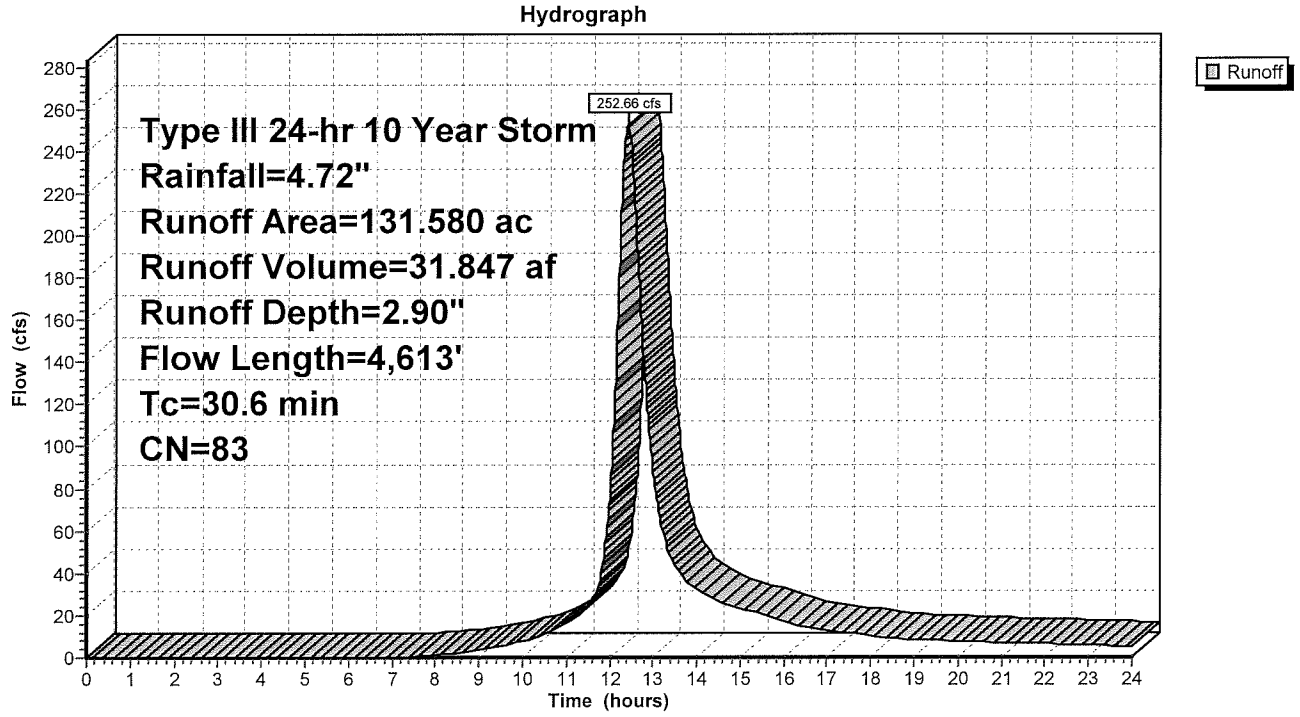
Runoff = 252.66 cfs @ 12.41 hrs, Volume= 31.847 af, Depth= 2.90"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Storm Rainfall=4.72"

Area (ac)	CN	Description
0.670	91	Gravel roads, HSG D
1.560	98	Water Surface
45.600	91	Row crops, straight row, Poor, HSG D
4.180	70	Woods, Good, HSG C
28.660	77	Woods, Good, HSG D
5.620	74	>75% Grass cover, Good, HSG C
45.290	80	>75% Grass cover, Good, HSG D
131.580	83	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.1123	0.2		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.7	1,860	0.1157	5.5		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	41	0.0500	21.1	149.14	**Circular Channel (pipe),** Diam= 36.0" Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
14.1	2,612	0.0071	3.1	49.37	**Channel Flow,** Area= 16.0 sf Perim= 11.7' r= 1.37' n= 0.050
30.6	4,613	Total			

Subcatchment 1S: Subcatchment 1S



Subcatchment 2S: Subcatchment 2S

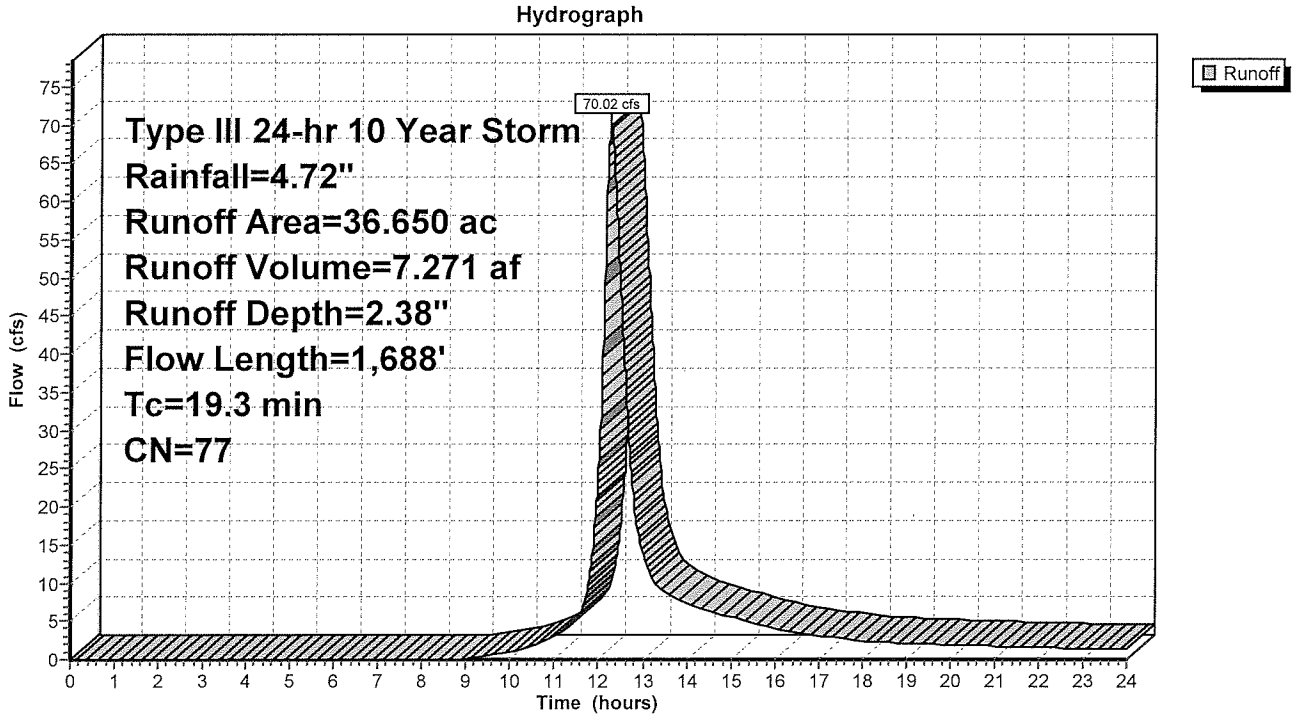
Runoff = 70.02 cfs @ 12.27 hrs, Volume= 7.271 af, Depth= 2.38"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Storm Rainfall=4.72"

Area (ac)	CN	Description
0.050	91	Gravel roads, HSG D
0.400	98	Water Surface
31.780	77	Woods, Good, HSG D
1.330	79	Woods/grass comb., Good, HSG D
2.810	73	Brush, Good, HSG D
0.280	80	>75% Grass cover, Good, HSG D
36.650	77	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	100	0.0857	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
2.2	1,024	0.2267	7.7		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.1	564	0.0025	1.8	29.29	**Channel Flow,** Area= 16.0 sf Perim= 11.7' r= 1.37' n= 0.050
19.3	1,688	Total			

Subcatchment 2S: Subcatchment 2S

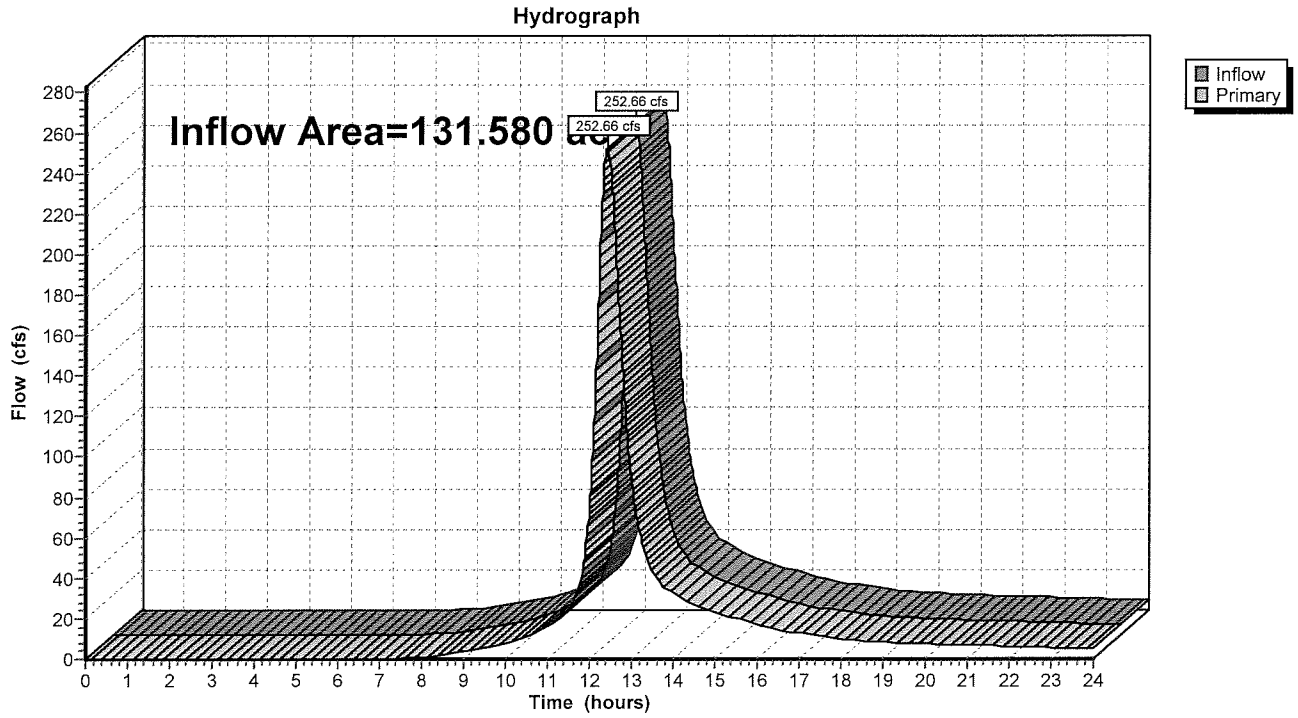


Pond 1P: Design Point 1

Inflow Area = 131.580 ac, Inflow Depth = 2.90" for 10 Year Storm event
Inflow = 252.66 cfs @ 12.41 hrs, Volume= 31.847 af
Primary = 252.66 cfs @ 12.41 hrs, Volume= 31.847 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Pond 1P: Design Point 1

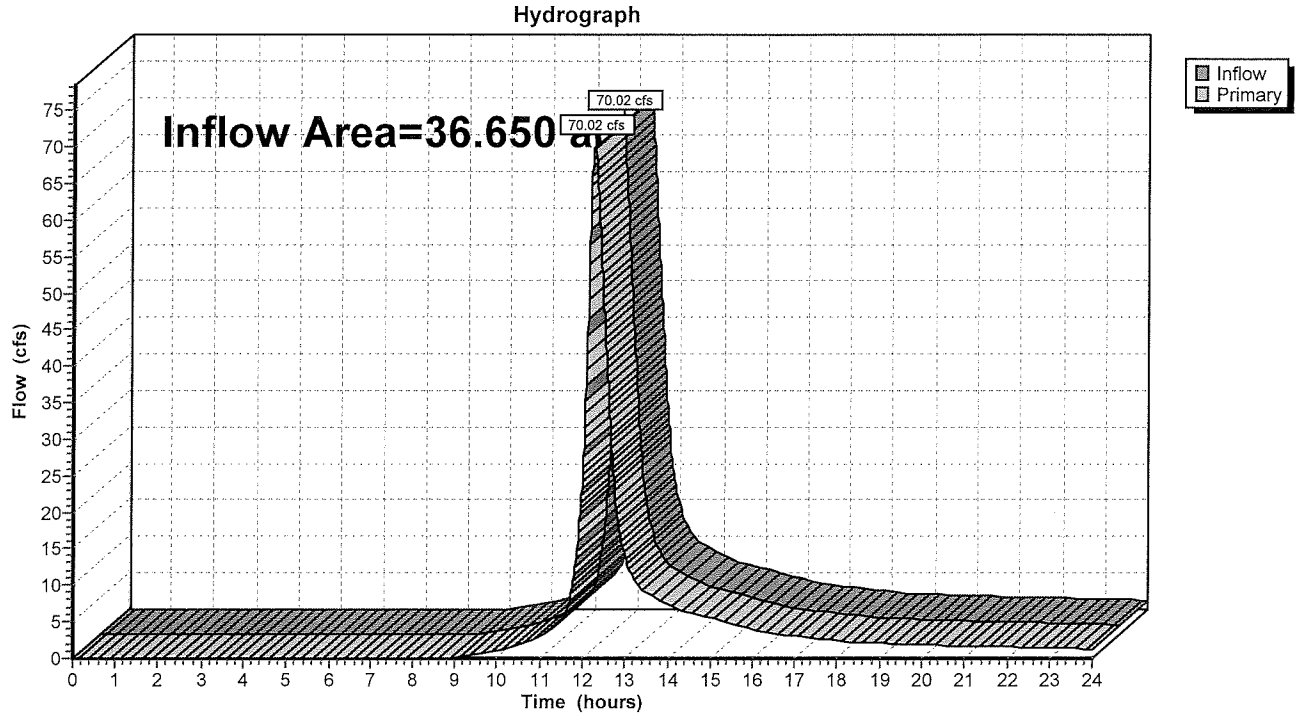


Pond 2P: Design Point 2

Inflow Area = 36.650 ac, Inflow Depth = 2.38" for 10 Year Storm event
Inflow = 70.02 cfs @ 12.27 hrs, Volume= 7.271 af
Primary = 70.02 cfs @ 12.27 hrs, Volume= 7.271 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Pond 2P: Design Point 2



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcatchment 1S Runoff Area=131.580 ac Runoff Depth=6.28"
Flow Length=4,613' Tc=30.6 min CN=83 Runoff=534.35 cfs 68.851 af

Subcatchment 2S: Subcatchment 2S Runoff Area=36.650 ac Runoff Depth=5.58"
Flow Length=1,688' Tc=19.3 min CN=77 Runoff=163.50 cfs 17.032 af

Pond 1P: Design Point 1 Inflow=534.35 cfs 68.851 af
Primary=534.35 cfs 68.851 af

Pond 2P: Design Point 2 Inflow=163.50 cfs 17.032 af
Primary=163.50 cfs 17.032 af

Total Runoff Area = 168.230 ac Runoff Volume = 85.883 af Average Runoff Depth = 6.13"

Subcatchment 1S: Subcatchment 1S

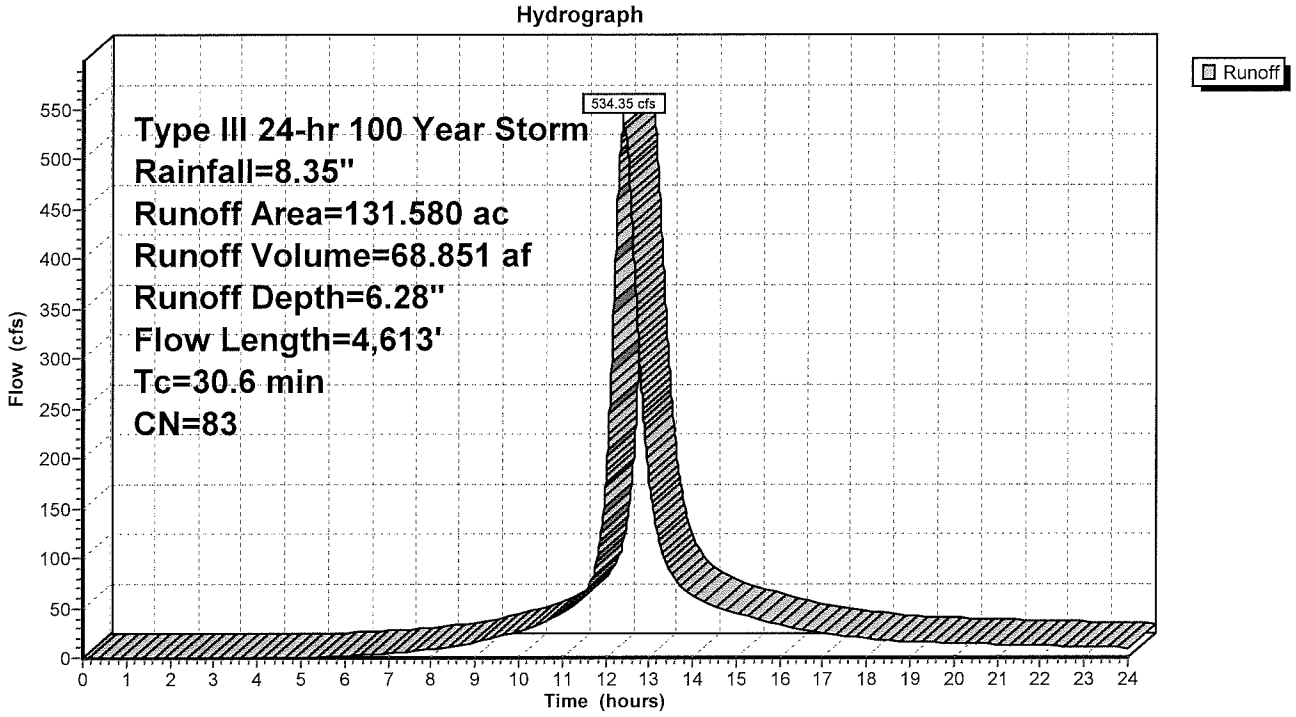
Runoff = 534.35 cfs @ 12.41 hrs, Volume= 68.851 af, Depth= 6.28"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=8.35"

Area (ac)	CN	Description
0.670	91	Gravel roads, HSG D
1.560	98	Water Surface
45.600	91	Row crops, straight row, Poor, HSG D
4.180	70	Woods, Good, HSG C
28.660	77	Woods, Good, HSG D
5.620	74	>75% Grass cover, Good, HSG C
45.290	80	>75% Grass cover, Good, HSG D
131.580	83	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.1123	0.2		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.7	1,860	0.1157	5.5		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	41	0.0500	21.1	149.14	**Circular Channel (pipe),** Diam= 36.0" Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
14.1	2,612	0.0071	3.1	49.37	**Channel Flow,** Area= 16.0 sf Perim= 11.7' r= 1.37' n= 0.050
30.6	4,613	Total			

Subcatchment 1S: Subcatchment 1S



Subcatchment 2S: Subcatchment 2S

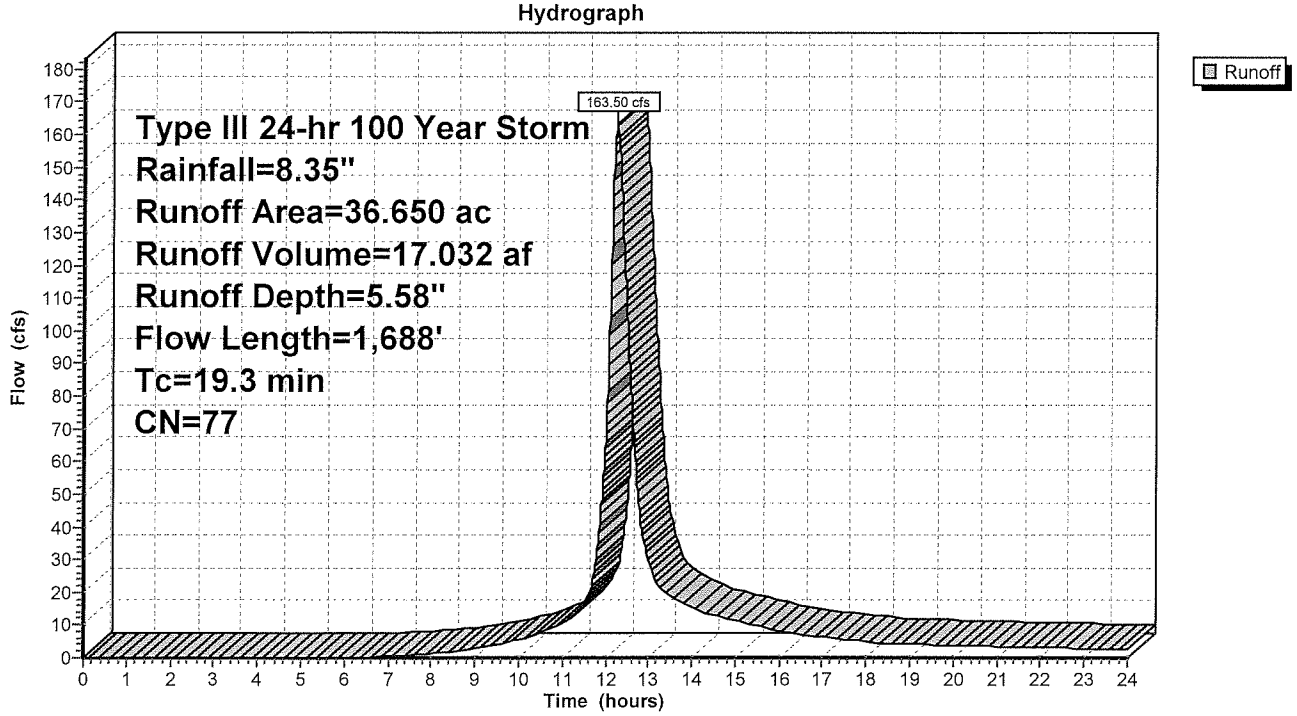
Runoff = 163.50 cfs @ 12.25 hrs, Volume= 17.032 af, Depth= 5.58"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=8.35"

Area (ac)	CN	Description
0.050	91	Gravel roads, HSG D
0.400	98	Water Surface
31.780	77	Woods, Good, HSG D
1.330	79	Woods/grass comb., Good, HSG D
2.810	73	Brush, Good, HSG D
0.280	80	>75% Grass cover, Good, HSG D
36.650	77	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	100	0.0857	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
2.2	1,024	0.2267	7.7		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.1	564	0.0025	1.8	29.29	**Channel Flow,** Area= 16.0 sf Perim= 11.7' r= 1.37' n= 0.050
19.3	1,688	Total			

Subcatchment 2S: Subcatchment 2S

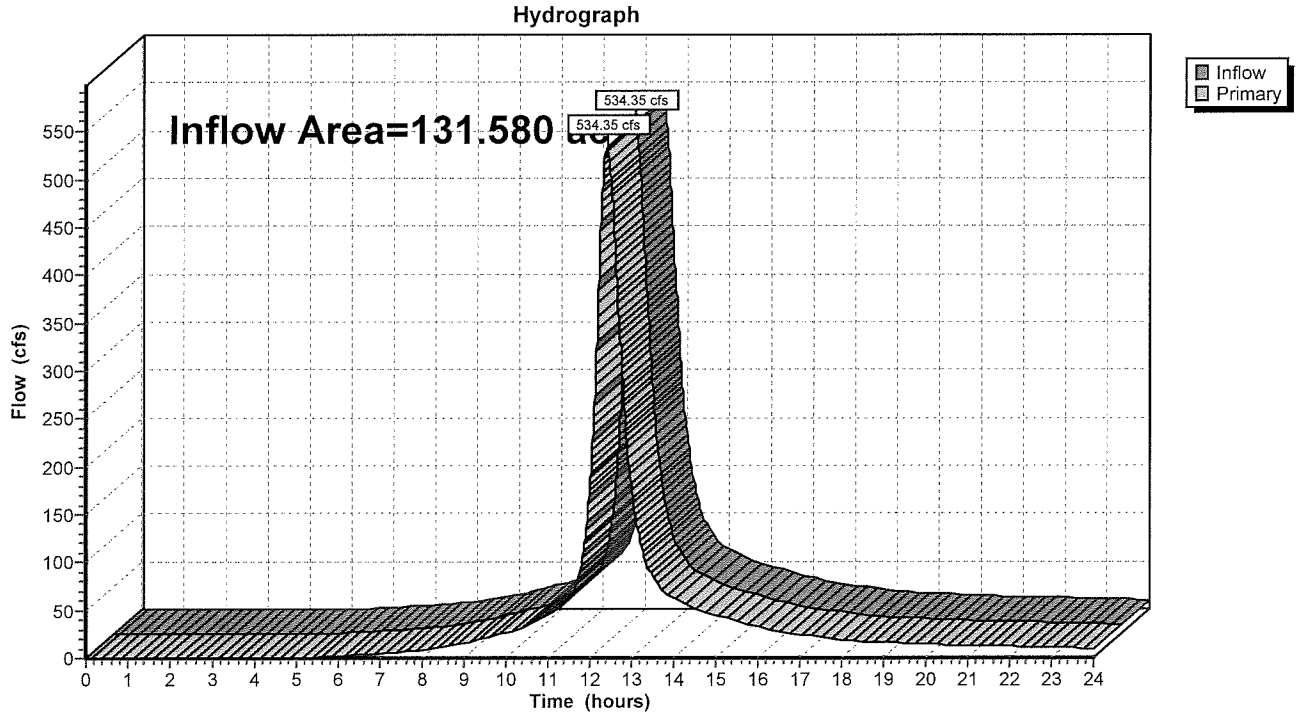


Pond 1P: Design Point 1

Inflow Area = 131.580 ac, Inflow Depth = 6.28" for 100 Year Storm event
Inflow = 534.35 cfs @ 12.41 hrs, Volume= 68.851 af
Primary = 534.35 cfs @ 12.41 hrs, Volume= 68.851 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Pond 1P: Design Point 1

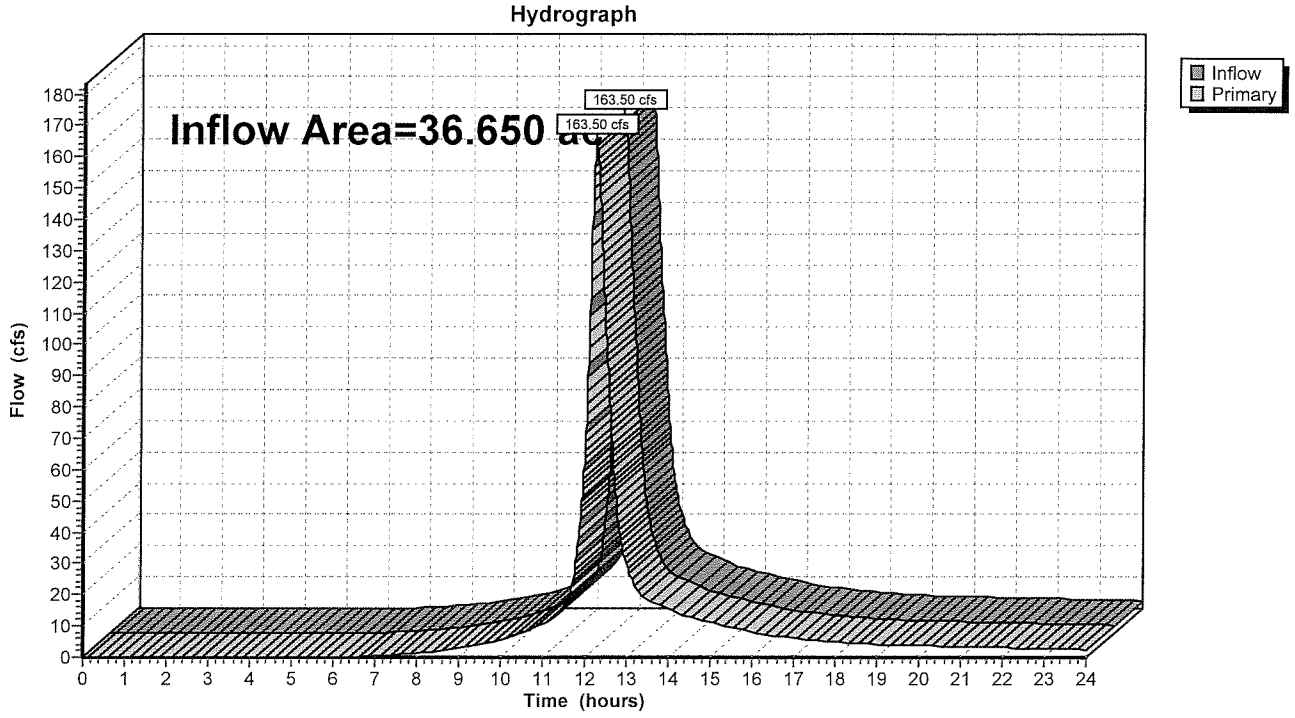


Pond 2P: Design Point 2

Inflow Area = 36.650 ac, Inflow Depth = 5.58" for 100 Year Storm event
Inflow = 163.50 cfs @ 12.25 hrs, Volume= 17.032 af
Primary = 163.50 cfs @ 12.25 hrs, Volume= 17.032 af, Atten= 0%, Lag= 0.0 min

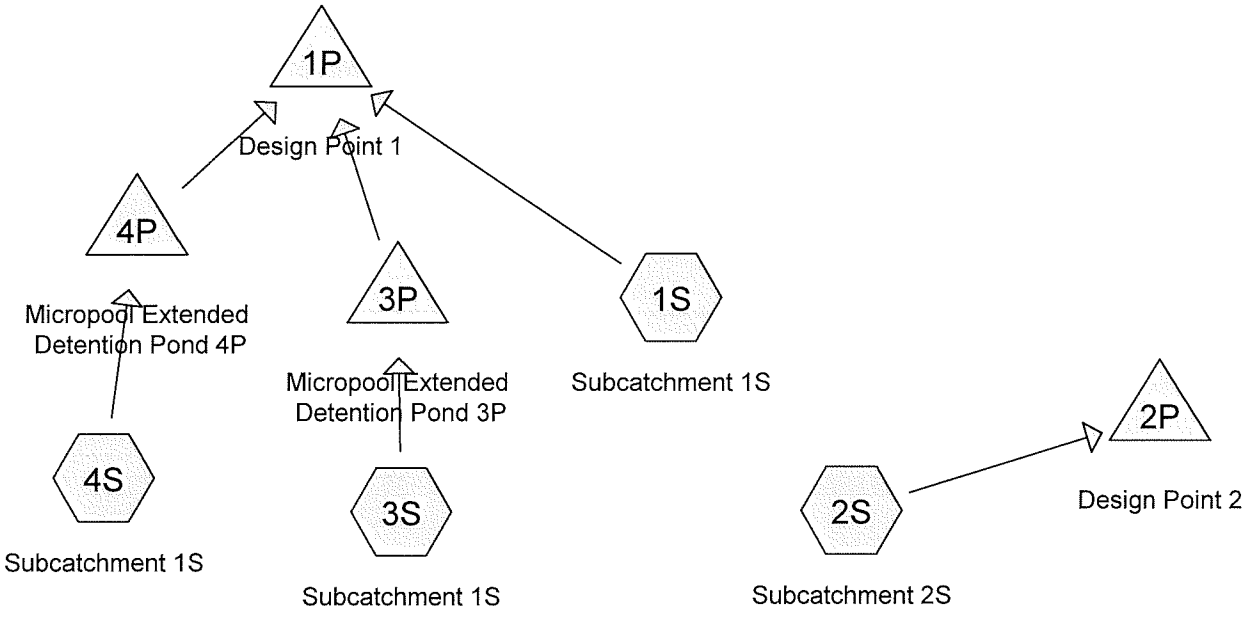
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Pond 2P: Design Point 2



Appendix 7

TR-20 Hydro-CAD Calculations – Proposed Conditions



Subcat Reach Pond Link

Drainage Diagram for 14118.01 Proposed Conditions
Prepared by {enter your company name here} 2/27/2018

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcatchment 1S Runoff Area=107.060 ac Runoff Depth=1.22"
Flow Length=4,613' Tc=30.6 min CN=84 Runoff=85.44 cfs 10.858 af

Subcatchment 2S: Subcatchment 2S Runoff Area=36.650 ac Runoff Depth=0.83"
Flow Length=1,688' Tc=19.3 min CN=77 Runoff=22.80 cfs 2.520 af

Subcatchment 3S: Subcatchment 1S Runoff Area=6.290 ac Runoff Depth=1.22"
Flow Length=1,911' Tc=8.4 min CN=84 Runoff=8.26 cfs 0.641 af

Subcatchment 4S: Subcatchment 1S Runoff Area=18.230 ac Runoff Depth=1.10"
Flow Length=2,116' Tc=8.5 min CN=82 Runoff=21.25 cfs 1.671 af

Pond 1P: Design Point 1 Inflow=86.41 cfs 11.969 af
Primary=86.41 cfs 11.969 af

Pond 2P: Design Point 2 Inflow=22.80 cfs 2.520 af
Primary=22.80 cfs 2.520 af

Pond 3P: Micropool Extended Detention P Peak Elev=479.59' Storage=18,052 cf Inflow=8.26 cfs 0.641 af
Primary=0.32 cfs 0.308 af Secondary=0.00 cfs 0.000 af Outflow=0.32 cfs 0.308 af

Pond 4P: Micropool Extended Detention P Peak Elev=479.75' Storage=46,303 cf Inflow=21.25 cfs 1.671 af
Primary=0.84 cfs 0.803 af Secondary=0.00 cfs 0.000 af Outflow=0.84 cfs 0.803 af

Total Runoff Area = 168.230 ac Runoff Volume = 15.690 af Average Runoff Depth = 1.12"

Subcatchment 1S: Subcatchment 1S

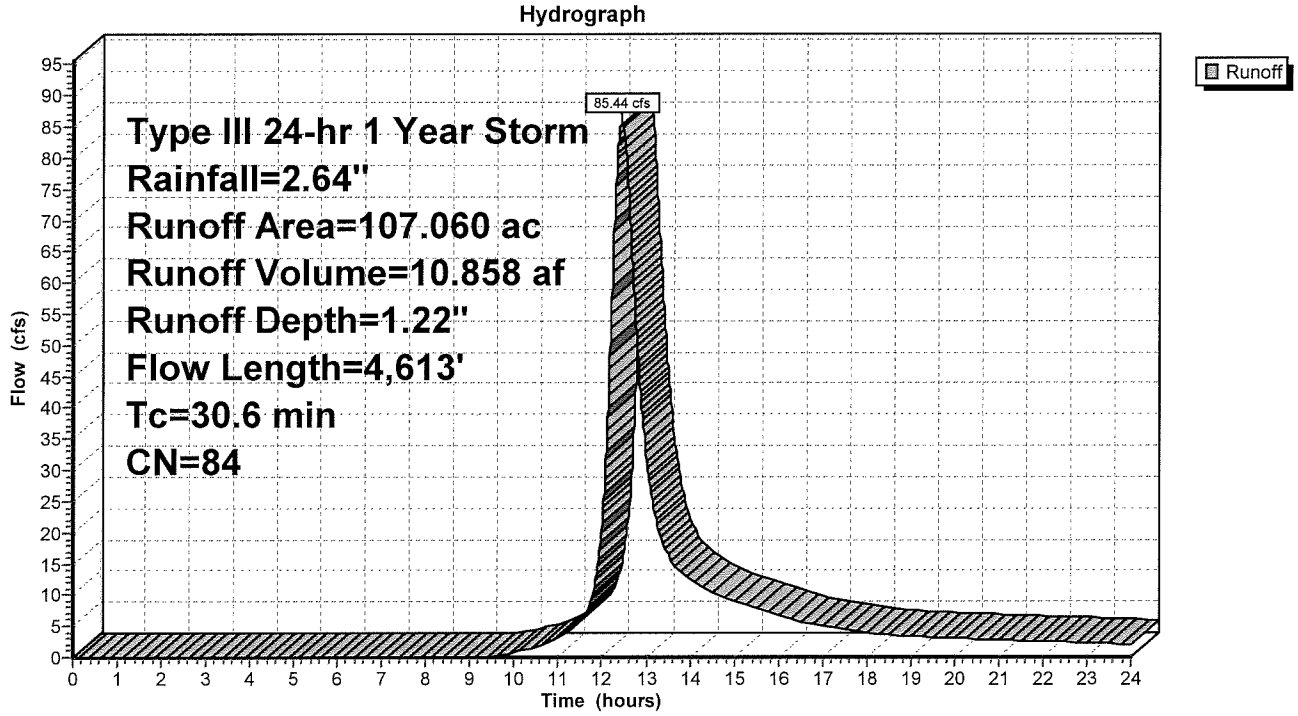
Runoff = 85.44 cfs @ 12.44 hrs, Volume= 10.858 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 Year Storm Rainfall=2.64"

Area (ac)	CN	Description
0.790	98	Paved parking & roofs (Proposed)
0.460	91	Gravel roads, HSG D
1.560	98	Water Surface
45.460	91	Row crops, straight row, Poor, HSG D
4.060	70	Woods, Good, HSG C
27.600	77	Woods, Good, HSG D
4.240	74	>75% Grass cover, Good, HSG C
22.890	80	>75% Grass cover, Good, HSG D
107.060	84	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.1123	0.2		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.7	1,860	0.1157	5.5		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	41	0.0500	21.1	149.14	**Circular Channel (pipe),** Diam= 36.0" Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
14.1	2,612	0.0071	3.1	49.37	**Channel Flow,** Area= 16.0 sf Perim= 11.7' r= 1.37' n= 0.050
30.6	4,613	Total			

Subcatchment 1S: Subcatchment 1S



Subcatchment 2S: Subcatchment 2S

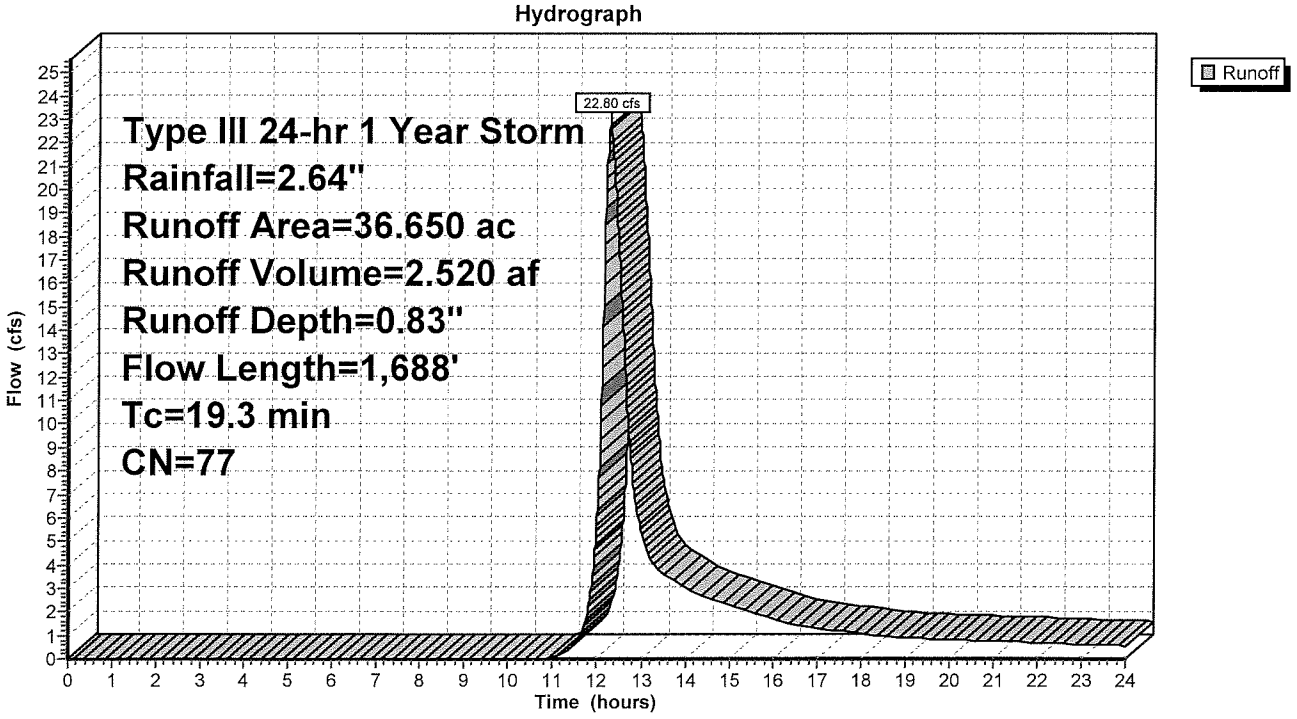
Runoff = 22.80 cfs @ 12.29 hrs, Volume= 2.520 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 Year Storm Rainfall=2.64"

Area (ac)	CN	Description
0.050	91	Gravel roads, HSG D
0.400	98	Water Surface
31.780	77	Woods, Good, HSG D
1.330	79	Woods/grass comb., Good, HSG D
2.810	73	Brush, Good, HSG D
0.280	80	>75% Grass cover, Good, HSG D
36.650	77	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	100	0.0857	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
2.2	1,024	0.2267	7.7		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.1	564	0.0025	1.8	29.29	**Channel Flow,** Area= 16.0 sf Perim= 11.7' r= 1.37' n= 0.050
19.3	1,688	Total			

Subcatchment 2S: Subcatchment 2S



Subcatchment 3S: Subcatchment 1S

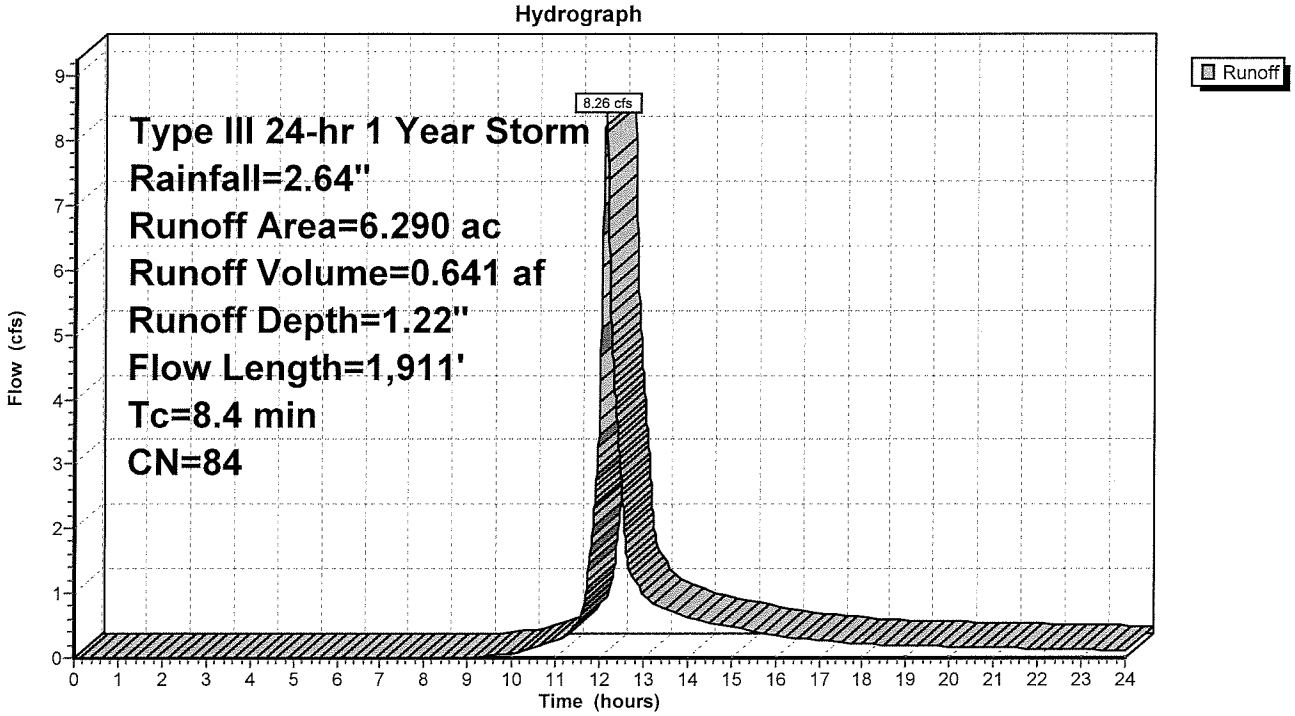
Runoff = 8.26 cfs @ 12.12 hrs, Volume= 0.641 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 Year Storm Rainfall=2.64"

Area (ac)	CN	Description
1.520	98	Paved parking & roofs (Proposed)
0.040	91	Gravel roads, HSG D
0.030	70	Woods, Good, HSG C
0.320	77	Woods, Good, HSG D
0.700	74	>75% Grass cover, Good, HSG C
3.680	80	>75% Grass cover, Good, HSG D
6.290	84	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	12	0.1181	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
4.3	88	0.1181	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.21"
0.5	168	0.1148	5.5		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	73	0.1808	6.8		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	33	0.0500	4.5		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.4	1,537	0.0694	18.5	32.70	**Circular Channel (pipe),** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011
8.4	1,911	Total			

Subcatchment 3S: Subcatchment 1S



Subcatchment 4S: Subcatchment 1S

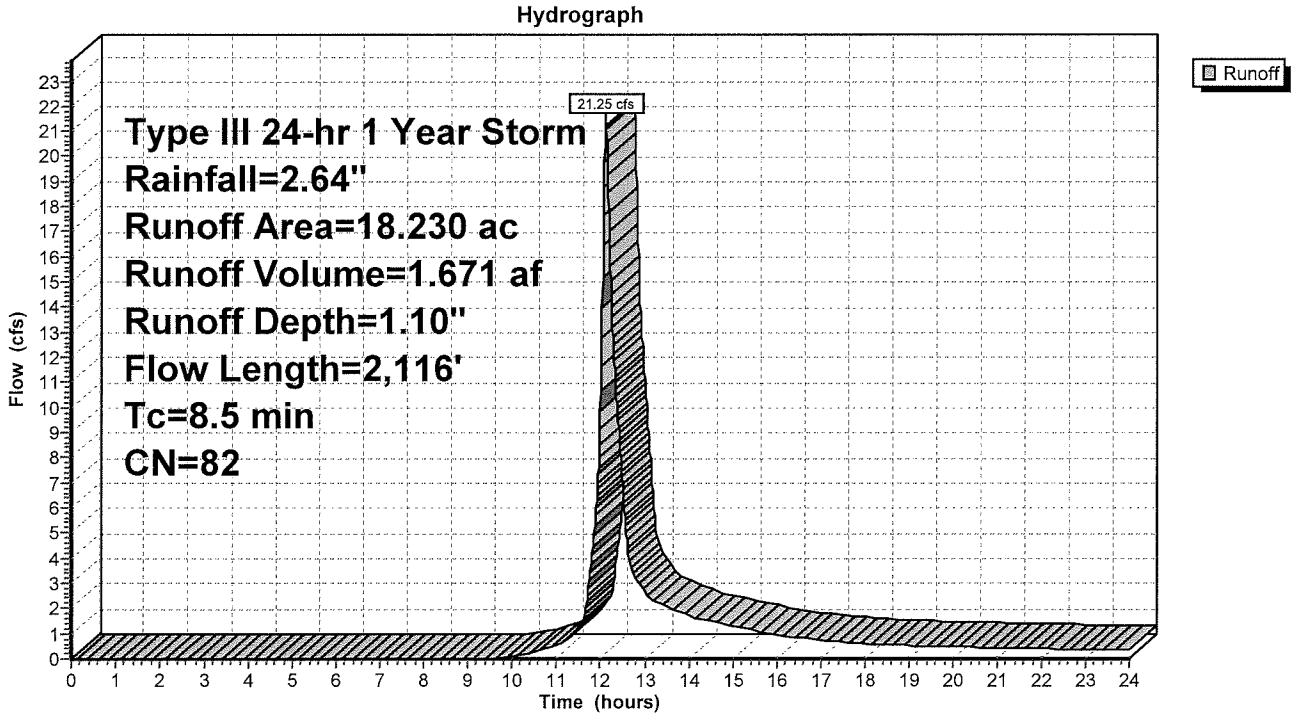
Runoff = 21.25 cfs @ 12.12 hrs, Volume= 1.671 af, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 Year Storm Rainfall=2.64"

Area (ac)	CN	Description
2.390	98	Paved parking & roofs (Proposed)
0.170	91	Gravel roads, HSG D
0.110	77	Woods, Good, HSG D
0.110	74	>75% Grass cover, Good, HSG C
15.450	80	>75% Grass cover, Good, HSG D
18.230	82	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	100	0.1192	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.21"
2.2	624	0.0825	4.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.5	1,392	0.0517	16.0	28.23	**Circular Channel (pipe),** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011
8.5	2,116	Total			

Subcatchment 4S: Subcatchment 1S

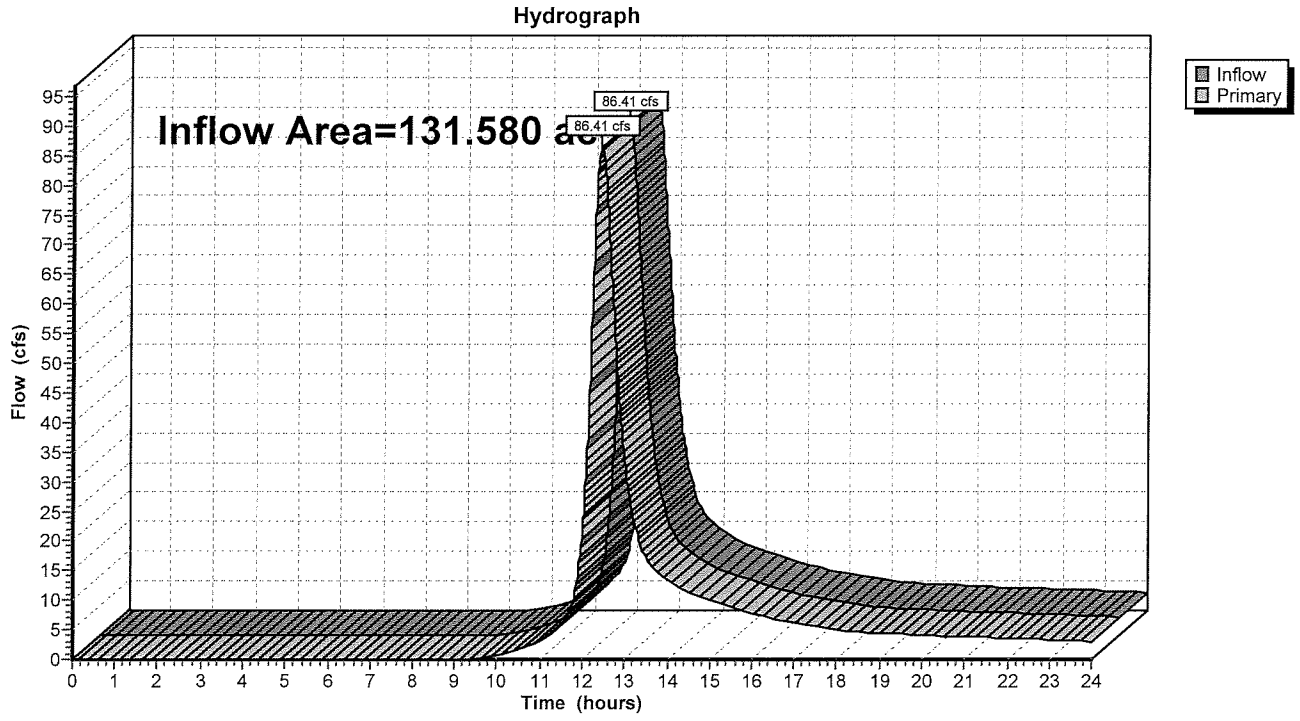


Pond 1P: Design Point 1

Inflow Area = 131.580 ac, Inflow Depth = 1.09" for 1 Year Storm event
Inflow = 86.41 cfs @ 12.44 hrs, Volume= 11.969 af
Primary = 86.41 cfs @ 12.44 hrs, Volume= 11.969 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Pond 1P: Design Point 1

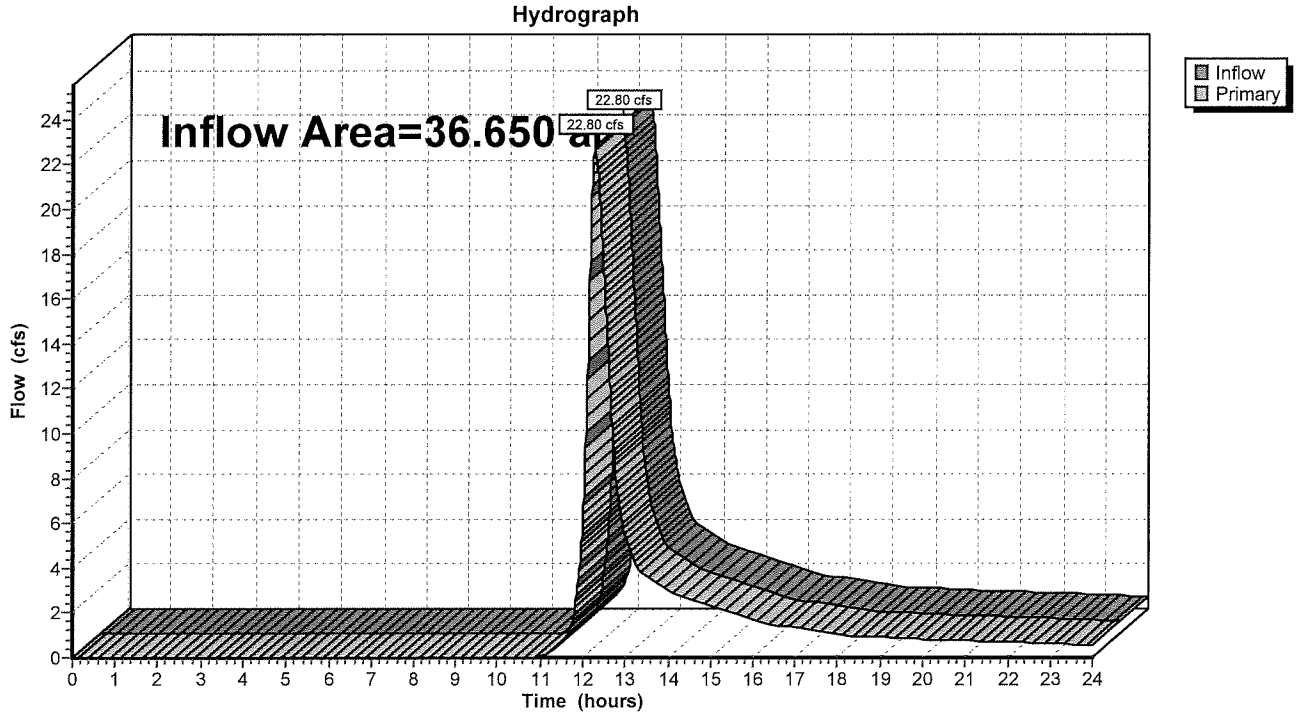


Pond 2P: Design Point 2

Inflow Area = 36.650 ac, Inflow Depth = 0.83" for 1 Year Storm event
Inflow = 22.80 cfs @ 12.29 hrs, Volume= 2.520 af
Primary = 22.80 cfs @ 12.29 hrs, Volume= 2.520 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Pond 2P: Design Point 2



Pond 3P: Micropool Extended Detention Pond 3P

Inflow Area = 6.290 ac, Inflow Depth = 1.22" for 1 Year Storm event
Inflow = 8.26 cfs @ 12.12 hrs, Volume= 0.641 af
Outflow = 0.32 cfs @ 16.22 hrs, Volume= 0.308 af, Atten= 96%, Lag= 246.1 min
Primary = 0.32 cfs @ 16.22 hrs, Volume= 0.308 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 479.59' @ 16.22 hrs Surf.Area= 0 sf Storage= 18,052 cf
Plug-Flow detention time= 357.9 min calculated for 0.307 af (48% of inflow)
Center-of-Mass det. time= 237.5 min (1,077.4 - 839.9)

#	Invert	Avail.Storage	Storage Description
1	478.00'	53,532 cf	**Custom Stage Data** Listed below

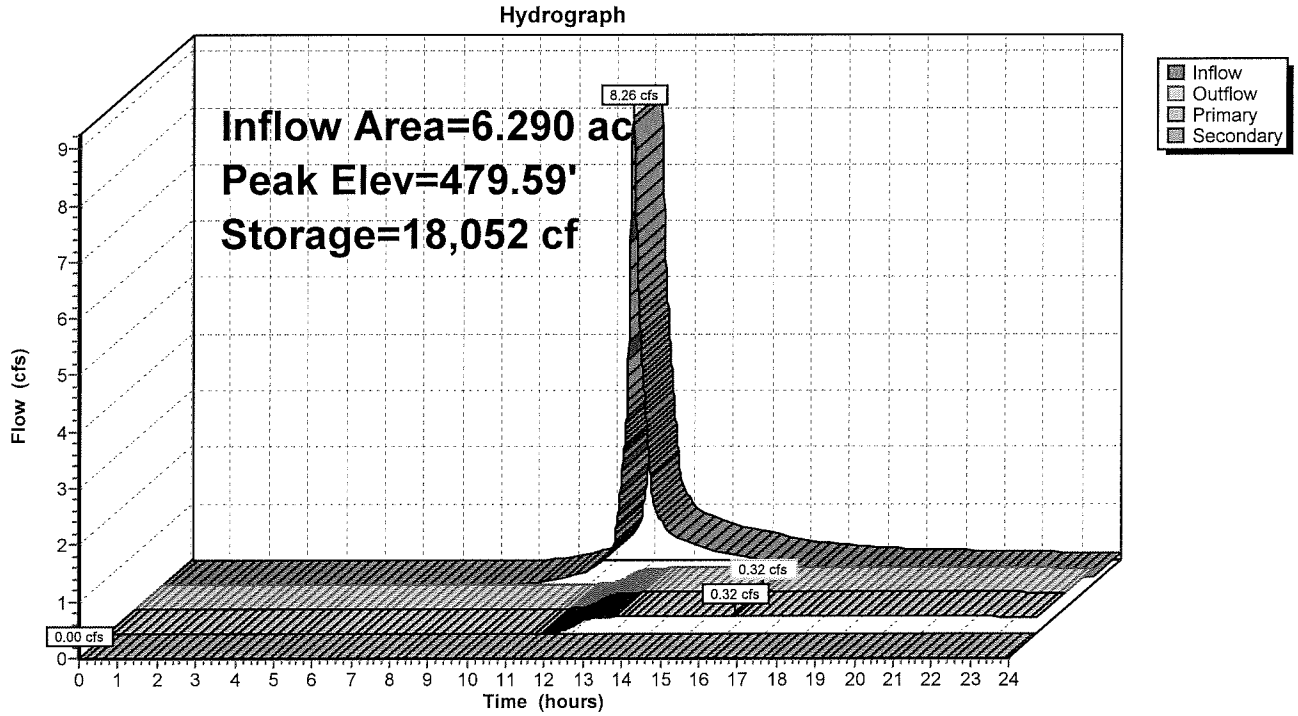
Elevation (feet)	Cum.Store (cubic-feet)
478.00	0
480.00	22,743
482.00	53,532

#	Routing	Invert	Outlet Devices
1	Primary	478.00'	**24.0" x 61.0' long Culvert X 2.00** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 477.39' S= 0.0100 '/' n= 0.011 Cc= 0.900
2	Device 1	478.00'	**3.2" Vert. Orifice/Grate** C= 0.600
3	Device 1	479.59'	**3.0' long x 0.7' 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 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32
4	Device 1	480.30'	**3.50' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600
5	Secondary	481.50'	**20.0' long x 13.0' 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) 2.60 2.64 2.70 2.66 2.65 2.66 2.65 2.63

Primary OutFlow Max=0.32 cfs @ 16.22 hrs HW=479.59' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 0.32 cfs of 22.34 cfs potential flow)
↑—**2=Orifice/Grate** (Orifice Controls 0.32 cfs @ 5.8 fps)
—**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
—**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=478.00' TW=0.00' (Dynamic Tailwater)
↑—**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Micropool Extended Detention Pond 3P



Pond 4P: Micropool Extended Detention Pond 4P

Inflow Area =	18.230 ac,	Inflow Depth =	1.10"	for	1 Year Storm event
Inflow =	21.25 cfs @	12.12 hrs,	Volume=	1.671 af	
Outflow =	0.84 cfs @	16.51 hrs,	Volume=	0.803 af,	Atten= 96%, Lag= 262.9 min
Primary =	0.84 cfs @	16.51 hrs,	Volume=	0.803 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 479.75' @ 16.51 hrs Surf.Area= 0 sf Storage= 46,303 cf
Plug-Flow detention time= 353.4 min calculated for 0.803 af (48% of inflow)
Center-of-Mass det. time= 230.0 min (1,077.2 - 847.2)

#	Invert	Avail.Storage	Storage Description
1	476.00'	87,964 cf	**Custom Stage Data** Listed below

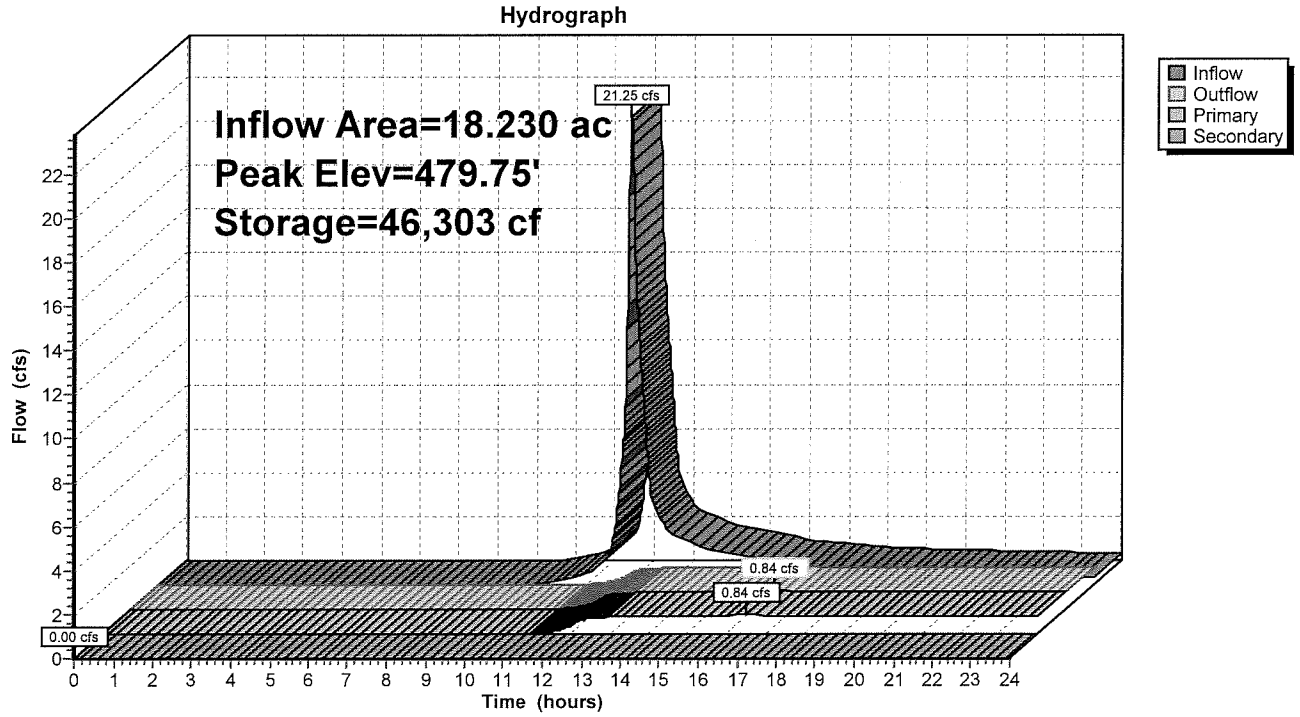
Elevation (feet)	Cum.Store (cubic-feet)
476.00	0
478.00	20,928
480.00	49,897
482.00	87,964

#	Routing	Invert	Outlet Devices
1	Primary	476.00'	**30.0" x 41.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 475.59' S= 0.0100 '/' n= 0.010 Cc= 0.900
2	Device 1	476.00'	**4.1" Vert. Orifice/Grate** C= 0.600
3	Device 1	479.75'	**3.50' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600
4	Secondary	480.00'	**30.0' long x 16.0' 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=0.84 cfs @ 16.51 hrs HW=479.75' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 0.84 cfs of 37.38 cfs potential flow)
↑—**2=Orifice/Grate** (Orifice Controls 0.84 cfs @ 9.1 fps)
—**3=Orifice/Grate** (Weir Controls 0.00 cfs @ 0.1 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=476.00' TW=0.00' (Dynamic Tailwater)
↑—**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Micropool Extended Detention Pond 4P



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcatchment 1S Runoff Area=107.060 ac Runoff Depth=3.00"
Flow Length=4,613' Tc=30.6 min CN=84 Runoff=211.86 cfs 26.744 af

Subcatchment 2S: Subcatchment 2S Runoff Area=36.650 ac Runoff Depth=2.38"
Flow Length=1,688' Tc=19.3 min CN=77 Runoff=70.02 cfs 7.271 af

Subcatchment 3S: Subcatchment 1S Runoff Area=6.290 ac Runoff Depth=3.01"
Flow Length=1,911' Tc=8.4 min CN=84 Runoff=20.38 cfs 1.578 af

Subcatchment 4S: Subcatchment 1S Runoff Area=18.230 ac Runoff Depth=2.83"
Flow Length=2,116' Tc=8.5 min CN=82 Runoff=55.46 cfs 4.292 af

Pond 1P: Design Point 1 Inflow=245.23 cfs 31.155 af
Primary=245.23 cfs 31.155 af

Pond 2P: Design Point 2 Inflow=70.02 cfs 7.271 af
Primary=70.02 cfs 7.271 af

Pond 3P: Micropool Extended Detention P Peak Elev=480.39' Storage=28,752 cf Inflow=20.38 cfs 1.578 af
Primary=8.02 cfs 1.170 af Secondary=0.00 cfs 0.000 af Outflow=8.02 cfs 1.170 af

Pond 4P: Micropool Extended Detention P Peak Elev=480.42' Storage=57,915 cf Inflow=55.46 cfs 4.292 af
Primary=20.69 cfs 2.659 af Secondary=22.15 cfs 0.583 af Outflow=42.84 cfs 3.242 af

Total Runoff Area = 168.230 ac Runoff Volume = 39.886 af Average Runoff Depth = 2.85"

Subcatchment 1S: Subcatchment 1S

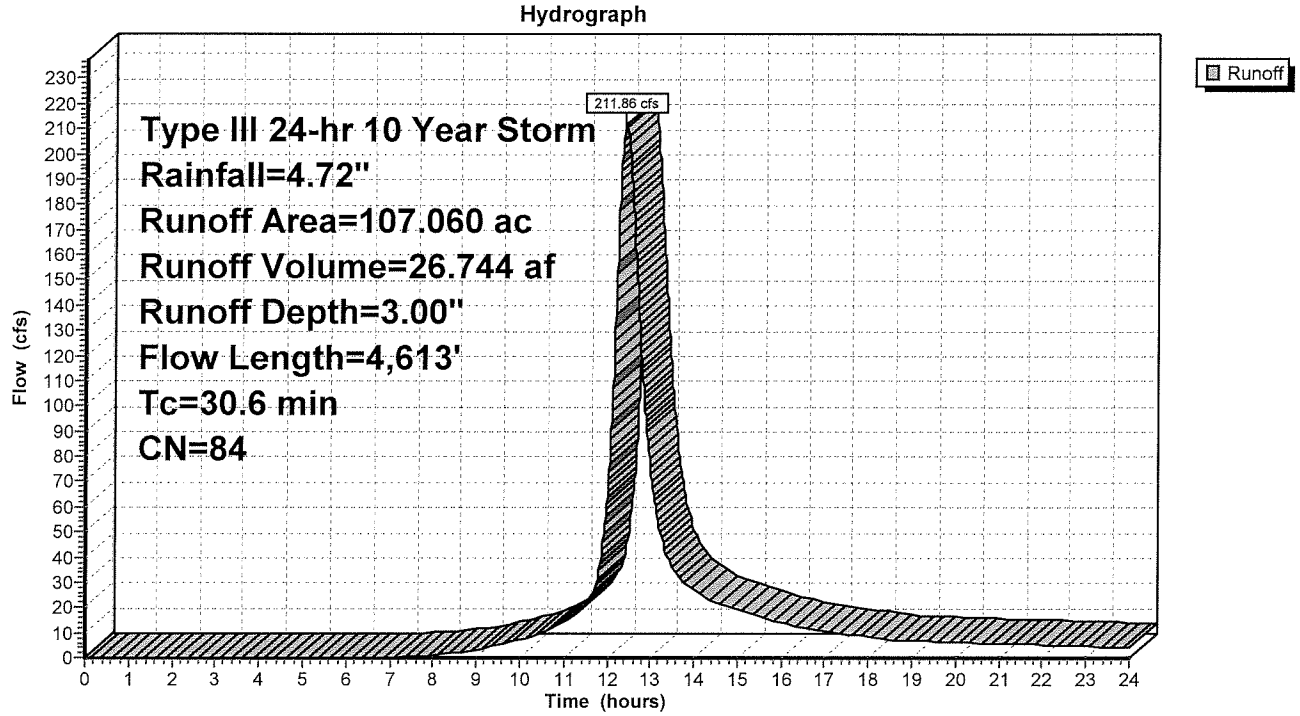
Runoff = 211.86 cfs @ 12.41 hrs, Volume= 26.744 af, Depth= 3.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Storm Rainfall=4.72"

Area (ac)	CN	Description
0.790	98	Paved parking & roofs (Proposed)
0.460	91	Gravel roads, HSG D
1.560	98	Water Surface
45.460	91	Row crops, straight row, Poor, HSG D
4.060	70	Woods, Good, HSG C
27.600	77	Woods, Good, HSG D
4.240	74	>75% Grass cover, Good, HSG C
22.890	80	>75% Grass cover, Good, HSG D
107.060	84	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.1123	0.2		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.7	1,860	0.1157	5.5		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	41	0.0500	21.1	149.14	**Circular Channel (pipe),** Diam= 36.0" Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
14.1	2,612	0.0071	3.1	49.37	**Channel Flow,** Area= 16.0 sf Perim= 11.7' r= 1.37' n= 0.050
30.6	4,613	Total			

Subcatchment 1S: Subcatchment 1S



Subcatchment 2S: Subcatchment 2S

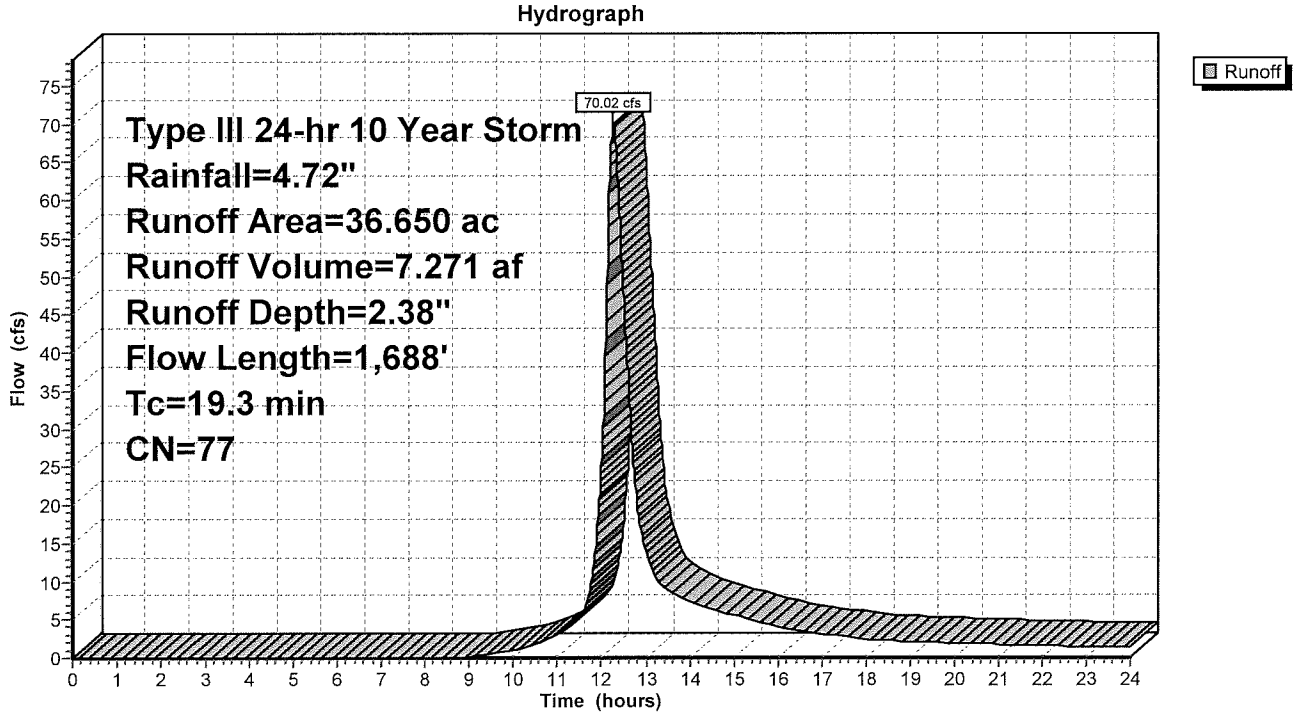
Runoff = 70.02 cfs @ 12.27 hrs, Volume= 7.271 af, Depth= 2.38"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Storm Rainfall=4.72"

Area (ac)	CN	Description
0.050	91	Gravel roads, HSG D
0.400	98	Water Surface
31.780	77	Woods, Good, HSG D
1.330	79	Woods/grass comb., Good, HSG D
2.810	73	Brush, Good, HSG D
0.280	80	>75% Grass cover, Good, HSG D
36.650	77	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	100	0.0857	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
2.2	1,024	0.2267	7.7		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.1	564	0.0025	1.8	29.29	**Channel Flow,** Area= 16.0 sf Perim= 11.7' r= 1.37' n= 0.050
19.3	1,688	Total			

Subcatchment 2S: Subcatchment 2S



Subcatchment 3S: Subcatchment 1S

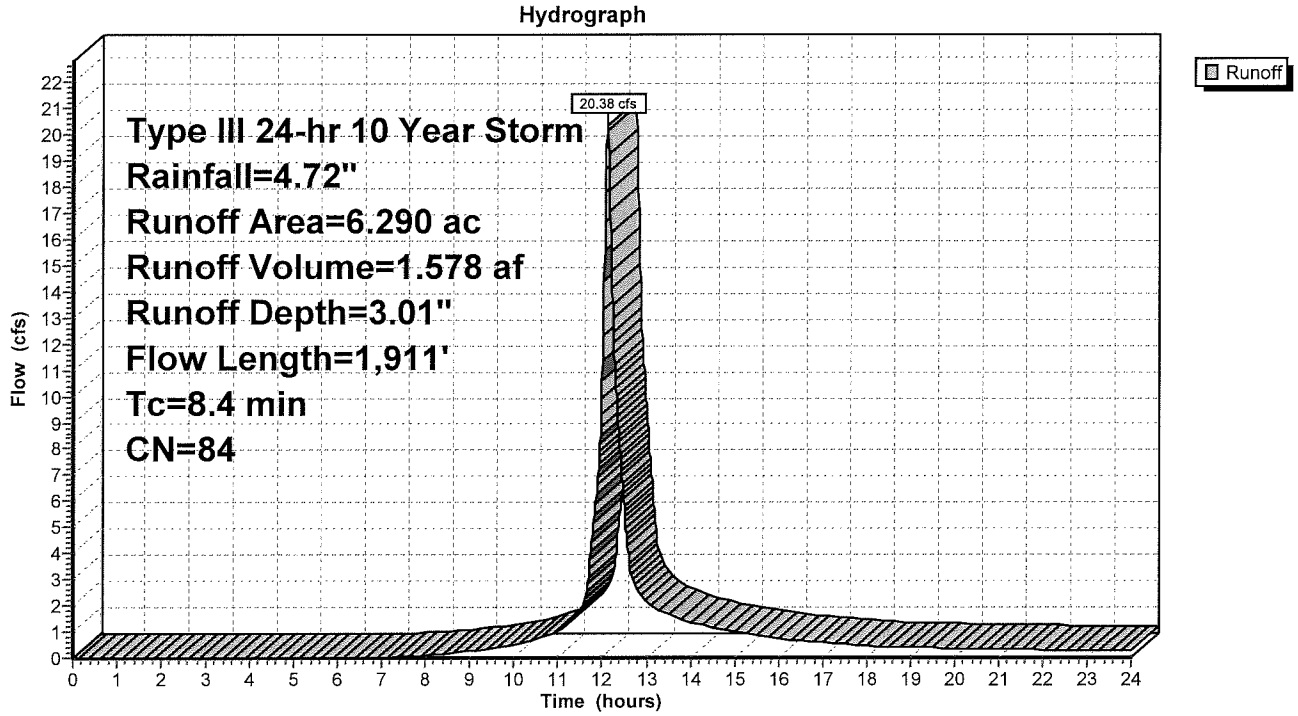
Runoff = 20.38 cfs @ 12.12 hrs, Volume= 1.578 af, Depth= 3.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Storm Rainfall=4.72"

Area (ac)	CN	Description
1.520	98	Paved parking & roofs (Proposed)
0.040	91	Gravel roads, HSG D
0.030	70	Woods, Good, HSG C
0.320	77	Woods, Good, HSG D
0.700	74	>75% Grass cover, Good, HSG C
3.680	80	>75% Grass cover, Good, HSG D
6.290	84	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	12	0.1181	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
4.3	88	0.1181	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.21"
0.5	168	0.1148	5.5		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	73	0.1808	6.8		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	33	0.0500	4.5		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.4	1,537	0.0694	18.5	32.70	**Circular Channel (pipe),** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011
8.4	1,911	Total			

Subcatchment 3S: Subcatchment 1S



Subcatchment 4S: Subcatchment 1S

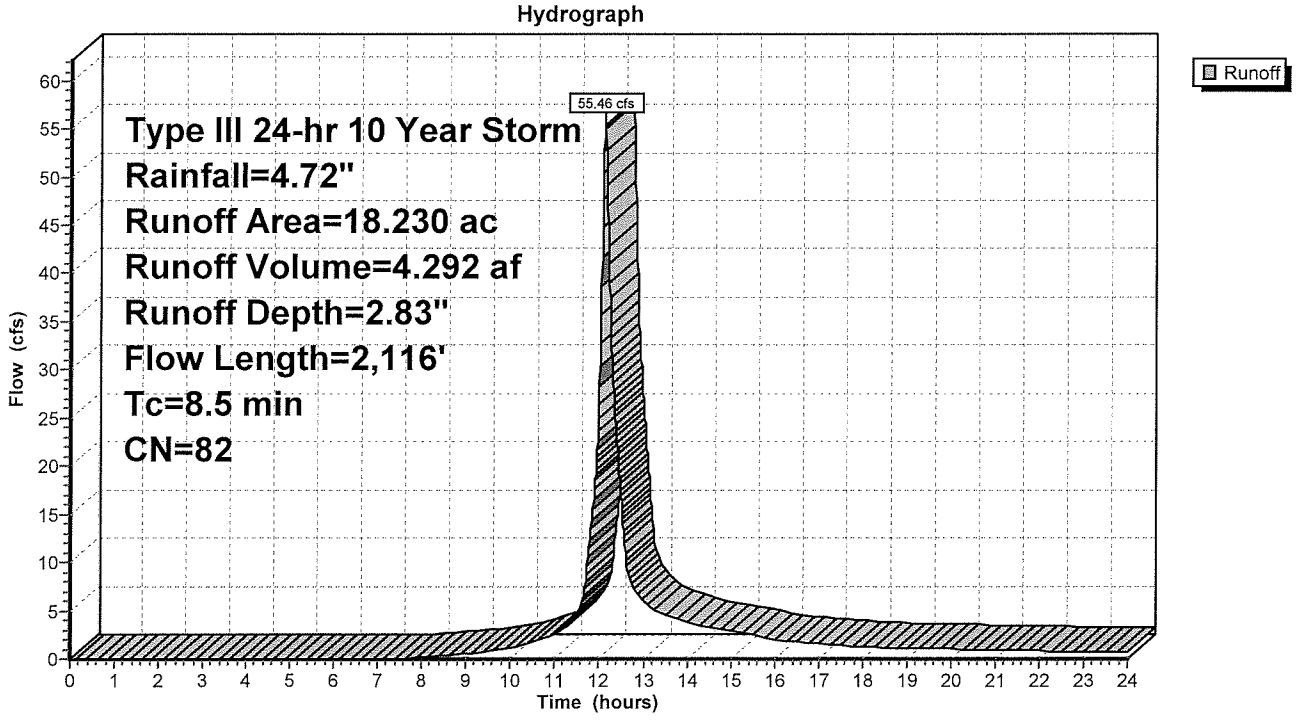
Runoff = 55.46 cfs @ 12.12 hrs, Volume= 4.292 af, Depth= 2.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Storm Rainfall=4.72"

Area (ac)	CN	Description
2.390	98	Paved parking & roofs (Proposed)
0.170	91	Gravel roads, HSG D
0.110	77	Woods, Good, HSG D
0.110	74	>75% Grass cover, Good, HSG C
15.450	80	>75% Grass cover, Good, HSG D
18.230	82	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	100	0.1192	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.21"
2.2	624	0.0825	4.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.5	1,392	0.0517	16.0	28.23	**Circular Channel (pipe),** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011
8.5	2,116	Total			

Subcatchment 4S: Subcatchment 1S

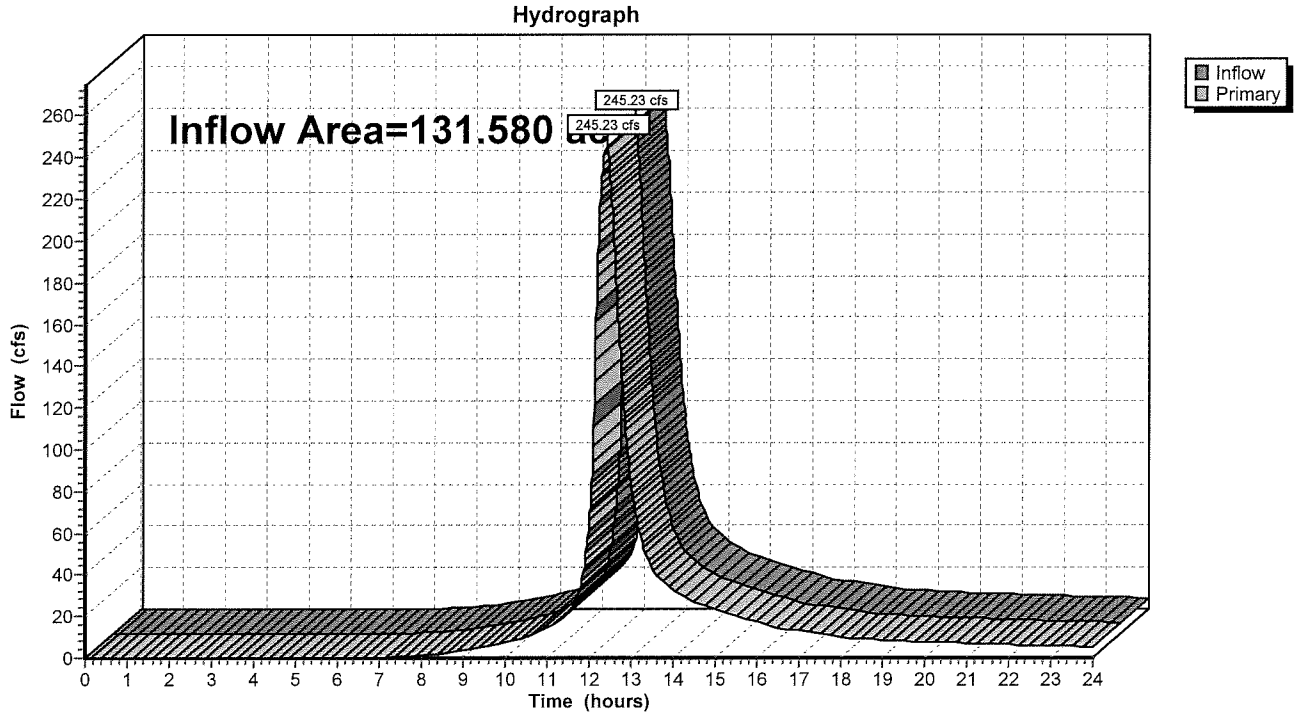


Pond 1P: Design Point 1

Inflow Area = 131.580 ac, Inflow Depth = 2.84" for 10 Year Storm event
Inflow = 245.23 cfs @ 12.41 hrs, Volume= 31.155 af
Primary = 245.23 cfs @ 12.41 hrs, Volume= 31.155 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Pond 1P: Design Point 1

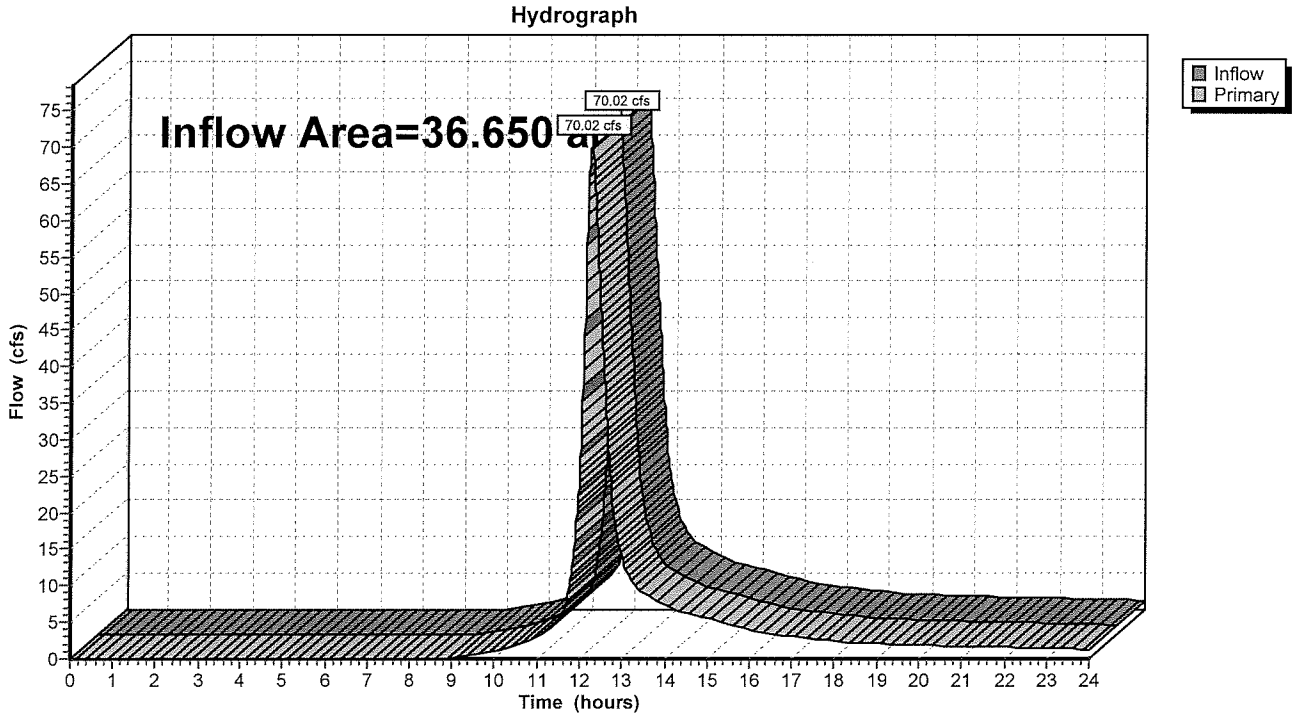


Pond 2P: Design Point 2

Inflow Area = 36.650 ac, Inflow Depth = 2.38" for 10 Year Storm event
Inflow = 70.02 cfs @ 12.27 hrs, Volume= 7.271 af
Primary = 70.02 cfs @ 12.27 hrs, Volume= 7.271 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Pond 2P: Design Point 2



Pond 3P: Micropool Extended Detention Pond 3P

Inflow Area = 6.290 ac, Inflow Depth = 3.01" for 10 Year Storm event
Inflow = 20.38 cfs @ 12.12 hrs, Volume= 1.578 af
Outflow = 8.02 cfs @ 12.40 hrs, Volume= 1.170 af, Atten= 61%, Lag= 17.1 min
Primary = 8.02 cfs @ 12.40 hrs, Volume= 1.170 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 480.39' @ 12.40 hrs Surf.Area= 0 sf Storage= 28,752 cf
Plug-Flow detention time= 164.7 min calculated for 1.169 af (74% of inflow)
Center-of-Mass det. time= 77.7 min (891.8 - 814.1)

#	Invert	Avail.Storage	Storage Description
1	478.00'	53,532 cf	**Custom Stage Data** Listed below

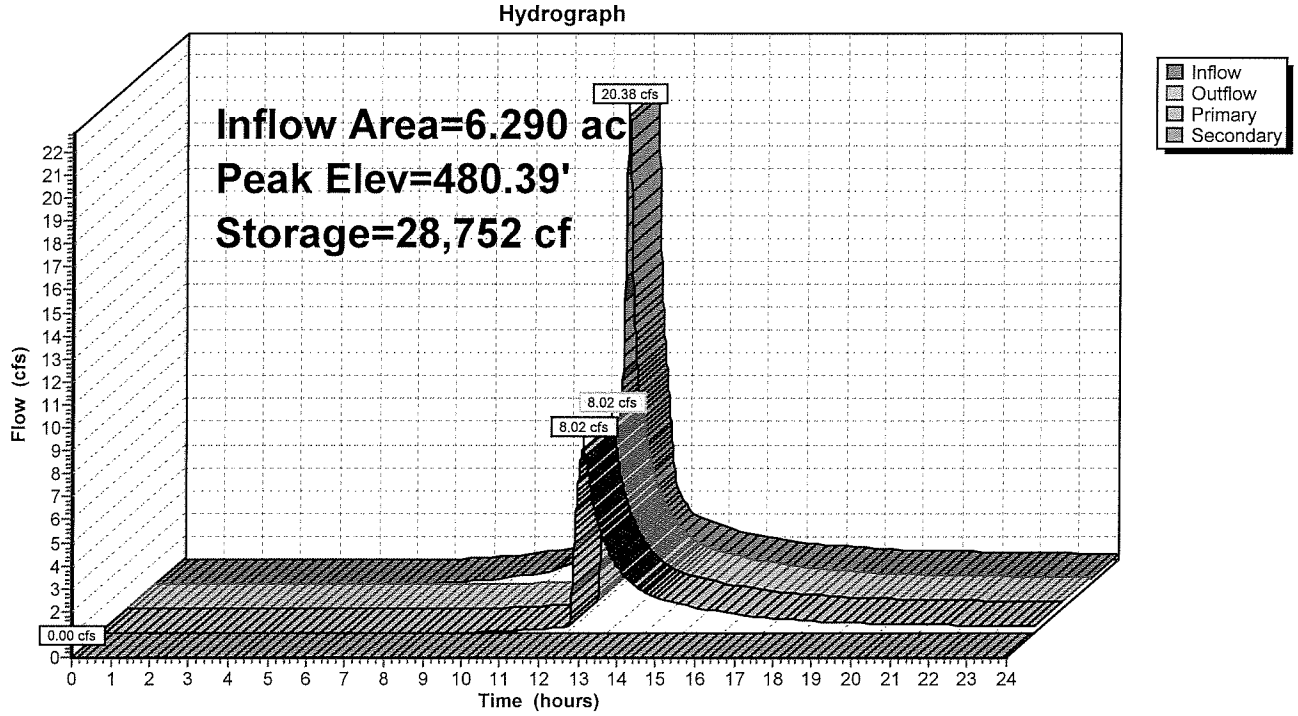
Elevation (feet)	Cum.Store (cubic-feet)
478.00	0
480.00	22,743
482.00	53,532

#	Routing	Invert	Outlet Devices
1	Primary	478.00'	**24.0" x 61.0' long Culvert X 2.00** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 477.39' S= 0.0100 '/' n= 0.011 Cc= 0.900
2	Device 1	478.00'	**3.2" Vert. Orifice/Grate** C= 0.600
3	Device 1	479.59'	**3.0' long x 0.7' 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 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32
4	Device 1	480.30'	**3.50' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600
5	Secondary	481.50'	**20.0' long x 13.0' 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) 2.60 2.64 2.70 2.66 2.65 2.66 2.65 2.63

Primary OutFlow Max=8.02 cfs @ 12.40 hrs HW=480.39' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 8.02 cfs of 35.67 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.40 cfs @ 7.2 fps)
  ├**3=Broad-Crested Rectangular Weir** (Weir Controls 6.64 cfs @ 2.8 fps)
  └**4=Orifice/Grate** (Weir Controls 0.98 cfs @ 1.0 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=478.00' TW=0.00' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Micropool Extended Detention Pond 3P



Pond 4P: Micropool Extended Detention Pond 4P

Inflow Area = 18.230 ac, Inflow Depth = 2.83" for 10 Year Storm event
Inflow = 55.46 cfs @ 12.12 hrs, Volume= 4.292 af
Outflow = 42.84 cfs @ 12.20 hrs, Volume= 3.242 af, Atten= 23%, Lag= 4.8 min
Primary = 20.69 cfs @ 12.20 hrs, Volume= 2.659 af
Secondary = 22.15 cfs @ 12.20 hrs, Volume= 0.583 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 480.42' @ 12.20 hrs Surf.Area= 0 sf Storage= 57,915 cf
Plug-Flow detention time= 139.4 min calculated for 3.240 af (75% of inflow)
Center-of-Mass det. time= 54.2 min (874.2 - 820.0)

#	Invert	Avail.Storage	Storage Description
1	476.00'	87,964 cf	**Custom Stage Data** Listed below

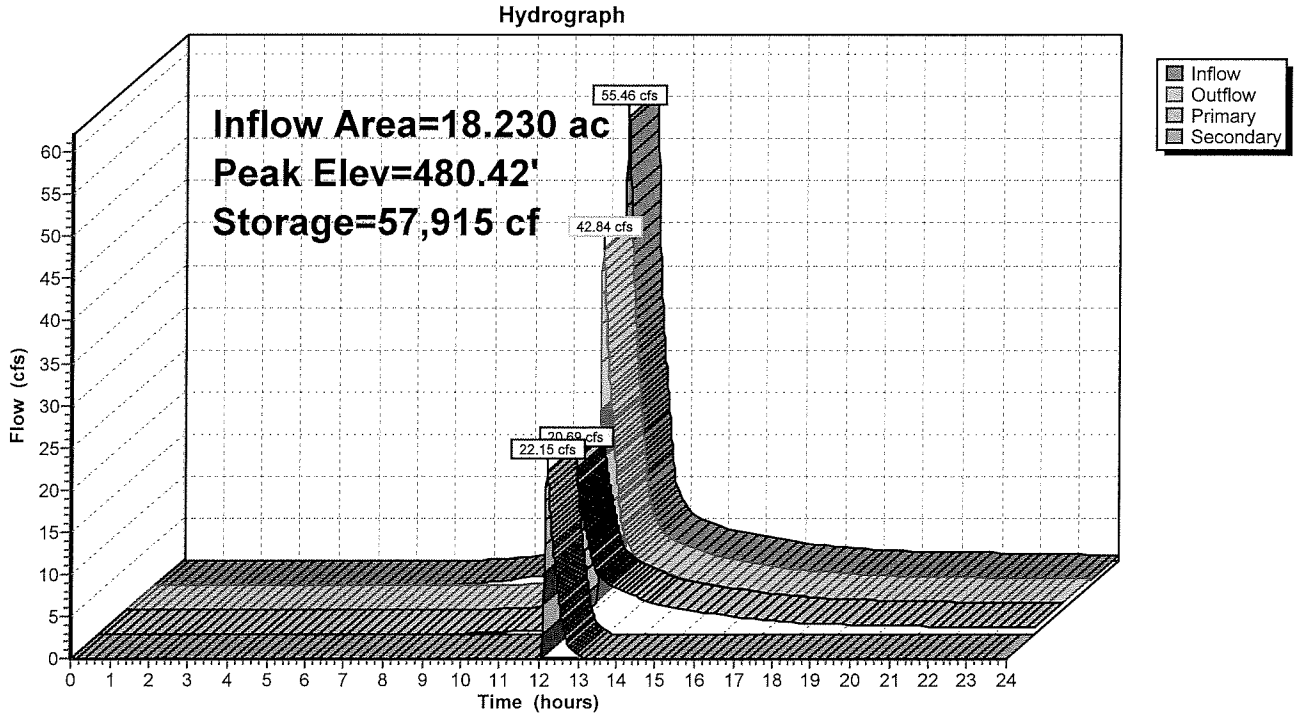
Elevation (feet)	Cum.Store (cubic-feet)
476.00	0
478.00	20,928
480.00	49,897
482.00	87,964

#	Routing	Invert	Outlet Devices
1	Primary	476.00'	**30.0" x 41.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 475.59' S= 0.0100 '/' n= 0.010 Cc= 0.900
2	Device 1	476.00'	**4.1" Vert. Orifice/Grate** C= 0.600
3	Device 1	479.75'	**3.50' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600
4	Secondary	480.00'	**30.0' long x 16.0' 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=20.69 cfs @ 12.20 hrs HW=480.42' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 20.69 cfs of 42.09 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.91 cfs @ 9.9 fps)
  └**3=Orifice/Grate** (Weir Controls 19.78 cfs @ 2.7 fps)

Secondary OutFlow Max=22.14 cfs @ 12.20 hrs HW=480.42' TW=0.00' (Dynamic Tailwater)
└**4=Broad-Crested Rectangular Weir** (Weir Controls 22.14 cfs @ 1.8 fps)

Pond 4P: Micropool Extended Detention Pond 4P



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: Subcatchment 1S Runoff Area=107.060 ac Runoff Depth=6.40"
Flow Length=4,613' Tc=30.6 min CN=84 Runoff=441.26 cfs 57.086 af

Subcatchment 2S: Subcatchment 2S Runoff Area=36.650 ac Runoff Depth=5.58"
Flow Length=1,688' Tc=19.3 min CN=77 Runoff=163.50 cfs 17.032 af

Subcatchment 3S: Subcatchment 1S Runoff Area=6.290 ac Runoff Depth=6.42"
Flow Length=1,911' Tc=8.4 min CN=84 Runoff=42.26 cfs 3.367 af

Subcatchment 4S: Subcatchment 1S Runoff Area=18.230 ac Runoff Depth=6.18"
Flow Length=2,116' Tc=8.5 min CN=82 Runoff=118.58 cfs 9.395 af

Pond 1P: Design Point 1 Inflow=513.97 cfs 68.332 af
Primary=513.97 cfs 68.332 af

Pond 2P: Design Point 2 Inflow=163.50 cfs 17.032 af
Primary=163.50 cfs 17.032 af

Pond 3P: Micropool Extended Detention P Peak Elev=480.97' Storage=37,606 cf Inflow=42.26 cfs 3.367 af
Primary=35.78 cfs 2.933 af Secondary=0.00 cfs 0.000 af Outflow=35.78 cfs 2.933 af

Pond 4P: Micropool Extended Detention Peak Elev=480.95' Storage=67,910 cf Inflow=118.58 cfs 9.395 af
Primary=37.83 cfs 5.531 af Secondary=72.71 cfs 2.782 af Outflow=110.54 cfs 8.314 af

Total Runoff Area = 168.230 ac Runoff Volume = 86.879 af Average Runoff Depth = 6.20"

Subcatchment 1S: Subcatchment 1S

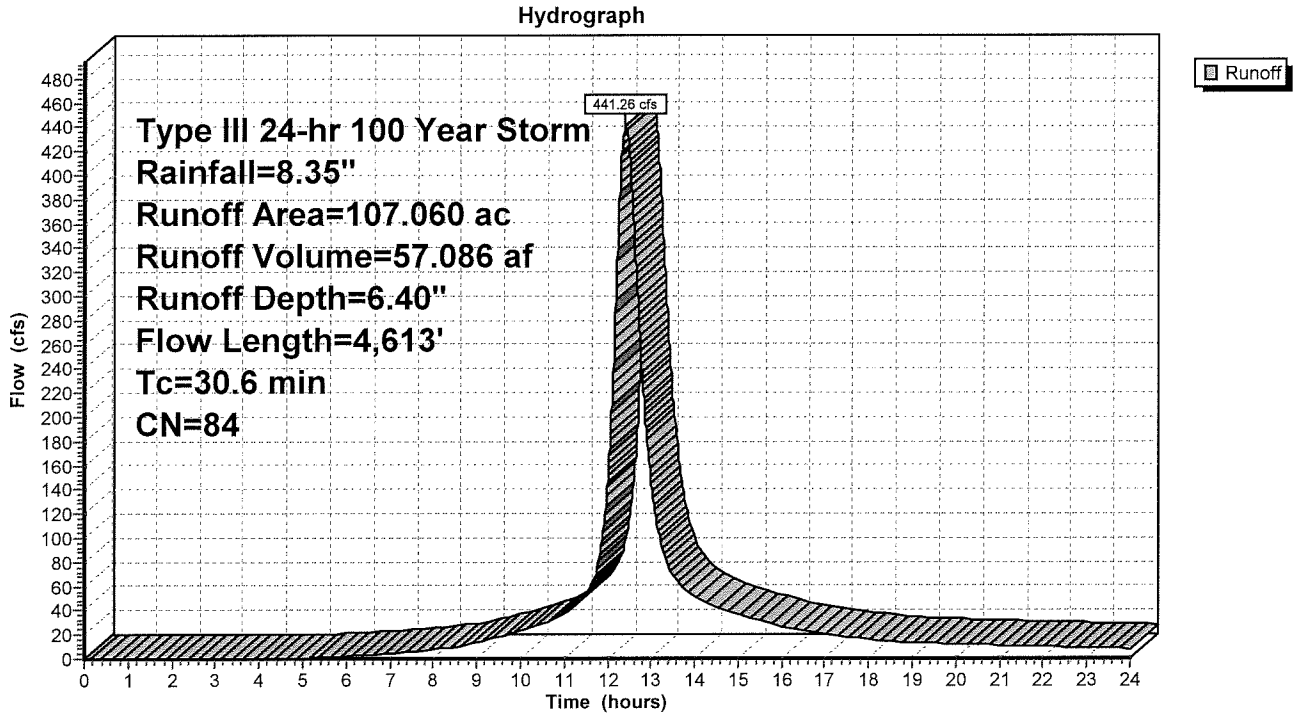
Runoff = 441.26 cfs @ 12.41 hrs, Volume= 57.086 af, Depth= 6.40"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=8.35"

Area (ac)	CN	Description
0.790	98	Paved parking & roofs (Proposed)
0.460	91	Gravel roads, HSG D
1.560	98	Water Surface
45.460	91	Row crops, straight row, Poor, HSG D
4.060	70	Woods, Good, HSG C
27.600	77	Woods, Good, HSG D
4.240	74	>75% Grass cover, Good, HSG C
22.890	80	>75% Grass cover, Good, HSG D
107.060	84	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8	100	0.1123	0.2		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
5.7	1,860	0.1157	5.5		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.0	41	0.0500	21.1	149.14	**Circular Channel (pipe),** Diam= 36.0" Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.013
14.1	2,612	0.0071	3.1	49.37	**Channel Flow,** Area= 16.0 sf Perim= 11.7' r= 1.37' n= 0.050
30.6	4,613	Total			

Subcatchment 1S: Subcatchment 1S



Subcatchment 2S: Subcatchment 2S

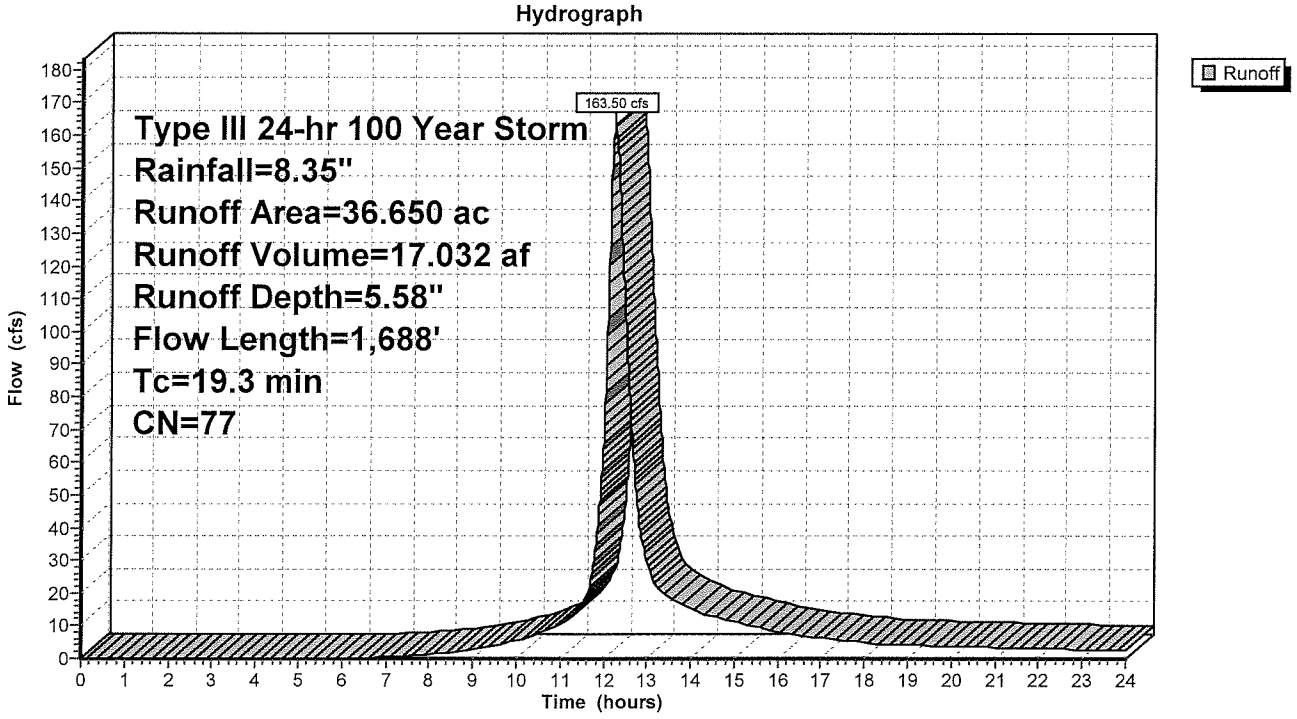
Runoff = 163.50 cfs @ 12.25 hrs, Volume= 17.032 af, Depth= 5.58"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=8.35"

Area (ac)	CN	Description
0.050	91	Gravel roads, HSG D
0.400	98	Water Surface
31.780	77	Woods, Good, HSG D
1.330	79	Woods/grass comb., Good, HSG D
2.810	73	Brush, Good, HSG D
0.280	80	>75% Grass cover, Good, HSG D
36.650	77	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	100	0.0857	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
2.2	1,024	0.2267	7.7		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
5.1	564	0.0025	1.8	29.29	**Channel Flow,** Area= 16.0 sf Perim= 11.7' r= 1.37' n= 0.050
19.3	1,688	Total			

Subcatchment 2S: Subcatchment 2S



Subcatchment 3S: Subcatchment 1S

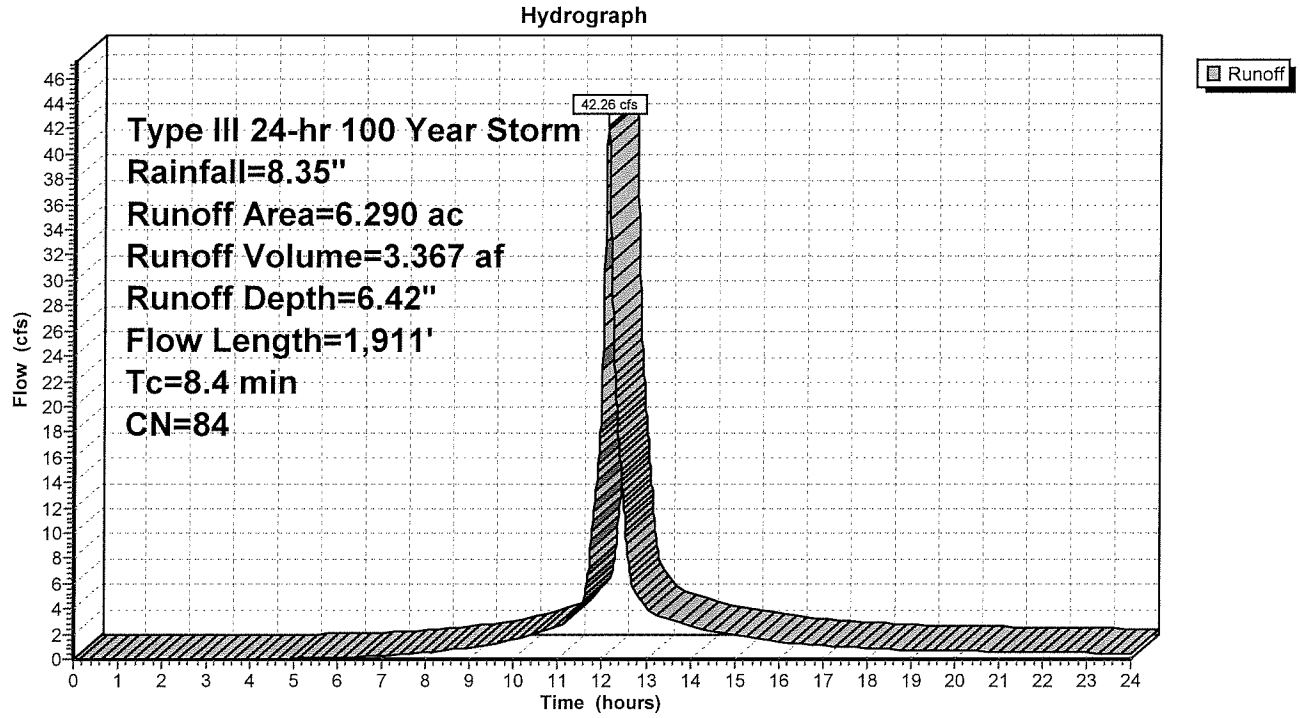
Runoff = 42.26 cfs @ 12.12 hrs, Volume= 3.367 af, Depth= 6.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=8.35"

Area (ac)	CN	Description
1.520	98	Paved parking & roofs (Proposed)
0.040	91	Gravel roads, HSG D
0.030	70	Woods, Good, HSG C
0.320	77	Woods, Good, HSG D
0.700	74	>75% Grass cover, Good, HSG C
3.680	80	>75% Grass cover, Good, HSG D
6.290	84	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	12	0.1181	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
4.3	88	0.1181	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.21"
0.5	168	0.1148	5.5		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	73	0.1808	6.8		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	33	0.0500	4.5		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.4	1,537	0.0694	18.5	32.70	**Circular Channel (pipe),** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011
8.4	1,911	Total			

Subcatchment 3S: Subcatchment 1S



Subcatchment 4S: Subcatchment 1S

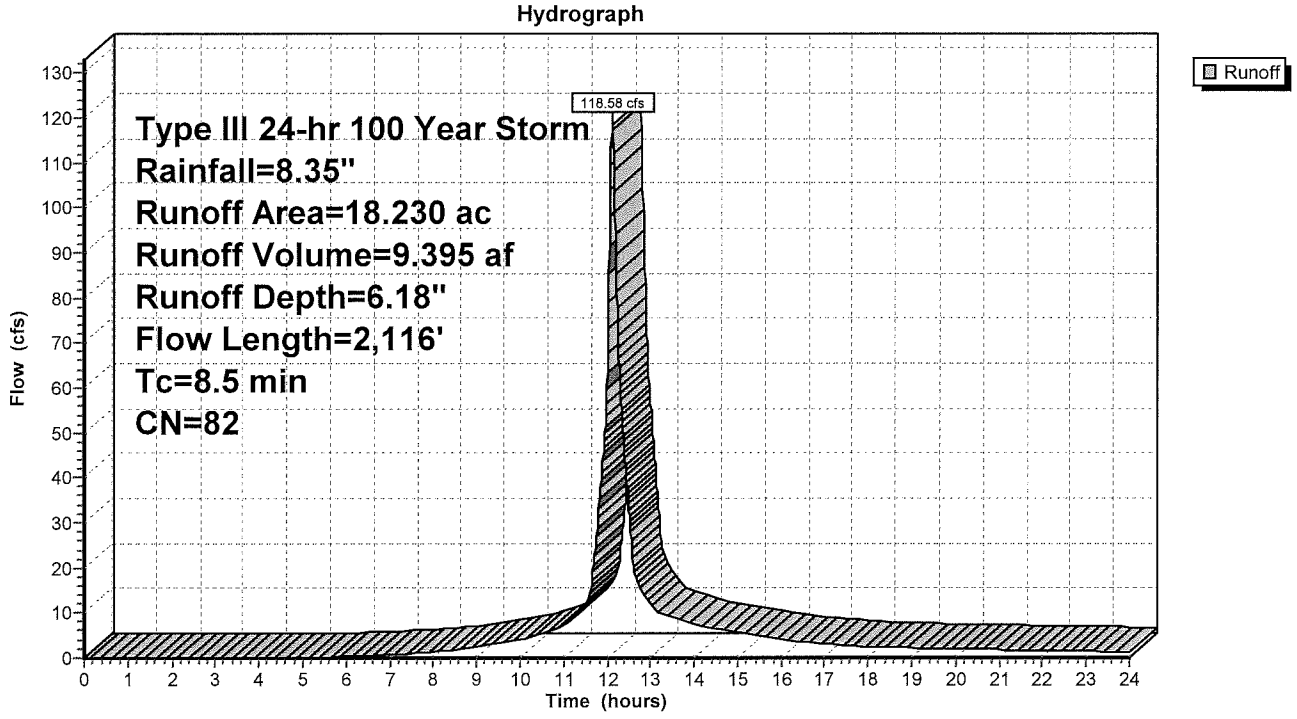
Runoff = 118.58 cfs @ 12.12 hrs, Volume= 9.395 af, Depth= 6.18"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Storm Rainfall=8.35"

Area (ac)	CN	Description
2.390	98	Paved parking & roofs (Proposed)
0.170	91	Gravel roads, HSG D
0.110	77	Woods, Good, HSG D
0.110	74	>75% Grass cover, Good, HSG C
15.450	80	>75% Grass cover, Good, HSG D
18.230	82	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	100	0.1192	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.21"
2.2	624	0.0825	4.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.5	1,392	0.0517	16.0	28.23	**Circular Channel (pipe),** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011
8.5	2,116	Total			

Subcatchment 4S: Subcatchment 1S

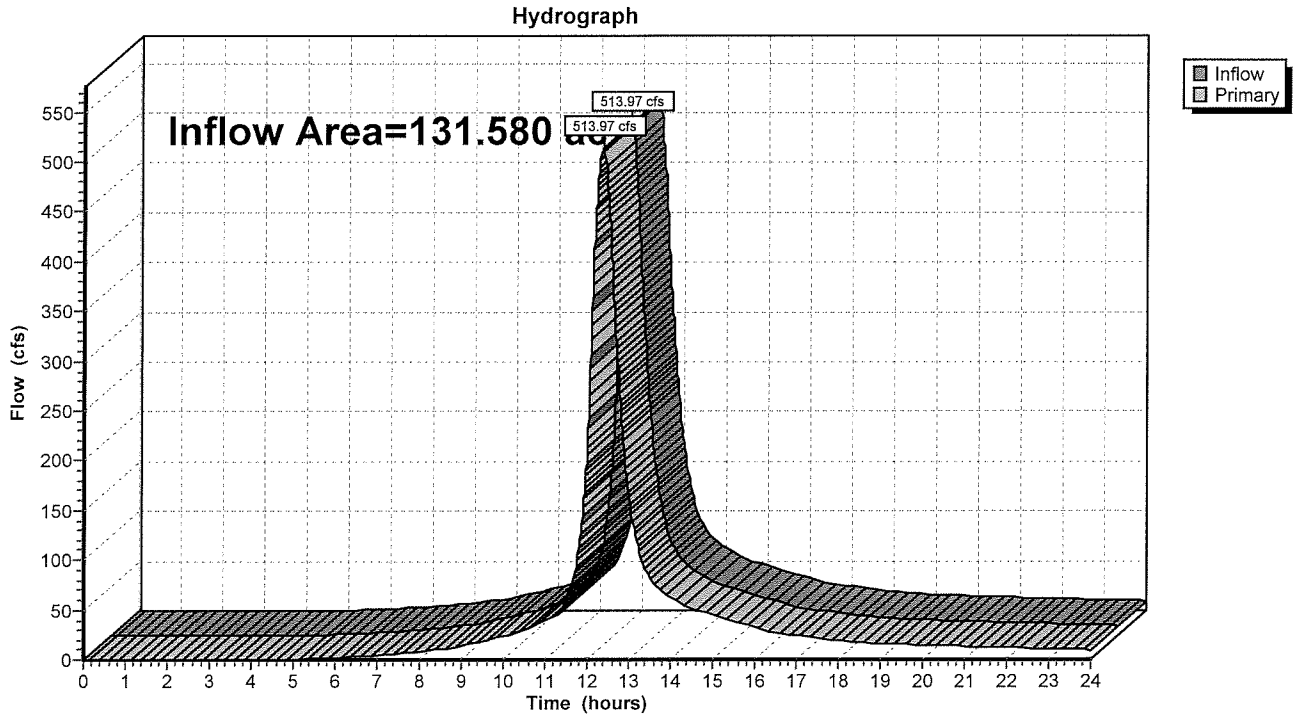


Pond 1P: Design Point 1

Inflow Area = 131.580 ac, Inflow Depth = 6.23" for 100 Year Storm event
Inflow = 513.97 cfs @ 12.37 hrs, Volume= 68.332 af
Primary = 513.97 cfs @ 12.37 hrs, Volume= 68.332 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Pond 1P: Design Point 1

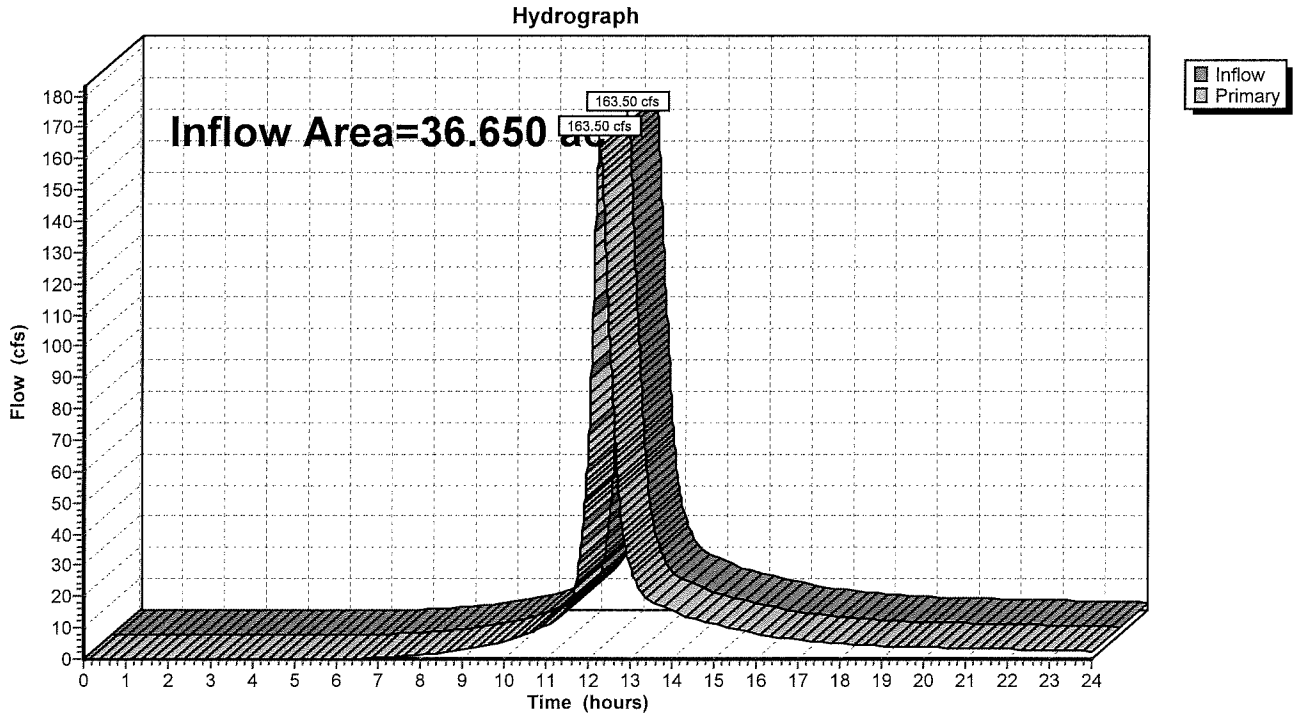


Pond 2P: Design Point 2

Inflow Area = 36.650 ac, Inflow Depth = 5.58" for 100 Year Storm event
Inflow = 163.50 cfs @ 12.25 hrs, Volume= 17.032 af
Primary = 163.50 cfs @ 12.25 hrs, Volume= 17.032 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Pond 2P: Design Point 2



Pond 3P: Micropool Extended Detention Pond 3P

Inflow Area = 6.290 ac, Inflow Depth = 6.42" for 100 Year Storm event
Inflow = 42.26 cfs @ 12.12 hrs, Volume= 3.367 af
Outflow = 35.78 cfs @ 12.17 hrs, Volume= 2.933 af, Atten= 15%, Lag= 3.6 min
Primary = 35.78 cfs @ 12.17 hrs, Volume= 2.933 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 480.97' @ 12.17 hrs Surf.Area= 0 sf Storage= 37,606 cf
Plug-Flow detention time= 104.9 min calculated for 2.933 af (87% of inflow)
Center-of-Mass det. time= 47.6 min (840.5 - 793.0)

#	Invert	Avail.Storage	Storage Description
1	478.00'	53,532 cf	**Custom Stage Data** Listed below

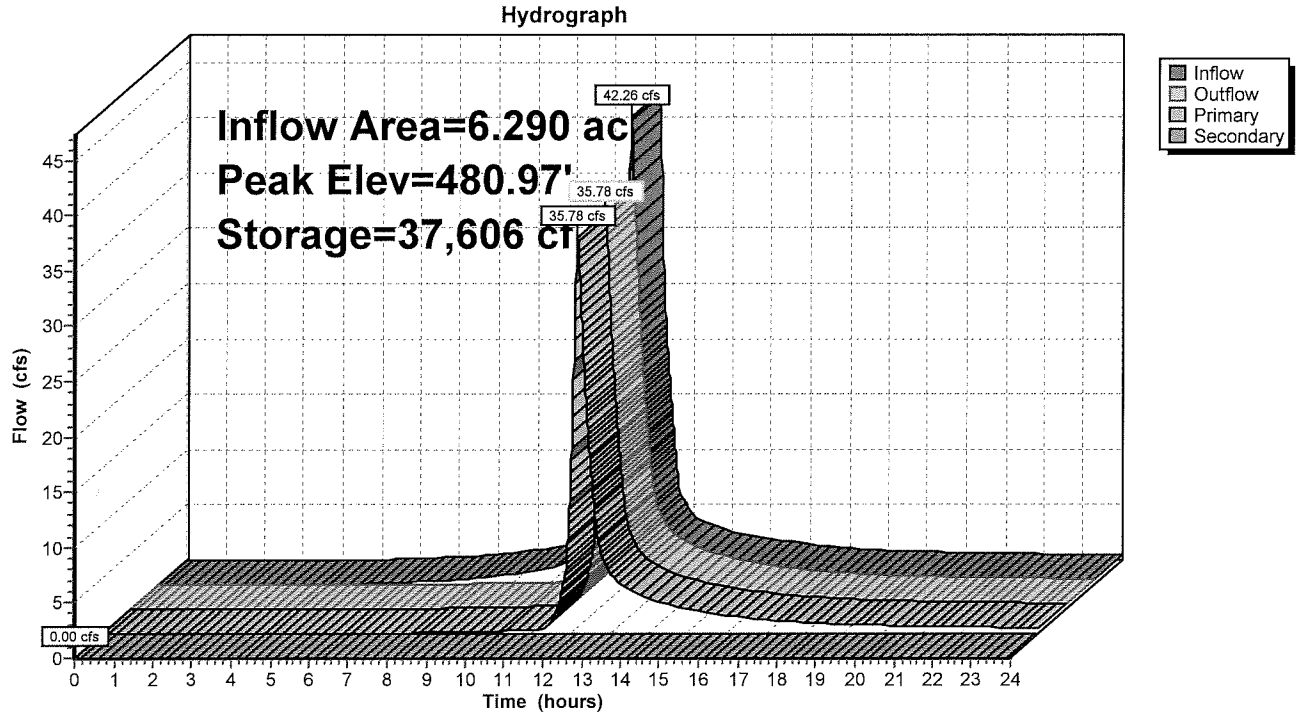
Elevation (feet)	Cum.Store (cubic-feet)
478.00	0
480.00	22,743
482.00	53,532

#	Routing	Invert	Outlet Devices
1	Primary	478.00'	**24.0" x 61.0' long Culvert X 2.00** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 477.39' S= 0.0100 '/' n= 0.011 Cc= 0.900
2	Device 1	478.00'	**3.2" Vert. Orifice/Grate** C= 0.600
3	Device 1	479.59'	**3.0' long x 0.7' 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 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32
4	Device 1	480.30'	**3.50' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600
5	Secondary	481.50'	**20.0' long x 13.0' 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) 2.60 2.64 2.70 2.66 2.65 2.66 2.65 2.63

Primary OutFlow Max=35.74 cfs @ 12.17 hrs HW=480.96' TW=0.00' (Dynamic Tailwater)
- **1=Culvert** (Passes 35.74 cfs of 42.41 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.45 cfs @ 8.1 fps)
  - **3=Broad-Crested Rectangular Weir** (Weir Controls 15.79 cfs @ 3.8 fps)
  - **4=Orifice/Grate** (Weir Controls 19.51 cfs @ 2.7 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=478.00' TW=0.00' (Dynamic Tailwater)
- **5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Micropool Extended Detention Pond 3P



Pond 4P: Micropool Extended Detention Pond 4P

Inflow Area = 18.230 ac, Inflow Depth = 6.18" for 100 Year Storm event
Inflow = 118.58 cfs @ 12.12 hrs, Volume= 9.395 af
Outflow = 110.54 cfs @ 12.15 hrs, Volume= 8.314 af, Atten= 7%, Lag= 2.2 min
Primary = 37.83 cfs @ 12.15 hrs, Volume= 5.531 af
Secondary = 72.71 cfs @ 12.15 hrs, Volume= 2.782 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 480.95' @ 12.15 hrs Surf.Area= 0 sf Storage= 67,910 cf
Plug-Flow detention time= 85.1 min calculated for 8.314 af (88% of inflow)
Center-of-Mass det. time= 32.0 min (830.0 - 798.0)

#	Invert	Avail.Storage	Storage Description
1	476.00'	87,964 cf	**Custom Stage Data** Listed below

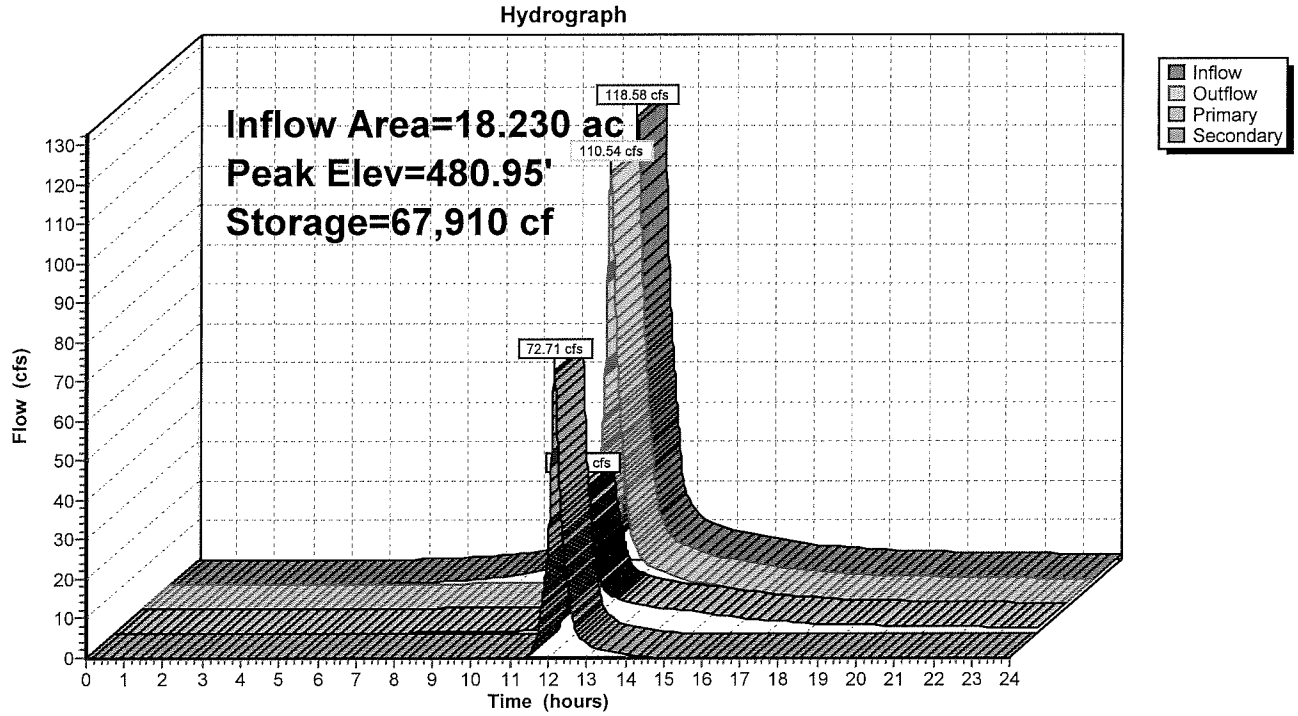
Elevation (feet)	Cum.Store (cubic-feet)
476.00	0
478.00	20,928
480.00	49,897
482.00	87,964

#	Routing	Invert	Outlet Devices
1	Primary	476.00'	**30.0" x 41.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 475.59' S= 0.0100 '/' n= 0.010 Cc= 0.900
2	Device 1	476.00'	**4.1" Vert. Orifice/Grate** C= 0.600
3	Device 1	479.75'	**3.50' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600
4	Secondary	480.00'	**30.0' long x 16.0' 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=37.82 cfs @ 12.15 hrs HW=480.95' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 37.82 cfs of 45.44 cfs potential flow)
↑—**2=Orifice/Grate** (Orifice Controls 0.96 cfs @ 10.5 fps)
—**3=Orifice/Grate** (Orifice Controls 36.85 cfs @ 5.3 fps)

Secondary OutFlow Max=72.61 cfs @ 12.15 hrs HW=480.95' TW=0.00' (Dynamic Tailwater)
↑—**4=Broad-Crested Rectangular Weir** (Weir Controls 72.61 cfs @ 2.6 fps)

Pond 4P: Micropool Extended Detention Pond 4P



Appendix 8

TR-20 Supporting Data

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	Yes
State	New York
Location	
Longitude	74.293 degrees West
Latitude	41.336 degrees North
Elevation	0 feet
Date/Time	Wed, 21 Feb 2018 13:09:04 -0500

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.33	0.51	0.63	0.82	1.03	1.28	**1yr**	0.89	1.20	1.46	1.79	2.18	2.66	3.06	**1yr**	2.35	2.95	3.39	4.08	4.72	**1yr**
2yr	0.39	0.61	0.75	0.99	1.25	1.55	**2yr**	1.08	1.45	1.78	2.18	2.65	3.21	3.66	**2yr**	2.84	3.52	4.03	4.75	5.40	**2yr**
5yr	0.46	0.72	0.90	1.20	1.54	1.94	**5yr**	1.33	1.79	2.23	2.73	3.33	4.02	4.63	**5yr**	3.56	4.45	5.08	5.87	6.63	**5yr**
10yr	0.52	0.81	1.02	1.39	1.81	2.29	**10yr**	1.56	2.10	2.64	3.25	3.96	4.78	5.53	**10yr**	4.23	5.32	6.05	6.89	7.75	**10yr**
25yr	0.60	0.95	1.21	1.68	2.24	2.87	**25yr**	1.93	2.60	3.32	4.10	4.99	6.00	7.00	**25yr**	5.31	6.73	7.64	8.52	9.53	**25yr**
50yr	0.68	1.09	1.39	1.95	2.63	3.39	**50yr**	2.27	3.05	3.94	4.88	5.93	7.13	8.38	**50yr**	6.31	8.06	9.11	10.02	11.16	**50yr**
100yr	0.77	1.24	1.60	2.27	3.10	4.03	**100yr**	2.67	3.59	4.69	5.81	7.06	8.48	10.03	**100yr**	7.50	9.65	10.88	11.78	13.07	**100yr**
200yr	0.87	1.42	1.84	2.64	3.65	4.77	**200yr**	3.15	4.23	5.58	6.92	8.41	10.09	12.02	**200yr**	8.93	11.56	12.99	13.85	15.31	**200yr**
500yr	1.04	1.71	2.23	3.23	4.53	5.98	**500yr**	3.91	5.25	7.00	8.71	10.60	12.71	15.27	**500yr**	11.25	14.68	16.44	17.18	18.90	**500yr**

Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.30	0.46	0.56	0.75	0.92	1.11	1yr	0.80	1.09	1.23	1.56	2.02	2.28	2.58	1yr	2.02	2.48	2.81	3.80	4.32	1yr
2yr	0.38	0.58	0.72	0.97	1.20	1.45	2yr	1.04	1.42	1.64	2.10	2.61	3.10	3.54	2yr	2.75	3.40	3.90	4.62	5.26	2yr
5yr	0.43	0.66	0.81	1.12	1.42	1.68	5yr	1.23	1.64	1.91	2.45	3.07	3.71	4.26	5yr	3.28	4.10	4.73	5.45	6.19	5yr
10yr	0.47	0.72	0.89	1.24	1.61	1.88	10yr	1.39	1.84	2.15	2.74	3.47	4.23	4.89	10yr	3.74	4.71	5.46	6.16	6.96	10yr
25yr	0.53	0.81	1.01	1.44	1.89	2.17	25yr	1.63	2.12	2.51	3.22	4.05	4.98	5.88	25yr	4.41	5.66	6.58	7.27	8.11	25yr
50yr	0.59	0.89	1.11	1.59	2.15	2.44	50yr	1.85	2.38	2.82	3.64	4.58	5.60	6.78	50yr	4.96	6.52	7.61	8.26	9.13	50yr
100yr	0.65	0.98	1.23	1.78	2.44	2.72	100yr	2.11	2.66	3.18	4.12	5.20	6.29	7.83	100yr	5.57	7.53	8.81	9.38	10.26	100yr
200yr	0.73	1.09	1.39	2.01	2.80	3.05	200yr	2.41	2.99	3.58	4.68	5.90	7.08	9.06	200yr	6.27	8.71	10.22	10.67	11.52	200yr
500yr	0.85	1.26	1.62	2.36	3.35	3.55	500yr	2.89	3.47	4.22	5.57	7.02	8.25	11.01	500yr	7.30	10.59	12.46	12.68	13.49	500yr

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.36	0.55	0.68	0.91	1.12	1.35	1yr	0.97	1.32	1.56	1.97	2.41	2.87	3.31	1yr	2.54	3.18	3.66	4.30	5.07	1yr
2yr	0.41	0.63	0.78	1.05	1.30	1.55	2yr	1.12	1.52	1.77	2.25	2.80	3.35	3.81	2yr	2.97	3.66	4.21	4.93	5.64	2yr
5yr	0.50	0.77	0.96	1.32	1.68	1.99	5yr	1.45	1.95	2.27	2.91	3.63	4.36	4.95	5yr	3.86	4.76	5.46	6.31	7.09	5yr
10yr	0.59	0.91	1.13	1.58	2.04	2.44	10yr	1.76	2.39	2.76	3.55	4.44	5.38	6.13	10yr	4.76	5.89	6.69	7.61	8.49	10yr
25yr	0.75	1.13	1.41	2.02	2.65	3.20	25yr	2.29	3.12	3.62	4.65	5.78	7.09	8.04	25yr	6.28	7.73	8.75	9.76	10.80	25yr
50yr	0.88	1.35	1.68	2.41	3.24	3.81	50yr	2.80	3.72	4.42	5.68	7.05	8.78	9.88	50yr	7.77	9.50	10.72	11.78	12.98	50yr
100yr	1.05	1.59	1.99	2.88	3.94	4.64	100yr	3.40	4.54	5.40	6.94	8.60	10.89	12.15	100yr	9.63	11.68	13.13	14.23	15.61	100yr
200yr	1.25	1.88	2.38	3.45	4.81	5.66	200yr	4.15	5.53	6.60	8.48	10.50	13.53	14.94	200yr	11.97	14.36	16.10	17.18	18.78	200yr
500yr	1.58	2.35	3.02	4.39	6.24	7.35	500yr	5.39	7.19	8.60	11.06	13.65	18.04	19.60	500yr	15.97	18.84	21.05	22.05	24.02	500yr

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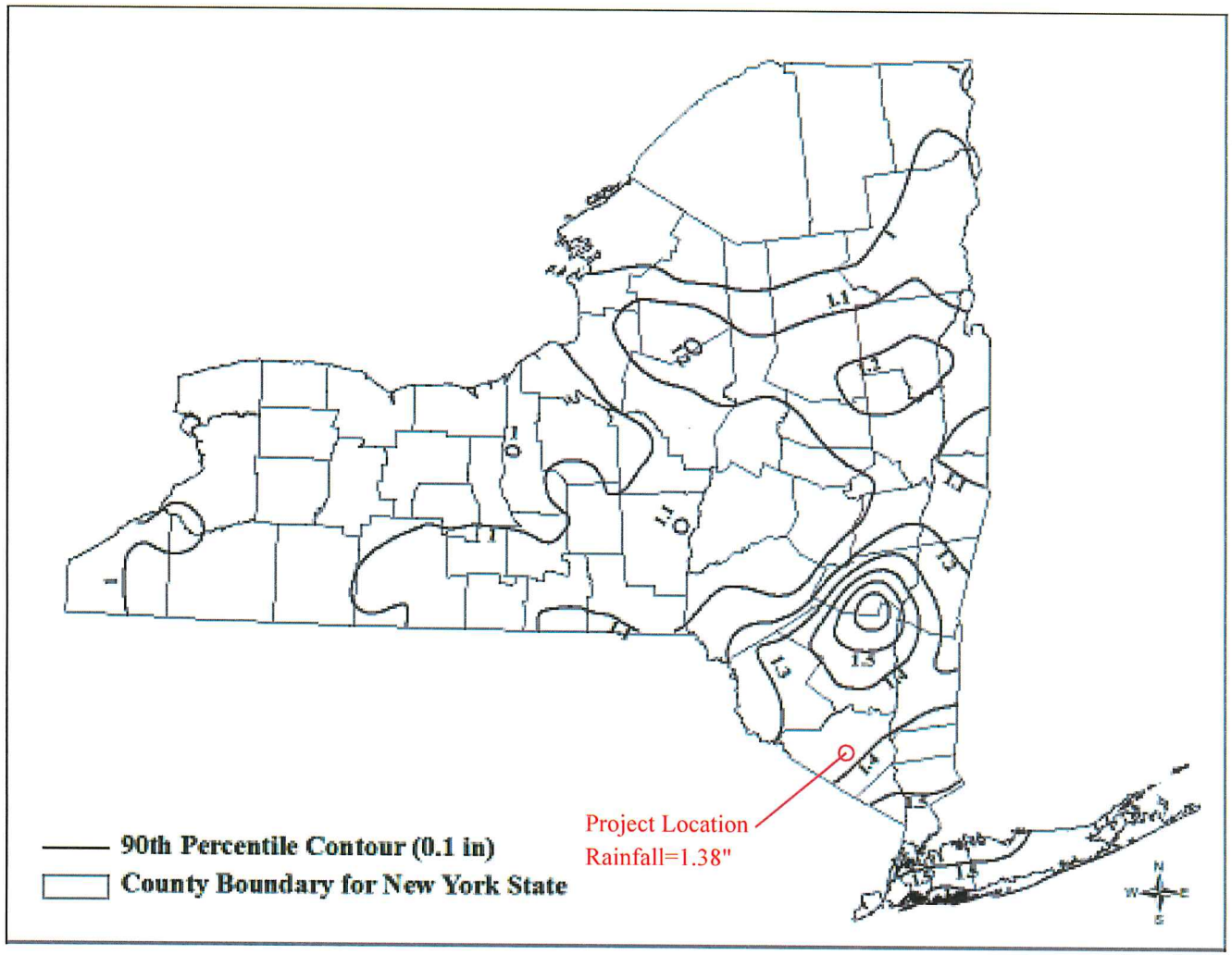
Northeast Regional Climate Center

New York State Stormwater Management Design Manual

Chapter 4: Unified Stormwater Sizing Criteria

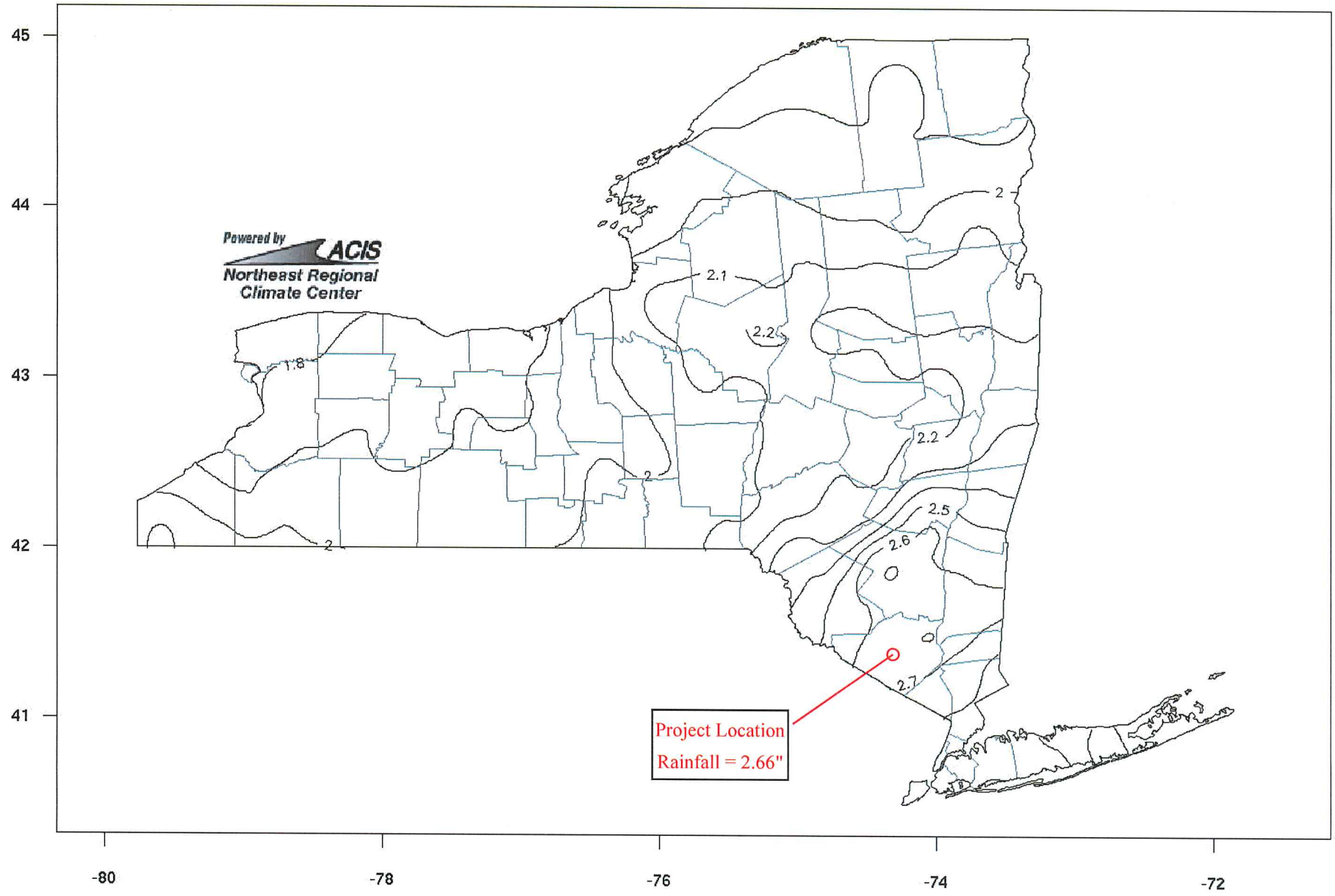
Section 4.2 Water Quality Volume (WQv)

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

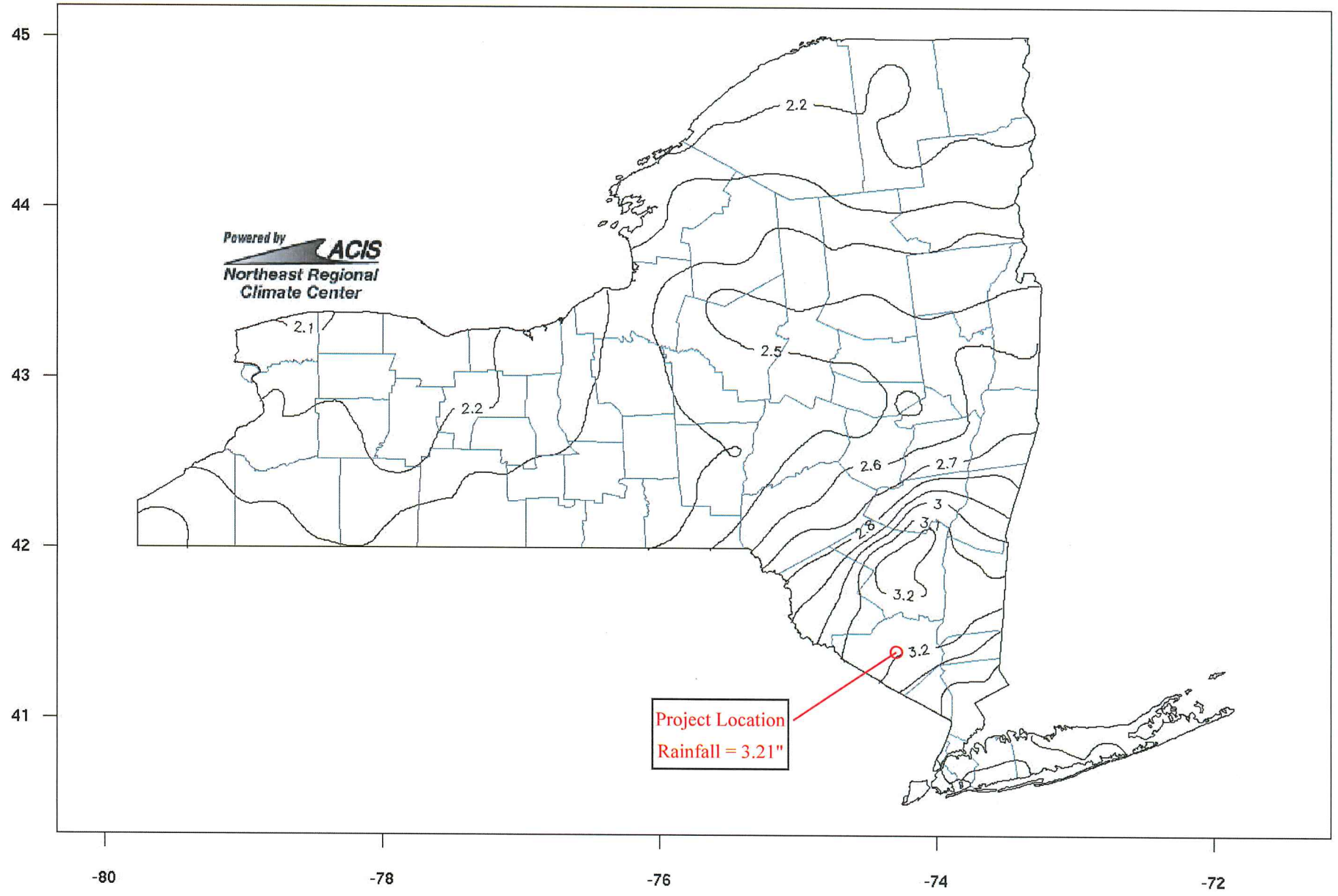


Basis of Design for Water Quality

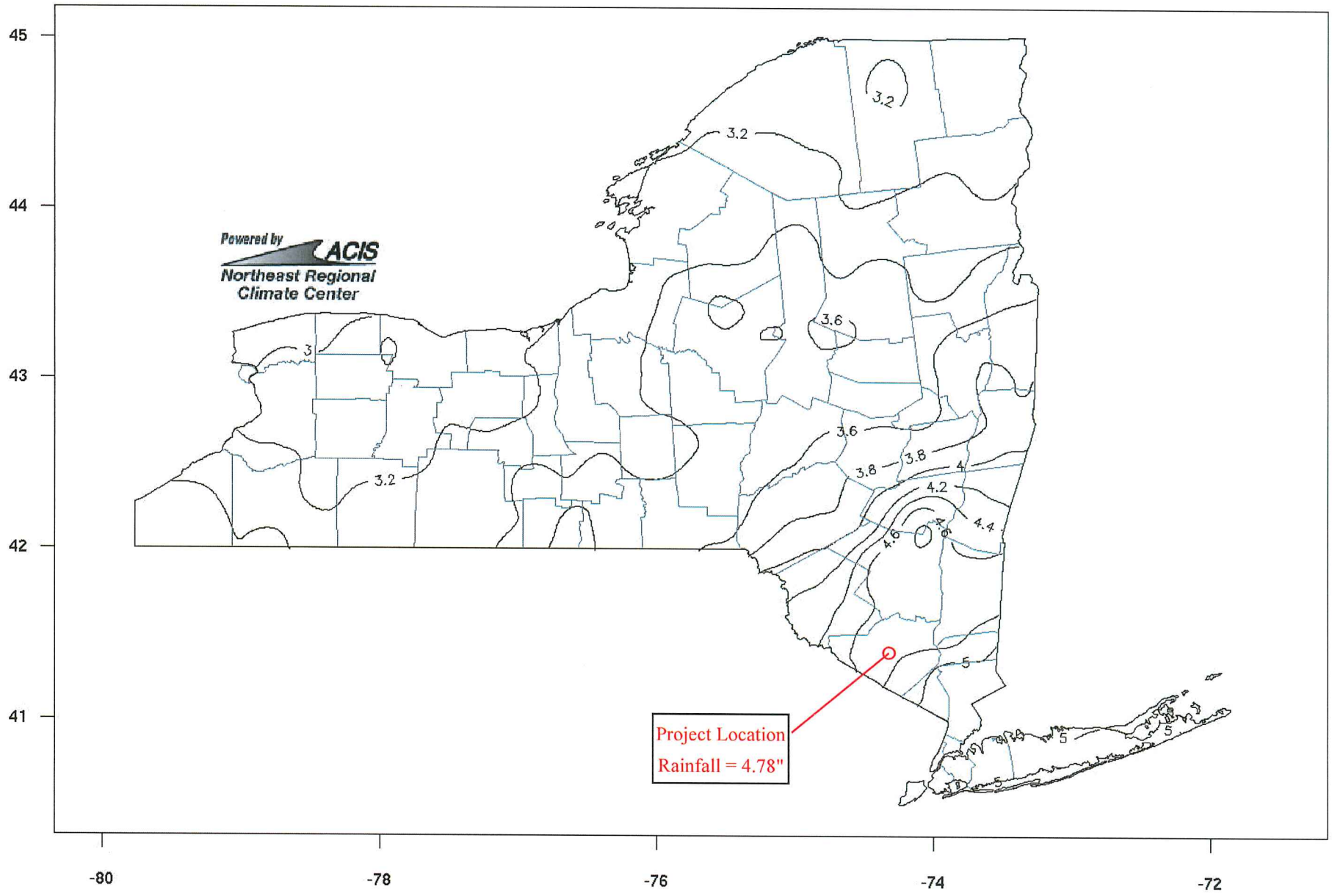
Extreme Precipitation Estimates
24hr 1yr



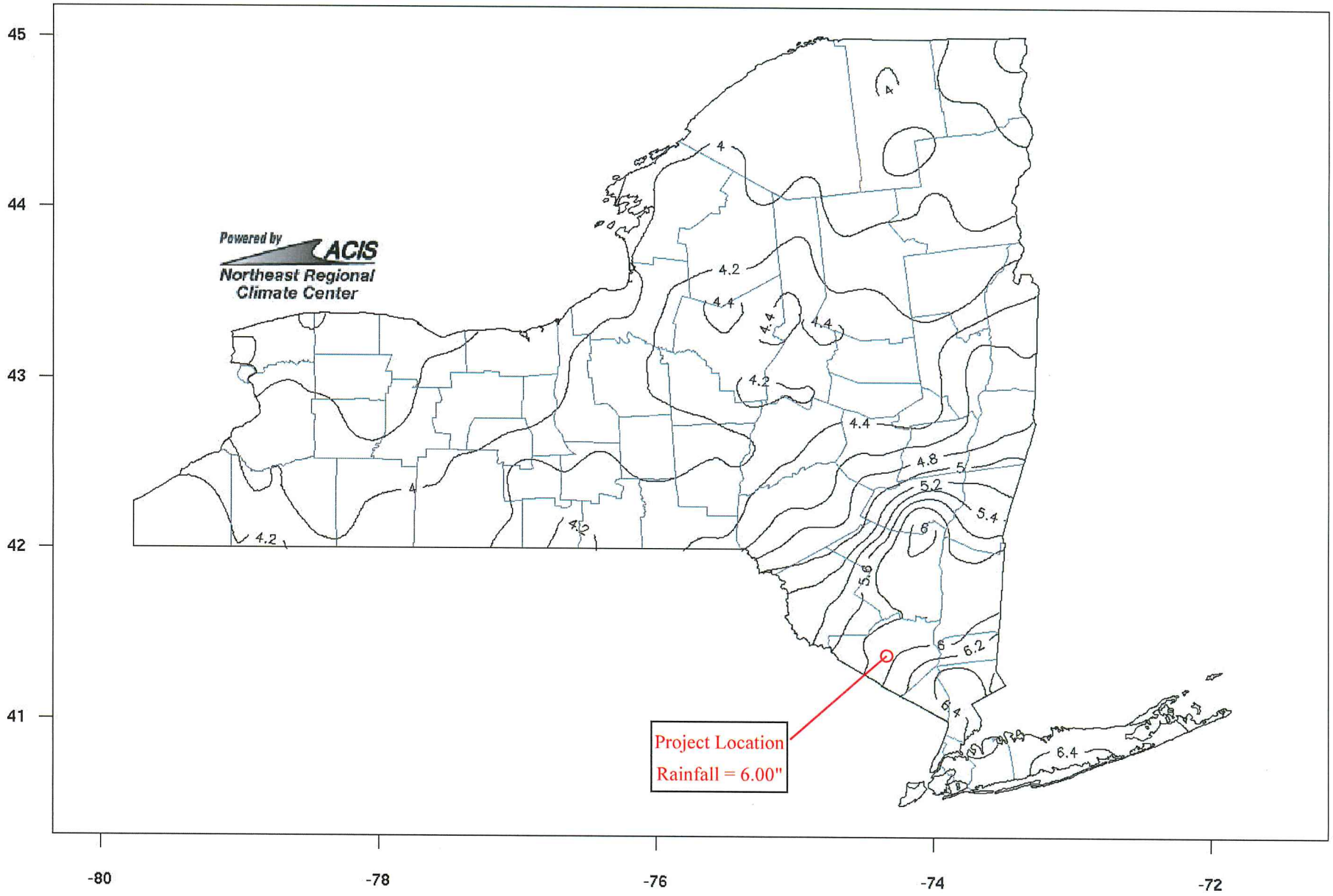
Extreme Precipitation Estimates
24hr 2yr



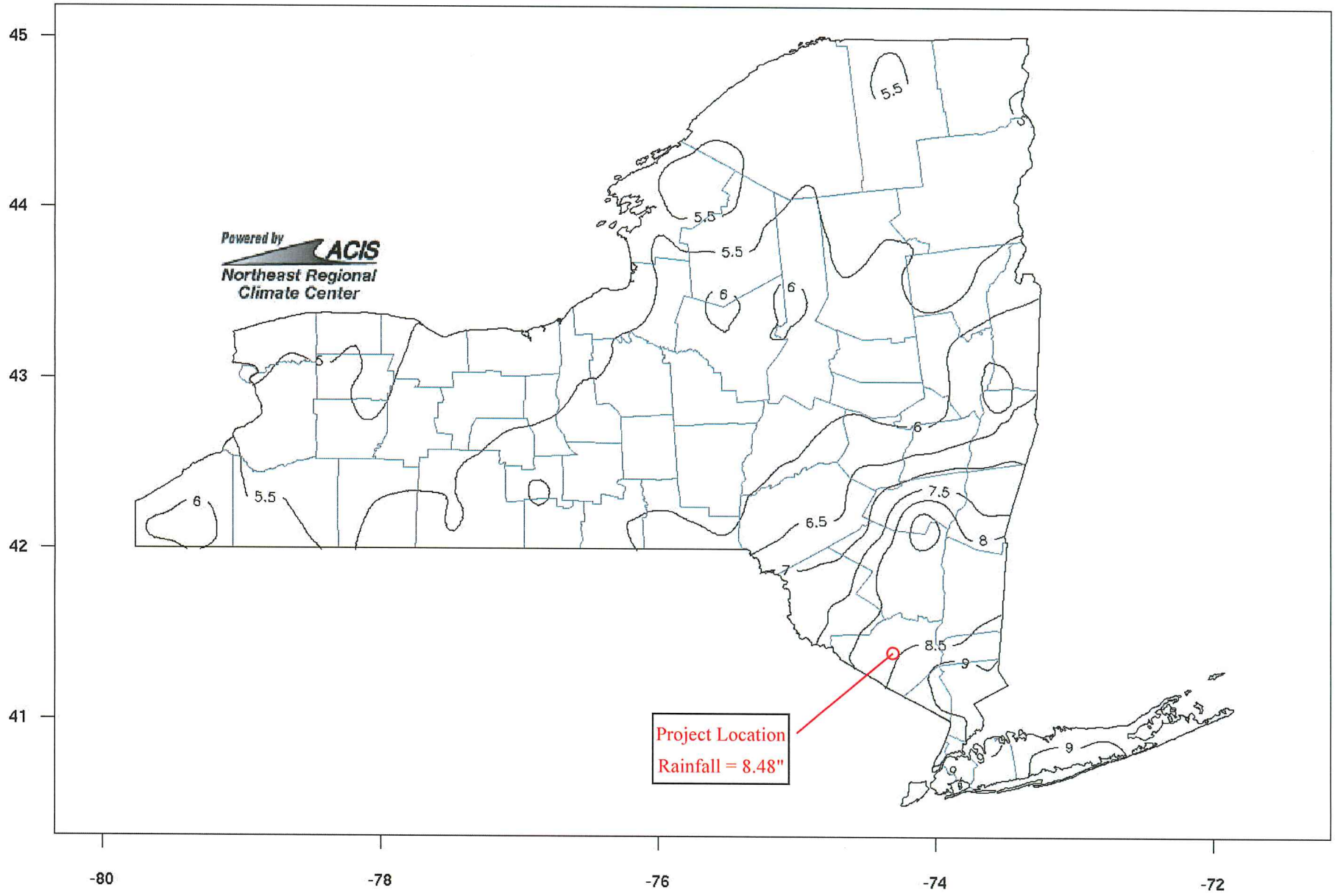
Extreme Precipitation Estimates
24hr 10yr



Extreme Precipitation Estimates
24hr 25yr



Extreme Precipitation Estimates
24hr 100yr



United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Orange County, New York

Baroda Cluster Subdivision

February 15, 2018

Preface

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

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

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

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

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

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

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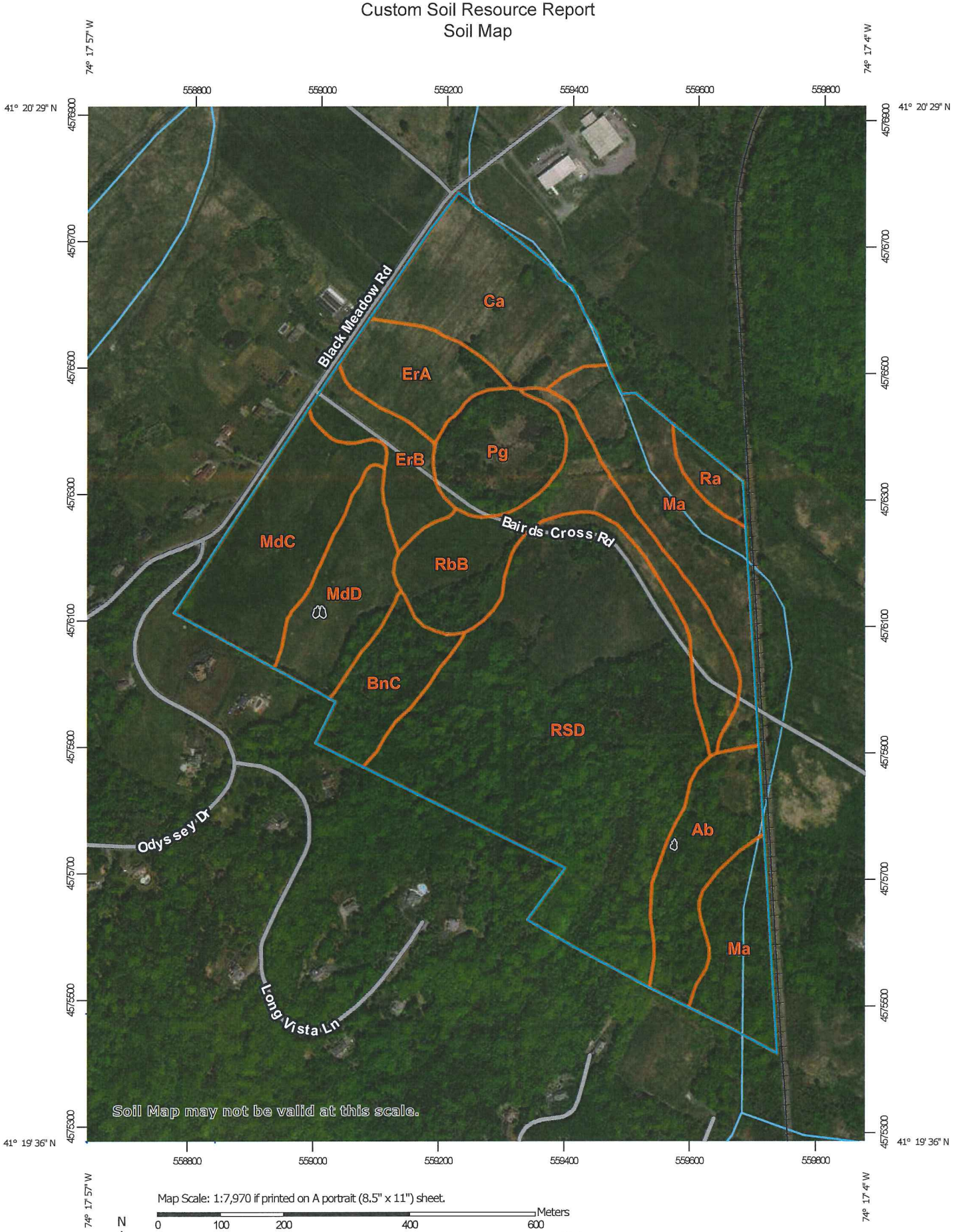
Contents

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: 1:7,970 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 350 700 1400 2100

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

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

Special Point Features

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Orange County, New York
Survey Area Data: Version 18, Oct 8, 2017

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

Date(s) aerial images were photographed: Oct 7, 2013—Feb 26, 2017

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Ab	Alden silt loam	9.6	5.7%
BnC	Bath-Nassau channery silt loams, 8 to 15 percent slopes	6.8	4.1%
Ca	Canandaigua silt loam	14.6	8.7%
ErA	Erie gravelly silt loam, 0 to 3 percent slopes	7.2	4.3%
ErB	Erie gravelly silt loam, 3 to 8 percent slopes	5.9	3.5%
Ma	Madalin silt loam	21.3	12.6%
MdC	Mardin gravelly silt loam, 8 to 15 percent slopes	14.1	8.4%
MdD	Mardin gravelly silt loam, 15 to 25 percent slopes	9.1	5.4%
Pg	Pits, gravel	8.1	4.8%
Ra	Raynham silt loam	2.0	1.2%
RbB	Rhinebeck silt loam, 3 to 8 percent slopes	15.5	9.2%
RSD	Rock outcrop-Nassau complex, hilly	54.1	32.1%
Totals for Area of Interest		**168.3**	**100.0%**

Map Unit Descriptions

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

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

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties

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

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

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

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

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

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

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

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

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

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

Orange County, New York

Ab—Alden silt loam

Map Unit Setting

National map unit symbol: 9vtc
Elevation: 300 to 1,500 feet
Mean annual precipitation: 42 to 52 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 135 to 215 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Alden

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: A silty mantle of local deposition overlying loamy till

Typical profile

H1 - 0 to 9 inches: silt loam
H2 - 9 to 36 inches: silt loam
H3 - 36 to 60 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.57 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 1 percent
Available water storage in profile: High (about 9.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Minor Components

Canandaigua

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Carlisle

Percent of map unit: 5 percent
Landform: Marshes, swamps
Hydric soil rating: Yes

Erie

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: No

Wayland

Percent of map unit: 5 percent
Landform: Flood plains
Hydric soil rating: Yes

BnC—Bath-Nassau channery silt loams, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 9vtp
Elevation: 600 to 1,800 feet
Mean annual precipitation: 42 to 52 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 135 to 215 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Bath and similar soils: 50 percent
Nassau and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Bath

Setting

Landform: Hills, till plains, drumlinoid 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 gray and brown siltstone, sandstone, and shale

Typical profile

H1 - 0 to 9 inches: channery silt loam
H2 - 9 to 29 inches: channery silt loam
H3 - 29 to 51 inches: very channery silt loam
H4 - 51 to 57 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 15 percent

Depth to restrictive feature: 22 to 38 inches to fragipan; 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 24 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Hydric soil rating: No

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

Typical profile

H1 - 0 to 10 inches: channery silt loam
H2 - 10 to 17 inches: very channery silt loam
H3 - 17 to 21 inches: unweathered bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Somewhat excessively 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
Available water storage in profile: Very low (about 1.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Lordstown

Percent of map unit: 9 percent
Hydric soil rating: No

Erie

Percent of map unit: 5 percent
Hydric soil rating: No

Mardin

Percent of map unit: 5 percent
Hydric soil rating: No

Rock outcrop

Percent of map unit: 1 percent
Hydric soil rating: Unranked

Ca—Canandaigua silt loam

Map Unit Setting

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

Map Unit Composition

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

Description of Canandaigua

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Silty and clayey glaciolacustrine deposits

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 35 inches: silty clay loam
H3 - 35 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 1.98 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Moderate (about 7.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Alden

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Halsey

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Madalin

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Palms

Percent of map unit: 5 percent
Landform: Marshes, swamps
Hydric soil rating: Yes

Raynham

Percent of map unit: 5 percent
Hydric soil rating: No

ErA—Erie gravelly silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 9vv8
Mean annual precipitation: 42 to 52 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 135 to 215 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Erie

Setting

Landform: Till plains, drumlinoid ridges, hills
Landform position (two-dimensional): Footslope, summit

Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy till derived from siltstone, sandstone, shale, and limestone

Typical profile

H1 - 0 to 10 inches: gravelly silt loam
H2 - 10 to 18 inches: channery silt loam
H3 - 18 to 56 inches: channery silt loam
H4 - 56 to 70 inches: channery silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 10 to 21 inches to fragipan
Natural drainage class: Somewhat 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 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Alden

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Bath

Percent of map unit: 5 percent
Hydric soil rating: No

Swartswood

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: No

Mardin

Percent of map unit: 5 percent
Hydric soil rating: No

Wurtsboro

Percent of map unit: 5 percent
Hydric soil rating: No

ErB—Erie gravelly silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9vv9
Mean annual precipitation: 42 to 52 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 135 to 215 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Erie

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 derived from siltstone, sandstone, shale, and limestone

Typical profile

H1 - 0 to 9 inches: gravelly silt loam
H2 - 9 to 18 inches: channery silt loam
H3 - 18 to 54 inches: channery silt loam
H4 - 54 to 70 inches: channery silt loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 10 to 21 inches to fragipan
Natural drainage class: Somewhat 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 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Very low (about 2.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Alden

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Bath

Percent of map unit: 5 percent
Hydric soil rating: No

Mardin

Percent of map unit: 5 percent
Hydric soil rating: No

Wurtsboro

Percent of map unit: 5 percent
Hydric soil rating: No

Ma—Madalin silt loam

Map Unit Setting

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

Map Unit Composition

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

Description of Madalin

Setting

Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Clayey and silty glaciolacustrine deposits

Typical profile

H1 - 0 to 10 inches: silt loam
H2 - 10 to 38 inches: silty clay loam
H3 - 38 to 60 inches: stratified silty clay

Properties and qualities

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

Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately 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: Frequent
Calcium carbonate, maximum in profile: 15 percent
Available water storage in profile: Moderate (about 8.4 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Minor Components

Canandaigua
Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Humaquepts
Percent of map unit: 5 percent
Landform: Marshes, swamps
Hydric soil rating: Yes

Palms
Percent of map unit: 5 percent
Landform: Marshes, swamps
Hydric soil rating: Yes

Rhinebeck
Percent of map unit: 5 percent
Hydric soil rating: No

MdC—Mardin gravelly silt loam, 8 to 15 percent slopes

Map Unit Setting
National map unit symbol: 2v30l
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Farmland of statewide importance

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

Description of Mardin

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy till

Typical profile

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

Properties and qualities

Slope: 8 to 15 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: 14 to 26 inches to fragipan
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 13 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Volusia

Percent of map unit: 5 percent
Landform: Hills, mountains
Landform position (two-dimensional): Footslope, summit
Landform position (three-dimensional): Base slope, interfluve, side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Bath

Percent of map unit: 5 percent
Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Nose slope, side slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Lordstown

Percent of map unit: 5 percent
Landform: Hills, mountains

Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope, nose slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

MdD—Mardin gravelly silt loam, 15 to 25 percent slopes

Map Unit Setting

National map unit symbol: 2v30p
Elevation: 330 to 2,460 feet
Mean annual precipitation: 31 to 70 inches
Mean annual air temperature: 39 to 52 degrees F
Frost-free period: 105 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Mardin

Setting

Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Loamy till

Typical profile

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

Properties and qualities

Slope: 15 to 25 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: 14 to 26 inches to fragipan
Natural drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 13 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Bath

Percent of map unit: 5 percent
Landform: Hills, mountains
Landform position (two-dimensional): Summit, backslope, shoulder
Landform position (three-dimensional): Interfluve, side slope, nose slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Hydric soil rating: No

Volusia

Percent of map unit: 5 percent
Landform: Hills, mountains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Interfluve, side slope
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Lordstown

Percent of map unit: 5 percent
Landform: Hills, mountains
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank, side slope, nose slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Pg—Pits, gravel

Map Unit Setting

National map unit symbol: 9vw7
Mean annual precipitation: 42 to 52 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 135 to 215 days
Farmland classification: Not prime farmland

Map Unit Composition

Pits, gravel: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Minor Components

Chenango

Percent of map unit: 5 percent

Hydric soil rating: No

Hoosic

Percent of map unit: 5 percent
Hydric soil rating: No

Riverhead

Percent of map unit: 5 percent
Hydric soil rating: No

Scarboro

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Udorthents

Percent of map unit: 5 percent
Hydric soil rating: No

Ra—Raynham silt loam

Map Unit Setting

National map unit symbol: 9vwd
Elevation: 50 to 500 feet
Mean annual precipitation: 42 to 52 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 135 to 215 days
Farmland classification: Prime farmland if drained

Map Unit Composition

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

Description of Raynham, Poorly Drained

Setting

Landform: Lake plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Glaciolacustrine, eolian, or old alluvial deposits, comprised mainly of silt and very fine sand

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 26 inches: silt loam
H3 - 26 to 60 inches: silt loam

Properties and qualities

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

Natural drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 6 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: High (about 11.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Description of Raynham, Somewhat Poorly Drained

Setting

Landform: Lake plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Glaciolacustrine, eolian, or old alluvial deposits, comprised mainly of silt and very fine sand

Typical profile

H1 - 0 to 8 inches: silt loam
H2 - 8 to 26 inches: silt loam
H3 - 26 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 6 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Available water storage in profile: High (about 11.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Canandaigua

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Madalin

Percent of map unit: 5 percent

Landform: Depressions
Hydric soil rating: Yes

Palms

Percent of map unit: 5 percent
Landform: Marshes, swamps
Hydric soil rating: Yes

Scio

Percent of map unit: 5 percent
Hydric soil rating: No

Unadilla

Percent of map unit: 5 percent
Hydric soil rating: No

RbB—Rhinebeck silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9vwg
Elevation: 80 to 1,000 feet
Mean annual precipitation: 42 to 52 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 135 to 215 days
Farmland classification: Prime farmland if drained

Map Unit Composition

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

Description of Rhinebeck

Setting

Landform: Lake plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Clayey and silty glaciolacustrine deposits

Typical profile

H1 - 0 to 7 inches: silt loam
H2 - 7 to 41 inches: silty clay loam
H3 - 41 to 60 inches: silty clay loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Available water storage in profile: Moderate (about 8.2 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Collamer
Percent of map unit: 5 percent
Hydric soil rating: No

Hudson
Percent of map unit: 5 percent
Hydric soil rating: No

Madalin
Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Unadilla
Percent of map unit: 5 percent
Hydric soil rating: No

RSD—Rock outcrop-Nassau complex, hilly

Map Unit Setting
National map unit symbol: 9vwx
Elevation: 600 to 1,800 feet
Mean annual precipitation: 42 to 52 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 135 to 215 days
Farmland classification: Not prime farmland

Map Unit Composition
Rock outcrop: 55 percent
Nassau and similar soils: 35 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rock Outcrop

Typical profile

H1 - 0 to 60 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydric soil rating: Unranked

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

Typical profile

H1 - 0 to 10 inches: channery silt loam
H2 - 10 to 18 inches: very channery silt loam
H3 - 18 to 22 inches: unweathered bedrock

Properties and qualities

Slope: 15 to 25 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Somewhat excessively 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
Available water storage in profile: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Arnot

Percent of map unit: 5 percent
Hydric soil rating: No

Bath

Percent of map unit: 5 percent
Hydric soil rating: No

Soil Information for All Uses

Suitabilities and Limitations for Use

The Suitabilities and Limitations for Use section includes various soil interpretations 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 interpretation.

Water Management

Water Management interpretations are tools for evaluating the potential of the soil in the application of various water management practices. Example interpretations include pond reservoir area, embankments, dikes, levees, and excavated ponds.

Stormwater Management - Infiltration (NY)

Proper management of stormwater runoff from construction sites and developed areas is an issue of growing importance in New York State. During construction, exposed soil is subject to a greater risk of erosion, resulting in a greater potential for sedimentation in waterways. Stormwater runoff increases on the rooftops of buildings, paved parking lots, and other impervious surfaces, and thus increases the potential for flooding and discharge of polluted runoff into open water. Management of stormwater runoff can prevent or reduce the availability, release, or transport of substances that can degrade surface and ground waters. Guidelines and design criteria for stormwater management practices have been established by the New York State Department of Environmental Conservation (2008).

This interpretation is designed to evaluate the limitations of soils for stormwater management practices. The purpose of the interpretation is to help decision makers use soil survey information in the selection and implementation of the stormwater management practices best suited to a particular location. The information in the interpretations is intended for planning purposes and does not eliminate the need for on-site investigation of the soil.

Rating class terms indicate the extent to which the soils are limited by the soil features that influence the design, construction, and performance of stormwater management practices. "Least limited" indicates that the soil has features that are

very favorable for this practice. Good performance and low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the practice. The limitations can be overcome or minimized by special planning, design, or construction. Fair performance and moderate maintenance can be expected. "Most limited" indicates that the soil has one or more features that are unfavorable for the practice. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive construction procedures. Poor performance and high maintenance can be expected.

The rating class is based on the maximum value of the rating indices generated for each soil feature considered. Where the rating value is:

equal to 0.0, the rating class is "least limited."

greater than 0 and less than 1.0, the rating class is "somewhat limited."

equal to 1.0, the rating class is "most limited."

Design criteria in the "New York State Stormwater Management Design Manual" (New York State Department of Environmental Conservation, 2008) were used to guide the selection of potentially limiting soil properties. Additional limiting features incorporated into the interpretations are based on soil function for the specific practice.

Infiltration Practices

This interpretation evaluates the limitations of soils for stormwater management infiltration practices. Infiltration practices collect stormwater runoff in basins (or trenches) for storage prior to filtration through undisturbed soil in the basin (or trench) floor and sides. Deep, well drained, and permeable soils are required for implementing infiltration practices. Following is a synopsis of the soil features considered in this interpretation.

Excessive permeability: Excessive permeability in one or more layers may allow stormwater to move rapidly through the soil without sufficient filtering, resulting in a potential for groundwater contamination. Additional pretreatment or soil amendments may be required as part of an infiltration practice. The interpretation evaluates the range (low to high) of permeability values for the most transmissive layer in the soil.

Low permeability: Low permeability restricts movement of water through the soil, impeding the infiltration function. The interpretation evaluates the range (low to high) of permeability values for the least transmissive layer in the soil.

Slope gradient: Excessive slope limits the functionality of an infiltration practice. The representative slope gradient percent for the soil component is the property evaluated.

Depth to bedrock: Limited depth to bedrock impedes excavation and restricts infiltration. The minimum depth to bedrock is the property evaluated.

Depth to manufactured layer: In urban areas, some anthropogenic (human-altered) soils have a restrictive layer, such as pavement, below the surface. Limited depth to this feature impedes excavation and restricts infiltration. The minimum depth to a manufactured layer is the property evaluated.

Depth to saturation: A seasonal high water table in the upper part of the soil limits the storage capacity of an infiltration practice. The interpretation evaluates the minimum depth to a zone of saturation.

Excessive fines: Soils with a high content of silt and clay may become plugged with sediment from stormwater, resulting in restricted infiltration. The interpretation evaluates the weighted average of the percent clay and percent silt, for depths greater than 36 inches.

In addition to soil characteristics, other attributes of the site and the surrounding area are important factors in planning and implementing stormwater management practices. For example, proximity and slope direction from the installation practice to a drinking water well are important considerations when sites for infiltration practices are selected.

The components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen, which is displayed in the report. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as the one listed for the map unit. The percent composition of these components is described. As a result, the percentage of the rating class in the map unit is indicated.

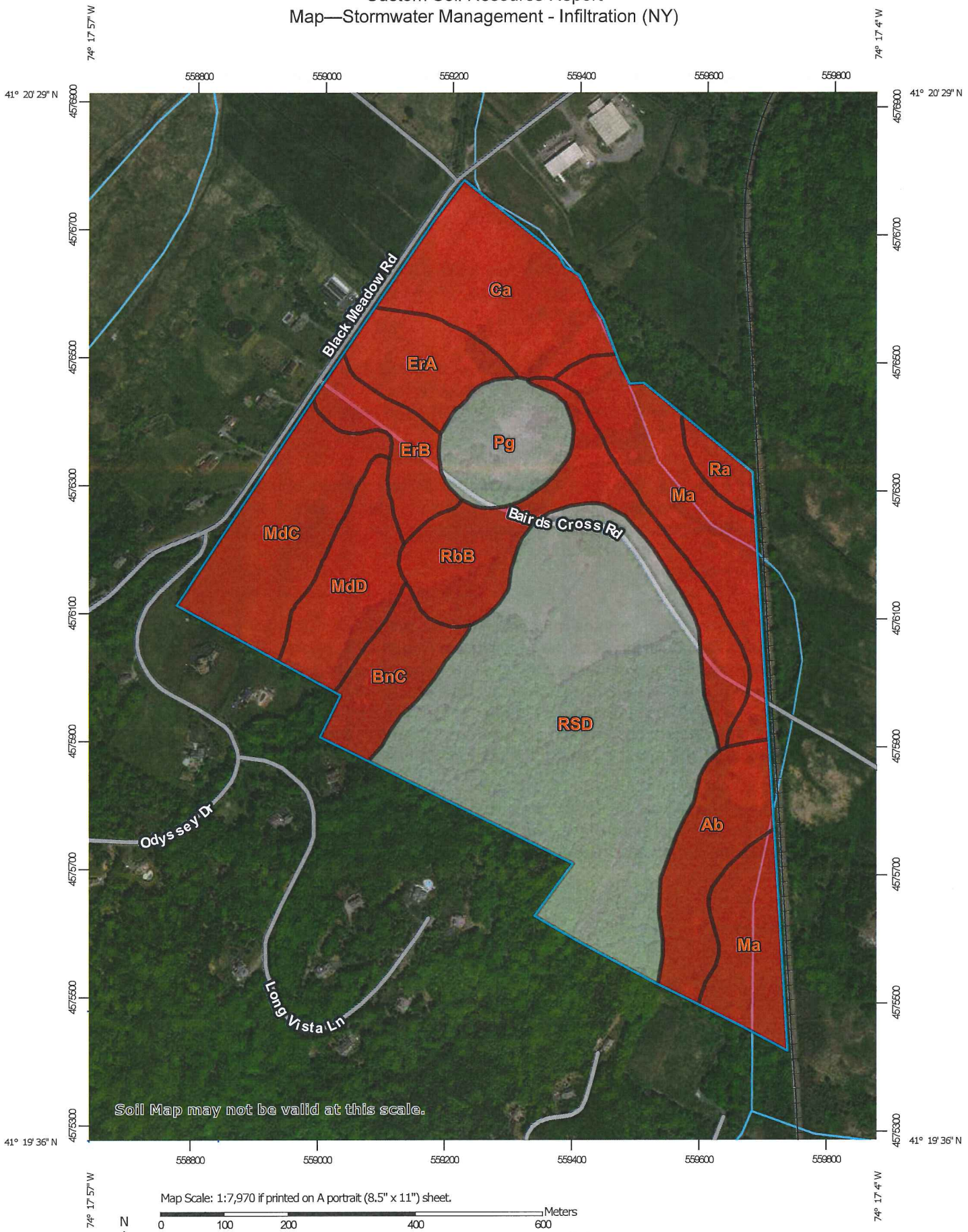
Other components with different ratings may occur in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the "Stormwater Management (NY)" report from the Soil Reports tab in Web Soil Survey.

References:

New York State Department of Environmental Conservation. April 2008. New York State Stormwater Management Design Manual.

New York State Department of Environmental Conservation. June 2000. Urban/ Stormwater Runoff Management Practices Catalogue for Nonpoint Source Pollution Prevention in New York State.

Map—Stormwater Management - Infiltration (NY)



MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- Most limited
- Somewhat limited
- Least limited
- Not rated or not available

Soil Rating Lines

- Most limited
- Somewhat limited
- Least limited
- Not rated or not available

Soil Rating Points

- Most limited
- Somewhat limited
- Least limited
- 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 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Orange County, New York
Survey Area Data: Version 18, Oct 8, 2017

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

Date(s) aerial images were photographed: Oct 7, 2013—Feb 26, 2017

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.

Tables—Stormwater Management - Infiltration (NY)

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
Ab	Alden silt loam	Most limited	Alden (80%)	Depth to saturation (1.00)	9.6	5.7%
				Low permeability (0.50)		
BnC	Bath-Nassau channery silt loams, 8 to 15 percent slopes	Most limited	Bath (50%)	Low permeability (1.00)	6.8	4.1%
				Depth to saturation (1.00)		
				Depth to bedrock (0.50)		
				Slope (0.50)		
				Excessive fines (0.50)		
			Nassau (30%)	Depth to bedrock (1.00)		
				Slope (0.50)		
Ca	Canandaigua silt loam	Most limited	Canandaigua (75%)	Depth to saturation (1.00)	14.6	8.7%
ErA	Erie gravelly silt loam, 0 to 3 percent slopes	Most limited	Erie (75%)	Low permeability (1.00)	7.2	4.3%
				Depth to saturation (1.00)		
				Excessive fines (1.00)		
ErB	Erie gravelly silt loam, 3 to 8 percent slopes	Most limited	Erie (80%)	Low permeability (1.00)	5.9	3.5%
				Depth to saturation (1.00)		
				Excessive fines (1.00)		
Ma	Madalin silt loam	Most limited	Madalin (80%)	Low permeability (1.00)	21.3	12.6%
				Depth to saturation (1.00)		
				Excessive fines (1.00)		
MdC	Mardin gravelly silt loam, 8 to 15 percent slopes	Most limited	Mardin (85%)	Low permeability (1.00)	14.1	8.4%

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Depth to saturation (1.00)		
				Slope (0.50)		
				Excessive fines (0.50)		
			Volusia (5%)	Low permeability (1.00)		
				Depth to saturation (1.00)		
				Excessive fines (1.00)		
			Bath (5%)	Low permeability (1.00)		
				Depth to saturation (1.00)		
				Slope (1.00)		
				Excessive fines (0.50)		
			Lordstown (5%)	Depth to bedrock (1.00)		
				Slope (1.00)		
MdD	Mardin gravelly silt loam, 15 to 25 percent slopes	Most limited	Mardin (85%)	Low permeability (1.00)	9.1	5.4%
				Depth to saturation (1.00)		
				Slope (1.00)		
				Excessive fines (0.50)		
			Volusia (5%)	Low permeability (1.00)		
				Depth to saturation (1.00)		
				Excessive fines (1.00)		
				Slope (0.50)		
			Lordstown (5%)	Depth to bedrock (1.00)		
				Slope (1.00)		
			Bath (5%)	Low permeability (1.00)		
				Depth to saturation (1.00)		

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
				Slope (1.00)		
				Excessive fines (0.50)		
Pg	Pits, gravel	Not rated	Pits, gravel (75%)		8.1	4.8%
			Chenango (5%)			
			Hoosic (5%)			
			Riverhead (5%)			
			Scarboro (5%)			
			Udorthents (5%)			
Ra	Raynham silt loam	Most limited	Raynham, poorly drained (50%)	Low permeability (1.00)	2.0	1.2%
				Depth to saturation (1.00)		
				Excessive fines (0.50)		
			Raynham, somewhat poorly drained (25%)	Low permeability (1.00)		
				Depth to saturation (1.00)		
				Excessive fines (0.50)		
RbB	Rhinebeck silt loam, 3 to 8 percent slopes	Most limited	Rhinebeck (80%)	Low permeability (1.00)	15.5	9.2%
				Depth to saturation (1.00)		
				Excessive fines (1.00)		
RSD	Rock outcrop-Nassau complex, hilly	Not rated	Rock outcrop (55%)		54.1	32.1%
			Arnot (5%)			
			Bath (5%)			
Totals for Area of Interest					**168.3**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Most limited	106.1	63.1%
Null or Not Rated	62.1	36.9%
Totals for Area of Interest	**168.3**	**100.0%**

Rating Options—Stormwater Management - Infiltration (NY)

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.

Stormwater Management - Ponds (NY)

Proper management of stormwater runoff from construction sites and developed areas is an issue of growing importance in New York State. During construction, exposed soil is subject to a greater risk of erosion, resulting in a greater potential for sedimentation in waterways. Stormwater runoff increases on the rooftops of buildings, paved parking lots, and other impervious surfaces, and thus increases the

potential for flooding and discharge of polluted runoff into open water. Management of stormwater runoff can prevent or reduce the availability, release, or transport of substances that can degrade surface and ground waters. Guidelines and design criteria for stormwater management practices have been established by the New York State Department of Environmental Conservation (2008).

This interpretation is designed to evaluate the limitations of soils for stormwater management practices. The purpose of the interpretation is to help decision makers use soil survey information in the selection and implementation of the stormwater management practices best suited to a particular location. The information in the interpretations is intended for planning purposes and does not eliminate the need for on-site investigation of the soil.

Rating class terms indicate the extent to which the soils are limited by the soil features that influence the design, construction, and performance of stormwater management practices. "Least limited" indicates that the soil has features that are very favorable for this practice. Good performance and low maintenance can be expected. "Somewhat limited" indicates that the soil has features that are moderately favorable for the practice. The limitations can be overcome or minimized by special planning, design, or construction. Fair performance and moderate maintenance can be expected. "Most limited" indicates that the soil has one or more features that are unfavorable for the practice. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive construction procedures. Poor performance and high maintenance can be expected.

The rating class is based on the maximum value of the rating indices generated for each soil feature considered. Where the rating value is:

equal to 0.0, the rating class is "least limited."

greater than 0 and less than 1.0, the rating class is "somewhat limited."

equal to 1.0, the rating class is "most limited."

Design criteria in the "New York State Stormwater Management Design Manual" (New York State Department of Environmental Conservation, 2008) were used to guide the selection of potentially limiting soil properties. Additional limiting features incorporated into the interpretations are based on soil function for the specific practice.

Pond Practices

This interpretation is designed to evaluate the limitations of soils for stormwater management ponds (excluding small "pocket ponds"). Although designs vary, most stormwater ponds are excavated, have a dam with a spillway, a separate forebay area, and a permanent pool 4 to 6 feet deep. Such designs detain stormwater for a number of days to a few weeks, allowing pollutants to settle out while aiding biological uptake of nutrients. Following is a synopsis of the soil features considered in this interpretation.

Permeability: Excessive permeability limits the capability of the soil to retain water. The interpretation evaluates the representative permeability in the least transmissive layer (minimum) and the bottom layer, excluding bedrock.

Slope gradient: Excessive slope reduces the feasibility of constructing a pond. The representative slope gradient percent for the soil component is the property evaluated.

Depth to bedrock: Limited depth to bedrock impedes excavation and construction of the pond. Minimum depth to bedrock is the property evaluated. The severity of the depth limitation increases as slope gradient increases, since the bedrock impedes grading and shaping of the land. The interpretation also evaluates slope gradient percent in conjunction with depth to bedrock.

Depth to manufactured layer: In urban areas, some anthropogenic (human-altered) soils have a restrictive layer, such as pavement, below the surface. Limited depth to this restriction impedes excavation and construction of the pond. The minimum depth to a manufactured layer is the property evaluated. The severity of the depth limitation increases as slope gradient increases, since the pavement or other restriction impedes grading and shaping of the land. The interpretation also evaluates slope gradient percent in conjunction with depth to a manufactured layer.

Flooding: Flooding limits the storage capacity of the pond and may degrade the quality of the site. The interpretation evaluates the flooding frequency of the soil.

Depth to saturation: A seasonal high water table at the surface of the soil limits the storage capacity of the pond. The interpretation evaluates the minimum depth to a zone of saturation.

In addition to soil characteristics, other attributes of the site and the surrounding area are important factors in planning and implementing stormwater ponds. For example, an increase in the runoff-generating potential and size of a contributing area upslope from the proposed pond site generally increases the size of the required area with suitable soils for constructing the stormwater pond.

The components listed for each map unit in the accompanying Summary by Map Unit table in Web Soil Survey or the Aggregation Report in Soil Data Viewer are determined by the aggregation method chosen, which is displayed in the report. An aggregated rating class is shown for each map unit. The components listed for each map unit are only those that have the same rating class as the one listed for the map unit. The percent composition of these components is described. As a result, the percentage of the rating class in the map unit is indicated.

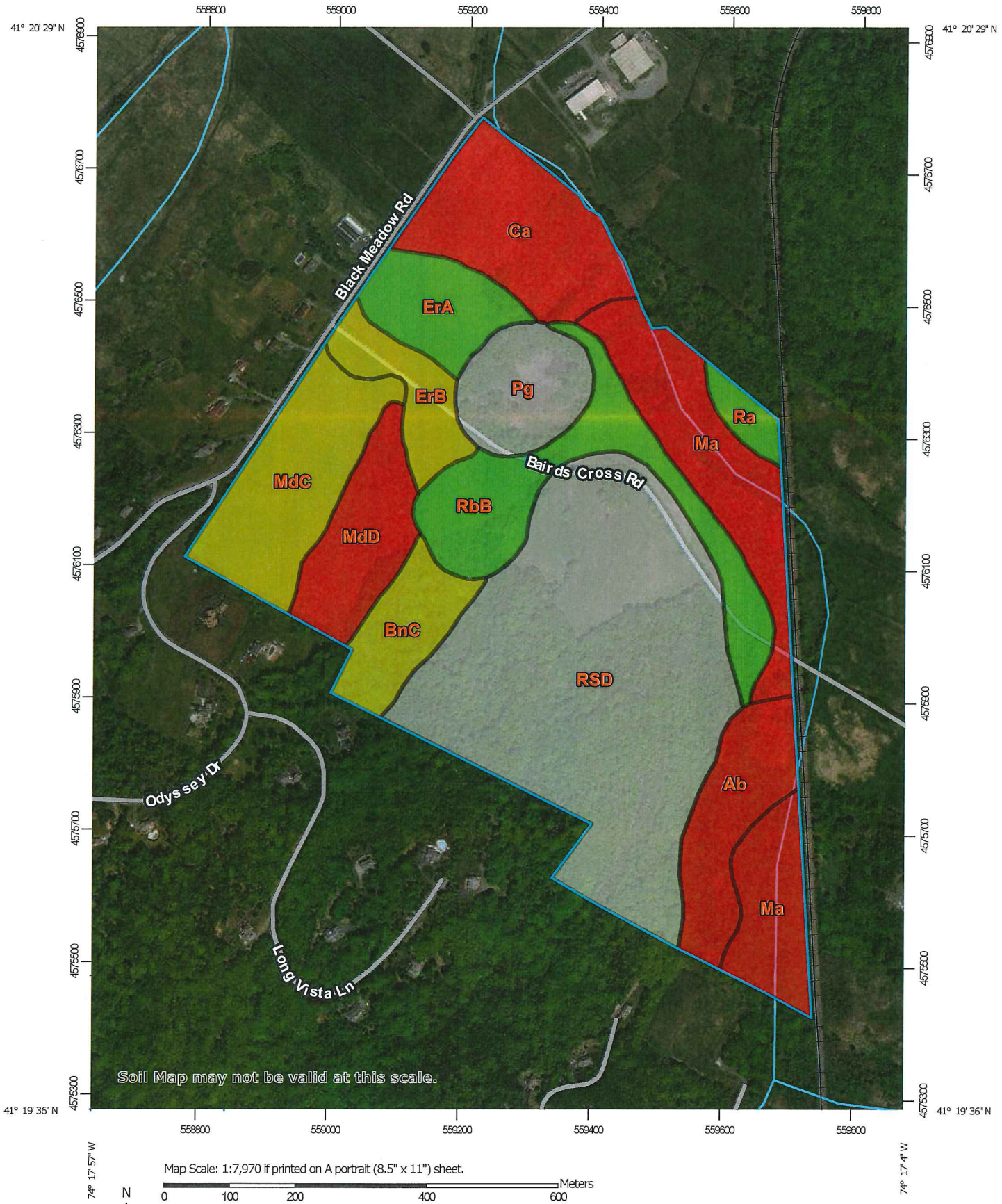
Other components with different ratings may occur in each map unit. The ratings for all components, regardless of the map unit aggregated rating, can be viewed by generating the "Stormwater Management (NY)" report from the Soil Reports tab in Web Soil Survey.

References:

New York State Department of Environmental Conservation. April 2008. New York State Stormwater Management Design Manual.

New York State Department of Environmental Conservation. June 2000. Urban/ Stormwater Runoff Management Practices Catalogue for Nonpoint Source Pollution Prevention in New York State.

Custom Soil Resource Report
Map—Stormwater Management - Ponds (NY)



Map Scale: 1:7,970 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 350 700 1400 2100

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
- Most limited
- Somewhat limited
- Least limited
- Not rated or not available

Soil Rating Lines
- Most limited
- Somewhat limited
- Least limited
- Not rated or not available

Soil Rating Points
- Most limited
- Somewhat limited
- Least limited
- 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 1:15,800.

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

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

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

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

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

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

Soil Survey Area: Orange County, New York
Survey Area Data: Version 18, Oct 8, 2017

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

Date(s) aerial images were photographed: Oct 7, 2013—Feb 26, 2017

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.

Tables—Stormwater Management - Ponds (NY)

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
Ab	Alden silt loam	Most limited	Alden (80%)	Depth to saturation (1.00)	9.6	5.7%
BnC	Bath-Nassau channery silt loams, 8 to 15 percent slopes	Somewhat limited	Bath (50%)	Slope (0.90)	6.8	4.1%
				Depth to bedrock (0.50)		
Ca	Canandaigua silt loam	Most limited	Canandaigua (75%)	Depth to saturation (1.00)	14.6	8.7%
				Excessive permeability (0.90)		
ErA	Erie gravelly silt loam, 0 to 3 percent slopes	Least limited	Erie (75%)		7.2	4.3%
ErB	Erie gravelly silt loam, 3 to 8 percent slopes	Somewhat limited	Erie (80%)	Slope (0.50)	5.9	3.5%
Ma	Madalin silt loam	Most limited	Madalin (80%)	Depth to saturation (1.00)	21.3	12.6%
MdC	Mardin gravelly silt loam, 8 to 15 percent slopes	Somewhat limited	Mardin (85%)	Slope (0.90)	14.1	8.4%
MdD	Mardin gravelly silt loam, 15 to 25 percent slopes	Most limited	Mardin (85%)	Slope (1.00)	9.1	5.4%
			Lordstown (5%)	Depth to bedrock (1.00)		
				Slope (1.00)		
			Bath (5%)	Slope (1.00)		
Pg	Pits, gravel	Not rated	Pits, gravel (75%)		8.1	4.8%
			Chenango (5%)			
			Hoosic (5%)			
			Riverhead (5%)			
			Scarboro (5%)			
			Udorthents (5%)			
Ra	Raynham silt loam	Least limited	Raynham, poorly drained (50%)		2.0	1.2%
			Raynham, somewhat poorly drained (25%)			

Map unit symbol	Map unit name	Rating	Component name (percent)	Rating reasons (numeric values)	Acres in AOI	Percent of AOI
RbB	Rhinebeck silt loam, 3 to 8 percent slopes	Least limited	Rhinebeck (80%)		15.5	9.2%
RSD	Rock outcrop-Nassau complex, hilly	Not rated	Rock outcrop (55%)		54.1	32.1%
			Arnot (5%)			
			Bath (5%)			
Totals for Area of Interest					**168.3**	**100.0%**

Rating	Acres in AOI	Percent of AOI
Most limited	54.7	32.5%
Somewhat limited	26.8	15.9%
Least limited	24.7	14.7%
Null or Not Rated	62.1	36.9%
Totals for Area of Interest	**168.3**	**100.0%**

Rating Options—Stormwater Management - Ponds (NY)

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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Hydrologic Soil Groups

Orange County, New York

November 2015

Map Unit Symbol	Map Unit Name	Component Name	Hydrologic Soil Group
Aa	Ackerman muck	Ackerman	C/D
Ab	Alden silt loam	Alden	C/D
AC	Alden extremely stony soils	Alden	C/D
AdA	Allard silt loam, 0 to 3 percent slopes	Allard	B
AdB	Allard silt loam, 3 to 8 percent slopes	Allard	B
ANC	Arnot-Lordstown complex, sloping	Arnot	D
ANC	Arnot-Lordstown complex, sloping	Lordstown	C
AND	Arnot-Lordstown complex, moderately steep	Arnot	D
AND	Arnot-Lordstown complex, moderately steep	Lordstown	C
ANF	Arnot-Lordstown complex, very steep	Arnot	D
ANF	Arnot-Lordstown complex, very steep	Lordstown	C
Ba	Barbour fine sandy loam	Barbour	B
Be	Basher fine sandy loam	Basher	B/D
BnB	Bath-Nassau channery silt loams, 3 to 8 percent slopes	Bath	C
BnB	Bath-Nassau channery silt loams, 3 to 8 percent slopes	Nassau	D
BnC	Bath-Nassau channery silt loams, 8 to 15 percent slopes	Bath	C
BnC	Bath-Nassau channery silt loams, 8 to 15 percent slopes	Nassau	D
Ca	Canandaigua silt loam	Canandaigua	B/D
Cb	Canadaigua mucky silt loam	Canandaigua	B/D
Cd	Catden muck, drained, 0 to 2 percent slopes	Catden	B/D
Cf	Catden, Muskego, and Pinnebog soils, 0 to 2 percent slopes	Catden	B/D
Cf	Catden, Muskego, and Pinnebog soils, 0 to 2 percent slopes	Muskego	B/D
Cf	Catden, Muskego, and Pinnebog soils, 0 to 2 percent slopes	Pinnebog	B/D
CgA	Castile gravelly silt loam, 0 to 3 percent slopes	Castile	A/D
CgB	Castile gravelly silt loam, 3 to 8 percent slopes	Castile	A/D
ChB	Charlton fine sandy loam, 3 to 8 percent slopes	Charlton	B
ChC	Charlton fine sandy loam, 8 to 15 percent slopes	Charlton	B
CLC	Charlton-Paxton complex, extremely stony, sloping	Charlton	B
CLC	Charlton-Paxton complex, extremely stony, sloping	Paxton	C
CLD	Charlton-Paxton complex, extremely stony, moderately st eep	Charlton	B
CLD	Charlton-Paxton complex, extremely stony, moderately st eep	Paxton	C

Map Unit Symbol	Map Unit Name	Component Name	Hydrologic Soil Group
CnA	Chenango gravelly silt loam, 0 to 3 percent slopes	Chenango	A
CnB	Chenango gravelly silt loam, 3 to 8 percent slopes	Chenango	A
CnC	Chenango gravelly silt loam, 8 to 15 percent slopes	Chenango	A
CoB	Collamer silt loam, 3 to 8 percent slopes	Collamer	C/D
CoC	Collamer silt loam, 8 to 15 percent slopes	Collamer	C/D
CoD	Collamer silt loam, 15 to 25 percent slopes	Collamer	C/D
Du	Dumps	Dumps	
ErA	Erie gravelly silt loam, 0 to 3 percent slopes	Erie	D
ErB	Erie gravelly silt loam, 3 to 8 percent slopes	Erie	D
ESB	Erie extremely stony soils, gently sloping	Erie	D
FAC	Farmington silt loam, sloping	Farmington	D
Fd	Fredon loam	Fredon	B/D
Fd	Fredon loam	Fredon	B/D
Ha	Halsey silt loam	Halsey	B/D
HH	Histic Humaquepts, ponded	Histic Humaquepts	A/D
HLC	Hollis soils, sloping	Hollis	D
HLD	Hollis soils, moderately steep	Hollis	D
HoA	Hoosic gravelly sandy loam, 0 to 3 percent slopes	Hoosic	A
HoB	Hoosic gravelly sandy loam, 3 to 8 percent slopes	Hoosic	A
HoC	Hoosic gravelly sandy loam, 8 to 15 percent slopes	Hoosic	A
HoD	Hoosic gravelly sandy loam, 15 to 25 percent slopes	Hoosic	A
LdB	Lordstown channery silt loam, 3 to 8 percent slopes	Lordstown	C
LdC	Lordstown channery silt loam, 8 to 15 percent slopes	Lordstown	C
Ma	Madalin silt loam	Madalin	C/D
Mb	Madalin mucky silt loam	Madalin	C/D
MdB	Mardin gravelly silt loam, 3 to 8 percent slopes	Mardin	D
MdC	Mardin gravelly silt loam, 8 to 15 percent slopes	Mardin	D
MdD	Mardin gravelly silt loam, 15 to 25 percent slopes	Mardin	D
MNE	Mardin soils, steep	Mardin	D
Ms	Muskego muck	Muskego	A/D
My	Middlebury silt loam	Middlebury	B/D
NaD	Nassau channery silt loam, 15 to 25 percent slopes	Nassau	D
OkA	Oakville loamy fine sand, 0 to 3 percent slopes	Oakville	A
OkB	Oakville loamy fine sand, 3 to 8 percent slopes	Oakville	A
On	Olentangy muck	Olentangy	C/D
OtB	Otisville gravelly sandy loam, 0 to 8 percent slopes	Otisville	A

Map Unit Symbol	Map Unit Name	Component Name	Hydrologic Soil Group
OtC	Otisville gravelly sandy loam, 8 to 15 percent slopes	Otisville	A
OtD	Otisville gravelly sandy loam, 15 to 25 percent slopes	Otisville	A
OVE	Otisville and Hoosic soils, steep	Otisville	A
OVE	Otisville and Hoosic soils, steep	Hoosic	A
Pa	Palms muck	Palms	B/D
Pb	Palms and Wawayanda soils	Palms	B/D
Pb	Palms and Wawayanda soils	Wawayanda	C/D
Pg	Pits, gravel	Pits	
Pn	Pinnebog muck	Pinnebog	A/D
PtB	Pittsfield gravelly loam, 3 to 8 percent slopes	Pittsfield	B
PtC	Pittsfield gravelly loam, 8 to 15 percent slopes	Pittsfield	B
PtD	Pittsfield gravelly loam, 15 to 25 percent slopes	Pittsfield	B
Qu	Quarries	Quarries	
Ra	Raynham silt loam	Raynham	C/D
Ra	Raynham silt loam	Raynham	C/D
RbA	Rhinebeck silt loam, 0 to 3 percent slopes	Rhinebeck	C/D
RbB	Rhinebeck silt loam, 3 to 8 percent slopes	Rhinebeck	C/D
RhA	Riverhead sandy loam, 0 to 3 percent slopes	Riverhead	A
RhB	Riverhead sandy loam, 3 to 8 percent slopes	Riverhead	A
RhC	Riverhead sandy loam, 8 to 15 percent slopes	Riverhead	A
RhD	Riverhead sandy loam, 15 to 25 percent slopes	Riverhead	A
RKC	Rock outcrop-Arnot complex, sloping	Rock outcrop	
RKC	Rock outcrop-Arnot complex, sloping	Arnot	D
RKD	Rock outcrop-Arnot complex, moderately steep	Rock outcrop	
RKD	Rock outcrop-Arnot complex, moderately steep	Arnot	D
RKF	Rock outcrop-Arnot complex, very steep	Rock outcrop	
RKF	Rock outcrop-Arnot complex, very steep	Arnot	D
RMC	Rock outcrop-Farmington complex, rolling	Rock outcrop	
RMC	Rock outcrop-Farmington complex, rolling	Farmington	D
RMD	Rock outcrop-Farmington complex, hilly	Rock outcrop	
RMD	Rock outcrop-Farmington complex, hilly	Farmington	D
ROC	Rock outcrop-Hollis complex, sloping	Rock outcrop	
ROC	Rock outcrop-Hollis complex, sloping	Hollis	D
ROD	Rock outcrop-Hollis complex, moderately steep	Rock outcrop	
ROD	Rock outcrop-Hollis complex, moderately steep	Hollis	D
ROF	Rock outcrop-Hollis complex, very steep	Rock outcrop	

Map Unit Symbol	Map Unit Name	Component Name	Hydrologic Soil Group
ROF	Rock outcrop-Hollis complex, very steep	Hollis	D
RSB	Rock outcrop-Nassau complex, undulating	Rock outcrop	
RSB	Rock outcrop-Nassau complex, undulating	Nassau	D
RSD	Rock outcrop-Nassau complex, hilly	Rock outcrop	
RSD	Rock outcrop-Nassau complex, hilly	Nassau	D
RSF	Rock outcrop-Nassau complex, very steep	Rock outcrop	
RSF	Rock outcrop-Nassau complex, very steep	Nassau	D
Sb	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	Scarboro	A/D
ScA	Scio silt loam, 0 to 3 percent slopes	Scio	B/D
ScB	Scio silt loam, 3 to 8 percent slopes	Scio	B/D
Su	Suncook sandy loam	Suncook	A
SwB	Swartswood gravelly loam, 3 to 8 percent slopes	Swartswood	C
SwC	Swartswood gravelly loam, 8 to 15 percent slopes	Swartswood	C
SwD	Swartswood gravelly loam, 15 to 25 percent slopes	Swartswood	C
SXC	Swartswood and Mardin soils, sloping, very stony	Swartswood	C
SXC	Swartswood and Mardin soils, sloping, very stony	Mardin	D
SXD	Swartswood and Mardin soils, moderately steep, very stony	Mardin	D
SXD	Swartswood and Mardin soils, moderately steep, very stony	Swartswood	C
SXF	Swartswood and Mardin soils, very steep, very stony	Swartswood	C
SXF	Swartswood and Mardin soils, very steep, very stony	Mardin	D
Tg	Tioga silt loam	Tioga	A
UF	Udifluvents-Fluvaquents complex, frequently flooded	Udifluvents	A
UF	Udifluvents-Fluvaquents complex, frequently flooded	Fluvaquents	A/D
UH	Udorthents, smoothed	Udorthents	A
UnB	Unadilla silt loam, 0 to 8 percent slopes	Unadilla	B
UnC	Unadilla silt loam, 8 to 15 percent slopes	Unadilla	B
Ur	Urban land	Urban land	
W	Water	Water	
Wa	Wallkill silt loam	Wallkill	B/D
Wa	Wallkill silt loam	Wallkill	B/D
Wd	Wayland soils complex, non-calcareous substratum, 0 to 3 percent slopes, frequently flooded	Wayland	B/D
Wd	Wayland soils complex, non-calcareous substratum, 0 to 3 percent slopes, frequently flooded	Wayland	B/D
Wn	Wawayanda muck	Wawayanda	C/D
WuB	Wurtsboro gravelly loam, 3 to 8 percent slopes	Wurtsboro	D
WuC	Wurtsboro gravelly loam, 8 to 15 percent slopes	Wurtsboro	D

Appendix 9

Stormwater Quality and Runoff Reduction – Calculations & Supporting Data

Baroda Cluster Subdivision

Water Quality Volume (WQ_v) Calculation for Project Site

Utilize 90% Rule:

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

WQ_v = Water Quality Volume (acre-feet)

$R_v = 0.05 + 0.009\ (I)$

I = Impervious Cover (Percent)

P = 90% Rainfall Event Number = 1.38 inches

A = Drainage Area in acres

Calculate Impervious Cover (%):

Project Site Area (A) =	168.23	acres
Impervious area within Site =	4.70	acres
Impervious Cover (I) =	2.8	%

Calculate Volumetric Runoff Coefficient (R_v):

$R_v = 0.05 + 0.009\ (I)$

$R_v =$ 0.08

Use R_v -> 0.08

90% Rainfall Event Number Utilized:

P = 1.38 inches

Calculate Water Quality Volume:

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

WQ_v =	1.454	acre-feet
=	63,326	ft^3

Baroda Cluster Subdivision

Minimum Runoff Reduction Volume (RRv) Calculation

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

RRv = Runoff Reduction Volume (acre-feet)

$R_v = 0.05 + 0.009 (I)$

(Where I = 100%)

I = Impervious Cover (Percent)

P = 90% Rainfall Event Number = 1.38 inches

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

Aic = Total Area of New Impervious Cover

S = Hydrologic Soil Group (HSG) Specific Reduction Factor

S for HSG A =0.55

S for HSG B =0.40

S for HSG C =0.30

S for HSG D =0.20

Calculate Specific Reduction Factor (S)

Total Project Site Area (A) =	168.23	acres
Total Area of HSG A	0.00	acres
Total Area of HSG B	0.00	acres
Total Area of HSG C	9.80	acres
Total Area of HSG D	158.43	acres

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

S = 0.2058

Calculate Impervious Cover Targeted for Runoff Reduction (Ai)

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

Aic = Total Area of New Impervious Cover = 4.70 acres

Ai = 0.97 acres

Calculate Volumetric Runoff Coefficient (R_v):

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

R_v = 0.95

Baroda Cluster Subdivision

Minimum Runoff Reduction Volume (RRv) Calculation

90% Rainfall Event Number Utilized:

P = 1.38 inches

Calculate Minimum Runoff Reduction Volume:

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

RRv = 0.106 acre-feet

RRv = 4,604 ft^3

Baroda Cluster Subdivision

Runoff Reduction Volume (RR_v) Calculation Utilizing Conservation of Natural Areas

Total Conservation Area
Site Area Reduction = 124.45 acres

Therefore Total Drainage Area (A) =
= 168.23 acres - 124.45 acres = 43.78 acres

Re-Calculate Impervious Cover (%):

Drainage Area (A) =	43.78	acres
Impervious area within Site Area =	4.70	acres
Impervious Cover (I) =	10.7	%

Re-Calculate Volumetric Runoff Coefficient (R_v):

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

$R_v =$ 0.15

Use R_v -> 0.15

90% Rainfall Event Number Utilized:

P = 1.38 inches

Re-Calculate Water Quality Volume:

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

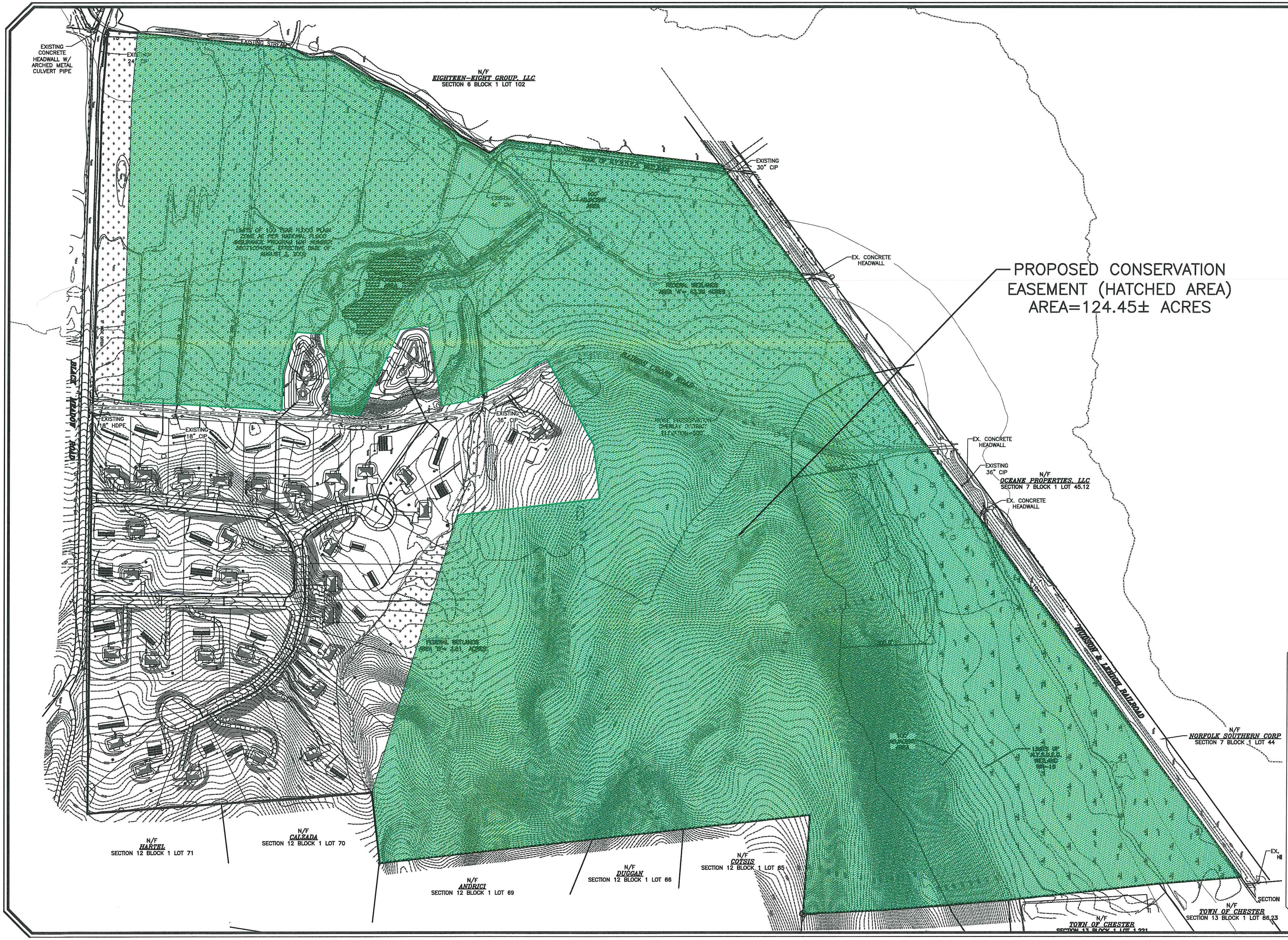
$WQ_v =$ 0.738 acre-feet
= 32,155 ft^3

Total Runoff Reduction Volume (RRv) Provided by Conservation of Natural Areas

RRv Provided = Original WQv - Re-calculated WQv

RRv = 63,326 - 32,155

Total Conservation Area RRv =	**31,171**	**ft^3**
=	**0.716**	**acre-feet**



2-07-18	ORIGINAL PREPARATION DATE	MWS
DATE	DESCRIPTION	INITIALS
REVISIONS		
MAP CHECK DATE: 00/00/00	INITIALED BY: -_-	

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SIGNATURE DATE

BARODA CLUSTER SUBDIVISION

TOWN OF CHESTER
COUNTY OF ORANGE, NEW YORK

PROJECT TITLE

RUNOFF REDUCTION VOLUME CONSERVATION AREA

SECTION 12, BLOCK 1, LOT 31

DRAWING TITLE

UNAUTHORIZED ALTERATION OR ADDITION TO A PLAN BEARING A LICENSED LAND SURVEYOR'S OR PROFESSIONAL ENGINEER'S SEAL IS A VIOLATION OF SECTION 7209, SUBDIVISION 2 OF THE N.Y. STATE EDUCATION LAW.

O.C.H.D. SHEET NO	D.E.C. SHEET NO	DRAWING NUMBER
N/A OF #	N/A OF #	1 OF 1
SCALE 1"=300'	CAD REFERENCE WORKING	PROJECT NUMBER 14118.01

Baroda Cluster Subdivision

Runoff Reduction Volume (RR_v) Calculation Utilizing Tree Planting Technique

New Trees Planted within 10 feet of Ground-Level, Directly Connected Impervious Area

Number of Applicable Trees to be Planted on Project Site:

Total Applicable Trees = 130

Allowable Impervious Area Reduction per Newly Planted Tree:

Per page 5-60 of the New York State Stormwater Design Manual: A 100 square-foot directly connected impervious area reduction is permitted for each new tree. This credit may be applied to the impervious area adjacent to the tree. Therefore:

Area Reduction = Total Applicable Tree * 100 ft^2

Area Reduction =	13,000	ft^2
Area Reduction =	0.30	acres

Re-Calculate Impervious Cover (%):

Reduced Site Area (A) =	43.48	acres
Impervious area within Site Area =	4.40	acres
Impervious Cover (I) =	10.1	%

Re-Calculate Volumetric Runoff Coefficient (R_v):

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

R_v = 0.14

Use R_v -> 0.14

90% Rainfall Event Number Utilized:

P = 1.38 inches

Re-Calculate Water Quality Volume:

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

WQ_v =	0.706	acre-feet
=	30,735	ft^3

Baroda Cluster Subdivision

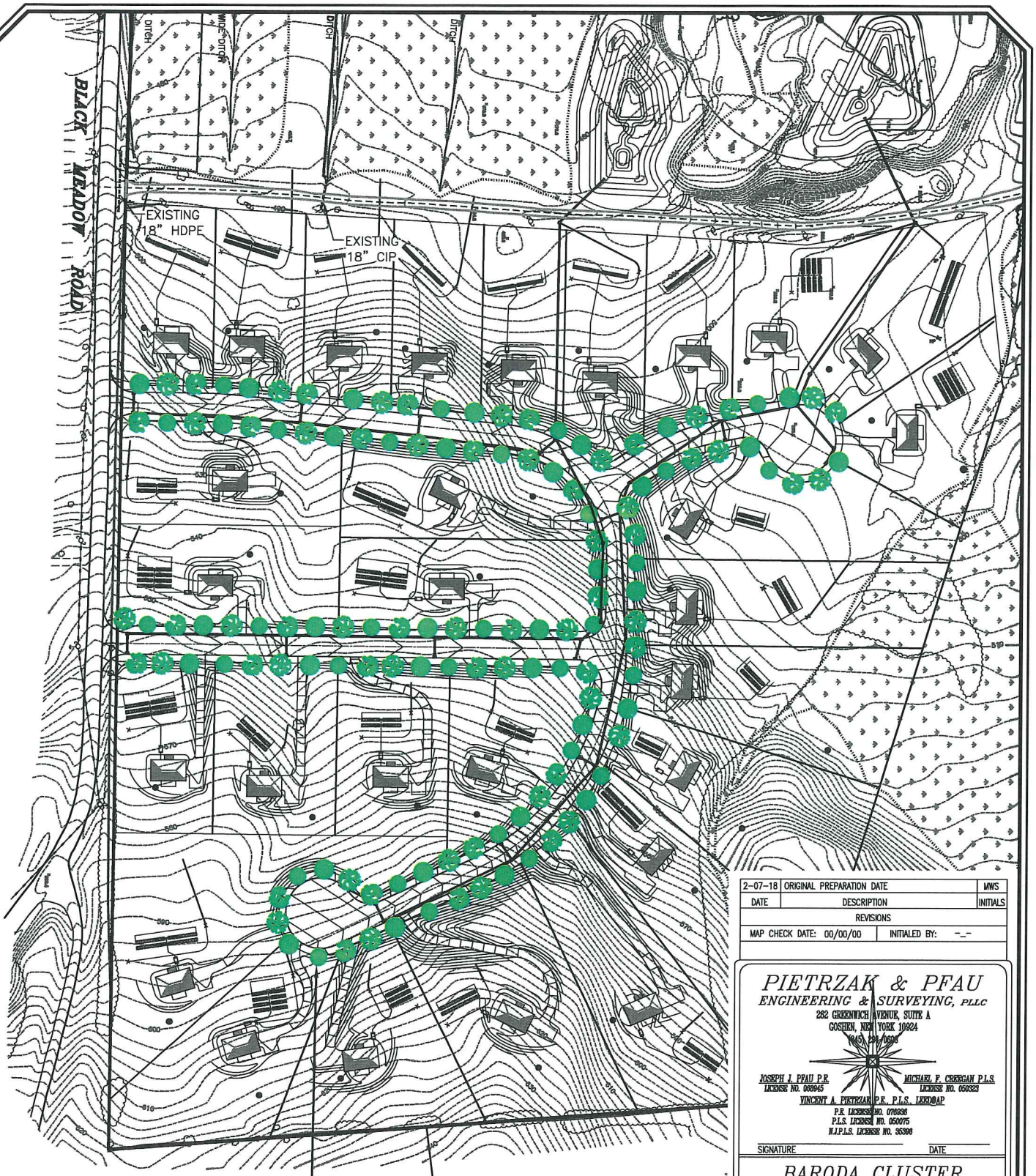
Runoff Reduction Volume (RR_v) Calculation Utilizing Tree Planting Technique

Total Runoff Reduction Volume (RRv) Provided by Tree Planting Technique

RRv Provided = Conservation Area Re-calculated WQv - Re-calculated WQv

RRv = 32,155 ft^3 - 30,735 ft^3

Total Tree Planting Technique RRv =		**1,420**	**ft^3**
	=	**0.033**	**acre-feet**



PROPOSED TREE PLANTING IN ACCORDANCE WITH PAGE 5-60 OF THE NEW YORK STATE STORMWATER DESIGN MANUAL TOTAL NUMBER OF TREE PLANTINGS = 130

2-07-18	ORIGINAL PREPARATION DATE	MWS
DATE	DESCRIPTION	INITIALS
REVISIONS		
MAP CHECK DATE: 00/00/00	INITIALED BY:	-_-

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SIGNATURE DATE

BARODA CLUSTER SUBDIVISION

TOWN OF CHESTER
COUNTY OF ORANGE, NEW YORK

PROJECT TITLE

RUNOFF REDUCTION VOLUME TREE PLANTING TECHNIQUE
SECTION 12, BLOCK 1, LOT 31

DRAWING TITLE

O.C.H.D. SHEET NO	D.E.C. SHEET NO	DRAWING NUMBER
N/A OF #	N/A OF #	1 OF 1
SCALE 1"=200'	CAD REFERENCE WORKING	PROJECT NUMBER 14118.01

Baroda Cluster Subdivision

Runoff Reduction Volume (RR_v) Calculation Utilizing Disconnection of Rooftop Runoff

The Roof Drains for the Proposed Dwellings on Lots 1, 2, 9, 10, 13, 14, 15, 16, & 29 are to be directed to a level spreader and flow over landscaped lawns, disconnecting the impervious area of the dwelling

Proposed Rooftop Area per Dwelling =	1,732	ft^2
Proposed Dwellings to be Disconnected =	9	dwellings
Prop. Impervious Area to be Disconnected =	15,588	ft^2

Total Impervious Rooftop Area to be Disconnected:

Total Tributary Area =	0.36	acres

Re-Calculate Impervious Cover (%):

Drainage Area (A) =	43.48	acres
Impervious area within Site Area =	4.04	acres
Impervious Cover (I) =	9.3	%

Re-Calculate Volumetric Runoff Coefficient (R_v):

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

$R_v =$ 0.13

Use R_v -> 0.13

90% Rainfall Event Number Utilized:

P = 1.38 inches

Re-Calculate Water Quality Volume:

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

$WQ_v =$ 0.669 acre-feet

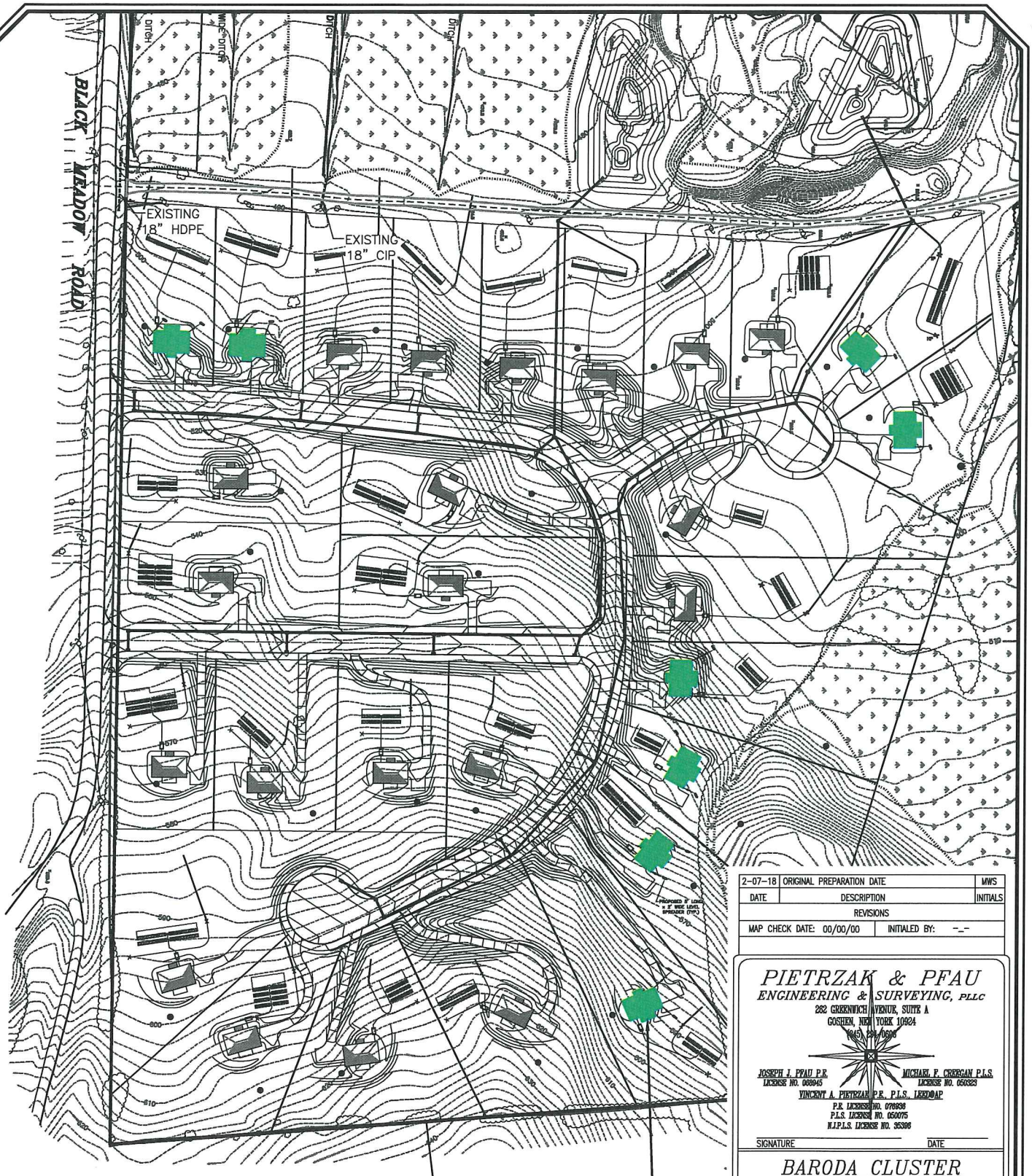
= 29,122 ft^3

Total Runoff Reduction Volume (RRv) Provided by Disconnection of Rooftop Runoff

RRv Provided = Tree Planting Re-calculated WQv - Re-calculated WQv

RRv = 30,735 ft^3 - 29,122 ft^3

Total Disconnection of Rooftop RRv =		**1,613**	**ft^3**
	=	**0.037**	**acre-feet**



PROPOSED DISCONNECTION OF ROOFTOP RUNOFF (TYP.)
ROOFTOP AREA PER DWELLING = 1,732 SQ.FT.
NUMBER OF DWELLINGS TO DISCONNECT = 9
TOTAL IMPERVIOUS AREA DISCONNECTED = 15,588 SQ.FT.

2-07-18	ORIGINAL PREPARATION DATE	MWS
DATE	DESCRIPTION	INITIALS
REVISIONS		
MAP CHECK DATE: 00/00/00	INITIALED BY: -_-	

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N.J.P.L.S. LICENSE NO. 35396

SIGNATURE DATE

BARODA CLUSTER SUBDIVISION

TOWN OF CHESTER
COUNTY OF ORANGE, NEW YORK
PROJECT TITLE

RUNOFF REDUCTION VOLUME DISCONNECTION OF ROOFTOP RUNOFF
SECTION 12, BLOCK 1, LOT 31
DRAWING TITLE

O.C.H.D. SHEET NO N/A OF #	D.E.C. SHEET NO N/A OF #	DRAWING NUMBER 1 OF 1
SCALE 1"=200'	CAD REFERENCE WORKING	PROJECT NUMBER 14118.01

Baroda Cluster Subdivision

Micropool Extended Detention Pond (P-1) Design (Pond 3P)

Step 1: Calculate the Water Quality Volume (WQ_v):

Utilize 90% Rule:

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

WQ_v = Water Quality Volume (acre-feet)

$R_v = 0.05 + 0.009\ (I)$

I = Impervious Cover (Percent)

P = 90% Rainfall Event Number = 1.38 inches

A = Drainage Area in acres

Calculate Impervious Cover (%):

Drainage Area (A) =	6.29	acres
Impervious Area =	1.52	acres
Impervious Cover (I) =	24.2	%

Calculate Volumetric Runoff Coefficient (R_v):

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

R_v = 0.27

Use R_v -> 0.27

90% Rainfall Event Number Utilized:

P = 1.38 inches

Calculate Water Quality Volume:

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

WQ_v =	0.193	acre-feet
=	8,428	ft^3

Baroda Cluster Subdivision

Micropool Extended Detention Pond (P-1) Design (Pond 3P)

Step 2: Calculate the Pond Forebay Pretreatment Volume:

Required Pretreatment Volume of 10% of the Required Water Quality Volume:

Pretreatment Forebay Volume = WQ_v * 0.10

= 843 ft^3

Forebay Volume Provided = 4,339 ft^3

Step 3: Calculate the Permanent Pool Volume:

Required Permanent Pool Volume for a Micropool Extended Detention Pond (P-1) is 20% of the Required Water Quality Volume:

(Not Including Pretreatment Volume)

Permanent Pool Volume = (WQ_v - Forebay Volume) * 20%

= 1,517 ft^3

Permanent Pool Volume Provided = 10,014 ft^3

Total Water Quality Volume WQv Provided = 14,353 ft^3 **

** Total WQv Provided accounts for 100% of Water Quality Volume Required

Step 4: Calculate Stream Channel Protection Volume (Cp_v):

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

Cp_v = 0.641 acre-feet

Step 5: Calculate Stream Channel Protection Volume (Cp_v) Release Rate:

Release Cp_v over a 24 hour period:

(Cp_v acre-feet * 43560 ft^2 / acre) / (24 hours * 3600 sec / hour)

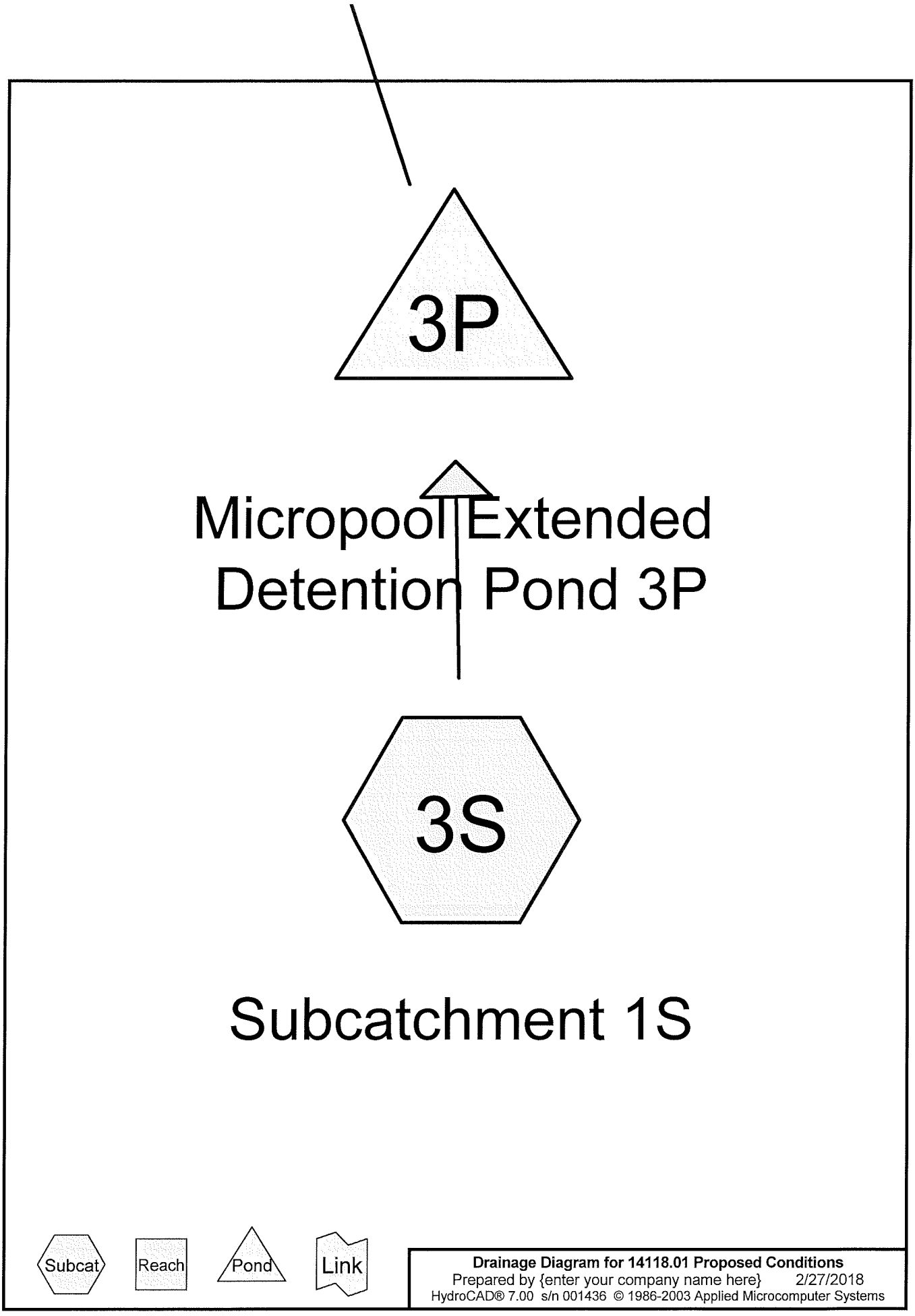
Release Rate = 0.32 ft^3 / sec

Baroda Cluster Subdivision

Micropool Extended Detention Pond (P-1) Design (Pond 3P)

Total Water Quality Volume (WQv) Provided by Micropool Extended Detention Pond 3P

Total MED Pond 3P WQv =		14,353	ft^3
	=	0.329	acre-feet



Drainage Diagram for 14118.01 Proposed Conditions
Prepared by {enter your company name here} 2/27/2018

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 3S: Subcatchment 1S Runoff Area=6.290 ac Runoff Depth=0.33"
Flow Length=1,911' Tc=8.4 min CN=84 Runoff=1.97 cfs 0.174 af

Pond 3P: Micropool Extended Detention Po Peak Elev=478.36' Storage=4,065 cf Inflow=1.97 cfs 0.174 af
Primary=0.13 cfs 0.110 af Secondary=0.00 cfs 0.000 af Outflow=0.13 cfs 0.110 af

Total Runoff Area = 6.290 ac Runoff Volume = 0.174 af Average Runoff Depth = 0.33"

Subcatchment 3S: Subcatchment 1S

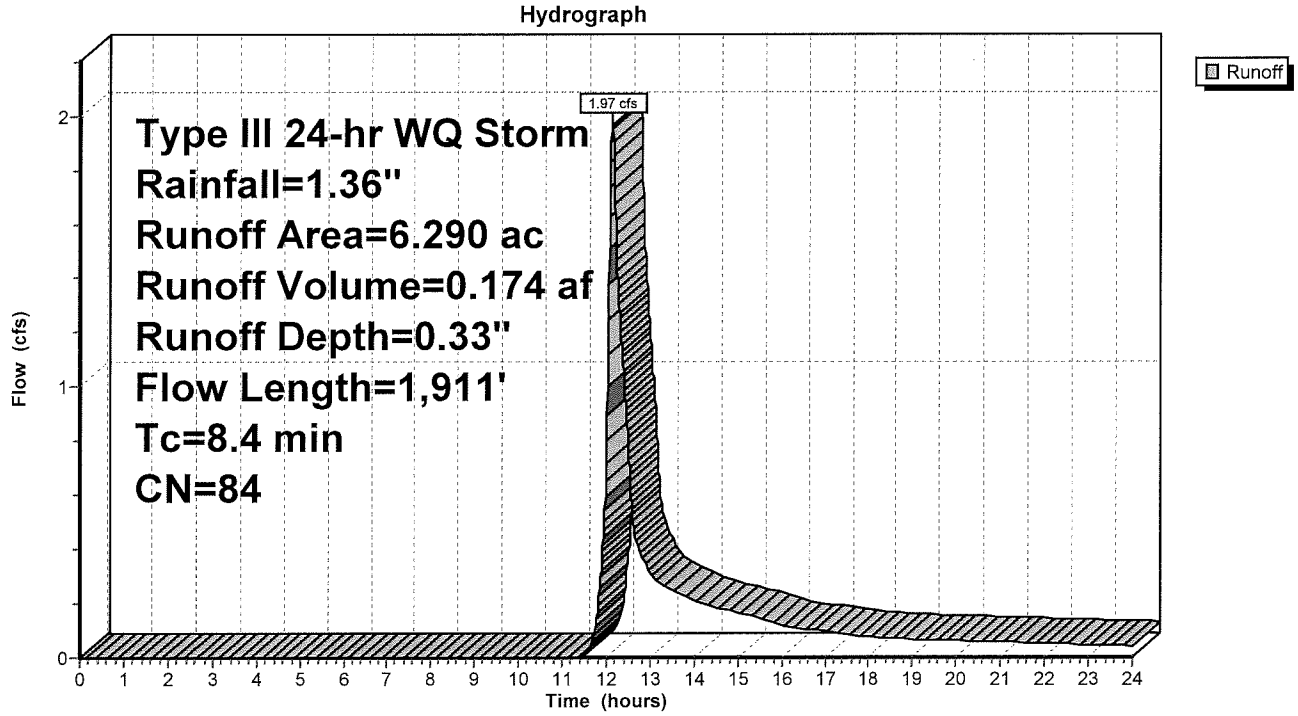
Runoff = 1.97 cfs @ 12.13 hrs, Volume= 0.174 af, Depth= 0.33"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr WQ Storm Rainfall=1.36"

Area (ac)	CN	Description
1.520	98	Paved parking & roofs (Proposed)
0.040	91	Gravel roads, HSG D
0.030	70	Woods, Good, HSG C
0.320	77	Woods, Good, HSG D
0.700	74	>75% Grass cover, Good, HSG C
3.680	80	>75% Grass cover, Good, HSG D
6.290	84	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	12	0.1181	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
4.3	88	0.1181	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.21"
0.5	168	0.1148	5.5		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	73	0.1808	6.8		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	33	0.0500	4.5		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.4	1,537	0.0694	18.5	32.70	**Circular Channel (pipe),** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011
8.4	1,911	Total			

Subcatchment 3S: Subcatchment 1S



Pond 3P: Micropool Extended Detention Pond 3P

Inflow Area = 6.290 ac, Inflow Depth = 0.33" for WQ Storm event
Inflow = 1.97 cfs @ 12.13 hrs, Volume= 0.174 af
Outflow = 0.13 cfs @ 15.87 hrs, Volume= 0.110 af, Atten= 94%, Lag= 224.2 min
Primary = 0.13 cfs @ 15.87 hrs, Volume= 0.110 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 478.36' @ 15.87 hrs Surf.Area= 0 sf Storage= 4,065 cf
Plug-Flow detention time= 317.5 min calculated for 0.110 af (63% of inflow)
Center-of-Mass det. time= 197.7 min (1,077.7 - 880.0)

#	Invert	Avail.Storage	Storage Description
1	478.00'	53,532 cf	**Custom Stage Data** Listed below

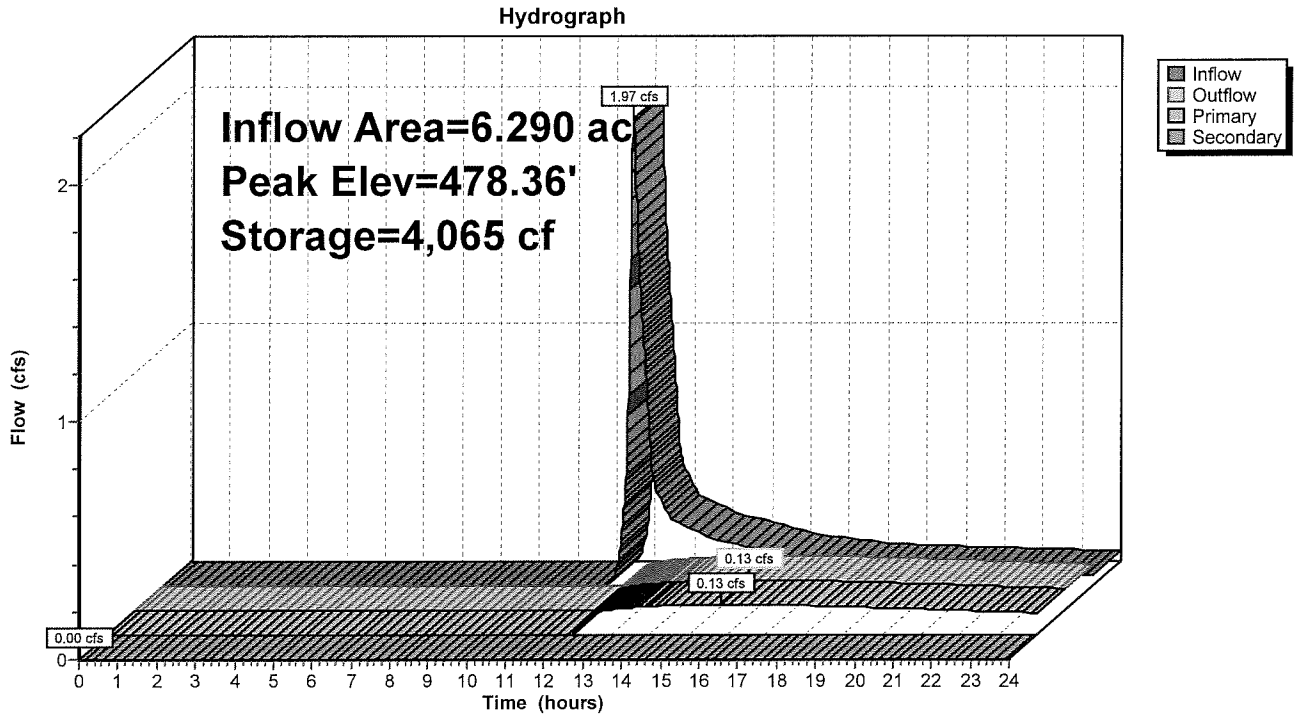
Elevation (feet)	Cum.Store (cubic-feet)
478.00	0
480.00	22,743
482.00	53,532

#	Routing	Invert	Outlet Devices
1	Primary	478.00'	**24.0" x 61.0' long Culvert X 2.00** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 477.39' S= 0.0100 '/' n= 0.011 Cc= 0.900
2	Device 1	478.00'	**3.2" Vert. Orifice/Grate** C= 0.600
3	Device 1	479.59'	**3.0' long x 0.7' 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 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32
4	Device 1	480.30'	**3.50' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600
5	Secondary	481.50'	**20.0' long x 13.0' 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) 2.60 2.64 2.70 2.66 2.65 2.66 2.65 2.63

Primary OutFlow Max=0.13 cfs @ 15.87 hrs HW=478.36' TW=0.00' (Dynamic Tailwater)
└─**1=Culvert** (Passes 0.13 cfs of 1.55 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.13 cfs @ 2.3 fps)
  ├─**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
  └─**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=478.00' TW=0.00' (Dynamic Tailwater)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Micropool Extended Detention Pond 3P



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 3S: Subcatchment 1S Runoff Area=6.290 ac Runoff Depth=1.22"
Flow Length=1,911' Tc=8.4 min CN=84 Runoff=8.26 cfs 0.641 af

Pond 3P: Micropool Extended Detention P Peak Elev=479.59' Storage=18,052 cf Inflow=8.26 cfs 0.641 af
Primary=0.32 cfs 0.308 af Secondary=0.00 cfs 0.000 af Outflow=0.32 cfs 0.308 af

Total Runoff Area = 6.290 ac Runoff Volume = 0.641 af Average Runoff Depth = 1.22"

Subcatchment 3S: Subcatchment 1S

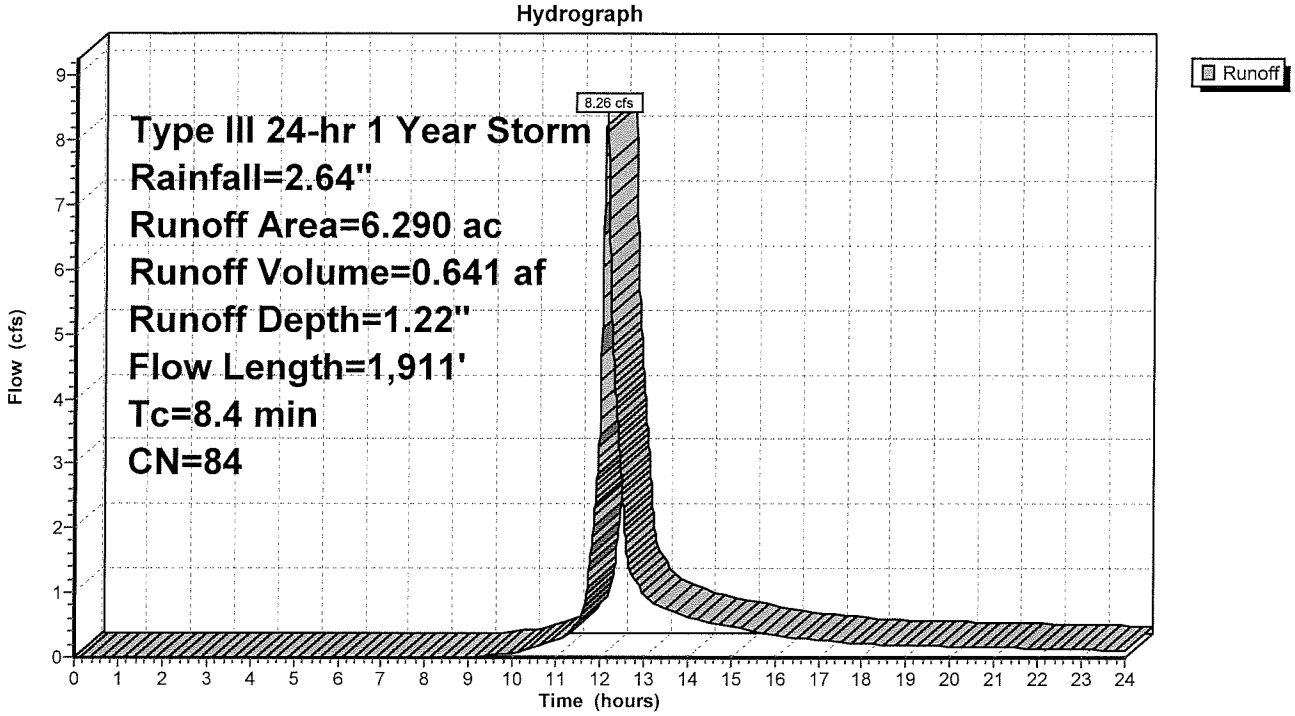
Runoff = 8.26 cfs @ 12.12 hrs, Volume= 0.641 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 Year Storm Rainfall=2.64"

Area (ac)	CN	Description
1.520	98	Paved parking & roofs (Proposed)
0.040	91	Gravel roads, HSG D
0.030	70	Woods, Good, HSG C
0.320	77	Woods, Good, HSG D
0.700	74	>75% Grass cover, Good, HSG C
3.680	80	>75% Grass cover, Good, HSG D
6.290	84	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	12	0.1181	0.1		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.21"
4.3	88	0.1181	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.21"
0.5	168	0.1148	5.5		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.2	73	0.1808	6.8		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	33	0.0500	4.5		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.4	1,537	0.0694	18.5	32.70	**Circular Channel (pipe),** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011
8.4	1,911	Total			

Subcatchment 3S: Subcatchment 1S



Pond 3P: Micropool Extended Detention Pond 3P

Inflow Area = 6.290 ac, Inflow Depth = 1.22" for 1 Year Storm event
Inflow = 8.26 cfs @ 12.12 hrs, Volume= 0.641 af
Outflow = 0.32 cfs @ 16.22 hrs, Volume= 0.308 af, Atten= 96%, Lag= 246.1 min
Primary = 0.32 cfs @ 16.22 hrs, Volume= 0.308 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 479.59' @ 16.22 hrs Surf.Area= 0 sf Storage= 18,052 cf
Plug-Flow detention time= 357.9 min calculated for 0.307 af (48% of inflow)
Center-of-Mass det. time= 237.5 min (1,077.4 - 839.9)

#	Invert	Avail.Storage	Storage Description
1	478.00'	53,532 cf	**Custom Stage Data** Listed below

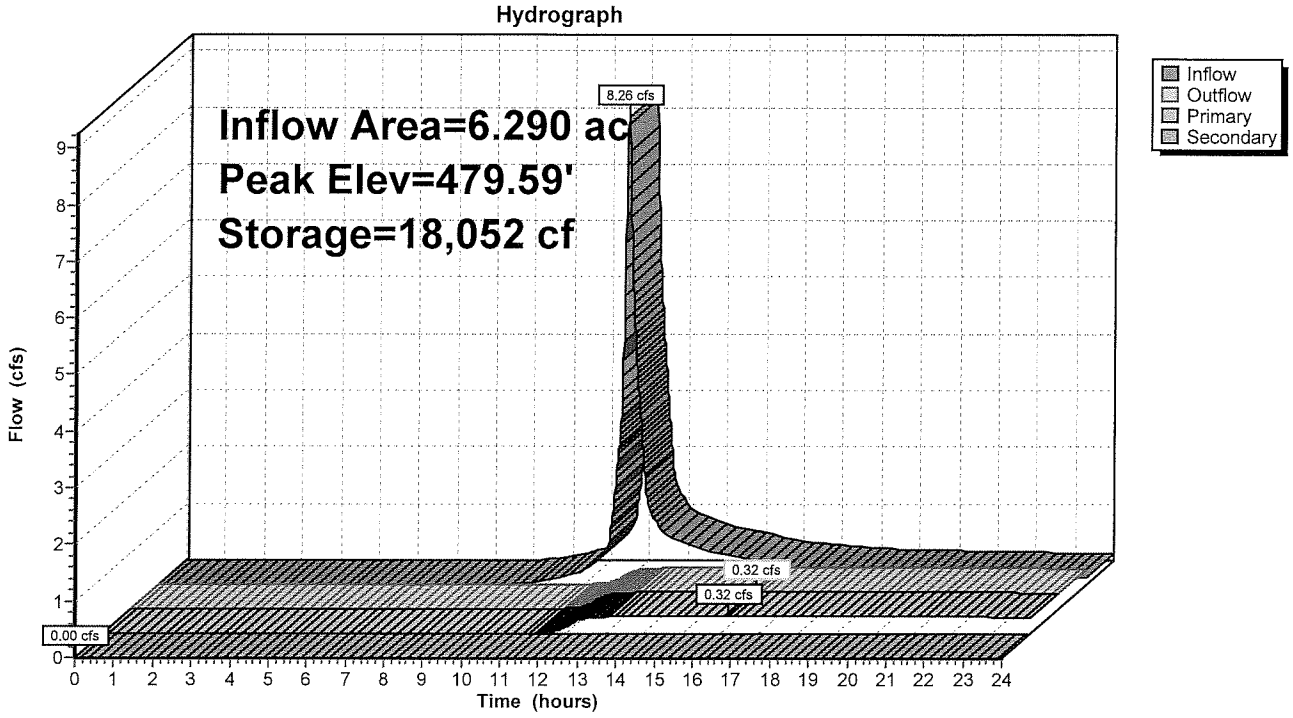
Elevation (feet)	Cum.Store (cubic-feet)
478.00	0
480.00	22,743
482.00	53,532

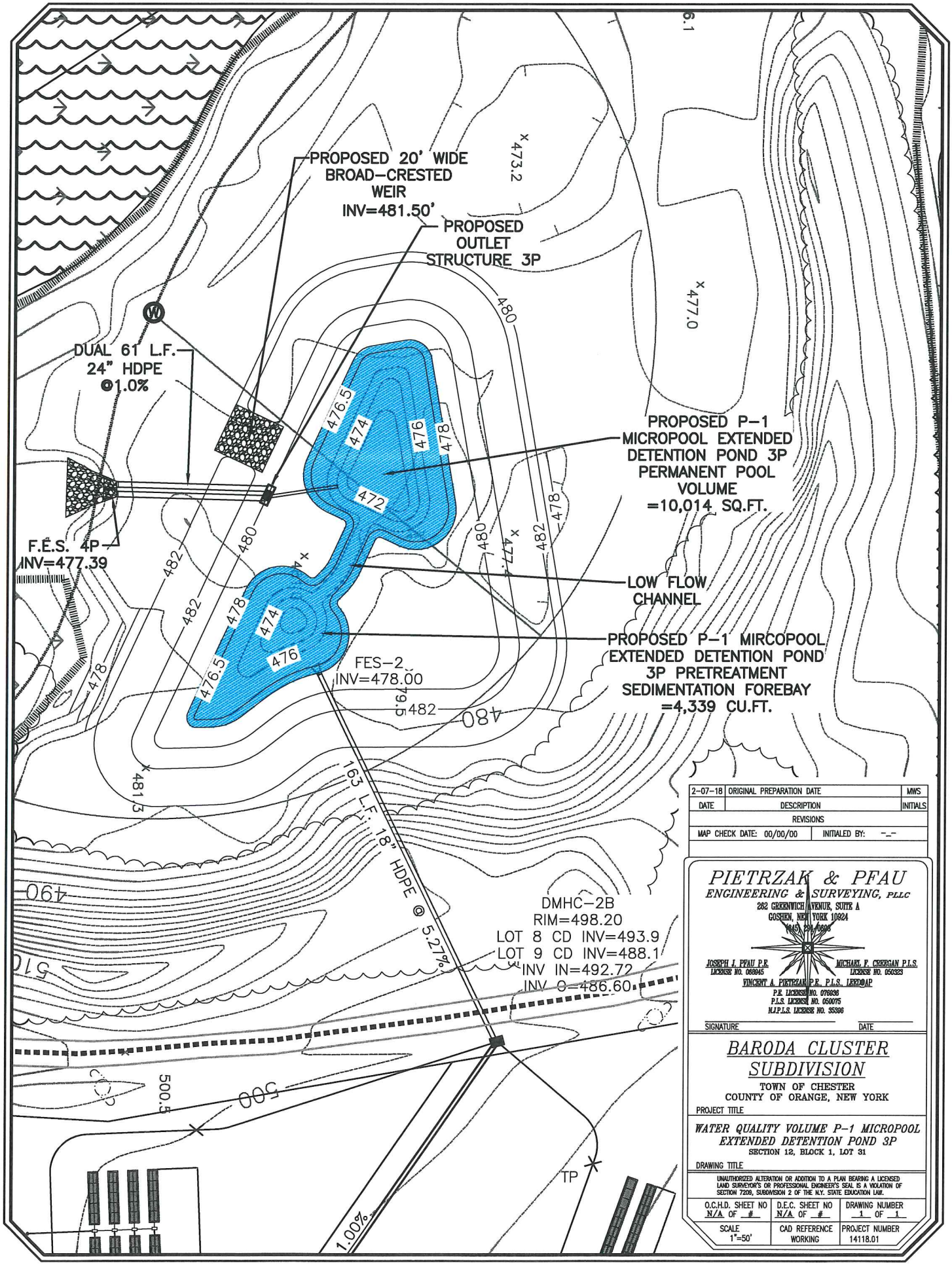
#	Routing	Invert	Outlet Devices
1	Primary	478.00'	**24.0" x 61.0' long Culvert X 2.00** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 477.39' S= 0.0100 '/' n= 0.011 Cc= 0.900
2	Device 1	478.00'	**3.2" Vert. Orifice/Grate** C= 0.600
3	Device 1	479.59'	**3.0' long x 0.7' breadth Broad-Crested Rectangular 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 Coef. (English) 2.76 2.82 2.93 3.09 3.18 3.22 3.27 3.30 3.32 3.31 3.32
4	Device 1	480.30'	**3.50' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600
5	Secondary	481.50'	**20.0' long x 13.0' 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) 2.60 2.64 2.70 2.66 2.65 2.66 2.65 2.63

Primary OutFlow Max=0.32 cfs @ 16.22 hrs HW=479.59' TW=0.00' (Dynamic Tailwater)
↑**1=Culvert** (Passes 0.32 cfs of 22.34 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 0.32 cfs @ 5.8 fps)
3=Broad-Crested Rectangular Weir (Controls 0.00 cfs)
4=Orifice/Grate (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=478.00' TW=0.00' (Dynamic Tailwater)
↑**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 3P: Micropool Extended Detention Pond 3P





2-07-18	ORIGINAL PREPARATION DATE	MWS
DATE	DESCRIPTION	INITIALS
REVISIONS		
MAP CHECK DATE: 00/00/00	INITIALED BY:	

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SIGNATURE DATE

BARODA CLUSTER SUBDIVISION

TOWN OF CHESTER
COUNTY OF ORANGE, NEW YORK

PROJECT TITLE

WATER QUALITY VOLUME P-1 MICROPOOL EXTENDED DETENTION POND 3P
SECTION 12, BLOCK 1, LOT 31

DRAWING TITLE

O.C.H.D. SHEET NO	D.E.C. SHEET NO	DRAWING NUMBER
N/A OF #	N/A OF #	1 OF 1
SCALE 1"=50'	CAD REFERENCE WORKING	PROJECT NUMBER 14118.01

Baroda Cluster Subdivision

Micropool Extended Detention Pond (P-1) Design (Pond 4P)

Step 1: Calculate the Water Quality Volume (WQ_v):

Utilize 90% Rule:

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

WQ_v = Water Quality Volume (acre-feet)

$R_v = 0.05 + 0.009 (I)$

I = Impervious Cover (Percent)

P = 90% Rainfall Event Number = 1.38 inches

A = Drainage Area in acres

Calculate Impervious Cover (%):

Drainage Area (A) =	18.23	acres
Impervious Area =	2.39	acres
Impervious Cover (I) =	13.1	%

Calculate Volumetric Runoff Coefficient (R_v):

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

R_v = 0.17

Use R_v -> 0.20

90% Rainfall Event Number Utilized:

P = 1.38 inches

Calculate Water Quality Volume:

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

WQ_v =	0.419	acre-feet
=	18,264	ft^3

Baroda Cluster Subdivision

Micropool Extended Detention Pond (P-1) Design (Pond 4P)

Step 2: Calculate the Pond Forebay Pretreatment Volume:

Required Pretreatment Volume of 10% of the Required Water Quality Volume:

Pretreatment Forebay Volume = WQ_v * 0.10

= 1,826 ft^3

Forebay Volume Provided = 5,011 ft^3

Step 3: Calculate the Permanent Pool Volume:

Required Permanent Pool Volume for a Micropool Extended Detention Pond (P-1) is 20% of the Required Water Quality Volume:

(Not Including Pretreatment Volume)

Permanent Pool Volume = (WQ_v - Forebay Volume) * 20%

= 3,288 ft^3

Permanent Pool Volume Provided = 13380 ft^3

Total Water Quality Volume WQv Provided = 18391 ft^3 **

** Total WQv Provided accounts for 100% of Water Quality Volume Required

Step 4: Calculate Stream Channel Protection Volume (Cp_v):

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

Cp_v = 1.671 acre-feet

Step 5: Calculate Stream Channel Protection Volume (Cp_v) Release Rate:

Release Cp_v over a 24 hour period:

(Cp_v acre-feet * 43560 ft^2 / acre) / (24 hours * 3600 sec / hour)

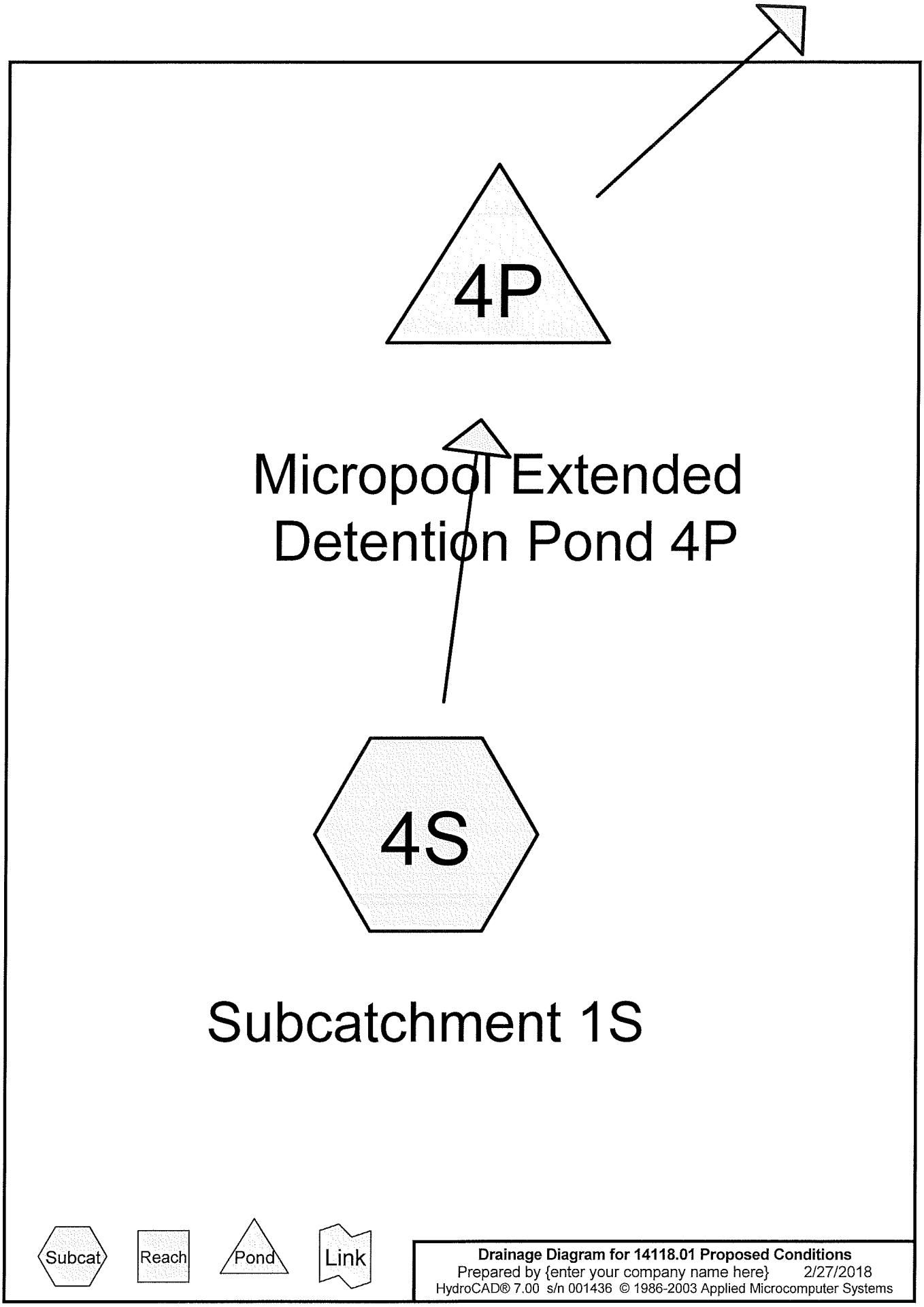
Release Rate = 0.84 ft^3 / sec

Baroda Cluster Subdivision

Micropool Extended Detention Pond (P-1) Design (Pond 4P)

Total Water Quality Volume (WQv) Provided by Micropool Extended Detention Pond 4P

Total MED Pond 4P WQv =	18,391	ft^3
=	0.422	acre-feet



Drainage Diagram for 14118.01 Proposed Conditions
Prepared by {enter your company name here} 2/27/2018

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 4S: Subcatchment 1S Runoff Area=18.230 ac Runoff Depth=0.27"
Flow Length=2,116' Tc=8.5 min CN=82 Runoff=4.28 cfs 0.412 af

Pond 4P: Micropool Extended Detention Po Peak Elev=476.81' Storage=8,515 cf Inflow=4.28 cfs 0.412 af
Primary=0.35 cfs 0.302 af Secondary=0.00 cfs 0.000 af Outflow=0.35 cfs 0.302 af

Total Runoff Area = 18.230 ac Runoff Volume = 0.412 af Average Runoff Depth = 0.27"

Subcatchment 4S: Subcatchment 1S

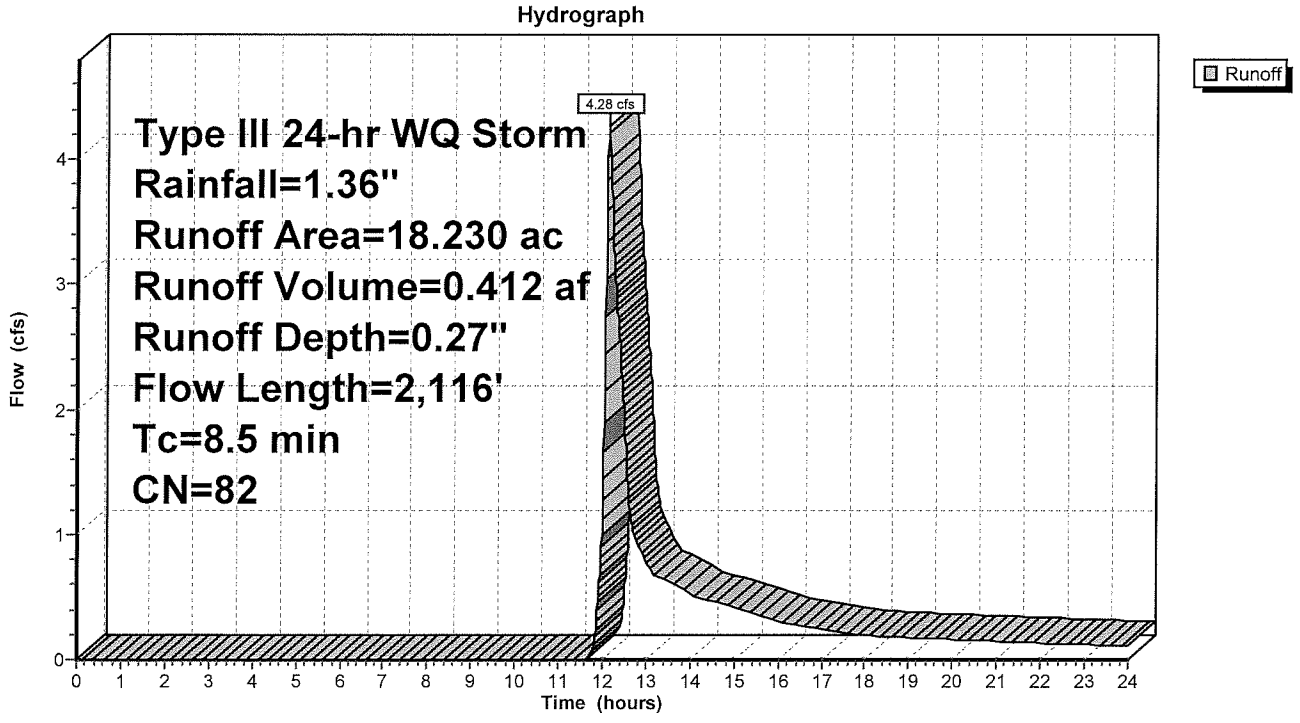
Runoff = 4.28 cfs @ 12.14 hrs, Volume= 0.412 af, Depth= 0.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr WQ Storm Rainfall=1.36"

Area (ac)	CN	Description
2.390	98	Paved parking & roofs (Proposed)
0.170	91	Gravel roads, HSG D
0.110	77	Woods, Good, HSG D
0.110	74	>75% Grass cover, Good, HSG C
15.450	80	>75% Grass cover, Good, HSG D
18.230	82	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	100	0.1192	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.21"
2.2	624	0.0825	4.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.5	1,392	0.0517	16.0	28.23	**Circular Channel (pipe),** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011
8.5	2,116	Total			

Subcatchment 4S: Subcatchment 1S



Pond 4P: Micropool Extended Detention Pond 4P

Inflow Area = 18.230 ac, Inflow Depth = 0.27" for WQ Storm event
Inflow = 4.28 cfs @ 12.14 hrs, Volume= 0.412 af
Outflow = 0.35 cfs @ 15.61 hrs, Volume= 0.302 af, Atten= 92%, Lag= 208.1 min
Primary = 0.35 cfs @ 15.61 hrs, Volume= 0.302 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 476.81' @ 15.61 hrs Surf.Area= 0 sf Storage= 8,515 cf
Plug-Flow detention time= 279.7 min calculated for 0.302 af (73% of inflow)
Center-of-Mass det. time= 178.7 min (1,070.9 - 892.2)

#	Invert	Avail.Storage	Storage Description
1	476.00'	87,964 cf	**Custom Stage Data** Listed below

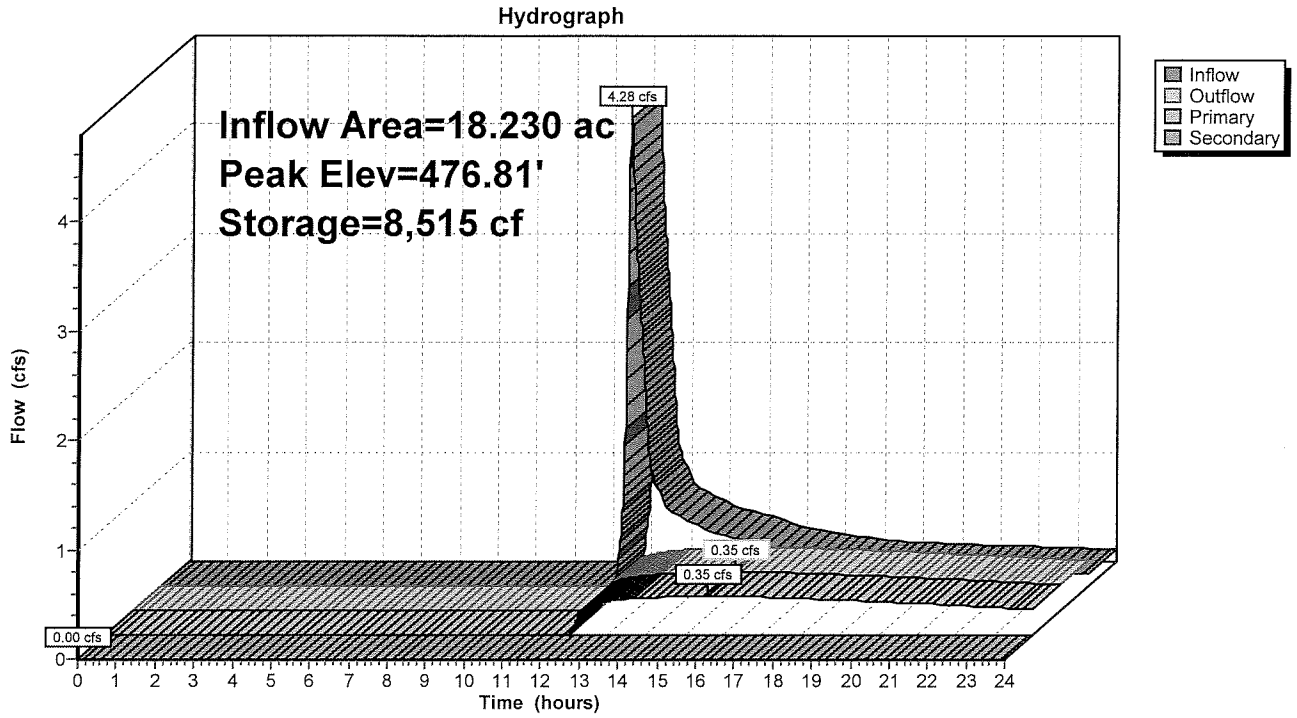
Elevation (feet)	Cum.Store (cubic-feet)
476.00	0
478.00	20,928
480.00	49,897
482.00	87,964

#	Routing	Invert	Outlet Devices
1	Primary	476.00'	**30.0" x 41.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 475.59' S= 0.0100 '/' n= 0.010 Cc= 0.900
2	Device 1	476.00'	**4.1" Vert. Orifice/Grate** C= 0.600
3	Device 1	479.75'	**3.50' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600
4	Secondary	480.00'	**30.0' long x 16.0' 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 @ 15.61 hrs HW=476.81' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert** (Passes 0.35 cfs of 4.16 cfs potential flow)
↑—**2=Orifice/Grate** (Orifice Controls 0.35 cfs @ 3.9 fps)
—**3=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=476.00' TW=0.00' (Dynamic Tailwater)
↑—**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Micropool Extended Detention Pond 4P



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 4S: Subcatchment 1S Runoff Area=18.230 ac Runoff Depth=1.10"
Flow Length=2,116' Tc=8.5 min CN=82 Runoff=21.25 cfs 1.671 af

Pond 4P: Micropool Extended Detention P Peak Elev=479.75' Storage=46,303 cf Inflow=21.25 cfs 1.671 af
Primary=0.84 cfs 0.803 af Secondary=0.00 cfs 0.000 af Outflow=0.84 cfs 0.803 af

Total Runoff Area = 18.230 ac Runoff Volume = 1.671 af Average Runoff Depth = 1.10"

Subcatchment 4S: Subcatchment 1S

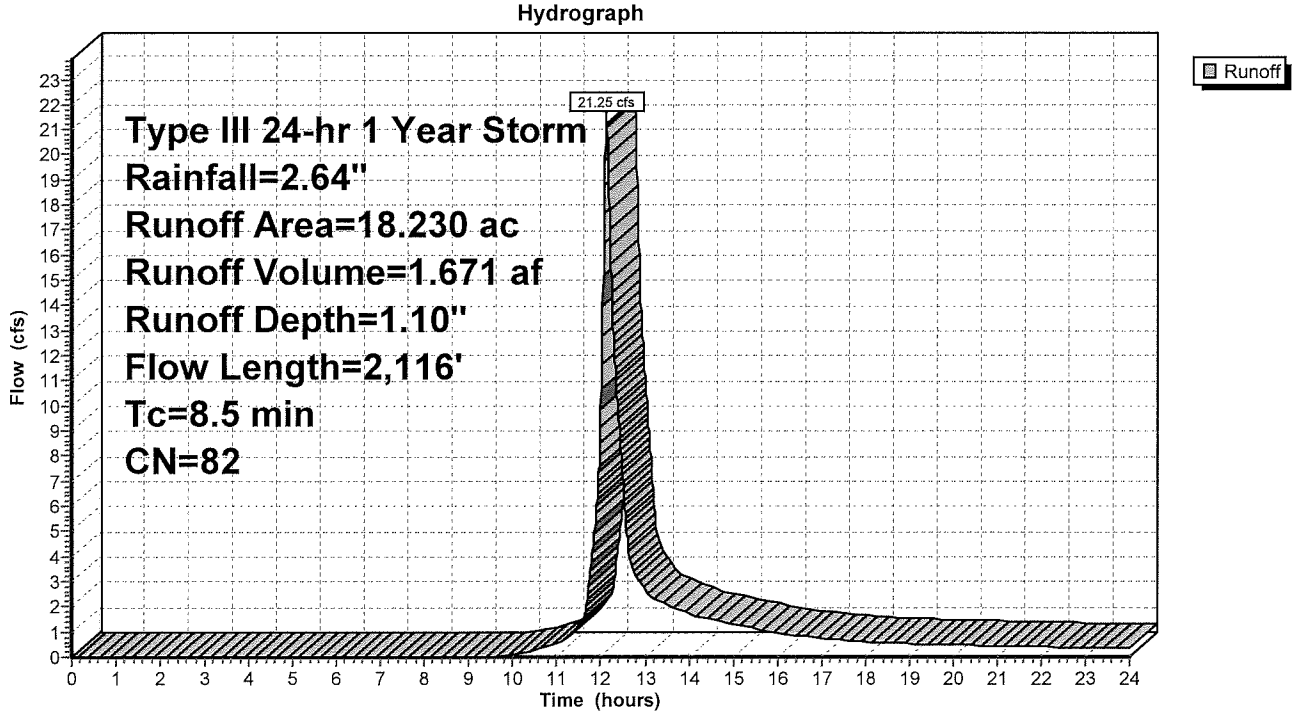
Runoff = 21.25 cfs @ 12.12 hrs, Volume= 1.671 af, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 Year Storm Rainfall=2.64"

Area (ac)	CN	Description
2.390	98	Paved parking & roofs (Proposed)
0.170	91	Gravel roads, HSG D
0.110	77	Woods, Good, HSG D
0.110	74	>75% Grass cover, Good, HSG C
15.450	80	>75% Grass cover, Good, HSG D
18.230	82	Weighted Average

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	100	0.1192	0.3		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.21"
2.2	624	0.0825	4.6		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.5	1,392	0.0517	16.0	28.23	**Circular Channel (pipe),** Diam= 18.0" Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011
8.5	2,116	Total			

Subcatchment 4S: Subcatchment 1S



Pond 4P: Micropool Extended Detention Pond 4P

Inflow Area = 18.230 ac, Inflow Depth = 1.10" for 1 Year Storm event
Inflow = 21.25 cfs @ 12.12 hrs, Volume= 1.671 af
Outflow = 0.84 cfs @ 16.51 hrs, Volume= 0.803 af, Atten= 96%, Lag= 262.9 min
Primary = 0.84 cfs @ 16.51 hrs, Volume= 0.803 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 479.75' @ 16.51 hrs Surf.Area= 0 sf Storage= 46,303 cf
Plug-Flow detention time= 353.4 min calculated for 0.803 af (48% of inflow)
Center-of-Mass det. time= 230.0 min (1,077.2 - 847.2)

#	Invert	Avail.Storage	Storage Description
1	476.00'	87,964 cf	**Custom Stage Data** Listed below

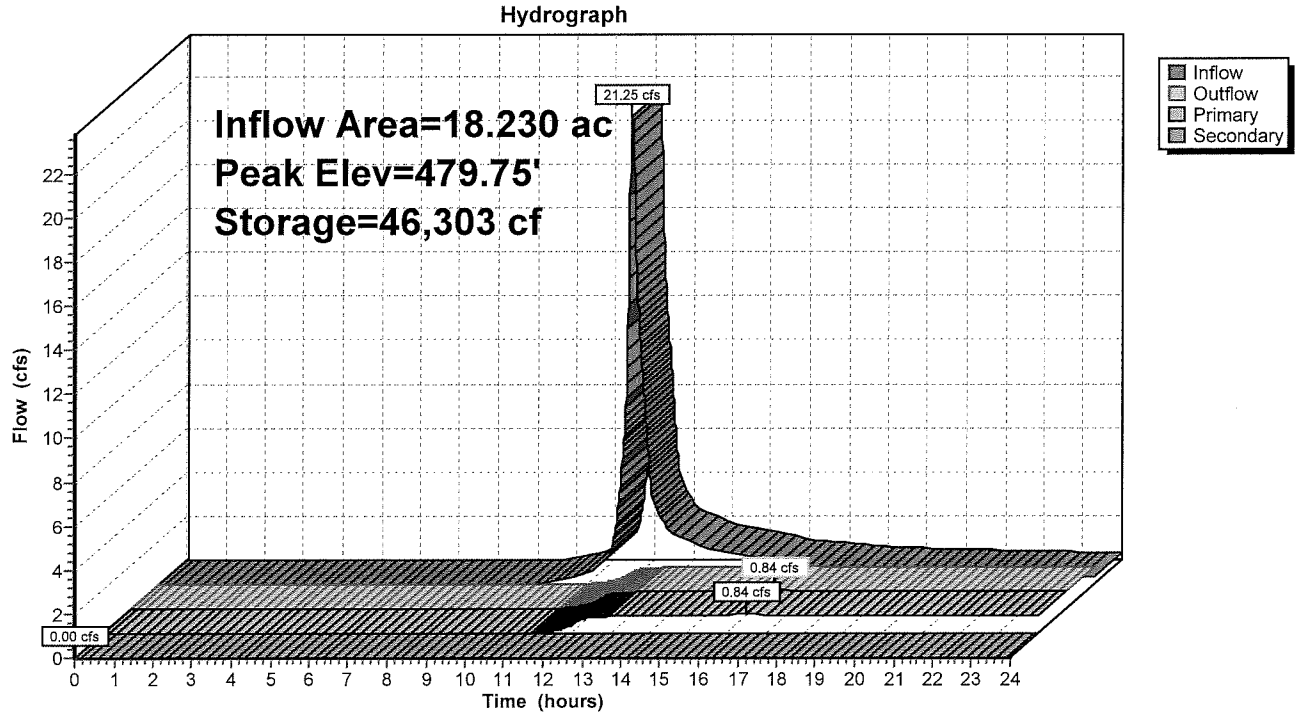
Elevation (feet)	Cum.Store (cubic-feet)
476.00	0
478.00	20,928
480.00	49,897
482.00	87,964

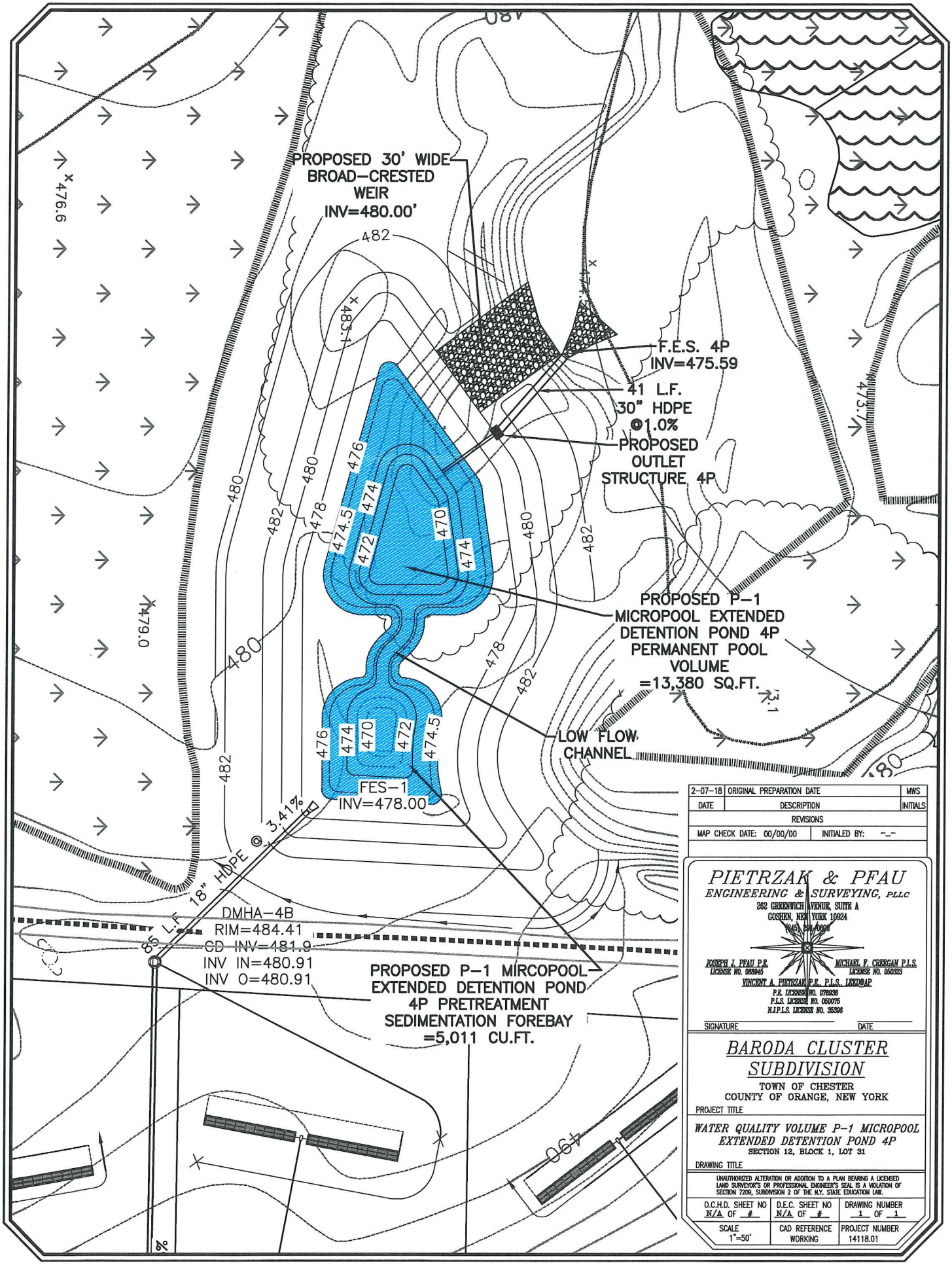
#	Routing	Invert	Outlet Devices
1	Primary	476.00'	**30.0" x 41.0' long Culvert** CPP, square edge headwall, Ke= 0.500 Outlet Invert= 475.59' S= 0.0100 '/' n= 0.010 Cc= 0.900
2	Device 1	476.00'	**4.1" Vert. Orifice/Grate** C= 0.600
3	Device 1	479.75'	**3.50' x 2.00' Horiz. Orifice/Grate** Limited to weir flow C= 0.600
4	Secondary	480.00'	**30.0' long x 16.0' 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=0.84 cfs @ 16.51 hrs HW=479.75' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.84 cfs of 37.38 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.84 cfs @ 9.1 fps)
  └**3=Orifice/Grate** (Weir Controls 0.00 cfs @ 0.1 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=476.00' TW=0.00' (Dynamic Tailwater)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: Micropool Extended Detention Pond 4P





2-07-18	ORIGINAL PREPARATION DATE	MWS
DATE	DESCRIPTION	INITIALS
	REVISIONS	
MAP CHECK DATE: 00/00/00	INITIALED BY: -.-	

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SIGNATURE DATE

BARODA CLUSTER SUBDIVISION

TOWN OF CHESTER
COUNTY OF ORANGE, NEW YORK

PROJECT TITLE

WATER QUALITY VOLUME P-1 MICROPOOL EXTENDED DETENTION POND 4P
SECTION 12, BLOCK 1, LOT 31

DRAWING TITLE

O.C.H.D. SHEET NO N/A OF #	D.E.C. SHEET NO N/A OF #	DRAWING NUMBER 1 OF 1
SCALE 1"=50'	CAD REFERENCE WORKING	PROJECT NUMBER 14118.01

Appendix 10

Soil Restoration

5.1.6 Soil Restoration

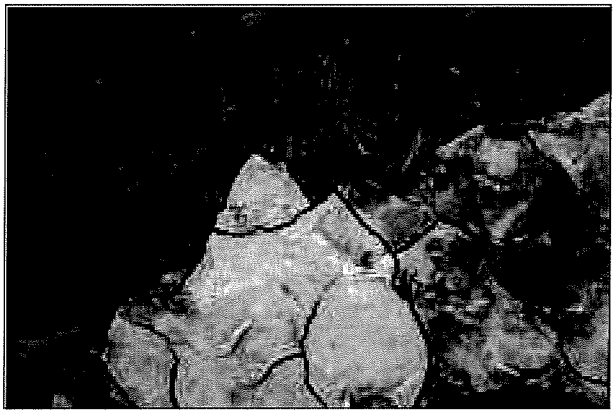
Description

Soil Restoration is a required practice applied across areas of a development site where soils have been disturbed and will be vegetated in order to recover the original properties and porosity of the soil. Healthy soil is vital to a sustainable environment and landscape. A deep, well drained soil, rich in organic matter, absorbs rainwater, helps prevent flooding and soil erosion, filters out water pollutants, and promotes vigorous plant growth that requires less irrigation, pesticides, and fertilizer.

Soil Restoration is applied in the cleanup, restoration, and landscaping phase of construction followed by the permanent establishment of an appropriate, deep-rooted groundcover to help maintain the restored soil structure. Soil restoration includes mechanical decompaction, compost amendment, or both.

Many runoff reduction practices need Soil Restoration measures applied over and adjacent to the practice to achieve runoff reduction performance. (See typical compacted soil in Figure 5.15). Consult individual profile sheets for specific design criteria.

Figure 5.14 Shows typical compacted soils that nearly reach the bulk density of concrete (Schueler et al 2000)



Key Benefits

- More marketable buildings and landscapes
- Less stormwater runoff, better water quality
- Healthier, aesthetically pleasing landscapes
- Increased porosity on redevelopment sites where impervious cover is converted to pervious
- Achieves performance standards on runoff reduction practices
- Decreases runoff volume generated and lowers the demand on runoff control structures
- Enhances direct groundwater recharge
- Promotes successful long-term revegetation by restoring soil organic matter, permeability, drainage and water holding capacity for healthy root system development of trees, shrubs and deep-rooted ground covers, minimizing lawn chemical requirements, plant drowning during wet periods, and burnout during dry periods

Typical Perceived Obstacles and Realities

- Higher cost due to soil restoration- *application of soil de-compaction and enhancement may have additional initial cost; however, they provide benefit in reducing the need for conveyance structures.*

- Space constraints and obstruction for use of equipment - *post construction space may limit the ability of some of the de-compaction equipment, however, alternative equipment and sensible planning help overcome this obstacle.*

Discussion

Tilling exposes compacted soil devoid of oxygen to air and recreates temporary air space. In addition, research has shown that the incorporation of organic compost, can greatly improve temporary water storage in the soil and subsequent runoff reduction through infiltration and evapotranspiration.

Soils that have a permanent high water table close to the surface (0-12 inches), either influenced by a clay or other highly impervious layer of material, may have bulk densities so naturally high that compaction has little added impact on infiltration (Lacey 2008). However, these soils will still benefit from the addition of compost. The water holding capacity, penetration, structural stability, and fertility of clay soils were improved with compost mixing (Avnimelech and Cohen 1988).

Table 5.3 describes various soil disturbance activities related to land development, soil types and the requirements for soil restoration for each activity. Soil Restoration or modification of curve numbers is a required practice. Restoration is applied across areas of a development site where soils have been compacted and will be vegetated according to the criteria defined in Table 5.3. If Soil Restoration is not applied according to these criteria, designers are required to:

a) Increase the calculated WQv by factoring in the compacted areas that have not been kept as impervious cover (including areas of cut or fill, heavy traffic areas on site, or Impervious Cover reduction in redevelopment projects unless aeration or full soil restoration is applied, per Table 5.3).

b) Change by one level the post-construction hydrologic soil group (HSG) to a less permeable group than the original condition. This is applied to all volumetric and discharge rate control computations.

Table 5.3 Soil Restoration Requirements			
Type of Soil Disturbance	**Soil Restoration Requirement**		**Comments/Examples**
No soil disturbance	Restoration not permitted		Preservation of Natural Features
Minimal soil disturbance	Restoration not required		Clearing and grubbing
Areas where topsoil is stripped only - no change in grade	HSG A &B	HSG C&D	Protect area from any ongoing construction activities.
	apply 6 inches of topsoil	Aerate* and apply 6 inches of topsoil	
Areas of cut or fill	HSG A &B	HSG C & D	
	Aerate and apply 6 inches of topsoil	Apply full Soil Restoration **	
Heavy traffic areas on site (especially in a zone 5-25 feet around buildings but not within a 5 foot perimeter around foundation walls)	Apply full Soil Restoration (de-compaction and compost enhancement)		
Areas where Runoff Reduction and/or Infiltration practices are applied	Restoration not required, but may be applied to enhance the reduction specified for appropriate practices.		Keep construction equipment from crossing these areas. To protect newly installed practice from any ongoing construction activities construct a single phase operation fence area
Redevelopment projects	Soil Restoration is required on redevelopment projects in areas where existing impervious area will be converted to pervious area.		

*Aeration includes the use of machines such as tractor-drawn implements with coulters making a narrow slit in the soil, a roller with many spikes making indentations in the soil, or prongs which function like a mini-subsoiler.

** Per "Deep Ripping and De-compaction, DEC 2008".

Using this Practice

During periods of relatively low to moderate subsoil moisture, the disturbed subsoils are returned to rough grade and the following Soil Restoration steps applied:

1) Apply 3 inches of compost over subsoil

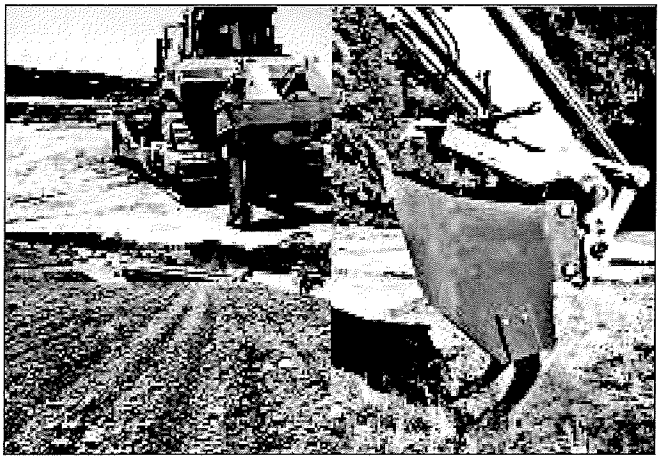
2) Till compost into subsoil to a depth of at least 12 inches using a cat-mounted ripper, tractor-mounted disc, or tiller, mixing, and circulating air and compost into subsoils

3) Rock-pick until uplifted stone/rock materials of four inches and larger size are cleaned off the site

4) Apply topsoil to a depth of 6 inches

5) Vegetate as required by approved plan.

Figure 5.15 Soil aerator implement



At the end of the project an inspector should be able to push a 3/8" metal bar 12 inches into the soil just with body weight. Figures 5.16 and 5.17 show two attachments used for soil decompaction. Tilling (step 2 above) should not be performed within the drip line of any existing trees or over utility installations that are within 24 inches of the surface.

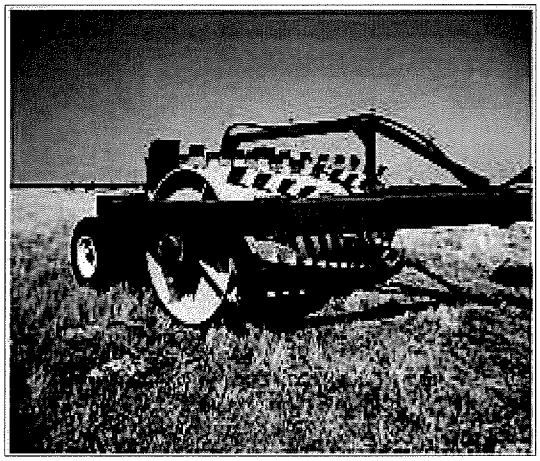
COMPOST SPECIFICATIONS

Compost shall be aged, from plant derived materials, free of viable weed seeds, have no visible free water or dust produced when handling, pass through a half inch screen and have a pH suitable to grow desired plants.

Maintenance

A simple maintenance agreement should identify where Soil Restoration is applied, where newly restored areas are/cannot be cleared, who the responsible parties are to ensure that routine vegetation improvements are made (i.e., thinning, invasive plant removal, etc.). Soil compost amendments within a filter strip or grass channel should be located in public right of way, or within a dedicated stormwater or drainage easement.

Figure 5.16 Soil aerator implement



First year maintenance operations includes:

- Initial inspections for the first six months (once after each storm greater than half- inch)

- Reseeding to repair bare or eroding areas to assure grass stabilization
- Water once every three days for first month, and then provide a half inch of water per week during first year. Irrigation plan may be adjusted according to the rain event.
- Fertilization may be needed in the fall after the first growing season to increase plant vigor
- Ongoing Maintenance:

  Two points help ensure lasting results of decompaction:

  1) Planting the appropriate ground cover with deep roots to maintain the soil structure
  2) Keeping the site free of vehicular and foot traffic or other weight loads. Consider pedestrian footpaths. (Sometimes it may be necessary to de-thatch the turf every few years)

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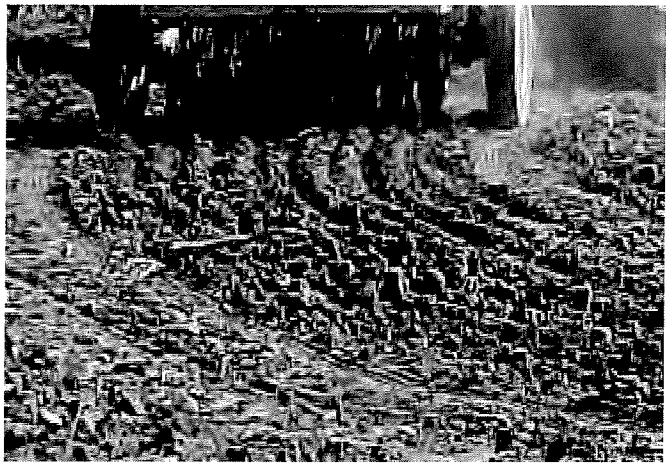
STANDARD AND SPECIFICATIONS FOR SOIL RESTORATION



Definition & Scope

The decompaction of areas of a development site or construction project where soils have been disturbed to recover the original properties and porosity of the soil; thus providing a sustainable growth medium for vegetation, reduction of runoff and filtering of pollutants from stormwater runoff.

Conditions Where Practice Applies

Soil restoration is to be applied to areas whose heavy construction traffic is done and final stabilization is to begin. This is generally applied in the cleanup, site restoration, and landscaping phase of construction followed by the permanent establishment of an appropriate ground cover to maintain the soil structure. Soil restoration measures should be applied over and adjacent to any runoff reduction practices to achieve design performance.

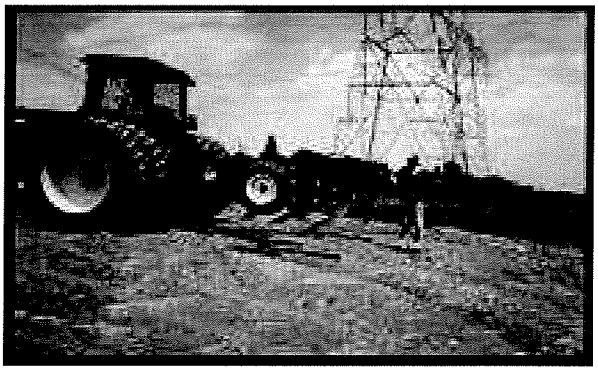
Design Criteria

1. Soil restoration areas will be designated on the plan views of areas to be disturbed.
2. Soil restoration will be completed in accordance with Table 4.6 on page 4.53.

Specification for Full Soil Restoration

During periods of relatively low to moderate subsoil moisture, the disturbed subsoils are returned to rough grade and the following Soil Restoration steps applied:

1. Apply 3 inches of compost over subsoil. The compost shall be well decomposed (matured at least 3 months), weed-free, organic matter. It shall be aerobically composted, possess no objectionable odors, and contain less than 1%, by dry weight, of man-made foreign matter. The physical parameters of the compost shall meet the standards listed in Table 5.2 - Compost Standards Table, except for "Particle Size" 100% will pass the 1/2" sieve. **Note: All biosolids compost produced in New York State (or approved for importation) must meet NYS DEC's 6 NYCRR Part 360 (Solid Waste Management Facilities) requirements. The Part 360 requirements are equal to or more stringent than 40 CFR Part 503 which ensure safe standards for pathogen reduction and heavy metals content.**



2. Till compost into subsoil to a depth of at least 12 inches using a cat-mounted ripper, tractor mounted disc, or tiller, to mix and circulate air and compost into the subsoil.
3. Rock-pick until uplifted stone/rock materials of four inches and larger size are cleaned off the site.
4. Apply topsoil to a depth of 6 inches.
5. Vegetate as required by the seeding plan. Use appropriate ground cover with deep roots to maintain the soil structure.
6. Topsoil may be manufactured as a mixture or a mineral component and organic material such as compost.

At the end of the project an inspector should be able to push a 3/8" metal bar 12 inches into the soil just with body weight. This should not be performed within the drip line of any existing trees or over utility installations that are within 24 inches of the surface.

Maintenance

Keep the site free of vehicular and foot traffic or other weight loads. Consider pedestrian footpaths.

Table 4.6
Soil Restoration Requirements

Type of Soil Disturbance	Soil Restoration Requirement		Comments/Examples
No soil disturbance	Restoration not permitted		Preservation of Natural Features
Minimal soil disturbance	Restoration not required		Clearing and grubbing
Areas where topsoil is stripped only - no change in grade	HSG A&B	HSG C&D	Protect area from any ongoing construction activities.
	Apply 6 inches of topsoil	Aerate* and apply 6 inches of topsoil	
Areas of cut or fill	HSG A&B	HSG C&D	
	Aerate* and apply 6 inches of topsoil	Apply full Soil Restoration**	
Heavy traffic areas on site (especially in a zone 5-25 feet around buildings but not within a 5 foot perimeter around foundation walls)	Apply full Soil Restoration (decompaction and compost enhancement)		
Areas where Runoff Reduction and/or Infiltration practices are applied	Restoration not required, but may be applied to enhance the reduction specified for appropriate practices.		Keep construction equipment from crossing these areas. To protect newly installed practice from any ongoing construction activities construct a single phase operation fence area
Redevelopment projects	Soil Restoration is required on redevelopment projects in areas where existing impervious area will be converted to pervious area.		

* Aeration includes the use of machines such as tractor-drawn implements with coulters making a narrow slit in the soil, a roller with many spikes making indentations in the soil, or prongs which function like a mini-subsoiler.
** Per "Deep Ripping and De-compaction, DEC 2008".

Appendix 11

State Pollutant Discharge Elimination System for Construction Activities

Construction Site Log Book

APPENDIX F
CONSTRUCTION SITE INSPECTION AND MAINTENANCE LOG BOOK

STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM FOR CONSTRUCTION ACTIVITIES

SAMPLE CONSTRUCTION SITE LOG BOOK

Table of Contents

I. PRE-CONSTRUCTION MEETING DOCUMENTS

Project Name _____

Permit No. _____ **Date of Authorization** _____

Name of Operator _____

Prime Contractor _____

a. Preamble to Site Assessment and Inspections

The Following Information To Be Read By All Person's Involved in The Construction of Stormwater Related Activities:

The Operator agrees to have a qualified inspector[1] conduct an assessment of the site prior to the commencement of construction[2] and certify in this inspection report that the appropriate erosion and sediment controls described in the SWPPP have been adequately installed or implemented to ensure overall preparedness of the site for the commencement of construction.

Prior to the commencement of construction, the Operator shall certify in this site logbook that the SWPPP has been prepared in accordance with the State's standards and meets all Federal, State and local erosion and sediment control requirements. A preconstruction meeting should be held to review all of the SWPPP requirements with construction personnel.

When construction starts, site inspections shall be conducted by the qualified inspector at least every 7 calendar days. The Operator shall maintain a record of all inspection reports in this site logbook. The site logbook shall be maintained on site and be made available to the permitting authorities upon request.

Prior to filing the Notice of Termination or the end of permit term, the Operator shall have a qualified inspector perform a final site inspection. The qualified inspector shall certify that the site has undergone final stabilization[3] using either vegetative or structural stabilization methods and that all temporary erosion and sediment controls (such as silt fencing) not needed for long-term erosion control have been removed. In addition, the Operator must identify and certify that all permanent structures described in the SWPPP have been constructed and provide the owner(s) with an operation and maintenance plan that ensures the structure(s) continuously functions as designed.

1 Refer to "Qualified Inspector" inspection requirements in the current SPDES General Permit for Stormwater Discharges from Construction Activity for complete list of inspection requirements.
2 "Commencement of construction" means the initial removal of vegetation and disturbance of soils associated with clearing, grading or excavating activities or other construction activities.
3 "Final stabilization" means that all soil-disturbing activities at the site have been completed and a uniform, perennial vegetative cover with a density of eighty (80) percent has been established or equivalent stabilization measures (such as the use of mulches or geotextiles) have been employed on all unpaved areas and areas not covered by permanent structures.

b. Pre-construction Site Assessment Checklist
(NOTE: Provide comments below as necessary)

1. Notice of Intent, SWPPP, and Contractors Certification:

Yes No NA

[ ] [ ] [ ] Has a Notice of Intent been filed with the NYS Department of Conservation?
[ ] [ ] [ ] Is the SWPPP on-site? Where?_____
[ ] [ ] [ ] Is the Plan current? What is the latest revision date?_____
[ ] [ ] [ ] Is a copy of the NOI (with brief description) onsite? Where?_____
[ ] [ ] [ ] Have all contractors involved with stormwater related activities signed a contractor's certification?

2. Resource Protection

Yes No NA

[ ] [ ] [ ] Are construction limits clearly flagged or fenced?
[ ] [ ] [ ] Important trees and associated rooting zones, on-site septic system absorption fields, existing vegetated areas suitable for filter strips, especially in perimeter areas, have been flagged for protection.
[ ] [ ] [ ] Creek crossings installed prior to land-disturbing activity, including clearing and blasting.

3. Surface Water Protection

Yes No NA

[ ] [ ] [ ] Clean stormwater runoff has been diverted from areas to be disturbed.
[ ] [ ] [ ] Bodies of water located either on site or in the vicinity of the site have been identified and protected.
[ ] [ ] [ ] Appropriate practices to protect on-site or downstream surface water are installed.
[ ] [ ] [ ] Are clearing and grading operations divided into areas <5 acres?

4. Stabilized Construction Access

Yes No NA

[ ] [ ] [ ] A temporary construction entrance to capture mud and debris from construction vehicles before they enter the public highway has been installed.
[ ] [ ] [ ] Other access areas (entrances, construction routes, equipment parking areas) are stabilized immediately as work takes place with gravel or other cover.
[ ] [ ] [ ] Sediment tracked onto public streets is removed or cleaned on a regular basis.

5. Sediment Controls

Yes No NA

[ ] [ ] [ ] Silt fence material and installation comply with the standard drawing and specifications.
[ ] [ ] [ ] Silt fences are installed at appropriate spacing intervals
[ ] [ ] [ ] Sediment/detention basin was installed as first land disturbing activity.
[ ] [ ] [ ] Sediment traps and barriers are installed.

6. Pollution Prevention for Waste and Hazardous Materials

Yes No NA

[ ] [ ] [ ] The Operator or designated representative has been assigned to implement the spill prevention avoidance and response plan.
[ ] [ ] [ ] The plan is contained in the SWPPP on page _____
[ ] [ ] [ ] Appropriate materials to control spills are onsite. Where? _____

II. CONSTRUCTION DURATION INSPECTIONS

a. **Directions:**

Inspection Forms will be filled out during the entire construction phase of the project.

Required Elements:

1) On a site map, indicate the extent of all disturbed site areas and drainage pathways. Indicate site areas that are expected to undergo initial disturbance or significant site work within the next 14-day period;

2) Indicate on a site map all areas of the site that have undergone temporary or permanent stabilization;

3) Indicate all disturbed site areas that have not undergone active site work during the previous 14-day period;

4) Inspect all sediment control practices and record the approximate degree of sediment accumulation as a percentage of sediment storage volume (for example, 10 percent, 20 percent, 50 percent);

5) Inspect all erosion and sediment control practices and record all maintenance requirements such as verifying the integrity of barrier or diversion systems (earthen berms or silt fencing) and containment systems (sediment basins and sediment traps). Identify any evidence of rill or gully erosion occurring on slopes and any loss of stabilizing vegetation or seeding/mulching. Document any excessive deposition of sediment or ponding water along barrier or diversion systems. Record the depth of sediment within containment structures, any erosion near outlet and overflow structures, and verify the ability of rock filters around perforated riser pipes to pass water; and

6) Immediately report to the Operator any deficiencies that are identified with the implementation of the SWPPP.

SITE PLAN/SKETCH

Inspector (print name)	**Date of Inspection**
Qualified Inspector (print name)	**Qualified Inspector Signature**

The above signed acknowledges that, to the best of his/her knowledge, all information provided on the forms is accurate and complete.

Maintaining Water Quality

Yes No NA

[ ] [ ] [ ] Is there an increase in turbidity causing a substantial visible contrast to natural conditions at the outfalls?
[ ] [ ] [ ] Is there residue from oil and floating substances, visible oil film, or globules or grease at the outfalls?
[ ] [ ] [ ] All disturbance is within the limits of the approved plans.
[ ] [ ] [ ] Have receiving lake/bay, stream, and/or wetland been impacted by silt from project?

Housekeeping

1. General Site Conditions

Yes No NA

[ ] [ ] [ ] Is construction site litter, debris and spoils appropriately managed?
[ ] [ ] [ ] Are facilities and equipment necessary for implementation of erosion and sediment control in working order and/or properly maintained?
[ ] [ ] [ ] Is construction impacting the adjacent property?
[ ] [ ] [ ] Is dust adequately controlled?

2. Temporary Stream Crossing

Yes No NA

[ ] [ ] [ ] Maximum diameter pipes necessary to span creek without dredging are installed.
[ ] [ ] [ ] Installed non-woven geotextile fabric beneath approaches.
[ ] [ ] [ ] Is fill composed of aggregate (no earth or soil)?
[ ] [ ] [ ] Rock on approaches is clean enough to remove mud from vehicles & prevent sediment from entering stream during high flow.

3. Stabilized Construction Access

Yes No NA

[ ] [ ] [ ] Stone is clean enough to effectively remove mud from vehicles.
[ ] [ ] [ ] Installed per standards and specifications?
[ ] [ ] [ ] Does all traffic use the stabilized entrance to enter and leave site?
[ ] [ ] [ ] Is adequate drainage provided to prevent ponding at entrance?

Runoff Control Practices

1. Excavation Dewatering

Yes No NA

[ ] [ ] [ ] Upstream and downstream berms (sandbags, inflatable dams, etc.) are installed per plan.
[ ] [ ] [ ] Clean water from upstream pool is being pumped to the downstream pool.
[ ] [ ] [ ] Sediment laden water from work area is being discharged to a silt-trapping device.
[ ] [ ] [ ] Constructed upstream berm with one-foot minimum freeboard.

Runoff Control Practices (continued)

2. Flow Spreader

Yes No NA

[ ] [ ] [ ] Installed per plan.
[ ] [ ] [ ] Constructed on undisturbed soil, not on fill, receiving only clear, non-sediment laden flow.
[ ] [ ] [ ] Flow sheets out of level spreader without erosion on downstream edge.

3. Interceptor Dikes and Swales

Yes No NA

[ ] [ ] [ ] Installed per plan with minimum side slopes 2H:1V or flatter.
[ ] [ ] [ ] Stabilized by geotextile fabric, seed, or mulch with no erosion occurring.
[ ] [ ] [ ] Sediment-laden runoff directed to sediment trapping structure

4. Stone Check Dam

Yes No NA

[ ] [ ] [ ] Is channel stable? (flow is not eroding soil underneath or around the structure).
[ ] [ ] [ ] Check is in good condition (rocks in place and no permanent pools behind the structure).
[ ] [ ] [ ] Has accumulated sediment been removed?.

5. Rock Outlet Protection

Yes No NA

[ ] [ ] [ ] Installed per plan.
[ ] [ ] [ ] Installed concurrently with pipe installation.

Soil Stabilization

1. Topsoil and Spoil Stockpiles

Yes No NA

[ ] [ ] [ ] Stockpiles are stabilized with vegetation and/or mulch.
[ ] [ ] [ ] Sediment control is installed at the toe of the slope.

2. Revegetation

Yes No NA

[ ] [ ] [ ] Temporary seedings and mulch have been applied to idle areas.
[ ] [ ] [ ] 4 inches minimum of topsoil has been applied under permanent seedings

Sediment Control Practices

1. Silt Fence and Linear Barriers

Yes No NA

[ ] [ ] [ ] Installed on Contour, 10 feet from toe of slope (not across conveyance channels).
[ ] [ ] [ ] Joints constructed by wrapping the two ends together for continuous support.
[ ] [ ] [ ] Fabric buried 6 inches minimum.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.
Sediment accumulation is ___% of design capacity.

Sediment Control Practices (continued)

2. Storm Drain Inlet Protection (Use for Stone & Block; Filter Fabric; Curb; or, Excavated; Filter Sock or Manufactured practices)

Yes No NA

[ ] [ ] [ ] Installed concrete blocks lengthwise so open ends face outward, not upward.
[ ] [ ] [ ] Placed wire screen between No. 3 crushed stone and concrete blocks.
[ ] [ ] [ ] Drainage area is 1acre or less.
[ ] [ ] [ ] Excavated area is 900 cubic feet.
[ ] [ ] [ ] Excavated side slopes should be 2:1.
[ ] [ ] [ ] 2" x 4" frame is constructed and structurally sound.
[ ] [ ] [ ] Posts 3-foot maximum spacing between posts.
[ ] [ ] [ ] Fabric is embedded 1 to 1.5 feet below ground and secured to frame/posts with staples at max 8-inch spacing.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.
[ ] [ ] [ ] Manufactured insert fabric is free of tears and punctures.
[ ] [ ] [ ] Filter Sock is not torn or flattened and fill material is contained within the mesh sock.

Sediment accumulation ___% of design capacity.

3. Temporary Sediment Trap

Yes No NA

[ ] [ ] [ ] Outlet structure is constructed per the approved plan or drawing.
[ ] [ ] [ ] Geotextile fabric has been placed beneath rock fill.
[ ] [ ] [ ] Sediment trap slopes and disturbed areas are stabilized.

Sediment accumulation is ___% of design capacity.

4. Temporary Sediment Basin

Yes No NA

[ ] [ ] [ ] Basin and outlet structure constructed per the approved plan.
[ ] [ ] [ ] Basin side slopes are stabilized with seed/mulch.
[ ] [ ] [ ] Drainage structure flushed and basin surface restored upon removal of sediment basin facility.
[ ] [ ] [ ] Sediment basin dewatering pool is dewatering at appropriate rate.

Sediment accumulation is ___% of design capacity.

Note: Not all erosion and sediment control practices are included in this listing. Add additional pages to this list as required by site specific design. All practices shall be maintained in accordance with their respective standards.

Construction inspection checklists for post-development stormwater management practices can be found in Appendix F of the New York Stormwater Management Design Manual.

CONSTRUCTION DURATION INSPECTIONS

b. Modifications to the SWPPP (To be completed as described below)

The Operator shall amend the SWPPP whenever:

1. There is a significant change in design, construction, operation, or maintenance which may have a significant effect on the potential for the discharge of pollutants to the waters of the United States and which has not otherwise been addressed in the SWPPP; or
2. The SWPPP proves to be ineffective in:
   a. Eliminating or significantly minimizing pollutants from sources identified in the SWPPP and as required by this permit; or
   b. Achieving the general objectives of controlling pollutants in stormwater discharges from permitted construction activity; and
3. Additionally, the SWPPP shall be amended to identify any new contractor or subcontractor that will implement any measure of the SWPPP.

Modification & Reason: